Biology and growth habits of giant reed (Arundo donax).

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Background:

More than 95% of the historic riparian habitat in the southern part of the state has been lost to agriculture, development, flood control, and other human-caused impacts. The greatest threat today to the remaining riparian corridors is the invasion of exotic plant species, primarily giant reed *(Arundo donax.* Giant reed readily invades riparian channels, especially in disturbed areas, is very competitive, difficult to control, and to the best of our knowledge does not provide either food or nesting habitat for native animals The reed does compete with native species such as willows, mulefat, and cottonwoods which provide nesting habitat for least Bell's vireo, willow flycatcher and other native species.

Ecological value of native riparian systems:

Cottonwood/willow riparian forest is a dynamic community, dependent upon periodic flooding to provide substrate, nutrients, and to cycle the community back to earlier successional stages (Figure l). Periodic floods of large magnitude, and migration of the river channel, are essential to laying down fresh alluvial deposits where seeds of mulefat, willow and cottonwood can germinate and propagules of willow can take root.

Adequate moisture and an absence of heavy flooding is particularly critical to the survival of the young trees through their first year. As these seedlings mature the river continues to deposit sediment on the floodplain. This sediment deposition builds the river terraces and, as they are elevated, other plant species colonize resulting in further diversification in the floodplain community.

When cottonwood/willow riparian scrub, which may include such species as mulefat, California grape, California blackberry *(Rubus ursinus),* and creek nettle *(Urtica dioica),* reaches four or five years of age, it begins to exhibit the structural diversity required by breeding least Bell's vireo. Least Bell's vireo, along with willow flycatcher, yellow-breasted chat, yellow warbler, and many other species may continue to use this diverse community for another ten to twenty years. Gradually the canopy of the maturing willows and cottonwoods begins to shade out the diverse understory of vascular plants required by these birds. Older riparian gallery forest will continue to be used by western yellow-billed cuckoo, Cooper's hawk, warbling vireo and other species, but as the stand ages the diversity of the flora and fauna within the forest declines. Annual flooding and occasional large flood events maintain this cycle of succession and therefore maintains a mosaic of diverse natural communities.

Giant reed:

Arundo is a genus of tall perennial reed-like grasses with six species native to warmer parts of the Old World. Giant reed, *Arundo donax*, is the largest member of the genus and is among the largest of the grasses (Poaceae), growing to more than 25 feet tall. Giant reed is native to Europe, and is found in freshwaters in the Mediterranean region. Giant reed was purposefully introduced to California in the 1820's in the Los Angeles area as an erosion- control agent in drainage canals. Giant reed was also used as thatching for roofs of sheds, barns, and other buildings.

Giant reed is a hydrophyte, growing along lakes, streams, drains and other wet sites. It uses prodigious amounts of water to supply its incredible rate of growth. Under optimal conditions giant reed can grow more than three inches per day.

Arundo as a competitor:

Within its introduced range, giant reed is an aggressive competitor. Giant reed flowers in late summer with a large, plumelike panicle. Fortunately for California land managers the seeds produced by *Arundo* in this country are seldom, if ever, fertile. As such, spread, and therefore management, of giant reed is essentially an intra-basin and downstream phenomenon. This species is well adapted to the high disturbance dynamics of riparian systems as it spreads primarily vegetatively. Flood events break up clumps of *Arundo* and spread the pieces downstream. Fragmented stem nodes and rhizomes can take root and establish as new plant clones.

Once established this species tends to form large, continuous, clonal root masses, sometimes covering several acres, usually at the expense of native riparian vegetation which cannot compete with *Arundo.* Giant reed is also highly flammable throughout most of the year, and the plant appears highly adapted to extreme fire events. While fire is a natural and beneficial process in many natural communities in southern California it is a largely unnatural and pervasive threat to riparian areas. Natural wild fires usually occur during rare lightening storm events in late fall, winter, and early spring. Under these conditions the moist green vegetation of riparian areas would normally act as a fire break. Human-caused wild fires, in contrast, often occur during the dry months of the year. Dryer conditions in riparian zones at this time of year make them more vulnerable to fire damage. Because it is extremely flammable, once established within a riparian area giant reed redirects the history of a site by increasing the probability of the occurrence of wildfire, and increasing the intensity of wildfire once it does occur. Giant reed effectively changes riparian forest from a flood-defined to a fire-defined natural community (Figure 2).

Rhizomes respond quickly after fire, sending up new sprouts and quickly outgrowing any native species which might have otherwise taken root in a burned-over site. Fire events thus tend to help push riparian stands in the direction of pure *Arundo donax.* This usually results in significant stands of giant reed with little additional plant species diversity.

Giant reed as habitat - NOT!:

Establishment and success of giant reed within a riparian corridor thus results in a decline in the diversity of native riparian plant species - reed supplants native habitat. All evidence indicates that giant reed does not provide either food or habitat for native species of wildlife. Areas largely taken over by giant reed are therefore depauperate of wildlife. This also means that native flora and fauna do not offer any significant control mechanisms for giant reed. It is uncertain what the natural controlling mechanisms for this species are in the Old World.

Recent studies by SAWPA have indicated that reed also lacks the structure necessary to provide significant shading of bank-edge river habitats, resulting in warmer water than would be found with a native gallery forest of willows. As a result, riverine areas dominated by giant reed tend to have warmer water temperatures and lower diversity of aquatic animals, including fishes. In the Santa Ana River system this lack of streambank structure and shading has been implicated in the reduction of rare native stream fishes including the arroyo chub *(Gila orcuttdi),* three-spired stickleback *(casterosteus aculatus),* speckled dace *(Rhinichthys osculus),* and Santa Ana sucker *(catostomus santaanae).*

Other studies have indicated that in addition to higher water temperatures, this lack of stream-side canopy structure may result in increased pH in the shallower sections of the river due to high algal photosynthetic activity. In turn, high pH facilitates the conversion of total ammonia to the toxic unionized ammonia form which further degrades water quality for aquatic species and for downstream users.

Conclusions:

By virtue of its growth characteristics, adaptations to disturbance, especially fire, its lack of natural predators and competitors in North America, and its unsuitability as food or habitat for native wildlife, giant reed has established itself as one of the primary threats to native riparian habitats in the western United States.

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ECOLOGY AND MANAGEMENT OF *ARUNDO DONAX*, AND APPROACHES TO RIPARIAN HABITAT RESTORATION IN SOUTHERN CALIFORNIA.

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Abstract

By far the greatest threat to the dwindling riparian resources of coastal southern California is the alien grass species known as *Arundo donax*. Over the last 25 years the riparian forests of coastal southern California have become infested with *A. donax* which has spread by flood-fragmentation and dispersal of vegetative propagules. *Arundo donax* dramatically alters the ecological/successional processes in riparian systems and ultimately moves most riparian habitats towards pure stands of this alien grass.

By current estimates there are tens of thousands of acres of *A. donax* along the major coastal drainage systems of southern California, including the Santa Ana, Santa Margarita, Ventura, Santa Clara, San Diego, and San Luis Rey rivers. The removal of *A. donax* from these systems provides numerous downstream benefits in terms of native species habitat, wildfire protection, water quantity and water quality.

Introduction

Arundo (L.) is a genus of tall perennial reed-like grasses (Poaceae) with six species native to warmer parts of the Old World. *Arundo donax* (L.) (giant reed, bamboo reed, giant reed grass, arundo grass, donax cane, giant cane, river cane, bamboo cane, canne de Provence), is the largest member of the genus and is among the largest of the grasses, growing to a height of 8 m (Figure 1). This species is believed to be native to freshwaters of eastern Asia (Polunin and Huxley 1987), but has been cultivated throughout Asia, southern Europe, north Africa, and the Middle East for thousands of years and has been planted widely in North and South America and Australasia in the past century (Perdue 1958, Zohary 1962). It was intentionally introduced to California from the Mediterranean in the 1820's in Los Angeles area as an erosion-control agent in drainage canals, and was also used as thatching for roofs of sheds, barns, and other buildings (Hoshovsky 1987). Subsequent plantings have been made for the production of reeds for a variety of musical instruments including bassoons and bagpipes. Today it is an invasive pest throughout the warmer coastal freshwaters of the United States, from Maryland to northern California.

Arundo donax is a hydrophyte, growing along lakes, streams, drains and other wet sites. It uses prodigious amounts of water, as much as 2,000L/meter of standing *A. donax*, to supply its incredible rate of growth (Purdue 1958; Iverson 1994). Under optimal conditions it can grow more than 5 cm per day (Purdue 1958). *Arundo donax* stands are among the most biologically

productive of all communities. Under ideal growth conditions they can produce more than 20 tons per hectare above-ground dry mass (Perdue 1958).

Perhaps as much as 90% of the historic riparian habitat in the southern part of California has been lost to agriculture, urban development, flood control, and other human-caused impacts (Jones & Stokes 1987; Katibah 1984). The greatest threat to the remaining riparian corridors today is the invasion of exotic plant species, primarily *Arundo donax.* This alien grass readily invades riparian channels, especially in disturbed areas, is very competitive, difficult to control, and to the best of our knowledge does not provide either food or nesting habitat for native animals. *Arundo* competes with native species such as *Salix* (willows), *Baccharis salicifolia* Ruiz Lopez & Pavon (mulefat), and *Populus* (cottonwoods) which provide nesting habitat for the federally endangered bird, the least Bell's vireo (*Vireo bellii pusillus*), the federally threatened bird, the willow flycatcher (*Empidonax traillii eximus*) and other native species (Hendricks and Rieger 1989; Franzreb 1989; Zembal 1986 and 1990).

Ecological value of native riparian systems

Like most riparian systems, the cottonwood/willow riparian forest is a dynamic community, dependent upon periodic flooding to cycle the community to earlier successional stages (Warner and Hendrix 1985). Periodic floods of large magnitude and migration of the river channel are essential to depositing fresh alluvium where seeds and vegetative propagules of *Baccharis*, *Salix*, and *Populus* can germinate and take root (Gregory et al. 1991; Richter and Richter 1992).

Adequate moisture and an absence of subsequent heavy flooding is critical to the survival of the young trees through their first year. As these seedlings mature they increase channel roughness and alter flow during small flood events, increasing sediment deposition (Kondolf 1988; Richter and Richter 1992; Stromberg *et al.* 1993). Sediment deposition builds river terraces and, as they elevate, other plant species colonize resulting in further diversification in the floodplain community (Richter and Richter 1992).

When *Populus/Salix* riparian scrub, which may include such species as *Baccharis salicifolia*, *Vitis californica* (Benth.), *Rubus ursinus* (Cham. & Schldl.), and *Urtica dioica* ssp. *holosericea* (Nutt.) Thorne, reaches four or five years of age, it begins to exhibit the structural diversity required for breeding by the bird, the least Bell's vireo (Franzreb 1989, Hendricks and Rieger 1989). Least Bell's vireo, along with the riparian birds, southwestern willow flycatcher, yellow-breasted chat (*Icteria virens*), yellow warbler (*Denroica petechia*), and many other species may continue to use this diverse community for another ten to twenty years. Gradually the canopy of the maturing willows and cottonwoods begins to shade out the diverse understory of vascular plants required by these birds. Older riparian gallery forests will continue to be used by western yellow-billed cuckoo (*Coccyzus americanus occidentalis*), Cooper's hawk (*Accipiter cooperii*), warbling vireo (*Vireo gilvus*) and other species (Zembal 1990; Zembal *et al.* 1985), but as the stand ages the diversity of the flora and fauna within the forest declines. Annual flooding, channel migration, and occasional large flood events maintain this cycle of succession and therefore maintains a mosaic of diverse natural communities (Gregory *et al.* 1991).

Arundo donax as a competitor

Within its introduced range, *A. donax* is an aggressive competitor. *Arundo donax* flowers in late summer with a large, plume-like panicle. Fortunately for California land managers, the seeds produced by *A. donax* in this country are seldom, if ever, fertile. It is not known if this is because of clonal isolation or because of the physiological effects of climate as has been observed in the related *Phragmites communis* Trin. (common reed) (Haslam 1958; Rudescu et al. 1965). *Arundo donax* is well adapted to the high disturbance dynamics of riparian systems as it spreads vegetatively. Flood events break up clumps of *A. donax* and spread the pieces downstream. Fragmented stem nodes and rhizomes can take root and establish as new plant clones. Thus invasion, spread, and therefore management, of *A. donax* is essentially an intra-basin and downstream phenomenon.

Once established *A. donax* tends to form large, continuous, clonal root masses, sometimes covering several acres, usually at the expense of native riparian vegetation which cannot compete. Root masses, which can become more than a meter thick, stabilize stream banks and terraces (Zohary and Willis 1992), altering flow regimes. *Arundo donax* is also highly flammable throughout most of the year, and the plant appears highly adapted to extreme fire events (Scott 1994). While fire is a natural and beneficial process in many natural communities in southern California it is a largely un-natural and pervasive threat to riparian areas. Natural wild fires usually occur during rare lightening storm events in late fall, winter, and early spring. Under these

conditions the moist green vegetation of riparian areas would normally act as a fire break. Human-caused wild fires, in contrast, often occur during the driest months of the year (July through October). Drier conditions in riparian zones at this time of year make them more vulnerable to fire damage. Because *A. donax* is extremely flammable, once established within a riparian area it redirects the history of a site by increasing the probability of the occurrence of wildfire, and increasing the intensity of wildfire once it does occur. If *A. donax* becomes abundant it can effectively change riparian forests from a flood-defined to a fire-defined natural community, as has occurred on the Santa Ana River in Riverside County, California. *Arundo donax* rhizomes respond quickly after fire, sending up new shoots and quickly outgrowing any native species which might have otherwise taken root in a burned site. Fire events thus tend to help push riparian stands in the direction of pure *A. donax.* This results in river corridors dominated by stands of giant reed with little biological diversity.

Arundo donax **as habitat**

All evidence indicates that *A. donax* provides neither food nor habitat for native species of wildlife. *Arundo donax* stems and leaves contain a wide array of noxious chemicals, including silica (Jackson and Nunez 1964), tri-terpines and sterols (Chandhuri and Ghosal 1970), cardiac glycosides, curare-mimicking indoles (Ghosal *et al.* 1972), hydroxamic acid (Zuñiga *et al.* 1983), and numerous other alkaloids which probably protect it from most native insects and other grazers (Miles *et al.* 1993, Zuñiga *et al.* 1983). Areas taken over by *A. donax* are therefore largely

Control Methods

A suite of methods is needed to control *A. donax* depending upon the presence or absence of native plants, the size of the stand, the amount of biomass which must be dealt with, the terrain, and the season.

The key to effective treatment of established *A. donax* is killing of the root mass. This requires treatment of the plant with systemic herbicide at appropriate times of the year to ensure translocation to the roots. Only one herbicide is currently labeled for wetlands use by the EPA; Rodeo®, a tradename formulation of glyphosate, produced by Monsanto Corporation. Glyphosate is a broad-spectrum herbicide which can be used on *A. donax*, *Tamarix ramosissima* (saltcedar), and most other monocots and dicots. It has proven very effective against *A. donax* (Finn and Minnesang 1990; Jackson 1994; USDA Forest Service 1993). Other herbicides might also be used as labels and conditions allow. Monocot-specific chemicals, such as Fusilade-DX® (fluazapop-butyl) and Post® (Sethoxidan), might be particularly useful for treating *A. donax* in stands with a substantial component of native dicots; however, neither is currently labeled for wetlands use.

The most effective treatment on *A. donax* is the foliar application of a two-to-five percent (2-5%) solution of Rodeo applied post-flowering and pre-dormancy at a rate of 0.5 to 1 L/hectare. During this period of time, usually mid-August to early November, the plants are actively translocating nutrients to the rootmass in preparation for winter dormancy which results in

effective translocation of herbicide to the roots. Recent preliminary comparison trials on the Santa Margarita River (Omori. 1996) indicate that foliar application during the appropriate season results in almost 100% control, compared with only 5-50% control using cut-stem treatment. Two to three weeks after foliar treatment. treatment the leaves and stalks brown and soften creating an additional advantage in dealing with the biomass: cut green stems might take root if left on damp soil and are very difficult to cut and chip. Treated stems have little or no potential for rooting and are brittle. They may be left intact on the ground or chipped *in situ* for mulch.

Cut-stem treatment requires more time and man-power than foliar spraying and requires careful timing. Cut stems must be treated with concentrated herbicide within one to two minutes in order to ensure tissue uptake (Monsanto 1989). This treatment is also most effective post-flowering. The chief advantage of the cut-stem treatment is that it requires less herbicide that can be more-or-less surgically applied to the stem. Because of its reduced efficacy, and due to the labor required, it is rarely cheaper than foliar spraying except on very small, isolated patches or individual plants.

A popular approach to dealing with *A. donax* has been to cut the stalks and remove the biomass, wait three to six weeks for the plants to grow to about one meter tall, then apply a foliar spray of herbicide solution. The chief advantage of this approach is that less herbicide must be applied to treat the fresh growth compared with tall, established plants, and that coverage is often better because of the shorter and uniform-height plants. However, cutting of the stems may result in the plants returning to growth-phase, drawing nutrients from the rootmass.

As a result there is less translocation of herbicide to the roots and less root-kill. Therefore many follow-up treatments must be made which negates any initial savings in herbicide and greatly increases the manpower costs.

Pure stands (>80% canopy cover) of *A. donax* or *T. ramosissima* are most efficiently treated by aerial application of an herbicide concentrate, usually by helicopter. Helicopter application can treat at least 50 hectares per day. Special spray apparatus produces extremely fine droplets (400 microns) of concentrated herbicide which actually reduces herbicide use, minimizes over-spray, and results in greater kill.

In areas where helicopter access is impossible, where *A. donax* makes up the understory, where patches are too small to make aerial application financially efficient, or where weeds are mixed with native plants (<80% cover), herbicides must be applied by hand. Street-vehicles with 400 liter spray tanks are a good alternative where road access is available, but small "quad-runner" vehicles equipped with 60 liter sprayers are the preferred approach where the streambed is not so rocky as to prevent access. Twenty liter backpack sprayers are the final alternative where the vegetation is too dense, or the landscape too rugged for vehicles to be effective.

Methods for vegetation removal include use of prescribed fire, heavy machinery (e.g. bulldozers), handcutting by chainsaw or brushcutter, hydro-axe, chipper, biomass burning or removal by vehicle. Removal of the biomass should only be done where the weed cover is so dense as to prevent recovery by native vegetation after treatment, or where cut vegetation might create a debris-dam hazard during flood events. Prescribed fire, or burning piles of stacked biomass, is the most cost-effective way of removing biomass as long as it does not threaten

native vegetation or other resources. Chipping is more costly in terms of equipment and labor, and cut, dried chips pose no threat for regeneration or for forming debris dams. Hauling of biomass by vehicle is extremely expensive and should only be done as a last resort. Most landfills will not accept *A. donax* and those that do will only accept if cut into short lengths and bagged into plastic trash bags, making the labor costs far too great. The use of heavy machinery such the Hydro-ax® is extremely expensive. The machines are very slow - a Hydro-ax can only cut about 3-4 acres per day.

Riparian restoration and management

One of the prime incentives for riparian habitat restoration has been endangered species recovery, including the federal Endangered Species Act (ESA). The ESA has focused attention on declining species and sought to protect those species in greatest risk by provisions against take (Under the ESA the term "take" means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.). Focus of the legislation has been on individual protected species with little attention given to the dynamics of the natural systems of which these species are a part. There are important historical and legislative reasons for this approach. In the 1970's, when the ESA was drafted, ecologists and wildlife managers were highly focused on single species; system-oriented approaches were not widely applied. In addition, it is far easier to attach legal definition to something tangible, such as an individual animal, than it is to the more vague concept of ecological processes (Gregory *et al.* 1991).

been successful in terms of establishing a matrix of riparian habitat which is used by some native species, re-vegetating is the not necessarily the best way to create habitat.

The best way to address habitat loss in southern California riparian systems is through a comprehensive program of eradication of *A. donax, T. ramosissima*, and other invasive aliens, and relying on natural physical processes, especially flood dynamics, for the recovery of native natural communities and species. This approach might be just as easily argued for other high disturbance-adapted communities.

This strategy is based upon two of important factors. First, riparian habitats are flood-dynamic communities, dependent upon natural cycles of flood scouring and sediment deposition to create the proper conditions for community establishment (Gregory *et al.* 1991; Richter and Richter 1992; Stromberg *et al.* 1991). The Santa Ana, Santa Margarita, San Luis Rey, and many other southern California streams have all of the factors necessary for the recovery and maintenance of healthy riparian communities and riparian species. These watersheds retain flood regimes sufficient to move and sort sediment and extensive sources of seed and vegetative propagules for *Salix* and other native riparian plants. Second, the only real threats to the integrity of the system are (1) habitat fragmentation by development and (2) introduced exotic species which have altered the successional dynamics and stability of the natural communities. In other words, the native riparian communities of the Santa Ana and other major riparian corridors (and thus riparian-dependent species such as least Bell's vireo) are limited, not by the capacity of the community to regenerate, or the available area of riparian zones, but by the capacity of native species to compete with aggressive invasive exotic species, chiefly *A. donax.*

The majority of the limited resources available for riparian management on these rivers should therefore be directed at managing for the process of riparian systems: removing the key perturbation from the system, thereby allowing natural flood dynamics to operate and the natural communities to recover. Attempts to re-vegetate riparian species in floodplains that retain both native riparian species and flood regimes are redundant, and resources spent to this end are largely wasted. This is not to imply that riparian (and other habitat) re-vegetation efforts should not be applied; however, they should be applied judiciously and only in situations where specific management goals are achieved by carrying out a re-vegetation project (e.g. closing up an important corridor or re-establishing native species in a depauperate watershed). Relying on natural processes for the recovery of the riparian communities has the following major benefits:

a. Cost-effectiveness. Riparian forest restoration is extremely expensive, often on the order of tens of thousands of dollars per hectare. This necessarily limits the size, and therefore the biological value, of any funded restoration project. *Arundo donax* can be removed from most areas of a river for a fraction of the cost of revegetation, opening up areas for natural re-colonization by native riparian species.

b. Biological value. As indicated above, the high cost of re-vegetation limits the size of restoration projects. Additionally, artificially-produced riparian habitat lacks the high stem densities characteristic of naturally regenerating riparian habitat, making the actual biological value of re-vegetated sites questionable. Much higher value may be achieved by removing invasive exotics such as *A. donax* from the system. Areas opened up for

tributaries to prevent reinfestation of treated downstream sites from upstream sources. Removal of *A. donax* requires treatment with systemic herbicides in order to kill the large root mass.

Past practices of riparian restoration have focused on re-vegetation of small sites without consideration of natural riparian processes. Resources should be spent on managing for the natural dynamic processes of these systems on a watershed-wide scale. In coastal southern California the primary perturbation to the natural riparian succession process in invasion by *A. donax*, and its removal from river systems will have a far greater beneficial effect on most riparian species than planting of riparian vegetation.

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Figure 1. *Arundo donax.* Plant X 1/3; spikelet and floret X 3 (from Hitchcock and Chase 1950).

Incident Information

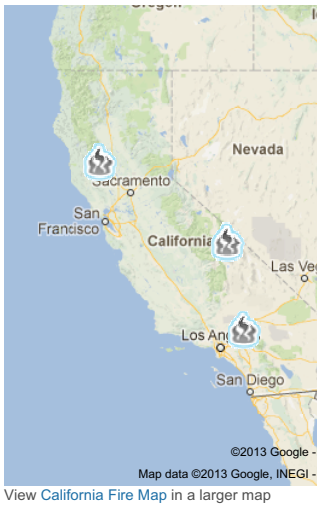
Last modified on Nov 01, 2007

BUCKWEED (AGUA DULCE) FIRE

Buckweed (Agua Dulce) Fire Incident Information:

Last Updated:	November 1, 2007 7:00 pm	FINAL
Date/Time Started:	October 21, 2007 12:55 pm	
Administrative Unit:	Los Angeles County Fire	
County:	Los Angeles County	
Location:	Mint Canyon Road and Sierra Highway	
Acres Burned:	38,000	
Containment	100% containment	
Structures Destroyed:	63 structures were destroyed and 30 structures were damaged.	
Evacuations:	Lifted	
Injuries:	Three civilians and one firefighter were injured	
Costs to date:	$7.4 million	
Phone Numbers	(323) 881-2411 (Buckweed Fire Information)	

California Statewide Fire Map



View California Fire Map in a larger map

BUCKWEED (AGUA DULCE) FIRE MORE INFO

- Buckweed (Agua Dulce) Fire Information
- Incident Maps
- Photos
- News Releases
- Weather Information
- Telephone Numbers
- Special Notices
- Related Links

CAL FIRE Official Twitter Accounts

FresnoCoFire Belmont Inc final CAL FIRE/Fresno Co Fire rescue team assisted FSO. Victim rescued & transported to local hospital. Inc terminated appx 7pm.
13 hours ago · reply · retweet · favorite

FresnoCoFire Technical rescue reported water rescue. 19000 blk Belmont Ave. CAL FIRE/ Fresno Co Fire responding.
15 hours ago · reply · retweet · favorite

CALFIRE_SLO Firefighters at scene a multi-vehicle accident. 2 semi-trucks and 3 automobiles. 5 injuries. Hwy 46 near Almond Rd.
18 hours ago · reply · retweet · favorite

CAL_FIRE #SafetyTipTuesday: Taking a road trip this spring break? Stay alert to changing road conditions at all times.

Click here to see more Tweets from CAL FIRE

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Incident Information

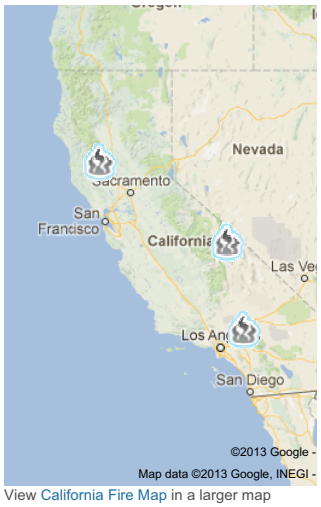
Last modified on Nov 01, 2007

RANCH FIRE

Ranch Fire Incident Information:

Last Updated:	November 1, 2007 6:30 pm	FINAL
Date/Time Started:	October 20, 2007 9:42 pm	
Administrative Unit:	Angeles National Forest	
County:	Los Angeles County	
Location:	Near Townsand Peak, southwest of Templin Highway and Interstate 5	
Acres Burned:	58,401 acres	
Containment	100%	
Structures Destroyed:	one home and nine outbuildings were destroyed	
Evacuations:	Lifted	
Cause:	under investigation	
Cooperating Agencies:	U.S. Forest Services, Los Angeles County	
Total Fire Personnel:	73	
Costs to date:	$9 million	
Major Incident Command Team:	Type 3 Team	
Phone Numbers	(626) 574-5208 (Ranch Fire Information)	

California Statewide Fire Map



View California Fire Map in a larger map

RANCH FIRE MORE INFO

- Ranch Fire Information
- Incident Maps
- Photos
- News Releases
- Weather Information
- Telephone Numbers
- Special Notices
- Related Links

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FresnoCoFire Belmont Inc final CAL FIRE/Fresno Co Fire rescue team assisted FSO. Victim rescued & transported to local hospital. Inc terminated appx 7pm.
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CALFIRE_SLO Firefighters at scene a multi-vehicle accident. 2 semi-trucks and 3 automobiles. 5 injuries. Hwy 46 near Almond Rd.
18 hours ago · reply · retweet · favorite

CAL_FIRE #SafetyTipTuesday: Taking a road trip this spring break? Stay alert to changing road conditions at all times.

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CALLEGUAS

MUNICIPAL WATER DISTRICT

Annual Water Quality Report

July 2012

Este informe contiene información muy importante sobre su agua potable. Tradúzcalo o hable con alguien que lo entienda bien.

Water Quality as Our Priority

Water quality continues to be a priority for Calleguas Municipal Water District. Our mission since the 1950s has been to provide our service area with a reliable supply of high quality, imported drinking water. A team of highly trained professionals works hard to ensure that Calleguas' water supply meets all state and federal water quality standards. This brochure provides information about the sources and quality of the water delivered by Calleguas in 2011. Included are details about where your water comes from, what it contains, and how it compares to State and Federal standards.

During the year, multiple tests for over 150 drinking water contaminants were performed on Calleguas' water supply to determine concentrations of mineral, physical, bacteriological, inorganic, organic, and radioactive constituents. Once again, we are proud to report our system did not violate any water quality standards. For additional information on the quality of water delivered by Calleguas, please contact Amy Maday at (805) 579-7117 or visit our website at www.calleguas.com.

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the USEPA's Safe Drinking Water Hotline (1-800-426-4791).

Our Mission

... is to provide our service area with a reliable and adequate supply of quality supplemental water through the acquisition and distribution of both regional and locally-developed water in an environmentally and economically responsible manner.

Our Source Water

Originating in northern California, Calleguas' drinking water supply is conveyed over five hundred miles through the State Water Project's network of reservoirs, aqueducts, and pump stations. Metropolitan Water District of Southern California completed a source water assessment of its State Water Project supply. This source is considered to be most vulnerable to urban and storm water runoff, wildlife, agriculture, recreation, and wastewater. A copy of the assessment can be obtained by contacting Metropolitan by phone at (213) 217-6850. The State Water Project supply is filtered and disinfected at Metropolitan's Joseph Jensen Filtration Plant in Granada Hills. Following treatment, water is conveyed by pipeline through the San Fernando Valley to Calleguas' mile-long tunnel in the Santa Susana Mountains. The water is then distributed by Calleguas and its purveyors to over one-half million Ventura County residents, representing 80% of the County's population. Surplus supplies of imported water are stored in Lake Bard, the District's surface water reservoir near the city of Thousand Oaks, and the Las Posas groundwater basin underlying the city of Moorpark and surrounding area.

Through the Las Posas Aquifer Storage and Recovery (ASR) project, Calleguas stores water for later use during summer peak demand periods, droughts and emergencies. With an estimated storage capacity of 300,000 acre feet, the lower aquifer system of the Las Posas Basin is optimal for groundwater storage as it is largely confined by clay layers which provide protection from potential contamination sources overlying the aquifer. To date, 18 ASR wells are operational. Additional wells are under consideration to further increase the program's injection and extraction capacity. Visit www.calleguas.com for more information on the Las Posas ASR project and other Calleguas water supply reliability programs.

General Information About Source Water

The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally-occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activity.

Contaminants that may be present in source water before we treat it include:

Microbial contaminants, such as viruses and bacteria, that may come from sewage treatment plants, septic systems, agricultural livestock operations, and wildlife.

- *Inorganic contaminants*, such as salts and metals, that can be naturally-occurring or result from urban stormwater runoff, industrial or domestic wastewater discharges, oil and gas production, mining, or farming.
- *Pesticides* and herbicides, that may come from a variety of sources such as agriculture, urban stormwater runoff, and residential uses.
- *Organic* chemical contaminants, including synthetic and volatile organic chemicals, that are by-products of industrial processes and petroleum production, and can also come from gas stations, urban stormwater runoff, agricultural application, and septic systems.
- *Radioactive* contaminants that can be naturally-occurring or be the result of oil and gas production and mining activities.

Our Treated Water

In order to ensure that tap water is safe to drink, the U.S. Environmental Protection Agency (USEPA) and the State Department of Public Health (Department) prescribe regulations which limit the amount of certain contaminants in water provided by public water systems. Department regulations also establish limits for contaminants in bottled water that must provide the same protection for public health.

Calleguas achieves these standards through vigilant watershed protection and treatment techniques used at Metropolitan's Jensen Plant as well as Calleguas' Lake Bard Water Filtration Plant. A good indicator of the effectiveness of our filtration system is the measurement of turbidity. Turbidity, or the cloudiness of water, is listed in the tables included in this report.

Water Quality Data

The tables below list all the drinking water contaminants that we detected during the 2011 calendar year. The presence of these contaminants in the water does not necessarily indicate that the water poses a health risk. Unless otherwise noted, the data presented in these tables is from testing done January 1 through December 31, 2011. The State requires that we monitor for certain contaminants less than once per year because the concentrations of these contaminants are not expected to vary significantly from year to year. Some of the data, though representative of water quality, is more than one year old.

Summary of Water Quality Results For 2011

CALLEGUAS MUNICIPAL WATER DISTRICT

			Imported Surface Water Treated by Metropolitan		Locally Stored Surface Water Treated by Calleguas		Las Posas Aquifer Storage and Recovery Program		
	Percent of Supply		*95%*		*4%*		*1%*		
Parameter	MCL [MRDL]	PHG (MCLG) [MRDLG]	Average	Range	Average	Range	Average	Range	**Major Sources in Drinking Water**
PRIMARY DRINKING WATER STANDARDS - Mandatory Health-Related Standards									
CLARITY (a)									
Turbidity (NTU) (TT)	Highest Single Value		0.05		0.08		(a)		Soil runoff
	% of samples <0.3		100%		100%		(a)		
DISINFECTION BY-PRODUCTS AND DISINFECTANT RESIDUALS									
Bromate (ppb) (b)	10	0.1	5.9	ND - 8.8	ND	ND - 7.1	(b)	(b)	By-product of drinking water disinfection
Haloacetic Acids (ppb) (c)	60	n/a	System Wide Range: 4 - 9, Highest RAA: 6						By-product of drinking water disinfection
Total Chlorine Residual (ppm)	[4]	[4]	System Wide Range: 1.8 - 2.0, Highest RAA: 1.9						Drinking water disinfectant added for treatment
Total Trihalomethanes (ppb) (c)	80	n/a	System Wide Range: 15 - 44, Highest RAA: 24						By-product of drinking water chlorination
INORGANIC CHEMICALS									
Aluminum (ppb)	1,000	600	82	61 - 99	ND	ND	60	60	Erosion of natural deposits, residual from water treatment process
Arsenic (ppb)	10	0.004	2.3	2.3	ND	ND	3.0	3.0	Erosion of natural deposits, runoff from orchards
Fluoride - Distribution System (ppm) (d)	2.0	1	System Wide Range: 0.7 - 0.9, Highest RAA: 0.8						Water additive that promotes strong teeth
Nitrate (as NO_3) (ppm)	45	45	1.8	1.8 - 2.2	ND	ND	ND	ND - 2.2	Runoff and leaching from fertilizer use, erosion of natural deposits
Selenium (ppb)	50	30	ND	ND	ND	ND	5	5	Runoff and leaching from fertilizer use, erosion of natural deposits
RADIOLOGICALS (e)									
Gross Alpha Particle Activity (pCi/L)	15	(0)	ND	ND	ND	ND	5	ND - 7	Erosion of natural deposits
Gross Beta Particle Activity (pCi/L)	50	(0)	ND	ND - 4	ND	ND	ND	ND	Decay of natural and manmade deposits
Uranium (pCi/L)	20	0.43	1	ND - 2	2	1 - 2	8	ND - 16	Erosion of natural deposits

ABBREVIATIONS, DEFINITIONS, and NOTES

n/a = not applicable
ND = None Detected
NTU = Nephelometric Turbidity Units
ppm = parts per million, or milligrams per liter (mg/L)
ppb = parts per billion, or micrograms per liter (µg/L)
pCi/L = PicoCuries per Liter

Maximum Contaminant Level (MCL) = The highest level of a contaminant that is allowed in drinking water. Primary MCLs are set as close to the PHGs (or MCLGs) as is economically and technologically feasible.

Maximum Contaminant Level Goal (MCLG) = The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs are set by the U.S. Environmental Protection Agency.

Maximum Residual Disinfectant Level (MRDL) = The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial pathogens.

Maximum Residual Disinfectant Level Goal (MRDLG) = The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.

Public Health Goal (PHG) = The level of a contaminant in drinking water below which there is no known or expected risk to health. PHGs are set by the California Environmental Protection Agency.

Primary Drinking Water Standard = MCLs and MRDLs for contaminants that affect health along with their monitoring and reporting requirements, and water treatment requirements.

Treatment Technique (TT) = A required process intended to reduce the level of a contaminant in drinking water.

Running Annual Average (RAA) = The average of all the samples taken for the year.

(a) The turbidity level of filtered water shall be less than or equal to 0.3 NTU in 95% of the measurements taken each month and shall not exceed 1.0 NTU. ASR water is not subject to these requirements.

(b) Compliance for treatment plants that use ozone is based on a running annual average of monthly samples. ASR water is not subject to these requirements.

(c) Compliance is based on a running annual average of quarterly distribution system samples. Values reported reflect the highest and lowest single value in the distribution system (range) and the highest running annual average.

(d) The Metropolitan Water District treats their water by adding fluoride to the naturally occurring level in order to help prevent dental caries in consumers. Fluoride level in the treated water is maintained within a range of 0.7 - 1.3 ppm, as required by CDPH regulations.

(e) Metropolitan results were taken from 2011 monitoring. Calleguas Las Posas ASR results were taken from 2009, 2010 and 2011 monitoring.

Summary of Water Quality Results For 2011

CALLEGUAS MUNICIPAL WATER DISTRICT

Parameter	Secondary MCL	Notification Level	Imported Surface Water Treated by Metropolitan		Locally Stored Surface Water Treated by Calleguas		Las Posas Aquifer Storage and Recovery Program		Major Sources in Drinking Water
		Percent of Supply	*95%*		*4%*		*1%*		
			Average	Range	Average	Range	Average	Range	
SECONDARY DRINKING WATER STANDARDS – Aesthetic Standards									
Aluminum (ppb) (a)	200		82	61 - 99	ND	ND	90	60	Erosion of natural deposits, residual from water treatment process
Chloride (ppm)	500		64	59 - 69	89	87 - 90	68	59 - 75	Runoff and leaching from natural deposits, seawater influence
Color (Units)	15		1	1	6	ND - 15	8	ND - 14	Naturally-occurring organic materials
Manganese (ppb)	50		ND	ND	ND	ND	ND	ND - 70	Leaching from natural deposits
Odor Threshold (Units)	3		2	2	ND	ND	ND	ND	Naturally-occurring organic materials
Specific Conductance (µS/cm)	1,600		500	420 - 530	638	633 - 644	602	515 - 754	Substances that form ions when in water, seawater influence
Sulfate (ppm)	500		56	54 - 58	70	70	90	56 - 147	Runoff and leaching from natural deposits
Total Dissolved Solids (ppm)	1,000		280	280 - 290	360	350 - 360	352	280 - 460	Runoff and leaching from natural deposits
Turbidity (NTU) (b)	5		0.03	0.03 - 0.09	0.04	0.04	0.3	ND - 0.6	Soil runoff
ADDITIONAL PARAMETERS (Unregulated)									
Alkalinity (ppm)	NS	NS	85	76 - 93	93	90 - 100	92	80 - 110	
Boron (ppb)	NS	1,000	190	190	200	200	200	200	
Calcium (ppm)	NS	NS	27	26 - 28	29	29	40	27 - 62	
Chlorate (ppb)	NS	800	26	26	ND	ND	ND	ND	
Corrosivity (AI) (c)	NS	NS	12.0	12.0	12.1	12.1	11.9	11.5 - 12.1	
Hardness (Total Hardness) (ppm)	NS	NS	110	110 - 120	130	130	159	117 - 229	
Magnesium (ppm)	NS	NS	12	12	14	14	14	12 - 18	
N-Nitrosodimethylamine (ppt)	NS	10	System-Wide Average = 5, Range = ND - 9						
pH (pH Units)	NS	NS	8.2	8.1 - 8.4	8.1	7.9 - 8.3	8.0	7.4 - 8.4	
Potassium (ppm)	NS	NS	3	3	3	3	3	3 - 4	
Radon (pCi/L) (d)	NS	NS	ND	ND	ND	ND	761	244 - 1087	
Sodium (ppm)	NS	NS	54	52 - 57	71	71	57	53 - 64	
Total Organic Carbon (ppm)	NS	NS	1.9	1.8 - 2.1	2.4	1.9 - 2.6	0.6	0.6	
Vanadium (ppb)	NS	50	3	3	ND	ND	3	3	

ABBREVIATIONS, DEFINITIONS, and NOTES

ND = None Detected NS = No Standard
NTU = Nephelometric Turbidity Units
ppm = parts per million, or milligrams per liter (mg/L)
ppb = parts per billion, or micrograms per liter (µg/L)
ppt = parts per trillion, or nanograms per liter (ng/L)
pCi/L = PicoCuries per Liter
µS/cm = microSiemen per Centimeter

Maximum Contaminant Level (MCL) = Secondary MCLs are set to protect the odor, taste, and appearance of drinking water.
Notification Level = The level at which notification of the public water system's governing body is required.
(a) Aluminum has both primary and secondary standards.
(b) The monthly averages and ranges of turbidity shown in the Secondary Standards section are based on source effluents.
(c) AI measures the aggressiveness of water transported through pipes. Water with AI <10.0 is highly aggressive and would be very corrosive to almost all materials found in a typical water system. AI ≥12.0 indicates non-aggressive water. AI between 10.0 and 11.9 indicates moderately aggressive water.
(d) Radon results were taken from 2009, 2010 and 2011 monitoring.

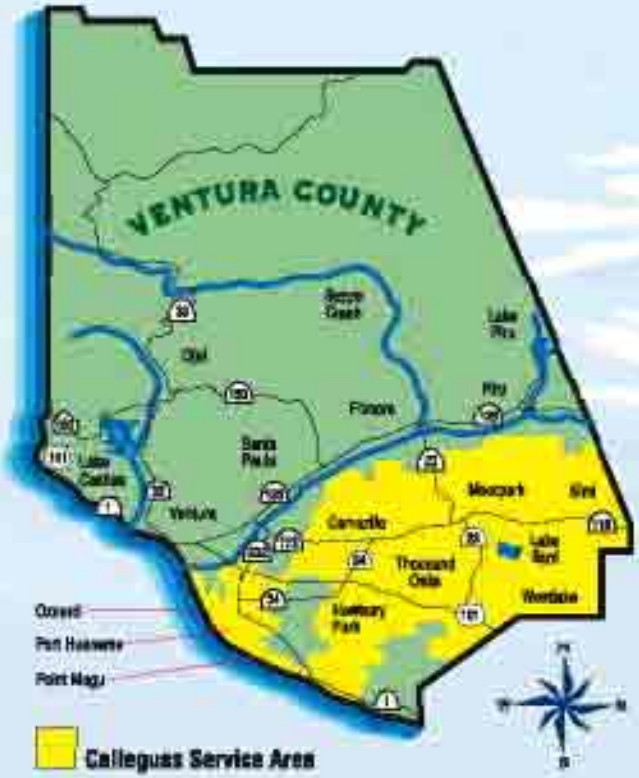
Information for Customers with Special Water Needs

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. USEPA/Centers for Disease Control guidelines on appropriate means to lessen the risk of infection by *Cryptosporidium* and other microbial contaminants are available from the Safe Drinking Water Hotline (1-800-426-4791).

Constituents Tested For and Not Detected

In addition to the information provided in the Summary of Water Quality Results, Calleguas also monitored for, but did not detect, the following contaminants during 2011:

Antimony	Cyanide	Perchlorate	Total Chromium
Asbestos	Foaming Agents	Pesticides	Tritium
Barium	Herbicides	Radium 226	Volatile Organic Chemicals (VOCs)
Beryllium	Lead	Radium 228	Zinc
Cadmium	Mercury	Silver	
Chromium 6	MTBE	Strontium-90	
Copper	Nitrite	Thallium	



Information on Lead in Household Plumbing

If present, elevated levels of lead can cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. Your local utility is responsible for providing high quality drinking water, but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to 2 minutes before using water for drinking or cooking. If you are concerned about lead in your water, you may wish to have your water tested. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline or at http://www.epa.gov/safewater/lead.

Drinking Water Fluoridation

In 2007, Calleguas' wholesale water provider, the Metropolitan Water District of Southern California, joined a majority of the nation's public water suppliers in systematically adding fluoride to drinking water at each of five water treatment plants in order to help prevent tooth decay.

In line with recommendations from the California Department of Public Health, as well as the U.S. Centers for Disease Control and Prevention, Metropolitan adjusted the natural fluoride level in the water, which ranges from 0.1 to 0.4 parts per million, to the optimal range for dental health of 0.7 to 0.8 parts per million.

Fluoride levels in drinking water are limited under California state regulations at a maximum dosage of 2 parts per million.

Fluoride has been added to U.S. drinking water supplies since 1945. Of the 50 largest cities in the U.S, 43 fluoridate their drinking water.

For more information about the benefits of drinking water fluoridation, please visit the following web sites:

The American Dental Association
http://www.ada.org/fluoride.aspx

U.S. Centers for Disease Control and Prevention
http://www.cdc.gov/fluoridation/fact_sheets/cwf_qa.htm

Information on Radon

Water suppliers are required to provide information on the presence of radon in water sources. A known human carcinogen, radon is a radioactive gas that one cannot see, taste, or smell. Commonly found in soils throughout the United States, breathing air containing radon may lead to lung cancer. Drinking water containing radon may also cause increased risk of stomach cancer. Radon can seep up through the ground and into homes and other structures through cracks and holes in foundations. Over time, concentrations of the gas can increase to high levels potentially exposing inhabitants to greater health risks. It is possible that radon can also be released from tap water when used for showering, washing dishes, and other household activities. However, the concentration of radon released through tap water is in most cases assumed to be considerably lower than concentrations entering a home from underlying ground. If you are concerned about radon, you are advised to test the air in your home. Testing is inexpensive and easy. The EPA recommends taking measures to reduce radon levels in your home if concentrations are 4 PicoCuries per liter of air (pCi/L) or higher. For additional information, call your State radon program (1-800-745-7236), the EPA Safe Drinking Water Act Hotline at (1-800-426-4791), or call the National Safe Council Radon Hotline (1-800-SOS-RADON).

More Information on Water Quality

Calleguas Municipal Water District
2100 Olsen Road • Thousand Oaks, CA 91360-6800
(805) 526-9323
http://www.calleguas.com

Metropolitan Water District of Southern California
Public Affairs • P.O. Box 54153 • Los Angeles, CA 90054-0153
(800) CALL MWD
www.mwdh2o.com/

State of California Department of Public Health
Office of Drinking Water • 601 North 7th Street • Sacramento, CA 94234-7320
http://www.cdph.ca.gov/programs/Pages/DDWEM.aspx

U.S. Environmental Protection Agency (WH-550)
Office of Ground Water & Drinking Water
401 M. Street, S.W. • Washington, D.C. 20460
Safe Drinking Water Hotline (800) 426-4791
http://water.epa.gov/drink/index.cfm

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UNIVERSITY OF CALIFORNIA

Los Angeles

Factors Influencing Invasion of Giant Reed (*Arundo donax*) in Riparian Ecosystems of Mediterranean-type Climate Regions

A dissertation submitted in partial satisfaction of the

requirements for the degree Doctor of Philosophy

in Environmental Health Sciences

by

Gretchen Christina Coffman

2007

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The dissertation of Gretchen Christina Coffman is approved.

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2007

DEDICATION

I dedicate this dissertation to my parents

Mary Lou Coffman

and

Glenn Norman Coffman

Without their constant love and support over the years

this dissertation would not have been possible.

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ABSTRACT OF THE DISSERTATION

Factors Influencing Invasion of Giant Reed (*Arundo donax*)

in Riparian Ecosystems of Mediterranean-type Climate Regions

by

Gretchen Christina Coffman

Doctor of Philosophy in Environmental Health Sciences

University of California, Los Angeles, 2007

Professor Richard F. Ambrose, Chair

Giant reed, *Arundo donax* L., is one of the greatest threats to riparian ecosystems of Mediterranean-type climate regions, including California. Forming extensive monotypic stands, *A. donax* increases the risks of flooding and fire, uses prodigious amounts of water, and reduces habitat value for wildlife. Urban and agricultural development adjacent to riparian ecosystems may contribute to its invasion success. The main hypothesis of my dissertation is that the current abundance of nutrients, water, light, and fire in riparian ecosystems of Mediterranean-type climate promotes *A. donax* invasion. A two-year field experiment in a riparian ecosystem on the Santa Clara River

in California showed that *A. donax* produced greater biomass than native species under high soil moisture, light, and nutrient levels, and its biomas-s in monoculture was much greater than most species and treatment levels. However, results suggest that high resource levels and this new plant functional group in these riparian ecosystems, rather than superior resource competition, promote *A. donax*'s competitive exclusion of native riparian species. Analysis of the influence of nutrient enrichment from residential and agricultural land use types on *A. donax* infestation throughout several coastal watersheds in Southern California revealed that floodplains with enriched soil NO_3-N supported *A. donax* infestations whereas sites with lower N levels did not. Unlike the native red willow (*Salix laevigata* Bebb.), *A. donax* may take advantage of anthropogenically enriched N (and K) levels in riparian ecosystems. Regarding fire, *A. donax* began regrowth from rhizomes immediately after being burned in October 2003 along the Santa Clara River whereas native riparian plants remained dormant for several months, and *A. donax* grew 3–4 times faster than native riparian plants. A year after the fire, *A. donax* dominated these burned areas (99% relative cover and a 24% increase in relative cover compared to pre-fire conditions). *Arundo donax* infestations appear to create an invasive plant-fire regime. These results help elucidate the optimal conditions for *A. donax* invasion of riparian ecosystems, which in turn can help prioritize control strategies and revegetation of riparian ecosystems.

CHAPTER 1 -

INTRODUCTION

Invasion of riparian ecosystems by the alien plant giant reed, *Arundo donax* L., is one of the most serious threats to rivers in Mediterranean-type climate regions worldwide. *Arundo donax* has successfully invaded many rivers in these regions, forming extensive monocultures and altering physical and biological processes. In California, infestations of *A. donax* are known to increase risks of flooding, create unnatural fire hazards, outcompeting indigenous riparian species for scarce water resources, and reduce the value of riparian habitat for most wildlife (Dudley and Collins 1995, Bell 1997, DiTomaso 1998, Dudley 2000). Although introduced several hundred years ago to southern California, rapid expansion of *A. donax* in natural riparian ecosystems appears to have occurred in the last 35 years (Bell 1997).

Researchers have suggested that natural and human disturbances, which are prevalent in Mediterranean-type climate regions such as California, are primary factors contributing to the extensive distribution of *A. donax* along rivers in these areas (Rieger and Kreager 1989, Bell 1997). Large winter floods occur naturally every few years and remove riparian plants from floodplains, thereby creating open substrates for recolonization. Pieces of *A. donax* (rhizomes and culms) are dispersed downstream during flooding and establish vegetatively wherever they are deposited (Else 1996, Else and Zedler 1996). However, natural disturbance along rivers is not a new phenomenon in Mediterranean-type climates; river systems have long been dynamic components of the

landscape in these regions (Mount 1995). Most physical human disturbance of rivers and their watersheds dates back to human settlement of these regions (Mount 1995, Rundel et al. 1998), which occurred much earlier than the onset of *A. donax* invasion. Therefore, other factors must contribute to the relatively recent success of this plant's invasion.

More recently, humans have altered riparian ecosystem processes by increasing nutrient delivery from adjacent land use practices, importing water for the ever-growing population, exporting water for agriculture, removing mature riparian vegetation for development, and increasing fire frequency in adjacent shrubland communities. I investigated the influence of these factors on invasion of rivers by *A. donax* in southern California. I hypothesized that increased nutrient, water, and light availability, as well as the introduction of fire into riparian ecosystems, has contributed to successful *A. donax* invasion in Mediterranean-type climate regions.

BACKGROUND

Throughout history, man has embraced the idea of cultivating exotic plants and animals worldwide for agricultural, aesthetic, and other purposes. However, moving biological organisms has created a human-induced breakdown of biogeographical barriers to species dispersal and many species that evolved separately are now living together (D'Antonio and Vitousek 1992, Richardson et al. 2000). As far back as 1958, Charles Elton wrote of the terrific dislocations in nature that mixing different organisms from various parts of the world would cause (Elton 1958). Despite his warning, consequences of these introductions of plants and animals had not been fully recognized until recently.

The problem of plant introductions[1] and resulting invasions[2] in Mediterranean-type climate regions has received considerable attention because these regions provide ideal climactic conditions for plant growth (Drake et al. 1989, D'Antonio and Dudley 1993). In California, plant invasions have occurred in many natural ecosystems, including grasslands, woodlands, wetlands, coastal dunes, salt marshes, and riparian areas (Kruger et al. 1989, Rejmanek 1989, Rejmanek et al. 1991). Aquatic ecosystems such as rivers and wetlands are among the world's most heavily invaded systems (Mooney et al. 1986, Kruger et al. 1989, Pysek and Prach 1994, Alpert et al. 2000, Rundel 2000). Natural and altered disturbance regimes and anthropogenic enhancement of nutrients are thought to contribute to success of plant invasion in rivers (Crawley 1986, Ashton and Mitchell 1989, Drake et al. 1989, Hobbs 1989, Hobbs and Huenneke 1992, Alpert et al. 2000).

Riparian ecosystems occupy a unique area in the landscape; as ecotones between aquatic and terrestrial ecosystems, they have naturally high species diversity, a diverse array of biological and physical processes, and a mosaic of vegetation types and structural components due to natural disturbance regimes (Gregory et al. 1991, Malanson 1993, Naiman and Decamps 1997). Natural dynamic disturbance regimes of river and stream systems in Mediterranean-type climates likely promote the spread of invasive plant species through these systems. For example, intense but infrequent winter flooding

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[1] Introduction implies human transport of a plant across a major geographic barrier.
[2] Invasion refers to an introduced plant that produces reproductive offspring in areas distant from the origin of its introduction (>100m in <50 years). Richardson et al. (2000) suggested several barriers to plant introduction, naturalization, and invasion by including geographic, environmental (local), reproductive, dispersal, environmental (disturbed habitats), and environmental (natural habitats).

scours stream corridors and exposes vast areas of sandy floodplain, channels, and terraces (Gasith and Resh 1999), rendering them vulnerable to disturbance colonizers, which are primarily invasive, weedy plants. Weedy plants are able to establish and grow quickly in these open disturbed areas, often out-competing the indigenous riparian plant species for light, water, and nutrients (Baker 1974).

Historically, riparian plant communities in Mediterranean-type climates have been particularly impacted by human perturbations due to the ephemeral and braided nature of the river systems in which they are found (Mount 1995). Since early human settlement of these areas, humans have dammed, channelized, mined, rerouted, diverted, and developed floodplains of rivers, resulting in great losses and degradation of associated riparian plant communities (Palmer 1993, Mount 1995). These alterations to river systems have left riparian plant communities susceptible to plant invasions by weedy species. Rapid expansion of urban and agricultural development into these regions in the last century has resulted in habitat fragmentation, reduction in biological diversity, and altered distribution of resources in these areas (i.e., water and nutrients) (Aschmann 1991, Palmer 1993). These anthropogenic land-use changes have created conditions that allow for large-scale plant invasion of remaining natural ecosystems (D'Antonio and Dudley 1993).

Arundo donax *Invasion*

Currently, one of the greatest invasive threats to the highly modified river ecosystems of Mediterranean-type climate regions is a tall bamboo-like member of the grass family (Poaceae), giant reed (*Arundo donax* L.). *Arundo donax* appears to be of a

broad southern Eurasian origin, extending from Southeast Asia to the Mediterranean Basin, although the precise extent of its native distribution is unclear (Perdue 1958, Zohary 1962, Hickman 1993). The relatively high diversity of herbivores associated with *A. donax* in the Mediterranean Basin compared to other areas where it grows suggests plant-animal co-evolution in that region (Kirk et al. 2003), but *A. donax* might have a broader indigenous range. Introduced to other areas primarily for building materials, erosion control, and windbreaks, it is now successfully established in freshwater systems in tropical to temperate climates worldwide (Polunin and Huxley 1987). In the U.S., *A. donax* has become especially widespread in riparian ecosystems in California's Mediterranean-type climate (Fischer et al. 1978). Although *A. donax* is thought to have been introduced to southern California for building materials and erosion control as early as the 1700s, and it was abundant along the Los Angeles River in the 1820s (Robbins et al. 1951), its widespread expansion in riparian ecosystems appears to be recent (Bell 1997). Currently, *A. donax* infests almost every stream and river system in coastal southern California (Gaffney 2002) (Figure 1). Based on spatial data analyses, researchers estimate more than 1,500 acres of *A. donax* infestations occur throughout rivers in southern California, although only approximately one-third of the riparian areas in coastal southern California have been surveyed (Casanova et al. unpublished data). A comprehensive survey is in progress to verify coverage of *A. donax* infestations in the field throughout all streams and rivers in southern California (Giessow pers. comm.).

Although *A. donax* produces a long plume-like inflorescence with no viable seeds in California (Johnson et al. 2006), *A. donax* spreads rapidly downstream when small

pieces of the plant break off, land on bare, moist substrates, and begin to grow (Else 1996, Else and Zedler 1996, Bell 1997, Boose and Holt 1999, Decruyenaere and Holt 2005). Growing at an extremely high rate (4–10 cm per day under optimal conditions) and during all times of the year, *A. donax* quickly establishes on unvegetated or sparsely vegetated soil and grows taller than 2-4 m after only a few months and may eventually reach up to 8 m (Perdue 1958). Singh et al. (1997) suggested that *A. donax* thrives in a variety of soil types in its indigenous range in India. Under greenhouse conditions, rhizomes of *A. donax* rooted successfully during all months of the year and both rhizomes and stem fragments established under various temperatures, moisture conditions, and soil types (Boose and Holt 1999, Decruyenaere and Holt 2001). It then expands outward in area via its large rhizome or via layering (adventitious sprouting of stem tips in contact with the ground), crowding and even displacing indigenous shrubs, herbs, grasses, and eventually even trees, under elevated light, soil moisture, and nutrient conditions, (Boland 2006, Decruyenaere pers. comm.). Wang (1998) suggested that nutrient loading contributes to *A. donax* invasion, and several authors have proposed that fire might promote *A. donax* invasion because this species can respond more quickly to fire than natives (Bell 1994, DiTomaso 1998). In this manner, *A. donax* forms extensive stands or monocultures in riparian ecosystems along the floodplains and terraces of southern California's river and stream systems.

Impacts of Invasion

Infestations of *A. donax* have created serious physical and biological problems along rivers in southern California. Where it grows extensively along floodplains, *A.*

donax acts as a transformer species; it causes physical obstructions to natural water flow, thereby increasing the risk of flooding to adjacent lands. During large floods *A. donax* increases stream roughness, creates debris dams at bridge crossings, and causes bank erosion and instability (DiTomaso 1998). As the aboveground biomass dries in the hot, dry summer months that characterize Mediterranean-type climates, *A. donax* creates an unnatural fire hazard where moisture-rich riparian corridors used to form natural barriers to fire (Scott 1994, Rundel and Gustafson 2005). Water loss due to high evapotranspiration (ET) of *A. donax* reduces already scarce water resources in Mediterranean-type climate regions. Based on transpiration rates of rice (another C3 species thought to have similar transpiration rates), Iverson (1994) estimated that *A. donax* uses three times more water than native riparian species. Studies using a variety of methods indicate that ET of *A. donax* (1.2–7.5 m/year) may be much higher than that of native riparian vegetation such as *Salix* spp., *Populus* spp. (1.0–3.3 m/year) and mixed riparian communities of arid and Mediterranean-type climates (0.11–1.6 m/year) (Zimmerman 1999, Hendrickson and McGaugh 2005, Shafroth et al. 2005, Abichandani 2007, Coffman in press). Abichandani (2007) showed that *A. donax* infestations may transpire 6 to 110 times more (up to 18,206 kg m^{-2} $year^{-1}$) than native vegetation.

Arundo donax has very little known value as a wildlife habitat in California (Bell 1997, Kisner 2004) compared to the dominant native vegetation (Bell 1994, Herrera and Dudley 2003). Its stems and leaves contain an array of inorganic noxious chemicals (Jackson and Nunez 1964) that reduce herbivory by most native insects and grazers. Due to its dense clonal growth form, it physically restricts indigenous wildlife passage, yet

many animals depend on the riparian corridor and river floodplain for foraging, nesting, and cover (Kisner 2004). Like other invasive plants, *A. donax* appears to have negative impacts on indigenous plant and animal biodiversity through the loss of suitable habitat and competition with indigenous species (Czech and Krausman 1997). In addition, *A. donax* threatens river ecosystem sustainability via its impacts on natural river processes, such as lowering of the groundwater table, decreased surface water levels in streams, creating the potential for unnatural and extremely hot fires, and loss of plant and animal biodiversity.

Control of* Arundo donax *in California

Because of the numerous impacts of *A. donax* infestations on rivers, streams, and adjacent property, large-scale *A. donax* control efforts have been initiated throughout California since 1990 by several multi-agency organizations. For example, Team Arundo, a forum of local, state, federal, and private organizations dedicated to the control of *A. donax*, was formed in 1992 and leads control efforts along the Santa Ana River in southern California, where invasion has been a problem since 1969 (SAWPA 2007). In 2001, the Santa Ana River contained approximately 10,000 acres of *A. donax*-infested riparian habitat; Team Arundo is currently removing *A. donax* along this river on a watershed-scale. Formed in 1996, the Team Arundo del Norte partnership was modeled after the original Team Arundo and leads control and eradication efforts in Central and Northern California, where *A. donax* has more recently invaded (Team Arundo del Norte 2007).

Many local organizations also work on *A. donax* control at the county and watershed levels. For example, the Ventura County Arundo Task Force, led by the Ventura County Resource Conservation District, conducted a pilot removal project on the Ventura River in 2003 and plans to continue long-term watershed-wide eradication of *A. donax* in all major watersheds in Ventura County starting with the Santa Clara River. In the Malibu Creek watershed, the Resource Conservation District of the Santa Monica Mountains and Mountain Conservation Trust conducted an *A. donax* eradication project on 5.2 miles of the stream. Also, *A. donax* eradication is being used for compensatory riparian and wetland mitigation in California (Stein 1998). However, controversy continues over *A. donax* removal and herbicide use associated with its removal in the Topanga Canyon watershed (Topanga Online 2007).

Eradication of *A. donax* from watersheds in Mediterranean-type climates is an important initial step in restoration and long-term sustainability of riparian ecosystems. Various mechanical and hand-clearing techniques have been successful in removing small areas of *A. donax* infestations throughout California. Several researchers are investigating the ecophysiology of *A. donax* (e.g., relative growth rates and critical nitrogen content) to determine the most effective time to apply glyphosate-containing herbicides to kill the rhizomes of these plants (Spencer et al. 2005, Wijte et al. 2005). Research on biocontrol agents is underway; however, the U.S. Food and Drug Administration (USFDA) has not approved any yet. Based on the mechanisms by which it spreads and colonizes, *A. donax* removal efforts are primarily concentrated along higher riparian terraces, locations where it is less likely to reinvade (Coffman et al. 2004).

Removal from floodplain locations requires development of watershed-scale removal plans and permits that specify removal from the upstream most infestation working downstream. However, Boland (2006) proposed an inside-out approach for *A. donax* removal (i.e., conduct treatments first inside and then outside the flood zone) due to his documentation of the importance of layering. Researchers believe that revegetation of riparian areas with native plant species after *A. donax* removal is essential in preventing infestations of other weedy species. However, long-term eradication of *A. donax* from rivers and streams in Mediterranean-type climate regions may not be completely successful without knowledge of understanding how to manage the factors that contribute to its invasion and proper management of those factors.

***Riparian Ecosystem Restoration and* Arundo donax**

Degradation of ecosystem processes and functions by man-made physical and biological alterations threatens river systems worldwide (Naiman and Decamps 1997). River restoration projects have increased exponentially since 1995 and are being conducted across the U.S. to improve water quality, enhance in-stream and riparian habitat quality, re-establish fish passage, and provide bank stabilization (Bernhardt et al. 2005). Current watershed-level river and stream restoration efforts in California include removal of dams for fish passage, elimination of levees to allow for more natural channel migrating and meandering, releases of water from dams to simulate natural flooding, implementation of policies to reduce pollutants, and revegetation of natural riparian ecosystems. However, regardless of the restoration goal or activity, restoration success will depend on control of *A. donax* in the streams that it infests. For example, removing a

dam with upstream *A. donax* infestations without implementing control programs first would result in widespread dispersal of this species. Understanding the relationship between nutrient levels found in rivers, the sources of these nutrients, and *A. donax* versus native riparian species growth will help watershed managers formulate more realistic nutrient reduction policies and implementation plans. Understanding water use by *A. donax* compared to native riparian plants is critical to justifying funding of removal efforts due to its presumed high use of water in arid regions where water is limited (Abichandani 2007).

Watershed managers, restoration planners, *A. donax* eradication groups, conservation organizations, and many others require scientifically based management recommendations to control expansion of and remove *A. donax* effectively. Knowledge of how factors such as nutrient levels, water, light, and fire contribute to growth and invasion of *A. donax* is essential to long-term, large-scale control. However, little is know about the *A. donax* invasion process related to the factors. In this dissertation, I address the influence of water, nutrients, light, and fire on the *A. donax* invasion process. My aim was to provide valuable information about *A. donax* invasion and long-term restoration of riparian ecosystems in California and other Mediterranean-type climate regions.

Influence of Water, Nutrients, Light, and Fire on Invasion by **Arundo donax**

Water Availability

Mediterranean-type climate regions are characterized by wet winters and warm, dry summers that regulate natural ecosystems processes. Many rivers and streams in

these regions are intermittent (i.e., with loosing and gaining reaches) or ephemeral because of wetting and drying periods (Gasith and Resh 1999) and underlying geology (Malanson 1993). Ever-increasing population pressure in these regions has created intense competition for water, resulting in serious alterations to water quantity and quality in rivers and streams (Gasith and Resh 1999). The city of Los Angeles, for example, imports 88% of its water to supply water for drinking, agricultural irrigation, and industrial uses (Hazy 2006). This imported water is discharged into natural water bodies after use, in many cases with degraded water quality, thereby increasing flow in many streams and creating perennial systems. Groundwater abstracted for agricultural irrigation and rural residential uses adjacent to rivers may decrease flow.

Increased water quantity in stream systems of Mediterranean-type climates may promote growth of invasive species such as *A. donax*. Although *A. donax* reportedly can tolerate a wide variety of ecological conditions, it thrives in areas with high soil moisture such as along canals, ditches, and stream banks (Perdue 1958, Rezk and Edany 1979). Much higher transpiration of *A. donax* compared to native riparian plants such as *Salix* spp. and *Populus* spp. and mixed riparian communities typical of arid and Mediterranean-type climates may give it an advantage where water is abundant (Zimmerman 1999, Hendrickson and McGaugh 2005, Shafroth et al. 2005, Abichandani 2007). I hypothesized that *A. donax* would have a competitive advantage over those native species found to uptake water at a lower rates in river floodplains and terraces that receive increased water inputs from anthropogenic sources.

In riparian ecosystems in which water tables are lowered due to groundwater extraction or along naturally loosing reaches (i.e., river reaches that contribute water to the groundwater supply), the scenario is more complicated. The presence of sustained high soil moisture or near-surface shallow groundwater during the growing season is important for establishment of most species, although both *A. donax* (Perdue 1958) and *Bacharris salicifolia* are known to establish under very low soil moisture conditions. Once established, rooting depth, distribution, and structure relative to soil moisture and groundwater likely play a large role in growth and competition between *A. donax* and native species. *Salix* spp., *Populus* spp., *B. salicifolia*, and other woody riparian species are phreatophytes with adaptations to low soil moisture conditions; their roots follow the receding soil moisture and can use water from depths of up to 30 m (Robinson 1958). *Arundo donax* is a perennial grass with roots that can only reach ~3 m below the soil surface.

Nutrient Loading

During the twentieth century, nutrient inputs to river systems worldwide increased dramatically due primarily to expanding agricultural practices and municipal sewage discharge (Rundel et al. 1983, Tilman et al. 2000, Nicola 2003, FAOUN 2004). Follett and Hatfield (2001) reported groundwater nitrate concentrations under agricultural systems in the U.S. to be as high as 30mg/L in 2001, which is much higher than the EPA drinking water standards [less than 10ppm (mg/L)]. Southern California is no exception; agricultural activities and their associated nutrient inputs are widespread along river systems of southern California (Mount 1995, Pedersen 2001). Other important

anthropogenic and natural sources of N and P that likely contribute to nutrient loading in river systems include: atmospheric N; manure from animal feedlots and corrals; fertilizer applied to lawns; leaky septic tanks; oxidation of organic materials; and the increased abundance of symbiotic N-fixing plants (Verhoeven et al. 1996, USEPA 1999).

Composition and increase in use of fertilizer has led to extensive nutrient loading of river systems, with mainly nitrogen (N) and phosphorus (P) (Nicola 2003). Global fertilizer use has increased more than fourfold, from 31.2 million tons in 1961 to 137.7 million tons in 2001 (FAO 2004). Total global nitrogen fertilization is expected to increase by 12.9% during the next 15 years and 23.7% in the next thirty years (FAOUN 2004). By 2050, Tilman et al. (2000) predicted that the global rates of nitrogen and phosphorus fertilization will be 2.5 times and 2.4 times, respectively, that of current levels. In the U.S., annual fertilizer use in agricultural areas has increased from 24.9 in 1959 to 53 million tons in 2001 and continues to increase (FAOUN 2004). Currently, nitrogen fertilizers represent about 55% of all fertilizer uses, followed by phosphate at 26%. In the U.S., the average percent of nitrogen, the main constituent in commercial fertilizers, has risen from 11% in 1959 to 22.7% in 2001 (FAOUN 2004).

Anthropogenic nutrient enrichment of natural ecosystems has been linked to plant invasions worldwide (Mooney et al. 1986, Drake et al. 1989, D'Antonio and Vitousek 1992, Hobbs and Huenneke 1992, Vitousek et al. 1996, Brooks 2003). Excess N and P from fertilizers used in agriculture, golf courses, and residential lawns, as well as treated wastewater effluent, have contributed to nutrient loading in rivers across the U.S. (USEPA 1999). Nutrient enrichment and the dynamics of riparian ecosystems in

agricultural landscapes in the eastern U.S. and Western Europe have been well studied (Peterjohn and Correll 1984, Gilliam 1994, Hill 1996, Bennett et al. 2005). However, limited information exists about these processes in Mediterranean-type climates such as southern California (Kim 2003, Robinson et al. 2005).

The effects of increased nutrient levels on plant composition and invasion may be even more profound in streams of Mediterranean-type climate regions compared to other regions of the world because they have naturally low levels of nitrogen and phosphorous (Day 1983, diCastri 1991, Dallman 1998). Plant species that are restricted to non-fertile sites generally respond less to nutrient addition or nutrient supply than do the same species from more fertile soils (Chapin et al. 1986). Hellmers et al. (1955) reported that the nitrogen-limiting conditions found in chaparral communities in southern California also exist in riparian ecosystems; thus, excess nitrogen from adjacent land use practices might promote *A. donax* growth and invasion in riparian ecosystems of southern California and other Mediterranean-type climate regions (Wang 1998). A demographic study of *A. donax* in southern California indicated that *A. donax* tends to spread radially or invade under nutrient-rich conditions, and it ceases spreading and establishes relatively dense clumps under nutrient-poor conditions (Decruyenaere and Holt 2001, Decruyenaere pers. comm. October 5, 2001). Preliminary results of another study indicate that *A. donax* biomass is greater than that of *Salix laevigata* under conditions of no nitrogen (0 g/m^2 N) and high levels of nitrogen addition (12–14 g/m^2 N) (Dudley unpublished data), whereas *S. laevigata* grows larger than *A. donax* at nutrient addition levels of $4g/m^2$. Seasonal drought conditions confine nutrient availability to wetter times

of the year and to areas with perennially high soil moisture retention regardless of nutrient inputs, potentially influencing invasion dynamics.

Excess nitrogen and phosphorus contained in surface and shallow groundwater are transported from land use activities to adjacent river ecosystems (Schlosser and Karr 1981, Correll 1984, Correll et al. 1992, Triska et al. 1994, Rodda 1995, Basnyat et al. 1999). Although the quantity of N and P in the shallow groundwater and soil is important to plant productivity, only certain constituents of N and P are readily available to plants. Plants absorb and assimilate both NO_3^- and NH_4^+ most readily. Nitrogen found in the form of NO_3^- and NH_4^+ in fertilizer and wastewater is water-soluble and moves quickly through soils in the shallow groundwater between agricultural practices, wastewater treatment plants, and adjacent river systems. Widely known as the primary productivity-enhancing nutrient, N assimilation and metabolism is complex and under genetic control (Duncan 1994). Although not addressed in this study, atmospheric N in the form of air pollution is a growing source of this nutrient for plants (Verhoeven et al. 1996). Because plant species vary in their ability to uptake atmospheric N through their stomata (Stark 1994), this anthropogenic source should be examined further.

Phosphorus is an insoluble mineral that readily adsorbs to soil particles, which are then transported to river systems through overland runoff and soil erosion. Required for many metabolic processes, P is absorbed rapidly into plant roots but requires active uptake due to steep concentration gradients between the soil solution and plant roots (Shuman 1994). Plants can uptake P only when dissolved in water as ortho-phosphates

or poly-phosphates, and the rate of uptake is highly pH-dependent (optimal uptake at pH 6.5) (Shuman 1994).

The majority of water and minerals absorbed by plants enters through the root system. The ability of plants to assimilate nutrients available in the surrounding soil and groundwater depends on the development of an extensive root system and on rooting structure (Kozlowski et al. 1991). Root morphology and architecture differ between monocots, such as *A. donax,* and dicots like *Salix laevigata* (Taiz and Zeiger 1991). The physiological strategies of both plants differ greatly due to their inherent structure. *A. donax* roots are fibrous and tend to be shallower than those of *S. laevigata*, which has a taproot that can extend 30 m or more to groundwater. Thus, *A. donax* may utilize nutrients in the upper soil profile and shallower groundwater compared to phreatophytes like *S. laevigata* from loosing stream reaches in which groundwater is deep.

The supply of N and P in the soil and the availability of these nutrients to plants in the soil medium can vary greatly based on soil grain size and pH (Metz et al. 1966). Variability in soil grain size leads to variability in soil moisture content, which in turn affects rates of both nutrient diffusion transport and biological activity. Soil grain size has a strong influence on water and nutrient retention in soils: Coarser soil grain sizes retain less water than finer particle soils, such as clay and silt, and have a lower cation exchange capacity due to lower surface area (Kozlowski et al. 1991; Taiz and Zeiger 1991). Soils with higher cation exchange capacity supply more minerals to roots. Mineral ions are either adsorbed onto the surface of soil particles or exist in soil solution. The cation NH_4^+ may be found dissolved in water or associated with aerobic soils in

which it oxidizes quickly into NO_2^- and NO_3^- (nitrification) or reacts with other components in the soil to form ammonium salts. Because NO_2^- and NO_3^- are highly soluble in water due to their negative charge, concentrations of these nutrients in the soil water solution tend to be lower in well-drained coarser grained soils. Conversely, negative charges on the soil particle surface promote adsorption of mineral cations such as phosphate, which bind readily to clay particles (containing aluminum or iron) and are not easily lost to groundwater or available to plants.

Light Availability

Light availability influences plant invasion in many ecosystems, due to both vegetation removal and direct effects of shading by invasive species (Crawley 1987, D'Antonio and Vitousek 1992, Yamashita et al. 2000, Meekins and McCarthy 2001, Fargione and Tilman 2002). Reduction in light availability may act as a barrier to invasion in both disturbed and natural habitats (Richardson et al. 2000). Plant species vary greatly in the amount of light they require for colonization and optimal growth (Treshow 1970, Menges and Waller 1983). Although the specific light requirements of *A. donax* and the dominant riparian plant species in California are not well known (Braatne et al. 1996), D'Antonio and Vitousek (1992) reported that invasive grass species prevent establishment and growth of woody species by shading them. Dudley (1998) suggested that monocultures (large infestations) of *A. donax* limit native riparian plant recruitment through light reduction, but the mechanisms behind this phenomenon are still unknown (Dudley 1998). Furthermore, light limitations can promote strong belowground competition between species (Schenk 2006).

Occurrence of Fire

Wildfires ignited by man at unnatural and dangerous times of the year burn rapidly through riparian corridors infested with *A. donax* and may help spread fires across watersheds and along riparian corridors. Historically, dense biomass that accumulated over a period of 30–50 years or more in chaparral communities of California and shrublands in other Mediterranean-type climate regions caused fires to ignite (Minnich 1983, Keeley et al. 1999, Keeley and Fotheringham 2001, 2005). Although fire was once a natural part of shrubland ecosystems in many Mediterranean-type climate regions, large riparian ecosystems provided natural firebreaks because native vegetation retained foliar water that resisted ignition (Bell 1994). Lightning was the primary cause of wildfires, especially during the summer and fall under dry, low humidity conditions (Naveh 1975, Keeley 1982, Keeley et al. 1999). Currently, however, most wildfires in these areas are anthropogenic in origin (Rugen 1987, D'Antonio and Vitousek 1992, Keeley et al. 1999). For example, all 14 concurrent fires in southern California in October 2003 (739,597 acres burned) resulted from human activities (Keeley and Fotheringham 2005).

Fire suppression and, more recently, controlled burning of wildland vegetation are techniques used in the twentieth century to manage vegetation and to avoid wildfires (Kozlowski et al. 1991). However, when enough fuel accumulates due to changes in vegetation type (i.e., native shrublands and perennial grasslands in California have changed to Mediterranean annual grasslands) or a decrease in fire frequency in a region, fires are easily started.

Invasion of annual grass species has been linked to altered fire regimes in rangelands, deserts, and wildlands of California and the Western U.S. (D'Antonio and Vitousek 1992, D'Antonio 2000, Brooks 2002, Brooks et al. 2004, Keeley 2004, Keeley and Fotheringham 2005). *Arundo donax* may pose a more extensive problem in riparian ecosystems due to its perennial growth form (the large volume of biomass produced) and its rapid recovery after fire. Several accounts suggest that infestations of giant reed have increased fuel load as well as fire frequency and intensity along riparian corridors (Rieger and Kreager 1989, Bell 1994, Scott 1994, Dukes and Mooney 2004).

Natural, healthy riparian areas historically have acted as firebreaks primarily because native vegetation has high leaf moisture content (i.e., contains enough water to have low flammability) when fires typically occur in summer and fall. However, the October 2003 wildfire along the Santa Clara River clearly has shown that when natural riparian habitats are infested with *A. donax*, fires spread readily through this historically fire-hardy habitat (Coffman in press). For example, during the Simi/Verdale fire, the fire jumped across Highway 126 and the Santa Clara River through a section of the river densely invaded by *A. donax*, and from there made its way rapidly up and down the riparian corridor on either side of the river (estimated 5 miles per hour) (see Chapter 4). The fire then spread from the riparian corridor to the shrublands on the other side of the river and burned the Santa Suzanna Mountains, including the Simi Hills in the Calleguas Creek watershed to the south. This process was observed in several other locations along the Santa Clara River where shrublands were located close to the river floodplains and terraces (observation by G. Coffman and S. Hedrick 2003). In this way, fire spread

rapidly up and down river corridors through large patches of *A. donax*, especially along terraces where *A. donax* was very dry and provided more fuel than natural vegetation.

Although no scientific evidence exists, a few authors have suggested that fire in riparian ecosystems may increase the ability of *A. donax* to invade natural riparian systems (Rieger and Kreager 1989, Bell 1994, Scott 1994). The large quantity of highly flammable biomass produced by *A. donax*, and its rhizomes immediate growth response compared to native riparian species following fire contributes to its invasion success. Bell (1994) suggested that invasion of riparian ecosystems by *A. donax* is changing these systems from primarily flood-defined to fire-defined systems. Riparian ecosystems infested by *A. donax* that are adjacent to fire-prone shrublands in southern California appear to be on a trajectory towards an invasive plant-fire regime (Brooks et al. 2004).

ORGANIZATION OF DISSERTATION

My dissertation research focused on investigating the influence of nutrients, water, light, and fire on *A. donax* invasion of riparian ecosystems in Mediterranean-type climate regions. My main hypothesis is that increased nutrient, water, and light availability caused by anthropogenic sources in river systems throughout southern California have promoted invasion by *A. donax*. To test this hypothesis, I conducted three main studies employing two study approaches. First, I conducted a large-scale field experiment, located along a riparian terrace of the Santa Clara River in southern California, to test competition between *A. donax* and three native plant species for water, nutrient, and light availability. In a second watershed-scale observational field study, I investigated the influence of nutrients from various land use types and fluvial geomorphic

locations on *A. donax* invasion of riparian ecosystems along several coastal rivers in southern California. In my third study, I examined the role of fire in promoting *A. donax* invasion of riparian terraces of the Santa Clara River. Following this Introduction chapter, each of these three studies will be described in chapters 1–3. The final chapter (Conclusions Chapter) of the dissertation presents conclusions and management implications based on these studies.

FIGURES

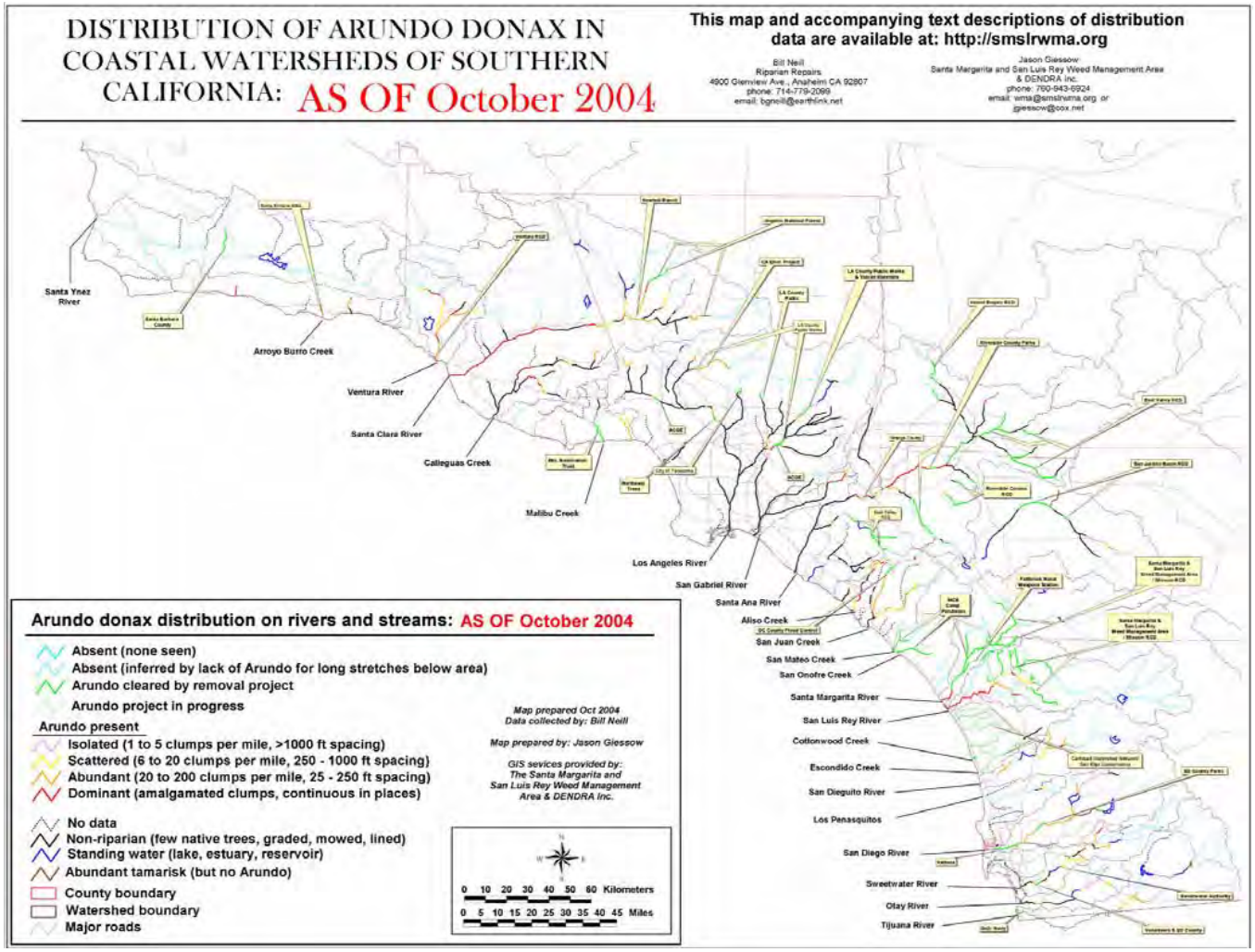

Figure 1. Distribution of *A. donax* throughout streams and rivers of Southern California (Used by the permission of Jason Giessow and Bill Neill, http://smslrwma.org/invasives/Arundo/ADRegionalMap.html).

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CHAPTER 2 -

EFFECTS OF WATER, NUTRIENT, AND LIGHT AVAILABILITY ON COMPETITION BETWEEN *ARUNDO DONAX*, A LARGE INVASIVE GRASS, AND NATIVE RIPARIAN SPECIES

Abstract: Invasion by alien plant species is currently one of the greatest threats to biodiversity and natural functioning of many ecosystems worldwide. Superior resource competition by alien grass species has been shown as the fundamental mechanism for invasion in many ecosystems. In this study, I tested the hypothesis that superior competition for soil moisture, light, and nutrient availability promotes invasion of a large bamboo-like grass, *Arundo donax* L., in riparian ecosystems. I established a large-scale field experiment with several competition plant groupings (mixed and single-species groupings), soil moisture, light, and nutrient treatments in a riparian ecosystem in southern California. I planted 168 four-plant groupings in 12 blocks perpendicular to shallow groundwater flow in a full factorial randomized block design. Effects of treatments on survivorship and aboveground biomass of *A. donax* were compared to native *Baccharis salicifolia*, *Salix laevigata*, and *Populus balsamifera* ssp. *trichocarpa*. Percent survivorship was high for all species (97.8% overall) and did not differ significantly for *A. donax* between treatments. Results show *A. donax* only suppressed one native species (*P. balsamifera* ssp. *trichocarpa*) under the most stressful environmental conditions. Competition from *B. salicifolia* and *S. laevigata* had a strong negative effect on *A. donax* biomass under high soil moisture, light, and nutrients.

Furthermore, *B. salicifolia* was facilitated by *A. donax* in half of the conditions tested. Despite negative effects of competition, *A. donax* produced a much higher biomass than native species under high soil moisture, light, and nutrient levels, and *A. donax* biomass in monoculture was much higher than all species within all treatment levels. Results suggest that high resource levels and the clonal growth form, not superior resource competition by the invasive *A. donax*, promote observed preemptive competitive exclusion of native riparian species. Its unique morphology and physiology, absent in this system before its introduction, allows *A. donax* to readily displace natives in many resource levels. *Arundo donax* appears to be a super invader, able to outperform native woody riparian species in almost every resource scenario tested.

Key Words: *Arundo donax, Salix laevigata*, *Populus balsamifera* ssp. *trichocarpa*, *Baccharis salicifolia*, giant reed, invasive species, alien, competition, nutrients, nitrogen, light, soil moisture, riparian, rivers, Mediterranean-type climate

INTRODUCTION

Invasion of natural ecosystems by alien plant species is a widespread phenomenon known to result in significant losses to biodiversity and impacts to ecosystem functioning (Elton 1958, Mooney and Drake 1986, Ramakrishnan and Vitousek 1989, D'Antonio and Vitousek 1992, Vitousek et al. 1996). Aquatic ecosystems such as rivers and wetlands are among the world's most heavily invaded systems (Mooney et al. 1986, Kruger et al. 1989, Pysek and Prach 1994, Alpert et al. 2000, Rundel 2000). Altered disturbance regimes, low stress environmental conditions, and anthropogenic enhancement of nutrients are thought to contribute to success of plant invasion in rivers and wetlands (Ashton and Mitchell 1989, Hobbs 1989, Hobbs and Huenneke 1992, Alpert et al. 2000). However, mechanisms by which invasive plant species exclude native plant species and dominate natural vegetation in these ecosystems are not well understood, yet are essential for developing effective control and restoration plans (Dudley 1998, Minchinton et al. 2006).

Superior interspecific competition between native and introduced species for water, light, and nutrient resources plays a critical role in plant invasion in many terrestrial ecosystems (D'Antonio and Vitousek 1992, Gordon and Rice 2000, Booth et al. 2003, Suding et al. 2004, White and Holt 2005, Richardson 2006). In the California grassland ecosystem, superior resource competition by Mediterranean annual grasses for water (Hamilton et al. 1999, Coleman and Levine 2007) and nutrients (Kolb et al. 2002) has been found to contribute to the almost total exclusion of native perennial bunchgrasses (D'Antonio and Vitousek 1992). Recent work by a number of authors has

revealed the relative importance of various resources and levels of each resource in this invasion process (Kolb and Alpert 2003, Corbin and D'Antonio 2004b, Thomsen et al. 2006). A few experimental studies in river and wetland ecosystems have demonstrated superior resource competition by invasive plants for either nutrients (Green and Galatowitsch 2002, Minchinton and Bertness 2003) or water (Sher and Marshall 2003), but no studies have examined effects of multiple resources simultaneously (i.e., various levels of water, light, and nutrients). Furthermore, controversy exists over the relative importance of competition in stressful, infertile versus productive ecosystems (Grime 1979, Tilman 1988, Goldberg and Novoplansky 1997, Alpert et al. 2000). Experimental studies addressing competitive interactions between invasive and native plants under multiple resources conditions (water, light, and nutrients) are needed to help elucidate the invasion process and aid in restoration of invaded ecosystems.

In the last half of the twentieth century, a tall bamboo-like member of the grass family (Poaceae), giant reed (*Arundo donax* L.), has become one of the most successful weedy riparian invaders in arid and Mediterranean-type climates worldwide (Bell 1997, Dudley 1998, Boose and Holt 1999). *Arundo donax* appears to be of a broad southern Eurasian origin, extending from Southeast Asia to the Mediterranean Basin, although the precise extent of its native distribution is unclear (Perdue 1958, Zohary 1962, Hickman 1993). Introduced extensively to other areas primarily for building materials, erosion control, and windbreaks, it is now successfully established in freshwater systems in tropical to temperate climates worldwide (Perdue 1958, Crampton 1974, Polunin and Huxley 1987, Hickman 1993, Sharma et al. 1998). Although the seeds are usually sterile

(Johnson et al. 2006), *A. donax* is dispersed downstream when pieces of culm or rhizome break off during flooding and land on bare, moist substrates (Else 1996, Else and Zedler 1996, Bell 1997, Boose and Holt 1999, Wijte et al. 2005). From these pieces, the plant grows at an extremely fast rate (up to 10 cm per day under optimal conditions), quickly establishing on exposed or sparsely vegetated soil and growing to more than 8 m in height after only a few months (Perdue 1958, Rieger and Kreager 1989, Bell 1994). Once established, *A. donax* expands outward in area by clonal propagation, displacing indigenous shrubs, herbs and grasses, and eventually even trees (Decruyenaere and Holt 2001). In this manner, *A. donax* forms extensive stands or monocultures in riparian ecosystems.

In Mediterranean-type climates, *A. donax* infestations have become especially devastating to riparian ecosystems, creating significant physical and biological impacts on natural river functioning and sustainability (Rieger and Kreager 1989, Bell 1997, DiTomaso 1998, Rundel 2003). High magnitude winter floods characteristic of many arid climates help distribute *A. donax* downstream, where it successfully establishes on a diverse array of substrates (Rieger and Kreager 1989, Else 1996, Else and Zedler 1996) much like the native riparian species in these systems. However, mechanisms of *A. donax* invasion in natural riparian ecosystems have been largely unexplored. Researchers have suggested that high resource levels and superior resource competition with native riparian plants (i.e., for elevated water, nutrients, and light availability) may promote invasion of *A. donax* in riparian ecosystems of southern California (Bell 1997, Wang 1998, Rundel 2003, Coffman et al. 2004), yet no experimental evidence of resource

competition by *A. donax* exists to support this hypothesis. Mechanisms that promote invasion of *A. donax* under various resource conditions in riparian ecosystems are essential to its control and restoration of these systems.

In this study, I examined the role of competition between *A. donax* and native species under varying resource scenarios found in riparian ecosystems in the plant invasion process. I predicted that aboveground biomass of native riparian plant species would be suppressed by high productivity of *A. donax* in high soil moisture, light and nutrient treatments, while under more stressful (and lower) resource conditions competitive interactions would favor native species which have evolved under these conditions (Alpert et al. 2000, Daehler 2003). Where *A. donax* establishes with native riparian plants in high resource conditions, growth rate will be high but competition from native plants for soil moisture and nutrients will be high as well. Differing habit, phenology, and rooting depth of *A. donax* (clonal) and native riparian species (phreatophytes) play a key role under these conditions (Fargione and Tilman 2005).

Physiological integration among culms and their spatial arrangement may provide *A. donax* with a competitive advantage over native woody riparian trees and shrubs (Gough et al. 2002). The clonal growth form of *A. donax* enables it to grow horizontally, preemptively acquiring space from competitors and to average out surrounding heterogeneity in soil resources (Decruyenaere and Holt 2005). Although *A. donax* has a much shallower rooting depth than native riparian phreatophytes, *S. laevigata* and *P. balsamifera* spp. *trichocarpa*, root depth of these plants should remain relatively shallow and density low when resources are abundant (Schade and Lewis 2006, Schenk 2006)

(See Chapter 3; Figure 9). Thus, substantial overlap in the density of root mass between species may result in stronger competition under these conditions. Depending on density (Gough et al. 2002) and native species competing, these conditions may lead to either successful competitive exclusion of all or some native species by *A. donax*. In high stress and low resource conditions, naturally found along rivers in Mediterranean-type climates, *A. donax* may avoid competition with native plants due to differential rooting depths; native phreatophytes will develop deeper roots than *A. donax* when soil moisture and nutrients are scarce.

I hypothesized that superior resource competition in high soil moisture, light, and nutrient regimes has promoted invasion of *A. donax* throughout rivers in Mediterranean-type climates. I investigated *A. donax* competition with several common native woody riparian plant species under various soil moisture, nutrient, and light levels in a large-scale field experiment in southern California. Plant survivorship and aboveground biomass of each species in intraspecific compared to interspecific competition groupings were analyzed. This experimental design allowed me to investigate the role of varying resource conditions thought to be most fundamental to competitive exclusion of indigenous riparian plants by *A. donax* using a natural, controlled approach.

METHODS

Study Site

The field experiment site was located on a private ranch on the south side of the Santa Clara River between Santa Paula and Fillmore, Ventura County, California (34.36° N, 118.99° W) (Figure 2). The 187 km long Santa Clara River and its tributaries drain a

4,185 square km watershed, the second largest coastal watershed in southern California. Prior to its clearing for agriculture, the riparian terrace in which the field experiment was established was once dominated by large riparian trees such as black cottonwood (*Populus* (L.) *balsamifera* ssp. *trichocarpa* Torrey & A. Gray) and red willow (*Salix laevigata* Bebb). A mixture of smaller trees and shrubs likely comprised the understory layer, including arroyo willow (*Salix lasiolepis* Benth.), mulefat [*Baccharis salicifolia* (Ruiz Lopez & Pavon) Pers.], and blue elderberry (*Sambucus mexicana* C. Presl.).

The experiment ran for two growing seasons, from December 2002 to December 2004. In October 2002, I began construction of the 0.5-hectare field experiment on a riparian terrace between agricultural fields and the river. Based on measurements of groundwater depth taken from a grid of borings throughout the experimental area, I found that shallow groundwater flowed in a southeast to northwest direction from the agricultural fields through the field experiment toward the river. Rows (or blocks) of plant groupings within the field experiment were located perpendicular to the direction of shallow groundwater flow to accommodate variance due to differing hydrology (Figure 3).

Baseline soil grain size (soil texture) and nutrient status were determined in Summer 2002, before construction of the experiment began to help in final placement of experimental groupings and treatments. The western side of the experimental area was primarily composed of a shallow horizon (soil surface to 26–66 cm) of sandy loam, silt loam, and loam with a deep horizon of fine sand and coarser sand below (to 171–199 cm and deeper). The eastern side of the experiment contained mostly loam (and silt loam) in

the top horizon (soil surface to 44–102 cm), loam and silt loam in a middle horizon, and sand in the lowest horizon (below 138–216 cm). Soil moisture was consistently higher on the eastern side of the experiment than the western side due to soil grain size composition and topography.

I conducted baseline soil nutrient analyses on 18 soil samples collected from 0–30 cm depth systematically throughout the experiment. In spring 2003, pre-fertilization soil nutrient levels in the experimental study area mean soil nitrate (5.2 ± 1.7 ppm) and phosphate (11.1 ± 1.1 ppm) levels were comparable to concentrations found in soil along similar riparian terraces along the Santa Clara River (see Chapter 3). Average soil pH (7.69 ± 0.02) did not differ markedly throughout the experimental site.

Study Species

Arundo donax is a robust, perennial, bamboo-like member of the Poaceae (grass) family that was introduced and is now widespread throughout the floodplains and terraces of rivers in California and other warm, temperate climates worldwide (Perdue 1958, Crampton 1974). It has erect stout (yet hollow) culms that are 1–4 cm thick and 2–8 m in height. Culms branch to form ramets, typically at the end of the first year of growth or after a culm is damaged. Leaf blades are broad (2–6 cm wide), less than 1 m long, flat, clasping at the base, strongly scabrous along their margins, and evenly spaced along the culm (Crampton 1974, Hickman 1993). *Arundo donax* reproduces vegetatively through a network of large, thick rhizomes that grow horizontally just below the ground surface. Under some conditions it produces a large (3–6 dm) terminal plume-like inflorescence (panicles) at the end of the growing season (Faber and Holland 1992, Hickman 1993).

I selected three native riparian plant species commonly found on terraces of rivers in southern California to use in the experiment: *Salix laevigata* (red willow) *Populus balsamifera* (black cottonwood) ssp. *trichocarpa*, and *Baccharis salicifolia* (mulefat). *Salix laevigata* is a riparian tree that can grow as tall as 15 m and is a member of the Salicaceae. Dominant in both floodplains and terraces along rivers in southern California, *S. laevigata* can be identified by its dark, deeply furrowed bark on mature trees and lanceolate leaves, which are shiny on the top and glaucous beneath. Also a member of Salicaceae, *P. balsamifera* ssp. *trichocarpa* grows to a height of 30 m in alluvial plains along rivers in southern California. *Populus balsamifera* ssp. *trichocarpa* trees can be identified by their broad crown and bicolored ovate leaves with acute tips, which are dark green on the top and glaucous underneath (Faber and Holland 1992, Hickman 1993). *Baccharis salicifolia* is the dominant shrub found throughout floodplains and terraces of streams and rivers in southern California. A member of the Asteraceae, *B. salicifolia* usually grows to a height of less than 4 m. Its long linear to lanceolate leaves resemble willow leaves, but they typically have three principal veins that extend the entire length of the leaf and are coarsely serrated (Faber and Holland 1992, Hickman 1993). In addition, *B. salicifolia* shrubs produce a rounded panicle of white simple compound dioecious flowers.

Experimental Design

This field experiment was organized as a full factorial randomized block design to minimize variation due to heterogeneous soil and shallow groundwater conditions found within the site. A total of 288 plant groupings (four plants per grouping) were organized

in 12 blocks (rows) of 24 groups each perpendicular to the general flow of shallow groundwater hydrology (Figure 3). Blocks of plant groupings were placed 4 m apart and plant groupings within blocks were placed 3 m apart. 756 cuttings of riparian trees (1 m long by approximately 2–3 cm in diameter) and 396 rhizomes of *A. donax* (200–400 g) were planted approximately 0.75 m apart in square configurations. Native riparian species cuttings were planted in December 2002, and *A. donax* rhizomes were planted in March 2003. Multiple levels of three resource treatments and competition treatment were applied randomly to plant groupings along rows before planting, including soil moisture (high and low), light (high and low), and nutrient additions (high and none). To simplify the interpretation and presentation of results, the 96 low-nutrient treatment plant groupings in the experiment are not included in the analyses.

I used two competition groupings (two-species and one-species groupings) in the experiment to compare interspecific versus intraspecific competitive interactions (Table 1). The two-species groupings, referred to as 'mixed species grouping' consisted of two *A. donax* plants and two plants of a single native species. Like species were planted diagonally across from each other in the mixed species groupings. One species-groupings, or monocultures, contained four plants of only one species per grouping. (The 36 four-species groupings in the experiment were not included in this study.) In this experiment, the criterion for existence of an interspecific competitive interaction was evidence of significantly different biomass in mixed plant groupings compared to monocultures. If mean biomass of a species was lower when grown with another species compared to in monoculture, an interspecific competitive interaction was present. An

interspecific interaction was deemed positive (facilitation) when the mean biomass of a species was higher in mixed species groupings compared to its biomass when grown in monoculture.

Two soil moisture treatments occurred naturally; the western half of the experiment contained soils that were better drained (referred to as low soil moisture), whereas the eastern half of the experiment retained higher soil moisture throughout the year (high soil moisture). To simulate natural establishment conditions, I did not apply artificial irrigation.

In Spring 2003, I built shade structures over half of the experiment to simulate shading by a mature riparian canopy and test the effects of light availability. The two light treatments consisted of full sun (referred to as high light) and 80% shade (low light). I used 80% black shade cloth on six shade structures (total dimensions were 200 feet x 10 feet x 15 feet high) that were erected along rows in two large blocks of the experiment to minimize the shade effect onto non-shaded rows. One block (three rows) was placed over the high soil moisture portion (northeast) and one block (three rows) was placed over the low soil moisture portion (southwest) (Figure 3). I applied nutrient treatments to designated plant groupings twice a year: a fertilized "high N" treatment and "no N" treatment control in which only water was added. Granular ammonium-nitrate fertilizer (N-P-K, 34-0-0) was used as the source of added nitrogen and was mixed with 2 gallons of water before application. High nitrogen treatments (100 g N/m^2/year or 56 g N/plant/year) were added to one-half of the plant groupings to simulate row crop fertilization levels adjacent to riparian areas. I applied half of the nutrient treatments at

the beginning of the growing season and the remainder at the peak of the growing season; this timing of fertilization application is similar to that used in agricultural practices in the area. Each plant in the no fertilizer treatment received 2 gallons of water at each of the two application periods.

Sampling Methods

I monitored soil moisture to characterize the soil water content throughout the experimental site using 14 soil moisture probes (20 cm ECH_2O Dielectric Aquameter sensors by Decagon Devices, Inc.), which I installed systematically throughout the experiment in the summer of 2004 (Figure 3). I placed 10 soil moisture probes in a soil horizon (between 60–80 cm from the soil surface) located roughly in the middle of the root system for most plants. The other four probes were placed in a shallower soil horizon (from 30–50 cm) to measure soil moisture in the area in which the cuttings were initially planted. I measured soil moisture content of these probes weekly from July 2004 to September 2005.

Annual mean soil moisture content (60–80 cm below ground surface) on the eastern side (Mean ± SE = 38.5% ± 0.5) of the experiment was significantly higher than on the western side (33.2% ± 1.0) during the 2004–2005 water year (one-way analysis of variance results: $F_{(1,383)} = 23.583$; $P < 0.001$). The shallower soil horizon (30–50 cm below the ground surface) in which cuttings were established exhibited a similar trend; soil moisture was 42.1% ± 0.4 on the eastern side and 37.8% ± 0.5 on the western side (one-way analysis of variance results: $F_{(1,166)} = 47.686$; $P < 0.001$). Mean soil moisture content fluctuated throughout the year but was consistently higher on the eastern side

than the western side (Figure 4). Although soil moisture probes were not installed until the end of the second growing season (Summer 2004), trends observed during 2004-2005 were likely similar or more pronounced in 2003-2004 due to lower annual precipitation. Thus, the eastern side was designated as the high soil moisture treatment and the western side as the low soil moisture treatment.

I measured plant survivorship at three time periods: 1) survivorship of planted cuttings in spring 2003, 2) plant survivorship at the end of 2003, and 3) plant survivorship at the end of 2004. A few cuttings and rhizomes that did not grow initially were replanted in spring 2003 and the replacement plant establishment success was included in the 2003 and 2004 percent survivorship results.

Biomass Estimation

The aboveground biomass of all plants in the field experiment was estimated over the two-year study period (2003 to 2004). I used non-destructive dimensional analyses to estimate aboveground biomass dry weight of plants in the experiment so that I would interfere as little as possible with plant growth and other measurements taken throughout the course of the study period (Whittaker 1961, 1965, Whittaker and Marks 1975, Sharifi et al. 1982, Spencer et al. 2006). Compartments of aboveground biomass measured included: branches, main trunk (cutting), leaves, flowers, and seeds of native species, and culms, leaves, and ramets of *A. donax*. Regression models were created using the basal diameter measurements to predict biomass of all compartments (except main trunks) of each plant. All data were natural log transformed in the regression models. Trunk biomass (the aboveground portion of the original cutting) of native species was estimated

by dividing the trunk volume (cm^3) by the density (cm^3/g) of a sample of wood of that particular species. Trunk volume was calculated using average diameter and length of the cutting in the equation for cylinder volume ($V = \pi r^2 h$).

At the end of each growing season (2003 and 2004), branches/culms were cut, basal diameter measured, biomass oven-dried, leaves separated from branches/culms, and biomass weighed separately. I collected a total of 320 branch/culm aboveground biomass samples in 2003 and 400 samples in 2004 for the dimensional analysis biomass estimation. In 2003, 20 branches/culms from the range of branch diameters present for each of the four species were harvested from monoculture competition groupings in each of the experimental quadrants (SE, NE, NW, SW – two soil moisture and two light levels) (20 x 4 x 4 = 320) (Figure 3). In addition, 20 second-year *A. donax* culms were collected in each experimental quadrant in 2004 (total of 80 culms). Only fully mature *A. donax* culms were sampled.

Regression equations for branch/culm basal diameter versus corresponding dry aboveground biomass samples were calculated for each species in each of the four soil moisture-light treatment combinations (16 for 2003 and 20 for 2004). Regression models for aboveground biomass were very highly significant for all species under various combinations of soil moisture and light treatments in 2003 and 2004 ($r^2 = 0.770–0.996$, $P < 0.001$) (see Appendix 2-1 for model equations). Therefore, I used these equations to estimate aboveground biomass for all plants within the field experiment.

At the end of the 2003 and 2004 growing seasons, I measured basal diameters (10 cm from the trunk of riparian plants or 10 cm above the ground surface for *A. donax*) of

each branch or culm growing from the original cutting. Only culms that were > 60% of mature height were measured. To calculate total biomass of each plant at the end of each growing season, I used the basal diameter of each branch/culm of an individual plant in the corresponding regression equation for that species and treatment and totaled the resulting biomass for all branches/culms. Trunk biomass estimates were added to total biomass for each native riparian plant.

Statistical Analyses

Descriptive statistics were performed on soil moisture and plant survivorship measurements. I conducted one-way ANOVAs on soil moisture content to validate high and low soil moisture treatments and establishment of plant species between the first and second growing season, with Tukey's post-hoc test for pair-wise comparisons of means.

The competition experiment was organized in a full multifactorial design in which combinations of four fixed factors (Model 1) were crossed with each other. Four-way analysis of variance (ANOVA) tests were used to analyze effects of various combinations of four factors (independent variables) on total aboveground biomass data (standing stock) collected at the end of the second growing season (dependent or response variables) (Systat Statistical Program [Version 10]). The four independent variables were competition plant groupings, soil moisture, light, and nutrient addition treatments. Data were analyzed for main effects of individual factors and interactions between factors. ANOVA F-tests were performed to evaluate a priori contrasts between means of grouping variables and levels in multifactor ANOVA results. Probability plots were examined to test for normality of data and to identify any data that required

transformation. Because soil moisture and percent survivorship data were normally distributed, data transformation was unnecessary. All biomass data were ln transformed. When means and standard errors were used to describe or present statistical differences, data were back-transformed and reported in original units.

RESULTS

Establishment

Plant establishment success between installation in winter 2002–2003 and the end of the growing season in 2004 was very high for all species. Cutting survivorship in spring 2003 was 97.7% for all plants. Total plant survivorship at the end of 2003 and 2004 was 98.4% and 97.8%, respectively, and slightly higher than cutting survivorship due to replanting of unsuccessful cuttings. Soil moisture, nutrient, and light treatments had no effect on *A. donax*, *S. laevigata*, or *B. salicifolia* survivorship (See Appendix 2-2 for analyses of species and resource treatment effects). However, establishment success of *P. balsamifera* ssp. *trichocarpa* at the end of the first growing season (2003) was significantly lower within the high soil moisture treatment than in any other species and soil moisture treatment combination. Percent survivorship did not decrease significantly during the two-year establishment period ($F_{(1,158)} = 0.485$; $P = 0.487$). Therefore, I considered plants fully established by the end of the first growing season (2003) and evaluated competitive interactions at the end of the second growing season (2004).

Biomass Production

Arundo donax biomass was higher than native plant species biomass under nearly all soil moisture, light, and nutrient conditions at the end of the second growing season. In fact, the mean biomass of *A. donax* in monoculture under high soil moisture, light and nutrient conditions was 2–34 times that of all native species under all conditions tested [range = 0.46 kg (SE 0.30–0.68) to 7.03 kg (SE 6.41–7.72)] (Figure 5). In high soil moisture, light, and nutrient conditions, monocultures of *A. donax* exhibited a significantly higher mean biomass [17.05 kg (SE 15.98–18.20)] than any native plant species under these conditions [2.63 kg (SE 2.24–3.10) to 4.21 kg (SE 3.69–4.80)] (Figure 6). Despite negative competitive interactions with *B. salicifolia* and *S. laevigata* under high resource conditions (high soil moisture, light, and nutrients), mean biomass of *A. donax* was nearly double that of *S. laevigata* and 20 percent higher than *B. salicifolia* in mixed groupings (Figure 5). Biomass of *A. donax* grown in monoculture was almost six times that of *P. balsamifera* spp. *trichocarpa* in high resource conditions. Facilitation by *P. balsamifera* spp. *trichocarpa* contributed to an even higher mean biomass of *A. donax* in the 2-species mixed grouping compared to monoculture in similar experimental conditions. *Arundo donax* biomass was consistently higher than that of most native species in other soil moisture, light, and nutrient treatments, however differences between biomass of *A. donax* and native species were not as great.

Biomass of *A. donax* grown under high soil moisture, light, and nutrient conditions was much higher than when grown under any other experimental condition (Figure 5 and Figure 6). Although native plant species show similar trends, differences in

mean biomass between these treatment conditions were much less than for *A. donax*. Under high resource conditions, mean biomass of *A. donax* was highest in monoculture [17.05 kg (SE 15.98–18.20)] and lowest in the low soil moisture-high light and high soil moisture-low light treatments (Figure 6). Of the native species grown in monoculture, *B. salicifolia* yielded the highest mean biomass [4.20 kg (SE 3.69–4.80)] in the high soil moisture, light, and nutrient treatment, but this was only one-quarter of the maximum biomass produced by *A. donax*. The lowest native species biomass in monoculture was produced by *P. balsamifera* spp. *trichocarpa* in the low soil moisture, light, and nutrient treatment [0.53 kg (SE 0.46–0.60)], more than 30 times lower than *A. donax* biomass in high resource conditions.

The 4-way ANOVA for aboveground biomass of all species by factors of plant grouping, soil moisture, light, and nutrients resulted in two 3-way interactions (Table 2). The plant grouping x soil moisture x light interaction was difficult to interpret but significance was mainly due to lower *S. laevigata* biomass than other species in low soil moisture-high light treatments as well as numerous significant competition interactions mentioned below. The significant soil moisture x light x nutrients interaction was explained by higher biomass in high soil moisture-high light than any other combination of these factors and levels.

Resource Competition

When I compared mean aboveground biomass by species in mixed groupings versus monocultures, effects of competition between *A. donax* and native plants varied significantly by species and resource treatment levels. *Arundo donax* was a superior

resource competitor to only one native plant, *P. balsamifera* spp. *trichocarpa*, under only one of the conditions tested. Under the most stressful experimental conditions of low soil moisture, full sun, and no nutrient additions, *A. donax* competition had a negative effect on *P. balsamifera* spp. *trichocarpa* biomass (Table 3). Under these conditions, *P. balsamifera* spp. *trichocarpa* obtained the lowest biomass of all native species [0.46 kg (SE 0.30–0.68)] (Figure 5). The 4-way ANOVA of *P. balsamifera* spp. *trichocarpa* biomass resulted in a significant 3-way interaction (plant grouping x light x nutrients) due to this competitive interaction (Table 3). In high resource conditions (high soil moisture, light, and nutrients), there was a suggestion of *A. donax* facilitation by *P. balsamifera* spp. *trichocarpa*, with *A. donax* biomass being 30% greater in the mixed species grouping with *P. balsamifera* spp. *trichocarpa* [22.95 kg (SE 20.13–26.16)] than in monoculture [17.05 kg (SE 15.98–18.20)], but this difference was not statistically significant. A significant negative effect of competition with *P. balsamifera* spp. *trichocarpa* was detected under high soil moisture, low light, and high nutrient levels, conditions in which *A. donax* was least productive [1.38 kg (SE 1.03–1.85)]. Significant 3-way interactions (plant grouping x light x nutrients and soil moisture x light x nutrients) in the 4-way ANOVA of *A. donax* biomass were found (Table 3). The plant grouping x light x nutrients interaction was due to facilitation of *A. donax* by *P. balsamifera* spp. *trichocarpa* under high soil moisture, light, and nutrients. Much higher biomass in high soil moisture-high light treatments than in all other treatments was the primary cause of the significant soil moisture x light x nutrients interaction.

When grown with *A. donax* in the mixed species grouping compared to in monoculture, *S. laevigata* exhibited no significant competitive interactions with *A. donax* regardless of resource levels. Although competitive effects were not significant, the trend throughout various combinations of treatments, especially under low soil moisture conditions, indicated slight facilitation of *S. laevigata* by *A. donax* (Figure 5). Two-way interactions (soil moisture x light and soil moisture x nutrients) were significant for *S. laevigata* biomass in the 4-way ANOVA (Table 4) due to differing trends among levels in these factors. The soil moisture x light interaction was significant due to lower biomass in high light-low soil moisture compared to the low light-low soil moisture treatments, and the significant soil moisture x nutrient interaction was caused primarily by higher biomass in high nutrient-high soil moisture treatments compared to low nutrient-high soil moisture treatments. *Arundo donax* aboveground biomass was significantly higher (roughly twice as high) in monoculture compared to in the 2-species grouping when grown with *S. laevigata* in the high soil moisture, light, and nutrient treatment (Figure 5). Results of the 4-way ANOVA indicate significant 2-way interactions between soil moisture and light as well as between light and nutrients. The soil moisture x light interaction was significant because in the shade biomass was similar with regard to soil moisture; however, biomass was significantly higher in full sun-high soil moisture compared to full sun-low soil moisture (Table 4). The significant light x nutrient interaction resulted from higher biomass in full sun-high nutrient treatment compared to full sun-no nutrient treatment.

When grown in the mixed species grouping compared to in monoculture, *A. donax* facilitated growth of *B. salicifolia* in half of the treatment combinations (Figure 5). When *B. salicifolia* was grown with *A. donax*, its mean aboveground biomass was almost two-fold higher on average than when grow in monoculture. In the 4-way ANOVA of *B. salicifolia* aboveground biomass, the 4-way interaction was significant (Table 5) due to the presence of strong facilitation effects on half of the treatment combinations and no significant effects on the other half. In contrast, *A. donax* biomass was suppressed by competition with *B. salicifolia* under high soil moisture, light, and nutrient conditions; its biomass was two times higher in monoculture [17.05 kg (SE 15.98–18.20)] than in the mixed grouping containing *A. donax* and *B. salicifolia* [8.74 kg (SE 6.55–1.17)]. Higher mean aboveground biomass of *A. donax* monocultures in high soil moisture-full sun treatments than in any other combination of treatments as well as the competitive suppression of *A. donax* by *B. salicifolia* (Figure 5) yielded a significant 3-way interaction between plant grouping, soil moisture, and light in the 4-way ANOVA (Table 5).

DISCUSSION

In this study, I experimentally investigated competition between a particularly invasive bamboo-like grass species and three native woody riparian species under varying multiple-resource conditions that are found in natural riparian ecosystems. Superior interspecific competitive interactions between native and introduced species for water, light, and nutrient resources are critical in the plant invasion process in many ecosystems (D'Antonio and Vitousek 1992, Hamilton et al. 1999, Gordon and Rice 2000,

Green and Galatowitsch 2002, Booth et al. 2003, Kolb and Alpert 2003, Sher and Marshall 2003, Suding et al. 2004, White and Holt 2005, Minchinton et al. 2006, Richardson 2006, Coleman and Levine 2007). Preemptive as well as interspecific competition for resources between plant species has been well documented in many ecosystems (Connell 1983, Schoener 1983, Tilman 1987, Goldberg and Barton 1992, Daehler 2003). Evidence of several positive, negative, and non-significant competitive interactions between species was observed in the experiment, but interactions were different than predicted. Surprisingly, results indicated only one negative competitive interaction of *A. donax* on a native riparian plant, although its biomass was higher than almost all native plants in almost every experimental condition tested during the length of this study. Competitive interactions between these species may change over time and should be studied over a longer time span.

Competition

The only instance in which *A. donax* outcompeted a native plant species for resources was under the most stressful experimental conditions tested (low soil moisture, high light, and no nutrient addition levels). Under these conditions, competition with *A. donax* resulted in lower *P. balsamifera* ssp. *trichocarpa* biomass than found in monoculture. In fact, the mean aboveground biomass of *P. balsamifera* ssp. *trichocarpa* under these conditions was lower than in any other combination of resource levels. It seems likely that exploitative competition (competition for limiting resources) for soil moisture and available nutrients accounts for this negative effect of competition, since *A. donax* did not grow large enough to shade out *P. balsamifera* ssp. *trichocarpa* by

preemptive (competition for space) or overgrowth (one species grows over another, blocking light or depriving other species of a limiting resource) competition (Schoener 1983). This finding does not concur with Grime's hypothesis that resource competition is relatively unimportant for plants in unproductive or stressful environments due to the low biomass produced and corresponding low resource depletion (Grime 1977, 1979). According to Tilman (1988) however, competition occurs across productivity gradients and plants compete strongly under low resource conditions for belowground resources, mainly nutrients and water. Alpert et al. (2000) asserted that environmental stress may shift the competitive balance between invasive and native plants; mainly invasive plants take advantage of high resource availability compared to natives and low resource availability tends to cause low invasibility. However, I found that *A. donax* grew much more rapidly than all three native species under nearly all treatment conditions and suppressed one native species under low resource conditions.

Despite these hypotheses and predictions, invasive-native competitive interactions in conditions of high environmental stress are not well understood and experimental results vary by species and ecosystem. In grasslands of the western U.S., low nitrogen levels were found to have no effect on competitive ability of invasive annual grasses (Kolb and Alpert 2003, Lowe et al. 2003, Thomsen et al. 2006) or an invasive herb (*Centaurea diffusa*) on native grassland species. An invasive perennial grass (*Phalaris arundinacea*) suppressed native aboveground and belowground biomass in a wetland sedge meadow at low nitrate levels (Green and Galatowitsch 2002), yet lower phosphorus levels decreased *C. diffusa* competitive advantage over native species (Suding et al.

2004). Lowered water availability had no effect on competitive interactions between an invasive grass compared to a native grass in a Canadian mixed-grass prairie; however, low water availability was found to favor a small invasive tree, *Tamarix ramosissima*, in a floodplain of the Mojave Desert (Cleverly et al. 1997). Only one published experiment has examined competitive interactions under stressful conditions similar to my study with low soil moisture, high light, and low soil nutrients. The non-native annual grass (*Lolium multiflorum*) outcompeted a native perennial grass (*Hordeum brachyantherum*) at all resource levels when germinated simultaneously (Kolb et al. 2002). No studies showed increase in (or higher) competitive ability of invasive species relative to native species in stressful conditions of low nutrients, low water, and/or high light availability (Alpert et al. 2000). My experiment demonstrates that resource competition between invasive and native species may be highly species-specific under stressful environmental conditions. Differences in physiology of competing species, including variation in soil moisture and associated nutrient use, phenology, and differing rooting depth, may be important in mediating competitive interactions between *A. donax* and native woody riparian species (Reynolds and Pacala 1993, Fargione and Tilman 2005, Schenk 2006).

Although specific light requirements of *A. donax* and dominant riparian plant species in California are not well known (Braatne et al. 1996), invasive grass species are known to prevent woody species establishment and growth by shading them (D'Antonio and Vitousek 1992). Under conditions of high soil moisture and nutrient levels but low light, such as those found in mature riparian forests along streams in California, *A. donax* biomass was lower when grown with *P. balsamifera* spp. *trichocarpa* compared to in

monoculture. Light limitations can promote strong belowground competition between species (Schenk 2006). Although not measured in this study, similarities in rooting depth and higher growth rate of roots versus shoots of *P. balsamifera* spp. *trichocarpa* (Braatne et al. 1996, Pregitzer and Friend 1996) compared to *A. donax* in these conditions may help explain suppression of *A. donax*. *Populus balsamifera* spp. *trichocarpa* develops a shallow, lateral root system primarily with occasional sinker roots (similar to a taproot) (Pregitzer and Friend 1996). Nonetheless, this finding was surprising given the documented shade-intolerance of riparian *Populus* spp. (Walters and Reich 2000, Portsmuth and Niinemets 2007), but competitive effects might differ if grown from seed due to high light germination requirements (Braatne et al. 1996). Conservation and restoration of structurally diverse mature riparian forest, including *P. balsamifera* spp. *trichocarpa*, may help suppress *A. donax* invasion where high water and nutrient conditions prevail.

Competition with both *S. laevigata* and *B. salicifolia* reduced *A. donax* biomass by half when grown together in mixed groupings in high soil moisture, light and nutrient conditions. Suppression of *A. donax* biomass by native trees in these high resource conditions was an unexpected result. I predicted *A. donax* would competitively suppress and exclude natives under high resource availability following Goldberg and Novoplanksy's (1997) two-phase resource dynamics hypothesis and Tilman's resource competition hypothesis (Tilman 1982, 1988). Native plant preemptive competition may be responsible for negative effects on *A. donax* biomass, since water, light, and nutrient resources were abundant. Although biomass of these two natives was much lower than

the *A. donax* they suppressed, their woody phenology (upward, wide branching growth habit) may have restricted *A. donax* from expanding horizontally in all directions as it does naturally when grown alone or with other *A. donax* individuals. After the first year of growth upward, *A. donax* adds biomass by growing outward in a clonal manner. It appears that *S. laevigata* and *B. salicifolia* were able to limit its growth outward toward them somewhat (although not totally). Close observation of *A. donax* removed after the experiment indicated that individual clones planted in monoculture (four individuals) grow laterally in all directions intertwining with other *A. donax* individuals.

Facilitation

The role of positive interspecific competition for multiple resources in the invasion process has been relatively unexplored, but potentially of considerable importance in explaining mechanisms of riparian ecosystems invasion. Most examples of invasive plant species exerting competitive exclusion on native species have focused on and demonstrated negative competitive effects varying only one resource condition. However, the importance of facilitation in plant community organization and structure and its role in ameliorating harsh physical environments have been elucidated recently (Bertness and Callaway 1994, Bruno et al. 2003). Several examples of positive competitive interactions, or facilitation, between invasive and native plant species have been documented (Maron and Connors 1996, Green and Galatowitsch 2001, Rodriguez 2006).

Direct positive interactions, including facilitation, between native and invasive species has been overlooked until recently (Bertness and Callaway 1994, Rodriguez

2006). In California coastal prairie, Maron and Connors (1996) demonstrated that the native bush lupine shrub (*Lupinus arboreus*) facilitates an invasive annual grass (*Bromus diandrus*) invasion through fertilizing of the surrounding soil by nitrogen fixing and deposition of nitrogen-rich litter. I found only one study exhibiting facilitation of a native plant species by an invasive plant species; evidence of weak facilitative effects of an invasive wetland monocot (*Typha* x *glauca*) on native sedge meadow community were documented under the highest nitrate levels applied (Green and Galatowitsch 2001). However, the authors admit that *T*. x *glauca* did not appear to be well established during the short duration (4-months) of the experiment and this likely effected results. I discovered that the invasive *A. donax* facilitated the native *B. salicifolia* under half of the conditions tested; *B. salicifolia* exhibited much higher biomass when grown with *A. donax* than when grown in monoculture. In three out of four treatments tested, facilitation of the native *B. salicifolia* was detected under high soil moisture, high light, or low nutrient conditions. Similar but weaker trends in facilitation of *S. laevigata* by *A. donax* were observed.

Plant facilitation may be a particularly common characteristic in harsh physical environments in which primary space-holders buffer neighbors from potentially limiting stresses (Bertness and Callaway 1994, Bruno et al. 2003, Rodriguez 2006). Introduction of novel habitats or physical structure provided by an invasive species can alter abiotic conditions that enable native species to survive (Rodriguez 2006). Although both plants occupy roughly the same rooting zone especially in the first few years under high soil moisture conditions, *A. donax* may ameliorate stressful conditions for *B. salicifolia*. For

example, *A. donax* may draw down high soil water content in the surrounding rooting zone in very high soil moisture levels or decrease high salinity levels, conditions that have been shown to limit *B. salicifolia* growth otherwise (Vandersande et al. 2001). Since *A. donax* is functionally unique compared to the native phreatophyte *S. laevigata* and slight facilitation was detected under almost all growing conditions, novel facilitation by *A. donax* could provide a new habitat structure for *S. laevigata* as well. Mechanisms responsible for this type of facilitative interaction should be addressed in future research. Finally, facilitation of *B. salicifolia* and *S. laevigata* by *A. donax* may be only present in paired species groupings or when surrounded by *A. donax* and absent or not as important in naturally diverse riparian communities due to more complex interspecific relationships with other species.

High Resource Levels and Competitive Exclusion

Contrary to my prediction, I found that *A. donax* did not exhibit superior resource competition or competitive exclusion of natives under high resource levels during the time period of my experiment. *Arundo donax* exhibits competitive exclusion of native species in riparian ecosystems in Mediterranean-type climates under most resource conditions, especially in high water, light, and nutrient levels. Although most competition experiments are 2 years or less in duration (Goldberg and Barton 1992), exclusion of native plant species by *A. donax* by resource competition was not observed due likely to the short duration of this study.

Arundo donax demonstrated inferior resource competition ability in almost all conditions, was suppressed by both a native tree and shrub in high resource conditions,

and even facilitated the native shrub *B. salicifolia* in half of the treatments. Despite these disadvantages, *A. donax* was still much more productive in high soil moisture, light, and nutrients compared to the native plants and under other experimental conditions. *Arundo donax* appears to be on a trajectory to competitive exclusion of natives when resource availability is high (high soil moisture, light, and nutrient levels) regardless of its inferior resource competitive ability.

Results of resource competition experiments between invaders and native species vary considerably by resource level (Alpert et al. 2000), but most invaders benefited from elevated nutrient and water conditions. In a review of invader versus native plant species performance, invaders exhibited either universal superior competitive performance or superior performance in high nutrient conditions in two-thirds of the studies examined, but under low resource conditions native species usually outperformed invaders (Daehler 2003). Daehler (2003) concluded from his evaluation that relative performance of invasive compared to native species may shift in high resource conditions; increased resource availability combined with altered disturbance regimes, not universal performance advantages, often increase performance of invasive relative to native species. High biomass production of *A. donax* compared to native species in high resource conditions revealed in this study supports Daehler's hypothesis.

Invasion Mechanisms in Varying Resource Conditions

Results of this study suggest that mechanisms of *A. donax* invasion in riparian ecosystems may vary depending on availability for multiple resources and competition from native species. When resources are abundant (high soil moisture, light, and

nutrients) and no competition from native species exists, high allocation to photosynthetic tissue, high growth rate, and phenology of *A. donax* allow it to accumulate biomass faster than natives and eventually competitively exclude natives in these areas. In this study, *A. donax* monocultures grew exceptionally well under high soil moisture, nutrient, and light conditions, producing between four to six times more biomass than other native species under these optimal conditions. Several other invasive versus native plant comparative studies in wetlands have reported similar trends in clonal plant performance under conditions of high resource availability (Green and Galatowitsch 2001, Svengsouk and Mitsch 2001, Green and Galatowitsch 2002).

When resources are abundant, Tilman (1988) suggested differences in growth rates between species are due to a greater allocation of growth to photosynthetic tissues compared to non-photosynthetic roots, seeds, and branches/trunk. In contrast, plants that allocate to more non-photosynthetic tissues are favored in resource limiting environments (Tilman 1988). All *A. donax* biomass produced in the first year of growth, both leaves and culms, contains photosynthetic tissue (Sharma et al. 1998, Decruyenaere and Holt 2001), whereas *B. salicifolia*, *S. laevigata*, and *P. balsamifera* ssp. *trichocarpa* allocate a significant percentage of their biomass to non-photosynthetic trunks, branches, roots, and reproductive parts. *Arundo donax* has an extremely high growth rate, with shoot elongation of up to 10 cm per day and a relative growth rate of 0.13 g $g^{-1}day^{-1}$ under optimal conditions (Perdue 1958, Else 1996, Bell 1997, DiTomaso 1998, Spencer et al. 2005). At the end of two growing seasons, the mean height of *A. donax* throughout the experiment was 4.01 m (SE ± 0.04) and ranged from 0.64–7.84m. On average native

riparian species grown from cuttings attained much lower heights than *A. donax* after two years growth [*P. balsamifera* ssp. *trichocarpa* = 2.71 m (SE ± 0.03); *S. laevigata* = 2.75 m (SE ± 0.05); *B. salicifolia* = 2.94 m (SE ± 0.03)] or when grown from seedlings. Seedlings of native species such as *P. balsamifera* ssp. *trichocarpa* are known to reach only 5–60 cm after two years (Braatne et al. 1996). Furthermore, Decruyenaere and Holt (2005) documented year-round growth of *A. donax* and recruitment of new culms in sites with high nitrogen levels in southern California.

High resource conditions appear optimal for competitive exclusion of natives by *A. donax*. However, *A. donax* exhibited higher biomass production than either *S. laevigata* or *P. balsamifera* ssp. *trichocarpa* in most other treatments and greatest differences between *A. donax* and native species were seen in low soil moisture treatments. This evidence of plant plasticity (ability of a plant to thrive under all resource availability levels) may contribute to *A. donax* invasibility (Rezk and Edany 1979, Claridge and Franklin 2002) in other resource conditions, as is often the case with other invaders (Daehler 2003). When resource levels are lower, soil resource availability for *A. donax* versus riparian species is likely more distinctly partitioned (niche differences greater) and interspecific competition is avoided. Fargione and Tilman (2005) attributed coexistence of two prairie bunchgrasses to niche differences of phenology and rooting depth. Phreatophyte adaptations to resource limitation, such as greater root:shoot allocation (Vandersande et al. 2001, Schade and Lewis 2006) and deep tap roots (Tilman 1988) provide *A. donax* almost exclusive use of soil moisture and nutrients in shallow soil horizons. Interspecific competition between *A. donax* and native phreatophytes may

only be important when native aboveground biomass is extremely low and thus rooting depths are similar. For example, evidence of negative competitive effects of *A. donax* on native plants was only found in the most stressful environmental conditions (low soil moisture, light, and nutrients); competition from *A. donax* reduced *P. balsamifera* spp. *trichocarpa* biomass to the lowest values found in the experiment. Native woody riparian plants were not found to have a competitive advantage in low resource conditions as predicted (Tilman 1988) or shown in other studies (Alpert et al. 2000, Daehler 2003).

Arundo donax appears to be a "super invader", outperforming three common native species under high as well as low resource conditions (Daehler 2003) due to its unique morphology and physiology in riparian ecosystems of Mediterranean-type climates. However, the competitive ability of *A. donax* is strongest under high resource conditions. Strong novel facilitation of *B. salicifolia* (and week facilitation of *S. laevigata*) by *A. donax* in several resource conditions and competition from *P. balsamifera* spp. *trichocarpa* in high soil moisture-low light-high nutrient conditions may partially combat this invasion, but further study is required. Community-level competition experiments are needed to identify any indirect competitive interactions and verify the magnitude of pairwise or individual-level competitive interactions found in this study. Also, competitive interactions and productivity are likely to change over time and should be studied over a longer-time frame to validate invasion predictions.

CONCLUSIONS

This experiment demonstrated the absence of competitive advantages for resource use by a highly invasive grass, *A. donax*. Under high resource levels, *A. donax* is

extremely productive, but is slightly suppressed by two native species. Nonetheless, it still obtains a higher biomass than all native plant species under these conditions. Relatively high plant plasticity allows *A. donax* to obtain a higher biomass than natives under lower resource level conditions as well. The unique morphology and physiology of *A. donax* compared to native woody riparian species enable *A. donax* to dominate the aboveground biomass under most environmental conditions. Under high resource levels, *A. donax* appears to be on a trajectory of competitive exclusion despite little observed resource competition with two common native species.

The results of this study have broad application to managing *A. donax* in rivers and wetlands worldwide, especially in areas where high soil moisture, elevated nutrients, and disturbance (high light availability) all exist. In arid and Mediterranean-type climates with naturally low soil nutrients (Pettijohn 1975, Day 1983, diCastri 1991, Dallman 1998) and groundwater levels, dense urbanization and intense agricultural practices have elevated both nutrient and water levels in streams (Hazy 2006). Both the natural dynamic flood regime characteristic of these climates and anthropogenic enhancement of water, nutrients, and light levels have created the ideal conditions for invasion of river and stream systems by *A. donax* (see Chapter 3).

If we continue to create or promote high resource conditions in riparian ecosystems, invasion of *A. donax* will continue and may eventually lead to its expanded dominance in riparian ecosystems. Displacement of native riparian species by *A. donax* will only continue to lead to decreased biodiversity, altered ecosystem functioning, loss

of wildlife habitat, and changes in natural flood and fire (Bell 1997, DiTomaso 1998, Dudley 2000).

My findings will help organizations working on riparian habitat conservation and restoration predict locations where it is most invasive and least invasive, contributing to successful control of this invasive species. Large-scale restoration projects (levee and dam removal) need to consider the effects of these restoration actions on the potential spread of fast growing invasive plants like *A. donax*. *Arundo donax* will be most invasive in high soil moisture, nutrient and light levels and most difficult to manage or remove. These conditions are commonly found along urbanized or agricultural river floodplains after large storms and along interfaces between high nutrient land use practices (agricultural fields) and riparian ecosystems (see Chapter 3). Areas exhibiting the most stressful environmental conditions (low soil moisture, low nutrients, high light, and competition from native species) will have the lowest risk of *A. donax* invasion. *Arundo donax* control efforts should focus in these stressful environments, such as dry reaches of rivers or ephemeral streams where *B. salicifolia* and other native species are established along with *A. donax*.

Knowledge of the effects of environmental conditions on *A. donax* growth provides valuable insight into the timing and selection of management techniques in *A. donax* control projects. Active revegetation with natives after *A. donax* removal is recommended in areas with high soil moisture and nutrients. However, *B. salicifolia* planting may be lower priority because it naturally colonizes riparian ecosystems. Active revegetation may also be effective in the low soil moisture, low nutrients, and full sun

conditions found in many arid stream systems; under such condition in this study, *B. salicifolia* had a higher biomass and was facilitated by *A. donax*.. Because plants are more susceptible to herbicide treatments when carbohydrates are translocated from aboveground to belowground organs, *A. donax* in low soil moisture and full sun conditions may require treatment earlier in the growing season than those growing along streams with high water availability (Spencer et al. 2005).

Long-term control of invasive species such as *A. donax* in natural ecosystems may require management of resource levels that promote invasion to reduce growth and competition. Manipulation of resource availability in favor of a given native (desired) species may create a competitive advantage and a barrier to reinvasion (Blumenthal et al. 2003, Corbin and D'Antonio 2004a, Suding et al. 2004, Prober et al. 2005, Perry and Galatowitsch 2006). Watershed management organizations should consider reducing nutrient levels from urban runoff and excess treated wastewater released into rivers to reduce growth and invasion by *A. donax*. Suppression of *A. donax* via competition from several native species under high soil moisture and low light conditions has implications for riparian forest conservation and restoration efforts aimed at controlling *A. donax*, but further research is needed to verify these finding over a longer time frame. Conservation and restoration of structurally and species diverse riparian forests may help to suppress and reduce *A. donax* invasion in areas of high soil moisture.

TABLES

Table 1. Plant distribution in competition plant groupings (four plants per grouping) used in the field experiment.

Competition grouping treatment	**Plant species (number of species per grouping)**			
	Arundo donax	***Baccharis salicifolia***	***Salix laevigata***	***Populus balsamifera* ssp. *trichocarpa***
2-species grouping	2	2		
	2		2	
	2			2
1-species grouping (monoculture)	4			
		4		
			4	
				4

Table 2. Four-way ANOVA significance table for aboveground biomass (total biomass at end of 2004 growing season) by factors of competition groupings [2-species mixed grouping of *A. donax* and one native riparian species (*S. laevigata*, *P. balsamifera* ssp. *trichocarpa*, and *B. salicifolia)* and monocultures groupings)], soil moisture (high and low), and light (high and low), and nutrients (high and none). Significant results are reported in bold.

Factors and interactions	Mean aboveground biomass
Plant grouping	**$F_{(9,560)}$ = 33.384, P < 0.001*** **
Soil moisture	**$F_{(1,560)}$ = 145.772, P < 0.001*** **
Light	**$F_{(1,560)}$ = 26.615, P < 0.001*** **
Nutrients	**$F_{(1,560)}$ = 16.339, P < 0.001*** **
Plant grouping x soil moisture	**$F_{(9,560)}$ = 1.917, P = 0.047***
Plant grouping x light	**$F_{(9,560)}$ = 3.633, P < 0.001*** **
Plant grouping x nutrients	$F_{(9,560)}$ = 1.100, P = 0.361
Soil moisture x light	**$F_{(1,560)}$ = 81.422, P < 0.001*** **
Soil moisture x nutrients	$F_{(1,560)}$ = 3.365, P = 0.067
Light x nutrients	**$F_{(1,560)}$ = 5.593, P = 0.018***
Plant grouping x soil moisture x light	**$F_{(9,560)}$ = 2.974, P = 0.002** **
Plant grouping x soil moisture x nutrients	$F_{(9,560)}$ = 1.124, P = 0.343
Plant grouping x light x nutrients	$F_{(9,560)}$ = 1.789, P = 0.067
Soil moisture x light x nutrients	**$F_{(1,560)}$ = 4.689, P = 0.031***
Plant grouping x soil moisture x light x nutrients	$F_{(9,560)}$ = 0.694, P = 0.715
r^2	0.581

Legend: * = 0.05 ≥ P > 0.01 = significant, ** = 0.01 ≥ P > 0.001 = highly significant, *** = P ≤ 0.001 = very highly significant

Table 3. Four-way ANOVA significance table for mean aboveground biomass (total biomass at end of 2004 growing season) of *A. donax* and *P. balsamifera* ssp. *trichocarpa* by factors of plant groupings (2-species mixed grouping and monocultures), soil moisture (high and low), light (high and low), and nutrients (high and none). Significant results are reported in bold.

Factors and interactions	*A. donax*	*P. balsamifera* ssp. *trichocarpa*
Plant grouping	$F_{(1,122)} = 1.789$, $P = 0.184$	$F_{(1,115)} = 0.053$, $P = 0.819$
Soil moisture	**$F_{(1,122)} = 35.445$, $P < 0.001$*** **	**$F_{(1,115)} = 63.190$, $P < 0.001$*** **
Light	**$F_{(1,122)} = 36.561$, $P < 0.001$*** **	**$F_{(1,115)} = 4.094$, $P = 0.045$* **
Nutrients	**$F_{(1,122)} = 7.682$, $P = 0.006$** **	**$F_{(1,115)} = 6.966$, $P = 0.009$** **
Plant grouping x soil moisture	$F_{(1,122)} = 1.027$, $P = 0.313$	$F_{(1,115)} = 0.900$, $P = 0.345$
Plant grouping x light	$F_{(1,122)} = 2.118$, $P = 0.148$	$F_{(1,115)} = 2.340$, $P = 0.129$
Plant grouping x nutrients	$F_{(1,122)} = 0.881$, $P = 0.350$	$F_{(1,115)} = 1.017$, $P = 0.315$
Soil moisture x light	**$F_{(1,122)} = 87.616$, $P < 0.001$*** **	**$F_{(1,115)} = 5.376$, $P = 0.022$* **
Soil moisture x nutrients	$F_{(1,122)} = 1.838$, $P = 0.178$	$F_{(1,115)} = 0.068$, $P = 0.795$
Light x nutrients	**$F_{(1,122)} = 12.246$, $P = 0.001$*** **	$F_{(1,115)} = 0.061$, $P = 0.805$
Plant grouping x soil moisture x light	$F_{(1,122)} = 1.024$, $P = 0.314$	$F_{(1,115)} = 0.241$, $P = 0.624$
Plant grouping x soil moisture x nutrients	$F_{(1,122)} = 0.706$, $P = 0.402$	$F_{(1,115)} = 0.165$, $P = 0.686$
Plant grouping x light x nutrients	**$F_{(1,122)} = 4.564$, $P = 0.035$* **	**$F_{(1,115)} = 5.022$, $P = 0.027$* **
Soil moisture x light x nutrients	**$F_{(1,122)} = 8.449$, $P = 0.004$** **	$F_{(1,115)} = 0.369$, $P = 0.545$
Plant grouping x soil moisture x light x nutrients	$F_{(1,122)} = 0.242$, $P = 0.623$	$F_{(1,115)} = 0.265$, $P = 0.608$
r^2	0.646	0.457

Table 4. Four-way ANOVA significance table for mean aboveground biomass (total biomass at end of 2004 growing season) of *A. donax* and *S. laevigata* by factors of plant groupings (2-species mixed grouping and monocultures), soil moisture (high and low), light (high and low), and nutrients (high and none). Significant results are reported in bold.

Factors and interactions	***A. donax***	***S. laevigata***
Plant grouping	$F_{(1,122)} = 0.034$, $P = 0.854$	**$F_{(1,120)} = 5.348$, $P = 0.022$***
Soil moisture	**$F_{(1,122)} = 52.395$, $P < 0.001$*****	**$F_{(1,120)} = 21.523$, $P < 0.001$*****
Light	**$F_{(1,122)} = 23.905$, $P < 0.001$*****	$F_{(1,120)} = 1.303$, $P = 0.256$
Nutrients	$F_{(1,122)} = 0.873$, $P = 0.352$	$F_{(1,120)} = 0.636$, $P = 0.427$
Plant grouping x soil moisture	$F_{(1,122)} = 1.364$, $P = 0.245$	$F_{(1,120)} = 0.076$, $P = 0.783$
Plant grouping x light	$F_{(1,122)} = 0.423$, $P = 0.516$	$F_{(1,120)} = 0.084$, $P = 0.772$
Plant grouping x nutrients	$F_{(1,122)} = 1.631$, $P = 0.204$	$F_{(1,120)} = 1.076$, $P = 0.302$
Soil moisture x light	**$F_{(1,122)} = 73.333$, $P < 0.001$*****	**$F_{(1,120)} = 5.427$, $P = 0.022$***
Soil moisture x nutrients	$F_{(1,122)} = 0.477$, $P = 0.491$	**$F_{(1,120)} = 4.416$, $P = 0.038$***
Light x nutrients	**$F_{(1,122)} = 4.349$, $P = 0.039$***	$F_{(1,120)} = 0.904$, $P = 0.344$
Plant grouping x soil moisture x light	$F_{(1,122)} = 2.279$, $P = 0.134$	$F_{(1,120)} = 0.918$, $P = 0.340$
Plant grouping x soil moisture x nutrients	$F_{(1,122)} = 3.837$, $P = 0.052$	$F_{(1,120)} = 0.514$, $P = 0.475$
Plant grouping x light x nutrients	$F_{(1,122)} = 0.194$, $P = 0.660$	$F_{(1,120)} = 0.407$, $P = 0.525$
Soil moisture x light x nutrients	$F_{(1,122)} = 3.866$, $P = 0.052$	$F_{(1,120)} = 0.060$, $P = 0.808$
Plant grouping x soil moisture x light x nutrients	$F_{(1,122)} = 0.897$, $P = 0.345$	$F_{(1,120)} = 0.013$, $P = 0.908$
r^2	0.652	0.310

Table 5. Four-way ANOVA significance table for mean aboveground biomass (total biomass at end of 2004 growing season) of *A. donax* and *B. salicifolia* by factors of plant groupings (2-species mixed grouping and monocultures), soil moisture (high and low), light (high and low), and nutrients (high and none). Significant results are reported in bold.

Factors and interactions	***A. donax***	***B. salicifolia***
Plant grouping	**$F_{(1,125)} = 4.715$, $P = 0.032$***	**$F_{(1,128)} = 21.950$, $P < 0.001$*****
Soil moisture	**$F_{(1,125)} = 56.410$, $P < 0.001$*****	**$F_{(1,128)} = 27.082$, $P < 0.001$*****
Light	**$F_{(1,125)} = 18.760$, $P < 0.001$*****	**$F_{(1,128)} = 32.204$, $P < 0.001$*****
Nutrients	**$F_{(1,125)} = 14.659$, $P < 0.001$*****	$F_{(1,128)} = 3.708$, $P = 0.056$
Plant grouping x soil moisture	$F_{(1,125)} = 0.483$, $P = 0.488$	$F_{(1,128)} = 1.033$, $P = 0.311$
Plant grouping x light	$F_{(1,125)} = 1.159$, $P = 0.284$	$F_{(1,128)} = 3.079$, $P = 0.082$
Plant grouping x nutrients	$F_{(1,125)} = 2.789$, $P = 0.097$	**$F_{(1,128)} = 5.154$, $P = 0.025$***
Soil moisture x light	**$F_{(1,125)} = 55.937$, $P < 0.001$*****	**$F_{(1,128)} = 16.483$, $P < 0.001$*****
Soil moisture x nutrients	$F_{(1,125)} = 2.668$, $P = 0.105$	$F_{(1,128)} = 0.009$, $P = 0.925$
Light x nutrients	$F_{(1,125)} = 0.801$, $P = 0.373$	$F_{(1,128)} = 0.093$, $P = 0.761$
Plant grouping x soil moisture x light	**$F_{(1,125)} = 5.539$, $P = 0.020$***	$F_{(1,128)} = 0.488$, $P = 0.486$
Plant grouping x soil moisture x nutrients	$F_{(1,125)} = 0.908$, $P = 0.342$	**$F_{(1,128)} = 5.346$, $P = 0.022$***
Plant grouping x light x nutrients	$F_{(1,125)} = 0.505$, $P = 0.479$	$F_{(1,128)} = 0.548$, $P = 0.460$
Soil moisture x light x nutrients	$F_{(1,125)} = 2.519$, $P = 0.115$	$F_{(1,128)} = 2.638$, $P = 0.107$
Plant grouping x soil moisture x light x nutrients	$F_{(1,125)} = 1.579$, $P = 0.211$	**$F_{(1,128)} = 6.267$, $P = 0.014$***
r^2	0.633	0.496

FIGURES

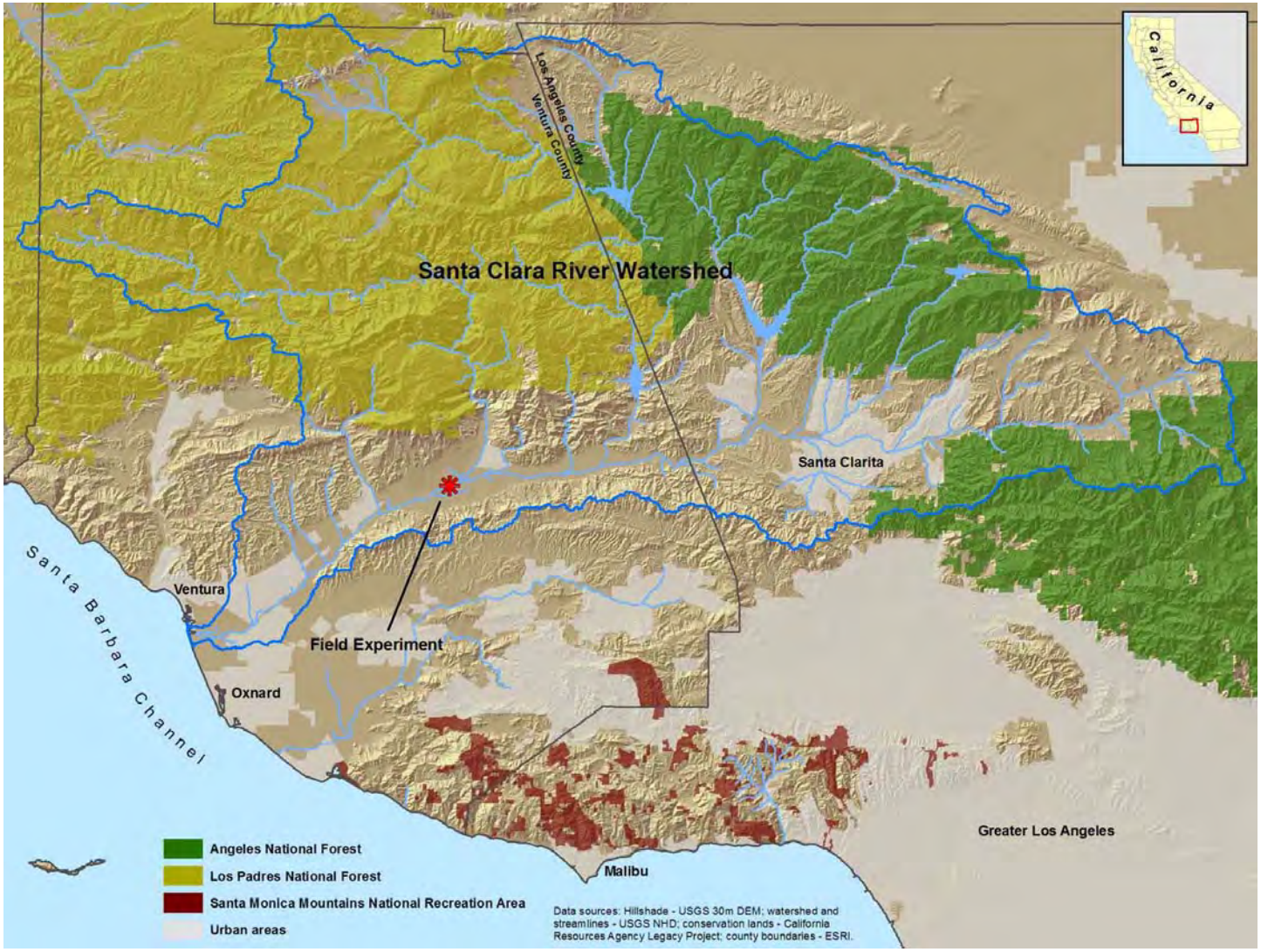

Figure 2. Location of field experiment study site, Santa Clara River Watershed, Ventura County, California.

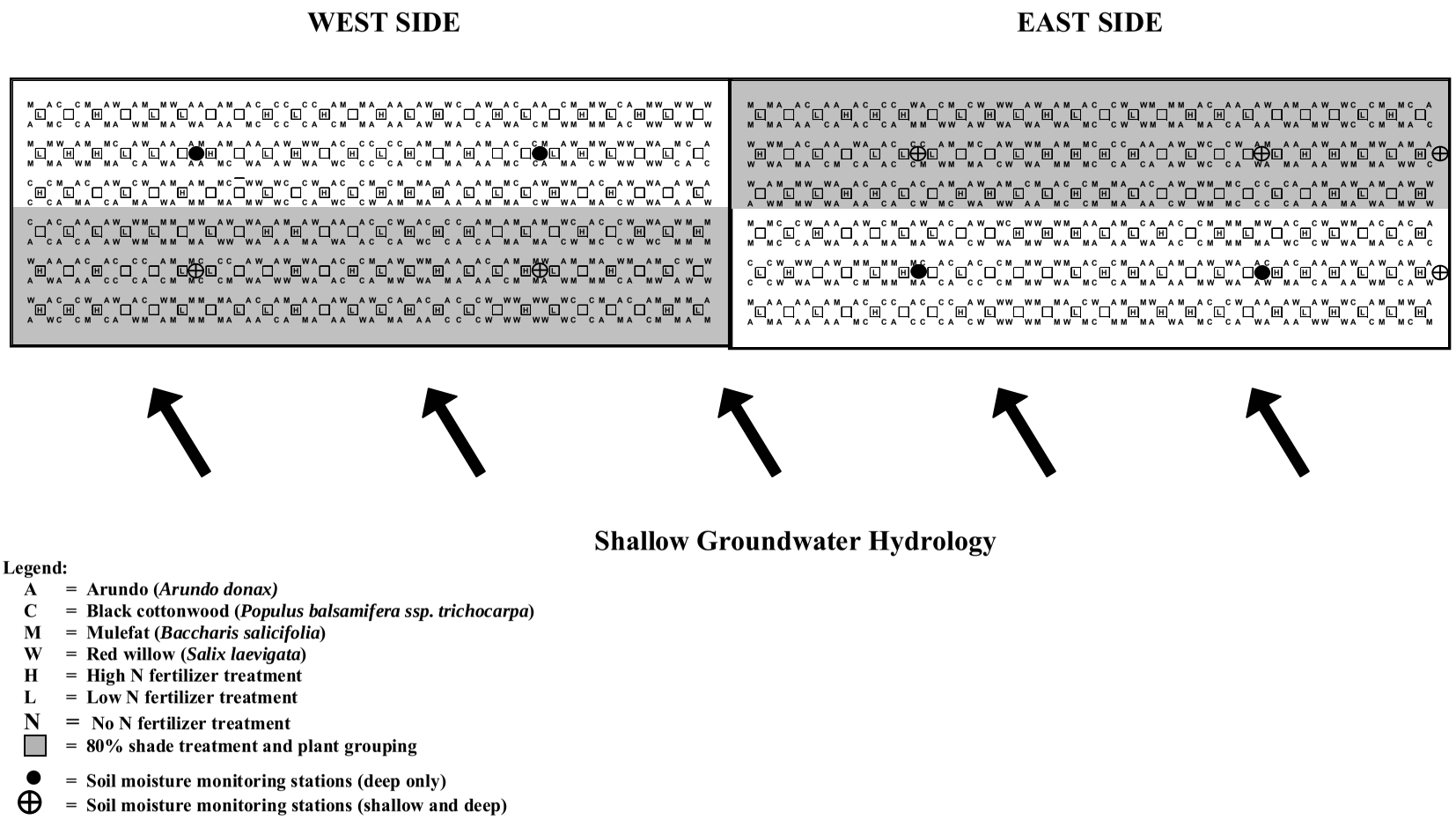

Figure 3. Field experiment planting and sampling layout.

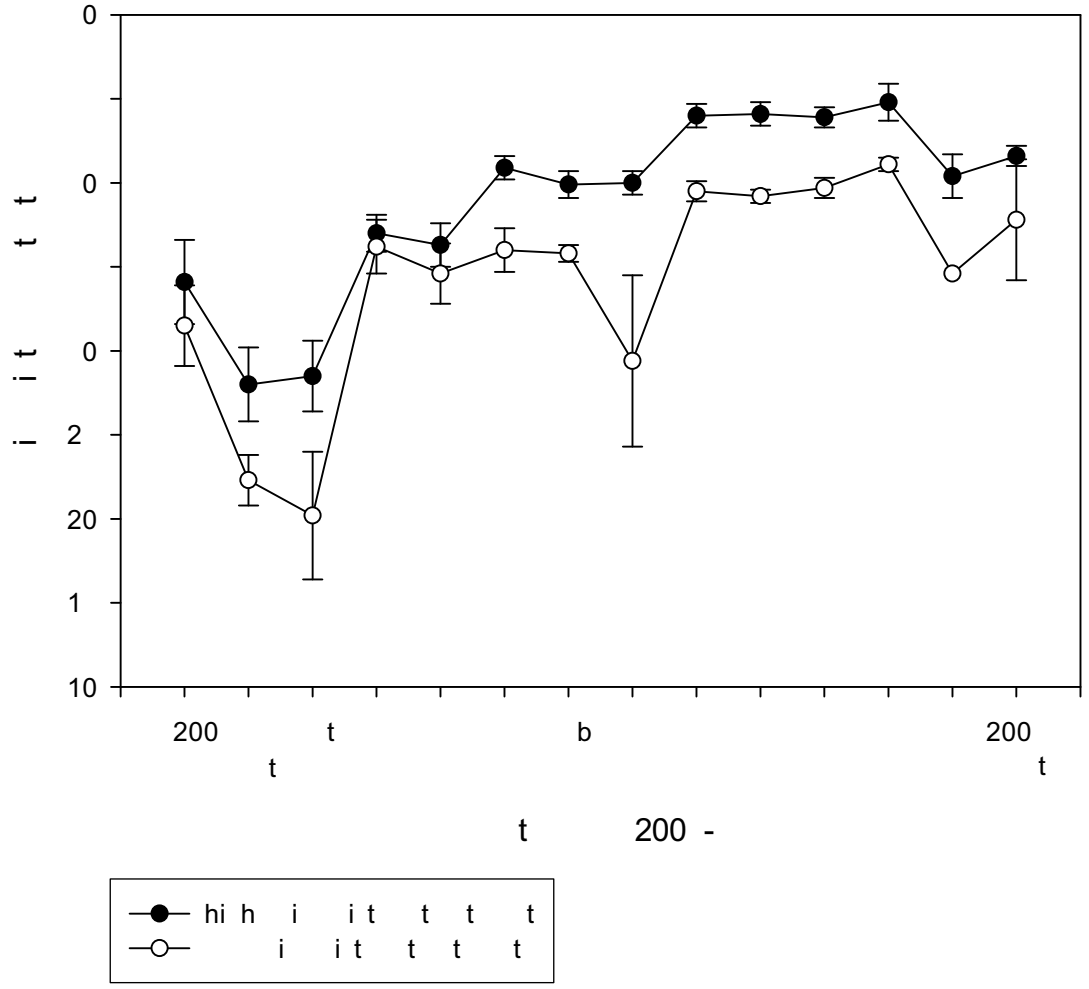

Figure 4. Mean monthly soil moisture content (percent) at 60–80 cm depth in the east and west sides of the experiment (high and low soil moisture treatments).

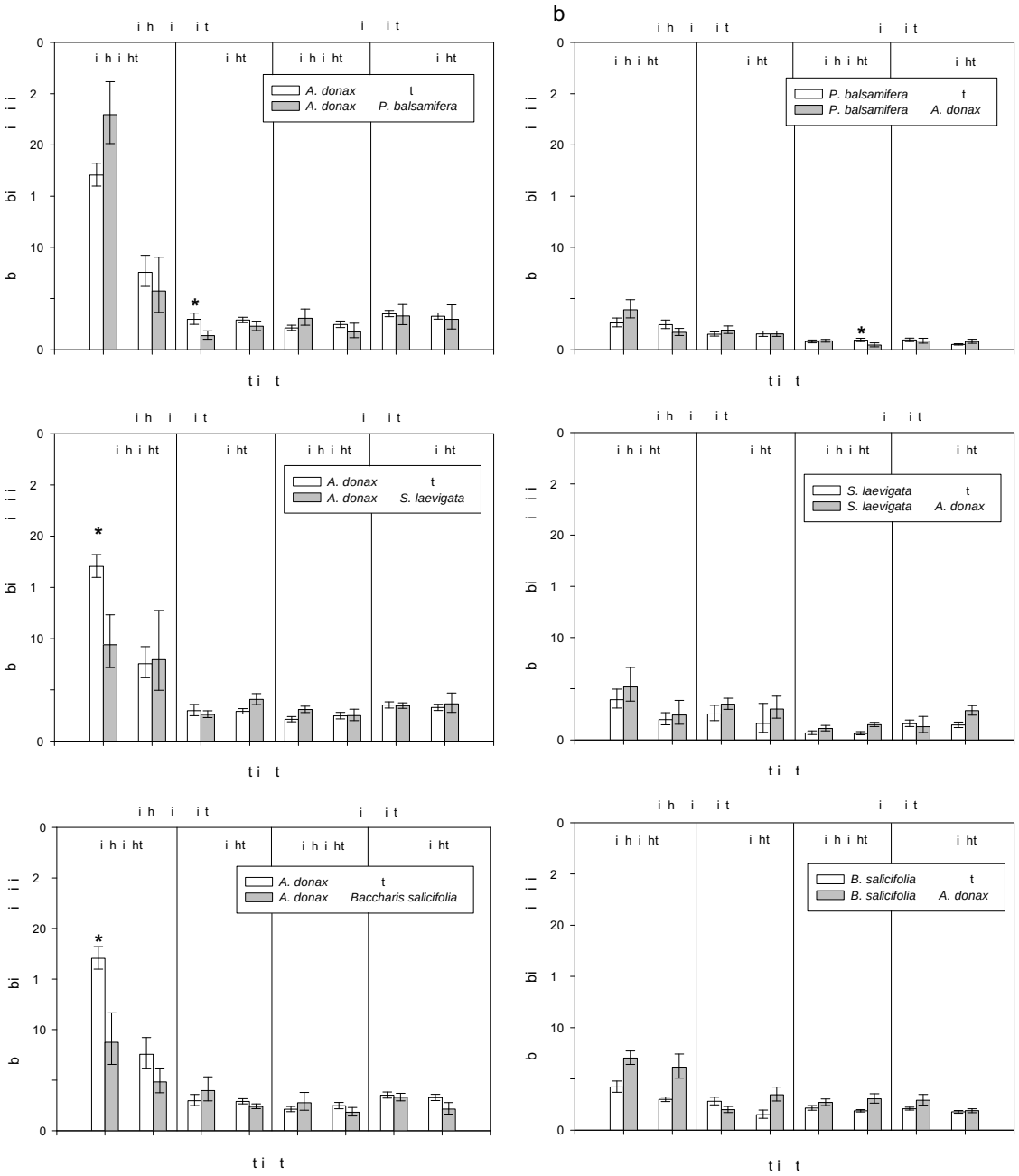

Figure 5. Mean aboveground biomass (± SE represented by error bars) of plants grown in monoculture compared to with a single competitor in the field experiment at the end of the 2004 growing season. Graphs show competitive effects by species pairings: a) *A. donax* by *P. balsamifera* spp. *trichocarpa*, b) *P. balsamifera* spp. *trichocarpa* by *A. donax*, c) *A. donax* by *S. laevigata*, d) *S. laevigata* by *A. donax*, e) *A. donax* by *B. salicifolia*, and f) *B. salicifolia* by *A. donax*. Asterisks denote results of post-hoc hypothesis tests (comparison of means) between plant groupings within similar treatments, with significance recognized at $\alpha < 0.05$.

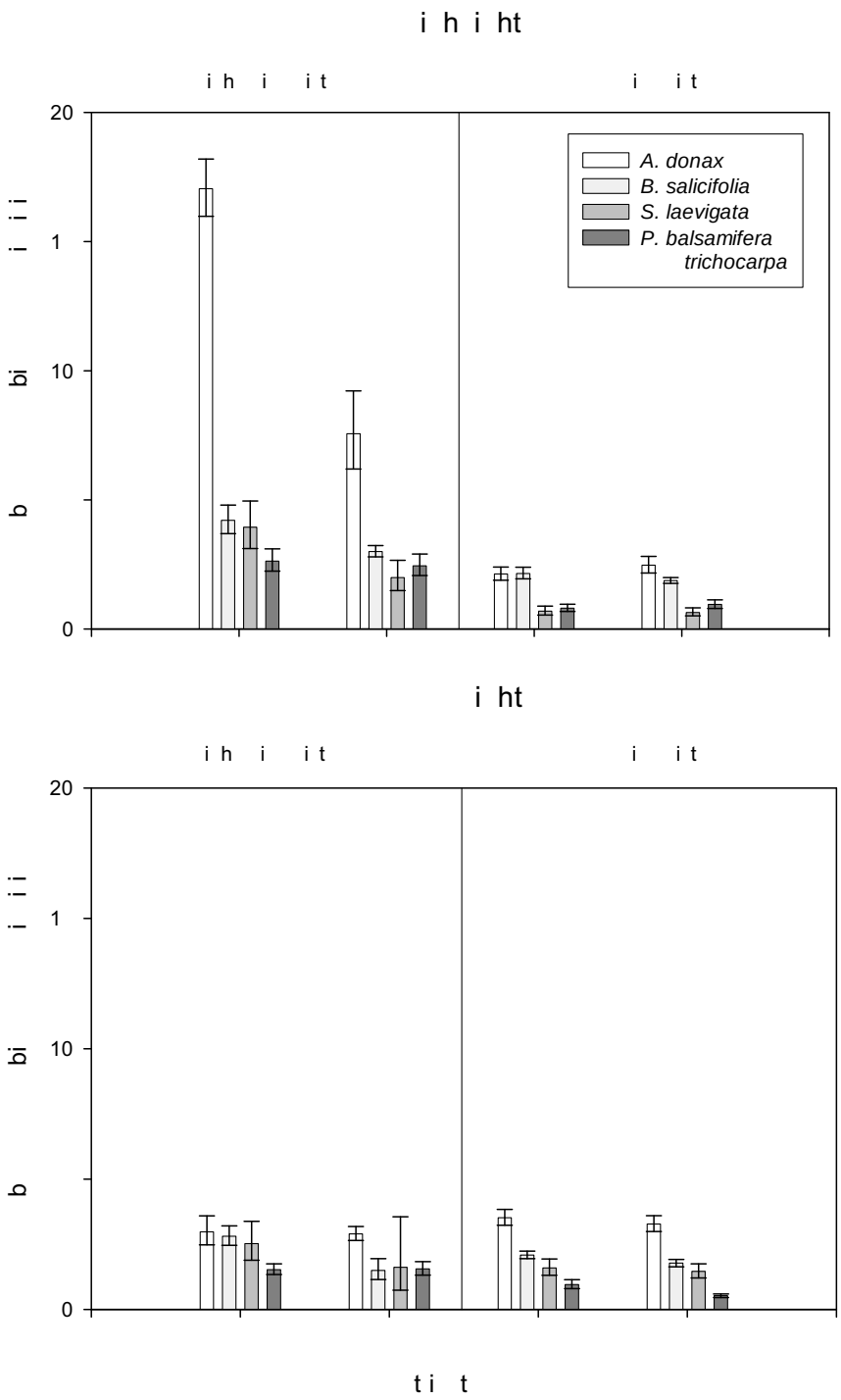

Figure 6. Mean aboveground biomass (± SE represented by error bars) of all plants grown in monoculture in the field experiment at the end of the 2004 growing season by species, soil moisture, nutrient, and light factors. Graphs are grouped by high light (a) and low light growing conditions (b).

APPENDICES

APPENDIX 2-1

BIOMASS REGRESSION EQUATIONS

Figure 1. Regression equations for *A. donax*, *Baccharis salicifolia*, *Salix laevigata*, and *Populus balsamifera* ssp. *trichocarpa* used to predict aboveground biomass of all plants under various soil moisture and light treatments in the field experiment in 2003. Equations ($y = b_1x_1 + c$) were based on aboveground biomass (g) of sample culms/branches (dependent variable or y), a

	High soil moisture						**Low soil moisture**					
	Full sun			**80% shade**			**Full sun**			**80% shade**		
Plant species	**b**	**c**	**r^2**	**b**	**c**	**r^2**	**b**	**c**	**r^2**	**b**	**c**	**r^2**
A. donax *(< 1 year)*	1.878	-0.197	0.906	3.097	-3.192	0.936	1.142	0.794	0.425	2.086	-0.760	0.923
B. salicifolia	2.287	-1.502	0.969	2.503	-2.110	0.995	2.455	-2.101	0.989	2.402	-1.905	0.969
S. laevigata	2.172	-1.023	0.989	2.173	-1.042	0.985	2.130	-1.248	0.979	2.335	-1.421	0.992
P. balsamifera* ssp. *trichocarpa	2.273	-1.037	0.993	2.256	-1.150	0.993	2.092	-1.266	0.982	2.210	-1.127	0.933

regression coefficient (b_1), basal diameter (mm) of sample culms/branches (independent variable or x_1), and a constant (y-intercept or c). All data were ln transformed. All regressions were significant.

Table 2. Regression equations for *A. donax*, *Baccharis salicifolia*, *Salix laevigata*, and *Populus balsamifera* ssp. *trichocarpa* used to predict aboveground biomass of all plants under various soil moisture and light treatments in the field experiment in 2004. Equations ($y = b_1x_1 + c$) were based on aboveground biomass (g) of sample culms/branches (dependent variable or y), a

	High soil moisture						**Low soil moisture**					
	Full sun			**80% shade**			**Full sun**			**80% shade**		
Plant species	**b**	**c**	**r^2**	**b**	**c**	**r^2**	**b**	**c**	**r^2**	**b**	**c**	**r^2**
A. donax *(< 1 year)*	2.516	-1.744	0.980	1.609	0.770	0.908	1.864	-0.020	0.956	1.634	0.686	0.891
A. *donax* (> 1 year)	2.636	-1.910	0.971	2.301	-0.918	0.895	2.316	-1.290	0.936	2.856	-2.336	0.947
B. salicifolia	2.625	-2.132	0.995	2.511	-1.869	0.994	2.657	-2.314	0.993	2.658	-2.302	0.994
S. laevigata	2.195	-0.983	0.993	2.305	-1.228	0.990	2.295	-1.358	0.988	2.321	-1.337	0.995
P. balsamifera* ssp. *trichocarpa	2.408	-1.352	0.993	2.413	-1.498	0.996	2.306	-1.285	0.992	2.353	-1.445	0.993

regression coefficient (b_1), basal diameter (mm) of sample culms/branches (independent variable or x_1), and a constant (y-intercept or c). All data were ln transformed.

APPENDIX 2-2

PLANT SURVIVORSHIP IN FIELD EXPERIMENT

METHODS

Sampling Methods

I measured plant survivorship at three time periods: 1) survivorship of planted cuttings in March 2003, 2) plant survivorship at the end of 2003, and 3) plant survivorship at the end of 2004. A few cuttings (14) and rhizomes (9) that did not grow initially were replanted in spring 2003. 2003 and 2004 percent survivorship results represented the establishment success for all initial and replacement cuttings.

Statistical Analyses

Descriptive statistics were performed on plant survivorship measurements. Four-way ANOVAs (all combinations of competition groupings, soil moisture, light, and nutrient factors and levels) were performed on percent survivorship data for three time periods (cuttings and at the end of the two growing seasons) to determine treatment effects during the plant establishment period. Percent plant survivorship measured at the end of 2003 and 2004 was compared in the two-way ANOVA (year x competition grouping). The 36 four-species groupings and 96 low nutrient treatments plant groupings in the experiment were not included in these statistical analyses.

RESULTS

The four-way ANOVA (species x soil moisture x nutrients x light) for percent survivorship yielded no significant main effects or interactions for cuttings and plants at

the end of the 2004 growing season (Table 1), yet resulted in one two-way interaction between species and soil moisture for plant survivorship at the end of 2003 growing season (Table 1). Only five plants (0.8% of plants in groupings analyzed) did not survive the second growing season. First year plant survivorship of *P. balsamifera* ssp. *trichocarpa* was significantly lower within the high soil moisture treatment than in any other species and soil moisture treatment combination (Figure 1).

Table 1. Four-way ANOVA significance table for percent plant survivorship during establishment by factors of species from one-species and two-species groupings combined (*Arundo donax* and three native riparian species, *Salix laevigata*, *Populus balsamifera* ssp. *trichocarpa*, and *Baccharis salicifolia*), soil moisture (high and low), nutrient additions (high and none), and light (high and low). Results are for three time periods: 1) cutting survivorship (March 2003), 2) plant survivorship at end of 2003, and 3) plant survivorship at end of 2004. Significant results are in bold.

Factors and interactions	Cuttings	2003	2004
Species	$F_{(3,48)} = 1.821$, $P = 0.156$	$F_{(3,48)} = 2.352$, $P = 0.084$	$F_{(3,48)} = 2.523$, $P = 0.069$
Soil moisture	$F_{(1,48)} = 1.346$, $P = 0.252$	$F_{(1,48)} = 4.029$, $P = 0.050$	$F_{(1,48)} = 1.858$, $P = 0.179$
Nutrients	$F_{(1,48)} = 0.050$, $P = 0.824$	$F_{(1,48)} = 0.042$, $P = 0.839$	$F_{(1,48)} = 0.046$, $P = 0.831$
Light	$F_{(1,48)} = 1.625$, $P = 0.208$	$F_{(1,48)} = 0.855$, $P = 0.360$	$F_{(1,48)} = 0.170$, $P = 0.682$
Species x soil moisture	$F_{(3,48)} = 1.456$, $P = 0.238$	**$F_{(3,48)} = 3.628$, $P = 0.019$***	$F_{(3,48)} = 2.100$, $P = 0.113$
Species x nutrients	$F_{(3,48)} = 0.398$, $P = 0.755$	$F_{(3,48)} = 0.513$, $P = 0.675$	$F_{(3,48)} = 0.723$, $P = 0.543$
Species x light	$F_{(3,48)} = 0.400$, $P = 0.754$	$F_{(3,48)} = 1.197$, $P = 0.321$	$F_{(3,48)} = 0.412$, $P = 0.745$
Soil moisture x nutrients	$F_{(1,48)} = 0.361$, $P = 0.551$	$F_{(1,48)} = 0.490$, $P = 0.487$	$F_{(1,48)} = 1.018$, $P = 0.318$
Soil moisture x light	$F_{(1,48)} = 0.022$, $P = 0.884$	$F_{(1,48)} = 0.000$, $P = 0.984$	$F_{(1,48)} = 1.455$, $P = 0.234$
Nutrients x light	$F_{(1,48)} = 0.624$, $P = 0.434$	$F_{(1,48)} = 0.001$, $P = 0.980$	$F_{(1,48)} = 0.138$, $P = 0.712$
Species x soil moisture x nutrients	$F_{(3,48)} = 0.124$, $P = 0.946$	$F_{(3,48)} = 0.265$, $P = 0.850$	$F_{(3,48)} = 1.266$, $P = 0.296$
Species x soil moisture x light	$F_{(3,48)} = 2.431$, $P = 0.077$	$F_{(3,48)} = 1.253$, $P = 0.301$	$F_{(3,48)} = 1.543$, $P = 0.215$
Species x nutrients x light	$F_{(3,48)} = 1.193$, $P = 0.322$	$F_{(3,48)} = 2.046$, $P = 0.120$	$F_{(3,48)} = 0.921$, $P = 0.438$
Soil moisture x nutrients x light	$F_{(1,48)} = 0.111$, $P = 0.740$	$F_{(1,48)} = 0.772$, $P = 0.384$	$F_{(1,48)} = 1.359$, $P = 0.249$
Species x soil moisture x nutrients x light	$F_{(3,48)} = 2.212$, $P = 0.099$	$F_{(3,48)} = 2.104$, $P = 0.112$	$F_{(3,48)} = 2.431$, $P = 0.077$
r^2	0.428	0.490	0.457

* = $0.05 \geq P > 0.01$ = significant; ** = $0.01 \geq P > 0.001$ = highly significant; *** = $P \leq 0.001$ = very highly significant.

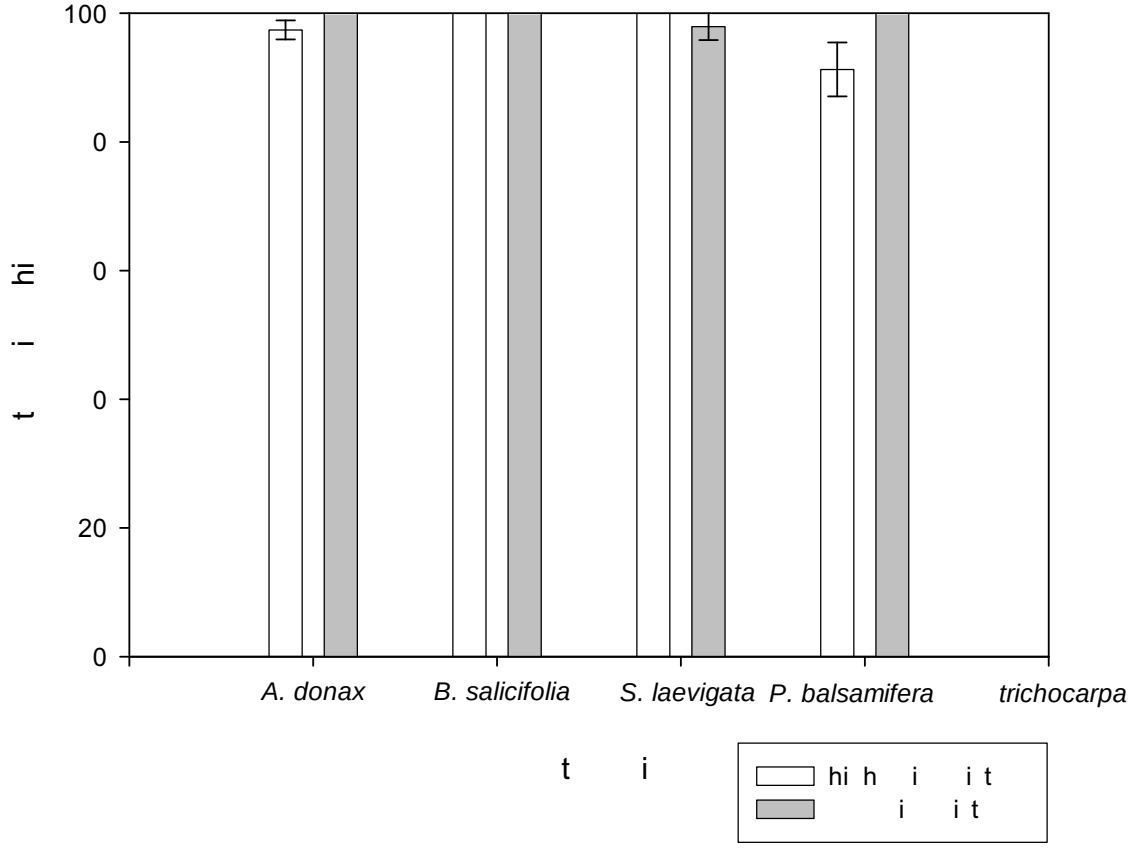

Figure 1. Effects of soil moisture availability on percent plant survivorship of *A. donax* compared to three native riparian plant species at the end of the first growing season (fall 2003) based on the four-way ANOVA (competition x soil moisture x nutrients x light). Letters denote results of post-hoc hypothesis tests (comparison of means) between individual treatments within each graph only, with significance recognized at $\alpha < 0.05$.

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CHAPTER 3 -

INFLUENCE OF ANTHROPOGENIC NUTRIENT ENRICHMENT ON INVASION OF RIPARIAN ECOSYSTEMS BY *ARUNDO DONAX* IN SOUTHERN CALIFORNIA

Abstract: One of the greatest threats to riparian ecosystems of Mediterranean-type climate regions, including California, is a member of the grass family (Poaceae), giant reed (*Arundo donax* L.). I tested the hypothesis that anthropogenic nutrient enrichment is one of the most significant factors contributing to the recent invasion of riparian ecosystems by *A. donax* in southern California. I examined the influence of nutrient enrichment of shallow groundwater and soil from various land use practices on the degree of infestation of *A. donax* throughout several coastal watersheds. Elevated levels of N (nitrogen) found in shallow groundwater and soils of floodplains were associated with adjacent land use and watersheds with higher anthropogenic nutrient inputs. Both large and small *A. donax* infestations on floodplains contained higher soil NO_3-N concentrations than did non-infested areas. Higher N and K (potassium) leaf tissue content of *A. donax* in large and small infestations compared to native red willow (*Salix laevigata* Bebb.) in non-infested and reference sites suggests that these nutrients may be more available to *A. donax*. Unlike *S. laevigata*, *A. donax* may take advantage of anthropogenically enriched N levels in riparian ecosystems, as illustrated by its positive response to all forms of shallow groundwater N in floodplains and soil N on riparian terraces. Results of this study suggest that N limiting conditions may naturally occur in

riparian ecosystems in this geologically young landscape, but anthropogenic nutrient inputs have elevated groundwater N:P ratios in study watersheds. Results of this study can help predict optimal nutrient conditions for *A. donax* invasion. Reducing excess N supply to riparian ecosystems associated with agricultural and residential land use activities may aid in the long-term control of *A. donax*.

Key Words: Arundo donax, giant reed, invasive species, alien species, nutrients, nutrient loading, nitrogen, phosphorus, land use, riparian, Mediterranean-type climate, watershed, rivers

INTRODUCTION

Both natural and anthropogenic disturbances along rivers in Mediterranean-type climate regions are thought to promote the spread of invasive plant species (Drake et al. 1989, Gregory et al. 1991, Pysek and Prach 1994, Else 1996, Else and Zedler 1996, Dudley 1998). Several experimental studies in wetland ecosystems have demonstrated higher response to nitrogen by clonal, invasive plants than natives (Green and Galatowitsch 2002, Maurer and Zedler 2002, Minchinton and Bertness 2003). Elevated nutrient levels have been linked to plant invasion in many ecosystems (Kolb et al. 2002, Booth et al. 2003, Brooks 2003, Kolb and Alpert 2003, Suding et al. 2004), however little is known about the role of nutrients in promoting invasion in riparian ecosystems (Wang 1998). In this paper, I explore the influence of anthropogenic nutrient enrichment on the invasion of riparian ecosystems by the clonal grass species *Arundo donax* in southern California.

Due to the intense but infrequent winter storm patterns characteristic of Mediterranean-type climates, rivers are heavily scoured every few years. Strong floods remove and disperse riparian vegetation downstream, creating open floodplains for colonization. Weedy plant species are able to establish and grow quickly in disturbed areas such as these (Elton 1958, Tilman 1988, Drake et al. 1989, Richardson et al. 2000), the most invasive of which often physically compete with native species for light, nutrients, and water. Historically, riparian ecosystems in Mediterranean-type climates have been severely altered by human perturbation. Since early human settlement of these areas, rivers have been dammed, channelized, mined, diverted, and subjected to

residential and commercial development in Mediterranean-type climates (Palmer 1993, Mount 1995). These alterations have magnified their susceptibility to plant invasions by weedy plant species (Randall et al. 1998, Rundel 1998). Currently, one of the greatest invasive threats to riparian ecosystems in Mediterranean-type climates is a tall, perennial bamboo-like member of the grass family (Poaceae) called giant reed (*Arundo donax* L.).

Indigenous to southern Eurasia, *A. donax* was introduced extensively to other locales and now thrives in many warm climates worldwide (Perdue 1958, Crampton 1974, Polunin and Huxley 1987, Hickman 1993, Sharma et al. 1998). In the United States, *A. donax* has become especially devastating to riparian habitats in California's Mediterranean-type climate region, creating significant impacts to natural-river functioning and sustainability (Rundel 2000). *Arundo donax* was introduced to agricultural landscapes in the Los Angeles area for building materials and erosion control along irrigation canals. Carried by floodwaters, *A. donax* eventually made its way to adjacent streams and rivers and by the 1820s patches were commonly found along floodplains of many streams (Robbins et al. 1951). However, it appears that *A. donax* has only recently succeeded in invading (i.e., expanding its distribution and displacing native vegetation) riparian ecosystems along floodplains and terraces in southern California after large floods in 1969 (Sanger Hedrick pers. comm.) (Bell 1997).

Arundo donax is one of the most successful weedy invaders in the disturbance-defined riparian ecosystems of Mediterranean-type climates (Bell 1997, Boose and Holt 1999). Although inflorescences (0.5 m long terminal panicles) are not known to produce seed in California (Johnson et al. 2006), *A. donax* reproduces readily by vegetative

propagation; it is dispersed downstream when small pieces of rhizomes or culms break off during flooding and land on bare, moist substrates (Else 1996, Else and Zedler 1996, Bell 1997, Boose and Holt 1999, Wijte et al. 2005). Growing at an extremely fast rate (up to 10 cm per day under optimal conditions), *A. donax* quickly establishes on exposed or sparsely vegetated soil and grows to more than 4 m in height after only a few months (Rieger and Kreager 1989) and may attain heights of up to 8 m a few years after establishment (Perdue 1958). Once established, *A. donax* then expands outward in area by clonal propagation (Decruyenaere and Holt 2001), crowding and displacing indigenous shrubs, herbs and grasses, and trees under elevated soil moisture, nutrient, and light conditions (Rieger and Kreager 1989). In this manner, *A. donax* forms extensive stands, or monocultures, along floodplains and terraces of California's river and stream systems.

Infestations of *A. donax* have created serious physical and biological problems along rivers in Mediterranean-type climate regions (Dudley and Collins 1995, DiTomaso 1998, Dudley 2000, Rundel 2003). Where it grows extensively along floodplains, *A. donax* physically obstructs natural water flow, thereby increasing the risk of flooding. As the aboveground biomass dries in the hot, dry summer months, *A. donax* creates a fire hazard where moisture-rich riparian corridors would normally form natural barriers to fire (Scott 1994, Rundel and Gustafson 2005). Furthermore, *A. donax* may outcompete native riparian species for scarce water resources (Iverson 1994, Coffman in press), thereby decreasing biodiversity and reducing the value of riparian habitats for wildlife (Kisner 2004).

Millions of dollars have been spent in efforts to remove *A. donax* from riparian ecosystems in southern California. Although these attempts have been successful in removing small infestations of *A. donax* on riparian terraces, it continues to thrive in floodplains. An understanding of the ecological conditions that promote continued growth and invasion of *A. donax* is needed for its effective control. Ever expanding residential and agricultural development in coastal southern California and other Mediterranean-type climates has led to increased water import and discharge into rivers, declining water quality, and removal of the once vast low-lying areas of riparian forest. The result – increased nutrient, water, and light availability – may promote invasion of riparian ecosystems by *A. donax* (Bell 1997, Wang 1998, Rundel 2003, Coffman et al. 2004). This study investigated one of the most important factors influencing *A. donax* invasion: elevated nutrient levels in riparian ecosystems caused by anthropogenic inputs.

Soils in Mediterranean-type climates commonly contain low levels of nitrogen (N) and phosphorus (P) (Day 1983, diCastri 1991, Dallman 1998). In southern California, the young sedimentary geology is naturally high in P, but has N-limiting conditions (Pettijohn 1975). Nutrient enrichment of riparian ecosystems (especially by N) from adjacent land use practices may promote *A. donax* growth and invasion in river systems of southern California. Excess N, P, and potassium (K) are transported in surface and shallow groundwater from various land use activities to adjacent riparian ecosystems (Schlosser and Karr 1981, Correll 1984, Correll et al. 1992, Triska et al. 1994, Rodda 1995, Basnyat et al. 1999). Weedy and invasive plant species often differ in their nutrient requirements and uptake efficiency compared to native plants, resulting in a

competitive advantage for the former in nutrient rich environments (Claridge and Franklin 2002). Thus, elevated nutrient levels in riparian ecosystems are thought to promote invasion of plants such as *A. donax*.

This study investigated the influence of anthropogenic nutrient enrichment on invasion of *A. donax* in three river systems of southern California. I hypothesized that nutrient enrichment of riparian ecosystems from anthropogenic sources has contributed significantly to invasion of river systems by *A. donax* in southern California. To test this hypothesis, I examined relationships between the degree of *A. donax* infestation and nutrient levels in the associated shallow groundwater, soil, and leaf tissue using a correlational approach.

METHODS

Study Area

The study area lies northwest of Los Angeles in Ventura and Los Angeles Counties, California. Three river systems (Calleguas Creek, the Santa Clara River, and Topanga Canyon) located in watersheds with varying compositions of land use were studied (Figure 7). Ten reference subwatersheds from within this region where *A. donax* is absent were used as indicators of natural conditions.

The Calleguas Creek watershed drains an area of approximately 888 km^2, predominantly in southern Ventura County. It contains a roughly equal mix of three main land use categories: ~30% residential development, ~32% agricultural areas (both row crops and orchards mostly in the western and lower watershed), and ~38% open

space (mainly in the mountains of the upper watershed) (Figure 8). This watershed was chosen for its relatively high level of anthropogenic nutrient input.

The Santa Clara River is one of southern California's last remaining large, unregulated river systems. The river and its tributaries drain a watershed of approximately 4,185 km^2, the second largest coastal watershed in southern California. The 187-km long river flows in a westerly direction from its headwaters on the northern slopes of the San Gabriel Mountains in Los Angeles County to the Oxnard Plain in Ventura County, emptying into the Pacific Ocean near the City of Ventura. The Santa Clara River contains a mix of land use types representing moderate anthropogenic nutrient input, although over 80% of the watershed (mainly upper and higher elevation portions) remains as open space (Figure 8). The floodplain of the lower watershed is dominated by agricultural land use (orchards and row crops), and urban and residential development is rapidly expanding in the mid to upper watershed.

The Topanga Canyon Watershed, approximately 91 km^2, is located in the heart of the Santa Monica Mountains in western Los Angeles County. Topanga Canyon is a low anthropogenic nutrient input system. The watershed is composed primarily of low-density rural residential development (6%) and open space (93%) in the upper parts of the watershed, with almost no agricultural land use (Figure 8).

To fully test my hypothesis that riparian ecosystems in developed watersheds were invaded due to increased nutrient supply from anthropogenic inputs, I documented reference conditions in undeveloped watersheds throughout the study area to compare to developed watersheds. In this coastal geographic region, none of the undeveloped

watersheds contained *A. donax*, so they were not true controls for testing my hypothesis. However to establish reference conditions, I sampled shallow groundwater, soil, and leaf tissue nutrients within ten undeveloped watersheds (reference sites) in the region: three subwatersheds (tributaries) of the Santa Clara River Watershed and seven smaller undeveloped watersheds in the Santa Monica Mountains. Reference sites were located in open space areas containing no upstream anthropogenic nutrient inputs and were dominated by red willow, *Salix laevigata* (no *A. donax* was present). I could not control for N inputs from atmospheric deposition, but based on model results for dry atmospheric N deposition for watersheds in the Los Angeles Region, I assumed similar levels of atmospheric N dry deposition among watersheds (Lu et al. unpublished data).

Study Design and Sampling Locations

I established stratified sampling locations along the main stem of each of the three river systems based on three factors and different levels within each factor: adjacent land use type (agricultural, residential development, and open space); fluvial geomorphic landform (floodplains and terraces); and degree of *A. donax* infestation (none, small, and large) (Table 6; Figure 8). Effects of nutrient inputs from land use activities on *A. donax* invasion were thought to be more directly related to adjacent land use type in higher riparian terraces (called terraces), whereas the watershed factor was used to address cumulative effects of upstream land use activities on floodplain sampling locations (lower terraces immediately adjacent to main channels with baseflow).

Each sampling location was approximately 600 m^2. Floodplain sampling sites were roughly 30 m in length (parallel and immediately adjacent to the main stream

channel, containing baseflow) by 20 m in width (perpendicular to the channel). Terrace sampling sites had similar dimensions but were located immediately adjacent to upland land use areas. I also selected locations where *A. donax* was: (1) completely absent and native riparian vegetation (*Salix laevigata*) dominated, (2) only present as small infestations (between 1–9 m^2), and (3) the dominant component of the vegetation (> 100 m^2), representing heavily invaded river reaches. *Salix laevigata* Bebb. (Salicaceae family) was selected because it is the most common woody plant consistently found throughout riparian ecosystems in the study area. Roots of the phreatophyte *S. laevigata* can reach up to 30 m when the groundwater table is deep, whereas *A. donax* roots have been observed to grow to only 8 feet in depth (Figure 9) (See Appendix 3-1 for site locations).

Sampling Methods

Samples of *A. donax* or *S. laevigata* leaf tissue and associated shallow groundwater and soils were taken once at each sampling location from July to September 2003. Ten *A. donax* or *S. laevigata* leaves from at least three plants were collected at each sampling location for leaf tissue nutrient analyses. *Arundo donax* leaves were collected at large and small infestation sampling sites. *Salix laevigata* leaves were collected from riparian ecosystem sampling sites with no *A. donax* and at reference sites where *A. donax* was absent. Only newly mature, healthy, full sun leaves were collected from the top of *A. donax* culms and the middle of *S. laevigata* canopies. Leaf tissue was analyzed for relative nutrient content to evaluate nutrient use and availability to plants (Taiz and Zeiger 1991).

Shallow groundwater samples were collected in the center of each sampling location next to the target plant (either *A. donax* or *S. laevigata*). An 8-cm diameter bucket auger was used to create sampling holes, and a temporary stainless steel piezometer connected to a bailer was used to collect the groundwater samples. After purging the bailer several times, a groundwater sample was collected. Each day, these samples were kept on ice until delivered to a local laboratory for immediate analysis. Because groundwater was too deep to sample at terrace study sites, only soil and leaf tissue nutrient contents were collected in these areas. Five subsamples of soil were collected adjacent to target plants and combined into a composite sample by mixing together thoroughly in a stainless steel bowl. Each soil subsample was collected with an 8-cm diameter bucket auger from the upper 30 cm of the soil surface, where nutrient concentrations are expected to be greatest (Day 1983).

Leaf tissue and soil samples were air-dried and ground to a powder in preparation for nutrient content analyses at the DANR Analytical Laboratory in Davis, California. Leaf tissue was analyzed for total percent N, P, and K. Total N content of leaf tissue was determined using a Nitrogen Gas Analyzer combustion method (LECO FP-528) (AOAC International 1997a), total P content by microwave acid digestion/dissolution of leaf tissue samples and quantitative determination by AAS and ICP-AES (Meyer and Keliher 1992, Sah and Miller 1992), and total K content by the 2% acetic acid extraction method and a quantitative determination using atomic emission spectrometry (Johnson and Ulrich 1959).

Soil samples were analyzed for total N (%), nitrate-N (NO_3-N/ppm), ammonia-N (NH_4-N/ppm), orthophosphate (PO_4-P/ppm), and pH. Total N in the soil was determined by the combustion gas analyzer method (Method 972.43) (AOAC International 1997b). Concentrations of NO_3-N and NH_4-N in the soil were determined by equilibrium extraction of soil with potassium chloride and a flow-injection analyzer (Hofer 2003, Knepel 2003). Because the soils studied were neutral to alkaline, the Olsen-P method was used to estimate the relative availability of inorganic PO_4-P in soils (Olsen and Sommers 1982, Prokopy 1995). Soil pH was determined using a saturated paste prepared from the soil and a pH meter (USDA 1954). Soil grain size was analyzed using a hydrometer to determine the particle size distribution of sand, silt, and clay in soil suspension (Sheldrick and Wang 1993).

Shallow groundwater samples were analyzed for NH_4-N, NO_3-N + NO_2-N, PO_4-P, total Kjeldahl nitrogen (TKN), total N (total N = TKN + NO_3-N + NO_2-N), and pH by Fruit Growers Environmental Laboratories in Santa Paula, California. NH_4-N (4500NH3H), NO_3-N + NO_2-N (SM4500-NO3 F/EPA 300.0), and pH (Method 4500-H B) were analyzed according to the *Standard Methods for the Examination of Water and Wastewater* (Franson et al. 1998). TKN (EPA Method 351.1) and PO_4-P (Olsen P Methods 300.0 and 4500) were analyzed per *Methods for Chemical Analysis of Water and Wastes* (USEPA 1983).

Statistical Analyses

In this study, I used a multifactorial design in which combinations of four fixed factors (Model 1) were crossed with each other. The factors and associated levels were:

watersheds (Santa Clara River, Calleguas Creek, Topanga Canyon, and reference watersheds), land use types (agricultural, residential, and open space), fluvial geomorphic location (floodplain and terrace), and degree of *A. donax* infestation (none, small, and large). Sampling sites with small *A. donax* infestations represented areas where *A. donax* presence may indicate different invasion trajectories (i.e., depending on site conditions *A. donax* will either invade the area or persist as a small patch). ANOVA tests were used to analyze effects of various combinations of the four factors (independent variables) on nutrient concentrations in shallow groundwater, soil, and leaf tissue, soil grain size, pH, and leaf tissue and shallow groundwater N:P (dependent or response variables) (Systat Statistical Program [Version 10]).

Since data for terrace locations were only collected within the Santa Clara River Watershed, four-way ANOVAs could not be conducted. Instead, two three-way ANOVAs (watershed x land use x degree of infestation and land use x fluvial geomorphic location x degree of infestation) were performed on a combination of the fixed factors and response variables. To further investigate differences between invaded and non-invaded sites, small *A. donax* infestation data were removed and three-way ANOVAs repeated. Because soil nutrients can be strongly influenced by soil grain size, three-way ANOVAs for soil nutrients were conducted using soil grain size (percent silt + clay) as a covariate. This parameter covaried significantly with all soil nutrient analytes. Since *A. donax* and *S. laevigata* leaves were not collected from the same sample locations to test species specific variation in leaf tissue nutrients, one-way ANOVAs were performed by the species factor (*A. donax* and *S. laevigata*, data from all infestation types

combined) using groundwater nutrient analytes as covariates. *Arundo donax* leaf tissue nutrient content was significantly greater than *S. laevigata* in all cases. Therefore, *A. donax* and *S. laevigata* leaf tissue nutrient results were compared separately in ANOVAs because variation in species nutrient uptake and use efficiency could potentially confound results (Chapin et al. 1986). F tests were performed to evaluate contrasts between means of grouping variables and levels in three-way ANOVA results.

I conducted one-way ANOVAs for watershed identity using all response variables to analyze the main effects of three study watersheds compared to reference watersheds. Nutrient content of leaf tissue was analyzed and reported separately by species in this one-way ANOVA. In addition, one-way ANOVAs by degree of infestation across all watersheds were conducted for *A. donax* leaf tissue nutrients in small and large infestations to compare foliar nutrient concentrations between infestation levels. Tukey's post hoc tests were conducted to determine significant differences between factor means in these one-way ANOVAs.

Linear regression analyses were performed to investigate relationships between *A. donax* and *S. laevigata* leaf total N and P content and various shallow groundwater and soil nutrient analyte concentrations on floodplains and terraces. Significance levels for regressions were determined from P values (ANOVA). I selected shallow groundwater and soil nutrient analytes with the strongest relationships to leaf tissue nutrients to analyze further in one- and three-way ANOVAs. All forms of N and P in the shallow groundwater in floodplains were analyzed. However, only soil NO_3-N and PO_4-P were analyzed along floodplains and terraces on the Santa Clara River.

Probability plots were used to test for normality of data and to identify data that required transformation. Most of the data were $\log_{10}$ base transformed. Raw data were used for leaf tissue N and K and shallow groundwater PO_4-P and pH. Square root transformations were used on percent silt + clay. When means and standard errors were used to describe or present statistical differences, data were back-transformed and reported in original units as an asymmetrical range.

RESULTS

Naturally Occurring Nutrient Levels

I used reference watershed data collected in this study to represent natural conditions for comparison to study watersheds, since historic data on natural conditions in neither study watersheds nor other watersheds in the southern California region were not available. Mean total soil N was much higher in reference watersheds than in floodplain or terraces of study watersheds (Table 7). However, NO_3-N and PO4-P levels in reference watersheds were similar to study floodplains but much lower than levels found on terraces. N and P levels of the shallow groundwater in reference watersheds were low (mean 0.13-1.11 mg/L) compared to study watersheds (mean 0.37-5.74 mg/L). The mean shallow groundwater molar N:P ratio (NO_3-N:PO_4-P) from reference sites was 2.4:1 (SE 2.0:1–3.0:1), which is considered to be N limiting according to the Redfield ratio (< 15:1 = N limiting and > 15:1 = P limiting for sea water or 15 atoms of N for every 1 atom of P). The N:P ratio of shallow groundwater in study watersheds was higher than found in reference watersheds but also in the range of N limiting [4.4:1 (SE 3.9:1–5.0:1)].

The mean N:P ratio of *S. laevigata* leaf tissue from the reference sites was 12.1:1 (SE 11.5:1–12.8:1), which is also considered to be N limiting (< 14:1 = N limiting and > 16:1 = P limiting on a per mass basis) (Koerselman and Meuleman 1996) (Table 8). Mean leaf tissue of both *S. laevigata* and *A. donax* collected from study watersheds had much higher N:P ratios, but considered neither N nor P limiting. The *S. laevigata* leaf tissue N:K ratio of 1.5:1 (SE 1.4:1–1.6:1) from the reference sites was optimal for plant growth (< 1.5:1 = N limiting and > 1.5:1 = K limiting) (Knecht and Goransson 2004). However, the N:K ratio is below the N limiting threshold for *A. donax* in study watersheds [0.99:1 (SE 0.96:1.02)].

Shallow Groundwater Nutrients

The three-way ANOVA (watershed x land use x degree of infestation) showed that the two-way interaction of watershed and land use factors best explained total N distribution in the shallow groundwater along the floodplains studied (Table 9). Concentrations of total N in the shallow groundwater were significantly higher in Calleguas Creek than in the Santa Clara River adjacent to agricultural and open space land uses (Figure 10a). No variation between the two watersheds existed for total N concentrations adjacent to residential land uses. However, shallow groundwater total N levels were significantly lower adjacent to residential land uses compared to agriculture and open space within Calleguas Creek. Results of the one-way ANOVA by watershed indicated that reference sites contained significantly lower total N in the shallow groundwater compared to any of the three study watersheds (Table 10). TKN results in shallow groundwater were similar to those of total N.

The watershed main effect for the three-way ANOVA was very highly significant for NO_3-N + NO_2-N concentration in the shallow groundwater (Table 9). These concentrations were significantly higher throughout Calleguas Creek (1.08 mg/L, SE 0.80–1.46 mg/L) compared to the Santa Clara River watershed (0.27 mg/L, SE 0.23–0.31 mg/L). When data from small *A. donax* infestations were removed, the interaction of watershed and land use type was significant for the three-way ANOVA ($F_{(2,50)} = 3.866$; $P = 0.027$). NO_3-N + NO_2-N concentrations in the shallow groundwater adjacent to agricultural land uses were significantly higher along Calleguas Creek than any other combination of land use and watershed (Figure 10b). The one-way ANOVA for NO_3-N + NO_2-N concentrations by watershed was very highly significant (Table 10). Shallow groundwater NO_3-N + NO_2-N levels were significantly higher along floodplains in Calleguas Creek compared to levels measured along the Santa Clara River, Topanga Canyon, or reference watersheds.

The three-way ANOVA resulted in a significant three-way interaction for shallow groundwater NH_4-N levels found in floodplains (Table 9). Significantly higher mean NH_4-N concentrations in the shallow groundwater were associated with small infestations next to open space along Calleguas Creek compared to sites with any other combination of land use and degree of infestation (Figure 10d and e). Large infestations adjacent to open space on Calleguas Creek contained higher shallow groundwater NH_4-N levels than many other combinations of factors. However, the one-way ANOVA by watershed indicated that levels of NH_4-N in shallow groundwater did not differ significantly between reference watersheds and any of the main study watersheds (Table 10).

Reference watersheds contained an average of 0.26 mg/L (SE 0.21–0.33) NH_4-N in shallow groundwater, which is lower only than levels found within small *A. donax* infestations on floodplains adjacent to open space within the Calleguas Creek watershed.

The main effect of watershed was very highly significant for PO_4-P in the three-way ANOVA (Table 9). The watershed with the highest proportion of total anthropogenic land cover, Calleguas Creek, contained the highest shallow groundwater PO_4-P concentrations (Figure 8). Orthophosphate concentrations in the shallow groundwater were significantly higher along Calleguas Creek (2.67 ± SE 0.38 mg/L) than Santa Clara River (0.64 ± SE 0.10 mg/L). The one-way ANOVA for shallow groundwater PO_4-P levels by watershed was also very highly significant (Table 10). Shallow groundwater PO_4-P concentrations on floodplains were significantly lower at reference sites and along the Santa Clara River compared to Calleguas Creek.

The one-way ANOVA for shallow groundwater pH levels by watershed was very highly significant (Table 10). Calleguas Creek and the Santa Clara River had significantly more acidic shallow groundwater than did Topanga Canyon and the reference watersheds.

Soils Nutrients and Grain Size

Nutrients

The relative availability of nutrients in soil made the soil nutrient results quite complex, due to variability in soil grain size and pH levels among sites, as well as different rooting depths of the two plant species (Figure 9). Availability of nitrogen varies considerably depending on soil grain size, which determines cation exchange

capacity and moisture holding capacity. NH_4^+ and NO_3^- are highly charged ions that readily dissolve in water. Percent silt + clay grain size was used as a covariate in ANOVAs for soil nutrients to account for variation due to soil grain size. Significant relationships between *A. donax* leaf tissue N and soil total N, NH_4-N and NO_3-N found on riparian terraces suggested that this species may rely more heavily on soil nutrients in the upper 30 cm of soil on terraces than *S. laevigata*, which may have much deeper roots in these areas (Figure 11).

HPO_4^{-2} adsorbs readily to soil particles (especially finer textured soils) and is most available to plants when dissolved in water at pH ~6.5 (Havlin et al. 1999). The mean soil pH of floodplains of reference watersheds was 7.38 (SE 7.26–7.50), which was similar to floodplains (7.41, SE 7.38–7.45) and terraces (7.38, SE 7.33–7.43) along the Santa Clara River. Higher than optimal pH levels in these areas may cause lower PO_4-P availability for both plant species. The three-way ANOVA (land use x location x degree of infestation) of soil pH resulted in a very highly significant land use main effect (Table 6). Mean soil pH levels varied significantly from one another by land use type as follows: open space (7.57, SE 7.51–7.62), agricultural (7.40, SE 7.35–7.45), and residential (7.23, SE 7.18–7.28). Thus, PO_4-P may be more available to plants adjacent to land use with higher anthropogenic inputs due to lower soil pH.

In the three-way ANOVA (watershed x land use x degree of infestation), the main effect of watershed was significant for percent total N content in the soil (Table 9); floodplain soils in Calleguas Creek (0.05%, SE 0.047–0.052%) contained significantly lower levels of mean total N than did soils along the Santa Clara River (0.06 ± SE

0.003%). NO_3-N levels in the soil varied significantly by all factors (all main effects significant). The mean content of NO_3-N was significantly higher in Calleguas Creek (2.1 ppm, SE 1.8–2.6ppm) than the Santa Clara River (0.7 ppm, SE 0.6–0.9 ppm). Floodplains adjacent to agricultural (1.6 ± 0.4 ppm) and open space (1.4 ppm, SE 1.1–1.8 ppm) contained significantly higher levels of NO_3-N than those adjacent to residential land uses (0.9 ± 0.2 ppm). Both large and small degrees of infestation were found to contain significantly higher mean NO_3-N soil levels (1.6 SE 0.4 ppm and 1.5 ppm, 1.1 –1.8 ppm, respectively) then non-infested areas (0.8 ppm, SE 0.7–1.1 ppm). Levels of NH_4-N were found to be significantly higher in floodplain soils of Calleguas Creek (1.5 ± 0.1 ppm) compared to the Santa Clara River (1.4 ± 0.1 ppm). The three-way interaction for mean PO_4-P levels found in floodplain soils was significant (Table 9). In most cases, levels of soil PO_4-P were higher in Calleguas Creek than along the Santa Clara River (Figure 12). Levels of PO_4-P in floodplain soils adjacent to agricultural land uses in Calleguas Creek were higher than levels found in soil anywhere along the Santa Clara River. Large infestations of *A. donax* were associated with higher soil PO_4-P levels than small or non-infested floodplains next to open space along the Santa Clara River.

Soil NO_3-N and PO_4-P concentrations were significantly higher on terraces versus floodplains of the Santa Clara River for all degrees of *A. donax* infestation according to the land use x fluvial geomorphic location x degree of infestation three-way ANOVA (Figure 13a and c). Soil nutrient levels did not differ significantly along floodplains, with the exception of lower PO_4-P levels adjacent to residential compared to agricultural land uses (Figure 13d). However, soil associated with the deeper-rooted *S. laevigata* from

non-infested riparian terraces contained significantly higher NO_3-N and PO_4-P concentrations than soil associated with either *A. donax* infestation stage (Figure 13a and c). Soil PO_4-P levels associated with all land uses were significantly higher on terraces compared to floodplains (except between terrace open space and floodplain agricultural areas) (Figure 13d). Terrace sites adjacent to anthropogenic land uses had significantly higher soil PO_4-P concentrations (as well as lower pH values allowing for greater availability) versus open space. Small and large *A. donax* infestations contained significantly more soil PO_4-P adjacent to agricultural versus open space land use (Figure 13e).

One-way ANOVAs for mean soil NO_3-N and PO_4-P content by watershed were very highly significant (Table 10). Mean NO_3-N content of soil along the floodplains of Calleguas Creek was significantly higher than content of soil along Santa Clara River. Soils sampled along Calleguas Creek contained significantly higher mean PO_4-P content than soils along the Santa Clara River or Topanga Canyon.

Grain Size

In general, soil grain size was highly correlated with the watershed from which it was sampled and adjacency to certain land use types. However, the combination of fluvial geomorphic location and degree of infestation affected soil grain size distribution in the 3-way ANOVA (land use x geomorphic location x degree of infestation, Santa Clara River only) (Table 11). Percent silt + clay content was significantly higher on terraces verses floodplains in non-infested sites and small infestations of *A. donax* (Figure 13b). However, this parameter did not differ significantly by geomorphic landform

within large infestations of *A. donax*. In addition, percent silt + clay did not differ by degree of infestation within floodplains but was significantly higher in non-infested sites versus large *A. donax* infestations on terraces. Reference sites contained 20.1% (SE 17.4–22.9%) silt + clay in floodplains, which was similar to small infestations of *A. donax* along floodplains but much lower than non-infested sites and small infestations along terraces. One-way ANOVAs for mean percent silt + clay in floodplains by watershed were very highly significant (Table 11). Mean silt + clay content found in floodplain soils along the Santa Clara River was significantly higher than silt + clay content found along Calleguas Creek or Topanga Canyon floodplains.

Relationship between Shallow Groundwater, Soil, and Leaf Tissue Nutrients

Various forms of N and P found in the shallow groundwater and soils had positive linear relationships with N and P content of *A. donax* and *S. laevigata* leaves (Figure 11 and Figure 14). However, pools of N and P available to plants varied considerably by species, medium, and fluvial geomorphic location. In floodplains, linear regressions showed significant positive relationships between *A. donax* leaf tissue N and each form of N individually (total N, NO_3-N + NO_2-N, and NH_4-N) in the shallow groundwater (Figure 14). In fact, as groundwater nutrients increased, *A. donax* N content increased more than *S. laevigata* N content in each case. However, only relationships between total N and NO_3-N + NO_2-N in the shallow groundwater and *S. laevigata* leaf tissue N content were significant. Relationships between P content of *S. laevigata* leaves and shallow groundwater PO_4-P levels were highly significant in floodplains, but were not found between *A. donax* leaves and shallow groundwater PO_4-P levels. A strong positive

relationship was found between *A. donax* leaf N content and soil NO_3-N on riparian terraces (Figure 11). Also, *A. donax* leaf N content indicated a positive relationship with both soil total N and NH_4-N on terraces and NO_3-N on floodplains; similar trends were not found for *S. laevigata*. No significant relationships were found between mean P content found in leaves of either species and soil PO_4-P concentrations in terrace or floodplain locations.

Leaf tissue Nutrients

Total Nitrogen

Mean leaf tissue N content of *A. donax* varied by watershed and land use in the three-way ANOVA (watershed x land use x degree of infestation – non-infested sites excluded) (Table 9). N content of *A. donax* leaves was significantly higher adjacent to open space land use within Calleguas Creek than any other land use types along either stream (Figure 15a). The three-way ANOVA (land use x fluvial geomorphic location x degree of infestation – non-infested sites excluded) for *A. donax* leaf tissue N content revealed significant main effects for land use and degree of infestation on the Santa Clara River (Table 11). Mean leaf tissue N content was higher in sites adjacent to agricultural (2.54 ± SE 0.08%) and residential (2.64 ± SE 0.08%) land uses compared to open space (2.21 ± SE 0.09%). Large *A. donax* infestations (2.59 ± SE 0.07%) contained significantly higher mean leaf tissue N than small infestations (2.36 ± SE 0.08%).

The one-way ANOVA for mean N content of *A. donax* leaf tissue by infestation stage for all study watersheds was highly significant ($F_{(1,79)} = 8.858$; $P = 0.004$). Mean N of *A. donax* leaves was higher in large infestations (2.67 ± SE 0.06%, n = 62) than in

small infestations (2.38 ± SE 0.07%, n = 60). The one-way ANOVAs for mean N leaf content by watershed were very highly significant for *A. donax* only and *S. laevigata* only (Table 10). N content of *S. laevigata* leaves in reference sites and from Topanga Canyon was significantly lower than N content sampled along the floodplains of Calleguas Creek or the Santa Clara River. *Arundo donax* leaves sampled in Calleguas Creek contained significantly higher N content than leaves from either the Santa Clara River or Topanga Canyon. Although leaf tissue nutrient content could not be compared statistically between species because species-specific differences might confound comparisons, N content of *A. donax* leaves from all watersheds was higher than that of *S. laevigata* leaves in reference sites.

Total Phosphorus

Mean P content of *A. donax* leaves varied by watershed only in the three-way ANOVA (watershed x land use x degree of infestation – non-infested sites excluded)(Table 9). Leaf tissue mean P content was higher in Calleguas Creek (0.19%, SE 0.184–0.193%) than in the Santa Clara River (0.17 ± SE 0.006%). The three-way ANOVA (land use x fluvial geomorphic location x degree of infestation – non-infested sites excluded) for *A. donax* leaf tissue P content was not significant for any main effects or interactions (Table 11).

The one-way ANOVA for mean P content of *A. donax* leaf tissue by degree of infestation for all study watersheds was significant ($F_{(1,79)} = 4.817$; $P = 0.031$). Mean P of *A. donax* leaves was higher in large infestations (0.18% SE 0.173–0.180%, n = 62) than in small infestations (0.16% SE 0.155–0.164%, n = 60).

One-way ANOVAs for mean P content of leaves by watershed were significant for *S. laevigata* only and *A. donax* only (Table 10). *Salix laevigata* leaves contained higher P content along floodplains of Calleguas Creek than along floodplains of the Santa Clara River, Topanga Canyon, or reference sites. Mean leaf P content of *A. donax* leaves was significantly higher in Calleguas Creek than in the Santa Clara River. Although leaf tissue nutrient content could not be compared statistically between species, P content of *A. donax* leaves from all watersheds was higher than that of *S. laevigata* leaves in reference sites.

Total Potassium

Mean K content of leaf tissue varied by land use and degree of infestation in the three-way ANOVA (watershed x land use x degree of infestation – non-infested sites excluded) (Table 9). Leaf tissue K content was significantly higher in large infestations adjacent to residential land uses than in any other combination of land use and infestation stage (Figure 15b). The degree of infestation main effect was highly significant in the three-way ANOVA (land use x fluvial geomorphic location x degree of infestation – non-infested sites excluded) for *A. donax* leaf tissue K (Table 11). Mean leaf tissue K content was significantly higher in large *A. donax* infestations (2.94 ± SE 0.08%) than in small infestations (2.66 ± SE 0.06%).

Although the one-way ANOVA for mean K content of *A. donax* leaf tissue by degree of infestation for all study watersheds was not significant ($F_{(1,79)} = 3.578$; $P = 0.062$), mean K of *A. donax* leaves was higher in large infestations (2.79 ± SE 0.07%, n = 62) than in small infestations (2.55 ± SE 0.05%, n = 60). The one-way ANOVA for K

content by watershed was not significant for *S. laevigata* leaves, but K content of *A. donax* leaves was significantly higher in the Santa Clara River compared to Calleguas Creek or Topanga Canyon (Table 10). Leaf tissue nutrient content could not be compared statistically between species, but K content of *A. donax* leaves from all watersheds was higher than that of *S. laevigata* leaves from reference sites or any of the study watersheds.

N:P and N:K Ratios

Shallow groundwater molar N:P ratios did not vary significantly in either three-way ANOVA or the one-way ANOVA by watershed. However, reference watersheds [2.1:1 (SE 2.0–3.0:1)] had lower mean N:P ratios than all study watersheds and Calleguas Creek [5.7:1 (SE 4.4:1–7.5:1) had the highest ratio (Table 8). All mean N:P ratios were in the N limiting range (<15:1) according to the Redfield Ratio.

Arundo donax leaf tissue N:P ratios did not vary significantly in either of the three-way ANOVAs performed for the study watersheds (Table 8). When only *S. laevigata* leaves from floodplain locations were examined in the one-way ANOVA by watershed, leaf N:P ratios within reference watersheds were significantly lower than those within the Santa Clara River, and N:P ratios in Calleguas Creek were significantly lower than those in the Topanga Canyon or the Santa Clara River. In addition, the mean N:P ratio of *A. donax* leaf tissue was significantly higher in Calleguas Creek and the Santa Clara River compared to Topanga Canyon. Although statistical comparisons could not be made between the plant species, the mean N:P ratios of *S. laevigata* leaf tissue in

reference sites were lower than the N:P ratio of *A. donax* leaf tissue in all study watersheds.

The land use x location x degree of infestation ANOVA for N:K revealed a significant land use main effect ($F_{(2,60)} = 4.589$; $P = 0.014$). Higher N:K ratios of *A. donax* leaf tissue were observed adjacent to residential (0.93:1, SE 0.89:1–0.96:1) and agricultural land uses (0.91:1, SE 0.88:1–0.94:1) compared to open space (0.78:1, SE 0.75:1–0.82:1). Mean N:K ratios of *S. laevigata* leaf tissue from floodplains did not vary among watersheds in the one-way ANOVA by watershed (Table 8). However, *A. donax* leaf tissue mean N:K was significantly higher in Calleguas Creek compared to either Santa Clara River or Topanga Canyon. Although statistical comparisons were not possible, the mean leaf N:K of *S. laevigata* was much higher in reference watersheds compared to *A. donax* leaf mean N:K ratios found in other watersheds.

DISCUSSION

Anthropogenic nutrient enrichment of natural ecosystems has been linked to plant invasions worldwide (Mooney et al. 1986, Drake et al. 1989, D'Antonio and Vitousek 1992, Hobbs and Huenneke 1992, Vitousek et al. 1996, Brooks 2003). However, little is known about the influence of elevated nutrients on invasions in river systems of Mediterranean-type climates such as California (Rundel 2000, Kim 2003, Robinson et al. 2005). This analysis of nutrient levels in several river systems in southern California supports the hypothesis that excess nutrients associated with anthropogenic land use activities have helped promote the recent invasion of riparian ecosystems by *A. donax* in southern California. I tested this hypothesis by evaluating N and P pools in shallow

groundwater and soil within riparian ecosystems invaded to various degrees by *A. donax* adjacent to several land uses. All factors investigated – land use, watershed, and fluvial geomorphic location – were important in explaining nutrient distribution and *A. donax* invasion. Furthermore, my results indicate that the greater supply and availability of N and K to *A. donax* compared to native plants may contribute to invasion of riparian ecosystems by *A. donax* in southern California (Charbonneau and Kondolf 1993, CRWQCB-LA 1995).

Natural Nutrient Levels

Naturally occuring nutrient levels essential for terrestrial plant growth (primarily N and P) vary widely in soils and shallow groundwater due to climate, topography, organisms, parent material, and soil texture. Precipitation and nitrogen fixation are the main natural sources of N, but all other essential soil nutrients (including P and K) are inherited from the parent material or added anthropogenically (Day 1983, Rundel et al. 1983, Stark 1994). Soils in Mediterranean-type climate regions of the world are naturally deficient in N and/or P compared to other regions (Day 1983, diCastri 1991, Dallman 1998), but vary considerably within these regions especially in the extent to which they are available to plants.

Historical soil and shallow groundwater nutrient data for natural or undisturbed riparian ecosystems in southern California were not available for comparison with my study results. The highly erosive soils found throughout this region likely transport associated nutrients to the alluvium of low-lying river systems, especially after fire. Average total N levels found in floodplain soils of my reference watersheds were within

the range of levels (slightly nutrient-rich) found in adjacent shrubland ecosystems of California (Day 1983, diCastri 1991) (Table 2). The young sedimentary geology of my study region is composed primarily of marine deposits containing organisms very high in P (Pettijohn 1975), creating soils higher in P than found in older more weathered geologies (Walker and Syers 1976, Groves et al. 1983). N and P levels found in the shallow groundwater of reference watersheds were low, although slightly higher than flow-weighted nutrient concentrations found in streams of many other small undeveloped basins in the U.S. (Williams et al. 1998, Clark et al. 2000) (Table 2).

Nutrient Limitation

N, P, and K alone and in combination were found to limit terrestrial and wetland plant production in the eastern U.S. and Europe (Koerselman and Meuleman 1996, Verhoeven et al. 1996, Svengsouk and Mitsch 2001, Knecht and Goransson 2004). Researchers have shown that N limits plant production on young substrates, such as southern California, whereas P is limiting on older substrates (Walker and Syers 1976, Vitousek 1996). Although nutrient limitations in riparian ecosystems of southern California are undocumented, they may provide important insight into the invasion process; anthropogenic N inputs may be relatively more important to plant production than P in younger geologies of southern California.

Results of this study indicate that N limiting conditions (relatively higher P levels) may naturally occur in riparian ecosystems in this geologically young landscape as suggested by several researchers (Walker and Syers 1976, Vitousek 1996). The N:P (molar ratio) in shallow groundwater of reference sites in this study (2.4:1) was much

lower than levels in sea water (<15:1 = N limiting conditions) or freshwater (19-48:1) reported in the literature, indicating naturally N limiting conditions in floodplains of southern California (Redfield 1958, Hecky et al. 1993). Also, leaf tissue N:P for *S. laevigata* in reference sites [12:1 (SE 11.5–12.8:1] suggests that N may be naturally limiting to plants in this region (<14:1 = N limiting) (Koerselman and Meuleman 1996, Verhoeven et al. 1996).

Groundwater and leaf tissue N:P ratios found in this study suggest that N is naturally limiting in riparian ecosystems of southern California, but anthropogenic nutrient inputs have contributed to elevated ratios in more developed watersheds. Shallow groundwater N:P ratios were higher in study watersheds with higher anthropogenic nutrient inputs compared to no nutrient input reference sites. Mean surface water N:P ratios for rivers worldwide were much higher (24:1 or P limited according to the Redfield Ratio) than in my reference or study watersheds (Hecky et al. 1993). Warrick et al. (2005) found N:P molar ratios in the surface water of the Santa Clara River to be 5:1 during a winter storm event and <1:1 during the low-flow summer months, in a similar range (N limiting) to results found for reference and study watersheds.

The N:P and N:K ratios in leaf tissue have been used to indicate nutrient limitations in freshwater wetland plant communities (Koerselman and Meuleman 1996, Verhoeven et al. 1996, Svengsouk and Mitsch 2001, Knecht and Goransson 2004). According to Koerselman and Meuleman (1996), N:P ratios by mass ≤ 14:1 (molar ratio 31:1) indicate N limiting conditions and ratios ≥ 16:1 indicate P limitations. Similar to

the trend in shallow groundwater N:P ratios, *S. laevigata* and *A. donax* leaf tissue N:P ratios found in reference watersheds were in the N limiting range (12:1) and adequate levels for both nutrients (14:1). Knecht and Göransson (2004) suggested optimal N:K nutrient ratios should be around 1.5:1 for deciduous and herbaceous plants based on a free supply of these nutrients under laboratory conditions. N:K ratios associated with *S. laevigata* leaf tissue in this study were similar to this optimal index (1.4:1–1.7:1) and did not differ by watershed. The *A. donax* leaf tissue N:K ratio was much lower (1:1) than that of optimal N:K, indicating that *A. donax* can assimilate K in excess of requirements (luxury consumption) or N may be limiting in relation to K.

Anthropogenic Nutrient Levels

Nutrient enrichment of rivers due to land use inputs is a global phenomenon. Increased use and composition of N and P in fertilizer have contributed to nutrient enrichment in rivers in agricultural landscapes (Charbonneau and Kondolf 1993, USEPA 1999, Nicola 2003). Surface and shallow groundwater run off from both agricultural and residential land use types contains excess N and P from fertilizers and drains into streams. Sewage treatment plants discharge treated wastewater that contains N, P, and K constituents into streams and rivers in southern California. Rural residential development throughout all of the studied watersheds may contribute NH_4-N, NO_3-N, and NO_2-N from septic tank leakage. In addition, levels of atmospheric N deposition are known to be high (from 1-45 kg/ha/year) around the Metropolitan Los Angeles Area (Padgett et al. 1999, Bytnerowicz et al. 2001, Meixner 2003, Lu et al. unpublished data). Although not widely known, K is required for biological phosphorus removal processes in sewage treatment

plants (Brdjanovic et al. 1996). Thus, excess amounts of K may be associated with wastewater discharged into rivers in this study, especially Calleguas Creek or the Santa Clara River that receive sewage discharge throughout their course. Alternatively, if not enough K is used in wastewater treatment, treated water may contain higher levels of P. Levels of K were not measured in shallow groundwater or soil in this study but may be important in understanding higher K content of *A. donax* versus *S. laevigata* leaf tissue found and thus invasion success of *A. donax*.

Higher levels of N and P in the shallow groundwater and soil of riparian ecosystems were associated with sites invaded by *A. donax*. However, nutrient levels in riparian ecosystems were found to vary considerably by watershed, land use, and fluvial geomorphic location. These factors helped explain the influence of nutrients from anthropogenic inputs on invasion of riparian ecosystems by *A. donax* on both floodplains and terraces throughout the study area.

Watershed

Many studies have shown that nutrient inputs from agricultural and urban land uses result in elevated N and P concentrations in adjacent water bodies (Peterjohn and Correll 1984, Fail et al. 1986, Frink 1991, Correll et al. 1992, Rodda 1995, Warrick et al. 2005), but few have focused on variation among multiple watersheds or cumulative effects of upstream land use inputs (Correll 1984, Correll et al. 1992, Basnyat et al. 1999, Ahearn et al. 2005, Robinson et al. 2005). Although many similarities exist between watersheds located within a given region (i.e., geology, climate, riparian vegetation), variation in factors such as land use composition and soil type can greatly influence

nutrient levels found in riparian ecosystems (Ahearn et al. 2005, Robinson et al. 2005). By comparing multiple watersheds with varying levels of anthropogenic nutrient inputs, my findings help disentangle the cumulative effects of both agricultural and residential land use on nutrient supply in floodplains at a watershed-scale. The general trend observed in total N, NO_3-N + NO_2-N, NH_4-N, and PO_4-P concentrations in the shallow groundwater and soil on floodplains was Calleguas Creek > Santa Clara River > Topanga Canyon > reference sites. In addition, pH of the shallow groundwater was more acidic in the watersheds with the highest anthropogenic land use.

Shallow groundwater and soil in floodplains of Calleguas Creek contained much higher levels of PO_4-P than the other study and reference watersheds. The higher percentage of agricultural and residential land uses and associated nutrients in this watershed compared to the other study watersheds might account for the observed P enrichment and lower pH levels. Agricultural nutrient sources may be the primary contributor to the elevated NO_3-N + NO_2-N levels found in groundwater in the floodplains of Calleguas Creek. Similar relationships between agricultural inputs and elevated nitrate were reported in other watershed-scale studies (Correll 1984, Peterjohn and Correll 1984, Correll et al. 1992, Rodda 1995, Basnyat et al. 1999, Ahearn et al. 2005, Robinson et al. 2005, Warrick et al. 2005).

Land Use

At a more local scale, adjacency to land uses was found to be important in characterizing nutrient supply on riparian terraces and floodplains. Adjacency to land use helped explain variation in nutrient supply in shallow groundwater total N and NH_4-N in

floodplain locations. Although NO_3-N and PO_4-P levels were higher in groundwater and soil on floodplains adjacent to agriculture than next to residential and open space land use in several cases, clearer trends were found on terraces in which PO_4-P levels were higher adjacent to both agriculture and residential land use than next to open space.

Fluvial Geomorphic Location

N and P levels in the soil were much higher on riparian terraces than on floodplains regardless of land use type or degree of infestation. NO_3-N and PO_4-P soil content was lower in floodplains of reference sites than on riparian terraces of the rivers with anthropogenic inputs. Lower soil pH as well as percent silt + clay grain size (no and small infestations) on terraces contributed to higher availability of PO_4-P on terraces compared to floodplains.

Degree of Infestation

Riparian ecosystems infested by *A. donax* contained higher NO_3-N levels in floodplain soils than did non-infested or reference sites, which may be the result of high nutrient input and adjacency to agricultural land use of invaded sites. Non-infested riparian terrace sites contained higher NO_3-N and PO_4-P levels than did sites invaded by *A. donax* on the Santa Clara River. This trend likely reflects the better utilization of surface soil nutrients on terraces by the shallow, extensive root system of *A. donax* compared to the much deeper tap root of *S. laevigata* trees (Phillips 1963, Russell 1963) (Figure 9). Conversely, *A. donax* and *S. laevigata* are likely to derive nutrients from similar depths in floodplains where available nutrients (and water) are much closer to the surface. Relationships among nutrient sources, nutrient pools, and *A. donax* infestation

level also were controlled by differences in nutrient availability to plant species, which in turn were controlled by physical constraints in the environment and species-specific rates of nutrient uptake, assimilation, metabolism, and limitation.

Factors Controlling Nutrient Availability

Nutrient availability in relation to supply of nutrients is key to understanding the *A. donax* invasion process, but quantification of nutrient availability is complex (Day 1983). Wetting and drying cycles, high soil temperatures, and wildfires characteristic of Mediterranean-type climates promote the release of nutrients by increasing the turnover of microbial biomass and organic matter that is otherwise sequestered (Stark 1994). Decomposition of litter releases nutrients, but quantities may vary by leaf species. Nutrients are thought to be most available in spring and autumn when water availability and temperature do not limit plant productivity (Day 1983). However, nutrient supply to floodplains of river systems in California was found to be greatest during winter storms (Robinson et al. 2005, Warrick et al. 2005). Supply to riparian terraces may occur throughout the year due to nutrient inputs from agricultural runoff, and supply to floodplains may occur year round due to sewage treatment plant releases. Ash from wildfires may contribute high proportions of N to riparian ecosystems and is considered to be a main factor promoting growth after fire (Day 1983).

Supply of N and P in the soil and their availability to plants vary greatly based on grain size, pH, and rooting depth (Metz et al. 1966). Variability in soil grain size and associated cation exchange and moisture holding capacity affects rates of diffusion transport of nutrients in the soil. Soil grain size has a strong influence on water and

nutrient retention in soils: Coarser soils retain less water than finer particle soils, such as clay and silt, and have a lower cation exchange capacity due to lower surface area (Kozlowski et al. 1991, Taiz and Zeiger 1991). Soils with higher cation exchange capacity supply more minerals to roots. In this study, nutrient content in the soil was strongly correlated with grain size. On riparian terraces, different degrees of infestation had similar trends in soil grain size and NO_3-N and PO_4-P concentrations. The relatively higher amount of finer soil particles in non-infested terrace sites relative to infested sites may have contributed to the higher soil nutrient levels found in the former.

Rate of P uptake by plants is strongly related to soil pH. Typically, basic soil pH values result in lower solubility of phosphate salts and thus a lowered ability of plant roots to assimilate P (Taiz and Zeiger 1991). At soil pH levels near 7.5 found in this study, P was slightly less available to plants than at optimal pH conditions (optimal pH = 6.5). However, native plants that have evolved under these conditions may have adapted mechanisms to extract P under lower than optimal pH conditions (Koerselman and Meuleman 1996). The ability to assimilate nutrients available in the surrounding soil and groundwater depends on development of an extensive root system and rooting structure, as well as mycorrhizal symbionts that maximize uptake (Kozlowski et al. 1991). For example, higher root surface area increases uptake rates and high P influx and root/shoot ratio results in higher P efficiency. Root morphology and architecture differ between monocots, such as *A. donax,* and dicots, like *S. laevigata* (Taiz and Zeiger 1991). Roots of *A. donax* are composed primarily of fibrous roots and tend to be much shallower than those of *S. laevigata*, which has a taproot that can extend 20 m or more to groundwater

(Figure 9). Physiological strategies of these plants differ greatly due to their inherent structure. Although *A. donax* has a shallower and less extensive rooting system, it is aided by a large rhizome that stores carbohydrates, water, and minerals under stressful conditions (Else 1996, Wijte et al. 2005). In contrast, *S. laevigata*, a large woody phreatophyte, has a long taproot and well-developed root system that can reach deeper groundwater and associated nutrients (Robinson 1958). Nutrient availability of N, P, and K to terrestrial plants is usually higher in surface layers of the soil, due to the more neutral pH, ease of root penetration, and accumulation of organic matter. Thus, *A. donax* may utilize nutrients in the upper soil profile and shallower groundwater, whereas *S. laevigata* may rely on a greater percentage of nutrients from deeper sources where a higher percentage of its roots are distributed.

On riparian terraces in which shallow groundwater occurs at a much greater depth than in floodplains, the differences in rooting structure of *A. donax* versus *S. laevigata* must be considered. *Salix laevigata* can use much deeper water (and associated nutrient sources) than *A. donax*. Results of this study reflect this difference, indicating significantly higher concentrations of NO_3-N and PO_4-P in terrace soils associated with *S. laevigata* in non-infested sites. However, higher soil nutrient levels observed next to non-infested sites may be due partly to variation in nutrient fluctuation rates as well. It follows that growth and invasion of *A. donax* depends more on shallower soil moisture and associated nutrients than *S. laevigata* (Figure 9). Soil nutrient results suggest that these two species may avoid competition for nutrients on riparian terraces after establishment, due to their varying rooting depths at maturity (Verhoeven et al. 1996).

However, *A. donax* may have other adaptations as well, such as higher growth response to N or nitrogen-use efficiency that result in its invasion success on terraces.

Variation in availability of N, P, and K to *A. donax* versus native *S. laevigata* is important in understanding the invasion process. Rates of nutrient assimilation and efficiency vary genetically by plant species (Duncan 1994). Plants adapted to more-fertile soils exhibit higher maximum potential growth rates compared with plants that have evolved under low soil nutrient conditions (Chapin et al. 1986). Thus, levels of available N, P, and K may vary greatly in their importance to the growth response of *A. donax* compared to *S. laevigata*. Data are not currently available on species-specific growth response of *A. donax* or *S. laevigata*, but fertilization studies should be conducted to measure their growth response to N, P, and K levels. Due to unknown species-specific assimilation rates and efficiency, leaf nutrient content of *A. donax* and *S. laevigata* could not be compared statistically to evaluate nutrient content of leaf tissue with respect to degree of infestation and other factors. However, several analyses are presented below in which availability to both species could be assessed.

Nutrient Supply and Availability

The nutrient content of leaf tissue is closely correlated with changes in nutrient availability due to supply during the growing season (Bouma 1983, Chapin and Cleve 1989). Relationships between N and P content of *A. donax* and *S. laevigata* leaf tissue and concentrations of nutrient in the surrounding shallow groundwater and soil indicate relative sources of N and P that may be used by each species on riparian floodplains versus terraces in this study. In floodplains, *A. donax* exhibited a significant positive

response to all forms of N in the shallow groundwater and NO_3-N in the soil, whereas *S. laevigata* showed a significant positive response to only NO_3-N + NO_2-N and PO_4-P pools in shallow groundwater. No significant relationships were found between soil N or P and *S. laevigata* leaf tissue nutrients in either floodplains or terraces, which suggests that this species may use primarily deeper nutrient pools. On riparian terraces, *A. donax* appears to use all forms of soil N, unlike *S. laevigata*. Relationships between nutrient supply and nutrient status of leaves support the assertion that these two plants may use different sources of nutrients on riparian terraces. These findings suggest that *A. donax* may have two main advantages over *S. laevigata*: (1) it is better able to uptake nutrients in the surface soils of riparian terraces due to different root distribution of the two species; and (2) it does not appear to require as much P.

Analysis of leaf tissue nutrient content revealed a clear link between *A. donax* invasion and anthropogenic supply of nutrients. In general, for both species percent total N, P, and K content of leaf tissue was higher in watersheds with greater anthropogenic inputs. In addition, *A. donax* leaf tissue N was higher in riparian ecosystems adjacent to both agricultural and residential land use types compared to open space. Total N, P, and K content of leaf tissue were much higher in areas heavily infested by *A. donax* than in areas with small infestations. These results suggest that a greater supply of N, P, and K from anthropogenic nutrient sources may be more available to *A. donax* in highly invaded riparian ecosystems than elsewhere. Preliminary analyses show that *A. donax* leaf litter contains significantly lower N content and higher C:N than litter from a mix of native species including *Salix* spp. (Lambert unpublished data). However, species-specific

nutrient assimilation and efficiency may vary and must be considered when comparing results for both species.

High levels of K found in *A. donax* leaf tissue were of particular interest and may be critical to the invasion process. Spencer et al. (2005) found that soluble K levels in the soil were higher where *A. donax* relative growth rate was greatest in northern California. K fertilization studies indicate a positive growth response and an increase in tissue K with increasing K availability in forest soils (Tripler et al. 2006). Although soil K was not measured in this study, *A. donax* leaves exhibited higher K levels in heavily infested sites adjacent to residential land use compared to areas with small infestations and were found to contain almost twice as much K as the native *S. laevigata*. Terrestrial plants use large amounts of K for various physiological activities, including stomatal regulation, but uptake mechanisms and efficiencies vary among plant species (Stark 1994). Adequate K is also known to prevent drought stress in crop plants (Spencer et al. 2005). High levels of K supply may give *A. donax* a competitive advantage during the hot, dry summer months in southern California. *Arundo donax* may either assimilate K more effectively than *S. laevigata* and/or levels of K in the soil or shallow groundwater may have been higher around *A. donax*. Fertilization studies measuring K uptake by *A. donax* compared to other native riparian species are needed to further understand its role in *A. donax* invasion.

MANAGEMENT AND RESTORATION IMPLICATIONS

This study elucidated the influence of anthropogenic nutrient inputs on invasion of riparian ecosystems of southern California by an alien plant species. Enrichment of

shallow groundwater with excess total N, NO_3-N, and NH_4-N from adjacent land appeared to have facilitated the rapid expansion of *A. donax* in the riparian ecosystems studied. Riparian terraces heavily invaded by the large, perennial grass *A. donax* were associated with nutrient inputs from adjacent agricultural and residential land uses. Contribution of nutrients from a combination of land use practices had an even stronger cumulative effect on invasion in floodplains at a watershed scale. Although not addressed in this study, the role of atmospheric N deposition as an important source of NO_3^- around large urban areas in *A. donax* invasion requires further attention.

Arundo donax will likely continue to spread rapidly in watersheds and locations within watersheds with higher anthropogenic nutrient loading regardless of the source. Reducing nutrient inputs to riparian ecosystems in California and other Mediterranean-type climate regions may help reduce the rate of spread of *A. donax* in watersheds where its distribution is low or it is not yet present. Within these watersheds, evaluation of nutrient levels in riparian ecosystems may help predict the threat of invasion; however, other factors (i.e., water availability) likely contribute to the invasion process. Results of this study indicate that riparian ecosystems adjacent to intensive agricultural operations or wastewater treatment plant discharge on terraces are at the greatest risk of invasion by *A. donax* if this species is introduced. Also, watersheds with high percentage of agricultural and residential land use composition are at risk. Recent expansion of urbanization and agricultural practices in watersheds of other Mediterranean-type climate regions, such as the Western Cape of South Africa, has resulted in similar trends in rapid expansion of *A. donax* in more urbanized streams and rivers (Samuels and Knight 2003).

Land management practices related to both agricultural and residential development should be evaluated to determine their nutrient inputs to riparian ecosystems, and best management practices should be employed to lower nutrient inputs to help control *A. donax* invasion along river systems.

Fluvial processes of flooding or scouring of streams in years with heavy rainfall are certainly primary factors in promoting spread of *A. donax*. My results showed that higher supply and availability of N, P, and K may also contribute to *A. donax* invasion after it is dispersed. However, manipulative experiments are needed to determine clear causal relationships between nutrient supply and availability to *A. donax* compared to dominant native riparian species under various water availability conditions. Further experimental investigation of the effects of light, water, and fire relative to nutrients on invasion of riparian ecosystems by *A. donax* will help elucidate the invasion process. Investigation of *A. donax* distribution and age of infestation related to land use change over time throughout watersheds in Mediterranean-type climates may provide further insight into contribution of anthropogenic land use to the invasion process.

Removal of invader species is often the initial step and prime component of stream restoration and mitigation in southern California (Coffman et al. 2004). Restoration plans for river systems and associated riparian revegetation must address anthropogenic nutrient levels if eradication or control of *A. donax* is a desired objective. In watersheds where nutrient levels are high, dam or levee removal projects need to consider the possibility that restoration actions might further distribute *A. donax* and promote its invasion. Revegetation or restoration on high terrace locations should

proceed with caution; high levels of nutrients added by land use practices or released by wildfires may promote *A. donax* invasion. With nutrient enrichment that exists throughout urbanized watersheds in southern California, aggressive maintenance programs and native riparian plant revegetation are essential elements of comprehensive *A. donax* removal and control programs.

TABLES

Table 6. Number and distribution of sampling locations in three study watersheds.

	Santa Clara River	**Calleguas Creek**	**Topanga Canyon**
Land use type	3	3	2 (no agricultural)
Floodplain/terrace	2	1 (no terrace)	1 (no terrace)
Degree of *A. donax* infestation	3	3	3
Number of replicates	5–6	5	5
TOTAL	93	45	30

Table 7. Natural and anthropogenic soil and shallow groundwater nutrient levels (means ± SE).

	Shrubland Ecosystems[3]			Streams draining undeveloped basins in U.S. (median)[4]	Riparian Ecosystems		
	Nutrient-poor; strongly-leached; oligotrophic	Nutrient-rich; moderately-leached; mesotrophic	Agriculturally-rich; weakly-leached; eutrophic		Reference watersheds (mean)	All study watersheds (mean)	
					Floodplains	Floodplains	Terraces
Soil							
Total N (%)	< 0.12 (CA: 0.03–0.12)	0.12–0.30 (CA: 0.12–0.21)	> 0.30	-	0.13 (0.11–0.16)	0.056 ± 0.002	0.095 (0.088–0.103)
NO_3-N (ppm)	-	-	-	-	1.3 (0.9–2.0)	1.2 (1.1–1.4)	3.8 (3.2–4.5)
Total P (%)	< 0.022	0.022–0.06 (CA: 0.022–0.06)	0.06 (CA: 0.06–0.082)	-	-	-	-
PO_4-P (ppm)	-	-	-	-	7.2 (6.1–8.6)	5.9 ± 0.4	12.2 (10.8–13.7)
Shallow groundwater							
Total N (mg/L)	-	-	-	0.26	1.11 (0.87–1.43)	5.74 (5.30–6.22)	-
NO_3-N (mg/L)	-	-	-	0.087	0.13 (0.11–0.16)[3]	0.40 (0.34–0.46)	-
NH_4-N (mg/L)	-	-	-	0.02	0.26 (0.21–0.33)	0.37 (0.33–0.40)	-
PO_4-P (mg/L)	-	-	-	0.01	0.53 (± 0.03)	1.39 (± 1.22–1.56)	-
N:P (molar)	-	-	-	19.2:1	2.4:1 (2.0:1–3.0:1)	4.4:1 (3.9:1–5.0:1)	-

Legend: CA = nutrient levels found in California SE = standard error

[3] Shrubland ecosystem soil nutrient data for 5 Mediterranean-type climate regions (Day 1983).
[4] Clark et al. 2000
[3] Values are NO_3-N + NO_2-N for reference and study watersheds.

Table 8. N:P and N:K ratios (on a mass basis) of *Salix laevigata* and *Arundo donax* leaf tissue and associated shallow groundwater (molar ratio) along floodplains of study watersheds (mean ± SE) and results of one-way ANOVAs by watershed.

	Reference Watersheds	**Topanga Canyon**	**Santa Clara River**	**Calleguas Creek**	**All Study Watersheds**	**Significance values**[5]
N:P						
Shallow groundwater	2.4:1 (2.0:1–3.0:1)	2.7:1 (2.3:1–3.2:1)	4.7:1 (3.9:1–5.7:1)	5.7:1 (4.4:1–7.5:1)	4.4:1 (3.9:1–5.0:1)	$F_{(3,128)} = 2.385$; $P = 0.072$
Leaf tissue (*S. laevigata*)	12.1:1 (11.5–12.8)	14.2:1 (13.5–14.9)	15.2:1 (14.4–16.1)	11.8:1 (11.2–12.7)	13.7:1 (13.2–14.1)	$F_{(3,47)} = 5.250$; $P = 0.003$**
Leaf tissue (*A. donax*)	ND	13.3:1 (13.0-13.6)	14.9:1 (14.5-15.3)	13.8:1 (13.4-14.3)	14.4:1 (14.1-14.6)	$F_{(2,78)} = 6.289$; $P = 0.003$**
N:K						
Leaf tissue (*S. laevigata*)	1.5:1 (1.4–1.6)	1.4:1 (1.3–1.5)	1.7:1 (1.6–1.8)	1.6:1 (1.5–1.7)	1.6:1 (1.5–1.6)	$F_{(3,47)} = 1.015$; $P = 0.356$
Leaf tissue (*A. donax*)	ND	0.9:1 (0.86-0.93)	0.9:1 (0.88-0.94)	1.2:1 (1.10–1.22)	1.0:1 (0.96–1.02)	$F_{(2,78)} = 12.109$; $P < 0.001$***

Legend:
SE = standard error
ND = no data since no *A. donax* in reference watersheds
* = $0.05 \geq P > 0.01$ = significant
** = $0.01 \geq P > 0.001$ = highly significant
*** = $P \leq 0.001$ = very highly significant

[5] No terrace data used in this analysis

Table 9. Three-way ANOVA significance table for shallow groundwater, soil, and leaf tissue nutrients by watershed (Santa Clara River[6], Calleguas Creek), land use (agricultural, residential, open space) and degree of infestation (none, small, large).

	Factors						
Nutrient analyte	**Watershed**	**Land use**	**Degree of infestation**	**Watershed x land use**	**Watershed x degree of infestation**	**Land use x degree of infestation**	**Watershed x land use x degree of infestation**
Shallow Groundwater							
Total N (mg/L)[7]	**$F_{(1,74)} = 5.474$; $P = 0.022$***	**$F_{(2,74)} = 3.630$; $P = 0.031$***	$F_{(2,74)} = 1.639$; $P = 0.201$	**$F_{(2,74)} = 3.848$; $P = 0.026$***	$F_{(2,74)} = 0.323$; $P = 0.725$	$F_{(4,74)} = 1.030$; $P = 0.398$	$F_{(4,74)} = 0.981$; $P = 0.423$
NO_3-N + NO_2-N (mg/L)	**$F_{(1,74)} = 18.788$; $P < 0.001$*** **	$F_{(2,74)} = 1.559$; $P = 0.217$	$F_{(2,74)} = 0.168$; $P = 0.846$	$F_{(2,74)} = 2.969$; $P = 0.057$	$F_{(2,74)} = 1.520$; $P = 0.225$	$F_{(4,74)} = 0.897$; $P = 0.470$	$F_{(4,74)} = 1.725$; $P = 0.154$
NH_4-N (mg/L)	**$F_{(1,74)} = 5.553$; $P = 0.021$***	**$F_{(2,74)} = 5.466$; $P = 0.006$****	**$F_{(2,74)} = 3.552$; $P = 0.034$***	**$F_{(2,74)} = 10.340$; $P < 0.001$*** **	**$F_{(2,74)} = 3.510$; $P = 0.035$***	$F_{(4,74)} = 1.044$; $P = 0.390$	**$F_{(4,74)} = 3.266$; $P = 0.016$***
PO_4 (mg/L)	**$F_{(1,74)} = 28.012$; $P < 0.001$*** **	$F_{(2,74)} = 0.160$; $P = 0.852$	$F_{(2,74)} = 1.276$; $P = 0.285$	$F_{(2,74)} = 0.383$; $P = 0.683$	$F_{(2,74)} = 2.201$; $P = 0.118$	$F_{(4,74)} = 0.948$; $P = 0.441$	$F_{(4,74)} = 0.982$; $P = 0.423$
pH	$F_{(1,74)} = 3.768$; $P = 0.056$	$F_{(2,74)} = 2.638$; $P = 0.078$	$F_{(2,74)} = 0.036$; $P = 0.964$	$F_{(2,74)} = 1.283$; $P = 0.283$	$F_{(2,74)} = 1.317$; $P = 0.274$	$F_{(4,74)} = 0.176$; $P = 0.950$	$F_{(2,74)} = 0.948$; $P = 0.441$
Soil[8]							
Total N (%)	**$F_{(1,73)} = 3.987$; $P = 0.050$***	$F_{(2,73)} = 0.859$; $P = 0.428$	$F_{(2,73)} = 0.002$; $P = 0.998$	$F_{(2,73)} = 0.241$; $P = 0.787$	$F_{(2,73)} = 0.931$; $P = 0.399$	$F_{(4,73)} = 1.313$; $P = 0.273$	$F_{(4,74)} = 2.071$; $P = 0.093$
NO_3-N (ppm)	**$F_{(1,73)} = 28.540$; $P < 0.001$*** **	**$F_{(2,73)} = 3.578$; $P = 0.033$***	**$F_{(2,73)} = 3.566$; $P = 0.033$***	$F_{(2,73)} = 0.544$; $P = 0.583$	$F_{(2,73)} = 1.983$; $P = 0.145$	$F_{(4,73)} = 1.771$; $P = 0.144$	$F_{(4,73)} = 0.390$; $P = 0.815$
NH_4-N (ppm)	**$F_{(1,73)} = 22.267$; $P < 0.001$*** **	$F_{(2,73)} = 2.286$; $P = 0.109$	$F_{(2,73)} = 0.347$; $P = 0.708$	$F_{(2,73)} = 2.340$; $P = 0.103$	$F_{(2,73)} = 1.750$; $P = 0.181$	$F_{(4,73)} = 0.871$; $P = 0.485$	$F_{(4,73)} = 1.340$; $P = 0.263$
PO_4 (ppm)	**$F_{(1,73)} = 102.353$; $P < 0.001$*** **	**$F_{(2,73)} = 14.664$; $P < 0.001$*** **	$F_{(2,73)} = 0.027$; $P = 0.974$	**$F_{(2,73)} = 3.162$; $P = 0.048$***	$F_{(2,73)} = 1.708$; $P = 0.188$	**$F_{(4,73)} = 5.517$; $P = 0.001$*** **	**$F_{(4,73)} = 3.259$; $P = 0.016$***

Legend: * = $0.05 \geq P > 0.01$ = significant, ** = $0.01 \geq P > 0.001$ = highly significant, *** = $P \leq 0.001$ = very highly significant

[6] No terrace data used in this analysis.
[7] All data log base 10 transformed except raw data were used for groundwater PO_4 and pH; and plant total N and K.
[8] Percent silt + clay (square root transformed) used as a covariate (significant for all soil nutrient analytes)

Table 9 (continued). Three-way ANOVA significance table for shallow groundwater, soil, and leaf tissue nutrients by watershed (Santa Clara River[9], Calleguas Creek), land use (agricultural, residential, open space), degree of infestation (none, small, large).

	Factors						
Nutrient analyte	**Watershed**	**Land use**	**Degree of infestation**	**Watershed x land use**	**Watershed x degree of infestation**	**Land use x degree of infestation**	**Watershed x land use x degree of infestation**
***Arundo donax* Leaf Tissue**							
Total N (%)	**$F_{(1,49)}$ = 10.511; P = 0.002****	$F_{(2,49)}$ = 2.223; P = 0.119	**$F_{(1,49)}$ = 5.081; P = 0.029***	**$F_{(2,49)}$ = 4.974; P = 0.011***	$F_{(1,49)}$ = 0.088; P = 0.522	$F_{(2,49)}$ = 0.799; P = 0.456	$F_{(2,49)}$ = 0.771; P = 0.468
Total P (%)	**$F_{(1,49)}$ = 7.947; P = 0.007****	$F_{(2,49)}$ = 2.424; P = 0.099	$F_{(1,49)}$ = 0.425; P = 0.517	$F_{(2,49)}$ = 1.927; P = 0.156	$F_{(1,49)}$ = 0.071; P = 0.792	$F_{(2,49)}$ = 0.535; P = 0.589	$F_{(2,49)}$ = 0.254; P = 0.777
Total K (%)	**$F_{(1,49)}$ = 5.651; P = 0.021***	**$F_{(2,49)}$ = 5.713; P = 0.006****	**$F_{(1,49)}$ = 4.528; P = 0.038***	$F_{(2,49)}$ = 0.315; P = 0.731	$F_{(1,49)}$ = 0.040; P = 0.843	**$F_{(2,49)}$ = 3.386; P = 0.042***	$F_{(2,49)}$ = 0.234; P = 0.793

Legend: * = 0.05 ≥ P > 0.01 = significant, ** = 0.01 ≥ P > 0.001 = highly significant, *** = P ≤ 0.001 = very highly significant

[9] No terrace data used in this analysis.

Table 10. Mean concentrations of shallow groundwater, soil, and leaf tissue nutrients and soil grain size in floodplains and results of the one-way ANOVA by watershed factor.

Nutrient analyte	Mean (± SE)				Significance values[10]
	Reference sites	Topanga Canyon	Santa Clara River	Calleguas Creek	
Shallow Groundwater Nutrients					
Total N (mg/L)[11]	1.11 (0.87–1.43)	4.03 (3.68–4.41)	5.22 (4.60–5.93)	8.02 (6.92–9.29)	**$F_{(3,128)}$ = 16.119; P < 0.001*** **
NO_3-N + NO_2-N (mg/L)	0.14 (0.11–0.16)	0.17 (0.14–0.19)	0.27 (0.23–0.32)	1.08 (0.80–1.46)	**$F_{(3,128)}$ = 14.711; P < 0.001*** **
NH_4-N (mg/L)	0.26 (0.21–0.33)	0.33 (0.27–0.40)	0.31 (0.28–0.35)	0.46 (0.39–0.54)	$F_{(3,128)}$ = 1.710; P = 0.168
PO_4 (mg/L)[12]	0.53 ± 0.03	0.66 ± 0.09	0.64 ± 0.10	2.67 ± 0.38	**$F_{(3,128)}$ = 16.664; P < 0.001*** **
pH	7.75 ± 0.09	7.80 ± 0.06	7.39 ± 0.05	7.25 ± 0.05	**$F_{(3,128)}$ = 20.847; P < 0.001*** **
Soil Nutrients and Grain Size[13]					
NO_3-N (ppm)	1.33 (0.89–1.98)	1.11 (0.91–1.36)	0.75 (0.65–0.87)	2.13 (1.75–2.60)	**$F_{(3,127)}$ = 9.047; P < 0.001*** **
PO_4-P (ppm)	7.23 (6.10–8.57)	4.84 (4.27–5.50)	4.14 (3.72–4.60)	9.71 (8.85–10.64)	**$F_{(3,12)}$ = 23.592; P < 0.001*** **
silt + clay (%)	20.1 (17.4–22.9)	12.8 (11.6–14.0)	25.3 (22.9–27.9)	11.18 (9.9–12.5)	**$F_{(3,128)}$ = 13.510; P < 0.001*** **
Leaf Tissue Nutrients					
Total N (%) (*Salix laevigata*)	1.78 ± 0.15	1.87 ± 0.13	2.40 ± 0.12	2.27 ± 0.10	**$F_{(3,47)}$ = 6.113; P = 0.001*** **
Total N (%) (*Arundo donax*)	No Data	2.19 ± 0.10	2.50 ± 0.08	2.88 ± 0.10	**$F_{(2,78)}$ = 11.982; P < 0.001*** **
Total P (%) (*Salix laevigata*)	0.14 ± 0.01	0.13 (0.125-0.134)	0.16 (0.147-0.164)	0.19 ± 0.01	**$F_{(3,47)}$ = 8.595; P < 0.001*** **
Total P (%) (*Arundo donax*)	No Data	0.17 ± 0.008	0.17 ± 0.006	0.19 (0.184-0.193)	**$F_{(2,78)}$ = 4.364; P = 0.016* **
Total K (%) (*Salix laevigata*)	1.25 ± 0.17	1.33 ± 0.06	1.44 ± 0.07	1.41 ± 0.07	$F_{(3,47)}$ = 0.860; P = 0.469
Total K (%) (*Arundo donax*)	No Data	2.49 ± 0.10	2.73 ± 0.07	2.49 ± 0.09	**$F_{(2,78)}$ = 3.172; P = 0.047* **

Legend: * = 0.05 ≥ P > 0.01 = significant, ** = 0.01 ≥ P > 0.001 = highly significant*** = P ≤ 0.001 = very highly significant
SE = standard error

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[10] No terrace data used in this analysis.
[11] All data log base 10 transformed except those noted otherwise.
[12] Raw data were used for groundwater PO_4 and pH; and plant total N and K.
[13] Percent silt + clay (square root transformed) was used as a covariate

Table 11. Three-way ANOVA significance table for soil and leaf tissue nutrients by land use (agricultural, residential, and open space), fluvial geomorphic location (terrace and floodplain), and degree of infestation (none, small, and large). Analyses were only conducted on Santa Clara River sites. Only *A. donax* from small and large infestations (levels) were used in leaf tissue ANOVAs.

	Factors						
Nutrient analyte	**Land use**	**Fluvial geomorphic location**	**Degree of infestation**	**Land use x fluvial geomorphic location**	**Land use x degree of infestation**	**Location x degree of infestation**	**Land use x location x degree of infestation**
Soil[14]							
NO_3-N (ppm)[15]	**$F_{(2,84)}$ = 5.101; P = 0.008***	**$F_{(1,84)}$ = 51.453; P < 0.001*****	$F_{(2,84)}$ = 2.662; P = 0.076	$F_{(2,84)}$ = 3.643; P = 0.030	$F_{(4,84)}$ = 1.661; P = 0.167	**$F_{(2,84)}$ = 4.626; P = 0.012***	$F_{(4,84)}$ = 1.636; P = 0.173
PO_4-P (ppm)	**$F_{(2,84)}$ = 8.081; P = 0.001*****	**$F_{(1,84)}$ = 60.137; P < 0.001*****	**$F_{(2,84)}$ = 4.613; P = 0.013***	**$F_{(2,84)}$ = 12.129; P < 0.001*****	**$F_{(4,84)}$ = 4.507; P = 0.002****	**$F_{(2,84)}$ = 3.689; P = 0.029***	**$F_{(2,84)}$ = 3.205; P = 0.017***
Silt + Clay (%)	$F_{(2,85)}$ = 1.772; P = 0.176	**$F_{(1,85)}$ = 4.343; P = 0.040***	$F_{(2,85)}$ = 1.517; P = 0.225	$F_{(2,85)}$ = 0.593; P = 0.555	$F_{(4,85)}$ = 0.865; P = 0.488	**$F_{(2,85)}$ = 3.206; P = 0.045***	$F_{(4,85)}$ = 0.343; P = 0.848
pH	**$F_{(2,85)}$ = 9.685; P < 0.001*****	$F_{(1,85)}$ = 0.297; P = 0.587	$F_{(2,85)}$ = 0.970; P = 0.383	$F_{(2,85)}$ = 2.366; P = 0.100	$F_{(4,85)}$ = 0.991; P = 0.417	$F_{(2,85)}$ = 1.738; P = 0.182	$F_{(4,85)}$ = 1.144; P = 0.341
***Arundo donax* Leaf Tissue**							
Total N (%)[16]	**$F_{(2,60)}$ = 6.029; P = 0.004****	$F_{(1,60)}$ = 0.862; P = 0.357	**$F_{(1,60)}$ = 5.876; P = 0.018***	$F_{(2,60)}$ = 2.572; P = 0.085	$F_{(2,60)}$ = 0.109; P = 0.897	$F_{(1,60)}$ = 0.964; P = 0.330	$F_{(2,60)}$ = 0.239; P = 0.788
Total P (%)	$F_{(2,60)}$ = 1.009; P = 0.371	$F_{(1,60)}$ = 3.015; P = 0.088	$F_{(1,60)}$ = 2.425; P = 0.125	$F_{(2,60)}$ = 1.172; P = 0.317	$F_{(2,60)}$ = 0.174; P = 0.841	$F_{(1,60)}$ = 1.481; P = 0.228	$F_{(2,60)}$ = 0.508; P = 0.604
Total K (%)	$F_{(2,60)}$ = 0.587; P = 0.559	$F_{(1,60)}$ = 1.637; P = 0.206	**$F_{(1,60)}$ = 9.909; P = 0.003****	$F_{(2,60)}$ = 2.775; P = 0.070	$F_{(2,60)}$ = 1.012; P = 0.370	$F_{(1,60)}$ = 1.198; P = 0.278	$F_{(2,60)}$ = 2.879; P = 0.064

Legend: * = $0.05 \geq P > 0.01$ = significant, ** = $0.01 \geq P > 0.001$ = highly significant*** = $P \leq 0.001$ = very highly significant

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[14] Percent silt + clay (square root transformed) used as a covariate for all soil nutrients.
[15] Soil nutrient data and pH were $\log_{10}$ base transformed.
[16] Raw data was used for leaf tissue total N and K. Leaf tissue total P was $\log_{10}$ base transformed.

FIGURES

Figure 7. The three study watersheds in Ventura and Los Angeles Counties, California.

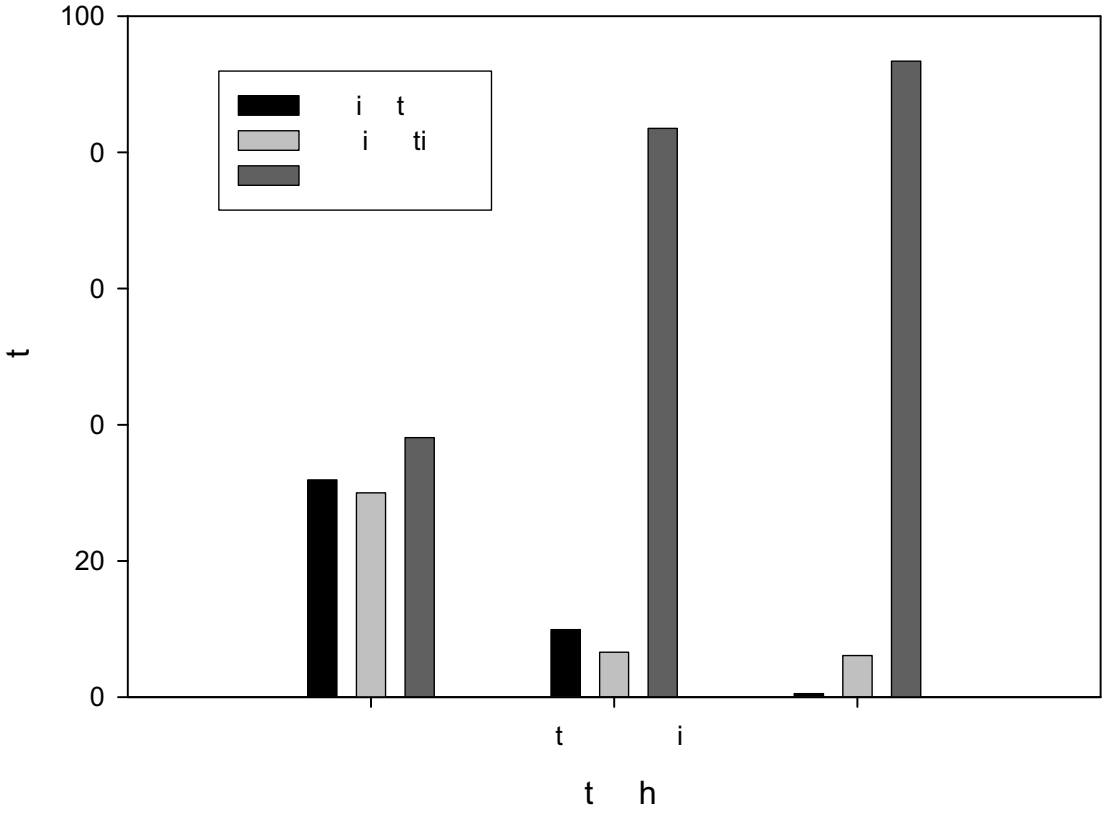

Figure 8. Distribution of land use type within the three studied watersheds.

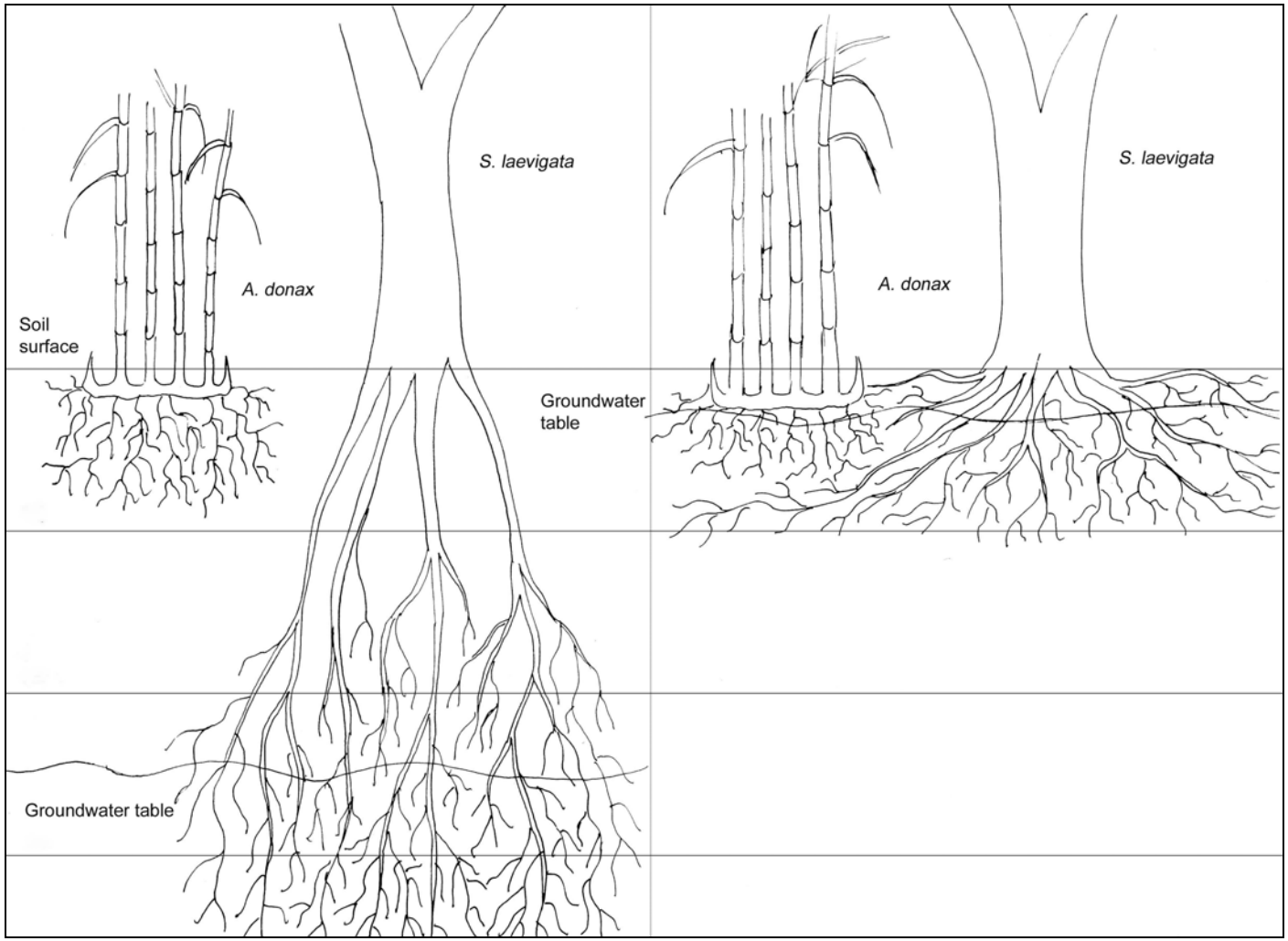

Figure 9. Diagram of *A. donax* and *S. laevigata* rooting depths and distribution in a) deep and b) shallow groundwater table conditions.

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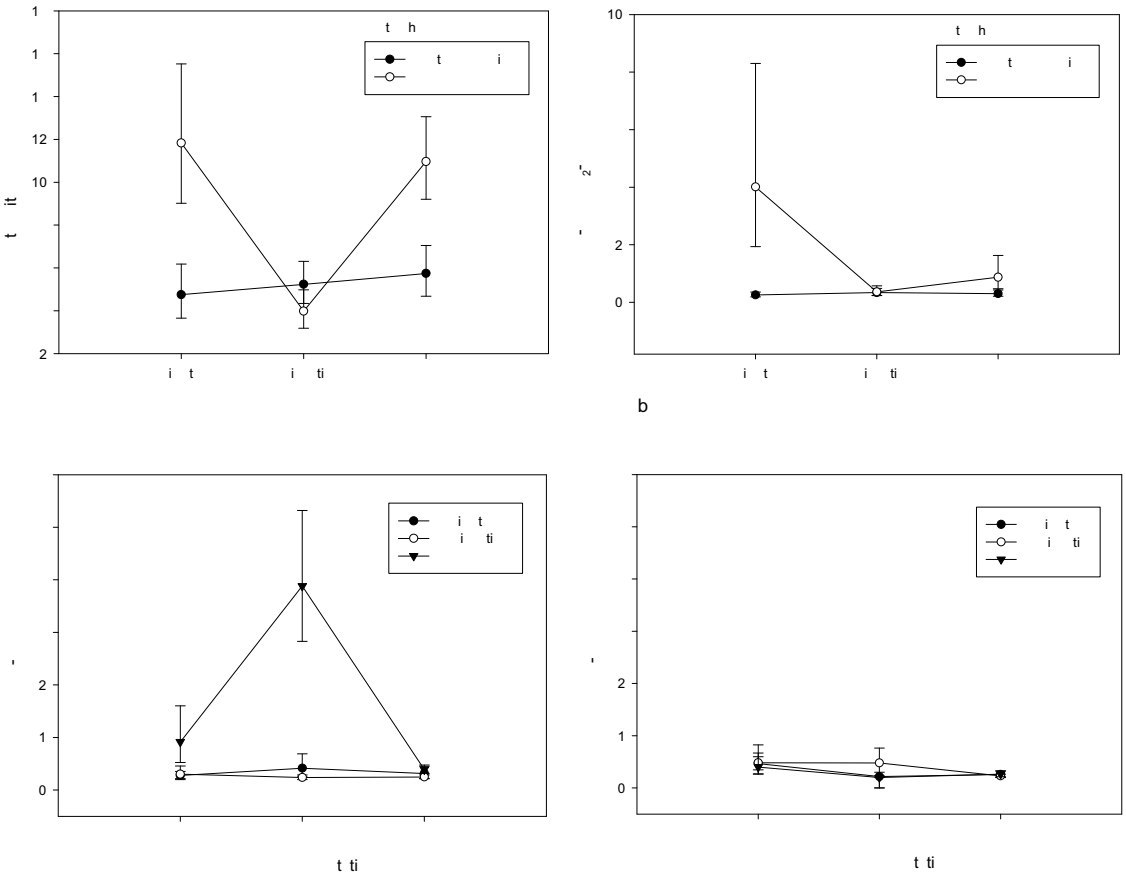

Figure 10. Interaction plots for 3-way ANOVA of shallow groundwater nutrients by watershed (Santa Clara River and Calleguas Creek only) x land use (A = agricultural, R = residential, and O = open space) x degree of infestation (N = none, S = small, and L = large). Plots include two-way interaction plots for shallow groundwater a) total N, and b) NO_3-N + NO_2-N (small infestation data removed), and three-way interaction plots for shallow groundwater NH_4-N in c) Calleguas Creek and d) Santa Clara River.

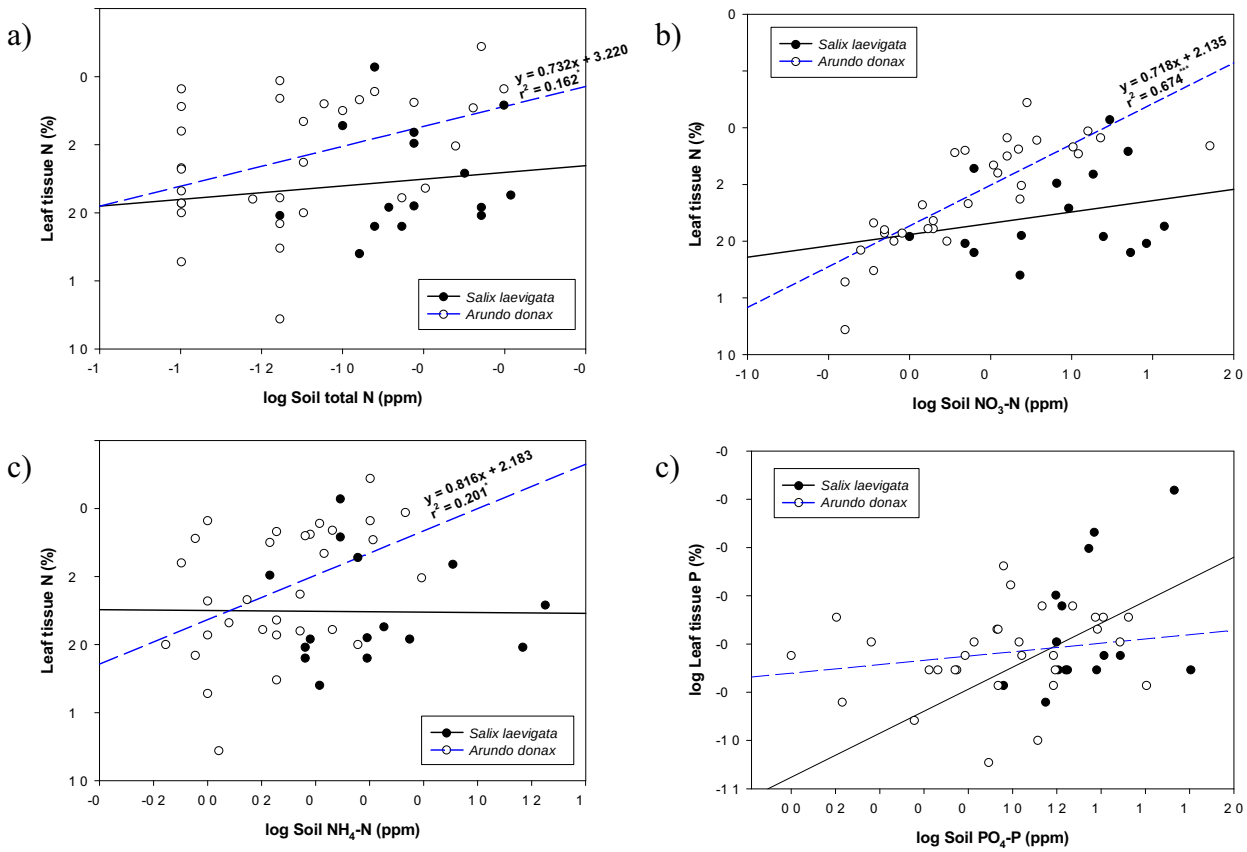

Figure 11. Linear regression relationships between shallow groundwater and soil nutrients (independent variable) found in terrace sites and associated leaf tissue nutrients (response variable) of target plants by plant species. Only Santa Clara River data was used. Equations were only included for significant relationships. Leaf tissue N/P and soil (a) total N, (b) NO_3-N, (c) NH_4-N, and (d) PO_4-P.

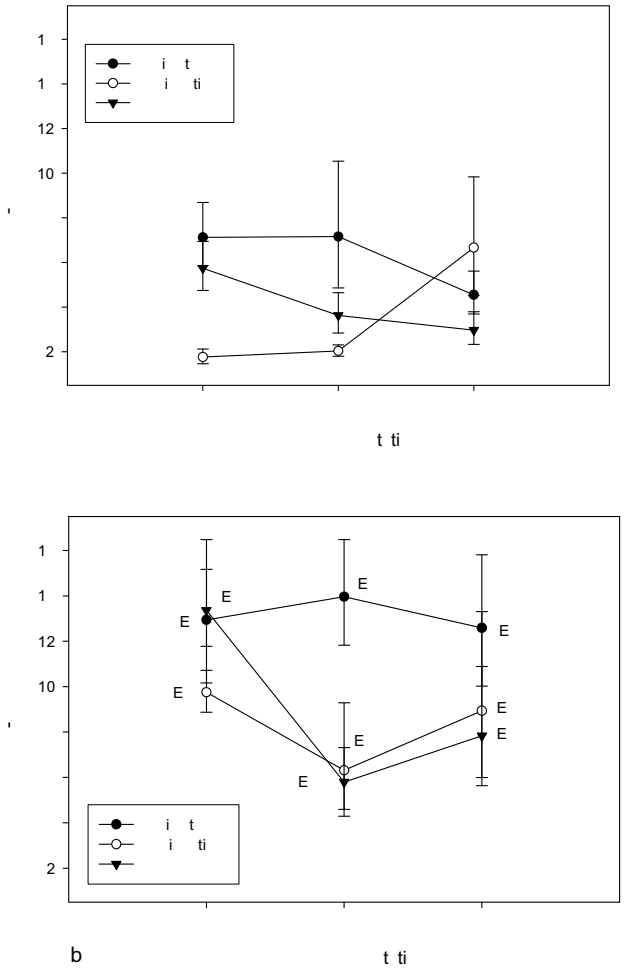

Figure 12. Interaction plots for 3-way ANOVA of soil nutrients by watershed (Santa Clara River and Calleguas Creek only) x land use (A = agricultural, R = residential and O = open space) x degree of infestation (N = none, S = small, and L = large). Plots show the three-way interaction for soil PO_4-P in a) Santa Clara River and b) Calleguas Creek.

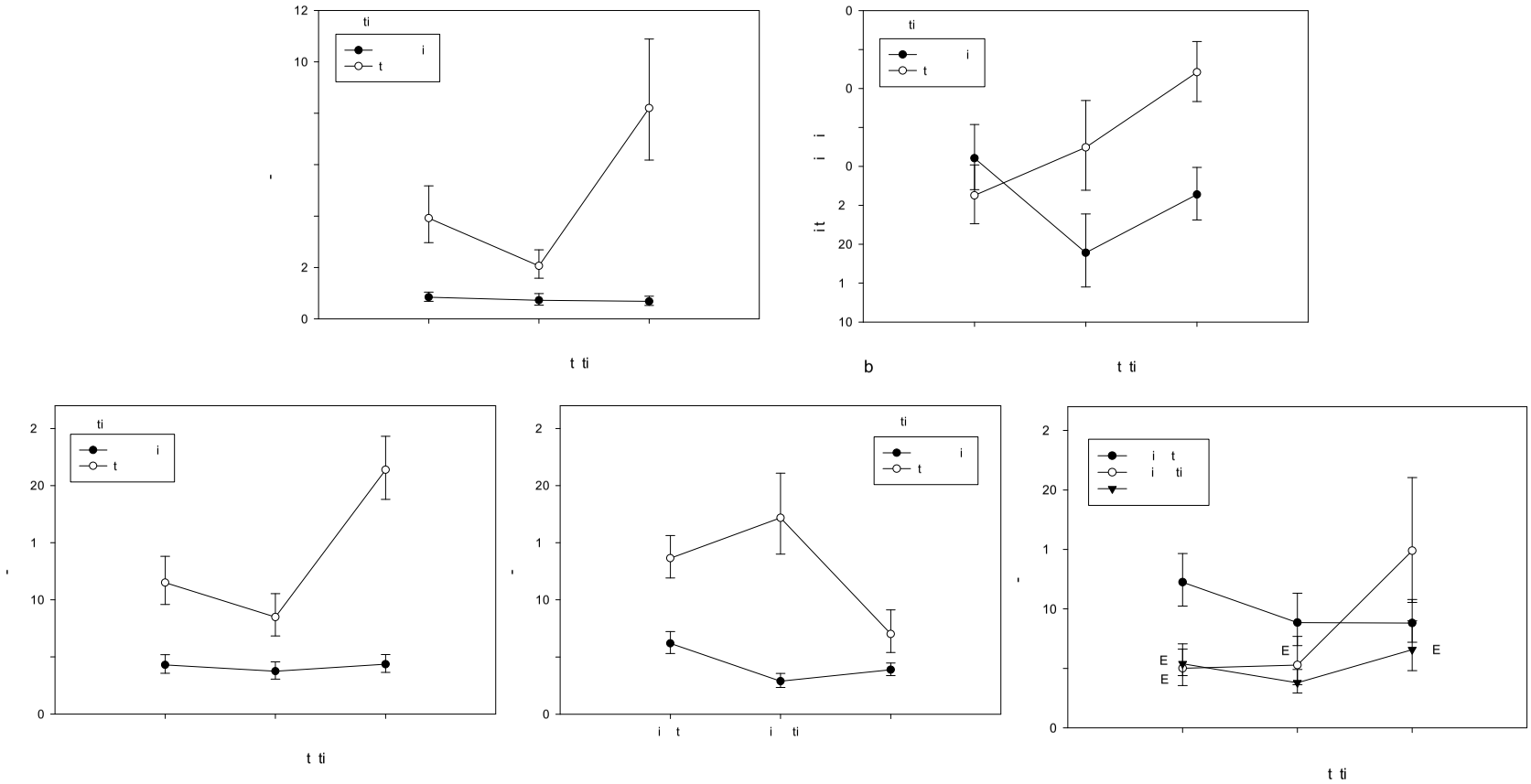

Figure 13. Interaction plots for 3-way ANOVA of soil nutrients and grain size for land use (A = agricultural, R = residential, and O = open space) x degree of infestation (N = none, S = small, and L = large) x fluvial geomorphic location (terrace and floodplain) for Santa Clara River only. Plots include 2-way interactions of a) soil NO_3-N and b) silt + clay and 3-way interaction of soil PO_4-P (c, d, and e).

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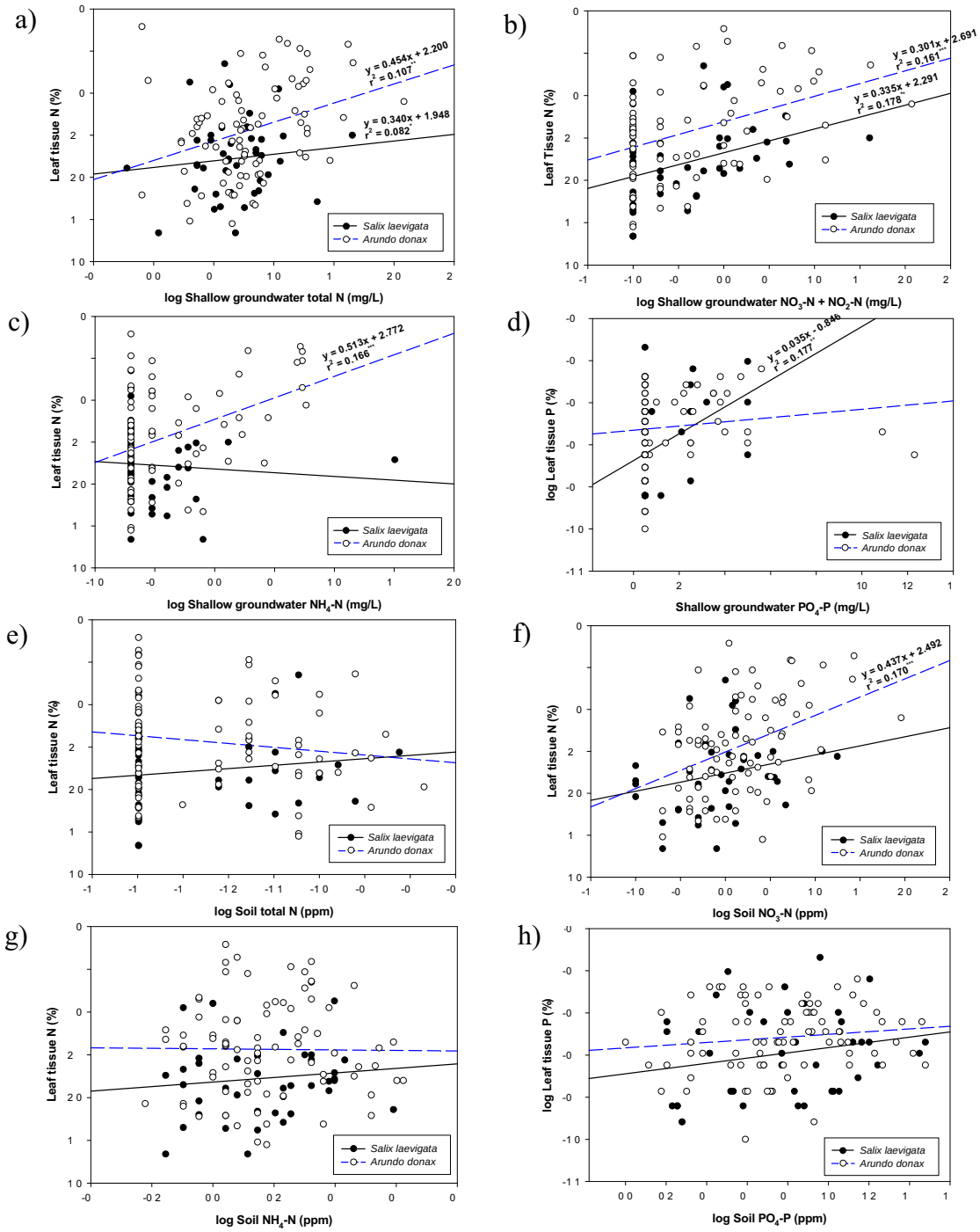

Figure 14. Linear regression relationships between shallow groundwater and soil nutrients (independent variable) found in floodplain sites and associated leaf tissue nutrients (response variable) of target plants by plant species. Equations were only included for significant relationships. Leaf tissue N/P and soil (a) total N, (b) NO_3-N, (c) NH_4-N, and (d) PO_4-P. Leaf tissue N/P and shallow groundwater (e) total N, (f) NO_3-N + NO_2-N, (g) NH_4-N, and (h) PO_4-P.

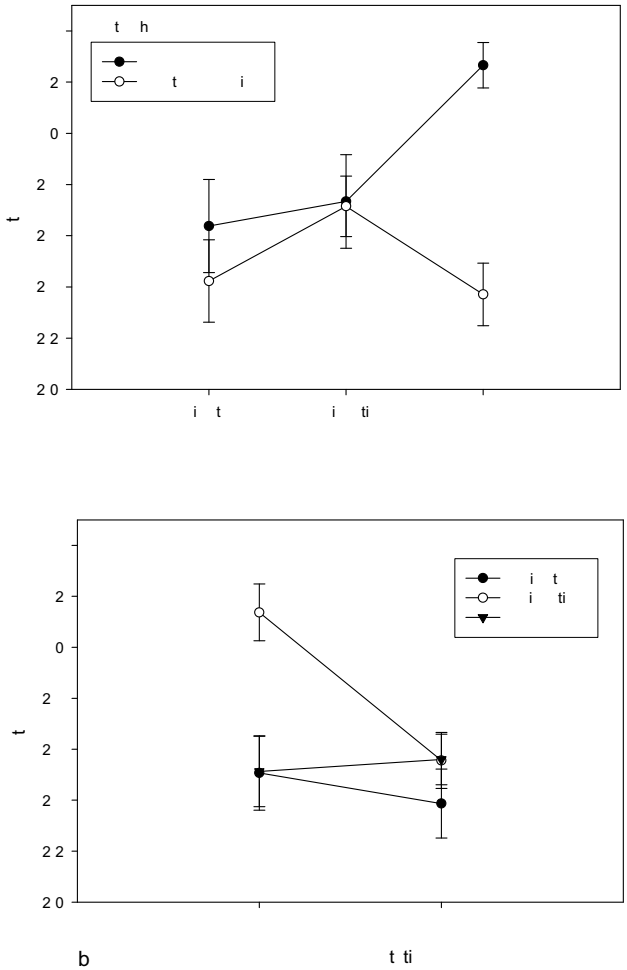

Figure 15. Interaction plots for 3-way ANOVA of *A. donax* leaf tissue nutrients by watershed (Santa Clara River and Calleguas Creek only) x land use (A = agricultural, R = residential, O = open space) x degree of infestation (S = small, L = large). Plots illustrate the two-way interaction for a) leaf tissue N and b) leaf tissue K.

APPENDIX

APPENDIX 3-1

TABLE 1. SAMPLING LOCATIONS

Site ID[17]	Latitude (degrees)	Longitude (degrees)
Calleguas Creek		
CAFL1	34.18181797	-119.03227547
CAFL2	34.18522848	-119.02564312
CAFL3	34.26126039	-118.97952396
CAFL4	34.26026671	-118.98207734
CAFL5	34.27144197	-118.92569614
CAFN1	34.13669625	-119.08521188
CAFN2	34.15400296	-119.07143463
CAFN3	34.17924422	-119.03796569
CAFN4	34.23487474	-118.96908212
CAFN5	34.18599115	-119.02471977
CAFS1	34.13507461	-119.08160741
CAFS2	34.13344902	-119.07335250
CAFS3	34.17960581	-119.04052360
CAFS4	34.21919798	-118.98473675
CAFS5	34.22309129	-118.98073481
COFL1	34.18100023	-119.03332044
COFL2	34.28386898	-118.85975520
COFL3	34.28732609	-118.83532254
COFL4	34.28502903	-118.82843195
COFL5	34.23055504	-118.93391920
COFN1	34.18210127	-119.02929805
COFN2	34.28435823	-118.85500057
COFN3	34.28635279	-118.83322028
COFN4	34.28214583	-118.80707444
COFN5	34.22688327	-118.93127832
COFS1	34.28637156	-118.83378790
COFS2	34.28705938	-118.82914742
COFS3	34.28464581	-118.82491607
COFS4	34.28645848	-118.83080796
COFS5	34.22922341	-118.93361712

[17] First character stands for watershed (S = Santa Clara River; C = Calleguas Creek; T = Topanga Cayon); Second character stands for land use (A = agricultural; O = open space; R = residential); Third character stands for fluvial geomorphic location (F = floodplain; T = terrace); Fourth character stands for degree of infestation (L = large infestation; S = small infestation; N = no infestation); and number stands for replicate.

TABLE 1 (continued). SAMPLING LOCATIONS

Site ID[18]	Latitude (degrees)	Longitude (degrees)
CRFL1	34.26952092	-118.90881867
CRFL2	34.27168974	-118.90275277
CRFL3	34.27363845	-118.89887664
CRFL4	34.28602137	-118.86197255
CRFL5	34.27015417	-118.90565316
CRFN1	34.27816652	-118.80317417
CRFN2	34.28010098	-118.80417497
CRFN3	34.28114930	-118.80471577
CRFN4	34.23009370	-118.97145169
CRFN5	34.28538610	-118.86089791
CRFS1	34.21678056	-118.98688914
CRFS2	34.22753965	-118.97609828
CRFS3	34.28504504	-118.86083965
CRFS4	34.28149489	-118.80560375
CRFS5	34.22546622	-118.97838193
Santa Clara River		
SAFL1	34.31599656	-119.09517872
SAFL2	34.38832736	-118.93290969
SAFL3	34.37853578	-118.95602329
SAFL4	34.35348068	-119.04170327
SAFL5	34.38983082	-118.89746865
SAFL6	34.40303776	-118.74487334
SAFN1	34.38109352	-118.95231379
SAFN2	34.38252431	-118.95086406
SAFN3	34.38010991	-118.95468604
SAFN4	34.38622895	-118.88881040
SAFN5	34.41809141	-118.64794627
SAFS1	34.38650915	-118.93600730
SAFS2	34.38889540	-118.91346602
SAFS3	34.37347672	-118.96392172
SAFS4	34.38713193	-118.89121969
SAFS5	34.40141788	-118.71480217
SATL1	34.37955360	-118.94674502

[18] First character stands for watershed (S = Santa Clara River; C = Calleguas Creek; T = Topanga Cayon); Second character stands for land use (A = agricultural; O = open space; R = residential); Third character stands for fluvial geomorphic location (F = floodplain; T = terrace); Fourth character stands for degree of infestation (L = large infestation; S = small infestation; N = no infestation); and number stands for replicate.

TABLE 1 (continued). SAMPLING LOCATIONS

Site ID[19]	Latitude (degrees)	Longitude (degrees)
SATL2	34.37299149	-118.96207594
SATL3	34.36193652	-119.02509629
SATL4	34.33253070	-119.07771637
SATL5	34.40404988	-118.74102739
SATLD1	34.23179138	-119.25541925
SATLD2	34.34685814	-119.05269706
SATLD3	34.36438361	-118.99051289
SATLD4	34.23333733	-119.21936131
SATLD5	34.32794371	-119.08172417
SATN1	34.41422937	-118.66145672
SATN2	34.40875657	-118.67276156
SATN3	34.36076590	-119.02292772
SATN4	34.41591941	-118.65056385
SATN5	34.40360916	-118.70071513
SATS1	34.37267943	-118.96522050
SATS2	34.38859608	-118.93302837
SATS3	34.38028551	-118.95542398
SATS4	34.40124856	-118.70185146
SATS5	34.39195890	-118.80118028
SATSD1	34.41272029	-118.66298717
SATSD2	34.37248522	-118.96579332
SATSD3	34.41051199	-118.66039256
SATSD4	34.41148815	-118.65905279
SATSD5	34.40319082	-118.70229227
SOFL1	34.35990047	-119.01475981
SOFL2	34.35719647	-119.01773538
SOFL3	34.36599487	-118.99932973
SOFL4	34.36452552	-119.00776427
SOFL5	34.39567518	-118.70910885
SOFN1	34.32881568	-119.07774386
SOFN2	34.31887373	-119.09080865
SOFN3	34.33239022	-119.07561427
SOFN4	34.35490100	-119.02514490

[19] First character stands for watershed (S = Santa Clara River; C = Calleguas Creek; T = Topanga Cayon); Second character stands for land use (A = agricultural; O = open space; R = residential); Third character stands for fluvial geomorphic location (F = floodplain; T = terrace); Fourth character stands for degree of infestation (L = large infestation; S = small infestation; N = no infestation); and number stands for replicate.

TABLE 1 (continued). SAMPLING LOCATIONS

Site ID[20]	Latitude (degrees)	Longitude (degrees)
SOFN5	34.35635107	-119.03155874
SOFN6	34.40588200	-118.67016896
SOFS1	34.31559457	-119.09520957
SOFS2	34.31924572	-119.09028830
SOFS3	34.35645919	-119.02864812
SOFS4	34.35424478	-119.03863080
SOFS5	34.35664217	-119.01821039
SOTL1	34.32809450	-119.07738880
SOTL2	34.32945983	-119.07627577
SOTL3	34.34939501	-119.04156798
SOTL4	34.35409910	-119.02377773
SOTL5	34.41041409	-118.73012722
SOTN1	34.36328583	-119.01684833
SOTN2	34.35810691	-119.00888879
SOTN3	34.41841671	-118.63987014
SOTN4	34.40295386	-118.67300430
SOTN5	34.42674807	-118.50331075
SOTS1	34.32863555	-119.07692595
SOTS2	34.35231283	-119.03071065
SOTS3	34.36246751	-119.01539817
SOTS4	34.40365333	-118.67624148
SOTS5	34.29775595	-119.11061701
SRFL1	34.34551662	-119.06320377
SRFL2	34.34638943	-119.06159009
SRFL3	34.34678681	-119.06052181
SRFL4	34.34727757	-119.05925003
SRFL5	34.34763791	-119.05837077
SRFN1	34.39021530	-118.91872273
SRFN2	34.39055946	-118.92006811
SRFN3	34.39047094	-118.92058108
SRFN4	34.34850996	-119.05502697
SRFN5	34.34279946	-119.06580761
SRFS1	34.34842966	-119.05599014

[20] First character stands for watershed (S = Santa Clara River; C = Calleguas Creek; T = Topanga Cayon); Second character stands for land use (A = agricultural; O = open space; R = residential); Third character stands for fluvial geomorphic location (F = floodplain; T = terrace); Fourth character stands for degree of infestation (L = large infestation; S = small infestation; N = no infestation); and number stands for replicate.

TABLE 1 (continued). SAMPLING LOCATIONS

Site ID[21]	Latitude (degrees)	Longitude (degrees)
SRFS2	34.34434206	-119.06444111
SRFS3	34.34619077	-119.06199317
SRFS4	34.34843880	-119.05402014
SRFS5	34.34869981	-119.05140314
SRTL1	34.34955376	-119.05358260
SRTL2	34.26270140	-119.16888054
SRTL3	34.27168856	-119.15589622
SRTL4	34.34653955	-119.06151641
SRTL5	34.23558016	-119.19549652
SRTL6	34.42552071	-118.56015748
SRTN1	34.39073430	-118.92195504
SRTN2	34.39069558	-118.92312767
SRTN3	34.26057022	-119.17577449
SRTN4	34.26676621	-119.16454090
SRTN5	34.42593033	-118.54444083
SRTS1	34.26179976	-119.17029432
SRTS2	34.34747539	-119.05919303
SRTS3	34.23591485	-119.19486805
SRTS4	34.42548039	-118.55383988
SRTS5	34.39371038	-118.91472976
Topanga Canyon		
TOFL1	34.06384511	-118.58723690
TOFL2	34.06142517	-118.58494202
TOFL3	34.05183099	-118.58190827
TOFL4	34.06960465	-118.58714193
TOFL5	34.06604201	-118.58649661
TOFN1	34.04854679	-118.58064923
TOFN2	34.06349609	-118.58599612
TOFN3	34.05022988	-118.58104510
TOFN4	34.06934339	-118.58688243
TOFN5	34.07574029	-118.58923590
TOFS1	34.04960300	-118.58127845
TOFS2	34.06511346	-118.58651371

[21] First character stands for watershed (S = Santa Clara River; C = Calleguas Creek; T = Topanga Cayon); Second character stands for land use (A = agricultural; O = open space; R = residential); Third character stands for fluvial geomorphic location (F = floodplain; T = terrace); Fourth character stands for degree of infestation (L = large infestation; S = small infestation; N = no infestation); and number stands for replicate.

TABLE 1 (continued). SAMPLING LOCATIONS

Site ID[22]	Latitude (degrees)	Longitude (degrees)
TOFS3	34.06168367	-118.58562925
TOFS4	34.06894994	-118.58698418
TOFS5	34.07637094	-118.59061053
TRFL1	34.04108514	-118.58094972
TRFL2	34.04112973	-118.58058594
TRFL3	34.04087928	-118.58260598
TRFL4	34.04068482	-118.58244010
TRFL5	34.03998594	-118.58274286
TRFN1	34.09726543	-118.60056496
TRFN2	34.09518739	-118.60157046
TRFN3	34.09382936	-118.60303125
TRFN4	34.09431375	-118.60276169
TRFN5	34.09441508	-118.60242583
TRFS1	34.09592609	-118.60095137
TRFS2	34.09501355	-118.60170339
TRFS3	34.09789693	-118.60000195
TRFS4	34.04005618	-118.58304461
TRFS5	34.04103183	-118.58065979
Reference Sites		
Agua Blanca	34.54197845	-118.76600772
Aliso Canyon	34.41807398	-118.09363894
Arroyo Sequit	34.06579390	-118.93263468
Bouquet Canyon	34.57381133	-118.38870624
Cold Creek	34.09425859	-118.64799891
Lachusa Creek	34.04172728	-118.89414808
Las Virgenes Creek	34.16885342	-118.70297916
Solstice Canyon	34.03844903	-118.75221346
Sespe Creek	34.55823516	-119.24346691
Santa Paula Creek	34.44816727	-119.06068350

[22] First character stands for watershed (S = Santa Clara River; C = Calleguas Creek; T = Topanga Cayon); Second character stands for land use (A = agricultural; O = open space; R = residential); Third character stands for fluvial geomorphic location (F = floodplain; T = terrace); Fourth character stands for degree of infestation (L = large infestation; S = small infestation; N = no infestation); and number stands for replicate.

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CHAPTER 4 -

WILDFIRE PROMOTES GIANT REED (*ARUNDO DONAX*) INVASION IN RIPARIAN ECOSYSTEMS

Abstract: Invasion of riparian ecosystems by the large bamboo-like grass species *Arundo donax* L. has caused major alterations to structure and ecosystem functions in streams of arid and Mediterranean-type climate regions. Although healthy riparian ecosystems function as natural barriers to wildfire, the extensive wildfires in southern California in October 2003 burned large expanses of riparian ecosystems along the Santa Clara River and appeared to promote *A. donax* invasion. I investigated post-fire plant colonization of riparian areas along the Santa Clara River to determine the influence of wildfire on *A. donax* invasion. Growth of *A. donax* was compared to native plants for 1 year after the fire. Pre- and post-fire plant abundance and soil nutrient concentrations were analyzed to ascertain the role of fire-derived nutrients in the invasion process. Due to its immediate re-growth after the fire and its high growth rate compared to native riparian plants, *A. donax* dominated these burned riparian ecosystems within a few months after the fire and reached 99% cover a year later. *Arundo donax* grew an average of 3–4 times faster than native woody riparian plants – up to 2.62 cm/day (average 0.72 cm/day) – and reached up to 2.3 m in height less than 3 months after the fire. One year post-fire, *A. donax* density was nearly 20 times higher and productivity was 14–24 times higher than native plants. Elevated soil NH_4-N and P levels post-fire may have stimulated the high growth rate of *A. donax*. Large quantities of *A. donax* biomass that

have replaced native woody species after wildfire have increased susceptibility of riparian ecosystems along the Santa Clara River to fire, creating an invasive plant-fire regime cycle. Wildfire not only promotes dominance of riparian ecosystems by *A. donax*, but also alters vital ecosystem processes and increases the risk of fire spreading to surrounding shrublands, towns, and agriculture.

Key Words: *Arundo donax,* wildfire, giant reed, invasive species, alien species, competition, nitrogen, riparian, Mediterranean-type climate, rivers, soil nutrients

INTRODUCTION

Historically, dense cover of chaparral biomass accumulating over a 30–50 years or more provided fuel for high-intensity wildfires in shrublands of southern California and in similar shrublands of other Mediterranean-type climate regions (Minnich 1983, Keeley et al. 1999, Keeley and Fotheringham 2001, 2005). However, riparian corridors may have acted as natural firebreaks (Dudley 1998, Rundel 2000, 2003) and refuge for wildlife in the landscape because of their low-lying topographic position and relative absence of flammable fuels. Lightning was the primary cause of wildfires, especially during dry, low humidity conditions that occur in the late summer and fall (Naveh 1975, Keeley 1982, Keeley et al. 1999). Currently, most wildfires in these areas are anthropogenic in origin (Rugen 1987, D'Antonio and Vitousek 1992, Keeley et al. 1999).

Invasion of annual grass species has been linked to altered fire regimes in rangelands, deserts, and wildlands of California and the western U.S. (Brooks and Pyke 2001, Brooks et al. 2004, Dukes and Mooney 2004). Grass/fire cycles, more recently termed invasive plant-fire regime cycles, may ensue when alien grass species colonize an area and provide fuel for fire propagation, increasing frequency, area, and intensity of fires (D'Antonio and Vitousek 1992, D'Antonio 2000, Brooks 2002, Brooks et al. 2004, Keeley 2004, Keeley and Fotheringham 2005). Rapid recovery of alien grass species compared to native species after fire leads to increased susceptibility of that ecosystem to fire.

In coastal shrubland watersheds in California, a large invasive grass species *Arundo donax* may be an even bigger problem in riparian ecosystems due to its perennial

growth form with a large volume of biomass produced, flammability compared to natives, and immediate rapid growth after fire (Rieger and Kreager 1989). *Arundo donax* was introduced from southern Eurasia into the Los Angeles region several hundred years ago for erosion control and building materials (Robbins et al. 1951, Perdue 1958, Dudley and Collins 1995), and now infests many stream and river system in coastal California (Gaffney 2002). The natural flood disturbance regime in this climate regime successfully distributes it along rivers, where it establishes readily on bare substrates (Else 1996, Else and Zedler 1996). Studies suggest that increased water and nutrient delivery to these systems have increased its invasion success (see Chapter 2 and 3), yet the influence of fire on its invasion in river systems remains relatively unexplored and undocumented. Several accounts suggest that infestations of *A. donax* have increased fuel load as well as fire frequency and intensity along riparian corridors (Robbins et al. 1951, Bell 1994, Scott 1994, D'Antonio 2000). Growing to between 4–8 m in height and as fast as 10 cm per day (Perdue 1958, Crampton 1974, Hickman 1993), it produces abundant flammable biomass that accumulates during the summer and fall months (Rundel 2000). The ability of its rhizomes to recover more rapidly than native plants after fire likely contributes to its invasion success, but no evidence exists to document this response to fire. Furthermore, increased post-fire nutrient effects may promote a positive feedback cycle (invasive plant-fire regime) in these ecosystems.

Although little research exists on the effects of fire in riparian ecosystems, several authors have suggested that fire may increase the ability of *A. donax* to invade natural riparian systems (Rieger and Kreager 1989, Scott 1994, Bell 1997). The large amount of

highly flammable biomass that *A. donax* produces and that accumulates during most of the year, as well as the ability of its rhizomes to respond quickly after fire, likely contribute to its invasion success by creating a invasive plant-fire regime cycle. DiTomaso (1998) suggests that *A. donax* invasion is changing riparian ecosystems from primarily flood-defined (Mount 1995) to fire-defined systems. The Simi/Verdale wildfire of October 2003 (Ventura County, CA) (Keeley and Fotheringham 2005) provided a unique opportunity to study the contribution of fire to invasion of riparian terrace ecosystems of the Santa Clara River by *A. donax*. In this study, I compared growth and recolonization of *A. donax* to that of native plant species in riparian ecosystems burned in a southern California wildfire. I hypothesized that high adjacent soil nutrient content, immediate post-fire resprouting phenology, and higher growth rate than native plants promote invasion of *A. donax* in riparian corridors of southern California.

METHODS

Study area

Study sites were located in the approximately 700-acres of riparian ecosystem of the Santa Clara River that was burned in the late October 2003 Simi/Verdale fire (Keeley and Fotheringham 2005) (Figure 16). The 187 km-long Santa Clara River and its tributaries drain a 4,185 km^2 watershed, the second largest coastal watershed in southern California. Hundreds of acres of *A. donax* infest floodplains and terraces along the Santa Clara River. Natural riparian vegetation on terraces consisted of large riparian trees, both black cottonwood (*Populus balsamifera* (L.) ssp. *trichocarpa* Torrey & A. Gray) and red willow (*Salix laevigata* Bebb) in the canopy layer. A mixture of smaller trees and shrubs

comprised the understory layer, including arroyo willow (*Salix lasiolepis* Benth.), sandbar willow (*Salix exigua* Nutt.), shining willow [*Salix lucida* Muhl. ssp. *lasiandra* (Benth.) E. Murray], mulefat [*Baccharis salicifolia* (Ruiz Lopez & Pavon) Pers.], and blue elderberry (*Sambucus mexicana* C. Presl.).

Study design

Six sites established in a previous study along the Santa Clara River (see Chapter 3) were burned during the 2003 wildfire. These study sites were all located on riparian terraces, and five out of six sites were adjacent to shrubland ecosystems. The wildfire crossed the river through one site located near the Los Angeles-Ventura County line and the other five sites were located near the town of Santa Paula. I compared pre-fire plant composition and soil nutrient data collected in summer 2003 at these six permanent monitoring sites to data collected in these sites during the year after the wildfire (2004). I established eight additional study sites along riparian terrace areas burned to the west of these sites in a river reach that did not contain previous study sites to make sure sites were well-distributed throughout the riparian areas burned and represented the range of environmental conditions found in the study area. I monitored recolonization of all sites from November 2003-October 2004 (Figure 16) (see Appendix 4-1 for study site locations and descriptions). The 14 study sites were approximately 600 m^2 (most sites were 30 m long x 20 m wide) and all but one was located next to open space land use types; the one exception was adjacent to a citrus orchard.

Study species

Arundo donax is a robust, perennial, bamboo-like member of the Poaceae family (grass family) that occurs throughout the floodplains and terraces of rivers in California and other warm, temperate climates worldwide (Crampton 1974, Hickman 1993). It has erect, stout yet hollow culms that are 1–4 cm in diameter and 2–8 m or more tall. Culms branch, forming ramets, typically at the end of the first year of growth or after a culm is damaged. Leaf blades are broad (2–6 cm wide), less than 1 m long, flat, clasping at the base, strongly scabrous along their margins, and evenly spaced along the culm (Faber and Holland 1992, Hickman 1993). *Arundo donax* reproduces vegetatively through a network of large thick rhizomes that grow horizontally just below the surface of the soil. Under some conditions it produces a large (3–6 dm), terminal, plume-like inflorescence (panicle) at the end of the growing season (Faber and Holland 1992, Hickman 1993); however, seeds of the inflorescence are primarily sterile in California (Johnson et al. 2006).

In addition to *A. donax*, I studied several native riparian plant species commonly found on terraces of rivers in southern California and in terraces that were burned in the fire: *Salix laevigata, S. lasiolepis*, *S. exigua*, *Populus balsamifera* ssp. *trichocarpa*, and *Baccharis salicifolia*. *Salix laevigata* is a riparian tree that reaches heights up to 15 m and is dominant in both floodplains and terraces along southern California rivers, and *Populus balsamifera* ssp. *trichocarpa* grows to a height of 30 m in alluvial plains and terraces along rivers in southern California (Faber et al. 1989, Faber and Holland 1992, Hickman 1993). *Salix lasiolepis* is a widely distributed plant that occurs as a small tree

in wetter areas and a spreading shrub in drier locations (Faber et al. 1989). *Salix exigua* is a shrub-sized willow that commonly grows on sandy substrates along active floodplains (Faber et al. 1989). *Baccharis salicifolia* is one of the most dominant shrubs found throughout floodplains and terraces of streams and rivers of southern California. A member of the Asteraceae, it usually grows to a height of less than 4 m.

Sampling methods

I took plant measurements monthly from November 2003 to October 2004 in all 14 study sites to examine the effects of fire on recolonization of riparian terraces. I determined change in plant abundance in burned areas by comparing pre- and post-fire (summer 2003 and July 2004) percent cover of *A. donax* and native woody plant species in the six long-term study locations. Ocular estimates of percent cover by species were taken within 1 m^2 quadrants place randomly throughout six permanent study sites during summer 2003 and all 14 study sites during each post-fire sampling period. Post-fire mean shoot density (stems m^{-2}) of *A. donax* and all native species were sampled monthly within six $1m^2$ quadrants (placed randomly each time) within all 14 study sites. I measured mean shoot length (cm) and basal diameter (mm) of 20 randomly selected *A. donax* and 20 native individuals of each dominant native woody species at each study site and post-fire sampling period. In addition, I measured shoot height and basal diameter for three permanently marked *A. donax* and native plant shoots (three of each species) at each sampling period. Basal diameter measurements were taken 10 cm above the surface of the soil. I calculated mean shoot elongation rate (cm d^{-1}) for each species using data from the permanently marked individuals.

I calculated the aboveground biomass, relative growth rates (RGRs), and productivity of plants within the study sites using the plant dimension data collected during the study. Non-destructive dimensional analyses were used to estimate aboveground biomass dry weight of plants in study sites with minimal interference to plant growth (Whittaker 1961, 1965, Whittaker and Marks 1975, Sharifi et al. 1982, Spencer et al. 2006). I created regression models for each species using basal diameter, shoot length, and aboveground biomass of culm/branch samples measured in the field experiment to predict biomass of each individual plant sampled in the study sites. Regression models for aboveground biomass were very highly significant for all species ($r^2 = 0.971$ to 0.990, $P < 0.001$) (see Chapter 2 for study design and Appendix 2-1 for equations). *Arundo donax* biomass was estimated based on both basal diameter and shoot length measurements taken at all study sites, and native species biomass estimates were based on basal stem diameter. All data were log transformed in regression models.

I calculated RGRs for all permanently marked individuals using the following differential equation, where *W* is the total aboveground biomass dry weight (g) of each shoot and *t* is time (day^{-1} post-fire).

$$RGR = \frac{dW}{dt}\frac{1}{W} = \frac{d(\ln W)}{dt}$$

Mean productivity (kg m^{-2} $year^{-1}$) for each species was calculated at approximately 1 year post-fire. I estimated biomass (kg) for the 20 randomly sampled culms/stems for each species measured during September 2004. For each species, mean biomass per shoot (kg $shoot^{-1}$) was multiplied by mean density (shoots m^{-2}) at each study

site and then divided by time (year). I averaged productivity calculations for each species across study sites.

Five soil subsamples were collected at each study site adjacent to *A. donax* and each native woody plant species immediately after fire (November through January). Subsamples were collected in the upper 20 cm of the soil where nutrient concentrations are greatest (Day 1983). For each species, soil samples were combined into a composite sample by thorough mixing in a stainless steel bowl. Each soil subsample was collected with an 8-cm diameter bucket auger. Soil samples taken before the fire (summer 2003) were taken adjacent to *A. donax* and *S. laevigata* according to the same sampling protocol.

Soil samples were air-dried and ground to a powder in preparation for nutrient content analyses at the DANR Analytical Laboratory in Davis, California. Soil samples were analyzed for total N (%), nitrate-N (NO_3-N - ppm), ammonia-N (NH_4-N - ppm), and orthophosphate (PO_4-P - ppm). Total N in the soil was determined by the combustion gas analyzer method (Method 972.43) (Hofer 2003, Knepel 2003). Concentrations of NO_3-N and NH_4-N in the soil were determined by equilibrium extraction of soil with potassium chloride and a flow-injection analyzer (Olsen and Sommers 1982, Prokopy 1995). Because the soils studied were neutral to alkaline, the Olsen-P method was used to estimate the relative availability of inorganic PO_4-P in the samples. Soil grain size was analyzed using a hydrometer to determine the particle size distribution of sand, silt, and clay in soil suspension (Sheldrick and Wang 1993).

Statistical analyses

One-way and two-way analysis of variance (ANOVA) tests were used to analyze effects of various combinations of factors (plant type and time) on plant performance and growth data (dependent or response variables) (Systat Statistical Program [Version 10]). Factors tested include plant type (*A. donax* and native plant species) and time (pre-fire vs. post-fire or months post-fire). Dependent variables included plant abundance (percent cover), density (stem m^{-2}), shoot length (cm), shoot elongation rate (cm d^{-1}), RGR (g $g^{-1}day^{-1}$), productivity (kg m^{-2} yr^{-1}), and soil nutrient concentrations (NH_4-N, NO_3-N, and phosphate in ppm).

I conducted a one-way ANOVA of productivity by species (*A. donax*, *B. salicifolia*, and *S. laevigata*) and two way-ANOVAs for all plant performance metrics by factors of plant type and time to determine differences in plant growth by species over time post-fire. Tukey's post-hoc test was used for pairwise comparisons of means in the one-way ANOVA. I performed ANOVA hypothesis tests to evaluate contrasts between means of grouping variables and levels in two-way ANOVA results. Probability plots were examined to test for normality of data and to identify any data that required transformation. All biomass, soil NH_4-N, and NO_3-N data were ln transformed. When means and standard errors were used to describe or present statistical differences, data were back-transformed and reported in original units.

RESULTS

Pre- versus post-fire plant abundance

In the two-way ANOVA (plant type x time period) of plant abundance, both main effects were significant (Table 12). Percent cover of *A. donax* was much higher than native plant cover both before and after the study sites were burned (Figure 17). Although both *A. donax* (65.0 ± SE 6.7% cover) and the native plants (21.7 ± SE 6.0% cover) were in greater abundance before the fire, less than a year after the fire *A. donax* (42.8 ± SE 4.3% cover) was the dominant plant species in these riparian ecosystems (Figure 17). Native species comprised 25.0% of the total vegetation before the fire and less than 1% (0.4 ± SE 0.2% cover) of the vegetation in burned riparian terraces only 9 months after the fire.

Post-fire density

The two-way ANOVA (plant type x time period) of plant density revealed a significant two-way interaction (Table 12). The mean density of *A. donax* (stems m^{-2}) was much greater than that of native plant species for all months sampled (March–September 2004) (Figure 18). Mean density of native plant species declined somewhat over time during the first year after the fire, although differences between sampling periods were not significant. However, mean density of *A. donax* shoots increased significantly over time. A year after the wildfire, *A. donax* density (26.3 ± SE 3.2 stems m^{-2}) was an order of magnitude greater than that of native species (1.4 ± SE 0.4 stems m^{-2}) within the burned riparian ecosystems sampled.

Post-fire shoot length

Post-fire resprout timing and shoot length over time differed significantly between *A. donax* and the native plants studied (Figure 19). *Arundo donax* began growing within days after being burned to the ground, whereas native plants did not start to appear (a few seedlings/resprouts at eight sites) sites until January (over two months after they burned). The two-way ANOVA of shoot length by plant type and time period resulted in a very highly significant two-way interaction (Table 12). Shoot length was 1.7–5.2 times greater (over 2.5 times greater on average) for *A. donax* than for natives during all months sampled (Figure 19).

Post-fire shoot elongation rate and RGR

Arundo donax shoots grew at a much faster rate than the native riparian plant species within the first year after fire (Figure 20 and Figure 21). The two-way ANOVA (plant type x month post-fire) for the shoot elongation rate revealed a significant two-way interaction due to variation in rate between species for each time period (Table 13). The highest *A. donax* shoot elongation rates were observed immediately post-fire (first two months) and in April 2004 at the beginning of the growing season. During the first 3 months post-fire, *A. donax* exhibited very high shoot elongation rates. Native plant species did not emerge until January 2004 and grew much more slowly than *A. donax*. Mean shoot elongation rates of *A. donax* were significantly higher than those of native plant species except during the winter (between January and March) when rates did not differ significantly. A series of heavy frosts occurred in late February 2004 (4 months post-fire), and they appeared to have lowered *A. donax* shoot elongation rates

substantially. In April, shoot elongation rates for both *A. donax* and native plant species increased from winter levels, corresponding with warmer spring growing conditions. From April 2004 until the end of the year, elongation rates decreased for all plants, with *A. donax* maintaining higher rates (up to two times higher) than native species until December 2004.

In the two-way ANOVA (plant type x month post-fire) of RGR, the two-way interaction was very highly significant (Table 13). The mean RGR of *A. donax* was much greater initially (first three months) than that of the native plant species (Figure 21). *Arundo donax* mean RGR was extremely high (0.094 ± SE 0.005 g $g^{-1}day^{-1}$) immediately after being burned, whereas the native plants did not emerge until the third month after the fire and then grew at a much more moderate rate. Mean RGR of native plants was highest five months after the fire and significantly higher than *A. donax* during the spring. As mentioned above, a series of very heavy frosts in February 2004 appeared to curtail *A. donax* growth but had little effect on the RGR of native plants. The mean RGR of both *A. donax* and native plants was very low at the end of the growing season, from mid-summer (July) to late fall (November).

Post-fire productivity

Approximately one year after the fire, *A. donax* productivity was much higher than that of any of the native species ($F_{(2,295)} = 43.291$; $P < 0.001$) (Figure 22). Productivity of *A. donax* was 14 times higher than that of *B. salicifolia* and 24 times higher than that of *S. laevigata* in burned areas. Due to initial low abundance and significant mortality during the year, *S. exigua*, *S. lasiolepis*, and *P. balsamifera* ssp.

trichocarpa were at such a low density in burned sites that their productivity was undetectable one year after the fire.

Soil nutrients

Mean pre- and post-fire soil nutrient levels surrounding *A. donax* compared to native plants differed significantly (Figure 23; Table 14). Mean soil nutrient levels (NH_4-N, NO_3-N, and PO_4-P) adjacent to *A. donax* plants increased substantially after the study sites burned. However, no significant differences in nutrient concentrations were observed between pre- and post-fire soil adjacent to native plant species. After the study sites burned, both NH_4-N and PO_4-P concentrations were more than twice as high in the soil adjacent to *A. donax* plants compared to native plant species.

DISCUSSION

In this study, I explored the role of fire in the *A. donax* invasion process in riparian ecosystems of southern California where wildfire is naturally prevalent in adjacent shrubland ecosystems. Burning through nearly 300 ha of *A. donax* infested riparian terraces, the October 2003 Verdale-Simi fire provided an opportunity to examine ecosystem-level effects of wildfire, namely the change in native versus invasive plant composition, and mechanisms responsible for invasion by *A. donax*. Comparisons of post-fire *A. donax* and native plant performance demonstrate several physiological and morphological characteristics that give *A. donax* an advantage over native species after fire. Elevated nutrient levels found surrounding *A. donax* compared to native plants, likely resulting from greater pre-fire biomass, may have maintain its immediate post-fire

growth. These findings indicate how fire promotes invasion of *A. donax* in riparian terraces adjacent to shrubland ecosystems and may help in establishing an invasive plant-fire regime cycle (Brooks et al. 2004).

Change in Plant Composition and Structure

Results of this study indicate a strong and potentially lasting effect of fire on plant composition in riparian areas burned along the Santa Clara River study area. Less than a year after the fire, *A. donax* was clearly increasing its dominance in these ecosystems. *Arundo donax* increased in abundance by almost 25% and comprised more than 99% of the vegetative cover in study sites a year after fire. The much higher biomass or productivity of *A. donax* a year after the fire compared to the two most abundant native species, *S. laevigata* and *B. salicifolia*, suggests that native riparian trees and shrubs might eventually be excluded by *A. donax* in fire-prone riparian ecosystems. Similar examples of post-fire competitive exclusion of native plant species by invasive grasses have been documented in many ecosystems in which fire is an unnatural or altered process (i.e., enhanced frequency) (D'Antonio and Vitousek 1992, D'Antonio 2000). Although smaller in stature, the invasive annual grass *Bromus tectorum* L. (cheatgrass) has caused an increase in wildfire occurrence followed by a decrease in native species abundance in sagebrush shrublands of the western United States (Whisenant 1990, Brooks and Pyke 2001). The dominant species in sagebrush shrublands, *Artemesia tridentata* (sagebrush), does not resprout after fire (Booth et al. 2003), whereas *B. tectorum* successfully germinates from seed and grows in harsh conditions in interspaces

between shrubs after fire (Brooks et al. 2004). Successive fire cycles and increased fire return intervals have lead to dominance by the invader.

Soil Nutrients Stimulate Growth

Elevated nutrient levels in surface soil provide high nutrient levels that increase or maintain plant growth immediately after fire in shrubland ecosystems (Rundel and Parsons 1980, Boerner 1982). Wildfires are known to alter nutrient budgets and cycling by volatilizing some nutrients and mobilizing the levels of others (Boerner 1982, D'Antonio and Vitousek 1992, D'Antonio 2000). Volatilization of nutrients depends on fire temperature but is thought to be high for nitrogen, carbon, and sulfur because of the low temperatures at which they become volatile (Rundel et al. 1983). Ammonium and phosphate levels in surface soils may increase rapidly after fire in shrubland ecosystems due to mineralization (Christensen 1973, Debano and Dunn 1982, Rundel et al. 1983), but post-fire nitrate levels are highly dependent on vegetation type and quantity (Romanya et al. 2001). Nitrogen losses in shrubland ecosystems may occur after fire due to leaching by rainfall and soil erosion (Debano and Conrad 1978, Romanya et al. 2001). Because of the low-lying nature of riparian ecosystems in the landscape, nutrient-rich ash may collect in these areas or nutrients in the ash may run off into these systems from surface erosion and soil leaching (Boerner 1982).

Mechanisms contributing to increased abundance of *A. donax* compared to native plant species in burned areas a year after fire were examined, including response to elevated nutrient levels, differing phenology, and high growth rates. A positive feedback cycle was observed, whereby *A. donax* contributes higher nutrient levels to soil post-fire

and these high levels promote rapid growth compared to native riparian species. Evidence suggests that large differences in pre- and post-fire soil nutrient levels may have stimulated and/or helped maintain high growth rates of *A. donax* following fire. Levels of ammonia, nitrate and phosphate in the soil surrounding *A. donax* were much higher in riparian study sites after the fire, whereas soil nutrient levels adjacent to the native plants species did not change. Higher soil nutrient levels found next to *A. donax* versus native plants were likely due to quality and quantity of fuel (vegetation) burned, fire intensity, and resulting ash deposited (Debano and Conrad 1978). Although not measured, these high post-fire levels were likely indicative of nutrient content contained in the pre-fire aboveground biomass of varying species, influencing nutrient content of ash (Christensen and Muller 1975, Debano and Conrad 1978). Variation in fire intensity between patches of *A. donax* (Bell 1997, D'Antonio 2000) and native plants mixed with *A. donax* observed may have also influenced nutrient content. In mature California chaparral, elevated post-fire soil nitrogen levels from addition of ammonium and phosphorus-rich ash (Christensen 1973) provide favorable nutrient conditions for plant growth (Christensen and Muller 1975, Rundel and Parsons 1980). The high proportion of nutrients, such as ammonium, in the ash remaining after fire is thought to mineralize rapidly, especially after the first rainfall, and become available to plants (Rundel and Parsons 1984), and be readily available to plants, if not lost from the system (Rundel et al. 1983). Higher soil ammonium and phosphate concentrations associated with *A. donax* compared to native plants post-fire may help explain higher initial growth rate of *A.*

donax compared to native species immediately after fire, but causation cannot be definitively determined from these results.

Mechanisms of Invasion

I found clear evidence of three mechanisms, response to nutrients, fire-adapted phenology, and high growth rate of *A. donax*, that promote its preemption of natives after fire. Fire appears to stimulate *A. donax* growth immediately, whereas native plant species recover much slower after burned. Native species did not begin resprouting or germinating until several months after the October 2003 wildfire. In areas containing high nitrogen levels, Decruyenaere & Holt (2005) found that *A. donax* exhibited no dormancy during the year, although recruitment of new shoots (from rhizomes) was higher in the summer than in winter months. Accordingly, high nutrient levels in soils surrounding *A. donax* post-fire may have led to high growth rates and maintenance of shoot growth after rhizomes burned. Conversely, native woody riparian species, such as *S. laevigata*, *P. balsamifera* spp. *trichocarpa* and *B. salicifolia*, are dormant in the winter months and are leafless (G. Coffman personal observation). Resprouting and germination of these species in southern California occurs between late winter and early spring, corresponding with declining river flows (Braatne et al. 1996, Stella et al. 2006). Resprouting and germination of native species after fire appeared similar to the natural phenology (no burn effect) of these species and nutrient levels did not appear to effect regrowth. In chaparral ecosystems, several sprouter non-seeder species (clonal growth form similar to *A. donax*) appear within weeks after fire (Hanes 1971, Naveh 1975, Zedler et al. 1983, Thomas and Davis 1989).

Growth rates and other measures of plant performance of *A. donax* were much higher than native species during the first year after fire, resulting in a higher aboveground biomass a year later. Mean monthly growth rates of *A. donax* were up to three times higher than native riparian plant species in the winter and twice as high in spring through summer. Most native species growth occurred in the spring and early summer and corresponds to phenology under non-burned conditions (Braatne et al. 1996). The pattern and mean RGRs of *A. donax* were similar to those measured for recruits that emerged in April in a Northern California study (Spencer et al. 2005) (see Chapter 3).

Riparian ecosystems infested by *A. donax* adjacent to fire-prone shrublands in southern California appear to be on a trajectory to an invasive plant-fire regime cycle (Brooks et al. 2004). Introduction the unique habit of *A. donax*, a clonal tall grass species, into an ecosystem naturally dominated by woody trees and shrubs has altered fuel types, layers, and loads (Scott 1994, DiTomaso 1998, Brooks et al. 2004). Decreased moisture content and increased surface to volume ratio of *A. donax* versus native vegetation may lead to an altered or increased length of fire susceptibility or increased probability of ignition in these systems, although no data currently exists to document this assertion. Addition of this novel fuel characteristic to the riparian ecosystem has increased vertical continuity (structure of fuel allows fire to spread from surface to crowns of shrubs and trees), which can in turn increase the frequency and extent of fires (Brooks et al. 2004). Due to its tall growth form, infestations of *A. donax* mixed with native species may spread fire vertically into the canopy of riparian trees

instead of mainly burning trunks of riparian species near the ground surface. As *A. donax* abundance increases in fire-prone areas due to increased nutrient levels, fire-adapted phenology and high growth rate of *A. donax*, increased fire return intervals may eventually lead to exclusion of native species in riparian ecosystems. Evidence of this positive-feedback cycle suggests that *A. donax* may create an invasive plant-fire regime cycle in streams and rivers of Mediterranean-type climates similar to this southern California example.

CONCLUSIONS AND MANAGEMENT IMPLICATIONS

That fire promotes invasion of riparian ecosystems by the large alien grass species, *Arundo donax* L., has long been speculated, but no data existed to support this premise. Although fire was once a natural part of shrubland ecosystems that characterize the coastal southern California landscape, large riparian ecosystems provided natural firebreaks because native vegetation retains foliar water that resists ignition (Hanes 1971, Naveh 1975, Bell 1997, Rundel 1998, Keeley and Fotheringham 2001). In October 2003, however, a wildfire burned more than 700 acres of vegetation on riparian terraces along the Santa Clara River. One year after the fire, *A. donax* dominated the vegetation in burned areas. This study illustrates how wildfire promotes invasion of this large alien grass species in riparian ecosystems of southern California.

Removal of *A. donax* from riparian ecosystems adjacent to fire-prone shrublands in Mediterreanean-type climates should be a key management priority. Negative effects on other ecosystem functions, such as wildlife habitat reduction (Knick et al. 2005), follow fire regime changes (Brooks et al. 2004) and associated plant invasions (Herrera

and Dudley 2003, Kisner 2004). Infestations of *A. donax* located on riparian terraces adjacent to towns or agricultural practices pose an increased risk of fire to people and property. Immediate post-fire removal of *A. donax* reduces future fire risk and greatly reduced the amount of biomass removal necessary. However, time of year is critical to selection and success of appropriate removal techniques. Active planting of removal areas with a diverse composition of native species may be required to prevent reinvasion by *A. donax* or other exotic species due to enhanced nutrient levels in these burned riparian ecosystems (Chapter 2).

TABLES

Table 12. Two-way ANOVA of plant abundance (% cover), density (stems m^{-2}), and shoot height (cm) by factors of plant type (*A. donax* and native plant species) and pre- and post-fire time periods.

Factors and interactions	Plant abundance	Density	Height (shoot elongation)
Plant type	$F_{(1,80)} = 59.123$; $P < 0.001$***	$F_{(1,852)} = 322.769$; $P < 0.001$***	$F_{(1,3231)} = 819.299$; $P < 0.001$***
Time period	$F_{(1,80)} = 15.166$; $P < 0.001$***	$F_{(5,852)} = 1.700$; $P = 0.132$	$F_{(8,3231)} = 442.074$; $P < 0.001$***
Plant type x time period	$F_{(1,80)} = 0.006$; $P = 0.937$	$F_{(5,852)} = 2.850$; $P = 0.015$*	$F_{(8,3231)} = 21.295$; $P < 0.001$***
r^2	0.626	0.287	0.591

* = $0.05 \geq P > 0.01$ = significant; ** = $0.01 \geq P > 0.001$ = highly significant; *** = $P \leq 0.001$ = very highly significant

Table 13. Two-way ANOVA of shoot elongation rate (cm d^{-1}) and relative growth rate (RGR; g $g^{-1}day^{-1}$) by factors of plant type (*A. donax* and native plant species) and month post-fire (12 months).

Factors and interactions	Shoot elongation rate	RGR
Plant type	$F_{(9,319)} = 16.178$; $P < 0.001$***	$F_{(9,315)} = 44.146$; $P < 0.001$***
Month post-fire	$F_{(1,319)} = 76.481$; $P < 0.001$***	$F_{(1,315)} = 81.154$; $P < 0.001$***
Plant type x month post-fire	$F_{(9,319)} = 6.845$; $P < 0.001$***	$F_{(9,315)} = 55.397$; $P < 0.001$***
r^2	0.556	0.762

Table 14. Two-way ANOVA of soil nutrients (NH_4-N, NO_3-N, and P) by factors of plant type (*A. donax* and native plant species) and pre- and post-fire time periods. Soil grain size (% silt + clay) was used as a covariate. NH_4-N and NO_3-N were ln transformed.

Factors and interactions	**NH_4-N (ppm)**	**NO_3-N (ppm)**	**P (ppm)**
Plant type	$F_{(2,44)} = 2.002$; $P = 0.164$	$F_{(2,44)} = 0.612$; $P = 0.438$	$F_{(2,44)} = 3.021$; $P = 0.089$
Time period	$F_{(1,44)} = 8.125$; $P = 0.001$***	$F_{(1,44)} = 2.670$; $P = 0.080$	$F_{(1,44)} = 6.002$; $P = 0.005$**
Plant type x time period	$F_{(2,44)} = 5.459$; $P = 0.008$**	$F_{(2,44)} = 2.268$; $P = 0.115$	$F_{(2,44)} = 2.224$; $P = 0.120$
Silt + clay	$F_{(1,44)} = 11.737$; $P = 0.001$***	$F_{(1,44)} = 2.710$; $P = 0.107$	$F_{(1,44)} = 5.803$; $P = 0.020$*
r^2	0.555	0.255	0.394

FIGURES

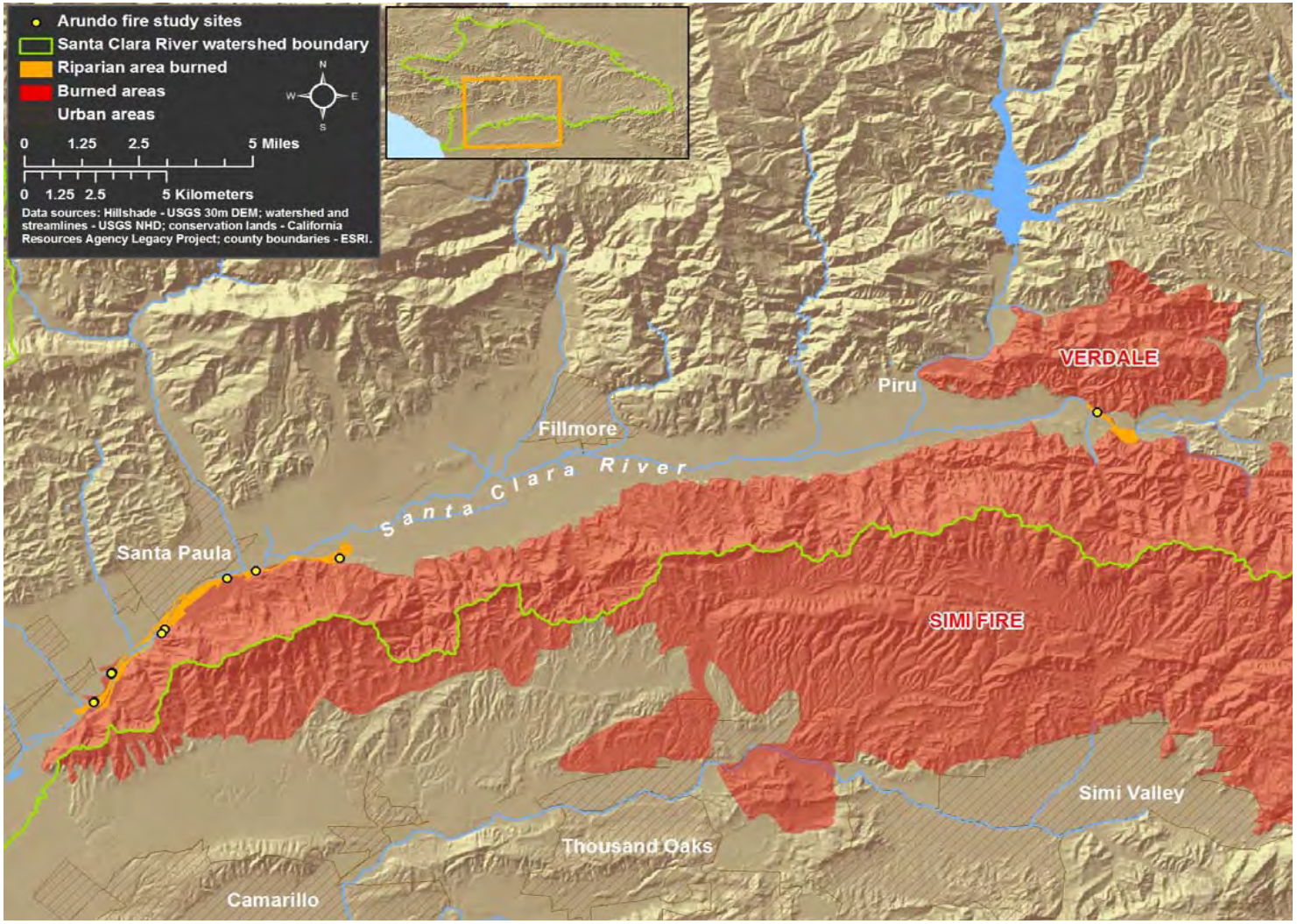

Figure 16. Location of study sites in riparian terraces of the Santa Clara River, Ventura County, California.

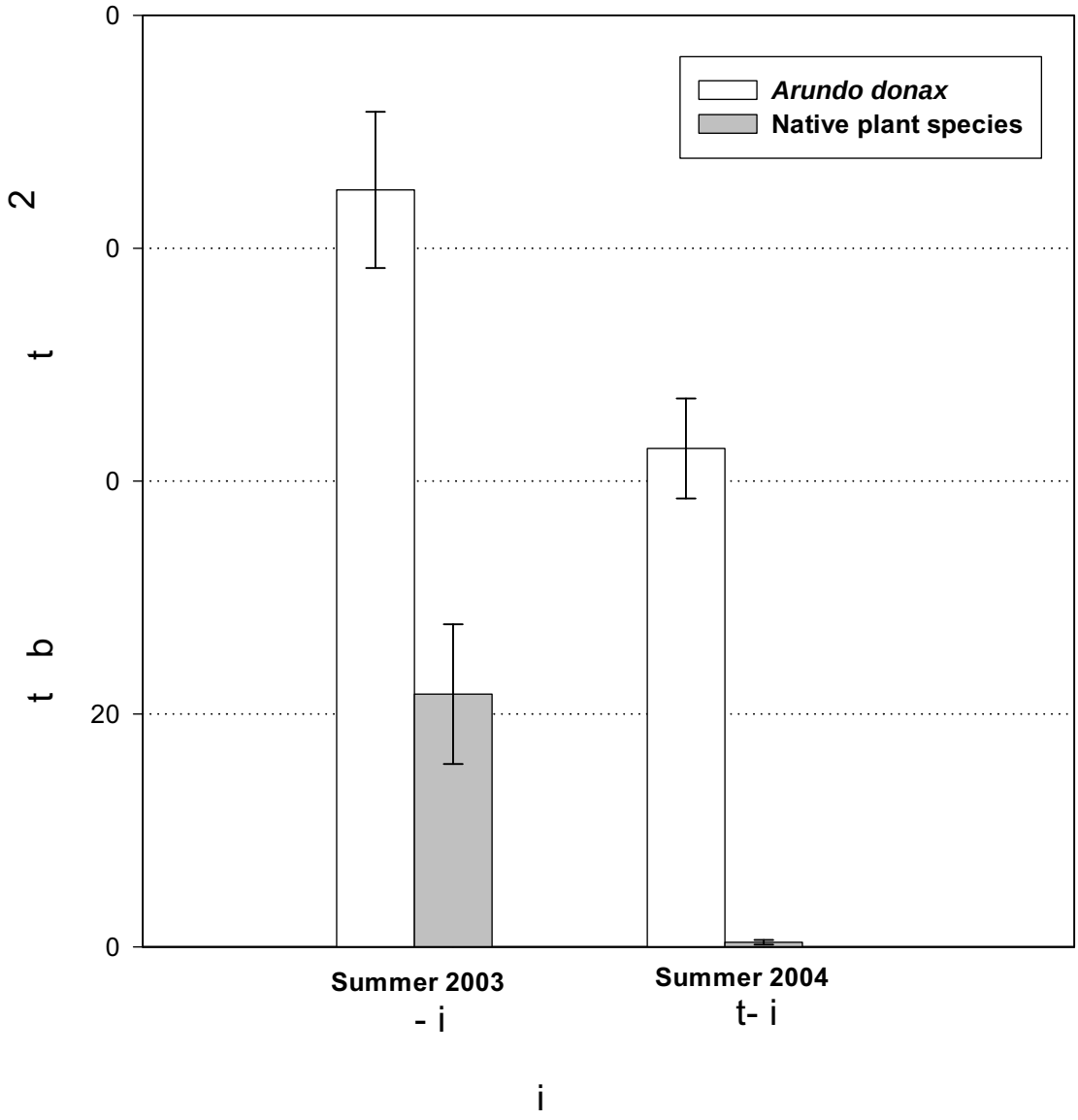

Figure 17. Abundance of *A. donax* compared to native riparian plant species before the October 2003 wildfire (summer 2003) and a year later. Letters denote results of post-hoc hypothesis tests (comparison of means) with significance recognized at $\alpha < 0.05$.

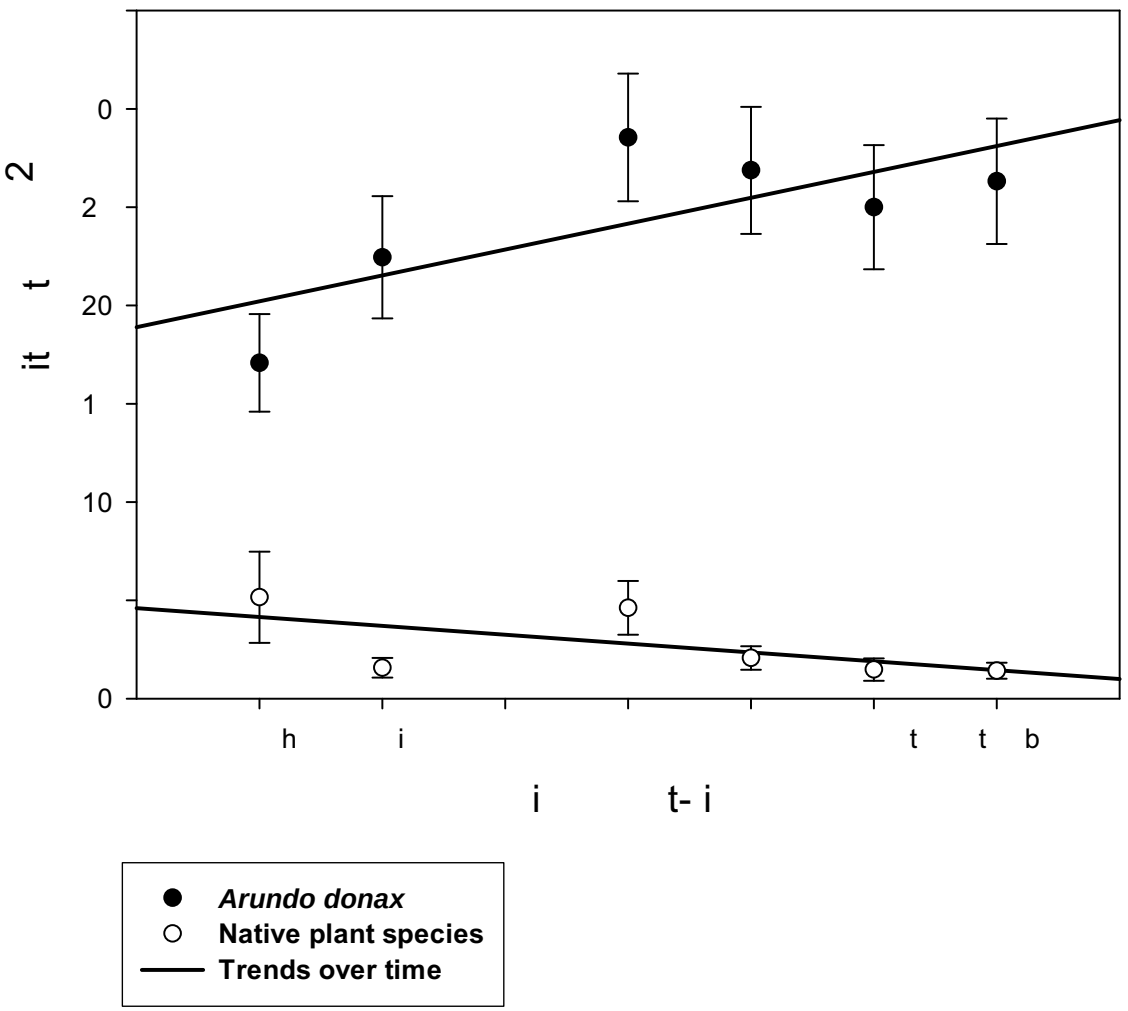

Figure 18. Mean density of *A. donax* versus native plants after the October 2003 wildfire. Regression lines illustrate trends over time. Letters denote results of post-hoc hypothesis tests (comparison of means) with significance recognized at $\alpha < 0.05$.

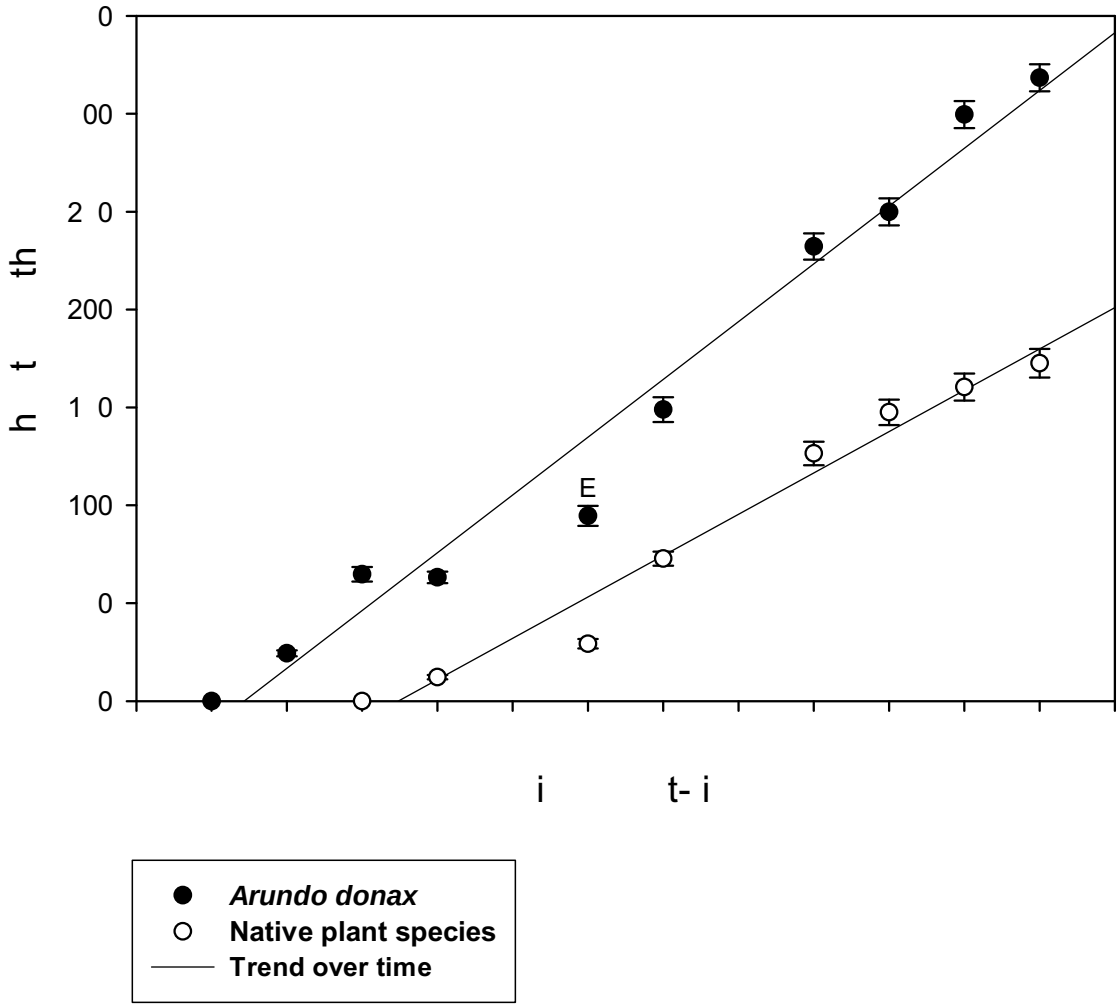

Figure 19. Monthly mean shoot length of *A. donax* compared to native plant species for a year following the October 2003 wildfires. Regression lines illustrate trends over time. Letters denote results of post-hoc hypothesis tests (comparison of means) with significance recognized at $\alpha < 0.05$.

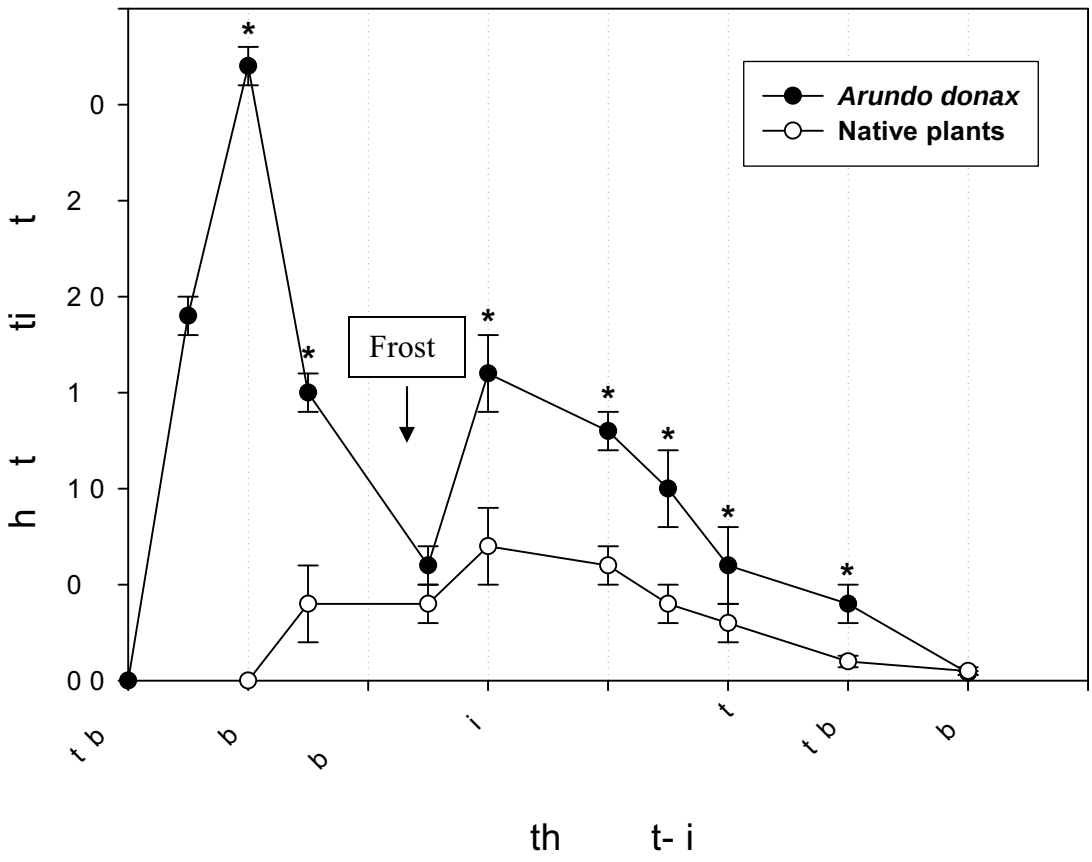

Figure 20. Mean monthly shoot elongation rates of *A. donax* compared to native plants after being burned in the October 25, 2003 wildfire. Asterisks denote significant differences in means between *A. donax* and native plants at each time period based on results of post-hoc hypothesis tests (comparison of means) with significance recognized at $\alpha < 0.05$.

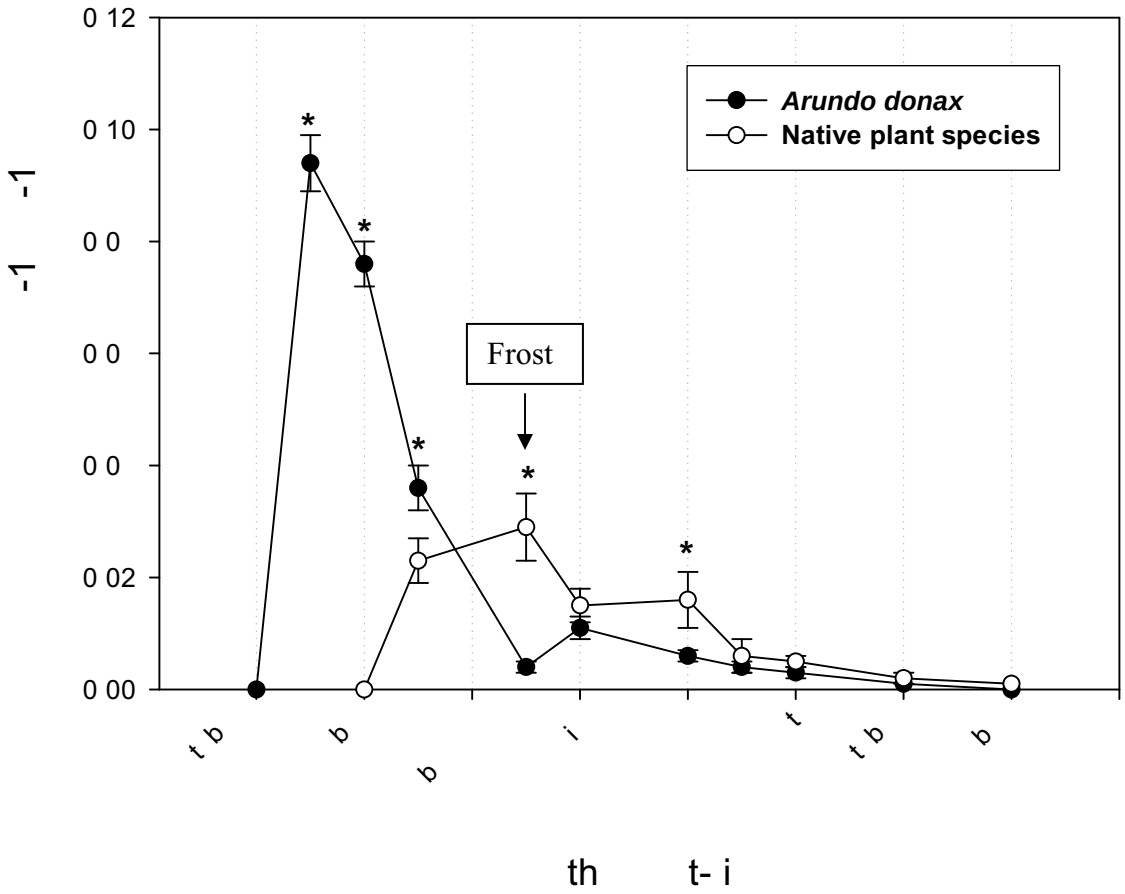

Figure 21. Relative growth rate of *A. donax* compared to native plant species. Asterisks denote significant differences in means between A. donax and native plants at each time period based on results of post-hoc hypothesis tests (comparison of means) with significance recognized at $\alpha < 0.05$.

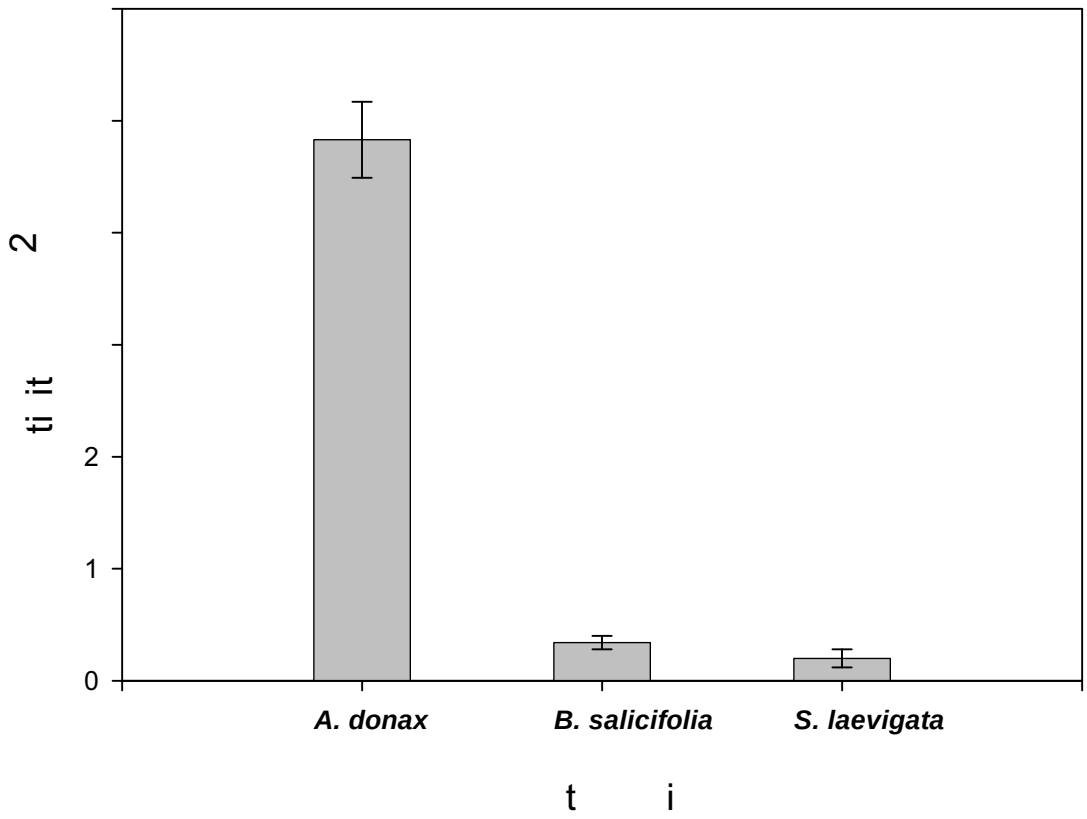

Figure 22. Mean productivity (kg/m^2/year) of *A. donax* compared to native plant species in burned sites. Letters denote results of post-hoc hypothesis tests (comparison of means) with significance recognized at $\alpha < 0.05$.

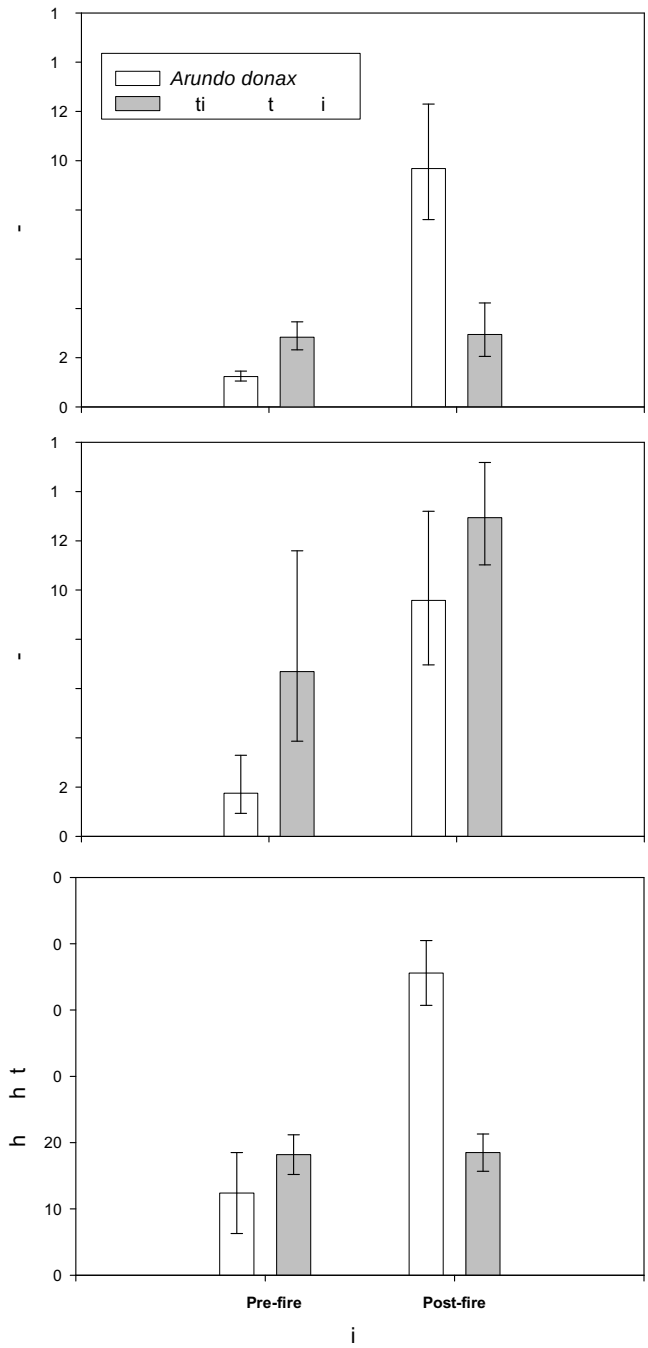

Figure 23. Pre- and post-fire mean nutrient levels of soil adjacent to *A. donax* compared to soil next to native plants. Letters denote results of post-hoc hypothesis tests (comparison of means) with significance recognized at $\alpha < 0.05$.

APPENDIX

APPENDIX 4-1

SAMPLING LOCATIONS

Site No.	Location Description	Latitude	Longitude	Pre-Fire Data Available
1	Near Piru, along Hwy 126 where fire spread to riparian corridor, on right bank of river terrace	34.41°	118.73°	Yes
2	East of Santa Paula and off of Peck Road, on left bank of river terrace	34.33°	119.08°	Yes
3	East of Santa Paula and off of Peck Road, on left bank of high river terrace	34.33°	119.08°	Yes
4	Just Downstream of 12th Street Bridge in Santa Paula, on left bank of river terrace under large coastal live oaks	34.35°	119.05°	Yes
5	Approximately 2 miles east of Santa Paula along South Mountain Road, on left bank of river terrace	34.35°	119.02°	Yes
6	Approximately 1 mile east of Santa Paula along South Mountain Road, on left bank of river terrace under mature willow trees	34.35°	119.04°	Yes
7	Southwest of Santa Paula, east of Mission Rock Road, on right bank of river terrace	34.31°	119.10°	No
8	Southwest of Santa Paula, east of Mission Rock Road, on right bank of river terrace	34.31°	119.10°	No
9	Southwest of Santa Paula, east of Mission Rock Road, on right bank of river terrace	34.31°	119.10°	No
10	Southwest of Santa Paula, east of Mission Rock Road, on right bank of river terrace	34.31°	119.10°	No
11	Southwest of Santa Paula, west of Mission Rock Road, on right bank of river terrace	34.30°	119.10°	No
12	Southwest of Santa Paula, west of Mission Rock Road, on right bank of river terrace	34.30°	119.10°	No
13	Southwest of Santa Paula, west of Mission Rock Road, on right bank of river terrace	34.30°	119.10°	No
14	Southwest of Santa Paula, west of Mission Rock Road, on right bank of river terrace	34.30°	119.10°	No

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CHAPTER 5 -

CONCLUSIONS

FACTORS INFLUENCING *ARUNDO DONAX* INVASION

I found that the role of all four factors that I investigated in my dissertation were critical to the *A. donax* invasion process, but varied in importance based on quantity and availability to plants. My results show that nutrient enrichment in riparian ecosystems due to increased urban and agricultural land use development plays an important role in *A. donax* expansion in the past half century. *Arundo donax* dominated experimental high soil moisture and nutrient treatments in full sun, indicating that the combination of elevated water quantity, decreased quality and light is key to its invasion success especially where disturbance levels are high. Fire appeared to have the greatest effect on *A. donax* invasion; it promotes rapid expansion of *A. donax* infestations near fire-prone shrublands and dominates the vegetation only months after burned.

Nutrient Availability

Anthropogenic nutrient enrichment has been linked to invasion of natural ecosystems worldwide (Kolb et al. 2002, Booth et al. 2003, Brooks 2003, Kolb and Alpert 2003, Suding et al. 2004), but little is known about the role of nutrients in promoting invasion in riparian ecosystems in Mediterranean-type climates (Wang 1998). I explored the influence of anthropogenic nutrient enrichment on the invasion of riparian ecosystems by *A. donax* in southern California. My field study results suggest that N

(nitrogen) limiting conditions may occur naturally in riparian ecosystems in this geologically young landscape but that anthropogenic nutrient inputs have elevated groundwater N:P ratios and may provide invasive species with an advantage where N enrichment of soils and groundwater occurs. In my study area, elevated levels of N in shallow groundwater and soils of floodplains were associated with adjacent land use and with watersheds with higher anthropogenic nutrient inputs. Floodplains with both large and small *A. donax* infestations contained higher soil NO_3-N concentrations than did non-infested areas. Higher N and K (potassium) leaf tissue content of *A. donax* in large and small infestations compared to those of native red willow (*Salix laevigata* Bebb.) collected from non-infested and reference sites suggests that these nutrients may be more available to *A. donax*. Unlike *S. laevigata*, *A. donax* may take advantage of anthropogenically enriched N levels in riparian ecosystems, as illustrated by its positive response to all forms of shallow groundwater N in floodplains and soil N on riparian terraces.

Interspecific competition between native and introduced species for nutrients, water, and light availability plays a critical role in plant invasion in many terrestrial ecosystems worldwide (D'Antonio and Vitousek 1992, Gordon and Rice 2000, Booth et al. 2003, Suding et al. 2004, White and Holt 2005, Richardson 2006). Experimental studies in river and wetland ecosystems have demonstrated superior resource competition by invasive plants for nutrients (Green and Galatowitsch 2002, Minchinton and Bertness 2003). My experimental findings suggest that higher nutrient levels may benefit *A. donax* more than native species, although response to competition for nutrients varies by

species groupings. *Arundo donax* exhibited a positive response to high nutrient additions, but primarily under high soil moisture and light levels, and these effects were much greater in monocultures of *A. donax* (see Chapter 2, Figure 6). Both *S. laevigata* and *B. salicifolia* responded positively to high nutrient treatments under similar conditions, but the effects were of much lower magnitude than those of *A. donax*. When *A. donax* was grown in competition with *P. balsamifera* spp. *trichocarpa*, responses to high nutrient treatments were greater for both species compared to the effects when they were grown in monoculture. However, when grown in competition with either *S. laevigata* and *B. salicifolia* effects of nutrient addition on *A. donax* were decreased; thus, competition from *B. salicifolia* and *S. laevigata* had a strong negative effect on *A. donax* biomass under high soil moisture, light, and nutrient conditions.

Water Availability

In this dissertation, I hypothesized that high soil moisture levels may promote invasion by *A. donax*. Although *A. donax* tolerates a wide variety of ecological conditions, it reportedly thrives in areas with high soil moisture, such as along canals, ditches, and stream banks (Perdue 1958, Rezk and Edany 1979). Preliminary data analyses (Stillwater Sciences, unpublished spatial data) indicate that a higher percentage of *A. donax* is associated with areas of rising groundwater, compared to other drier areas in riparian ecosystems along the Santa Clara River. In addition, increased water quantity in stream systems of Mediterranean-type climates caused by anthropogenic inputs may contribute to higher than natural soil moisture availability. My field experiment showed that *A. donax* produced the highest biomass under high soil moisture conditions,

especially when light and nutrient levels were also high (see Chapter 2; Figure 5). Although competition with *A. donax* did not suppress native plant species aboveground biomass under these high resource conditions during the time frame of the study, its biomass was much higher than those of all three native plant species studied.

Along naturally loosing stream reaches (i.e., river reaches that contribute water to the groundwater supply) in southern California or in riparian ecosystems with water tables lowered by groundwater extraction, invasion by *A. donax* appears to be diminished by lower water availability. However, growth of all native riparian species as well as *A. donax* appears to be lower than under higher water availability; all four species exhibited much lower biomass under low soil moisture versus high soil moisture conditions in my field experiment (see Chapter 2). The presence of sustained high soil moisture or near-surface shallow groundwater during the growing season may important for establishment of most riparian species (especially *Populus* spp. seedlings) (Braatne et al. 1996, Stella et al. 2006), although *A. donax* is known to establish under very low soil moisture conditions (Perdue 1958) and *B. salicifolia* grown from cuttings also had a high rate of survival in low soil moisture conditions in my field experiment (See Appendix 2-2). However, in years with prolonged wet winters all species may establish successfully, even in areas where soil type does not normally sustain high moisture levels. Once established, rooting depth, distribution, and structure relative to soil moisture and depth to groundwater likely play a larger role in growth of and competition between *A. donax* and native species (see Chapter 2, Figure 9). *Salix* spp., *Populus* spp., *B. salicifolia*, and other woody riparian species are phreatophytes with adaptations to low soil moisture

conditions; their roots follow the receding soil moisture during establishment and can use water from depths of up to 30 m (Robinson 1958). In contrast, *A. donax* is a perennial grass with roots that can only reach ~3 m below the soil surface based on my field observations. Evidence from my field experiment indicates that all plants grow much more slowly under low compared to high soil moisture conditions, but the higher biomass of *A. donax* under all conditions may only decrease the rate of expansion in drier riparian ecosystems.

Light Availability

Light availability influences plant invasion in many ecosystems, due to both vegetation removal and direct effects of shading by invasive species (Crawley 1987, D'Antonio and Vitousek 1992, Yamashita et al. 2000, Meekins and McCarthy 2001, Fargione and Tilman 2002). Reduction in light availability may act as a barrier to invasion in both disturbed and natural habitats (Richardson et al. 2000), because plant species vary greatly in the amount of light they require for colonization and optimal growth (Treshow 1970, Menges and Waller 1983). Light availability varies greatly according to time and space along rivers in Mediterranean-type climates; the natural dynamic disturbance regime within these rivers creates large open areas after flooding and mature riparian forests create light limiting environments on high terraces. I experimentally investigated the effects of varying light levels on *A. donax* growth (in combination with nutrients and soil moisture factors) and competition with three native plant species. Light availability did not affect initial plant establishment of woody species (or *A. donax*) in this experiment, as was documented by D'Antonio and Vitousek

(1992) for other invasive grass species (see Appendix 2-2). In general, biomass of *A. donax* and native plant species was lower under low light conditions when soil moisture was not limiting (see Chapter 3, Figure 5). However, *A. donax* biomass was much higher than that of native species in low light and low soil moisture conditions but similar in high soil moisture conditions. Only one negative effect of competition was observed under conditions of low light (and high soil moisture): *A. donax* biomass was significantly lower when grown with *P. balsamifera* spp. *trichocarpa* compared to monoculture. Thus, light reduction does not appear to be an effective barrier to initial *A. donax* invasion in riparian ecosystems in Mediterranean-type climates. Dudley (1998) suggested that monotypic stands of *A. donax* limit native riparian plant recruitment through light reduction. Further investigation is needed to determine the effects of *A. donax* infestations on recruitment of native plant species in later stages of the invasion process.

Occurrence of Fire

Although healthy riparian ecosystems function as natural barriers to wildfire (Radtke et al. 1981, Dudley 1998, Rundel 2000, 2003), the extensive wildfires in southern California in October 2003 burned large expanses of riparian ecosystems along the Santa Clara River and appeared to promote *A. donax* invasion. Due to its immediate regrowth after the fire and its high growth rate compared to that of native riparian plants, *A. donax* dominated these burned riparian ecosystems within a few months after the fire and comprised 99% of the vegetative cover a year later. *Arundo donax* grew an average of 3–4 times faster than native woody riparian plants – up to 2.62 cm/day (average 0.72

cm/day) – and reached up to 2.3 m in height less than 3 months after the fire. One year post-fire, *A. donax* density was nearly 20 times greater and productivity was 14–24 times higher than density and productivity of native plants. Elevated soil nutrient levels post-fire may have contributed to *A. donax*'s high post-fire growth rate, which was similar to post-fire growth observed for chaparral resprouters after fire (Zedler et al. 1983). The large amounts of *A. donax* biomass that replaced native woody species after the wildfire have increased the susceptibility of riparian ecosystems along the Santa Clara River to fire, creating an invasive plant-fire regime cycle similar to those described by D'Antonio and Vitousek (1992) and Brooks et al. (2004). Wildfire not only promotes dominance of *A. donax* in riparian ecosystems but also alters vital ecosystem processes and increases the risk that fire will spread to surrounding shrublands, towns, and agricultural areas.

***ARUNDO DONAX* INVASION ECOLOGY**

Based on my research findings and available literature, I propose three *A. donax* invasion scenarios and associated conceptual invasion trajectories. I extrapolated invasion scenarios and trajectories from my two-year field experiment based on results of my two field studies, other *A. donax* invasion research, and my personal field observations. Proposed conceptual invasion trajectories represent general degree of infestation (abundance of *A. donax*) over time depending on variation in amount and timing in factors (and levels) investigated in my research: water, nutrient, light, and fire. Invasion scenarios include: *A. donax* growing alone in monocultures (scenario1), *A. donax* growing with native plants from the onset of establishment (scenario 2), and *A. donax* growing under a mature riparian forest canopy (scenario 3).

Invasion Scenario 1

According to experimental results and field observations, *A. donax* expansion is most rapid where it grows alone in large monotypic stands (Figure 24). Results of my field experiment show that after two years, *A. donax* biomass was highest when it was grown by itself in monoculture then when grown with any other species (see Chapter 3, Figure 4). *Arundo donax* (and native riparian plant) biomass was relatively low under the low resource conditions (low water and nutrient availability) that naturally exist in the riparian ecosystems found in many floodplains as well as high terraces in Mediterranean-type climates (Figure 24). However, I predict that a rapid *A. donax* invasion trajectory will occur where naturally high soil moisture, nutrient, and light conditions prevail or are added to the system, such as in floodplains in highly urbanized watersheds or high terraces next to agricultural areas (see Chapters 2 and 3). Several studies have shown a similar increased response of invasive, clonal plant species to addition of nutrients and light in a variety of ecosystems (Aerts and Berendese 1988, Bobbink et al. 1988, Green and Galatowitsch 2002, Maurer and Zedler 2002). Maurer and Zedler (2002) reported that rapid expansion of *Phalaris arundinacea*, another clonal grass species, into wetlands throughout North America was likely due to clonal subsidy, morphological plasticity, and high nutrient availability. When fire burns through large, continuous *A. donax* infestations on riparian terraces where high resource conditions are prevalent, *A. donax* reinvades on an even steeper trajectory (Figure 24; also Coffman unpublished data and Chapter 4). Results of my fire study showed that *A. donax* dominated burned riparian ecosystems (i.e., via high regrowth from rhizomes) within a few months after a large fire

and reached 99% in aerial cover one year later (see Chapter 4). Regardless of resource level or combination of resources added, *A. donax* expansion is most rapid when it grows alone in monotypic stands.

Invasion Scenario 2

Where *A. donax* begins (at time 0) to grow with native plants on bare substrates after a large disturbance, a more gradual but similar invasion trajectory to Scenario 1 may be found regardless of resources added (Figure 24). Results of my field experiment show that in low resource conditions *A. donax* aboveground biomass was slightly lower when grown with *B. salicifolia* compared to in monoculture, possibly due to early shading by this native species (see Chapter 2; Figure 5). Although *A. donax* only suppressed one native species (*P. balsamifera* ssp. *trichocarpa*) under naturally low resource conditions, its biomass was 2–3 times higher than that of either native tree. Under high soil moisture, nutrient, and light conditions, competition from *B. salicifolia* and *S. laevigata* had negative effects on *A. donax* biomass. Despite some suppression by these native species, however, *A. donax* had a higher biomass than that of all native plant species examined. In a similar field competition experiment, Booth et al. (2003) showed that a native clonal perennial grass (*Elymus elymoides*) suppressed an annual invasive grass (*Bromus tectorum*) in high soil moisture and nutrient conditions, thereby facilitating recruitment of a native shrub (*Artemesia tridentata*). When fire is introduced to riparian terraces infested with *A. donax* and a mix of native riparian plants, fire intensity is likely decreased due to higher leaf water content of natives (Brooks et al. 2004). However, the invasion trajectory in this type of mixed community is probably only slightly lower than

that of large *A. donax* infestations (Scenario 1) due to immediate resprouting and much higher growth rates of *A. donax* compared to native plants after fire (Figure 24). However, this invasion trajectory will vary between Scenario 1 and 3 depending on length of time from establishment to fire.

Invasion Scenario 3

An invasion trajectory similar to Scenario 2 (low water and nutrient availability) occurs when *A. donax* establishes under a mature riparian canopy regardless of soil moisture or nutrient levels (Figure 24). In my field experiment, under low light but high water and nutrient availability conditions *A. donax* biomass was slightly lower than it was where all resource conditions were low, but the biomass of native plant species was slightly higher. Competition with *Populus balsamifera* ssp. *trichocarpa* saplings that establish concurrently may suppress *A. donax* growth, but only under high soil moisture and nutrient levels. Thus, the incline of the trajectory may be slightly lower when water and nutrients are added due to the different responses of *A. donax* and native plant species found under these experimental conditions. When fire enters riparian ecosystems containing a mature riparian canopy infested by an understory of *A. donax*, a crown fire may spread through these areas due to an unnatural ladder effect: *A. donax* provides a large quantity of flammable material that transfers fire vertically to large riparian trees under which it grows (Brooks et al. 2004). The post-fire invasion trajectory is initially gradual due to competition from resprouts, but most of these resprouts will eventually die (according to field observations; Coffman unpublished data), and the trajectory then increases in steepness.

MANAGEMENT IMPLICATIONS

Arundo donax ***removal effort priorities***

Millions of dollars have been spent to remove *A. donax* infestations of riparian ecosystems throughout California (Katagi et al. 2002). Due to the lack of understanding of *A. donax* ecology, however, decisions regarding prioritization of removal areas and removal techniques often have to be made in the absence of sufficient scientific information. After analyzing my own research results and the current body of literature available on *A. donax*, I propose the following management strategies, which incorporate the most current understanding of the *A. donax* invasion process, to most effectively and efficiently address this problem. I recommend that *A. donax* control efforts should be placed where ecological benefits are the greatest and associated removal effort the lowest.

1. Remove *A. donax* under mature riparian forests, especially adjacent to fire-prone shrublands. The highest priority location for *A. donax* control is within mature riparian forests adjacent to shrublands. My research suggests that removal in these areas creates the greatest environmental benefit, because these areas have the highest risk of further damage if removal is conducted and threat of reinfestation is lowest (i.e., where removal effort is long-lasting). *Arundo donax* may reinfest areas that are flooded occasionally but not completely scoured (e.g., higher terraces), especially where water and nutrient levels are high. In these locations, mature riparian forests may facilitate invasion by physically trapping propagules after flooding (Dudley pers. comm.). Although my research shows that *A. donax* does not grow as rapidly in low light

conditions compared to high light conditions when high levels of water and nutrients are present (see Chapter 2), my field observations suggest that the understory of mature riparian forests can be invaded by *A. donax* after large floods; the invasion trajectory just may be more protracted. When these mature riparian forests become heavily invaded, areas near fire-prone shrublands are highly susceptible to fire. The large, dry biomass produced by *A. donax* in these areas carries fires (i.e., ladder effect) through canopies of these once-natural firebreaks, burning across and along river systems. These areas should be targeted for high priority removal due to the subsequent threat of an invasive plant-fire cycle and the lasting damage caused, the complete loss of mature riparian forests.

2. Remove the largest *A. donax* propagule source. Another *A. donax* removal priority should be to target areas containing the largest source of propagules to curtail the distribution of *A. donax*, thereby working to control it in the initial phase of the invasion process. Due to its clonal growth form, dominant asexual reproduction, and flood-driven dispersal mechanisms, the largest *A. donax* infestations will produce the highest quantity of vegetative propagules. My research suggests that the largest infestations are most prevalent in riparian ecosystems that are within highly urbanized watersheds, located adjacent to agricultural and residential land uses, and in areas that have burned in both southern California and the Western Cape region of South Africa. Large infestations in areas most frequently scoured by winter flooding contain the largest potential source of propagules.

Prioritization of removal in riparian ecosystems with the lowest likelihood of reinfestation has been suggested (i.e., areas outside the flood zone) (Coffman et al. 2004).

In general, my research findings suggest that *A. donax* is least likely to invade open substrates or recently scoured areas in which resources levels are low (i.e., low soil moisture and nutrient availability) and where native plants have established at the same time. Further investigation of the relationship between frequency of rhizome establishment and *A. donax* abundance in various locations after flood events is necessary to validate this recommendation. Riparian ecosystems downstream of large propagule sources along active floodplains are most likely to be reinfested and removal in these areas should be given lowest priority. Results of my studies suggest that *A. donax* is most likely to invade open (i.e., very low native vegetation cover) or recently scoured areas in which resources levels area high (i.e., high soil moisture and nutrient availability). These areas often are found next to agricultural land uses and areas exposed to wastewater treatment discharge from residential land use (see Chapter 3) (Neely and Baker 1989).

I recommend that more effort should be placed where ecological benefits are the greatest and associated removal costs the lowest. Natural biological and physical processes in riparian ecosystems that are heavily invaded by *A. donax* are usually already degraded. Although removal efforts may slightly reduce propagule abundance, net ecological benefits from removing *A. donax* in these areas may be much lower than in areas less invaded. My research suggests that removal of *A. donax* in locations within riparian forests adjacent to fire-prone shrublands, watersheds with low nutrient inputs, and watersheds with little *A. donax* abundance will result in the greatest ecological benefit. Furthermore, a considerable amount of money and effort is involved in removal of large infestations.

3. Control *A. donax* on a watershed scale. Here I suggest several watershed-scale *A. donax* control strategies given the natural dynamic flood regime in streams of Mediterranean-type climate regions and the widespread anthropogenic resource inputs that are not easily altered. *Arundo donax* should be removed from low nutrient input watersheds where infestations are small or area of infestation is localized; the highest probability of eradication success at the lowest cost is possible in these locations. However, watershed-scale long-term control of *A. donax* in natural riparian ecosystems may require management of resource levels that promote invasion to reduce growth and competition. Manipulation of resource availability in favor of a given native (desired) species has been proposed to create a competitive advantage and a barrier to reinvasion (Blumenthal et al. 2003, Corbin and D'Antonio 2004, Suding et al. 2004, Prober et al. 2005, Perry and Galatowitsch 2006). Results of my studies suggest that reduction of nutrient inputs in urbanized watersheds may slow invasion of *A. donax* but likely will not alone prevent its eventual spread.

Several researchers suggest that *A. donax* should be removed from the most frequently inundated floodplains only using a top-down directional approach (Bell 1997, Coffman et al. 2004). Removal of *A. donax* on higher terraces may not necessarily need to proceed in this downstream manner because reinfestation is much less likely. However, one study suggests that layering (i.e., rooting from nodes) is an important *A. donax* invasion mechanism in streams of southern California and, thus, an inside-out approach is required (Boland 2006). I suggest that both approaches are necessary depending on the flooding dynamics of the stream, infestation size and distribution, and

fluvial geomorphic location of the infestation. Because removal of large areas of *A. donax* is very costly, the ideal time to remove it from a heavily infested watershed may be immediately after a very large flood event (i.e., 100-year flood) that removes most of the vegetation, resulting in much easier access to much reduced quantities of *A. donax* biomass.

4. Revegetation after removal may not help resist or suppress *A. donax*. The management literature recommends revegetation of riparian systems with native species after removal of invasive species, including *A. donax*, to resist further invasion (Sonoma Ecology Center 1999, County of Ventura Planning Division 2006). Resistance to invasion may be achieved if natives obtain a much higher biomass than *A. donax* and suppress it when competing for resources. However, results of my two-year competition field experiment suggest that this is rarely the case; *A. donax* had a significantly higher biomass than almost all native plant species under all resource levels and only minimal suppression by native plants was documented under a few conditions tested (see Chapter 2). Results of my competition field experiment indicate that *B. salicifolia* may increase in biomass when grown with *A. donax*, although it never obtained a significantly higher biomass than *A. donax* under any condition. Longer studies are needed to validate these findings, although it appears that revegetation will not resist reinvasion without implementation of appropriate *A. donax* maintenance. However, active revegetation after *A. donax* removal should help initiate restoration of riparian ecosystem functioning if *A. donax* removal is conducted in the appropriate location and diligent maintenance is implemented.

FIGURES

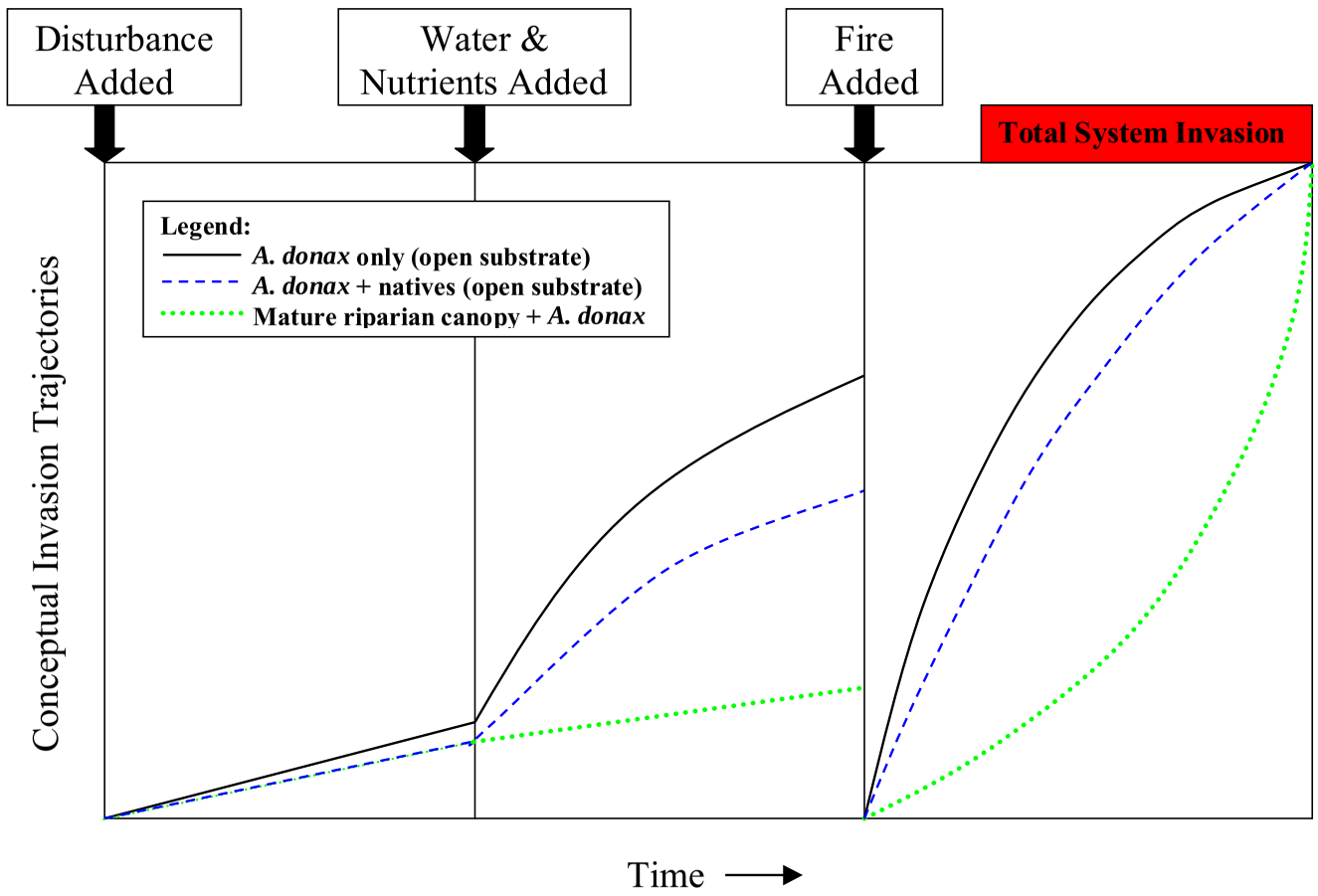

Figure 24. Conceptual *Arundo donax* invasion trajectories over time. Trajectories represent three invasion trends beginning after a large disturbance, including invasion where *A. donax* grows in monotypic stands, where it begins to grow at the same time as native riparian plants, and where it grows underneath a mature riparian forest canopy. The first panel shows invasion under low resource levels, conditions found throughout natural riparian ecosystems in California. When water and nutrients are added to riparian ecosystems, trajectories increase (panel 2). Panel 3 illustrates the steep invasion trajectories that occur when fire is introduced to riparian ecosystems where *A. donax* is already present.

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ORIGINAL PAPER

Wildfire promotes dominance of invasive giant reed (*Arundo donax*) in riparian ecosystems

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Abstract Widespread invasion of riparian ecosystems by the large bamboo-like grass *Arundo donax* L. has altered community structure and ecological function of streams in California. This study evaluated the influence of wildfire on *A. donax* invasion by investigating its relative rate of reestablishment versus native riparian species after wildfire burned 300 ha of riparian woodlands along the Santa Clara River in southern California in October 2003. Post-fire *A. donax* growth rates and productivity were compared to those of native woody riparian species in plots established before and after the fire. *Arundo donax* resprouted within days after the fire and exhibited higher growth rates and productivity compared to native riparian plants. *Arundo donax* grew 3–4 times faster than native woody riparian plants—up to a mean of 2.62 cm day^{-1}—and reached up to 2.3 m in height less than 3 months after the fire. One year post-fire, *A. donax* density was nearly 20 times higher and productivity was 14–24 times higher than for native woody species. Three mechanisms—fire-adapted phenology, high growth rate, and growth response to nutrient enrichment—appear to promote the preemption of native woody riparian species by *A. donax* after fire. This greater dominance of *A. donax* after wildfire increased the susceptibility of riparian woodlands along the Santa Clara River to subsequent fire, potentially creating an invasive plant-fire regime cycle. Moreover, *A. donax* infestations appear to have allowed the wildfire to cross the broad bed of the Santa Clara River from the north, allowing thousands of acres of shrubland to the south to burn.

Keywords *Arundo donax* · Invasive plant-fire regime cycle · Invasive species · Mediterranean-type climate · Riparian · Wildfire

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Introduction

Wildfire is a natural process in terrestrial ecosystems worldwide. Many ecosystems are adapted to fire as a periodic and natural disturbance regime, including Mediterranean-type shrublands, temperate conifer forests, savannas, and grasslands (Ellis 2000; Bond and Keeley 2005). In semi-arid climates, fire has a particularly significant role in shaping vegetation due

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to weather conditions favorable for growth and short periods in which decomposition can occur. Historically, dense cover of shrub biomass accumulating for up to 50 years or more provided fuel for high-intensity wildfires in shrublands of southern California and other semi-arid climate regions (Keeley et al. 1999; Keeley and Fotheringham 2001, 2005). Lightning was the primary natural cause of wildfires, especially during the dry, low humidity conditions that occur in late summer and fall (Naveh 1975; Keeley 1982; Keeley et al. 1999). Currently, most wildfires in these areas are anthropogenic in origin and occur much more frequently than they did historically when human population density was lower (D'Antonio and Vitousek 1992; Keeley et al. 1999).

Invasion of annual grass species has been linked to altered fire regimes in rangelands, deserts, and wildlands in many parts of the world (Brooks and Pyke 2001; Brooks et al. 2004; Sugihara et al. 2006). Invasive grass-fire cycles, also called invasive plant-fire regime cycles, may ensue when alien grass species colonize an area and provide fuel for fire propagation, thereby increasing the frequency, extent, and intensity of fires (D'Antonio and Vitousek 1992; D'Antonio 2000; Brooks 2002; Brooks et al. 2004; Keeley 2004; Keeley and Fotheringham 2005). Rapid recovery of alien grass species after fire compared to native species after fire leads to increased susceptibility of that ecosystem to fire.

Large riparian corridors have historically acted as natural firebreaks in semi-arid Mediterranean-type climates (Dudley 1998; Dudley et al. 2000; Rundel 2000) because of their low-lying topography and relative absence of flammable fuels. However, invasive woody species have been shown to alter this situation. Thickets of saltcedar (*Tamarix ramosissima*), for example, have invaded riverine corridors throughout the Southwestern United States. Saltcedar burns more frequently and destructively than native riparian vegetation (Dudley et al. 2000) and resprouts rapidly from the rootcrown the year after it is burned (Duncan 1997).

In coastal shrubland watersheds of California, a large invasive grass species *Arundo donax* L. (often called giant reed and hereafter referred to as *Arundo*) poses multiple threats in riparian ecosystems, with many similarities to saltcedar, including high flammability. *Arundo* was introduced from southern Eurasia into California several hundred years ago for erosion control and building materials (Robbins et al. 1951; Perdue 1958). It now infests many stream and river systems throughout coastal California (Gaffney 2002) and other arid and Mediterranean-type climates worldwide, including South Africa, Australia, and the Mediterranean Basin. The natural flood disturbance regime in these climates successfully distributes vegetative culms and rhizomes of *Arundo* along streams, where it establishes readily on bare substrates (Else 1996). Studies indicate that increased water and nutrient delivery to these systems has increased its invasion success (Coffman 2007), yet the influence of fire on its invasion in river systems remains relatively unexplored. Several accounts suggest that infestations of *Arundo* have increased fuel load as well as fire frequency and intensity along riparian corridors (Robbins et al. 1951; Bell 1997; Scott 1994; D'Antonio 2000).

The Simi/Verdale wildfire of October 2003 (Keeley and Fotheringham 2005) provided the opportunity to study the role of fire in the invasion of riparian terrace ecosystems of the Santa Clara River by *Arundo* after hundreds of hectares of healthy riparian ecosystems containing a mixture of native riparian vegetation and *Arundo* burned. In this study, we compared growth and recolonization of *Arundo* to that of native plant species in this riparian ecosystem after the wildfire. We hypothesized that *Arundo*'s immediate post-fire resprouting, phenology, and higher growth rate compared to native plants and the high soil nutrient content after fire would promote the dominance of *Arundo*.

Methods

Study area

The Simi/Verdale fire burned more than 45,000 ha of shrublands, grasslands, and riparian ecosystems from 25 October to 1 November 2003 (Keeley and Fotheringham 2005; Coffman 2007; California Department of Forestry and Fire Protection unpublished data; G. Coffman unpublished data; Fig. 1). Fire severity was variable throughout the riparian areas burned, but was predominately high or deep burning in areas in which *Arundo* density was highest. Study sites were located along the Santa Clara River floodplain throughout approximately 300 ha of riparian ecosystems burned in this fire.

Percent canopy closure was variable throughout sites before the fire—from 10 to 45% cover of trees and shrubs. We observed deep burning (high fire severity) in study sites with a few patches of moderate fire severity on the edges of a couple of the sites according to field indicators described in Keeley (2009). Indicators observed throughout study sites included: native riparian trees in the canopy layer killed; all leaves consumed; shrubs burned to ground or only skeletons remaining; surface litter of all sizes consumed; and white ash deposition and charred organic matter between 1 and 30 cm thick. Most native trees and shrubs were top-killed with no green or singed leaves remaining. Some woody native plants resprouted from stumps and others did not. According to the County of Ventura, Fire Department records, no other recorded fires from 1918 to present (greater than 1 acre) were found to coincide with our 14 study sites within the 500-year floodplain of the Santa Clara River. Detailed descriptions of fire intensity and stand composition are available from the author.

Natural riparian vegetation along the river consisted of large black cottonwood (*Populus balsamifera* subsp. *trichocarpa*), Fremont cottonwood (*Populus fremontii*), and red willow (*Salix laevigata*) trees in the canopy layer. A mixture of smaller trees and shrubs comprised the understory layer, including arroyo willow (*Salix lasiolepis*), sandbar willow (*Salix exigua*), shining willow (*Salix lucida* subsp. *lasiandra*), mulefat (*Baccharis salicifolia*), and blue elderberry (*Sambucus mexicana*). Species names follow Hickman (1993). Currently, *Arundo* infests more than 2,000 ha of floodplain along the Santa Clara River (Stillwater Sciences, URS 2007).

Study species

Arundo is a robust, perennial, bamboo-like member of the Poaceae family that has become widely established throughout the floodplains and terraces of rivers and streams in California and other warm, temperate climates worldwide (Hickman 1993). *Arundo* reproduces vegetatively through a network of large rhizomes that grow horizontally just below the soil surface. Under some conditions it produces a large (3–6 dm), terminal, plume-like inflorescence (panicle) at the end of the growing season (Hickman 1993); however, seeds of the inflorescence are generally sterile in California (Johnson et al. 2006).

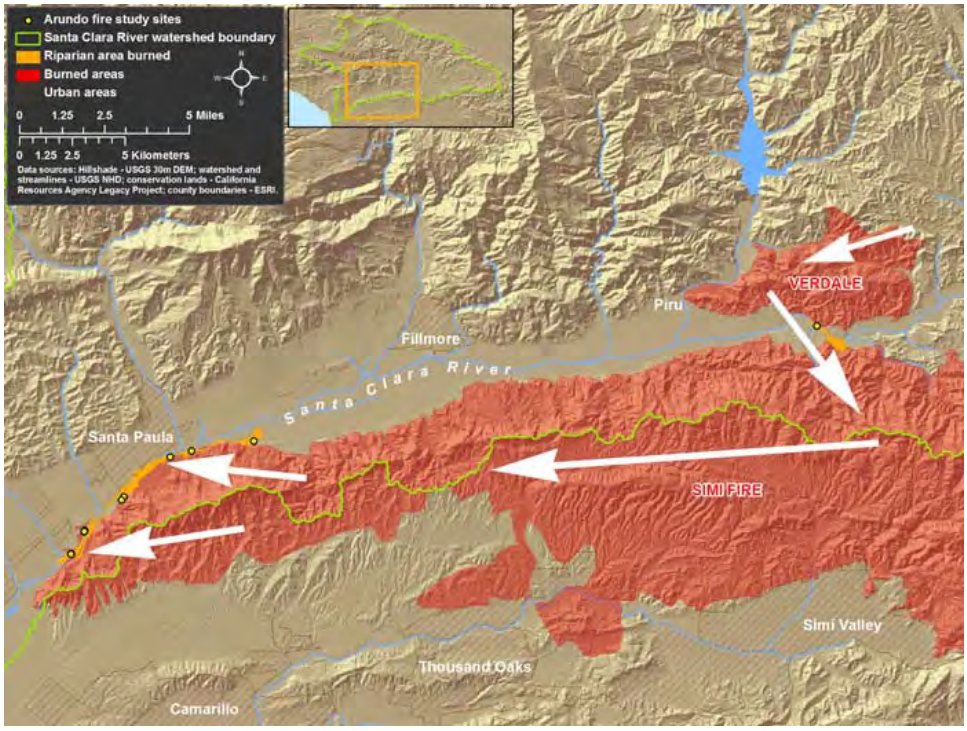

Fig. 1 Location of study sites within riparian ecosystems along the Santa Clara River, Ventura County, California. *Arrows* indicate progression of the Simi/Verdale wildfire

For comparison, we also studied several native woody riparian plant species commonly found on burned riparian terraces and along other rivers in southern California, including *Salix laevigata, S. lasiolepis*, *S. exigua*, *Populus balsamifera* subsp. *trichocarpa*, and *Baccharis salicifolia*.

Sampling design and methods

Six permanent study sites established in a previous study (Coffman 2007) along the Santa Clara River burned during the 2003 wildfire; all were located on riparian floodplain terraces adjacent to shrubland ecosystems (Fig. 1). We compared pre-fire plant composition and soil nutrient data collected in summer 2003 at these six permanent monitoring sites to data collected monthly during 2004, the year after the wildfire occurred. We established eight additional study sites along riparian terrace areas burned to the west of the permanent study sites to ensure that sites were well-distributed throughout the burned areas and represented the range of environmental conditions found in the study area. We monitored reestablishment of plant cover on the 14 sites from November 2003 to December 2004. Each study site was approximately 600 m^2 and 30 × 20 m in extent.

Precipitation and temperature data along the Santa Clara River were recorded at the Piru 2 ESE station (34.40°N 118.75°W, elevation 222 m). Although 24 mm of rain were recorded only 5 days after the fire, the 2003–2004 hydrologic year was relatively dry with a total of 256 mm compared to a long-term mean of about 435 mm (Fig. 2).

We determined change in plant abundance in burned areas by comparing pre- and post-fire (summer 2003 and July 2004) percent cover of *Arundo* and native woody plant species in the six permanent study sites. Plant composition before the fire was determined by ocular estimation of percent aerial cover within the entire study site area. Since all trees and shrubs were top-burned, we used visual estimates of percent aerial cover of new seedlings and stump resprouts by species within 1 m^2 quadrants placed randomly throughout all study sites during post-fire sampling periods and within six study sites during summer 2003. Post-fire mean shoot density (stems m^{-2}) of *Arundo* and all native species were sampled monthly (March to September 2004) within six 1 m^2 quadrants (placed randomly each sampling period) within all 14 study sites. We measured mean shoot length (cm) and basal diameter (mm) of 20 randomly selected individuals of

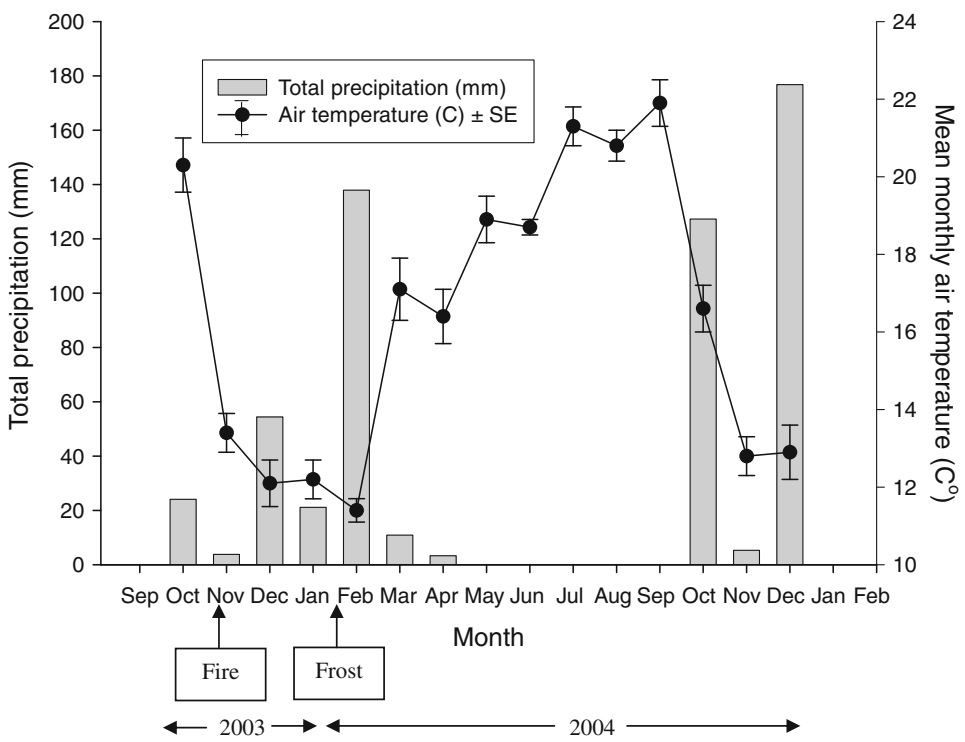

Fig. 2 Mean monthly precipitation and temperature within the Santa Clara River study area near Piru, CA for the study period (October 2003–December 2004). *Frost label* indicates freezing air temperatures (from 0 to −5°C) were experienced near the ground surface at several of the low-lying sites for several days

Arundo and each dominant native woody riparian species at all sites during each post-fire sampling period. In addition, we measured shoot height and basal diameter (10 cm above the soil surface) of three permanently marked *Arundo* and native plant shoots (three of each species) during each sampling period. We calculated mean shoot elongation rate (cm day^{-1}) for each species using data from permanently marked individuals.

We calculated the aboveground biomass, relative growth rates (RGRs), and productivity of plants within the study sites using plant dimension data collected during the study period. Non-destructive dimensional analyses were used to estimate aboveground biomass dry weight of plants in study sites with minimal plant growth interference (Whittaker 1965; Whittaker and Marks 1975; Sharifi et al. 1982; Spencer et al. 2006). We created regression models for each species using basal diameter, shoot length, and aboveground biomass of culm/branch samples measured in a nearby field experiment to predict biomass of each individual plant sampled in the study sites. Regression models were based on *Arundo* (resprouts) and native woody plants (resprouts) grown at an experimental field plot on a terrace of the Santa Clara River near the burned study sites. Regression models for aboveground biomass were very highly significant for all species ($r^2 = 0.971$–0.990, $P < 0.001$; Coffman, 2007). Biomass of *Arundo* and native species was estimated based on both basal diameter and shoot length measurements taken at all study sites. All data were log transformed in regression models to achieve normally distributed residuals.

We calculated RGRs for all permanently marked individuals using the following differential equation, where W is the total aboveground biomass dry weight (g) of each shoot, t is time (days post-fire), and ln is natural logarithm:

$$\mathrm{RGR} = \frac{\mathrm{d}W}{\mathrm{d}t}\frac{1}{W} = \frac{\mathrm{d}(\ln W)}{\mathrm{d}t}.$$

Mean productivity (kg m^{-2} $year^{-1}$) for each species was calculated at approximately 1 year post-fire. We estimated biomass (kg) for the 20 randomly sampled culms/stems for each species measured during September 2004. For each species, mean biomass per shoot (kg $shoot^{-1}$) was multiplied by mean density (shoots m^{-2}) at each study site and then divided by time (1 year). We averaged productivity calculations for each species across study sites.

Five soil sub-samples were collected at each study site adjacent to *Arundo* and each native woody plant species in summer 2003 (*Arundo* and *S. laevigata* only) and immediately after the fire. Samples were collected in the upper 20 cm of the soil where nutrient concentrations are greatest. For each species, five soil samples were combined into a composite sample by thorough mixing in a stainless steel bowl. Soil samples were air-dried and ground to a powder in preparation for nutrient content analyses at the DANR Analytical Laboratory in Davis, California using standard techniques for total nitrogen (total N- %), nitrate–N (NO_3-N—ppm), ammonia-N (NH_4-N—ppm), and orthophosphate (PO_4-P—ppm; http://danranlab.ucanr.org/). Soil grain size was analyzed at UCLA with a hydrometer to determine the particle size distribution of sand, silt, and clay in soil suspension (Sheldrick and Wang 1993).

Statistical analyses

One-way and two-way analysis of variance (ANOVA) tests were used to analyze effects of various combinations of factors (plant type and time) on plant performance and growth data (dependent or response variables; Systat Software, Inc 2000). We conducted a one-way ANOVA of productivity (kg m^{-2} $year^{-1}$) by species (*Arundo*, *B. salicifolia*, and *S. laevigata*). Two-way ANOVAs for plant performance metrics by factors of plant type (*Arundo* and native plant species) and time (pre-fire vs. post-fire or months post-fire) were conducted to determine differences in plant growth by species over time post-fire. Dependent variables included plant abundance (percent cover), density (stem m^{-2}), shoot length (cm), and soil nutrient concentrations (NH_4-N, NO_3-N, and PO_4-P in ppm). Soil grain size (% silt + clay) was used as a covariate in two-way ANOVAs for soil nutrients. Repeated measures ANOVA were used for shoot elongation rate (cm day^{-1}) and RGR (g $g^{-1}day^{-1}$) because data consisted of repeated samplings of the same individuals over time.

Tukey's post-hoc test was used for pairwise comparisons of means in one-way ANOVAs. We performed ANOVA F-tests to evaluate a priori contrasts between means of grouping variables and levels in two-way and repeated measures ANOVA

results. Probability plots were examined to test for normality of data and to identify any data that required transformation. All biomass, soil NH_4-N, and soil NO_3-N data were ln transformed. When means and standard errors are used to describe or present statistical differences, data were back-transformed and reported in original units.

Results

The pre-fire diameter of native woody riparian species varied by species as follows: *B. salicifolia* (1–4 cm), *Salix exigua* (2–5 cm), *S. lasiolepis* (9–22 cm), *S. laevigata* (62–75 cm), *P. balsamifera* subsp. *trichocarpa* (21–70), and *P. fremontii* (72–80 cm). Regeneration of native plant species observed in study sites was predominantly by new seedlings. Resprouting from the root crown was only observed at a few sites for the following species (range of diameters): *P. balsamifera* subsp. *trichocarpa* (1–2 cm, died by the end of summer 2003), *B. salicifolia* (1–2 cm), *S. lasiolepis* (3–14 cm), *S. exigua* (2–5 cm), and *S. laevigata* (7–12 cm).

Pre- versus post-fire plant abundance

Percent cover of *Arundo* was significantly greater than native woody riparian plant cover both before and after the study sites were burned (Table 1). Although both *Arundo* (65.0 ± 6.7% cover, mean ± SE) and the native woody plants (21.7 ± 6.0% cover) were more abundant before the fire than after, less than a year after the fire *Arundo* (42.8 ± 4.3% cover) was the overwhelmingly dominant plant species in these riparian ecosystems (native woody species = 0.4 ± 0.2% cover). Thus, native woody species comprised 25.0% relative cover of the total vegetation before the fire and less than 1% of the vegetation in burned riparian terraces 9 months after the fire.

Post-fire density

The two-way ANOVA (plant type x time period) of plant density revealed a significant two-way interaction (Table 1). The mean density of *Arundo* (stems m^{-2}) was significantly greater than that of native plant species for all months sampled (March–September 2004; Fig. 3a). Mean density of native plant species declined somewhat over time during the first year after the fire, although differences between sampling periods were not significant. However, mean density of *Arundo* shoots increased significantly over time. A year after the wildfire, *Arundo* density (26.3 ± 3.2 stems m^{-2}) was an order of magnitude greater than that of native species (1.4 ± 0.4 stems m^{-2}) within the burned riparian plots sampled.

Post-fire shoot growth

The post-fire phenology of resprouting timing and shoot growth differed significantly between *Arundo* and native plants (Fig. 3b). *Arundo* began growing within days after being burned to the ground, whereas resprouts of native woody plants did not appear until January, over 2 months post-fire. The two-way ANOVA of shoot length by plant type and time period revealed a highly significant two-way interaction as the shoot lengths diverged over time (Table 1). Shoot length was 1.7–5.2 times greater (over 2.5 times greater on average) for *Arundo* than for natives during all months sampled (Fig. 3b).

Arundo shoots grew at a much faster rate than native woody riparian plant species within the first year after fire (Fig. 4). The repeated measures

Table 1 Two-way ANOVA of plant abundance (% cover), density (stems m^{-2}), and shoot length (cm) by factors of plant type (*Arundo donax* and native plant species) and pre- and post-fire time periods

Factors and interactions	Plant abundance	Density	Shoot length
Plant type	$F_{(1,80)} = 59.123$; $P < 0.001$***	$F_{(1,852)} = 322.769$; $P < 0.001$***	$F_{(1,3231)} = 819.299$; $P < 0.001$***
Time period	$F_{(1,80)} = 15.166$; $P < 0.001$***	$F_{(5,852)} = 1.700$; $P = 0.132$	$F_{(8,3231)} = 442.074$; $P < 0.001$***
Plant type × time period	$F_{(1,80)} = 0.006$; $P = 0.937$	$F_{(5,852)} = 2.850$; $P = 0.015$*	$F_{(8,3231)} = 21.295$; $P < 0.001$***
r^2	0.626	0.287	0.591

* = $0.05 \geq P > 0.01$ = significant; ** = $0.01 \geq P > 0.001$ = highly significant; *** = $P \leq 0.001$ = very highly significant

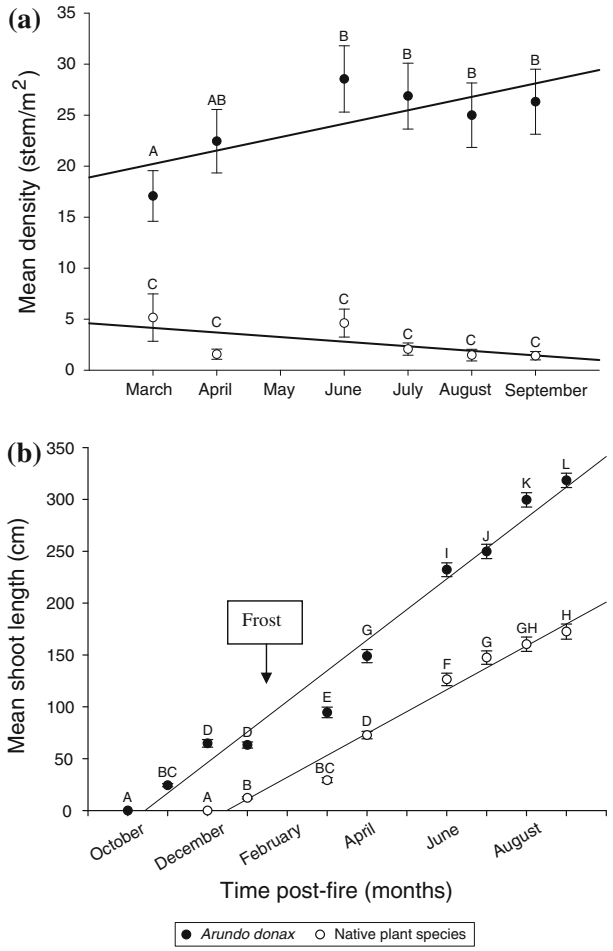

Fig. 3 Mean density (**a**) and shoot length (**b**) of *Arundo donax* versus native woody plants for 1 year after wildfire (October 2003–September 2004). *Regression lines* illustrate trends over time. *Letters* denote results of post-hoc hypothesis tests (comparison of means) with significance at $\alpha < 0.05$

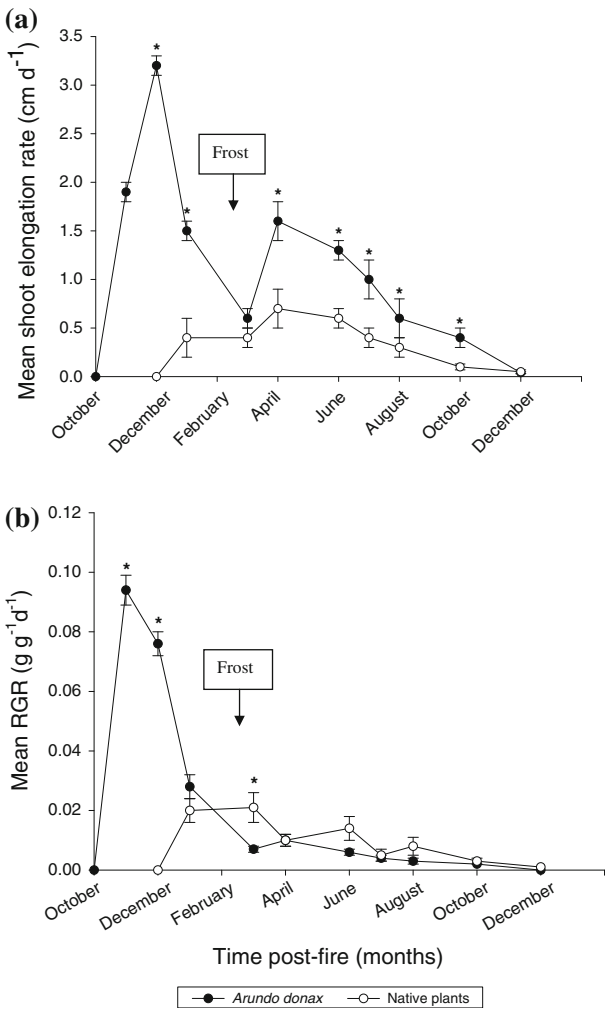

Fig. 4 Mean monthly shoot elongation rates (**a**) and relative growth rates (**b**) of *Arundo donax* compared to native woody plants for 1 year after wildfire (October 2003–September 2004). *Asterisks* denote significant differences in means between *Arundo donax* and native plants at each time period based on results of post-hoc hypothesis tests (comparison of means) with significance at $\alpha < 0.05$

ANOVA (time post-fire × plant type) for the shoot elongation rate revealed a significant main effect for time post-fire within subjects due to variation in rates for both *Arundo* and native plants (Table 2). *Arundo* emerged immediately after the fire, and the highest *Arundo* shoot elongation rates were observed in the first two months post-fire. Native woody species did not resprout until January 2004 and grew much more slowly than *Arundo*. Mean shoot elongation rates of *Arundo* were significantly higher than those of native woody species except in March and December. A series of heavy frosts occurred in late February 2004 (4 months post-fire) and appeared to have lowered *Arundo* shoot elongation rates substantially during the March sampling period. In April, shoot elongation rates for both *Arundo* and native woody species increased from winter levels, corresponding with warmer spring growing conditions. From April 2004 until the end of the year, elongation rates decreased for all plants, with *Arundo* maintaining higher rates (up to two times higher) than native species until December 2004.

In the repeated measures ANOVA (time post-fire × plant type), RGR varied significantly by plant type between subjects (individuals) and by time post-fire within subjects (Table 2). The mean RGR of *Arundo* was much greater initially than that of the native woody species (Fig. 4b). *Arundo*'s mean RGR was extremely high (0.094 ± 0.005 g $g^{-1}day^{-1}$)

Table 2 Repeated measures ANOVA with shoot elongation rate (cm day^{-1}) and relative growth rate (RGR; g g^{-1}day^{-1}) between time post-fire (months) as dependent variables and plant type (*Arundo donax* and native plant species) as the independent variable

Factors and interactions	Shoot elongation rate				RGR			
	df	MS	*F*	*P*	*df*	MS	*F*	*P*
Between subjects								
Plant type	1	0.228	0.614	0.440	1	0.001	16.026	<0.001***
Error	29	0.371			29	0.000		
Within subjects								
Time post-fire	6	4.559	17.071	<0.000***	6	0.001	5.983	0.001***
Time post-fire × plant type	6	0.128	0.480	0.728	6	0.000	1.796	0.158
Error	174	0.267			174	0.000		

immediately after the fire, whereas native plants did not emerge until the third month after the fire and then grew at a much more moderate rate. Mean RGR of native plants was higher than *Arundo* only during the spring, 5 months after the fire. While the heavy frosts in February 2004 appeared to curtail *Arundo* growth, they had little effect on the RGR of native plants. The mean RGR of both *Arundo* and native plants was very low at the end of the growing season from mid-summer (July) to winter (December).

Post-fire productivity

Approximately 1 year after the fire, *Arundo* productivity was significantly higher than that of any of the native species [$F_{(2,295)} = 43.291; P < 0.001$]. Productivity of *Arundo* (4.83 ± 0.34 kg m^{-2} year^{-1}) was 14 times higher than that of *B. salicifolia* (0.34 ± 0.06 kg m^{-2} year^{-1}) and 24 times higher than that of *S. laevigata* (0.20 ± 0.08 kg m^{-2} year^{-1}) in burned areas. Due to initial low abundance and significant mortality during the year, *S. exigua*, *S. lasiolepis*, and *P. balsamifera* subsp. *trichocarpa* were at such low densities in burned sites that their productivity was undetectable 1 year after the fire.

Soil nutrients

Mean pre- and post-fire soil nutrient levels surrounding *Arundo* differed significantly from levels found around native plants (Fig. 5; Table 3). Mean soil nutrient levels (NH_4-N, NO_3-N, and PO_4-P) adjacent to *Arundo* plants increased substantially after the study sites burned, but no significant differences in nutrient concentrations were observed between pre- and post-fire soil adjacent to native woody species. Concentrations of NH_4-N and PO_4-P in the soil next to *Arundo* versus native plant species were significantly higher post-fire.

Discussion

Several accounts have previously suggested that infestations of *Arundo* have increased fuel loads as well as fire frequency and intensity along riparian corridors (Robbins et al. 1951; Bell 1997; Scott 1994; D'Antonio 2000). Growing from 4 to 8 m in height and as fast as 10 cm day^{-1} (Perdue 1958; Hickman 1993), *Arundo* produces abundant flammable biomass that accumulates during the summer and fall months (Rundel 2000). Its ability to recover more rapidly than native plants after fire contributes to its invasion success, but no supporting quantitative evidence for this has been published to date. Several researchers have suggested that fire may increase the ability of *Arundo* to invade natural riparian systems (Rieger and Kreager 1989; Scott 1994; Bell 1997) and that it may be part of an invasive plant-fire regime cycle, changing riparian ecosystems from primarily flood-defined to fire-defined systems (Bell 1997).

Our study provides the first evidence that wildfire promotes invasion of riparian ecosystems by *Arundo*. Comparisons of post-fire *Arundo* and native plant performance demonstrated several physiological and morphological characteristics that give *Arundo* an advantage over native species after fire.

Three mechanisms—fire-adapted phenology, high growth rate, and growth response to nutrient enrichment—appear to promote the preemption of native

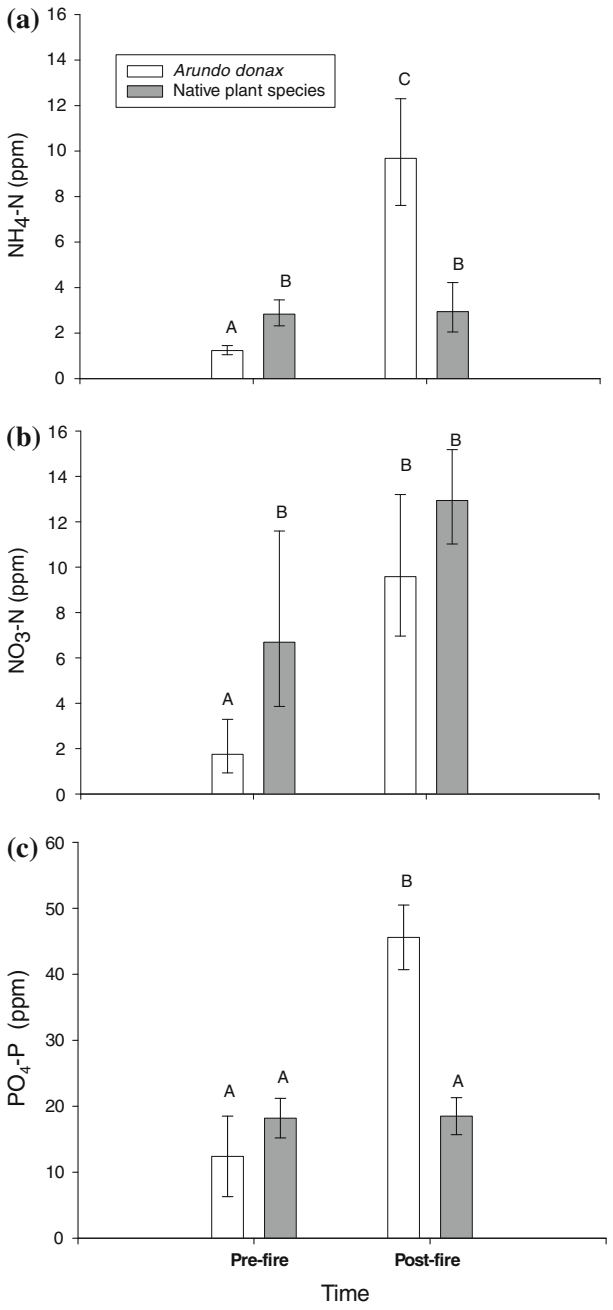

Fig. 5 Pre- and post-fire mean nutrient levels in soil adjacent to *Arundo donax* compared to soil next to native woody plants. *Letters* denote results of post-hoc hypothesis tests (comparison of means) with significance at $\alpha < 0.05$

woody riparian species by *Arundo* after fire. Fire stimulated *Arundo* regrowth almost immediately, as might be expected from a species with large below-ground carbohydrate reserves, whereas native woody riparian plant species recovered much more slowly after being burned. The evergreen phenology of *Arundo* clearly aids this invader in establishing resprouts following late fall or winter fires. Native riparian woody species measured in this study, *S. laevigata, S. lasiolepis*, *S. exigua*, *P. balsamifera* subsp. *trichocarpa*, and *B. salicifolia*, are all winter deciduous. Their growth and seedling establishment occur between late winter and early spring, corresponding with declining river flows (Stella et al. 2006) and increased temperatures. Decruyenaere and Holt (2005) found that *Arundo* exhibited no dormancy during the year in areas with high nitrogen levels, although recruitment of new shoots from rhizomes was higher in the summer than in winter months.

Arundo clearly expanded its dominance in our study area over the first year following the wildfire. It increased in relative abundance by almost 25% and comprised more than 99% of the vegetative cover in study sites only a year after fire. The large increase in relative biomass of *Arundo* 1 year after the fire compared to *Salix laevigata* and *Baccharis salicifolia* suggests that abundance of native riparian trees and shrubs might eventually be greatly reduced or excluded completely by *Arundo* in fire-prone riparian ecosystems. Observations of study sites taken in December 2009 indicate that native plant regeneration after the fire (less than 5% cover on average) has been greatly reduced due to *Arundo* dominance. Similar examples of post-fire competitive exclusion of native plant species by invasive grasses have been documented in many ecosystems in which fire is an unnatural or altered process (D'Antonio and Vitousek 1992; D'Antonio 2000; Brooks and Pyke 2001; Keeley 2006). The invasion of riparian forests by saltcedar has also exhibited a substantial effect on the composition and fire regime of riparian woodlands in the southwestern United States (Brothers 1984; Ellis 2000; Glenn and Nagler 2005; Nagler et al. 2005).

Large differences in pre- and post-fire soil nutrient levels post-fire may have stimulated and/or helped maintain high growth rates of *Arundo* following fire. Precipitation received within a few weeks of the fire mobilized nutrients, making them available for plant uptake. Both field and pot experiments have shown that *Arundo* responds positively to nutrient enrichment under non-burn conditions and may enhance competition with native plants under some conditions (Coffman 2007; Quinn et al. 2007). Levels of ammonia-N and orthophosphate in the soil surrounding *Arundo* were much higher in riparian study sites

Table 3 Two-way ANOVA of soil nutrients [ammonia-N (NH_4-N), nitrate–N (NO_3-N), and orthophosphate (PO_4-P)] by factors of plant type (*Arundo donax* and native plant species) and pre- and post-fire time periods

Factors and interactions	NH_4-N (ppm)[a]	NO_3-N (ppm)[a]	PO_4-P (ppm)
Plant type	$F_{(1,23)} = 1.120$; $P = 0.301$	$F_{(1,23)} = 2.160$; $P = 0.155$	$F_{(1,23)} = 4.511$; $P = 0.045$*
Time period	$F_{(1,23)} = 12.737$; $P = 0.002$**	$F_{(1,23)} = 5.037$; $P = 0.035$*	$F_{(1,23)} = 7.044$; $P = 0.014$*
Plant type × time period	$F_{(1,23)} = 12.753$; $P = 0.002$**	$F_{(1,23)} = 0.967$; $P = 0.336$	$F_{(1,23)} = 7.281$; $P = 0.013$*
Silt + clay[b]	$F_{(1,23)} = 5.245$; $P = 0.032$*	$F_{(1,23)} = 0.893$; $P = 0.354$	$F_{(1,23)} = 3.240$; $P = 0.085$
r^2	0.690	0.322	0.607

[a] Data ln transformed

[b] Soil grain size (% silt + clay) was used as a covariate

after the fire, whereas soil nutrient levels adjacent to native plants did not change. Higher post-fire soil nutrient levels found next to *Arundo* versus native plants were likely due to quality and quantity of fuel (vegetation) burned, fire intensity, and resulting ash deposited (Debano and Conrad 1978).

Riparian ecosystems invaded by *Arundo* adjacent to fire-prone shrublands in southern California appear to be on a trajectory toward a potential invasive plant-fire regime cycle (Brooks et al. 2004). Introduction of a tall clonal grass species such as *Arundo* into this riparian ecosystem has altered fuel types and loads (Scott 1994; Brooks et al. 2004). Decreased moisture content and increased surface-to-volume ratio of *Arundo* versus native vegetation may lead to altered or increased fire susceptibility or increased probability of ignition in these systems. Addition of this fuel to the riparian ecosystem has increased vertical continuity (i.e., the structure of fuel allows fire to spread from surface to crowns of shrubs and trees). Due to its tall growth form, infestations of *Arundo* mixed with native species may spread fire vertically into the canopy of riparian trees.

The October 2003 Simi/Verdale wildfire provides an excellent example of the invasive plant-fire regime cycle that *Arundo* invasion has created. The wildfire reached the Santa Clara River from the north, crossed the broad riverbed through large stands of *Arundo* (one of our permanent study sites), then burned through thousands of hectares of native shrublands and alien grasslands before again entering extensive riparian woodlands intermixed with *Arundo* to the west along the river (Fig. 1).

The results of this study have important implications for *Arundo* invasion in river systems in other regions of the world. Removal of *Arundo* from riparian ecosystems adjacent to fire-prone shrublands in arid climates should be a key management priority. Negative effects on other ecosystem functions, such as wildlife habitat reduction (Knick et al. 2005), generally follow fire regime changes (Brooks et al. 2004) and associated plant invasions (Herrera and Dudley 2003; Kisner 2004). The invasion of *Arundo* on riparian terraces adjacent to communities or agricultural fields and structures pose an increased risk of fire to people and property.

Post-fire removal of *Arundo* when aboveground biomass is still low helps to reduce future fire risk. However, time of year is critical to selection and success of appropriate removal techniques, and diligent maintenance is required to completely remove *Arundo* (Spencer et al. 2005; Coffman 2007). Active planting of removal areas with a diverse composition of native species may be required to prevent reinvasion by *Arundo* or other exotic species due to enhanced nutrient levels and openings in the canopy (Quinn and Holt 2008) in post-fire riparian ecosystems.

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Foreword >

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Invasive Plants of California's Wildland

Foreword

The heart of this book is the species accounts, which provide detailed information about the biology and control of seventy-eight non-native plant species that are listed as Exotic Invasive Plants of Greatest Ecological Concern as of 1996 by the California Exotic Pest Plant Council (Cal-IPC). We decided to cover only the species on this list because it is the best effort to date1 to determine which of the non-native plants already growing wild in California cause or have the potential to cause serious damage in the state's parks, preserves, and other wildlands. We are convinced that non-native invasive plants pose one of worst threats, perhaps the worst of all, to the state's remaining populations and communities of native species. We hope the information on the pages that follow will be used to help promote the survival and growth of native plants and animals threatened by these invaders.

Cal-IPC was established in 1992 in response to growing concern about invasive non-native plants in the state's wildlands. In 1994 Cal-IPC canvassed its members and other land managers and researchers around the state for information about non-native plants that invade California's preserves, parks, and other wildlands. This information was used to develop a list of Exotic Invasive Plants of Greatest Ecological Concern in California. The species were grouped into several categories to indicate how severe and/or widespread they are. List A-1 includes the most invasive and damaging species that are widespread in the state. List A-2 includes highly damaging species that are invasive in fewer than five of the geographic subdivisions designated in The Jepson Manual: Higher Plants of California. List B includes less invasive species that move into and degrade wildlands. The Red Alert List includes species whose ranges in California currently are small but that are believed to have the potential to spread explosively and become major pests. Species for which there was insufficient information to determine their ability to invade and degrade natural areas were placed on a Need More Information list and only a few for whom strong evidence is mounting are included in this book. As the list was being compiled and categorized it was reviewed, re-reviewed, and finally approved by a group of respected researchers. In 1996 the Cal-IPC list was updated based on new information and expanded to include a total of seventy-eight species.

We begin this book with a brief overview of the impacts of invasive plants and what we know about the characteristics of plant species most likely to invade and the habitats and communities most likely to be invaded. This is followed by a discussion of strategies and methods appropriate for the control of invasive plants in parks, preserves, and other wildlands. The remainder of the book consists of species accounts for seventy-eight invasive non-native species. Each account helps readers to identify the species and understand important aspects of its biology and lists specific control methods that are regarded as relatively effective, as well as some found to be ineffective.

[1] We acknowledge that several non-native invaders that have caused severe damage to wildlands in California are not on the 1996 edition of the list, as does Cal-IPC. As we write this Cal-IPC is preparing an updated version of the list, but it will not be ready in time for us to include newly listed species.

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Invasive Plants of California's Wildland

California Wildland Invasive Plants

John M. Randall and Marc C. Hoshovsky

The focus of this book is non-native plants that invade parks, preserves, and other wildlands in California, but our real concern is the survival and growth of the native plants and animals these invaders threaten. Unfortunately, some non-native invasive plant species inflict so much damage that, unless they are controlled, it will be impossible to preserve viable populations of many native species or many of the state's natural communities and ecosystems.

The good news is that many plant invasions can be halted or slowed, and, in certain situations, even badly infested areas can be restored to relatively healthy communities dominated by native species. Weed control and restoration are now widely regarded as necessary in many wildlands across the state and around the world. We hope this book will help land managers, volunteer stewards, and others to recognize some of California's most damaging wildland in vad ers, to better understand their impacts, and to minimize the damage they do to native biological diversity.

Invasive species are now widely recognized worldwide as posing threats to biological diversity second only to direct habitat loss and fragmentation (Pimm and Gilpin 1989, Scott and Wilcove 1998). In fact, when biological invasion by all types of organisms is considered as a single phenomenon, it is clear that to date it has had greater impacts on the world's biota than have more notorious aspects of global environmental change such as rising CO2 concentrations, climate change, and decreasing stratospheric ozone levels (Vitousek et al. 1996). Compared to other threats to biological diversity, invasive non-native plants present a complex problem that is difficult to manage and has long-lasting effects. Even when exotics are no longer actively introduced, these plants continue to spread and invade new areas. Effective control will require awareness and active participation of the public as well as natural resource managers and specialists.

California's invasive plant problems are widespread and severe. The state's varied topography, geology, and climates have helped to give rise to the state's extraordinary native biological diversity and high levels of endemism. However, these varied conditions also provide suitable habitat for a wide variety of non-native plant species, many of which have readily established and rapidly spread in the state. Fewer than ten percent of the 1,045 non-native plant species that have established in California are recognized as serious threats (Randall et al. 1998), but these have dramatically changed California's ecological landscape. They alter ecosystem functions such as nutrient cycles, hydrology, and wildfire frequency, outcompete and exclude native plants and animals, harbor dangerous animal invaders, and hybridize with native species. Some spread into national parks, preserves, and other wildlands and reduce or eliminate the species and communities these sites were set aside to protect.

Rare species appear to be particularly vulnerable to the changes wrought by non-native invaders. For example, the California Natural Diversity Database indicates that 181 of the state's rare plant species are experiencing threats from invasive weeds (California Department of Fish and Game, Natural Heritage Division). Habitats for rare animals such as the San Clemente sage sparrow and the Palos Verde blue butterfly are also being invaded. Even more common species could be driven to rarity or near extinction by particularly disruptive invaders, as evidenced by the fate of the American chestnut (Castanea dentata) in the eastern hardwood forest following introduction of chestnut blight, Cryphonectria parasitica (National Academy of Science 1975).

IMPACTS OF INVASIVE PLANTS ON WILDLANDS

Non-native plant invasions can have a variety of effects on wildlands, including alteration of ecosystem processes; displacement of native species; support of non-na tive animals, fungi, or microbes; and alteration of gene pools through hybridization with native species.

Ecosystem Effects

The invasive species that cause the greatest damage are those that alter ecosystem processes such as nutrient cycling, intensity and frequency of fire, hydrological cycles, sediment deposition, and erosion (D'Antonio and Vitousek 1992, Vitousek 1986, Vitousek and Walker 1989, Vitousek et al. 1987, Whisenant 1990). These invaders change the rules of the game of survival and growth, placing many native species at a severe disadvantage (Vitousek et al. 1996). Cheat grass (Bromus tectorum) is a well studied example of an invader that has altered ecosystem processes. This annual grass has invaded millions of acres of rangeland in the Great Basin, leading to widespread increases in fire frequency from once every sixty to 110 years to once every three to five years (Billings 1990, Whisenant 1990). Native shrubs do not recover well from more frequent fires and have been eliminated or reduced to minor components in many of these areas (Mack 1981).

Some invaders alter soil chemistry, making it difficult for native species to survive and reproduce. For example, iceplant (Mesembryanthemum crystallinum) accumulates large quantities of salt, which is released after the plant dies. The increased salinity prevents native vegetation from reestablishing (Vivrette and Muller 1977, Kloot 1983). Scotch broom (Cytisus scoparius) and gorse (Ulex europaea) can increase the content of nitrogen in soil. Although this increases soil fertility and overall plant growth, it gives a competitive advantage to non-native species that thrive in nitrogen-rich soil. Researchers have found that the nitrogen-fixing firetree (Myrica faya) increases soil fertility and consequently alters succession in Hawaii (Vitousek and Walker 1989).

Wetland and riparian invaders can alter hydrology and sedimentation rates. Tamarisks (Tamarix chinensis, T. ramosissima, T. pentandra, T. parviflora) invade wetland and riparian areas in southern and central California and throughout the Southwest, and are believed to be responsible for lowering water tables at some sites. This may reduce or eliminate surface water habitats that native plants and animals need to survive (Brotherson and Field 1987, Neill 1983). For example, tamarisk invaded Eagle Borax Spring in Death Valley in the 1930s or 1940s. By the late 1960s the large marsh had dried up, with no visible surface water. When managers removed tamarisk from the site, surface water reappeared, and the spring and its associated plants and animals recovered (Neill 1983). Tamarisk infestations also can trap more sediment than stands of native vegetation and thus alter the shape, carrying capacity, and flooding cycle of rivers, streams, and washes (Blackburn et al. 1982). Interestingly, the only species of Tamarix established in California that is not generally regarded as invasive (athel, or T. aphylla) is regarded as a major riparian invader in arid central Australia.

Other wetland and riparian invaders and a variety of beach and dune invaders dramatically alter rates of sedimentation and erosion. One example is saltmarsh cordgrass (Spartina alterniflora), native to the Atlantic and Gulf coasts and introduced to the Pacific Coast, where it invades intertidal habitats. Sedimentation rates may increase dramatically in infested areas, while nearby mudflats deprived of sediment erode and become areas of open water (Sayce 1988). The net result is a sharp reduction in open intertidal areas where many migrant and resident waterfowl feed.

Coastal dunes along the Pacific Coast from central California to British Columbia have been invaded and altered by European beachgrass (Ammophila arenaria). Dunes in infested areas are generally steeper and oriented roughly parallel to the coast rather than nearly perpendicular to it as they are in areas dominated by Leymus mollis, L. pacificus, and other natives (Barbour and Johnson 1988). European beachgrass eliminates habitats for rare native species such as Antioch Dunes evening-primrose (Oenothera deltoides ssp. howellii) and Menzies' wallflower (Erysimum menziesii ssp. menziesii). Species richness on foredunes dominated by European beachgrass may be half that on adjacent dunes dominated by Leymus species (Barbour et al. 1976). Changes in the shape and orientation of the dunes also alter the hydrology and microclimate of the swales and other habitats behind the dunes, affecting species in these areas.

Some upland invaders also alter erosion rates. For example, runoff and sediment yield under simulated rainfall were fifty-six percent and 192 percent higher on plots in western Montana dominated by spotted knapweed (Centaurea maculosa) than on plots dominated by native bunchgrasses (Lacey et al 1989). This species is already established in northern California and the southern Peninsular Range and recently was found on an inholding within Yosemite National Park (Hrusa pers. comm.).

Some invasive plants completely alter the structure of the vegetation they invade. For example, the punk tree (Melaleuca quinquenervia) invades marshes in southern Florida's Everglades that are dominated by sedges, grasses, and other herbaceous species, rapidly converting them to swamp forest with little or no herbaceous understory (LaRoche 1994, Schmitz et al. 1997). Such wholesale changes in community structure may be expected to be followed by changes in ecosystem function.

HABITAT DOMINANCE AND DISPLACEMENT OF NATIVE SPECIES

Invaders that move into and dominate habitats without obviously altering ecosystem properties can nevertheless cause grave damage. They may outcompete native species, suppress native species recruitment, alter community structure, degrade or eliminate habitat for native animals, and provide food and cover for undesirable non-native animals. For example, edible fig (Ficus carica) is invading riparian forests in the Central Valley and surrounding foothills and can become a canopy dominant. Invasive vines are troublesome in forested areas across the continent. In California, cape ivy (Delairea odorata) blankets riparian forests along the coast from San Diego north to the Oregon border (Elliott 1994).

Non-native sub-canopy trees and shrubs invade forest understories, particularly in the Sierra Nevada and Coast Ranges. Scotch broom (Cytisus scoparius), French broom (Genista monspessulana), and gorse (Ulex europaea) are especially troublesome invaders of forests and adjacent openings and of coastal grasslands (Bossard 1991a, Mountjoy 1979). Herbaceous species can colonize and dominate grasslands or the ground layer in forests. Eupatory (Ageratina adenophora) invades and dominates riparian forest understories along California's southern and central coast. Impacts of these ground-layer invaders have not been well studied, but it is suspected that they displace native herbs and perhaps suppress recruitment of trees.

Annual grasses and forbs native to the Mediterranean region have replaced most of California's native grasslands. Invasion by these species was so rapid and complete that we do not know what the dominant native species were on vast areas of bunchgrasses in the Central Valley and other valleys and foothills

around the state. The invasion continues today as medusa-head (Taeniatherum caput-medusae) and yellow starthistle (Centaurea solstitialis) spread to sites already dominated by other non-natives. Yellow starthistle is an annual that produces large numbers of seeds and grows rapidly as a seedling. It is favored by soil disturbance, but invades areas that show no sign of being disturbed by humans or livestock for years and has colonized several relatively pristine preserves in California, Oregon, and Idaho (Randall 1996b).

In some situations invasive, non-native weeds can prevent reestablishment of na tive species following natural or human-caused disturbance, altering natural suc ces sion. Ryegrass (Lolium multiflorum), which is used to reseed burned areas in southern California, interferes with herb establishment (Keeley et al. 1981) and, at least in the short term, with chaparral recovery (Schultz et al. 1955, Gautier 1982, Zedler et al. 1983).

Hybridization with Native Species

Some non-native plants hybridize with natives and could, in time, effectively eliminate native genotypes. The non-native Spartina alterniflora hybridizes with the native S. foliosa where they occur together. In some Spartina populations in salt marshes around south San Francisco Bay, all individual plants tested had non-native genes (Ayres et al. in press).

Promotion of Non-Native Animals

Many non-native plants facilitate invasions by non-native animals and vice versa. Myrica faya invasions of volcanic soils in Hawaii promote populations of non-native earthworms, which increase rates of nitrogen burial and accentuate the impacts these nitrogen-fixing trees have on soil nutrient cycles (Aplet 1990). M. faya is aided by the non-native bird, Japanese white-eye (Zosterops japonica), perhaps the most active of the many native and non-native species that consume its fruits and disperse its seeds to intact forest (Vitousek and Walker 1989).

EARLY INVASIONS BY NON-NATIVE PLANTS

The first recorded visit by European explorers to the territory now called California occurred in 1524, but people of Old World ancestry did not begin to settle here until 1769. Available evidence indicates that the vast majority of non-native plants now established in California were introduced after this time. There is compelling evidence that red-stem filaree (Erodium cicutarium), and perhaps a few other species, may have established even earlier, perhaps after being carried to the territory by roaming animals or by way of trading networks that connected Indian communities to Spanish settlements in Mexico (Hendry 1931, Hendry and Kelley 1925, Mensing and Byrne 1998). Once settlers began to arrive, they brought non-native plants accidentally in ship ballast and as contaminants of grain shipments and intentionally for food, fiber, medicine, and ornamental uses (Frenkel 1970, Gerlach 1998).

The number of non-native species established in California rose from sixteen during the period of Spanish colonization (1769-1824) to seventy-nine during the period of Mexican occupation (1825-1848) to 134 by 1860 following American pioneer settlement (Frenkel 1970). Jepson's A Manual of the Flowering Plants of California (1925), the first comprehensive flora covering the entire state, recognized 292 established non-native species. Rejmnek and Randall (1994) accounted for taxonomic inconsistencies between the 1993 Jepson Manual and earlier floras and found that Munz and Keck's 1959 A Flora of California included 725 non-native plants species and their 1968 A California Flora and Supplement included 975. The 1993 Jepson Manual recorded 1,023 non-natives, and subseqent reports in the literature have brought the number up

to 1,045 (Randall et al. 1998). Rejmnek and Randall (1994) remarked that, although non-native species continue to establish in California, the rate of increase in their number appears to be slowing after roughly 150 years of rapid growth.

Most non-native plants introduced to California in earlier times first established at coastal sites near ports and around missions and other settlements. In recent times, first reports of new non-native species have come from every major geographic subdivision of the state (Rejmnek and Randall 1994). Apparently, the great speed and reach of modern transportation systems and the increasing global trade in plants and other commodities have enabled non-natives to spread to sites throughout the state. A variety of human activities continue to introduce new species to California and to spread those that have established populations in only a few areas. For example, land managers still introduce non-native species to control erosion or provide forage for livestock. New ornamental plants and seeds are imported and sold. Movement of bulk commodities such as gravel, roadfill, feed grain, straw, and mulch transport invasive plant propagules from infested to uninfested areas (OTA 1993). The rate of spread is often alarming. For example, within California, yellow starthistle has expanded its range at an exponential rate since the late 1950s, increasing from 1.2 to 7.9 million acres by 1991 (Maddox et al. 1996, Thomsen et al. 1993).

Problems caused by invasive plants in California were recognized by Frederick Law Olmsted in 1865 in a report he filed on the newly set-aside Yosemite Valley, noting that, unless actions were taken, its vegetation likely would be diminished by common weeds from Europe. The report pointed out that this had already happened in large districts of the Atlantic States. Botanists and other students of natural history noted the establishment of non-native species in the state in published papers, and by the 1930s natural area managers in Yosemite and scattered parks and preserves around the state began controlling invading non-native species that were recognized as agricultural pests (Randall 1991). The issue was brought into mainstream ecology in the late 1950s with the publication of Charles Elton's book, The Ecology of Invasions by Animals and Plants (1958). Concern and interest among both land managers and researchers have grown since that time, particularly since the mid-1980s.

SPECIES MOST LIKELY TO BE INVASIVE

Many people have wondered if certain traits distinguish species that become invasive. Despite a great deal of study, no single answer presents itself, and researchers have been surprised by the success of some species and the failure of others. Studies conducted in 1980 in central California on Peruvian pepper (Schinus molle) and its close relative Brazilian pepper (Schinus terebinthifolius) failed to determine why the former was spreading in California (Nilsen and Muller 1980a, 1980b). Instead the studies suggested Brazilian pepper was the more invasive species. Recently, Brazilian pepper has been found to be invasive in southern California, so perhaps studies of this type do have some predictive power.

Despite these puzzling cases, recent work has pointed to several factors that may help to predict which species are likely to be invasive. In two studies the best predictor was whether a species was invasive elsewhere (Panetta 1993, Reichard and Hamilton 1997). For example, if a species native to Spain is invasive in Western Australia, it is likely to be invasive in California and South Africa as well. Rejmnek and Richardson (1996) analyzed characteristics of twenty species of pines and found that the invasive species were those that produce many small seeds and that begin reproducing within their first few years. When they extended the analysis to a group of flowering trees, these same characters usually discriminated between invasive and non-invasive species. This study and several others also found plants with animal-dispersed seeds, such as bush honeysuckles or ligustrums, are much more likely to be invasive in forested communities (Reichard 1997, Reichard and Hamilton 1997). It has also been suggested that species capable of reproducing both by seed and by vegetative growth have a better chance of spreading in a new land (Reichard 1997).

Self-compatible species, with individuals that can fertilize themselves, have been thought more likely to invade, since a single plant of this type could initiate an invasion (Baker 1965). However, many self-incompatible species are successful invaders, including some with male and female flowers on separate plants. It is also thought that plants dependent on one or a few other species for pollination, fruit dispersal, or the uptake of nutrients from the soil are less likely to invade new areas unless these organisms are introduced at the same time. As a group, figs may be relatively poor invaders because, with few exceptions, each species is pollinated by a distinctive species of wasp that is in turn dependent on that species of fig. However, the edible fig's pollinator was introduced to promote fruit production, and now the species is invasive in parts of California. Other plant invasions may be promoted by introduced animals as well. For example, honeybees boost seed production of invaders whose flowers they favor (Barthell pers. comm.). In Hawaii feral pigs promote the spread of banana poka (Passiflora mollissima) and other species by feeding voraciously on their fruits and distributing them in their scat, often in soil they have disturbed while rooting for food.

It has also been suggested that species with relatively low DNA contents in their cell nuclei are more likely to be invasive in disturbed habitats (Rejmnek 1996). Under certain conditions, cells with low DNA contents can divide and multiply more quickly, and consequently these plants grow more rapidly than species with higher cellular DNA content. Plants that germinate and grow rapidly can quickly occupy such areas and exclude other plants following disturbance.

It is generally agreed that a species is most likely to invade an area with a climate similar to that of its native range, but some non-native species now thrive in novel conditions. An analysis of the distribution of non-native herbs of the sunflower and grass families in North America indicated that species with a larger native range in Europe and Asia are more likely to become established and to have a larger range here than species with small native ranges (Rejmnek 1995). It is thought that species with large native ranges are adapted to a variety of climate and soil conditions and are more likely to find suitable habitat in a new area. This ability to cope with different conditions can be attributed in part to genetic plasticity (genetic differences among individuals of a species) or to phenotypic plasticity (the ability of any given individual of some species to cope with a variety of conditions). Another factor that may help to determine whether a plant will invade a site is whether it is closely related to a native species (e.g., in the same genus). Plants without close relatives appear more likely to become established (Rejmnek 1996).

A species may be more likely to become established if many individuals are introduced at once or if they are introduced repeatedly. Introductions of many individuals may help to ensure that they will mate and produce offspring and that there will be sufficient genetic variability in the population for the species to cope with a wider variety of conditions. In addition, if sites where the species can successfully germinate and grow are limited in number, the chance that at least one seed scattered at random will land on an appropriate site increases with the number of seeds dispersed. Chance may be important in other ways. For example, species that happen to be introduced at the beginning of a drought may be doomed to fail, although they might easily establish following a return to normal rainfall. An early introduction may by chance include no individuals with the genetic makeup to thrive in an area, while a later introduction may include several.

There is often a time lag of many decades between the first introduction of a plant and its rapid spread. In fact, some species that rarely spread today may turn out to be troublesome forty, fifty, or more years from now. This makes it all the more urgent that we find some way of determining which species are most likely to become invasive so that we can control them while their populations are still small.

HABITATS AND COMMUNITIES MOST LIKELY TO BE INVADED

Another question that has long intrigued ecologists is why some areas appear more prone to invasion than others. Again, many hypotheses have been advanced, but we have few solid answers. There is even some question about which areas have suffered the highest numbers of invasions, since this may differ depending on the type of organism considered and which species are regarded as firmly established. A given area may be highly susceptible to invasion by one type of organism and highly resistant to another, while the situation might be reversed in other areas.

It is generally agreed that areas where the vegetation and soil have been disturbed by humans or domestic animals are more susceptible to invasion. In North America disturbed sites are commonly invaded by species native to the Mediterranean region and the fertile crescent of the Old World where the plants had millennia to adapt to agricultural disturbances. Changes in stream flows, the frequency of wildfires, or other environmental factors caused by dam building, firefighting, and other human activities may also hinder survival of native plants and promote invasion by non-natives. Nonetheless, reserves and protected areas are not safe from exotic species. In a 1996 poll, sixty-one percent of National Park Service supervisors throughout the United States reported that non-native plant invasions are moderate to major problems within their parks. In more than half (fifty-nine percent) of The Nature Conservancy's 1,500 preserves exotic plants are considered one of the most important management problems (TNC 1996a, 1997).

It is also safe to say that remote islands in temperate and tropical areas appear to be highly susceptible to invasions by non-native plants and animals. For example, nearly half (forty-nine percent) of the flowering plant species found in the wild in Hawaii are non-native as are twenty-five percent of plants on California's Santa Cruz Island (Junak et al. 1995). Most remote islands had no large native herbivores, so pigs, cattle, sheep, and other grazers introduced by humans found the native plants unprotected by spines or foul-tasting chemicals. Introduced grazers often denuded large areas of native vegetation, leaving them open to colonization by introduced species adapted to grazing. There is also speculation that islands, peninsulas such as southern Florida, and other areas with low numbers of native species or without any representative or distinctive groups are more prone to invasion. For example, there are no rapidly growing woody vines native to the Hawaiian Islands, where several introduced vines have become pests. Some researchers theorize that where such gaps exist, certain resources are used inefficiently if at all. Such open niches are vulnerable to invasion by non-native species capable of exploiting these resources. Other researchers reject this concept, maintaining that open niches are impossible to identify in advance and that when new species move in they do not slip into unoccupied slots but instead use resources that would have been used by organisms already present.

History likely also plays a large role in determining the susceptibility of a site to invasion. Busy seaports, railroad terminals, and military supply depots are exposed to multiple introductions. People from some cultures are more likely to introduce plants from their homelands when they migrate to new regions. In fact, colonization of much of the Americas, Australia, and other areas of the world by western Europeans and the plants and animals from their homelands may go hand in hand, the success of one species promoting the success of others. European colonists were followed, sometimes preceded, by animals and plants with which they were familiar and that they knew how to exploit. The plants and animals benefited in turn when these people cleared native vegetation and plowed the soil.

DEFINITIONS OF TERMS USED IN THIS BOOK

Native plants are those growing within their natural range and dispersal potential. They are species or subspecies that are within the range they could occupy without direct or indirect introduction and/or care by humans. Most species can be easily classed as either native or non-native using this definition, but

there are some gray areas. Natural ranges should not be confused with political or administrative boundaries. Bush lupine (Lupinus arboreus), for example, may be thought of as a California native, but its native range is only along the central and southern coasts of the state. It is not native along the north coast, where it was intentionally planted outside its natural range (Miller 1988, Pickart this volume). All hybrids between introduced or domesticated species and native species are also non-native.

Non-native plants are those species growing beyond their natural range or natural zone of potential dispersal, including all domesticated and feral species and all hybrids involving at least one non-native parent species. Other terms that are often used as synonyms for non-native include alien, exotic, introduced, adventive, non-indigenous, non-aboriginal, and naturalized. With rare exceptions, conservation programs are dedicated to the preservation of native species and communities. The addition of non-native species rarely contributes positively to this unless these plants alter the environment in ways that favor native species as do some grazers and biological control agents.

Natural areas are lands and waters set aside specifically to protect and preserve undomesticated organisms, biological communities, and/or ecosystems. Examples include most national parks, state and federally designated wilderness areas, and preserves held by private organizations such as The Nature Conservancy and the National Audubon Society.

Wildlands include natural areas and other lands managed at least in part to promote game and/or non-game animals or populations of native plants and other organisms. Examples include federal wildlife refuges, some national and state forests, portions of Bureau of Land Management holdings, including some areas used for grazing, and some lands held by private landowners.

Pest plant and weed are used interchangeably in this book to refer to species, populations, and individual plants that are unwanted because they interfere with management goals and objectives. Plants regarded as pests in some wildlands may not be troublesome elsewhere. For example, the empress tree (Paulownia tomentosa) is a pest in deciduous forests of the eastern United States, particularly in the southern Appalachians, but it is not known to escape from cultivation in California, where it is used as an ornamental landscape tree. Some species that are troublesome in agricultural or urban areas rarely, if ever, become wildland weeds. The term environmental weeds is used by many Australians (Groves 1991, Humphries et al. 1991b) to refer to wildland weeds, but few North American land managers or researchers use this term.

Invasive species are those that spread into areas where they are not native, according to Rejmnek (1995), while other authors define as invasives only species that displace natives or bring about changes in species composition, community structure, or ecosystem function (Cronk and Fuller 1995, White et al. 1993). Most wildland weeds are both invasive and non-native, but not all non-native plants are invasive. In fact, only a small minority of the thousands of species introduced to California have escaped cultivation, and a minority of those that have escaped spread into wildlands.

Management of Invasive Species >

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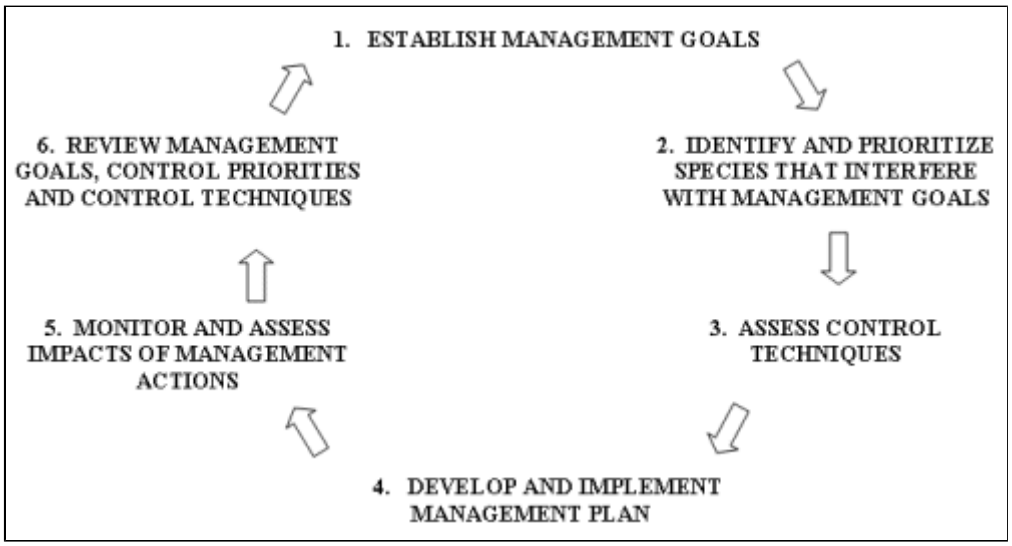
Invasive Plants of California's Wildland

Management of Invasive Species

Marc C. Hoshovsk and John M. Randall

Before embarking on a weed management program, it is important to develop a straightfor-ward rationale for the actions you plan to take. We believe this is best accomplished using an adaptive management approach as follows: (1) establish management goals and objectives for the site; (2) determine which plant species or populations, if any, block or have potential to block attainment of management goals and objectives; (3) determine which methods are available to control the weed(s); (4) develop and implement a management plan designed to move conditions toward management goals and objectives; (5) monitor and assess the impacts of management actions in terms of effectiveness in moving toward goals and objectives; and (6) reevaluate, modify, and start the cycle again (Figure 1). Note that control activities are not begun until the first three steps have been taken.



It is vital to establish management goals before embarking on any management activities. What is it you want to protect or manage? Is your objective to protect or enhance a certain species or community, preserve a vignette of pre-Columbian America, preserve certain ecosystem attributes, or preserve a functioning ecosystem? A weed control program is best viewed as part of an overall restoration program, so focus on what you want in place of the weed, rather than simply eliminating the weed. Keep in mind that the ultimate purpose of a weed control program is to further the goal of preserving a species, community, or functioning ecosystem.

In many cases it will be easy to identify species that degrade the site or threaten to do so. If impacts of a

species are not clear, you may need to monitor its abundance and effects on the natural community. Set priorities to minimize your total, long-term workload. This often means assigning highest priority to preventing new invasions and to quickly detecting and eliminating any new invasions that occur. High priority should also be assigned to the species with the most damaging impacts, to infestations that are expanding rapidly, and to infestations that affect highly valued areas of the site. Also consider the difficulty of control. It is of little use to spend time and resources to attack an infestation you have little hope of controlling.

Consider all control options available: manual, mechanical, encouraging competition from native plants, grazing, biocontrol, herbicides, prescribed fire, solarization, flooding, and other, more novel techniques. Each of these methods has advantages and disadvantages, and often the best approach is to use a combination of methods. Frequently, one or more methods will not be appropriate for a given situation because they do not work well, their use is objectionable to people in the area, or they are too costly. Herbicides may kill important non-target plants. Mechanical methods often disturb soil and destroy vegetation, providing ideal conditions for establishment of weedy species. It will often be best to employ two or more methods. For example, cutting and herbicides or prescribed fire and herbicides have been used successfully in combination in many weed control programs.

Biological control can be an extremely selective control tool, but there is some risk that control agents may attack desirable species. The best known example of a biocontrol agent attacking desirable species is that of Rhinocyllus conicus, a beetle first released to control non-native thistles in North America in the 1960s that was recently found attacking native thistles and reducing their populations at some sites (Louda et al. 1997).

Some native animals use invasive non-native species for food and cover and may have difficulty finding replacements if infestations are removed and not replaced with non-invasive native or introduced species. For example, huge numbers of monarch butterflies (Danaus plexippus) roost in some groves of Eucalyptus globulus in coastal California. In addition, elimination of plants in a natural area can be alarming to some people, particularly when herbicides are used, so it is important to explain the threats posed by the pest and the reasons why you chose the methods you did.

There is much room for improvement in control methods for many of the species described in this book. Readers may want to experiment with methods that may more effectively and efficiently control these invaders and promote native species.

The Bradley Method is a sensible approach to weed management (Bradley 1988, Fuller and Barbe 1985). In this approach, weed control is begun in portions of the site with the best stands of desirable native vegetation (those with few weeds) and proceeds slowly to areas with progressively worse weed infestations. This is similar to Moody and Mack's (1988) advice to attack outlying satellite weed populations first rather than larger, denser source populations. They based this advice on modeling work that indicated that the rate of spread of small satellite poplations is generally significantly higher than that of older, larger populations and that containing or eliminating the outliers saves time and effort in the long run. The Bradley Method dictates that the area under control should expand at a rate that allows previously treated areas to be monitored and kept in satisfactory condition. It also advocates the use of techniques that minimize damage to native plants and disturbance to the soil so that the natives can thrive and defend against reinvasion. This approach is particularly promising for small preserves or sites with access to large pools of volunteer labor. More detailed information on the Bradley Method is contained in Fuller and Barbe (1985).

PREVENTION

The most effective and efficient weed control strategies are preventing invasions by new plants species and quickly detecting invasions that occur so weeds can be eradicated or contained before they spread. The California Department of Food and Agriculture (CDFA) has long recognized this, and the state's Noxious Weed List gives highest priority to species that either are not yet established in the state or whose populations are not yet widespread. The state's native species will be better protected if new invaders are detected quickly and word of their discovery is communicated to those who can take action to prevent their spread, such as the staff at the CDFA Control and Eradication Branch or Plant Pest Diagnostics Branch.

There are already at least 1,045 non-native plant species established in California (Randall et al.1998), and more continue to arrive and become established. If allowed to spread, some of these new species could impact native species and communities as severely as yellow starthistle and tamarisk do now. Preventing or stopping just one new invasive weed would be of greater conservation benefit in the long run than far more costly and difficult efforts to control an already widespread pest.

Taking precautions in normal resource management activities can halt or slow the establishment and spread of weeds in a given area. Wise precautions include: removing seed sources from roads, trails, rights-of-way, watercourses, and other dispersal routes; closing unnecessary roads and trails where possible; planning work projects to minimize soil disturbance and reestablish vegetation as quickly as possible where disturbance does occur; limiting the use of construction materials such as gravel, fill, mulch, straw, and seed mixes that may carry weeds or buying from suppliers who guarantee their products are weed-free; washing vehicles and equipment to remove weed seeds and other propagules before they are used in another area; follow-up monitoring of work sites to detect new weed populations while they are still small and easily controlled; and public education and outreach regarding the importance of weed detection and prevention of invasion.

ERADICATION

Eradication is the complete elimination of a species from a given area. The great appeal of eradicating a weed is, of course, that once the project achieves success no more work is required and the species cannot spread unless it is re-introduced. Unfortunately, it is rarely possible to eradicate an established weed from a large area. In fact, the history of CDFA's eradication projects indicates that there is little likelihood of eradicating a species from California once it has spread to a few tens of acres in the state.

It may be possible to eradicate a weed from a given area, such as a preserve or national park if it has not yet become widespread there, but it is likely to re-invade from adjacent lands unless there is some barrier that will prevent it from doing so. Eradication is most likely when the species has just begun to establish in a new area, which underscores the importance of efforts to detect new invaders at national, state, and local levels.

PHYSICAL CONTROL

Physical methods of weed control generally are labor intensive and often are used for small populations or where other control methods are inappropriate, such as near sensitive water supplies. Nonetheless, physical methods have been used successfully by volunteer groups and paid workers to control weed infestations on several large sites in California (e.g., Pickart and Sawyer 1998). Physical methods can be highly selective, targeting only the pest species, but they can also disturb the soil or damage nearby vegetation, thereby promoting germination and establishment of weedy species. Physical control methods may also produce large amounts of debris, disposal of which is sometimes difficult.

Physical control methods range from manual hand pulling of weeds to the use of hand and power tools to uproot, girdle, or cut plants. Two companies produce tools specifically for pulling shrubs such as scotch broom, tamarisk, and Russian olive. The Weed Wrench (see Resources section) and the Root Jack (see Resources section) are lever arms with a pincher or clamp at the bottom that grips the plant stem. Once the stem is secured, the user leans back, tightening the clamp in the process. After a little rocking, the entire plant comes up, roots included (Hanson 1996). Other tools for weed control, including girdling knives, axes, machetes, loppers, clippers, chainsaws, and brush cutters, are available from hardware stores and gardening and forestry supply companies. Various attachments are available for bulldozers and tractors to clear and uproot woody plants. Brush rakes or blades may be mounted on the front of the bulldozer, and brushland disks or root plows may be pulled behind. Mowing can prevent seed formation on tall annual and perennial weeds and deplete food reserves of shoots and roots. Unfortunately, repeated mowing can favor low-growing weeds or damage desirable native species (Ashton and Monaco 1991).

Prescribed Fire

Fire can be an effective means of reducing weed infestations, particularly for shrub by weeds and in native communities that evolved with fire. Fire may sometimes be the only element necessary to give native species a chance to recover. Fire may also be used to eliminate old vegetation and litter in areas infested with perennial herbs such as fennel (Foeniculum vulgare) or leafy spurge (Euphorbia esula) prior to treating the area with herbicide. This allows more herbicide to reach the living leaves and stems of target plants, potentially enhancing its effectiveness. Fire can also be used to induce seeds of some species to germinate so the seedbank can be flushed and the resulting seedlings can then be killed with another fire or some other method (e.g., Bossard 1993).

Conducting a prescribed burn is not a simple or risk-free operation. Managers considering prescribed burning should be trained and certified and should work close ly with the local office of the California Department of Forestry and Fire Protection to ensure safe, effective, and legal burns. Good logistical planning, coordination of work teams, careful timing with respect to weather (winds, moisture conditions), co or di na tion with air quality agencies, and attention to other details are required to carry out an effective and safe burn. In most parts of California it is necessary to address air quality concerns and to obtain permission from the regional air quality board. Escaped fires are costly and can be disastrous.

Prescribed fires may promote certain invasive, non-native species, and so should be used with caution. Non-native annual and biennial species, such as cheat grass (Bromus tectorum) and bull thistle (Cirsium vulgare), are most likely to be favored in the years immediately following a burn and in repeatedly burned areas. Hot fires can also sterilize the soil, volatilizing important nutrients and killing microorganisms on which native plants rely. Removal of vegetation by fire can also increase soil erosion and stream sedimentation. Construction of firebreaks and associated soil disturbance can increase erosion and provide a seedbed for invasive weeds.

Blowtorches and flamethrowers can also be used to burn individual plants or small areas. This method has been used with some success on thistles in several areas. Flamethrowers have also been used to heat-girdle the lower stems of shrubs such as scotch broom (Cytisus scoparius). This technique has the advantages of being less costly than basal and stem herbicide treatments and suitable for use during wet weather. On the other hand, it is time-consuming and not viable in areas where wildfire is a danger.

Flooding and Draining

Prolonged flooding can kill plants that infest impoundments, irrigated pastures, or other areas where water

levels can be controlled. This method may be even more effective if plants are mowed or burned before flooding. Spotted knapweed (Centaurea maculosa) is sensitive to flood ing, and its populations can be reduced by flood irrigation in pastures. Flooding may also help to control non-natives by promoting the growth and competitive ability of certain native species in some situations. Unfortunately, flood ing will not kill the seeds of many target species.

Draining water from ponds and irrigation canals may control aquatic weeds such as reed canary grass (Phalaris arundinacea) (Schlesselman et al. 1989). Drainage can be conducted in different ways, including seasonal, intermittent (within-season), or par tial draw downs (McNabb and Anderson 1989).

Mulching

Mulching excludes light from weeds and prevents them from photosynthesizing. Commonly used mulches are hay, manure, grass clippings, straw, sawdust, wood chips, rice hulls, black paper, and black plastic film. The most effective mulches are black paper or plastic because of their uni form coverage. Particle mulches cannot prevent all weeds from breaking through (Schlesselman et al. 1989). Mulch materials and application can be expensive and may be suitable only for small infestations. Particle mulches should be weed-free to avoid introduction of other weeds.

Soil Solarization

Soil solarization is a technique for killing weed seeds that have not yet germinated. A clear polyethylene plastic sheet is placed over moist soil and kept in place for a month or more. The incoming solar radiation creates a greenhouse effect under the plastic, increasing soil temperatures. High temperatures kill some seeds outright and weaken others, making them more susceptible to attack by pathogens (Schlesselman et al. 1989).

BIOLOGICAL CONTROL

Biological control, or biocontrol, involves the use of animals, fungi, or other mi crobes that prey upon, consume, or parasitize a target species. Target species are fre quent ly non-natives whose success in new environments may be due in part to the absence of their natural predators and pathogens.

Classical biological control involves careful selection and introduction of one or more natural enemies to the target species' new habitat to reduce target populations. Successful control programs of this kind result in permanent establishment of the control agent or agents and permanent reduction in target species populations. Such programs are not designed to eliminate the target species completely, and it may take repeated releases to ensure the establishment of an agent. It may take years or decades before their effects are obvious. Some of the greatest strengths of classical biological control are that once an agent is established it will last indefinitely and it may spread on its own to cover most or all of the area infested by the weed, generally without additional costs. On the other hand, these strengths can become liabilities if the agent begins to attack desirable species as well as the pest it was introduced to control. Biocontrol researchers take great pains to locate and use agents that are highly specific to the targeted weed. This contributes to the high cost and long time required for development and approval of new biological control agents. Several of the species covered in this book are the subjects of ongoing classical biological control programs.

As opposed to classical biocontrol, inundative or augmentative biocontrol involves mass releases of pathogens whose effects on the target are normally limited by their inability to reproduce and spread. Inundative biocontrol agents that are non-native and/or not target-specific may be sterilized or otherwise

rendered incapable of establishing permanent populations before they are released. Because they do not become established, they must be reared and released again each time weed populations erupt. There have, however, been instances in which mistakes or back mutations allowed some of these species to establish permanent wild populations.

The USDA must approve biocontrol agents for use. Approved biological control agents have been studied, and their host specificity determined. Accidentally introduced species have unknown host species, are not permitted for distribution, and should not be redistributed. If you have questions about any potential biocontrol agents, contact the CDFA Biological Control Program (see Resources section).

Competition and Restoration

The use of native plants to outcompete alien weeds is a frequently overlooked but potentially powerful technique. Sometimes the natives must be planted into the habitat and given some care until they are well established. This may be appropriate where a native forest community is to be reestablished in an old field currently occupied by a thick cover of alien grasses and forbs. Reseeding with native species also works well in some grasslands. In other cases all that may be required is time; the native community may reestablish itself once human-caused disturbance ceases. Even in these cases, it may be important to locate and remove certain weeds capable of hindering succession. You can also enhance other weed control methods by encouraging competition from native species.

Ideally, seeds or cuttings used in restoration should be collected on the site or from adjacent properties. Unfortunately, in many cases the only available or affordable seeds and plants are from distant or unidentified populations. Potential impacts of using seeds and plants collected at distant sites include project failure if genotypes used are unable to survive conditions on the site, introduction of diseases, and loss of genetic diversity through overwhelming or contaminating locally adapted genotypes.

Grazing

Grazing animals may be used to selectively control or suppress weeds, but grazing is also known to promote certain invaders in some circumstances. Cattle, sheep, goats, geese, chickens, and grass carp have been used to graze undesirable species at sites around the nation. Often grazing must be continued until the weed's seedbank is gone, as the suppressed plants may otherwise quickly regain dominance. Another drawback to using grazing animals is that they sometimes spread weed seeds in their droppings.

CHEMICAL CONTROL

Herbicides are chemicals that kill or inhibit plant growth. They can be extremely effective tools when used to eliminate certain species. They can also be dangerous and should be used only after careful consideration of other options and only with extreme care. Each species treatment in this book provides specific information on the herbicides, rates, and times that have been found most effective against that species. However, the effectiveness of a given treatment may vary with climate and environmental conditions, and some populations of a given species may be more tolerant of, or even resistant to, a particular herbicide than other populations of the same species. It may be necessary to conduct trials to identify the most effective techniques for controlling a particular problem species.

The most important safety rule for herbicide use is to read the label and follow the directions. Applicators must wear all protective gear required on the label of the herbicide they are using. It is also important to adopt or develop protocols for storing, mixing, transporting, cleaning up, and disposing of herbicides and for dealing with medical emergencies and spills.

California's programs to regulate pesticides and pesticide applicators are regarded as the most stringent in the nation and as such are the standard against which many other states measure their programs. California's Department of Pesticide Regulation reviews health effects of pesticides independently of the federal Environmental Protection Agency and has more stringent registration requirements. California also has the most stringent pesticide use reporting requirements. Agricultural pesticide use is broadly defined and includes applications made in nature preserves, parks, golf courses, and cemeteries and along roadsides. Such applications are regulated by the CDFA, and county agricultural commissioners' offices enforce the regulations. Pest control businesses, agricultural pest control advisors, and pest control aircraft pilots must register in each county where they operate. Anyone who wants to buy a restricted pesticide must have a permit from the commissioner's office. All agricultural pesticide use must be reported monthly to the commissioner's office. Home-use pesticides (those purchased over-the-counter in small volumes) are exempt. There are also more detailed requirements for applicator training and protective gear. Inspectors from county commissioners' offices conduct thousands of compliance inspections every year and have the authority to halt pesticide applications if they believe an applicator's safety is in danger or the pesticide is likely to drift off-site. Contact your county agriculture commissioner's office for details on training and other regulations before purchasing or applying herbicides. County agricultural agents can answer questions about both wildland and agricultural uses of herbicides, as can certified herbicide applicators.

Environmental risks posed by herbicide use include drift, volatilization, persistence in the environment, groundwater contamination, and harmful effects on animals. Drift and resulting death or damage to non-target plants may occur when herbicides are applied as a spray; chances of drift increase with decreasing size of spray droplets and increase with increasing wind speeds. Volatilization and subsequent condensation on non-target plants resulting in their death or damage is another risk of herbicide use. Some herbicides are much more likely to volatilize than others, and likelihood of volatilization increases with increasing temperature. Some herbicides are more persistent in the environment and thus have a greater opportunity for harmful effects. Most herbicides will decompose more rapidly with increasing temperature and soil moisture, and some are decomposed by ultra-violet light. Chances of groundwater contamination generally increase with increasing solubility and persistence of the herbicide, increasing porosity of the soil, and decreasing depth to the water table. Herbicides with potential to cause direct harm to animals (e.g., diquat) are rarely used in natural areas. Animals may, however suffer from indirect impacts if, for example, their food plants are killed.

In order to minimize these environmental risks, look for compounds that can be used selectively (to kill one or a few species); that degrade rapidly under conditions found at the site; that are immobilized on soil particles and unlikely to reach groundwater; that are non-toxic to animals; and that are not easily volatilized.

Also choose an application method that minimizes risks of harming non-target plants and environmental damage. Possible application methods include: spraying on intact, green leaves (foliar spray); spot application (usually from backpack or handheld sprayer); wick application; boom application (from a boom mounted on a vehicle or aircraft); single spot or around the circumference of the trunk on intact bark (basal bark); cuts in the stem (frill or hack and squirt); injected into the inner bark; cut stems and stumps (cut stump); spread in pellet form at the plant's base; and sprayed on the soil before seeds germinate and emerge (pre-emergent).

Mix a dye with the herbicide so applicators can see which plants have been treated and if they have gotten any on themselves or their equipment. Some pre-mixed herbicides include a dye (e.g., Pathfinder II® includes the active ingredient triclopyr, a surfactant and a dye). Ester-based herbicides such as Garlon4® require oil-soluble dyes such as colorfast purple, colorfast red, and basoil red (for use in basal bark

treatments), which are sold by agricultural chemical and forestry supply companies. Clothing dyes such as those produced by Rit® will work in water-soluble herbicides such as Garlon3A®, and they are inexpensive and available at most supermarkets and drugstores.

Detailed information on herbicides is available in the *Weed Science Society of America's Herbicide Handbook* (Ahrens 1994) and *Supplement* (Hatzios 1998). This publication gives information on nomenclature, chemical and physical properties, uses and modes of action, precautions, physiological and biochemical behavior, behavior in or on soils, and toxicological properties for several hundred chemicals (see Resources section). Critical reviews of several common herbicides are available at a small charge from the Northwest Coalition for Alternatives to Pesticides (see Resources section).

Beyond this book, additional information and training on weeds and their control can be found by contacting local universities, extension agents, county weed and pest supervisors, and the California Department of Food and Agriculture. The California Exotic Pest Plant Council can direct readers to other local experts on weeds. The Bureau of Land Management offers an Integrated Pest Management and Pesticide Certification course in Denver, Colorado, and the Western Society of Weed Science offers a Noxious Weed Management Short Course in Bozeman, Montana.

View plant list by:
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July 2011

2010 Ventura River and San Antonio Creek Watershed Sanitary Survey Update

Source: LARWQCB, December 2002

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July 2011

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Acronyms

AF	acre-feet
AL	Action Level
AMCL	alternative MCL
Avenue WTP	Ventura Avenue Water Treatment Plant
BWT	Business Plan (BP), Waste Producer (W), Underground Tank (T)
CAP	Cryptosporidium Action Plan
CCR	Consumer Confidence Report
CCTV	line cleaning and video inspection
CMMS	Computerized Maintenance Management System
CMWD	Casitas Municipal Water District
DBP	disinfection byproducts
DBPR	Disinfection By-Products Rule
DBPP	Disinfection Byproduct Precursors
DPH	California Department of Public Health
DTSC	Department of Toxic Substances Control
DU	Dwelling Unit
DWR	Department of Water Resources
DWSAP	Drinking Water Source Assessment and Protection
E&ERD	Ventura County Environmental and Energy Resources Division
EIS	Environmental Impact Statement
FBR	Filter Backwash Rule
FEMA	Federal Emergency Management Act
FOG	Fats, Oil and Grease
gpm	gallons per minute
HPC	heterotrophic plate count
GSA	General Services Agency (Ventura County)
GWR	Ground Water Rule
HHWCF	Household Hazardous Waste Collection Facility
I&I	inflow and infiltration
ICR	Information Collection Rule
IDSE	Initial Distribution System Evaluation

IESWTR	Interim Enhanced Surface Water Treatment Rule
IWPP	Integrated Watershed Protection Plan
L	Liter
LAFCO	Local Agency Formation Commission
LARWQCB	Los Angeles Regional Water Quality Control Board
LCR	Lead and Copper Rule
LRAA	locational running annual average
LT1ESWTR	Long-Term 1 Enhanced Surface Water Treatment Rule
LT2ESWTR	Long-Term 2 Enhanced Surface Water Treatment Rule
LUFT	Leaking Underground Fuel Tank
MGD	million gallons per day
mg/l	milligrams per liter
MCL	Maximum Contaminant Level
ME-VR	Mass Emission Monitoring Station
M/DBP	Microbial/Disinfection Byproducts
ml	milliliter
MMM	Multimedia Mitigation
MOU	Memorandum of Understanding
MRDL	maximum residual disinfectant level
MS4	municipal separate storm sewer system
MTBE	Methyl Tertiary Butyl Ether
NA	No Action or Not Applicable
NDMA	N-nitrosodimethylamine
NFA	No Further Action
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NTU	nephelometric turbidity units
OES	Office of Emergency Services
OVSD	Ojai Valley Sanitary District
PCA	possible contaminant activity
PHG	Public Health Goal
POE	points of entry
ppm	parts per million

REFRW	referred to Regional Water Quality Control Board
REFOA	referred to other government agency
RR	Rural Residential
RWQCB	Regional Water Quality Control Board
SCADA	Supervisory Control and Data Acquisition
SMP	Ventura Countywide Stormwater Quality Management Plan
SWTR	Surface Water Treatment Rule
TC	Thatcher Creek
TCR	Total Coliform Rule
TMDL	Total Maximum Daily Load
TOC	Total Organic Carbon
TTHM	Total Trihalomethanes
WWTP	Wastewater Treatment Plant
UR	Urban Residential
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
UV	Ultraviolet light
VCEHD	Ventura County Environmental Health Department
VCFD	Ventura County Fire Department
VCWPD	Ventura County Watershed Protection District
VCSWQMP	Ventura County Stormwater Quality Management Program
Ventura Water	City of San Buenaventura Water Department
WWRB	Washwater Recovery Basin
WY	Water Year
µg/L	micrograms per Liter

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Executive Summary

The Surface Water Treatment Rule (SWTR), Section 64665, Watershed Sanitary Surveys, requires that all water systems subject to the SWTR shall conduct a sanitary survey of their watershed(s) at least every five years. The aim of the Sanitary Survey is to identify potential sources of contamination within the watershed, and to make recommendations on how to reduce the risks to water quality.

The first Watershed Sanitary Survey (1995 Report) for the City of San Buenaventura's Avenue Water Treatment Plant (Avenue WTP) was completed in October 1995. In 2005, the Report evaluated the 51,000-acre watershed area drained by the lower Ventura River and the tributary San Antonio Creek system. As part of the requirement for a 5-year update, the City of San Buenaventura Water Department (Ventura Water) completed the 2010 Update to the Sanitary Survey in April 2011.

This 2010 Update, describes the changes in the watershed since the 2005 Sanitary Survey, and confirms Ventura Water's ongoing commitment to protecting the water quality of the lower Ventura River water source.

Sources of Contaminants

The 2010 Sanitary Survey confirmed the previous sanitary survey concerns for horse manure, sewer overflows, septic tanks near Casitas Springs, illegal dumping, oil wells and tanks. One of the other major potential sources of contamination is the Ojai Valley Sanitation District sanitary sewer trunkline which is in a levee that requires improvement. Ventura Water is pursuing funding from the Federal Emergency Management Agency to repair the levee such that the sewer trunkline is protected against flood related damage. The 2005 Survey also identified new concerns for sediment transport with the planned removal of the Matilija Dam and the presence of gas utility pipelines near some of the creeks. These potential concerns remain but are not likely to pose a significant water quality risk in the near future as the Matilija Dam sediment removal is not likely to occur within the next five years and the threat of the gas utility pipelines is minimized by the contingency planning required of the utilities.

Compliance with Drinking Water Standards

Ventura Water is not using the surface water diversion, but has maintained the structures for possible use in the future. Ventura Water is using groundwater under the direct influence (GUDI) of surface water from the sub-surface diversion and shallow wells that fall under the SWTR and the need for Watershed Sanitary Surveys. The use of sub-surface diversions and shallow wells reduces water quality risks, especially for turbidity and pathogens, because of the natural filtration that is provided. The Avenue WTP with the associated improvements and Ventura Water monitoring programs are in compliance with the SWTR and related regulations.

Recommended Levels for Removal of Giardia and Other Viruses

The water source monitoring results show that Giardia, virus, and Cryptosporidium are less than detection limits. Removal rates for the 2005 sanitary survey were 3-log for Giardia, 4-log for virus, and 2-log for Cryptosporidium. The Avenue WTP improvements, which were completed in 2007, have resulted in removal rates to 6-log for Giardia, 4-log for Cryptosporidium, and greater than 9-log for virus.

Key Conclusions

Foster Park Intake Facilities and Avenue Water Treatment Plant

Ventura Water is not currently using the surface water diversion, but has maintained the structures for possible use in the future. The completed improvements at the Avenue WTP, the use of sub-surface diversions and shallow wells, and Ventura Water's monitoring programs are in compliance with the SWTR and related regulations.

Overall Water Quality

The 2009 Ventura County Storm Water Monitoring Mid-Year Sampling report provides a snapshot of the main water quality issues on the Ventura River that indicates that sample events in November 2008 – February 2009 showed exceedances of bacteriological water quality objectives. These wintertime bacteriological increases are consistent with winter storms in surface waters and are the reason that the Avenue WTP improvements were constructed.

Giardia and *Cryptosporidium* were below detection limits in Ventura Water's water sampling program during the 2005 to 2010 period. The Title 22 monitoring of general mineral, general physical, radionuclide, and inorganic chemicals stayed within the historical range.

Potential Contamination Sources

Continued watershed monitoring and reporting programs during the period of 2005 through 2010 by Ventura Water, the County of Ventura, the Ventura River Stream Team (Channel Keepers), and a number of interagency studies continued since 2005, provide a more thorough understanding of the watershed than was available for previous Sanitary Surveys.

There continues to be potential water quality hazards in the watershed that need to be monitored. The potential contamination issues in the study area are shown on Figure 6. There are increasing concerns with respect to water quality risks from downstream sediment transport as a result of the future Matilija Dam removal. Septic tanks and gas utility pipelines continue to be identified as potential contaminant sources but have existed in the watershed for decades. Potential impacts from septic tanks can be managed through drinking water treatment.

Actions over the last five years that have reduced the risk of contamination are:

New OVSD siphons that reduce the risk of spilling untreated wastewater,

Horse manure awareness program,

Successful operation of Household Hazardous Waste Collection Facility (HHWCF), and

Avenue WTP improvements.

Key Recommendations

Regulatory Compliance

Ventura Water will continue its review of water quality sampling for compliance with drinking water regulations and of treatment effectiveness of the Avenue WTP. A comparison of raw water and treated water parameters, as regularly occurs, will be particularly useful to evaluate treatment effectiveness.

Coordination of Watershed Water Quality Monitoring Programs

Coordination is needed to avoid duplication of effort and to maintain standards of multi-agency monitoring efforts in the study area. Ventura Water can continue to rely on the monitoring of the upper San Antonio Creek watershed by other programs such as Ventura County Stormwater monitoring, Ventura River Stream Team, and Agricultural Waiver (Ag Waiver) monitoring, because these other programs cover the same locations and constituents. Steps that Ventura Water may take include:

- Share data with others monitoring or studying the watershed.
- The Ventura County Watershed Protection NPDES Database may be the best place for combining electronic data from the multiple monitoring programs in the study area. It is recommended that Ventura Water become informed as to updates to the monitoring plans for the data collected for the NPDES Database and coordinate where necessary.
- Establish contact with the Ag Waiver monitoring group thru the Ventura Farm Bureau or the Ventura County Agricultural Water Quality Coalition to obtain information on the Ventura River from the existing monitoring programs.
- Update the water quality monitoring station GIS map (Figure 8) as changes are made. It is recommended to assign this to City of San Buenaventura GIS Department with coordination by staff from the various monitoring programs.
- Agree on naming of sampling sites to avoid duplication of site names between different monitoring programs.

Modified Watershed Monitoring Program

Based on the efforts of the other active monitoring programs, Ventura Water can continue to focus its watershed monitoring on the lower San Antonio Creek and Ventura River near Foster Park. It is recommended that Ventura Water confirm that the monitoring by the other organizations in the watershed conform to EPA requirements and reporting guidelines.

The recommendations for Ventura Water's watershed monitoring program are summarized in Table 8-1, which focuses on the lower portions of the contributing watersheds, is consistent, with Ventura Water's watershed monitoring needs, and avoids duplication of effort. The proposed watershed sampling reduces frequencies of monitoring where previous monitoring has shown low or non-detected constituents.

Septic Conversion and Monitoring

The source assessments for the Nye Wells show that the septic systems (On-site Wastewater Treatment Systems) in Casitas Springs and the Burnham Road corridor continue to pose some risk to the water supply for nitrates and pathogens that migrate in the alluvial groundwater and that could affect the shallow City wells. Ventura Water should support the County Environmental Health Division and other agencies to seek funding and develop incentives for home owners to convert to sewer systems, especially in the lower Ventura River area.

It is recommended that Ventura Water continue discussions with the Ventura County Storm Water Monitoring or the Stream Team to consider monitoring near the Arbolada and Siete Robles areas of Ojai where septic tanks are in areas that have high groundwater in wet years.

Participate in Matilija Dam Removal and Other Watershed Planning

The control, or lack of control, of the sediment transport from behind Matilija Dam is a water supply and water quality concern for all the wells and sub-surface diversions along the Ventura River. Ventura Water continues to participate in the planning and implementation process of the Matilija Dam removal and has provided suggestions for protecting the local water resources from the potential impacts to the Ventura River. Ventura Water has implemented a suggestion from the 2005 WSS to install two new wells in the Foster Park area prior to the removal phases of the dam as a hazard mitigation measure. It is recommended that Ventura Water continue to put forward ideas and share data with the participating agencies.

Other watershed planning activities that Ventura Water is participating in, and is recommended to continue participation include:

Integrated Regional Water Management Plan to obtain Department of Water Resources (DWR) Proposition 84 funding

Ventura River Habitat Conservation Plan

Public Outreach to Reduce Effects of Horse and Stock Manure

Ventura Water should continue to work with the Ventura County Stormwater Quality Management Program (VCSWQMP) to encourage distribution of information and to restart the educational program about the effects of horse or stock manure on water quality.

Coordination with the OVSD

Although OVSD's efforts have reduced the magnitude of sewage spills in the last five years, sewage spills continue to pose a significant potential impact on Ventura Water's Foster Park water sources, Ventura Water should continue working with the OVSD to improve coordination in case a sewer overflow occurs. This may be accomplished by the following:

- Continue to communicate and provide comments on the updates to any emergency planning or regulatory documents.
- Participate in a practice drill once a year for the emergency overflow manhole warning system.
- Encourage FEMA levee improvements in the vicinity of Foster Park to further protect the OVSD sanitary sewer trunk line from flood-related breakage

Section 1: Introduction

1.1 Background

Ventura Water owns and operates the 15 million gallon per day (MGD) Ventura Avenue Water Filtration Plant (Avenue WTP), which provides full conventional treatment with supplemental improvements to improve finished water quality that were completed in 2007. This plant processes lower Ventura River/San Antonio Creek water diverted at Ventura Water's Foster Park diversion facilities as well as Ventura River water provided by the Casitas Municipal Water District (CMWD). CMWD diverts its water from the upper Ventura River at the Robles Diversion, stores the diverted water in Lake Casitas and provides disinfection and pressure filtration before distributing the treated water to its wholesale and retail water customers. Ventura Water can take the treated Lake Casitas water directly into the Ventura water distribution system at two connections or re-treat the water at the Avenue WTP.

The Surface Water Treatment Rule (SWTR), Section 64665, Watershed Sanitary Surveys, requires that all water systems subject to the SWTR shall conduct a sanitary survey of their watershed(s) at least every five years. The goal of the Sanitary Survey is to identify potential sources of contamination and to recommend operational or watershed management steps to reduce risk of that contamination reaching the water supply.

The first Watershed Sanitary Survey (1995 Report) for Ventura Water's Avenue WTP was completed in October 1995. The 1995 Report evaluated the 51,000-acre watershed area drained by the lower Ventura River and the tributary San Antonio Creek system. To meet the requirement for a 5-year update, Ventura Water completed the 2005 Update to the Sanitary Survey in March 2006.

This 2010 Update Sanitary Survey, summarizes and updates the 2005 Sanitary Survey, and confirms Ventura Water's ongoing commitment to protecting the water quality of the lower Ventura River water source. Results from a number of recent studies on this watershed will be incorporated herein and, in turn, this report is designed to be usable for other water resource investigations. For example, this report documents that the National Marine Fisheries Service provided a biological opinion indicating that as proposed "is not likely to jeopardize the continued existence of the endangered southern California steelhead Distinct Population segment, or destroy or adversely modify critical habitat for this species." (NMFS, 2007 as found in Appendix A). This biological opinion with the prior Environmental Impact Statement (EIS) for the removal of the Matilija Dam indicates that water quality for steelhead habitat and domestic water supply will be protected.

1.2 Study Area Description

As shown on Figure 1, the sanitary survey study area is comprised of approximately 51,000 acres in the Ojai and Ventura River Valleys. The western portion of the study area drains directly to the Ventura River. The eastern area of the watershed is tributary to San Antonio Creek, which then also drains into the Ventura River south of the community of Oak View. About 80 percent of the time, there is no significant surface flow in the Ventura River above the confluence with San Antonio Creek. There is generally year-round flow in the lower reaches of San Antonio Creek.

The study area includes City of Ojai and the unincorporated areas of Casitas Springs, Live Oak Acres, Meiners Oaks, Mira Monte, and Oak View. The northern and eastern sections of the watershed are mountainous, including approximately 16,300 acres of the U.S. Forest Service Los Padres National Forest land. Areas east of City of Ojai are primarily agricultural with some farm animal grazing.

The Ojai Valley Sanitary District (OVSD) provides sewer service for City of Ojai and the unincorporated areas of Casitas Springs, Live Oak Acres, Meiners Oaks, Mira Monte, and Oak View. The OVSD also provides service outside its boundaries to community sewers in areas where private onsite sewage disposal problems may occur. OVSD annexation of these areas soon follows. The remainder of the watershed is on private sewage disposal systems and septic tanks.

Figure 1 shows the watershed boundary for the Upper and Lower Ventura River, the San Antonio Creek sub-basin, the study area boundary, and U.S. Forest Service lands. Also shown on Figure 1 are the locations of rainfall monitoring stations (rainfall and weather stations) and the location of the Avenue WTP.

Figure 2 shows in more detail the location of Ventura Water's diversion facilities and wells at Foster Park. Within the study area, sub-surface water diversions are made by Ventura Water at Foster Park (see Figure 2). The only other domestic water utility that diverts shallow subsurface water from the Ventura River is the Meiners Oaks County Water District. This is done with two shallow wells on the east side of the river and south of the Robles Diversion. Figure 2 includes information from a 2005 survey of the bank and stream channels (Fugro West, 2005).

There are other domestic water utilities in the watershed, but these pump from deeper groundwater wells. They are the Ventura River County Water District, the Southern California Water Company, Casitas Springs, Senior Canyon, and several smaller mutual water companies. CMWD supplies chloraminated and filtered surface water from Lake Casitas to its own retail customers, to the Avenue WTP for further treatment if taste and odors increase, and sometimes, directly to Ventura Water's water distribution system at two locations.

1.3 Report Organization

This 2010 Update summarizes significant changes in watershed conditions that affect the water quality of raw Ventura River water diverted at Foster Park since 2005. Available water quality data is provided for the 2005 to 2010 period. For information on watershed conditions that have not changed since 2005, the reader is referred to the 2005 Sanitary Survey.

1.3.1 Section Summary

- Section 1 – Introduces the 2010 Update, provides the background and study area descriptions, and presents the report organization.
- Section 2 – Presents the 2010 status of the 2005 Sanitary Survey recommendations.
- Section 3 – Provides updated information on the lower Ventura River/San Antonio Creek watershed characteristics and water supply components.
- Section 4 – Summarizes descriptions of the current potential contamination sources in the watershed and an evaluation of the potentially significant impacts which each contamination source could have on watershed water quality.

- Section 5 – Provides updated information on the watershed control and management practices. Contacts with agencies having jurisdiction throughout the watershed are documented. Land use policies, wastewater discharge requirements, storm water regulations, fire control management, and other policies that are enforced throughout the watershed are discussed. Each discussion includes examples of existing activities/facilities that are in place in the watershed.

- Section 6 – Provides an update on water treatment regulations.

- Section 7 – Presents the water quality monitoring programs that are active in the watershed and provides the watershed raw water quality data.

- Section 8 – Presents the 2010 Update conclusions and recommendations.

1.4 Conduct of Study

Ventura Water retained Kennedy/Jenks Consultants (Kennedy/Jenks) to prepare this sanitary survey update. Ventura Water authorized this study on October 29, 2010. Only the lower Ventura River/San Antonio Creek watershed is covered by this survey. The upper Ventura River watershed (as shown in Figure 1) above the Robles Diversion is included by reference because CMWD prepares a watershed sanitary survey for that area.

During preparation of this 2010 Update, Kennedy/Jenks contacted numerous agencies involved with water quality, land use and other information regarding activities that could significantly affect the water quality within the watershed. Field surveys were made by a combination of driving and walking throughout the watershed. City staff supplied Kennedy/Jenks with various water quality data during the project. Various Ventura County Departments and the OVSD also provided considerable input to the content of this report.

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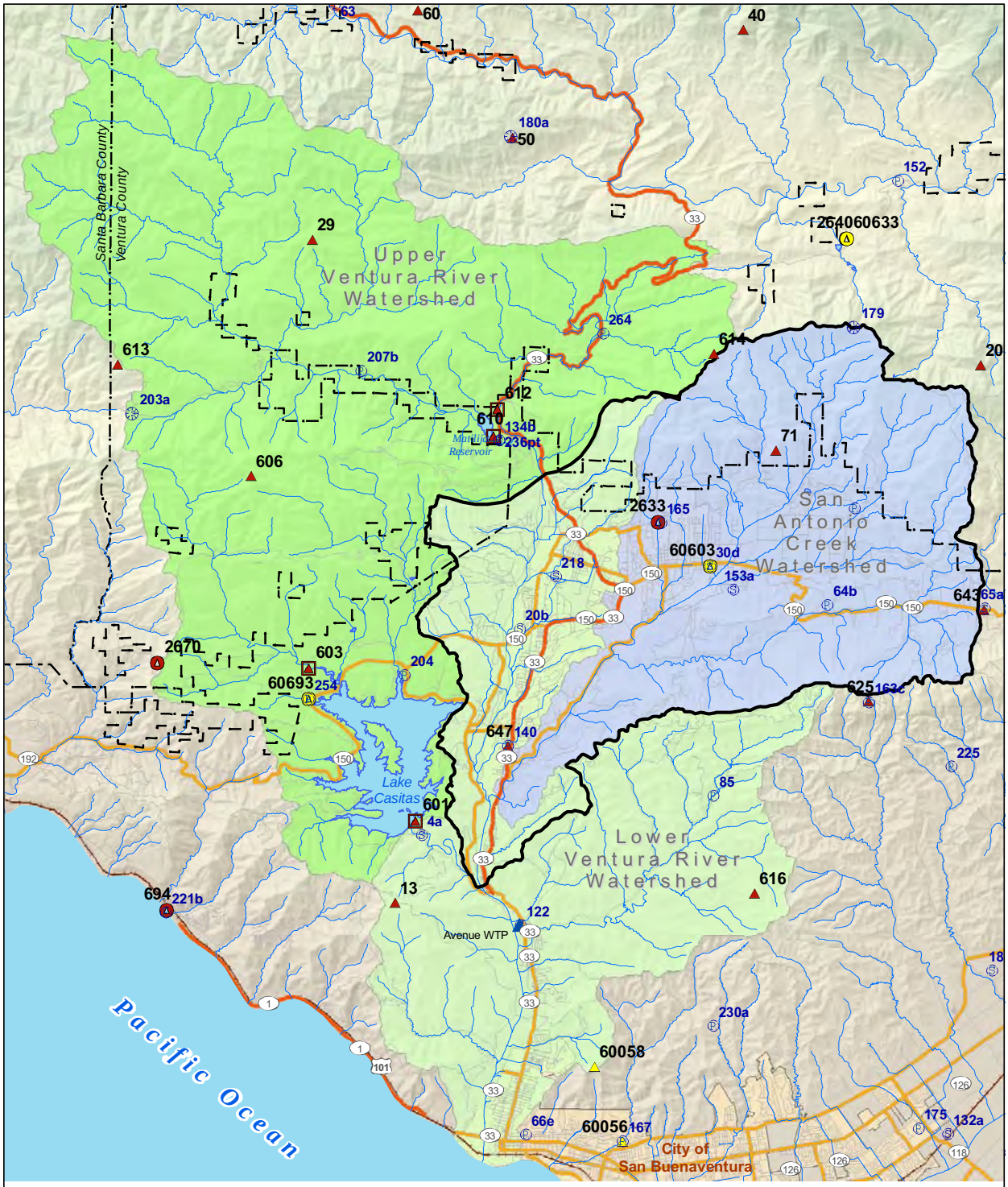

Gage Explanation

Active Rain Stations
- Punch Tape
- Recorder and Standard
- Recording
- Standard
- Storage Gage

GOES (Satellite) Stations
- Rain and Stream Gage (USGS or Calif. Dept. Water Res.)
- Remote Auto Weather Station (RAWS)
- Rain Gage

Automated Local Evaluation in Real Time (ALERT)
- Rain Gage
- Rain and Stream Gage
- Weather Station
- Wind and Precip

Explanation
- San Antonio Creek Watershed
- Lower Ventura River Watershed
- Upper Ventura River Watershed
- Study Area Boundary
- National Forest Boundary
- Urban Area Land Use
- Streams
- Highway
- Major Road
- Local Road

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Kennedy/Jenks Consultants

City of San Buenaventura, California

Location Map and Hydrologic Monitoring Stations

0589056
March 2006

Figure 1

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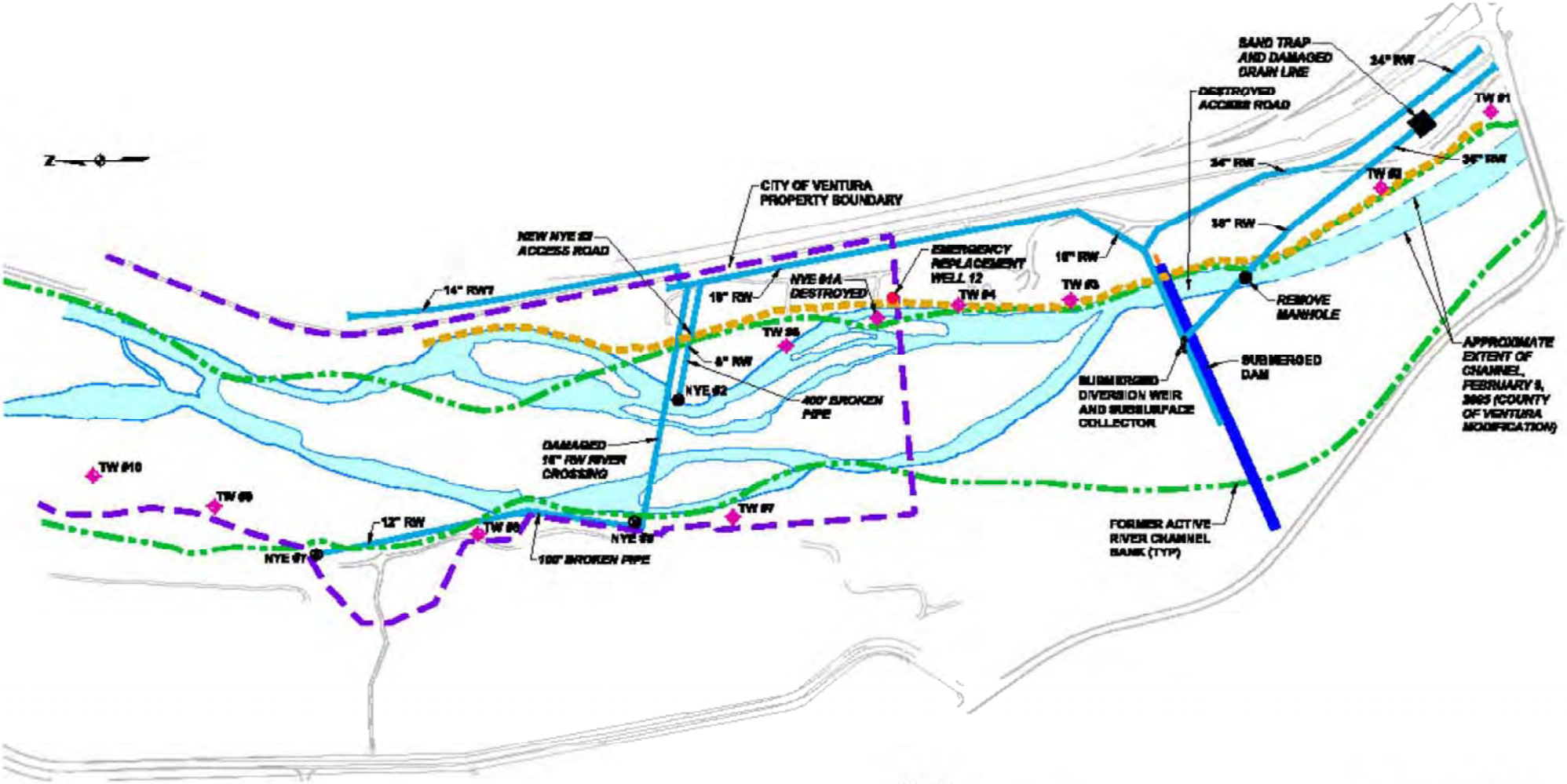

LEGEND

- River bank, surveyed 1/28/2005
- Stream channels, surveyed 1/2005
- City of Ventura property boundary
- Former active river channel bank
- WELL — Existing water supply well
- TW — Foster Park Improvement Project test well
- RW — Raw water to Avenue WTP

Kennedy/Jenks Consultants

City of San Buenaventura, California

Water Diversion Facilities
Near Foster Park

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July 2011
Figure 2

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Section 2: 2010 Status of 2005 Sanitary Survey Recommendations

This section reproduces the year 2005 Update Sanitary Survey recommendations and summarizes the 2010 status of each recommendation.

2.1.1 Regulatory Compliance Monitoring and Studies

2.1.1.1 2005 Recommendation

It was recommended that Ventura Water conduct a review of water quality sampling for compliance with drinking water regulations and of treatment effectiveness of the Avenue WTP approximately six months after the modifications are completed and operational. This sampling was completed as part of start-up operation. The potential for additional pre-treatment with powdered activated charcoal for improving TOC removal and post-treatment using ultraviolet light for improving *Cryptosporidium* removal was to be considered. Minimizing TTHMs and HAA5s with additional treatment may be important once compliance with the Stage 2 DDBPR and the LT2ESWTR are enforced in the future.

Ventura Water submitted the Initial Distribution System Evaluation (IDSE) plan by October 1, 2006. IDSE monitoring was completed by September 30, 2008, and the final report was submitted by January 1, 2009. Ventura Water must begin Stage 2 DBPR compliance monitoring by April 1, 2012.

Regarding the LT2ESWTR, Ventura Water was to submit a sampling plan for the first round of source water monitoring for *Cryptosporidium*, *E. coli*, and turbidity (or notice of intent to use grandfathered data) prior to July 1, 2006, and begin source water monitoring by October 31, 2006. Ventura Water was to submit all data and required information for grandfathering by December 1, 2006. Ventura Water was to submit a *Cryptosporidium* treatment bin classification and supporting data for approval by April 1, 2009. Ventura Water must complete additional *Cryptosporidium* treatment requirements by April 1, 2012. Ventura Water must submit a sampling plan for the second round of source water monitoring by January 1, 2015, and start monitoring by April 1, 2015. Ventura Water must submit a *Cryptosporidium* treatment bin classification and supporting data from the second round for approval by October 1, 2017.

2.1.1.2 2010 Status

Ventura Water complies with all drinking water regulations. The Avenue WTP has switched to chloramines disinfection to reduce DBP formation and incorporated submerged UF membrane filtration to increase turbidity removal. An IDSE plan was completed by Ventura Water and submitted in September 2006. Current monitoring for Stage 2 DBPR is underway for completion in 2012.

2.1.2 Coordination of Watershed Water Quality Monitoring Programs

2.1.2.1 2005 Recommendation

It was reported that coordination was needed to avoid duplication of effort and to maintain standards of multi-agency monitoring efforts in the study area. Ventura Water will not need to continue monitoring in the upper San Antonio Creek watershed because of these other programs that cover the same locations and constituents (Ventura County Stormwater monitoring, Ventura River Stream Team, and Ag Waiver monitoring). Steps that Ventura Water could take include:

- Share data, including providing the Sanitary Survey and other water quality reports to others monitoring or studying the watershed.

- The Ventura County Watershed Protection NPDES Database may be the best place for combining electronic data from the multiple monitoring programs in the study area. It is recommended that Ventura Water obtain updates to the monitoring plans for the data collected for the NPDES Database and confirm the sampling locations, what constituents are tested for, frequency of sampling, sampling agency/staff, and other information so that Ventura Water can determine which locations are duplicative of Ventura Water's monitoring efforts.

- Assist the Ag Waiver monitoring group thru the Ventura Farm Bureau or the Ventura County Agricultural Water Quality Coalition to coordinate their new monitoring requirements with existing programs.

- Update the water quality monitoring station GIS map (Figure 8) as sites are changed. Continue to show stations that are discontinued because they would still have a data record that could be useful to others. It is recommended to assign this to City of San Buenaventura GIS Department with coordination by staff that does the water quality sampling.

- Agree on naming of sampling sites to avoid duplication of site names between different monitoring programs, and possible confusion about individual sites. Recommend keeping one site name per sampling site and have distinct program labels to avoid having multiple records for the same site label. Distinct names such as VR1 and VR11 are recommended rather than New VRI and Old VR1.

2.1.2.2 2010 Status

Although coordination between the agencies has continued, streamlining of monitoring locations is still underway. OVSD's new permit has reduced the number of monitoring locations in the watershed due to evidence that the additional monitoring stations showed that the water quality did not change. Further agreement on sampling locations would streamline the monitoring within the watershed and some coordination has occurred.

2.1.3 Modified Watershed Monitoring Program

2.1.3.1 2005 Recommendation

Based on the efforts of the other active monitoring programs, Ventura Water can focus its watershed monitoring on the lower San Antonio Creek and Ventura River near Foster Park. The upper portions of the watershed are currently monitored by multiple other groups. The Watershed Monitoring Program does not cover the Title 22 regulations by DPH, but covers the source waters and potential watershed contaminants. Title 22 monitors alkalinity, general minerals, general physical, inorganic, organic, radionuclides, and higher frequencies of coliform tests for DPH.

It is recommended that Ventura Water confirm that the monitoring by the other organizations in the watershed conform to EPA requirements and reporting guidelines. The recommendations for Ventura Water's watershed monitoring program were summarized in Table 8-1 in the 2005 WSS, which focused on the lower portions of the contributing watersheds. The proposed watershed sampling reduces frequencies of monitoring where previous monitoring has shown low or non-detected constituents. TKN was eliminated because of the low test results and the partially overlapping coverage of by the Ammonia test. The source water collection point, 27-Flume, had the most constituents monitored.

2.1.3.2 2010 Status

The recommended City watershed monitoring program is summarized in Table 8-1 and is essentially unchanged since 2005 except that TKN was not monitored because of the reasons mentioned above. It is not appropriate to further reduce monitoring at this time as no constituents were consistently non-detected over the five year period. Tests can be added at any time if there are some high results or emergencies. Sampling for TOC, bromide, and *Giardia/Cryptosporidium* may need to be adjusted once a monitoring plan is made for the Stage 2 DDBPR and the LT2ESWTR regulations as discussed in Section 2.1.1.1 and 2.1.1.2.

2.1.4 Septic Conversion and Monitoring

2.1.4.1 2005 Recommendation

The source assessments for the Nye Wells show that the septic systems (On-site Wastewater Treatment Systems) in Casitas Springs and the Burnham Road corridor pose some risk to the water supply for nitrates and pathogens that migrate in the alluvial groundwater and that could affect the shallow City wells. Ventura Water should work with the County Environmental Health Division and other agencies to seek funding and develop incentives for home owners to convert to sewer systems, especially in the lower Ventura River area.

It is recommended that Ventura Water initiate discussions with the Ventura County Storm Water Monitoring or the Stream Team to consider monitoring near the Arbolada and Siete Robles areas of Ojai where septic tanks are in areas that have high groundwater in wet years.

2.1.4.2 2010 Status

The OVSD reported sewering 53 homes that were previously unsewered within the watershed . However, the problem areas remain the same as reported in the 2005 Sanitary Survey as far as contamination potential from overflowing septic tanks in high groundwater areas.

2.1.5 Participate in Matilija Dam Removal and Other Watershed Planning

2.1.5.1 2005 Recommendation

The control, or lack of control, of the sediment transport from behind Matilija Dam is a water supply and water quality concern for all the wells and sub-surface diversions along the Ventura River. Ventura Water is participating in the planning and implementation process of the Matilija Dam removal and has provided suggestions for protecting the local water resources from the potential impacts to the Ventura River. Their suggestions have included a hazard mitigation measure to install two new wells in the Foster Park area prior to the removal phases of the dam. It is recommended that Ventura Water continue to put forward ideas and share data with the participating agencies.

Other watershed planning activities that Ventura Water is participating in, and is recommended to continue participation include:

Integrated Regional Water Management Plan to obtain DWR Proposition 50 funding

- Ventura River Habitat Conservation Plan

2.1.5.2 2010 Status

Ventura Water has become involved in the Matilija Dam removal and is aware of the consequences of the additional sediment that will be conveyed by the removal of the dam. In response to the planned removal Ventura Water has drilled two additional wells. Nye Wells No. 12 and 13 were drilled as part of the Matilija Dam removal mitigation but are not yet in service. Funding limitations have prevented moving forward with Matilija Dam removal.

2.1.6 Public Outreach to Reduce Effects of Horse and Stock Manure

2.1.6.1 2005 Recommendation

Ventura Water should continue to work with the VCSWQMP to encourage distribution of information and to restart the educational program about the effects of horse or stock manure on water quality.

2.1.6.2 2010 Status

A citizen group has been working to try to get a horse manure collection and biodigester project to a feasibility study stage and has kept Ventura Water informed. The County Watershed Protection District is sponsoring the feasibility study using DWR Proposition 84 grants. Additionally, in 2009 as part of the nutrient Total Maximum Daily Load (TMDL), a horse survey

was conducted and collection methods were discussed. Ventura Water also continues a public outreach program to provide information regarding the effected of manure on water quality.

2.1.7 Coordination with the OVSD

2.1.7.1 2005 Recommendation

Due to the significant potential impact of a sewer spill on Ventura Water's Foster Park water sources, Ventura Water should continue working with the OVSD to improve coordination and operations in case a sewer overflow occurs. Ways this may be accomplished include the following:

- Provide comments on the updates to any emergency planning or regulatory documents.
- Participate in a practice drill once a year for the emergency overflow manhole warning system in the spring or summer so that there is time to make changes before the next wet season.

2.1.7.2 2010 Status

Due the storms and damage in 2005, Ventura Water conducted the following upgrades to the wells below.

- Nye Well 1A – This well has been abandoned and destroyed.
- Nye Well No. 2 – Service access to Nye Well No. 2 has been completed but reconstruction of the connection lateral between the well and the 18-inch conveyance pipeline has not been completed.
- Nye Well No. 7 – The connection pipeline between Nye Well No. 7 and Nye Well No. 8 was destroyed yet again along with significant bank area. Ventura Water has since obtained new land to accommodate a new connection pipeline which has been constructed. The well is now operational and Ventura Water plans to upgrade it with a higher pressure pump and Variable Frequency Drive (VFD).
- Nye Well No. 8 – The previously damaged 16-inch west to east pipeline beneath the river between Nye Well No. 8 and the existing 18-inch conveyance pipeline on the East side of the river has been sliplined using 12-inch HDPE. This well is now operational. The well is now operational and Ventura Water plans to upgrade it with a higher pressure pump and Variable Frequency Drive (VFD).
- Nye Well No. 11 – This well is now operational in place of Well No. 1A.
- Nye Wells No. 12 & 13 – These wells have been drilled as part of the Matilija Dam removal mitigation but are not yet in service.

In addition, Ventura Water continues to work with FEMA to construct levee improvements that will protect the OVSD sanitary sewer trunk line from washout.

2.1.8 Design Standards Review

2.1.8.1 2005 Recommendation

Ventura Water should periodically review well and other water system design standards with the intent to minimize potential contamination sources to the Foster Park water supply.

2.1.8.2 2010 Status

The recent upgrades have allowed Ventura Water to review the well and other water system design standards.

Section 3: Watershed Characteristics and Water Supply System Components

3.1 Watershed Study Area

The watershed study area has remained the same as the previous watershed sanitary surveys and is shown on Figure 1.

3.2 Land Use

The major land uses within the lower Ventura River/San Antonio Creek watershed are agricultural, commercial, light industrial, and residential. These uses are outlined in the "Ojai Valley Area Plan" which was adopted by the Ventura County Board of Supervisors on July 18, 1995 and last amended on February 5, 2008 and is found in Appendix B.

Open space and residential uses account for over 99 percent of the watershed. Residential use is categorized by dwelling units (DU) per acre. Rural residential use, designated RR5 and RR2, represents 0.5 and 1.22 DU/acre, respectively. Urban residential use is designated UR, followed by the range of intensity as measured in dwelling units per acre. A designation of UR 2-4, for example, represents intensities of 2 to 4 DU/acre. Rural institutional use, designated RI, represents camps and educational facilities set in a rural environment. Other uses include commercial and light industrial. Table 3-1 is a list of these designations and the percentage of developed watershed area assigned to each land use:

Table 3-1
Ojai Valley Area Planning Area Land Use

Designation	Percentage of Developed Watershed
RI	14.4
RR5	30.4
RR2	22.4
UR 1-2	18.2
UR 2-4	5.2
UR 4-6	2.0
UR 6-10	4.0
UR 10-20	1.4
Commercial	1.5
Industrial	0.4

Development in the watershed has generally been limited to floodplain areas. Most of the land in the Ventura River valley is privately held.

Included in the watershed is the incorporated City of Ojai and several unincorporated population centers, including Casitas Springs, Live Oak Acres, Meiners Oaks, Mira Monte, and Oak View.

For incorporated cities, land use and land development is controlled by the policies of each city's General Plan and the regulations set forth in each city's zoning ordinance. The County's General Plan and zoning ordinance control land use and development in unincorporated areas. Use of land within the boundaries of the Los Padres National Forest is controlled by the U.S. Department of Agriculture (USDA) Forest Service.

Population data for the study area was provided by the US Census data from 2000, and shown in Table 3-2. Land uses within City of Ojai are included in the Ojai City Land Use Element. City of Ojai reported little development during the last five years, which is likely attributable to the City of San Buenaventura's stringent development code. The largest growth in population compared to the previous Sanitary Survey was the Oak View/Mira Monte area, increasing from 8,125 in 2000 to the current estimate of 11,209. These population data can be updated once 2010 census data are available.

Table 3-2

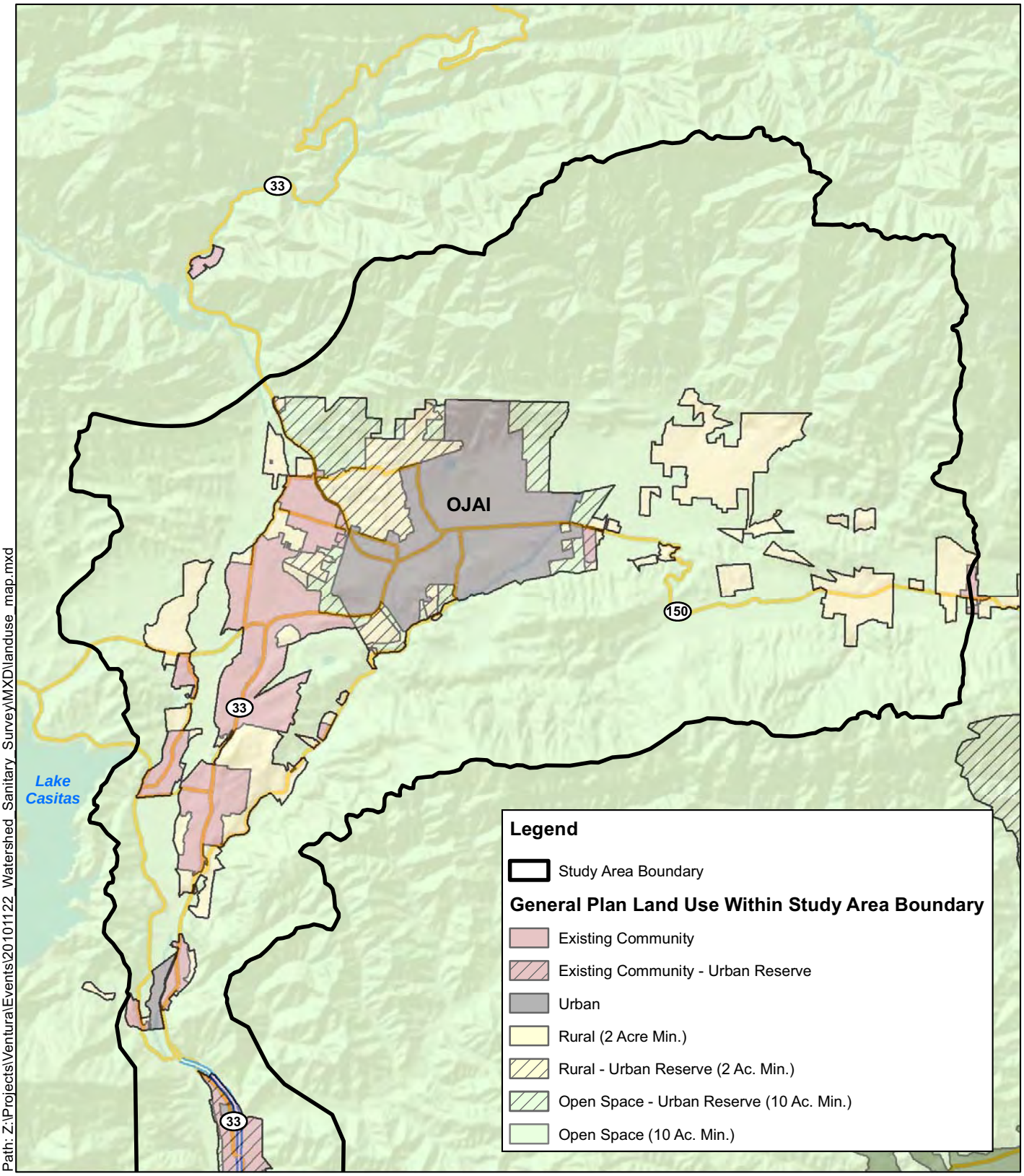
Study Area Population Estimate

City/Town	Population Estimate
Casitas Springs	1,121
Meiners Oaks	3,921
Mira Monte	6,915
Oak View	4,294
City of Ojai	7,862
Other Unincorporated Areas	774
Total Population in the Study Area	24,887

Source: Community populations from Maps Etc., 2004 and City of Ojai, Other areas from 2000 US Census

Figure 3 shows the latest available land use survey of the study area from the Ventura County General Plan (2010). As shown on the figure, most of the land is not developed within the study area.

Figure 4 compares the 2008 land use with 2004 land use to see where the changes have taken place over the last 4 years, some reduction in prime farmland areas have occurred. Categories of land use in Figures 4 are based on the Farmland Mapping and Monitoring Program of the California Division of Land Resource Protection, and are defined as:



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N

0 4,500 9,000

Feet

Kennedy/Jenks Consultants

Watershed Sanitary Survey Update
Ventura, California

General Plan Land Use Map

K/J 1089061*00
July 2011

Figure 3

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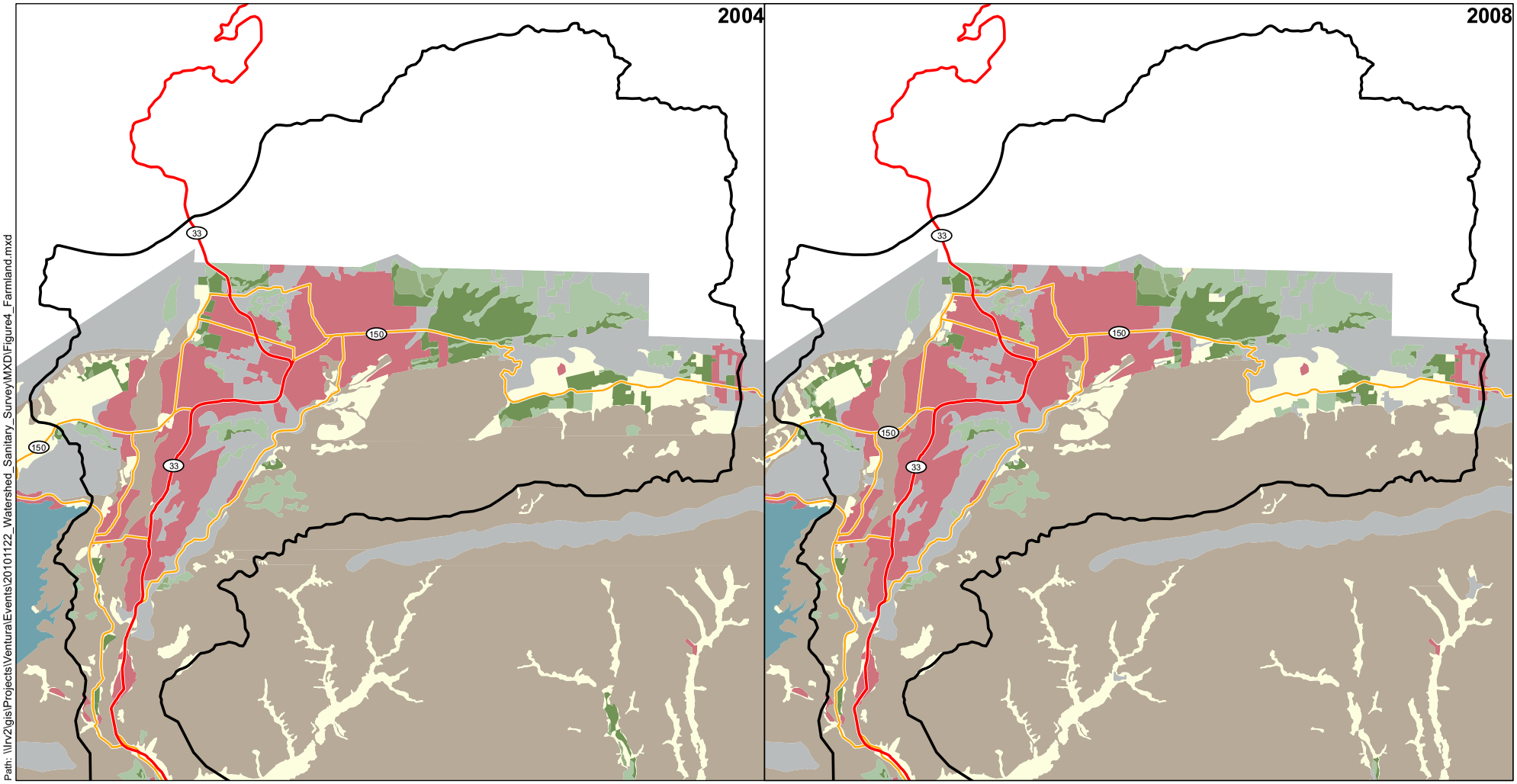

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Legend

- Prime Farmland
- Farmland of Statewide Importance
- Unique Farmland
- Farmland of Local Importance
- Grazing Land
- Urban and Built-Up Land
- Other Land
- Water
- Farmland of Local Potential
- Irrigated Farmland
- Nonirrigated Farmland
- Not Surveyed
- Study Area Boundary
- Highway
- Major Road

N

0 0.75 1.5
Miles

Kennedy/Jenks Consultants

Watershed Sanityary Survey Update
Ventura, California

Changes in Major Categories of Land Use from 2004 to 2008

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July 2011

Figure 4

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- Prime Farmland (P): Farmland with the best combination of physical and chemical features able to sustain long term agricultural production. This land has the soil quality, growing season, and moisture supply needed to produce sustained high yields. Land must have been used for irrigated agricultural production at some time during the four years prior to the mapping date. Information on the soils qualifying for Prime Farmland can be downloaded from the embedded link. More general information on the definition of Prime Farmland is also available for download in the embedded link.

- Farmland of Statewide Importance (S): Farmland similar to Prime Farmland but with minor shortcomings, such as greater slopes or less ability to store soil moisture. Land must have been used for irrigated agricultural production at some time during the four years prior to the mapping date. Download information on the soils qualifying for Farmland of Statewide Importance.

- Unique Farmland (U): Farmland of lesser quality soils used for the production of the state's leading agricultural crops. This land is usually irrigated, but may include nonirrigated orchards or vineyards as found in some climatic zones in California. Land must have been cropped at some time during the four years prior to the mapping date.

- Farmland of Local Importance (L): Land of importance to the local agricultural economy as determined by each county's board of supervisors and a local advisory committee. Download a complete set of the Farmland of Local Importance definitions in PDF format from the embedded link.

- Grazing Land (G): Land on which the existing vegetation is suited to the grazing of livestock. This category was developed in cooperation with the California Cattlemen's Association, University of California Cooperative Extension, and other groups interested in the extent of grazing activities. The minimum mapping unit for Grazing Land is 40 acres.

- Urban and Built-up Land (D): Land occupied by structures with a building density of at least 1 unit to 1.5 acres, or approximately 6 structures to a 10-acre parcel. This land is used for residential, industrial, commercial, construction, institutional, public administration, railroad and other transportation yards, cemeteries, airports, golf courses, sanitary landfills, sewage treatment, water control structures, and other developed purposes.

- Other Land (X): Land not included in any other mapping category. Common examples include low density rural developments; brush, timber, wetland, and riparian areas not suitable for livestock grazing; confined livestock, poultry or aquaculture facilities; strip mines, borrow pits; and water bodies smaller than forty acres. Vacant and nonagricultural land surrounded on all sides by urban development and greater than 40 acres is mapped as Other Land.

3.3 Natural Setting

No known changes with respect to topography, geology, or wildlife have occurred since 2005. The 2004/05 winter brought the second wettest rain season on record in southern California with over twice the average rainfall, which caused a number of problems within the watershed relating to flooding, damage to roadways and monitoring locations, the destruction of some pipes and a well near Foster Park, and landslides in the watershed.

3.4 Existing Hydrologic Monitoring

Updated hydrological information was provided by the Ventura County Watershed Protection District (VCWPD). The County maintains numerous rain gauges at precipitation stations throughout the County. There are ten precipitation stations within the Ventura River/San Antonio Creek Watershed (see Figure 1). Station 59 – Ojai-Thacher School was not included in the data set because no rainfall data beyond WY 2005-2006 was available. Five of these gauges are standard-type gauges which record yearly data, while the remaining five are both standard-type and recorder-type gauges from which daily records are obtained. Rainfall data is collected for each gauging station by local residents and provided to the County for compilation. The average yearly rainfall for the past five years, from water year (WY)[1] 2004-2005 through WY 2008-2009 ranges from 20.74 inches at the driest station (Station 140, Oak View – County Fire Station) to 28.98 inches at the wettest station (Station 163c, Sulfur Mountain). January proved to be the wettest month at all rainfall stations. Rainfall data for WY 2004-2005 through WY 2008-2009 for the watershed is summarized in Table 3-3 that follows, and is provided in greater detail in Appendix C.

[1] A Water Year (WY) is defined by Ventura County as October 1 through September 30; so WY 2005 is from October 1, 2004 through September 30, 2005.

Table 3-3

AVERAGE ANNUAL RAINFALL (INCHES) FOR WY 2004-2005 THROUGH 2008-2009

Station	WY 2004-2005	WY 2005-2006	WY 2006-2007	WY 2007-2008	WY 2008-2009
Ojai Barrett Ranch	51.01	24.58	7.64	22.31	13.56
Oak View – County Fire Station	44.52	22.47	5.63	19.67	11.43
Sulphur Mountain	65.96	28.61	8.46	26.7	15.19
Ojai- Stewart Canyon	45.77	23.44	6.42	21.25	13.76
Lake Casitas-Upper	51.28	25.84	7.15	24.47	12.91
Ventura River County Water District	48.25	24.96	6.43	23.8	13.02
Meiners Oaks-County Fire Station	51.35	25.91	7.00	23.86	Not available
Ojai County fire Station	43.84	23.87	7.43	20.59	12.91
Upper Ojai-Happy Valley	54.93	24.91	7.07	25.87	13.65

Other hydrological characteristics of the watershed, such as stream flow characteristics, reservoir or lake characteristics, wetlands characteristics and groundwater recharge have not changed significantly over the last five years, except in response to the changes in precipitation.

A portion of Ventura Water's water supply is upper Ventura River water which CMWD diverts at the Robles Diversion, stores in Lake Casitas, and then pressure filters and disinfects before providing the treated water to its retail and wholesale customers, including Ventura Water.

One proposed project may create major changes in the movement of sediment in the Ventura River, the removal of Matilija Dam. This project is discussed in more detail in Section 5.13 Water Agency Coordination Measures.

3.5 City of San Buenaventura Water Supply System

The main water supply for the western portion of Ventura Water is served from the Ventura River, either from the Foster Park facilities or the CMWD facilities. This discussion focuses on the Foster Park facilities.

In October 2002, Ventura Water and Kennedy/Jenks completed the *Preliminary Design Report - Avenue Water Treatment Plant/Foster Park Facility Improvements Project*. In this report Ventura Water considered potential improvements to increase the yield from the Foster Park Well Field and Diversion Facilities and to improve the treated water quality, treatment capacity and reliability provided by the Avenue WTP. To support the Foster Park facilities improvements work, Fugro West completed a *Hydrogeologic Investigation - Avenue Water Treatment Plant/Foster Park Improvements Project* in July 2002.

Figure 2 shows the locations of Ventura Water's facilities near Foster Park.

3.5.1 Foster Park Well Field and Diversion and Conveyance Facilities

Prior to 2001, the Foster Park Well Field and Diversion Facilities consisted of the Ventura River surface diversion, a subsurface collector consisting of a perforated pipe upstream of a submerged dam and four active Nye wells, which pump groundwater under the direct influence of the river. Environmental constraints have resulted in the loss of the surface diversion, the loss of a well, multiple conveyance pipelines, and they have resulted in the construction of two additional wells, currently unused, as part of the Matilija Dam Removal Project.

3.5.2 Storm Damage and Repairs

From 2006 to 2009, a variety of storm events had flood runoff that damaged Ventura Water's Foster Park facilities. This section provides a summary of the major repairs to those facilities. Figure 2 presents a schematic of the Foster Park facility improvements.

- <u>Storms 2006 through 2009</u>: Ventura Water has made plans to or has already completed the following repairs:
    - Nye Well 1A – This well has been abandoned and destroyed.
    - Nye Well No. 2 – Service access to Nye Well No. 2 has been completed but reconstruction of the connection lateral between the well and the 18-inch conveyance pipeline has not been completed.
    - Nye Well No. 7 – The connection pipeline between Nye Well No. 7 and Nye Well No. 8 was destroyed yet again along with significant bank area. Ventura Water has since obtained new land to accommodate a new connection pipeline which has been constructed. The well is now operational and Ventura Water plans to upgrade it with a higher pressure pump and Variable Frequency Drive (VFD).

- Nye Well No. 8 – The previously damaged 16-inch west to east pipeline beneath the river between Nye Well No. 8 and the existing 18-inch conveyance pipeline on the East side of the river has been sliplined using 12-inch HDPE. This well is now operational. The well is now operational and Ventura Water plans to upgrade it with a higher pressure pump and Variable Frequency Drive (VFD).

- Nye Well No. 11 – This well is now operational in place of Well No. 1A.

- Nye Wells No. 12 & 13 – These wells have been drilled as part of the Matilija Dam removal mitigation but are not yet in service.

3.5.3 Foster Park Water Production

In 1996, Fugro West Inc. reported in its *Hydrogeologic Study for the Ventura Avenue Treatment Plant/Foster Park Master Plan* that the average production from the Foster Park facilities for the 1986 through 1995 period was 6,400 acre-feet (AFY). In Table 4-3 of the 2000 Report, it was shown that the water diversion from Foster Park from 1996 through 1999 declined to about 5,000 AF/year. This was noted to be due primarily to increased water purchases from CMWD rather than low water yields. The average production between the years 2000 and 2004 increased 6,260 AF/year but significant damage to Foster park facilities incurred during 2005 storm events lowered the average production between the years 2005 and 2009 to 2,250 AF/year (Table 3-4).

Table 3-4

2005 - 2009 Water Diversions from Foster Park (AF)

Source	2005	2006	2007	2008	2009	5-Year Total	5-Year %
Nye Wells	123	207	223	1,065	1,382	3,000	27%
Subsurface River Intake	1,144	2,026	1,777	1,646	1,655	8,248	73%
Surface River Intake	0	0	0	0	0	0	<1
Total	***1,267***	***2,233***	***2,000***	***2,711***	***3,037***	***11,248***	***100***

Source: City's Water Production Records

In their 1996 hydrogeologic study, Fugro West, Inc., concluded that the long-term potential yield of upgraded Foster Park facilities could be 7,000 additional AF/year for a total of 13,400 AF/year (Fugro West Inc., 1996). To achieve this yield would require improvements to the existing well field and diversion facilities.

In July 2002 Fugro West completed a study entitled, *Hydrogeologic Investigation - Avenue Water Treatment Plant/*Foster *Park Improvements Project.* In that study, Fugro West, Inc. conducted an evaluation of the river subsurface conditions based on test well drilling and short-

term pumping at ten (10) locations. The resulting data were used to select the sites for up to five new wells at 350 to 400-foot spacing.

3.5.4 Proposed Foster Park Well Field and Diversion Facilities Improvements

According to the 1999 *Avenue Treatment Plant/Foster Park Master Plan* (Kennedy/Jenks 1999), eliminating the need to maintain/restore/operate the surface diversion facility and constructing additional wells and/or a subsurface collection facility would have several advantages, including providing a more reliable water supply, better raw water quality, and improved ability to meet DPH requirements. Ventura Water's stated goal for Foster Park water production is 8,500 to 10,500 gpm for average and peak demand conditions. Opportunities for meeting this goal through improvement of existing facilities and development of new wells were assessed through the 2002 hydrogeologic investigation.

Conservatively estimating an average production rate for each well of 1,500 gpm, Ventura Water's water supply goals can be met by installing four new wells (including replacing Well No. 2 and the newly operable Well No. 11). A summary of the system yield with the existing, new and improved facilities is provided in the Table 3-5:

Table 3-5

Proposed Water Supply Yield at Foster Park

Water Supply Element	Instantaneous Yield		Cumulative Yield	
	GPM	MGD	GPM	MGD
Existing Well Field (Nye Well No.'s 7, 8, & 11)	2,450	3.53	2,450	3.53
Subsurface Collector	1,300	1.87	3,550	5.11
New Well Field (4 wells)	6,000	8.64	9,550	13.75
Improvement of Existing Facilities	400	0.58	9,950	14.33
Total Supply	10,150	14.62	25,500	36.73

Source: Provided by City of Ventura, 2010

Ventura Water's plans for permanent Foster Park facilities improvements have been postponed due to delays in approval of the associated Environmental Impact Report and negotiations required thereon. However, if successful, Ventura Water's plans for Foster Park in the next several years include:

- Replace Well No. 2 which is the active river channel with a new production well set back from the east river bank.
- Harden and upgrade the wellheads at Wells No.'s 7 and 8.

- Add two or three new production wells set back from the east river bank.

The plan is that all new wells would be setback from the riverbank by at least 50 feet, would have their motors, meters, valves and piping above the 100-year flood elevation and would have the well casings hardened for protection from flood carried debris should the river bank become scoured away.

3.5.5 Avenue Water Treatment Plant Improvements

During 2005 through 2006, as part of the Avenue WTP Membrane Filtration Project, Ventura Water completed major construction upgrades to the facility which at the time was over 70 years old. The objectives of the Filtration Project included:

- Improve reliable capacity
- Meet current and future regulations
- Provide high quality water from multiple sources
- Incorporate the shift to chloramine disinfection
- pH corrosion control
- Provide simplified and safe plant operations

Currently, the Avenue WTP treats groundwater under the influence of surface water from Ventura Water's Foster Park Nye well system. This source water from the Foster Park Facilities enters the Avenue WTP property at the northeast corner through parallel 24-inch and 36-inch pipelines and discharge into an Inlet Meter Vault. A 36-inch pipeline connects the Inlet Meter Vault to the Kingston Reservoir, which acts as a raw water flow equalization basin for the WTP. The Avenue WTP can also receive treated surface water from the Casitas Municipal Water District (CMWD) that can be sent directly into the Zone 210 and 400 distribution systems or directed to the Kingston Reservoir.

The Avenue WTP treatment process consists of oxidation and coagulation, filtration with submerged UF membrane filtration units (to remove turbidity and pathogens from the water), disinfection with free chlorine (to disinfect the filtered water prior to the Power Reservoir and Ventura Water's distribution system), followed by ammonia addition to produce chloramines (to minimize disinfection byproducts in the distribution system). Corrosion control chemicals are also added to the treated water. The treated water is stored in the Power Reservoir, which is a 15 million-gallon covered, concrete water storage facility. The Power Reservoir and Valley Vista booster pump stations deliver water from the reservoir to the Zone 210 and 400 distribution systems, respectively.

The Avenue WTP has a design capacity of up to 10 million gallons per day (MGD) of treated water and has the potential for expansion to 15 MGD. The Avenue WTP operating staff increase or decrease plant output based on system demands and water availability from Foster Park.

During the year since startup, the Avenue WTP has typically operated only seven to eight hours per day due to limited source water availability.

The Avenue WTP treatment system is fully automated and does not require continuously attended operation. An overall plant system supervisory control and data acquisition (SCADA) system communicates with and coordinates the membrane units and supporting plant equipment during plant operation. The Avenue WTP is normally operated from the SCADA Computer Workstation in an automatic or semi-automatic mode. The plant operator monitors plant parameters, responds to alarm conditions, and adjusts plant flow rate based on system demand. The plant SCADA system has a remote access system to permit remote monitoring and operation of the facility.

The Avenue WTP operating staff performs routine operation, maintenance, and basic water quality analysis to calibrate and verify online analysis equipment, and SCADA maintenance are supported by Ventura Water's Production Section personnel. The basic water quality analyses performed by the operating staff include turbidity, pH, temperature, and residual chlorine concentration. Other water quality analyses including bacteriological testing are sent to an offsite laboratory for analysis.

Data is collected from the operation of the Avenue WTP to monitor the facility performance and to verify compliance with State and Federal Regulations. Data is recorded from on-line instruments that record turbidity, temperature, pressure, pH, chlorine residual concentration, flow rates, and tank levels. Laboratory analysis is conducted periodically to calibrate and verify on-line analyzers in accordance with the SWTR.

Additional improvements at the Avenue WTP include: construction of new sludge drying beds and washwater recovery basins; construction of a new raw water reservoir outlet pipe and source water pump station, construction of a new Chemical Building with gas chlorine storage feed as well as coagulant, caustic soda and miscellaneous membrane cleaning chemical storage and feed systems; construction of a new Membrane Building with submerged ultrafiltration membrane filters and associated equipment, piping, valves, instrumentation and controls; and new site utilities and improvements, including site security work.

Table 3-6 presents the removal and inactivation credits that the Avenue WTP now achieves with the new membrane filtration system and free chlorine disinfection in Power Reservoir as compared to the treatment objectives of the LT2ESWTR. The new WTP can provide greater removal and inactivation than is required.

Table 3-6

Avenue WTP Removal and Inactivation Credits

Pathogen	Zenon 1000 UF Log Removal Credit[c]	Power Reservoir Free Chlorine Log Inactivation[a]	Total Avenue WTP Log Removal-Inactivation	LT2ESWTR Treatment Removal-Inactivation Objectives
Giardia	4	2	6	3.0[b]
Cryptosporidium	4	N/A	4	2.0
Virus	3.5	>6	>9	4.0[b]

Notes:
(a) Based on 0.5 mg/l chlorine residual, 15°C, pH 7 and 1.7 hrs of contact time at low level (206 feet) and max flow (15 MGD). Power Reservoir is assumed to have a T_{10} to hydraulic detention time ratio of 0.1 to 1.
(b) MF/UF membrane systems are required to provide at least 0.5 log *Giardia* inactivation or 2-log virus inactivation in addition to removal credits.
(c) DPH approved credits based upon previous testing

3.5.6 Casitas Municipal Water District Purchases

Ventura Water continues to take CMWD water through the CMWD No. 1 turnout, which sends the water to Kingston Reservoir. The Lake Casitas water mixes with the raw water diverted from Foster Park before entering the Avenue WTP for treatment or can be bypassed around the plant. The CMWD No. 2 connection feeds directly into Ventura Water's Hall Canyon Reservoir.

Under Ventura Water's water purchase agreement with CMWD dated June 28, 1995 which is still current, Ventura Water agreed to purchase at least 6,000 AF/year from CMWD. In October 1996 Casitas began operating its direct filtration water treatment plant. At that time the pipeline delivering water to Ventura was converted from a raw water pipeline to a treated water pipeline. This allowed Ventura Water to take Casitas water directly into Ventura Water's water distribution system through the CMWD No. 2 turnout without additional treatment at the Avenue WTP. Between the years 2000 and 2004, Ventura Water took an average of 2,883 AFY through CMWD No. 1 turnout and an average of 2,731 AFY through CMWD No. 2 turnout. Between the years of 2005 and 2009, Ventura Water has increased its average annual CMWD deliveries in the No. 1 turnout to 3,399 AFY but has decreased deliveries in the No. 2 turnout to an annual average of 2,255 AFY. Annual CMWD purchases during this time period are reflected in Table 3-7. During October and November when Lake Casitas turns over, Ventura customers have complained about the taste and odor of the CMWD water supply (Kennedy/Jenks 1999). To avoid this problem, Ventura Water maximizes its use of Casitas water during the July to September period and reduces CMWD water purchases during the fall or re-treats the CMWD water to lower taste and odor complaints from the public.

Table 3-7

Water Purchases from Casitas Municipal Water District (AF/Year)

Turnout	2005	2006	2007	2008	2009
CMWD No. 1	4,754	3,067	3,342	3,087	2,744
CMWD No. 2	1,806	1,842	2,999	2,301	2,326
Total	6,560	4,909	6,341	5,388	5,070

As recommended in the Master Plan (Kennedy/Jenks 1999), Ventura Water has completed the following system retrofits:

- Shift the primary delivery point to CMWD No. 2. This allows concurrent use of the Ventura River Foster Park supply and CMWD water.
- Connect the CMWD No. 1 turnout directly to the 400/260R Zone along Ventura Avenue at the Valley Vista Booster Pump Station.
- Add piping to allow taking CMWD No. 1 water directly into the distribution system (210 Zone).
- Add additional motor operated valves to allow remote control of the various delivery points.

Direct use of the CMWD water without additional treatment at the Avenue WTP requires additional monitoring of the CMWD water quality.

CMWD converted from traditional chlorination to chloramination disinfection. Consequently, Ventura Water in 2004 converted its system–wide disinfection system to chloramination. This should reduce the potential for creation of THMs in Ventura Water's drinking water as well as eliminating the potential for taste and odor complaints at the interface between chlorinated and chloraminated water in the distribution system.

3.6 Emergency Response Agencies/Responsibilities

The OVSD has upgraded its emergency notification equipment and response program. The updated Sewage Spill Prevention and Response Plan, dated October 2010 is included as Appendix D. OVSD maintains the manhole with an overflow sensor near the confluence of San Antonio Creek and the Ventura River and Ventura Water monitors the water level in the OVSD manhole through the Avenue WTP SCADA system.

Section 4: Potential Contamination Sources in the Watershed

4.1 Sanitary Survey Methods

Regulatory agencies contacted for the 2005 Sanitary Survey were again contacted regarding changes in land uses, operations, and policies and permitting procedures that would affect the watershed and ultimately water quality of the surface water streams. OVSD provided significant assistance to the sanitary survey team regarding their sewage collection facilities, water quality testing results, sewage spills, GIS data, and OVSD facility upgrades. Field survey inspections by driving and walking were conducted during April 2011. Photographs of some of the watershed features that affect water quality are provided in Appendix E. Some locations from the 2005 survey were no longer relevant (i.e. construction was completed) or could not be located because of overgrowth and were not photographed. Locations of the photographs taken on the field survey are shown on Figure 5.

4.2 Potential Contaminants

A map showing potential contaminants in the study area is presented in Figure 6. These contaminants were identified in the current and previous sanitary surveys. Only if there is evidence of a potential contamination being mitigated was it taken off the map, such as one of the golf courses or the Honor Farm.

4.2.1 Sediment from Matilija Dam

The USACE has developed proposals to remove the Matilija Dam that quickly filled with sediments since its construction in 1947. There is now only about 500 AF of storage capacity in what once was a reservoir designed for over 7,000 AF of storage. Of concern is the risk from sediment being carried over the dam with large floods if no other action is taken, or with a slurry and pipeline sediment removal project. The EIS for the removal of the dam (USACE 2004) discussed the potential sediment contamination and the effects of the sediment on the groundwater recharge downstream of the dam. With or without the Matilija Dam removal Project, sediment transfer to the recharge areas of the lower Ventura River and sediment effects on the riverbed aquifer are a concern for the following reasons:

- Extra sediment will fill pore spaces, may form a seal, and decrease the effective storage in the riverbed aquifer.
- Extra sediment may affect operation of the Los Robles diversion structure, impacting flow down the main channel.
- The sediment will affect the geomorphology of the river.

If the proposed slurry line and sediment removal take place, there will be impacts of that operation to consider.

4.2.2 Sewered versus Unsewered Areas

The unsewered areas within the watershed are essentially unchanged from 2005. Only minor additions have been made in the Arbolada area of Ojai and in the Casitas Springs area. The problem areas also remain the same as reported in the 2000 and 2005 Sanitary Surveys as far as contamination potential from overflowing septic tanks in high groundwater areas. However, some homes have converted from septic to community sewer as described in Section 4.2.4.4.

Siete Robles Tract. This area in eastern Ojai has high groundwater (8 to 10 feet to the water table) and artesian wells. During the rainy season, the septic tanks and leachfields are often within the water table increasing the potential for surfacing effluent. Many residents have their septic systems pumped to tanker trucks frequently during the rainy season that haulers take away to Santa Clara Sanitation for disposal.

Arbolada. This area north of the intersection of Highways 33 and 150 has a high water table and, in some areas, a shallow depth to bedrock. Some property owners have been denied permission to develop because of poor conditions for septic systems. In 2005, some of the residents constructed a sewer collection system in the lower lying southern portion of this neighborhood and have connected to OVSD.

Areas Southwest of Intersection of Highway 150 and Burnham Road (Los Encinos). Septic system problems in this area are caused mainly by clay soils that significantly reduce percolation rates. In 2003 OVSD connected a sewer line to the Montessori school on Highway 150 at the northern edge of this neighborhood.

Live Oak Acres. Septic system problems in this area are caused by the high water table.

Santa Ana Road. The unsewered housing development along Santa Ana Road west of the Ventura River and just north of Foster Park has septic sewer problems due primarily to the high water table. This area is difficult to access by sewer line because of having to cross the Ventura River.

Casitas Springs within OVSD Boundary. The Casitas Springs area within the OVSD boundary is partially served by sewers and partially by septic systems as shown on Figure 6. Portions of Casitas Springs have good soils for septic systems; however, repairs at the older homes are often needed for failing septic systems. According to OVSD, new homeowners are beginning to connect to the sewage collection system. OVSD is working with a number of homeowners to repair their connections to the sewer system after the January and February 2005 mudslides.

Casitas Springs outside OVSD Boundary. Similar conditions exist for these older homes outside the OVSD boundaries as for the homes within the Sanitary District boundaries. They do not have the option to connect to the OVSD collection system unless they annex to the District.

4.2.3 Domestic Wastewater – Ojai Valley Sanitary District

OVSD is the governing agency for domestic wastewater collection, treatment, and disposal within the watershed. The OVSD service area has remained essentially unchanged since 2005 and is shown on Figure 7. OVSD's wastewater treatment plant provides tertiary level treatment with nutrient reduction treatment facilities. The OVSD WWTP location and discharge point

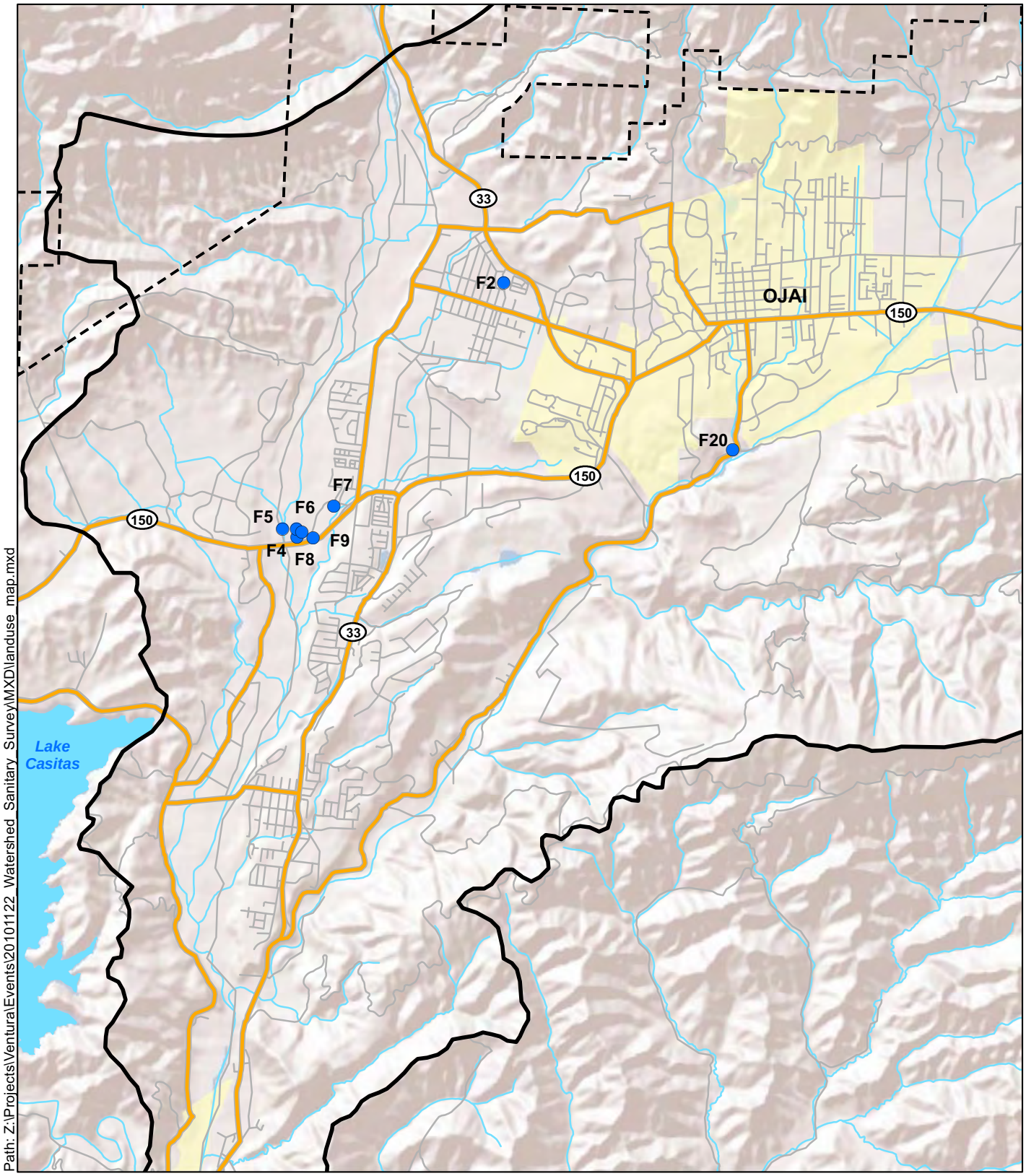

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Image Source: © 2009 ESRI

Legend

- Field Photo Survey Points
- National Forest Boundary
- Study Area Boundary
- Lake
- Highway; Major Road
- Local Road
- Stream

N

0 2,500 5,000

Feet

Kennedy/Jenks Consultants

Watershed Sanitary Survey Update
Ventura, California

2010 Sanitary Survey Photograph Locations (Photographs in Appendix E)

K/J 1089061*00
July 2011

Figure 5

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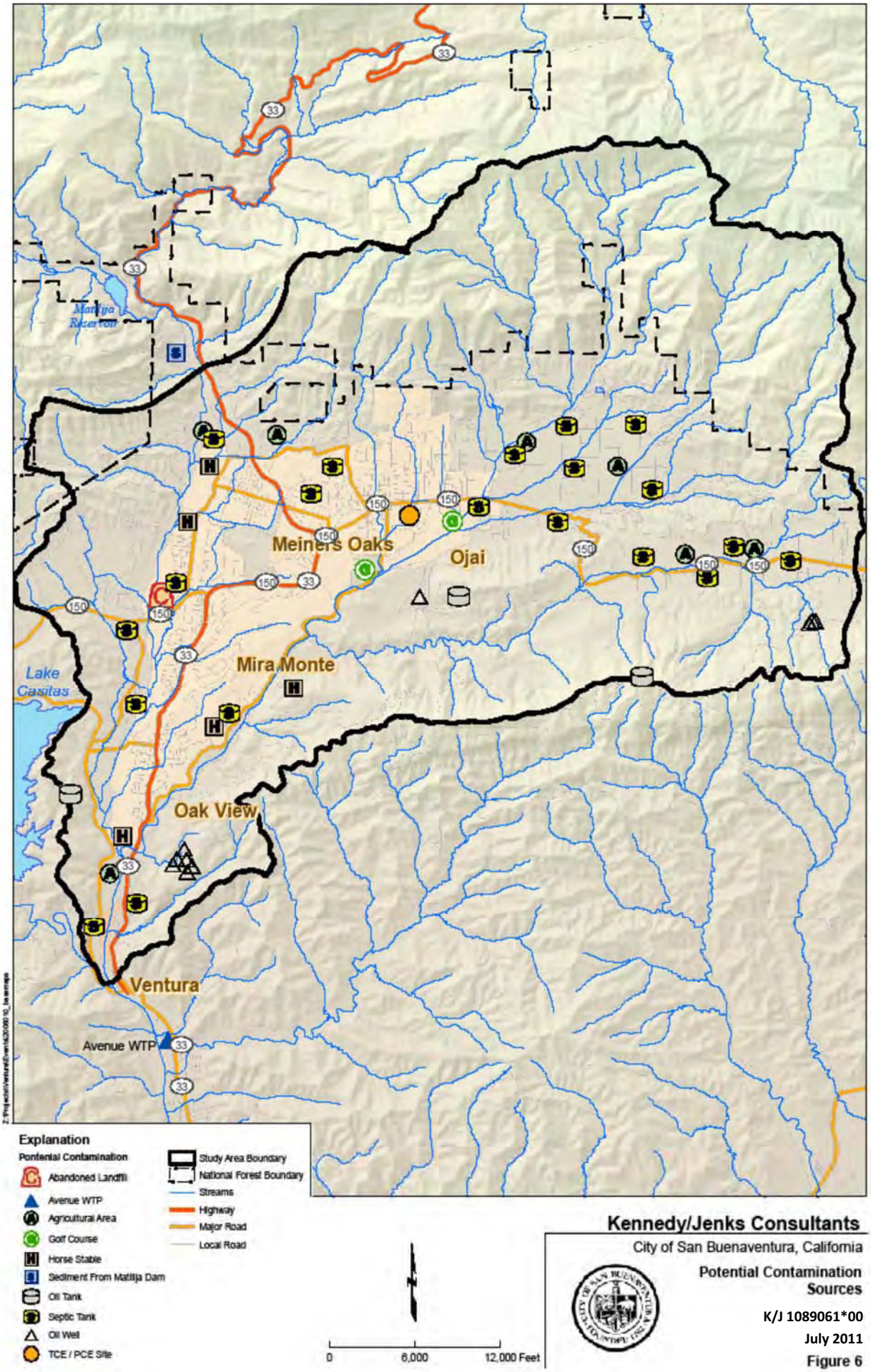

Kennedy/Jenks Consultants

City of San Buenaventura, California

Potential Contamination Sources

K/J 1089061*00

July 2011

Figure 6

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remain unchanged at a location along the Ventura River, which is outside and downstream from the watershed study area.

OVSD's 2008 NPDES Permit CA0053961 No. R4-2008-0039 for treated wastewater disposal is included as Appendix F.

4.2.4 OVSD Sewage Lift Stations in Watershed

Four of OVSD's six lift stations are still located within the study area. Their locations are shown on Figure 7. The pump stations are monitored 24 hours a day via a radio-based telemetry system connected directly into the OVSD Treatment Plant SCADA system. OVSD has installed its DCS telemetry system at its facilities throughout the District. This telemetry system transmits up to the minute operational information, flows, and alarms to the treatment plant's SCADA system. The SCADA system is equipped with a call out system that receives alarms and automatically contacts standby personnel during off-hours.

In addition, to prevent or reduce the impact of short-term power failures, the five largest pumping stations have been provided with emergency standby power capability. OVSD continued to maintain five (5) emergency generators, three of which are portables, which could be moved to run the OVSD headquarters if necessary. The Matilija Lift Station could be pumped periodically by vacuum truck during the emergency period.

Lift Station "Y" is located next to an out of business Ford dealership which used to be the sole contributor of sewage into the lift station. Currently, this lift station is out of service since there is no flow from the adjacent property.

OVSD upgraded the SCADA equipment during 2000 to 2005, and took over operation of a small 6th lift station at the Park and Ride at the Highway 33 and 150 intersections in Ojai. The District made another major automation software upgrade since 2005 which entailed conversion of their SCADA system from Transdyn to Rockwell Automation RS View32.

4.2.4.1 Sewer Line Crossings Under/Near Ventura River and Tributaries

The OVSD sewer lines which cross the Ventura River and its tributary creeks have continued to fail periodically because of damage during flood events, however, spill volumes for 2005 to 2009 as compared to 2000 to 2004 are much less due to the many system improvements by OVSD barring the lift station overflow and washed out trunk line. Spills are commonly related to blockages and the average spill amount due to blockages has decreased from 2,200 gal between 2000 and 2004 to 556 gal between 2005 and 2009. OVSD documents major line breaks in great detail including records of staff emergency response and repairs activities, estimates of the total volume of sewage spilled, and photographic documentation of the storm damage and repairs. A discussion of the system upgrades is provided below. A listing ofreported sewage spills of 200 gallons or more is provided in Table 4-1. None of the spills affected flowing water.

TABLE 4-1
OJAI VALLEY SANITARY DISTRICT SEWAGE SPILL SUMMARY (200 GAL. OR MORE)
REPORTING PERIOD 2005 TO 2009

Date	Problem	Spill Amount	Time Called	Time Arrived	Completed	Location	Reason for Spill
1/9/2005	Manhole Overflowing	N/A	1205	1220	1750	MH @ conflicting Ojai-OV trunks	Excess Flow
1/9/2005	Lift Station Overflow	0.94 MG	Onsite	1545	NA	SALS#1	Excess Flow
1/10/2005	Trunkline Washed Out	16.2 MG	1/10/2005	N/A	1/18/2005	Winery Siphon	Excess Flow
3/3/2006	Mainline - Blockage	230 gal	955	1005	1130	Sumac Drive	Roots-. from Lateral
4/19/2007	Manhole Overflowing	1,125 gal	1920	1945	2115	MH - Stewart Canyon	Roots
1/7/2008	Mainline - Blockage	1,200 gal	958	1010	1050	Descano Drive	Grease & Roots
3/1/2008	Mainline - Blockage	600 gal	937	1010	1100	Villanova Road	Roots
6/25/2009	Mainline - Blockage	450 gal	1327	1342	1407	Shady Ln/Hwy 150	Grease & Debris
8/30/2009	Mainline - Blockage	300 gal	1230	1250	1315	High Street	Debris

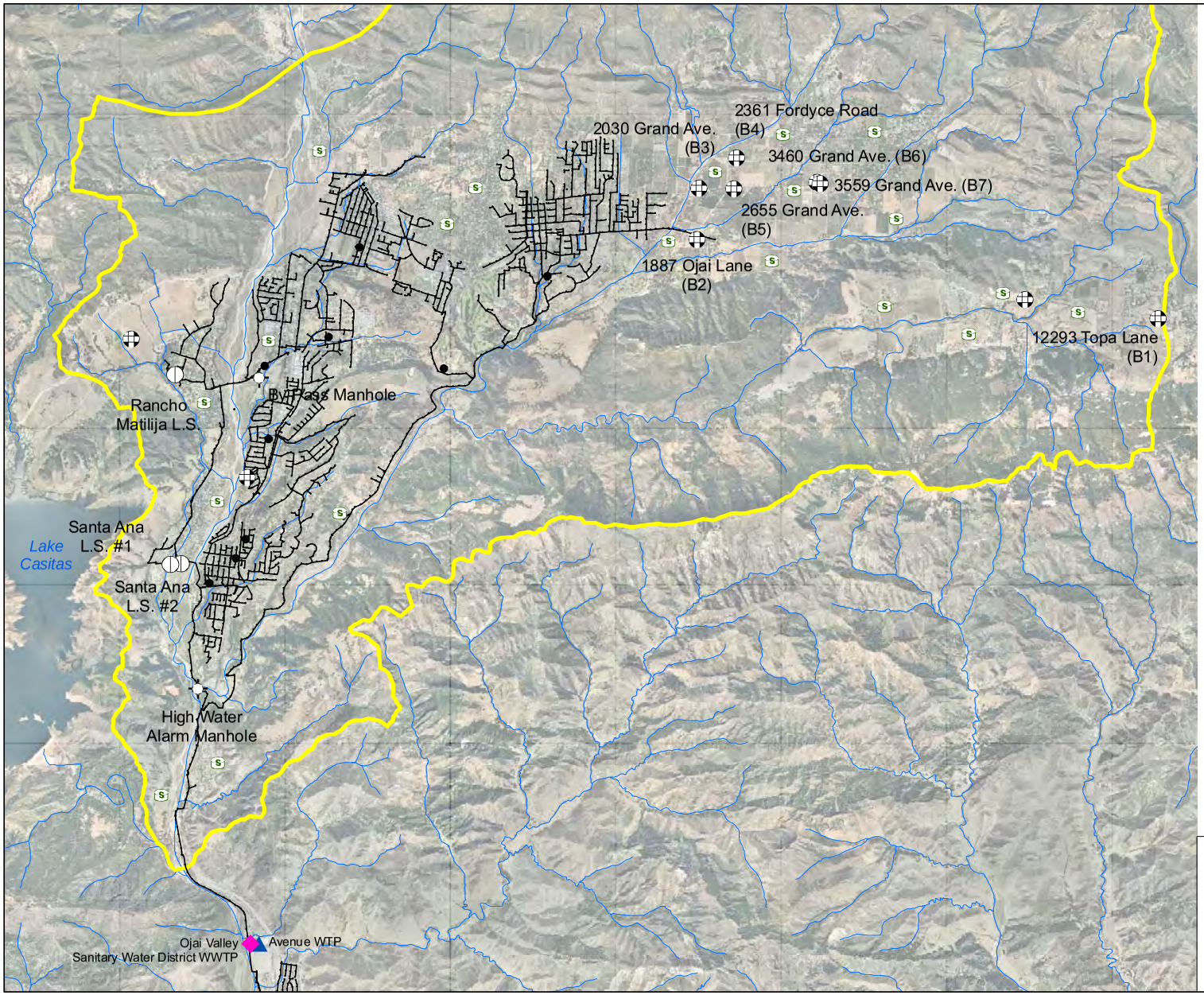
4.2.4.2 Ventura River and San Antonio Creek Crossings

The sewer line crossing the Ventura River at Highway 150 Bridge was replaced with a siphon to eliminate the potential for washout. The siphon with two 10-inch and one 12-inch diameter pipeline, was installed in 2003 using Horizontal Directional Drilling that placed the 3,100 foot siphon approximately 200 feet below the surface at its deepest point.

A similar double barrel siphon has been constructed to replace a trunk line that was washed out during the spring 2005 floods when the San Antonio Creek jumped its bank and flooded an agricultural field where the trunk line was located. This section of trunk line and adjoining short 100± foot siphon under the creek was replaced with a 1,800 foot, two-barrel, HDPE siphon in 2005. It is located further downstream and at a deeper invert elevation to minimize the risk of a second wash out in the event of additional severe flood events.

4.2.4.3 OVSD System Infrastructure Maintenance and Rehabilitation

During 2005-2009, OVSD took a number of preventative measures to further reduce the risk of system failures including routine maintenance, repairs, replacements, and equipment purchases.



Explanation

- Study Area Boundary
- Streams
- Septic Tank Areas

Sewer Crossings

- Sewage Lift Station
- Manhole
- Biosludge Disposal Area
- Sewage Spill Location
- Mainlines
- Structures

0 1 2 Miles

Kennedy/Jenks Consultants

City of San Buenaventura, California

Sewer Facility Locations in 2010

0589056
March 2006

Figure 7

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4.2.4.3.1 System Maintenance

1. Line Cleaning - During the period of January 2005 through December 2009, OVSD cleaned 1,044,186 LF of sewer line for routine maintenance based on a three year cleaning cycle, and 21,473 LF of enhanced cleaning line segments (Hot Spots).
2. CCTV Inspections - During the period of January 2005 through December 2009, OVSD conducted 336,342 LF of CCTV inspection for the purpose of performing a condition assessment of the entire collection system, post construction inspections, and locating Infiltration and Inflow (I&I) sources, and root assessment.
3. Root Control Program – During the period of January 2005 through December 2009, OVSD applied root inhibitor to 91,329 LF of mainline utilizing both in-house personnel and Duke's Root Control.

4.2.4.3.2 System Repairs and Rehabilitation

During the 2005 through 2009 wet weather seasons, OVSD conducted a rehabilitation program to reduce I&I into the sewer mains. Visual inspections inside manholes during rain events and flow monitors were employed as part of this program. ISCO and Flo-Dar open channel flow meters were implemented at strategic locations and CCTV inspections were conducted to quantify and isolate I&I flows. The use of ground monitoring wells in the Ojai area and five (5) rain gauges has also been incorporated into this effort.

This inspection program led to OVSD contracting with an outside vendor to grout 46 brick manholes providing high strength spun-on mortar with a two-part epoxy 100% solids coating. Subsequently, OVSD purchased a hand-operated grout injection system that they began using in 2009. Nine manholes were rehabilitated during the reporting period using the grout injection system.

4.2.4.3.3 System Replacement

During the period of January 2005 through December 2009, no pipe was replaced using open trench or pipe bursting methods nor was any pipe repaired using insituform technology. One manhole was replaced as well as 388 manhole rings and covers.
Zero point repairs were conducted during the reporting period.

Currently in construction (started June 2009) is the replacement of Ventura Avenue's two lift stations and associated force mains, which will eliminate one and replace the second lift station. The resulting configuration will provide a single 9,300 foot, ten-inch HPDE force main that will discharge directly into the Avenue Treatment Plant. The project is expected to be completed in early 2011.

See Section 4.2.4.2 for other aforementioned system replacements.

4.2.4.3.4 Equipment Purchases

OVSD purchased a track driven easement machine that increased the reach of the vactor unit hydraulic cleaning capability by 600 feet into areas of restricted access to improve pipeline cleaning capabilities and thereby reduce the risk of spills..
OVSD also purchased five new portable flow meters with radio frequency transmission capability, one permanently mounted flow meter, and a radio receiver unit to enhance flow data downloading. The hand-operated grout injection system was also purchased as mentioned in Section 4.2.4.3.2.

4.2.4.4 Septic System Upgrades

OVSD had 53 properties convert from septic systems to the District's sewer system between 2005 and 2009. OVSD does not plan or suggest that homes be converted, but rather they allow the homeowners to initiate the conversion process.

4.2.4.5 OVSD's Sewage Spill Prevention and Response Plans

In October 2010, OVSD updated its Sewage Spill Prevention and Response Plan. A copy of the 2010 Plan can be found in Appendix D.

A number of preventative measures are included in the 2010 Plan. The District's six pumping stations are monitored 24-hours a day via a radio-based telemetry system connected directly into the OVSD treatment plant SCADA system. This telemetry system transmits up-to-the-minute operation information. Additionally, to prevent or reduce the impact of short-term power failures, the five largest pumping stations have been provided with emergency standby power capability. To minimize sewage overflows and spills, OVSD schedules the cleaning of all main sewer lines over a three-year period, while line segments that have root, grease, or odor problems known as "hot spots" are cleaned more frequently.

Among the parties to be notified in an emergency, the October 2010 plan contains the following phone numbers for sewage spill notifications:

- State Office of Emergency Services (OES) at: 800-852-7550.

- Ventura County Environmental Health Department (VCEHD):
  - Business Hours (805) 654-2813
  - After Hours (805) 320-6244 or (805) 655-9181

Unless:

The spill is in or into the Ventura River and/or San Antonio Creek above Foster Park; then due to potential potable water contamination, first contact the Avenue WTP at:

- Business Hours (805) 652-4548 7 days/week 7am - 3:30pm, or (805) 652-4500 M-F 8am - 5pm
- After Hours (805) 339-4399, Police and Fire Dispatch

And then notify VCEHD next.

The City of San Buenaventura's central dispatch will report the incident and call Ventura Water standby personnel. The plan also contains phone numbers for the Los Angeles RWQCB and California Department of Fish and Game. The plan does not contain daytime and/or nighttime phone numbers for the DPH (Santa Barbara office), which is intimately involved in the regulation of drinking water quality.

4.2.5 Golf Courses

There are currently two existing golf courses in the watershed as shown on Figure 6; the Ojai Valley Inn Golf Course and Country Club, and the Soule Park Golf Course. These two golf courses border San Antonio Creek. The impacts on water quality in San Antonio Creek from the golf courses are not believed to be significant based on review of nitrate and pesticide data that may indicate over fertilization or treatment for insects.

4.2.6 Organized Recreational Facilities within Watershed

The Ventura River/San Antonio Creek watershed continues to offer a diverse array of outdoor activities. The watershed has parks, campgrounds, golf courses, ten miles of equestrian trails and retreat facilities. The Ventura County Parks and Recreation Department reported no significant changes in the operation of the recreational facilities within the watershed.

4.2.6.1 Ojai Valley Land Conservancy

The Ojai Valley Land Conservancy worked at developing the trails and trail heads for hiking and horseback riding along the Ventura River, in the area between the Los Robles Diversion and Highway 150. Other than providing a setting where small quantities of manure could potentially be washed into the watercourse, the Conservancy aims to protect both the Ventura River and San Antonio Creek Corridors through land acquisition and restoration.

4.2.6.2 Arnaz Program Center

The Arnaz Program Center is a camp privately owned and operated by the Girl Scouts of California's Central Coast. A portion of the property borders San Antonio Creek. A number of buildings are connected to the OVSD collection system and water is provided to the facility by CMWD. There have been no changes in the operation of this facility since 2005.

4.2.6.3 Foster Park

Foster Park is a historic park, first developed in 1906. The Ventura River flows through the park. Activities in the park include fishing and hiking. Family and group barbecue areas are also provided. Dogs are not allowed in the day use section. There are no known reported changes in operation of this facility.

4.2.6.4 Ojai Valley Bike Equestrian Trail

The Ojai Valley Trail parallels Highway 33 from Foster Park. Permitted activities along the trail include equestrian, bicycling, walking, and jogging. Dogs are permitted on leash only.

Construction of a new bridge over a section of dry creek bed is scheduled to commence in the first quarter of 2011. There are no additional reported changes in operation of this facility.

4.2.6.5 Camp Comfort

Camp Comfort is located within the Ojai Valley. The San Antonio Creek flows through the park. Activities in the park include campsite with full hookups including water and sewer utilities. Also provided are laundry facilities and indoor showers. Dogs are not allowed in the day use section. There are no known reported changes in operation of this facility.

4.2.6.6 Dennison Park

Dennison Park is located within the Ojai Valley. Activities within the park include family and group barbecue areas, individual campsites, and fire pits. There are no known reported changes in operation of this facility.

4.2.6.7 Soule Park

Soule Park, next to the Soule Park Golf Course, is the most frequently used Ventura County park. Activities in the park include tennis, an equestrian arena, softball field, and children's playgrounds. Family and group barbecue areas are located throughout the park. Dogs are not allowed. There are no known reported changes in operation of this facility.

4.2.6.8 Camp Ramah

Camp Ramah is a private, organized, sewered camping facility in McDonald Canyon, northeast of Meiners Oaks. In 2005, over 1,300 campers attended the summer month program at the camp. There are no known changes in the operation of this facility with respect to watershed contaminants.

4.2.7 Educational Facilities in the Watershed

There are no known changes to water runoff from the existing educational facilities in the study area.

4.2.8 Correctional Institutions in Watershed

The only correctional institution within the watershed was the County Sheriff's Honor Farm which closed in August 2003. In 2006, the Help of Ojai non-profit organization leased the property from the County of Ventura which is now called the Baldwin Road West Campus. The plan for West Campus is to provide expansion of existing programs and development of new programs to serve the citizens in need within the Ojai Valley.

4.2.9 Mine Runoff

The Ventura County Planning Department confirmed that there are currently no active or inactive mines within the Ventura River/San Antonio Creek watershed.

4.2.10 Recycled Water in Watershed

Currently there is no use of reclaimed water in the watershed study area. OVSD's wastewater treatment plant does provide for tertiary treatment, which is suitable for non-potable use of reclaimed water. One of the issues with delivering recycled water is the distance from the OVSD treatment plant to potential recycled water users and there is some discussion of satellite WWTPs in the mid to upper portions of the watershed.

The City of San Buenaventura owns the effluent from the OVSD and has evaluated ways to utilize recycled water. In September of 2007, they published a Feasibility Study that examined using treated water for agricultural irrigation and oilfield use which would subsequently offset their water demands. The treatment plant produces valuable water for the aquatic habitat of the watershed and thus no agreement has been reached on how to make use of the effluent.

4.2.11 Biosolids Applications on Lands within Watershed

During the dry season, biosolids within the OVSD service area are composted as manure and given away free to the public. However, during the wet season, all biosolids are trucked out of the watershed to Kern County.

4.2.12 Agricultural Crops Grown

According to the Ventura County Agricultural Commissioner's office, the principal crops grown within the watershed are citrus and avocados. Additionally, there are only small patches of field or row crops grown within the watershed.

4.2.13 Pesticide and Herbicide Use

Information on pesticide and herbicide use in California is available from the State Department of Pesticide Regulations. Pesticide use reports for Ventura County from 2005 to 2008 were available, indexed by commodity and chemical. A representative report for 2008 is provided in Appendix G. On a Countywide basis, from 2005 to 2008, the total amount of pesticides applied to agricultural crops has increased by 1.3 percent (approximately 85,438 pounds). Over the same time period, the total number of agricultural applications Countywide increased by 20.2 percent (approximately 13,462 applications). Statistics specific to the study area were not available.

4.2.14 Farm Animal Grazing Areas

The Ventura County Agricultural Commission was contacted for updated information on current animal grazing areas within the watershed. According to the office, the only reports of farm animal grazing are for cattle from the State Agricultural Office. The County office does not track horses in the watershed area. As the Sheriff's Honor Farm was closed in 2003, the Ventura County Agricultural Commissioner's Office no longer receives reports on swine.

There are no known large herds grazing areas within the watershed, although there are minor grazing leases upstream of the study area. There are no concentrated feedlot or slaughterhouse animal facilities that would affect water quality within the watershed.

There is the presence of horse stables and resulting manure directly adjacent to San Antonio Creek and along the Ventura River. Should horse manure be stockpiled or stored along and near creek banks, this presents a threat to water quality during rainy weather periods and rising floodwater events. The major potential concerns are that these manures may be adding parasitic cysts and bacteriological contamination to the creek. Also of concern is the addition of nitrate/phosphate nutrients to the river/creek system at these sites.

4.2.15 Wild Animals

There are no known changes in wild animal populations since 2005.

4.2.16 Oil and Gas Facilities

There were no reported changes in oil wells and oil storage tanks since 2005 in the study area. There are a number of gas pipelines that cross creeks in the Ojai area and have potential for spill to the waterways from flood, earthquake or traffic accidents. The 2005 field survey identified two such crossings; these locations could not be located in 2011 because of changed field conditions.

Oil and gas facilities are included on the BWT lists and are subject to a three-year review for spill prevention, control, and countermeasure (SPCC) plans. SPCC Plans are a cornerstone of EPA's strategy to prevent oil and gas spills from reaching the nation's waters. Unlike contingency plans that address cleanup measures after a spill has occurred, SPCC Plans ensure that containment facilities are put in place and other countermeasures that would prevent oil spills from reaching navigable waters. Transfer facilities, such as pipelines, are included in the SPCCs. (Vintage Petroleum, 2001)

4.2.17 Hazardous Waste Spills

Since 2005, Ventura County Environmental Health has reported many small sewage and petroleum spills within the Ojai area of the Ventura River watershed (see Table 4-2). Additional individual spill report data is available on their on-line data base at: http://www.vcenvhealth.org/prop/.

TABLE 4-2
ENVIRONMENTAL HEALTH
SPILL SUMMARY
REPORTING PERIOD 2006 TO 2010

Spill Control No.	Date of Incident	Incident Location	City	Substance	Quantity	Unit
98785	9/1/06	1072 Tico Road	Ojai	Untreated sewage	40-60	gal
98873	12/1/06	3468 Grand Ave	Ojai	Mineral oil	8	gal
98894	1/12/2007	1103 Creekside Way	Ojai	Mineral oil, UNK PCB by SCE	20	gal

Spill Control No.	Date of Incident	Incident Location	City	Substance	Quantity	Unit
98902	1/23/07	271 Fairview	Ojai	Sewage	15-20	gal
98909	1/29/07	1131 Rancho Road	Ojai	Petroleum	3	gal
99071	9/9/07	1400 Park Drive		Mineral oil, poss PCB by SCE	5	gal
99098	9/2/07	324 N. La Luna	Ojai	Mineral oil, unk PCB by SCE	Unk	Unk
99101	9/4/07	2276 Los Encinos	Ojai	Mineral Oil	10	gal
99375	7/14/08	616 E Ojai Ave	Ojai	Gasoline	<2	gal
99453	10/8/08	12720 Ojai Road	Ojai	Produced water	106	bbl
99537	2/16/09	12720 Ojai Road	Ojai	Produced water	6	bbl
99903	8/18/10	1124 Myers Road	Ojai	Diesel on road	5	gal.
99906	8/22/10	15501 Ojai Road	Unincorporated county area	Injection water	30	bbl.

Additionally, as part of the Ventura County Hazardous Materials Program, the County conducts annual facility inspections, is involved with hazardous materials emergency response, investigation of the illegal disposal of hazardous waste, public complaints, and storm water illicit discharge inspections. The Ventura County Environmental Health Division records the hazardous waste spills occurring within the watershed, and presents the information in a weekly report, entitled, "Hazardous Materials Discharge Summary Report." These weekly reports can be viewed on the County's Hazardous Materials Program web page.

4.2.18 Geologic Hazards

There have been no major geologic hazards such as earthquakes within the watershed over the last five years. Landslides and mudslides were associated with the larger rainfall and flood events, with damage to roadways and some houses in January and February 2005. Sediment from the mudslides affected turbidity in the creeks and Ventura River, and unknown debris from houses and properties washed into the waterways.

4.2.19 Wildfires

Between the dates of 12/28/2006 and 9/21/2010, thirty (30) fires were recorded by the Ventura County Fire Department within the Watershed. All 30 fires were deemed "Brush" and "Grass" fires by the County and size in acreage is not typically reported for each incident.

4.2.20 Unauthorized Activities

Aside from an unauthorized activity noted within the watershed reported in the 2000 Watershed Sanitary Survey concerning two parcels owned by Mr. Appel, who had a landscape and tree

trimming business that he conducted from both properties, no new unauthorized activities are currently reported or being pursued.

4.2.21 Abandoned Burn Dump and Waste Transfer Station

The Ojai Valley Organics Recycling Facility (OVORF) is located at the eastern side of the Highway 150 Bridge crossing of the Ventura River at the site of an abandoned burn dump that was closed in the 1960's. The County has obtained a conditional use permit to run this green waste facility via RWQCB Cleanup and Abatement Order No. 97-107. (see photographs in Appendix E). A monitoring program was established by the permit that requires groundwater monitoring to begin in 2006, and every three years thereafter. The 2009 Annual Groundwater Monitoring Report is attached in Appendix H.

There are no other known active or abandoned landfills or transfer stations in the study area.

4.2.22 Underground Tanks

Many individuals and businesses, including gas stations, within the watershed continue to use underground storage tanks. Information about underground storage tanks is available at the VCEHD's web site. A list of business plan holders, hazardous waste producers, and underground storage tank sites (BWT List[2]) in Ventura County was developed from information at the website.

The VCEHD also maintains a list of closed underground tank sites. This list included 82 inactive underground tank sites located within or in the vicinity of the watershed (see Table A in Appendix I). These sites have been categorized as closed sites, which indicates that they have been cleaned up or retrofitted according to applicable clean-up procedures as directed by the RWQCB or the County of Ventura.

The BWT list also included 13 locations within or in the vicinity of watershed as "permitted" underground tank sites (see Table B in Appendix I).

A list of leaking underground fuel tank sites (LUFT) was also accessed at the Ventura County Environmental Health Departments web site. Fifty-eight (58) sites within or in the vicinity of the watershed were included on this list. These tanks have been identified as having been contaminated and requiring site assessment. Farm tanks are exempt from County Agency review and are handled by the RWQCB. Once the County confirms that the sites have been contaminated, the business or property owner must furnish the County with a work plan for site clean up. The Ventura County Tank Regulatory Department is in charge of tank inspection and permitting of tank operation, abandonment, and installation/removal. The list characterizes these sites as currently undergoing preliminary site assessment, site characterization, remedial action, or as being closed. The majority of these tanks within the watershed are listed as closed (see Table C in Appendix I).

[2] BWT List: The Business Plan, Hazardous Waste Producers, and Operating Underground Tanks Site Address List indicates by site address whether EHD has Business Plan (B), Waste Producer (W), and/or Underground Tank (T) Information.

4.2.23 Hazardous Waste and Business Plan

The VCEHD requires companies handling 55 gallons, 500 pounds, or 200 cubic feet or more of hazardous materials to obtain a special business plan. The business plan identifies how the hazardous materials are handled onsite, how much material is handled at any time, how it is stored, where storage is, and procedures to be used in case of emergencies. A listing of 81 business plan holders within or in the vicinity of the watershed was included on the BWT list (see Table D in Appendix I).

4.2.24 Hazardous Waste Generators

The current BWT list also includes 55 sites within or in the vicinity of the watershed considered hazardous waste generators. A hazardous waste generator is defined as any business generating materials that have been categorized as hazardous by the Title 22 Code of Regulations (see Table E in Appendix I). There is no information at this time to suggest that any of these hazardous waste generators have caused a surface water quality problem.

4.2.25 Solid, Liquid and Hazardous Waste Sites

A listing of the inactive hazardous material sites (BWT list) is provided in Table F in Appendix I. The permanent HHWCF in the watershed is still operable and discussed in Section 4.2.27.

4.2.26 Toxic Waste Sites

In 2007, the Department of Toxic Substances Control (DTSC) launched an enhanced environmental database, known as “EnviroStor,” that provides access to detailed information on hazardous waste permitted and corrective action facilities, as well as existing site cleanup information. EnviroStor allows one to search for information on investigation, cleanup, permitting, and/or corrective actions that are planned, being conducted or have been completed under DTSC’s oversight. The DTSC “EnviroStor” database was accessed to update the list of toxic waste sites in the watershed involving contaminated onsite soils or shallow groundwater contamination problems. The following sites listed in Table 4-3 lie within the watershed and are currently listed on the “EnviroStor” website:

TABLE 4-3
TOXIC WASTE SITES

CalSite Facility	Category[(a)]
Farmont Corporation, Off Hwy 150 at Rancho Matilija, Ojai	REFRW
Corpus Paving, 1370 South Rice Road, Ojai	REFOA
O.W. Stovall, 505 Prospect Street, Oak View	NFA
Nordoff High School Expansion, 1401 Maricopa Hwy, Ojai	NA
Ojai Valley Club, 905 Country Club Road, Ojai	INE

Note:
(a) REFRW – referred to Regional Water Quality Control Board
REFOA – referred to other government agency
NFA – no further action
NA – no action
INE – inactive - needs evaluation

4.2.27 Permanent Household Hazardous Waste Collection Facility (HHWCF)

The HHWCF which was put into operation in July of 2001 is located within the Ventura River watershed next to the Avenue WTP. The operation of the facility is limited to monthly deposits of household hazardous materials and appointments are requested so as to limit the potential for spills or misplacing the wastes. Since 2001, facility staff has collected and properly managed 1,045, 890 pounds of household hazardous waste.

There have been no changes in operations since 2005 for this facility; nor are there any spills or violations of significance to report (personal communication, Don Sheppard, Ventura County E&ERD).

4.2.28 Urban Area Runoff and Industrial Waste Discharges

Urban and industrial runoff is regulated under the NPDES. The RWQCB permit for Waste Discharge Requirements for Storm Water (Wet Weather) and Non-Storm Water (Dry Weather) Discharges from the Municipal Separate Storm Sewer Systems Within the Ventura County Watershed Protection District, County of Ventura and the Incorporated Cities Therein, NPDES Permit No. CAS004002 Order 09-0057 was adopted on May 7, 2009 and is attached as Appendix J. This permit expires on May 7, 2014.

4.3 Significance of Actual and Potential Contamination Sources

4.3.1 Significant Improvements in Actual and Potential Contamination Sources

During the 2005 to 2010 period, there were some significant changes that reduced the actual and potential contaminant sources within the Ventura River and San Antonio Creek watershed study area. Significant positive changes include:

- OVSD installing siphon crossings of the Ventura River (2003) and San Antonio Creek (2005-2006)
- 2010 Update to the OVSD Sewage Spill Prevention and Response Plan
- 53 Septic tank to OVSD sewer system conversions
- Successful completion of Avenue WTP Membrane Filtration Project and other associated plant improvements

4.3.2 Significant Actual and Potential Contamination Sources

Based on the information summarized above, it is the opinion of Kennedy/Jenks that the following potential contaminant sources the watershed may be significant from a water quality perspective:

<u>Actual Contamination Sources</u>

- Horse manure stockpiles
- Septic tanks in Casitas Springs and the Burnham Road corridor
- Illegal activities such as dumping in the river or storm drains

<u>Potential Contamination Sources</u>

- Sediments from Matilija Dam. The expected sediment, either from natural erosion during floods or the slurry pipeline project proposed by the USACE, poses a direct challenge to clogging the subsurface diversion, and the function of recharge and extraction by Ventura Water's Nye Wells, the wells of the Ventura River County Water District, and Meiners Oaks Water District.
- Oil wells and tanks. These have emergency plans to keep oil from waterways, so only if those fail and oil affect the water sources.
- Gas utility pipelines. These are also covered by emergency plans, so are only potential problems if the emergency plans fail. Also, as this is pressurized natural gas, it will likely vaporize quickly thus reducing the risk.

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Section 5: Watershed Control and Management Practices

This section summarizes updates since 2005 to the watershed management practices that are used by the private entities and public agencies that exercise any watershed controls within the Ventura River/San Antonio Creek watershed. Control measures discussed in this section are those that may impact the water quality of the watershed. The categories of watershed management programs and practices described in 2005 are included in the descriptions below. The changes are summarized and updates to those categories are discussed. The 2010 status of recommendations made in 2005 is discussed in Section 2.

This section focus on control and management practices that affect surface water supplies. The delayed but potential effects of groundwater from its interface with surface water have not been ignored. In this and the previous Sanitary Surveys, issues of groundwater contamination of hazardous materials, leaking underground tanks, septic tanks are discussed because they have the potential to affect what becomes surface flow at Foster Park

5.1 Watershed Management Practices and Programs

There are a number of different programs that monitor the water quality in the watershed. The active management practices and monitoring programs during 2005 through 2010 are described below and in more detail about the monitoring programs in Section 7. An overview of the existing monitoring data from these efforts is also in Section 7. A more regional view of watershed management is provided in the Los Angeles RWQCB 2007 Watershed Management Initiative report, an excerpt of which is provided as Appendix K.

5.1.1 Toxic Substances Monitoring Program

The State Toxic Substances Monitoring Program is a program to assess the quality of waters throughout the state. Fish, other organisms, and sediment are collected and analyzed for metals and organic chemicals (primarily pesticides). Recent sampling under this program has not occurred as the state is evaluating the program.

5.1.2 Ojai Valley Sanitary District

OVSD has taken steps to manage its operations and effects on the watershed. OVSD has implemented system maintenance and improvements, such as siphon crossings of the Ventura River and San Antonio Creek and Infiltration & Inflow management.

OVSD has a monitoring program for its system and outfall. A receiving water monitoring program is implemented by Ventura County Stormwater Monitoring and the Ventura River Stream team. The monitoring supports compliance evaluation, nonpoint source identification, and potential Total Maximum Daily Load (TMDL) development.

OVSD currently monitors for a broad array of conventional pollutants as well as bacterial indicators at three sites in the main stem, as well as the Ventura River just south of the Canada Larga confluence.

5.1.3 Casitas Municipal Water District

The CMWD produces an Annual Water Quality Report for their customers that provide water quality information about Lake Casitas and Mira Monte wells for general, bacteriological, organic chemicals, and radiological parameters.

The CMWD also monitors in the main reach of the Ventura River, Lake Casitas, and in tributaries leading into and out of the lake for total and fecal coliform as well as minerals. Methyl Tertiary Butyl Ether (MTBE) is also monitored in the lake.

5.1.4 Ventura County Watershed Protection District

The current Stormwater NPDES permit adopted in 2008 includes a monitoring and reporting program which requires monitoring at mass emissions stations in the County and more specifically requires bioassessment monitoring in the Ventura River. The mass emissions site was established on the Ventura River main reach at Foster Park west of Highway 33, on the south side of Casitas Vista Road, just west of Foster Park Bridge. The bioassessment program shall include an analysis of the community structure of the instream macroinvertebrate assemblages in urban runoff-impacted stream segments at experimental sites and is now conducted by the Southern California Coastal Water Research Program (SCCWRP). Many sites will overlap with water quality monitoring sites of the Ventura River Stream team sponsored by the Santa Barbara Channel Keeper.

5.1.5 City of San Buenaventura

City of San Buenaventura Planning and Public Works Departments actively participate in City water supply policy and planning, as well as in interagency studies of the watershed.

Ventura Water has multiple monitoring programs in and for the Ventura River supply:

Source water monitoring (Title 22): Includes water sources and the distribution system. These results are reported to DPH and the public in the Consumer Confidence Reports.

Watershed monitoring: developed after the 2000 and 2005 Sanitary Surveys, monitors locations in the watershed on a weekly, monthly, or annual basis; for conventional pollutants, minerals, coliform, and metals. The watershed program is meant to provide early warning of contamination plumes and provide baseline data for new treatment regulations described in Section 6.

Avenue WTP operations – monitoring of the process at various points to check the plant operations.

5.1.6 Ventura River Stream Team

The Santa Barbara Channel Keeper, in conjunction with the Regional Board, VCFCD, Ventura Water, and the OVSD, started a Ventura River Stream Team to conduct a watershed-wide water quality monitoring program which began in 2001. Fourteen sites are monitored for conventional pollutants and bacterial indicators under this program. The group is pursuing additional funding to continue the effort as well as conduct additional work relating to habitat conditions.

5.2 County General Plan Policies

Ventura County continues to have land use and building permit authority throughout the watershed, with the exception of the area designated as the Los Padres National Forest and City of Ojai. Other jurisdictions in the watershed include the Los Padres National Forest and the CMWD. Most of the unincorporated Ventura River/San Antonio Creek watershed is covered by the Ojai Valley Area Plan, which constitutes a portion of the Ventura County General Plan. The Ojai Valley Area Plan found in Appendix B and Ventura County General Plan have both been amended since 2005 as follows in Table 5-1: (see Appendix L for more detail on the Ventura County General Plan amended in 2010)

TABLE 5-1
OJAI VALLEY AREA PLAN AND VENTURA COUNTY GENERAL PLAN

Document Title	Date adopted or last amended
Ventura County General Plan	
Goals, Policies, and Programs	04-06-10
Resources Appendix	04-06-10
Hazards Appendix	05-08-07
Land Use Appendix	12-16-08
Public Facilities and Services Appendix	05-08-07
Ojai Valley Area Plan	02-05-08

Aspects of General Plan Policies with particular bearing on watershed management and control are land use/population, sewage disposal, storm water regulations, and transportation.

Regarding land use and population, the majority of the watershed is zoned open space, agricultural, or low density residential. Land use goals include limiting growth to already established urban and rural residential areas. Land use policies include provisions to minimize environmental degradation while providing developable land to serve the needs of valley residences in terms of residential, commercial, industrial, and open space land uses.

These plans and policies have not changed significantly since the 2005 Sanitary Survey.

5.3 Federal Agency Plans and Policies

No known major changes have occurred since September 2005 when the USDA issued a Land Management Plan for the Los Padres National Forest. The Plan focuses on community protection from wildland fire, restoration of forest health including discussion of fire regime, invasive species, managed recreation, improving watershed conditions through cooperative management, improving riparian conditions and ecological conditions, all of which benefit water quality within the watershed.

5.4 Wastewater Discharge Requirements

Effective August 2003, the RWQCB eliminated monitoring stations several monitoring stations from the OVSD's NPDES monitoring program because sufficient data was being collected by other programs such as: the Ventura Stream Team, and VCWQMP. To date three monitoring stations are now active as described in Section 7. A copy of OVSD's 2008 NPDES permit is included as Appendix F.

5.5 Storm Water Regulations

The Ventura River/San Antonio Creek Watershed is covered under the VCSWQMP and the most current reports can be found on the programs website.. Under this program, the County of Ventura, the VCWPD, and the cities of Camarillo, Fillmore, Moorpark, Ojai, Oxnard, Port Hueneme, San Buenaventura, Santa Paula, Simi Valley, and Thousand Oaks are jointly responsible as Co-Permittees under Order No. 09-0057 of NPDES Permit No. CAS004002 for the Waste Discharge Requirements for Stormwater Discharges from the Municipal Separate Storm Sewer System Within the Ventura County Watershed Protection District, County of Ventura and the Incorporated Cities Therein. Provisions of this permit are included in Appendix J. This permit was granted to the VCFCD in May 2009 with final corrections made and accepted on January 13, 2010.

5.6 Lease Agreements

The Ventura County General Services Administration reported that there are currently no lease agreements in the study area.

As discussed in the 2005 Survey, a determination was made to protect all roadless areas in Los Padres National Forest from oil and gas development (USDA Forest Service 2005). While the Watershed is not susceptible to leasing of oil and gas reserves, this decision does help to protect the overall water quality in the region from future development of such resources.

5.7 Recreational Activities and Policies

There have been only minor changes to recreational facilities and activities within the watershed since 2005. This information can be found in Section 4.2.6.

5.8 Erosion Control/Soil Management Policies

The Ventura County Resource Conservation District administers the County's Hillside Erosion Program (Program) under the County's Ordinance No. 3539 and No. 3683. The Public Works Agency enforces the ordinance. The Program establishes minimum standards and regulations for construction and maintenance of fill, excavation and grading within new developments. There are no known changes to erosion control/soil management policies related to the Program since 2005.

5.9 Fire Management

The only reported change during 2005-2010 was the closure of Ventura Fire Station No. 4 located at 8803 Telephone Road in Eastern Ventura. This closure was effective on 7/1/10 due to budget constraints but the station will remain available for reopening in the future.

5.10 Hazardous Waste

There have been no changes with regard to hazardous waste operations within the watershed from 2005 to 2010 (personal communication, Don Sheppard, Ventura County Integrated Waste Management Division);

5.11 Septic Tank Regulations

Currently the Ventura County Environmental Health Division has the authority to deny building permits for new construction or remodeling if there are not adequate conditions for septic systems.

Proposed changes in the statewide septic system regulations as specified in Legislation AB 885, also called "On-site Wastewater Treatment Systems" (OWTS), are being studied in an EIR process, and draft regulations are currently under review as the public comment period has been extended to spring 2011. The regulations in their current form would increase pretreatment requirements, groundwater monitoring, and setback distances required. The relative costs of a septic system will increase. The new regulations are aimed at protecting groundwater quality as well as surface water quality (SWRCB, 2011).

5.12 Agricultural Runoff

The Los Angeles Regional Water Board has been engaged in a lengthy process to develop a Conditional Ag Waiver for discharges from irrigated lands. On November 3, 2005, the Regional Board adopted the Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands within the Los Angeles Region (Order No. R4-2005-0080). The waiver applies to all irrigated lands in Los Angeles and Ventura counties and will affect several thousand growers. Any grower who owns or conducts irrigation operations and from which a discharge occurs is covered by the waiver (note: the definition of a discharge is very broad and includes percolation to groundwater and stormwater runoff). Growers were required to register with the Regional Water Board by filing a notice by August 3, 2006.

However, few growers are expected to register for individual coverage since the obligations on a single grower will be extensive and expensive to implement. As a result, the Ventura Farm Bureau in cooperation with other agricultural organizations and individuals formed the Ventura County Agricultural Irrigated Lands Group. This group acts as a unified discharger representing agricultural land owners and growers. The monitoring plan dated 2009 has been prepared and submitted to the LARWQCB as found in Appendix M. Two sampling locations are along the Ventura River which represents a total of 6,003 acres drained comprised predominantly of citrus and avocado with row crops, nurseries, and other fruit trees minimally represented. The wavier established benchmarks for temperature, pH, dissolved oxygen, turbidity, biostimulatory substances, TSS, salt and nutrients, pesticides, and toxicity. In the 2008 sampling only, VRT_THACH had a single water quality exceedance based on the benchmarks of the conditional wavier. Of the four sampling events in 2006 and 2008, only 4,4-DDT was detected in a single wet event. In 2007, the sampling locations were dry therefore no samples were taken.

Watershed	Station ID	Station Location	Latitude	Longitude
Ventura River	VRT_THACH	Thatcher Creek at Ojai Avenue	34.446719	-119.210893
Ventura River	VRT_SANTO	San Antonio Creek at Grand Avenue	34.454455	-119.221723

5.13 Water Agency Coordination Measures

This split jurisdiction between Ventura Water and the planning agencies means that interagency coordination is necessary for this watershed. Ventura Water continues to be the only major water agency directly using surface water collected from the Ventura River Watershed between their Foster Park diversion and CMWD's Los Robles diversion. Ventura County has local planning jurisdiction over about fifty percent of the Foster Park diversion watershed. The northern portion of the watershed is under the jurisdiction of Los Padres National Forest. City of Ojai is the third entity with local planning jurisdiction.

Long-range plans for the Los Padres National Forest do not call for significantly altering the land use within the federally owned watershed. As stated above, the Los Padres National Forest intends to complete a comprehensive watershed analysis within their jurisdiction, on the upper Ventura River Watershed.

Overall there continues to be consistency among allowable land uses throughout the watershed (predominantly open space) and the goal of preserving water quality.

There were four major developments in interagency coordination since the 2005 Sanitary Survey:

Matilija Dam Ecosystem Restoration Project: The Feasibility Study (2004) and Environmental Impact Statement (2004) by the U.S. Corps of Engineers, VCWPD, and others created a forum to address many of the Ventura River water supply sediment,

and flooding issues. Matilija Dam Project objectives were to (1) improve aquatic and terrestrial habitat, to benefit fish and species along Matilija Creek and the Ventura River, (2) restoration of hydrologic and sediment transport regime in support of downstream coastal beach sand replenishment to pre-dam conditions, and (3) enhancement of recreational opportunities along Matilija Creek (including U.S. Forest Service land) and the downstream Ventura River system. Numerous study subcommittees were formed to support the Project, that continues to provide a wealth of information and understanding about the watershed.

City of Ojai Urban Watershed Assessment and Restoration Plan: In 2005, City of Ojai, with funding from the California Department of Fish and Game, prepared a comprehensive assessment and restoration plan for the watersheds that drain into City of San Buenaventura limits. The primary purpose of the Plan was to identify specific problems of the Ojai creeks relevant to Steelhead Trout, and to develop a plan to restore fish habitat and to address the land use issues that adversely affect the habitat and the ecological health of the watersheds (see 2005 WSS for more detail on the Plan). Table 31 of the UWARP details a series of potential stream habitat restoration actions to be taken by City of Ojai and various non-governmental organizations (NGOs). Actions that were identified in Table 31 and have been completed to date include:

- A-1 (Soule Park Golf Course creek crossing): Clear span bridges have been built at Soule Park Golf Course.

- B-1 (Eradicate invasive exotic plants): Ojai Valley Green Coalition successfully obtained a grant (with support from Ventura Water) during the last two years for Ojai Creek restoration efforts in Libbey Park. They removed palms and other invasive species, planted natives, and are now maintaining it.

- B-2 (Remove trash): City staff clean some creek areas and volunteers organize every September for Creek Clean up Day (Ojai Valley Green Coalition and other NGOs) that coincides with a county wide coastal clean up day.

- B-3 (Prevent fecal material and other pollutants from entering streams): A citizen group has been working to try to get a horse manure collection and biodigester project to a feasibility study stage and has kept City of San Buenaventura Public Works Department informed. The County Watershed Protection District is sponsoring the feasibility study using Prop 84 grants.

- D-1 (Conduct water quality monitoring in city streams): Stormwater samples were taken for the NPDES permit for City of San Buenaventura Yard, and City of San Buenaventura stormwater outfall near the Athletic Club is monitored by the Countywide NPDES Stormwater Permit.

- D-3b (Provide technical assistance to landowners to control nonpoint source pollution): In 2009 as part of the nutrient TMDL, a horse survey was conducted and collection methods were discussed.

- D-4 (Minimize impervious cover): City of San Buenaventura is in the process of passing a new landscaping ordinance to improve mitigation of impervious areas. The 2010 NPDES Stormwater Permit will require more LID and pervious cover on new and redevelopment projects.

Ventura River Habitat Conservation Plan (HCP): Eleven different agencies within the Ventura River watershed were previously involved in a HCP planning process to address adverse environmental impacts to native species listed within the Federal Endangered Species Act (FESA). The HCP was to include individual environmental impact analyses for each of the eleven member agencies that would determine what mitigation efforts and associated funding (as required per future Federal and State legislature), would be required by each entity.

The HCP has not progressed further than a 2004 Draft Report and was never released to the public. The latest revision to the Document was in 2006 when the VCWPD issued an amendment relating to the funding breakdown per agency. To this day, each member agency has expressed no interest to the Document and it is highly unlikely that it will be completed. (Personal Communication, Pam Lindsay VCWPD).

Ventura County Integrated Regional Watershed Planning: The Integrated Watershed Protection Plan (IWPP) was formed by VCWPD. This is long-range planning effort that has the following objectives: (1) to provide a systematic process for the inclusion of projects into the VCWPD's Capital Improvement Plan over its five-year planning period, and (2) to improve the long-range VCWPD planning process for the 20-year period subsequent to the Capital Improvement Plan by allocating projected revenues to identified projects. The IWPP also provides a Level-of-Service evaluation that identifies the need for additional project funding to achieve desired flooding mitigation goals. Elements of the IWPP have been implemented through a grant under Proposition 50 Integrated Regional Water Management Program with the Watersheds Coalition of Ventura County.

The VCWPD is broken up into four zones; Zone 1 follows the boundaries of the Ventura River watershed and is the relevant zone for this Sanitary Survey. Benefit assessment monies collected from each zone are dedicated to support activities within that zone.

Table 5-2 describes the status of the projects planned in the 2005 Study for the Ventura Rivers watershed Zone 1 (see 2005 WSS for more detail on the IWPP for Zone 1) (Personal Communication, Sergio Vargas, VCWPD). Many projects have been reduced in priority because of funding limitations and other higher priority activities occurring.

TABLE 5-2
IWPP VENTURA RIVER WATERSHED ZONE 1 PROJECTS

Project Name/Status	Location	Problem Description	Preliminary Solution
Canada Larga Channel Improvements/Not Completed	North of Ventura, Zone 1	The Creek shortcut Canada Larga Road during Jan. 2005 storm. Overbank flooding caused agriculture and property damages.	Make the short cut permanent. Excavate 1,500-foot long channel and/or build levees.
Coyoto Creek (Red Mountain Canyon) Debris Basin/Decreased in Priority	0.5 mile downstream of Casitas Dam, Zone 1	Excessive debris and sediments fill coyote creek and causing flooding to residents along the creek.	Routine maintenance to clean out debris bushes in the stream, enforce floodplain

Project Name/Status	Location	Problem Description	Preliminary Solution
			management regulations, build a debris basin at the mouth of Red Mountain Canyon to hold approximately 10,000 cubic yards sediment.
Coyote Creek Right-of-Way/Dropped in Priority	City of Ventura, from Santa Ana Road to Ventura River along Coyote Creek	Need right of way or easement to get adequate access for needed repairs and future maintenance.	Right of way acquisition.
Dron Creek Detention/Debris Basin/Decreased in Priority	City of Ojai	High Debris Bulking Factor (1.67), very high sediment yield fill existing channel and cause flooding.	Construct debris basin(s) in the canyon(s) north of Gridery Road. Additional feasibility study will be required to develop a detailed design concept and to determine the potential for causing erosion in the downstream channel.
Howard Ave. Drain/Decreased in Priority	Skyline Area in Oakview	No access road to maintain the earth channel.	Extend 36-inch pipe from Howard Ave. upstream 1,060 feet to Brandt Ave. within existing 12-foot wide easement.
Ojai Basin Safe Yield Study/Completed as part of Prop 50 IRWM Grant*	East Ojai, Zone 1	Increasing groundwater demand from City of Ojai and the removal of Matilija Dam, requires a better understanding of the resources.	Conduct a demand and supply study to determine the safe yield of the Ojai Basin along with the demands.
Other Thatcher Creek Flood Mitigation Projects/Decreased in Priority	East of Ojai	Thatcher Creek is, in general, inadequate in passing 100-year flood flows. Steep channels also bring down significant amounts of sediment.	Modeling study needs to be carried out, system deficiency be identified, and projects be implemented.
Fresno Canyon Flood Mitigation	Upstream of SR33	Provide 100 year level of flood protection for the Community of Casitas Springs	Construct a bypass reinforced concrete box conduit from upstream of SR33 to the Ventura

Project Name/Status	Location	Problem Description	Preliminary Solution
			River
Casitas Spring Levee Evaluation, Rehabilitation, and Certification	Ventura River	Communities need protection from flood	Conduct a feasibility study and update pre-design

*Other projects that are contained in the Proposition 50 IRWM Grant include preparation of the IWPP which is approximately 75% complete, water quality monitoring station construction and data collection, Ojai Basin groundwater monitoring, non-native plant removal in San Antonio Creek, and the Watershed Council Website.

Section 6: Water Treatment Regulations

One element of this watershed sanitary survey includes an assessment of Ventura Water's compliance with existing/future regulations as they relate to Ventura Water's Avenue WTP and the associated water distribution system. This assessment applies to the existing WTP and the proposed modified/improved plant. This assessment does not include operations of City wells, existing wellhead treatment facilities, or the purchase of fully treated surface water from CMWD. This section discusses the drinking water quality regulations relevant to Ventura Water's surface water supply. The section presents the current regulations, as well as regulations being developed. A listing of the current Federal and State water quality standards can also be found in Appendix N. In addition, this section will include a summary of Ventura Water's monitoring program.

6.1 Background

Ventura Water completed an in-depth evaluation of the Avenue WTP (Kennedy/Jenks 1999), which included issues other than treatment plant capacity/plant performance. These additional issues included source water improvements on the Ventura River such as discontinuing the surface intake and drilling more shallow wells. City of San Buenaventura Plan (1999) included numerous recommendations intended to improve the existing treatment plant in terms of both capacity and treatment efficiency.

6.2 Existing Treatment Plant

The existing Avenue WTP is a conventional filtration plant with a capacity of 15 MGD. The chemicals currently being used in the treatment process include chloramines, 48 percent liquid alum (approximately 4 mg/l), polymers, and blended polyphosphate for corrosion control. Corrosion control treatment is used at all times. The plant has been upgraded by the addition of submerged ultrafiltration membranes to decrease turbidity as detailed in Section 6.3.

Kingston Reservoir (an uncovered raw water storage facility) has a capacity of 10 MG. There are two flocculation basins, two sedimentation basins, and three rapid sand gravity filters at the Avenue WTP. Power Reservoir (a covered treated water storage reservoir that functions as a clearwell) and chlorine contact facility has a capacity of 16 MG. Chlorine can be applied at four different plant locations.

The pressure zones influenced by the Avenue WTP are as follows: Zones 210, 260, 400, 430, 466, 599 and 605. In the past, CMWD water has been discharged into Kingston Reservoir during low demand periods for re-treatment to prevent taste and odor or other water quality issues. During high demand periods, CMWD water is conveyed directly into Ventura Water's distribution system (zones 210, 260, and 400/260R). The CMWD chloraminates their water for disinfection by-product control. Ventura Water provides chloramination of their water to make the water sources compatible and to continue controlling excessive disinfection by-product formation in its own water sources and in the water purchased from CMWD.

6.3 Avenue WTP Improvements

Ventura Water initiated construction of the Avenue WTP improvements in June 2005 with completion in 2007. Improvements included constructing submerged ultra filtration. Ventura Water's new membrane filtration treatment process removed suspended solids from the source water through a physical straining process using Zenon 1000 series submerged membranes. The ultrafiltration process produces a higher quality of filtered water than the conventional treatment process with fewer chemicals. The improvements to the Avenue WTP also included filtration and disinfection of the recycled filter backwash water to meet the objectives of the California Cryptosporidium Action Plan (CAP) and the Filter Backwash Rule. The improvements to the Avenue WTP increased the reliability of the system to provide safe drinking water.

Abandonment of the river's surface water intake and using only shallow subsurface river flow resulted in a raw water influent flow containing a turbidity of less than 10 NTU at all times and provided raw water with much lower coliform bacteria densities, thus reducing the overall treatment requirements.

Ultrafiltration membranes use a vacuum driven (immersed type) membrane separation process that separates particulate matter from the source by physical straining. Approximately every 45 minutes to 60 minutes, the membranes will perform an automatic backwash cycle for a period of 1 to 2 minutes to discharge captured solids. Chemical coagulation will not be required for turbidity and particulate removal, therefore the spent washwater will typically contain only concentrated solids removed from the source water.

Spent washwater, containing water and solids (e.g., silts from the Ventura River), will be captured in washwater recovery basins (WWRB). At an average source water turbidity of 0.2 NTU, the spent washwater turbidity will be approximately 2 NTU, and at the maximum source water turbidity of 1 NTU, the spent washwater turbidity will be approximately 15 NTU. Small amounts of sodium hypochlorite (5 to 10 mg/l) and/or citric acid or caustic soda may be added periodically to the washwater supply to the membranes to suppress bio-fouling and possible scaling.

6.4 Current Regulations

This section provides a summary of the current rules and regulations governing drinking water quality. Those discussed include the following:

- Total Coliform Rule
- Lead and Copper Rule
- Information Collection Rule
- Surface Water Treatment Rule
- Cryptosporidium Action Plan
- Stage 1 Disinfectants and Disinfection By-Products Rule
- Interim Enhanced Surface Water Treatment Rule
- Long Term 1 Enhanced Surface Water Treatment Rule
- Stage 2 - Disinfectants and Disinfection Byproducts Rule

- Long-Term 2 Enhanced Surface Water Treatment Rule

6.4.1 Total Coliform Rule

The Total Coliform Rule (TCR) requires stringent control and/or reduction of pathogenic bacteria in distributed water (Federal Register, 1989). Coliforms are found in human and animal wastes, as well as in soils. The presence of coliforms, which may not necessarily be disease causing, serve as indicators for the presence of infectious organisms. Therefore, coliforms are used as a surrogate for all potentially pathogenic bacteria because of prevalence, survival, and relative ease of monitoring. The TCR established monitoring and sanitary survey requirements for surface water systems and monitoring for groundwater systems. Current regulations require that suppliers monitor water quality in the distribution system through a routine sampling program approved by DPH.

Ventura Water conducts daily in-house bacteriological testing using the presence/absence method at City of San Buenaventura's WWTP lab and weekly testing by a certified laboratory (on Mondays). The unfiltered surface water sources are sampled weekly at Sampling Station 27 (the "flume"). At this location the river water is already mixed with the Nye well water and is still unchlorinated. There is also monthly bacteriological sampling of the individual Nye wells for total and fecal coliform bacteria.

In July 2010, the US EPA proposed the Revised Total Coliform Rule (RTCR) which will requires a system to correct any defects that may result in a sanitary vulnerability, public notification with treatment technique violations or *E. coli* violation of MCL and increased monitoring for high risk systems. The US EPA had yet to adopt the rule during the preparation of this document and comments continued to be accepted through November 30, 2010.

Ventura Water provides adequate disinfection of the filtered water based on data from the plant effluent and distribution system. Ventura Water achieves compliance with the TCR. A summary of City water quality data is provided in Appendix O.

6.4.2 Lead and Copper Rule

The Lead and Copper Rule (LCR) regulates excessive corrosion leaching of these toxic metals from pipe materials, including service piping and customers' on-site piping. (Federal Register, 1991) The LCR establishes action levels (AL) for lead and copper in treated water collected from likely customer taps in first-draw samples following overnight stagnation.

Lead solder and copper tubing are common materials used in household plumbing and/or customer service connection pipe. Lead and copper are soluble in water and can be leached from pipe, solder and/or fixtures under corrosive water quality conditions. The presence of these metals in drinking water, especially lead, can cause adverse impacts on health, particularly in children. Lead is associated with retarding physical development and interfering with mental development.

The U.S. Environmental Protection Agency's (EPA's) Lead and Copper Rule is intended to protect the public not just from the water delivered to the consumers' service pipe connection, but also after it has flowed through the consumers' plumbing to the tap. The

LCR establishes action levels to be lower than 0.015 mg/l for lead and 1.3 mg/l for copper in at least 90 percent of the most likely consumer tap samples in first draw samples after overnight stagnation. Sampling must also be conducted at points of entry (POE) to the distribution system to verify that lead and copper in the source of supply do not exceed the USEPA criteria.

Ventura Water's consumer tap sampling program conducted to date achieves compliance with the 90th percentile action levels for copper (1.3 mg/l) and lead (0.015 mg/l). A summary of City water quality data is provided in Appendix O.

6.4.3 Information Collection Rule

The Information Collection Rule (ICR) was a key element in the USEPA's Microbial/Disinfection Byproducts (M/DBP) Regulatory Negotiation (Reg-Neg) process and was intended to provide more definitive information on specific source water quality, microorganism contaminants and treatment process performance including disinfection by-product generation. (Federal Register, 1996) This federal regulation required most public water systems serving more than 100,000 people to collect data on their source and treated water and provides these data to the USEPA for evaluation. The data were collected between July 1997 and December 1998.

Ventura Water was not required to participate in this data collection program because at the time the water system served less than 100,000 persons.

6.4.4 Surface Water Treatment Rule

The Surface Water Treatment Rule (SWTR) was implemented to provide protection against Giardia cysts and pathogenic enteric viruses. The federal SWTR requires that the water treatment process achieve a minimum of 99.9 percent (3-log) removal and/or inactivation of Giardia cysts and 99.99 percent (4-log) removal and/or inactivation of enteric viruses. This must be accomplished through a combination of physical removal and disinfection. The DPH generally requires that the water treatment process provide the minimum removal and/or inactivation requirements for Giardia and viruses in the federal SWTR (99.9 percent (3-log) for Giardia cysts and 99.99 percent (4-log) for viruses).

A well-designed and operated "conventional filtration treatment plant," can receive credit for at least 99.7 percent (2.5-log) removal of Giardia cysts and 99 percent (2-log) removal of enteric viruses. These removal credits currently require that the filtered water turbidity be less than or equal to 0.5 NTU for at least 95 percent of the measurements taken each month. Disinfection must be used to achieve the rest of the combined removal-inactivation requirement. This requires providing 68 percent (0.5-log) inactivation of Giardia cysts and 99 percent (2-log) inactivation of enteric viruses via disinfection.

The DPH, with regulatory primacy in California, regulations include a daily average filtered water turbidity requirement of 0.2 NTU for water treatment plants that were new or upgraded after 5 June 1991. The SWTR also requires that systems demonstrate, by monitoring and recording, that they continuously maintain a disinfectant residual of at least 0.2 mg/l in water delivered to the distribution system.

Raw, in-plant, and filtered water turbidities are monitored at Avenue WTP as required. Maximum allowable gravity filtration rates (up to 6.0 gpm/ft^2) are complied with, as are the Maximum Contaminant Levels (MCLs) for filter performance of water being conveyed from the filters into Power Reservoir.

Each of the three filter units, and the blended filter water, is equipped with a continuous analyzer. A particle counter is provided in the plant. The final turbidity analyzer is equipped with a 0.3-NTU alarm set point. When Kingston Reservoir effluent turbidities are high (over 10 NTU), the river water is not used.

After filter backwashing, each filter is automatically wasted for 10 minutes or until the effluent has a turbidity of not more than 0.1 NTU. Until this turbidity level is achieved, the filtered water is not allowed to enter the clearwell (Power Reservoir).

The filter backwash water is recovered. Sedimentation is the only treatment provided at this time for this recovered water. In the past, DPH has noted that the returned filter backwash water has averaged 4 to 5 NTU in turbidity and that this turbidity level exceeds their 2 NTU guideline. This finding, however, does not appear to have significantly impacted filtration plant performance.

Ventura Water achieves compliance with the SWTR. A summary of City water quality data is provided in Appendix O and Section 7.

6.4.5 Cryptosporidium Action Plan

The DPH developed the Cryptosporidium Action Plan (CAP) in response to increased public health concern regarding the protozoan pathogen *Cryptosporidium* parvum. The return of spent filter backwash water and sedimentation basin waste solids has been shown in several studies to contain significantly higher particle concentrations than many source water supplies. Blending these high-risk recycle streams with the source water stream is a particular concern.

The CAP established new turbidity goals for settled water, filtered water, and return water. The settled (clarified) water turbidity goal includes settled water turbidity between 1 and 2 NTU at all times. The filtered water turbidity goals include a 0.1 NTU goal for both individual filters beginning 4 hours after a filter backwash and for the combined filtered water from all the filters at all times, and a 0.3 NTU goal for individual filters within 4 hours following a filter backwash. The CAP also includes a return (recycle) water turbidity goal set at 2.0 NTU.

To comply with the goals of this plan, Ventura Water will limit the recycled water return rate to no more than 5 percent of the raw water flow rate and to improve the treatment provided for the recycled water to achieve a turbidity of not more than 2.0 NTU. The return point will be moved upstream of Kingston Reservoir to take advantage of the additional disinfection and settling benefits. These changes will be included in the Avenue WTP improvements currently under construction.

Ventura Water has performed raw water sampling for *Giardia* and *Cryptosporidium* at numerous raw water and treated water locations. The data obtained do not indicate detectable levels of *Giardia* and *Cryptosporidium* cysts. However during the period of March through May 2010 detection of *Cryptosporidium* occurred in San Antonio Creek

with a maximum of 4 oocysts recorded in April 2010. Since May 2010, no oocysts have been detected in San Antonio Creek.

Ventura Water achieves compliance with the CAP. A summary of City water quality data is provided in Appendix O.

6.4.6 Stage I Disinfectants/Disinfection By-Product Rule

The Stage 1 Disinfectants and Disinfection By-Products Rule (DBPR) was published in the Federal Register on 16 December 1998. The Stage 1 DBPR set new MCLs for selected disinfection by-products, and established maximum residual disinfectant levels (MRDLs) and treatment techniques for control of DBP precursors (DBPPs). The Stage 1 DBPR regulated both oxidants that are used for disinfection and the chemical compounds formed when the oxidants used to disinfect microbial contaminants in drinking water react with organic and inorganic compounds in the source water. Disinfectants include ozone, chlorine dioxide, chlorine, chloramines, and ultraviolet light (UV) radiation. Surface water systems supplying more than 10,000 people were required to comply with this rule beginning 2 January 2002.

The Stage 1 DBPR revised the THM MCL, created a new MCL for HAA5, and also included MCLs for bromate and chlorite as part of the new regulations. The Total THM (TTHM) MCL was reduced from 0.1 mg/l (100 µg/l) to 0.080 mg/l (80 µg/l). The HAA5 MCL was set at 0.060 mg/l (60 µg/l). The bromate MCL was set at 0.010 mg/l (10 µg/l) and the chlorite MCL was set at 1.0 mg/l. In addition, the Stage 1 DBPR included maximum contaminant level goals and MRDLs for chlorine, chloramines and chlorine dioxide.

Based on the TOC quality of the raw water, the filtration plant may be exempted from the enhanced coagulation requirements contained in the Stage I rule. The TOC of the raw water is generally less than 2 mg/l; however, Ventura Water should review TOC sampling and analysis since a few treated water samples exceeded 2 mg/l over the last 5 years. This increased TOC level may be due to the elevated TOC from CMWD which reports TOCs of >3 mg/L with a max value of 4.97 within the last 5 years. In addition, Ventura Water implemented a treatment plant influent/effluent TOC sampling program. Sampling indicated values generally less than 2 mg/l for the plant influent and effluent.

Ventura Water provides chloramination disinfection of the treated effluent. Water purchased from the CMWD is also treated with chloramines. Chloramines reduce TTHM/HAA5 formation in Ventura Water distribution system and storage reservoirs. Chloramination treatment may require the maintenance of much higher total chlorine residuals. Use of chloramines may require the water system to be monitored much more extensively and frequently and require the overall water system and all of its components to be kept as clean and sanitary as possible. All of the above are necessary for maintaining a sanitary water distribution system free of significant nitrification-related problems. Several utilities already using chloramines to limit disinfection by-product formation have experienced serious bacteriological and physical water quality problems, mainly because they did not have a nitrification control plan. Ventura Water has developed a comprehensive nitrification control plan for the operations and facilities of the entire water system, including a careful review of the inlet/outlet arrangement of all major reservoirs. The rule also has maximum residual disinfectant level (MRDL) for chloramines of 4.0 mg/l. Ventura Water's plant did not

exceed these levels based on the CCRs. Ventura Water achieves compliance with the Stage 1 DBPR.

This rule has an MCL for bromate of 10 µg/L. Ventura Water should consider requesting DPH to reduce bromine sampling of source waters since most samples were less than detection limits.

A summary of City water quality data is provided in Appendix O.

6.4.7 Interim Enhanced Surface Water Treatment Rule and Long-Term 1 Enhanced Surface Water Treatment Rule

The Interim Enhanced Surface Water Treatment Rule (IESWTR), published in the Federal Register on 16 December 1998, required utilities to conduct raw water bacteriological sampling. This rule requires meeting lower treated water turbidity MCL of 0.3 NTU (from 0.5 NTU) 95 percent of the time. The Long Term 1 Enhanced Surface Water Treatment Rule (LT1-ESWTR) was published on 14 January 2002. The intent of the LT1ESWTR was to improve public health protection through the control of microbial contaminants, particularly *Cryptosporidium*, for public water systems that use surface water, or ground water under the influence of surface water, and serve fewer than 10,000 people. The intent of the Filter Backwash Rule (FBR) was to reduce the risk that contaminants removed in the pretreatment and filtration processes are not returned in the recycle water flow. The FBR, published in the Federal Register 8 June 2001, required large in-plant recycle streams to be blended with source water "prior to the point of primary coagulant addition." Ventura Water complies with the California CAP (see Section 7.2.5) which is more stringent than the FBR.

In general, Ventura Water's raw surface water samples (Station SC1) contains a total coliform bacteria level of less than 100 MPN/100 ml, though one sample did exceed 1,000 MPN/100 ml during December. Fecal coliform testing indicated samples were generally less than 1 MPN/100 ml, with levels exceeding 5 only twice. Also, it is very important for Ventura Water to continue providing disinfection of the raw water as part of the treatment process, considering the fluctuating bacteriological quality of the river water. As previously discussed, Ventura Water's surface water diversion is not planned to be restored to service which should reduce raw water turbidity and coliform spikes. Total coliform bacteria levels at the sampling location following blending of the river water and water from the Nye wells (Kingston Reservoir) were much lower than at the river intake, perhaps due to dilution with the water from Nye wells.

Through the improvements at the Avenue WTP, Ventura Water achieves the turbidity standard of 0.3 NTU (95 percent of the time) and the filter spiking allowances of less than 2.0 NTU, less than 1.0 NTU, and less than 0.3 NTU. This membrane filtration means that the Avenue WTP qualifies for the 4-log *Cryptosporidium* cyst removal credit, which exceeds the 2-long removal credit required of the IESWTR. .

This rule requires that Ventura Water maintain minimum (measurable) chloramine residual in all parts of the surface water impacted distribution system. Ventura Water maintains minimum chloramine residuals of 4 mg/l within all parts of the system.

Ventura Water achieves compliance with the IESWTR and LT1ESWTR. A summary of City water quality data is provided in Appendix O.

6.4.8 Stage 2 - Disinfectants and Disinfection Byproducts Rule

The Stage 2 - Disinfectants and Disinfection Byproducts Rule (Stage 2 DBPR) was published in the Federal Register on January 4, 2006. The Stage 2 DBPR builds upon the Stage 1 DBPR (see Section 7.2.6) to address higher risk public water systems for protection measures beyond those required for existing regulation. The THM and HAA5 MCLs will be 80 µg/l and 60 µg/l, respectively. Compliance with the maximum contaminant levels for both TTHM and HAA5 will be calculated for each monitoring location in the distribution system. This approach, referred to as the locational running annual average (LRAA), differs from current requirements, which determine compliance by calculating the running annual average of samples from all monitoring locations across the system.

In addition, Ventura Water will be required to conduct an "Initial Distribution System Evaluation" (IDSE) to identify the locations with high disinfection byproduct concentrations. There are four IDSE options: (1) standard monitoring, (2) conducting a system specific study and modeling requirements, (3) obtaining a 40/30 waiver, and (4) obtaining a very small system waiver. The IDSE will include sampling for THMs and HAA5 at locations of highest potential for disinfection byproduct formation. The IDSE results will not be used for compliance purposes.

Systems with a population between 50,000 and 249,999 using chloramines for oxidation and disinfection must collect samples at 16 locations during the IDSE. The 16 locations must include the following: 3 near the entry (connection) to the distribution system, 4 with an average residence time, 5 locations representing the highest TTHM concentrations, and 4 representing the highest HAA5 concentrations. These locations may be used by the systems as the sampling sites for future compliance monitoring with the approval of DPH.

The Stage 2 DBPR also requires each system to determine if they have exceeded an operational evaluation level, which is identified using their compliance monitoring results. The operational evaluation level provides an early warning of possible future MCL violations, which allows the system to take proactive steps to remain in compliance. A system that exceeds an operational evaluation level is required to review their operational practices and submit a report to their state that identifies actions that may be taken to mitigate future high DBP levels, particularly those that may jeopardize their compliance with the DBP MCLs. The operational evaluation includes an examination of system treatment and distribution operational practices, including changes in sources or source water quality, storage tank operations, and excess storage capacity, which may contribute to high TTHM and HAA5 formation.

Ventura Water submitted their IDSE plan on September 7, 2006. Ventura Water must begin Stage 2 DBPR compliance monitoring by April 1, 2012. Monitoring is planned to commence on schedule.

6.4.9 Long-Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR)

The Long-Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) was published in the Federal Register on January 5, 2006. The LT2ESWTR builds upon earlier rules to address higher risk public water systems for protection measures beyond those required for existing regulations. The purpose of LT2ESWTR is to reduce illness linked with the contaminant *Cryptosporidium* and other pathogenic microorganisms in drinking water. The LT2ESWTR will supplement existing regulations by targeting additional *Cryptosporidium* treatment requirements to higher risk systems. Current regulations require filtered water systems to reduce source water *Cryptosporidium* levels by 2-log (99 percent). Recent data on *Cryptosporidium* infectivity and occurrence indicate that this treatment requirement is sufficient for most systems, but additional treatment is necessary for certain higher risk systems. These higher risk systems include filtered water systems with high levels of *Cryptosporidium* in their water sources and all unfiltered water systems, which do not treat for *Cryptosporidium*. This rule also contains provisions to reduce risks from uncovered finished water reservoirs and provisions to ensure that systems maintain microbial protection when they take steps to decrease the formation of disinfection byproducts that result from chemical water treatment.

Filtered systems serving at least 10,000 people must sample their source water for *Cryptosporidium*, *E*. *coli*, and turbidity at least monthly for 24 months. Systems may use previously collected (grandfathered) data in lieu of conducting new monitoring, and systems are not required to monitor if they provide the maximum level of treatment required under the rule. Systems must collect source water samples prior to chemical treatment, such as coagulants, oxidants and disinfectants. Systems that recycle filter backwash water must collect source water samples prior to the point of filter backwash water addition.

Filtered water systems will be classified in one of four treatment categories (or bins) based on their monitoring results. For calculating bin placement, a total of at least 48 samples need to have been collected; the bin concentration is equal to the arithmetic mean of all sample concentrations. For a total of at least 24 samples, but not more than 47 samples, the bin concentration is equal to the highest arithmetic mean of all sample concentrations in any 12 consecutive months during which *Cryptosporidium* samples were collected. Systems classified in higher treatment bins must provide 1.0 to 2.5-log additional treatment for *Cryptosporidium*. Systems will select from a wide range of treatment and management strategies in the "microbial toolbox" to meet their additional treatment requirements. Systems classified in Bin 3 and Bin 4 must achieve at least 1 log of additional treatment using either one or a combination of the following: bag filters, bank filtration, cartridge filters, chlorine dioxide, membranes, ozone, or UV light.

Ventura Water was required to submit a sampling plan for the first round of source water monitoring for *Cryptosporidium*, *E*. coli, and turbidity (or notice of intent to use grandfathered data) prior to July 1, 2006, and begin source water monitoring by October 31, 2006. Ventura Water began sampling for Giardia and Cryptosporidium in July 2006 and continues to monitor for these organisms in San Antonio Creek and Kingston Reservoir. Ventura Water submitted a *Cryptosporidium* treatment bin classification . Ventura Water must complete additional *Cryptosporidium* treatment requirements by April 1, 2012. Ventura Water must submit a sampling plan for the second round of source water monitoring by January 1, 2015, and start monitoring by April 1, 2015.

Ventura Water must submit a *Cryptosporidium* treatment bin classification and supporting data from the second round for approval by October 1, 2017.

6.5 Other Regulations

6.5.1 Ground Water Rule

USEPA's Science Advisory Board concluded in 1990 that exposure to microbial contaminants such as bacteria, viruses, and protozoa (e.g., *Giardia* lamblia and *Cryptosporidium*) was likely the greatest remaining health risk management challenge for drinking water suppliers. The final Ground Water Rule (GWR) requires that all public water systems using groundwater supplies or systems distributing mixed surface and groundwater that is untreated to protect against infectious microbial contaminants particularly viruses (Federal Register, 2006). The GWR provides four elements that target risks to the system. The rule requires regular sanitary surveys, source water monitoring when a positive sample occurs its TCR monitoring, corrective actions upon evidence of fecal contamination, and compliance monitoring.

By December 1, 2009, all groundwater suppliers must have begun compliance monitoring if they achieve the required 4-log virus inactivation, removal, or combined technology approved by the state. Alternatively, a triggered source water monitoring is required when a 4-log virus inactivation, removal, or combined treatment technology has not been achieved and the supplier has received a positive total coliform notice from the state based on the Total Coliform Rule. However, if the groundwater supplier has a significant deficiency as identified by the state and has tested positive for fecal coliforms, the supplier must comply with the treatment technique requirements.

6.5.2 Radon Rule

The proposed Radon Rule was scheduled to be promulgated in 2001, but has not been finalized yet as of 2010. Radon is a naturally occurring radioactive gas that may cause cancer, and may be found in drinking water and indoor air. Radon-222 is an inert, noble gas formed from the radioactive decay of radium-226, as part of the uranium-238 decay series. The proposed Radon Rule includes a radon MCL of 300 pCi/l. A higher alternative MCL (AMCL) at 4,000 pCi/l is possible if the primacy agency or a public water purveyor implement a Multimedia Mitigation (MMM) Program focused on reducing the risk of radon exposure in indoor air environments. The USEPA has not released a revised schedule for a final rule.

6.5.3 Regulations for Other Compounds

DPH established in 2000 an MCL of 13 micrograms per liter (µg/l) for the gasoline additive methyl tertiary butyl ether (MTBE). A secondary MCL of 5 µg/l, established in 1999, addressed taste and odor concerns. Limited MTBE sampling involving the Ventura River water sources indicated that MTBE was not detected.

DPH established an Action Level of 20 µg/l for the disinfection by-product known as N-nitrosodimethylamine (NDMA). City sampling indicated that samples were significantly less than the AL.

Glyphosate is a herbicide used in the watershed to control Giant Reed (*Arundo donax*). This compound has a primary MCL of 700 ppb (0.7 mg/L) from the US EPA. A breakdown product due to microbial metabolism, Aminomethylphosphonic acid, does not currently have a regulatory limit.

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Section 7: Surface Water Quality Monitoring Programs

There are several surface water quality monitoring programs in the study area. The active programs during 2005 to 2010 are described in this section. Results of these monitoring programs are presented in Appendix O.

7.1 City of Ventura

As previously mentioned, Ventura Water owns and operates a full-scale, state-certified laboratory to test water quality. Ventura Water routinely collects samples in its distribution system and reports these in the Consumer Confidence Reports (Appendix P). Sampling points in the distribution system are shown in Table 7-1.

In addition to the water quality monitoring of the intake facilities, Avenue WTP, and four Nye wells, Ventura Water collects water quality samples at 11 sites located throughout the watershed; seven of which were added after the 2000 Report. Figure 8 shows the locations of Ventura Water's monitoring stations and Appendix D-1 has photographs of each monitoring site. Since 2002, Ventura Water has monitored water quality along the Ventura River and San Antonio Creek at these sites for *Cryptosporidium*, *Giardia*, bacteria, nutrients, bromide, TOC, chloride, and conductivity. Details on the frequency and constituent type sampled at each location are provided in Table 7-1. Results of the sampling are in Appendix O Table O-1A.

A summary of Ventura Water's overall water quality delivered to its customers in 2005 through 2010 can be found in the Consumer Confidence Report (CCR) located in Appendix P. The pressure zones influenced by the Avenue WTP are as follows: Zones 210, 260, 400, 430, 466, 599, and 605.

TABLE 7-1
DISTRIBUTION SYSTEM SAMPLING LOCATIONS

Zone No.	Sampling Station No.	Sampling Station Name
210	22	Harbor Boulevard
260	31	McKinley and Katherine
400	34	Seneca Street and Montalvo
430	1	Hospital and Foothill
466	30	Hillcrest and Catalina
599	32	Breaker Drive and Breaker Court
605	3	Victoria and Foothill

Additionally, as a water supplier, Ventura Water must complete an evaluation of its drinking water supply with respect to Public Health Goals (PHG) every three years. The goals are not mandatory limits and are based solely on public health risk factors. The CCRs in this 2010 report indicate that individual samples exceed the MCL for gross alpha particles however, on average the MCL is met. Gross alpha particles are naturally occurring radioactive isotopes that typically occur in the drinking water by the erosion of natural deposits and are considered carcinogenic. Noncarcinogenic effects of

uranium on the kidneys and the liver, and radium to cause tumors have been documented.

Total dissolved solids, specific conductance, and sulfate do not currently meet the secondary MCLs which represent the aesthetic quality of water and not necessary present a public health risk. Copper and lead can be found in water as a result of the corrosion of plumbing fixtures used in most homes. Ventura Water has conducted tests to optimize its treatment with corrosion inhibitors in an effort to further reduce lead and copper levels. High levels of lead can result in kidney problems or high blood pressure, and delays in physical and mental development in children. High levels of copper are known to cause gastrointestinal disturbance and kidney damage.

7.2 Ojai Valley Sanitary District

As part of the NPDES permit for the OVSD WWTP to discharge treatment plant effluent, an NPDES monitoring program is required to monitor the Ventura River upstream and downstream from the point of plant effluent river discharge. In June 2003, OVSD's NPDES monitoring program changed with the elimination of 6 sampling sites. The current sites are listed below in Table 7-2.

TABLE 7-2
OVSD VENTURA RIVER WATER SAMPLING STATIONS

Station Name	Location	Status	Latitude	Longitude
R3	Just north of treatment plant	Active	34.34542	119.300100
R4	Just south of treatment plant	Active	34.34302	119.299500
R5	Ventura River immediately south of Canada Larga Creek confluence	Active	34.38013	119.305640

The numbering of the monitoring stations remained the same to avoid the potential for future data being misinterpreted due to "like" station numbers, but at different locations. The RWQCB eliminated the above monitoring stations as other monitoring programs were collecting sufficient data. The OVSD staff assists the Ventura County/Storm Water personnel when they are performing the annual bio-assessment and nutrient sampling that is included with the information prepared for this Update.

The OVSD Water Quality Data is provided in Appendix O of this report. This includes:

- Table O-2A: Monthly Effluent & River Stations Sampling Results
- Table O-2B: Toxicity Data
- Table O-2C: Annual River Priority Pollutants Results
- Table O-3B: Nutrient Data for the Annual In-stream Bioassessment of the Ventura River Watershed

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Image Source: ESRI

Legend

- Ventura County Stormwater Program
- Ojai Valley Sanitary District Program
- SCCWRP
- Ventura River Stream Team
- VCAILG
- Study Area Boundary

N

0 1.75 3.5
Miles

Kennedy/Jenks Consultants

Watershed Sanitary Survey Update
Ventura, California

Sampling Locations for Water Quality Monitoring Programs

K/J 1089061*00
July 2011

Figure 8

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7.3 Ventura County Watershed Protection District.

The Ventura County Watershed Protection District (VCWPD) removed giant reed (*Arundo donax*) from the upper San Antonio Creek Watershed. The reed is a non-native invasive species displacing native habitat. The reeds are cut and glyphosate (herbicide) is applied to the freshly cut reed. Giant reed eradication and control is only conducted when no surface water is present and VCWPD routinely monitors for glyphosate and periodically monitors for aminomethylphosphonic acid (AMPA), a breakdown product in the waters. The project began on June 8, 2010 and is expected to conclude in October 2011. As of September 2010, no glyphosate has been detected at any of the four sampling locations. The current MCL for glyphosate is 700 ppb.

7.3.1 Ventura County Storm Water Monitoring Program

As part of the countywide Municipal NPDES Permit (Permit No. CAS004002), the VCWQMP must implement a Monitoring and Reporting Program, Ventura Countywide Stormwater Quality Urban Impact Mitigation Plan, and Ventura Countywide Stormwater Quality Management Plan (SMP). There are two pertinent parts of the VCWQMP that are of particular interest for the Ventura River watershed:

Bioassessment Monitoring

- Mass Emission Monitoring

Locations of these stations are shown in Figure 8.

7.3.2 Bioassessment Monitoring

Biological assessments (bioassessments) of water resources integrate the effects of water quality over time and are capable of simultaneously evaluating multiple aspects of water and habitat quality. When integrated with physical and chemical assessments, bioassessments help to further define the effects of point and non-point source discharges of pollutants and provide a more appropriate means for evaluating impacts of non-chemical substances, such as sedimentation and habitat destruction. A work plan for in-stream bioassessment monitoring in the Ventura River watershed was developed and submitted in January 2001 to the RWQCB as part of the revised SMP. For four (4) years, starting in 2001, bioassessment monitoring has been conducted once a year in the fall to establish baseline data. Bioassessment monitoring is conducted during the fall because it is the time period during which flows are most consistent and macroinvertebrates are most productive and diverse. The fall season provides a consistent, stable environment for sampling that allows for macroinvertebrate comparability from year to year.

As part of the new stormwater NPDES permit approved in 2008, bioassessment monitoring has changed and no monitoring in the 2008-2009 year was conducted. Past bioassessment monitoring was reported in the previous Watershed Sanitary Survey (2005). Beginning in spring 2010, bioassessment monitoring will be conducted and the report of the first results is expected but reported after the completion of this Sanitary Survey for 2010 however the data was made available for this report. The new

bioassessment program consists of a regional monitoring program that will be conducted by the Southern California Coastal Water Research Project (SCCWRP) annually in the spring. A greater number of sites in multiple watersheds (Ventura River, Santa Clara River and Calleguas Creek watersheds), as well as a larger number of water quality constituents and other physical measurements of riparian corridor health will be evaluated.

For six years, starting in 2001, Ventura River watershed bioassessment monitoring was conducted once a year in the fall to compile a baseline data set. With the approval of a new permit, the latest bioassessment data for the watershed was conducted in 2006. Table 7-3 shows the sampling sites for that year with 14 of the 15 stations sampled.

TABLE 7-3
2006 VENTURA RIVER WATERSHED BIOASSESSMENT MONITORING SAMPLING LOCATIONS

Sta. ID	Name	Description and Comments	BMI rating 2006	Latitude (D.M.S.)	Longitude (D.M.S.)	Elev.
0	Ventura River – Main Street Bridge	Mainstem Ventura River, first site above estuary with fresh water.	Poor	34 16 54.23	119 18 24.09	19
2	Canada Larga Creek	Canada Larga Creek, downstream of grazing.	Poor	34 20 31.7	119 17 08.2	293
3	Canada Larga Creek	Canada Larga Creek, above main area of grazing impact.	Fair	34 22 23.3	119 14 8.8	334
4	Ventura River – Foster Park	Mainstem Ventura River. Closest downstream site to confluence with San Antonio Creek. Station is also mass emission station. Bioassessment downstream from Foster Park Bridge	Poor	34 21 07.9	119 18 23.7	200
5	San Antonio Creek – near Ventura River	San Antonio Creek, first upstream site from confluence with Ventura River.	Fair	34 22 50.9	119 15 46.8	347
6	Ventura River – Santa Ana Rd.	Mainstem Ventura River		34 23 59.1	119 18 29.7	403
7	Lion Canyon Creek – upstream confluence	Lion Canyon Creek (tributary to San Antonio Creek) First upstream	Fair	34 25 19.3	119 15 46.8	623

Sta. ID	Name	Description and Comments	BMI rating 2006	Latitude (D.M.S.)	Longitude (D.M.S.)	Elev.
	San Antonio Creek	location from confluence. Site with heavy sediment load and influence by nearby stables and grazing.				
8	Stewart Canyon Creek – upstream conf. San Antonio Creek	Stewart Creek (tributary to San Antonio Creek) First upstream location from confluence. Within close proximity to City of Ojai and less densely developed residential lots.	Fair	34 26 07.1	119 14 49.3	685
9	San Antonio Creek near Stewart Canyon Creek	San Antonio Creek. Within close proximity to City of Ojai and less densely developed residential lots.	Fair	34 26 1.8	119 14 52.7	650
10	North Fork Matilija Creek – upstream Ventura River conf.	North Fork Matilija Creek above influence of Matilija Dam and below rock quarry.	Fair	34 29 06.0	119 17 59.4	978
11	North Fork Matilija Creek – at gauging station	North Fork Matilija Creek above influence of Matilija Dam and above rock quarry.	Fair/good	34 29 35.1	119 18 18.6	1,360
12	Ventura River – below Matilija Dam	Matilija Creek. First station above urban influence.	No sample	34 29 2.4	119 18 1.7	1020
13	Matilija Creek – below community	Matilija Creek above dam and below community. Site has excessive amount of algae.	Fair	34 30 04.5	119 20 51.7	1,355
14	Matilija Creek – at gate at end of road	Matilija Creek. Above dam and above community. Dry – Not Sampled	Fair/good	34 30 16.9	119 22 26.3	1,553
15	San Antonio Creek above Lion Creek	San Antonio Creek above Lion Creek	Poor	34 25 19.3	119 15 46.8	623

The August 2007 report for the 2006 year showed that the aquatic health of the Ventura River Watershed ranged from poor to good in 2006, based on the results of the southern California IBI. Stations 0 and 4 each scored in the poor range, indicating that the BMI communities found there were impaired. Possible causes of low water quality in this reach include a reinforced levee present on the east bank, a large transient human population that use the streambed for shelter and possibly the location in relation to the Ojai Valley Sanitation District wastewater treatment plant. The potential water quality impacts of transient persons may be worthy of additional evaluation.

The Canada Larga Creek drainage is impacted by grazing in its lower reaches which resulted in low ratings for the sampling sites at these locations. The three stations located on the main stem of San Antonio Creek (5, 15 and 9), and on its tributaries at Lion Canyon and Stewart Canyon Creeks (7 and 8, respectively), all scored in the fair range for the IBI score, except for Station 15 which scored in the poor range. Four stations were located in the upper watershed: Stations 10 and 11 on the North Fork of Matilija Creek and Stations 13 and 14 located on Matilija Creek above Matilija Dam. All sites are used as recreational swimming areas. Station 13 is located downstream of a small residential community and Station 14 is located upstream. Stations 11 and 14 are located at the highest elevations in the watershed (over 1,300 ft) and had the best IBI scores in the watershed, which attaining the fair range and good range (Table 7-4).

TABLE 7-4
2009 VENTURA RIVER WATERSHED BIOASSESSMENT MONITORING SAMPLING LOCATIONS

Station Code	Station	Latitude	Longitude	Sample Date	SC-IBI Score (Adjusted)	Impaired	Condition
SMC00271	SMC00271	34.55	-119.17	04/Jun/2009	57.8	No	Fair
SMC00827	SMC00827	34.56	-119.19	15/Jun/2009	57.8	No	Fair
SMC00911	SMC00911	34.51	-119.30	04/Jun/2009	52.1	No	Fair
SMC01151	SMC01151	34.37	-118.97	17/Jun/2009	20.7	Yes	Poor
SMC01684	SMC01684	34.28	-118.92	03/Jun/2009	16.4	Yes	Very poor
SMC01748	SMC01748	34.29	-118.83	03/Jun/2009	22.1	Yes	Poor
SMC01860	SMC01860	34.22	-118.98	28/May/2009	20.7	Yes	Poor
SMC02127	SMC02127	34.42	-119.26	04/Jun/2009	30.7	Yes	Poor
SMC02436	SMC02436	34.26	-118.97	28/May/2009	17.8	Yes	Very poor
SMC03268	SMC03268	34.16	-119.06	28/May/2009	27.8	Yes	Poor
SMC04047	SMC04047	34.46	-119.29	14/May/2009	17.8	Yes	Very poor
SMC04175	SMC04175	34.41	-119.28	11/Jun/2009	43.6	No	Fair
SMC04239	SMC04239	34.36	-119.31	11/Jun/2009	35	Yes	Poor
SMC04308	SMC04308	34.19	-118.91	17/Jun/2009	20.7	Yes	Poor
SMC04399	SMC04399	34.31	-119.30	11/Jun/2009	33.5	Yes	Poor

7.3.3 Mass Emission Monitoring

The purpose of mass emission monitoring is to identify pollutant loads to the ocean and identify long- term trends in pollutant concentrations. Mass Emission sites are located in the lower reaches of major watersheds. Through water quality monitoring at these sites, the Ventura County Stormwater Monitoring Program (SMP) is intended to evaluate the cumulative effects of stormwater and other surface water discharges on beneficial uses in the watershed prior to discharge to the ocean. Both Mass Emission and Receiving Water stations measure water quality parameter concentrations in a surface water body,

whereas Land Use monitoring stations permit the water quality characterization of discharges to surface water bodies. Mass Emission monitoring stations measure water quality parameter concentrations resulting from discharges throughout an entire watershed. The Mass Emission drainage area is much larger than the drainage area for the Receiving Water sites and includes other sources of discharge, such as wastewater treatment plants, non-point sources, and groundwater discharges.

Mass Emission stations are located in the three major Ventura County watersheds: Calleguas Creek, Ventura River, and Santa Clara River. However, the monitoring location for the Ventura River Watershed was relocated in 2005. The Ventura River NPDES Mass Emission Monitoring Station (ME-VR) which was formerly located on Casitas Vista Road at Foster Park was determined to be unsafe due to land slide activities observed during the heavy rainfalls of January and February 2005.

Safety concerns with the station's location at Foster Park prompted the SMP to relocate the ME-VR station to the OVSD's WWTP (located at 6363 North Ventura Avenue, Ventura, CA). The new ME-VR station (ME-VR2) is located approximately one mile downstream of the station's former location. The new monitoring site is a safer location on the Ventura River than the previous sites due to the presence of a levee on the east side and bedrock on the west side of the site. The new location also provides an improved ability to secure monitoring equipment. Monitoring in ME-VR2 station was initiated in May 2005.

In 2009, monitoring locations experienced elevated levels above the California Toxics Rule and California Ocean Plan. All sites showed elevated levels during wet weather events and only mass emission sites showed an occasional elevated level during dry weather events. The table below summarizes all compounds that were detected above the water quality objectives of the California Toxics Rule and California Ocean Plan (Table 7-5).

The full report of the Mass Emission Monitoring and data for the constituents monitored from 2008 to 2009 can be accessed through VCWQMP: Ventura Countywide Stormwater Quality Annual Monitoring Reports in Appendix Q.

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Table 7-5

Summary Results Of Mass Emission Monitoring Sites- Constituents in Excess of California Toxics Rule and California Ocean Plan

Site	Monitoring location	Anion	Bacterio-logical	Conven-tional	Metal	Nutrient	Organic	Pesticide
Mass emission	ME-CC	Chloride	E. coli, Enterococcus, Fecal Coliform, Total Coliform	Total Dissolved Solids	Aluminum, Chromium, Copper, Lead, Nickel, Zinc	Nitrate as N	Bis(2-ethylhexyl)phthalate, Total PAH Compounds	4,4'-DDD, 4,4'-DDE, Total Chlordane Compounds, Total DDT Compounds, Toxaphene
	ME-VR2		E. coli, Enterococcus, Fecal Coliform, Total Coliform					
	ME-SCR		E. coli, Enterococcus, Fecal Coliform, Total Coliform		Aluminum, Chromium, Copper, Lead, Mercury, Nickel, Selenium	Ammonia as N	Bis(2-ethylhexyl)phthalate, Total PAH Compounds	Toxaphene

Site	Monitoring location	Anion	Bacterio-logical	Conven-tional	Metal	Nutrient	Organic	Pesticide
Receiving Waters	W-3		E. coli, Enterococcus, Total Coliform		Aluminum, Copper, Lead, Zinc		Total PAH Compounds	4,4'-DDD, 4,4'-DDE, Total DDT Compounds, Toxaphene
	W-4		E. coli, Enterococcus, Fecal Coliform, Total Coliform	Total Dissolved Solids	Aluminum, Copper	Nitrate as N	Total PAH Compounds	4,4'-DDD, 4,4'-DDE, Total Chlordane compounds, Total DDT Compounds, Toxaphene
Land Use	A-1		E. coli, Enterococcus, Fecal Coliform, Total Coliform	Total Dissolved Solids	Aluminum, Copper	Nitrate as N	Total PAH Compounds	4,4'-DDD, 4,4'-DDE, Total Chlordane Compounds, Total DDT compounds, Toxaphene

7.4 Ventura Stream Team

The Ventura River Watershed Monitoring Program "Stream Team" is a volunteer-based water quality monitoring program established jointly by the Santa Barbara Channel Keepers in conjunction with the Regional Board, VCFCD, Ventura Water, and the OVSD. Their goals are to develop and implement regular and precise testing of standard water quality parameters that will establish baseline information on a watershed level, establish a trained volunteer monitoring base, and locate previously unidentified point sources of pollution.

There are 15 sites chosen for this monitoring program. There are four Lower Ventura River sites, two Canada Larga sites, four San Antonio Creek sites, and four Upper Ventura River sites of which four represent four distinct reaches or sub-watersheds. Site selection is based on:

Sites that are representative of a certain reach or sub-watershed

Sites that are accessible, especially during high water events

History of monitoring at that site

Even spacing throughout watershed

Area of special interest

- Sites that are representative of diverse range of land uses

Table 7-6 identifies the locations of the 22 active monitoring sites chosen for this Watershed Monitoring Program, and their locations are shown in Figure 8.

The Ventura Stream Team conducted monthly on-site testing at the designated location on the Ventura River. They measure physical and chemical parameter in the field using portable, hand-held instruments. On-site data collected includes dissolved oxygen, turbidity, conductivity, pH, temperature and flow. Water samples, collected at each site, are processed in Channel Keeper's laboratory for three Public Health bacterial indicators: Total coliform, *E. coli*, and Enterococcus, using approved standard methodology as Colilert-18 and Enterolert-24 by Idexx Laboratories. Parameters such as ammonium, nitrite plus nitrate, orthophosphate, total dissolved nitrogen and particulate carbon, nitrogen and phosphorus are measured and analyzed through the cooperation of the Santa Barbara Channel – Long Term Ecological Research Project at the University of California, Santa Barbara. Occasional tests for other ions and contaminants are also done. In addition, site characteristics such as vegetation and aquatic life are also being assessed and recorded during sample collection on standardized forms.

Data collected by Ventura Stream Team is summarized and available in Appendix O. The State of the Ventura River Report, provided in Appendix P covers the review of the Ventura River watershed from January 2001 to the end of the 2006.

TABLE 7-6
VENTURA STREAM TEAM WATER SAMPLING SITES

Station Name	Location	Sampling Frequency
VRW000	Ventura River Estuary	Year Round
VRW001	Ventura River at Main Street Bridge	Year Round
VRW002	Ventura River at Canada Larga Confluence	Historic
VRW003	Ventura River at Shell Road	Historic
VRW004	Lower Canada Larga Creek	Seasonal
VRW005	Upper Canada Larga Creek	Seasonal
VRW006	Ventura River at Foster Park	Year Round
VRW007	San Antonio Creek at Old Creek Road	Year Round
VRW008	Lion Canyon	Seasonal
VRW009	Stewart/Fox Creek	Year Round
VRW010	San Antonio Creek above confluence with VR09	Year Round
VRW011	Ventura River at Santa Ana Road bridge	Seasonal
VRW012	Ventura River at Highway 150	Seasonal
VRW013	Matilija Creek	Historic
VRW014	North Fork Matilija Creek	Year Round
VRW015	Upper Matilija Creek	Year Round
VRW017	San Antonio Creek at Lion Canyon	Year Round
VRW018	Field QAQC Blank	Year Round
VRW021	Upper N. Fork Matilija Creek	Intermittent
VRW022	N. Fork Matilija at Wheeler Gorge	Intermittent
VRW03.5	Ventura River at Canada Larga	Year Round

Station Name	Location	Sampling Frequency
VRW06.3	Ventura River at San Antonio Creek Confluence	Year Round
VRW07A	San Antonio Creek above confluence with Ventura River	Year Round
VRW12.9	Ventura River at Camino Cielo	Year Round

7.5 DPH Drinking Water Source Assessments

DPH's Division of Drinking Water and Environmental Management established the California Drinking Water Source Assessment and Protection (DWSAP) Program to provide information to communities wanting to develop local programs to protect their sources of drinking water. The DWSAP Program addresses both groundwater and surface water sources. The assessments typically include: a delineation of the area around a drinking water source through which contaminants might move and reach that drinking water supply; an inventory of possible contaminating activities (PCAs) that might lead to the release of microbiological or chemical contaminants within the delineated area; and a determination of the PCAs to which the drinking water source is most vulnerable.

A Summary of the DPH Drinking Water Source Assessments (DWSA) for the four Nye Wells (Nos. 1A, 2, 7, and 8) for 2002 and/or 2003 is summarized in Table 7-7 indicate that there have been no contaminants detected in these wells. Additional DWSA were conducted in 2005 on Nye Well 11 (see Appendix S) and the Saticoy County Yard Well (see Appendix T). However, the sources are still considered vulnerable to PCA's located near the drinking water source.

TABLE 7-7
SUMMARY OF DPH SOURCE WATER ASSESSMENTS FOR THE SIX WELLS

Water Source	Assessment Date	Identified Vulnerabilities (PCAs)
Nye Well No. 1A	Mar-03	Automobile – Repair Shops Grazing (> 5 large animals or equivalent per acre)
Nye Well No. 2	Apr -02	
Nye Well No. 7	Apr-02	
Nye Well No. 8	Apr-02	Illegal activities/unauthorized dumping Junk/scrap/salvage yards Machine shops Septic systems – low density (< 1 acre) Sewer collection systems
Saticoy County Yard Well	Apr-05	Automobile-Gas Station

Nye Well No. 11	Sept-05	Agricultural Drainage Automobile - Repair shops Farm machinery repair Junk/scrap/salvage yards Machine shops NPDES/WDR permitted discharges Recreational area - surface water source Septic systems - low density [<1/acre] Sewer collection systems Utility stations - maintenance areas Wells - Agricultural/ Irrigation Historic gas stations

7.6 Water Sampling by Others in Study Area

7.6.1 Los Angeles Regional Water Quality Control Board

The Los Angeles RWQCB had a previous monitoring program for the Ventura River Watershed that was discussed in the 2005 Sanitary Survey. Another program, the Surface Water Ambient Monitoring Program (SWAMP) administered by the State Water Resources Control Board, was introduced in 2001. SWAMP is a statewide monitoring effort designed to assess the conditions of surface waters throughout the state of California. Responsibility for implementation of monitoring activities resides with the nine RWQCBs that have jurisdiction over their specific geographical areas of the state. Monitoring is conducted in SWAMP through the Department of Fish and Game and US Geological Survey master contracts and local RWQCBs monitoring contracts.

On November 3, 2005, the Regional Board adopted the Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands within the Los Angeles Region (Order No. R4-2005-0080). The waiver applies to all irrigated lands in Los Angeles and Ventura counties and will affect several thousand growers. Any grower who owns or conducts irrigation operations and from which a discharge occurs is covered by the waiver (note: the definition of a discharge is very broad and includes percolation to groundwater and stormwater runoff). Growers, or growers groups, should have registered with the Regional Water Board by filing a notice by August 3, 2006. The Ventura County Agricultural Irrigated Lands proposed monitoring plan is found in Appendix M and has been submitted to the RWQCB for review as of 2008.

7.6.2 Ventura River County Water District

This District has four wells and an agreement with CMWD for purchase of water when drought reduces the ability of the agency' wells to meet demand. VRCWD conducts ground water quality sampling and provides CCR's to its customers. The 2009 CCR is attached in Appendix P. These wells are not under the direct influence of surface water.

7.6.3 Meiners Oaks County Water District

The Meiners Oaks County Water District has four wells, of which two are shallow wells located adjacent to the Ventura River, downstream of the Robles Diversion. The District, in July 1995, began treating its river well supply through a pressure filter system. Since then, the District has not conducted any additional *Giardia* or *Cryptosporidium* testing.

In 2009, Meiners Oaks County Water District CCR identified their sources of water for supply as four groundwater wells drilled 100 to 400 feet into underground aquifers and one connection to receive surface water from Lake Casitas. They can meet their demand using groundwater. The surface water system connection is only used for emergency supply during repairs of their groundwater wells or when demand is higher than usual. On those occasions, a blend of surface and ground water is delivered throughout their system.

Because this water source is considered under the influence of surface water, a copy of MOCWD 2009 CCR is included in Appendix P

7.6.4 City of Ojai

City of Ojai, in coordination with the CDFG, prepared an assessment of the Ojai Urban Watershed and Restoration Plan (David Magney Environmental Consulting 2005) which can be reviewed in the 2005 Sanitary Survey. No update has been prepared of Ojai's Restoration Plan.

7.6.5 Casitas Municipal Water District

The CMWD provides a separate Sanitary Survey for the monitoring program in the Upper Ventura River Watershed.

7.6.6 Groundwater Monitoring

The groundwater purveyors in the study area all monitor their drinking water wells per DPH regulations for groundwater supplies. A review of the groundwater monitoring reported in 2008 annual report by the Ojai Groundwater Management Agency showed instances of wells on the East end of Ojai showed high TDS and sulfate. Because of the distance and travel times to the lower Ventura River from the Ojai area, it is not considered a potential threat to surface water quality at this time.

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Section 8: Conclusions and Recommendations

8.1 Conclusions

8.1.1 Changes in Water Quality

As in the 2005 Report, there have not been significant changes in water quality in the watershed in the 2005 – 2010 period. As would be expected high runoff events in the wintertime would contribute mainly high suspended solids while metals, organics and pesticides may be more associated with urban runoff first flush events. As described in Table 7-6, exceedances mass emissions of the California Toxics Rule and California Ocean Plan constituents of chloride, coliform, nutrients some metals, and some organics and pesticides have occurred from the watershed.

Giardia and *Cryptosporidium* were generally below detection limits in Ventura Water's water sampling program during the 2005 to 2010 period with detection of *Cryptosporidium* at 4 oocysts in April 2010 in San Antonio Creek. Since May 2010, no oocysts have been detected. The Title 22 monitoring of general mineral, general physical and inorganic chemicals stayed within the historical range, and radionuclide's had no exceedances.

There were a few occasions of high Total Coliform (greater than 24,000 MPN) in Ventura Water's watershed monitoring. This is likely an indicator of ineffective septic tanks, bird excrement, or animal manure. The influent of the Avenue WTP did not show the high Total Coliform because of the use of subsurface intake and wells.

The use of subsurface intake and wells and operation of the Avenue WTP reduces the risks of most contaminants

8.1.2 Foster Park Intake Facilities and Avenue Water Treatment Plant

Ventura Water is not currently using the surface water diversion, but has maintained the structures for possible use in the future. Ventura Water is however, using the groundwater that is under the direct influence (GUDI) of surface water from the sub-surface diversion and from shallow wells that meet the requirements of the SWTR and the need for Watershed Sanitary Surveys by DPH.

The completed improvements at the Avenue WTP and Ventura Water's monitoring programs are in compliance with the SWTR and related regulations.

8.1.3 Potential Contamination Sources

8.1.3.1 Survey of Watershed

The continuation of watershed monitoring and reporting programs developed during the period of 2005 through 2010 by Ventura Water, the County of Ventura, the Ventura River Stream Team

(Channel Keepers), and a number of interagency studies initiated, continue to provide valuable information to understand the watershed.

8.1.3.2 Primary Sites of Potential Contamination

There continues to be potential water quality hazards in the watershed that need to be monitored. The potential contamination issues in the study area are shown in Figure 6.

Actions over the last five years that have reduced the risk of contamination are:

New OVSD siphons that reduce the risk of spilling untreated wastewater,

2010 Update to the OVSD Sewage Spill Prevention and Response Plan,

53 septic tank to OVSD sewer system conversions, and

- Successful completion of Avenue WTP Membrane Filtration Project and other associated plant improvements.

There are continuing concerns with the potential failure of a levee that protects one of OVSD's sanitary sewer trunk lines and increasing concerns with respect to water quality risks from downstream sediment transport as a result of the future Matilija Dam removal. Septic tanks and gas utility pipelines were recognized in this 2005 Sanitary Survey Update, but these have existed in the watershed for decades.

8.1.4 Watershed Control and Management

8.1.4.1 Interagency Watershed Studies

The many active watershed level studies demonstrate the importance of water resources and water quality to the stakeholders in the watershed. Furthermore, the level of activity also demonstrates the benefit of interagency cooperation in providing for the understanding and planning for use of the limited resources in the watershed.

8.1.4.2 Monitoring Programs

Water quality monitoring of the Ventura River and San Antonio Creek has continued in its activity during the 2005 to 2010 period. The watershed monitoring programs by Ventura Water, the OVSD, the Ventura River Stream Team by Channel Keepers, the County Storm Water Monitoring all have continued and improved over the last five years. Additionally, the Agricultural Waiver Program has initiated plans to monitor agricultural runoff. Ventura Water's experience and the increase in other monitoring programs since the 2005 Sanitary Survey continues to target specific sampling stations.

8.2 2010 Recommendations

This section provides various recommendations for water quality monitoring and for specific actions that Ventura Water can take to improve watershed water quality.

8.2.1 Regulatory Compliance Monitoring and Studies

Two elements of regulatory compliance are underway by Ventura Water as they relate to the Stage 2 DBPR and the LT2ESWTR compliance. Ventura Water is targeting Stage 2 DBPR compliance monitoring for completion in 2012.

Regarding the LT2ESWTR, with the completion of the Avenue WTP, Ventura Water completed additional *Cryptosporidium* treatment requirements by April 1, 2012. Ventura Water is on track to submit a sampling plan for the second round of source water monitoring by January 1, 2015, and start monitoring by April 1, 2015. Ventura Water plans to submit a *Cryptosporidium* treatment bin classification and supporting data from the second round for approval by October 1, 2017.

Ventura Water complies with drinking water regulations.

8.2.2 Coordination of Watershed Water Quality Monitoring Programs

Although coordination between the agencies has continued, streamlining of monitoring locations is still underway. OVSD's new permit has reduced the number of monitoring locations in the watershed due to evidence that the additional monitoring stations showed that the water quality did not change. Further agreement on sampling locations would streamline the monitoring within the watershed and some coordination has occurred.

8.2.3 Modified Watershed Monitoring Program

The recommended City watershed monitoring program is summarized in Table 8-1 and is essentially unchanged since 2005 except that TKN was not monitored because of non-detection. It is not appropriate to further reduce monitoring at this time as no constituents were consistently non-detected over the five year period. Tests can be added at any time if there are some high results or emergencies. Sampling for TOC, bromide, and *Giardia/Cryptosporidium* may need to be adjusted once a monitoring plan is made for the Stage 2 DDBPR and the LT2ESWTR regulations as discussed in Section 2.1.1.1 and 2.1.1.2.

8.2.4 Septic Conversion and Monitoring

The OVSD reported sewering 53 homes that were previously unsewered within the watershed . However, the problem areas remain the same as reported in the 2005 Sanitary Survey as far as contamination potential from overflowing septic tanks in high groundwater areas. It is recommended that Ventura Water initiate discussions with the Ventura County Storm Water Monitoring or the Stream Team to consider monitoring near the Arbolada and Siete Robles areas of Ojai where septic tanks are in areas that have high groundwater in wet years.

Ventura Water should continue to work with the County Environmental Health Division and other agencies to seek funding and develop incentives for home owners to convert to sewer systems, especially in the lower Ventura River area.

8.2.5 Participate in Matilija Dam Removal and Other Watershed Planning

Ventura Water should continue its involvement in the Matilija Dam removal and to continue to raise awareness of the consequences of the additional sediment that will be conveyed by the removal of the dam. Ventura Water is prepared, if needed, to use Nye Wells No. 12 and 13 that were drilled as part of the Matilija Dam removal mitigation but are not yet in service.

8.2.6 Public Outreach to Reduce Effects of Horse and Stock Manure

Ventura Water should continue to work with the VCSWQMP to encourage distribution of information and to continue the public outreach program about the effects of horse or stock manure on water quality.

8.2.7 Coordination with the OVSD

Due to the significant potential impact of a sewer spill on Ventura Water's Foster Park water sources, Ventura Water should continue working with the OVSD to improve coordination and operations in case a sewer overflow occurs. Ways this may be accomplished include the following:

- Participate in a practice drill once a year for the emergency overflow manhole warning system in the spring or summer so that there is time to make changes before the next wet season.

8.2.8 Design Standards Review

Ventura Water should periodically review well and other water system design standards to minimize potential contamination sources to the Foster Park water supply.

References

Personal Communications

Ron Sheets, Operations Superintendent, Ojai Valley Sanitary District

Arnold Moser, Water Production Supervisor, City of San Buenaventura

Raphael Mazor, Scientist, SCCWRP

Sergio Vargas, Deputy Director, Ventura County Watershed Protection District.

Don Sheppard, Ventura County E&ERD and IWMD

Pam Lindsay Ventura County Watershed Protection District.

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Ventura Countywide Stormwater Quality Management Program. http://www.vcstormwater.org/publications.html and http://www.vcstormwater.org/documents/workproducts/2009midyearsampling/Ventura%20July%202009%20Report_2009.07.10.pdf

Appendices

The following appendices are found on the attached CD-Rom

Appendix A:	National Marine Fisheries Service Biological Opinion for Removal of Matilija Dam
Appendix B:	Ojai Valley Area Plan 2008 Amendment
Appendix C:	Ventura County Watershed Protection District, Annual Rainfall Data
Appendix D:	Ojai Valley Sanitary District Sewage Spill Prevention and Response Plans
Appendix E:	Project Photographs
Appendix F:	Ojai Valley Sanitary District 2008 NPDES Permit
Appendix G:	2008 Annual Pesticide Use Reports, Ventura County, Indexed by Commodity
Appendix H:	OVORF 2009 Groundwater Monitoring Report
Appendix I:	Business Plan, Hazardous Waste Generator & Underground Storage Tank Sites (BWT) Tables
Appendix J:	Ventura County Municipal Storm Water NPDES Permit
Appendix K:	RWQCB 2007 Watershed Management Initiative Excerpt
Appendix L:	Ventura County General Plan 2010 Excerpt
Appendix M:	Ventura County Agricultural Irrigated Lands Group 2008 Water Quality Monitoring Plan
Appendix N:	Federal Primary and Secondary Drinking Water Standards
Appendix O:	Water Quality Data
Appendix P:	Consumer Confidence Reports (CCR)
Appendix Q:	2008-09 Annual Report, Ventura Countywide Stormwater Quality Management Program
Appendix R:	Ventura Stream Team 2006 Annual Report
Appendix S:	2005 DPH Drinking Water Source Assessments for Nye Well No.11
Appendix T:	2005 DPH Drinking Water Source Assessments for Saticoy County Yard Well

Appendix A

National Marine Fisheries Service Biological Opinion for Removal of Matilija Dam

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UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Region
501 West Ocean Boulevard, Suite 4200
Long Beach, California 90802-4213

MAR 29 2007

In reply refer to:
SWR/2002/01708:APS

Ruth Villalobos
Chief, Planning Division
U.S. Army Corps of Engineers
Los Angeles District
P.O. Box 532711
Los Angeles, California 90053-2325

Dear Ms. Villalobos

Enclosed with this letter is NOAA's National Marine Fisheries Service's (NMFS) biological opinion for the Army Corps of Engineers' Matilija Dam Removal Project. This biological opinion addresses the effects of the proposed action on the Southern California Distinct Population Segment (DPS) of endangered steelhead (*Oncorhynchus mykiss*) and critical habitat for this species in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*).

The biological opinion concludes that the proposed action is not likely to jeopardize the continued existence of the endangered Southern California steelhead DPS, or destroy or adversely modify critical habitat for this species. NMFS believes the proposed action is likely to result in take of steelhead, and therefore an incidental take statement is attached to the biological opinion. The incidental take statement includes reasonable and prudent measures that NMFS believes are necessary and appropriate to minimize and monitor incidental take of steelhead. Please contact Anthony Spina at (562) 980-4045 if you have any questions concerning the biological opinion or if you would like additional information.

Sincerely,

Rodney R McInnis

Rodney R. McInnis
Regional Administrator

Enclosure

BIOLOGICAL OPINION

AGENCY: U.S. Army Corps of Engineers

ACTION: Matilija Dam Removal and Ecosystem Restoration Project on Matilija Creek, Ventura County, California

CONSULTATION CONDUCTED BY: National Marine Fisheries Service, Southwest Region

TRACKING NUMBER: SWR/2002/01708

DATE ISSUED: MAR 29 2007

I. CONSULTATION HISTORY

On July 15, 2004, NOAA's National Marine Fisheries Service (NMFS) received a letter requesting formal consultation with the U. S. Army Corps of Engineers' (Corps) planning branch in the Los Angeles district office. The request concerned the Matilija Dam Ecosystem Restoration Project proposed for the Ventura River watershed. When the Corps requested the formal consultation, important features about the proposed action had not been defined or were in the early phases of planning and design. Consequently, how the action would affect the Southern California Distinct Population Segment (DPS) of endangered steelhead (*Oncorhynchus mykiss*) and critical habitat for this species could not be adequately evaluated. Therefore, NMFS was unable to initiate formal consultation, and instead requested additional clarification and information of the Corps by letter dated December 8, 2004. NMFS' letter indicated support for the proposed action and identified the specific information needed to initiate formal consultation. In May 2006, NMFS met with the Corps to reaffirm the information needs to undertake a formal consultation and to discuss measures for minimizing adverse effects of the proposed action (including uncertainties) on steelhead and their critical habitat. Additional meetings and letter exchanges followed, and on August 15, 2006, NMFS concluded it had received sufficient information to initiate formal consultation. Accordingly, NMFS prepared a biological opinion for the proposed action. A preliminary draft biological opinion was provided to the Corps at the end of January 2007, and the Corps provided NMFS with comments on the draft shortly thereafter. Following a February 26, 2007, meeting between the Corps and NMFS to discuss the comments, and after NMFS received additional information from the Corps (Corps 2007), NMFS prepared this final biological opinion. This biological opinion is based on the best scientific and commercial data available, including descriptions of the proposed action (Corps 2004a, b, c, d, Corps 2006a, b, Corps 2007), NMFS' observations of the river system, expected effects of the proposed action on endangered steelhead, and the relevant ecological literature. A complete administrative record for this consultation is maintained on file at NMFS' Southwest Regional Office (501 W. Ocean Blvd., Suite 4200, Long Beach, California 90802).

The U. S. Endangered Species Act (ESA) requires NMFS to reach conclusions based on the best scientific and commercial data available. There is only partial information available at this time for our analysis of the effects of the proposed action on endangered steelhead and their critical habitat. This is due to the ongoing nature of the complex planning, design, and implementation

process for the proposed action and to the limited information available on the effects of large-scale dam removals. As part of the proposed action, the Corps has included measures and objectives that are intended to avoid, minimize or mitigate the potential effects of the action on endangered steelhead and designated critical habitat for this species, but the empirical basis currently available to NMFS for concluding that the measures and objectives will be effective at avoiding or reducing the adverse effects of the action is limited. To address the uncertainties remaining in the potential effects of the proposed action, NMFS has developed a series of key assumptions for assessing effects of the proposed action on endangered steelhead and critical habitat. These assumptions derive from (1) discussions with, and written correspondence from, the Corps, (2) NMFS' understanding of the proposed action, and (3) NMFS' experience evaluating effects of projects on steelhead, and developing measures for minimizing such effects.

NMFS has proceeded to write this biological opinion with the understanding that more information would be forthcoming during the next phase of the project planning and design. NMFS and the Corps will continue to collaborate on the proposed action, including after issuance of this biological opinion. In this regard, NMFS expects to continue to provide input, review design drawings, and participate in the development of monitoring and mitigation procedures for the purpose of ensuring that the final design and implementation of various project elements are executed in a manner that will not jeopardize the endangered Southern California DPS of steelhead or destroy or adversely modify critical habitat for this species, and to make certain the goals and objectives of the proposed action are met. As project designs and plans develop, or if key assumptions are found to be invalid, NMFS and the Corps may need to re-initiate section 7 consultation to incorporate new information and re-assess project effects.

II. DESCRIPTION OF THE PROPOSED ACTION AND ACTION AREA

The Corps proposes to remove Matilija Dam (dam) on Matilija Creek, a major tributary to the Ventura River (Figure 1) for the purpose of (1) promoting ecosystem restoration of terrestrial and aquatic habitat to benefit native fish and wildlife (including the endangered steelhead) in the Ventura River watershed, (2) improving the natural hydrologic and sediment transport regime to restore and sustain local coastal beach sand replenishment, and (3) enhance recreational opportunities along Matilija Creek (including U. S. Forest Service land) and the downstream Ventura River system consistent with ecosystem recovery objectives. The recommended restoration alternative to be carried out by the Corps is known as the "Recommended Plan" (Corps 2004a). The specific features of this alternative form the basis of this biological opinion and are summarized on Page 4 (a generalized schedule for the individual project elements can be found in Appendix B). Readers wishing additional information about the proposed action are referred to the supporting documents (Corps 2004a, b, c, d, Corps 2006a, b, Corps 2007).

The action area involves a portion of Matilija Creek (a tributary to the Ventura River), the mainstem Ventura River, and the Ventura River estuary. Within Matilija Creek, the action area begins about 1.5 miles upstream of the dam and extends 0.6 miles downstream to the confluence with the Ventura River. Within the Ventura River, the action area extends from the confluence with the North Fork Matilija Creek downstream for approximately 15.5 miles within and along the mainstem of the Ventura River to the Pacific Ocean, including the estuary. The action area includes a freshwater rearing, spawning, and migration sites, and an estuarine area, for adult and juvenile steelhead, and designated critical habitat for the Southern California DPS of endangered steelhead (Figures 1-40 in Appendix A).

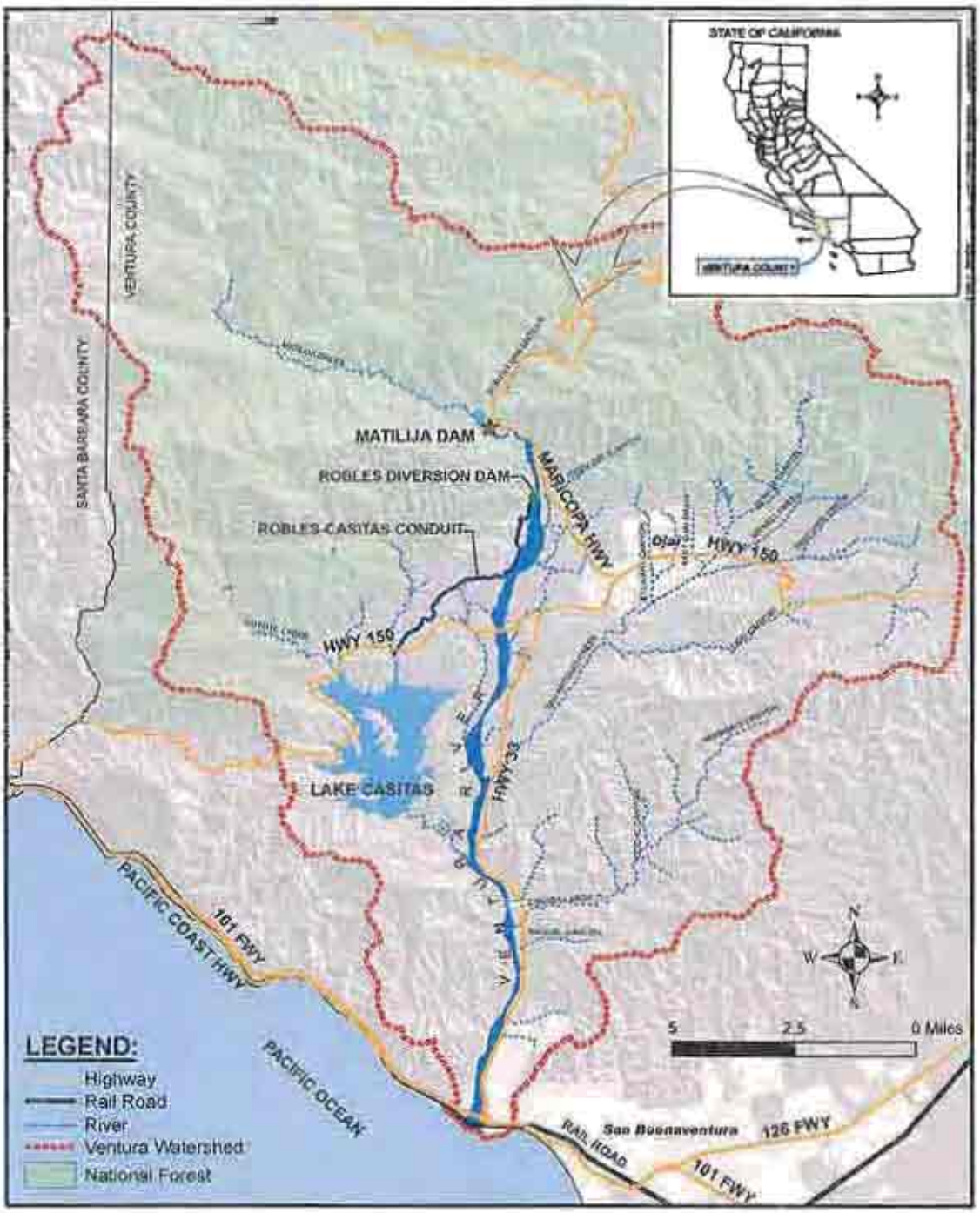

Figure 1.—Map of the action area showing the Ventura River Watershed and location of Matilija Dam.

A. Removal of Fine Sediments from the Reservoir Area

Demolition of Matilija Dam will begin with removal of sediment from the reservoir. Two 12-inch cutter-head suction dredges working 24 hours a day, 7 days a week (for about 9 months) will remove the 2.1 million cubic yards of fine sediment within the existing lake behind Matilija Dam. The extracted slurry will be transported by pipeline downstream to disposal areas (either a single or multiple disposal sites) near the Highway 150 (Baldwin Road) Bridge. The potential sites, comprising about 118 acres in the floodplain, are both upstream and downstream of the bridge and are 3.6 to 6.3 miles downstream of Matilija Dam. Earthen containment dikes (10 to 20 feet in height) will be constructed to contain the slurry. The dikes will be constructed of sands and gravels obtained from the on-site excavation and grading performed as part of the overall project. Interior dikes will be constructed during slurry placement to enhance stability and separation of the fines from water. The disposal areas will be cleared of vegetation to enhance percolation. For the upstream-most slurry disposal site located just north of the Highway 150 Bridge, rock-slope protection will be required to protect the site from periodic high flows. The three other disposal areas, downstream of the bridge, are located on low floodplain terraces and would be subjected to less frequent flows. Rock protection for these areas will likely consist of boulders obtained during construction of the containment dikes. Slope protection at the slurry disposal site will consist of willows planted on the outside slopes of the basin to provide additional soil stabilization during large storm events. Additional revegetation of the fine-sediment disposal site(s) using native plants will be developed for the plan (Figures 7-9 in Appendix A).

B. Dam Demolition and Removal

Demolition of the dam will occur in one phase and is expected to take about 36 months (while crews are not expected to work within the creek and lake bed during the winter, some work will continually occur in the area behind the dam during the 3-year period.). Following dredging of the reservoir area, the dam structure will be slowly removed in sections by controlled blasting in approximately 15-foot vertical increments. Concrete rubble will be reduced and processed in designated areas behind the dam and transported to a commercial concrete recycling plant. Heavy equipment to be used for dam demolition, deconstruction, and concrete hauling, as well as other activities includes cranes, front end loaders, dump trucks, scrapers, bulldozers, graders, backhoe, hoe-rams, water trucks, excavators, and rollers (Figure 10 in Appendix A).

The reach of Matilija Creek extending 500 to 1000 feet downstream of the dam will be dewatered to allow workers and equipment to remove fallen debris and concrete footings, and to align and reconnect the upstream and downstream portions of the creek channel to their historical configuration. Because planning and design is not complete for this phase, this dewatering is assumed for the third season of construction and will be complete before the following winter. Prior to dewatering the creek, qualified fishery biologists will inspect the area for steelhead and relocate individuals to suitable habitats upstream or downstream of the water-diversion outlet. Inspections and relocations will continue during, and after the water diversion process to minimize impacts to steelhead. Impacts to the riparian zone will be monitored, and some revegetation of the riparian zone may be needed to supplement the natural recolonization of riparian vegetation.

C. Temporary Stabilization of Remaining Sediments

The remaining reservoir sediments will be stabilized once fine sediment removal activities (and dewatering activities) allow workers to access the lake bed. Each year, following the spring runoff, the affected portion of Matilija Creek upstream of the dam will be placed in a 36-inch diameter corrugated pipe and then released at a designated point in Matilija Creek downstream of the dam. A new creek channel (about 100-feet wide) will be excavated in the sediment remaining behind (upstream of) the dam, and the excavated material will be placed in several storage sites within the reservoir basin (or alternate sites as necessary). The storage sites will be located adjacent to the newly engineered creek channel and some, but not all, will be stabilized with soil cement (using on-site aggregate), which is expected to allow the sites to erode "naturally" downstream during higher flow events into the Ventura River (in the case of upstream storage sites consisting of mostly coarse-grained sediments) or flood events (mid-basin storage sites with mid-grain sediment). With regard to the excavated channel, certain segments of the channel within the lower half of the reservoir basin will be protected with soil cement bank revetment. The revetment will facilitate gradual erosion of the remaining delta area sediments whenever the revetment is overtopped and (or) eroded by larger flows. The height of the revetment will extend 7 feet above the engineered channel invert and 5 feet below the invert to prevent undermining of the structure. The revetment height is designed to be overtopped by flows exceeding a 10-year storm event (estimated at 12,500 cfs). Unstabilized sediments above the revetment will be placed at a slope similar to the revetment to reduce the likelihood of steelhead becoming stranded when high flows overtop the revetments. All soil cement revetment would be removed from the site following sufficient evacuation of stored sediment from within the original reservoir limits. The removal will occur in stages, and will be dependent on criteria established in the Monitoring and Adaptive Management Plan (MAMP, discussed further on page 8), though complete removal of the sediments and a return to sediment supply equilibrium is expected to occur only after 10 to 20 years (Figure 9 Appendix A).

D. Foster Park Groundwater Wells

Two groundwater wells will be constructed in the vicinity of the City of Ventura's (City) Foster Park well-field facility about 5 miles upstream from the river mouth. These wells will be drilled into the shallow Ventura River alluvium and then operated by the City and only as a substitute water source when surface diversions are not possible due to high turbidity (owing to the release of sediments from the removal of the dam and related activities). Consequently, these new wells will not operate when surface water is diverted (Corps 2004a). While the design and operation for the wells have not been fully defined, preliminary information indicates the wells would be placed approximately 1000-1500 feet from the active channel, and would extend about 50 feet deep into the shallow aquifer. This shallow aquifer provides rising groundwater during low-flow periods in the vicinity of Casitas Springs and Foster Park. The two wells would have a combined capacity of 3 cfs. In addition to the restriction on surface-water diversion noted above, the Corps proposes the following specific provision to guide well operation: "the operation of the new wells at Foster Park will not begin until flows measured at Foster Park gauging station (USGS gauge No. 11118500) equal or exceed 15 cfs" (Corps 2007). This provision applies only to the two new wells and does not extend to the City's existing wells (currently operable or inoperable), existing surface water diversion, and subsurface water diversion (i.e., the subsurface perforated pipe, or "Ranney Collector") (Figures 35-37 in Appendix A).

E. Downstream Flood Control Protection Improvements

Existing public road, utility, and flood-control structures will be improved or modified to compensate for the temporarily increased sediment loads and aggradation of river reaches resulting from the removal of the dam and the release of stored sediments. Improvements involve raising the elevation of two existing levees several feet along the Ventura River in the communities of Live Oak Acres and Casitas Springs, the construction of one new levee (approximately 5000 feet long and 10 to 17 feet high) near Meiners Oaks, the removal and relocation of the Camino Cielo bridge and construction of a new (wider) bridge to replace the existing Santa Ana Road Bridge. If work in or around flowing water is necessary for any of the improvements, steelhead surveys will be performed, and any steelhead found within construction areas will be captured and relocated to the nearest suitable habitat. Best management practices (BMPs), including water diversions and sediment control devices, will be followed where work in flowing water cannot be avoided (Figures 15, 29, 30, 33, 34 in Appendix A).

F. High-Flow Sediment Bypass

A high-flow sediment bypass is proposed for construction on the east side of the existing sediment basin overflow timber weir (which is currently buried underneath river rock), about 300 feet to the east of the Robles Diversion (Appendix C). The purpose of the bypass is to direct sediment-laden flow away from the diversion intakes, thereby reducing the amount of potential sediment deposition in, and impacts on, the forebay. While the high-flow sediment bypass has not been fully designed, existing designs indicate the bypass would be a radial gate structure (140-ft wide) with four gates, a concrete spillway and downstream concrete apron, and a bypass capacity of 10,000 cfs. The current sluice gate structure (three radial gates) adjacent to the Robles Diversion and Fish Passage Facility would remain in place and would continue to operate consistent with the terms and conditions of the biological opinion issued for the facility (NMFS 2003). Construction of a fishway, or a design and operational program, to allow for migrating steelhead is currently being considered (e.g., fish ladders, rock ramp, at-grade passage, etc), but has not yet been fully designed. The Corps proposes that "the high-flow sediment bypass would be operated in a manner that would not interfere with steelhead migration" (Corps 2006b), and will seek input from NMFS steelhead biologists and fish-passage engineers on the design and operation of this project feature during the upcoming detailed design phase of the dam removal. Additionally, "design and construction of fish passage capability or feasibility will be incorporated into the project feature" (Corps 2007) (Figures 17-24 in Appendix A).

G. Desilting Basin

This basin will be constructed within the Robles Diversion canal, which delivers water to Lake Casitas. The desilting basin will be an off-line structure to the Robles-Casitas canal (i.e., not within the existing canal), and will filter sediment from water diverted from the Ventura River prior to delivery to Lake Casitas. The proposed basin will be off the mainstem river and will not affect flows or habitat in the Ventura River. For this reason, NMFS determined this specific project element is unlikely to affect steelhead or critical habitat for this species. Accordingly, this element is not considered further in this biological opinion.

H. Arundo Removal Plan.

Invasive exotic plants, primarily Arundo (*Arundo donax*) (hereafter *giant reed*), will be removed from the reservoir area and upstream reaches in Matilija Creek behind the dam and from areas in lower Matilija Creek and the mainstem of the Ventura River downstream of the dam. Current estimates of the extent of giant reed infestation throughout the action area are about 250 acres, with the highest concentrations of giant reed in the areas behind Matilija Dam (but with substantial amounts also in the mainstem of the lower Ventura River). Because steelhead and critical habitat for this species are not currently present in areas upstream of the dam, only the giant reed removal proposed for reaches downstream of the dam (where steelhead and critical habitat are currently present) is considered in this biological opinion. The giant reed removal plan is scheduled to begin in fall 2007, and will be accomplished using an EPA-approved foliar herbicide (i.e., glyphosate) or similar compound, such as Aquamaster™, sprayed over the selected areas, as well as mechanical equipment or hand crews in some locations. Exclusive use of herbicides is not expected. Treated plants may be removed with mechanical equipment or hand crews. Periodic follow-up treatment will be required for at least five years, and additional monitoring and eradication efforts will be necessary to prevent reestablishment and reinfestation (Figures 5, 6, 11 in Appendix A).

I. Recreation Plan and Components

A conceptual recreation plan, comprising interpretive areas, trails and rest stops located near the dam removal site on upper Matilija Creek, is planned as part of the proposed action. The location for the recreational facilities is based on access requirements, suitability of staging areas, safety of access routes, and connectivity with existing recreational areas. The alignments for slurry pipelines and freshwater lines as well as any haul roads and other access routes will be considered for future recreation potential. Recreation facilities outside the immediate project area will be considered if such areas would connect to and enhance other regional recreation resources. The plan would include a network of trails and interpretive areas and would greatly enhance the public educational and recreational value of the project. Two trails, one on an existing access road, and three interpretive areas are proposed for the project site (Corps 2004a). Based on NMFS' current understanding of the conceptual recreation plan, the recreation elements (trails and interpretative areas) are not expected to create conditions that adversely affect endangered steelhead or critical habitat for this species. Therefore, the conceptual recreation plan is not considered further in this biological opinion, though NMFS expects to be involved in the development of the interpretative material for this component of the proposed action, particularly the material relating to endangered steelhead.

J. Monitoring and Adaptive Management Plan

The MAMP will be implemented to manage contingencies, to evaluate the effectiveness of the project's implemented restoration measures and to make adaptive changes, if necessary, to achieve overall project objectives (Corps 2006b). A group of experts from the Corps, County of Ventura (i.e., Ventura County Watershed Protection District), City of Ventura, NMFS, U. S. Fish and Wildlife Service, California Department of Fish and Game, and other appropriate agencies or organizations, would be assembled to aid in the development and implementation of the MAMP and to address project-related uncertainties. The plan would identify and address project

uncertainties related to potential effects to steelhead and critical habitat for this species as a result of project implementation, as well as identify a monitoring program (Corps 2006b). The MAMP, once implemented would provide the necessary information to answer questions for resolving the identified uncertainties, and would also define a protocol that will respond to new information or changing conditions detected through the monitoring program (Corps 2006b). Additional objectives of the MAMP include:

1) Monitor deposition and erosion in the riverine system and at the estuary and to take necessary actions to reduce any adverse impacts including blockage to fish passage, spawning and rearing habitat, and increase to flooding risks;

2) Monitor erosion of trapped sediment from the reservoir basin, performance of the soil cement protection, and plan and execute staged removal of soil cement;

3) Monitor turbidity levels and suspended sediment concentrations with the intent to minimize impacts to water supply;

4) Monitor water quality for regulated substances potentially transferred to the water by trapped sediments associated with Matilija Dam, and negotiate any necessary mitigation measures in accordance with consultations with the Regional Water Quality Control Board; and,

5) Monitor the effects of sediment bypass to sediment deposition and diversion operations at the Robles Diversion Facility, and monitor the effects to the fish passage facility function and operation, with the intent to minimize any impacts to current operating criteria of the diversion facility, and to ensure that the fish passage facility functions as designed.

The Corps in conjunction with local agencies will be responsible for collecting monitoring data and preparing annual monitoring reports for a 10-year monitoring period, but the MAMP is not limited to 10 years[1]. A technical committee consisting of, at least, U.S. Fish and Wildlife Service, NMFS, California Department of Fish and Game, and possibly other agencies or organizations, will assist in collection of monitoring data, review monitoring data results, and provide recommendations of possible adaptive management measures. The technical committee will recommend adaptive management measures to the existing project designs should the project components not achieve the identified goal and objectives. For example, if designed revegetation species compositions are not achieved, replanting, additional irrigation, and/or removal of vegetation (especially exotics) may be necessary. Annual monitoring reports and any adaptive management measures recommended by the technical committee will be forwarded to an executive committee that will consist of, at least, a representative of the County of Ventura, the Corps, the California Department of Fish and Game, and NMFS. The executive committee (consisting of representatives of the County of Ventura and NMFS) will decide whether to adopt adaptive management measures recommended by the technical committee.

[1] The Corps and Ventura County Watershed Protection District (VCWPD) is responsible for the MAMP for the first 10 years after initial construction, thereafter the MAMP becomes the responsibility of the VCWPD. With regard to sediment-related effects due to removal of the dam, no time limit for the MAMP is specified. The time horizon for the MAMP is at the discretion of the executive committee, which will make decisions based on recommendations of the technical committee (i.e., USFWS, NMFS, and California Department of Fish and Game) (Kayama 2007).

III. STATUS OF THE SPECIES AND CRITICAL HABITAT

Because this biological opinion considers effects of the proposed action on the Southern California steelhead DPS and critical habitat for this species, the status of the DPS and steelhead critical habitat is described as follows.

A. Description of the Species and Critical Habitat

Steelhead are a short-lived species native to Pacific Coast streams extending from Alaska south to northwestern Mexico (Moyle 2002, NMFS 1997, Good *et al.* 2005). Like other steelhead populations, the Southern California steelhead DPS reproduce, spawn, and rear in freshwater coastal streams along the southern California coast. The geographic range of this coastal steelhead DPS was determined to extend from the Santa Maria River, near Santa Maria, California, to the U.S.–Mexico border (NMFS 1997, 2002). Adult steelhead have been known to spawn in river mainstem and upstream reaches (including tributaries) within coastal watersheds, and the progeny rear in freshwater or estuary for a period of one to three years prior to emigrating to sea where they reach maturity before returning to natal streams for spawning. The species exhibits a polymorphic life history with some individuals not returning to the ocean before maturing and reproducing, and some individuals residing, maturing and reproducing entirely in freshwater (or an estuary), giving rise to progeny that resume an anadromous reproductive cycle.

Critical habitat for the Southern California steelhead DPS was designated on September 2, 2005 (NMFS 2005). The designation identifies primary constituent elements that include sites necessary to support one or more steelhead life stages and, in turn, these sites contain the physical or biological features essential for conservation of the DPS. Specific sites include freshwater spawning sites, freshwater rearing sites, freshwater migration corridors, and estuarine areas. The physical or biological features that characterize these sites include water quality, quantity, depth, and velocity, shelter/cover, living space, and passage conditions. Activities with the potential to affect critical habitat for the Southern California steelhead DPS include: (1) forestry, (2) grazing and related rangeland activities, (3) agriculture and associated water withdrawals for agriculture, (4) road building or maintenance, (5) modifications of the creek channel or bank, (6) urbanization, (7) sand and gravel mining, (8) mineral mining, (9) dams, (10) irrigation impoundments and water withdrawals, (11) wetland (including estuaries) loss or removal, (12) introduction of exotic or invasive species, and (13) impediments to fish passage (NMFS 2005). In the Ventura River watershed, the mainstem of the river from the estuary to the confluence of Matilija Creek, the North Fork Matilija Creek, the Matilija Creek from its confluence with the North Fork Matilija Creek upstream to the base of Matilija Dam, are designated critical habitat for the endangered Southern California DPS of steelhead (NMFS 2005) (Figures 11-40 in Appendix A).

B. Life History and Habitat Requirements

The life history of steelhead generally involves rearing in freshwater for one to three years before migrating to the ocean, usually in the spring and fall, where they may remain for up to four years. The timing of emigration appears to be influenced by photoperiod, streamflow, and temperature. In some drainages, immature steelhead may rear in lagoon or estuary for several weeks prior to entering the ocean. Steelhead grow and reach maturity at age two to four while in

the ocean. Adults generally immigrate to natal streams for spawning (but may also enter non-natal streams) during winter; some adults may not enter coastal streams until spring. Adults may migrate several miles, hundreds of miles in some watersheds, to reach their spawning grounds. Although spawning may occur in late winter and early spring, the specific timing of spawning may vary a month or more among streams within a region. Steelhead do not necessarily die after spawning and may return to the ocean, sometimes repeating their spawning migration one or more years. Female steelhead excavate a nest in the streambed and then deposit their eggs. After fertilization by the male, the female covers the nest with a layer of gravel, and the embryos incubate within this gravel pocket. Hatching time varies from about three weeks to two months depending on water temperature. The young fish emerge from the nest two to six weeks after hatching. Additional details regarding steelhead life history can be found in Shapovalov and Taft (1954), Barnhart (1991), Bjornn and Reiser (1991), and Quinn (2005).

Habitat requirements of steelhead in streams generally depend on the life history stage (Cederholm and Martin 1983, Bjornn and Reiser 1991). Generally, discharge, water temperature, and water chemistry must be appropriate for adult and juvenile migration. Passage of adults to upstream spawning areas should not be impeded because evidence suggests delays in arrival times at spawning areas can reduce fitness and ultimately production of young. Low discharge, high water temperature, physical barriers, low dissolved oxygen, and turbidity (high levels, see Bjornn and Reiser 1991) may delay or halt upstream migration of adults and timing of spawning, and downstream migration of juveniles and subsequent entry into the estuary, lagoon, or ocean. Suitable water depth and velocity, and substrate composition are the primary requirements for spawning, but water temperature and turbidity are also important. Dissolved oxygen concentration, pH, and water temperature are factors affecting survival of incubating embryos. Fine sediment, sand and smaller particles, can fill interstitial spaces between large substrate particle types, thereby reducing waterflow through and dissolved oxygen levels within a nest. Juvenile steelhead require living space (different combinations of water depth and velocity), shelter from predators and harsh environmental conditions, food resources, and suitable water quality and quantity, for growth and survival during summer and winter. Young-of-the-year and yearling steelhead generally use riffles, runs and pools (*e.g.*, Roper *et al.* 1994) during much of a given year where these habitats exist. Young-of-the-year and older juveniles may seek cover and cool water in pools during summer (Nielsen *et al.* 1994) particularly as discharge and therefore space declines in summer and fall (Kraft 1972). Juvenile steelhead have specific habitat requirements as indicated by the similarity of microhabitat use despite changes in microhabitat availability, as observed in some streams (Spina 2003).

C. Population Dynamics

The number of steelhead in the Southern California steelhead DPS is small (Busby *et al.* 1996, Good *et al.* 2005) (see these source documents for information regarding the study streams). Recent total run size of adults for the DPS (based on combined estimates for the Santa Ynez, Ventura, and Santa Clara rivers, and Malibu Creek) is estimated at less than 500 adults. The small estimated run sizes suggest the Southern California steelhead DPS is not likely to be viable over lengthy temporal scales because the risk of extinction increases with decreasing population size and the extinction factors affecting population dynamics have more effect on small populations as compared to large populations (Pimm *et al.* 1988, McElhany *et al.* 2000). Evidence suggests that production of juvenile steelhead (i.e., numbers of individuals) is relatively low, with fewer than 5000 age-1 and older individuals noted within selected areas of

the watershed (Appendix D).

Although no long-term data set is available that would allow an adequate assessment of population variability, observations of species presence and distribution since 1997 indicate the variability of the Southern California steelhead DPS is high. For instance, since this species was listed in 1997, NMFS has periodically observed steelhead in drainages, with abundance ranging from no fish to numerous fish (A. Spina, NMFS, pers. obs.). These observations corresponded with years in which rainfall was more or less at or above normal for the region, which provided increased attraction flows and migration for adult and juvenile steelhead. Because population abundance depends, in part, on the availability of suitable freshwater habitat, and the frequency and magnitude of annual rainfall (which creates and sustains living space for steelhead) fluctuates greatly in southern California, steelhead abundance is likely to vary substantially over time. Such population variability is expected to increase the risk of species' extinction because risk increases with variation (fluctuation) in population size (Pimm *et al.* 1988). Steelhead populations in southern California exhibit sub-populations of residualized fish (i.e., fish which complete their life-cycle in freshwater without returning to the ocean to mature). These fish have the ability to produce progeny which may revert to a fully anadromous life-cycle. Genetic investigations of southern California steelhead (including those from the Ventura River drainage) provide evidence that residualized *O. mykiss* above Matilija Casitas Dams are more closely related to anadromous fish below the dams than to other populations (including hatchery derived populations), and that they are most likely derived from native anadromous populations of *O. mykiss* (Nielsen *et al.* 2005, Girman and Garza 2006)

D. Status and Distribution

Wild steelhead populations in California have decreased from their historic levels (Swift *et al.* 1993, Busby *et al.* 1996, Good *et al.* 2005). Reasons for the decline of steelhead include past and present destruction, modification or curtailment of the species habitat; over-utilization for commercial, recreational and educational purposes; disease and predation; and inadequacy of existing regulatory mechanisms (NMFS 1997, 2006a). In many watersheds throughout the Southern California steelhead DPS, steelhead have been cut off from historical spawning and rearing habitats due to the damming of streams for creation of water-storage and diversion facilities (*e.g.*, Twitchell Reservoir within the Santa Maria River watershed, Bradbury Dam within the Santa Ynez River watershed, Matilija and Casitas dams within the Ventura River watershed, Rindge Dam within the Malibu Creek watershed). Such facilities have resulted in both physical barriers and hydrological impediments for adults and juveniles migrating to and from prime spawning and rearing habitats. Within stream reaches that are accessible to this species, diversion and storage of surface waters and groundwater pumping have in many watersheds eliminated or dramatically reduced the quality and amount of living space for juvenile steelhead, based on NMFS' observations (A. Spina, NMFS, pers. obs.). Urbanization has contributed to declines in the quality and quantity of suitable habitat for this species. The decline in the abundance of steelhead prompted listing of the Southern California steelhead DPS as endangered on August 18, 1997 (NMFS 1997) and the endangered status was reaffirmed on January 5, 2006 (NMFS 2006a).

Reviews of the DPS status (Busby *et al.* 1996, Good *et al.* 2005) note that the number of individuals throughout much of the species' historical geographic range has declined and have concluded (and reaffirmed) the species is at risk of extinction. The historical run size of adults within the Southern California steelhead DPS (based on combined estimates for the Santa Ynez,

Ventura, and Santa Clara rivers, and Malibu Creek) was roughly estimated to be at least 32,000 to 46,000. In contrast, recent total run sizes for the same four waterways was estimated at less than 500 adults. While the estimates of historical run sizes have been criticized for lacking adequate support (Good *et al.* 2005), there is recent evidence indicating that the number of streams currently supporting the Southern California steelhead DPS (46 drainages) has been reduced to less than 50 % and may be as low as 37 % of streams that historically supported steelhead (Good *et al.* 2005). The NMFS Technical Recovery Team identified the Ventura River steelhead population as one of the "core" populations essential for the successful recovery of endangered steelhead. Of the core populations, the Ventura River was ranked as having the third highest intrinsic potential to support a viable steelhead population if restored to an unimpaired state. This ranking is due, in part, to the watershed's large size, spawning and rearing habitat quality, relatively reliable winter river discharge, and greater potential for being independently viable (Boughton *et al.* 2006).

E. Analysis of the Species and Critical Habitat Likely to be Affected

The proposed action is expected to adversely affect the Southern California steelhead DPS of steelhead and elements of this species' critical habitat (see the foregoing description of the distribution of this species' critical habitat within the Ventura River watershed). With regard to the species, the wet season (Nov-June) is considered the "migratory season" for adults and juvenile steelhead (Shapovalov and Taft 1954), and finding parr, presmolt, and smolt steelhead in the winter-spring emigration is not uncommon (Spina *et al.* 2005). Adults spawn during this time as well. During the dry season (June-Nov), juvenile steelhead are often found in streams. Because various elements of the proposed action will be occurring throughout the year, and will create impacts such as sedimentation and loss of habitat, these specific steelhead life stages are expected to be affected. With regard to critical habitat (NMFS 2005), the proposed action is expected to affect the following essential habitat features: water quantity and quality, space, water velocity, water depth, cover/shelter, passage conditions, food, and riparian vegetation. Other anthropogenic activities have contributed to the decline in the quality and quantity of steelhead critical habitat.

The NMFS Technical Recovery Team identified the Ventura River steelhead population as one of the "core" populations essential for the successful recovery of endangered steelhead due, in part, to the watershed's large size, spawning and rearing habitat quality, relatively reliable winter river discharge, and greater potential for being independently viable (Boughton *et al.* 2006). There are many streams within designated critical habitat areas, including Matilija Creeks and the Ventura River, which have been given high conservation values by the Critical Habitat Analysis Review Teams and have healthy habitat which has allowed steelhead to persist, and will facilitate the future recovery of steelhead populations within the DPS (Good *et al.* 2005). Contemporary juvenile steelhead use in the mainstem of the Ventura River, particularly in the Casitas Springs/Foster Park and upper Ventura River reaches, have been documented (Capelli 1995). Additionally, steelhead productivity of portions of the Ventura River has been investigated and has documented high growth and survival rates of juvenile steelhead in the Casitas Springs reach of the river (Moore 1980) where two municipal wells are proposed.

IV. ENVIRONMENTAL BASELINE

This section describes the status of steelhead and critical habitat in the action area and past and ongoing factors affecting steelhead abundance and distribution.

A. Status of Critical Habitat and Steelhead in the Action Area

Critical habitat within the action area begins at the base of Matilija Dam and extends downstream several miles to the estuary, and represents a substantial proportion of critical habitat within the Southern California DPS of endangered steelhead (NMFS 2005). Matilija Dam and the Robles Diversion have blocked steelhead access to historical habitat in the tributaries of the Ventura River (though a fish-passage facility was constructed at the diversion in 2004). Anthropogenic factors, such as agricultural activities, urbanization, and water withdrawals, have reduced the quality and quantity of habitat for steelhead in the action area. The amount and extent of surface flow during the dry season (i.e., habitat used as sites of freshwater rearing) is affected by diversion of surface water and groundwater pumping. The Robles Diversion removes a variable amount of surface water throughout any given year, depending on natural rainfall and runoff. Riffles, runs, and many pools (depth range from a few feet to over 6 feet) are present and appear to provide suitable sites of spawning and rearing for adult and juvenile steelhead, based on NMFS' observations. Portions of the habitat in the lower reaches are noticeably impaired by development along the river, or development in the watershed such as roads, residences, and agriculture located on steep, highly erosive soils. Surface flow in the middle reaches of the lower river (e.g., from the Robles Diversion extending downstream to San Antonio Creek) often ceases during the dry season, particularly in years with limited precipitation. Downstream of San Antonio Creek, surface water is supported by tributary inflow, rising groundwater, and tertiary-treated discharge from the Ojai Valley Sanitary District's wastewater-treatment facility.

The number of adult steelhead returning to the Ventura River has declined over the past several decades, with only a small number of adult steelhead being observed annually since the mid 1970. NMFS' estimated run size of less than 200 adults (Busby *et al.* 1996) is the most recent published estimate of the Ventura River steelhead population. Recent abundance surveys were performed in summer of 2006 and showed a large number of juvenile steelhead in the upper portions of the action area above the Robles Diversion compared to the lower portions of the action area, but few if any ocean reared steelhead (Appendix C). Steelhead utilization of the Ventura River watershed is currently limited to the mainstem of the Ventura River, San Antonio Creek, the lower reaches of Coyote Creek below Casitas Dam, Matilija Creek below Matilija Dam and the North Fork Matilija Creek. Spawning and rearing currently occurs primarily in the Casitas Springs/Foster Park reach and upper reaches of the mainstem of the Ventura, San Antonio Creek, and the lower reaches of Matilija Creek and the North Fork of Matilija Creek, when adequate water conditions exists (Figures 11-40 in Appendix A).

B. Factors Affecting Species Environment within the Action Area

Matilija and Robles Dams

Matilija Dam has blocked passage of steelhead to historical spawning and rearing habitats upstream (for about the last 50 years), and reduced the amount of sediment that would otherwise be transported to downstream reaches and the estuary (Corps 2004d). The reduction in sediment has deprived downstream reaches of substrates that are necessary to provide a suitable substrate for steelhead spawning. The dam has interfered with the natural hydrology and hydraulics of Matilija Creek and the Ventura River, which contributes to the formation and maintenance of channel diversity and complexity. Additionally, water that has been impounded and subsequently released downstream is typically of poorer quality, affected by higher temperature, lower dissolved oxygen, and potentially higher nutrient loads (Corps 2004d) (Figures 9 and 10 in Appendix A).

Operation of the Robles Diversion has impacted the natural flow regime of the lower Ventura River, and thus steelhead migration, spawning, and rearing within this area. The historic 20 cfs downstream bypass flow from the Robles Diversion is insufficient to provide the depth necessary for successful upstream migration, and for adequately maintaining available spawning and rearing habitat in the lower river, particularly within the Casitas Springs/Foster Park area below San Antonio Creek. Recently, since the construction of the Robles Diversion fish-passage facility in 2004, a new plan to allow more of the Ventura River's natural flow to remain in the river channel for adult and smolt migration in and out of the watershed, and to support downstream spawning and rearing is now being implemented and flows of 30-50 cfs are allowed to pass downstream through the Robles Diversion fish-passage facility during diversion operations for the period of the January through July when natural upstream surface flows are available during wet and average rainfall years. NMFS consulted with the Bureau of Reclamation on operation of the diversion and concluded that the fish-passage facility is not likely to jeopardize the continued existence of the endangered Southern California steelhead DPS (NMFS 2003) (Figures 17-21 in Appendix A).

Flood Control

Levees & rip rap flood-control measures are present on the Ventura River. These are mostly in the lower reaches and are usually near developments, namely the Live Oak Acres and Casitas Springs area, and adjacent to Highway 33 in the lower reaches in the vicinity of the City of Ventura. The levees are usually only on one side of the river where human infrastructure is present, generally on the east side (except for Live Oak Acres). Levees do affect the fluvial geomorphology of the Ventura River and also recruitment of riparian vegetation by concentrating flow and increasing velocities and scouring riparian vegetation, and disrupting the natural meandering and fluvial geomorphology of the river. The County of Ventura (Watershed Protection District) also keeps the riverside of most levee reaches (i.e., the levee structure plus 10 feet from the toe) free of vegetation by herbicide spraying or mechanical removal. Impacts to steelhead and steelhead critical habitat from these facilities include loss of riparian vegetation and cover, loss of undercut bank (undercut banks have been observed in the action area, including the mainstem Ventura River, A. Spina, NMFS, pers. obs.) and pool habitats next to the banks and loss of sediment inputs some of which would provide spawning gravel size substrates.

Repeated emergency actions undertaken by various agencies of the county of Ventura (Public Works, Road Department, Parks Department), Ventura County Watershed Protection District, and the City of Ventura, have had a detrimental effect on significant portions of the middle and lower reaches of the mainstem of the Ventura River. These periodic flood-control activities disrupt instream habitat, increase and prolong turbidity, alter the natural distribution of plant propagules (e.g., seeds, stems) by disrupting the natural patterns of soil deposition, and prevent the natural maturation and succession of riparian habitats. Such activities also facilitate the spread of non-native species such as giant reed (Capelli and Stanley 1984, Lockard and Burgess 1984) (Figures 29, 30, 33 and 34 in Appendix A).

Non-Native Plant Species

Giant reed has become the dominant vegetation type within extensive portions of the Matilija Reservoir basin, and is continuing to spread into the remaining areas, including some portions of the Matilija Creek riparian habitat upstream of the reservoir basin. This plant displaces native vegetation and can degrade habitat quality within localized areas. Downstream of Matilija Dam, giant reed have colonized in parts of the floodplain of the Ventura River (Figures 5, 23, 24, 35 – 40 in Appendix A).

Urbanization, Agriculture, and Industrial Impacts

Although not heavily urbanized in its upper reaches (which are within the Los Padres National Forest), the Ventura River Watershed is affected by the cities of Ojai, and Ventura, and several unincorporated residential areas, including Matilija Canyon, Hawthorne Acres, Live Oak Acres, Meiners Oaks, and Foster Park. There are also industrial complexes that were built next to the river in the 1940s through 1970s (and now no longer operate) as well as extensive oil development within the highly erosive unconsolidated marine sediments characteristic of the lower reaches of the watershed. Discharges into the Ventura River, including point source contributions from a wastewater-treatment facility, and non-point source contributions from agricultural and urban development, have affected the water quality, particularly of the lower river. The California Regional Water Quality Control Board has classified the Ventura River as a Category I (impaired) watershed and has approved the river's status on the 303(d) list and TMDL priority schedule for pollutants including DDT, copper, silver, zinc, algae (eutrophication) and trash. Impacts to steelhead and steelhead critical habitat from these impairments within the Ventura River itself have not been adequately studied. Urbanization around streams can increase runoff severity and can lower water quality in the creeks (Spence *et al.* 1996). Increased impervious surfaces, such as that due to roads and urbanization in the action area, can increase runoff and peak flood flows (Florsheim and Goodwin 1993). The subsequent increase in peak flow volume and velocity, due to urbanization, can increase streambank erosion, turbidity, channel downcutting, and the extent that gravels are surrounded or covered by sand and smaller particles (Spence *et al.* 1996) (Figures 29, 30, 33, 34, and 39 in Appendix A).

Stream pollution from runoff is expected to have increased in response to higher human density along the Ventura River (Florsheim and Goodwin 1993, Bowen and Valiela 2001). Runoff from road surfaces can have oils, antifreeze, gasoline residue and other pollutants from vehicles, while runoff from urban development can include pesticides, herbicides, fertilizers, sewage, antibiotics, and other chemicals, all of which drain into creeks from storm drains and degrade water quality

for both people and wildlife (Florsheim and Goodwin 1993, Bowen and Valiela 2001). Agricultural activities can degrade water quality in the action area via stream bank erosion, sedimentation, and runoff from fields (Spence *et al.* 1996). Agricultural runoff can transfer nutrients and pesticides to the creek, which lowers dissolved oxygen levels by increasing algae growth in streams, and kills macroinvertebrates which salmonids use for food (Warren 1971, Spence *et al.* 1996). Given the existing impacts to water quality from a variety of point and non-point sources, additional impacts from more sediments, particularly fine sediments (sand and smaller particles) originating from the project, pose an increased risk to the currently depressed steelhead populations in the Ventura River watershed below Matilija Dam.

Water Withdrawals

Besides the diversion, and therefore removal, of several hundred acre-feet of water by Matilija Dam and the Robles Diversion (average annual diversion for the period 1959 to 2005 = 12,137 acre feet, Wickstrum 2005), pumping of subsurface alluvial groundwater within or near to the Ventura River occurs along much of the 11 miles directly below the Robles Diversion. The City of Ventura operates a well field and subsurface diversion in the Foster Park area, which diverted an annual average of 6,800 acre-feet (AF) of water between 1980 and 1990. Several smaller water districts and individual water extractors also take water from the alluvial aquifer in the downstream reaches of the Ventura River. Approximately 18,000 AF of water is withdrawn annually from the Ventura River basin, a majority as a result of the operation of the Casitas Municipal Water District facilities, including the Robles Diversion. The substantial amount of water extracted from the Ventura River aquifer combined with Robles Diversion operations substantially abbreviates the duration and magnitude of river flows necessary for successful steelhead migration, both upstream and downstream (NMFS 2003). Aquatic habitat in the lower Ventura River is especially vulnerable to water extractions in the summer and fall periods when base flows in the Ventura River are low (Rogers 2004). The reduction in the amount and extent of surface flows is expected to translate into reductions in water-dependent features of steelhead critical habitat. Such features include freshwater rearing sites, freshwater migration corridors, and freshwater spawning sites (and their constituent elements). While the Ojai Valley Sanitary District wastewater treatment plant releases an average of 2 million gallons/day (~ 3.0 cfs) of tertiary treated effluent to the river (Ojai Valley Sanitary District 2007), the functional value of the release of treated water for creating and maintaining suitable habitat for steelhead is poorly understood (Figures 25-37 in Appendix A).

V. EFFECTS OF THE PROPOSED ACTION

A. Methodology for Determining Effects

NMFS reviewed the supporting environmental documents (e.g., the Matilija Dam Feasibility Study Final Report, final EIR/EIS) to develop an understanding of the type, amount, and extent of impacts that were expected to result from the dam-removal project. These impacts were integrated with a review of the ecological literature concerning the effects of habitat changes on fish and the aquatic environment to predict the possible effects of the impacts on steelhead and critical habitat for this species. This review was supplemented with information acquired from federal and state agency websites, and a general knowledge of physical and biological processes, population dynamics, and the life history and habitat requirements of steelhead. With regard to

determining effects of the proposed action on critical habitat, this biological opinion does not rely on the regulatory definition of "destruction or adverse modification" of critical habitat at 50 CFR §402.02. Instead, NMFS has relied on the statutory provisions of the ESA to complete the foregoing analysis with respect to critical habitat. Therefore, destruction or adverse modification involves direct or indirect alteration that appreciably reduces the conservation value of critical habitat. Such alterations include, but are not limited to, alterations adversely modifying any of those physical or biological features that were the basis for determining the habitat to be critical.

B. Important Assumptions of this Effects Analysis and Biological Opinion

NMFS relied on certain assumptions when assessing effects of the proposed action on endangered steelhead and critical habitat (Table 1). While other assumptions, though of no less importance, can be found elsewhere in this biological opinion, the assumptions listed here relate to elements of the proposed action that possess a heightened potential of creating (or influencing) conditions that harm steelhead. These assumptions derived from (1) discussions with, and written correspondence from, the Corps (e.g., Corps 2006b, Corps 2007), (2) NMFS' understanding of the proposed action, (3) the habitat and life history requirements of steelhead, and (4) NMFS' experience evaluating effects of projects on steelhead, and developing measures for minimizing such effects. If new information indicates an assumption in the following table (or elsewhere in this biological opinion) is invalid, the Corps and NMFS may be required to re-initiate section 7 consultation to consider the new information and then re-assess effects of the proposed action on endangered steelhead and critical habitat.

C. Effects on Critical Habitat

Removing Fine Sediments from the Reservoir Area

Removing fine sediment from the reservoir with subsequent placement in protected locations outside the normally active river channel is not expected to diminish the functional value of critical habitat downstream of the dam. Sediment-water slurry will be contained in a temporary pipeline and transported downstream to disposal sites. The pipeline is generally expected to be placed out of the river (or creek) channel and riparian areas, so location (placement) effects due to the pipeline footprint are not expected. In narrow canyon areas, the pipeline will overlap with riparian areas, but because placing the pipeline does not appear to require removal of streamside

Table 1. List of important assumptions NMFS relied on to predict the effects of the dam-removal project on endangered steelhead and critical habitat for this species.

Project Element	Assumption
Foster Park Groundwater Wells	• The new wells will be operated only when surface flows in the Ventura River (measured at the Foster Park Gauging Station, USGS 11118500, or similar device), equal or exceed 15 ft^3/sec (cfs). When surface flows in the river, as above, fall below 12 cfs, operation of the subject wells will cease. • The operation of said wells will not reduce surface flows more than 3 cfs, leaving a minimum discharge of 12 cfs in the river. • Through application of reliable monitoring techniques, the Corps will verify the foregoing assumptions. Evidence of this verification (*i.e.*, field data obtained from the monitoring) will be provided to NMFS within a reasonable time after such data become available.
High-Flow Sediment Bypass	• The high-flow sediment bypass will be designed and operated in a manner that will not interfere with passage of adult or juvenile steelhead during operation of the facility. Design and construction of fish-passage capability or facility will be incorporated into this project feature. • The Corps will convene a panel of NMFS (and other) technical experts (e.g., steelhead ecologists and fish-passage engineers) and seek expert recommendations for the purpose of designing a high-flow sediment bypass that is commensurate with the life history and habitat requirements of steelhead. The Corps will receive NMFS' recommendations and make mutually agreeable revisions to the subject design. • Prior to constructing the high-flow sediment bypass, the Corps will develop design drawings for the high-flow sediment bypass, as well as a description of how the bypass will be operated, and NMFS will find these designs agreeable. • Prior to constructing the high-flow sediment bypass, the Corps will prepare a plan for validating post-construction performance and ensuring long-term maintenance of the high-flow sediment bypass, and NMFS will find this plan to be agreeable. This validation plan will be implemented according to a schedule defined in the plan. • Operation of the high-flow sediment bypass will not affect operation of the Robles fish-passage facility, or steelhead attempting to enter or migrate through said facility.
Removal of the dam	• Steelhead will access and use historical spawning and rearing habitat upstream of the dam location; adults will reproduce and progeny will rear upstream of the dam location, and successfully emigrate from the dam site; as a result the steelhead population in the Ventura River watershed will increase beyond current levels.
Removal of sediment from reservoir	• An accidental rupture of the transport pipeline and release or spill of the sediment-water slurry will be avoided.
Monitoring and Adaptive Management Plan	• The Corps will develop a program (e.g., a monitoring and adaptive management plan) to address NMFS project-related uncertainties (identified in the enclosure to NMFS' October 25, 2006, letter to the Corps). The Corps' program will accomplish the following: (a) Within each general category of uncertainty (as identified in NMFS' letter of October 25, 2006), identify specific uncertainties and the questions that need to be addressed to resolve each uncertainty; (b) Identify biological goals and objectives for each specific uncertainty; (c) Implement a monitoring program that is able to provide the necessary information to answer questions related to resolving each uncertainty (e.g., define a process for measuring the spatial and temporal changes in habitat quantity and quality due to the proposed action, and the related biological responses to these changes); (d) Outline the compensatory mitigation program that will be implemented to offset impacts of the proposed action on instream and riparian habitat, as currently identified, and as may be experienced as a result of unforeseen project impacts; (e) Define a protocol that will respond to new information or changing conditions, and detect and effectively address deficiencies in the mitigation program or other project related issues in a timely manner; (f) Incorporate feedback loops that link implementation and monitoring to a decision-making process that result in appropriate changes in project features or operations; and, (g) Define a protocol that will track performance of the mitigation program, respond to new information or changing conditions, and detect and address deficiencies in the mitigation program or other project related issues in a timely manner. • The MAMP as well as the program for addressing NMFS project-related uncertainties will be adequately funded.

trees or vegetation, the pipeline is not expected to create conditions that reduce the functional value of the streamside area (e.g., to provide shade). While an accidental rupture of the pipeline and release of sediment-water slurry are possible, NMFS believes such an incident is speculative (and difficult to meaningfully analyze effects because they are dependent on a variety of unknown factors such as location and duration) and therefore is not specifically evaluated in this biological opinion. A NMFS-approved contingency plan will be implemented if an accidental release of sediment occurs (Corps 2004b, Corps 2006b). The pipeline will be dismantled and removed and the area restored following completion of this project element.

With regard to the sediment disposal sites, these sites lie in upland or floodplain areas; with only a few exceptions inundation of these sites during high-flow events is not expected to be a frequent occurrence (Corps 2004a, Corps 2004d). The upstream-most disposal site, located near the Highway 150 bridge, is designed to gradually release stored sediments over time (during 5 to 10-year flow events). Other slurry disposal sites are farther away from the river, but inundation from flood events greater than a 10-year event is possible. The effects of sediment releases (sand and smaller particles are the principal substrate types of concern to NMFS, given the reported effects of these substrate particle types on the aquatic environment, e.g., Cordone and Kelley 1961) could range from discountable (e.g., a few discrete accumulations of surficial fine sediment, i.e., sand and smaller particles) to catastrophic (extensive accumulations of surficial fine sediment throughout the action area and widespread alteration of freshwater rearing, spawning, and migration sites, and the estuary). The latter effects do not seem likely given that elaborate controls have been incorporated into the proposed action for the purpose of reducing the likelihood of such an event. These controls include (1) the design and intended function of the sites, which are projected to erode only during less frequent higher flow events, >10-yr return frequency, (2) the soil cement on the downstream storage sites, which is expected to increase the potential that fine sediment will erode only during the high-flow events (and subsequently evacuated latitudinally and longitudinally from the active river), and (3) removing one-third of the total volume of material from behind the dam, which will reduce the total volume of fine sediment that could adversely affect downstream habitats. Consequently, effects related to the release of sediment from the disposal sites are expected to be near discountable. The actual effects will depend, in part, on the type, amount, and extent of sediments that are released into the water column, the magnitude and duration of discharge, the performance of the disposal sites, and background turbidity concentrations. Because the magnitude and extent of effects are to some extent uncertain, implementation of a reliable MAMP, in combination with the Corps' commitment to implement a program that will address the uncertainties that NMFS has identified (including effects due to sedimentation, NMFS 2006b; see also Corps 2006b), becomes increasingly important for detecting and then reconciling sediment-related effects on critical habitat (Figures 27 and 28 in Appendix A).

Dam Removal and Release of Sediments from Behind the Dam

Habitats that were historically available to steelhead, but rendered inaccessible due to the dam, will become accessible to this species. The actual degree of accessibility is governed largely by the effective operation of the downstream Robles Diversion fish-passage facilities and whether steelhead can pass the high-flow sediment bypass. Removing the dam will increase the amount and extent of suitable habitat available for the local (watershed specific) population of steelhead as well as the Southern California DPS of endangered steelhead. Although dam-removal

activities will temporarily create considerable and extensive physical disturbance to the channel immediately upstream and downstream of the dam, when the dam is fully removed and the stored sediments flushed from the reservoir site, the affected area will be restored to historical conditions. The channel that was present prior to construction of the dam will be restored in the former reservoir area, and several hundred feet of the existing creek channel downstream of the dam will be re-configured, aligned and graded. The new channel will be designed to allow steelhead passage to upstream reaches of Matilija Creek for the first time since 1947. The natural fluvial processes after dam removal are expected to form meanders and other essential features of critical habitat over time. As part of the MAMP, this area will be monitored for an extended period of about 10 years (or possibly longer if necessary) to ensure irreparable and undesirable changes to steelhead habitat (*i.e.*, development of steelhead migration barriers) in this reach of Matilija Creek do not occur, or are adequately mitigated (Corps 2004a) (Figures 7 and 8 in Appendix A).

During construction, the reach of Matilija Creek extending about 500 to 1000 feet downstream of the dam will be dewatered during late spring through fall for 6 to 9 months to allow work in the dry. Work or use of heavy equipment in creek and flowing water during winter will not occur (Corps 2004b). The diversion of surface water and dewatering to facilitate construction in the dry are expected to cause loss of a freshwater rearing site for steelhead, and loss of food-producing areas. The loss of these features of critical habitat will be temporary because the affected area will be rewatered following completion of the in-channel work activities, though full restoration of those features may require several seasons of normal or above normal rainfall and runoff. All contractors will be required to follow a set of best management practices (Corps 2004a, b) to reduce the likelihood of water-quality alterations and therefore effects on critical habitat.

Dam-removal activities will expose extensive areas of fine and coarse sediments, thereby increasing the potential for erosion, turbidity and sediment-related effects on critical habitat. An understanding of the type, magnitude, and degree of probable sediment releases is necessary to develop a basis for predicting the possible effects on critical habitat. Therefore, the following discussion briefly summarizes what sorts of sediment releases, and increases in turbidity, are expected. The discussion of the sediment releases is taken directly from the supporting environmental documents (e.g., Corps 2004b, d) as well as supplemental information (Corps 2007), where additional information and specific details can be found. Although a substantial effort was undertaken to assess potential sediment impacts, the variable southern California climate challenges the development of a reliable prediction of the effects on critical habitat (and steelhead).

With regard to fine sediments, "large" releases into flowing water are not expected until the first rains after the dam is completely removed and the flows are reintroduced into the reconfigured channel (Shuman 1995, Pizzuto 2002, Cluer 2006a). At this time, the area of the former reservoir will have been converted to a new channel and temporary sediment-storage sites. Because most of the fine sediments from the lake bed will have been removed through the sediment-slurry operation, and the fraction of silt and clay particles in the remaining delta-area sediments is relatively small, the turbidity impact from the first few rainfall events is expected to be of short duration, though this period could be extended depending on rainfall and runoff patterns in the watershed. NMFS expects 1 to 3 rainfall events each of 1 to 2 days in duration will be required to flush residual unstabilized fines from the new channel (Cluer 2006a). After

flood peaks have passed, the concentrations of fine materials are expected to quickly decrease to background levels. Concentrations will still be approximately 2 to 3 times higher during smaller rainstorms than if the dam had not been removed, and this condition could persist for 3 to 10 years depending on rainfall patterns. After the initial flushes of fine sediment from areas upstream of the dam, the release of fine sediments and turbidity increases will occur again many times over the next 10 to 20 years as the sediment-storage sites are inundated by large floods. Because the Corps estimates four separate removals of revetment along the sediment-storage sites as they erode (due to discharges above the 2 to 5-year range, or 3000 to 7100 cfs) and sediments are transported downstream, there will be at least four episodic impacts from fine sediments released into downstream reaches during the 10 to 20 years. As each revetment is removed, the turbidity concentrations and suspended sediment levels are expected to increase by a factor of 2 to 10 times the background conditions within the Matilija Creek and Ventura River depending on the severity of the flood event and hydrologic conditions (i.e., if there is a 2 versus a 10-year flood event). After the final revetment is removed, the turbidity levels should stabilize at equilibrium levels after one or two floods of average size pass through the historic reservoir area above the dam. Estimates indicate that 10 to 20 years will be needed for all the sediments within the storage sites to be transported downstream.

With regard to coarse sediments, these will be released at a much slower rate, depending on their size, and they will take a decade or more to distribute through the downstream reaches of Matilija Creek and the Ventura River. The main short-term effect of renewed coarse sediment mobilization will be sediment deposition and aggradation of the Matilija Creek and Ventura River channels (Shuman 1995, Pizzuto 2002, Corps 2004a, Corps 2004d). The project is also expected to restore sediment-transport function. The elevation of the channel bed will rise while the sediments migrate through the downstream reaches, in some areas by several feet, with extensive deposits of sediment observed in localized areas. Specific changes in channel geomorphology and channel bed elevation were modeled on a reach scale throughout the action area in an attempt to predict the effects of the dam removal with more confidence. The modeling of future sediment flows was made with past hydrology; one key assumption of the model involved the future hydrology of the region. Recent computer modeling of precipitation for Southern California over the next hundred years shows slight to modest decreases in annual precipitation ranging from 5 to 15% occurring by the year 2100 (Hayhoe *et al.* 2004). In this context, the evacuation of sediment from the storage sites and corresponding changes in channel bed elevation may take longer if the climate becomes drier in the next 20 years, or the channel bed elevation could change abruptly if a major 50-year flood event occurs during the project life. These channel changes over the project life (20 years) are illustrated in Table 2, with the 10-year modeling results corresponding to a drier climate, and the 50-year modeling results corresponding to a severe flood. In either scenario, the channel bed is expected to aggrade, but the rate of aggradation will result in differing amounts of deposition (Table 2) (Figures 11, 12, 15, and 25-30 in Appendix A).

Table 2. Two possible scenarios in average reach-specific aggradation of the channel bed during the 20-year project life: one scenario based on a drier climate, and the second based on a severe flood event. Reach number increases in proximity to the dam, with reach 6b being closest to the dam. Values in the table represent the predicted average deposition (feet) of sediment, and are obtained from modeling.

Location	Dry climate 10-year	Flood event 50-year
Reach 2	1.2	3.6
Reach 3	2.0	4.2
Reach 4	0.8	2.3
Reach 5	1.4	2.2
Reach 6a	2.3	6.4
Reach 6b	1.0	0.9

In regard to critical habitat, the release of fine and coarse sediment into Matilija Creek and the Ventura River is expected to alter freshwater rearing and spawning sites and the estuary, despite the actions taken to limit the adverse effects (e.g., the design of the sediment storage sites, the use of soil cement, among others). Given the expected magnitude, frequency, and duration of sediment releases, and predicted increases in channel-bed elevations throughout the action area, a reduction in water-column depth and filling and loss of habitats (such as pools, and runs, which serve as freshwater rearing sites and freshwater spawning sites) throughout the action area is expected (cf. Cordone and Kelley 1961, Eaglin and Hubert 1993). Such effects are likely to persist for several years until the increased sediment loads are buffered by fluvial processes and scour, and the sediment equilibrium becomes reestablished (Pizzuto 2002, Cluer 2006b). The additional amount of sediments in the channel bed could also be susceptible to "clumping" in some areas and may migrate downstream as "waves" (Pizzuto 2002); these clumps of sediment could become stalled in locations for years and impair long-existing pools (Cluer 2006b) or other areas that may support freshwater rearing and spawning. Given the highly variable hydrology of coastal streams in southern California, freshwater rearing and spawning sites could remain largely filled or impaired for several years between large storm flows. Input of gravel, cobble, and boulder may enhance existing critical habitat because these substrate types support freshwater spawning and rearing sites. Deposition of sands and finer materials along the channel margins is expected to benefit establishment and growth of riparian vegetation (Shafroth *et al.* 2002, Cluer 2006a), which can provide shade over freshwater rearing sites. Overall, the foregoing effects largely do not favor maintenance of critical habitat for endangered steelhead in the short and medium time frame (2 to 10 years). However, the projected sediment-related effects on critical habitat are not expected to persist indefinitely and to be offset by anticipated project benefits, such as restored steelhead access to historical spawning and rearing habitats.

Sediment-related effects of the proposed action are expected to extend downstream to the estuary. The loss or alteration of estuarine habitat within the Ventura River watershed, should such effects in fact occur, would be of major ecological concern because such habitats provide numerous values to anadromous salmonids (Smith 1990, Thorpe 1994, Bond 2006), and possess features that are essential to the conservation of adult and juvenile steelhead (NMFS 2005). For instance, essential features of estuarine areas include (1) water quality, water quantity, and salinity conditions that are capable of supporting adult and juvenile physiological transitions between fresh and saltwater, (2) natural submerged and overhanging cover, and (3) forage for adults and juveniles, which supports growth and maturation. According to the source documents for the proposed action (i.e., the feasibility report), the estuary is not expected to incur more than

1 foot of deposition due to sand. Whether this level of aggradation would result in an alteration or loss of essential features of the estuary to conserve the species is not clear at this time because the information needed to inform such an assessment is not available. Accordingly, reliable implementation of the proposed MAMP, in combination with the Corps' commitment to implement a program that will address the uncertainties NMFS has identified (which included effects due to sedimentation, NMFS 2006b; see also Corps 2006b), will be necessary to detect and then reconcile sediment-related effects on critical habitat (Figures 39 and 40 in Appendix A).

Foster Park Groundwater Wells

Information on the design and operation for the two new wells is incomplete at this time, and therefore only a general assessment of the effects on critical habitat can be made. The construction and operation of the Foster Park wells will preserve the City of Ventura's ability to extract water. The proposed operation of the new Foster Park groundwater wells is expected to reduce surface flows in the Ventura River in the vicinity of Foster Park no more than 3 cfs (Corps 2006b). While the maximum flow reduction can be assumed from the information provided, the geographic extent of the reduction cannot because the distance between the groundwater elevation and the elevation of the bottom of the sloped river channel fluctuates, causing a change in the intersection of the groundwater with the river channel. Therefore, the downstream extent that surface flow throughout the Casitas/Foster Park reach of river (which encompasses freshwater rearing and spawning sites) would be reduced is unknown at this time. The Corps' proposal to confine operation of the new wells to periods when discharge is 15 cfs or greater and no other surface diversion occurs, and to not reduce discharge by more than 3 cfs, will ensure that discharge will not fall below 12 cfs due to operation of the new wells.

The manner in which a reduction in discharge of 3 cfs will affect the quality and quantity of freshwater rearing or spawning sites cannot be determined from the available information. Given NMFS' examination of recent hydrology records for the Foster Park area, daily mean discharge appears to rarely exceed 15 cfs during the dry season (May 1 to Nov 1). Assuming these discharge records accurately represent discharge for the local area, operation of the new wells during the dry season is not expected, and effects on critical habitat are unlikely within this period. Water extractions outside the dry season by the new wells do possess the potential to reduce the amount and extent of surface flow because annual droughts or extended rain-free periods can result in dry season surface-flow conditions even during winter, as was observed during a February 8, 2007, inspection of the action area (A. Spina, NMFS, pers. obs., Appendix E). However, the Corps' proposal to confine pumping of the new wells to periods when discharge is 15 cfs or greater is expected to reduce the amount and extent of pumping-related effects on surface flows (and therefore critical habitat) during the wet season. The proposed MAMP, in combination with the Corps' program for addressing uncertainties NMFS has identified (NMFS 2006b; see also Corps 2006b, Corps 2007), is expected to provide the information necessary for determining the actual effects of well operation on critical habitat. Developing a clearer understanding of how wells will be operated would further NMFS' ability to assess effects of well operation on critical habitat for endangered steelhead. While specific provisions are expected to minimize adverse effects due to operation of the new wells, other wells, which are not the subject of this consultation, may continue to operate, thereby causing surface flows to decline beyond the level defined for operation of the new wells (Figures 35-37 in Appendix A).

High-Flow Sediment Bypass

The design and operating criteria for the high-flow sediment bypass are only preliminary at this time, and therefore only a general assessment of the effects on critical habitat can be made.

Construction of the high-flow sediment bypass (with the incorporation of fish-passage capability or feasibility) is expected to reduce effects of the existing earthen berm (i.e., the timber crib wall that is currently buried under accumulated channel bed substrates) on the freshwater migration site for endangered steelhead. Preliminary plans for the sediment bypass include a fishway on the left bank of the high-flow sediment bypass, and a rock fishway with boulder weirs on the downstream dam slope adjacent to the right wall of the sediment bypass (Corps 2006a). While these plans are conceptual, the Corps proposes to (1) design and operate the bypass to avoid interfering with migration of adult and juvenile steelhead at the bypass, (2) design and construct fish-passage capability or feasibility for incorporation into the bypass, and (3) work with NMFS steelhead biologists and NMFS fish-passage engineers on the design and operation of this project feature during the upcoming detailed design phase of the dam removal (Corps 2006a, Corps 2007). Accordingly, NMFS expects the bypass will be designed, constructed, and operated in a manner that will not impede migration of steelhead at the bypass (i.e., over the range of hydrologic events the structure is designed to operate). The bypass has the potential to extend the operational range of fish passage in the localized area and therefore more fully realize the potential benefits of the removal of the Matilija Dam. A description of how the incorporation of fish-passage capability or feasibility into the high-flow sediment bypass will minimize effects on steelhead is as follows.

Incorporating an ecologically meaningful fish-passage element into the high-flow sediment bypass is critically important for reducing the effects of this project feature on endangered steelhead. The existing earthen berm spans the entire mainstem of the Ventura River and represents an obstruction to passage of steelhead. Although a fish-passage facility was recently constructed at the Robles Diversion Dam on the west bank of the river adjacent to the earthen berm, passage of steelhead through the ladder has not been corroborated. Additionally, operation of this facility is confined to relatively low flows (50 to 1,500 cfs) and limits the average number of fish-passage days per year (44 days under the existing terms of NMFS' 2003 biological opinion versus 150 fish-passage days prior to the construction of the Robles Diversion facilities). The physical characteristics of the local area and the behavior and migratory ecology of steelhead represent other reasons why incorporation of fish passage into the sediment bypass is needed. In this context, the preliminary design for the high-flow sediment bypass specifies placement on the east bank of the river channel and would discharge high flows (in excess of 1,500 cfs and the operating range of the existing fish-passage facility) to a separate eastern channel, which connects to the western active channel about 1000 feet downstream (Appendix B). Adult steelhead migrate during periods of elevated streamflow (Shapovalov and Taft 1954) and are attracted to areas of "heavy" turbulent water (Bunt *et al.* 1999, Bunt 2001, Rivinoja *et al.* 2001). The high flows released through the bypass are therefore expected to lure steelhead into the eastern channel, toward the water apex just downstream of the bypass and away from the westerly channel and the entrance to the existing fish-passage facility. Any steelhead remaining in the eastern channel when operation of the bypass ends would be exposed to lethal conditions created when the water releases subside or cease (e.g., Cushman 1985). Consequently,

incorporation of a proper fish-passage facility or capability into the high-flow sediment bypass is necessary to reduce the likelihood that migrating steelhead would be delayed (because they cannot locate the entrance of the existing fish-passage facility) or stranded and killed (due to being trapped in the eastern channel following cessation of flows from the bypass) (Figures 17-24 in Appendix A).

With regard to construction of the bypass, effects to critical habitat are expected to be discountable. Short-term impacts from the construction of the bypass and fish-passage facility (or fish-passage capability) are expected to be those related to temporary channel disturbance (from heavy equipment), excavation, compaction, and the loss of native channel bed material where the dam and the bypass structure would be located. Some exposed soils may result from construction activities, thereby increasing the potential of erosion and sedimentation in freshwater rearing and spawning sites. The type, amount, and extent of the effects are expected to be minimized through implementation of best management practices during construction activities.

Downstream Flood Control Improvement Projects (Levees/Floodwall, and Bridges)

Raising the existing levees will preserve the levees and perpetuate existing effects on critical habitat into the future. The existing levees prevent natural lateral migration of the river channel, confine the river within an artificially defined corridor, and propagate the existing fragmentation of the active river channel and the historical floodplain. Freshwater rearing sites for steelhead include floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility. Therefore, the existing levees (and the proposed raising) increase the likelihood that adverse effects to critical habitat will continue into the future. The new levee and floodwall proposed in the Meiners Oaks area is expected to produce effects similar to the foregoing effects on critical habitat. Activities to construct or raise levees and floodwalls will take place in upland areas, where riparian plant species, and flowing water, are not expected. Therefore, construction activities are not expected to affect critical habitat.

Designs for the new and improved bridges are only preliminary at this time, and therefore only a general assessment of the effects on critical habitat can be made. Removal and relocation of the Camino Cielo Bridge and the widening and elevation of the Santa Ana Road Bridge are expected to require workspace dewatering, excavation, and slope and channel alterations. These activities can lead to temporary loss of freshwater rearing sites (dewatering), loss of shade, decreased bank stability (where streambanks are disturbed and then not adequately protected), and increased erosion. Best management practices will be implemented as part of the construction activities, which is expected to minimize adverse effects on critical habitat. Long-term effects due to the new and improved bridges are expected to include bank stabilization (rock riprap) in the vicinity of the bridges, and loss of riparian habitat. The river channel beneath both bridges will be widened to improve flow and sediment conveyance, and to allow for the passage of a 100-year flood event (but not at the Camino Cielo Bridge) with the increased sediment loads expected after dam removal. Replacing the Camino Cielo Bridge is expected to improve the freshwater migration site because the box culverts under the current bridge appear to represent an obstruction within the migratory corridor (Corps 2004a) (Figures 15, 29, 30, 33 and 34 in Appendix A).

Giant reed Removal Plan

The removal of non-native plants (chiefly giant reed) downstream of the dam in Matilija Creek and the Ventura River is expected to result in discountable effects to critical habitat (because steelhead and critical habitat for this species are not currently present in areas upstream of the dam, only the giant reed removal proposed for reaches downstream of the dam, where steelhead and critical habitat are currently present, is considered in this biological opinion). The removal will use mechanical means, hand laborers, and herbicides. Minor localized releases of fine sediments during mechanical removal of plants are possible, but should such releases occur, they are not expected to diminish the functional value of freshwater rearing and spawning sites. Removal activities will take place largely during the dry season, however. The herbicides are not expected to alter water quality; NMFS' experience indicates Glyphosate is immobile in the soil, becomes inactive over several weeks, and is not likely to create toxic instream conditions. Much of the removal activities will be far removed from the active channel where surface water would be present. Best management practices will be implemented (e.g., avoid spraying herbicides in or near flowing water, using hand dispensers to directly apply herbicides to plants) to further minimize the likelihood of adverse effects (Figures 5-8, 11, 23-25, and 35-40 in Appendix A).

D. Effects on Steelhead

Removal of Reservoir Area Fine Sediments

Because the effects of sediment releases from the disposal sites on critical habitat (and primary constituent elements) are to some degree uncertain, only a general characterization of the possible effects on steelhead can be made. While steelhead in the Ventura River are expected to be affected when high flows contact the sediment-disposal sites causing the release of fines, the release of fine sediment from the sites is expected to be infrequent (once every 5 to 10 years), short lived (2 to 3 days) and create low turbidity concentrations. The sites themselves will be designed to minimize contact of fine sediment with flowing water. Background turbidity concentrations are expected to be elevated during periods of increased flows, therefore the potential exists that background levels could mask turbidity concentrations resulting from the release of sediment from the disposal sites. The severity of the effects on steelhead will depend on both suspended sediment concentration and duration of exposure (Newcombe and Macdonald 1991, Newcombe and Jensen 1996), but are expected to be discountable based on the foregoing. With regard to effects due to sedimentation, once mobilized, the fine sediments released from the disposal sites are not expected to settle, and therefore eggs, incubating embryos, and alevins in nests are not expected to be harmed. A NMFS-approved contingency plan will be implemented in the event of an accidental release of sediment (Corps 2004b, Corps 2006b) (Figures 27 and 28 in Appendix A).

Dam Removal and Release of Sediments behind Matilija Dam

Dewatering the reach of creek immediately downstream of the dam is expected to be problematic for steelhead because the temporary loss of water, and therefore habitat, would disrupt steelhead behavioral patterns. Steelhead need suitable living space for ontogeny and survival; living space absent surface water is not suitable. Streamflow diversion could harm individual steelhead by

concentrating or stranding them in residual wetted areas (Cushman 1985) or by causing them to migrate to adjacent habitats (Kraft 1972; Campbell and Scott 1984). Dewatering the workspace may cause harm, injury and mortality to steelhead by confining them to areas that are predisposed to dewatering or desiccation, increased water temperature, decreased dissolved oxygen concentration and predation (Cushman 1985). The number of steelhead that may be affected by isolating workspaces from flowing water is expected to be relatively low, based on the number of juvenile steelhead recently observed in the action area (Appendix D). Monitoring biologists would relocate steelhead from work areas (i.e., net steelhead and move them a short distance to instream areas outside the work area) thereby reducing the number of steelhead that could be killed or harmed by dewatering activities. Effects to steelhead resulting from dewatering activities, including relocation of stranded individuals, are expected to be largely non-lethal and temporary (Figures 7-9 in Appendix A).

The effects on steelhead that may result from the release of fine and coarse sediments from the former reservoir area (during high-flow events) are of concern to NMFS. Given the expected effects of the releases on critical habitat (e.g., increased turbidity, and some alteration of instream and estuarine habitat, filling or alteration of freshwater rearing and spawning sites, and channel aggradation), the potential exists that extensive portions of action area could be rendered unsuitable for spawning and rearing steelhead for several months or years. Increased turbidity levels may increase "coughing" and gill flaring in fish (Berg and Northcote 1985), and increase respiration and reduce oxygen uptake by the gills (Cordone and Kelley 1961, Herbert and Merkins 1961). Juvenile steelhead may experience a reduced ability to forage when turbidity increases (Berg and Northcote 1985, Gregory and Northcote 1993, Suttle *et al.* 2004). With regard to physical alteration of the channel bed due to sedimentation, the increased coarse sediment load is expected to affect all life stages of steelhead within the action area since the sequence and locations of pools, riffles and runs will likely be changed (Pizzuto 2002). The filling of freshwater rearing sites (e.g., pools) is expected to reduce, if not eliminate, the quality of such sites for juvenile steelhead. A reduction in the availability of suitable rearing sites increases the potential that the abundance of juvenile steelhead would decrease within the action area. Additionally, the timing of such sediment releases could influence the type and degree of impacts. For example, if sediment deposition occurs after steelhead have spawned in the lower river (Casitas Springs/Foster Park reach), there is an increased risk that deposition of fine sediments would adversely affect the incubation and emergence of any steelhead embryos and fry (and alevins). By contrast, the riparian area is expected to benefit from deposits of sediment in river margins and the floodplains (Shafroth *et al.* 2002, Cluer 2006a). NMFS presumes that through implementation of the MAMP, as well as the Corps' program for addressing the uncertainties NMFS has identified, sediment-related effects on steelhead (based on impacts to habitat) can be detected and will be remedied as appropriate and necessary. The foregoing projected sediment-related effects on steelhead are expected to be offset by the ecological benefits due to removal of the dam, which are described as follows.

While the process of removing the dam is expected to create temporary instream conditions that are not entirely agreeable with the habitat requirements of steelhead, after the dam is gone the Ventura River population of endangered steelhead and the entire Southern California DPS of endangered steelhead is expected to experience an increased potential of being viable over time (this expectation is predicated on the population gaining access to the upstream spawning and rearing tributaries above Matilija Dam, which in turn is governed largely by the effective

operation of the downstream Robles Diversion fish-passage facilities and the degree to which steelhead can effectively pass the high-flow sediment bypass). After the dam has been removed, habitat connectivity will have been achieved and steelhead will once again have access to historical spawning and rearing habitats. The elimination of habitat fragmentation and restoration of bi-directional gene flow (i.e., movement of steelhead to and from the reaches upstream of the former dam) is expected to decrease the risk of species extinction (Rieman and McIntyre 1995, Rieman and Allendorf 2001). This favors conservation of the local population of endangered steelhead and the entire Southern California DPS. Further, the Ventura River is one of the relatively few inland populations within the Southern California DPS that has historically produced the largest run sizes in the study area, and has a high priority for protection (Boughton *et al.* 2006). While historical habitat will be accessible to steelhead following dam removal, the proposed action includes no monitoring to determine whether steelhead are using the historical habitats and the type, magnitude, and degree of the use. Therefore, no mechanism exists, related to the proposed action, for determining whether steelhead will be able to migrate to and then spawn and rear in the subject area. The anticipated benefits of removing the dam for steelhead are currently tentative (Figures 1-6 in Appendix A).

Foster Park Groundwater Wells

Because specific information on the design and operation for the two new wells is not available, only a general understanding of the effects on steelhead can be developed at this time. Confining operation of the new wells to river flows of 15 cfs or more (and ceasing pumping when surface flows fall below 12 cfs) is expected to minimize the amount and extent adverse effects that steelhead may incur as a result of operating the new wells. This expectation assumes that (1) surface flows of 12 cfs are in fact sufficient to create and maintain essential habitat features that are needed for growth and survival of adult and juvenile steelhead, and (2) the 3 cfs reduction in surface flow does not have a consequence for the survival or growth of steelhead (i.e., the essential features of critical habitat and growth and survival conditions for steelhead are the same at 15 cfs and 12 cfs regardless of season). The information needed to validate these assumptions is not currently available, however. While the flow-related precautionary measure governs operation of the new wells, operation of existing wells in the Foster Park area is apparently not controlled by a similar precautionary measure. As a result, pumping of existing wells may cause surface flows to decline beyond those "protective" flows defined to guide operation of the new wells. The proposed MAMP, in combination with the Corps' program for addressing uncertainties NMFS has identified (NMFS 2006b; see also Corps 2006b), will contribute to determining the true effects of operating the new wells on critical habitat. Developing a clear understanding of the manner in which the new wells would be operated would further NMFS' ability to assess effects of operating the new wells on endangered steelhead (Figures 35-37 in Appendix A).

High-Flow Sediment Bypass

Activities related to the construction of the bypass are not expected to affect steelhead individuals because NMFS presumes construction will occur when the channel is dry. If flowing water is present, no dewatering of the workspace is believed necessary because river discharge is likely to be diverted away from the workspace through the Robles Fishway on the west side of the river (Figures 19-24 in Appendix A).

Because the design and operating criteria for the high-flow sediment bypass are preliminary at this time, only a general assessment of the effects on steelhead can be made. Construction of the high-flow sediment bypass with incorporation of ecologically meaningful fish-passage capability or feasibility is expected to improve migration of adult and juvenile steelhead through the river channel (and high-flow sediment bypass) in the localized area, within a range of operating discharge. A fish-passage facility was recently constructed at the Robles Diversion Dam, adjacent to the earthen berm; steelhead may be able to migrate upstream past the berm using the fish ladder, though passage of steelhead, as such, through the ladder has not been corroborated and has an inherent limitation on the operation range (50 to 1,500 cfs). The Corps proposes to design and operate the bypass to benefit passage of steelhead at the bypass and to work with NMFS' steelhead ecologists and fish-passage engineers on the design and operation of this project feature during the upcoming detailed design phase of the dam removal (Corps 2006b). Moreover, NMFS has defined some assumptions regarding the outcome of the final design and operation of this structure (Table 1); under these assumptions, the bypass has the potential to extend the operational range of the fish passage and therefore more fully realize the potential benefits of the removal of the Matilija Dam. Consequently, NMFS expects the bypass will be designed, constructed, and operated in a manner that will not stop or delay migration of adult or juvenile steelhead over the bypass (or those individual steelhead attempting to migrate through the Robles fish-passage facility), within the range of hydrologic events during which the structure is designed to operate (i.e., NMFS presumes the bypass will operate under a specified range of discharges, and therefore when the structure is not operated, the bypass will represent an obstruction in the species freshwater migration).

Downstream Flood Control Projects

The levees and floodwall do not provide the ecological role of floodplains for maintaining the productivity and diversity of riverine communities; raising the levees will increase the likelihood that these structures will be preserved into the future. Evidence provided in the ecological literature indicates that floodplains can impart an elevated level of biotic diversity, fish and invertebrate production, and habitat area and diversity. Precluding the Ventura River from entering the available historical floodplain during the wet season is expected to be unfavorable for the aquatic environment in general and the local population of steelhead in particular. However, NMFS does not possess the specific information needed to reliably predict how the levees and floodwall would in fact affect steelhead at the individual and population level. Activities to construct or raise levees and floodwalls will take place in or near upland and floodplain areas, where riparian plant species, and flowing water, are not expected. Therefore, construction activities are not expected to affect steelhead.

Designs for the proposed bridges are incomplete at this time; only a general evaluation of the effects on steelhead can be performed. Construction activities, such as dewatering, excavation, slope and channel alterations, are expected to create conditions that affect adult and juvenile steelhead. Should dewatering of workspaces be needed, this would be expected to displace juvenile steelhead, presuming individuals are present in the workspace at the time of the dewatering. Currently, the Camino Cielo Bridge lies in an area where surface flow is perennial and therefore appears to represent the only case where dewatering may be necessary. Since the area of water diversion in the vicinity of the bridge is likely not more that 100-200 feet, the numbers of steelhead that are expected to be captured during the removal and reconstruction of this bridge are likely less than 100, based on NMFS' knowledge of steelhead abundance in the action area. With regard to excavation, bank-slope protection, and access routes, these activities are likely to expose soils, thereby increasing the potential for sediment input into flowing water. Best management practices will be implemented as part of the construction activities, which is expected to reduce the likelihood that exposed soils will create instream conditions that adversely affect steelhead. The bank stabilization (through use of rock riprap) may result in the permanent loss of riparian habitat, but the amount and extent of the loss, should one occur, is unknown at this time. Replacement of the Camino Cielo Bridge is expected to favor migration of adult steelhead because the culverts under the existing bridge represents an obstruction within the migratory corridor for adult steelhead (Corps 2004a). Overall, the effects of the flood-control improvements on adult and juvenile steelhead are expected to be largely discountable and non-lethal, presuming best management practices are effective and the MAMP and the Corps' program for addressing the uncertainties NMFS has identified can resolve effects on steelhead (Figures 29, 30, 33 and 34 in Appendix A).

Giant reed Removal Plan

Based on NMFS current understanding of the proposed plan to remove non-native plant species, and anticipated effects on critical habitat (as described previously), effects to steelhead are expected to be confined to juveniles and discountable (Figures 5-8, 11, 23-25, and 35-40 in Appendix A).

VI. CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Endangered Species Act. Based on NMFS' review of the supporting documents (i.e., the draft EIS), there does not appear to be at this time any actions or activities that would be reasonably certain to occur that would not require section 7 consultation.

VII. INTEGRATION AND SYNTHESIS OF EFFECTS

This section combines the effects of past and present activities (*i.e.*, environmental baseline) that are projected to extend into the future with effects of the proposed action and cumulative effects (*i.e.*, those future actions that are reasonably certain to occur). The purpose of this assessment is

to develop an understanding of how the combined effects might affect steelhead and critical habitat for this species. The methodology for this assessment involved identifying potential environmental effects associated with reasonably certain actions, integrating potential effects of these actions with the environmental baseline and expected effects of the proposed action, and qualitatively evaluating the combined effects of future actions, past and present activities, and the proposed action on steelhead and critical habitat.

The larger river systems are believed to have been the historical foundation for the Southern California steelhead DPS. The Ventura River watershed is one such system because the drainage is one of the largest steelhead-bearing watersheds within the Southern California DPS. However, the abundance of steelhead in the Ventura River, like other drainages throughout the DPS, has been dramatically reduced due to a variety of anthropogenic alterations to the watershed and waterways. Presently, the number of steelhead in the Ventura River watershed is extremely small. Likewise, the number of steelhead comprising the DPS is small, less than 1% of the estimate historical run size. Because the viability of small populations is especially tenuous, and such populations are susceptible to prompt decreases in abundance and possess a greater risk of extinction relative to large populations (Pimm *et al.* 1988, Berger 1990, Primack 2004), activities that reduce the quality and quantity of habitats, or that preclude formation of "new" populations, are expected to compel the population toward extinction as individual populations become extinct (McElhany *et al.* 2000). The Ventura River is one of the core populations that NMFS has identified as essential for the recovery of the endangered southern California steelhead. This river is one of the few populations within the Southern California DPS that have historically produced the largest run sizes in the study area, and have a high priority for protection (Boughton *et al.* 2006). Consequently, activities harming steelhead or destroying habitat, including critical habitat, with this population has implications for the recovery and ultimately delisting of the DPS under the ESA.

A. Summary of Effects of Past and Present Activities

Evidence indicates past and present activities have reduced the quality and quantity of spawning, migration, and rearing habitat for the Southern California DPS within action area (and Ventura River watershed). Anthropogenic activities, including urbanization, are believed to have contributed to declines in steelhead abundance within the action area and the watershed. The Ventura River watershed is a highly altered, manipulated, and managed ecosystem, and in its present state is considerably different from its historical natural condition. Water is removed annually via surface diversions and groundwater pumping, which has reduced the quantity and quality of freshwater rearing, spawning and migration sites in the action. The existing wells and surface diversions (including the subsurface water diversion) in the Foster Park area can substantially reduce, if not eliminate, surface flows within the action area. Because existing dams (e.g., Casitas, Matilija) block steelhead from accessing historical spawning and rearing habitat upstream of the dams, abundance of this species in the upstream areas is expected to have decreased. Effects of past and present activities are expected to extend into the future. As a result, the Ventura river population of steelhead is expected to continue to experience a risk of extinction in the foreseeable future.

B. Summary of Effects of the Proposed Action

The removal of Matilija Dam is expected to restore habitat connectivity, restore steelhead access to about 10 miles of spawning and rearing areas within Matilija Creek, and increase the amount and extent of freshwater spawning and rearing sites available to steelhead, though the actual amount is controlled largely by the Robles Diversion Dam (i.e., the effectiveness of the fish-passage facility) and whether steelhead can pass the high-flow sediment bypass. These consequences of the dam removal are expected to favor conservation of the local population of endangered steelhead and the DPS of endangered steelhead. Release of sand and smaller particles, due to a variety of features related to the proposed action, is expected to diminish the functional value of freshwater rearing and spawning sites for endangered steelhead over extensive areas of the action area. Instream habitats are likely to be altered and some areas necessary for steelhead ontogeny and survival may be lost. Sediment-related effects are not expected to persist indefinitely (beyond 20 years), however. Input of coarse sediments (such as gravel, cobble and boulder) may favor essential features of steelhead critical habitat, e.g., in the formation of extensive instream accumulations of gravel for spawning or a buildup of boulders and cobble, which juveniles can use as shelter, and as a colonization substrate for macroinvertebrates, which serve as food for rearing steelhead. The expected benefits that the local population of steelhead (and Southern California DPS) is expected to incur from removal of the dam are expected to offset the transient adverse effects of the proposed action.

C. Combined effects

With regard to effects on critical habitat, the aggregate continuing effects of past and present activities and the effects due to the proposed action are expected to have mixed influences on the quality and quantity of critical habitat for endangered steelhead. On one hand, the aggregate effects seem likely to reduce the amount and extent of essential features of critical habitat in certain areas within the action area, particularly while the former reservoir area is contributing fine and coarse sediments at unnatural accelerated rates (i.e., widespread loss and alteration of instream and estuarine habitat throughout the action area). NMFS assumes that the MAMP in combination with the Corps' program for addressing the uncertainties NMFS has identified, will contribute to reducing the amount, extent, and duration of effects. On the other hand, an increase in accessibility to spawning and rearing areas (about 10 miles) is expected due to removal of the dam. Given that the effects of urbanization are expected to extend into the future, it is possible that areas of the Ventura River watershed that are susceptible to the effects of urbanization will experience a decline in the functional value of steelhead critical habitat. The increased access to historical spawning and rearing habitat, which lies upstream of the principal urban area, may therefore serve to compensate, to some degree, the future effects of urbanization on downstream steelhead habitat, though the unique role of the estuary cannot be similarly compensated by opening stream habitats.

With regard to effects on steelhead, based on the perceived aggregate effects of past and present activities and the effects due to the proposed action on critical habitat, the local steelhead population may show increased reliance on habitats upstream of urban influences. Such habitats include those that are expected to be made accessible to steelhead following dam removal. While re-establishing steelhead access to historical spawning and rearing habitats (and the anticipated benefits to endangered steelhead) is expected to favor the viability of the Southern

California steelhead DPS, the dam removal is not projected to fully ameliorate the continuing effects of past and present activities on this species.

VIII. CONCLUSION

After reviewing the best available scientific and commercial information, the recent status of the Southern California steelhead DPS, the environmental baseline, expected effects of the proposed action, cumulative effects, and the combined effects of past and present activities, the proposed action, and actions that are reasonably certain to occur, NMFS concludes the proposed action is not likely to jeopardize the continued existence of the Federally endangered Southern California steelhead DPS, and is not likely to destroy or adversely modify critical habitat for this species.

IX. INCIDENTAL TAKE STATEMENT

Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or to attempt to engage in any such conduct. Harm is further defined by NMFS to include significant habitat modification or degradation which actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding, or sheltering. Incidental take is defined as take of listed animal species that results from, but is not the purpose of, carrying out an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not the purpose of the agency action is not considered a prohibited taking provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are non-discretionary and must be undertaken by the Corps for the exemption in section 7(o)(2) to apply. The Corps has a continuing duty to regulate the activity covered by this incidental take statement. If the Corps (1) fails to assume and implement the terms and conditions or (2) fails to adhere to the terms and conditions of this incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the Corps must report the progress of the action and its impact on the species to NMFS as specified in the incidental take statement (50 CFR §402.14(i)(3)).

A. Amount or Extent of Take

NMFS believes the proposed action that will occur in Matilija Creek and the Ventura River, Ventura County, California, may result in the incidental take of steelhead. Incidental take would be in the form of harassment, harm, or mortality, and the principal sources of take involve (1) the relocation effort to remove juvenile steelhead from workspaces that are dewatered, and (2) the release of sediments from the reservoir area on adult and juvenile steelhead. With regard to #1 above, NMFS anticipates that no more than 350 juvenile steelhead will be captured and then relocated, based on NMFS' experience in the Ventura River watershed as well as recent information regarding the number of juvenile steelhead in the action area. Of these, no more than 5% will be killed. With regard to the release of sediments (#2 above), NMFS expects that the river channel and instream habitats throughout the action area downstream of the dam to the estuary (a distance of about 15 miles), will experience the magnitude of deposition identified in

Table 2 (also presented below) (the estuary is expected to experience no more than 1 foot of sediment deposition, as considered in pages 22-23 of this biological opinion).

Table 2. Two possible scenarios in average reach-specific aggradation of the channel bed during the 20-year project life: one scenario based on a drier climate, and the second based on a severe flood event. Reach number increases in proximity to the dam, with reach 6b being closest to the dam. Values in the table represent the predicted average deposition (feet) of sediment, and are obtained from modeling.

Location	Dry climate 10-year	Flood event 50-year
Reach 2	1.2	3.6
Reach 3	2.0	4.2
Reach 4	0.8	2.3
Reach 5	1.4	2.2
Reach 6a	2.3	6.4
Reach 6b	1.0	0.9

No other incidental take of steelhead (or its habitat) is anticipated as a result of the proposed action, and at this time NMFS does not have information indicating the new wells will cause take of steelhead. The accompanying biological opinion does not anticipate any form of take that is not incidental to the proposed action.

B. Effect of Take

In the Biological Opinion, NMFS concluded that the anticipated level of take associated with the proposed action is not likely to jeopardize the continued existence of the federally endangered Southern California steelhead DPS.

C. Reasonable and Prudent Measures

NMFS believes Reasonable and Prudent Measures are necessary and appropriate to minimize and monitor incidental take of steelhead. The results of the effects analysis provide the basis for the following Reasonable and Prudent Measures:

1. Avoid working in flowing water within the action area.
2. Minimize the amount and extent of temporary and permanent changes to the quality and quantity of instream, riparian, and estuarine habitat within the action area.
3. Employ a fisheries biologist(s) for the purposes of monitoring the affected area, and for removing and relocating steelhead from the affected area within the action area.
4. Implement effective sediment and turbidity control measures within the action area.
5. Minimize the amount and extent of sediment-related effects on the type, amount, extent, and quality of instream and estuarine habitat within the action area.
6. Minimize the type and amount of adverse effects associated with operating the high-flow sediment bypass on migration of steelhead at the bypass.
7. Minimize the amount and extent of changes in discharge, and alterations in the quality and quantity of instream habitat, due to operation of the new Foster Park wells within the action area.
8. Minimize the effects of specifically identified project-related uncertainties on steelhead

and the quality and quantity of habitat for this species within the action area.

9. Monitor and assess steelhead migration, abundance, distribution, and habitat use within the action area.

10. Provide written reports to NMFS describing the activities associated with minimizing and monitoring project action effects within the action area.

X. TERMS AND CONDITIONS

In order to be exempt from take prohibitions of section 9 of the ESA, the Corps and its contractors, associates, and partners in the proposed action is responsible for ensuring compliance with the following Terms and Conditions, which implement the Reasonable and Prudent Measures described above and outline required reporting/monitoring conditions. These Terms and Conditions are non-discretionary:

1. The following terms and conditions implement reasonable and prudent measure #1.

    A. The Corps, or their authorized designee, shall isolate the workspace from flowing water when such isolation is necessary for avoiding heavy equipment or other activities in flowing water, sedimentation, turbidity and direct effects to steelhead or their critical habitat. Prior to construction activities, sandbags, cofferdams, straw bales, visqueen, or culvert (hereafter referred to as *diversion*) shall be installed to divert streamflow around the workspace (i.e., isolate the workspace from flowing water). The diversion shall remain in place during the project, then removed immediately after work is completed.

    B. Wherever feasible, the Corps, or their authorized designee, shall use existing ingress or egress points, or perform work from the top of the creek banks, for the purposes of avoiding work and heavy equipment or other activities in flowing water, and disturbing creekbank, vegetation and instream habitat.

    C. The Corps, or their authorized designee, shall ensure and certify that the selected contractor(s) and monitoring biologist(s) have read and understand each term and condition of this biological opinion prior to implementation of the proposed action.

2. The following terms and conditions implement reasonable and prudent measure #2.

    A. The Corps, or their authorized designee, shall photograph the action area during and immediately before and after construction activities are completed for developing a reference library of instream and riparian habitat characteristics.

    B. Channel excavation for isolating the workspace from flowing water is prohibited.

    C. The Corps, or their authorized designee, shall minimize disturbance to existing native instream, riparian and upland vegetation. Native vegetation affected by the proposed action shall be replaced and a revegetation success ratio (in terms of area) of no less than 2:1 (for streamside vegetation and riparian species) or 1:1 (upland areas) shall be ensured for a minimum of 5 years following completion of the proposed action.

D. The Corps, or their authorized designee, shall revegetate soil exposed as a result of construction related activities using seed casting, hydroseeding, or live planting methods, no later than the first November following the completion of the proposed action. Only native plant species shall be used for revegetation.

E. The Corps, or their authorized designee, may collaborate with NMFS as necessary for the purpose of identifying an area(s) and conditions where natural revegetation of disturbed areas can proceed in the absence of full or partial vegetative plantings. The Corps shall obtain written NMFS agreement for each subject area no later than 30 days following completion of the activities that caused the vegetation disturbance (including vegetation loss or alteration) for the subject area.

F. The Corps, or their authorized designee, shall inspect revegetated area(s) one year after the subject area was revegetated (or planted or seeded), and every year thereafter for a period of no more than four years (total of five years of monitoring). The first year of monitoring shall commence in fall (November). The purpose of the monitoring is to qualitatively assess growth of the plantings or seedlings and the presence of exposed soil. The presence of native and non-native vegetation and extent (percent area) of exposed soil shall be noted, and the subject area shall be photographed during each inspection.

G. Woody debris or large native rock removed from the channel shall be retained and later returned to the creek in functional form immediately following completion of the dam removal.

H. All equipment shall be refueled in upland areas and in accordance with a spill and pollution-control plan.

3. The following terms and conditions implement reasonable and prudent measure #3.

A. The Corps, or their authorized designee, shall retain a fishery biologist(s) with expertise in the areas of resident or anadromous salmonid biology and ecology; fish/habitat relationships; biological monitoring; and, handling, collecting, and relocating salmonid species. The biologist(s) will monitor installation and removal of the diversion, the workspace, and construction activities (monitoring biologist).

B. The monitoring biologist(s) shall continuously monitor placement and removal of the diversion for removing any steelhead. The biologist(s) shall capture steelhead stranded in residual wetted areas as a result of streamflow diversion and workspace dewatering, and relocate steelhead to a suitable instream location outside of the workspace. The biologist(s) shall note the number of steelhead, condition, and size of steelhead observed in the affected area, the number of steelhead relocated, and the date and time of the collection and relocation. Photo-documentation of any captured or relocated steelhead shall be filed as part of written reports of such monitoring, capture and relocation activities to be submitted to NMFS on an annual basis (or as defined in term and condition 10B). One or more of the following methods shall be used to capture steelhead: dip net, seine, throw net, minnow trap, hand. Electrofishing is prohibited. Once the diversion is in place, the biologist shall monitor periodically, based on a

monitoring schedule and protocol that is mutually agreeable to the Corps and NMFS. The Corps shall obtain written NMFS agreement for this schedule and protocol prior to undertaking activities that are necessary to begin isolating the workspace(s) from flowing water.

C. The monitoring biologist(s) shall periodically monitor (based on a schedule and protocol that is mutually agreeable to the Corps and NMFS) construction activities, instream habitat, and performance of sediment control/detention devices (see Term and Condition No. 4A) for the purpose of identifying and reconciling any condition that could adversely affect steelhead or their habitat. The biologist shall be empowered to halt work activity and to recommend measures for avoiding adverse effects to steelhead and their habitat. The Corps shall obtain written NMFS agreement for this schedule and protocol prior to undertaking activities that are necessary to begin removing Matilija Dam.

D. The monitoring biologist(s) shall contact NMFS (Anthony Spina, 562-980-4045) immediately if one or more steelhead are found dead or injured. The purposes of the contact shall be to review the activities resulting in take, to determine if additional protective measures are required, and to discuss handling procedures for injured or dead steelhead.

4. The following terms and conditions implement reasonable and prudent measure #4.

A. Erosion control and (or) sediment-detention devices (e.g., straw bales, silt fencing) shall be installed outside flowing water and at the time of construction within the action area. These devices shall be in place during construction activities, and after if necessary, for minimizing fine sediment and sediment-water slurry input to flowing water. The devices shall be placed at all locations where the likelihood of sediment input exists.

B. Placement of any soil-sediment berm in direct contact with flowing water for the purpose of isolating any workspace from flowing water is prohibited within the action area.

C. When dewatering any area, methods shall be employed to collect then return clear water to the creek or river for avoiding input of sediment-water slurry to flowing water within the action area.

5. The following Terms and Conditions implement Reasonable and Prudent Measure #5.

A. The Corps, or their authorized designee, shall develop and then implement a mutually agreeable (to NMFS and the Corps) written study plan to detect sediment-related effects within instream and estuarine habitats within the action area and remedy the identified effects (note that this plan may be included in the MAMP). This will require the collection of baseline (pre-dam removal) data both upstream and downstream of the reservoir (behind Matilija Dam). The plan shall include (1) a description of the study objectives, (2) a description of the field methods and equipment that will be used to quantify sediment-related effects, (3) proposed locations to monitor channel-bed characteristics, or a suggested protocol that would allow for the random selection of monitoring locations, (4) a clearly defined schedule to guide implementation and field sampling (monitoring)

activities over time and space, (5) a description of the types of actions that will be taken to resolve a particular sediment-related effect, (6) a schedule for resolving effects, whereby the effects shall be remedied within a reasonable period of time, but in no case later than 30 days after the subject effect was detected, and (7) reporting requirements. This plan shall be prepared in collaboration with a qualified quantitative steelhead biologist with prior experience performing studies of steelhead (abundance, distribution, habitat use) within the action area. The Corps shall obtain written NMFS agreement for this plan prior to undertaking activities that are necessary to begin removing Matilija Dam.

6. The following Terms and Conditions implement Reasonable and Prudent Measure #6.

   A. With regard to the Corps' proposal to collaborate with NMFS on the design of the high-flow sediment bypass, this collaboration shall involve working with NMFS for the purpose of designing and then constructing a fish-passage facility or fish-passage capability that will be physically integrated with the high-flow sediment bypass. The fish-passage facility shall be designed, constructed, and operated such that the operation of the bypass shall not interfere with the migration of any adult or juvenile steelhead attempting to migrate over, through, or around the bypass. The Corps shall provide to NMFS engineered design drawings (at 30 %, 60 %, and 90 % completion) of the fish-passage facility and high-flow sediment bypass for review and potential approval. The guidance NMFS provides to the Corps shall be used to make mutually agreeable revisions to the design drawings. The Corps shall obtain written NMFS agreement for the final engineered design drawings for the fish-passage facility and the high-flow sediment bypass prior to undertaking activities that are necessary to begin removing Matilija Dam.

   B. The Corps, or their authorized designee, shall prepare and then implement a mutually agreeable (to NMFS and the Corps) written plan to validate post-construction performance of the high-flow sediment bypass and fish-passage facility, as described in term and condition 6A (note that this plan may be included in the MAMP). The plan shall adopt a specific protocol for validating post-construction performance, and shall include measurement of water depth and velocity within the fish-passage facility over a range of river discharge representing those magnitudes experienced by migrating adult and juvenile steelhead (or measurement of other variables determined by NMFS). The measured values of depth and velocity (or other variables) shall be compared with the migration requirements of adult and juvenile steelhead, and the results of the hydraulic design analyses (i.e., predicted depths and velocities) for the as-built condition. A summary report describing the results of the validation task shall be prepared and then submitted to NMFS (501 W. Ocean Blvd., Suite 4200, Long Beach, California, 90802) no later than 30 days following completion of the validation task. The Corps shall obtain written NMFS agreement for the plan to validate post-construction performance of the high-flow sediment bypass and fish-passage facility or fish-passage capability prior to constructing the high-flow sediment bypass and fish-passage facility.

C. The Corps, or their authorized designee, shall prepare and then implement a mutually agreeable (to NMFS and the Corps) written plan to maintain the high-flow sediment bypass and the fish-passage facility or fish-passage capability, as described in term and condition 6A. The maintenance plan shall ensure long-term maintenance of the fish-passage facility or fish-passage capability and include a clearly defined schedule requiring timely inspection and removal of debris (both sediment and wood). Although an inspection of the subject structure is warranted during wet and dry seasons, greater visit frequency shall be allocated to the wet season (e.g., immediately after rainfall events). To guide field personnel, the plan shall clearly define the type and magnitude of debris requiring removal and the physical methods of removal. The fish-passage facility or fish-passage capability shall be inspected at least once annually for the life of the structure. The inspection shall include visual evaluation of the structure, along with measurements of water depth and velocity, performed similar to those conducted for validation. The Corps shall submit an annual summary report describing the results of the maintenance task to NMFS (501 W. Ocean Blvd., Suite 4200, Long Beach, California, 90802) no later than 30 days following completion of the subject year's maintenance evaluation. The Corps shall obtain written NMFS agreement for this maintenance plan prior to constructing the high-flow sediment bypass.

7. The following Terms and Conditions implement Reasonable and Prudent Measure #7.

A. The Corps, or their authorized designee, shall prepare and then implement a mutually agreeable (to NMFS and the Corps) written plan describing how the new wells at Foster Park will be operated (note that this plan may be included in the MAMP). The plan shall include (1) a description of the operating criteria for the wells, (2) a schedule directing the operation of the wells, (3) the proposed protocol for minimizing reductions in the amount and extent of surface flow due to operation of the wells, (4) the proposed protocol for minimizing effects due to operation of the wells on endangered steelhead and the amount and extent of habitat for this species, (5) a description of the methods that will be used to evaluate whether the actual operation of the wells comports with the operating criteria (#1 above), the schedule (#2), and the protocols for minimizing effects on surface flow and steelhead (#3 and #4), (6) a description of the methods that will be used to assess the effectiveness of the minimization measures (#3 and #4 above), and (7) reporting requirements. This plan shall be prepared in collaboration with a qualified steelhead biologist who has prior experience performing field studies of steelhead (abundance, habitat use, distribution) within the Ventura River watershed. The Corps shall submit this plan to NMFS (501 W. Ocean Blvd., Suite 4200, Long Beach, California, 90802) for review. The Corps shall obtain written NMFS agreement for this plan prior to initiating operation of the subject wells.

B. The Corps, or their authorized designee, shall prepare and then implement a written plan for the purpose of assessing effects of operating the new wells at Foster Park on steelhead and critical habitat for this species in the Ventura River for a period of no less than 12 years following completion of the proposed action.

The plan shall include (1) a proposed protocol to monitoring discharge, (2) a description of the field methods that will be used to quantify steelhead abundance in the Ventura River upstream, adjacent to, and downstream of the new Foster Park wells over time, (3) a description of the field methods that will be used to quantify instream habitat characteristics in the Ventura River upstream, adjacent to, and downstream of the new Foster Park wells over time, (4) a clear description of the methods that will be used to assess effects of operation of the wells on steelhead and critical habitat for this species, (5) identification of the response variables, inferential models, and sample size requirements, (6) a schedule for the field studies, and (7) reporting requirements. This plan shall be prepared by a qualified quantitative steelhead biologist who has prior experience performing field studies of steelhead (abundance, habitat use, distribution), preferably within the Ventura River watershed. The Corps shall submit this plan to NMFS (501 W. Ocean Blvd., Suite 4200, Long Beach, California, 90802) for review. The Corps shall obtain written NMFS agreement for this plan prior to initiating operation of the subject wells.

8. The following Terms and Conditions implement Reasonable and Prudent Measure #8.

   A. With regard to the Corps' program to address uncertainties, the Corps, or their authorized designee, shall prepare and then implement a mutually agreeable (to NMFS and the Corps) written plan to address steelhead related uncertainties (note that this plan may be included in the MAMP). This plan shall be submitted to NMFS (501 W. Ocean Blvd., Suite 4200, Long Beach, California, 90802) for review and comment on the adequacy of the plan. The Corps shall obtain written NMFS agreement for this plan prior to undertaking activities that are necessary to begin removing Matilija Dam.

9. The following Terms and Conditions implement Reasonable and Prudent Measure #9.

   A. The Corps, or their authorized designee, shall prepare and then implement a mutually agreeable (to NMFS and the Corps) written plan to quantify adult and juvenile steelhead abundance, distribution, and use of the habitats within creek reaches (both the north fork and south fork of Matilija Creek) upstream of the former location of Matilija Dam for a period of no less than 8 years (two years dedicated to collection of pre-dam removal data) for the purpose of assessing the benefits the dam-removal project on this species (note that this plan may be included in the MAMP). This plan shall be prepared by a qualified quantitative steelhead biologist who has prior experience performing field studies of steelhead (abundance, distribution, habitat use), preferably in the Ventura River watershed. The selected biologist will consult with NMFS prior to preparing the plan for the purpose of identifying the study elements, objectives, work tasks for inclusion into the plan, and reporting requirements. The Corps will submit this plan to NMFS (501 W. Ocean Blvd., Suite 4200, Long Beach, California, 90802) for review and comment. The selected biologist will make mutually agreeable revisions to the draft plan, based on NMFS' comments on the adequacy of the study plan, to produce the final study plan. The Corps shall obtain written NMFS agreement for this plan prior to undertaking activities that are necessary to begin removing Matilija Dam.

B. The Corps, or their authorized designee, shall prepare and then implement a written plan to quantify steelhead abundance and distribution within the Ventura River watershed for a period of no less than 8 years (two years dedicated to collection of pre-dam removal data) for the purpose of assessing benefits of the dam-removal project on this species. This plan shall be prepared by a qualified quantitative steelhead biologist who has prior experience performing field studies of steelhead (abundance, distribution, habitat use), preferably in the Ventura River watershed. The selected biologist will consult with NMFS prior to preparing the plan for the purpose of identifying the study elements, objectives, work tasks for inclusion into the plan, and reporting requirements. The Corps will submit this plan to NMFS (501 W. Ocean Blvd., Suite 4200, Long Beach, California, 90802) for review and comment. The selected biologist(s) will make mutually agreeable revisions to the draft plan, based on NMFS' comments on the adequacy of the study plan, to produce the final study plan. The Corps shall obtain written NMFS agreement for this plan prior to undertaking activities that are necessary to begin removing Matilija Dam.

10. The following Terms and Conditions implement Reasonable and Prudent Measure #10.

A. The Corps, or their authorized designee, shall provide written evidence to NMFS demonstrating compliance with Term and Conditions 1C.

B. The Corps, or their authorized designee, shall provide a written monitoring report to NMFS (501 W. Ocean Blvd., Suite 4200, Long Beach, California 90802) within 15-working days following completion of any activity that requires the dewatering of a workspace (e.g., bridge replacements, levee improvements, removal of dam debris from the base of the dam or channel restoration). The report shall include the number of steelhead killed or injured during the proposed action and biological monitoring; the number and size of steelhead removed and relocated; any effect of the proposed action on steelhead that was not previously considered (reinitiation of consultation would be required, see section XI (2) of the Biological Opinion); and, photographs taken during, before and after work activity.

C. The Corps, or their authorized designee, shall provide a written report describing results of any project-related revegetation task to NMFS (501 W. Ocean Blvd., Suite 4200, Long Beach, California 90802) within 15-working days following completion of any revegetation effort (e.g., those related to bridge replacements, restoration of the creek channel, bank stabilization). The report shall include a description of the locations planted or seeded, the area (ft^2) revegetated, a plant palette, planting or seeding methods, proposed methods to monitor and maintain the revegetated area, performance or success criteria, and pre- and post-planting color photographs of the revegetated area.

D. The Corps, or their authorized designee, shall provide a written report describing the results of vegetation monitoring to NMFS (501 W. Ocean Blvd., Suite 4200, Long Beach, California 90802) within 15-working days following completion of any vegetation monitoring inspection conducted during fall as required for a particular activity related to the proposed action. The report shall include color photographs taken of the project area during each inspection and before and after implementation of the project, and estimated percent of exposed soil remaining within each area affected by the project.

E. The Corps, or their authorized designee, shall document and notify NMFS of any dispute or problem encountered with achieving compliance with any of the Reasonable and Prudent Measures and Terms and Conditions in this biological opinion. Such notification shall be made to NMFS within a reasonable period of time, but in no case later than ten days after the Corps' discovery of any such problem or dispute.

XI. REINITIATION OF CONSULTATION

This concludes formal Section 7 consultation on the actions outlined in the project proposal. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded, (2) new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered in this opinion, (3) the action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion, or (4) a new species is listed or critical habitat designated that may be affected by the action.. In instances where the amount or extent of incidental take is exceeded, formal consultation shall be reinitiated immediately. As project designs and plans develop, or if key assumptions are found to be invalid, NMFS and the Corps may need to re-initiate section 7 consultation to incorporate new information and re-assess project effects.

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Appendix A

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Figure 3. Matilija Creek looking west 2 miles above Matilija Dam. 2-23-07

Figure 4. Matilija Creek looking southwest 1.5 miles above Matilija Dam. 2-23-07

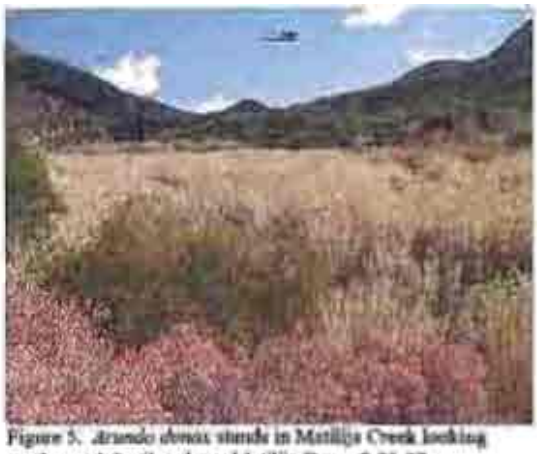

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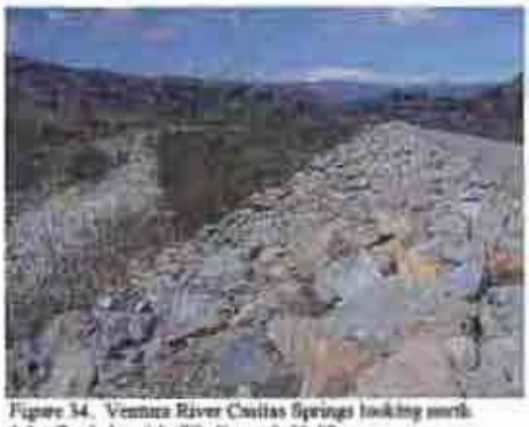
Figure 33. Ventura River Casitas Springs levee looking southeast 9.0 miles below Matilija Dam. 2-06-07



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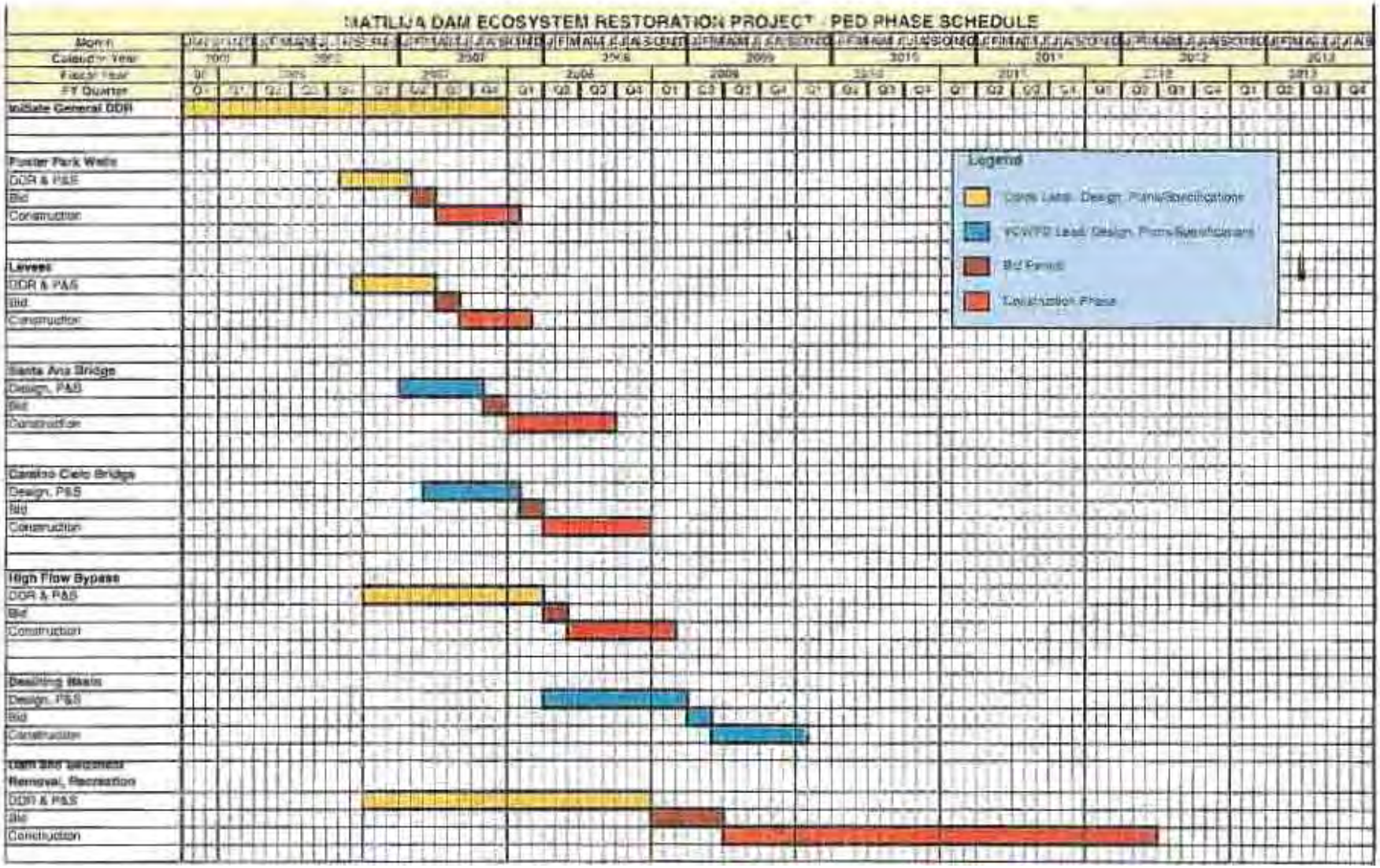
Appendix B

Generalized Schedule for Elements of the Proposed Action


MATILIJA DAM ECOSYSTEM RESTORATION PROJECT - PED PHASE SCHEDULE
Month
Calendar Year
Fiscal Year
FY Quarter
Initiate General DDR
Foster Park Wells
DDR & P&S
Bid
Construction
Levees
DDR & P&S
Bid
Construction
Santa Ana Bridge
Design, P&S
Bid
Construction
Cerritos Cielo Bridge
Design, P&S
Bid
Construction
High Flow Bypass
DDR & P&S
Bid
Construction
Desilting Basin
Design, P&S
Bid
Construction
Legend
Corps Lead, Design, Plans/Specifications
FCWCD Lead, Design, Plans/Specifications
Bid Period
Construction Phase

Appendix C

Aerial Photograph of the Proposed Construction Site on the Ventura River for the High-Flow Sediment Bypass

Present Robles Diversion Dam and location of proposed high flow by-pass
Robles Canal
Sluice Gates

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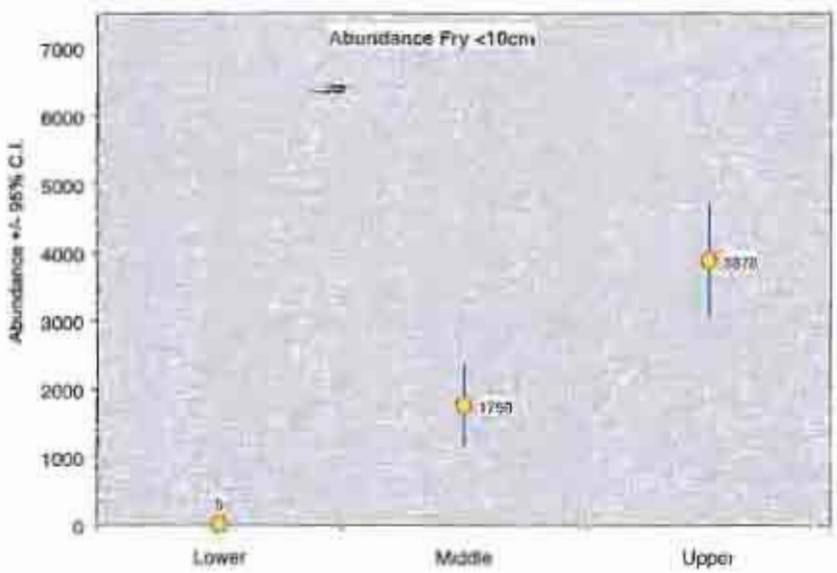
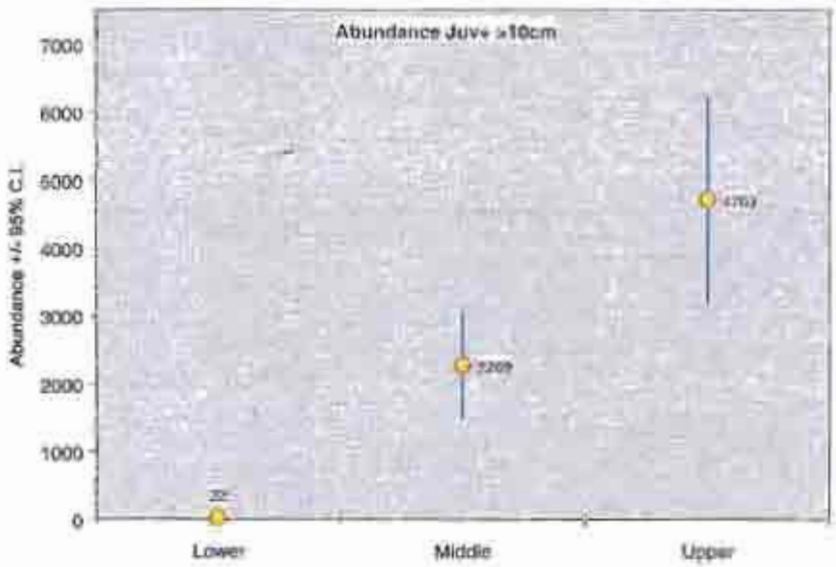
Results of seelhead (*Oncorhynchus mykiss*) abundance surveys performed in Matilija Creek and Ventura River, summer 2006. Provided by M. Allen, Thomas R. Payne & Associates, Arcata, California





Lower = Ventura River from lagoon up to Robles Diversion Dam
Middle = Ventura River from Robles Diversion Dam up to Matilija Dam and Lower NF Matilija Creek up to Wheeler Gorge CG
Upper = Matilija Creek above Matilija Dam and Upper NF Matilija Creek (both to first impassable barriers) - NOT incl Murietta or Old Man Creeks

Appendix E

Photographs of the "Foster Park Reach" of the Mainstem Ventura River, February 8, 2007

Ventura River (looking south from Foster Park Bridge) 2-8-07

Ventura River (looking north 0.25 mile below Foster Park Bridge) 2-8-07

Appendix B

Ojai Valley Area Plan 2008 Amendment

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VENTURA COUNTY GENERAL PLAN

OJAI VALLEY AREA PLAN

Last Amended 02-05-2008

Ventura County Planning Division

VENTURA COUNTY GENERAL PLAN

OJAI VALLEY AREA PLAN

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VENTURA COUNTY GENERAL PLAN

OJAI VALLEY AREA PLAN

Adopted by the Ventura County Board of Supervisors - July 18, 1995

Amended - December 10, 1996

Amended – October 28, 1997

Amended - July 13, 1999

Amended - November 19, 1999
(S.O.A.R. Election - March 7, 2000/Effective - April 7, 2000)

Amended – November 15, 2005

Amended – February 5, 2008

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Introduction

History

The first Area Plan governing the Ojai Valley was part of the Land Use Element of the General Plan for Ventura County and was adopted in 1963.

In March, 1977, the Board of Supervisors adopted an Emergency Ordinance to restrict subdivisions in the Ojai Valley because questions were raised regarding the cumulative impacts on air quality, traffic and water supply. They established a technical task force to prepare a report on the status of services and the quality of the physical environment in the Valley. In conjunction with that effort, County staff began work on the Ojai Valley Area Plan, which was subsequently adopted by the Board of Supervisors on August 14, 1979.

In 1988, during discussions regarding the comprehensive update to the Countywide General Plan, the Board of Supervisors directed County staff to "revisit" the Ojai Valley Area Plan.

Purpose

In general, the purpose of an Area Plan is to specify the distribution, location, types and intensity of land uses within a prescribed area, as well as provide specific policies concerning development in that area.

The specific purposes for updating the 1979 Ojai Valley Area Plan were to:

1. Update the Plan's technical information and goals, policies and programs in light of changing conditions;
2. Ensure that Area Plan policies are consistent with Countywide General Plan goals, policies and programs; and
3. Reformat the Area Plan to be consistent with other County Area Plans.

The planning area of the Ojai Valley Area Plan encompasses approximately 74,000 acres and is generally bound on the north by the Nordhoff Ridge, on the south by the Sulphur Mountain ridgeline, on the east by the mountain ridge between Bear Canyon and Santa Paula Canyon and on the west by the Lake Casitas/Ventura River watershed boundary. Parcel lines, which most closely match those identified geographic features, have been used as the actual boundaries in order to avoid the splitting of land use designations and zoning of parcels.

Due to staff vacancies, work on the update did not begin until July 3, 1990 when the Board of Supervisors adopted a Resolution of Intention directing staff to proceed with processing of a General Plan Amendment to update the Ojai Valley Area Plan.

Process

County staff began work on updating the Ojai Valley Area Plan by preparing a Background Report (separate document) which was completed in June, 1991. In order to provide for input from the citizens of the Ojai Valley, an Area Plan Advisory Committee was formed consisting of six representatives from District 1, appointed by Supervisor Lacey, and three representatives and one alternate from District 3, appointed by Supervisor Kildee. From July, 1991 through February, 1993 the committee held public meetings at which time they formulated goals, policies, programs and land use maps of the draft Ojai Valley Area Plan.

On February 8, 1993, the Ojai Valley Area Plan Advisory Committee preliminarily approved the draft Ojai Valley Area Plan, and on December 12, 1994, made its final recommendation to the County Planning Commission and Board of Supervisors. The Ojai Valley Area Plan was subsequently adopted by the Board of Supervisors on July 18, 1995.

Relationship To Other County General Plan Elements

The Ventura County General Plan is the plan by which the unincorporated portions of Ventura County will develop in the future. The County General Plan is divided into four chapters which

encompass the State-mandated General Plan elements. In addition to the general goals, policies and programs contained in these four chapters, portions of the unincorporated area of Ventura County are governed by more detailed land use plans (area plans) designed to reflect the needs and desires of those individual communities. The Ojai Valley Area Plan is the detailed land use plan of the Ventura County General Plan for the Ojai and Ventura River Valley areas. It should be noted that words in *italics* in the Area Plan are defined in its glossary or in the General Plan Goals, Policies and Programs volume.

State law also mandates that all elements of a general plan be consistent with one another. To achieve this consistency, the goals, policies and programs and maps of the Ventura County General Plan were reviewed and used in drafting this Area Plan. The goals, policies and programs of this Area Plan supplement those goals, policies and programs of the Countywide General Plan.

Overall Committee Goals For The Ojai Valley Area Plan Update

This Area Plan was developed in public meetings over a period of two years by a 10-member citizen's advisory committee. The following overall goal statements were used by the committee in drafting the Ojai Valley Area Plan:

A. The primary goals of the committee are to preserve and protect the character of the Ojai Valley and ensure and maintain the quality of life for its residents. These goals can only be met by ensuring that population densities, land uses, and development are consistent with the appropriate utilization of existing valley resources. The committee intends to protect and maintain a healthful and attractive environment for the inhabitants of the study area.

B. The character of the Ojai Valley is defined by its rural, small town qualities containing many natural and cultural resources, and framed by its commercial agricultural and open space lands which provide for scenic views and vistas. The committee, in establishing this list of goals, expressly recognizes that with respect to its most important resources, particularly air quality, transportation and water, the study area is at, nearing, or exceeding the limits of its resources. The recommendations of the committee, both as to general and specific goals, must be viewed in that context.

C. The committee recognizes that although the Ojai Valley comprises several distinct and diverse neighborhoods, it is one valley-wide community, wherein everyone shares a common air basin, road system, sources of water supply, etc.

The specific recommendations made by the committee with respect to the Plan were governed by the following general goals:

1. Ensure that the type, rate, amount and location of both the population and economic growth do not compromise the public health and safety (e.g. air quality, water quality, geologic, fire and flood hazards), nor exceed the Valley's ability to provide adequate public facilities and services (e.g., roads, sewers, water supply, parks, trails and schools).

2. Ensure that any future development within the study area is of high quality, consistent with the character of the Ojai Valley and beneficial to the community as a whole.

3. Within the limitations of the resources found within the study area, it is important to ensure that land uses are planned and managed to foster a healthy commercial and economic base.

4. Promote adequate housing opportunities by ensuring, to the extent possible, that a diversity of housing types for all segments of the population are provided.

5. Protect and preserve the continued viability of commercial agriculture within the study area.

6. Ensure that adequate and efficient public facilities and services (e.g., roads, sewers, water supply, parks, trails, public transportation, police, fire and schools) are provided to serve the existing and future residents of the Valley and that these facilities be sized and located in a manner which does not, in and of itself, induce and promote growth.

7. Utilize a common unified approach to land use planning and provide and enhance mechanisms for decision-making by area residents. The fiscal and political feasibility of a single valley-wide governmental entity should be explored.

8. Prevent the degradation of the Ojai Valley airshed from developments which are site specific sources of air pollution, specifically including a dump site in Weldon Canyon or elsewhere affecting the Ojai Valley airshed, whether privately or publicly owned and operated.

Definitions

The goals, policies and programs contained in this Area Plan express the intent of the Board of Supervisors, with input from the community and those governmental agencies responsible for providing services to the area. Goals, policies and programs are defined below:

Goal - The ultimate purpose of the County's effort stated in a way that is general in nature. Example: "Discourage further land divisions of large parcels that are presently in agricultural production or those that are suitable for agriculture."

Policy- A specific statement guiding day-to-day actions and implying clear commitment to carry out the goals of the General Plan in a prescribed manner. Example: "Land outside the existing urban area which is primarily in agricultural use shall be designated Open Space."

Program- A coordinated set of actions to carry out the goals of the plan. Example: "Special economic programs that aid agriculture, (e.g. the Land Conservation Act), will be preserved and promoted."

***-** An asterisk (*) next to a program means that particular program will not be pursued until the budgetary constraints affecting the County are relieved and the Planning Division is given direction by the Board of Supervisors to proceed with the program.

The goals, policies and programs are divided into four major sections as follows:

1. **Resources**
2. **Hazards**
3. **Land Use**
4. **Public Facilities And Services**

Overall Goals For The Ojai Valley Area Plan

The following goals establish the overall framework for the Ojai Valley Area Plan:

A. The primary goals of the Ojai Valley Area Plan are to preserve and protect the character of the Ojai Valley and ensure and maintain the quality of life for its residents. These goals can only be met by ensuring that population densities, land uses, and *development* are consistent with the appropriate utilization of existing valley resources. The Plan has been written to protect and maintain a healthful and attractive environment for the inhabitants of the study area.

B. The character of the Ojai Valley is defined by its rural, small town qualities containing many natural and cultural resources, and framed by its commercial agricultural and open space lands which provide for scenic views and vistas. This Area Plan expressly recognizes that with respect to its most important resources, particularly air quality, transportation and water, the Ojai Valley is at, nearing or exceeding the limits of its resources. The recommendations of the Area Plan, both as to general and specific goals, must be viewed in that context.

C. This Area Plan recognizes that although the Ojai Valley comprises several distinct and diverse neighborhoods, it is one valley-wide community, wherein everyone shares a common air basin, road system, sources of water supply, etc.

Figure 1
Vicinity Map

1. Resources

1.1 Air Quality

1.1.1 Goals

1. Promote a level of air quality which protects the public health, safety and welfare and seeks to meet or surpass State and Federal primary and secondary standards.
2. Control oil and gas exploration/development, landfills and other industrial development which are site specific sources of air pollution by imposing conditions in order to move toward achieving State and Federal mandated air quality standards.
3. Promote public transportation with the intent of improving air quality.
4. Promote the development of alternative energy sources, with the intent of improving air quality, which are not deemed to cause other significant environmental impacts.

1.1.2 Policies

1. *Discretionary development* in the *Ojai Valley* shall be found to have a significant adverse impact on the regional air quality if daily emissions would be greater than 5 pounds per day of Reactive Organic Compounds (ROC) and/or greater than 5 pounds per day of Nitrogen Oxides (NOx).

1.1.3 Programs

*1. The Planning Division will prepare a program proposal for the Board of Supervisors' consideration to re-examine and lower the current pace of *development* in the *Ojai Valley* concurrent with the next update of the VCOG population, dwelling unit and employment forecasts.

*2. To the extent the methodology exists or can reasonably be determined, the Planning Division will prepare a program proposal for the Board of Supervisors' consideration to regulate the pace of commercial and industrial development.

3. South Coast Area Transit (SCAT) should provide public transit service both intra-valley and inter-city with particular emphasis on providing for senior and disabled persons and increasing service for commuters desiring to take public transit to and from work.

*4. The Planning Division will prepare a budgetary proposal for the preparation of a brochure to promote the use of alternative energy sources.

5. The Planning Division will amend the County Initial Study Guidelines so that the Ventura River Municipal Advisory Council and the City of Ojai will have review authority over all projects in the Ojai Valley Airshed that emit more than 5 lbs./day of NOx and/or ROC.

1.2 Water Resources

1.2.1 Goals

1. Ensure that water which currently meets State standards shall not be degraded and ensure that water quality which does not meet State standards is improved.

1.2.2 Policies

1. New *development* that generates sewage in *aquifer recharge areas* shall be required to comply with the County Sewer Policy.

* See Page 4

2. Existing homes and businesses with private sewage disposal systems that function improperly shall be required to make necessary modifications or to convert to a sewer system in compliance with the County Sewer Policy.
3. New oil and gas exploration and production activity shall not significantly affect the quality or quantity of the water supply.
4. *Discretionary development* which has the potential to deposit a significant amount of sedimentation, oil residue or other urban pollutants into the surface water drainage system shall be conditioned as appropriate, to require retention basins and oily water separators so that at least the first inch of rainfall from any one storm is retained within the project, in order that contaminants from urban runoff do not significantly impact downstream surface water quality and biological resources. The control devices used in the oily separators shall be properly maintained for the life of the authorized use.

1.2.3 Programs

1. The Casitas Municipal Water District, in coordination with the Ojai Groundwater Basin Management Agency, should investigate the *conjunctive use of water*, giving full consideration to all affected beneficial uses of water, including in-stream and out-of-stream beneficial uses.

*2. The Ventura County Flood Control District, Public Works Agency-Water Resources Division and Planning Division, City of Ojai, City of Ventura, water and sewer districts within the *Ojai Valley*, and appropriate Federal and State agencies should explore the development of a comprehensive watershed management study to address the full spectrum of water quantity and quality issues of the Ventura River system.

3. The Agricultural Department will continue to encourage the use of alternatives to chemical methods of pest control and fertilization.

1.3 Mineral Resources

1.3.1 Goals

1. Ensure that mineral extraction is conducted in a manner which is least impacting to the environment and the public's health, safety and welfare.
2. Ensure compatibility between oil and gas exploration and production and neighboring land uses.

1.3.2 Policies

1. Oil and gas exploration and production permits shall utilize "Best Available Control Technology" (BACT), as outlined by *APCD* Rules and Regulations.
2. Gases emitted from all oil and gas wells shall be collected and used or removed for sale or proper disposal, if feasible. Flaring or venting should only be allowed in cases of emergency or for testing purposes.
3. Electrically powered oil and gas exploration and production equipment shall be used where practical to alleviate pollution from internal combustion engines.
4. If it is determined there would be a significant visual impact created or if visible from a public road or publically owned land, oil and gas production sites shall be landscaped in accordance with an approved landscape plan.
5. Exploration activities for oil and gas shall be conditioned to require the restoration and revegetation of the site if the exploration does not result in oil and gas production facilities.

* See Page 4

6. Drill sites that would be silhouetted on a prominent ridge as illustrated by the Scenic Resource Protection Overlay Zone on Figure 2 (Resource Map), shall not be permitted.
7. No refining facilities shall be permitted within the *Ojai Valley*.
8. All *discretionary development* permits for oil and gas exploration and production shall be kept to a minimum size and area.
9. As existing oil and gas exploration and production permits are modified or come up for renewal, they shall be conditioned so that drilling and production will be subject to current policies, standards and conditions.

1.3.3 Programs

1. Conditions applied to *conditional use permits* for oil and gas exploration and development will be enforced to the maximum extent feasible in order to protect the health and welfare of the citizens and the character of the *Ojai Valley*.

1.4 Biological Resources

1.4.1 Goals

1. Protect significant *biological resources* within the *Ojai Valley* in order to maintain natural ecosystems and also preserve the natural beauty of the area.
2. Balance the preservation of *wetland habitats* with the need to adequately protect public safety and property from flooding hazards.
3. Recognize the role of fire in local ecosystems by supporting controlled burns and other fire prevention measures.

1.4.2 Policies

1. A biological field reconnaissance report detailing the composition of species at the site, the presence of *rare, threatened, endangered* or candidate plant or animal species, significant *wetlands, locally important plant communities*, and suitable mitigation measures shall be prepared by the County's biological consultant as part of the environmental assessment of all *discretionary development* permits involving earth movement or construction on previously undeveloped land where the natural vegetation still exists.
2. The California Department of Fish and Game, the U.S. Fish and Wildlife Service, the National Audubon Society, the California Native Plant Society and the Los Padres National Forest shall be contacted during the initial 30-day project review period for *discretionary development* proposals when proposals are submitted which may adversely affect the *biological resources* under their purview. This policy does not apply to *emergency permits*.
3. *Discretionary development* shall be located to avoid loss or damage to protected trees as defined in the County's Tree Protection Ordinance. Removal of protected trees shall only occur after review of the necessity of such removal, and in accordance with the provisions of the County's Tree Protection Ordinance.
4. Required revegetation or landscaping plans shall incorporate *indigenous plant species* where feasible in order to restore habitat in already disturbed areas.
5. Proposed *discretionary development* shall be coordinated with affected agencies that regulate water courses and wetland habitats early in the planning stages so as to ensure that appropriate mitigation measures and the concerns of these agencies are adequately addressed, including protection of anadromous fish habitat.
6. *Discretionary development* within *high fire hazard areas* shall be reviewed with attention to the environmental impact of required brush clearance to *biological resources*, particularly on *moderate* to *steep slopes*. Brush clearance that reduces fuel volumes while allowing the selective retention of native shrubs a minimum of 20 feet apart should be encouraged, as permitted by the Ventura County Fire Protection District.

7. *Discretionary development* which would result in a significant adverse impact to a *Locally Important Plant Community* shall be required to replace such *Locally Important Plant Community* proposed for removal on at least a 1:1 basis and will be required to monitor the success of such planting for a minimum of seven years. In lieu of replacement, developers may dedicate without compensation, acreage containing such *Locally Important Plant Community* to a government agency or non-profit organization (e.g., a homeowners' association, a land conservancy) provided such entity will provide assurances that the dedicated *Locally Important Plant Community* acreage will be retained in a permanent undeveloped state. Such dedicated lands shall be at least two times the acreage of the *Locally Important Plant Community* which is proposed for removal. The form of such dedication may be fee title, conservation easement or other instrument approved by the County.

8. *Discretionary development* within 300 feet of the Ventura River, Coyote Creek, San Antonio Creek/Reeves Creek and Lion Canyon Creek, or located within the Sensitive Biological Resources Area (as illustrated on Figure 2) shall be reviewed to determine the potential for interference with *wildlife migration* opportunities and potential for impact on *"Endangered", "Threatened", "Rare*" or "*Locally Important*" species and communities. Projects which would result in significant adverse impacts to such resources shall be denied unless they can be mitigated to a less-than-significant level or a statement of overriding considerations is adopted by the decision-making body per CEQA requirements.

1.4.3 Programs

1. The U.S. Forest Service is encouraged to monitor and protect sensitive species, including the Ojai Fritillary. Appropriate resource management efforts to protect the Ojai Fritillary might include realignment of the Gridley Springs hiking trail and/or the transplanting of specimens to minimize the risk of extirpation of this species.

2. For any proposed Highway 33 improvements between Sulphur Mountain Road and Canada Larga Road, CALTRANS is encouraged to incorporate appropriate *wildlife migration* mitigation measures, such as underpasses or other means that will allow safe movement of wildlife between the Ventura River corridor and the Sulphur Mountain area.

1.5 Farmland Resources

1.5.1 Goals

1. Preserve agricultural land as a resource and economic benefit to the Ojai Valley.

2. Discourage the expansion of Rural and Existing Community designations into the East Ojai and Upper Ojai Valleys.

3. Minimize land use incompatibilities between agricultural operations and other land uses.

1.5.2 Policies

1. *Discretionary*, non-agricultural land uses adjacent to agricultural operations shall be required to establish appropriate buffers.

2. Land outside the Existing Community and Rural designated areas which is primarily in agricultural use shall be designated Open Space.

1.5.3 Programs

**1. The Planning Division will prepare a budgetary proposal to develop a brochure on the County's Right to Farm Ordinance in order to increase public awareness of the ordinance.

2. Special economic programs that aid agriculture (e.g., *Land Conservation Act*) should be preserved and promoted.

* See Page 4

1.6 Scenic Resources

1.6.1 Goals

1. Preserve and protect the significant visual quality and aesthetic beauty of the *Ojai Valley* which includes, but is not limited to, surrounding mountains, hills, and ridgelines, arroyos, barrancas and protected trees.
2. Preserve the scenic view of State, Federal and local park land in and around the *Ojai Valley.*
3. Ensure that *discretionary development* on or near ridgelines minimizes impacts from grading activities in order to preserve the natural beauty of the area.
4. Discourage the proliferation of antenna and satellite dish facilities from developing on ridgelines.

1.6.2 Policies

1. *Discretionary development*/grading which will significantly degrade or destroy a scenic view or vista from public roads or publicly-owned land shall be prohibited, unless the development/grading is a public project, or a private project for which there is a substantial public benefit, and overriding considerations are adopted by the decision-making body.
2. The area within 400 feet (horizontal) of prominent ridgelines as shown in Figure 2 shall be zoned "Scenic Resource Protection Overlay" in order to ensure that visual impacts of grading and attendant structures are minimized to the maximum extent feasible. *Discretionary development* shall be located and designed to minimize visibility and silhouetting against the skyline as viewed from nearby public roads, and shall incorporate as many of the following planning techniques as feasible:
   a. Limit construction to single-story structures on or near ridgelines;
   b. Utilize large building pad setbacks (50 feet or more) from the edge of a ridgeline;
   c. Utilize berms and landscaping to soften the visual impact of homes and graded areas;
   d. Utilize raised foundations, split-level designs, roof materials consisting of clay or concrete plate tile with a natural color, and other techniques to fit the home to the hillside terrain, and to minimize the amount of grading equired.
3. *Discretionary development* for antenna and satellite dish facilities shall be prohibited unless public need has been adequately demonstrated. When it can be demonstrated that antenna and/or satellite dish facilities are necessary for public safety or to provide a substantial public benefit, they shall be conditioned to minimize visual impacts to the maximum extent feasible. The following standards shall apply:
   a. Such facilities shall be colored to blend in with the background view and shall utilize landscaping which is consistent with the natural character of the area to screen or soften the visual impact of such facilities.
   b. The height of such facilities, with the exception of monopole whiptype antennas, shall be limited to 40 feet where technically feasible. Several shorter facilities are preferable to one larger facility.
   c. New facilities shall be avoided when feasible if there is available capacity on existing antenna facilities.
   d. Visual impacts of ancillary facilities (e.g., power lines, cables, equipment buildings) shall be taken into consideration in the conditioning of antenna facilities.
   e. *Discretionary development* permits for antenna facilities shall be reviewed by the Planning Division at least once every ten years. The purpose of such review is to ascertain whether there have been significant changes in antenna technology which

would allow replacement of existing apparatus with smaller or less visually intrusive equipment.

f. Abandoned or unused antenna equipment shall be removed.

4. As a result of *any discretionary development*, the reshaping of the natural terrain to permit access and construction shall be kept to the absolute minimum. Where possible, improvements shall be designed to conform to the terrain rather than the reverse and shall comply with the following:

   a. Transition Design: The angle of the graded slope shall be gradually adjusted to the angle of the natural terrain.

   b. Angular Forms: Angular forms shall generally not be permitted. The graded form shall reflect the natural rounded terrain, unless exposed rock faces can be used as a desirable visual element.

   c. Exposed Slopes: Graded slopes shall be concealed by landscaping, berms or other measures.

   d. The toe and crest of all cut and fill slopes in excess of five feet vertical height shall be rounded with vertical curves.

   e. Where cut or fill slopes exceed 100 feet in horizontal length, the horizontal contours of the slope shall be curved in a continuous, undulating fashion in conformance with natural slopes.

   f. Where cut and fill slopes in excess of five feet in height are created, detailed landscape and irrigation plans shall be submitted to and approved by the Planning Division and Public Works Agency prior to the issuance of any grading permit, conditional use permit or building permit. The plan will be reviewed for type and density of ground cover, seed-mix, hydromulch mix, plant sizes and irrigation systems.

5. *Discretionary development* on parcels containing protected trees as defined in the County's Tree Protection Ordinance, shall design necessary grading to ensure the survival and health of all such trees, except those which have been expressly authorized for removal or encroachment into the protected zone. These trees shall be protected from grading activities. If a permit has been issued for encroachment into the protected zone, the grading plan shall be accompanied by details for retaining walls and drainage devices prepared by a landscape architect.

6. A sign program shall be submitted concurrently with a *discretionary development* permit for all commercial and industrial development. Freestanding off-site advertising signs shall be prohibited. All on-site freestanding signs shall be limited to five feet in height.

7. Cut or fill slopes for *discretionary development* which exceed a vertical height of 25 feet shall be subject to a Planning Commission hearing.

1.6.3 Programs

*1. The Planning Division will prepare a budgetary proposal, for the Board of Supervisors' consideration, to develop ministerial ridgeline development standards which will regulate the height, shape and color of structures built on or near prominent ridge lines. Once these standards are adopted, the requirement for a Conditional Use Permit will be removed from properties zoned Scenic Resource Protection Overlay Zone outside of the Lake Casitas Resource Protection area. After the Planning Division prepares the proposal and before action is taken by the Board of Supervisors, a citizen's committee will convene for the purpose of reviewing and commenting on the proposal.

* See Page 4

1.7 Cultural Resources

1.7.1 Goals

1. Preserve and protect the unique *cultural resources* within the *Ojai Valley*.
2. Ensure the utilization of proper archaeological research and assistance to precede future development so as to prevent the loss or destruction of significant *archaeological* and *historic resources*.
3. Encourage the maintenance and use of facilities and organizations, (such as libraries, museums, historical societies and schools), which provides an understanding of the history and diversity of cultures in the *Ojai Valley* and surrounding areas.

1.7.2 Policies

1. All *discretionary development* permits involving construction or earth movement within the *Ojai Valley* shall be reviewed by the County's designated archaeological resource review organization.
   a. Whenever such *discretionary development* requires a field reconnaissance study, such study shall be conducted by a County approved archaeologist to determine the potential for surface or subsurface cultural remains.
   b. A *qualified archaeological monitor* shall be present to monitor significant trenching or earth movement at any such site if deemed to be needed by the study. If the archaeological monitor is not a Native American and Native American cultural resources are found at the site, then a Native American monitor shall be required.
   c. In the event that artifacts of historical or archaeological significance are uncovered, the *qualified archaeological monitor* shall be empowered to halt construction in the immediate vicinity of such unearthed artifacts until disposition of the site has been determined by the County Planning Division.
2. All structures and/or sites designated, or being considered for designation as County Historical Landmarks within the *Ojai Valley* shall be preserved or appropriately salvaged, when deemed reasonable by the permitting authority, as a condition of *discretionary development*. All costs of preservation/salvage shall be borne by the developer. An appropriate marker shall be placed on the site to describe the historical significance of the structure, site or event.

1.7.3 Programs

1. The Planning Division will review the County's list of qualified archaeological monitors every five years.

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2. Hazards

2.1 Geotechnical Hazards

2.1.1 Goals

1. Minimize the risk of loss of life, injury, damage to property, and economic and social dislocations resulting from seismic and geological hazards.

2.1.2 Policies

1. Developers shall provide all necessary information relative to seismic and geologic hazards which may affect their project. The developer shall specify how they intend to alleviate any and all identified hazards.
2. *Discretionary development* shall be prohibited in seismic and geologic hazard areas (as identified during the environmental review process) where such hazards cannot be mitigated to less-than-significant levels.

2.2 Flood Hazards

2.2.1 Goals

1. Minimize the risk of loss of life, injury, damage to property, and economic and social dislocations resulting from flood hazards.

2.2.2 Policies

1. New *development* shall be protected from flood hazards and shall not adversely affect the flood carrying capacity of the area of Special Flood Hazard, as provided for in the Flood Plain Management Ordinance.
2. Subdivisions of land within the 100 year floodplain of the Ventura River shall be prohibited until flood control facilities to protect the area from the 100-year flood are constructed by the Ventura County Flood Control District (VCFCD) or others.

2.2.3 Programs

1. The County Sheriff's Department Office of Emergency Services, in coordination with the Ventura County Flood Control District and the Casitas Municipal Water District, will maintain and update as necessary an emergency warning and evacuation plan to protect affected residents in the event of failure or spill-over of either the Matilija Dam or the Casitas Dam.

2.3 Fire Hazards

2.3.1 Goals

1. Minimize the risk of loss of life, injury, damage to property, and economic and social dislocations resulting from fire hazards.
2. Ensure that development in "*high*" and *"very high" fire hazard areas* provides adequate protection of life and property.
3. Support controlled burn programs and other fire prevention measures.

2.3.2 Policies

1. *Discretionary development* permits shall be conditioned to provide adequate water and access for fire fighting purposes as determined by the Fire Protection District. Adequate access and fire flow improvements shall be completed prior to combustible construction.
2. All roads shall meet or exceed the standards of the Fire Protection District.

3. *Discretionary development* in "*high*" and "*very high" fire hazard areas*, as determined by the Ventura County Fire Protection District shall be required to develop landscape plans utilizing fire retardant plant material, cleared areas, or other acceptable means of reducing fire hazards consistent with Fire Protection District standards.
4. A Fire Protection District approved *fuel modification zone* (fuel break) of at least 100 linear feet shall be provided around all combustible structures located in *"high"* or *"very high" fire hazard areas*.
5. Fire-retardant roofing materials shall be required for new construction in *"high"* and *"very high" fire hazard areas.*

2.3.3 Programs

1. The Fire Protection District, in cooperation with the Los Padres National Forest Service, will continue control burn programs as necessary.
2. The Ventura County Fire Protection District should continue the fire hazard management (including enforcement of brush clearance requirements) program within the *Ojai Valley*.
3. [*] The Ventura County Fire Protection District should prepare, for the Board of Supervisors' consideration, a budgetary proposal to upgrade the Oak View Fire Station.

2.4 Noise Hazards

2.4.1 Goals

1. Provide for a quiet environment within the *Ojai Valley* through proper land use planning and permit conditioning.
2. Separate and/or buffer *noise sensitive uses* from noise generating uses.

2.4.2 Policies

1. *Discretionary development* which would create significant noise impacts shall not be permitted to locate near residences and other *noise sensitive uses* (dwellings, schools, hospitals, nursing homes, churches and libraries) unless the impact is mitigated to an insignificant level, as defined in Section 2.16.2.1(4) of the Countywide General Plan.
2. *Noise sensitive uses* shall be buffered from excessive road noise by either the placement of walls or berms, the establishment of setbacks, greenbelts and appropriate speed limits, installation of double glazed windows, or other appropriate means.
3. Mufflers shall be used on all heavy construction equipment used in conjunction with *discretionary development* and equipment used in oil/gas exploration and production activities.

2.4.3 Programs

1. The Ventura River Valley Municipal Advisory Council (or successor group) will continue to review all *discretionary* projects within its review boundaries that could generate significant noise impacts affecting the *Ojai Valley*.

[*] See Page 4

3. Land Use

3.1 General Land Use

3.1.1 Goals

1. Maintain the existing rural, small town character of the *Ojai Valley*.
2. Locate new *development* primarily within the existing urban communities and rural residential areas in order to avoid encroaching into established agricultural operations and undeveloped open space lands, and to minimize environmental degradation.
3. Ensure that future *discretionary development* within the study area is of high quality, consistent with the character of the *Ojai Valley*, and beneficial to the community as a whole.
4. Ensure that there are adequate public facilities and services available to serve the needs of the present and future residents of the *Ojai Valley* before additional growth is allowed to occur.
5. Promote the annexation of property located within the Ojai *Sphere of Influence* to the City of Ojai, in accordance with the County's *Guidelines for Orderly Development*.
6. Establish zoning and land use designations within the City of Ojai's *Sphere of Influence* to reflect existing parcel sizes and uses so that future *discretionary development* requests would be required to annex and develop under the auspices of the City.

3.1.2 Policies

1. All zoning shall be in conformance with the Land Use Maps (Figures 3, 4, 5 and 6) and Zoning Compatibility Matrix (Figure 7). A Summary Table (Figure 8) lists each land use designation and its total area, building intensity, population capacity, and population density.
2. Outward expansion of the boundaries of the Existing Community areas, as delineated on Figures 4, 5 and 6, shall be prohibited.
3. All *discretionary development* projects shall be reviewed and conditioned to ensure that they are compatible with their surroundings, are of high quality and good design, are consistent with the character of the *Ojai Valley*, and are beneficial to the community as a whole.
4. *Discretionary development* shall be required to demonstrate that there are adequate public facilities and services available to serve the needs of the proposed development.
5. Property owners requesting a *discretionary* permit in conjunction with existing *development* (e.g. a modification to an existing CUP or PD) within the City of Ojai's *Sphere of Influence* shall be encouraged to request annexation to the City of Ojai prior to consideration of their request by the County.
6. The following annexation policies shall apply to all requests for subdivisions of land and all requests for *discretionary development* permits which would result in new uses on land designated Existing Community or Rural within the Ojai *Sphere of Influence*:
   a. Owners of property contiguous and legally annexable to the City of Ojai shall be required to request annexation to the City prior to consideration by the County of any subdivision of land or request for new *discretionary development*. Such subdivisions and *discretionary development* requests shall not be accepted by the County unless an application for annexation has been denied by the City or the *Local Agency Formation Commission (LAFCO).*
   b. Owners of property not contiguous and legally annexable to the City shall be required to record an *agreement to annex* when such property becomes legally annexable, as a

condition of any subdivision or new *discretionary development* approved by the County. This agreement to annex shall contain language that is binding on all future owners of the property.

3.1.3 Programs

1. The City of Ojai will be requested by the Planning Division to process *discretionary* permits concurrently with any request for annexation.

*2. The Planning Division will prepare a budgetary proposal to develop, with suitable public input, a set of guidelines that will ensure that *discretionary development* projects are compatible with their surroundings, are of high quality and good design, are consistent with the character of the *Ojai Valley* and beneficial to the community as a whole. The general parameters of these guidelines have been included as Appendix "A" of the Ojai Valley Area Plan.

3. The Planning Division will prepare, on behalf of the Board of Supervisors, a request to LAFCO to amend the existing city Sphere of Influence line in the area north of El Roblar and west of Highway 33 in the Existing Community of Meiners Oaks.

3.2 Open Space

3.2.1 Goals

1. Preserve the undeveloped lands which surround and frame the urban and rural communities of the *Ojai Valley* as a means of retaining the existing natural, scenic resources of the area.

2. Preserve agricultural lands as a valuable resource in the *Ojai Valley*.

3. Prevent *development* from occurring in areas where it would exceed the ability to provide public facilities and services.

3.2.2 Policies

1. Open Space designated parcels shall be zoned in conformance with the Land Use Map (Figure 3) and Zoning Compatibility Matrix (Figure 7) which have been developed in accordance with the above goals. Within the Open Space designation, there are four subcategories, each with a different minimum parcel size. The minimum parcel size for the OS 10 subcategory is 10 acres, OS 20 is 20 acres, OS 40 is 40 acres and OS 80 is 80 acres.

2. The Open Space designation shall be used to define the boundaries of the Existing Community and Rural designated areas, in order to prevent urban sprawl and to promote the efficient use of public facilities and services by confining the areas of *development*.

3. All *discretionary development* that would have a significant unavoidable impact on agricultural operations in Open Space designated lands shall be prohibited unless a statement of overriding considerations is adopted by the decision-making body.

3.2.3 Programs

1. The County will continue to support the work of the Ojai Valley Land Conservancy, the Ventura County Agricultural Land Trust and Conservancy and other similar preservation organizations that might acquire and maintain "Public Open Space" lands within the *Ojai Valley*.

* See Page 4

3.3 Rural Institutional

3.3.1 Goals

1. Recognize the camps and educational uses in the *Ojai Valley* that require large acreage and are set in a rural environment.

3.3.2 Policies

1. Rural institutional development shall be zoned in conformance with the Land Use Maps (Figures 4, 5 and 6) and Zoning Compatibility Matrix (Figure 7) that have been developed in accordance with the above goal.
2. The principal uses allowed in the Rural Institutional designation shall be camps and educational facilities. Other permitted uses include those uses which are found to be necessary to maintain the principal use, or other accessory uses that are customarily incidental, but subordinate to the principal permitted use.
3. The minimum parcel size consistent with the Rural Institutional land use designation is 20 acres.

3.4 Rural Residential

3.4.1 Goals

1. Recognize and plan for low density, large lot (2 to 10 acres in size) residential development and other compatible and ancillary land uses in a rural setting.
2. Provide a transitional land use designation to buffer agricultural and open space lands from the more densely developed urban areas.

3.4.2 Policies

1. Rural Residential designated parcels shall be zoned in conformance with the Land Use Maps (Figures 4, 5 and 6) and Zoning Compatibility Matrix (Figure 7) that have been developed in accordance with the above goals. Within the Rural Residential designation there are two subcategories, each with a different minimum parcel size. The minimum parcel size for the RR 2 subcategory is 2 acres and RR 5 is 5 acres.
2. Minimum parcel size consistent with the Rural Residential land use designation for residential parcels is 2 to 10 acres.

3.5 Urban Residential

3.5.1 Goals

1. Ensure that existing and future Urban Residential land use patterns result in cohesive and consolidated neighborhoods.
2. Promote adequate housing opportunities by ensuring, to the extent possible, that a diversity of housing types for all segments of the population is provided.
3. Provide housing opportunities affordable to people of all income levels.
4. Encourage the use of the “R-P-D” zone on undeveloped parcels of five acres in size or larger which are designated Urban Residential, except in situations of in-fill development where it would not result in a cohesive, consolidated neighborhood.
5. Improve the condition of existing substandard housing and housing otherwise in need of rehabilitation.

3.5.2 Policies

1. Urban Residential designated parcels shall be zoned in conformance with the Land Use Maps (Figures 4, 5 and 6) and Zoning Compatibility Matrix (Figure 7) that have been

developed in accordance with the above goals. Within the Urban Residential designation there are five subcategories, each with a different density limitation. The density range permitted in the UR 1-2 subcategory is 1 to 2 DU/acre, UR 2-4 is 2 to 4 DU/acre, UR 4-6 is 4 to 6 DU/acre, UR 6-10 is 6 to 10 DU/acre and UR 10-20 is 10 to 20 DU/acre.

2. New residential *discretionary development* shall be conditioned so as to be compatible with its surroundings and to maintain the character of the *Ojai Valley*.

3.5.3 Programs

1. The Area Housing Authority will continue to administer the HOME improvement program (funded by Community Development Block Grants) to provide low interest loans, deferred payment loans and grants to qualified low income home owners within the *Ojai Valley* for the purpose of rehabilitating substandard or deteriorated housing.
2. The Planning Division will investigate ways to provide preferential treatment to affordable housing projects on the Ojai Valley Clean Air Ordinance waiting lists.

3.6 Commercial

3.6.1 Goals

1. Provide commercially designated property to meet the convenience shopping and service needs of the residents of the *Ojai Valley*.
2. Locate and design commercial land uses so as to minimize land use incompatibility with urban and rural residential, open space and agricultural land uses.
3. Discourage the expansion of strip commercial development.

3.6.2 Policies

1. Commercially designated parcels shall be zoned in conformance with the Land Use Map (Figures 4, 5 and 6) and Zoning Compatibility Matrix (Figure 7) which have been developed in accordance with the above goals.
2. *Discretionary development* in Commercial designated areas shall be subject to either a *Planned Development* or a *Conditional Use Permit* to assure compatibility with neighboring land uses. Such review shall give careful attention to landscaping, signage, access, site and building design and size, drainage, on-site parking and circulation, operating hours, fencing and mitigation of nuisance factors.

3.7 Industrial

3.7.1 Goals

1. Recognize the current industrial uses within the Ojai Valley.
2. Provide for industrial uses that are sensitive to the environment and to re-enforce the need to conserve local resources.
3. Locate and design industrial land uses so as to minimize land use incompatibilities with urban and rural residential, open space and agricultural uses, and to minimize aesthetic impacts.

3.7.2 Policies

1. Industrially designated parcels shall be zoned in conformance with the Land Use Maps (Figures 4, 5 and 6) and Zoning Compatibility Matrix (Figure 7) which have been developed in accordance with the above goals.
2. *Discretionary development* in Industrial designated areas shall be subject to either a *Planned Development* or *Conditional Use Permit* to assure compatibility with neighboring uses. Such review shall give careful attention to aesthetics, landscaping, signage, access, site and building design and size, drainage, on-site parking and circulation, operating hours, fencing and mitigation of nuisance factors.
3. Expansion of “M-2” and “M-3” zoning shall be prohibited.

Figure 2
Resources Map

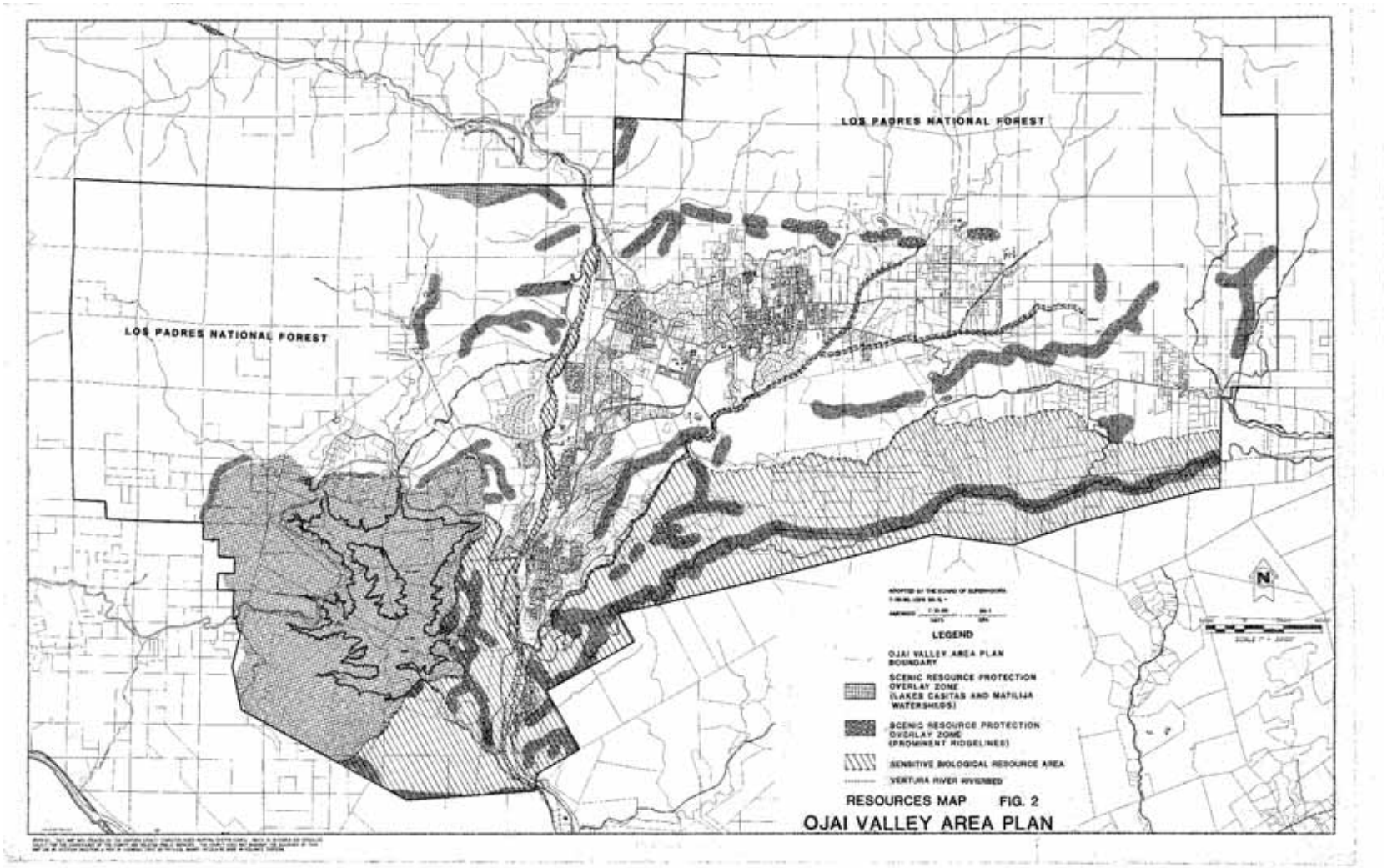

Figure 3
Land Use Map Open Space

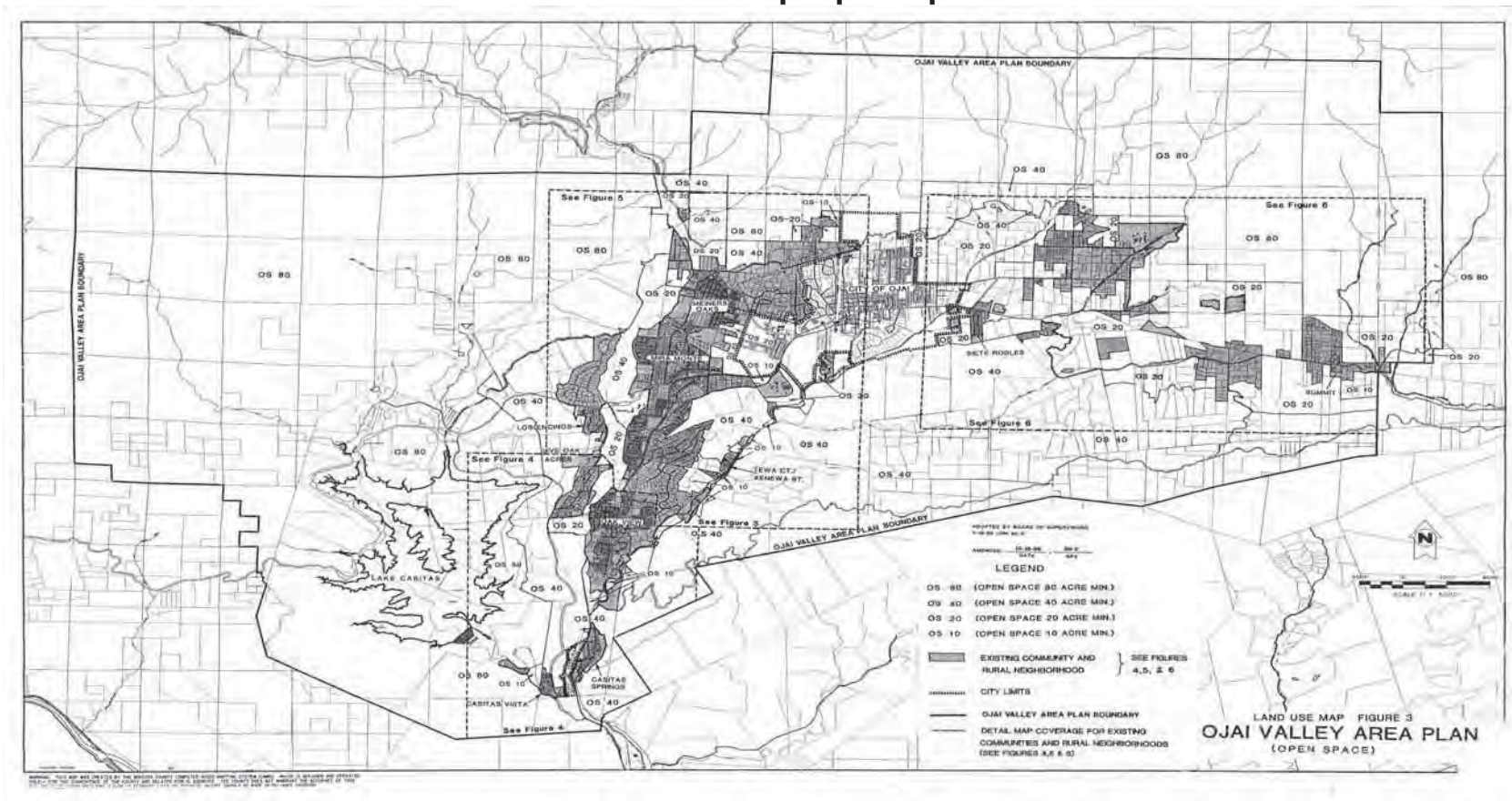

Figure 4
Land Use Map
Oak View, Casitas Springs, Live Oak Acres and Vicinity

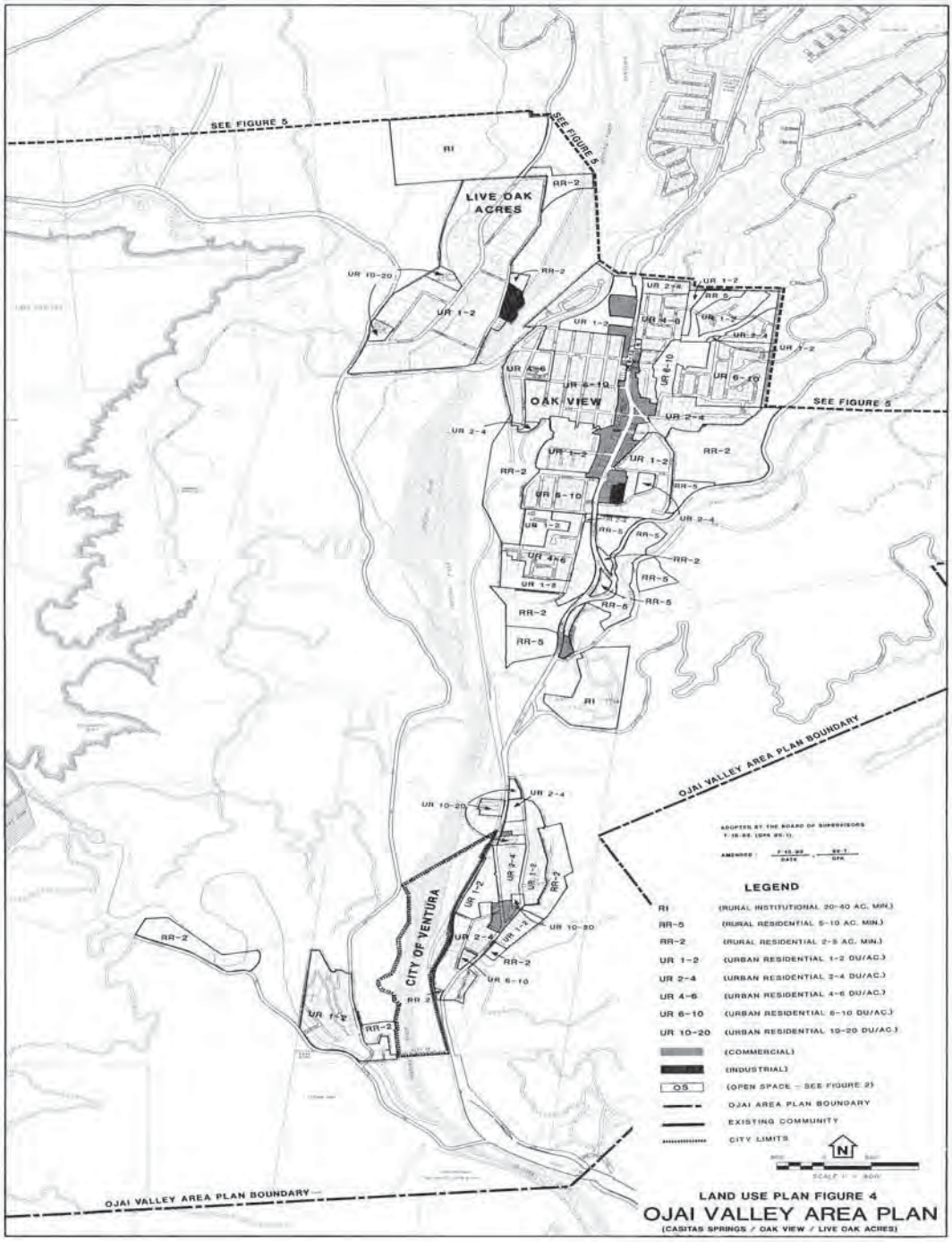

Figure 5
Land Use Map
Mira Monte, Meiners Oaks and Vicinity

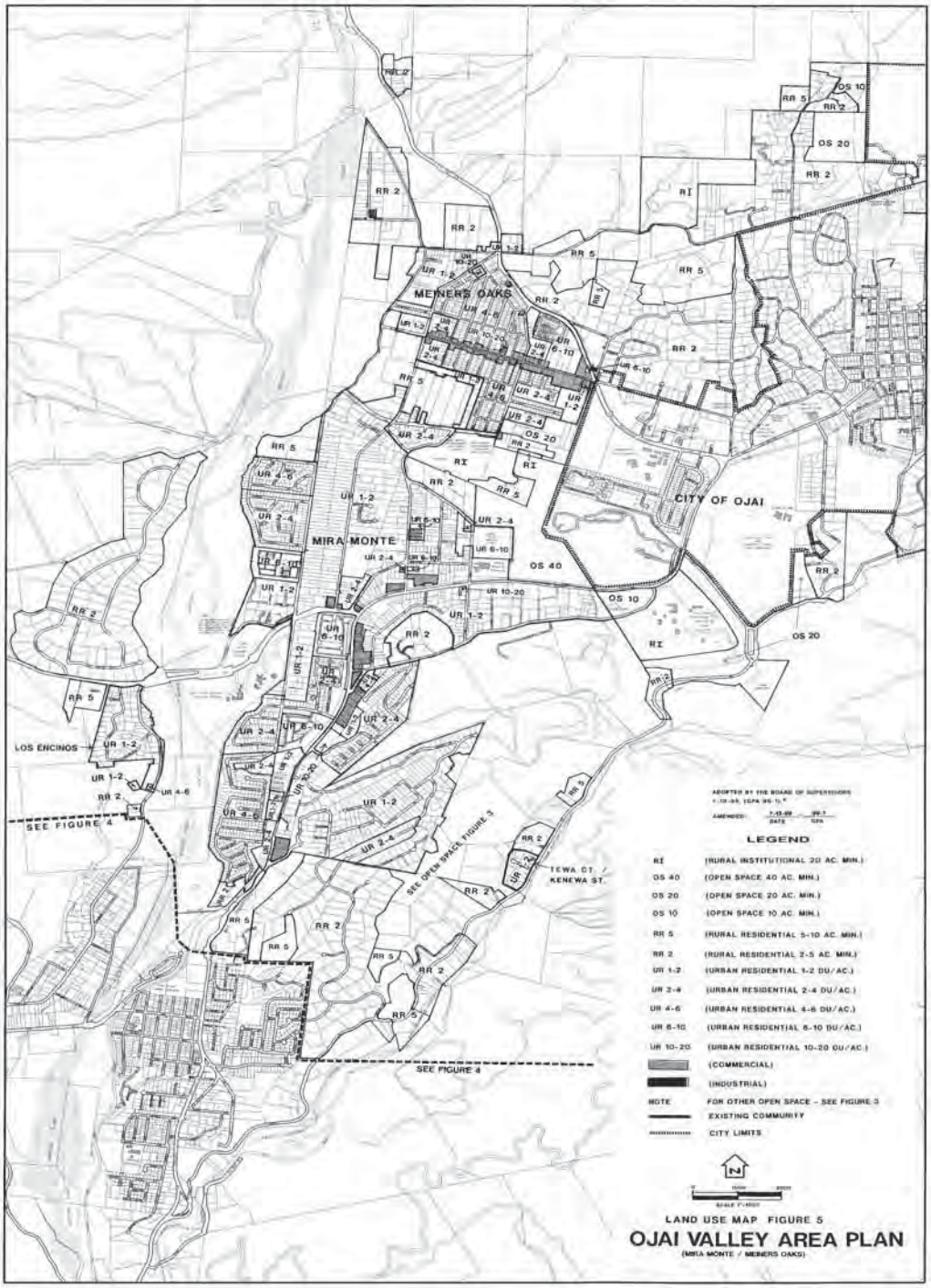

Figure 6
Land Use Map
East Ojai Valley, Summit and Vicinity

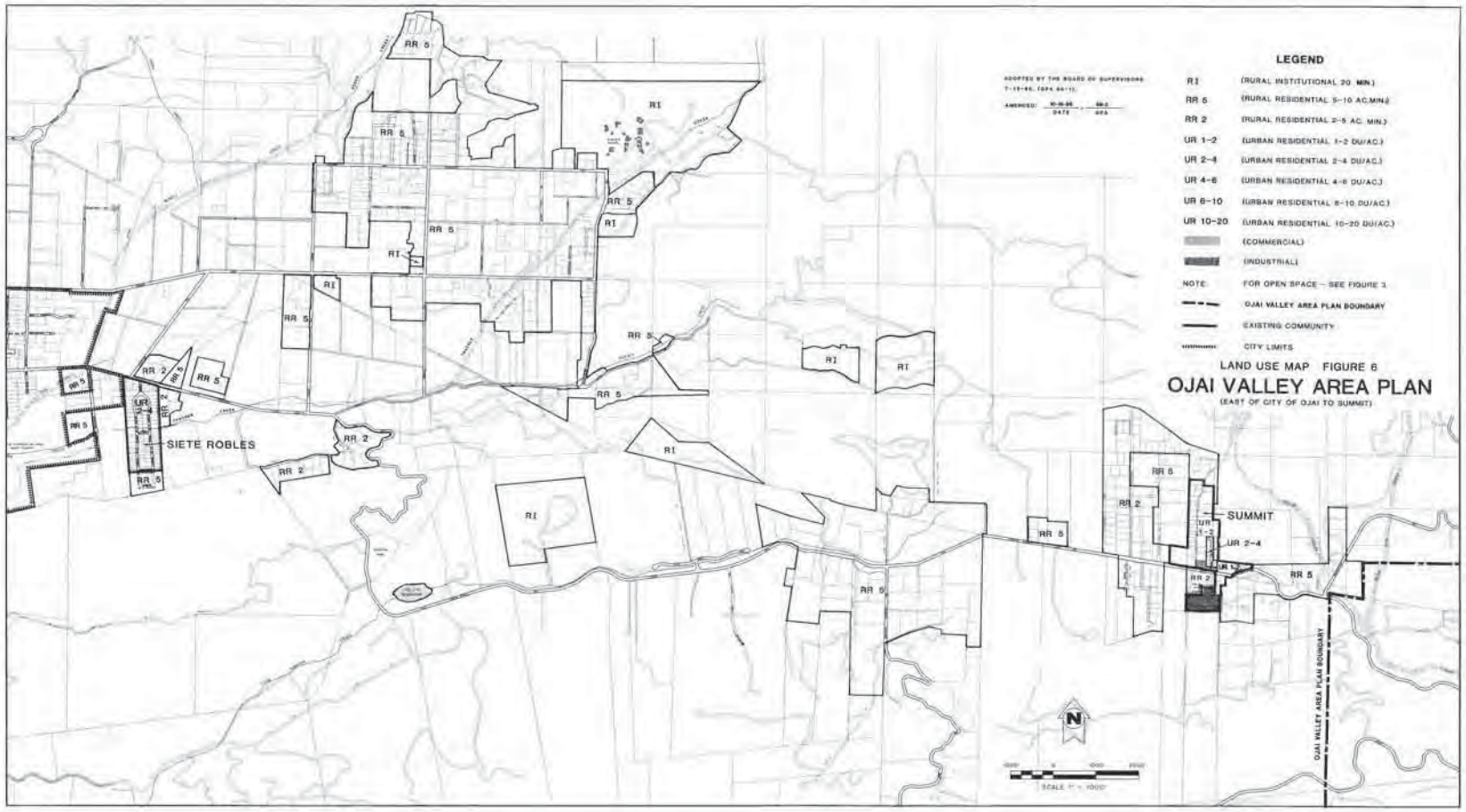

Figure 7
Zoning Compatibility Matrix

AREA PLAN MAP LAND USE DESIGNATIONS		ZONES O-S (10 AC. Min.)	A-E (40 AC. Min.)	R-A (1 AC. Min.)	R-E (10,000 S.F. Min.)	R-O (20,000 S.F. Min.)	R-1 (6,000 S.F. Min.	R-2 (3.500 S.F./DU)	R-P-D	S-P	T-P	C-O	C-1	C-P-D	M-1	M-2	M-3
OS 80	**(Open Space 80 Acre Min.)**	80 AC	80 AC														
OS 40	**(Open Space 40 Acre Min.)**	40 AC															
OS 20	**(Open Space 20 Acre Min.)**	20 AC															
OS 10	**(Open Space 10 Acre Min.)**																
R 1	**(Rural Institutional 20 Ac. Min.)**			20 AC	20 AC												
RR 5	**(Rural Residential 5-10 Ac. Min.)**			5 AC	5 AC	5 AC											
RR 2	**(Rural Residential 2-5 Ac. Min.)**			2 AC	2 AC	2 AC											
UR 1-2	**(Urban Residential 1-2 DU/Ac.)**			*	20		20		2 U								
UR 2-4	**(Urban Residential 2-4 DU/Ac.)**						10		4 U								
UR 4-6	**(Urban Residential 4-6 DU/Ac.)**								6 U								
UR 6-10	**(Urban Residential 6-10 DU/Ac.)**								10 U								
UR 10-20	**(Urban Residential 10-20 DU/Ac.)**								20 U								
COM	**(Commercial)**																
IND	**(Industrial)**															**	**

Not compatible with Plan

Compatible with Plan

X U — Compatible only with zone suffix equal to or more restrictive than that shown in circle.

X AC = X acre minimum lot size

X = X thousand square feet minimum lot size

X U = X units per acre maximum

A. 7-13-99

* Applies to those parcels zoned "R-A" as of 7/18/95

** Only compatible within parcels zoned "M-2" and "M-3" as of 7/18/95

Figure 8
Building Intensity/Population Density Standards Table

Open Space/Residential

Designation		Net Acres	Max. Bldg. Coverage (% Of Lot Area)	Maximum Intensity (DU/AC)[1]	Dwelling Units	Average Pop/DU[2]	Population	Average Population Density (Persons/Acre)
OS 80	(80 Ac. Min.)	42,198	5%[3]	0.013	143[5]	2.51	359[5]	0.03
OS 40	(40 Ac. Min.)	14,490	5%[3]	0.025	362	2.51	908	0.06
OS 20	(20 Ac. Min.)	6,690	5%[3]	0.05	335	2.51	841	0.12
OS 10	(10 Ac. Min.)	467	5%[3]	0.1	47	2.51	118	0.25
RI	(20 Ac. Min.)	966	25%	N/A	N/A	N/A	N/A	N/A
RR 5	(5-10 Ac. Min.)	2,039	25%[4]	0.2	408	2.51	1,024	0.50
RR 2	(2-5 Ac. Min.)	1,504	25%[4]	0.5	752	2.51	1,888	1.22
UR 1-2	(1-2 DU/Ac.)	1,223	28%[4]	2.0	2,446	2.43	5,943	4.86
UR 2-4	(2-4 DU/Ac.)	349	35%[4]	4.0	1,396	2.43	3,392	9.72
UR 4-6	(4-6 DU/Ac.)	137	45%[4]	6.0	822	2.43	1,997	14.47
UR 6-10	(6-10 DU/Ac.)	269	50%[4]	10.0	2,690	2.43	6,537	24.30
UR 10-20	(10-20 DU/Ac.)	94	60%	20.0	1,880	2.43	4,568	48.60
TOTALS		70,426			11,281		27,575	

Commercial/Industrial

Designation	Net Acres	Max. Bldg. Coverage (% Of Lot Area)	Projected Floor Area (X 1,000 SF)	Average Number Of Employees Per 1,000 SF	Employees	Average Number Of Employees/Acre
C-Commercial	99	60%	633	2.0	1,266	13.0
I-Industrial	25	50%	218	2.0	436	17.4
TOTALS	124		851		1,702	

Footnotes

[1] Excludes second dwelling units.
[2] Year 2010 Forecast for Ojai Growth and Nongrowth Areas.
[3] Excludes structures used for growing plants such as greenhouses, hothouses, and agricultural shade/mist structures, but includes structures used for preliminary packing, storage and preservation of produce and similar structures. For nonconforming lots of less than 10 acres in area, maximum *building coverage* shall be 2,500 square feet, plus 1 square foot for each 22.334 square feet of lot area over 5,000 square feet. Greater building coverage may be allowed under discretionary permits for Farmworker Housing Complexes and may be allowed on non-conforming lots by discretionary permits for existing uses listed in the zoning ordinance under the heading of “Crop and Orchard Production”.
[4] For nonconforming lots of less than one acre in area, maximum *building coverage* shall be as specified, or 2,500 square feet, plus 1 square foot of building area for each 4.596 square feet of lot area over 5,000 square feet, whichever is greater.
[5] Projection adjusted to reflect 74% (31,249 acres) of OS-80 designation is owned by US government and thus will not be developed with housing.
N/A = Not Applicable

4. Public Facilities And Services

4.1 Transportation And Circulation

4.1.1 Goals

1. Promote a safe road system throughout the *Ojai Valley* without encouraging population growth and development.
2. Encourage alternatives to single occupancy motor vehicle trips by promoting carpools, vanpools and expanded bus service.
3. Encourage the expansion of the Ojai Valley Trail.

4.1.2 Policies

1. The County Road Standards and Five-Year Capital Improvement Programs shall be consistent with the goals, policies and programs of the Area Plan.
2. For the area covered by this plan, the minimum acceptable *Level of Service (LOS)* for road segments and intersections within the *Regional Road Network* and *Local Road Network* shall be as follows:
   a. *LOS - 'D'* for all *County thoroughfares* and *State highways* within the unincorporated area of the County, except as otherwise provided in Subparagraph (b);
   b. *LOS - 'E'* for Highway 33 between the end of the freeway and the City of Ojai;
   c. *LOS - 'C'* for all *County maintained local roads*; and
   d. The *LOS* prescribed by the City of Ojai's General Plan for all city thoroughfares and city-maintained local roads located within that city, if the city has formally adopted policies (similar to Policies 4.1.2-2 through 4) respecting *discretionary development* in the city that would affect the *LOS* of *County thoroughfares, County-maintained local roads*, and *State highways* within the unincorporated area of the County.

   At any intersection between two roads, each of which has prescribed minimum acceptable *LOS*, the lower *LOS* of the two shall be the minimum acceptable *LOS* for that intersection.
3. Area Plan land use designation changes, zone changes and *discretionary development* shall be evaluated for individual and cumulative impacts on existing and future roads, with special emphasis on the following:
   a. Whether they would cause existing roads within the *Regional Road Network* or *Local Road Network* that are currently functioning at an acceptable *LOS* to function below an acceptable *LOS*;
   b. Whether they would worsen traffic conditions on existing roads within the *Regional Road Network* that are currently functioning below an acceptable *LOS*; and
   c. Whether they could cause future roads planned for addition to the *Regional Road Network* or the *Local Road Network* to function below an acceptable *LOS*.
4. Area Plan land use designation changes, zone changes and *discretionary development* that would individually or cumulatively cause any of the impacts identified in subparagraphs (a) through (c) of Policy 4.1.2-3 (above) shall be prohibited unless feasible mitigation measures are adopted that would ensure that the impact does not occur or unless a project completion schedule and full funding commitment for road improvements are adopted that ensure that the impact will be eliminated within a reasonable period of time. This policy does not apply to *city thoroughfares*, city-maintained *local roads,* or *Federal or State highways* located within the city unless the City of Ojai has formally adopted General Plan policies, ordinances, or a reciprocal agreement with the County (similar to Policies 4.1.2-2 through 4.2.2-4) respecting *development* in the city that would affect the *LOS* of the *County*

thoroughfares, County-maintained *local roads*, and *Federal and State highways* located within the unincorporated area of the County. Exceptions to the prohibitions of this policy include the following:

a. Farmworker Housing Complexes, Affordable Housing development per Article 16 of the Non-Coastal Zoning Ordinance, and other housing exclusively for *lower-income* households, where such developments are served by roads that are currently operating at LOS"E" or better.

b. Additional dwellings and lots on Cultural Heritage Sites as permitted in the Non-Coastal Zoning Ordinance.

c. Agriculture and Agricultural Operations as permitted in the Coastal and Non-Coastal Zoning Ordinances, where such developments are served by roads that are currently operating at LOS"E" or better.

5. Highway 33 shall be limited to two lanes between Oak View and the City of Ojai. Highway 33 south of Oak View shall be limited to as few lanes as necessary to accommodate the traffic projected to occur under the City of Ojai General Plan and this Area Plan at the prescribed *LOS* in Policy 4.1.2-2 above. Highway 33 shall not be constructed to *freeway* standards.

6. All public roads within the *Ojai Valley* shall be maintained and improved in a manner which preserves their scenic qualities.

4.1.3 Programs

1. In order to improve circulation both within the City of Ojai and valley-wide, increased cooperation and communication between CALTRANS, the City of Ojai and the County Public Works Agency should be established.

2. CALTRANS should install modifications such as traffic signals, turn lanes and pedestrian crossing facilities on Highway 33 from Foster Park to the city of Ojai as needed and where feasible, to achieve a safer highway for both motorists and pedestrians. To determine where the installation of such modifications should occur, a traffic study should be conducted by the County Public Works Agency. The study should include a travel time/intersection analysis and implementation strategies.

3. Without expanding the road beyond two lanes, CALTRANS should provide an acceptable and safe level of service on Highway 150 for motorists, pedestrians, bicyclists and equestrians through modifications such as lane widening, curve alterations and bridge improvements where necessary and feasible.

4. A modification to Highway 33 is needed in the vicinity of Casitas Springs to improve pedestrian and motor vehicle safety and to allow for an improved sense of community in Casitas Springs. Funding and construction of a Casitas Springs by-pass should only be undertaken after a thorough and complete consideration of all alternatives, including but not limited to, cuplets, pedestrian overcrossings and stoplights. Analysis of alternatives should include the following considerations:

   a. there should be minimal intrusion upon adjoining property owners and residents,

   b. safety and not traffic flow should be the primary concern, and

   c. a thorough discussion of all issues related to the proposed project should be presented in a public forum to the citizens of Casitas Springs.

5. The Ojai Valley Trail will continue to be maintained and should be extended where possible.

6. The County Public Works Agency will meet with CALTRANS officials to discuss the establishment of a restriction on truck traffic on the Highway 33 corridor during peak traffic hours.

4.2 Water Supply And Distribution

4.2.1 Goals

1. Ensure that new *development* does not exceed water resources available to the *Ojai Valley*.
2. Ensure the employment of water conservation measures in new construction and encourage water conservation practices in agricultural, municipal, industrial and recreational uses and in existing *development*.
3. Encourage the safe use of *reclaimed water* for irrigation, agriculture, wetland enhancement and stream flow maintenance and such other uses as are applicable.

4.2.2 Policies

1. New *discretionary development* shall be required to *retrofit* existing plumbing fixtures or provide other means so as not to add any net increased demand on the existing water supply. This policy shall be applicable until such time as a groundwater basin study is completed and it is found that the available groundwater, or other sources of water, could adequately provide for cumulative demand without creating an overdraft situation.
2. *Discretionary development* shall be conditioned to utilize all feasible water conservation techniques.

4.2.3 Programs

1. The County Public Works Agency, in coordination with the Ojai Groundwater Basin Management Agency, City of Ventura and water purveyors within the *Ojai Valley*, should work to establish a data base on actual available groundwater supply, projected use factors for all types of *development* and threshold limits for *development* within available water resources.
2. The Casitas Municipal Water District, the other water purveyors within the *Ojai Valley* and the City of Ojai should adopt a policy similar to Policy 4.2.2-1 above.
3. The Agriculture Department will discourage inefficient irrigation methods in agriculture including *flood or furrow irrigation*. Conservation, such as the goal of 80% distribution uniformity and irrigation efficiency, as currently encouraged by the Casitas Municipal Water District, will be encouraged.
4. The Casitas Municipal Water District should continue to explore the concept of the importation of State water.
5. [*] The Water Resources Division of the County Public Works Agency, in conjunction with the appropriate water agency, should investigate the groundwater availability of the Upper Ventura River Groundwater Basin and the Upper Ojai Groundwater Basin.
6. The Casitas Municipal Water District and other water purveyors should promote water conservation through the implementation of a tiered rate structure, and through participation and implementation of their own water conservation program.

4.3 Waste Treatment And Disposal Facilities

4.3.1 Goals

1. Ensure that sewage lines are constructed to serve all existing and future *development* in the unincorporated urban neighborhoods of the *Ojai Valley*, and are sized so as not to facilitate future *development* outside of the unincorporated urban neighborhoods.
2. Encourage practices that reduce the volume of waste disposed of in landfills.

[*] See Page 4

4.3.2 Policies

1. *Discretionary development* within the service boundaries of the Ojai Valley Sanitation District shall either connect directly to the existing sewer system or install necessary off-site pipelines to connect with the sewer system.
2. Private septic systems outside of the Ojai Valley Sanitation District boundaries shall be installed and regulated in accordance with the County Environmental Health Division regulations.
3. *Discretionary development* shall be encouraged to employ practices that reduce the quantities of wastes generated and shall be requested to engage in recycling activities.

4.4 Flood Control And Drainage Facilities

4.4.1 Goals

1. Provide and adequately maintain flood control and drainage facilities as necessary for the protection of life and property.

4.4.2 Policies

(There are no supplemental policies regarding this issue.)

4.4.3 Programs

1. The Ventura County Flood Control District (VCFCD) should continue to monitor, clean and adequately maintain the existing drainage channels and storm drain system within the *Ojai Valley*.
2. The VCFCD will actively investigate and pursue all available sources of funding for flood control improvements and maintenance such as bond issues, state grants and borrowed funds.

4.5 Public Safety

4.5.1 Goals

1. Provide for the protection of the public through effective law enforcement, fire protection and paramedic programs.
2. Prohibit *development* in areas where either emergency access or adequate water supplies for fire fighting purposes cannot be provided.

4.5.2 Policies

1. *Discretionary development* shall comply with the requirements of the Fire Protection District and Sheriff's Department by providing adequate access for fire, law enforcement, emergency equipment and personnel, and evacuation.
2. Adequate water supplies and delivery system for fire fighting purposes shall be required to serve any *discretionary development* in accordance with the standards of the Fire Protection District.

4.5.3 Programs

1. Crime prevention programs such as "Neighborhood Watch" and the "Senior Patrol" will continue to be encouraged by the County Sheriff's Department.
2. The County Sheriff's Department will work with the local schools, both public and private, in providing anti-drug, anti-gang and other anti-crime programs.
3. The hospitals and school districts should continue to provide CPR training programs to local residents.

4.6 Education

4.6.1 Goals

1. Ensure a quality education for the children of the Ojai Valley.
2. Promote the multiple use of school facilities.

4.6.2 Policies

1. All *development* projects shall comply with the school districts' impact mitigation fee programs as prescribed by State law.
2. In order to ensure adequate school facilities, general plan amendments and/or zone changes for *development* which would increase the numbers of school aged children shall not be approved, unless the applicant enters into a binding agreement with the affected school district to fully mitigate the project's impact.

4.6.3 Programs

1. The County Planning Division will coordinate an exchange of information with the Ojai Unified School District and the Ventura Unified School District regarding school needs and new residential *development*.
2. The Ojai Unified School District, the Ventura Unified School District and private schools throughout the valley, should make school facilities available during off-school hours for community meeting space, recreational programs and other compatible functions.

4.7 Parks And Recreation

4.7.1 Goals

1. Ensure that the recreational needs of existing and future residents throughout the *Ojai Valley* are adequately provided for.
2. Fully utilize existing county, city and school district park and recreational facilities and encourage the acquisition and development of new park and recreation facilities.
3. Protect existing trails and encourage the development of new bicycle and hiking/equestrian trails.
4. Ensure that recreational uses in sensitive Open Space areas preserve natural resources in balance with the provision of opportunities for the use and enjoyment of those resources.

4.7.2 Policies

1. *Discretionary development* near existing trails shall be conditioned to mitigate or avoid adverse impacts to the existing trail system.
2. *Discretionary development* permits which may be expected to benefit from or contribute to the need for the trails system shall be conditioned to dedicate and improve, or pay a fee for, planned trails and public trail access points and install appropriate signs to the standards of the County of Ventura and the National Forest Service.
3. Limited expansion of recreational facilities at Lake Casitas and other recreational areas within the *Ojai Valley* shall be encouraged, consistent with the open space character of the area.

4.7.3 Programs

1. Service clubs, civic groups and individuals who wish to coordinate or provide recreational programs in the *Ojai Valley* will be encouraged to do so.
2. The County General Services Agency will work with the City of Ojai, local civic groups and public and private schools throughout the *Ojai Valley* in order to establish cooperative

agreements for use of each other's facilities to provide the best possible service for all residents of the *Ojai Valley*.

3. The County Trails Advisory Committee, in cooperation with the General Services Agency, City of Ojai and National Forest Service will develop a master plan of proposed bicycle and hiking/equestrian trails.
4. The County General Services Agency and the City of Ojai should plan for at least 180 acres of additional local park facilities. Funding for this park acquisition should come from Quimby Fees, development dedications and other sources which may be available to the City and the County.
5. The County General Services Agency and the City of Ojai should jointly investigate the potential for formation of a new park district for the *Ojai Valley* in order to more equitably spread the cost of providing recreational services to the entire Ojai Valley.
6. To fund an expanded local parks program, the County and the City of Ojai should consider a Special Tax or other means to permanently support local and regional park and recreational services within the *Ojai Valley*.

4.8 Governmental Organization

4.8.1 Goals

1. Provide opportunities for the citizens of the *Ojai Valley* to take an active role in determining community affairs.
2. Maintain the governmental mechanisms used to communicate the residents' needs and desires to their elected representatives.
3. Encourage the study of local governmental options available to the citizens of the *Ojai Valley*.

4.8.2 Policies

1. The Ventura River Valley Municipal Advisory Council (VRVMAC) or successor group shall continue to be the Board of Supervisors' recognized public review group for all projects which fall within its review boundaries. All applications for *discretionary development* and all environmental documents for projects which would affect the *Ojai Valley* shall be reviewed by the VRVMAC or successor group.
2. All County departments shall make an effort to notify the VRVMAC (or successor group), concerning issues and programs of importance to the *Ojai Valley* area prior to decisions being made regarding these matters.

4.8.3 Programs

1. The County Planning Division will continue to coordinate an information exchange with the City of Ojai to ensure that each is informed of proposed projects that could affect the other jurisdiction.
2. The County will work with the Ojai Valley Unified Local Government Options Study Committee in order to provide adequate information for the residents of the *Ojai Valley* to make a knowledgeable decision regarding future incorporation options.
3. The members of the Board of Supervisors representing the *Ojai Valley* should explore reconstituting the VRVMAC to cover the entire planning area.

Glossary

Unless the context requires otherwise, the definitions of words and terms provided in this section as well as the Goals, Policies and Programs volume of the County General Plan, shall be used in interpreting this Plan.

Agreement to Annex: A binding agreement, officially recorded with the deed of a property, in which the owners of a property, and all heirs and successors, give their permission to allow their property to be annexed to the City of Ojai at such time as the City wishes to carry out annexation.

Aquifer Recharge Area: Streambeds, spreading grounds, aquifer outcrops which are areas where the aquifer is exposed at the ground surface, or the area above a groundwater basin that does not have a clay cap.

Area of Interest: Major geographic areas reflective of community and planning identity established by the Ventura County *Local Agency Formation Commission (LAFCO)*. (c.f., *Sphere of Influence*)

Conditional Use Permit (CUP): See County Zoning Ordinance.

Conjunctive Use of Water: The operation of a groundwater basin in combination with a surface water storage and conveyance system. Water is stored in the groundwater basin for later use by intentionally recharging the basin during years of above-average water supply.

Emergency Use Authorization: See County Zoning Ordinance.

Flood and Furrow Irrigation: An agricultural irrigation technique in which the ground is graded with a very gentle, uniform slope and water is distributed down furrows. Most commonly used in orchards and row crops.

Indigenous Plant Species: Vegetation native to the region.

Land Conservation Act (LCA): A California statute which allows local government to enter into long-term contracts with agricultural landowners by lowering property taxes as an incentive to continue agricultural use of the land. Also known as the Williamson Act.

Locally Important Plant Communities: Southern Sycamore-Alder, Riparian Woodland, California Walnut Woodland, Southern Coast Live Oak Riparian Forest, Oak Woodlands, and Coastal Sage-Scrub Community.

***Ojai Valley*:** Approximately 74,000 acres governed by the Area Plan that is generally bound on the north by the Nordhoff Ridge, on the south by the Sulphur Mountain ridgeline, on the east by the mountain ridge between Bear Canyon and Santa Paula Canyon and on the west by the Lake Casitas/Ventura River watershed boundary. (see Figure 1).

Planned Development Permit (PD): See County Zoning Ordinance.

***Qualified Archaeological Monitor*:** A County-recognized Archaeologist or Native American who is trained to monitor trenching or earthmoving activities at a potentially or confirmed archaeologically sensitive area.

Retrofit: Replacement of less efficient plumbing fixtures in existing structures with new ultra-low volume (ULV) devices.

Slope, moderate: Any slope on a property, or portion of a property, which exceeds ten percent (10%) average slope, but is below twenty-five percent (25%) average slope.

Slope, steep: Any slope on a property, or portion of a property, which exceeds twenty-five percent (25%) average slope.

***Sphere of Influence*:** An area designated by the *Local Agency Formation Commission (LAFCO)* for each city or special district representing the probable, ultimate boundary of the city or special district. (c.f., *Area of Interest*)

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Appendix "A" - Urban And Rural Design Concept

The indigenous settlement pattern of the Ojai Valley consists of small towns and villages connected by country roads through intervening rural land. The scale, forms, materials and detailing of the roads, streets and buildings typical of the Valley prior to the 1950's define the unique design character which this Plan seeks to preserve and promote. In the near future, the essential characteristics of these design elements will be codified as Special Development Standards and Design Guidelines for all development within the Plan area requiring discretionary review, and for major public improvements. For clarity, existing prototypical examples of roads, streets and buildings are identified. These are intended to illustrate principles of scale, massing, materials, construction methods, and detailing which are appropriate to the Valley, but are not intended to require a particular "style".

General

Simple, rustic street, road and building types, designed in the local vernacular, are appropriate. Streets and public and private roads are narrow and often irregular, deflecting around natural features of terrain and vegetation, and closely following the natural contours of the land. Frontages are typically defined by low walls, fences and native plants. Building walls are typically made of or clad in wood siding, smooth stucco, or native stone. Doors and windows have vertical or square proportions. Roofs are gabled, with overhanging eaves, and are clad in wood shingles, clay tile, or dimensional composition shingles. Parking is to the side or rear of the lot except for single rows of parking spaces directly off the street at retail frontages.

Suburban street and building types - including standard arterial - and collector-type streets, strip-type retail buildings, chain-type architectural design and signage, parking lots fronting the street, and tract-type houses with garage doors visible from the public way - are specifically identified as destructive of the Valley's unique character and are strongly discouraged.

Towns and Villages

Communities are close-knit, each residence within walking distance of a store, a park or other public open space, and a bus stop. Buildings are scaled to the pedestrian, and enfront the public way with porches, colonnades or forecourts. The prototypical town center is Ojai Avenue from Ventura Street to Montgomery Street; the village center is Ventura Avenue in Casitas Springs; prototypical neighborhood streets are Canada Street and Grand Avenue in Ojai.

Countryside

Country roads are two-lane with a pavement of 16-20 feet, flanked by 4-8 foot gravel shoulders, ditches or earth banks. Frontage improvements include native stone walls, wood board or wire fences, and native shrubs and trees. Prototypical roads are Thacher Road, Carne Road and Ojai-Santa Paula Road. Houses are typically obscured from public views by frontage elements or are well set back in groves of trees. Grading is strictly minimized. Local-serving general merchandise stores and restaurants are located at selected crossroads -Boccali's at Ojai-Santa Paula and Reeves Roads is the prototype.

Appendix C

Ventura County Watershed Protection District

Annual Rainfall Data

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Monthly and Seasonal Rainfall

Ventura County Watershed Protection District

Station: 153a - Ojai-Barrett Ranch
Lattitude: 34:26:29 **ongitude:** 119:13:19 **Elevation:** 780 **Type:** S

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual Total
2004-2005	6.46	0.07	10.16	17.94	11.32	3.11	0.59	1.06	0.00	0.00	0.00	0.30	51.01
2005-2006	1.11	1.39	0.60	5.60	4.33	4.96	5.43	1.16	0.00	0.00	0.00	0.00	24.58
2006-2007	0.23	0.13	0.88	2.40	2.23	0.17	0.84	0.00	0.00	0.00	0.00	0.76	7.64
2007-2008	0.32	0.15	2.85	16.36	2.15	0.00	0.09	0.39	0.00	0.00	0.00	0.00	22.31
2008-2009	0.37	2.75	2.62	0.99	5.85	0.65	0.17	0.00	0.16	0.00	0.00	0.00	13.56
	1.70	0.90	3.42	8.66	5.18	1.78	1.42	0.52	0.03	0.00	0.00	0.21	23.82

Station: 140 - Oak View-County Fire Station
Lattitude: 34.23:42.5 **ongitude:** 19:18:00.7 **Elevation:** 520 **Type:** R

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual Total
2004-2005	5.40	0.04	9.79	15.03	8.93	3.82	0.62	0.59	0.00	0.00	0.00	0.30	44.52
2005-2006	0.83	0.75	0.73	4.15	3.42	4.26	7.18	1.15	0.00	0.00	0.00	0.00	22.47
2006-2007	0.18	0.17	0.68	2.15	1.48	0.06	0.68	0.00	0.00	0.00	0.00	0.23	5.63
2007-2008	0.37	0.06	2.33	14.42	2.20	0.00	0.05	0.03	0.00	0.00	0.20	0.01	19.67
2008-2009	0.05	2.65	2.49	0.61	4.58	0.85	0.20	0.00	0.00	0.00	0.00	0.00	11.43
	1.37	0.73	3.20	7.27	4.12	1.80	1.75	0.35	0.00	0.00	0.04	0.11	20.74

Monthly and Seasonal Rainfall

Ventura County Watershed Protection District

Station: 163c - Sulphur Mountain
Lattitude: 34:24:33 **ongitude:** 119:10:27 **Elevation:** 2450 **Type:** R

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual Total
2004-2005	10.23	0.09	11.16	24.15	14.17	3.69	0.79	1.32	0.01	0.00	0.00	0.35	65.96
2005-2006	1.26	2.01	0.68	7.38	4.02	5.43	6.21	1.52	0.02	0.03	0.02	0.03	28.61
2006-2007	0.15	0.13	0.78	3.42	2.04	0.23	1.10	0.01	0.00	0.00	0.00	0.60	8.46
2007-2008	0.42	0.22	4.44	18.65	2.49	0.02	0.13	0.32	0.00	0.00	0.00	0.01	26.70
2008-2009	0.23	3.11	2.82	1.25	6.14	1.08	0.22	0.00	0.34	0.00	0.00	0.00	15.19
	2.46	1.11	3.98	10.97	5.77	2.09	1.69	0.63	0.07	0.01	0.00	0.20	28.98

Station: 165 - Ojai-Stewart Canyon
Lattitude: 34:27:37.7 **ongitude:** 19:14:51.6 **Elevation:** 960 **Type:** R

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual Total
2004-2005	5.95	0.07	8.64	16.90	9.46	2.93	0.58	1.00	0.00	0.00	0.00	0.24	45.77
2005-2006	1.16	1.13	0.55	4.35	4.36	4.75	5.96	1.10	0.02	0.02	0.00	0.04	23.44
2006-2007	0.16	0.11	0.78	1.86	1.93	0.28	0.73	0.00	0.00	0.00	0.00	0.57	6.42
2007-2008	0.33	0.05	3.26	14.95	2.44	0.00	0.03	0.17	0.00	0.00	0.02	0.00	21.25
2008-2009	0.28	3.18	2.50	1.07	5.73	0.68	0.22	0.00	0.10	0.00	0.00	0.00	13.76
	1.58	0.91	3.15	7.83	4.78	1.73	1.50	0.45	0.02	0.00	0.00	0.17	22.13

Monthly and Seasonal Rainfall

Ventura County Watershed Protection District

Station: 204 - Lake Casitas-Upper
Lattitude: 34:24:55 **ongitude:** 119:20:12 **Elevation:** 600 **Type:** R

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual Total
2004-2005	7.09	0.02	10.37	17.30	10.22	4.47	0.90	0.60	0.00	0.00	0.00	0.31	51.28
2005-2006	0.97	0.87	0.79	4.93	3.73	4.87	8.21	1.47	0.00	0.00	0.00	0.00	25.84
2006-2007	0.22	0.10	1.03	2.68	1.66	0.10	1.01	0.00	0.00	0.00	0.00	0.35	7.15
2007-2008	0.46	0.04	3.40	17.93	2.49	0.00	0.09	0.06	0.00	0.00	0.00	0.00	24.47
2008-2009	0.16	3.19	2.64	0.43	5.43	0.84	0.19	0.00	0.03	0.00	0.00	0.00	12.91
	1.78	0.84	3.65	8.65	4.71	2.06	2.08	0.43	0.01	0.00	0.00	0.13	24.33

Station: 020b - Ventura River County Water District
Lattitude: 34:25:45 **ongitude:** 119:17:48 **Elevation:** 570 **Type:** S

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual Total
2004-2005	6.40	0.01	9.73	16.94	10.03	3.30	0.82	0.69	0.01	0.00	0.00	0.32	48.25
2005-2006	0.87	0.71	0.68	4.88	4.37	5.00	7.26	1.19	0.00	0.00	0.00	0.00	24.96
2006-2007	0.19	0.14	0.68	2.54	1.87	0.11	0.68	0.00	0.00	0.00	0.00	0.22	6.43
2007-2008	0.40	0.09	3.35	16.92	2.57	0.00	0.09	0.28	0.00	0.00	0.10	0.00	23.80
2008-2009	0.08	3.40	2.49	0.86	5.13	0.76	0.30	0.00	0.00	0.00	0.00	0.00	13.02
	1.59	0.87	3.39	8.43	4.79	1.83	1.83	0.43	0.00	0.00	0.02	0.11	23.29

Monthly and Seasonal Rainfall

Ventura County Watershed Protection District

Station: 218 - Meiners Oaks-County Fire Station
Lattitude: 34:26:40.5 **ongitude:** 19:17:03.3 **Elevation:** 730 **Type:** S

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual Total
2004-2005	7.29	0.05	9.71	18.14	10.20	3.35	0.74	0.90	0.00	0.00	0.00	0.97	51.35
2005-2006	0.98	0.76	0.68	5.06	5.40	5.20	7.01	0.82	0.00	0.00	0.00	0.00	25.91
2006-2007	0.23	0.13	0.78	2.48	1.94	0.17	0.74	0.00	0.00	0.00	0.00	0.53	7.00
2007-2008	0.61	0.00	3.56	17.14	2.43	0.00	0.07	0.05	0.00	0.00	0.00	0.00	23.86
2008-2009													
	2.28	0.24	3.68	10.71	4.99	2.18	2.14	0.44	0.00	0.00	0.00	0.38	27.03

Station: 30d - Ojai County Fire Station
Lattitude: 34:26:52.9 **ongitude:** **Elevation:** 760 **Type:** RS

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual Total
2004-2005	5.24	0.06	8.57	15.46	9.74	2.87	0.62	0.93	0.00	0.00	0.00	0.35	43.84
2005-2006	1.08	1.15	0.58	5.38	4.27	4.84	5.46	1.06	0.00	0.02	0.00	0.03	23.87
2006-2007	0.24	0.11	0.99	2.40	2.08	0.21	0.80	0.00	0.00	0.04	0.00	0.56	7.43
2007-2008	0.32	0.07	2.71	15.08	2.14	0.01	0.06	0.17	0.00	0.00	0.03	0.00	20.59
2008-2009	0.10	2.80	2.43	0.91	5.67	0.58	0.19	0.01	0.21	0.01	0.00	0.00	12.91
	1.40	0.84	3.06	7.85	4.78	1.70	1.43	0.43	0.04	0.01	0.01	0.19	21.73

Monthly and Seasonal Rainfall

Ventura County Watershed Protection District

Station: 064b - Upper Ojai-Happy Valley
Lattitude: 34:26:14.1 **ongitude:** 19:11:20.4 **Elevation:** 1320 **Type:** R

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual Total
2004-2005	8.11	0.04	10.42	19.47	11.81	3.27	0.58	0.94	0.00	0.00	0.00	0.29	54.93
2005-2006	1.11	1.27	0.55	5.85	4.28	4.58	5.98	1.19	0.00	0.02	0.01	0.07	24.91
2006-2007	0.12	0.11	0.84	2.70	1.92	0.09	0.74	0.00	0.00	0.00	0.00	0.55	7.07
2007-2008	0.36	0.09	3.26	19.47	2.32	0.05	0.08	0.24	0.00	0.00	0.00	0.00	25.87
2008-2009	0.14	2.65	2.75	1.37	5.79	0.68	0.16	0.00	0.11	0.00	0.00	0.00	13.65
	1.97	0.83	3.56	9.77	5.22	1.73	1.51	0.47	0.02	0.00	0.00	0.18	25.29

Appendix D

Ojai Valley Sanitary District

Sewage Spill Prevention and Response Plans

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OJAI VALLEY
SANITARY DISTRICT

SEWAGE SPILL PREVENTION
and
RESPONSE PLANS

Updated

October 2010

OJAI VALLEY SANITARY DISTRICT

Sewage Spill Prevention
and
Response Plans

The Ojai Valley Sanitary District is a public agency dedicated to serving the people of the District by collecting and treating residential and commercial sewage. It is the policy of the District to use every reasonable means to protect and safeguard public health in the event of a wastewater related emergency within the District's service area. The purpose of this spill prevention and response plan is to identify those actions to be taken by District personnel in responding to wastewater spills, overflows, line breaks, and other situations involving wastewater that create a threat to the health and safety of the general public.

SEWAGE SPILL PREVENTION PLAN

General Information

The District operates a wastewater collection system which consists of approximately 120 miles of gravity sewer lines, six pumping stations, and associated force mains that are required for the collection and conveyance of sewage. Every effort is taken to ensure that these facilities are well maintained to prevent sewage overflows and spills. An experienced and knowledgeable crew, modern line maintenance equipment, and an aggressive preventative maintenance program support these efforts.

Preventative Measures

The District operates six pumping stations that are monitored 24-hours a day via a radio-based telemetry system connected directly into the District's treatment plant SCADA system. This telemetry system transmits up-to-the-minute operational information such as: pumping status, wetwell levels, metered flows, and individual components performance alarms to the treatment plant's SCADA system, which is equipped with a callout system that receives alarms and automatically contacts standby personnel during off-hours. In addition, to prevent or reduce the impact of short-term power failures, the five largest pumping stations have been provided with emergency standby power capability.

Commercial and residential dischargers whose plumbing fixtures are identified as being lower in elevation than the rim of the upstream manhole are notified of the need for a backflow prevention device.

To minimize sewage overflows and spills, the District schedules the cleaning of all main sewer lines over a three-year period, while known "hot spots" (those line segments that have root, grease, or odor problems) are cleaned more frequently.

To facilitate this effort the District uses state-of-the-art maintenance and data storage equipment. The maintenance equipment includes a sewer cleaning machine that uses high pressure water for line cleaning and is equipped with a centrifugal vacuum system for removing debris; and video inspection equipment that records in a digital format for clear images and ease of use to document the collection system's line condition. The District has an up-to-date sewer atlas, a GIS (Geographical Information System) that provides a visual overview of District facilities, selected maintenance activities, access to as-built drawings, and is connected to a CMMS (Computerized Maintenance Management System) database. The CMMS is used for storing and tracking sewer line information and scheduled maintenance activities. Information for the CMMS database was initially collected and entered from as-built drawings, sewer system evaluation surveys, historical line cleaning and video inspection records, and is continually updated as new information is obtained. This CMMS is integrated with the GIS and allows the District to conduct detailed assessments of collection system sewer line conditions and includes:

- Identifying and scheduling line cleaning and maintenance requirements;
- Evaluating and classifying line segments for their potential overflow risk;
- Prioritizing and scheduling those line segments requiring rehabilitation and/or repair.

Safety and Public Awareness

All employees assigned to line cleaning and maintenance duties are trained in sewer line cleaning techniques, safety considerations, and proper use of sewer cleaning equipment.

SEWAGE SPILL REPSONSE PLAN

Sewer backups into homes and businesses are one of the District's greatest general liability exposures. Effective risk management following a sewer backup event requires preplanning and coordinated efforts between the:

- Collection System Crew
- Emergency Restoration Services Contractor
- Claims Management Coordinator
- Carl Warren & Company (Insurance claims administrator)

The Administrative Officer serves as the District's Claims Management Coordinator and is the primary on-going point of contact between the District and Carl Warren & Company.

Communication with Carl Warren & Company during any necessary clean-up and/or restoration will be a combined responsibility between the Claims Management Coordinator and Collection System Supervisor. The Collection System Supervisor will coordinate any communication between any third party vendors and the affected individuals.

A "Sewer Backup Incident/Claim Report" form **must** be completed by District personnel following all sewer backup/spill events. The backside of this form is a "Livability Assessment Guide" to be used to determine if the occupants of the affected structure should vacate premises during cleanup.

The following sewage spill response plan is provided as a "guide" to District personnel to facilitate a timely and technically-correct response, which may help to reduce:

- the spill volume,
- damage to the homeowners' property, and
- potentially adverse public and environmental impacts.

Sewage Spill Containment

When a sewage spill occurs (regardless of spill volume) public health and employee safety is of the utmost importance. In order to protect public health and employee safety the following steps should be followed:

1. The Collection System Supervising Operator or lead operator on-site shall immediately perform an on-the-spot evaluation of the problem to determine the source of the sewage spill and request any equipment, tools, safety equipment, or additional personnel required to provide for containment of the sewage spill; and then clear the blockage or cause of the spill.
   Photographs are to be taken of the spill **to include the area not impacted by the spill both inside the home and outside areas** throughout the cleanup.

2. Containment should be performed in a safe and orderly manner before any repair work begins. Personnel are to implement the following safety procedures as appropriate:

   - Use of personal protective equipment;
   - Cordon off the spill area to minimize the risk of public contact with raw sewage;
   - Initiate the use of traffic control procedures for the site;

3. Selection of the containment plan and its implementation will take into consideration all reasonable steps to minimize or prevent any discharge that has a likelihood of adversely affecting human health or the environment. Examples of containment plans include:

   (a) Blockages:
   - Prevent the sewage spill from flowing into storm drains and/or streams.
   - If sewage has entered a drainage swale, storm drain, etc., and spill volume is small enough, proceed downstream and dam the flow in an attempt to prevent sewage from traveling further.
   - Clear the sewer line blockage, or make the necessary mechanical or electrical repairs as applicable.
   - Vacuum up spilled sewage, and clean up by removing debris and sanitizing the immediate area.

     NOTE: VC-EHD has requested that all sewage spills occurring on concrete or asphalt surfaced areas be sanitized with a hospital grade type disinfectant. At no time shall any disinfectant or residual disinfectant be allowed to enter a storm drain or waterway.

   (b) Line Failures:
   - Line failures may require bypass pumping from an upstream manhole to a manhole downstream of the line failure.
   - When the volume of sewage overflow allows, vacuum trucks may be utilized to transport wastes around the line failure until bypass pumping is initiated, or repairs are completed.

   (c) Spill Within a Structure:
   - When a sewage spill occurs within a structure, District personnel will be sympathetic to the occupants.
   - Regardless of the cause of the spill, the goal of District personnel will be to assist in stopping the overflow and minimizing damage.
   - The Collection System Supervisor or lead operator will take the time needed to determine the cause of the sewer back-up.
   - Photographs shall be taken of the damaged, and undamaged areas.
   - The Collection System Supervisor has the authority from the District to act on all necessary emergency services to mitigate damages from the incident and may delegate such authority to the lead operator at the incident scene.
   - If the problem is related to the District's system, the Collection System Supervisor or lead operator shall immediately contact the District's sewage cleanup management firm currently **All Seasons Restorations, Inc. at (800) 988-1249,** this is a 24/7 response number to respond to the location. All Seasons will manage the cleanup thereafter, and maintain close communication with District personnel to ensure the cleanup is adequately performed, the home owners' needs are met, and the District is protected.
   - If the cause of the sewer spill is or may be related to the District's system the Collection System Supervisor or lead operator will call the **Carl Warren 24 hour telephone number 1st: (707) 732-6728, 2nd: (805) 509-1426, or 3rd: (925) 639-5674** to report the incident **<u>within four hours</u>** of becoming aware of the sewer backup into private property.

- The Collection System Supervisor or Operator III shall evaluate the livability of the affected property by referencing the District's "Livability Assessment Flow-Chart. If the evaluation determines the property is not livable, then lodging at a local hotel/motel may be offered. The "Motel/Hotel Authorization Form" must be utilized if lodging is necessary.
- Provide resident with "Customer Information Regarding Sewer Backup Claims" form. Provide resident with a "Claim Form" if they request it.
- **Any Services needed or desired beyond those identified as "Emergency Services" are to be authorized only by Carl Warren & Company.**

Regulatory Agency Notification

Notification to regulatory agencies shall be done immediately, or as soon as the situation is stabilized in the case of an extreme emergency. In the event any sewage from a spill enters a drainage channel or waterway the State Office of Emergency Services shall be notified within two (2) hours. District personnel authorized to contact regulatory agencies are (in the order of responsibility): the Operations Superintendent, CS & TP Supervisor's, and the General Manager.

Ventura County Environmental Health Department (VC-EHD) is to be contacted for **all** sewage spills, and a Proposition 65 Report is to be filled out and submitted to VC-EHD. The location and severity of the sewage spill shall determine additional regulatory agencies that are to be notified (Attachment A).

Contact shall begin with:

1. Ventura County Environmental Health Department (VC-EHD), at:
   Regular hours: 654-2813 – (If you get the message center, Press 3 for a live person) -– Send a Fax of the Proposition 65 Report to 654-2480
   After hours: Call 320-6244, VC-EHD's On-call person, or
   Call 911 – Specify this is a "sewage spill" and Request VC-EHD's Sewage Discharge Response
   (Particularly if additional assistance is required)

Unless:

- The spill is in or flowing into the Ventura River and/or San Antonio Creek above Foster Park; then due to the potential for potable water contamination, first contact the City of Ventura, Avenue Water Treatment Plant at:
  Regular hours: 652-4548 7 days/week 7a—3:30p
  Or 652-4500 Mon-Friday 8a—5p
  After hours: 339-4399 Police & Fire Dispatch
- And then notify VC-EHD second.

2. State Office of Emergency Services (OES) at: 800-852-7550.

   Call OES within (2) hours for all spills that reach a drainage channel and/or waterway, or is greater than 1,000 gallons. OES will provide a "Report Number" that is to be used for subsequent contacts with the following agencies:

   a. Los Angeles Regional Water Quality Control Board (LA-RWQCB) at: Normal Bus hours: 213-576-6657
      After Hours: 213-305-2284, or 213-305-2253; Fax 213-620-6140

   b. Department of Fish & Game (DFG will be contacted by OES)

District' Liability Insurance Notification

If a sewage backup or spill occurs within a structure on private property the District's Liability Insurance adjuster, Carl Warren & Company, must be **notified within four hours** of the incident. The Supervisor or lead operator is responsible for making this call. Carl Warren & Company's 24 hour number is 1st:Janice Yardley-(707) 732-6728, 2nd: Mauri McGuire-(805) 509-1426, or 3rd: Brandon Schlenker-(925) 639-5674.

On the first workday following the spill, facts about the spill and the communication with Carl Warren & Company shall be communicated to the District's Claims Management Coordinator.

Coliform Sampling Requirements

The District's Treatment Plant Supervisor and/or Operator III are responsible, following notification of a sewage spill by CS personnel, for setting up a sampling and analysis program as appropriate for the sewage spill conditions.

The District's NPDES permit issued by the LA-RWQCB requires coliform sampling any time a sewage spill enters a stream or waterway containing flowing water. The requirements are as follows:

- In the event of a spill or discharge of raw sewage, total and fecal coliform analyses shall be performed on grab samples collected at all potentially affected downstream receiving water areas (based on size and duration of spill, and waterway flows) and at least one unaffected area immediately upstream of the spill.
- At minimum, coliform samples shall be collected on the date of the spill or discharge, and daily on each of the following four days. The severity (volume and duration) of the spill dictates the distance downstream sampling is to be performed. Sampling must be continued until test results indicate coliform levels are, or have returned, to background levels. (upstream sample analysis results are the control)
- The VC-EHD may require the District to perform additional coliform sampling, and request that they be informed of the results of coliform sampling to assist in their determination of the monitoring efforts effectiveness.

Posting of Warning Signs

Warning signs may be required any time a sewage spill enters a stream or waterway. The VC-EHD is the agency responsible for determining whether warning signs are to be posted when a sewage spill occurs. VC-EHD has developed specific criteria, based on the estimated spill volume, for evaluating and determining the extent of warning sign posting and sampling requirements. In general:

- When warning signs are required by the VC-EHD, typically the District collection system personnel will post the warning signs along the inland waterways downstream of the spill, while VC-EHD personnel will post warning signs as necessary along the beaches.
- When warning signs are required along inland waterways, signs are to be conspicuously posted in all areas utilized by the general public for gaining access to the waterway, such as:
    - Roads leading into the affected area;
    - Bridges on watercourses downstream of the affected area;
    - Parking areas and parks in the affected area.

- When warning signs are posted, **the sign location shall be recorded and photographed for documentation of posting, and to ensure retrieval**.
- Once signs are posted they shall remain until such time the VC-EHD has determined that the water quality no longer poses a threat to the public.
  Note: This is normally the result of the District demonstrating through test results that the coliform levels have returned to background levels.
- The District is responsible for removing its own signs. VC-EHD will typically remove their own signs unless, due to their workload, they may request District assistance.

Should a sewage spill occur in a residential neighborhood that cannot be immediately contained and cleaned up, the recommended interval for posting signs is every 200 feet.

Regulatory Agency Reporting

District personnel responding to a sewage spill shall document the occurrence by completing the District's Callout Report Form and Sewer Backup Incident/Claim Report and the Proposition 65 Report Form.

- All sewage spills outside of a structure are to be reported to VC-EHD immediately.
- The Proposition 65 Report form is to be faxed to the VC-EHD at 654-2480 within 24 hours of a spill.
- New WDR (Waste Discharge Requirements) require: 1) a spill into a drainage channel or waterway be reported to State OES **within (2) hours**; 2) all spills be reported electronically within three (3) days; 3) a final certified report must be completed **within (15) days** of the conclusion of SSO response and remediation
- LA-RWQCB requires notification within (2) hours; certification within (24) hours that State OES and VC-EHD have been notified; and a written report within five working days of a major spill. This initial report is then to be followed by a complete report of the incident and the steps taken to prevent a recurrence of a similar incident.

Public Notification

The General Manager is the District's designated person to contact and/or respond to the news media regarding sewage spills.

Members of the Board of Directors must be made aware of major spills so they can be prepared to respond with information relating to the spill in the event they are contacted by the media. The General Manager, Operations Superintendent, Administrative Officer, CS & TP Supervisors, as available in that order are responsible for notifying the Board of Directors regarding all major spills.

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Appendix

Project Photographs

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ield Observations for Watershed Sanitary Survey

F2: Green waste compost in 2005

F2: Green waste compost in 2010

F4: OVSD Station near sewer siphon crossing of Ventura River near Highway 150 in 2005

F4: OVSD Station near sewer siphon crossing of Ventura River near Highway 150 in 2010

F5: Ventura County Environment and Energy Division Monitoring Well near River in 2005

F5: Ventura County Environment and Energy Division Monitoring Well near River in 2010

F6: Ventura County Environment and Energy Division Monitoring Well near Green Waste entrance in 2005

F6: Ventura County Environment and Energy Division Monitoring Well near Green Waste entrance in 2010

F7: Signs to discourage dumping at Old Baldwin Road and Highway 150 in 2005

F7: Signs to discourage dumping at Old Baldwin Road and Highway 150 in 2010

F8: Scour and graffiti under Highway 150 Bridge in 2005

F8: Scour and graffiti under Highway 150 Bridge in 2010

F9: Lower fields of Honor Farm Looking toward Ventura River in 2005

F9: Lower fields of Honor Farm Looking toward Ventura River in 2010

F20: Gas pipeline crossing San Antonio Creek near Country Club Drive in 2005

F20: Gas pipeline crossing San Antonio Creek near Country Club Drive in 2010

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Appendix F

Ojai Valley Sanitary District NPDES Permit

(Board Order No. R4-2008-0039; NPDES No. CA0053961)

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CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD

REGION 4, LOS ANGELES REGION

320 W. West 4th Street, Suite 200, Los Angeles, California 90013
(213) 576-6600 • Fax (213) 576-6640
http://www.waterboards.ca.gov

ORDER NO. R4-2008-0039
NPDES NO. CA0053961

WASTE DISCHARGE REQUIREMENTS FOR OJAI VALLEY SANITARY DISTRICT (Ojai Valley Wastewater Treatment Plant)

The following Discharger is subject to waste discharge requirements as set forth in this Order:

Table 1. Discharger Information

Discharger	**Ojai Valley Sanitary District**
Name of Facility	**Ojai Valley Wastewater Treatment Plant**
Facility Address	**6363 North Ventura Avenue**
	Ventura, CA 93001
	Ventura County
The U.S. Environmental Protection Agency (USEPA) and the Regional Water Quality Control Board have classified this discharge as a major discharge.	

The discharge by the Ojai Valley Sanitary District from the points identified below is subject to waste discharge requirements as set forth in this Order:

Table 2. Discharge Location

Discharge Point	Effluent Description	Discharge Point Latitude	Discharge Point Longitude	Receiving Water
001	Tertiary treated wastewater	34º, 20', 33" N	119º, 17', 26" W	Ventura River

Table 3. Administrative Information

This Order was adopted by the Regional Water Quality Control Board on:	**July 10, 2008**
This Order shall become effective on:	**August 29, 2008**
This Order shall expire on:	**June 10, 2013**
The Discharger shall file a Report of Waste Discharge in accordance with title 23, CCR, as application for issuance of new waste discharge requirements no later than:	**180 days prior to the Order expiration date** (Title 40, Code of Federal Regulations, part 122.21(d))

I, Tracy J. Egoscue, Executive Officer, do hereby certify that this Order with all attachments is a full, true, and correct copy of an Order adopted by the California Regional Water Quality Control Board, Los Angeles Region, on July 10, 2008.

_____

Tracy J. Egoscue, Executive Officer

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Attachment I – Pretreatment Reporting Requirements I-1

I. FACILITY INFORMATION

The following Discharger is subject to waste discharge requirements as set forth in this Order:

Table 4. Facility Information

Discharger	Ojai Valley Sanitary District
Name of Facility	Ojai Valley Wastewater Treatment Plant
Facility Address	6363 North Ventura Avenue
	Ventura, CA 93001
	Ventura County
FACILITY CONTACT, TITLE, AND PHONE	Ronald Sheets, Operations Superintendent, (805) 646-5548
MAILING ADDRESS	1072 Tico Road, Ojai Valley, CA 93023
Type of Facility	Publicly-Owned Treatment Works
Facility Design Flow	3 million gallons per day (MGD)

II. FINDINGS

The California Regional Water Quality Control Board, Los Angeles Region (hereinafter Regional Water Board), finds:

A. Background. Ojai Valley Sanitary District (hereinafter OVSD or Discharger) is currently discharging pursuant to Order No. R4-2003-0087 and National Pollutant Discharge Elimination System (NPDES) Permit No. CA 0053961. The Discharger submitted a Report of Waste Discharge, dated November 21, 2007, and applied for a NPDES permit renewal to discharge up to 3 MGD of tertiary-treated wastewater from the Ojai Valley Wastewater Treatment Plant, hereinafter Ojai Valley WWTP. The application was deemed complete on March 24, 2008.

For the purposes of this Order, references to the "discharger" or "permittee" in applicable federal and state laws, regulations, plans, or policy are held to be equivalent to references to the Discharger herein.

B. Facility Description. The Discharger owns and operates the Ojai Valley Wastewater Treatment Plant, a Publicly-Owned Treatment Works (POTW). The treatment system consists of comminution, primary sedimentation, activated sludge treatment with using an oxidation ditch with an anaerobic-anoxic and aerobic zones for BOD, nitrogen, and phosphorus removal, secondary sedimentation, tertiary filtration, ultraviolet disinfection, (with chlorination/dechlorination as backup), and reaeration. Primary screenings are hauled off-site for disposal. Secondary sludge is pumped either to the oxidation ditches (return activated sludge) or to the belt press for dewatering (waste activated sludge) and composted in the sludge drying beds. Wastewater is discharged from Discharge Point 001 (see Table on cover page) to Ventura River, a water of the United States. Attachment B provides a map of the area around the facility. Attachment C provides a flow schematic of the facility.

C. Legal Authorities. This Order is issued pursuant to section 402 of the federal Clean Water Act (CWA) and implementing regulations adopted by the U.S. Environmental Protection Agency (USEPA) and chapter 5.5, division 7 of the California Water Code (commencing with section 13370). It shall serve as an NPDES permit for point source discharges from this facility to surface waters. This Order also serves as Waste Discharge Requirements (WDRs) pursuant to article 4, chapter 4, division 7 of the California Water Code (commencing with section 13260).

D. Background and Rationale for Requirements. The Regional Water Board developed the requirements in this Order based on information submitted as part of the application, through monitoring and reporting programs, and other available information. The Fact Sheet (Attachment F), which contains background information and rationale for Order requirements, is hereby incorporated into this Order and constitutes part of the Findings for this Order. Attachments A through E and G through I are also incorporated into this Order.

E. California Environmental Quality Act (CEQA). Under California Water Code section 13389, this action to adopt an NPDES permit is exempt from the provisions of CEQA, Public Resources Code sections 21100-21177.

F. **Technology-based Effluent Limitations**. Section 301(b) of the CWA and implementing USEPA permit regulations at part 122.44, title 40 of the Code of Federal Regulations[1], require that permits include conditions meeting applicable technology-based requirements at a minimum, and any more stringent effluent limitations necessary to meet applicable water quality standards. The discharge authorized by this Order must meet minimum federal technology-based requirements based on Secondary Treatment Standards at Part 133 and Best Professional Judgment (BPJ) in accordance with Part 125, section 125.3. A detailed discussion of the technology-based effluent limitations development is included in the Fact Sheet (Attachment F).

G. **Water Quality-Based Effluent Limitations.** Section 301(b) of the CWA and part 122.44(d) require that permits include limitations more stringent than applicable federal technology-based requirements where necessary to achieve applicable water quality standards. This Order contains requirements, expressed as a technology equivalence requirement, that are necessary to achieve water quality standards. The Regional Board has considered the factors listed in California Water Code section 13241 in establishing these requirements. The rationale for these requirements, which consist of tertiary treatment or equivalent requirements or other provisions, is discussed in Section IV.C.2. of the Fact Sheet.

Part 122.44(d)(1)(i) mandates that permits include effluent limitations for all pollutants that are or may be discharged at levels that have the reasonable potential to cause or contribute to an exceedance of a water quality standard, including numeric and narrative objectives within a standard. Where reasonable potential has been established for a pollutant, but there is no numeric criterion or objective for the pollutant, water quality-based effluent limitations (WQBELs) must be established using: (1) USEPA criteria guidance under CWA section 304(a), supplemented where necessary by other relevant information; (2) an indicator parameter for the pollutant of concern; or (3) a calculated numeric water quality criterion, such as a proposed state criterion or policy interpreting the state's narrative criterion, supplemented with other relevant information, as provided in part 122.44(d)(1)(vi).

H. **Water Quality Control Plans.** The Regional Water Board adopted a Water Quality Control Plan for the Los Angeles Region (hereinafter Basin Plan) on June 13, 1994, that designates beneficial uses, establishes water quality objectives, and contains implementation programs and policies to achieve those objectives for all waters addressed through the plan. In addition, the Basin Plan implements State Water Resources Control Board (State Water Board) Resolution No. 88-63, which established state policy that all waters, with certain exceptions, should be considered suitable or potentially suitable for municipal or domestic supply. Beneficial uses applicable to Ventura River are as follows:

[1] All further statutory references are to title 40 of the Code of Federal Regulations unless otherwise indicated and will be abbreviated as "40 C.F.R. part number".

Table 5a. Basin Plan Beneficial Uses- Surface Water

Discharge Point	Receiving Water Name	Beneficial Use(s)
001	Ventura River (Hydro. Unit No. 402.10)	Existing: Industrial service supply (IND), agricultural supply (AGR), groundwater recharge (GWR), freshwater replenishment (FRSH), contact and non-contact water recreation (REC-1 and REC2), warm freshwater habitat (WARM), cold freshwater habitat (COLD), wild life habitat (WILD), rare, threatened or endangered species (RARE), migration of aquatic organisms (MIGR), spawning, reproduction, and early development (SPWN), and wetland habitat(WET). Potential*: Municipal and domestic water supply (MUN).
001	Ventura River Estuary (Hydro. Unit No. 402.10)	Existing: Navigation (NAV), commercial and sport fishing(COMM), contact and non-contact water recreation (REC-1 and REC-2), warm freshwater habitat (WARM), estuarine habitat (EST), marine habitat (MAR), wild life habitat (WILD), rare threatened or endangered species (RARE), migration of aquatic organisms (MIGR), spawning, reproduction, and early development (SPWN), shellfish harvesting (SHELL), and wetland habitat (WET).

Table 5b Basin Plan Beneficial Uses- Ground Water

Discharge Point	Receiving Water Name	Beneficial Use(s)
001	Lower Ventura Groundwater Basin	Existing: Industrial service supply (IND), agricultural supply (AGR). Potential: Municipal and domestic water supply (MUN), industrial process supply (PROC).

Requirements of this Order implement the Basin Plan and subsequent amendments.

The 1994 Basin Plan provided water quality objectives for ammonia to protect aquatic life, in Tables 3-1 through Tables 3-4. However, those ammonia objectives were revised on April 25, 2002, by the Regional Water Board with the adoption of Resolution No. 2002-011, *Amendment to the Water Quality Control Plan for the Los Angeles Region to Update the Ammonia Objectives for Inland Surface Waters (Including Enclosed Bays, Estuaries and Wetlands) with Beneficial Use Designations for Protection of Aquatic Life*. The ammonia Basin Plan amendment was approved by the State Water Board, the Office of Administrative Law, and USEPA on April 30, 2003, June 5, 2003, and June 19, 2003, respectively. On December 1, 2005, Resolution No. 2005-014, *Amendment to the Water Quality Control Plan for the Los Angeles Region to Revise the Early Life Stage Implementation Provision of the Freshwater Ammonia Objectives for Inland Surface Waters (including enclosed bays, estuaries and wetlands)*

* The potential MUN beneficial use for the water body is consistent with Regional Board Resolution 89-03; however, the Regional Board has only conditionally designated the MUN beneficial uses and at this time cannot establish effluent limitation designed to protect the conditional designation.

for Protection of Aquatic Life, was adopted by the Regional Water Board. Resolution No. 2005-014 was approved by the State Water Board, the Office of Administrative Law, and USEPA on July 19, 2006, August 31, 2006, and April 5, 2007, respectively. Although the revised ammonia water quality objectives may be less stringent than those contained in the 1994 Basin Plan, they are still protective of aquatic life and are consistent with USEPA's 1999 ammonia criteria update.

On October 25, 2006, the State Water Resources Control Board adopted a revised 303(d) list. The 2006 303(d) list was partially approved by the USEPA on November 30, 2006. However, on March 8, 2007, USEPA partially disapproved the State's 303(d) list by disapproving the State's omission of impaired waters that met federal listing regulations or guidance. USEPA is adding 64 waters and 37 associated pollutants to the State's 303(d) list. On June 28, 2007, USEPA transmitted the final approved 2004-2006 Section 303(d) list, which serves as the State's most recent list of impaired waterbodies. The list (hereinafter referred to as the 303(d) list) was prepared in accordance with section 303(d) of the Federal Clean Water Act to identify specific impaired waterbodies where water quality standards are not expected to be met after the implementation of technology-based effluent limitations on point sources.

Ventura River and Ventura Estuary are on the 303(d) list. The following pollutants/ stressors, from point and non-point sources, were identified as impacting the receiving waters:

Upstream of the Discharge Point 001:

Ventura River Reach 3 (Weldon Canyon to Confluence with Coyote Creek) -- Hydrologic unit 402.20
Pumping, water diversion

Ventura River Reach 4 (Coyote Creek to Camino Cielo Road) -- Hydrologic unit 402.20
Pumping, water diversion

Downstream of the Discharge Point 001:

Ventura River Reach 1 and 2 (Estuary to Weldon Canyon) -- Hydrologic unit 402.10
Algae

Ventura Estuary--Hydrologic unit 402.10
Algae, eutrophic, coliform bacteria, and trash

I. **National Toxics Rule (NTR) and California Toxics Rule (CTR).** USEPA adopted the NTR on December 22, 1992, and later amended it on May 4, 1995 and November 9, 1999. About forty criteria in the NTR applied in California. On May 18, 2000, USEPA adopted the CTR. The CTR promulgated new toxics criteria for California and, in addition, incorporated the previously adopted NTR criteria that were applicable in the

state. The CTR was amended on February 13, 2001. These rules contain water quality criteria for priority pollutants.

J. **State Implementation Policy.** On March 2, 2000, the State Water Board adopted the *Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California* (State Implementation Policy or SIP). The SIP became effective on April 28, 2000, with respect to the priority pollutant criteria promulgated for California by the USEPA through the NTR and to the priority pollutant objectives established by the Regional Water Board in the Basin Plan. The SIP became effective on May 18, 2000 with respect to the priority pollutant criteria promulgated by the USEPA through the CTR. The State Water Board adopted amendments to the SIP on February 24, 2005 that became effective on July 13, 2005. The SIP establishes implementation provisions for priority pollutant criteria and objectives and provisions for chronic toxicity control. Requirements of this Order implement the SIP.

K. **Compliance Schedules and Interim Requirements.** Section 2.1 of the SIP provides that, based on a Discharger's request and demonstration that it is infeasible for an existing Discharger to achieve immediate compliance with an effluent limitation derived from a CTR criterion, compliance schedules may be allowed in an NPDES permit. Unless an exception has been granted under section 5.3 of the SIP, a compliance schedule may not exceed 5 years from the date that the permit is issued or reissued, nor may it extend beyond 10 years from the effective date of the SIP (or May 18, 2010) to establish and comply with CTR criterion-based effluent limitations. Where a compliance schedule for a final effluent limitation exceeds 1 year, the Order must include interim numeric limitations for that constituent or parameter. Where allowed by the Basin Plan, compliance schedules and interim effluent limitations or discharge specifications may also be granted to allow time to implement a new or revised water quality objective. This Order does not include compliance schedules or interim effluent limitations.

L. **Alaska Rule.** On March 30, 2000, USEPA revised its regulation that specifies when new and revised state and tribal water quality standards (WQS) become effective for CWA purposes. (40 C.F.R. § 131.21; 65 Fed. Reg. 24641 (April 27, 2000).) Under the revised regulation (also known as the Alaska rule), new and revised standards submitted to USEPA after May 30, 2000, must be approved by USEPA before being used for CWA purposes. The final rule also provides that standards already in effect and submitted to USEPA by May 30, 2000 may be used for CWA purposes, whether or not approved by USEPA.

M. **Stringency of Requirements for Individual Pollutants.** This Order contains both technology-based and water quality-based effluent limitations for individual pollutants. The technology-based effluent limitations consist of restrictions on BOD, TSS, pH, and percent removal of BOD and TSS. Restrictions on BOD, TSS and pH are discussed in Section IV.B. of the Fact Sheet. This Order's technology-based pollutant restrictions implement the minimum, applicable federal technology-based requirements. In addition, this Order contains effluent limitations more stringent than the minimum, federal technology-based requirements that are necessary to meet water quality standards. The rationale for including these limitations is explained in the Fact Sheet.

In addition, the Regional Board has considered the factors in California Water Code section 13241 in establishing these requirements.

Water quality-based effluent limitations have been scientifically derived to implement water quality objectives that protect beneficial uses. Both the beneficial uses and the water quality objectives have been approved pursuant to federal law and are the applicable federal water quality standards. To the extent that toxic pollutant water quality-based effluent limitations were derived from the CTR, the CTR is the applicable standard pursuant to 40 C.F.R. § 131.38. The scientific procedures for calculating the individual water quality-based effluent limitations for priority pollutants are based on the CTR-SIP, which was approved by USEPA on May 18, 2000. All beneficial uses and water quality objectives contained in the Basin Plan were approved under state law and submitted to and approved by USEPA prior to May 30, 2000. Any water quality objectives and beneficial uses submitted to USEPA prior to May 30, 2000, but not approved by USEPA before that date, are nonetheless "applicable water quality standards for purposes of the CWA" pursuant to 40 C.F.R. part 131.21(c)(1).

This Order contains pollutant restrictions that are more stringent than applicable federal requirements and standards. Specifically, this Order includes effluent limitations for BOD and TSS that are more stringent than applicable federal standards, but that are nonetheless necessary to meet numeric objectives or protect beneficial uses. The rationale for including these limitations is explained in Section IV.B. of the Fact Sheet.

N. **Antidegradation Policy.** Part 131.12 requires that the state water quality standards include an antidegradation policy consistent with the federal policy. The State Water Board established California's antidegradation policy in State Water Board Resolution No. 68-16. Resolution No. 68-16 incorporates the federal antidegradation policy, which requires that existing quality of waters be maintained unless degradation is justified based on specific findings. The Regional Water Board's Basin Plan implements, and incorporates by reference, both the state and federal antidegradation policies. As discussed in detail in the Fact Sheet the permitted discharge is consistent with the antidegradation provision of part 131.12 and State Water Board Resolution No. 68-16.

O. **Anti-Backsliding Requirements.** Sections 402(o)(2) and 303(d)(4) of the CWA and federal regulations at title 40, Code of Federal Regulations part 122.44(l) prohibit backsliding in NPDES permits. These anti-backsliding provisions require effluent limitations in a reissued permit to be as stringent as those in the previous permit, with some exceptions where limitations may be relaxed. All effluent limitations in this Order are at least as stringent as the effluent limitations in the previous Order.

P. **Endangered Species Act.** This Order does not authorize any act that results in the taking of a threatened or endangered species or any act that is now prohibited, or becomes prohibited in the future, under either the California Endangered Species Act (Fish and Game Code sections 2050 to 2097) or the Federal Endangered Species Act (16 U.S.C.A. sections 1531 to 1544). This Order requires compliance with effluent limits, receiving water limits, and other requirements to protect the beneficial uses of waters of the state. The discharger is responsible for meeting all requirements of the applicable Endangered Species Act.

Q. **Monitoring and Reporting.** Part 122.48 requires that all NPDES permits specify requirements for recording and reporting monitoring results. California Water Code sections 13267 and 13383 authorizes the Regional Water Board to require technical and monitoring reports. The Monitoring and Reporting Program establishes monitoring and reporting requirements to implement federal and State requirements. This Monitoring and Reporting Program is provided in Attachment E.

R. **Standard and Special Provisions.** Standard Provisions, which apply to all NPDES permits in accordance with part 122.41, and additional conditions applicable to specified categories of permits in accordance with part 122.42, are provided in Attachment D. The discharger must comply with all standard provisions and with those additional conditions that are applicable under part 122.42. The Regional Water Board has also included in this Order special provisions applicable to the Discharger. A rationale for the special provisions contained in this Order is provided in the attached Fact Sheet.

S. **Provisions and Requirements Implementing State Law.** The provisions/ requirements in subsections VI.C. of this Order are included to implement state law only. These provisions/requirements are not required or authorized under the federal CWA; consequently, violations of these provisions/requirements are not subject to the enforcement remedies that are available for NPDES violations.

T. **Notification of Interested Parties.** The Regional Water Board has notified the Discharger and interested agencies and persons of its intent to prescribe Waste Discharge Requirements for the discharge and has provided them with an opportunity to submit their written comments and recommendations. Details of notification are provided in the Fact Sheet of this Order.

U. **Consideration of Public Comment.** The Regional Water Board, in a public meeting, heard and considered all comments pertaining to the discharge. Details of the Public Hearing are provided in the Fact Sheet of this Order.

THEREFORE, IT IS HEREBY ORDERED, that Order No. R4-2003-0087 is rescinded upon the effective date of this Order except for enforcement purposes, and, in order to meet the provisions contained in division 7 of the California Water Code (commencing with section 13000) and regulations adopted thereunder, and the provisions of the federal Clean Water Act and regulations and guidelines adopted thereunder, the Discharger shall comply with the requirements in this Order.

III. DISCHARGE PROHIBITIONS

A. Discharge of wastewater at a location different from that described in this Order is prohibited.

B. The bypass or overflow of untreated wastewater or wastes to surface waters or surface water drainage courses is prohibited, except as allowed in Standard Provision I.G. of Attachment D, Standard Provisions.

C. The monthly average effluent dry weather discharge flow rate from the facility shall not exceed the design capacity.

D. The Discharger shall not cause degradation of any water supply, except as consistent with State Water Board Resolution No. 68-16.

E. The treatment or disposal of wastes from the facility shall not cause pollution or nuisance as defined in section 13050, subdivisions (l) and (m) of the CWC.

F. The discharge of any substances in concentrations toxic to animal or plant is prohibited.

G. The discharge of any radiological, chemical, or biological warfare agent or high level radiological waste is prohibited.

IV. EFFLUENT LIMITATIONS AND DISCHARGE SPECIFICATIONS

A. Effluent Limitations – Discharge Point 001

1. Effluent Limitations Applicable to Discharge Point 001

a. The Discharger shall maintain compliance with the following effluent limitations at Discharge Point 001 into Ventura River, with compliance measured at Monitoring Location EFF-001 as described in the attached MRP.

b. The ammonia nitrogen effluent limitation is the translated effluent limitation based on the water quality objective for ammonia in the current Basin Plan, Table 3-1 and Table 3-2, which resulted from Resolution No. 2002-011, and Resolution No. 2005-014 adopted by the Regional Water Board on April 25, 2002, and December 1, 2005, respectively. This effluent limitation is derived according to the Implementation Section of Resolution No. 2002-011.

c. The effluent limitations for Bis(2-ethylhexyl)phthalate will apply immediately on the effective date of this permit. The effluent limitation for Bis(2-ethylhexyl)phthalate is based on USEPA Technical Support Document procedures. Bis(2-ethylhexyl)phthalate shows reasonable potential to exceed the criteria (B>C), therefore effluent limits are required.

Table 6a. Effluent Limitations Applicable to Discharge Point 001

Parameter	Units	Effluent Limitations				
		Average Monthly	Average Weekly	Maximum Daily	Instantaneous Minimum	Instantaneous Maximum
$BOD_5 20^oC$	mg/L	10	--	15		
	lbs/day[1]	250		380		
Total Suspended Solids (TSS)	mg/L	10		15		
	lbs/day[1]	250		380		
pH	standard units	--	--	--	6.5	8.5
Removal Efficiency for BOD and TSS	%	85	--	--		
Oil and Grease	mg/L	10	--	15		
	lbs/day[1]	250	--	380		
Settleable Solids	ml/L	0.1	--	0.2		
Total Residual Chlorine	mg/L	--	--	0.1		
Total Dissolved Solids	mg/L	1500	--	--		

[1] The mass emission rates are based on the plant design flow rate of 3 MGD, and are calculated as follows: Flow (MGD) x Concentration (mg/L) x 8.34 (conversion factor) = lbs/day. During wet-weather storm events in which the flow exceeds the design capacity, the mass discharge rate limitations shall not apply, and concentration limitations will provide the only applicable effluent limitations.

Parameter	Units	Effluent Limitations				
		Average Monthly	Average Weekly	Maximum Daily	Instantaneous Minimum	Instantaneous Maximum
	lbs/day[1]	38,000	--	--		
Sulfate	mg/L	500	--	--		
	lbs/day[1]	13,000	--	--		
Chloride	mg/L	300	--	--		
	lbs/day[1]	7,500	--	--		
Boron	mg/L	1.5	--	--		
	lbs/day[1]	38.0	--	--		
MBAS	mg/L	0.5	--	--		
	lbs/day[1]	13.0	--	--		
Ammonia Nitrogen[2]	mg/L	3.0	--	4.6		
	lbs/day[1]	75	--	120		
Nitrate + Nitrite (as N)	mg/L	--	--	10		
	lbs/day[1]	--	--	251		
Nitrite (as N)	mg/L	--	--	1		
	lbs/day[1]		--	25		
Bis(2-ethylhexyl)phthalate	µg/L	4.0	--	--		
	lbs/day[1]	0.10		--		

2. Other Effluent Limitations Applicable to Discharge Point 001

a. **Percent removal**: The average monthly removal of BOD 5-day 20°C and total suspended solids shall not be less than 85 percent.

b. The temperature of wastes discharged shall not exceed 86°F except when the ambient temperature of the receiving waters is higher than 86°F, in which case the temperature of the wastes discharged shall not exceed the ambient temperature of the receiving waters.

c. The radioactivity of the wastes discharged shall not exceed the limits specified in Title 22, Chapter 15, Article 5, Section 64443, of the California Code of Regulations (CCR), or subsequent revisions.

d. The wastes discharged to water courses shall at all times be adequately disinfected. For the purpose of this requirement, the wastes shall be considered adequately disinfected if the median number of total coliform

[2] This is the translated effluent limitation for ammonia based on the water quality objective for ammonia in the current Basin Plan, Table 3-1 and Table 3-2, which resulted from Resolution Nos. 2002-011 and 2005-014 adopted by the Regional Water Board on April 25, 2002, and December 1, 2005, respectively. This effluent limitation is derived according to the Implementation Section of Resolution No. 2002-011.

bacteria at the end of the UV channel during normal operation when the UV backup system is in use, and at the end of the chlorine contact chamber when the back up method is used, does not exceed a 7-day median of 2.2 MPN or CFU per 100 milliliters, and the number of total coliform bacteria does not exceed 23 MPN or CFU per 100 milliliters in more than one sample within any 30-day period. No sample shall exceed 240 MPN or CFU of total coliform bacteria per 100 milliliters in more than one sample in any 30 day period. The median value shall be determined from the bacteriological results of the last seven (7) days for which an analysis has been completed. Samples shall be collected at a time when wastewater flow and characteristics are most demanding on treatment facilities and disinfection processes.

e. For the protection of the water contact recreation beneficial use, the wastes discharged to water courses shall have received adequate treatment, so that the turbidity of the treated wastewater does not exceed any of the following: (a) an average of 2 Nephelometric turbidity units (NTUs) within a 24-hour period; (b) 5 NTUs more than 5 percent of the time (72 minutes) within a 24-hour period; and (c) 10 NTU at any time.

f. To protect the underlying ground water basins, pollutants shall not be present in the wastes discharged at concentrations that pose a threat to ground water quality.

g. Acute Toxicity Limitation and Requirements:

a. The acute toxicity of the effluent shall be such that:

(i) The average survival in the undiluted effluent for any three (3) consecutive 96-hour static renewal bioassay tests shall be at least 90%, and

(ii) No single test producing less than 70% survival.

b. If either of the above requirements g.a.(i) or g.a.(ii) is not met, the Discharger shall conduct six additional tests over a 12-week period, approximately one test every two weeks. The Discharger shall ensure that results of a failing acute toxicity test are received by the Discharger within 24 hours of completion of the test, and the additional tests shall begin within 5 business days of receipt of the result. If the additional tests indicate compliance with acute toxicity limitation, the Discharger may resume testing at the regular frequency as specified in the monitoring and reporting program. However, if the results of any two of the six accelerated tests are less than 90% survival, then the Discharger shall begin a Toxicity Identification Evaluation (TIE). The TIE shall include all reasonable steps to identify the sources of toxicity. Once the sources are

identified, the Discharger shall take all reasonable steps to reduce toxicity to meet the objective.

c. If the initial test and any of the additional six acute toxicity bioassay tests results are less than 70% survival, the Discharger shall immediately implement the Initial Investigation Toxicity Reduction Evaluation (TRE) Workplan.

d. The Discharger shall conduct acute toxicity monitoring as specified in Attachment E - Monitoring and Reporting Program (MRP).

h. Chronic Toxicity Trigger and Requirements:

a. The chronic toxicity of the effluent shall be expressed and reported in toxic units, where:

$$TU_c = \frac{100}{NOEC}$$

The No Observable Effect Concentration (NOEC) is expressed as the maximum percent effluent concentration that causes no observable effect on test organisms, as determined by the results of a critical life stage toxicity test.

b. There shall be no chronic toxicity in the effluent discharge.

c. If the chronic toxicity of the effluent exceeds the monthly median trigger of 1.0 TU_c, the Discharger shall immediately implement an accelerated chronic toxicity testing according to Attachment E - MRP, Section V.B.3. If any three out of the initial test and the six accelerated tests results exceed 1.0 TU_c, the Discharger shall initiate a TIE and implement the Initial Investigation TRE Workplan, as specified in Attachment E – MRP, Section V.D and V.E.

d. The Discharger shall conduct chronic toxicity monitoring as specified in Attachment E – MRP.

B. Land Discharge Specifications

Not applicable.

C. Reclamation Specifications

The production, distribution, and reuse of recycled water are presently regulated under Water Reclamation Requirements (WRRs) Order No. 88-107, adopted by this Board on October 24, 1988, continued in Board Order No. 97-072, adopted on May 12, 1997. Pursuant to California Water Code section 13523, these

WRRs were revised in 1997 and were readopted without change in Order No. 97-072, adopted May 12, 1997.

V. RECEIVING WATER LIMITATIONS

A. Surface Water Limitations

Receiving water limitations are based on water quality objectives contained in the Basin Plan and are a required part of this Order. The discharge shall not cause the following in Ventura River:

1. For waters designated with a warm freshwater habitat (WARM) or cold freshwater habitat (COLD) beneficial use, the temperature of the receiving water at any time or place and within any given 24-hour period shall not be altered by more than 5°F above the natural temperature (or above 70°F if the ambient receiving water temperature is less than 60°F) at the receiving water station located downstream of the discharge, as a result of the waste discharged. Natural conditions shall be determined on a case-by-case basis.

2. The pH of inland surface waters shall not be depressed below 6.5 or raised above 8.5 as a result of wastes discharged. Ambient pH levels shall not be changed more than 0.5 units from natural conditions as a result of wastes discharged. Natural conditions shall be determined on a case-by-case basis.

3. The dissolved oxygen in the receiving water shall not be depressed below 7 mg/L as a result of the wastes discharged.

4. The total residual chlorine shall not exceed 0.1 mg/L in the receiving waters and shall not persist in the receiving water at any concentration that causes impairment of beneficial uses as a result of the wastes discharged.

5. The fecal coliform concentration in the receiving water shall not exceed the following, as a result of wastes discharged:

   a. Geometric Mean Limits

      i. E.coli density shall not exceed 126/100 mL.

      ii. Fecal coliform density shall not exceed 200/100 mL.

   b. Single Sample Limits

      i. E.coli density shall not exceed 235/100 mL.

      ii. Fecal coliform density shall not exceed 400/100 mL.

6. Waters shall be free of changes in turbidity that cause nuisance or adversely affect beneficial uses. Increases in natural turbidity attributable to controllable water quality factors shall not exceed the following limits, as a result of wastes discharged:

a. Where natural turbidity is between 0 and 50 NTU, increases shall not exceed 20%, and

b. Where natural turbidity is greater than 50 NTU, increases shall not exceed 10%.

7. The wastes discharged shall not produce concentrations of substances in the receiving water that are toxic to or cause detrimental physiological responses in human, animal, or aquatic life.

8. The wastes discharged shall not cause concentrations of contaminants to occur at levels that are harmful to human health in waters which are existing or potential sources of drinking water.

9. The concentrations of toxic pollutants in the water column, sediments, or biota shall not adversely affect beneficial uses as a result of the wastes discharged.

10. The wastes discharged shall not contain substances that result in increases in BOD, which adversely affect the beneficial uses of the receiving waters.

11. Waters discharged shall not contain biostimulatory substances in concentrations that promote aquatic growth to the extent that such growth causes nuisance or adversely affects beneficial uses.

12. The dissolved sulfide concentration of waters in and near sediments shall not be significantly increased above that present under natural conditions as a result of waters discharged.

13. The wastes discharged shall not cause the receiving waters to contain any substance in concentrations that adversely affect any designated beneficial use.

14. The wastes discharged shall not degrade surface water communities and populations, including vertebrate, invertebrate, and plant species.

15. The wastes discharged shall not alter the natural taste, odor, and color of fish, shellfish, or other surface water resources used for human consumption.

16. The wastes discharged shall not result in problems due to breeding of mosquitoes, gnats, black flies, midges, or other pests.

17. The wastes discharged shall not result in visible floating particulates, foams, and oil and grease in the receiving waters.

18. The wastes discharged shall not cause objectionable aquatic growths or degrade indigenous biota.

19. The wastes discharged shall not alter the color of the receiving waters; not create a visual contrast with the natural appearance of the water; nor cause aesthetically undesirable discoloration of the receiving waters.

20. No physical evidence of wastes discharged shall be visible at any time in the water or on beaches, shores, rocks, or structures.

21. The wastes discharged shall not contain any individual pesticide or combination of pesticides in concentrations that adversely affect beneficial uses of the receiving waters. There shall be no increase in pesticide concentrations found in bottom sediments or aquatic life as a result of the wastes discharged.

22. The natural hydrologic conditions necessary to support the physical, chemical, and biological characteristics present in wetlands shall be protected to prevent significant adverse effects on: (a) natural temperature, pH, dissolved oxygen, and other natural physical and chemical conditions; (b) movement of aquatic fauna; (c) survival and reproduction of aquatic flora and fauna; and (d) water levels.

23. The existing habitats and associated populations of wetlands fauna and flora shall be maintained by: (a) maintaining substrate characteristics necessary to support flora and fauna, which would be present naturally; (b) protecting food supplies for fish and wildlife; (c) protecting reproductive and nursery areas; and (d) protecting wildlife corridors.

24. Ammonia shall not be present at levels that, when oxidized to nitrate, pose a threat to groundwater quality.

25. Acute Toxicity Receiving Water Quality Objective

    a. There shall be no acute toxicity in ambient waters as a result of wastes discharged.

    b. Receiving water and effluent toxicity testing shall be performed on the same day as close to concurrently as possible.

    c. The acute toxicity of the receiving water, at monitoring location RSW-004, located approximately 50 feet downstream of the discharge, shall be such that: (i) the average survival in the undiluted receiving water for any three (3) consecutive 96-hour static, static-renewal, or continuous flow bioassay tests shall be at least 90%, and (ii) no single test producing less than 70% survival. Static-renewal bioassay tests may be used, as allowed by the most current USEPA test method for measuring acute toxicity.

    d. If the upstream acute toxicity of the receiving water is greater than the downstream acute toxicity but the effluent acute toxicity is in compliance, acute toxicity accelerated monitoring in the receiving water according to MRP Section V.A.2.d does not apply.

26. Chronic Toxicity Receiving Water Quality Objective

    a. There shall be no chronic toxicity in ambient waters as a result of wastes discharged.

    b. Receiving water and effluent toxicity testing shall be performed on the same day as close to concurrently as possible.

    c. If the chronic toxicity in the receiving water at the monitoring station immediately downstream of the discharge, exceeds the monthly median of 1.0 TU_c trigger in a critical life stage test and the toxicity cannot be attributed to upstream toxicity, as assessed by the Discharger, then the Discharger shall immediately implement an accelerated chronic toxicity testing according to Monitoring and Reporting Program CI 4245, Section V.B.3. If two of the six tests exceed a 1.0 TU_c trigger, the Discharger shall initiate a TIE and implement the Initial Investigation TRE Workplan.

    d. If the chronic toxicity of the receiving water upstream of the discharge is greater than the downstream and the TUc of the effluent chronic toxicity test is less than or equal to a monthly median of 1 TU_c trigger, then accelerated monitoring need not be implemented.

27. The wastes discharged shall not cause the ammonia water quality objective in the Basin Plan to be exceeded in the receiving waters. Compliance with the ammonia water quality objectives shall be determined by comparing the receiving water ammonia concentration to the ammonia water quality objective in the Basin Plan. The ammonia water quality objective can also be calculated using the pH and temperature of the receiving water at the time of collection of the ammonia sample.

B. Groundwater Limitations

1. The discharge shall not cause the underlying groundwater to be degraded, to exceed water quality objectives, unreasonably affect beneficial uses, or cause a condition of pollution or nuisance.

VI. PROVISIONS

A. Standard Provisions

1. **Standard Provisions**
   The Discharger shall comply with all Standard Provisions included in Attachment D of this Order.

2. **Regional Water Board Standard Provisions**
   The Discharger shall comply with the Regional Water Board-specific Standard Provisions as follows:

   a. Neither the treatment nor the discharge of pollutants shall create a pollution, contamination, or nuisance as defined by Section 13050 of the California Water Code.

   b. Odors, vectors, and other nuisances of sewage or sludge origin beyond the limits of the treatment plant site or the sewage collection system due to improper operation of facilities, as determined by the Regional Water Board, are prohibited.

   c. All facilities used for collectionand transport of "wastes" shall be adequately protected against damage resulting from overflow, washout, or inundation. The treatment plant shall be protected from a 100-year return, 24-hour duration storm.

   d. Collection, treatment, and disposal systems shall be operated in a manner that precludes public contact with wastewater.

   e. Collected screenings, sludges, and other solids removed from liquid wastes shall be disposed of in a manner approved by the Executive Officer of the Regional Water Board.

   f. The provisions of this order are severable. If any provision of this order is found invalid, the remainder of this Order shall not be affected.

   g. Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the discharger from any responsibilities, liabilities or penalties established pursuant to any applicable State law or regulation under authority preserved by Section 510 of the CWA.

   h. Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the discharger from any responsibilities, liabilities or penalties to which the discharger is or may be subject to under Section 311 of the CWA.

   i. The Discharger must comply with the lawful requirements of municipalities, counties, drainage districts, and other local agencies regarding discharges of

storm water to storm drain systems or other water courses under their jurisdiction, including applicable requirements in municipal storm water management programs developed to comply with NPDES permits issued by the Regional Water Board to local agencies.

j. Discharge of wastes to any point other than specifically described in this Order is prohibited, and constitutes a violation thereof.

k. The Discharger shall comply with all applicable effluent limitations, national standards of performance, toxic effluent standards, and all federal regulations established pursuant to Sections 301, 302, 303(d), 304, 306, 307, 316, 403, and 405 of the Federal CWA and amendments thereto.

l. These requirements do not exempt the operator of the waste disposal facility from compliance with any other laws, regulations, or ordinances which may be applicable; they do not legalize this waste disposal facility, and they leave unaffected any further restraints on the disposal of wastes at this site which may be contained in other statutes or required by other agencies.

m. Oil or oily material, chemicals, refuse, or other polluting materials shall not be stored or deposited in areas where they may be picked up by rainfall and carried off of the property and/or discharged to surface waters. Any such spill of such materials shall be contained and removed immediately.

n. A copy of these waste discharge specifications shall be maintained at the discharge facility so as to be available at all times to operating personnel.

o. If there is any storage of hazardous or toxic materials or hydrocarbons at this facility and if the facility is not manned at all times, a 24-hour emergency response telephone number shall be prominently posted where it can easily be read from the outside.

p. The Discharger shall file with the Regional Water Board a report of waste discharge at least 120 days before making any proposed change in the character, location or volume of the discharge.

q. In the event of any change in name, ownership, or control of these waste disposal facilities, the discharger shall notify the Regional Water Board of such change and shall notify the succeeding owner or operator of the existence of this Order by letter, a copy of which shall be forwarded to the Regional Water Board.

r. The CWC section 13385 provides that any person who violates a waste discharge requirement or a provision of the California Water Code is subject to civil penalties of: up to $5,000 per day, $10,000 per day, or $25,000 per day of violation; or when the violation involves the discharge of pollutants, is subject to civil penalties of up to $10 per gallon per day or $25 per gallon per day of violation; or some combination thereof, depending on the violation, or upon the combination of violations. Violation of any of the provisions of the NPDES

program or of any of the provisions of this Order may subject the violator to any of the penalties described herein, or any combination thereof, at the discretion of the prosecuting authority; except that only one kind of penalty may be applied for each kind of violation.

s. Pursuant to CWC 13387(e), any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this order, including monitoring reports or reports of compliance or noncompliance, or who knowingly falsifies, tampers with, or renders inaccurate any monitoring device or method required to be maintained in this order and is subject to a fine of not more than $25,000 or imprisonment for not more than two years, or both. For a subsequent conviction, such a person shall be punished by a fine of not more than $25,000 per day of violation, by imprisonment of not more than four years, or by both.

t. The discharge of any waste resulting from the combustion of toxic or hazardous wastes to any waste stream that ultimately discharges to waters of the United States is prohibited, unless specifically authorized elsewhere in this permit.

u. The Discharger shall notify the Executive Officer in writing no later than 6 months prior to planned discharge of any chemical, other than the products previously reported to the Executive Officer, which may be toxic to aquatic life. Such notification shall include:
(1) Name and general composition of the chemical,
(2) Frequency of use,
(3) Quantities to be used,
(4) Proposed discharge concentrations, and
(5) USEPA registration number, if applicable.

v. In the event the Discharger does not comply or will be unable to comply for any reason with any prohibition, maximum daily effluent limitation, or receiving water limitation of this Order, the Discharger shall notify the Watershed Regulatory Section Chief at the Regional Water Board by telephone (213) 576-6616, or by fax at (213) 576-6660 within 24 hours of having knowledge of such noncompliance, and shall confirm this notification in writing to the Regional Water Board within five business days, unless the Regional Water Board waives confirmation. The written notification shall state the nature, time, duration, and cause of noncompliance, and shall describe the measures being taken to remedy the current noncompliance and the measures to prevent recurrence including, where applicable, a schedule of implementation. Other noncompliance requires written notification as above at the time of the normal monitoring report.

B. Monitoring and Reporting Program (MRP) Requirements

The Discharger shall comply with the MRP, and future revisions thereto, in Attachment E of this Order.

C. Special Provisions

1. Reopener Provisions

a. This Order may be modified, revoked and reissued, or terminated for cause, including, but not limited to:

(1) Violation of any term or condition contained in this Order;

(2) Obtaining this Order by misrepresentation, or by failure to disclose fully all relevant facts; or

(3) A change in any condition that requires either a temporary or permanent reduction or elimination of the authorized discharge.

The filing of a request by the Discharger for an Order modification, revocation, and issuance or termination, or a notification of planned changes or anticipated noncompliance does not stay any condition of this Order.

b. This Order may be reopened for modification, or revocation and reissuance, as a result of the detection of a reportable priority pollutant generated by special conditions included in this Order. These special conditions may be, but are not limited to, fish tissue sampling, whole effluent toxicity, monitoring requirements on internal waste stream(s), and monitoring for surrogate parameters. Additional requirements may be included in this Order as a result of the special condition monitoring data.

c. This Order may be modified, in accordance with the provisions set forth in 40 C.F.R. parts 122 and 124 to include requirements for the implementation of the watershed protection management approach.

d. The Board may modify, or revoke and reissue this Order if present or future investigations demonstrate that the discharge(s) governed by this Order will cause, have the potential to cause, or will contribute to adverse impacts on water quality and/or beneficial uses of the receiving waters.

e. This Order may also be modified, revoked, and reissued or terminated in accordance with the provisions of 40 C.F.R. parts 122.44, 122.62 to 122.64, 125.62, and 125.64. Causes for taking such actions include, but are not limited to, failure to comply with any condition of this Order, endangerment to human health or the environment resulting from the permitted activity, or acquisition of newly obtained information which would have justified the application of different conditions if known at the time of Order adoption. The filing of a request by the Discharger for an Order modification, revocation and issuance or termination, or a notification of planned changes or anticipated noncompliance does not stay any condition of this Order.

f. This Order may be modified, in accordance with the provisions set forth in 40 C.F.R. parts 122 to 124, to include new minimum levels (MLs).

g. If an applicable toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is promulgated under section 307(a) of the CWA for a toxic pollutant and that standard or prohibition is more stringent than any limitation on the pollutant in this Order, the Regional Water Board may institute proceedings under these regulations to modify or revoke and reissue the Orders to conform to the toxic effluent standard or prohibition.

h. The waste discharged shall not cause a violation of any applicable water quality standard for receiving waters. If more stringent applicable water quality standards are promulgated or approved pursuant to Section 303 of the CWA, or amendments, thereto, the Regional Water Board will revise and modify this Order in accordance with such standards.

i. This Order may be reopened and modified, to revise effluent limitations as a result of future Basin Plan Amendments, such as an update of a water quality objective, or the adoption of a TMDL for the Ventura River Watershed.

j. This Order may be reopened and modified, to revise effluent limitations as a result of the delisting of a pollutant from the 303(d) list.

k. This Order may be reopened and modified to revise the chronic toxicity effluent limitation, and/or total residual chlorine limitations, to the extent necessary, to be consistent with State Water Board precedential decisions, new policies, new laws, or new regulations.

l. This Order may be reopened and modified to revise the chronic toxicity effluent limitation or the residual chlorine effluent limitation, to the extent necessary, to be consistent with State Water Board precedential decisions, new policies, new laws, or new regulations.

2. Special Studies, Technical Reports and Additional Monitoring Requirements

a. Toxicity Reduction Requirements

The Discharger shall prepare and submit a copy of the Discharger's Initial Investigation Toxicity Reduction Evaluation (TRE) workplan to the Executive Officer of the Regional Water Board for approval within 90 days of the effective date of this permit. If the Executive Officer does not disapprove the workplan within 60 days from the date in which it was received, the workplan shall become effective. The Discharger shall use USEPA manual EPA/833B-99/002 (municipal), or the most current version, as guidance. At a minimum, the Initial Investigation TRE workplan must contain the provisions in Attachment G. This workplan shall describe the steps the Discharger intends to follow if toxicity is detected, and should include, at a minimum:

(1) A description of the investigation and evaluation techniques that will be used to identify potential causes and sources of toxicity, effluent variability, and treatment system efficiency.

(2) A description of the facility's methods of maximizing in-house treatment efficiency and good housekeeping practices, and a list of all chemicals used in the operation of the facility; and,

(3) If a toxicity identification evaluation (TIE) is necessary, an indication of the person who would conduct the TIEs (i.e., an in-house expert or an outside contractor).

If the effluent toxicity test result exceeds the 1.0 TUc monthly median toxicity trigger, then the Discharger shall immediately implement accelerated toxicity testing that consists of six additional tests over a12-week period, i.e. approximately one test every two weeks. Effluent sampling for the first test of the six additional tests shall commence within 5 business days of receipt of the test results exceeding the toxicity trigger.

If the results of any two of the six tests (any two tests in a 12-week period) exceed the limitation, the Discharger shall initiate a Toxicity Reduction Evaluation (TRE).

If results of the implementation of the facility's initial investigation TRE workplan (as described above) indicate the need to continue the TRE/TIE, the Discharger shall expeditiously develop a more detailed TRE workplan for submittal to the Executive Officer within 15 days of completion of the initial investigation TRE.

Detailed toxicity testing and reporting requirements are contained in Section V of the MRP, (Attachment E).

b. Treatment Plant Capacity

The Discharger shall submit a written report to the Executive Officer of the Regional Water Board within 90 days after the "30-day (monthly) average" daily dry-weather flow equals or exceeds 75 percent of the design capacity of waste treatment and/or disposal facilities. The Discharger's senior administrative officer shall sign a letter, which transmits that report and certifies that the discharger's policy-making body is adequately informed of the report's contents. The report shall include the following:

(1) The average daily flow for the month, the date on which the peak flow occurred, the rate of that peak flow, and the total flow for the day;

(2) The best estimate of when the monthly average daily dry-weather flow rate will equal or exceed the design capacity of the facilities; and

(3) A schedule for studies, design, and other steps needed to provide additional capacity for waste treatment and/or disposal facilities before the waste flow rate equals the capacity of present units.

This requirement is applicable to those facilities which have not reached 75 percent of capacity as of the effective date of this Order. For those facilities that have reached 75 percent of capacity by that date but for which no such report has been previously submitted, such report shall be filed within 90 days of the issuance of this Order.

3. Best Management Practices and Pollution Prevention

a. Storm Water Pollution Prevention Plan (SWPPP)

Not applicable

b. Spill Clean-up Contingency Plan (SCP)

Within ninety days, the Discharger is required to submit a Spill Clean-up Contingency Plan, which describes the activities and protocols to address clean-up of spills, overflows, and bypasses of untreated or partially treated wastewater from the Discharger's collection system or treatment facilities that reach water bodies, including dry channels and beach sands. At a minimum, the Plan shall include sections on spill clean-up and containment measures, public notification, and monitoring. The Discharger shall review and amend the Plan as appropriate after each spill from the facility or in the service area of the facility. The Discharger shall include a discussion in the annual summary report of any modifications to the Plan and the application of the Plan to all spills during the year.

c. Pollutant Minimization Program (PMP)

Reporting protocols in the Monitoring and Reporting Program, Attachment E, Section X.B.4 describe sample results that are to be reported as Detected but Not Quantified (DNQ) or Not Detected (ND). Definitions for a reported Minimum Level (ML) and Method Detection Limit (MDL) are provided in Attachment A. These reporting protocols and definitions are used in determining the need to conduct a Pollution Minimization Program (PMP) as follows:

The Discharger shall be required to develop and conduct a PMP as further described below when there is evidence (e.g., sample results reported as DNQ when the effluent limitation is less than the MDL, sample results from analytical methods more sensitive than those methods required by this Order, presence of whole effluent toxicity, health advisories for fish consumption, results of benthic or aquatic organism tissue sampling) that a pollutant is present in the effluent above an effluent limitation and either:

(1) The concentration of the pollutant is reported as DNQ and the effluent limitation is less than the reported ML; or

(2) The concentration of the pollutant is reported as ND and the effluent limitation is less than the MDL.

The goal of the PMP shall be to reduce all potential sources of a pollutant through pollutant minimization (control) strategies, including pollution prevention measures as appropriate, to maintain the effluent concentration at or below the effluent limitation. Pollution prevention measures may be particularly appropriate for persistent bioaccumulative priority pollutants where there is evidence that beneficial uses are being impacted. The Regional Water Board may consider cost-effectiveness when establishing the requirements of a PMP. The completion and implementation of a Pollution Prevention Plan, if required pursuant to CWC section 13263.3(d), shall be considered to fulfill the PMP requirements.

The PMP shall include, but not be limited to, the following actions and submittals acceptable to the Regional Water Board:

(1) An annual review and semi-annual monitoring of potential sources of the reportable pollutant(s), which may include fish tissue monitoring and other bio-uptake sampling;

(2) Quarterly monitoring for the reportable pollutant(s) in the influent to the wastewater treatment system;

(3) Submittal of a control strategy designed to proceed toward the goal of maintaining concentrations of the reportable pollutant(s) in the effluent at or below the effluent limitation;

(3) Implementation of appropriate cost-effective control measures for the reportable pollutant(s), consistent with the control strategy; and

(5) An annual status report that shall be sent to the Regional Water Board including:

(a) All PMP monitoring results for the previous year;

(b) A list of potential sources of the reportable pollutant(s);

(c) A summary of all actions undertaken pursuant to the control strategy; and

(d) A description of actions to be taken in the following year.

4. Construction, Operation and Maintenance Specifications

a. Wastewater treatment facilities subject to this Order shall be supervised and operated by persons possessing certificates of appropriate grade pursuant to CCR, title 23, chapter 3, subchapter 14 (Section 13625 of the California Water Code).

b. The Discharger shall maintain in good working order a sufficient alternate power source for operating the wastewater treatment and disposal facilities. All equipment shall be located to minimize failure due to moisture, liquid spray, flooding, and other physical phenomena. The alternate power source shall be designed to permit inspection and maintenance and shall provide for periodic testing. If such alternate power source is not in existence, the discharger shall halt, reduce, or otherwise control all discharges upon the reduction, loss, or failure of the primary source of power.

5. Special Provisions for Municipal Facilities (POTWs Only)

a. **Sludge Disposal Requirements**

(1) All sludge generated at the wastewater treatment plant will be disposed of, treated, or applied to land in accordance with federal regulations contained in 40 C.F.R. Part 503, in general, and in particular with the requirements in Attachment H of this Order, (Biosolids, Sludge Management]. These requirements are enforceable by USEPA.

(2) The Discharger shall ensure compliance with the requirements in SWRCB Order No. 2004- 10-DWQ, General Waste Discharge Requirements for the Discharge of Biosolids to Land for Use as a Soil Amendment in Agricultural, Silvicultural, Horticultural and Land Reclamation Activities" for those sites receiving the Discharger's biosolids which a Regional Water Board has placed under this general order, and with the requirements in individual WDRs issued by a Regional Water Board for sites receiving the Discharger's biosolids.

(3) The Discharger shall comply, if applicable, with WDRs issued by other Regional Water Boards to which jurisdiction the biosolids are transported and applied.

(4) The Discharger shall furnish this Regional Water Board with a copy of any report submitted to USEPA, State Water Board or other Regional Water Board, with respect to municipal sludge or biosolids.

b. **Pretreatment Requirements**

(1) This Order includes the Discharger's Pretreatment Program as previously submitted to this Regional Water Board. Any change to the Program shall be reported to the Regional Water Board in writing and shall not become effective until approved by the Executive Officer in accordance with procedures established in 40 C.F.R. 403.18.

(2) The Discharger shall enforce the requirements promulgated under sections 307(b), 307(c), 307(d), and 402(b) of the Federal Clean Water Act with timely, appropriate, and effective enforcement actions. The Discharger shall require industrial users to comply with Federal Categorical Standards and shall initiate enforcement actions against those users who do not comply with the standards. The Discharger shall require industrial users subject to the Federal Categorical Standards to achieve compliance no later than the date specified in those requirements or, in the case of a new industrial user, upon commencement of the discharge.

(3) The Discharger shall perform the pretreatment functions as required in Federal Regulations 40 C.F.R. Part 403 including, but not limited to:

A. Implement the necessary legal authorities as provided in 40 C.F.R. 403.8(f)(1);

B. Enforce the pretreatment requirements under 40 C.F.R. 403.5 and 403.6;

C. Implement the programmatic functions as provided in 40 C.F.R. 403.8(f)(2); and

D. Provide the requisite funding of personnel to implement the Pretreatment Program as provided in 40 C.F.R. 403.8(f)(3).

(4) The Discharger shall submit semiannual and annual reports to the Regional Water Board, with copies to the State Water Board, and USEPA Region 9, describing the Discharger's pretreatment activities over the period. The annual and semiannual reports shall contain, but not be limited to, the information required in the attached *Pretreatment Reporting Requirements* (Attachment I), or an approved revised version thereof. If the Discharger is not in compliance with any conditions or requirements of this Order, the Discharger shall include the reasons for noncompliance and shall state how and when the Discharger will comply with such conditions and requirements.

(5) The Discharger shall be responsible and liable for the performance of all control authority pretreatment requirements contained in 40 C.F.R. Part 403, including subsequent regulatory revisions thereof. Where Part 403 or subsequent revision places mandatory actions upon the Discharger as Control Authority but does not specify a timetable for completion of the actions, the Discharger shall complete the required actions within six months from the effective date of this Order or the effective date of Part 403 revisions, whichever comes later. For violations of pretreatment requirements, the Discharger shall be subject to enforcement actions, penalties, fines, and other remedies by the Regional Water Board, USEPA, or other appropriate parties, as provided in the Federal Clean Water Act. The Regional Water Board or USEPA may initiate enforcement action against an industrial user for

noncompliance with acceptable standards and requirements as provided in the Federal Clean Water Act and/or the California Water Code.

c. The Discharger's collection system is part of the system that is subject to this Order. As such, the Discharger must properly operate and maintain its collection system (40 C.F.R. § 122.41(e)). The Discharger must report any non-compliance (40 C.F.R. § 122.41(l), subsections (6) and (7)) and mitigate any discharge from the collection system in violation of this Order (40 C.F.R. § 122.41(d)). See Attachment D, subsections I.D, V.E, V.H, and I.C., and the following section (Spill Reporting Requirements) of this Order.

6. Other Special Provisions

A. Notification

Although State and Regional Water Board staff do not have duties as first responders, this requirement is an appropriate mechanism to ensure that the agencies that do have first responder duties are notified in a timely manner in order to protect public health and beneficial uses. For certain spills, overflows and bypasses, the Discharger shall make notifications as required below:

a. For any discharges of sewage that results in a discharge to a drainage channel or a surface water, the Discharger shall, as soon as possible, but no later than two (2) hours after becoming aware of the discharge, notify the State Office of Emergency Services, the local health officer or directors of environmental health with jurisdiction over affected water bodies, and the Regional Water Quality Control Board.

b. As soon as possible, but no later than twenty-four (24) hours after becoming aware of a discharge to a drainage channel or a surface water, the Discharger shall submit to the Regional Water Quality Control Board a certification that the State Office of Emergency Services and the local health officer or directors of environmental health with jurisdiction over the affected water bodies have been notified of the discharge.

B. Monitoring

For certain spills, overflows and bypasses, the Discharger shall monitor as required below:

a. To define the geographical extent of spill's impact the Discharger shall obtain grab samples (if feasible, accessible, and safe) for spills, overflows or bypasses of any volume that reach receiving waters. The Discharger shall analyze the samples for total and fecal coliforms or *E. coli*, and *enterococcus*, and relevant pollutants of concern, upstream and downstream of the point of entry of the spill (if feasible, accessible and safe). This monitoring shall be done on a daily basis from time the spill is known until the results of two consecutive sets of bacteriological

monitoring indicate the return to the background level or the County Department of Public Health or appropriate local agency authorizes cessation of monitoring.

b. The Discharger shall obtain a grab sample (if feasible, accessible, and safe) for spills, overflows or bypasses of any volume that flowed to receiving waters, entered a shallow ground water aquifer, or have the potential for public exposure; and for all spills, overflows or bypasses of 1,000 gallons or more. The Discharger shall characterize the sample for total and fecal coliforms or *E. coli*, and *enterococcus*, and analyze relevant pollutants of concern depending on the area and nature of spills or overflows (if feasible, accessible and safe).

C. Reporting

The initial notification to the Regional Water Board shall be followed by:

a. A written preliminary report five working days after disclosure of the incident (submission to the Regional Water Board of the log number of the Sanitary Sewer Overflow database entry shall satisfy this requirement). Within 30 days after submitting the preliminary report, the Discharger shall submit the final written report to this Regional Water Board. (A copy of the final written report, for a given incident, already submitted pursuant to a Statewide General Waste Discharge Requirements for Wastewater Collection System Agencies, may be submitted to the Regional Water Board to satisfy this requirement.) The written report shall document the information required in paragraph D. below, monitoring results and any other information required in provisions of the Standard Provisions document including corrective measures implemented or proposed to be implemented to prevent/minimize future occurrences. The Executive Officer for just cause can grant an extension for submittal of the final written report.

b. The Discharger shall include a certification in the annual summary report (due according to the schedule in the Monitoring and Reporting Program) stating that the sewer system emergency equipment, including alarm systems, backup pumps, standby power generators, and other critical emergency pump station components were maintained and tested in accordance with the Discharger's Preventative Maintenance Plan. Any deviations from or modifications to the Plan shall be discussed.

D. Records

The Discharger shall develop and maintain a record of all spills, overflows or bypasses of raw or partially treated sewage from its collection system or treatment plant. This record shall be made available to the Regional Water Board upon request and a spill summary shall be included in the annual summary report. The records shall contain:

a. the date and time of each spill, overflow or bypass;

b. the location of each spill, overflow or bypass;

c. the estimated volume of each spill, overflow or bypass including gross volume, amount recovered and amount not recovered, monitoring results as required by Section VI.C.6.B;

d. the cause of each spill, overflow or bypass;

e. whether each spill, overflow or bypass entered a receiving water and, if so, the name of the water body and whether it entered via storm drains or other man-made conveyances;

f. mitigation measures implemented; and,

g. corrective measures implemented or proposed to be implemented to prevent/minimize future occurrences.

E. Activities Coordination

In addition, Regional Water Board expects that the POTW's owners/operators will coordinate their compliance activities for consistency and efficiency with other entities that have responsibilities to implement: (i) this NPDES permit, including the Pretreatment Program, (ii) a Municipal Separate Storm Sewer (MS4) NPDES permit that may contain spill prevention, sewer maintenance, reporting requirements and (iii) the Sanitary Sewer Overflows (SSOs) WDR.

F. Consistency with Sanitary Sewer Overflows WDRs

The Clean Water Act prohibits the discharge of pollutants from point sources to surface waters of the United States unless authorized under an NPDES permit. (33 U.S.C. §§1311, 1342). The State Water Board adopted a General WDR for SSOs, (WQ Order No. 2006-0003) on May 2, 2006, to provide a consistent, statewide regulatory approach to address SSOs. The SSOs WDR requires public agencies that own or operate sanitary sewer systems to develop and implement sewer system management plans and report all SSOs to the State Water Board's online SSOs database.

The requirements contained in this Order in Sections VI.C.3.b. (Spill Contingency Plan Section), VI.C.4. (Construction, Operation and Maintenance Specifications Section), and VI.C.6. (Spill Reporting Requirements) are intended to be consistent with the requirements of the SSOs WDR. The Regional Water Board recognizes that there may be some overlap between the NPDES permit provisions and SSOs WDR requirements. The requirements of the SSOs WDR are considered the minimum thresholds (see Finding 11 of WQ Order No. 2006-0003). The Regional Water Board will accept the

documentation prepared by the Permittees under the SSOs WDR for compliance purposes, as satisfying the requirements in Sections VI.C.3.b., VI.C.4., and VI.C.6. provided any more specific or stringent provisions enumerated in this Order, have also been addressed.

G. The Discharger shall provide standby or emergency power facilities and/or storage capacity or other means so that in the event of plant upset or outage due to power failure or other cause, discharge of raw or inadequately treated sewage does not occur.

VII. COMPLIANCE DETERMINATION

Compliance with the effluent limitations contained in section IV of this Order will be determined as specified below:

A. General.

Compliance with effluent limitations for priority pollutants shall be determined using sample reporting protocols defined in the MRP and Attachment A of this Order. For purposes of reporting and administrative enforcement by the Regional and State Water Boards, the Discharger shall be deemed out of compliance with effluent limitations if the concentration of the priority pollutant in the monitoring sample is greater than the effluent limitation and greater than or equal to the reporting level (RL).

B. Multiple Sample Data

When determining compliance with a measure of central tendency (arithmetic mean, geometric mean, median, etc.) of multiple sample analyses and the data set contains one or more reported determinations of "Detected, but Not Quantified" (DNQ) or "Not Detected" (ND), the Discharger shall compute the median in place of the arithmetic mean in accordance with the following procedure:

1. The data set shall be ranked from low to high, ranking the reported ND determinations lowest, DNQ determinations next, followed by quantified values (if any). The order of the individual ND or DNQ determinations is unimportant.

2. The median value of the data set shall be determined. If the data set has an odd number of data points, then the median is the middle value. If the data set has an even number of data points, then the median is the average of the two values around the middle unless one or both of the points are ND or DNQ, in which case the median value shall be the lower of the two data points where DNQ is lower than a value and ND is lower than DNQ.

C. Average Monthly Effluent Limitation (AMEL).

If the average (or when applicable, the median determined by subsection B above for multiple sample data) of daily discharges over a calendar month exceeds the AMEL for a given parameter, this will represent a single alleged violation, though the Discharger may be considered out of compliance for each day of that month for that parameter

(e.g., resulting in 31 days of non-compliance in a 31-day month). If only a single sample is taken during the calendar month and the analytical result for that sample exceeds the AMEL, the Discharger may be considered out of compliance for that calendar month. The Discharger will only be considered out of compliance for days when the discharge occurs. For any one calendar month during which no sample (daily discharge) is taken, no compliance determination can be made for that calendar month with respect to the AMEL.

If the analytical result of a single sample, monitored monthly, quarterly, semiannually, or annually, does not exceed the AMEL for a given parameter, the Discharger will have demonstrated compliance with the AMEL for each day of that month for that parameter.

If the analytical result of any single sample, monitored monthly, quarterly, semiannually, or annually, exceeds the AMEL for any parameter, the Discharger shall collect up to four additional samples within the same calendar month. All analytical results shall be reported in the monitoring report for that month. The concentration of pollutant (an arithmetic mean or a median) in these samples estimated from the "Multiple Sample Data Reduction" Section above, will be used for compliance determination.

In the event of noncompliance with an AMEL, the sampling frequency for that parameter shall be increased to weekly and shall continue at this level until compliance with the AMEL has been demonstrated.

D. Average Weekly Effluent Limitation (AWEL).

If the average (or when applicable, the median determined by subsection B above for multiple sample data) of daily discharges over a calendar week exceeds the AWEL for a given parameter, this will represent a single alleged violation, though the Discharger may be considered out of compliance for each day of that week for that parameter, resulting in 7 days of non-compliance. If only a single sample is taken during the calendar week and the analytical result for that sample exceeds the AWEL, the Discharger may be considered out of compliance for that calendar week. The Discharger will only be considered out of compliance for days when the discharge occurs. For any one calendar week during which no sample (daily discharge) is taken, no compliance determination can be made for that calendar week with respect to the AWEL.

A calendar week will begin on Sunday and end on Saturday. Partial weeks consisting of four or more days at the end of any month will include the remaining days of the week, which occur in the following month in order to calculate a consecutive seven-day average. This value will be reported as a weekly average or seven-day average on the SMR for the month containing the partial week of four or more days. Partial calendar weeks consisting of less than four days at the end of any month will be carried forward to the succeeding month and reported as a weekly average or a seven-day average for the calendar week that ends with the first Saturday of that month.

E. Maximum Daily Effluent Limitation (MDEL).

If a daily discharge exceeds the MDEL for a given parameter, the Discharger may be considered out of compliance for that parameter for that 1 day only within the reporting period. For any 1 day during which no sample is taken, no compliance determination can be made for that day with respect to the MDEL.

F. Instantaneous Minimum Effluent Limitation.

If the analytical result of a single grab sample is lower than the instantaneous minimum effluent limitation for a parameter, the Discharger may be considered out of compliance for that parameter for that single sample. Non-compliance for each sample will be considered separately (e.g., the results of two grab samples taken within a calendar day that both are lower than the instantaneous minimum effluent limitation would result in two instances of non-compliance with the instantaneous minimum effluent limitation).

G. Instantaneous Maximum Effluent Limitation.

If the analytical result of a single grab sample is higher than the instantaneous maximum effluent limitation for a parameter, the Discharger may be considered out of compliance for that parameter for that single sample. Non-compliance for each sample will be considered separately (e.g., the results of two grab samples taken within a calendar day that both exceed the instantaneous maximum effluent limitation would result in two instances of non-compliance with the instantaneous maximum effluent limitation).

H. Six-month Median Effluent Limitation.

If the median of daily discharges over any 180-day period exceeds the six-month median effluent limitation for a given parameter, an alleged violation will be flagged and the discharger may be considered out of compliance for each day of that 180-day period for that parameter. The next assessment of compliance will occur after the next sample is taken. If only a single sample is taken during a given 180-day period and the analytical result for that sample exceeds the six-month median, the discharger may be considered out of compliance for the 180-day period. For any 180-period during which no sample is taken, no compliance determination can be made for the six-month median effluent limitation.

I. Percent Removal.

The average monthly percent removal is the removal efficiency expressed in percentage across a treatment plant for a given pollutant parameter, as determined from the 30-day average values of pollutant concentrations (C in mg/L) of influent and effluent samples collected at about the same time using the following equation:
Percent Removal (%) = [1-(CEfluent/CInfluent)] x 100 %
When preferred, the Discharger may substitute mass loadings and mass emissions for the concentrations.

J. Mass and Concentration Limitations

Compliance with mass and concentration effluent limitations for the same parameter shall be determined separately with their respective limitations. When the concentration of a constituent in an effluent sample is determined to be ND or DNQ, the corresponding mass emission rate determined from that sample concentration shall also be reported as ND or DNQ.

K. Compliance with single constituent effluent limitations

Dischargers may be considered out of compliance with the effluent limitation if the concentration of the pollutant (see Section B "Multiple Sample Data Reduction" above) in the monitoring sample is greater than the effluent limitation and greater than or equal to the Reporting Level (RL).

L. Compliance with effluent limitations expressed as a sum of several constituents

Dischargers are out of compliance with an effluent limitation which applies to the sum of a group of chemicals (e.g., PCB's) if the sum of the individual pollutant concentrations is greater than the effluent limitation. Individual pollutants of the group will be considered to have a concentration of zero if the constituent is reported as ND or DNQ.

M. Mass Emission Rate.

The mass emission rate shall be obtained from the following calculation for any calendar day:

$$\text{Mass emission rate (lb/day)} = \frac{8.34}{N}\sum_{i=1}^{N} Q_i C_i$$

$$\text{Mass emission rate (kg/day)} = \frac{3.79}{N}\sum_{i=1}^{N} Q_i C_i$$

in which 'N' is the number of samples analyzed in any calendar day. 'Qi' and 'Ci' are the flow rate (MGD) and the constituent concentration (mg/L), respectively, which are associated with each of the 'N' grab samples, which may be taken in any calendar day. If a composite sample is taken, 'Ci' is the concentration measured in the composite sample and 'Qi' is the average flow rate occurring during the period over which samples are composited.

The daily concentration of all constituents shall be determined from the flow-weighted average of the same constituents in the combined waste streams as follows:

$$\text{Daily concentration} = \frac{1}{Q_1}\sum_{i=1}^{N} Q_i C_i$$

in which 'N' is the number of component waste streams. 'Qi' and 'Ci' are the flow rate (MGD) and the constituent concentration (mg/L), respectively, which are associated with each of the 'N' waste streams. 'Qt' is the total flow rate of the combined waste streams.

N. Bacterial Standards and Analysis.

1. The geometric mean used for determining compliance with bacterial standards is calculated with the following equation:

   Geometric Mean = (C1 x C2 x ... x Cn)1/n

   where n is the number of days samples were collected during the period and C is the concentration of bacteria (MPN/100 mL or CFU/100 mL) found on each day of sampling.

2. For bacterial analyses, sample dilutions should be performed so the expected range of values is bracketed (for example, with multiple tube fermentation method or membrane filtration method, 2 to 16,000 per 100 ml for total and fecal coliform, at a minimum, and 1 to 1000 per 100 ml for enterococcus). The detection methods used for each analysis shall be reported with the results of the analyses.

3. Detection methods used for coliforms (total and fecal) shall be those presented in Table 1A of 40 C.F.R. part 136 (revised March 12, 2007), unless alternate methods have been approved by USEPA pursuant to 40 C.F.R. part 136, or improved methods have been determined by the Executive Officer and/or USEPA.

4. Detection methods used for *enterococcus* shall be those presented in Table 1A of 40 C.F.R. part 136 (revised March 12, 2007) or in the USEPA publication EPA 600/4-85/076, *Test Methods for Escherichia coli and Enterococci in Water By Membrane Filter Procedure* or any improved method determined by the Executive Officer and/or USEPA to be appropriate.

O. Single Operational Upset

A single operational upset (SOU) that leads to simultaneous violations of more than one pollutant parameter shall be treated as a single violation and limits the Discharger's liability in accordance with the following conditions:

1. A single operational upset is broadly defined as a single unusual event that temporarily disrupts the usually satisfactory operation of a system in such a way that it results in violation of multiple pollutant parameters.

2. A Discharger may assert SOU to limit liability only for those violations which the Discharger submitted notice of the upset as required in Provision V.E.2(b) of Attachment D – Standard Provisions.

3. For purposes outside of CWC section 13385, subsections (h) and (i), determination of compliance and civil liability (including any more specific definition of SOU, the

requirements for Dischargers to assert the SOU limitation of liability, and the manner of counting violations) shall be in accordance with USEPA Memorandum "Issuance of Guidance Interpreting Single Operational Upset" (September 27, 1989).

4. For purposes of CWC section 13385, subsections (h) and (i), determination of compliance and civil liability (including any more specific definition of SOU, the requirements for Dischargers to assert the SOU limitation of liability, and the manner of counting violations) shall be in accordance with CWC section 13385(f)(2).

Appendix

2008 Annual Pesticide Use Reports, Ventura County

Indexed by Commodity

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Commodity Chemical		Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
ANIMAL PREMISE					
PIPERONYL BUTOXIDE		34.6717		24.00	U
		3.1594		3.00	A
TOTAL POUNDS OF THIS CHEMICAL	37.8311				
PIPERONYL BUTOXIDE, OTHER RELATED		8.6679		24.00	U
		0.7899		3.00	A
TOTAL POUNDS OF THIS CHEMICAL	9.4578				
PYRETHRINS		4.3340		24.00	U
		0.3949		3.00	A
TOTAL POUNDS OF THIS CHEMICAL	4.7289				
Site Total		52.0178			
APPLE					
ALUMINUM PHOSPHIDE		11.5500	3	26.00	A
BOSCALID		1.8270	1	8.00	A
DIPHACINONE		0.0015	2	18.00	A
FLONICAMID		0.6250	1	8.00	A
KAOLIN		4,476.8750	7	163.50	A
LIME-SULFUR		61.5810	1	8.00	A
MYCLOBUTANIL		0.5000	1	8.00	A
PYRACLOSTROBIN		0.9280	1	8.00	A
PYRETHRINS		0.0336	1	0.63	A
QST 713 STRAIN OF DRIED BACILLUS SUBTILIS		11.3877	1	100.00	A
SPINOSAD		2.0892	2	16.00	A
STREPTOMYCIN SULFATE		6.8096	2	16.00	A
SULFUR		2,964.0000	3	247.00	A
Site Total		7,538.2076	25		
ARRUGULA					
ALPHA-ALKYL (C10-C12)-OMEGA-HYDROXYPOLY (OXYETHYLENE)		0.0937	1	2.00	A
AZADIRACHTIN		0.7550	15	76.70	A
BENSULIDE		51.5569	3	9.60	A
CYFLUTHRIN		0.2125	1	5.80	A
BETA-CYFLUTHRIN		0.1516	4	9.00	A
CYPERMETHRIN		0.2541	1	5.60	A
(S)-CYPERMETHRIN		0.6353	3	13.70	A
DIMETHYLPOLYSILOXANE		0.0104	1	2.00	A
EMAMECTIN BENZOATE		0.1203	10	16.00	A
FLONICAMID		0.0625	1	1.00	A
INDOXACARB		0.1313	1	2.00	A
PROPYLENE GLYCOL		0.0208	1	2.00	A
PYRACLOSTROBIN		2.2250	4	15.80	A
SPINETORAM		1.7724	4	28.40	A
THIAMETHOXAM		1.2344	11	22.00	A
Site Total		59.2362	59		
ARTICHOKE, GLOBE					
AZADIRACHTIN		11.3806	13	423.10	A
AZOXYSTROBIN		22.9780	2	125.00	A
BACILLUS THURINGIENSIS, SUBSP. AIZAWAI, STRAIN ABTS-1857		178.2000	8	202.40	A
BIFENTHRIN		270.9504	22	1,118.20	A
N,N-BIS-(2-OMEGA-HYDROXYPOLY(OXYETHYLENE)ETHYL) ALKYLAMINE, ALKYL DERIVED FROM TALLOW FATTY ACIDS		17.7788	5	278.00	A
CLARIFIED HYDROPHOBIC EXTRACT OF NEEM OIL		238.8159	1	125.00	A
DELTAMETHRIN		27.7204	20	986.40	A
DIMETHYLPOLYSILOXANE		97.7204	11	458.70	A
ESFENVALERATE		25.9190	12	636.95	A
FATTY ACIDS, METHYL ESTERS		66.3743	5	278.00	A
FATTY ACIDS, MIXED		7.0578	13	435.60	A
GIBBERELLINS		16.6467	20	695.85	A
IMIDACLOPRID		71.3800	13	589.20	A
LECITHIN		271.7595	37	1,532.55	A
METHIDATHION		159.0323	3	159.00	A

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Commodity Chemical	Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
ARTICHOKE, GLOBE				
METHOXYFENOZIDE	69.4446	9	400.90	A
METHYLATED SOYBEAN OIL	186.5967	7	507.00	A
MYCLOBUTANIL	39.3000	7	393.00	A
4-NONYLPHENOL, FORMALDEHYDE RESIN, PROPOXYLATED	22.5199	5	278.00	A
ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE)	105.5746	44	2,039.55	A
OXYFLUORFEN	179.1641	14	511.30	A
PERMETHRIN	161.4022	11	626.90	A
POLYACRYLAMIDE, POLYETHYLENE GLYCOL MIXTURE	2.0500	3	91.80	A
POLYALKENE OXIDE MODIFIED HEPTAMETHYL TRISILOXANE	198.9592	21	1,490.70	A
POLYBUTENES	11.8526	5	278.00	A
POLY-I-PARA-MENTHENE	10.5059	1	44.00	A
POLYOXYETHYLENE POLYOXYPROPYLENE	22.5897	10	344.70	A
POTASSIUM PHOSPHITE	84.4072	1	54.00	A
PROPIONIC ACID	271.7595	37	1,532.55	A
PYRETHRINS	11.2494	9	234.20	A
SPINETORAM	1.5058	1	32.00	A
SPINOSAD	44.3795	13	379.00	A
SULFUR	520.0000	2	65.00	A
THIAMETHOXAM	27.2016	13	580.30	A
Site Total	3,454.1766	272		
AVOCADO				
ABAMECTIN	125.8667	357	7,478.96	A
	0.0074	1	3.00	U
TOTAL POUNDS OF THIS CHEMICAL 125.8741				
ALPHA-ALKYL (C9-C11)-OMEGA-HYDROXYPOLY(OXYETHYLENE)	20.2853	6	214.00	A
ALPHA-ALKYL (C12-C14)-OMEGA-HYDROXYPOLY (OXYETHYLENE)	3.4659	4	21.40	A
ALUMINUM PHOSPHIDE	2.2000	2	93.00	A
AMMONIUM SULFATE	1.5000	1	1.50	A
AZOXYSTROBIN	2.0793	1	10.00	A
BENTONITE	45.9000	4	50.50	A
CASEIN	3.3285	4	50.50	A
CHLOROPHACINONE	0.0055	16	303.00	A
COCONUT DIETHANOLAMIDE	0.0143	1	2.00	A
COPPER HYDROXIDE	32.2700	1	20.00	A
COPPER SULFATE (BASIC)	26.5000	1	10.00	A
COTTONSEED OIL	0.4381	1	4.00	A
DAZOMET	0.4950	1	32.62	A
DIETHYLENE GLYCOL	0.0092	1	5.00	A
DIMETHYLPOLYSILOXANE	119.6568	28	1,009.60	A
DIPHACINONE	0.0662	60	523.28	A
	0.0009	5	3,200.00	S
TOTAL POUNDS OF THIS CHEMICAL 0.0671				
DODECYLBENZENE SULFONIC ACID	0.0622	1	2.00	A
EDTA, TETRASODIUM SALT	0.0038	1	2.00	A
FATTY ACIDS, MIXED	8.3857	24	1,152.00	A
FATTY ACIDS DERIVED FROM TALLOW	1.3863	4	21.40	A
FOSETYL-AL	0.2000	1	2.00	A
GLYPHOSATE	20.7997	1	21.00	A
GLYPHOSATE, DIAMMONIUM SALT	3.7466	1	7.67	A
GLYPHOSATE, ISOPROPYLAMINE SALT	11,134.4100	1,165	14,280.64	A
GLYPHOSATE, MONOAMMONIUM SALT	4,190.1234	26	3,177.90	A
GLYPHOSATE, POTASSIUM SALT	14,224.4618	861	10,069.92	A
IRON PHOSPHATE	0.3500	1	2.00	A
ISOPROPYL ALCOHOL	0.0354	2	6.00	A
ISOPROPYLAMINE DODECYLBENZENE SULFONATE	0.3263	22	1,125.00	A
KAOLIN	285.0000	3	18.75	A
	11.8750	1	40.00	U
TOTAL POUNDS OF THIS CHEMICAL 296.8750				
LACTOSE	3.4125	4	50.50	A
METALDEHYDE	309.5325	48	848.66	A
METAM-SODIUM	5,079.9672	2	16.00	A
METHYL BROMIDE	13.5258	1	4.17	A

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Commodity	Chemical	Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
AVOCADO					
	MINERAL OIL	118,578.0000	268	6,728.40	A
		0.3553	1	3.00	U
	TOTAL POUNDS OF THIS CHEMICAL 118,578.3553				
	ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE)	46.7257	32	1,192.40	A
	ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE), BRANCHED	0.0239	1	5.00	A
	ORYZALIN	27.9978	2	28.00	A
	OXYFLUORFEN	0.6249	1	2.50	A
	PARAQUAT DICHLORIDE	88.4344	14	126.02	A
	PETROLEUM DISTILLATES	4.9527	3	15.00	A
	PETROLEUM OIL, PARAFFIN BASED	53.0976	22	1,125.00	A
	PETROLEUM OIL, UNCLASSIFIED	21,083.9947	104	1,164.30	A
	PHOSPHORIC ACID	0.0122	1	2.00	A
	POLYACRYLAMIDE POLYMER	0.2812	14	243.00	A
	POLYALKENE OXIDE MODIFIED HEPTAMETHYL TRISILOXANE	2.5039	1	17.00	A
	POLYETHYLENE GLYCOL MONO(3-(TETRAMETHYL-1-(TRIMETHYLSILOXY)DISILOXANYL)PROPYL)ETHER	262.7994	65	1,901.31	A
	POLYOXYETHYLENE POLYOXYPROPYLENE	32.0177	14	375.60	A
	POLYOXYETHYLENE SORBITAN MONOOLEATE	1.3050	22	1,125.00	A
	POLYOXYETHYLENE SORBITAN TRIOLEATE	8.5916	22	1,125.00	A
	POTASSIUM PHOSPHITE	617.0963	5	238.00	A
	PROPYLENE GLYCOL	17.1521	8	174.00	A
	SABADILLA ALKALOIDS	1.6420	3	104.79	A
	SILICONE DEFOAMER	0.0016	1	2.00	A
	SIMAZINE	397.3972	73	1,518.65	A
	SODIUM XYLENE SULFONATE	0.0191	1	2.00	A
	SPINETORAM	0.8106	2	8.30	A
	SPINOSAD	16.3378	9	112.40	A
	STRYCHNINE	0.5184	64	553.50	A
	SUGAR	437.5000	1	35.00	A
	SULFAQUINOXALINE	0.0100	1	20.00	A
		0.0045	9	5,760.00	S
	TOTAL POUNDS OF THIS CHEMICAL 0.0145				
	TALL OIL FATTY ACIDS	0.0163	1	5.00	A
	ALPHA-[PARA-(1,1,3,3-TETRAMETHYLBUTYL)PHENYL]-OMEGA-HYDROXYPOLY(OXYETHYLENE)	0.0729	1	2.00	A
	TETRAPOTASSIUM PYROPHOSPHATE	0.0096	1	2.00	A
	TRIETHANOLAMINE	0.0244	1	2.00	A
	ALPHA-2,6,8-TRIMETHYL-4-NONYLOXY-OMEGA-HYDROXYPOLY (OXYETHYLENE)	62.8910	8	174.00	A
	ALPHA-UNDECYL-OMEGA-HYDROXYPOLY(OXYETHYLENE)	0.0239	1	5.00	A
	WARFARIN	0.0300	3	65.00	A
		0.0045	9	5,760.00	S
	TOTAL POUNDS OF THIS CHEMICAL 0.0345				
	Site Total	177,414.9735	3,279		
BARLEY					
	BROMOXYNIL HEPTANOATE	7.7944	1	22.00	A
	BROMOXYNIL OCTANOATE	8.0830	1	22.00	A
	CARFENTRAZONE-ETHYL	4.9849	1	170.00	A
	Site Total	20.8623	2		
BASIL, SWEET					
	IMIDACLOPRID	0.4451	2	3.13	A
	Site Total	0.4451	2		
BEAN, SUCCULENT					
	ACEPHATE	203.7325	5	207.00	A
	ALACHLOR	862.5317	11	380.00	A
	COTTONSEED OIL	5.8290	3	15.00	A
	DIAZINON	23.9904	2	12.00	A
	DIMETHOATE	100.8578	5	207.00	A
	EPTC	415.7385	3	155.05	A
	ESFENVALERATE	0.6101	3	15.00	A

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BEAN, SUCCULENT				
IMIDACLOPRID	113.5843	14	510.00	A
ISOPROPYL ALCOHOL	0.2186	3	15.00	A
LAMBDA-CYHALOTHRIN	4.1487	1	139.33	A
LECITHIN	10.0318	3	107.00	A
MYCLOBUTANIL	1.5000	3	15.00	A
ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE)	4.1049	6	122.00	A
PROPIONIC ACID	10.0318	3	107.00	A
THIOPHANATE-METHYL	146.2930	2	139.33	A
TRIFLURALIN	71.5398	1	143.05	A
Site Total	1,974.7429	56		
BEAN, UNSPECIFIED				
ACEPHATE	651.5819	23	707.56	A
ALACHLOR	1,505.8744	16	502.00	A
ALPHA-ALKYL (C12-C14)-OMEGA-HYDROXYPOLY (OXYETHYLENE)	57.1830	8	247.00	A
(S)-CYPERMETHRIN	8.7679	6	192.41	A
DIAZINON	117.4730	14	58.75	A
DIMETHOATE	339.7653	22	677.56	A
DIMETHYLPOLYSILOXANE	0.0598	1	47.11	A
EPTC	220.5764	15	63.25	A
FATTY ACIDS DERIVED FROM TALLOW	22.8732	8	247.00	A
IMIDACLOPRID	274.5208	14	59.25	A
ISOPROPYL ALCOHOL	1.2342	1	47.11	A
S-METOLACHLOR	56.9979	1	30.00	A
ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE)	71.4743	9	294.11	A
ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE), PHOSPHATE ESTER	77.3646	9	249.02	A
PENDIMETHALIN	72.9779	2	50.00	A
POLYETHYLENE GLYCOL	7.7952	1	47.11	A
TRIFLURALIN	81.4063	4	135.00	A
Site Total	3,567.9261	135		
BEET				
ALPHA-ALKYL (C12-C14)-OMEGA-HYDROXYPOLY (OXYETHYLENE)	9.5354	17	30.43	A
AZADIRACHTIN	0.1642	6	7.12	A
AZOXYSTROBIN	6.5497	5	55.36	A
BACILLUS PUMILUS, STRAIN QST 2808	0.4801	1	4.00	A
BACILLUS THURINGIENSIS (BERLINER), SUBSP. AIZAWAI, SEROTYPE H-7	1.9766	12	22.26	A
BACILLUS THURINGIENSIS, SUBSP. AIZAWAI, STRAIN ABTS-1857	13.6026	9	20.69	A
BACILLUS THURINGIENSIS (BERLINER), SUBSP. KURSTAKI, STRAIN SA-11	5.7658	10	15.72	A
BENTONITE	0.8280	1	1.84	A
CASEIN	0.0621	1	1.84	A
CLARIFIED HYDROPHOBIC EXTRACT OF NEEM OIL	2.9988	2	8.00	A
COPPER HYDROXIDE	132.8250	25	123.50	A
COPPER OXIDE (OUS)	3.6497	1	2.90	A
CYCLOATE	255.3722	36	90.00	A
CYFLUTHRIN	0.2587	2	6.64	A
DIAZINON	56.2892	26	129.00	A
DIMETHYLPOLYSILOXANE	0.1431	4	12.00	A
FATTY ACIDS DERIVED FROM TALLOW	3.8142	17	30.43	A
IMIDACLOPRID	6.7549	22	85.46	A
ISOPROPYL ALCOHOL	0.3484	3	10.00	A
LACTOSE	0.0621	1	1.84	A
LECITHIN	1.5318	6	16.50	A
MALATHION	12.5133	1	10.00	A
MEFENOXAM	80.3757	15	157.56	A
	0.5596		7,447.14	P
TOTAL POUNDS OF THIS CHEMICAL 80.9353				

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Commodity	Chemical	Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
BEET					
	MEFENOXAM, OTHER RELATED	2.3640	15	157.56	A
		0.0173		7,447.14	P
	TOTAL POUNDS OF THIS CHEMICAL 2.3813				
	METHOXYFENOZIDE	3.1175	12	28.36	A
	METHYLATED SOYBEAN OIL	0.7277	3	2.88	A
	ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE)	14.1442	29	59.81	A
	PHENMEDIPHAM	17.6360	9	44.00	A
	POLYALKENE OXIDE MODIFIED HEPTAMETHYL TRISILOXANE	0.0364	3	2.88	A
	POLYETHYLENE GLYCOL	2.2007	3	10.00	A
	POLY-I-PARA-MENTHENE	27.4441	8	58.32	A
	POLYOXYETHYLENE POLYOXYPROPYLENE	0.0421	1	2.00	A
	POTASH SOAP	77.9610	13	19.29	A
	POTASSIUM PHOSPHITE	20.7427	2	8.00	A
	PROPIONIC ACID	1.5318	6	16.50	A
	PYRACLOSTROBIN	2.9340	8	18.36	A
	PYRETHRINS	0.1394	4	8.24	A
	QST 713 STRAIN OF DRIED BACILLUS SUBTILIS	2.6280	2	6.00	A
	SPINETORAM	0.6023	8	12.16	A
	SPINOSAD	6.6645	21	81.12	A
	SULFUR	84.0400	8	29.21	A
	THIRAM	154.1591		61,739.18	P
		24.1272		4.83	T
	TOTAL POUNDS OF THIS CHEMICAL 178.2863				
	TRIFLOXYSTROBIN	0.2813	1	3.00	A
	Site Total	1,040.0025	300		
BLACKBERRY					
	ALPHA-PINENE BETA-PINENE COPOLYMER	2.1650	1	12.00	A
	BACILLUS THURINGIENSIS (BERLINER), SUBSP. AIZAWAI, SEROTYPE H-7	0.3770	1	3.66	A
	BACILLUS THURINGIENSIS, SUBSP. AIZAWAI, STRAIN ABTS-1857	12.9600	1	12.00	A
	BACILLUS THURINGIENSIS (BERLINER), SUBSP. KURSTAKI, STRAIN SA-11	0.9000	1	12.00	A
	CLARIFIED HYDROPHOBIC EXTRACT OF NEEM OIL	38.4398	4	23.01	A
	ALPHA-(PARA-DODECYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE)	0.1155	1	12.00	A
	KAOLIN	95.0000	1	4.00	A
	LIME-SULFUR	566.6483	2	18.47	A
	MINERAL OIL	0.6062	1	12.00	A
	PETROLEUM DISTILLATES, REFINED	372.7464	3	20.37	A
	POTASSIUM BICARBONATE	9.8400	1	6.00	A
	SOYBEAN OIL	186.4715	1	12.99	A
	Site Total	1,286.2697	16		
BLUEBERRY					
	ALUMINUM PHOSPHIDE	0.5500	1	3.03	A
	CHLOROPICRIN	279.6497	1	5.00	A
	1,3-DICHLOROPROPENE	510.5917	1	5.00	A
	DIMETHYLPOLYSILOXANE	5.6790	1	58.00	A
	FENHEXAMID	23.6250	3	31.00	A
	GLYPHOSATE, POTASSIUM SALT	2.9308	2	0.69	A
	IMIDACLOPRID	9.1095	1	18.00	A
	NAPROPAMIDE	1.2500	1	12.00	A
	POLY-I-PARA-MENTHENE	14.6930	3	31.00	A
	POLYOXYETHYLENE POLYOXYPROPYLENE	1.8930	1	58.00	A
	STRYCHNINE	0.4250	9	25.79	A
	Site Total	850.3967	22		
BOK CHOY					
	ABIETIC ANHYDRIDE	0.3758	2	6.25	A
	ACETAMIPRID	3.2620	6	30.22	A
	AZOXYSTROBIN	1.5179	1	6.00	A
	BACILLUS PUMILUS, STRAIN QST 2808	4.0944	6	34.11	A

Commodity	Chemical	Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
BOK CHOY					
	BACILLUS THURINGIENSIS (BERLINER), SUBSP. AIZAWAI, SEROTYPE H-7	1.6122	7	10.75	A
	BACILLUS THURINGIENSIS, SUBSP. AIZAWAI, STRAIN ABTS-1857	127.6182	52	212.94	A
	BACILLUS THURINGIENSIS (BERLINER), SUBSP. KURSTAKI, SEROTYPE 3A,3B	0.0640	1	1.00	A
	BACILLUS THURINGIENSIS, SUBSP. KURSTAKI, STRAIN ABTS-351, FERMENTATION SOLIDS AND SOLUBLES	66.7980	19	123.70	A
	BENSULIDE	338.7881	19	77.60	A
	ALPHA-(PARA-TERT-BUTYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE)	0.0320	1	3.00	A
	ALPHA-(PARA-TERT-BUTYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE) PHOSPHATE	2.5248	1	3.00	A
	CHLORTHAL-DIMETHYL	601.5000	47	69.00	A
	CLARIFIED HYDROPHOBIC EXTRACT OF NEEM OIL	9.0762	12	16.95	A
	CYPERMETHRIN	5.8753	11	70.63	A
	(S)-CYPERMETHRIN	11.3709	50	238.71	A
	CYROMAZINE	3.9075	6	31.38	A
	DIAZINON	5.0000	1	2.00	A
	DIETHYLENE GLYCOL ABIETATE	0.3758	2	6.25	A
	DIMETHYLPOLYSILOXANE	19.5163	52	215.48	A
	DINOTEFURAN	3.9970	5	27.91	A
	EMAMECTIN BENZOATE	0.0640	1	4.28	A
	ETHYL ALCOHOL	0.3099	2	6.25	A
	FLONICAMID	1.0500	3	12.05	A
	FOSETYL-AL	40.0000	5	10.00	A
	FREE FATTY ACIDS AND/OR AMINE SALTS	0.4418	2	6.25	A
	IMIDACLOPRID	55.8364	42	233.57	A
	INDOXACARB	3.3150	12	50.39	A
	ISOPROPYL ALCOHOL	3.9378	43	163.75	A
	MANEB	246.2322	42	248.03	A
	ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE)	45.5958	43	163.75	A
	ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE), PHOSPHATE ESTER	1.3929	2	3.50	A
	PARAFFIN WAX	0.2559	2	6.25	A
	PERMETHRIN	1.5311	2	7.65	A
	POLYETHYLENE GLYCOL	24.8705	43	163.75	A
	PYRACLOSTROBIN	9.5340	11	47.67	A
	PYRETHRINS	0.4312	13	17.05	A
	QST 713 STRAIN OF DRIED BACILLUS SUBTILIS	27.6728	14	63.18	A
	SPINETORAM	3.0216	15	56.73	A
	SPINOSAD	2.6778	15	28.26	A
	TEBUFENOZIDE	0.9200	1	2.00	A
	Site Total	1,676.3971	476		
BROCCOLI					
	ACETAMIPRID	32.0845	27	516.50	A
	ALPHA-ALKYL (C12-C14)-OMEGA-HYDROXYPOLY (OXYETHYLENE)	176.3150	46	777.00	A
	AZADIRACHTIN	3.5377	3	83.50	A
	BACILLUS THURINGIENSIS (BERLINER), SUBSP. AIZAWAI, SEROTYPE H-7	3.8796	4	36.97	A
	BACILLUS THURINGIENSIS, SUBSP. AIZAWAI, STRAIN ABTS-1857	167.4000	11	156.00	A
	BENOMYL	0.0350		0.01	A
		0.0300		11.99	P
	TOTAL POUNDS OF THIS CHEMICAL 0.0650				
	CHLORANTRANILIPROLE	3.1833	4	67.00	A
	CHLOROTHALONIL	7.2000	4	5.00	A
	CHLORPYRIFOS	495.6100	37	673.00	A
	CLARIFIED HYDROPHOBIC EXTRACT OF NEEM OIL	59.0771	12	155.87	A
	COPPER OXIDE (OUS)	45.1500	2	62.50	A
	(S)-CYPERMETHRIN	5.5594	7	137.00	A
	DIMETHYLPOLYSILOXANE	3.2812	3	36.50	A
	EMAMECTIN BENZOATE	0.0391	1	5.00	A
	ESFENVALERATE	0.9761	4	20.00	A

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BROCCOLI					
	FATTY ACIDS DERIVED FROM TALLOW	70.5260	46	777.00	A
	FLONICAMID	2.9575	3	37.00	A
	FLUDIOXONIL	0.0011		8.53	P
	IMIDACLOPRID	0.9041	4	20.00	A
	INDOXACARB	44.8336	37	683.00	A
	IPRODIONE	0.0640		12.79	P
	LAMBDA-CYHALOTHRIN	1.9860	7	78.50	A
	MALATHION	300.5970	8	163.00	A
	MEFENOXAM	0.0005		5.68	P
	MEFENOXAM, OTHER RELATED	0.0000		5.68	P
	METALAXYL	0.9000	4	5.00	A
	METHOXYFENOZIDE	30.7237	13	221.50	A
	ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE)	176.3150	46	777.00	A
	ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE), PHOSPHATE ESTER	33.0232	12	105.50	A
	NOVALURON	1.2063	3	15.00	A
	OXYDEMETON-METHYL	89.4611	10	177.00	A
	OXYFLUORFEN	65.9695	15	319.50	A
	POLYACRYLAMIDE, POLYETHYLENE GLYCOL MIXTURE	2.6215	4	117.00	A
	POLYALKENE OXIDE MODIFIED HEPTAMETHYL TRISILOXANE	26.7918	7	137.00	A
	POLY-I-PARA-MENTHENE	2.7406	5	6.00	A
	POLYOXYETHYLENE POLYOXYPROPYLENE	1.0937	3	36.50	A
	POTASSIUM PHOSPHITE	89.1589	3	57.00	A
	PYMETROZINE	2.1500	1	25.00	A
	PYRACLOSTROBIN	0.4200	1	2.10	A
	PYRETHRINS	6.7465	14	212.87	A
	SOYBEAN OIL	35.4041	5	38.97	A
	SPINOSAD	50.8531	16	346.40	A
	SPIROTETRAMAT	0.1323	3	15.00	A
	THIRAM	106.3804		42,607.07	P
		4.1218		0.82	T
	TOTAL POUNDS OF THIS CHEMICAL 110.5022				
	Site Total	2,151.4413	336		
CABBAGE					
	ACETAMIPRID	67.1542	85	973.97	A
	ALCOHOLS, C4-C12, NORMAL	0.2039	2	19.20	A
	ALPHA-ALKYL (C12-C14)-OMEGA-HYDROXYPOLY (OXYETHYLENE)	1,173.6410	297	4,695.20	A
	ALKYL (C8,C10) POLYGLYCOSIDE	5.1252	36	372.33	A
	AZADIRACHTIN	18.1157	15	389.70	A
	AZOXYSTROBIN	67.8516	28	283.30	A
	BACILLUS PUMILUS, STRAIN QST 2808	56.8642	34	497.04	A
	BACILLUS THURINGIENSIS (BERLINER), SUBSP. AIZAWAI, SEROTYPE H-7	78.2775	81	758.50	A
	BACILLUS THURINGIENSIS, SUBSP. AIZAWAI, STRAIN ABTS-1857	1,310.8500	102	1,929.60	A
	BACILLUS THURINGIENSIS (BERLINER), SUBSP. KURSTAKI, SEROTYPE 3A,3B	0.8280	2	13.05	A
	BACILLUS THURINGIENSIS, SUBSP. KURSTAKI, STRAIN ABTS-351, FERMENTATION SOLIDS AND SOLUBLES	98.8200	17	183.00	A
	BENOMYL	15.0000	1	20.00	A
		0.0116		4.63	P
	TOTAL POUNDS OF THIS CHEMICAL 15.0116				
	BENSULIDE	142.8126	17	72.00	A
	BIFENTHRIN	0.4000	1	4.00	A
	BOSCALID	106.5581	18	174.54	A
	CAPSICUM OLEORESIN	0.0242	1	2.00	A
	CHLORANTRANILIPROLE	139.9560	119	1,441.72	A
	CHLOROTHALONIL	1,267.3448	73	1,053.90	A
	CHLORPYRIFOS	2,673.0463	173	2,240.00	A
	CHLORTHAL-DIMETHYL	231.0000	7	31.00	A
	CLARIFIED HYDROPHOBIC EXTRACT OF NEEM OIL	1,392.2323	21	269.50	A
	CLETHODIM	0.3904	1	3.00	A
	COCONUT DIETHANOLAMIDE	0.6521	9	172.00	A
	COPPER HYDROXIDE	119.3022	38	337.35	A

Commodity	Chemical		Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
CABBAGE						
	COTTONSEED OIL		30.7474	8	77.78	A
	CRYOLITE		360.0000	3	30.00	A
	CYFLUTHRIN		6.7438	15	138.00	A
	BETA-CYFLUTHRIN		1.8865	5	60.50	A
	CYPERMETHRIN		39.2542	26	513.00	A
	(S)-CYPERMETHRIN		55.1300	143	1,324.30	A
	DIAZINON		155.2879	12	203.50	A
	DIMETHOATE		104.9458	9	219.00	A
	DIMETHOMORPH		0.1160	1	5.00	A
	DIMETHYLPOLYSILOXANE		132.2385	157	1,999.50	A
	DINOTEFURAN		18.4345	14	123.82	A
	DISULFOTON		1,036.1524	53	517.63	A
	DODECYLBENZENE SULFONIC ACID		2.8256	9	172.00	A
	EDTA, TETRASODIUM SALT		0.1739	9	172.00	A
	EMAMECTIN BENZOATE		12.8255	82	1,250.29	A
	ESFENVALERATE		56.4547	99	1,237.53	A
	FATTY ACIDS, MIXED		0.9342	7	73.50	A
	FATTY ACIDS DERIVED FROM TALLOW		469.4564	297	4,695.20	A
	FLONICAMID		55.8550	54	670.00	A
	FLUBENDIAMIDE		1.4559	4	48.53	A
	FLUDIOXONIL		0.4200		17,077.35	P
	FOSETYL-AL		160.8000	3	67.00	A
	GLYPHOSATE, ISOPROPYLAMINE SALT		38.6921	2	12.00	A
	GLYPHOSATE, POTASSIUM SALT		71.4067	2	17.25	A
	IMIDACLOPRID		205.7234	91	1,302.63	A
	INDOXACARB		200.3260	233	3,105.28	A
	IPRODIONE		14.5035	3	15.00	A
			0.0181		3.63	P
	TOTAL POUNDS OF THIS CHEMICAL	14.5216				
	ISOPROPYL ALCOHOL		38.2592	144	1,757.24	A
	LAMBDA-CYHALOTHRIN		17.1616	56	977.40	A
	LECITHIN		130.3430	110	962.44	A
	MALATHION		3,633.1066	147	1,920.88	A
	MANDIPROPAMID		35.4454	24	272.03	A
	MANEB		2,582.5132	160	1,847.00	A
	MEFENOXAM		12.4726	7	137.57	A
			0.0048		15.88	P
	TOTAL POUNDS OF THIS CHEMICAL	12.4774				
	MEFENOXAM, OTHER RELATED		0.3316	7	137.57	A
			0.0001		15.88	P
	TOTAL POUNDS OF THIS CHEMICAL	0.3317				
	METALAXYL		0.1800	2	2.00	A
	METHOMYL		32.6610	3	36.29	A
	METHOXYFENOZIDE		199.8793	116	1,218.30	A
	METHYLATED SOYBEAN OIL		42.1464	5	89.00	A
	METHYL SILICONE RESINS		13.2295	3	46.70	A
	MINERAL OIL		2,738.2018	10	289.00	A
	NALED		1,186.6015	70	1,111.90	A
	ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE)		1,588.0692	513	6,978.75	A
	ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE), PHOSPHATE ESTER		314.2936	111	1,199.75	A
	NOVALURON		236.9121	282	3,228.52	A
	OLEIC ACID, METHYL ESTER		23.4319	1	24.00	A
	OXYDEMETON-METHYL		265.4191	21	282.03	A
	OXYFLUORFEN		778.3044	199	2,174.07	A
	PARAQUAT DICHLORIDE		24.3376	4	28.20	A
	PERMETHRIN		102.7216	60	572.17	A
	PHOSPHORIC ACID		0.5564	9	172.00	A
	POLYACRYLAMIDE, POLYETHYLENE GLYCOL MIXTURE		12.3361	56	555.25	A
	POLYALKENE OXIDE MODIFIED HEPTAMETHYL TRISILOXANE		147.7507	87	836.10	A
	POLYETHYLENE GLYCOL		199.8142	123	1,467.66	A
	POLYETHYLENE GLYCOL MONO(3-(TETRAMETHYL-1-(TRIMETHYLSILOXY)DISILOXANYL)PROPYL)ETHER		7.8851	4	36.00	A
	POLY-I-PARA-MENTHENE		10.3202	9	35.97	A
	POLYOXYETHYLENE POLYOXYPROPYLENE		4.5012	9	97.46	A
	POLYSILOXANE		0.2050	36	372.33	A
	POTASSIUM HYDROXIDE		6.0067	36	372.33	A

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CABBAGE						
	POTASSIUM PHOSPHITE		1,511.8314	31	588.93	A
	PROPICONAZOLE		0.0177	1	20.00	A
	PROPIONIC ACID		115.9926	110	962.44	A
	PYMETROZINE		1.1150	1	13.00	A
	PYRACLOSTROBIN		76.2040	32	394.52	A
	PYRETHRINS		16.8616	23	326.60	A
	QST 713 STRAIN OF DRIED BACILLUS SUBTILIS		59.8600	9	138.00	A
	SILICONE DEFOAMER		0.0739	9	172.00	A
	SODIUM XYLENE SULFONATE		0.8694	9	172.00	A
	SOYBEAN OIL		17.2834	4	19.35	A
	SPINETORAM		85.3477	145	1,608.47	A
	SPINOSAD		120.8765	88	1,058.20	A
	SPIROMESIFEN		13.0682	2	52.78	A
	SPIROTETRAMAT		1.7896	28	246.60	A
	STREPTOMYCES LYDICUS WYEC 108		0.0037	2	20.00	A
	TALL OIL FATTY ACIDS		5.0211	1	24.00	A
	ALPHA-[PARA-(1,1,3,3-TETRAMETHYLBUTYL)PHENYL]-OMEGA-HYDROXYPOLY(OXYETHYLENE)		3.3124	9	172.00	A
	TETRAPOTASSIUM PYROPHOSPHATE		0.4347	9	172.00	A
	THIAMETHOXAM		5.9950	12	112.75	A
	THIODICARB		1.2215	1	2.00	A
	THIRAM		42.3793		16,972.10	P
			2.7915		0.55	T
	TOTAL POUNDS OF THIS CHEMICAL	45.1708				
	TRIETHANOLAMINE		1.1085	9	172.00	A
	TRIFLURALIN		15.4072	8	26.50	A
	ALPHA-UNDECYL-OMEGA-HYDROXYPOLY(OXYETHYLENE)		66.5230	37	396.33	A
	Site Total		28,750.0615	4,089		
CANTALOUPE						
	THIRAM		141.8823		47,347.42	P
			2.9934		1.06	T
	TOTAL POUNDS OF THIS CHEMICAL	144.8757				
	Site Total		144.8757			
CARROT						
	AZOXYSTROBIN		12.8984	5	68.51	A
	BACILLUS THURINGIENSIS, SUBSP. AIZAWAI, STRAIN ABTS-1857		3.7800	1	3.50	A
	CLETHODIM		8.2860	6	66.18	A
	COPPER HYDROXIDE		157.8660	17	206.30	A
	COPPER SULFATE (BASIC)		169.0000	3	33.50	A
	FLUDIOXONIL		0.0186		0.38	T
	IMIDACLOPRID		4.6241	1	14.25	A
			0.7845		0.15	T
	TOTAL POUNDS OF THIS CHEMICAL	5.4086				
	IPRODIONE		600.2122		121,123.37	P
			167.7925		33,599.83	U
			105.3205	14	167.05	A
			11.5681		1.15	T
	TOTAL POUNDS OF THIS CHEMICAL	884.8933				
	LINURON		202.0000	38	347.70	A
	MEFENOXAM		96.8019	32	373.96	A
			0.1113		0.37	T
			0.0023		15.00	P
	TOTAL POUNDS OF THIS CHEMICAL	96.9155				
	MEFENOXAM, OTHER RELATED		3.0019	32	373.96	A
			0.0034		0.37	T
			0.0001		15.00	P
	TOTAL POUNDS OF THIS CHEMICAL	3.0054				
	METAM-SODIUM		27,250.8490	1	143.05	A
	MINERAL OIL		475.1994	7	79.30	A
	ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE)		28.5120	7	79.30	A
	POLY-I-PARA-MENTHENE		89.4814	14	177.13	A
	QST 713 STRAIN OF DRIED BACILLUS SUBTILIS		31.9296	5	329.60	A

Commodity	Chemical	Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
CARROT					
	SETHOXYDIM	1.8085	8	7.00	A
	TALL OIL FATTY ACIDS	51.9924	7	79.30	A
	THIRAM	756.6041		303,020.69	P
		104.3799		20.90	T
	TOTAL POUNDS OF THIS CHEMICAL 860.9840				
	Site Total	30,334.8281	135		
CAULIFLOWER					
	BENOMYL	0.0516		0.01	T
	FLUDIOXONIL	0.0135		556.67	P
	IPRODIONE	0.0009		0.17	P
	MEFENOXAM	0.0000		0.17	P
	MEFENOXAM, OTHER RELATED	0.0000		0.17	P
	THIRAM	88.0140		35,249.80	P
		8.7343		1.74	T
	TOTAL POUNDS OF THIS CHEMICAL 96.7483				
	Site Total	96.8143			
CELERY					
	ABAMECTIN	18.9749	58	1,270.41	A
	ACEPHATE	4,327.3626	214	4,626.54	A
	ACETAMIPRID	456.0548	335	7,776.36	A
	ALPHA-ALKYL (C12-C14)-OMEGA-HYDROXYPOLY (OXYETHYLENE)	3,054.9475	477	10,245.00	A
	ALKYL (C8,C10) POLYGLYCOSIDE	15.6818	29	1,004.05	A
	AMMONIUM SULFATE	18.3435	1	9.50	A
	AZADIRACHTIN	51.2656	199	2,152.12	A
	AZOXYSTROBIN	951.6645	215	4,415.73	A
	BACILLUS THURINGIENSIS (BERLINER), SUBSP. AIZAWAI, GC-91 PROTEIN	1.2160	1	16.00	A
	BACILLUS THURINGIENSIS (BERLINER), SUBSP. AIZAWAI, SEROTYPE H-7	167.4842	87	1,758.91	A
	BACILLUS THURINGIENSIS, SUBSP. AIZAWAI, STRAIN ABTS-1857	4,660.6914	337	6,254.30	A
	BACILLUS THURINGIENSIS, SUBSP. KURSTAKI, STRAIN ABTS-351, FERMENTATION SOLIDS AND SOLUBLES	852.6546	116	1,122.45	A
	BACILLUS THURINGIENSIS (BERLINER), SUBSP. KURSTAKI, STRAIN SA-11	73.3125	4	57.50	A
	N,N-BIS-(2-OMEGA-HYDROXYPOLY(OXYETHYLENE)ETHYL) ALKYLAMINE, ALKYL DERIVED FROM TALLOW FATTY ACIDS	23.0541	1	18.30	A
	BOSCALID	607.0879	72	1,537.82	A
	CALCIUM HYDROXIDE	0.0615	1	11.45	A
	CARBARYL	795.9190	26	491.73	A
	CHLORANTRANILIPROLE	200.9170	163	3,479.71	A
	CHLOROPICRIN	1,848.0000	1	16.00	A
	CHLOROTHALONIL	21,775.1456	570	12,366.39	A
	CLARIFIED HYDROPHOBIC EXTRACT OF NEEM OIL	950.9821	41	582.30	A
	CLETHODIM	94.3813	38	758.40	A
	COCONUT DIETHANOLAMIDE	0.7898	4	57.62	A
	COPPER HYDROXIDE	4,158.9138	348	6,163.63	A
	COPPER OCTANOATE	1,373.9410	69	1,040.65	A
	COPPER OXIDE (OUS)	313.0729	27	285.90	A
	COTTONSEED OIL	42.2324	6	217.58	A
	COUMAFURYL, SODIUM SALT	0.0010	1	32.96	A
	CYFLUTHRIN	2.0499	3	42.60	A
	BETA-CYFLUTHRIN	30.2826	97	1,202.38	A
	CYPERMETHRIN	1.1089	2	27.00	A
	(S)-CYPERMETHRIN	195.9741	215	4,674.45	A
	CYPRODINIL	170.9285	19	552.28	A
	CYROMAZINE	1,740.7750	625	13,841.93	A
	DICLORAN	26,671.4775	493	10,314.24	A
	DIMETHOATE	672.9554	42	1,377.93	A
	DIMETHYLPOLYSILOXANE	786.0552	222	5,498.09	A
	DINOTEFURAN	73.2083	19	562.50	A
	DODECYLBENZENE SULFONIC ACID	3.4225	4	57.62	A

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Commodity	Chemical	Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
CELERY					
	EDTA, TETRASODIUM SALT	0.2106	4	57.62	A
	EMAMECTIN BENZOATE	12.8297	74	1,156.79	A
	ENDOSULFAN	0.0235	1	3.00	A
	FATTY ACIDS, MIXED	18.0588	76	1,226.30	A
	FATTY ACIDS DERIVED FROM TALLOW	1,221.9790	477	10,245.00	A
	FLONICAMID	514.9757	345	6,716.34	A
	FLUBENDIAMIDE	3.5898	3	93.04	A
	FLUDIOXONIL	113.9524	19	552.28	A
	GLYPHOSATE, ISOPROPYLAMINE SALT	120.8958	2	30.50	A
	GLYPHOSATE, POTASSIUM SALT	53.8034	1	13.00	A
	HEPTAMETHYLTRISILOXANE-1,3-PROPANEDIOL ETHER, ETHOXYLATED PROPOXYLATED	0.9928	1	37.73	A
	HYDROGEN PEROXIDE	40.1724	1	16.30	A
	IMIDACLOPRID	96.5048	12	335.36	A
	INDOXACARB	52.3940	37	793.90	A
	IRON PHOSPHATE	4.0000	1	20.00	A
	ISOPROPYL ALCOHOL	49.3418	86	2,323.74	A
	LECITHIN	1,000.2536	324	7,960.85	A
	LIGNIN SULFONIC ACID, CALCIUM SALT	58.7360	1	16.30	A
	LINURON	2,332.0600	321	5,967.29	A
	MALATHION	1,675.7566	55	1,117.61	A
	METHOMYL	40.5000	2	45.00	A
	METHOXYFENOZIDE	1,481.0649	494	10,206.41	A
	METHYLATED SOYBEAN OIL	2,286.7027	350	5,840.67	A
	METHYL BROMIDE	3,752.0000	1	16.00	A
	METHYL SILICONE RESINS	76.2270	11	189.80	A
	MINERAL OIL	935.5434	5	75.70	A
	ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE)	4,261.2460	1,205	25,348.59	A
	ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE), PHOSPHATE ESTER	1,236.3047	184	4,454.47	A
	OLEIC ACID, METHYL ESTER	72.8991	2	56.00	A
	OXAMYL	6,702.8282	349	8,331.91	A
	OXYFLUORFEN	0.2000	1	3.00	A
	PERMETHRIN	2,778.2375	759	15,545.16	A
	PETROLEUM DISTILLATES	36.2255	1	40.00	A
	PETROLEUM OIL, UNCLASSIFIED	67.8734	3	45.50	A
	PHOSPHORIC ACID	0.6740	4	57.62	A
	PIPERONYL BUTOXIDE	10.1499	1	26.67	A
	PIPERONYL BUTOXIDE, OTHER RELATED	2.5375	1	26.67	A
	POLYACRYLAMIDE, POLYETHYLENE GLYCOL MIXTURE	6.8858	23	370.67	A
	POLYALKENE OXIDE MODIFIED HEPTAMETHYL TRISILOXANE	176.0149	373	6,426.17	A
	POLYETHYLENE GLYCOL	291.7379	72	2,044.54	A
	POLYETHYLENE GLYCOL MONO(3-(TETRAMETHYL-1-(TRIMETHYLSILOXY)DISILOXANYL)PROPYL)ETHER	10.0660	2	51.00	A
	POLY-I-PARA-MENTHENE	54.3205	11	176.71	A
	POLYOXYETHYLENE POLYOXYPROPYLENE	57.7154	77	1,369.15	A
	POLY(OXYETHYLENE) POLY(OXYPROPYLENE) GLYCOL MONOALLYL ETHER	3.9710	1	37.73	A
	POLYSILOXANE	0.6273	29	1,004.05	A
	POTASH SOAP	155.1979	7	65.00	A
	POTASSIUM HYDROXIDE	18.3790	29	1,004.05	A
	POTASSIUM PEROXYMONOSULFATE	0.0278	1	5.50	A
	POTASSIUM PHOSPHITE	17.1940	2	11.00	A
	PROMETRYN	9,300.4633	506	8,030.34	A
	PROPICONAZOLE	1,949.0937	769	17,448.49	A
	PROPIONIC ACID	956.3446	324	7,960.85	A
	PYMETROZINE	308.8626	171	3,585.70	A
	PYRACLOSTROBIN	511.9230	112	2,615.32	A
	PYRETHRINS	35.3449	78	872.72	A
	QST 713 STRAIN OF DRIED BACILLUS SUBTILIS	366.3286	63	1,003.65	A
	ROTENONE	1.9137	13	214.80	A
	ROTENONE, OTHER RELATED	1.9137	13	214.80	A
	SETHOXYDIM	38.9318	8	148.00	A
	SILICONE DEFOAMER	0.0895	4	57.62	A
	SODIUM BISULFATE	0.3824	2	64.23	A
	SODIUM CARBONATE	47.8497	3	54.80	A
	SODIUM XYLENE SULFONATE	1.0531	4	57.62	A

Commodity Chemical		Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
CELERY					
SPINETORAM		179.1432	131	3,258.74	A
SPINOSAD		801.2071	374	6,987.50	A
SPIROTETRAMAT		3.0818	20	388.87	A
STREPTOMYCES LYDICUS WYEC 108		0.0132	2	47.60	A
SULFUR		19.9680	1	12.48	A
SULFURYL FLUORIDE		28.0388	2	40.00	A
TALL OIL FATTY ACIDS		15.6212	2	56.00	A
ALPHA-[PARA-(1,1,3,3-TETRAMETHYLBUTYL)PHENYL]-OMEGA-HYDROXYPOLY(OXYETHYLENE)		4.0122	4	57.62	A
TETRAPOTASSIUM PYROPHOSPHATE		0.5265	4	57.62	A
THIAMETHOXAM		5.6532	8	128.85	A
THIODICARB		70.7521	5	109.80	A
THIRAM		0.7360		0.14	T
		0.0574		23.04	P
TOTAL POUNDS OF THIS CHEMICAL	0.7934				
TRIETHANOLAMINE		1.3427	4	57.62	A
TRIFLOXYSTROBIN		254.9069	151	2,918.80	A
TRIFLURALIN		91.7228	6	153.00	A
ALPHA-UNDECYL-OMEGA-HYDROXYPOLY(OXYETHYLENE)		203.8025	31	1,060.05	A
VEGETABLE OIL		22.0056	1	27.00	A
Site Total		124,309.3590	10,975		
CHICORY					
ABIETIC ANHYDRIDE		1.1125	1	19.00	A
AZADIRACHTIN		1.1908	6	26.10	A
BACILLUS THURINGIENSIS, SUBSP. AIZAWAI, STRAIN ABTS-1857		52.5150	4	60.50	A
CHLOROPHACINONE		0.0000	1	19.00	A
DIETHYLENE GLYCOL ABIETATE		1.1125	1	19.00	A
DIMETHYLPOLYSILOXANE		5.0865	6	154.00	A
ETHYL ALCOHOL		0.9172	1	19.00	A
FLONICAMID		2.8000	1	32.00	A
FREE FATTY ACIDS AND/OR AMINE SALTS		1.3078	1	19.00	A
IMIDACLOPRID		36.6614	5	116.00	A
ISOPROPYL ALCOHOL		3.5474	5	135.00	A
ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE)		41.0753	5	135.00	A
PARAFFIN WAX		0.7575	1	19.00	A
POLYETHYLENE GLYCOL		22.4047	5	135.00	A
POTASSIUM NITRATE		2.8479	1	19.00	A
PROPYZAMIDE		14.2500	1	19.00	A
PYRETHRINS		1.2071	5	22.10	A
SAWDUST		0.5363	1	19.00	A
SPINETORAM		4.2061	3	84.00	A
SPINOSAD		3.3200	5	22.10	A
SULFUR		2.1451	1	19.00	A
Site Total		199.0011	39		
CHINESE CABBAGE (NAPPA)					
ACETAMIPRID		4.1782	10	49.50	A
ALPHA-PINENE BETA-PINENE COPOLYMER		0.9237	1	5.00	A
BACILLUS THURINGIENSIS (BERLINER), SUBSP. AIZAWAI, SEROTYPE H-7		1.0558	3	4.50	A
BACILLUS THURINGIENSIS, SUBSP. KURSTAKI, STRAIN ABTS-351, FERMENTATION SOLIDS AND SOLUBLES		149.3127	54	279.13	A
BENSULIDE		1,041.9941	32	243.60	A
CHLORTHAL-DIMETHYL		223.5000	9	37.00	A
CLARIFIED HYDROPHOBIC EXTRACT OF NEEM OIL		1.6868	2	2.25	A
COCONUT DIETHANOLAMIDE		0.0544	3	13.00	A
CYFLUTHRIN		0.1000	1	4.00	A
BETA-CYFLUTHRIN		0.2021	3	10.00	A
CYPERMETHRIN		15.1443	40	239.30	A
(S)-CYPERMETHRIN		20.0284	64	435.53	A
DIAZINON		3.4727	1	7.00	A
DIMETHOATE		10.8829	4	46.00	A
DODECYLBENZENE SULFONIC ACID		0.2359	3	13.00	A

Commodity Chemical	Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
CHINESE CABBAGE (NAPPA)				
ALPHA-(PARA-DODECYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE)	0.0493	1	5.00	A
EDTA, TETRASODIUM SALT	0.0145	3	13.00	A
EMAMECTIN BENZOATE	0.0469	2	6.00	A
FOSETYL-AL	22.0000	2	5.50	A
GLYPHOSATE, ISOPROPYLAMINE SALT	31.8087	1	8.00	A
IMIDACLOPRID	80.4923	36	274.50	A
INDOXACARB	0.1313	1	2.00	A
ISOPROPYL ALCOHOL	0.0719	3	13.00	A
MANEB	453.3371	72	476.40	A
MEFENOXAM	3.9455	14	31.50	A
MINERAL OIL	0.2586	1	5.00	A
ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE), PHOSPHATE ESTER	1.6913	3	4.50	A
PHOSPHORIC ACID	0.0465	3	13.00	A
POTASSIUM PHOSPHITE	8.5009	1	5.00	A
PYRACLOSTROBIN	1.0000	2	8.00	A
PYRETHRINS	0.0656	2	2.25	A
SILICONE DEFOAMER	0.0062	3	13.00	A
SODIUM XYLENE SULFONATE	0.0726	3	13.00	A
SPINETORAM	0.2077	2	5.00	A
SPINOSAD	0.6869	5	7.75	A
ALPHA-[PARA-(1,1,3,3-TETRAMETHYLBUTYL)PHENYL]-OMEGA-HYDROXYPOLY(OXYETHYLENE)	0.2766	3	13.00	A
TETRAPOTASSIUM PYROPHOSPHATE	0.0363	3	13.00	A
THIAMETHOXAM	2.5672	13	42.50	A
TRIETHANOLAMINE	0.0926	3	13.00	A
Site Total	2,080.1785	383		
CHINESE GREENS				
ACETAMIPRID	0.2975	1	4.00	A
COCONUT DIETHANOLAMIDE	0.0341	2	8.00	A
CYPERMETHRIN	0.7819	3	12.00	A
DODECYLBENZENE SULFONIC ACID	0.1478	2	8.00	A
EDTA, TETRASODIUM SALT	0.0091	2	8.00	A
IMIDACLOPRID	0.2601	1	0.90	A
ISOPROPYL ALCOHOL	0.0450	2	8.00	A
PHOSPHORIC ACID	0.0291	2	8.00	A
SILICONE DEFOAMER	0.0039	2	8.00	A
SODIUM XYLENE SULFONATE	0.0455	2	8.00	A
ALPHA-[PARA-(1,1,3,3-TETRAMETHYLBUTYL)PHENYL]-OMEGA-HYDROXYPOLY(OXYETHYLENE)	0.1733	2	8.00	A
TETRAPOTASSIUM PYROPHOSPHATE	0.0227	2	8.00	A
TRIETHANOLAMINE	0.0580	2	8.00	A
Site Total	1.9080	7		
CHIVE				
ACETAMIPRID	0.8095	9	9.50	A
IMIDACLOPRID	0.4529	3	2.57	A
SPINOSAD	1.6381	7	9.27	A
Site Total	2.9005	19		
CHRISTMAS TREE				
ALUMINUM PHOSPHIDE	0.3750	1	2.00	A
ESFENVALERATE	1.2950	2	30.00	A
GLYPHOSATE, ISOPROPYLAMINE SALT	12.0844	6	12.06	A
GLYPHOSATE, POTASSIUM SALT	10.6055	3	2.80	A
OXYTHIOQUINOX	0.8769	2	4.80	A
PERMETHRIN	1.9657	3	10.00	A
POLYETHYLENE GLYCOL MONO(3-(TETRAMETHYL-1-(TRIMETHYLSILOXY)DISILOXANYL)PROPYL)ETHER	1.9293	1	15.00	A
POLY-I-PARA-MENTHENE	2.0962	1	4.50	A

Commodity Chemical		Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
CHRISTMAS TREE					
SIMAZINE		7.2563	3	3.22	A
TRIADIMEFON		0.6875	1	2.80	A
Site Total		39.1718	23		
CILANTRO					
ALPHA-ALKYL (C12-C14)-OMEGA-HYDROXYPOLY (OXYETHYLENE)		2.2860	1	9.50	A
AZADIRACHTIN		0.5026	1	10.00	A
AZOXYSTROBIN		2.4119	1	20.00	A
BACILLUS THURINGIENSIS, SUBSP. AIZAWAI, STRAIN ABTS-1857		24.8400	1	23.00	A
BACILLUS THURINGIENSIS (BERLINER), SUBSP. KURSTAKI, STRAIN SA-11		62.0585	3	49.67	A
CLARIFIED HYDROPHOBIC EXTRACT OF NEEM OIL		38.2106	1	10.00	A
DIMETHYLPOLYSILOXANE		1.1626	46	215.27	A
FATTY ACIDS DERIVED FROM TALLOW		0.9144	1	9.50	A
IMIDACLOPRID		43.9501	15	454.50	A
ISOPROPYL ALCOHOL		3.3669	45	212.27	A
METHOXYFENOZIDE		17.9825	33	103.50	A
ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE)		41.2708	46	221.77	A
POLYETHYLENE GLYCOL		21.2645	45	212.27	A
POTASSIUM PHOSPHITE		47.6049	1	7.00	A
PYRETHRINS		11.0276	46	205.87	A
SPINETORAM		2.5197	8	53.00	A
SPINOSAD		2.0265	3	23.10	A
THIRAM		16.3378		6,558.91	U
		3.7117		1,489.21	P
TOTAL POUNDS OF THIS CHEMICAL	20.0495				
Site Total		343.4496	160		
CITRUS					
ALUMINUM PHOSPHIDE		1.2650	1	0.10	A
2,4-D, ISOPROPYL ESTER		40.5738		47,400.00	T
		19.8443		87,120.00	U
		2.8033		12,540.00	C
TOTAL POUNDS OF THIS CHEMICAL	63.2214				
GIBBERELLINS		10.0243		563,311.55	U
		1.2095		67,968.13	C
TOTAL POUNDS OF THIS CHEMICAL	11.2338				
GLYPHOSATE, ISOPROPYLAMINE SALT		150.9887	4	152.00	A
IMAZALIL		334.8982		4,708,050.60	U
		305.3173		77,071.00	T
		47.7267		670,949.10	C
TOTAL POUNDS OF THIS CHEMICAL	687.9422				
IMIDACLOPRID		18.3218	1	37.10	A
SODIUM HYPOCHLORITE		3,789.7335		23,383,706.00	U
		1,892.3894		77,071.00	T
		249.9000		561,178.00	C
TOTAL POUNDS OF THIS CHEMICAL	5,932.0229				
THIABENDAZOLE		599.0278		1,594,558.79	U
		180.5210		688,465.70	C
TOTAL POUNDS OF THIS CHEMICAL	779.5488				
Site Total		7,644.5446	6		
COLLARD					
ACETAMIPRID		3.1225	5	42.22	A
ALPHA-ALKYL (C12-C14)-OMEGA-HYDROXYPOLY (OXYETHYLENE)		209.8092	59	640.39	A
AZADIRACHTIN		0.1383	2	8.65	A
BACILLUS THURINGIENSIS (BERLINER), SUBSP. AIZAWAI, SEROTYPE H-7		45.9872	29	264.56	A
BACILLUS THURINGIENSIS, SUBSP. AIZAWAI, STRAIN ABTS-1857		17.2368	9	29.39	A

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Commodity	Chemical	Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
COLLARD					
	BACILLUS THURINGIENSIS (BERLINER), SUBSP. KURSTAKI, STRAIN SA-11	53.8085	37	204.63	A
	BENSULIDE	509.0248	11	92.91	A
	BENTONITE	1.1400	3	2.07	A
	CASEIN	0.0855	3	2.07	A
	CHLORANTRANILIPROLE	12.1936	26	228.23	A
	CHLORPYRIFOS	6.8325	1	9.11	A
	CHLORTHAL-DIMETHYL	371.5200	4	61.92	A
	CLARIFIED HYDROPHOBIC EXTRACT OF NEEM OIL	8.8645	11	26.38	A
	CLETHODIM	0.9202	1	10.14	A
	COPPER HYDROXIDE	25.0150	13	27.50	A
	COPPER OXIDE (OUS)	11.1923	1	13.34	A
	CYFLUTHRIN	3.7560	6	65.79	A
	BETA-CYFLUTHRIN	2.2207	10	102.64	A
	CYPERMETHRIN	14.4191	22	192.02	A
	(S)-CYPERMETHRIN	0.3475	3	8.00	A
	DIATOMACEOUS EARTH	9.4982	1	3.84	A
	DIAZINON	94.9642	25	215.40	A
	DIMETHOATE	2.8647	1	9.08	A
	DIMETHYLPOLYSILOXANE	12.8093	9	88.38	A
	EMAMECTIN BENZOATE	3.7693	33	347.12	A
	ESFENVALERATE	6.0259	13	131.42	A
	FATTY ACIDS DERIVED FROM TALLOW	83.9237	59	640.39	A
	FLUBENDIAMIDE	0.6969	2	23.23	A
	IMIDACLOPRID	12.7064	25	239.71	A
	INDOXACARB	27.2707	39	415.60	A
	ISOPROPYL ALCOHOL	2.7432	2	18.07	A
	LACTOSE	0.0855	3	2.07	A
	LECITHIN	0.1802	1	2.00	A
	MALATHION	214.5787	13	114.82	A
	MANDIPROPAMID	22.7625	17	175.06	A
	MEFENOXAM	24.0383	19	195.51	A
	MEFENOXAM, OTHER RELATED	0.5266	14	146.49	A
	METHYLATED SOYBEAN OIL	76.4701	18	166.04	A
	METHYL SILICONE RESINS	13.1556	7	89.20	A
	MINERAL OIL	0.0980	1	2.56	A
	NALED	213.5047	16	193.54	A
	ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE)	232.4283	80	826.50	A
	PETROLEUM DISTILLATES, AROMATIC	0.8398	1	2.56	A
	POLYACRYLAMIDE, POLYETHYLENE GLYCOL MIXTURE	0.0429	1	2.00	A
	POLYALKENE OXIDE MODIFIED HEPTAMETHYL TRISILOXANE	4.2408	19	168.04	A
	POLY-I-PARA-MENTHENE	38.3693	11	134.17	A
	POLYOXYETHYLENE POLYOXYPROPYLENE	4.2698	9	88.38	A
	POTASH SOAP	1,039.1091	48	265.67	A
	PROPIONIC ACID	0.1802	1	2.00	A
	PYMETROZINE	2.0144	2	23.44	A
	PYRACLOSTROBIN	36.0860	16	180.46	A
	PYRETHRINS	1.8743	25	155.72	A
	ROTENONE	0.8492	8	115.19	A
	ROTENONE, OTHER RELATED	0.8492	8	115.19	A
	SODIUM CARBONATE	0.0521	2	17.94	A
	SOYBEAN OIL	5.7516	3	6.53	A
	SPINETORAM	7.6199	15	161.31	A
	SPINOSAD	2.5844	10	26.94	A
	SULFUR	342.7440	8	109.62	A
	TEBUFENOZIDE	0.5077	1	4.00	A
	THIAMETHOXAM	1.2091	2	23.48	A
	XYLENE RANGE AROMATIC SOLVENT	53.0782	13	146.61	A
	Site Total	3,895.0072	638		
COMMODITY FUMIGATION					
	METHYL BROMIDE	781.5168			
	Site Total	781.5168			

Commodity	Chemical		Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
CORN, HUMAN CONSUMPTION						
	ALACHLOR		1,496.5767	42	492.40	A
	ALPHA-ALKYL (C12-C14)-OMEGA-HYDROXYPOLY (OXYETHYLENE)		20.4821	23	90.25	A
	BACILLUS THURINGIENSIS, SUBSP. AIZAWAI, STRAIN ABTS-1857		3.2400	2	3.50	A
	BACILLUS THURINGIENSIS, SUBSP. KURSTAKI, STRAIN ABTS-351, FERMENTATION SOLIDS AND SOLUBLES		3.2400	2	6.00	A
	CARBARYL		648.0000	14	648.00	A
	CHLORPYRIFOS		39.8771	3	40.00	A
	CYPERMETHRIN		2.0654	3	42.00	A
	(S)-CYPERMETHRIN		93.7096	46	1,938.90	A
	DELTAMETHRIN		6.1584	6	253.00	A
	DIAZINON		98.5000	4	197.00	A
	DIMETHYLPOLYSILOXANE		0.0831	3	32.00	A
	ESFENVALERATE		79.5439	73	2,013.13	A
	FATTY ACIDS DERIVED FROM TALLOW		8.1928	23	90.25	A
	LAMBDA-CYHALOTHRIN		3.0287	23	90.25	A
	LECITHIN		408.8084	125	4,395.13	A
	MALATHION		480.4646	8	410.00	A
	METHOMYL		315.0000	18	848.00	A
	METHOXYFENOZIDE		140.6288	51	1,001.13	A
	ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE)		140.6084	151	4,517.38	A
	OXYDEMETON-METHYL		9.8919	1	20.00	A
	PERMETHRIN		28.9283	24	145.10	A
	PHOSPHORIC ACID		9.2241	3	32.00	A
	PROPIONIC ACID		408.8084	125	4,395.13	A
	SPINETORAM		23.8013	11	506.00	A
	SPINOSAD		53.6994	11	526.00	A
	UREA		14.7087	3	32.00	A
	Site Total		4,537.2701	493		
CUCUMBER						
	ABAMECTIN		0.1028	2	8.70	A
	ACETAMIPRID		2.4527	3	25.06	A
	AZADIRACHTIN		0.5378	6	12.50	A
	AZOXYSTROBIN		3.1786		122,584.74	P
			0.9914		19.89	T
			0.4158	2	3.50	A
	TOTAL POUNDS OF THIS CHEMICAL	4.5858				
	BACILLUS THURINGIENSIS (BERLINER), SUBSP. AIZAWAI, SEROTYPE H-7		1.9014	1	18.46	A
	BACILLUS THURINGIENSIS (BERLINER), SUBSP. KURSTAKI, STRAIN SA-11		1.8560	4	10.00	A
	BENSULIDE		107.5557	9	54.25	A
	BIFENAZATE		26.2500	6	52.50	A
	CHLORPYRIFOS		151.2657		242,526.58	P
			38.6900		30.95	T
	TOTAL POUNDS OF THIS CHEMICAL	189.9557				
	BETA-CYFLUTHRIN		0.4312	1	18.46	A
	DIMETHOMORPH		0.2976	1	12.60	A
	DIMETHYLPOLYSILOXANE		15.2132	32	131.43	A
	DINOTEFURAN		0.5688	1	3.00	A
	FLONICAMID		1.9700	1	22.49	A
	FLUDIOXONIL		3.5544		120,668.60	P
			0.7804		15.88	T
	TOTAL POUNDS OF THIS CHEMICAL	4.3348				
	IMIDACLOPRID		38.2899	12	91.74	A
			0.4233		0.35	T
	TOTAL POUNDS OF THIS CHEMICAL	38.7132				
	ISOPROPYL ALCOHOL		1.6331	4	62.38	A
	LECITHIN		0.1802	1	2.00	A
	MANEB		3.2054	1	2.00	A
	MEFENOXAM		18.4757		245,935.73	P
			9.0355		31.31	T
			0.2398	1	3.00	A
	TOTAL POUNDS OF THIS CHEMICAL	27.7510				

Commodity	Chemical		Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
CUCUMBER						
	MEFENOXAM, OTHER RELATED		0.5720		245,935.73	P
			0.2797		31.31	T
			0.0071	1	3.00	A
	TOTAL POUNDS OF THIS CHEMICAL	0.8588				
	METHOMYL		3.6996	2	4.50	A
	METHYLATED SOYBEAN OIL		1.1522	1	2.00	A
	MINERAL OIL, PETROLEUM DISTILLATES, SOLVENT REFINED LIGHT		2.8669	1	12.60	A
	MYCLOBUTANIL		17.1710	22	147.30	A
	ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE)		19.1766	6	66.38	A
	ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE), BRANCHED		0.5447	1	12.60	A
	ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE), PHOSPHATE ESTER		20.0337	5	69.58	A
	OCTANOL		0.6020	1	12.60	A
	OLEYL ALCOHOL		0.8314	1	12.60	A
	ALPHA-OLEYL-OMEGA-HYDROXYPOLY(OXYETHYLENE)		0.8887	1	12.60	A
	PERMETHRIN		1.8820	1	12.60	A
	PIPERONYL BUTOXIDE		1.2687	3	3.70	A
	PIPERONYL BUTOXIDE, OTHER RELATED		0.3172	3	3.70	A
	POLYALKENE OXIDE MODIFIED HEPTAMETHYL TRISILOXANE		0.0576	1	2.00	A
	POLYETHYLENE GLYCOL		10.3141	4	62.38	A
	POLYOXYETHYLENE POLYOXYPROPYLENE		5.0447	28	69.05	A
	POTASSIUM BICARBONATE		12.3000	1	6.00	A
	PROPAMOCARB HYDROCHLORIDE		15.9558	3	13.80	A
	PROPIONIC ACID		0.1802	1	2.00	A
	PYRACLOSTROBIN		4.0920	2	20.46	A
	PYRETHRINS		0.1586	3	3.70	A
	QST 713 STRAIN OF DRIED BACILLUS SUBTILIS		12.7660	9	22.19	A
	SPINETORAM		2.5068	3	42.45	A
	SPINOSAD		2.3993	4	7.80	A
	SPIROMESIFEN		0.2574	1	2.00	A
	SULFUR		328.9600	4	62.38	A
	THIAMETHOXAM		0.9903	2	20.46	A
	THIOPHANATE-METHYL		6.6500	3	13.80	A
	THIRAM		654.1732		465,907.06	P
			58.0082		41,249.32	U
			48.6190		17.28	T
	TOTAL POUNDS OF THIS CHEMICAL	760.8004				
	TRICHODERMA HARZIANUM RIFAI STRAIN KRL-AG2		0.0916	5	12.00	A
	TRIFLUMIZOLE		6.6853	7	26.74	A
	Site Total		1,671.0000	163		
DAIKON						
	AZOXYSTROBIN		0.0653	1	1.00	A
	CHLORPYRIFOS		0.4985	2	4.00	A
	CHLORTHAL-DIMETHYL		36.0000	3	6.00	A
	DIAZINON		3.3021	4	7.50	A
	Site Total		39.8659	10		
DANDELION GREEN						
	MALATHION		3.0663	3	3.00	A
	Site Total		3.0663	3		
DILL						
	COPPER HYDROXIDE		20.4959	14	26.00	A
	IMIDACLOPRID		0.0938	1	2.00	A
	PROMETRYN		181.1687	20	173.76	A
	Site Total		201.7584	35		
DITCH BANK						
	ALPHA-ALKYL-OMEGA-HYDROXYPOLY(OXYETHYLENE)		2.9721	1	1.20	A
	AMMONIUM SULFATE		840.0000	21	56.00	A

Commodity Chemical		Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
DITCH BANK					
BRODIFACOUM		0.0000	1	0.17	A
CALCIUM HYPOCHLORITE		44,199.3200		531.00	U
DIMETHYLPOLYSILOXANE		0.2059	22	58.00	A
GLYPHOSATE, ISOPROPYLAMINE SALT		534.8857	28	58.35	A
GLYPHOSATE, POTASSIUM SALT		57.9420	4	10.50	A
ISOPROPYL ALCOHOL		4.2527	22	58.00	A
ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE)		49.2416	22	58.00	A
POLYETHYLENE GLYCOL		26.8590	22	58.00	A
Site Total		45,715.6790	77		
EGGPLANT					
IMIDACLOPRID		1.0838	3	2.50	A
THIRAM		8.6835		4,244.32	P
		0.4670		0.11	T
		0.0265		13.14	A
TOTAL POUNDS OF THIS CHEMICAL	9.1770				
Site Total		10.2608	3		
ENDIVE (ESCAROLE)					
ACETAMIPRID		2.9969	5	66.00	A
ALPHA-ALKYL (C12-C14)-OMEGA-HYDROXYPOLY (OXYETHYLENE)		12.5555	29	44.00	A
AZADIRACHTIN		0.4635	5	47.00	A
AZOXYSTROBIN		6.9687	3	31.50	A
COPPER HYDROXIDE		88.5689	15	182.50	A
CYFLUTHRIN		0.4500	1	12.20	A
CYPERMETHRIN		0.2541	1	5.50	A
(S)-CYPERMETHRIN		1.7558	3	40.50	A
DICLORAN		180.5813	26	133.50	A
DINOTEFURAN		0.6563	1	10.00	A
FATTY ACIDS DERIVED FROM TALLOW		5.0222	29	44.00	A
FENAMIDONE		0.5159	1	2.00	A
FLONICAMID		0.7000	1	8.00	A
IMIDACLOPRID		2.7231	3	26.90	A
INDOXACARB		0.6563	1	10.00	A
METHOXYFENOZIDE		9.0011	7	64.00	A
ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE)		12.5555	29	44.00	A
PERMETHRIN		8.5809	29	44.00	A
PROPYZAMIDE		110.1600	9	72.80	A
PYRACLOSTROBIN		12.5125	30	71.00	A
SPINETORAM		0.6588	1	10.50	A
SPINOSAD		2.8726	2	22.00	A
THIRAM		23.0572		6.14	T
		0.9036		264.89	P
TOTAL POUNDS OF THIS CHEMICAL	23.9608				
Site Total		485.1707	173		
FENNEL					
AZOXYSTROBIN		7.0486	4	40.00	A
PERMETHRIN		6.8425	4	40.00	A
POLY-I-PARA-MENTHENE		17.2053	4	40.00	A
SPINOSAD		3.3886	4	40.00	A
Site Total		34.4850	16		
FORAGE HAY/SILAGE					
BROMOXYNIL HEPTANOATE		5.5836	1	21.00	A
BROMOXYNIL OCTANOATE		5.7904	1	21.00	A
ISOPROPYL ALCOHOL		2.1912	1	21.00	A
ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE)		6.5735	1	21.00	A
Site Total		20.1387	2		

Commodity Chemical	Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
FUMIGATION, OTHER				
IMIDACLOPRID	21.4305			
METHYL BROMIDE	5,110.9703			
Site Total	5,132.4008			
GAI LON				
BACILLUS THURINGIENSIS, SUBSP. KURSTAKI, STRAIN ABTS-351, FERMENTATION SOLIDS AND SOLUBLES	68.2560	70	127.60	A
BENSULIDE	260.4117	29	59.00	A
BOSCALID	65.5380	61	168.20	A
CHLOROTHALONIL	113.7240	41	105.30	A
CYPERMETHRIN	5.3043	43	83.00	A
(S)-CYPERMETHRIN	7.4544	57	161.30	A
IMIDACLOPRID	22.1403	35	77.40	A
MEFENOXAM	6.9498	41	105.30	A
MEFENOXAM, OTHER RELATED	0.1580	41	105.30	A
PYRACLOSTROBIN	4.5400	15	22.70	A
Site Total	554.4765	351		
GRAPE				
ALPHA-PINENE BETA-PINENE COPOLYMER	1.1295	15	8.90	A
ALUMINUM PHOSPHIDE	1.7319	7	4.40	A
BOSCALID	1.0500	6	3.50	A
CARBARYL	1.0000	1	0.50	A
CHLORPYRIFOS	8.0040	1	4.00	A
CYPRODINIL	2.2069	5	4.70	A
ALPHA-(PARA-DODECYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE)	0.0602	15	8.90	A
FENARIMOL	0.3172	10	10.51	A
FENPROPATHRIN	0.1564	1	0.40	A
GLYPHOSATE, ISOPROPYLAMINE SALT	4.5722	9	4.10	A
GLYPHOSATE, POTASSIUM SALT	0.9519	1	0.46	A
IMIDACLOPRID	2.6171	6	22.68	A
MALATHION	0.9814	1	0.50	A
MINERAL OIL	0.3163	15	8.90	A
MYCLOBUTANIL	0.7000	1	7.00	A
POLY-I-PARA-MENTHENE	3.3145	16	19.85	A
PYRACLOSTROBIN	0.2240	3	1.75	A
PYRIMETHANIL	0.6005	2	1.55	A
QST 713 STRAIN OF DRIED BACILLUS SUBTILIS	0.2088	3	2.85	A
QUINOXYFEN	0.5583	6	5.70	A
SULFUR	108.1120	20	39.96	A
TEBUCONAZOLE	0.7875	1	7.00	A
TRIFLOXYSTROBIN	0.4575	8	7.54	A
Site Total	140.0581	120		
GRAPE, WINE				
ACETAMIPRID	0.0634	1	0.50	A
ALPHA-PINENE BETA-PINENE COPOLYMER	0.3824	7	4.00	A
BOSCALID	0.1546	2	0.50	A
CARBARYL	1.0000	1	0.50	A
CYPRODINIL	0.3919	2	0.75	A
ALPHA-(PARA-DODECYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE)	0.0204	7	4.00	A
FENARIMOL	0.0773	5	2.75	A
FENPROPATHRIN	0.1955	1	0.50	A
IMIDACLOPRID	0.3241	4	3.00	A
MINERAL OIL	0.1071	7	4.00	A
POLY-I-PARA-MENTHENE	0.7804	8	4.00	A
PYRACLOSTROBIN	0.0358	1	0.25	A
PYRIMETHANIL	0.3821	1	1.00	A
QST 713 STRAIN OF DRIED BACILLUS SUBTILIS	0.0730	1	1.00	A
QUINOXYFEN	0.1791	4	1.75	A

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Commodity Chemical		Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
GRAPE, WINE					
SULFUR		108.4000	10	22.25	A
TRIFLOXYSTROBIN		0.1013	3	1.75	A
Site Total		112.6684	50		
GRAPEFRUIT					
GLYPHOSATE, ISOPROPYLAMINE SALT		61.1551	5	43.04	A
Site Total		61.1551	5		
HERB, SPICE					
ABAMECTIN		0.3345	25	26.05	A
AZADIRACHTIN		0.4024	8	9.23	A
AZOXYSTROBIN		29.9970	33	27.77	A
BACILLUS THURINGIENSIS, SUBSP. AIZAWAI, STRAIN ABTS-1857		24.7725	18	90.00	A
BACILLUS THURINGIENSIS (BERLINER), SUBSP. KURSTAKI, SEROTYPE 3A,3B		0.1280	4	2.00	A
BACILLUS THURINGIENSIS, SUBSP. KURSTAKI, STRAIN ABTS-351, FERMENTATION SOLIDS AND SOLUBLES		0.8100	1	0.75	A
BACILLUS THURINGIENSIS (BERLINER), SUBSP. KURSTAKI, STRAIN SA-11		1.4280	19	18.53	A
CHLOROPICRIN		223.7198	4	3.75	A
CLARIFIED HYDROPHOBIC EXTRACT OF NEEM OIL		163.1588	30	42.62	A
CLETHODIM		0.1135	2	1.50	U
COPPER HYDROXIDE		3.7552	3	3.24	A
CYPRODINIL		2.6250	11	13.00	U
		2.2969	18	12.25	A
TOTAL POUNDS OF THIS CHEMICAL	4.9219				
1,3-DICHLOROPROPENE		408.4733	4	3.75	A
DIMETHYLPOLYSILOXANE		0.2466	4	2.00	A
FLUDIOXONIL		1.7500	11	13.00	U
		1.5313	18	12.25	A
TOTAL POUNDS OF THIS CHEMICAL	3.2813				
IMIDACLOPRID		1.3790	28	33.31	A
MANCOZEB		2.7000	2	2.10	A
POLYOXYETHYLENE POLYOXYPROPYLENE		0.0822	4	2.00	A
POTASH SOAP		123.3379	18	27.63	A
POTASSIUM BICARBONATE		49.7150	11	19.05	A
PYRETHRINS		0.2492	25	35.78	A
ROTENONE		0.2076	25	35.78	A
ROTENONE, OTHER RELATED		0.2076	25	35.78	A
SPINETORAM		0.9850	21	27.10	A
		0.0471	2	1.50	U
TOTAL POUNDS OF THIS CHEMICAL	1.0321				
SPINOSAD		1.5342	4	11.03	A
SULFURYL FLUORIDE		0.1238	1	0.50	U
Site Total		1,046.1114	292		
HOUSEHOLD					
ALKYL (60%C14, 30%C16, 5%C12, 5%C18) DIMETHYLBENZYL AMMONIUM CHLORIDE		2.0825		50,000.00	S
ALKYL (68%C12, 32%C14) DIMETHYLETHYLBENZYL AMMONIUM CHLORIDE		2.0825		50,000.00	S
Site Total		4.1650			
INDUSTRIAL SITE					
DIQUAT DIBROMIDE		5.9134	4	34.00	A
GLYPHOSATE, ISOPROPYLAMINE SALT		20.1498	1	20.00	A
GLYPHOSATE, MONOAMMONIUM SALT		18.3891	2	12.00	A
Site Total		44.4523	5		

Commodity	Chemical	Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
KALE					
	ACETAMIPRID	1.8441	9	30.28	A
	ALPHA-ALKYL (C12-C14)-OMEGA-HYDROXYPOLY (OXYETHYLENE)	73.7182	57	184.01	A
	AZADIRACHTIN	3.2206	18	119.34	A
	BACILLUS PUMILUS, STRAIN QST 2808	4.7414	8	39.50	A
	BACILLUS THURINGIENSIS (BERLINER), SUBSP. AIZAWAI, SEROTYPE H-7	41.6247	65	241.56	A
	BACILLUS THURINGIENSIS, SUBSP. AIZAWAI, STRAIN ABTS-1857	146.5884	38	194.17	A
	BACILLUS THURINGIENSIS (BERLINER), SUBSP. KURSTAKI, SEROTYPE 3A,3B	0.5479	3	8.59	A
	BACILLUS THURINGIENSIS (BERLINER), SUBSP. KURSTAKI, STRAIN SA-11	73.0925	36	155.20	A
	BENSULIDE	134.9997	7	25.27	A
	BENTONITE	1.0380	1	2.30	A
	CASEIN	0.0779	1	2.30	A
	CHLORANTRANILIPROLE	2.0322	12	37.78	A
	CHLORTHAL-DIMETHYL	220.8300	4	37.43	A
	CLARIFIED HYDROPHOBIC EXTRACT OF NEEM OIL	46.6793	35	126.49	A
	CLETHODIM	0.5231	2	5.70	A
	CYFLUTHRIN	0.1880	3	3.76	A
	BETA-CYFLUTHRIN	0.8947	10	36.51	A
	CYPERMETHRIN	29.3721	65	306.19	A
	(S)-CYPERMETHRIN	1.7464	7	36.10	A
	CYROMAZINE	1.2450	2	10.00	A
	DIAZINON	19.3818	14	41.05	A
	1,3-DICHLOROPROPENE	1,191.2674	1	10.00	A
	DIMETHOATE	7.5202	7	22.87	A
	DIMETHYLPOLYSILOXANE	10.7303	22	94.45	A
	EMAMECTIN BENZOATE	1.5206	30	110.49	A
	FATTY ACIDS DERIVED FROM TALLOW	29.4873	57	184.01	A
	FOSETYL-AL	20.0000	1	5.00	A
	IMIDACLOPRID	19.0050	64	290.32	A
	INDOXACARB	7.1509	30	110.35	A
	ISOPROPYL ALCOHOL	1.3056	10	49.50	A
	LACTOSE	0.0779	1	2.30	A
	MALATHION	493.4847	55	249.34	A
	MANDIPROPAMID	3.8527	7	29.69	A
	MEFENOXAM	3.6780	9	29.34	A
	MEFENOXAM, OTHER RELATED	0.0976	8	26.49	A
	METHOXYFENOZIDE	2.8916	3	14.35	A
	METHYLATED SOYBEAN OIL	19.5270	15	46.57	A
	METHYL SILICONE RESINS	15.0949	18	53.03	A
	NALED	89.8329	27	78.02	A
	ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE)	92.4971	82	280.08	A
	PHOSPHORIC ACID	0.1051	1	1.00	A
	POLYACRYLAMIDE, POLYETHYLENE GLYCOL MIXTURE	0.3143	2	14.10	A
	POLYALKENE OXIDE MODIFIED HEPTAMETHYL TRISILOXANE	2.1449	16	52.67	A
	POLYETHYLENE GLYCOL	8.2459	10	49.50	A
	POLY-I-PARA-MENTHENE	12.9418	16	46.99	A
	POLYOXYETHYLENE POLYOXYPROPYLENE	0.8623	7	19.95	A
	POTASH SOAP	906.0996	54	242.57	A
	POTASSIUM PHOSPHITE	12.9642	1	5.00	A
	PROPYLENE GLYCOL	0.1282	1	1.00	A
	PYMETROZINE	0.3078	1	3.58	A
	PYRACLOSTROBIN	11.1820	16	57.17	A
	PYRETHRINS	41.0784	61	239.10	A
	ROTENONE	0.2267	15	41.06	A
	ROTENONE, OTHER RELATED	0.2267	15	41.06	A
	SOYBEAN OIL	33.0933	11	36.32	A
	SPINETORAM	3.1110	17	64.52	A
	SPINOSAD	12.2598	34	145.27	A
	STREPTOMYCES LYDICUS WYEC 108	0.0014	1	5.00	A
	SULFUR	72.3040	12	31.02	A
	THIAMETHOXAM	2.4256	9	39.48	A

Commodity	Chemical		Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
KALE						
	TRISODIUM PHOSPHATE		0.0021	1	1.00	A
	XYLENE RANGE AROMATIC SOLVENT		3.0837	3	9.20	A
	Site Total		3,936.5165	922		
KIWI						
	GLYPHOSATE, ISOPROPYLAMINE SALT		8.2415	2	6.00	A
	Site Total		8.2415	2		
KOHLRABI						
	AZOXYSTROBIN		0.1307	2	2.00	A
	BACILLUS THURINGIENSIS, SUBSP. KURSTAKI, STRAIN ABTS-351, FERMENTATION SOLIDS AND SOLUBLES		1.0800	1	1.00	A
	CHLORTHAL-DIMETHYL		0.3750	2	2.00	A
	IMIDACLOPRID		0.0500	1	1.00	A
	MALATHION		7.1546	7	7.00	A
	PIPERONYL BUTOXIDE		0.1586	1	1.00	A
	PIPERONYL BUTOXIDE, OTHER RELATED		0.0396	1	1.00	A
	PYRETHRINS		0.0198	1	1.00	A
	Site Total		9.0083	14		
LANDSCAPE MAINTENANCE						
	ABAMECTIN		0.0089			
	ACEPHATE		8.9238			
			0.6360	1	100.00	A
	TOTAL POUNDS OF THIS CHEMICAL	9.5598				
	ACID BLUE 9, DIAMMONIUM SALT		10.9048			
	ALKYL (50%C14, 40%C12, 10%C16) DIMETHYLBENZYL AMMONIUM CHLORIDE		0.0032	1	100.00	A
	ALKYL (C8,C10) POLYGLYCOSIDE		0.0792			
	D-TRANS ALLETHRIN		0.0040	3	300.00	A
			0.0021			
	TOTAL POUNDS OF THIS CHEMICAL	0.0061				
	ALUMINUM PHOSPHIDE		1,642.0154			
			111.9243	35	2,054.69	A
			0.0688	2	600.00	S
	TOTAL POUNDS OF THIS CHEMICAL	1,754.0085				
	AMINOPYRALID, TRIISOPROPANOLAMINE SALT		3.8561			
	AMMONIUM SULFATE		60.8612			
	AZADIRACHTIN		0.6075			
			0.2585	2	28.00	A
	TOTAL POUNDS OF THIS CHEMICAL	0.8660				
	AZOXYSTROBIN		30.3054			
	BACILLUS THURINGIENSIS (BERLINER), SUBSP. ISRAELENSIS, SEROTYPE H-14		76.5060			
	BENEFIN		50.2000			
			8.5000	2	200.00	A
	TOTAL POUNDS OF THIS CHEMICAL	58.7000				
	BENSULIDE		225.4135			
	BIFENAZATE		0.0390			
	BIFENTHRIN		22.3536			
			4.5091	10	1,400.00	A
	TOTAL POUNDS OF THIS CHEMICAL	26.8627				
	BISPYRIBAC-SODIUM		3.6000			
			0.0500	1	80.00	A
	TOTAL POUNDS OF THIS CHEMICAL	3.6500				
	BORAX		0.3798	2	200.00	A
	BORIC ACID		8.9846	7	700.00	A
	BRODIFACOUM		0.0098			
			0.0006	1	300.00	A
	TOTAL POUNDS OF THIS CHEMICAL	0.0104				
	BROMADIOLONE		0.0757			
			0.0505	5	450.00	A
	TOTAL POUNDS OF THIS CHEMICAL	0.1262				

Commodity	Chemical		Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
LANDSCAPE MAINTENANCE						
	BROMETHALIN		0.0074			
			0.0008	2	400.00	A
	TOTAL POUNDS OF THIS CHEMICAL	0.0082				
	BUTOPYRONOXYL		0.0081	1	14.00	A
	CARBARYL		185.3283	4	360.00	A
			113.3250			
	TOTAL POUNDS OF THIS CHEMICAL	298.6533				
	CARBON		0.0350			
	CARBON TETRACHLORIDE		0.0920	1	160.00	A
	CARFENTRAZONE-ETHYL		6.0096			
			0.3087	3	340.00	A
	TOTAL POUNDS OF THIS CHEMICAL	6.3183				
	CHLORANTRANILIPROLE		3.6343			
			3.3588	1	20.00	A
	TOTAL POUNDS OF THIS CHEMICAL	6.9931				
	CHLORFENAPYR		0.8846	2	200.00	A
			0.3378			
	TOTAL POUNDS OF THIS CHEMICAL	1.2224				
	CHLORFLURENOL, METHYL ESTER		0.2006			
	CHLOROPHACINONE		0.0271			
			0.0002	2	200.00	A
	TOTAL POUNDS OF THIS CHEMICAL	0.0273				
	CHLOROTHALONIL		2,370.8159			
			126.5793	6	457.00	A
	TOTAL POUNDS OF THIS CHEMICAL	2,497.3952				
	CHLORPYRIFOS		25.7757			
			0.9805	1	100.00	A
	TOTAL POUNDS OF THIS CHEMICAL	26.7562				
	CHLORSULFURON		4.6719			
	CHOLECALCIFEROL		0.0087	1	100.00	A
	CITRIC ACID		3.4086			
	CLARIFIED HYDROPHOBIC EXTRACT OF NEEM OIL		0.4264			
	CLOPYRALID, MONOETHANOLAMINE SALT		7.6991			
	CLOPYRALID,TRIETHYLAMINE SALT		0.0900			
	COCONUT DIETHANOLAMIDE		1.6486			
	COPPER AMMONIUM COMPLEX		0.1968			
	COPPER CARBONATE, BASIC		443.6604			
	COPPER ETHANOLAMINE COMPLEXES, MIXED		1,031.5094			
	COPPER HYDROXIDE		58.1965			
	COPPER SULFATE (BASIC)		83.2842			
	COPPER SULFATE (PENTAHYDRATE)		645.4795			
	CYFLUTHRIN		0.1882	3	214.00	A
			0.0475			
	TOTAL POUNDS OF THIS CHEMICAL	0.2357				
	BETA-CYFLUTHRIN		1.8961	4	114.00	A
			1.5832			
	TOTAL POUNDS OF THIS CHEMICAL	3.4793				
	CYPERMETHRIN		12.2467	4	400.00	A
			6.0749			
	TOTAL POUNDS OF THIS CHEMICAL	18.3216				
	2,4-D		0.2736			
	2,4-D, DIMETHYLAMINE SALT		19.1769			
			0.3799	3	109.00	A
	TOTAL POUNDS OF THIS CHEMICAL	19.5568				
	2,4-D, 2-ETHYLHEXYL ESTER		115.1556			
			5.9972	3	340.00	A
	TOTAL POUNDS OF THIS CHEMICAL	121.1528				
	2,4-D, ISOOCTYL ESTER		0.2281			
	2,4-D, TRIISOPROPANOLAMINE SALT		2.4151			
	DEET		0.1870	1	14.00	A
	DEET, OTHER RELATED		0.0098	1	14.00	A
	DELTAMETHRIN		0.5728	8	703.50	A
			0.3551			
	TOTAL POUNDS OF THIS CHEMICAL	0.9279				
	DEXTRIN		0.0088			
	DIAZINON		1.8604			

Commodity	Chemical		Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
LANDSCAPE MAINTENANCE						
	DICAMBA		19.2809			
			1.0760	4	346.00	A
	TOTAL POUNDS OF THIS CHEMICAL	20.3569				
	DICAMBA, DIMETHYLAMINE SALT		6.4850			
			1.7073	6	141.00	A
	TOTAL POUNDS OF THIS CHEMICAL	8.1923				
	4,5-DICHLORO-2-N-OCTYL-3(2H)-ISOTHIAZOLONE		8.2217			
	DIETHYLENE GLYCOL		0.9522			
	DIFETHIALONE		0.0328			
			0.0003	3	300.00	A
	TOTAL POUNDS OF THIS CHEMICAL	0.0331				
	DIGLYCOLAMINE SALT OF 3,6-DICHLORO-O-ANISIC ACID		22.2248			
	DIKEGULAC SODIUM		57.9536			
			1.6797	1	100.00	A
	TOTAL POUNDS OF THIS CHEMICAL	59.6333				
	DIMETHYL PHTHALATE		0.0098	1	14.00	A
	DIMETHYLPOLYSILOXANE		0.2625			
			0.0152	1	6.00	A
	TOTAL POUNDS OF THIS CHEMICAL	0.2777				
	DINOTEFURAN		0.0250			
	DIPHACINONE		0.6066			
			0.0106	5	400.00	A
	TOTAL POUNDS OF THIS CHEMICAL	0.6172				
	DIQUAT DIBROMIDE		803.7767			
			4.2850	4	426.50	A
	TOTAL POUNDS OF THIS CHEMICAL	808.0617				
	DISODIUM OCTABORATE TETRAHYDRATE		4.9000	1	100.00	A
	DISULFOTON		2.1500			
			0.2000	1	100.00	A
	TOTAL POUNDS OF THIS CHEMICAL	2.3500				
	DITHIOPYR		14.2671			
			0.1750	1	17,000.00	S
			0.1250	1	0.50	A
	TOTAL POUNDS OF THIS CHEMICAL	14.5671				
	DIURON		199.4662			
	DODECYLBENZENE SULFONIC ACID		7.1439			
	DODECYL GUANIDINE HYDROCHLORIDE		7.2971	1	160.00	A
	2-(2,4-DP), DIMETHYLAMINE SALT		0.0048			
	2,4-DP-P, ISOOCTYL ESTER		0.1144			
	EDTA, TETRASODIUM SALT		0.4396			
	ENDOTHALL, DIPOTASSIUM SALT		373.0693			
	ENDOTHALL, MONO [N,N-DIMETHYL ALKYLAMINE] SALT		4.5253			
	ETHEPHON		771.9856			
			19.9633	2	160.00	A
	TOTAL POUNDS OF THIS CHEMICAL	791.9489				
	ETHOFUMESATE		0.5412			
	ETHYLENE DICHLORIDE		0.2146	1	160.00	A
	ETOXAZOLE		0.0500			
	FATTY ACIDS, MIXED		4.2386			
	FATTY ACIDS, C16-C18 AND C18-UNSATURATED, METHYL ESTERS		12.4502			
	FIPRONIL		2.0178			
			1.5101	7	700.00	A
	TOTAL POUNDS OF THIS CHEMICAL	3.5279				
	FLUAZIFOP-P-BUTYL		35.1416			
			1.8436	3	206.50	A
	TOTAL POUNDS OF THIS CHEMICAL	36.9852				
	FLUDIOXONIL		15.7747			
			1.5000	1	85.00	A
	TOTAL POUNDS OF THIS CHEMICAL	17.2747				
	FLURECOL-METHYL		0.0479			
	FLURIDONE		41.9713			
	FLUROXYPYR		2.1742			
	FLUROXYPYR, 1-METHYLHEPTYL ESTER		1.4365			
	FLUTOLANIL		208.6000			
	TAU-FLUVALINATE		1.7228			

Commodity	Chemical		Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
LANDSCAPE MAINTENANCE						
	FORAMSULFURON		3.0713			
			0.0188	1	3.50	A
	TOTAL POUNDS OF THIS CHEMICAL	3.0901				
	FOSETYL-AL		58.9000			
	GLYPHOSATE, DIAMMONIUM SALT		17.9007			
			0.9294	1	6.50	A
	TOTAL POUNDS OF THIS CHEMICAL	18.8301				
	GLYPHOSATE, ISOPROPYLAMINE SALT		11,207.0308			
			76.3726	17	859.60	A
	TOTAL POUNDS OF THIS CHEMICAL	11,283.4034				
	GLYPHOSATE, MONOAMMONIUM SALT		874.5048			
			2.2678	2	126.50	A
	TOTAL POUNDS OF THIS CHEMICAL	876.7726				
	GLYPHOSATE, POTASSIUM SALT		42.5081			
			0.8461	1	6.50	A
	TOTAL POUNDS OF THIS CHEMICAL	43.3542				
	HALOSULFURON-METHYL		5.4666			
			0.1406	1	100.00	A
	TOTAL POUNDS OF THIS CHEMICAL	5.6072				
	HYDRAMETHYLNON		0.7500			
			0.1829	4	400.00	A
	TOTAL POUNDS OF THIS CHEMICAL	0.9329				
	HYDROPRENE		0.2092	2	200.00	A
			0.0766			
	TOTAL POUNDS OF THIS CHEMICAL	0.2858				
	IMAZAPYR, ISOPROPYLAMINE SALT		0.1297			
	IMIDACLOPRID		37.6261			
			1.6875	2	200.00	A
	TOTAL POUNDS OF THIS CHEMICAL	39.3136				
	INDOXACARB		0.0000	1	100.00	A
	IPRODIONE		98.9677			
	IRON PHOSPHATE		14.3578			
			0.9120	1	100.00	A
	TOTAL POUNDS OF THIS CHEMICAL	15.2698				
	ISOPROPYL ALCOHOL		6.9604			
			1.7549	3	26.50	A
	TOTAL POUNDS OF THIS CHEMICAL	8.7153				
	ISOXABEN		8.9494			
			0.5000	1	15,000.00	S
			0.5000	1	0.50	A
	TOTAL POUNDS OF THIS CHEMICAL	9.9494				
	LAMBDA-CYHALOTHRIN		2.1092	5	500.00	A
			0.2482			
	TOTAL POUNDS OF THIS CHEMICAL	2.3574				
	LECITHIN		60.5645			
	LIMONENE		62.2511			
	MALATHION		9.1988			
	MALEIC HYDRAZIDE, POTASSIUM SALT		4.5018	2	300.00	A
	MANCOZEB		1,150.0000			
			36.0000	1	120.00	A
	TOTAL POUNDS OF THIS CHEMICAL	1,186.0000				
	MCPA, DIMETHYLAMINE SALT		47.8897			
			17.0030	3	32.00	A
	TOTAL POUNDS OF THIS CHEMICAL	64.8927				
	MCPA, 2-ETHYL HEXYL ESTER		74.3995			
	MCPA, ISOOCTYL ESTER		110.4421			
			10.8061	1	6.00	A
	TOTAL POUNDS OF THIS CHEMICAL	121.2482				
	MCPP		0.1224			
	MCPP, DIMETHYLAMINE SALT		9.6586			
			0.1563	2	108.00	A
	TOTAL POUNDS OF THIS CHEMICAL	9.8149				
	MCPP-P, DIMETHYLAMINE SALT		10.4475			
			3.3610	3	32.00	A
	TOTAL POUNDS OF THIS CHEMICAL	13.8085				
	MECOPROP-P		37.4299			
			1.5207	3	340.00	A
	TOTAL POUNDS OF THIS CHEMICAL	38.9506				

Commodity	Chemical		Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
LANDSCAPE MAINTENANCE						
	MEFENOXAM		17.3564			
			0.4415	4	400.00	A
	TOTAL POUNDS OF THIS CHEMICAL	17.7979				
	MEFENOXAM, OTHER RELATED		0.4891			
			0.0093	2	200.00	A
	TOTAL POUNDS OF THIS CHEMICAL	0.4984				
	MEFLUIDIDE, DIETHANOLAMINE SALT		9.2030			
			0.2219	2	300.00	A
	TOTAL POUNDS OF THIS CHEMICAL	9.4249				
	METALAXYL		0.0470			
	METALDEHYDE		214.5953			
			15.0750	2	200.00	A
	TOTAL POUNDS OF THIS CHEMICAL	229.6703				
	METHIOCARB		0.0235	1	0.10	A
	METHOPRENE		0.3231			
	METHYLATED FATTY ACIDS FROM CANOLA OIL		2.4554			
	METHYLATED SOYBEAN OIL		127.3490			
	METHYL-2,7-DICHLORO-9-HYDROXYFLUORENE-9-CARBOXYLATE		0.0365			
	METHYLENE BIS(THIOCYANATE)		3.6485	1	160.00	A
	MINERAL OIL		268.5704			
	MSMA		59.2931			
	MYCLOBUTANIL		5.3311			
			1.0633	4	212.50	A
			0.4185	1	17,000.00	S
	TOTAL POUNDS OF THIS CHEMICAL	6.8129				
	NAA, AMMONIUM SALT		23.7361			
	NAPROPAMIDE		0.5000	1	100.00	A
	ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE)		57.7402			
			8.6479	3	26.50	A
	TOTAL POUNDS OF THIS CHEMICAL	66.3881				
	N-OCTYL BICYCLOHEPTENE DICARBOXIMIDE		1.1331	5	313.00	A
			0.0054			
	TOTAL POUNDS OF THIS CHEMICAL	1.1385				
	ORYZALIN		938.7000			
			8.5000	2	200.00	A
	TOTAL POUNDS OF THIS CHEMICAL	947.2000				
	OXADIAZON		46.7100			
	OXYDEMETON-METHYL		0.1917			
	OXYFLUORFEN		2.9997			
	PACLOBUTRAZOL		48.6579			
			7.7598	2	160.00	A
	TOTAL POUNDS OF THIS CHEMICAL	56.4177				
	PCNB		274.7749	3	245.00	A
			85.5706			
	TOTAL POUNDS OF THIS CHEMICAL	360.3455				
	PENDIMETHALIN		264.7430			
	PENOXSULAM		1.0140			
	PERMETHRIN		131.7417			
			30.7632	4	400.00	A
	TOTAL POUNDS OF THIS CHEMICAL	162.5049				
	PETROLEUM DISTILLATES		0.2245	5	313.00	A
	PETROLEUM DISTILLATES, REFINED		45.7421			
	PETROLEUM OIL, PARAFFIN BASED		1.2047			
	PETROLEUM OIL, UNCLASSIFIED		1,612.6949			
			14.2474	2	112.00	A
	TOTAL POUNDS OF THIS CHEMICAL	1,626.9423				
	PHENOTHRIN		0.0037	3	300.00	A
			0.0020			
	TOTAL POUNDS OF THIS CHEMICAL	0.0057				
	PHOSPHORIC ACID		20.2395			
	PIPERONYL BUTOXIDE		11.7078			
			1.3241	14	1,213.00	A
	TOTAL POUNDS OF THIS CHEMICAL	13.0319				
	PIPERONYL BUTOXIDE, OTHER RELATED		2.9270			
			0.3133	10	813.00	A
	TOTAL POUNDS OF THIS CHEMICAL	3.2403				
	POLYACRYLIC POLYMER		1.7043			

Commodity	Chemical		Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
LANDSCAPE MAINTENANCE						
	POLYALKENE OXIDE MODIFIED HEPTAMETHYL TRISILOXANE		6.7358			
	POLYETHYLENE GLYCOL		1.9886	1	6.00	A
	POLYOXIN D		4.9547			
			0.5500	1	85.00	A
	TOTAL POUNDS OF THIS CHEMICAL	5.5047				
	POLYOXYETHYLENE POLYOXYPROPYLENE		0.9531			
	POLYSILOXANE		0.0032			
	POTASH SOAP		0.0341			
	POTASSIUM HYDROXIDE		0.0928			
	POTASSIUM NITRATE		0.1969			
	POTASSIUM PHOSPHITE		10.6145			
			2.3498	1	100.00	A
	TOTAL POUNDS OF THIS CHEMICAL	12.9643				
	PRODIAMINE		265.3053			
			1.4862	1	100.00	A
	TOTAL POUNDS OF THIS CHEMICAL	266.7915				
	PROPICONAZOLE		94.3092			
			5.0962	3	87.00	A
	TOTAL POUNDS OF THIS CHEMICAL	99.4054				
	PROPIONIC ACID		60.3428			
	PYRACLOSTROBIN		18.8675			
	PYRETHRINS		1.4649			
			0.5028	13	1,113.00	A
	TOTAL POUNDS OF THIS CHEMICAL	1.9677				
	PYRIPROXYFEN		0.0115			
			0.0018	1	100.00	A
	TOTAL POUNDS OF THIS CHEMICAL	0.0133				
	QUINCLORAC		41.3056			
			0.0171	1	1.00	A
	TOTAL POUNDS OF THIS CHEMICAL	41.3227				
	SILICA AEROGEL		1.6225	4	400.00	A
			0.0500			
	TOTAL POUNDS OF THIS CHEMICAL	1.6725				
	SILICONE DEFOAMER		0.1868			
	SIMAZINE		17.6000	1	100.00	A
			17.6000			
	TOTAL POUNDS OF THIS CHEMICAL	35.2000				
	SODIUM CARBONATE PEROXYHYDRATE		227.8000			
	SODIUM XYLENE SULFONATE		2.1981			
	SPINOSAD		0.3158			
			0.1405	1	14.00	A
	TOTAL POUNDS OF THIS CHEMICAL	0.4563				
	STRYCHNINE		2.8141			
			0.0801	5	500.00	A
	TOTAL POUNDS OF THIS CHEMICAL	2.8942				
	SULFAQUINOXALINE		0.0209			
	SULFENTRAZONE		0.0512			
			0.0021	1	1.00	A
	TOTAL POUNDS OF THIS CHEMICAL	0.0533				
	SULFOMETURON-METHYL		11.4335			
			0.5625	1	100.00	A
	TOTAL POUNDS OF THIS CHEMICAL	11.9960				
	SULFOSULFURON		0.0981			
	SULFUR		0.1969			
	TALL OIL		1.2590			
			0.3790	2	20.50	A
	TOTAL POUNDS OF THIS CHEMICAL	1.6380				
	TARTRAZINE		1.1029			
	TEBUCONAZOLE		0.1064			
	TETRAMETHRIN		0.0004	1	100.00	A
	ALPHA-[PARA-(1,1,3,3-TETRAMETHYLBUTYL)PHENYL]-OMEGA-HYDROXYPOLY(OXYETHYLENE)		8.3726			
	TETRAPOTASSIUM PYROPHOSPHATE		1.0991			
	THIABENDAZOLE		0.7696	1	85.00	A
	THIOPHANATE		20.0000			
	THIOPHANATE-METHYL		285.2150			
			43.4468	3	260.00	A
	TOTAL POUNDS OF THIS CHEMICAL	328.6618				

Commodity Chemical		Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
LANDSCAPE MAINTENANCE					
THIRAM		11.6197			
TRIADIMEFON		8.3907			
		4.1250	1	20.00	A
TOTAL POUNDS OF THIS CHEMICAL	12.5157				
TRICLOPYR, BUTOXYETHYL ESTER		231.7344			
		3.0021	3	206.00	A
TOTAL POUNDS OF THIS CHEMICAL	234.7365				
TRICLOPYR, TRIETHYLAMINE SALT		2.3322			
TRIETHANOLAMINE		2.8026			
TRIFLOXYSTROBIN		10.5103			
TRIFLOXYSULFURON-SODIUM		0.6614			
TRIFLURALIN		22.8000			
		2.0000	1	15,000.00	S
		2.0000	1	0.50	A
TOTAL POUNDS OF THIS CHEMICAL	26.8000				
TRINEXAPAC-ETHYL		48.2225			
		1.1972	6	492.00	A
TOTAL POUNDS OF THIS CHEMICAL	49.4197				
ALPHA-UNDECYL-OMEGA-HYDROXYPOLY(OXYETHYLENE)		11.7314			
WARFARIN		0.0209			
XYLENE RANGE AROMATIC SOLVENT		0.0207			
ZINC PHOSPHIDE		6.8393			
		1.3975	3	500.00	A
TOTAL POUNDS OF THIS CHEMICAL	8.2368				
Site Total		30,240.3693	266		
LEEK					
BOSCALID		12.1590	9	48.50	A
CHLOROTHALONIL		588.9698	49	278.30	A
CYPERMETHRIN		20.2465	35	206.80	A
PYRACLOSTROBIN		30.3200	44	256.30	A
SPINETORAM		3.1483	15	79.00	A
SPINOSAD		0.8774	2	13.50	A
Site Total		655.7210	145		
LEMON					
ABAMECTIN		156.3431	677	14,867.17	A
ACETAMIPRID		10.6427	6	111.80	A
ALCOHOLS, C4-C12, NORMAL		0.3011	1	30.00	A
ALCOHOLS, C6-C10		0.0772	1	22.00	A
ALPHA-ALKYL (C8-C18)-OMEGA-HYDROXYPOLY(OXYETHYLENE) POLY(OXYPROPYLENE)		49.9250	27	433.00	A
ALPHA-ALKYL (C9-C11)-OMEGA-HYDROXYPOLY(OXYETHYLENE)		667.7944	67	1,656.13	A
ALPHA-ALKYL (C12-C14)-OMEGA-HYDROXYPOLY (OXYETHYLENE)		5.3852	2	27.60	A
AMMONIUM DODECYL POLY OXYETHYLENE SULFATE		1.1168	1	10.00	A
AMMONIUM LAURYL SULFATE		2.1943	1	10.00	A
AMMONIUM PROPIONATE		0.0000	2	4.00	A
AMMONIUM SULFATE		0.0000	2	4.00	A
BENTONITE		10,616.0060	256	7,381.12	A
BROMACIL		27.4000	3	44.30	A
BROMADIOLONE		0.0005	1	140.00	A
CALCIUM HYDROXIDE		21,944.3161	129	3,966.52	A
CARBARYL		819.6066	2	154.00	A
CASEIN		639.0768	246	6,927.94	A
CHLOROPHACINONE		0.0068	25	456.00	A
CHLORPYRIFOS		27,825.6458	310	8,388.17	A
CINNAMALDEHYDE		354.3083	13	556.00	A
CITRIC ACID		0.0000	2	4.00	A
COCONUT DIETHANOLAMIDE		0.6560	2	20.00	A
COPPER		15.6000	1	80.00	A
COPPER HYDROXIDE		7,031.6701	192	4,661.43	A
COPPER OXIDE (OUS)		41.9500	1	8.00	A
COPPER SULFATE (BASIC)		29,188.7597	173	5,407.21	A
COTTONSEED OIL		26.6687	1	30.00	A
2,4-D, DIMETHYLAMINE SALT		897.1305	60	2,493.58	A

Commodity	Chemical		Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
LEMON						
	2,4-D, ISOPROPYL ESTER		378.5900		293,311.69	T
			11.0656		9,581.00	U
	TOTAL POUNDS OF THIS CHEMICAL	389.6556				
	1,3-DICHLOROPROPENE		28,276.0616	6	85.10	A
	DICOFOL		53.8393	2	21.25	A
	DIETHYLENE GLYCOL		0.1283	1	16.00	A
	DIMETHOATE		6.8062	1	11.96	A
	DIMETHYLPOLYSILOXANE		94.4395	16	469.42	A
	DINOSEB		140.0496	2	43.06	A
	DIPHACINONE		0.0527	46	584.00	A
	DIURON		616.9340	13	284.56	A
	DODECYLBENZENE SULFONIC ACID		2.8426	2	20.00	A
	DRY MILK SOLIDS		10.7997	1	126.79	A
	EDTA, TETRASODIUM SALT		0.1749	2	20.00	A
	FATTY ACIDS, MIXED		13.1995	71	2,272.50	A
	FATTY ACIDS DERIVED FROM TALLOW		2.1541	2	27.60	A
	FENPYROXIMATE		1.4457	2	6.00	A
	FLUDIOXONIL		27.5000		5,474.54	T
	FOSETYL-AL		120.0000	2	30.00	A
	GIBBERELLINS		333.7666	248	6,613.06	A
			20.1626		103,375.91	T
	TOTAL POUNDS OF THIS CHEMICAL	353.9292				
	GLYPHOSATE		51.9993	1	50.00	A
	GLYPHOSATE, DIAMMONIUM SALT		292.5819	19	333.08	A
	GLYPHOSATE, ISOPROPYLAMINE SALT		23,787.3657	1,059	21,375.68	A
			7.9918		15.00	U
	TOTAL POUNDS OF THIS CHEMICAL	23,795.3575				
	GLYPHOSATE, MONOAMMONIUM SALT		2,287.4589	33	2,825.90	A
	GLYPHOSATE, POTASSIUM SALT		21,409.6765	856	12,822.14	A
	HYDROGEN PEROXIDE		418.5325		18,667.00	T
	HYDROGENATED WAX, NEUTRAL WAX AND ALKALI SOAPS OF FATTY ACIDS		148.1750	1	15.00	A
	IMAZALIL		2,815.6825		676,078.22	T
	IMIDACLOPRID		293.7681	34	813.27	A
	ISOPROPYL ALCOHOL		113.8157	29	812.50	A
	ISOPROPYLAMINE DODECYLBENZENE SULFONATE		0.3001	22	906.00	A
	LACTOSE		784.9220	255	7,254.33	A
	LAURYL DIMETHYLAMINE OXIDE		0.5290	1	10.00	A
	LECITHIN		0.5537	2	15.00	A
	LIME-SULFUR		1.7257	1	10.00	A
	MEFENOXAM		0.7494	4	106.87	A
	MEFENOXAM, OTHER RELATED		0.0220	4	106.87	A
	METALDEHYDE		8,930.6668	584	18,482.69	A
	METHIOCARB		0.5000	1	2.00	A
	METHOXYFENOZIDE		0.3177	1	3.00	A
	MINERAL OIL		658,374.0426	534	12,088.96	A
	MODIFIED PHTHALIC GLYCEROL ALKYD RESIN		4.3845	1	11.25	A
	MYROTHECIUM VERRUCARIA, DRIED FERMENTATION SOLIDS & SOLUBLES, STRAIN AARC-0255		216.0000	1	8.00	A
	ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE)		414.7153	103	3,147.60	A
	ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE), BRANCHED		0.3344	1	16.00	A
	ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE), PHOSPHATE ESTER		0.0000	2	4.00	A
	NORFLURAZON		24.3660	1	48.60	A
	OIL OF JOJOBA		29.2500	1	10.00	A
	ORYZALIN		14.9988	2	12.50	A
	OXAMYL		9.9560	2	10.00	A
	OXYFLUORFEN		2.6244	3	10.50	A
	PARAQUAT DICHLORIDE		205.2247	22	528.54	A
	PEROXYACETIC ACID		77.3890		18,667.00	T
	PETROLEUM OIL, PARAFFIN BASED		65,095.6674	55	1,851.21	A
	PETROLEUM OIL, UNCLASSIFIED		666,659.9827	476	10,463.00	A
	PHOSPHORIC ACID		118.3202	4	118.00	A
	PIPERONYL BUTOXIDE		714.3890	116	3,057.54	A
	PIPERONYL BUTOXIDE, OTHER RELATED		178.5973	116	3,057.54	A
	POLYACRYLAMIDE POLYMER		0.0622	6	223.98	A

Commodity	Chemical	Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
LEMON					
	POLYBUTENES	45.0000	1	52.00	A
	POLYETHYLENE GLYCOL	1.6571	1	14.00	A
	POLYETHYLENE GLYCOL MONO(3-(TETRAMETHYL-1-(TRIMETHYLSILOXY)DISILOXANYL)PROPYL)ETHER	249.2733	58	896.09	A
	POLYMERIZED ACRYLIC ACID	0.0000	2	4.00	A
	POLYOXYETHYLENE POLYOXYPROPYLENE	48.4766	13	420.42	A
	POLYOXYETHYLENE SORBITAN MONOOLEATE	1.2004	22	906.00	A
	POLYOXYETHYLENE SORBITAN TRIOLEATE	7.9027	22	906.00	A
	POTASSIUM PHOSPHITE	894.0340	8	320.00	A
	PROPIONIC ACID	0.5537	2	15.00	A
	PYRETHRINS	89.7190	119	3,081.54	A
	PYRIMETHANIL	113.6240		18,923.00	T
	PYRIPROXYFEN	4.3020	3	42.61	A
	RIMSULFURON	0.1550	1	2.50	A
	ROTENONE	0.1272	2	13.00	A
	ROTENONE, OTHER RELATED	0.1272	2	13.00	A
	SABADILLA ALKALOIDS	2.2824	5	101.94	A
	SILICONE DEFOAMER	0.0743	2	20.00	A
	SIMAZINE	960.1795	81	2,434.20	A
	SODIUM CARBONATE	70.5600	1	8.00	A
	SODIUM DODECYLBENZENE SULFONATE	0.9256	1	26.00	A
	SODIUM HYPOCHLORITE	23,949.9570		676,105.03	T
		124.9500		185,091.00	U
		0.0674	1	22.00	A
	TOTAL POUNDS OF THIS CHEMICAL 24,074.9744				
	SODIUM LAURYL SULFATE	0.8523	1	10.00	A
	SODIUM TETRATHIOCARBONATE	6,007.4975	4	132.70	A
	SODIUM XYLENE SULFONATE	0.8747	2	20.00	A
	SPINOSAD	98.2656	56	897.18	A
	SPIRODICLOFEN	16.3954	3	51.50	A
	SPIROTETRAMAT	0.6932	3	34.83	A
	STRYCHNINE	0.6067	37	287.25	A
	STYRENE BUTADIENE COPOLYMER	224.6623	27	433.00	A
	SUGAR	312.0000	2	30.00	A
	SULFAQUINOXALINE	0.0090	2	14.00	A
	SULFUR	1,304.8425	10	170.20	A
	TALL OIL FATTY ACIDS	0.2286	1	16.00	A
	ALPHA-[PARA-(1,1,3,3-TETRAMETHYLBUTYL)PHENYL]-OMEGA-HYDROXYPOLY(OXYETHYLENE)	3.3324	2	20.00	A
	TETRAPOTASSIUM PYROPHOSPHATE	0.4373	2	20.00	A
	THIABENDAZOLE	781.7914		226,683.73	T
		59.2248		189,556.40	U
	TOTAL POUNDS OF THIS CHEMICAL 841.0162				
	TRIETHANOLAMINE	1.1152	2	20.00	A
	ALPHA-UNDECYL-OMEGA-HYDROXYPOLY(OXYETHYLENE)	0.3344	1	16.00	A
	UREA INCLUSION ADDUCT OF POLYOXY(ETHYLENE)/POLYOXY(PROPYLENE) BLOCK COPOLYMER	1.0575	1	37.33	A
	VINYL POLYMER	209.5412	1	26.00	A
	WARFARIN	0.0090	2	14.00	A
	ZINC PHOSPHIDE	0.0045	1	1.80	A
	ZINC SULFATE	7.4044	1	26.00	A
	Site Total	1,619,516.5613	6,463		
LETTUCE, HEAD					
	ABAMECTIN	0.0198	1	2.00	A
	ACETAMIPRID	0.2975	2	4.00	A
	ACIBENZOLAR-S-METHYL	0.3125	5	10.00	A
	AZADIRACHTIN	0.0565	1	2.00	A
	AZOXYSTROBIN	1.9547	3	9.20	A
	BACILLUS PUMILUS, STRAIN QST 2808	0.0300	2	4.00	A
	BENEFIN	7.2000	2	6.00	A
	BOSCALID	33.1625	17	70.00	A
	CHLORANTRANILIPROLE	0.2099	2	4.00	A
	COPPER HYDROXIDE	2.3241	1	4.20	A
	COTTONSEED OIL	0.5829	1	2.00	A
	BETA-CYFLUTHRIN	0.0168	1	2.00	A
	CYPERMETHRIN	0.0231	1	2.00	A

Commodity Chemical	Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
LETTUCE, HEAD				
(S)-CYPERMETHRIN	0.4731	2	12.00	A
DIAZINON	96.2827	19	52.66	A
DICLORAN	69.9832	7	28.00	A
DIMETHOATE	1.9360	1	6.00	A
DIMETHOMORPH	1.3216	9	52.00	A
DIMETHYLPOLYSILOXANE	0.0082	3	10.00	A
DINOTEFURAN	0.7000	1	2.00	A
FATTY ACIDS, MIXED	0.0155	1	2.00	A
FENAMIDONE	1.5685	1	6.00	A
FOSETYL-AL	110.7000	6	48.00	A
IMIDACLOPRID	29.5864	25	90.66	A
INDOXACARB	1.3500	2	12.00	A
ISOPROPYL ALCOHOL	0.1912	4	12.00	A
LECITHIN	1.5042	3	14.00	A
MALATHION	3.8410	1	2.00	A
MANDIPROPAMID	1.8327	3	14.00	A
MANEB	106.2728	17	71.00	A
METHOMYL	0.9000	1	2.00	A
METHOXYFENOZIDE	8.6128	7	44.20	A
METHYLATED SOYBEAN OIL	1.9406	1	6.85	A
METHYL BROMIDE	705.6000	2	2.00	A
ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE)	2.8631	8	32.85	A
ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE), PHOSPHATE ESTER	46.2635	22	135.00	A
PARAQUAT DICHLORIDE	0.3461	1	2.00	A
PERMETHRIN	26.8288	30	153.85	A
POLYALKENE OXIDE MODIFIED HEPTAMETHYL TRISILOXANE	0.0970	1	6.85	A
POLYETHYLENE GLYCOL	1.0697	3	10.00	A
POLY-I-PARA-MENTHENE	6.8993	3	29.00	A
POTASSIUM PHOSPHITE	18.7571	2	12.00	A
PROPAMOCARB HYDROCHLORIDE	7.3097	2	8.00	A
PROPIONIC ACID	1.5042	3	14.00	A
PROPYZAMIDE	56.7732	20	50.66	A
PYMETROZINE	0.1250	1	2.00	A
PYRACLOSTROBIN	0.4500	2	4.00	A
PYRETHRINS	0.0973	1	2.00	A
QST 713 STRAIN OF DRIED BACILLUS SUBTILIS	0.5840	2	4.00	A
SPINETORAM	3.2440	8	65.00	A
SPINOSAD	5.0485	16	50.05	A
THIRAM	14.5832		5,840.45	P
	2.6108		0.52	T
TOTAL POUNDS OF THIS CHEMICAL 17.1940				
Site Total	1,386.2653	260		
LETTUCE, LEAF				
ABAMECTIN	0.6084	7	54.44	A
ACETAMIPRID	17.5337	19	242.68	A
ACIBENZOLAR-S-METHYL	15.0625	53	507.04	A
ALCOHOLS, C4-C12, NORMAL	4.4209	38	440.71	A
ALPHA-ALKYL (C12-C14)-OMEGA-HYDROXYPOLY (OXYETHYLENE)	49.3656	69	216.00	A
ALKYL (C8,C10) POLYGLYCOSIDE	2.1786	14	182.71	A
AZADIRACHTIN	2.2426	19	146.12	A
AZOXYSTROBIN	20.2253	8	89.13	A
BACILLUS PUMILUS, STRAIN QST 2808	38.6993	22	331.89	A
BACILLUS THURINGIENSIS (BERLINER), SUBSP. AIZAWAI, SEROTYPE H-7	32.3121	27	317.46	A
BACILLUS THURINGIENSIS, SUBSP. AIZAWAI, STRAIN ABTS-1857	705.0780	78	1,280.70	A
BACILLUS THURINGIENSIS, SUBSP. KURSTAKI, STRAIN ABTS-351, FERMENTATION SOLIDS AND SOLUBLES	15.6600	3	29.00	A
BACILLUS THURINGIENSIS (BERLINER), SUBSP. KURSTAKI, STRAIN SA-11	0.7500	1	10.00	A
BENEFIN	34.2000	6	29.30	A
BENSULIDE	833.9622	32	212.30	A
BOSCALID	596.8542	167	1,469.73	A

Commodity Chemical	Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
LETTUCE, LEAF				
CARBARYL	0.7875	1	3.50	A
CHLORANTRANILIPROLE	13.7264	24	211.93	A
CHLOROPICRIN	149.9741	2	17.00	A
COPPER HYDROXIDE	23.2407	9	40.00	A
COTTONSEED OIL	409.6899	48	532.49	A
COUMAFURYL, SODIUM SALT	0.0069	2	27.85	A
CYFLUTHRIN	1.4500	4	38.80	A
BETA-CYFLUTHRIN	6.0512	17	229.40	A
CYPERMETHRIN	1.0867	4	23.50	A
(S)-CYPERMETHRIN	68.4789	156	1,607.73	A
CYPRODINIL	4.4850	4	44.05	A
CYROMAZINE	9.8588	8	83.10	A
DIAZINON	226.3588	35	135.82	A
DICLORAN	619.1004	66	606.84	A
DIMETHOATE	5.1552	2	21.00	A
DIMETHOMORPH	50.0366	218	2,010.32	A
DIMETHYLPOLYSILOXANE	139.9802	116	1,769.23	A
DINOTEFURAN	3.9970	3	30.47	A
EMAMECTIN BENZOATE	0.0469	1	6.00	A
FATTY ACIDS, MIXED	0.0855	2	17.50	A
FATTY ACIDS DERIVED FROM TALLOW	19.7462	69	216.00	A
FENAMIDONE	145.1790	76	561.40	A
FLONICAMID	59.5300	81	756.76	A
FLUBENDIAMIDE	0.7962	2	26.54	A
FLUDIOXONIL	2.9900	4	44.05	A
FOSETYL-AL	1,108.1570	44	454.77	A
GLYPHOSATE, ISOPROPYLAMINE SALT	198.2653	4	115.00	A
IMIDACLOPRID	216.1442	96	888.76	A
INDOXACARB	8.2050	6	110.88	A
IPRODIONE	352.9497	35	393.16	A
ISOPROPYL ALCOHOL	34.6171	103	1,498.50	A
LAMBDA-CYHALOTHRIN	0.1805	1	6.00	A
LECITHIN	131.5629	155	1,342.31	A
MALATHION	218.0734	12	110.70	A
MANDIPROPAMID	25.0250	28	193.53	A
MANEB	3,036.6058	260	2,096.90	A
MEFENOXAM	17.4776	17	119.37	A
MEFENOXAM, OTHER RELATED	0.2556	5	48.37	A
METALAXYL	0.0500	1	0.50	A
METHOXYFENOZIDE	84.0885	76	616.92	A
ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE)	502.0108	351	3,314.81	A
ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE), PHOSPHATE ESTER	203.2968	88	832.27	A
OXYFLUORFEN	0.1120	1	0.50	A
PARAQUAT DICHLORIDE	188.1830	9	155.40	A
PERMETHRIN	344.4702	224	1,970.47	A
BETA-PINENE POLYMER	0.9285	1	2.00	A
POLYACRYLAMIDE, POLYETHYLENE GLYCOL MIXTURE	5.7002	34	281.40	A
POLYALKENE OXIDE MODIFIED HEPTAMETHYL TRISILOXANE	11.9353	4	58.00	A
POLYETHYLENE GLYCOL	214.3424	93	1,406.72	A
POLY-I-PARA-MENTHENE	3.9587	4	32.11	A
POLYOXYETHYLENE POLYOXYPROPYLENE	5.4897	2	20.81	A
POLYSILOXANE	0.0871	14	182.71	A
POTASSIUM BICARBONATE	38.4450	5	15.00	A
POTASSIUM HYDROXIDE	31.9281	16	220.37	A
POTASSIUM PHOSPHITE	2,864.0516	146	1,597.23	A
PROPAMOCARB HYDROCHLORIDE	814.4629	95	892.38	A
PROPIONIC ACID	125.4628	155	1,342.31	A
PROPYZAMIDE	2,100.1675	221	1,552.14	A
PYMETROZINE	10.5042	13	122.20	A
PYRACLOSTROBIN	43.1945	31	229.06	A
PYRETHRINS	0.0822	2	14.00	A
QST 713 STRAIN OF DRIED BACILLUS SUBTILIS	412.8836	49	949.99	A
ROTENONE	0.0685	2	14.00	A
ROTENONE, OTHER RELATED	0.0685	2	14.00	A
SETHOXYDIM	3.9394	1	15.00	A
SPINETORAM	47.0048	113	863.49	A

Commodity Chemical		Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
LETTUCE, LEAF					
SPINOSAD		36.7663	48	367.78	A
SPIROMESIFEN		5.4247	5	41.15	A
SPIROTETRAMAT		0.6370	8	80.64	A
SULFURYL FLUORIDE		45.0450	1	13.00	A
THIAMETHOXAM		1.3600	4	21.00	A
THIRAM		36.5668		14,649.90	P
ALPHA-UNDECYL-OMEGA-HYDROXYPOLY(OXYETHYLENE)		26.1434	14	182.71	A
VINYL POLYMER		0.3224	1	2.00	A
Site Total		17,887.6930	3,235		
LIME					
ABAMECTIN		0.0819	2	7.50	A
ACETAMIPRID		0.4813	1	2.00	A
CHLORPYRIFOS		27.0642	3	8.50	A
GLYPHOSATE, ISOPROPYLAMINE SALT		40.2995	1	0.25	A
ISOPROPYL ALCOHOL		0.2174	1	1.00	A
MINERAL OIL		250.1576	1	5.50	A
ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE)		0.6523	1	1.00	A
Site Total		318.9542	9		
MELON					
ALPHA-PINENE BETA-PINENE COPOLYMER		5.4194	2	30.00	A
AZOXYSTROBIN		0.1871	1	1.00	A
BACILLUS THURINGIENSIS, SUBSP. AIZAWAI, STRAIN ABTS-1857		1.0800	1	1.00	A
COPPER HYDROXIDE		1.2000	1	1.00	A
ALPHA-(PARA-DODECYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE)		0.2890	2	30.00	A
MANEB		45.0000	2	30.00	A
MEFENOXAM		0.0960	1	1.00	A
MEFENOXAM, OTHER RELATED		0.0040	1	1.00	A
MINERAL OIL		1.5174	2	30.00	A
MYCLOBUTANIL		0.0120	1	1.00	A
POLY-I-PARA-MENTHENE		1.8633	2	4.00	A
Site Total		56.6682	10		
MINT					
AZADIRACHTIN		0.0080	2	0.20	A
BACILLUS THURINGIENSIS, SUBSP. KURSTAKI, STRAIN ABTS-351, FERMENTATION SOLIDS AND SOLUBLES		2.4300	3	3.00	A
CLARIFIED HYDROPHOBIC EXTRACT OF NEEM OIL		17.1947	5	4.50	U
		5.0749	2	1.07	A
TOTAL POUNDS OF THIS CHEMICAL	22.2696				
MALATHION		13.2872	7	8.00	A
METHOXYFENOZIDE		0.4942	3	3.50	A
MYCLOBUTANIL		1.0250	8	10.25	A
PYRETHRINS		0.0998	17	17.00	A
QST 713 STRAIN OF DRIED BACILLUS SUBTILIS		0.7483	3	3.50	A
		0.1095	1	0.50	U
TOTAL POUNDS OF THIS CHEMICAL	0.8578				
ROTENONE		0.0832	17	17.00	A
ROTENONE, OTHER RELATED		0.0832	17	17.00	A
SPINOSAD		0.0082	1	0.07	A
THIAMETHOXAM		0.1172	4	3.75	A
		0.0156	1	0.50	U
TOTAL POUNDS OF THIS CHEMICAL	0.1328				
Site Total		40.7790	57		

Commodity Chemical	Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
MIZUNA				
AZADIRACHTIN	0.1194	2	10.60	A
(S)-CYPERMETHRIN	0.5891	2	12.80	A
PYRACLOSTROBIN	0.4750	1	3.80	A
Site Total	1.1835	5		
MUSHROOM				
AZADIRACHTIN	3.2755	12	87.00	A
THIABENDAZOLE	1,473.2476	12	240.60	A
Site Total	1,476.5231	24		
MUSTARD				
ALPHA-ALKYL (C12-C14)-OMEGA-HYDROXYPOLY (OXYETHYLENE)	230.1532	86	813.84	A
AZADIRACHTIN	0.1683	3	5.94	A
BACILLUS THURINGIENSIS (BERLINER), SUBSP. AIZAWAI, SEROTYPE H-7	60.8596	8	97.22	A
BACILLUS THURINGIENSIS (BERLINER), SUBSP. KURSTAKI, STRAIN SA-11	5.7323	12	11.21	A
BENSULIDE	2,219.2060	35	452.93	A
CHLORANTRANILIPROLE	1.2597	3	26.55	A
CHLORTHAL-DIMETHYL	1,328.2500	16	208.83	A
COPPER HYDROXIDE	26.1700	14	35.00	A
COPPER OXIDE (OUS)	66.0041	8	75.32	A
CYFLUTHRIN	10.4674	23	213.89	A
BETA-CYFLUTHRIN	20.2558	59	692.94	A
CYPERMETHRIN	47.5508	35	514.45	A
DIATOMACEOUS EARTH	6.5300	3	2.86	A
DIAZINON	12.1487	12	28.50	A
DIMETHOATE	11.2004	3	35.00	A
EMAMECTIN BENZOATE	4.2288	39	493.53	A
ESFENVALERATE	0.2147	2	4.70	A
FATTY ACIDS DERIVED FROM TALLOW	92.0613	86	813.84	A
FLONICAMID	8.3550	10	95.45	A
IMIDACLOPRID	49.6905	77	764.92	A
INDOXACARB	32.8707	56	502.05	A
MALATHION	143.9704	10	63.98	A
MEFENOXAM	5.2358	12	42.17	A
MEFENOXAM, OTHER RELATED	0.1540	12	42.17	A
METHYL SILICONE RESINS	4.0479	1	30.55	A
ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE)	230.1532	86	813.84	A
POLY-I-PARA-MENTHENE	9.7446	3	37.32	A
POTASH SOAP	8.2107	4	2.52	A
PYMETROZINE	1.1260	1	13.10	A
PYRACLOSTROBIN	41.0340	36	272.41	A
PYRETHRINS	0.2627	11	17.93	A
ROTENONE	0.0548	1	5.60	A
ROTENONE, OTHER RELATED	0.0548	1	5.60	A
SPINETORAM	9.7383	25	212.67	A
SPINOSAD	0.2521	2	4.00	A
SULFUR	2.4000	1	3.00	A
Site Total	4,689.8166	607		
N-GRNHS FLOWER				
ABAMECTIN	2.7744	127	206.52	A
ACEPHATE	21.9640	22	24.06	A
ACEQUINOCYL	2.4259	18	12.32	A
ACETAMIPRID	19.0473	88	163.25	A
ALKYL (60%C14, 30%C16, 5%C12, 5%C18) DIMETHYLBENZYL AMMONIUM CHLORIDE	7.4745	1	0.25	A
ALPHA-PINENE BETA-PINENE COPOLYMER	0.4262	4	3.10	A
AZADIRACHTIN	30.3549	321	735.31	A
AZOXYSTROBIN	11.5900	39	120.78	A
BACILLUS THURINGIENSIS (BERLINER), SUBSP. AIZAWAI, SEROTYPE H-7	4.4805	19	70.70	A

Commodity	Chemical	Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
N-GRNHS FLOWER					
	BACILLUS THURINGIENSIS, SUBSP. AIZAWAI, STRAIN ABTS-1857	8.6778	12	20.12	A
	BACILLUS THURINGIENSIS, SUBSP. KURSTAKI, STRAIN ABTS-351, FERMENTATION SOLIDS AND SOLUBLES	11.6316	15	42.28	A
	BACILLUS THURINGIENSIS, SUBSP. KURSTAKI, STRAIN HD-1	0.9334	11	15.50	A
	BACILLUS THURINGIENSIS (BERLINER), SUBSP. KURSTAKI, STRAIN SA-11	17.7375	24	57.40	A
	BEAUVERIA BASSIANA STRAIN GHA	158.7153	153	374.63	A
	BIFENAZATE	7.6101	34	49.59	A
	BIFENTHRIN	2.0573	19	51.06	A
	BUPROFEZIN	10.2901	17	27.10	A
	CAPTAN	3.5758	12	3.88	A
	CAPTAN, OTHER RELATED	0.0804	12	3.88	A
	CHLORFENAPYR	8.2426	54	79.37	A
	CHLOROPICRIN	60.0000	1	10.00	A
	CHLOROTHALONIL	306.0539	105	340.25	A
	CHLORPYRIFOS	19.0188	22	47.20	A
	CITRIC ACID	0.5903	8	9.48	A
	CLETHODIM	0.0646	1	0.25	A
	COCONUT DIETHANOLAMIDE	1.1248	94	186.38	A
	COPPER HYDROXIDE	4.9120	4	8.00	A
	COPPER SULFATE (BASIC)	0.1810	6	7.77	A
	COPPER SULFATE (PENTAHYDRATE)	0.7514	6	4.75	A
	CREOSOTE	0.0371	1	1.00	A
	CYAZOFAMID	0.0026	1	0.10	A
	CYFLUTHRIN	1.5715	45	46.00	A
	CYPRODINIL	0.3900	2	4.14	A
	CYROMAZINE	72.6829	162	473.56	A
	DAMINOZIDE	171.6823	79	31.36	A
	DIATOMACEOUS EARTH	0.9948	1	0.20	A
	DIETHYLENE GLYCOL	1.8011	44	81.23	A
	DIFLUBENZURON	16.2675	60	10.78	A
	DIMETHOATE	2.1677	13	3.25	A
	DIMETHOMORPH	9.8800	34	42.70	A
	DIMETHYLPOLYSILOXANE	141.9672	288	452.58	A
	DINOSEB, TRIETHANOLAMINE SALT	0.3024	1	0.25	A
	DINOTEFURAN	7.0413	25	32.06	A
	DIQUAT DIBROMIDE	28.2571	16	15.81	A
	DIURON	9.9000	5	25.00	A
	DODECYLBENZENE SULFONIC ACID	4.8741	94	186.38	A
	ALPHA-(PARA-DODECYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE)	0.0227	4	3.10	A
	EDTA, TETRASODIUM SALT	0.2999	94	186.38	A
	ETOXAZOLE	0.6090	11	16.18	A
	FATTY ACIDS, MIXED	5.3270	115	193.22	A
	FENAMIDONE	4.4831	7	14.60	A
	FENARIMOL	1.9954	18	24.28	A
	FENHEXAMID	102.8919	93	261.34	A
	FENPYROXIMATE	0.0640	2	1.20	A
	FLONICAMID	13.3819	39	82.79	A
	FLUDIOXONIL	24.1003	135	158.41	A
	TAU-FLUVALINATE	40.4570	73	174.32	A
	FOSETYL-AL	208.9580	92	256.91	A
	GIBBERELLINS	0.0104	1	0.50	A
	GLYPHOSATE, ISOPROPYLAMINE SALT	38.0181	20	25.00	A
	HEPTAMETHYLTRISILOXANE-1,3-PROPANEDIOL ETHER, ETHOXYLATED PROPOXYLATED	0.2019	1	4.01	A
	HEXYTHIAZOX	1.2320	8	25.21	A
		0.0313	1	19,400.00	S
	TOTAL POUNDS OF THIS CHEMICAL 1.2633				
	IPRODIONE	43.6633	68	141.86	A
	IRON PHOSPHATE	1.7555	2	4.03	A
	ISOPROPYL ALCOHOL	5.1371	138	262.38	A
	ISOXABEN	0.3281	2	1.10	A
	KRESOXIM-METHYL	8.6338	64	91.53	A
	LAMBDA-CYHALOTHRIN	2.9554	37	67.02	A
	LECITHIN	130.5879	335	814.10	A

Commodity Chemical	Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
N-GRNHS FLOWER				
MANCOZEB	52.5415	64	50.29	A
MANEB	43.4255	25	18.13	A
MEFENOXAM	6.8450	102	59.76	A
MEFENOXAM, OTHER RELATED	0.1983	90	44.98	A
METALAXYL	0.0091	1	0.29	A
METALDEHYDE	3.3524	5	6.70	A
METHIOCARB	34.0800	14	43.76	A
METHYL BROMIDE	2,973.5400	17	21.00	A
MINERAL OIL	0.1193	4	3.10	A
MODIFIED PHTHALIC GLYCEROL ALKYD RESIN	96.6897	126	238.37	A
MYCLOBUTANIL	18.5714	82	197.27	A
ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE)	62.0800	478	1,032.22	A
ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE), PHOSPHATE ESTER	98.6866	140	247.10	A
NOVALURON	10.2891	45	120.27	A
ALPHA-OCTYLPHENYL-OMEGA-HYDROXYPOLY(OXYETHYLENE)	0.0406	1	2.00	A
ORYZALIN	1.6303	2	1.10	A
PACLOBUTRAZOL	0.0524	10	39.50	A
PERMETHRIN	14.3694	24	72.90	A
PETROLEUM DISTILLATES, REFINED	1,095.0976	46	106.84	A
PHOSPHORIC ACID	0.9820	95	188.38	A
PIPERALIN	94.7113	70	114.50	A
PIPERONYL BUTOXIDE	39.5746	98	119.10	A
PIPERONYL BUTOXIDE, OTHER RELATED	9.8936	98	119.10	A
POLYETHYLENE GLYCOL MONO(3-(TETRAMETHYL-1-(TRIMETHYLSILOXY)DISILOXANYL)PROPYL)ETHER	38.2710	80	96.30	A
POLYOXIN D	2.4055	16	66.40	A
POLYOXYETHYLENE POLYOXYPROPYLENE	24.3031	160	214.08	A
POLY(OXYETHYLENE) POLY(OXYPROPYLENE) GLYCOL MONOALLYL ETHER	0.8077	1	4.01	A
POTASH SOAP	427.0176	29	72.00	A
POTASSIUM BICARBONATE	18.2040	17	52.70	A
PROPICONAZOLE	2.1226	9	30.20	A
PROPIONIC ACID	130.5879	335	814.10	A
PYMETROZINE	45.8879	75	206.08	A
PYRACLOSTROBIN	0.9250	5	17.20	A
PYRETHRINS	5.0141	120	124.73	A
PYRIDABEN	0.3426	1	1.50	A
PYRIPROXYFEN	8.3320	37	97.15	A
QST 713 STRAIN OF DRIED BACILLUS SUBTILIS	63.1128	71	234.90	A
ROTENONE	0.0551	22	5.63	A
ROTENONE, OTHER RELATED	0.0551	22	5.63	A
SILICONE DEFOAMER	0.1275	94	186.38	A
SODIUM XYLENE SULFONATE	1.4997	94	186.38	A
SPINOSAD	55.1982	289	472.58	A
SPIROMESIFEN	3.6317	14	23.89	A
STREPTOMYCES LYDICUS WYEC 108	0.0014	3	15.00	A
STREPTOMYCIN SULFATE	1.4933	4	22.06	A
STRYCHNINE	0.0050	1	1.00	A
SULFUR	68.2400	4	15.00	A
ALPHA-[PARA-(1,1,3,3-TETRAMETHYLBUTYL)PHENYL]-OMEGA-HYDROXYPOLY(OXYETHYLENE)	5.7112	94	186.38	A
TETRAPOTASSIUM PYROPHOSPHATE	0.7499	94	186.38	A
THIAMETHOXAM	1.7717	20	27.60	A
THIOPHANATE-METHYL	62.8958	113	240.34	A
TRIADIMEFON	4.2125	22	38.50	A
TRIETHANOLAMINE	1.9122	94	186.38	A
TRIFLOXYSTROBIN	0.1150	2	3.70	A
TRIFLUMIZOLE	11.5058	27	43.45	A
TRINEXAPAC-ETHYL	0.0035	6	22.00	A
ALPHA-UNDECYL-OMEGA-HYDROXYPOLY(OXYETHYLENE)	4.6927	44	81.23	A
VINCLOZOLIN	3.0000	17	47.00	A
Site Total	7,478.7418	4,820		

Commodity	Chemical		Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
N-GRNHS PLANTS IN CONTAINERS						
	ABAMECTIN		0.8422	60	47.72	A
			0.7817	25	2,450,600.00	S
	TOTAL POUNDS OF THIS CHEMICAL	1.6239				
	ACEPHATE		24.2860	28	17.30	A
			20.3210	7	1,081,250.00	S
	TOTAL POUNDS OF THIS CHEMICAL	44.6070				
	ACEQUINOCYL		0.3625	5	400,000.00	S
	ACETAMIPRID		0.6461	5	242,200.00	S
			0.0615	3	4.30	A
	TOTAL POUNDS OF THIS CHEMICAL	0.7076				
	ALKYL (60%C14, 30%C16, 5%C12, 5%C18) DIMETHYLBENZYL AMMONIUM CHLORIDE		7.0484	6	344,620.00	S
	ALKYL (68%C12, 32%C14) DIMETHYLETHYLBENZYL AMMONIUM CHLORIDE		7.0484	6	344,620.00	S
	ANCYMIDOL		0.0860	14	39,040.00	S
			0.0128	2	18.00	A
	TOTAL POUNDS OF THIS CHEMICAL	0.0988				
	AZADIRACHTIN		2.3566	22	2,118,910.00	S
			1.0202	22	27.56	A
	TOTAL POUNDS OF THIS CHEMICAL	3.3768				
	AZOXYSTROBIN		8.1384	28	1,942,720.00	S
			5.3305	26	51.20	A
	TOTAL POUNDS OF THIS CHEMICAL	13.4689				
	BACILLUS THURINGIENSIS (BERLINER), SUBSP. AIZAWAI, SEROTYPE H-7		0.0515	2	0.50	A
	BACILLUS THURINGIENSIS, SUBSP. AIZAWAI, STRAIN ABTS-1857		3.3076	13	4.60	A
			0.2700	1	10,000.00	S
	TOTAL POUNDS OF THIS CHEMICAL	3.5776				
	BACILLUS THURINGIENSIS (BERLINER), SUBSP. KURSTAKI, SEROTYPE 3A,3B		1.0460	15	17.75	A
	BACILLUS THURINGIENSIS, SUBSP. KURSTAKI, STRAIN ABTS-351, FERMENTATION SOLIDS AND SOLUBLES		0.2700	1	10,000.00	S
	BACILLUS THURINGIENSIS (BERLINER), SUBSP. KURSTAKI, STRAIN SA-11		0.1880	7	560,000.00	S
	BEAUVERIA BASSIANA STRAIN GHA		8.0627	8	1,447,180.00	S
			0.0350	1	0.04	A
	TOTAL POUNDS OF THIS CHEMICAL	8.0977				
	N6-BENZYL ADENINE		0.0780	1	4.00	A
	BIFENAZATE		17.3904	36	40.98	A
			0.4787	8	438,400.00	S
	TOTAL POUNDS OF THIS CHEMICAL	17.8691				
	BIFENTHRIN		1.1671	9	48.50	A
	BUPROFEZIN		7.6922	6	11.00	A
	BUTYL ALCOHOL		0.0184	1	0.44	A
	CARBARYL		13.6285	18	69.50	A
			3.7718	18	996,000.00	S
	TOTAL POUNDS OF THIS CHEMICAL	17.4003				
	CHLORFENAPYR		3.7355	13	831,000.00	S
	CHLORMEQUAT CHLORIDE		30.2816	14	16.75	A
			5.6900	11	166,590.00	S
			0.6266	2	2.00	U
	TOTAL POUNDS OF THIS CHEMICAL	36.5982				
	CHLOROTHALONIL		24.6794	7	8.26	A
			2.4822	7	186,800.00	S
	TOTAL POUNDS OF THIS CHEMICAL	27.1616				
	CHLORPYRIFOS		25.3625	6	30.50	A
			5.7188	3	366,000.00	S
	TOTAL POUNDS OF THIS CHEMICAL	31.0813				
	CLETHODIM		3.0685	2	1.52	A
	COPPER HYDROXIDE		1.2430	4	54,060.00	S
			0.8715	1	1.00	A
	TOTAL POUNDS OF THIS CHEMICAL	2.1145				
	COPPER SALTS OF FATTY AND ROSIN ACIDS		2.3692	9	48,050.00	S
			1.9742	2	9.50	A
	TOTAL POUNDS OF THIS CHEMICAL	4.3434				
	COPPER SULFATE (BASIC)		0.9360	14	794,800.00	S

Commodity Chemical		Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
N-GRNHS PLANTS IN CONTAINERS					
COPPER SULFATE (PENTAHYDRATE)		4.7401	9	437,460.00	S
		1.1570	4	5.25	A
TOTAL POUNDS OF THIS CHEMICAL	5.8971				
CYFLUTHRIN		2.4176	11	2,189,630.00	S
		1.2078	14	24.21	A
TOTAL POUNDS OF THIS CHEMICAL	3.6254				
CYROMAZINE		4.6547	10	18.50	A
		0.0623	1	10,000.00	S
TOTAL POUNDS OF THIS CHEMICAL	4.7170				
DAMINOZIDE		212.9781	70	61.55	A
		39.2281	10	279,620.00	S
		1.0625	2	2.00	U
TOTAL POUNDS OF THIS CHEMICAL	253.2687				
DIAZINON		1.0000	1	2.00	A
		0.7813	1	45,000.00	S
TOTAL POUNDS OF THIS CHEMICAL	1.7813				
DIMETHOMORPH		8.6432	20	1,206,890.00	S
		2.5635	5	8.50	A
TOTAL POUNDS OF THIS CHEMICAL	11.2067				
DIMETHYLPOLYSILOXANE		8.9483	7	779,330.00	S
		2.0984	4	10.80	A
TOTAL POUNDS OF THIS CHEMICAL	11.0467				
DINOTEFURAN		16.8400	24	1,033,040.00	S
		15.5445	46	87.96	A
		1.2000	1	11,000.00	U
TOTAL POUNDS OF THIS CHEMICAL	33.5845				
ENCAPSULATED DELTA ENDOTOXIN OF BACILLUS THURINGIENSIS VAR. KURSTAKI IN KILLED PSEUDOMONAS FLUORESCENS		0.4612	8	3.78	A
ETHEPHON		1.0450	3	3.05	A
		0.3592	9	19,260.00	S
TOTAL POUNDS OF THIS CHEMICAL	1.4042				
ETOXAZOLE		0.0063	1	2.00	A
FENARIMOL		0.0234	1	0.44	A
FENBUTATIN-OXIDE		2.5000	1	2.50	A
FENHEXAMID		32.8200	29	60.76	A
		10.1413	24	1,239,150.00	S
TOTAL POUNDS OF THIS CHEMICAL	42.9613				
FENPROPATHRIN		1.7458	2	11.00	A
		0.2190	1	80,000.00	S
TOTAL POUNDS OF THIS CHEMICAL	1.9648				
FENPYROXIMATE		0.8672	7	8.75	A
FLONICAMID		0.8774	24	3.98	A
		0.1313	2	16,187.42	S
TOTAL POUNDS OF THIS CHEMICAL	1.0087				
FLUDIOXONIL		2.6267	13	573,080.00	S
		1.7970	16	47.00	A
TOTAL POUNDS OF THIS CHEMICAL	4.4237				
TAU-FLUVALINATE		2.7793	13	12.48	A
		2.0155	4	313,000.00	S
TOTAL POUNDS OF THIS CHEMICAL	4.7948				
FOSETYL-AL		194.2222	28	1,372,630.00	S
		77.2676	25	54.15	A
TOTAL POUNDS OF THIS CHEMICAL	271.4898				
GIBBERELLINS		0.0780	1	4.00	A
GLUFOSINATE-AMMONIUM		0.0151	36	0.82	A
		0.0038	8	119.74	S
TOTAL POUNDS OF THIS CHEMICAL	0.0189				
GLYPHOSATE, DIAMMONIUM SALT		1.8744	1	4.00	A
GLYPHOSATE, ISOPROPYLAMINE SALT		43.0599	3	14.00	A
		7.0258	1	16,000.00	S
TOTAL POUNDS OF THIS CHEMICAL	50.0857				
HEXYTHIAZOX		0.0625	1	0.54	A
IMIDACLOPRID		1.7074	18	1,437,940.00	S
		0.6472	13	49.22	A
TOTAL POUNDS OF THIS CHEMICAL	2.3546				

Commodity Chemical		Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
N-GRNHS PLANTS IN CONTAINERS					
IPRODIONE		19.5355	36	34.86	A
		4.0702	7	492,500.00	S
TOTAL POUNDS OF THIS CHEMICAL	23.6057				
IRON PHOSPHATE		0.0871	1	0.20	A
KINOPRENE		0.2353	1	0.56	A
(S)-KINOPRENE		12.5817	11	1,182,670.00	S
		0.1169	1	0.19	A
TOTAL POUNDS OF THIS CHEMICAL	12.6986				
LAGENIDIUM GIGANTEUM (CALIFORNIA STRAIN)		0.4190	1	0.20	A
LAMBDA-CYHALOTHRIN		1.5217	12	47.44	A
		0.0327	1	11,000.00	S
TOTAL POUNDS OF THIS CHEMICAL	1.5544				
MALATHION		4.5995	3	3.00	A
		0.0018	2	95.00	S
TOTAL POUNDS OF THIS CHEMICAL	4.6013				
MANCOZEB		13.4029	20	1,055,060.00	S
		2.8800	3	11.75	A
TOTAL POUNDS OF THIS CHEMICAL	16.2829				
MANEB		6.7453	3	4.50	A
MEFENOXAM		7.9580	18	57.25	A
		1.5398	19	864,250.00	S
TOTAL POUNDS OF THIS CHEMICAL	9.4978				
MEFENOXAM, OTHER RELATED		0.0806	11	51.75	A
		0.0506	19	864,250.00	S
TOTAL POUNDS OF THIS CHEMICAL	0.1312				
METALAXYL		0.0944	3	11.25	A
METALDEHYDE		9.1630	9	6.69	A
METHIOCARB		33.7694	19	28.04	A
		0.1875	1	16,000.00	S
TOTAL POUNDS OF THIS CHEMICAL	33.9569				
MINERAL OIL		129.6172	2	11.00	A
MODIFIED PHTHALIC GLYCEROL ALKYD RESIN		5.3530	27	21.77	A
		0.2927	3	41,400.00	S
TOTAL POUNDS OF THIS CHEMICAL	5.6457				
MYCLOBUTANIL		3.0901	11	751,670.00	S
		1.6354	5	13.40	A
TOTAL POUNDS OF THIS CHEMICAL	4.7255				
ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE), PHOSPHATE ESTER		1.9659	10	4.94	A
NOVALURON		0.8352	13	962,600.00	S
		0.4369	3	4.50	A
TOTAL POUNDS OF THIS CHEMICAL	1.2721				
PACLOBUTRAZOL		2.6972	24	386,740.00	S
		0.6864	16	31.53	A
TOTAL POUNDS OF THIS CHEMICAL	3.3836				
PCNB		0.0651	1	400.00	S
PERMETHRIN		11.5977	12	29.50	A
PETROLEUM DISTILLATES, REFINED		247.7242	1	15.00	A
		15.6192	7	275,000.00	S
TOTAL POUNDS OF THIS CHEMICAL	263.3434				
PIPERALIN		3.9737	6	5.50	A
		0.5399	5	400,000.00	S
TOTAL POUNDS OF THIS CHEMICAL	4.5136				
POLYETHER MODIFIED POLYSILOXANE		1.6969	1	130,400.00	S
POLY-I-PARA-MENTHENE		2.5884	5	2.75	A
POLYOXIN D		0.1875	5	6.50	A
		0.0131	2	160,000.00	S
TOTAL POUNDS OF THIS CHEMICAL	0.2006				
POTASH SOAP		105.5270	38	32.48	A
		17.4697	3	51,600.00	S
TOTAL POUNDS OF THIS CHEMICAL	122.9967				
PRODIAMINE		0.0688	2	4.25	A
PROPICONAZOLE		1.5824	14	22.92	A
		0.2835	9	503,000.00	S
TOTAL POUNDS OF THIS CHEMICAL	1.8659				
PYMETROZINE		10.2513	29	64.44	A
		1.6016	9	551,000.00	S
TOTAL POUNDS OF THIS CHEMICAL	11.8529				

Commodity Chemical		Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
N-GRNHS PLANTS IN CONTAINERS					
PYRACLOSTROBIN		0.8890	7	336,600.00	S
PYRETHRINS		0.0270	1	1.00	A
PYRIDABEN		2.8172	8	398,000.00	S
		0.8438	4	2.95	A
TOTAL POUNDS OF THIS CHEMICAL	3.6610				
PYRIPROXYFEN		0.6764	4	440,000.00	S
		0.1008	3	0.87	A
TOTAL POUNDS OF THIS CHEMICAL	0.7772				
QST 713 STRAIN OF DRIED BACILLUS SUBTILIS		1.4246	12	356,130.00	S
SOYBEAN OIL		31.0931	8	640,000.00	S
SPINOSAD		14.5118	49	75.47	A
		3.1147	22	1,234,490.00	S
TOTAL POUNDS OF THIS CHEMICAL	17.6265				
STREPTOMYCIN		7.2080	1	9.00	A
STREPTOMYCIN SULFATE		0.8120	3	7.25	A
SULFUR		11.9552	1	2.00	A
TERRAZOLE		9.8930	10	19.25	A
ALPHA-[PARA-(1,1,3,3-TETRAMETHYLBUTYL)PHENYL]-OMEGA-HYDROXYPOLY(OXYETHYLENE)		0.3280	2	0.39	A
ALPHA-[PARA-(1,1,3,3,-TETRAMETHYLBUTYL)PHENYL]-OMEGA-HYDROXYPOLY(OXYETHYLENE) PHOSPHATE ESTER		0.1030	1	0.44	A
THIAMETHOXAM		14.5837	14	64.70	A
		0.4375	2	6,330.00	S
TOTAL POUNDS OF THIS CHEMICAL	15.0212				
THIOPHANATE-METHYL		121.5875	12	191,870.00	S
		62.9699	38	62.58	A
TOTAL POUNDS OF THIS CHEMICAL	184.5574				
TRIADIMEFON		0.0781	2	50,000.00	S
		0.0313	1	1.50	A
TOTAL POUNDS OF THIS CHEMICAL	0.1094				
TRICHODERMA HARZIANUM RIFAI STRAIN KRL-AG2		0.8090	10	224,100.00	S
TRIFLOXYSTROBIN		1.9063	15	30.09	A
		0.1094	2	17,400.00	S
TOTAL POUNDS OF THIS CHEMICAL	2.0157				
TRIFLUMIZOLE		6.7208	6	553,000.00	S
		1.0006	1	4.00	A
TOTAL POUNDS OF THIS CHEMICAL	7.7214				
TRIFORINE		1.8233	1	6.00	A
UNICONIZOLE-P		0.0654	10	72,970.00	S
		0.0501	11	12.50	A
TOTAL POUNDS OF THIS CHEMICAL	0.1155				
Site Total		1,940.7875	1,709		
N-GRNHS TRANSPLANTS					
ABAMECTIN		0.0742	5	7.50	A
ACEPHATE		15.8556	31	39.35	A
ACETAMIPRID		0.0438	1	1.00	A
ALCOHOLS, C4-C12, NORMAL		0.0038	1	1.00	A
AZADIRACHTIN		0.1164	11	1.72	A
BACILLUS THURINGIENSIS (BERLINER), SUBSP. AIZAWAI, SEROTYPE H-7		8.2014	66	80.00	A
BACILLUS THURINGIENSIS, SUBSP. AIZAWAI, STRAIN ABTS-1857		23.7600	40	37.00	A
BACILLUS THURINGIENSIS (BERLINER), SUBSP. ISRAELENSIS, SEROTYPE H-14		0.0893	28	2.54	A
BACILLUS THURINGIENSIS (BERLINER), SUBSP. KURSTAKI, SEROTYPE 3A,3B		0.1052	3	6.10	A
BACILLUS THURINGIENSIS, SUBSP. KURSTAKI, STRAIN ABTS-351, FERMENTATION SOLIDS AND SOLUBLES		2.1600	3	3.00	A
BACILLUS THURINGIENSIS (BERLINER), SUBSP. KURSTAKI, STRAIN SA-11		1.1438	8	15.25	A
CARBARYL		0.2000	1	0.50	A
CARBON DISULFIDE		0.1578	1	1.00	A
CARBON TETRACHLORIDE		0.7960	1	1.00	A
CHLOROTHALONIL		52.3800	48	48.50	A
COPPER HYDROXIDE		5.6650	8	13.00	A
COTTONSEED OIL		0.8902	2	2.00	A

Commodity Chemical		Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
N-GRNHS TRANSPLANTS					
CYANURIC ACID		1.2250	1	1.00	A
CYROMAZINE		0.0375	3	0.25	A
2,4-D		0.0369	1	1.00	A
DICAMBA		0.0060	1	1.00	A
DICLORAN		7.8965	4	3.60	A
DIFLUBENZURON		0.0350	3	0.60	A
DIMETHOMORPH		0.0694	7	0.67	A
DIMETHYLPOLYSILOXANE		4.9232	27	39.95	A
DINOTEFURAN		0.0600	3	0.40	A
EDTA, TETRASODIUM SALT		0.0133	1	1.00	A
FATTY ACIDS, MIXED		0.0130	1	0.25	A
FOSETYL-AL		0.1680	5	0.42	A
HYDROGEN PEROXIDE		1.8426	3	1.15	A
IBA		0.0115	1	0.15	A
ISOPROPYL ALCOHOL		4.5492	35	32.00	A
(S)-KINOPRENE		0.0350	2	0.18	A
LINDANE		0.0273	3	3.00	A
MANEB		37.5209	51	47.50	A
MEFENOXAM		0.0918	3	8,100.00	S
		0.0306	1	3.00	A
TOTAL POUNDS OF THIS CHEMICAL	0.1224				
MEFENOXAM, OTHER RELATED		0.0030	3	8,100.00	S
		0.0010	1	3.00	A
TOTAL POUNDS OF THIS CHEMICAL	0.0040				
MYROTHECIUM VERRUCARIA, DRIED FERMENTATION SOLIDS & SOLUBLES, STRAIN AARC-0255		0.5691	2	2.00	A
NAA		0.0057	1	0.15	A
NALED		4.5321	5	6.00	A
ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE)		13.4401	36	32.25	A
PERMETHRIN		1.2006	9	9.25	A
PIPERONYL BUTOXIDE		0.1604	1	1.75	A
PIPERONYL BUTOXIDE, OTHER RELATED		0.0401	1	1.75	A
POLY-I-PARA-MENTHENE		37.5577	89	109.25	A
POLYOXYETHYLENE POLYOXYPROPYLENE		1.6411	27	39.95	A
POLYVINYL PYRROLIDONE		0.0098	1	1.00	A
PROPICONAZOLE		1.4053	12	14.00	A
PYRETHRINS		0.0200	1	1.75	A
PYRIPROXYFEN		0.0083	2	0.20	A
QST 713 STRAIN OF DRIED BACILLUS SUBTILIS		0.1685	31	2.86	A
SPINOSAD		0.1306	1	2.00	A
STREPTOMYCIN SULFATE		0.2650	2	2.50	A
SULFUR DIOXIDE		0.0150	1	1.00	A
THIOPHANATE-METHYL		0.7500	3	8,100.00	S
		0.2750	2	3.10	A
TOTAL POUNDS OF THIS CHEMICAL	1.0250				
3,4',5-TRIBROMOSALICYLANILIDE		0.0021	1	1.00	A
TRICHLORO-S-TRIAZINETRIONE		0.6188	1	1.00	A
ZINC NAPHTHENATE		0.2041	1	1.00	A
Site Total		233.2586	571		
N-OUTDR FLOWER					
ABAMECTIN		3.6292	103	455.28	A
ACEPHATE		275.9811	136	511.85	A
ACEQUINOCYL		3.7428	14	22.53	A
ACETAMIPRID		2.7461	37	34.16	A
ALKYL (60%C14, 30%C16, 5%C12, 5%C18) DIMETHYLBENZYL AMMONIUM CHLORIDE		0.0021	1	7.00	A
ALKYL (68%C12, 32%C14) DIMETHYLETHYLBENZYL AMMONIUM CHLORIDE		0.0021	1	7.00	A
ALPHA-PINENE BETA-PINENE COPOLYMER		0.3465	6	2.77	A
ALUMINUM PHOSPHIDE		0.1125	2	4.00	A
AMMONIUM SULFATE		0.7461	1	1.50	A
AZADIRACHTIN		2.6236	63	192.92	A
AZOXYSTROBIN		14.4538	112	218.03	A
BACILLUS THURINGIENSIS (BERLINER), SUBSP. AIZAWAI, SEROTYPE H-7		23.4655	78	503.30	A

Commodity	Chemical		Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
N-OUTDR FLOWER						
	BACILLUS THURINGIENSIS, SUBSP. AIZAWAI, STRAIN ABTS-1857		38.4318	41	46.77	A
	BACILLUS THURINGIENSIS, SUBSP. KURSTAKI, STRAIN ABTS-351, FERMENTATION SOLIDS AND SOLUBLES		87.8958	42	200.94	A
	BACILLUS THURINGIENSIS, SUBSP. KURSTAKI, STRAIN HD-1		4.9858	34	77.70	A
	BACILLUS THURINGIENSIS (BERLINER), SUBSP. KURSTAKI, STRAIN SA-11		2.2688	12	31.00	A
	BEAUVERIA BASSIANA STRAIN GHA		8.9212	17	10.01	A
	BIFENAZATE		10.7339	25	92.86	A
	BIFENTHRIN		3.7839	31	36.14	A
	CAPTAN		12.7140	9	14.00	A
	CAPTAN, OTHER RELATED		0.2860	9	14.00	A
	CHLORFENAPYR		2.2778	19	26.13	A
	CHLOROPICRIN		4,575.8253	23	56.08	A
	CHLOROTHALONIL		1,189.1669	220	1,268.55	A
	CHLORPYRIFOS		108.8670	92	298.63	A
	CHLORTHAL-DIMETHYL		39.0000	14	4.67	A
	CITRIC ACID		0.5921	2	3.55	A
	CLARIFIED HYDROPHOBIC EXTRACT OF NEEM OIL		53.5617	9	24.50	A
	COCONUT DIETHANOLAMIDE		4.2470	167	1,063.09	A
	COPPER HYDROXIDE		7.0610	10	16.00	A
	COPPER SALTS OF FATTY AND ROSIN ACIDS		22.7850	3	6.25	A
	COPPER SULFATE (PENTAHYDRATE)		26.9479	40	77.75	A
	CYAZOFAMID		0.0033	1	0.25	A
	CYFLUTHRIN		0.6300	28	16.12	A
	CYPRODINIL		0.3075	4	3.23	A
	CYROMAZINE		12.5093	26	173.55	A
	2,4-D, ISOPROPYL ESTER		0.1250	1	1.00	A
	DALAPON, MAGNESIUM SALT		0.1560	1	8.00	A
	DALAPON, SODIUM SALT		0.9340	1	8.00	A
	DAMINOZIDE		3.3575	3	0.81	A
	DAZOMET		185.1300	1	0.75	A
	DEET		0.0390	1	1.00	A
	DIATOMACEOUS EARTH		2.6362	2	0.53	A
	DIAZINON		0.5000	1	0.62	A
	1,3-DICHLOROPROPENE		3,931.5559	13	29.25	A
	DIETHYLENE GLYCOL		1.4553	36	34.79	A
	DIFLUBENZURON		1.2256	6	4.63	A
	DIMETHOATE		5.6688	14	8.49	A
	DIMETHOMORPH		19.9773	56	96.51	A
	DIMETHYLPOLYSILOXANE		141.6067	168	254.13	A
	DINOTEFURAN		5.3305	15	102.04	A
	DIQUAT DIBROMIDE		0.8158	2	2.00	A
	DODECYLBENZENE SULFONIC ACID		18.4038	167	1,063.09	A
	ALPHA-(PARA-DODECYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE)		0.0185	6	2.77	A
	EDTA, TETRASODIUM SALT		1.1325	167	1,063.09	A
	ETOXAZOLE		1.6765	12	50.78	A
	FATTY ACIDS, MIXED		8.0792	206	649.59	A
	FENARIMOL		7.7914	67	225.39	A
	FENHEXAMID		61.0569	43	178.76	A
	FLONICAMID		0.2360	5	1.35	A
	FLUDIOXONIL		29.8316	143	458.96	A
	TAU-FLUVALINATE		42.0178	103	460.36	A
	FOSETYL-AL		156.4800	44	201.60	A
	GIBBERELLINS		0.1510	4	6.50	A
	GLYPHOSATE, ISOPROPYLAMINE SALT		72.5690	23	39.50	A
			0.1249	1	2,600.00	S
	TOTAL POUNDS OF THIS CHEMICAL	72.6939				
	GLYPHOSATE, POTASSIUM SALT		2.1960	1	48.10	A
			0.5172	2	200.00	U
	TOTAL POUNDS OF THIS CHEMICAL	2.7132				
	HEXYTHIAZOX		5.3770	18	78.08	A
	HYDROGEN CHLORIDE		0.3896	1	7.00	A
	HYDROGEN PEROXIDE		0.7055	5	9.00	A
	IMIDACLOPRID		1.2156	9	22.00	A
	IPRODIONE		245.0710	140	472.34	A

Commodity	Chemical	Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
N-OUTDR FLOWER					
	ISOPROPYL ALCOHOL	15.5185	217	1,193.37	A
	KRESOXIM-METHYL	5.5150	35	65.38	A
	LAMBDA-CYHALOTHRIN	2.6730	63	46.53	A
	LECITHIN	142.7457	216	849.40	A
	MALATHION	0.6600	22	4,400.00	S
		0.3724	11	33.00	A
	TOTAL POUNDS OF THIS CHEMICAL 1.0324				
	MANCOZEB	536.7826	212	598.58	A
	MANEB	162.2868	76	67.83	A
	MANGANESE SULFATE	0.0955	1	3.00	A
	MEFENOXAM	18.6936	31	42.03	A
	MEFENOXAM, OTHER RELATED	0.6141	30	41.50	A
	METALAXYL	0.0587	1	1.87	A
	METALDEHYDE	0.9640	4	1.91	A
	METAM-SODIUM	818.4493	5	3.75	A
	METHIOCARB	1.1850	3	0.79	A
	METHYL BROMIDE	5,610.7847	12	28.34	A
	METOLACHLOR	0.5884	1	0.30	A
	MINERAL OIL	0.0970	6	2.77	A
	MODIFIED PHTHALIC GLYCEROL ALKYD RESIN	107.3519	225	273.58	A
	MYCLOBUTANIL	27.4969	95	350.80	A
	NALED	22.5340	18	29.92	A
	ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE)	79.4244	384	1,068.87	A
	ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE), PHOSPHATE ESTER	68.7637	176	172.89	A
	NOVALURON	2.0993	24	55.85	A
	OXADIAZON	26.9663	46	21.06	A
	PCNB	6.9750	11	0.93	A
	PERMETHRIN	42.2622	109	371.20	A
	PETROLEUM DISTILLATES, REFINED	155.1511	18	57.23	A
	PHOSPHORIC ACID	3.9600	169	1,066.59	A
	BETA-PINENE POLYMER	0.2569	1	1.00	A
	PIPERALIN	33.6015	18	51.90	A
	PIPERONYL BUTOXIDE	45.4749	44	335.53	A
	PIPERONYL BUTOXIDE, OTHER RELATED	11.3687	44	335.53	A
	POLYACRYLIC POLYMER	0.0209	1	1.50	A
	POLY-I-PARA-MENTHENE	4.0443	13	15.00	A
	POLYOXIN D	1.3113	14	56.25	A
	POLYOXYETHYLENE POLYOXYPROPYLENE	0.1683	4	4.00	A
	POTASH SOAP	98.5990	19	24.51	A
	POTASSIUM BICARBONATE	37.8758	15	19.73	A
	POTASSIUM N-METHYLDITHIOCARBAMATE	4,025.8562	7	23.50	A
	PROPICONAZOLE	31.6595	124	348.07	A
	PROPIONIC ACID	142.7457	216	849.40	A
	PROPOXUR	0.0750	1	7.00	A
	PYMETROZINE	13.4529	28	129.93	A
	PYRACLOSTROBIN	1.3060	3	4.75	A
	PYRETHRINS	5.8285	65	347.52	A
	PYRIDABEN	1.6942	3	15.85	A
	PYRIPROXYFEN	0.6229	6	17.16	A
	QST 713 STRAIN OF DRIED BACILLUS SUBTILIS	35.8826	38	362.20	A
	ROTENONE	0.1175	21	11.99	A
	ROTENONE, OTHER RELATED	0.1175	21	11.99	A
	SILICONE DEFOAMER	0.4813	167	1,063.09	A
	SODIUM BICARBONATE	7.0000	1	7.00	A
	SODIUM XYLENE SULFONATE	5.6627	167	1,063.09	A
	SPINOSAD	27.1533	177	494.21	A
	SPIROMESIFEN	0.6411	4	4.66	A
	STREPTOMYCIN SULFATE	2.3058	5	25.00	A
	SULFUR	2,152.0180	164	709.75	A
	TALL OIL FATTY ACIDS	0.0734	1	1.00	A
	ALPHA-[PARA-(1,1,3,3-TETRAMETHYLBUTYL)PHENYL]-OMEGA-HYDROXYPOLY(OXYETHYLENE)	21.5730	167	1,063.09	A
	TETRAPOTASSIUM PYROPHOSPHATE	2.8313	167	1,063.09	A
	THIAMETHOXAM	1.4406	12	30.95	A
	THIOPHANATE-METHYL	214.4839	179	706.74	A
	TRIADIMEFON	5.8532	23	97.00	A

Commodity Chemical		Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
N-OUTDR FLOWER					
TRICHLOROACETIC ACID, SODIUM SALT		0.6120	1	8.00	A
TRIETHANOLAMINE		7.2199	167	1,063.09	A
TRIFLOXYSTROBIN		3.7157	9	33.50	A
TRIFLUMIZOLE		13.6954	29	46.58	A
TRINEXAPAC-ETHYL		0.0010	1	12.00	A
ALPHA-UNDECYL-OMEGA-HYDROXYPOLY(OXYETHYLENE)		3.7919	36	34.79	A
ZINC SULFATE		0.0123	1	3.00	A
UNKNOWN			1	3.00	A
Site Total		26,320.9240	4,796		
N-OUTDR PLANTS IN CONTAINERS					
ABAMECTIN		4.7273	187	287.92	A
ACEPHATE		332.4438	164	496.25	A
		24.1247	3	4,500.00	U
TOTAL POUNDS OF THIS CHEMICAL	356.5685				
ACEQUINOCYL		8.7657	4	1.50	A
ACETAMIPRID		85.3479	103	1,170.84	A
ALKYL (60%C14, 30%C16, 5%C12, 5%C18) DIMETHYLBENZYL AMMONIUM CHLORIDE		0.4541	1	1.75	A
ALKYL (68%C12, 32%C14) DIMETHYLETHYLBENZYL AMMONIUM CHLORIDE		0.4541	1	1.75	A
ALPHA-ALKYL (C8-C18)-OMEGA-HYDROXYPOLY(OXYETHYLENE) POLY(OXYPROPYLENE)		0.1580	1	0.40	A
ALKYL (C8,C10) POLYGLYCOSIDE		0.1685	9	34.50	A
ALLETHRIN		0.0019	1	30.00	A
ALLETHRIN, OTHER RELATED		0.0002	1	30.00	A
ALLIDOCHLOR		3.2015	1	2.00	A
ALUMINUM PHOSPHIDE		0.4125	1	4.00	A
		0.0199	1	1.00	U
TOTAL POUNDS OF THIS CHEMICAL	0.4324				
AMMONIUM SULFATE		15.0362	45	15.80	A
ANCYMIDOL		0.0137	1	0.25	A
AZADIRACHTIN		2.0200	43	34.00	A
AZOXYSTROBIN		24.1304	135	120.23	A
BACILLUS PUMILUS, STRAIN QST 2808		0.1275	3	1.75	A
BACILLUS THURINGIENSIS (BERLINER), SUBSP. AIZAWAI, SEROTYPE H-7		10.7120	13	104.00	A
BACILLUS THURINGIENSIS, SUBSP. AIZAWAI, STRAIN ABTS-1857		22.5113	29	39.50	A
BACILLUS THURINGIENSIS (BERLINER), SUBSP. KURSTAKI, STRAIN SA-11		2.4703	11	10.00	A
BEAUVERIA BASSIANA STRAIN GHA		5.6274	14	6.25	A
N6-BENZYL ADENINE		0.0868	1	0.25	A
BIFENAZATE		16.5762	27	71.44	A
BIFENTHRIN		13.5612	39	702.20	A
		0.5528	6	6,432.00	U
TOTAL POUNDS OF THIS CHEMICAL	14.1140				
BROMADIOLONE		0.0000	1	10.00	U
CALCIUM HYDROXIDE		0.5750	1	0.62	A
CAPSICUM OLEORESIN		0.0036	1	0.08	A
CARBARYL		29.9434	42	43.97	A
		0.0269	1	125.00	U
TOTAL POUNDS OF THIS CHEMICAL	29.9703				
CHLORMEQUAT CHLORIDE		0.8751	4	1.00	A
CHLOROPICRIN		272.2500	1	3.00	A
CHLOROTHALONIL		650.5399	208	400.96	A
CHLORPYRIFOS		44.9720	68	70.95	A
CITRIC ACID		0.8428	47	16.07	A
CLARIFIED HYDROPHOBIC EXTRACT OF NEEM OIL		1.5672	16	7.50	A
CLETHODIM		10.8527	1	0.28	A
COCONUT DIETHANOLAMIDE		7.9215	300	325.02	A
COPPER HYDROXIDE		475.6843	152	412.84	A
COPPER SALTS OF FATTY AND ROSIN ACIDS		146.2156	32	20.77	A
COPPER SULFATE (BASIC)		0.1560	1	0.50	A
COPPER SULFATE (PENTAHYDRATE)		43.4271	54	60.68	A
COTTONSEED OIL		4.4688	1	11.50	A
CRYOLITE		32.6400	3	3.00	A

Commodity	Chemical		Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
N-OUTDR PLANTS IN CONTAINERS						
	CYFLUTHRIN		4.4410	52	277.65	A
	BETA-CYFLUTHRIN		0.1671	22	6.38	A
	CYROMAZINE		0.1247	1	1.00	A
	DAMINOZIDE		92.4906	26	8.25	A
	DELTAMETHRIN		0.3491	11	5.61	A
	DIAZINON		30.8698	22	13.89	A
	DICAMBA		0.4235	2	4.50	A
	DIMETHOMORPH		9.1250	12	14.65	A
	DIMETHYLPOLYSILOXANE		258.7453	274	2,006.70	A
	DINOSEB		0.5383	1	1.00	A
	DINOTEFURAN		50.3067	121	88.20	A
	DIQUAT DIBROMIDE		26.5700	5	52.00	A
	DODECYLBENZENE SULFONIC ACID		34.3267	300	325.02	A
	DODECYL GUANIDINE HYDROCHLORIDE		0.8908	2	2.50	A
	EDTA, SODIUM SALT		0.1456	113	44.26	A
	EDTA, TETRASODIUM SALT		2.1124	300	325.02	A
	ENCAPSULATED DELTA ENDOTOXIN OF BACILLUS THURINGIENSIS VAR. KURSTAKI IN KILLED PSEUDOMONAS FLUORESCENS		0.5248	1	0.07	A
	ETHEPHON		8.8552	19	5.50	A
			0.9676	2	190.00	U
	TOTAL POUNDS OF THIS CHEMICAL	9.8228				
	ETHYLENE OXIDE		2.5478	1	12,000.00	U
	ETOXAZOLE		4.0619	15	67.78	A
	FATTY ACIDS, MIXED		10.1217	331	237.65	A
	FENARIMOL		1.6765	18	30.50	A
	FENHEXAMID		2.7188	6	7.25	A
	FENPROPATHRIN		52.0336	111	331.46	A
			1.0557	9	9,000.00	S
			0.0489	1	80.00	U
	TOTAL POUNDS OF THIS CHEMICAL	53.1382				
	FLUDIOXONIL		21.5063	56	280.57	A
	FLUMIOXAZIN		2.6439	60	7.61	A
	TAU-FLUVALINATE		62.7649	96	339.77	A
	FOSETYL-AL		294.9699	76	96.63	A
	GLYPHOSATE, ISOPROPYLAMINE SALT		6,570.8472	1,037	2,901.09	A
			4.4740	5	5,000.00	S
	TOTAL POUNDS OF THIS CHEMICAL	6,575.3212				
	GLYPHOSATE, MONOAMMONIUM SALT		1.3388	1	30.00	A
	GLYPHOSATE, POTASSIUM SALT		742.6417	21	513.50	A
	HALOSULFURON-METHYL		0.3093	11	6.63	A
	HEXAHYDRO-1,3,5-TRIS (2-HYDROXYETHYL)-S-TRIAZINE		98.4388	1	13.00	A
	HEXYTHIAZOX		3.0860	16	46.50	A
	HYDROGEN PEROXIDE		27.8450	6	0.41	A
	IBA		0.0136	2	1,428.00	U
			0.0078	6	0.74	A
	TOTAL POUNDS OF THIS CHEMICAL	0.0214				
	IMIDACLOPRID		42.9626	282	1,684.98	A
			0.1530	14	4,803.00	U
			0.0019	2	2,000.00	S
	TOTAL POUNDS OF THIS CHEMICAL	43.1175				
	IPRODIONE		141.9580	89	86.50	A
	IRON PHOSPHATE		31.8837	31	1,171.41	A
	ISOPROPYL ALCOHOL		24.3948	421	426.48	A
	ISOXABEN		111.6675	128	337.76	A
			0.8150	17	117,300.00	U
	TOTAL POUNDS OF THIS CHEMICAL	112.4825				
	(S)-KINOPRENE		9.3057	12	38.31	A
	LECITHIN		247.0030	346	317.89	A
	LIME-SULFUR		5.1813	4	4.30	A
	MALATHION		348.7326	80	335.70	A
	MALIC ACID		0.0006	2	0.27	A
	MANCOZEB		196.7375	122	199.01	A
	MCPA, ISOOCTYL ESTER		6.6037	2	4.50	A
	MEFENOXAM		41.2628	328	852.00	A
	MEFENOXAM, OTHER RELATED		1.2276	283	796.25	A

Commodity	Chemical		Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
N-OUTDR PLANTS IN CONTAINERS						
	METALDEHYDE		171.1081	33	90.10	A
			3.2625	10	54,000.00	U
	TOTAL POUNDS OF THIS CHEMICAL	174.3706				
	METALLIC SILVER		0.3125	1	3.00	A
	METHIOCARB		84.7225	50	59.97	A
			0.7500	2	650.00	U
	TOTAL POUNDS OF THIS CHEMICAL	85.4725				
	METHOXYFENOZIDE		10.5896	14	88.50	A
	METHYL BROMIDE		552.7500	1	3.00	A
	METHYLENE BIS(THIOCYANATE)		0.4454	2	2.50	A
	MINERAL OIL		2,284.2043	60	213.37	A
	MODIFIED PHTHALIC GLYCEROL ALKYD RESIN		22.3003	126	111.21	A
	MYCLOBUTANIL		25.5089	75	164.93	A
	NAA		0.0068	2	1,428.00	U
			0.0000	3	0.65	A
	TOTAL POUNDS OF THIS CHEMICAL	0.0068				
	NAA, ETHYL ESTER		0.2700	1	3.00	A
	NALED		1.0071	1	1.00	A
	ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE)		88.5160	345	340.59	A
	ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE), PHOSPHATE ESTER		456.2677	75	723.68	A
	NOVALURON		0.5018	8	11.00	A
	N-OCTYL BICYCLOHEPTENE DICARBOXIMIDE		0.0158	2	30.02	A
	ALPHA-OCTYLPHENYL-OMEGA-HYDROXYPOLY(OXYETHYLENE)		0.0019	2	0.27	A
	OIL OF JOJOBA		2.6284	1	0.50	A
	OLEIC ACID, METHYL ESTER		2.9290	1	1.50	A
	ORYZALIN		76.5071	5	29.00	A
			0.7524	1	1,000.00	S
	TOTAL POUNDS OF THIS CHEMICAL	77.2595				
	OXADIAZON		6.7070	23	2.81	A
	OXYFLUORFEN		176.0265	43	558.49	A
	PACLOBUTRAZOL		0.3210	17	13.00	A
	PCNB		0.0938	1	0.30	A
	PENDIMETHALIN		217.0079	70	151.50	A
	PERMETHRIN		98.3122	275	476.43	A
			0.0001	1	140.00	U
	TOTAL POUNDS OF THIS CHEMICAL	98.3123				
	PETROLEUM DISTILLATES		0.0001	1	30.00	A
	PETROLEUM DISTILLATES, AROMATIC		0.4891	2	32.00	A
	PETROLEUM DISTILLATES, REFINED		990.9245	34	149.00	A
	PETROLEUM OIL, UNCLASSIFIED		750.7467	24	35.90	A
			0.1897	2	2,000.00	S
	TOTAL POUNDS OF THIS CHEMICAL	750.9364				
	PHOSPHORIC ACID		25.2254	416	1,060.82	A
	PIPERALIN		0.2483	1	1.50	A
	PIPERONYL BUTOXIDE		17.1917	23	7.04	A
			0.0002	1	140.00	U
	TOTAL POUNDS OF THIS CHEMICAL	17.1919				
	POLYACRYLIC POLYMER		0.4211	45	15.80	A
	POLYETHYLENE GLYCOL MONO(3-(TETRAMETHYL-1-(TRIMETHYLSILOXY)DISILOXANYL)PROPYL)ETHER		7.2246	3	90.20	A
	POLYOXIN D		0.8605	6	8.00	A
	POLYOXYETHYLENE POLYOXYPROPYLENE		83.4809	202	1,196.77	A
	POLYSILOXANE		0.0067	9	34.50	A
	POTASH SOAP		246.7734	19	10.99	A
	POTASSIUM HYDROXIDE		0.1975	9	34.50	A
	POTASSIUM PHOSPHITE		191.6354	14	109.75	A
	PRODIAMINE		716.7951	140	1,047.29	A
	PROPICONAZOLE		13.2543	75	120.98	A
	PROPIONIC ACID		368.3246	415	1,037.62	A
	PROPYLENE GLYCOL		11.6714	3	90.20	A
	PYMETROZINE		0.3126	3	4.00	A
	PYRETHRINS		1.7193	23	7.04	A
	PYRIPROXYFEN		0.2320	3	1.14	A
	SILICONE DEFOAMER		0.8978	300	325.02	A
	SODIUM XYLENE SULFONATE		10.5621	300	325.02	A
	SPINOSAD		72.3935	191	451.75	A

Commodity Chemical		Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
N-OUTDR PLANTS IN CONTAINERS					
STARCH		0.0282	2	79.20	A
STREPTOMYCIN SULFATE		8.2270	22	20.76	A
		0.4480	1	1,000.00	U
TOTAL POUNDS OF THIS CHEMICAL	8.6750				
STRYCHNINE		0.0525	3	15.00	A
STYRENE BUTADIENE COPOLYMER		14.8130	3	79.60	A
SULFUR		233.8094	52	150.50	A
TALL OIL FATTY ACIDS		0.6276	1	1.50	A
ALPHA-[PARA-(1,1,3,3-TETRAMETHYLBUTYL)PHENYL]-OMEGA-HYDROXYPOLY(OXYETHYLENE)		60.0922	416	370.77	A
ALPHA-[PARA-(1,1,3,3,-TETRAMETHYLBUTYL)PHENYL]-OMEGA-HYDROXYPOLY(OXYETHYLENE) PHOSPHATE ESTER		0.0006	2	0.27	A
TETRAPOTASSIUM PYROPHOSPHATE		5.2810	300	325.02	A
THIOPHANATE-METHYL		444.6906	298	353.89	A
TRIADIMEFON		5.4409	35	14.26	A
TRICHODERMA HARZIANUM RIFAI STRAIN KRL-AG2		0.0216	1	2.00	A
TRICLOPYR, BUTOXYETHYL ESTER		0.8479	3	5.00	A
TRIETHANOLAMINE		13.4666	300	325.02	A
TRIFLOXYSTROBIN		2.4063	4	39.00	A
		0.1250	1	2,400.00	U
TOTAL POUNDS OF THIS CHEMICAL	2.5313				
TRIFLURALIN		249.4200	41	266.88	A
		3.2600	17	117,300.00	U
TOTAL POUNDS OF THIS CHEMICAL	252.6800				
ALPHA-2,6,8-TRIMETHYL-4-NONYLOXY-OMEGA-HYDROXYPOLY(OXYETHYLENE)		10.4737	3	90.20	A
ALPHA-UNDECYL-OMEGA-HYDROXYPOLY(OXYETHYLENE)		2.6499	10	36.00	A
ZINC SULFATE		0.0015	2	0.27	A
Site Total		20,785.4740	6,983		
N-OUTDR TRANSPLANTS					
ABAMECTIN		0.7224	25	45.06	A
		0.0099	1	20,000.00	S
TOTAL POUNDS OF THIS CHEMICAL	0.7323				
ACEPHATE		32.7047	41	52.56	A
		4.5588	4	205,000.00	S
TOTAL POUNDS OF THIS CHEMICAL	37.2635				
ACETAMIPRID		0.3025	3	3.50	A
		0.1500	2	24,290.00	S
TOTAL POUNDS OF THIS CHEMICAL	0.4525				
ALCOHOLS, C4-C12, NORMAL		0.0038	1	1.00	A
ALKYL (60%C14, 30%C16, 5%C12, 5%C18) DIMETHYLBENZYL AMMONIUM CHLORIDE		0.7765	1	40,000.00	S
ALKYL (68%C12, 32%C14) DIMETHYLETHYLBENZYL AMMONIUM CHLORIDE		0.7765	1	40,000.00	S
AZADIRACHTIN		0.0668	4	2.35	A
AZOXYSTROBIN		15.2770	23	82.95	A
		1.3845	9	253,450.00	S
TOTAL POUNDS OF THIS CHEMICAL	16.6615				
BACILLUS THURINGIENSIS (BERLINER), SUBSP. AIZAWAI, SEROTYPE H-7		0.0773	1	1.50	A
BACILLUS THURINGIENSIS, SUBSP. AIZAWAI, STRAIN ABTS-1857		0.2700	1	10,000.00	S
BACILLUS THURINGIENSIS (BERLINER), SUBSP. ISRAELENSIS, SEROTYPE H-14		0.0530	1	1.00	A
BACILLUS THURINGIENSIS (BERLINER), SUBSP. KURSTAKI, SEROTYPE 3A,3B		1.2970	17	25.50	A
BACILLUS THURINGIENSIS, SUBSP. KURSTAKI, STRAIN ABTS-351, FERMENTATION SOLIDS AND SOLUBLES		10.0575	13	14.50	A
BIFENAZATE		0.0935	1	0.75	A
BUPROFEZIN		0.6563	2	3.75	A
CARBARYL		2.5687	2	5.25	A
CHLORMEQUAT CHLORIDE		6.5796	6	5.25	A
CHLOROTHALONIL		55.5368	52	73.98	A
CHLORPYRIFOS		6.2501	3	10.00	A
COCONUT DIETHANOLAMIDE		2.4365	2	130.00	A
COPPER HYDROXIDE		23.0711	25	47.70	A

Commodity Chemical		Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
N-OUTDR TRANSPLANTS					
COPPER SALTS OF FATTY AND ROSIN ACIDS		0.0000	1	0.50	A
COPPER SULFATE (BASIC)		0.0780	1	1.00	A
COPPER SULFATE (PENTAHYDRATE)		2.6032	29	26.14	A
COTTONSEED OIL		0.3334	1	1.00	A
CYANURIC ACID		0.4288	1	0.20	A
CYFLUTHRIN		0.1544	3	130,000.00	S
CYROMAZINE		0.2192	1	1.75	A
DAMINOZIDE		40.9063	14	10.25	A
		1.4377	4	9,460.00	S
TOTAL POUNDS OF THIS CHEMICAL	42.3440				
DELTAMETHRIN		0.2604	1	5.00	A
DIMETHOMORPH		2.0313	9	11.41	A
		1.0041	6	80,440.00	S
TOTAL POUNDS OF THIS CHEMICAL	3.0354				
DIMETHYLPOLYSILOXANE		4.3009	28	34.90	A
		1.2965	3	87,860.00	S
TOTAL POUNDS OF THIS CHEMICAL	5.5974				
DINOTEFURAN		1.6000	4	8.50	A
8-DODECENE-1-OL, OTHER RELATED		0.0138	1	0.60	A
DODECYLBENZENE SULFONIC ACID		10.5583	2	130.00	A
EDTA, TETRASODIUM SALT		0.6497	2	130.00	A
ETOXAZOLE		0.4250	2	5.00	A
FENHEXAMID		4.6094	7	11.16	A
		0.1250	1	5,000.00	S
TOTAL POUNDS OF THIS CHEMICAL	4.7344				
FENOXYCARB		0.0013	1	2.00	A
FENPROPATHRIN		1.4205	2	10.00	A
FLUDIOXONIL		1.1250	9	20.00	A
		0.5938	4	105,800.00	S
TOTAL POUNDS OF THIS CHEMICAL	1.7188				
FLUMIOXAZIN		3.7500	1	10.00	A
TAU-FLUVALINATE		1.3979	17	22.51	A
FOSETYL-AL		134.3626	18	47.25	A
		31.2500	8	124,060.00	S
TOTAL POUNDS OF THIS CHEMICAL	165.6126				
GLYPHOSATE, ISOPROPYLAMINE SALT		663.8200	6	79.00	A
(Z,E)-7,11-HEXADECADIEN-1-YL ACETATE		0.1575	1	0.60	A
HYDROGEN PEROXIDE		2.1180	4	2.75	A
IMIDACLOPRID		0.6394	4	12.25	A
		0.1459	4	110,000.00	S
TOTAL POUNDS OF THIS CHEMICAL	0.7853				
IPRODIONE		30.0229	5	28.25	A
ISOPROPYL ALCOHOL		3.2162	2	130.00	A
ISOXABEN		86.2500	6	115.00	A
LAMBDA-CYHALOTHRIN		0.0784	1	6.00	A
LIME-SULFUR		1.1496	2	4.00	A
MANCOZEB		21.0891	16	20.52	A
		7.0313	6	160,000.00	S
TOTAL POUNDS OF THIS CHEMICAL	28.1204				
MANEB		7.5586	9	8.10	A
MEFENOXAM		19.6487	51	116.58	A
		0.4762	7	45,060.00	S
TOTAL POUNDS OF THIS CHEMICAL	20.1249				
MEFENOXAM, OTHER RELATED		0.0880	4	11.00	A
		0.0157	7	45,060.00	S
TOTAL POUNDS OF THIS CHEMICAL	0.1037				
METALAXYL		0.1176	4	7.50	A
METALDEHYDE		45.0000	2	30.00	A
MINERAL OIL		110.2186	1	10.00	A
MYCLOBUTANIL		0.7979	9	8.50	A
		0.4420	8	87,000.00	S
TOTAL POUNDS OF THIS CHEMICAL	1.2399				
NALED		2.5178	3	3.00	A
NONANOIC ACID		91.8757	2	7.00	A
NONANOIC ACID, OTHER RELATED		4.8356	2	7.00	A
ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE)		0.0213	1	1.00	A
NOVALURON		0.0515	1	10,000.00	S

Commodity Chemical		Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
N-OUTDR TRANSPLANTS					
ORYZALIN		0.5016	1	1.00	A
PACLOBUTRAZOL		0.9262	15	288,180.00	S
		0.2381	18	8.78	A
TOTAL POUNDS OF THIS CHEMICAL	1.1643				
PCNB		42.9516	6	265,199.99	S
		5.4666	1	1.50	A
TOTAL POUNDS OF THIS CHEMICAL	48.4182				
PERMETHRIN		1.0791	7	8.95	A
PETROLEUM DISTILLATES, REFINED		9.5723	5	3.10	A
PHOSPHORIC ACID		2.0792	2	130.00	A
PIPERONYL BUTOXIDE		0.4354	2	4.75	A
PIPERONYL BUTOXIDE, OTHER RELATED		0.1088	2	4.75	A
POLYETHER MODIFIED POLYSILOXANE		0.1952	1	15,000.00	S
POLYOXYETHYLENE POLYOXYPROPYLENE		1.4336	28	34.90	A
POTASH SOAP		2.5701	9	12.00	A
POTASSIUM BICARBONATE		0.8200	1	20,000.00	S
PRODIAMINE		19.5067	2	30.00	A
		0.0195	1	1,200.00	S
TOTAL POUNDS OF THIS CHEMICAL	19.5262				
PROPICONAZOLE		11.6630	18	94.15	A
		0.0507	1	20,000.00	S
TOTAL POUNDS OF THIS CHEMICAL	11.7137				
PYMETROZINE		4.6875	2	15.00	A
		1.5156	5	185,000.00	S
TOTAL POUNDS OF THIS CHEMICAL	6.2031				
PYRETHRINS		0.0544	2	4.75	A
PYRIDABEN		0.2344	1	1.25	A
PYRIPROXYFEN		0.3496	4	180,000.00	S
SILICONE DEFOAMER		0.2761	2	130.00	A
SODIUM XYLENE SULFONATE		3.2487	2	130.00	A
SPINOSAD		1.7334	12	21.85	A
		0.7728	2	90,000.00	S
TOTAL POUNDS OF THIS CHEMICAL	2.5062				
STREPTOMYCIN SULFATE		1.1395	7	8.75	A
TERRAZOLE		0.4594	2	3.00	A
ALPHA-[PARA-(1,1,3,3-TETRAMETHYLBUTYL)PHENYL]-OMEGA-HYDROXYPOLY(OXYETHYLENE)		12.3775	2	130.00	A
TETRAPOTASSIUM PYROPHOSPHATE		1.6244	2	130.00	A
THIAMETHOXAM		5.0000	1	20.00	A
THIOPHANATE-METHYL		37.9779	15	45.24	A
		25.3000	8	54,400.00	S
TOTAL POUNDS OF THIS CHEMICAL	63.2779				
TRIADIMEFON		0.4219	3	3.75	A
		0.0396	2	25,300.00	S
TOTAL POUNDS OF THIS CHEMICAL	0.4615				
TRIETHANOLAMINE		4.1421	2	130.00	A
TRIFLOXYSTROBIN		0.6563	6	10.50	A
TRIFLURALIN		165.0000	4	55.00	A
Site Total		1,878.6296	725		
OAT					
BROMOXYNIL HEPTANOATE		78.6540	2	222.00	A
BROMOXYNIL OCTANOATE		81.5671	2	222.00	A
2,4-D, DIMETHYLAMINE SALT		104.0888	1	185.00	A
FATTY ACIDS, MIXED		3.7187	1	115.00	A
GLYPHOSATE, POTASSIUM SALT		320.0609	2	123.00	A
ISOPROPYL ALCOHOL		0.7617	1	8.00	A
LECITHIN		86.7708	1	115.00	A
MCPA, DIMETHYLAMINE SALT		104.8099	1	185.00	A
ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY(OXYETHYLENE)		23.7187	2	123.00	A
PROPIONIC ACID		86.7708	1	115.00	A
TALL OIL		0.2004	1	8.00	A
Site Total		891.1218	8		

Commodity Chemical		Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
OAT (FORAGE - FODDER)					
CHLORSULFURON		1.0210	2	66.00	A
2,4-D, DIMETHYLAMINE SALT		8.1764	1	11.00	A
DICAMBA, DIMETHYLAMINE SALT		6.4502	2	66.00	A
ISOPROPYL ALCOHOL		16.3085	2	66.00	A
ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE)		48.9254	2	66.00	A
Site Total		80.8815	7		
OKRA					
THIRAM		72.0435		38,423.68	P
Site Total		72.0435			
OLIVE					
GLYPHOSATE, POTASSIUM SALT		46.3404	3	23.00	A
PYRETHRINS		0.0942	1	7.00	A
SIMAZINE		21.6000	1	10.00	A
SPINOSAD		0.0425	31	147.00	A
Site Total		68.0771	36		
ONION, DRY					
ALPHA-ALKYL (C12-C14)-OMEGA-HYDROXYPOLY (OXYETHYLENE)		139.9763	13	586.00	A
AZOXYSTROBIN		0.1123		4,511.77	P
		0.0140		0.27	T
TOTAL POUNDS OF THIS CHEMICAL	0.1263				
BROMOXYNIL OCTANOATE		10.7489	2	54.00	A
CARBOXIN		338.4003		3,505.25	P
		25.4940		1.75	T
TOTAL POUNDS OF THIS CHEMICAL	363.8943				
CHLOROTHALONIL		386.6400	7	268.50	A
CHLORPYRIFOS		156.4950	4	175.00	A
CYROMAZINE		1,795.8375		2,682.41	P
		138.8925		1.39	T
TOTAL POUNDS OF THIS CHEMICAL	1,934.7300				
FATTY ACIDS DERIVED FROM TALLOW		55.9905	13	586.00	A
FLUDIOXONIL		0.3554		10,552.72	P
		0.1294		2.62	T
TOTAL POUNDS OF THIS CHEMICAL	0.4848				
LAMBDA-CYHALOTHRIN		5.0250	4	175.00	A
MANCOZEB		428.8000	6	268.00	A
MEFENOXAM		49.7305	12	756.94	A
		1.1147		10,206.00	P
		0.1353		0.90	T
TOTAL POUNDS OF THIS CHEMICAL	50.9805				
MEFENOXAM, OTHER RELATED		1.2065	12	756.94	A
		0.0345		10,206.00	P
		0.0042		0.90	T
TOTAL POUNDS OF THIS CHEMICAL	1.2452				
METALAXYL		0.0900	1	0.50	A
ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE)		139.9763	13	586.00	A
OXAMYL		248.9004	6	250.00	A
OXYFLUORFEN		30.8884	5	134.50	A
PENDIMETHALIN		5.3030	1	20.00	A
SPINETORAM		10.2594	5	218.00	A
THIRAM		1,132.6469		306,817.28	P
		81.5294		12.16	T
TOTAL POUNDS OF THIS CHEMICAL	1,214.1763				
Site Total		5,184.7306	53		
ONION, GREEN					
BACILLUS THURINGIENSIS, SUBSP. AIZAWAI, STRAIN ABTS-1857		13.2840	4	24.60	A
CHLOROTHALONIL		388.4318	39	202.90	A

Commodity Chemical		Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
ONION, GREEN					
CHLORTHAL-DIMETHYL		173.2500	11	23.00	A
CYPERMETHRIN		23.2438	48	213.80	A
(S)-CYPERMETHRIN		0.4103	4	12.30	A
CYROMAZINE		1.5300	4	12.30	A
DIAZINON		95.4937	10	41.00	A
DIMETHOMORPH		0.1917	2	8.15	A
DIMETHYLPOLYSILOXANE		1.5512	9	45.60	A
FENAMIDONE		15.4372	18	93.00	A
ISOPROPYL ALCOHOL		3.6870	8	44.60	A
MANDIPROPAMID		0.7914	1	6.15	A
MANEB		458.0864	57	250.10	A
ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE)		17.5799	8	44.60	A
PARAQUAT DICHLORIDE		30.1223	3	29.00	A
PERMETHRIN		0.8787	2	6.00	A
POLYETHYLENE GLYCOL		4.7992	7	30.60	A
POLYOXYETHYLENE POLYOXYPROPYLENE		0.5048	2	15.00	A
SPINETORAM		5.4907	25	118.65	A
SPINOSAD		0.1224	1	1.25	A
Site Total		1,234.8865	239		
ORANGE					
ABAMECTIN		0.4973	6	174.79	A
ACETAMIPRID		42.8712	41	609.49	A
BROMACIL		76.0000	12	150.64	A
CALCIUM HYDROXIDE		85.0000	1	13.00	A
CHLOROPHACINONE		0.0013	8	145.00	A
CHLORPYRIFOS		401.3017	51	293.15	A
COCONUT DIETHANOLAMIDE		0.0246	2	4.00	A
COPPER SULFATE (BASIC)		9.9000	2	15.00	A
2,4-D, DIMETHYLAMINE SALT		19.1378	17	1,952.06	A
DIMETHYLPOLYSILOXANE		17.3728	2	24.00	A
DIPHACINONE		0.0085	4	149.00	A
		0.0009	4	2,400.00	S
TOTAL POUNDS OF THIS CHEMICAL	0.0094				
DIURON		385.3331	26	281.64	A
DODECYLBENZENE SULFONIC ACID		0.1066	2	4.00	A
EDTA, TETRASODIUM SALT		0.0066	2	4.00	A
ENDOSULFAN		0.0625	1	2.00	A
FATTY ACIDS, MIXED		6.0305	39	3,552.57	A
FENPYROXIMATE		0.1205	1	1.00	A
FOSETYL-AL		8.0000	1	2.00	A
GIBBERELLINS		1.1214	2	41.92	A
GLYPHOSATE, ISOPROPYLAMINE SALT		4,036.0710	446	8,286.00	A
GLYPHOSATE, POTASSIUM SALT		4,088.4535	414	2,184.07	A
IMIDACLOPRID		74.7222	18	235.30	A
ISOPROPYL ALCOHOL		0.8704	4	8.00	A
MALATHION		0.0781	1	5.00	A
METALDEHYDE		373.5102	85	1,669.04	A
METHIOCARB		5.0300	6	29.00	A
MINERAL OIL		5,950.7402	11	317.58	A
		0.4679	1	1.00	U
TOTAL POUNDS OF THIS CHEMICAL	5,951.2081				
ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE)		36.2680	41	3,556.57	A
NORFLURAZON		123.0090	14	1,496.48	A
ORYZALIN		59.9953	1	15.00	A
PARAQUAT DICHLORIDE		3.2813	2	12.50	A
PETROLEUM OIL, UNCLASSIFIED		1,229.5668	9	80.84	A
PHOSMET		115.0000	1	115.00	A
PHOSPHORIC ACID		0.0210	2	4.00	A
PIPERONYL BUTOXIDE		7.0288	2	27.30	A
PIPERONYL BUTOXIDE, OTHER RELATED		1.7572	2	27.30	A
POLYACRYLAMIDE POLYMER		0.0414	4	459.16	A
POLYETHYLENE GLYCOL		2.6514	1	2.00	A
POLYETHYLENE GLYCOL MONO(3-(TETRAMETHYL-1-(TRIMETHYLSILOXY)DISILOXANYL)PROPYL)ETHER		0.0426	2	0.65	A

Commodity	Chemical	Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
ORANGE					
	POLYOXYETHYLENE POLYOXYPROPYLENE	5.7842	1	22.00	A
	PYRETHRINS	1.0368	3	31.30	A
	PYRIPROXYFEN	5.5862	2	52.00	A
	SILICONE DEFOAMER	0.0028	2	4.00	A
	SIMAZINE	534.8983	46	3,614.62	A
	SODIUM TETRATHIOCARBONATE	673.2705	2	16.00	A
	SODIUM XYLENE SULFONATE	0.0328	2	4.00	A
	SPINOSAD	7.4657	7	74.54	A
	STRYCHNINE	0.2409	9	194.50	A
	SULFAQUINOXALINE	0.0015	1	640.00	S
	SULFUR	336.0000	1	21.00	A
	ALPHA-[PARA-(1,1,3,3-TETRAMETHYLBUTYL)PHENYL]-OMEGA-HYDROXYPOLY(OXYETHYLENE)	0.1250	2	4.00	A
	TETRAPOTASSIUM PYROPHOSPHATE	0.0164	2	4.00	A
	TRIETHANOLAMINE	0.0418	2	4.00	A
	WARFARIN	0.0015	1	640.00	S
	ZINC PHOSPHIDE	0.0139	5	6.05	A
	Site Total	18,726.0219	1,294		
ORCHARD FLOOR					
	ALUMINUM PHOSPHIDE	0.4538	2	8.00	A
	STRYCHNINE	0.0330	1	7.00	A
	Site Total	0.4868	3		
OREGANO					
	IMIDACLOPRID	0.0025	1	0.06	A
	Site Total	0.0025	1		
PARSLEY					
	ACETAMIPRID	1.0430	1	14.00	A
	AZADIRACHTIN	2.2738	2	80.50	A
	AZOXYSTROBIN	78.8865	67	484.45	A
	BACILLUS THURINGIENSIS, SUBSP. AIZAWAI, STRAIN ABTS-1857	204.3900	20	372.50	A
	BENSULIDE	47.5910	1	12.00	A
	N,N-BIS-(2-OMEGA-HYDROXYPOLY(OXYETHYLENE)ETHYL) ALKYLAMINE, ALKYL DERIVED FROM TALLOW FATTY ACIDS	0.8547	1	6.00	A
	COPPER HYDROXIDE	243.0621	36	333.50	A
	(S)-CYPERMETHRIN	0.9920	1	20.00	A
	CYPRODINIL	3.6563	2	12.00	A
	DIAZINON	39.6330	14	81.00	A
	DIMETHYLPOLYSILOXANE	11.1568	38	788.00	A
	DINOTEFURAN	2.2330	1	17.00	A
	FATTY ACIDS, METHYL ESTERS	3.1910	1	6.00	A
	FLONICAMID	22.5950	17	263.00	A
	FLUDIOXONIL	2.4375	2	12.00	A
	IMIDACLOPRID	23.3888	88	503.65	A
	ISOPROPYL ALCOHOL	19.3972	37	773.00	A
	LECITHIN	1.3215	2	14.00	A
	MALATHION	20.8580	13	26.00	A
	METHOXYFENOZIDE	11.8603	4	72.00	A
	4-NONYLPHENOL, FORMALDEHYDE RESIN, PROPOXYLATED	1.0827	1	6.00	A
	ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE)	219.9541	39	787.00	A
	PERMETHRIN	25.2958	7	128.00	A
	POLYACRYLAMIDE, POLYETHYLENE GLYCOL MIXTURE	1.0215	6	45.50	A
	POLYBUTENES	0.5698	1	6.00	A
	POLYETHYLENE GLYCOL	118.8110	35	762.00	A
	POTASSIUM BICARBONATE	1,145.1300	22	465.50	A
	PROMETRYN	189.8673	37	124.75	A
	PROPIONIC ACID	1.3215	2	14.00	A
	PYRACLOSTROBIN	63.3000	17	318.00	A
	PYRETHRINS	0.0413	1	7.00	A
	QST 713 STRAIN OF DRIED BACILLUS SUBTILIS	95.9220	10	219.00	A

Commodity	Chemical	Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
PARSLEY					
	ROTENONE	0.0345	1	7.00	A
	ROTENONE, OTHER RELATED	0.0345	1	7.00	A
	SETHOXYDIM	1.0515	1	4.00	A
	SPINOSAD	1.7967	4	18.50	A
	SPIROTETRAMAT	0.0831	2	11.00	A
	STREPTOMYCES LYDICUS WYEC 108	0.0640	7	230.00	A
	THIRAM	0.3943		157.84	P
	Site Total	2,606.5971	424		
PASTURELAND					
	ALUMINUM PHOSPHIDE	4.6044	6	77.00	A
		0.3229	5	30.00	U
	TOTAL POUNDS OF THIS CHEMICAL 4.9273				
	CLOPYRALID,TRIETHYLAMINE SALT	1.7239	1	15.00	A
	DIPHACINONE	0.0050	1	10.00	A
	GLYPHOSATE, ISOPROPYLAMINE SALT	95.9844	19	641.00	A
	TRICLOPYR, TRIETHYLAMINE SALT	4.7014	1	15.00	A
	Site Total	107.3420	32		
PEAR					
	ACETAMIPRID	0.0127	1	0.10	A
	MINERAL OIL	0.7083	1	0.10	A
	Site Total	0.7210	2		
PEAS					
	BACILLUS THURINGIENSIS, SUBSP. KURSTAKI, STRAIN ABTS-351, FERMENTATION SOLIDS AND SOLUBLES	26.8920	30	49.80	A
	BOSCALID	1.7588	2	5.40	A
	COPPER HYDROXIDE	79.0396	47	74.50	A
	CYPERMETHRIN	0.9657	18	20.90	A
	(S)-CYPERMETHRIN	2.5664	32	55.50	A
	IMIDACLOPRID	8.0925	31	28.10	A
	OXYFLUORFEN	0.3000	1	3.00	A
	Site Total	119.6150	161		
PEPPER, FRUITING					
	ABAMECTIN	3.5666	6	184.00	A
	ACEPHATE	110.9486	3	114.38	A
	ACETAMIPRID	23.6916	12	287.00	A
	ALPHA-PINENE BETA-PINENE COPOLYMER	14.8076	15	164.03	A
	ALPHA-ALKYL (C12-C14)-OMEGA-HYDROXYPOLY (OXYETHYLENE)	223.8169	34	1,095.00	A
	ALKYL (C8,C10) POLYGLYCOSIDE	0.6040	4	71.70	A
	AMMONIUM SULFATE	28.9634	1	15.00	A
	AZADIRACHTIN	0.6348	1	30.00	A
	AZOXYSTROBIN	154.3020	42	1,453.80	A
	BACILLUS THURINGIENSIS (BERLINER), SUBSP. AIZAWAI, SEROTYPE H-7	78.5221	25	802.60	A
	BACILLUS THURINGIENSIS, SUBSP. AIZAWAI, STRAIN ABTS-1857	1,173.9600	52	2,085.00	A
	BACILLUS THURINGIENSIS (BERLINER), SUBSP. KURSTAKI, STRAIN SA-11	38.2500	1	30.00	A
	BIFENAZATE	131.5900	20	343.18	A
	N,N-BIS-(2-OMEGA-HYDROXYPOLY(OXYETHYLENE)ETHYL) ALKYLAMINE, ALKYL DERIVED FROM TALLOW FATTY ACIDS	4.9222	6	153.54	A
	BOSCALID	154.7508	13	441.95	A
	ALPHA-(PARA-TERT-BUTYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE) PHOSPHATE	2.5790	2	41.00	A
	CARBARYL	448.0000	7	230.00	A
	CHLORANTRANILIPROLE	2,671.9732	17	651.30	A
	CHLOROPICRIN	38,130.9231	20	817.45	A
	CHLORTHAL-DIMETHYL	240.5175	6	190.30	A
	CLARIFIED HYDROPHOBIC EXTRACT OF NEEM OIL	208.2475	1	54.50	A

Commodity Chemical	Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
PEPPER, FRUITING				
COPPER HYDROXIDE	904.5600	38	1,518.60	A
CRYOLITE	20,241.8472	85	2,354.57	A
BETA-CYFLUTHRIN	39.8649	40	1,687.60	A
CYPERMETHRIN	7.9842	12	160.98	A
(S)-CYPERMETHRIN	97.0861	54	2,341.20	A
CYROMAZINE	43.4135	21	348.98	A
1,3-DICHLOROPROPENE	68,062.4165	20	817.45	A
DIFLUBENZURON	203.9200	76	1,860.50	A
DIMETHOATE	21.7319	2	67.00	A
DIMETHYLPOLYSILOXANE	230.9248	42	1,597.58	A
DINOTEFURAN	7.2538	3	48.60	A
ALPHA-(PARA-DODECYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE)	0.7897	15	164.03	A
ESFENVALERATE	31.9188	31	668.98	A
FATTY ACIDS, METHYL ESTERS	18.3763	6	153.54	A
FATTY ACIDS, MIXED	0.2436	1	54.00	A
FATTY ACIDS DERIVED FROM TALLOW	89.5268	34	1,095.00	A
FLONICAMID	64.9600	22	867.70	A
GLYPHOSATE, POTASSIUM SALT	68.3164	1	15.00	A
HALOSULFURON-METHYL	5.7797	9	205.50	A
HYDROGEN PEROXIDE	29.3036	14	507.00	A
IMIDACLOPRID	774.8030	74	2,740.96	A
INDOXACARB	12.5476	6	191.20	A
ISOPROPYL ALCOHOL	485.7294	194	5,955.89	A
LAMBDA-CYHALOTHRIN	1.5729	1	30.00	A
LECITHIN	126.3118	34	1,136.50	A
MANEB	1,113.1134	19	698.00	A
MEFENOXAM	909.9922	78	2,736.72	A
MEFENOXAM, OTHER RELATED	12.3063	36	1,588.00	A
METALAXYL	74.6600	18	746.60	A
METAM-SODIUM	3,787.5132	1	14.00	A
METHOMYL	269.4600	11	299.40	A
METHOXYFENOZIDE	196.9436	31	1,094.74	A
S-METOLACHLOR	125.5577	22	396.85	A
MINERAL OIL	425.2460	16	194.03	A
MYCLOBUTANIL	395.5430	123	3,882.89	A
NAPROPAMIDE	228.5000	7	148.00	A
4-NONYLPHENOL, FORMALDEHYDE RESIN, PROPOXYLATED	6.2348	6	153.54	A
ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE)	1,873.8430	259	8,140.69	A
ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE), PHOSPHATE ESTER	62.0827	3	104.00	A
OXAMYL	3,185.0291	132	4,496.25	A
PARAQUAT DICHLORIDE	187.5999	8	184.99	A
PENDIMETHALIN	1.8939	1	2.00	A
PERMETHRIN	40.7410	7	189.62	A
PETROLEUM DISTILLATES	11.3506	1	25.00	A
PETROLEUM DISTILLATES, REFINED	769.7000	6	113.50	A
POLYACRYLAMIDE, POLYETHYLENE GLYCOL MIXTURE	2.0357	4	90.00	A
POLYALKENE OXIDE MODIFIED HEPTAMETHYL TRISILOXANE	188.5446	19	787.80	A
POLYBUTENES	3.2815	6	153.54	A
POLYETHYLENE GLYCOL	114.8602	24	819.58	A
POLYETHYLENE GLYCOL MONO(3-(TETRAMETHYL-1-(TRIMETHYLSILOXY)DISILOXANYL)PROPYL)ETHER	22.6484	2	115.00	A
POLY-I-PARA-MENTHENE	4,043.8577	131	5,490.20	A
POLYOXYETHYLENE POLYOXYPROPYLENE	8.7919	3	107.00	A
POLYSILOXANE	0.0242	4	71.70	A
POTASSIUM BICARBONATE	130.0500	3	61.00	A
POTASSIUM HYDROXIDE	0.7079	4	71.70	A
POTASSIUM PHOSPHITE	74.1553	2	28.60	A
PROPAMOCARB HYDROCHLORIDE	275.3059	22	507.61	A
PROPIONIC ACID	124.6206	34	1,136.50	A
PYRACLOSTROBIN	318.4980	45	1,771.70	A
PYRETHRINS	0.7282	1	30.00	A
PYRIPROXYFEN	3.3392	2	49.70	A
QST 713 STRAIN OF DRIED BACILLUS SUBTILIS	55.6260	4	137.00	A
SPINETORAM	143.2633	96	2,956.89	A
SPINOSAD	161.5437	38	1,520.23	A

Commodity Chemical	Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
PEPPER, FRUITING				
SPIROMESIFEN	417.3999	107	3,293.18	A
SPIROTETRAMAT	385.8508	33	880.50	A
STREPTOMYCES LYDICUS WYEC 108	0.0393	6	205.60	A
SULFUR	20,270.3092	61	1,955.92	A
THIAMETHOXAM	162.8955	69	2,440.10	A
THIRAM	101.4513		40,632.96	P
	9.4329		1.88	T
TOTAL POUNDS OF THIS CHEMICAL 110.8842				
TRIFLURALIN	216.0141	24	548.85	A
ALPHA-UNDECYL-OMEGA-HYDROXYPOLY(OXYETHYLENE)	7.2477	4	71.70	A
Site Total	176,336.5868	2,119		
PEPPER, SPICE				
COPPER HYDROXIDE	1.3988	1	1.05	A
CRYOLITE	9.6000	1	22.00	A
(S)-CYPERMETHRIN	1.0941	1	22.00	A
PARAQUAT DICHLORIDE	12.4021	1	22.00	A
POTASSIUM BICARBONATE	5.2700	3	1.77	A
Site Total	29.7650	7		
PIMENTO				
ALPHA-ALKYL (C12-C14)-OMEGA-HYDROXYPOLY (OXYETHYLENE)	3.0501	1	22.00	A
FATTY ACIDS DERIVED FROM TALLOW	1.2201	1	22.00	A
ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE)	3.0501	1	22.00	A
Site Total	7.3203	1		
PUBLIC HEALTH				
BACILLUS SPHAERICUS, SEROTYPE H-5A5B, STRAIN 2362	656.6410			
BACILLUS THURINGIENSIS (BERLINER), SUBSP. ISRAELENSIS, SEROTYPE H-14	1.0399			
BACILLUS THURINGIENSIS, SUBSP. ISRAELENSIS, STRAIN AM 65-52	371.9487			
GLYPHOSATE, ISOPROPYLAMINE SALT	1.7078			
ALPHA-ISOOCTADECYL-OMEGA-HYDROXYPOLY(OXYETHYLENE)	3.6677			
MALATHION	228.2666			
METHOPRENE	29.2345			
S-METHOPRENE	0.1053			
MINERAL OIL	102.0575			
PIPERONYL BUTOXIDE	15.1193			
PIPERONYL BUTOXIDE, OTHER RELATED	3.7722			
RESMETHRIN	7.6005			
Site Total	1,421.1610			
PUMPKIN				
AZOXYSTROBIN	4.3456	3	26.75	A
BACILLUS THURINGIENSIS (BERLINER), SUBSP. AIZAWAI, SEROTYPE H-7	2.0600	2	20.00	A
BACILLUS THURINGIENSIS, SUBSP. AIZAWAI, STRAIN ABTS-1857	21.8700	3	26.75	A
CHLOROTHALONIL	9.3600	1	6.50	A
CLARIFIED HYDROPHOBIC EXTRACT OF NEEM OIL	4.2757	1	4.00	A
DIMETHYLPOLYSILOXANE	10.5786	25	272.50	A
ESFENVALERATE	0.4881	1	10.00	A
FLONICAMID	5.9600	10	75.50	A
HYDROGEN PEROXIDE	36.9685	3	15.00	A
IMIDACLOPRID	22.4732	6	57.00	A
ISOPROPYL ALCOHOL	12.1073	19	251.00	A
LECITHIN	1.8622	2	20.00	A
METALAXYL	1.1700	1	6.50	A
MYCLOBUTANIL	13.0020	18	122.00	A
ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE)	122.3543	21	271.00	A

Commodity	Chemical		Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
PUMPKIN						
	PERMETHRIN		4.0831	7	27.50	A
	POLYALKENE OXIDE MODIFIED HEPTAMETHYL TRISILOXANE		3.8393	2	20.00	A
	POLYETHYLENE GLYCOL		62.9450	15	210.00	A
	POLY-I-PARA-MENTHENE		15.7259	5	34.00	A
	POLYOXYETHYLENE POLYOXYPROPYLENE		3.3653	10	62.50	A
	PROPIONIC ACID		1.8622	2	20.00	A
	PYRACLOSTROBIN		1.5760	3	10.50	A
	PYRETHRINS		0.2142	1	10.00	A
	PYRIPROXYFEN		0.6799	3	10.50	A
	QST 713 STRAIN OF DRIED BACILLUS SUBTILIS		1.7520	1	4.00	A
	SPINETORAM		1.7671	6	37.50	A
	SPINOSAD		0.2507	1	2.50	A
	SPIROMESIFEN		10.1674	11	70.00	A
	SULFUR		80.0000	1	10.00	A
	THIAMETHOXAM		0.8600	1	10.00	A
	THIOPHANATE-METHYL		70.0000	1	10.00	A
	THIRAM		3.7664		2,682.59	P
			1.8251		0.64	T
	TOTAL POUNDS OF THIS CHEMICAL	5.5915				
	TRIFLUMIZOLE		8.2379	4	33.50	A
	Site Total		541.7930	126		
QUINCE						
	COPPER HYDROXIDE		0.9146	1	1.05	A
	Site Total		0.9146	1		
RADICCHIO						
	ACETAMIPRID		0.3710	1	5.00	A
	BACILLUS THURINGIENSIS, SUBSP. AIZAWAI, STRAIN ABTS-1857		119.2428	4	152.22	A
	CHLORANTRANILIPROLE		8.0619	3	123.00	A
	CYPRODINIL		38.8500	5	118.40	A
	DIMETHYLPOLYSILOXANE		25.7880	10	357.42	A
	FLONICAMID		16.7300	5	191.20	A
	FLUDIOXONIL		25.9000	5	118.40	A
	IMIDACLOPRID		29.1679	2	77.20	A
	INDOXACARB		13.8150	3	122.82	A
	ISOPROPYL ALCOHOL		6.1586	7	234.42	A
	ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE)		71.3105	7	234.42	A
	ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE), PHOSPHATE ESTER		22.6044	2	63.00	A
	POLYETHYLENE GLYCOL		38.8966	7	234.42	A
	PROPYZAMIDE		47.2500	3	63.00	A
	QST 713 STRAIN OF DRIED BACILLUS SUBTILIS		36.0036	3	82.20	A
	SPINETORAM		4.2362	2	77.20	A
	SPIROTETRAMAT		0.2922	2	90.50	A
	Site Total		504.6787	45		
RADISH						
	AZOXYSTROBIN		66.2877	88	502.09	A
	BACILLUS PUMILUS, STRAIN QST 2808		2.2927	2	19.10	A
	BACILLUS THURINGIENSIS, SUBSP. AIZAWAI, STRAIN ABTS-1857		232.0758	77	409.77	A
	CHLORPYRIFOS		43.4555	49	82.50	A
	CHLORTHAL-DIMETHYL		2,554.6397	93	497.05	A
	COPPER HYDROXIDE		564.6180	101	584.29	A
	CYFLUTHRIN		0.7760	4	19.30	A
	BETA-CYFLUTHRIN		10.8987	90	476.87	A
	DIAZINON		1.9852	2	3.50	A
	DIMETHYLPOLYSILOXANE		0.0703	12	61.38	A
	ESFENVALERATE		22.3398	95	557.29	A
	HYDROGEN PEROXIDE		47.0732	2	19.10	A
	IMIDACLOPRID		0.6562	3	14.60	A
	ISOPROPYL ALCOHOL		1.4525	12	61.38	A

Commodity Chemical	Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
RADISH				
LECITHIN	50.3995	1	179.00	A
MEFENOXAM	159.2268	153	964.34	A
MEFENOXAM, OTHER RELATED	2.5757	49	410.29	A
METAM-SODIUM	175.5990	1	179.00	A
ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE)	31.2188	13	240.38	A
POLYACRYLAMIDE, POLYETHYLENE GLYCOL MIXTURE	0.2298	1	2.50	A
POLYETHYLENE GLYCOL	9.1739	12	61.38	A
POLY-I-PARA-MENTHENE	63.8726	1	179.00	A
PROPIONIC ACID	50.3995	1	179.00	A
PYRACLOSTROBIN	77.0640	73	388.57	A
PYRETHRINS	0.5451	2	10.00	A
SPINETORAM	13.2610	51	281.84	A
SPINOSAD	7.6882	17	82.59	A
THIRAM	74.0148		2,371.20	U
	63.9589		25,615.63	P
	2.7406		0.54	T
TOTAL POUNDS OF THIS CHEMICAL 140.7143				
Site Total	4,330.5895	817		
RANGELAND				
ALUMINUM PHOSPHIDE	0.6531	2	12.00	A
Site Total	0.6531	2		
RASPBERRY				
ACETAMIPRID	22.0723	6	219.30	A
ALPHA-PINENE BETA-PINENE COPOLYMER	79.4255	7	70.64	A
ALPHA-ALKYL (C12-C14)-OMEGA-HYDROXYPOLY (OXYETHYLENE)	5.9868	3	15.55	A
AMMONIUM PROPIONATE	24.3314	4	39.50	A
AMMONIUM SULFATE	6.0828	4	39.50	A
AZADIRACHTIN	0.0621	1	71.00	A
AZOXYSTROBIN	36.9275	14	148.00	A
BACILLUS THURINGIENSIS (BERLINER), SUBSP. AIZAWAI, SEROTYPE H-7	127.9641	72	1,011.12	A
BACILLUS THURINGIENSIS, SUBSP. AIZAWAI, STRAIN ABTS-1857	745.6536	77	792.21	A
BACILLUS THURINGIENSIS (BERLINER), SUBSP. KURSTAKI, STRAIN SA-11	121.8321	81	684.66	A
BIFENAZATE	175.0991	37	365.12	A
BIFENTHRIN	5.7690	8	55.59	A
BOSCALID	14.6828	5	41.06	A
CARBARYL	20.0000	1	10.00	A
CARFENTRAZONE-ETHYL	1.7054	3	18.00	A
CHLOROPICRIN	8,027.2500	6	71.00	A
CITRIC ACID	12.1657	4	39.50	A
CLARIFIED HYDROPHOBIC EXTRACT OF NEEM OIL	1,861.0710	58	738.06	A
COCONUT DIETHANOLAMIDE	0.1338	3	39.51	A
COPPER OXIDE (OUS)	2.7687	2	1.37	A
COPPER SALTS OF FATTY AND ROSIN ACIDS	181.1838	7	195.00	A
CYPRODINIL	28.2188	3	86.00	A
DIAZINON	369.6895	38	337.91	A
DIMETHYLPOLYSILOXANE	26.7159	33	350.50	A
DODECYLBENZENE SULFONIC ACID	0.5799	3	39.51	A
ALPHA-(PARA-DODECYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE)	4.2360	7	70.64	A
EDTA, TETRASODIUM SALT	0.0357	3	39.51	A
FATTY ACIDS, MIXED	0.2799	2	32.00	A
FATTY ACIDS DERIVED FROM TALLOW	2.3947	3	15.55	A
FENHEXAMID	22.6550	2	81.30	A
FLUDIOXONIL	18.8125	3	86.00	A
HEXYTHIAZOX	84.5026	48	467.65	A
IPRODIONE	52.9600	3	85.00	A
ISOPROPYL ALCOHOL	4.5294	20	217.01	A
KAOLIN	2,800.6000	6	117.40	A
LECITHIN	19.3481	10	124.00	A

Commodity	Chemical		Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
RASPBERRY						
	LIME-SULFUR		10,708.9295	47	359.45	A
	MALATHION		552.8881	8	182.50	A
	METHYL BROMIDE		16,297.7500	6	71.00	A
	MINERAL OIL		280.1629	11	105.64	A
	MYCLOBUTANIL		10.8590	29	159.56	A
	ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE)		55.0385	32	328.05	A
	ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE), PHOSPHATE ESTER		175.2518	28	515.45	A
	PARAQUAT DICHLORIDE		16.6116	1	12.00	A
	PETROLEUM DISTILLATES		16.6637	2	11.00	A
	PETROLEUM DISTILLATES, REFINED		10,984.7245	136	976.75	A
	PHOSPHORIC ACID		0.1142	3	39.51	A
	POLYACRYLAMIDE, POLYETHYLENE GLYCOL MIXTURE		0.0857	1	9.00	A
	POLYALKENE OXIDE MODIFIED HEPTAMETHYL TRISILOXANE		51.1961	21	322.65	A
	POLYETHER MODIFIED POLYSILOXANE		17.8607	13	125.89	A
	POLYETHYLENE GLYCOL		19.5677	16	165.50	A
	POLYETHYLENE GLYCOL MONO(3-(TETRAMETHYL-1-(TRIMETHYLSILOXY)DISILOXANYL)PROPYL)ETHER		30.9541	12	201.35	A
	POLY-I-PARA-MENTHENE		169.2788	18	361.23	A
	POLYOXYETHYLENE POLYOXYPROPYLENE		4.0025	2	41.00	A
	POTASH SOAP		596.8078	22	87.63	A
	POTASSIUM BICARBONATE		0.4920	1	0.20	A
	PROPICONAZOLE		7.1372	10	39.39	A
	PROPIONIC ACID		19.3481	10	124.00	A
	PROPYLENE GLYCOL		0.6601	1	25.00	A
	PYRACLOSTROBIN		37.0317	28	228.47	A
	PYRETHRINS		2.0996	12	156.06	A
	SILICONE DEFOAMER		0.0152	3	39.51	A
	SODIUM POLYACRYLATE		3.5633	4	39.50	A
	SODIUM XYLENE SULFONATE		0.1784	3	39.51	A
	SPINETORAM		17.8366	23	236.16	A
	SPINOSAD		74.5726	49	563.97	A
	STREPTOMYCES LYDICUS WYEC 108		0.0189	8	111.00	A
	SULFUR		724.8000	5	99.00	A
	TEBUFENOZIDE		11.1675	12	54.26	A
	ALPHA-[PARA-(1,1,3,3-TETRAMETHYLBUTYL)PHENYL]-OMEGA-HYDROXYPOLY(OXYETHYLENE)		0.6798	3	39.51	A
	TETRAPOTASSIUM PYROPHOSPHATE		0.0892	3	39.51	A
	THIAMETHOXAM		3.9673	20	95.99	A
	TRIADIMEFON		30.2563	9	242.06	A
	TRIETHANOLAMINE		0.2275	3	39.51	A
	Site Total		55,830.6140	1,049		
RIGHTS OF WAY						
	ABAMECTIN		0.4221	2	37.40	A
			0.0027	1	16,400.00	S
	TOTAL POUNDS OF THIS CHEMICAL	0.4248				
	ACEPHATE		0.9740	1	2.00	A
	ACETAMIPRID		0.5941	3	98.50	A
	ACIBENZOLAR-S-METHYL		17.4200	1	17.42	A
	ALKYL (60%C14, 30%C16, 5%C12, 5%C18) DIMETHYLBENZYL AMMONIUM CHLORIDE		0.4941	1	4.00	A
	ALKYL (50%C12, 30%C14, 17%C16, 3%C18) DIMETHYLETHYLBENZYL AMMONIUM CHLORIDE		0.4941	1	4.00	A
	ALKYL (C8,C10) POLYGLYCOSIDE		3,425.7951			
	ALUMINUM PHOSPHIDE		113.2863			
			8.3910	11	6.90	A
	TOTAL POUNDS OF THIS CHEMICAL	121.6773				
	AMINOPYRALID, TRIISOPROPANOLAMINE SALT		123.0143			
	AMMONIUM NITRATE		10.4218			
	AMMONIUM PROPIONATE		4.1847	5	9.75	A
	AMMONIUM SULFATE		465.7706	28	104.75	A
			212.2618			
	TOTAL POUNDS OF THIS CHEMICAL	678.0324				

Commodity	Chemical		Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
RIGHTS OF WAY						
	AZADIRACHTIN		0.2068			
			0.0565	1	2.00	A
			0.0167	1	24,000.00	S
	TOTAL POUNDS OF THIS CHEMICAL	0.2800				
	BACILLUS PUMILUS, STRAIN QST 2808		0.5402	1	9.00	A
	BACILLUS THURINGIENSIS, SUBSP. AIZAWAI, STRAIN ABTS-1857		10.2600	2	11.00	A
	BACILLUS THURINGIENSIS, SUBSP. KURSTAKI, STRAIN ABTS-351, FERMENTATION SOLIDS AND SOLUBLES		0.5400	1	2.00	A
	BACILLUS THURINGIENSIS (BERLINER), SUBSP. KURSTAKI, STRAIN SA-11		11.4750	1	9.00	A
			0.0750			
	TOTAL POUNDS OF THIS CHEMICAL	11.5500				
	BIFENAZATE		8.5000	1	17.00	A
			0.0312	1	16,400.00	S
	TOTAL POUNDS OF THIS CHEMICAL	8.5312				
	BIFENTHRIN		2.2687			
			0.6295	3	96.60	A
	TOTAL POUNDS OF THIS CHEMICAL	2.8982				
	BORAX		1.2000			
	BOSCALID		28.1131	2	85.00	A
	BROMACIL		137.2000			
	BROMADIOLONE		0.0025	10	40.00	A
	BROMETHALIN		0.0000			
	BUTYL ALCOHOL		15.8931			
	CACODYLIC ACID		34.3160			
	CAPTAN		19.1816	1	20.00	A
	CAPTAN, OTHER RELATED		0.4103	1	20.00	A
	CARFENTRAZONE-ETHYL		0.0053			
	CHLORPYRIFOS		1.4954	1	1.00	A
	CHLORSULFURON		34.7625			
			9.2600	2	624.00	A
	TOTAL POUNDS OF THIS CHEMICAL	44.0225				
	CITRIC ACID		10.7207			
			2.9170	12	74.75	A
	TOTAL POUNDS OF THIS CHEMICAL	13.6377				
	CLARIFIED HYDROPHOBIC EXTRACT OF NEEM OIL		0.1194			
	COCONUT DIETHANOLAMIDE		2.5818			
	COPPER NAPHTHENATE		12.2323			
	COTTONSEED OIL		3.3574	1	17.42	A
	CYPERMETHRIN		0.2310	2	6.60	A
	CYPRODINIL		30.8438	1	94.00	A
	2,4-D		12.0362			
	2,4-D, DIMETHYLAMINE SALT		63.8555			
	2,4-D, 2-ETHYLHEXYL ESTER		0.1022			
	DAZOMET		234.8590			
	DICAMBA		1.1417			
	DICOFOL		0.0875	1	16,400.00	S
	DIETHYLENE GLYCOL		339.4433			
	DIGLYCOLAMINE SALT OF 3,6-DICHLORO-O-ANISIC ACID		130.5286			
	DIKEGULAC SODIUM		1.3648			
	DIMETHYLPOLYSILOXANE		13.6129			
			11.9186	109	145.88	A
	TOTAL POUNDS OF THIS CHEMICAL	25.5315				
	DIPHACINONE		0.0275			
			0.0175	8	94.12	A
	TOTAL POUNDS OF THIS CHEMICAL	0.0450				
	DIQUAT DIBROMIDE		865.8196			
			114.8044	75	31.45	A
	TOTAL POUNDS OF THIS CHEMICAL	980.6240				
	DISODIUM OCTABORATE TETRAHYDRATE		69.5220			
	DITHIOPYR		0.1250			
	DIURON		3,736.5130			
			1,870.9131	10	659.00	A
	TOTAL POUNDS OF THIS CHEMICAL	5,607.4261				
	DODECYLBENZENE SULFONIC ACID		11.1879			
	EDTA, TETRASODIUM SALT		0.6885			
	ESFENVALERATE		0.0407	1	84.00	A

Commodity Chemical		Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
RIGHTS OF WAY					
ETHEPHON		0.2064			
ETHYLENE OXIDE		0.1020	1	1.70	A
FATTY ACIDS, MIXED		610.9050			
FENPROPATHRIN		34.9087	1	85.00	A
FLUAZIFOP-P-BUTYL		11.1638			
FLUBENDIAMIDE		0.0528	1	1.76	A
FLUDIOXONIL		20.5625	1	94.00	A
FLUMIOXAZIN		147.0649			
TAU-FLUVALINATE		0.2608	1	1.70	A
		0.0157			
TOTAL POUNDS OF THIS CHEMICAL	0.2765				
FOSETYL-AL		41.8080	1	17.42	A
GLUFOSINATE-AMMONIUM		6.0551	34	2.68	A
GLYPHOSATE		12.9998	3	25.00	A
GLYPHOSATE, DIAMMONIUM SALT		565.9248			
GLYPHOSATE, ISOPROPYLAMINE SALT		28,218.0181			
		3,975.3321	177	1,628.15	A
TOTAL POUNDS OF THIS CHEMICAL	32,193.3502				
GLYPHOSATE, MONOAMMONIUM SALT		82.1235			
GLYPHOSATE, POTASSIUM SALT		506.1159			
		314.8852	26	106.60	A
TOTAL POUNDS OF THIS CHEMICAL	821.0011				
HALOSULFURON-METHYL		35.9878			
HEXYTHIAZOX		15.9400	1	85.00	A
		0.0313	1	19,400.00	S
TOTAL POUNDS OF THIS CHEMICAL	15.9713				
IMIDACLOPRID		2.2256			
		1.3091	2	7.75	A
TOTAL POUNDS OF THIS CHEMICAL	3.5347				
ISOPROPYL ALCOHOL		219.8669			
		1.9998	20	52.92	A
TOTAL POUNDS OF THIS CHEMICAL	221.8667				
ISOPROPYLAMINE DODECYLBENZENE SULFONATE		0.2803	7	65.00	A
ISOXABEN		171.3281			
LAMBDA-CYHALOTHRIN		0.0596	1	1.00	A
LECITHIN		4.4030			
		0.5106	3	5.75	A
TOTAL POUNDS OF THIS CHEMICAL	4.9136				
LINURON		16.0000			
		0.5000	1	2.00	A
TOTAL POUNDS OF THIS CHEMICAL	16.5000				
MALATHION		173.7555	1	85.00	A
MANCOZEB		4.6250	2	4.00	A
MANEB		1.9236	1	2.00	A
MCPP		5.3856			
MECOPROP-P		0.0259			
METALAXYL		0.0533	1	1.70	A
METALDEHYDE		16.0000			
METHYLATED SOYBEAN OIL		329.4094			
MINERAL OIL		3,689.0255	2	37.40	A
MODIFIED PHTHALIC GLYCEROL ALKYD RESIN		2.1384	3	6.70	A
MYCLOBUTANIL		0.2009	1	1.50	A
NAPROPAMIDE		0.5000			
ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE)		2,051.0156			
		22.5576	23	58.67	A
TOTAL POUNDS OF THIS CHEMICAL	2,073.5732				
ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE), PHOSPHATE ESTER		9.2950	8	205.75	A
ORYZALIN		863.5903			
OXYFLUORFEN		64.9065			
		26.1575	20	98.40	A
TOTAL POUNDS OF THIS CHEMICAL	91.0640				
PACLOBUTRAZOL		0.9719	1	1.00	A
PARAQUAT DICHLORIDE		66.1001	8	67.00	A
PENDIMETHALIN		99.6968			
PERMETHRIN		2.8123	2	19.42	A
PETROLEUM DISTILLATES		27.0282			

Commodity	Chemical		Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
RIGHTS OF WAY						
	PETROLEUM OIL, PARAFFIN BASED		45.6161	7	65.00	A
	PHOSPHORIC ACID		61.4351			
			4.5563	7	65.00	A
	TOTAL POUNDS OF THIS CHEMICAL	65.9914				
	POLYACRYLAMIDE POLYMER		17.0518			
	POLYACRYLIC POLYMER		5.3604			
			0.4123	7	65.00	A
	TOTAL POUNDS OF THIS CHEMICAL	5.7727				
	POLYALKENE OXIDE MODIFIED HEPTAMETHYL TRISILOXANE		16.4705			
	POLYETHYLENE GLYCOL		27.1772			
			11.8354	19	35.50	A
	TOTAL POUNDS OF THIS CHEMICAL	39.0126				
	POLYETHYLENE GLYCOL MONO(3-(TETRAMETHYL-1-(TRIMETHYLSILOXY)DISILOXANYL)PROPYL)ETHER		35.3987	4	242.00	A
	POLY-I-PARA-MENTHENE		58.5633	6	185.00	A
	POLYOXYETHYLENE POLYOXYPROPYLENE		3.5485	32	100.35	A
	POLYOXYETHYLENE SORBITAN MONOOLEATE		1.1212	7	65.00	A
	POLYOXYETHYLENE SORBITAN TRIOLEATE		7.3810	7	65.00	A
	POLYSILOXANE		0.0163			
	POTASH SOAP		2.1837			
			1.0090	1	19,400.00	S
	TOTAL POUNDS OF THIS CHEMICAL	3.1927				
	POTASSIUM BICARBONATE		22.1400	1	9.00	A
	POTASSIUM HYDROXIDE		0.4778			
	PRODIAMINE		37.5578			
	PROPICONAZOLE		0.1675	1	2.00	A
	PROPIONIC ACID		3.2615			
			0.5106	3	5.75	A
	TOTAL POUNDS OF THIS CHEMICAL	3.7721				
	PROPYZAMIDE		36.7200	6	31.00	A
	PYRACLOSTROBIN		28.3797	3	179.00	A
	PYRAFLUFEN-ETHYL		0.2507			
	PYRETHRINS		0.0973	1	2.00	A
	PYRIMETHANIL		32.6159	1	85.00	A
	QUINCLORAC		0.7500	1	1.00	A
	SILICONE DEFOAMER		0.2926			
	SIMAZINE		598.5000			
	SODIUM CACODYLATE		200.7483			
	SODIUM CARBONATE		0.9264	1	4.00	A
	SODIUM METASILICATE		0.3088	1	4.00	A
	SODIUM POLYACRYLATE		0.7713	5	9.75	A
	SODIUM XYLENE SULFONATE		3.4424			
	SPINETORAM		1.1055	2	22.02	A
	SPINOSAD		0.1561	2	30,000.00	S
			0.0624	1	2.00	A
			0.0468			
	TOTAL POUNDS OF THIS CHEMICAL	0.2653				
	SPIROMESIFEN		21.0477	1	85.00	A
	STRYCHNINE		0.1909			
	SULFOMETURON-METHYL		177.9479			
			22.3600	2	624.00	A
	TOTAL POUNDS OF THIS CHEMICAL	200.3079				
	SULFUR		439.2000	3	180.50	A
	TALL OIL		55.8305			
	TEBUTHIURON		122.1920			
	ALPHA-[PARA-(1,1,3,3-TETRAMETHYLBUTYL)PHENYL]-OMEGA-HYDROXYPOLY(OXYETHYLENE)		13.0422			
	TETRAPOTASSIUM PYROPHOSPHATE		1.7212			
	THIAMETHOXAM		10.6250	3	170.00	A
	THIOPHANATE-METHYL		14.7250			
			0.1063	1	1,000.00	S
	TOTAL POUNDS OF THIS CHEMICAL	14.8313				
	TRICLOPYR, BUTOXYETHYL ESTER		99.0016			
	TRIETHANOLAMINE		4.3891			
	TRIFLURALIN		40.8929	1	55.00	A

Commodity Chemical	Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
RIGHTS OF WAY				
ALPHA-UNDECYL-OMEGA-HYDROXYPOLY(OXYETHYLENE)	889.3187			
VINYL POLYMER	7.0042			
Site Total	57,905.7225	628		
ROSEMARY				
IMIDACLOPRID	0.0888	1	2.00	A
Site Total	0.0888	1		
SAGE				
AZADIRACHTIN	0.1130	2	2.43	A
AZOXYSTROBIN	1.0429	3	3.43	A
CLARIFIED HYDROPHOBIC EXTRACT OF NEEM OIL	0.9934	1	0.04	A
IMIDACLOPRID	0.0100	1	0.22	A
POTASH SOAP	8.7863	1	2.10	A
POTASSIUM BICARBONATE	4.3420	2	2.55	A
PYRETHRINS	0.0186	4	2.77	A
ROTENONE	0.0155	4	2.77	A
ROTENONE, OTHER RELATED	0.0155	4	2.77	A
SPINOSAD	0.4897	1	1.98	A
Site Total	15.8269	15		
SOIL FUMIGATION/PREPLANT				
ALACHLOR	9.9697	1	4.00	A
N,N-BIS-(2-OMEGA-HYDROXYPOLY(OXYETHYLENE)ETHYL) ALKYLAMINE, ALKYL DERIVED FROM TALLOW FATTY ACIDS	5.1399	4	72.00	A
CHLOROPICRIN	465,682.3515	194	3,651.75	A
CHLOROTHALONIL	33.9353	1	45.00	A
CYPERMETHRIN	0.2913	1	3.00	A
1,3-DICHLOROPROPENE	47,647.6751	19	323.00	A
DIMETHYLPOLYSILOXANE	0.0571	1	45.00	A
FATTY ACIDS, METHYL ESTERS	19.1891	4	72.00	A
FATTY ACIDS, MIXED	3.1558	2	26.00	A
FLUMIOXAZIN	2.4888	3	18.00	A
GLIOCLADIUM VIRENS GL-21 (SPORES)	641.4000	15	1,068.00	A
GLYPHOSATE, ISOPROPYLAMINE SALT	220.0442	5	48.50	A
GLYPHOSATE, POTASSIUM SALT	135.1982	4	27.00	A
ISOPROPYL ALCOHOL	11.0484	4	110.30	A
LECITHIN	11.9240	7	126.98	A
METAM-SODIUM	108,606.6478	21	585.75	A
METHYL BROMIDE	315,299.9375	146	1,828.35	A
NAPROPAMIDE	1,023.0000	18	1,023.00	A
4-NONYLPHENOL, FORMALDEHYDE RESIN, PROPOXYLATED	8.0414	5	80.00	A
ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE)	63.1471	13	263.28	A
ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE), PHOSPHATE ESTER	43.0629	4	172.00	A
OXYFLUORFEN	993.1488	91	2,898.80	A
PARAQUAT DICHLORIDE	172.0404	10	178.98	A
PERMETHRIN	8.9893	1	45.00	A
POLYACRYLAMIDE, POLYETHYLENE GLYCOL MIXTURE	29.5434	40	1,227.03	A
POLYBUTENES	3.4266	4	72.00	A
POLYETHYLENE GLYCOL	7.4505	1	45.00	A
POLY-I-PARA-MENTHENE	28.9054	2	108.00	A
POTASSIUM N-METHYLDITHIOCARBAMATE	497.8670	2	2.00	A
PROMETRYN	1.4979	1	22.00	A
PROPIONIC ACID	11.9240	7	126.98	A
SETHOXYDIM	0.8762	1	1.50	A
SODIUM TETRATHIOCARBONATE	190.8000	1	2.00	A
Site Total	941,414.1746	438		

Commodity	Chemical		Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
SPINACH						
	ABAMECTIN		0.5787	35	62.55	A
	ACETAMIPRID		7.0083	7	94.19	A
	ACIBENZOLAR-S-METHYL		25.1720	197	1,068.29	A
	ALPHA-ALKYL (C12-C14)-OMEGA-HYDROXYPOLY (OXYETHYLENE)		19.1893	41	60.68	A
	AZADIRACHTIN		1.9702	16	99.99	A
	AZOXYSTROBIN		0.1509		3.03	T
	BACILLUS PUMILUS, STRAIN QST 2808		86.7397	70	723.99	A
	BACILLUS THURINGIENSIS (BERLINER), SUBSP. AIZAWAI, SEROTYPE H-7		0.3090	1	3.00	A
	BACILLUS THURINGIENSIS, SUBSP. AIZAWAI, STRAIN ABTS-1857		1,078.1640	241	1,967.10	A
	BACILLUS THURINGIENSIS (BERLINER), SUBSP. KURSTAKI, SEROTYPE 3A,3B		0.3192	1	5.48	A
	CHLORANTRANILIPROLE		15.4854	30	258.24	A
	CLARIFIED HYDROPHOBIC EXTRACT OF NEEM OIL		19.5379	12	53.61	A
	COCONUT DIETHANOLAMIDE		0.0079	1	2.00	A
	COPPER HYDROXIDE		3.8500	2	5.00	A
	COPPER OCTANOATE		2.2043	1	7.65	A
	CYCLOATE		3,932.0099	139	1,006.64	A
	CYFLUTHRIN		0.8424	9	24.29	A
	BETA-CYFLUTHRIN		10.0579	42	396.19	A
	CYPERMETHRIN		0.1733	1	3.80	A
	(S)-CYPERMETHRIN		4.0709	9	83.40	A
	CYROMAZINE		23.6475	30	190.92	A
	DIAZINON		27.2818	10	32.00	A
	DIMETHOATE		0.4972	1	2.00	A
	DIMETHYLPOLYSILOXANE		100.0861	246	1,972.97	A
	DINOTEFURAN		0.4375	1	3.30	A
	DODECYLBENZENE SULFONIC ACID		0.0341	1	2.00	A
	EDTA, TETRASODIUM SALT		0.0021	1	2.00	A
	EMAMECTIN BENZOATE		0.1682	9	20.87	A
	FATTY ACIDS DERIVED FROM TALLOW		7.6757	41	60.68	A
	FLONICAMID		21.8313	50	258.16	A
	FLUDIOXONIL		0.5772		23,507.64	P
			0.2852		5.80	T
	TOTAL POUNDS OF THIS CHEMICAL	0.8624				
	FOSETYL-AL		1.6000	1	2.00	A
	IMIDACLOPRID		58.4717	229	1,239.90	A
	INDOXACARB		3.7104	40	56.09	A
	ISOPROPYL ALCOHOL		34.2586	219	1,714.86	A
	MANDIPROPAMID		2.9781	18	23.06	A
	MEFENOXAM		299.4889	104	960.86	A
			54.7713		357,998.99	P
			19.5010		64.93	T
			0.4752		3,164.75	U
	TOTAL POUNDS OF THIS CHEMICAL	374.2364				
	MEFENOXAM, OTHER RELATED		6.6335	70	807.00	A
			1.6957		357,998.99	P
			0.6037		64.93	T
			0.0147		3,164.75	U
	TOTAL POUNDS OF THIS CHEMICAL	8.9476				
	METHOXYFENOZIDE		35.8998	26	205.78	A
	ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE)		415.7478	259	1,773.54	A
	PERMETHRIN		255.7331	210	1,341.03	A
	PHOSPHORIC ACID		0.0067	1	2.00	A
	POLYETHYLENE GLYCOL		216.3047	218	1,712.86	A
	POLYOXYETHYLENE POLYOXYPROPYLENE		0.2945	1	3.00	A
	POTASSIUM BICARBONATE		112.6250	2	26.50	A
	POTASSIUM PHOSPHITE		3,409.6279	163	1,316.22	A
	PYRACLOSTROBIN		57.8783	44	304.88	A
	PYRETHRINS		0.1507	1	3.60	A
	QST 713 STRAIN OF DRIED BACILLUS SUBTILIS		87.1357	13	198.94	A
	SILICONE DEFOAMER		0.0009	1	2.00	A
	SODIUM CARBONATE		0.0882	1	2.00	A
	SODIUM XYLENE SULFONATE		0.0105	1	2.00	A
	SPINETORAM		17.6531	66	345.86	A

Commodity	Chemical	Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
SPINACH					
	SPINOSAD	18.2302	52	221.34	A
	TEBUFENOZIDE	0.6600	1	5.00	A
	ALPHA-[PARA-(1,1,3,3-TETRAMETHYLBUTYL)PHENYL]-OMEGA-HYDROXYPOLY(OXYETHYLENE)	0.0400	1	2.00	A
	TETRAPOTASSIUM PYROPHOSPHATE	0.0052	1	2.00	A
	THIAMETHOXAM	0.1400	1	3.00	A
	THIODICARB	1.2215	1	2.00	A
	THIRAM	1,672.9950		864,252.55	P
		338.9848		67.87	T
	TOTAL POUNDS OF THIS CHEMICAL 2,011.9798				
	TRIETHANOLAMINE	0.0134	1	2.00	A
	Site Total	12,516.0149	2,175		
SQUASH					
	AZOXYSTROBIN	0.5624	3	3.00	A
	BACILLUS THURINGIENSIS, SUBSP. AIZAWAI, STRAIN ABTS-1857	1.0800	1	1.00	A
	POLY-I-PARA-MENTHENE	1.3607	3	3.00	A
	THIRAM	530.1111		377,779.24	P
		34.4104		12.23	T
	TOTAL POUNDS OF THIS CHEMICAL 564.5215				
	Site Total	567.5246	7		
STORAGE AREA/BOX					
	METHYL BROMIDE	30.6000		858.00	U
	Site Total	30.6000			
STRAWBERRY					
	ABAMECTIN	42.4518	91	2,212.92	A
	ACEQUINOCYL	201.7867	14	506.41	A
	ACETAMIPRID	833.4007	134	5,921.97	A
	ALPHA-ALKYLARYL-OMEGA-HYDROXYPOLY(OXYETHYLENE)	61.7035	8	258.44	A
	ALPHA-ALKYL (C8-C18)-OMEGA-HYDROXYPOLY(OXYETHYLENE) POLY(OXYPROPYLENE)	0.2107	1	10.00	A
	ALPHA-ALKYL (C9-C16)-OMEGA-HYDROXYPOLY(OXYETHYLENE)	1.7055	2	76.00	A
	ALPHA-ALKYL (C10-C12)-OMEGA-HYDROXYPOLY (OXYETHYLENE)	1.9758	1	24.00	A
	ALPHA-ALKYL-OMEGA-HYDROXYPOLY(OXYETHYLENE)	17.7309	8	258.44	A
	ALPHA-PINENE BETA-PINENE COPOLYMER	346.3535	50	1,463.75	A
	ALPHA-ALKYL (C12-C14)-OMEGA-HYDROXYPOLY (OXYETHYLENE)	94.4067	8	708.00	A
	ALUMINUM PHOSPHIDE	0.6000	1	20.00	A
	AMMONIUM PROPIONATE	843.6476	53	1,950.64	A
	AMMONIUM SULFATE	210.9119	53	1,950.64	A
	AMMONIUM THIOCYANATE	3.6342	1	7.00	A
	AZADIRACHTIN	5.8737	17	184.75	A
	AZOXYSTROBIN	119.8865	19	692.00	A
	BACILLUS THURINGIENSIS (BERLINER), SUBSP. AIZAWAI, SEROTYPE H-7	1,114.1525	254	9,379.83	A
	BACILLUS THURINGIENSIS, SUBSP. AIZAWAI, STRAIN ABTS-1857	7,175.7630	153	8,868.12	A
	BACILLUS THURINGIENSIS, SUBSP. KURSTAKI, STRAIN ABTS-351, FERMENTATION SOLIDS AND SOLUBLES	1,760.0220	76	3,167.80	A
	BACILLUS THURINGIENSIS (BERLINER), SUBSP. KURSTAKI, STRAIN SA-11	939.2390	44	1,782.07	A
	BIFENAZATE	6,066.0575	315	12,365.67	A
	BIFENTHRIN	1,629.0820	337	16,217.58	A
	N,N-BIS-(2-OMEGA-HYDROXYPOLY(OXYETHYLENE)ETHYL) ALKYLAMINE, ALKYL DERIVED FROM TALLOW FATTY ACIDS	2.7808	2	39.00	A
	BOSCALID	7,832.0634	507	23,418.27	A
	CAPTAN	99,443.0528	1,286	59,340.93	A
	CAPTAN, OTHER RELATED	2,226.9654	1,286	59,340.93	A
	CARBARYL	27.0080	2	13.50	A
	CHLOROPICRIN	1,019,251.3403	203	8,296.15	A

Commodity	Chemical	Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
STRAWBERRY					
	CHLORPYRIFOS	6,576.2225	153	6,808.21	A
	CHLORTHAL-DIMETHYL	9.0000	1	2.00	A
	CITRIC ACID	421.8238	53	1,950.64	A
	CLARIFIED HYDROPHOBIC EXTRACT OF NEEM OIL	2,256.1883	34	1,261.08	A
	COCONUT DIETHANOLAMIDE	6.5477	26	1,375.94	A
	COPPER HYDROXIDE	16.0921	2	26.00	A
	COPPER OCTANOATE	187.3889	2	183.00	A
	COPPER SALTS OF FATTY AND ROSIN ACIDS	206.8023	4	88.00	A
	COUMAFURYL	0.5000	1	5.00	A
	CRYOLITE	46.0800	1	24.00	A
	CYPRODINIL	6,259.5069	399	19,725.87	A
	2,4-D, ALKANOLAMINE SALTS (ETHANOL AND ISOPROPANOL AMINES)	14.5207	2	47.81	A
	DIATOMACEOUS EARTH	615.1430	7	244.61	A
	DIAZINON	10.0000	4	81.00	A
	1,3-DICHLOROPROPENE	751,670.8128	114	4,730.17	A
	DIETHYLENE GLYCOL	2.8811	3	114.00	A
	DIMETHYLPOLYSILOXANE	1,690.3405	681	30,330.87	A
	DIMETHYL SILICONE FLUID EMULSION	11.1154	5	302.00	A
	DIPHACINONE	0.0001	1	20.00	A
	DODECYLBENZENE SULFONIC ACID	28.3734	26	1,375.94	A
	ALPHA-(PARA-DODECYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE)	18.5155	50	1,463.75	A
	EDTA, TETRASODIUM SALT	1.7461	26	1,375.94	A
	ENDOSULFAN	1.6636	4	142.00	A
	EPOXIDIZED SOYBEAN OIL	204.2924	6	439.50	A
	ETOXAZOLE	121.5126	22	898.20	A
	FATTY ACIDS, METHYL ESTERS	10.3817	2	39.00	A
	FATTY ACIDS, MIXED	48.6556	73	3,228.75	A
	FATTY ACIDS DERIVED FROM TALLOW	37.7627	8	708.00	A
	FENHEXAMID	12,001.5649	331	17,154.06	A
	FENPROPATHRIN	1,248.2541	111	3,899.77	A
	FLUDIOXONIL	4,173.0046	399	19,725.87	A
	FLUMIOXAZIN	54.1263	23	930.82	A
	FOSETYL-AL	288.0000	1	72.00	A
	GLYPHOSATE, POTASSIUM SALT	66.2195	1	4.00	A
	HARPIN PROTEIN	0.5625	5	60.00	A
	HEXYTHIAZOX	768.5938	97	3,962.34	A
	HYDROGEN PEROXIDE	120.7636	1	49.00	A
	IMIDACLOPRID	932.2428	29	1,791.15	A
	IPRODIONE	19.9774	1	20.00	A
	ISOPROPYL ALCOHOL	951.2595	276	14,812.48	A
	ISOPROPYLAMINE DODECYLBENZENE SULFONATE	1,568.9654	6	439.50	A
	LECITHIN	2,803.8247	456	17,737.77	A
	MALATHION	9,903.2138	147	5,288.51	A
	MEFENOXAM	253.6805	16	616.90	A
	MEFENOXAM, OTHER RELATED	5.1506	8	430.00	A
	METAM-SODIUM	157,188.6440	29	1,296.87	A
	METHOMYL	2,959.2900	87	3,386.85	A
	METHOXYFENOZIDE	1,319.4985	157	7,120.50	A
	METHYL BROMIDE	148,998.5075	33	781.95	A
	MINERAL OIL	96.7190	50	1,463.75	A
	MINERAL OIL, PETROLEUM DISTILLATES, SOLVENT REFINED LIGHT	3.4589	1	43.00	A
	MOLASSES	3.7561	4	120.97	A
	MYCLOBUTANIL	680.5105	162	6,758.24	A
	NALED	2,620.6378	73	2,596.00	A
	NAPROPAMIDE	2,895.1400	41	2,057.31	A
	4-NONYLPHENOL, FORMALDEHYDE RESIN, PROPOXYLATED	3.5224	2	39.00	A
	ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE)	6,789.6486	709	31,603.37	A
	ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE), BRANCHED	1,433.7612	9	564.50	A
	ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE), PHOSPHATE ESTER	17,047.2463	1,076	51,578.86	A
	OCTANOL	0.7264	1	43.00	A
	ALPHA-OCTYLPHENYL-OMEGA-HYDROXYPOLY(OXYETHYLENE)	0.4570	1	38.00	A
	OLEIC ACID	3.3098	8	258.44	A

Commodity Chemical	Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
STRAWBERRY				
OLEYL ALCOHOL	1.0031	1	43.00	A
ALPHA-OLEYL-OMEGA-HYDROXYPOLY(OXYETHYLENE)	1.0722	1	43.00	A
OXYFLUORFEN	342.8055	20	919.91	A
PARAQUAT DICHLORIDE	15.5733	2	24.00	A
PETROLEUM DISTILLATES, REFINED	628.0464	4	99.00	A
PHOSPHORIC ACID	5.8367	27	1,413.94	A
BETA-PINENE POLYMER	51.8517	6	202.00	A
POLYACRYLAMIDE, POLYETHYLENE GLYCOL MIXTURE	18.2718	26	966.01	A
POLYALKENE OXIDE MODIFIED HEPTAMETHYL TRISILOXANE	1,860.2567	332	11,612.98	A
POLYBUTENES	1.8539	2	39.00	A
POLYETHER MODIFIED POLYSILOXANE	60.6159	14	407.00	A
POLYETHYLENE GLYCOL	3,182.6360	233	12,700.60	A
POLYETHYLENE GLYCOL MONO(3-(TETRAMETHYL-1-(TRIMETHYLSILOXY)DISILOXANYL)PROPYL)ETHER	1,420.3179	198	8,775.17	A
POLY-I-PARA-MENTHENE	10,916.5443	545	31,444.11	A
POLYMERIZED ACRYLIC ACID	22.8627	5	194.00	A
POLYOXYETHYLENE POLYOXYPROPYLENE	2,229.2410	405	15,879.47	A
POLYOXYETHYLENE POLYOXYPROPYLENE MONOBUTYL ETHER	408.5848	6	439.50	A
POTASH SOAP	14.9493	1	46.00	A
POTASSIUM BICARBONATE	4,348.4192	71	1,888.85	A
POTASSIUM N-METHYLDITHIOCARBAMATE	53,390.2697	7	298.00	A
PROPICONAZOLE	325.8074	67	2,671.77	A
PROPIONIC ACID	2,803.8247	456	17,737.77	A
PROPYLENE GLYCOL	3.4387	5	144.97	A
PYRACLOSTROBIN	4,175.1842	532	24,569.94	A
PYRETHRINS	19.7844	33	861.09	A
PYRIMETHANIL	2,577.4525	154	7,246.66	A
PYRIPROXYFEN	50.3622	17	524.46	A
QST 713 STRAIN OF DRIED BACILLUS SUBTILIS	207.0365	39	1,529.00	A
QUINOXYFEN	647.4463	163	6,921.06	A
ROTENONE	3.1731	4	178.96	A
ROTENONE, OTHER RELATED	5.9527	4	178.96	A
SILICONE DEFOAMER	0.7421	26	1,375.94	A
SODIUM CARBONATE	2.2969	1	60.00	A
SODIUM POLYACRYLATE	221.3362	48	1,756.64	A
SODIUM XYLENE SULFONATE	8.7303	26	1,375.94	A
SPINETORAM	269.2996	91	3,824.83	A
SPINOSAD	428.8075	112	4,456.06	A
SPIROMESIFEN	1,094.3262	131	4,572.64	A
STRYCHNINE	0.0009	1	31.00	A
STYRENE BUTADIENE COPOLYMER	0.9482	1	10.00	A
SULFUR	140,850.3414	832	40,217.22	A
SYNTHETIC VEGETABLE GUMS	2.5084	4	120.97	A
TALL OIL FATTY ACIDS	16.9046	8	284.00	A
ALPHA-[PARA-(1,1,3,3-TETRAMETHYLBUTYL)PHENYL]-OMEGA-HYDROXYPOLY(OXYETHYLENE)	33.2094	26	1,375.94	A
TETRAPOTASSIUM PYROPHOSPHATE	4.3651	26	1,375.94	A
THIAMETHOXAM	172.6947	88	2,851.85	A
THIOPHANATE-METHYL	3,082.7580	101	4,351.03	A
THIRAM	10,237.3775	124	4,930.48	A
TRIETHANOLAMINE	11.1311	26	1,375.94	A
TRIFLUMIZOLE	3,001.3189	254	12,298.33	A
ALPHA-UNDECYL-OMEGA-HYDROXYPOLY(OXYETHYLENE)	3.0574	2	82.00	A
WARFARIN, SODIUM SALT	0.0336	1	24.00	A
Site Total	2,547,114.5769	11,183		
STRUCTURAL PEST CONTROL				
ABAMECTIN	0.0630			
ACEPHATE	7.2885			
ACETAMIPRID	0.1989			
ALKYL (AS IN FATTY ACIDS OF COCONUT OIL) MONOETHANOLAMIDE	0.1397			
ALKYL (50%C14, 40%C12, 10%C16) DIMETHYLBENZYL AMMONIUM CHLORIDE	0.9724			
ALKYL (60%C14, 30%C16, 5%C12, 5%C18) DIMETHYLBENZYL AMMONIUM CHLORIDE	0.0619			

Commodity	Chemical		Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
STRUCTURAL PEST CONTROL						
	ALPHA-ALKYL (MIXED)-OMEGA-HYDROXYPOLY (OXYETHYLENE) SULFATE		0.4470			
	D-TRANS ALLETHRIN		2.1632			
	ALUMINUM PHOSPHIDE		98.2513			
	4-AMINOPYRIDINE		0.6719			
	AZADIRACHTIN		0.0067			
	AZOXYSTROBIN		0.0626			
	BIFENTHRIN		788.6954			
	BORAX		17.4695			
	BORIC ACID		583.0312			
	BRODIFACOUM		0.1077			
	BROMADIOLONE		0.8474			
	BROMETHALIN		0.0403			
	1-BROMO-3-CHLORO-5,5-DIMETHYL HYDANTOIN		0.6000			
	CAPSICUM OLEORESIN		0.0001			
	CARBARYL		0.0377			
	CARFENTRAZONE-ETHYL		0.0179			
	CHLORDANE		2.0676			
	CHLORFENAPYR		94.0673			
	5-CHLORO-2-METHYL-4-ISOTHIAZOLIN-3-ONE		0.0943			
	CHLOROPHACINONE		0.0016			
	CHLOROPICRIN		4.7838			
	CHLOROTHALONIL		2.1135			
	CHOLECALCIFEROL		0.1463			
	COPPER NAPHTHENATE		0.1574			
	CYFLUTHRIN		792.7745			
	BETA-CYFLUTHRIN		103.0997			
	CYPERMETHRIN		949.3939			
	2,4-D, DIMETHYLAMINE SALT		4.6963			
	2,4-D, 2-ETHYLHEXYL ESTER		0.3477			
	DDVP		0.0088			
	DDVP, OTHER RELATED		0.0006			
	DELTAMETHRIN		2,214.5551			
	DIAZINON		0.3775			
	DICAMBA		0.0222			
	DICAMBA, DIMETHYLAMINE SALT		0.5546			
	1,3-DICHLORO-5,5-DIMETHYLHYDANTOIN		0.2740			
	1,3-DICHLORO-5-ETHYL-5-METHYLHYDANTOIN		0.1060			
	DIDECYL DIMETHYL AMMONIUM CHLORIDE		1.1986			
	DIFETHIALONE		0.0445			
	DIPHACINONE		0.0733			
			0.0001	1	30.00	A
	TOTAL POUNDS OF THIS CHEMICAL	0.0734				
	DIPHACINONE, SODIUM SALT		0.0041			
	DISODIUM OCTABORATE TETRAHYDRATE		4,878.9786			
	ESFENVALERATE		4.8396			
	FENVALERATE		0.0404			
	FIPRONIL		1,389.5655			
			0.8007	2	60.00	A
	TOTAL POUNDS OF THIS CHEMICAL	1,390.3662				
	FLUDIOXONIL		0.0848			
	TAU-FLUVALINATE		0.0325			
	GLYPHOSATE, ISOPROPYLAMINE SALT		15.6917			
	HEXAFLUMURON		0.0000			
	HYDRAMETHYLNON		23.3790			
	HYDROPRENE		29.3304			
	IMIDACLOPRID		205.7181			
	INDOXACARB		0.4398			
	IRON PHOSPHATE		47.7976			
	ISOXABEN		0.0188			
	LAMBDA-CYHALOTHRIN		53.6518			
	LIMONENE		296.3846			
	LINALOOL		0.1743			
	MALATHION		42.9995			
	MCPP, DIMETHYLAMINE SALT		1.7302			
	MCPP-P, DIMETHYLAMINE SALT		0.9576			
	MECOPROP-P		0.0882			
	METALDEHYDE		117.3583			

Commodity Chemical	Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
STRUCTURAL PEST CONTROL				
METHIOCARB	0.0300			
METHOMYL	0.2450			
METHOPRENE	1.2738			
S-METHOPRENE	1.5816			
2-METHYL-4-ISOTHIAZOLIN-3-ONE	0.0331			
METHYL NONYL KETONE	0.0173			
METHYL NONYL KETONE, OTHER RELATED	0.0009			
MUSCALURE	0.0151			
NOVIFLUMURON	0.0125			
N-OCTYL BICYCLOHEPTENE DICARBOXIMIDE	103.5008			
OIL OF BLACK PEPPER	0.0009			
ORYZALIN	1.9990			
OXADIAZON	20.0000			
PENDIMETHALIN	9.4697			
PERMETHRIN	934.1440			
PERMETHRIN, OTHER RELATED	0.0373			
PETROLEUM DISTILLATES	4.9180			
PETROLEUM DISTILLATES, AROMATIC	0.0051			
PHENOTHRIN	4.2614			
PHENYLETHYL PROPIONATE	24.2624			
PIPERINE	0.0003			
PIPERONYL BUTOXIDE	106.8651			
PIPERONYL BUTOXIDE, OTHER RELATED	21.1100			
POTASH SOAP	0.1889			
PRODIAMINE	0.1239			
PROPETAMPHOS	0.1153			
PROPICONAZOLE	0.3728			
PROPOXUR	2.0126			
PYRETHRINS	35.8976			
PYRIPROXYFEN	1.3275			
RESMETHRIN	0.0039			
RESMETHRIN, OTHER RELATED	0.0005			
SILICA AEROGEL	56.6440			
SODIUM DECYL SULFATE	20.6637			
SODIUM LAUROAMPHO ACETATE	15.5953			
SODIUM LAURYL SULFATE	10.5268			
SODIUM PERSULFATE	142.5000			
SODIUM TETRABORATE (PENTAHYDRATE)	13.5000			
SPINOSAD	0.1204			
STREPTOMYCIN SULFATE	0.0795			
STRYCHNINE	0.0251			
SULFAQUINOXALINE	0.0041			
SULFLURAMID	0.1924			
SULFUR	2.2663			
SULFURYL FLUORIDE	71,831.6969			
TETRAMETHRIN	0.0198			
THYME	32.6784			
TRICLOPYR, BUTOXYETHYL ESTER	9.6982			
WARFARIN	0.0041			
ZINC PHOSPHIDE	2.2045			
UNKNOWN	0.4190			
Site Total	86,194.8644	3		
SWISS CHARD				
ABAMECTIN	0.2991	7	30.17	A
ACETAMIPRID	0.5353	3	13.39	A
ALPHA-ALKYL (C12-C14)-OMEGA-HYDROXYPOLY (OXYETHYLENE)	50.9940	34	148.16	A
AZADIRACHTIN	0.8191	19	64.95	A
BACILLUS THURINGIENSIS (BERLINER), SUBSP. AIZAWAI, SEROTYPE H-7	4.6666	13	41.41	A
BACILLUS THURINGIENSIS, SUBSP. AIZAWAI, STRAIN ABTS-1857	10.6704	4	16.08	A
BACILLUS THURINGIENSIS (BERLINER), SUBSP. KURSTAKI, STRAIN SA-11	6.6780	6	20.84	A
BENTONITE	1.6560	1	3.68	A
CASEIN	0.1242	1	3.68	A

Commodity Chemical	Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
SWISS CHARD				
CHLORANTRANILIPROLE	0.2351	1	4.35	A
CHLOROTHALONIL	1.0525	1	1.00	A
CLARIFIED HYDROPHOBIC EXTRACT OF NEEM OIL	38.7850	29	94.88	A
CYCLOATE	15.0474	1	5.04	A
CYFLUTHRIN	0.8386	5	17.27	A
BETA-CYFLUTHRIN	0.3234	3	15.20	A
CYPERMETHRIN	2.2622	5	33.80	A
(S)-CYPERMETHRIN	0.5587	4	15.00	A
CYROMAZINE	6.0610	13	50.68	A
DIAZINON	2.9874	2	6.00	A
DIMETHOATE	4.7583	3	15.43	A
DIMETHYLPOLYSILOXANE	3.0289	5	25.20	A
EMAMECTIN BENZOATE	0.4063	10	46.48	A
FATTY ACIDS DERIVED FROM TALLOW	20.3976	34	148.16	A
FLONICAMID	2.3300	7	31.08	A
FOSETYL-AL	2.4000	1	3.00	A
GLYPHOSATE, ISOPROPYLAMINE SALT	1.2014	1	5.35	A
GLYPHOSATE, MONOAMMONIUM SALT	0.1095	1	5.35	A
IMIDACLOPRID	0.9542	4	18.25	A
INDOXACARB	4.5810	16	70.98	A
LACTOSE	0.1242	1	3.68	A
MALATHION	39.2900	20	46.76	A
MEFENOXAM	0.7157	2	5.46	A
MEFENOXAM, OTHER RELATED	0.0210	2	5.46	A
METHOXYFENOZIDE	16.4687	24	105.84	A
METHYLATED SOYBEAN OIL	11.0370	9	35.15	A
S-METOLACHLOR	1.0640	1	3.57	A
ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE)	53.0634	43	183.31	A
PERMETHRIN	4.9175	8	29.12	A
POLYALKENE OXIDE MODIFIED HEPTAMETHYL TRISILOXANE	0.5518	9	35.15	A
POLY-I-PARA-MENTHENE	0.4658	1	4.00	A
POLYOXYETHYLENE POLYOXYPROPYLENE	1.0096	5	25.20	A
POTASH SOAP	483.4640	31	121.94	A
PYMETROZINE	0.2613	1	3.04	A
PYRACLOSTROBIN	12.7000	16	69.33	A
PYRETHRINS	2.9080	22	74.76	A
QST 713 STRAIN OF DRIED BACILLUS SUBTILIS	8.7513	3	16.05	A
ROTENONE	0.0049	1	1.00	A
ROTENONE, OTHER RELATED	0.0049	1	1.00	A
SPINETORAM	2.8974	16	61.01	A
SPINOSAD	5.3452	23	72.08	A
SULFUR	132.6480	21	76.65	A
TEBUFENOZIDE	3.6810	7	28.00	A
THIAMETHOXAM	1.2125	9	40.51	A
THIRAM	1.0513		421.08	P
Site Total	968.4197	412		
TANGELO				
ABAMECTIN	0.1481	1	10.00	A
CHLORPYRIFOS	35.0173	1	10.00	A
MINERAL OIL	480.0079	1	10.00	A
Site Total	515.1733	3		
TANGERINE				
ABAMECTIN	2.5814	24	1,218.00	A
ALUMINUM PHOSPHIDE	0.2400	1	1.00	A
BENTONITE	33.3000	2	61.00	A
CALCIUM HYDROXIDE	2.7600	1	1.00	A
CASEIN	1.4715	2	61.00	A
CHLORPYRIFOS	510.4997	14	676.33	A
COPPER HYDROXIDE	125.8530	3	121.00	A
2,4-D, DIMETHYLAMINE SALT	326.1291	84	4,808.00	A
DINOSEB	1.1006	5	375.00	A
DIPHACINONE	0.0213	3	305.00	A
FATTY ACIDS, MIXED	6.9747	33	1,496.92	A

Commodity	Chemical	Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
TANGERINE					
	GIBBERELLINS	5.7189	15	920.00	A
	GLYPHOSATE, ISOPROPYLAMINE SALT	1,167.0908	129	5,881.74	A
	GLYPHOSATE, POTASSIUM SALT	2,160.4795	45	848.72	A
	IMIDACLOPRID	82.4321	6	297.00	A
	LACTOSE	2.2275	2	61.00	A
	METALDEHYDE	43.5100	4	179.00	A
	MINERAL OIL	6,992.2990	28	1,706.00	A
	MODIFIED PHTHALIC GLYCEROL ALKYD RESIN	102.8902	15	920.00	A
	ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE)	34.8734	33	1,496.92	A
	NORFLURAZON	5.6249	4	47.50	A
	PETROLEUM HYDROCARBONS	7.9168	4	300.00	A
	PETROLEUM OIL, UNCLASSIFIED	959.7160	7	180.00	A
	POLYACRYLAMIDE POLYMER	1.0689	55	3,309.00	A
	POLYETHYLENE GLYCOL MONO(3-(TETRAMETHYL-1-(TRIMETHYLSILOXY)DISILOXANYL)PROPYL)ETHER	3.1456	1	11.00	A
	POLYSACCHARIDE POLYMER	1.8604	3	114.00	A
	SIMAZINE	13.5845	4	43.50	A
	SPINOSAD	2.2586	3	13.00	A
	UREA INCLUSION ADDUCT OF POLYOXY(ETHYLENE)/POLYOXY (PROPYLENE) BLOCK COPOLYMER	4.2300	1	75.00	A
	Site Total	12,601.8584	490		
TARRAGON					
	AZADIRACHTIN	0.0509	3	2.11	A
	AZOXYSTROBIN	0.2437	1	0.80	A
	CLARIFIED HYDROPHOBIC EXTRACT OF NEEM OIL	5.3136	2	1.45	A
	CYPRODINIL	0.3446	2	0.80	A
	FLUDIOXONIL	0.2297	2	0.80	A
	IMIDACLOPRID	0.4140	8	4.81	A
	MEFENOXAM	0.1503	1	0.20	A
	PYRETHRINS	0.0057	2	0.88	A
	ROTENONE	0.0048	2	0.88	A
	ROTENONE, OTHER RELATED	0.0048	2	0.88	A
	SPINOSAD	0.4717	3	2.44	A
	Site Total	7.2338	22		
THYME					
	IMIDACLOPRID	0.2526	4	2.25	A
	Site Total	0.2526	4		
TOMATO					
	ABAMECTIN	4.9678	15	284.50	A
	ACETAMIPRID	4.0688	7	50.00	A
	ALPHA-ALKYL (C12-C14)-OMEGA-HYDROXYPOLY (OXYETHYLENE)	268.3860	52	1,734.00	A
	AMMONIUM SULFATE	26.9999	8	109.99	A
	AZADIRACHTIN	237.9509	129	9,408.20	A
		0.0557	1	52,272.00	S
	TOTAL POUNDS OF THIS CHEMICAL 238.0066				
	AZOXYSTROBIN	77.2455	25	786.70	A
		0.1200	1	52,272.00	S
	TOTAL POUNDS OF THIS CHEMICAL 77.3655				
	BACILLUS PUMILUS, STRAIN QST 2808	2.4007	1	20.00	A
	BACILLUS THURINGIENSIS, SUBSP. AIZAWAI, STRAIN ABTS-1857	3,309.6600	158	5,968.00	A
		0.6480	1	52,272.00	S
	TOTAL POUNDS OF THIS CHEMICAL 3,310.3080				
	BACILLUS THURINGIENSIS (BERLINER), SUBSP. KURSTAKI, STRAIN SA-11	3,624.8250	35	2,843.00	A
	BIFENAZATE	18.2058	6	119.60	A
	BOSCALID	667.3205	28	1,225.00	A
	BUPROFEZIN	148.1834	31	476.00	A
	CARBARYL	0.1000	1	4.00	A
	CHLORANTRANILIPROLE	5.7945	5	95.00	A

Commodity	Chemical		Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
TOMATO						
	CHLOROPICRIN		59,609.9020	19	1,011.54	A
	CHLOROTHALONIL		12,158.1497	127	6,556.70	A
			5.0337	1	52,272.00	S
	TOTAL POUNDS OF THIS CHEMICAL	12,163.1834				
	CITRIC ACID		1.5122	8	109.99	A
	CLARIFIED HYDROPHOBIC EXTRACT OF NEEM OIL		27,407.5874	122	8,653.00	A
	COCONUT DIETHANOLAMIDE		2.6003	19	640.00	A
	COPPER HYDROXIDE		7,997.7567	149	10,309.40	A
			0.8298	2	104,544.00	S
	TOTAL POUNDS OF THIS CHEMICAL	7,998.5865				
	COPPER OXIDE (OUS)		77.4680	3	44.00	A
	COPPER SALTS OF FATTY AND ROSIN ACIDS		213.8666	6	135.00	A
	COPPER SULFATE (BASIC)		0.0199	1	52,272.00	S
	BETA-CYFLUTHRIN		0.5137	2	28.00	A
	CYMOXANIL		129.9375	27	1,038.50	A
	CYPERMETHRIN		1.4901	1	30.00	A
	(S)-CYPERMETHRIN		91.2843	36	1,835.50	A
	CYROMAZINE		63.4425	9	509.00	A
	DIAZINON		331.3958	4	83.50	A
	1,3-DICHLOROPROPENE		30,818.6899	9	374.10	A
	DICLORAN		7.5000	1	20.00	A
	DIMETHOMORPH		98.7619	23	828.00	A
	DIMETHYLPOLYSILOXANE		267.9496	233	10,086.70	A
			0.0184	4	156,817.20	S
	TOTAL POUNDS OF THIS CHEMICAL	267.9680				
	DINOTEFURAN		62.2423	12	406.50	A
	DODECYLBENZENE SULFONIC ACID		11.2678	19	640.00	A
	EDTA, TETRASODIUM SALT		0.6934	19	640.00	A
	EMAMECTIN BENZOATE		5.8025	8	453.00	A
	ESFENVALERATE		24.6240	15	504.00	A
	FAMOXADONE		129.9375	27	1,038.50	A
	FATTY ACIDS, MIXED		8.5217	11	868.00	A
	FATTY ACIDS DERIVED FROM TALLOW		107.3544	52	1,734.00	A
	FENAMIDONE		7.4812	1	29.00	A
	FENHEXAMID		193.1500	15	256.40	A
	FENPROPATHRIN		22.4717	4	115.00	A
	FLONICAMID		17.9350	5	205.00	A
	GLYPHOSATE		127.3930	4	34.99	A
	GLYPHOSATE, DIAMMONIUM SALT		39.3628	1	15.00	A
	GLYPHOSATE, ISOPROPYLAMINE SALT		1,626.7990	1	30.00	A
	HYDROGEN PEROXIDE		5,613.0441	35	3,115.00	A
	IMIDACLOPRID		779.2310	54	2,811.00	A
			0.0321	1	1.20	S
	TOTAL POUNDS OF THIS CHEMICAL	779.2631				
	INDOXACARB		20.6160	10	340.00	A
	ISOPROPYL ALCOHOL		157.5071	155	6,569.90	A
			0.3798	4	156,817.20	S
	TOTAL POUNDS OF THIS CHEMICAL	157.8869				
	ISOPROPYLAMINE DODECYLBENZENE SULFONATE		0.6773	9	134.99	A
	LECITHIN		198.8397	11	868.00	A
	MANEB		1,299.8572	29	954.50	A
	MEFENOXAM		242.8002	45	1,139.80	A
	MEFENOXAM, OTHER RELATED		7.1431	45	1,139.80	A
	METALAXYL		0.6300	4	4.00	A
	METAM-SODIUM		13.3580	1	100.00	A
	METHOMYL		24.6643	1	20.00	A
	METHOXYFENOZIDE		537.1510	46	2,423.50	A
	METHYL BROMIDE		33,282.0000	6	452.00	A
	S-METOLACHLOR		1.5723	1	5.00	A
	METRIBUZIN		89.6250	4	201.00	A
	MINERAL OIL		1,607.1975	9	164.00	A
	MYCLOBUTANIL		258.4440	52	2,584.50	A
	NAPROPAMIDE		9.8750	3	10.00	A
	ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE)		2,100.6996	199	8,531.90	A
			4.3977	4	156,817.20	S
	TOTAL POUNDS OF THIS CHEMICAL	2,105.0973				

Commodity	Chemical		Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
TOMATO						
	ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE), PHOSPHATE ESTER		12.9339	3	65.00	A
	OXAMYL		2,778.7242	57	3,370.00	A
	PARAQUAT DICHLORIDE		338.6059	16	427.99	A
	PERMETHRIN		100.5695	10	504.00	A
	PETROLEUM DISTILLATES, REFINED		112.5909	1	16.00	A
	PETROLEUM OIL, PARAFFIN BASED		110.2316	9	134.99	A
	PHOSPHORIC ACID		10.5736	27	749.99	A
	BETA-PINENE POLYMER		0.6384	1	1.50	A
	PIPERONYL BUTOXIDE		4,624.1330	120	8,848.70	A
			0.0042	1	52,272.00	S
	TOTAL POUNDS OF THIS CHEMICAL	4,624.1372				
	PIPERONYL BUTOXIDE, OTHER RELATED		1,156.0333	120	8,848.70	A
			0.0011	1	52,272.00	S
	TOTAL POUNDS OF THIS CHEMICAL	1,156.0344				
	POLYACRYLIC POLYMER		0.7561	8	109.99	A
	POLYALKENE OXIDE MODIFIED HEPTAMETHYL TRISILOXANE		13.0412	1	25.00	A
	POLYETHYLENE GLYCOL		973.1040	136	5,929.90	A
			2.3987	4	156,817.20	S
	TOTAL POUNDS OF THIS CHEMICAL	975.5027				
	POLY-I-PARA-MENTHENE		4,387.7427	163	12,973.00	A
	POLYOXYETHYLENE POLYOXYPROPYLENE		313.4479	95	4,061.80	A
	POLYOXYETHYLENE SORBITAN MONOOLEATE		2.7093	9	134.99	A
	POLYOXYETHYLENE SORBITAN TRIOLEATE		17.8363	9	134.99	A
	POTASH SOAP		58.2952	3	53.50	A
			9.9939	1	52,272.00	S
	TOTAL POUNDS OF THIS CHEMICAL	68.2891				
	POTASSIUM BICARBONATE		1,608.8400	16	654.00	A
			15.3000	3	156,816.00	S
	TOTAL POUNDS OF THIS CHEMICAL	1,624.1400				
	PROPAMOCARB HYDROCHLORIDE		508.6070	24	654.00	A
	PROPIONIC ACID		198.8397	11	868.00	A
	PYMETROZINE		57.5547	19	266.50	A
	PYRACLOSTROBIN		367.8500	35	1,865.50	A
	PYRETHRINS		592.3514	138	9,112.30	A
			0.1460	4	209,088.00	S
	TOTAL POUNDS OF THIS CHEMICAL	592.4974				
	PYRIMETHANIL		12.5380	5	84.70	A
			0.3582	2	104,544.00	S
	TOTAL POUNDS OF THIS CHEMICAL	12.8962				
	PYRIPROXYFEN		16.7025	8	247.50	A
	QST 713 STRAIN OF DRIED BACILLUS SUBTILIS		312.5860	26	772.00	A
			0.4145	1	1.20	S
	TOTAL POUNDS OF THIS CHEMICAL	313.0005				
	ROTENONE		0.0889	3	3.60	A
			0.0117	1	52,272.00	S
	TOTAL POUNDS OF THIS CHEMICAL	0.1006				
	ROTENONE, OTHER RELATED		0.0889	3	3.60	A
			0.0117	1	52,272.00	S
	TOTAL POUNDS OF THIS CHEMICAL	0.1006				
	SILICONE DEFOAMER		0.2947	19	640.00	A
	SODIUM XYLENE SULFONATE		3.4670	19	640.00	A
	SPINETORAM		185.0701	60	2,864.50	A
	SPINOSAD		60.0602	17	483.50	A
	SPIROMESIFEN		169.7472	27	1,291.00	A
	SPIROTETRAMAT		2.0313	7	215.00	A
	STREPTOMYCES LYDICUS WYEC 108		0.2919	30	1,049.00	A
	SULFUR		14,554.0000	39	1,827.50	A
	TEBUFENOZIDE		26.5531	9	172.60	A
	ALPHA-[PARA-(1,1,3,3-TETRAMETHYLBUTYL)PHENYL]- OMEGA-HYDROXYPOLY(OXYETHYLENE)		13.2093	19	640.00	A
	TETRAPOTASSIUM PYROPHOSPHATE		1.7335	19	640.00	A
	THIAMETHOXAM		2.8125	1	60.00	A
	THIRAM		128.9634		106,501.25	P
			6.3336		3.34	T
	TOTAL POUNDS OF THIS CHEMICAL	135.2970				

Commodity Chemical	Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
TOMATO				
TRIETHANOLAMINE	4.4204	19	640.00	A
TRIFLURALIN	210.4490	7	293.00	A
Site Total	230,403.5121	2,401		
TROPICAL/SUBTROPICAL FRUIT				
GLYPHOSATE, ISOPROPYLAMINE SALT	10.0120	1	10.00	A
Site Total	10.0120	1		
TURF/SOD				
ALKYL (C8,C10) POLYGLYCOSIDE	0.8305	1	92.50	A
ALMOND, BITTER	0.0012	1	37,000.00	S
ALUMINUM PHOSPHIDE	23.2106	5	371.45	A
4-AMINOPYRIDINE	0.0781	1	130,000.00	S
ATRAZINE	5.0550	2	5.18	A
ATRAZINE, OTHER RELATED	0.1068	2	5.18	A
CARBO METHOXY ETHER CELLULOSE, SODIUM SALT	0.2131	1	37,000.00	S
CARFENTRAZONE-ETHYL	23.2089	71	1,502.85	A
CHLORANTRANILIPROLE	23.0078	17	420.72	A
CHLOROPICRIN	2,189.6875	5	31.85	A
CHLOROTHALONIL	47.9400		8.00	A
CORN GLUTEN MEAL	0.2438	1	130,000.00	S
2,4-D, DIMETHYLAMINE SALT	277.2214	29	727.41	A
2,4-D, 2-ETHYLHEXYL ESTER	450.8538	71	1,502.85	A
DICAMBA	30.5127	74	1,537.85	A
DICAMBA, DIMETHYLAMINE SALT	17.2814	25	599.91	A
DIQUAT DIBROMIDE	2.1070	2	204.00	A
ETHEPHON	17.9669	1	203.00	A
ETHOFUMESATE	141.8592	15	143.56	A
FATTY ACIDS, MIXED	0.4120	2	25.50	A
FENUGREEK	0.1279	1	37,000.00	S
FLUROXYPYR, 1-METHYLHEPTYL ESTER	2.4702	3	35.00	A
FORAMSULFURON	1.6206	4	56.01	A
GLYPHOSATE, DIAMMONIUM SALT	238.7861	7	71.84	A
GLYPHOSATE, ISOPROPYLAMINE SALT	2,058.4985	12	458.00	A
HALOSULFURON-METHYL	0.1337	7	2.19	A
ISOPROPYL ALCOHOL	8.8354	5	46.34	A
LAMBDA-CYHALOTHRIN	26.7635	37	821.48	A
LECITHIN	18.5833	3	118.00	A
MANCOZEB	16,229.8390	112	1,812.23	A
MANEB	8,497.5781	83	751.05	A
MCPP, DIMETHYLAMINE SALT	94.2215	24	580.43	A
MCPP-P, DIMETHYLAMINE SALT	3.7309	1	19.48	A
MECOPROP-P	114.3252	71	1,502.85	A
MEFENOXAM	1,022.2769	92	2,066.17	A
MEFENOXAM, OTHER RELATED	33.5960	92	2,066.17	A
METHYL BROMIDE	6,569.0625	5	31.85	A
S-METOLACHLOR	9.8687	2	5.18	A
MSMA	1.6868	1	1.00	A
NAPROPAMIDE	110.1100	3	20.02	A
ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE)	33.0264	7	71.84	A
OXADIAZON	1,734.3100	27	648.12	A
PACLOBUTRAZOL	0.4703		3.00	A
PENDIMETHALIN	1.0938	1	200.00	A
POLYSILOXANE	0.0332	1	92.50	A
POTASSIUM HYDROXIDE	0.9733	1	92.50	A
POTASSIUM PEROXYMONOSULFATE	94.1265	1	29.25	A
PRODIAMINE	5.5888	1	200.00	A
PROPICONAZOLE	958.5612	115	2,280.20	A
PROPIONIC ACID	16.2580	3	118.00	A
PROPYLENE GLYCOL	0.5212	1	37,000.00	S
PROPYZAMIDE	154.1261	31	132.34	A
QUINCLORAC	1.5000		2.86	A
SUGAR	0.2131	1	37,000.00	S
TALL OIL	2.3251	5	46.34	A
THIOPHANATE	0.1563	1	130,000.00	S

Commodity	Chemical	Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
TURF/SOD					
	TRICLOPYR, BUTOXYETHYL ESTER	248.4472	13	522.22	A
	TRICLOPYR, TRIETHYLAMINE SALT	238.5906	11	134.99	A
	TRIFLOXYSULFURON-SODIUM	0.0000	1	1.00	A
	TRINEXAPAC-ETHYL	0.6328	1	202.86	A
	ALPHA-UNDECYL-OMEGA-HYDROXYPOLY(OXYETHYLENE)	9.9656	1	92.50	A
	VANILLIN	0.0198	1	37,000.00	S
	Site Total	41,794.8518	720		
TURNIP					
	ALPHA-ALKYL (C12-C14)-OMEGA-HYDROXYPOLY (OXYETHYLENE)	32.1303	30	124.09	A
	CHLORTHAL-DIMETHYL	264.5625	20	32.71	A
	CYFLUTHRIN	3.1309	16	68.04	A
	BETA-CYFLUTHRIN	0.2803	4	14.16	A
	EMAMECTIN BENZOATE	0.7935	10	39.56	A
	FATTY ACIDS DERIVED FROM TALLOW	12.8521	30	124.09	A
	IMIDACLOPRID	3.3788	16	63.01	A
	INDOXACARB	4.9080	17	74.84	A
	MEFENOXAM	9.2726	8	18.72	A
	MEFENOXAM, OTHER RELATED	0.2727	8	18.72	A
	ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE)	32.1303	30	124.09	A
	PYRACLOSTROBIN	7.7560	11	46.94	A
	SPINETORAM	0.5320	4	11.80	A
	THIRAM	254.6898		44,885.87	P
		1.0844		0.21	T
	TOTAL POUNDS OF THIS CHEMICAL 255.7742				
	Site Total	627.7742	136		
UNCULTIVATED AG					
	ALPHA-ALKYL (C12-C14)-OMEGA-HYDROXYPOLY (OXYETHYLENE)	0.8292	1	3.00	A
	ALUMINUM PHOSPHIDE	2.3272	14	5.70	A
	AMMONIUM PROPIONATE	0.5150	1	1.50	A
	AMMONIUM SULFATE	311.3888	12	150.10	A
	N,N-BIS-(2-OMEGA-HYDROXYPOLY(OXYETHYLENE)ETHYL) ALKYLAMINE, ALKYL DERIVED FROM TALLOW FATTY ACIDS	3.4190	1	12.00	A
	CHLOROPICRIN	3,095.4200	1	32.93	A
	CITRIC ACID	0.2575	1	1.50	A
	2,4-D, ALKANOLAMINE SALTS (ETHANOL AND ISOPROPANOL AMINES)	2.9180	1	7.50	A
	DIPHACINONE	0.0064	3	16.50	A
	EPTC	8.7170	3	2.00	A
	FATTY ACIDS, METHYL ESTERS	12.7643	1	12.00	A
	FATTY ACIDS DERIVED FROM TALLOW	0.3317	1	3.00	A
	FLUMIOXAZIN	24.9747	15	130.50	A
	GLYPHOSATE, ISOPROPYLAMINE SALT	445.9281	13	165.89	A
	GLYPHOSATE, POTASSIUM SALT	804.7325	24	170.20	A
	LECITHIN	2.5906	2	14.50	A
	METALDEHYDE	0.4800	1	1.50	A
	4-NONYLPHENOL, FORMALDEHYDE RESIN, PROPOXYLATED	4.3307	1	12.00	A
	ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE)	1.5693	3	17.50	A
	ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE), PHOSPHATE ESTER	0.1288	1	1.50	A
	OXYFLUORFEN	0.7999	1	2.00	A
	PARAQUAT DICHLORIDE	55.0397	5	52.00	A
	POLYACRYLAMIDE, POLYETHYLENE GLYCOL MIXTURE	0.2715	1	12.00	A
	POLYBUTENES	2.2793	1	12.00	A
	PROPIONIC ACID	2.5906	2	14.50	A
	SODIUM POLYACRYLATE	0.1622	1	1.50	A
	SULFAQUINOXALINE	0.0063	1	7.50	A
	WARFARIN	0.0063	1	7.50	A
	Site Total	4,784.7846	99		

Commodity Chemical		Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
UNCULTIVATED NON-AG					
ALUMINUM PHOSPHIDE		0.5625	1	0.25	A
GLYPHOSATE, ISOPROPYLAMINE SALT		330.2621	23	169.81	A
GLYPHOSATE, POTASSIUM SALT		8.2775	1	5.00	A
SODIUM CHLORITE		2.5244	1	23.00	A
STRYCHNINE		0.0310	2	29.00	A
Site Total		341.6575	28		
UNKNOWN					
ACEPHATE		117.0825	2	134.00	A
ALUMINUM PHOSPHIDE		13.8000	4	40.00	A
		0.6000		20,000.00	S
TOTAL POUNDS OF THIS CHEMICAL	14.4000				
BACILLUS THURINGIENSIS (BERLINER), SUBSP. AIZAWAI, SEROTYPE H-7		0.2582	1	1.83	A
BIFENTHRIN		0.3416	1	10.00	A
2,4-D, DIMETHYLAMINE SALT		11.6151	5	45.00	A
DICAMBA		1.2047	5	45.00	A
DIMETHOATE		82.0312	3	164.00	A
DIPHACINONE		0.0006		100.00	S
DIQUAT DIBROMIDE		0.1946	1	10.00	A
DITHIOPYR		0.7500		3.00	A
ETHEPHON		17.9669		180,000.00	S
		9.9816		3.00	A
TOTAL POUNDS OF THIS CHEMICAL	27.9485				
FLUROXYPYR, 1-METHYLHEPTYL ESTER		1.7336	5	45.00	A
IPRODIONE		11.9241		90,000.00	S
LECITHIN		15.3782	3	164.00	A
MEFLUIDIDE, DIETHANOLAMINE SALT		0.3641		3.00	A
ALPHA-(PARA-NONYLPHENYL)-OMEGA-HYDROXYPOLY (OXYETHYLENE)		4.3938	3	164.00	A
PACLOBUTRAZOL		0.8779		3.00	A
PROPICONAZOLE		3.2272		90,000.00	S
PROPIONIC ACID		15.3782	3	164.00	A
QUINCLORAC		0.7500		3.00	A
SIDURON		6.8750		5.00	A
THIRAM		22.6842		9,085.13	P
TRINEXAPAC-ETHYL		1.1735		261,540.00	S
Site Total		340.5868	20		
VEGETABLE					
THIRAM		111.4445		44,634.63	P
		14.4765		2.89	T
TOTAL POUNDS OF THIS CHEMICAL	125.9210				
Site Total		125.9210			
VERTEBRATE CONTROL					
ALKYL (60%C14, 30%C16, 5%C12, 5%C18) DIMETHYLBENZYL AMMONIUM CHLORIDE		0.5000			
ALKYL (68%C12, 32%C14) DIMETHYLETHYLBENZYL AMMONIUM CHLORIDE		0.5000			
ALUMINUM PHOSPHIDE		18.2721			
		0.0344	1	6.00	U
TOTAL POUNDS OF THIS CHEMICAL	18.3065				
BIFENTHRIN		0.6469			
BORAX		0.5893			
BROMADIOLONE		0.0008			
CARFENTRAZONE-ETHYL		0.0882			
DELTAMETHRIN		0.0002			
DICAMBA		0.4945			
DIPHACINONE		0.0398			
DIQUAT DIBROMIDE		0.0082			
FORAMSULFURON		0.0116			
GLYPHOSATE, ISOPROPYLAMINE SALT		75.4385			
GLYPHOSATE, MONOAMMONIUM SALT		46.5716			
MCPA, 2-ETHYL HEXYL ESTER		7.7169			

Commodity Chemical		Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
VERTEBRATE CONTROL					
MECOPROP-P		0.9908			
PHOSPHORIC ACID		9.0000			
STRYCHNINE		0.0420			
TRIFLOXYSTROBIN		1.0000			
Site Total		161.9458	1		
WATER (INDUSTRLIAL)					
ALKYL(42%C12, 26%C18, 15%C14, 8%C16, 5%C10, 4%C8)1, 3-PROPYLENEDIAMINE		7,592.5052		9.00	A
		2,319.1800		2.00	U
TOTAL POUNDS OF THIS CHEMICAL	9,911.6852				
1-BROMO-3-CHLORO-5,5-DIMETHYL HYDANTOIN		33.6000		7.00	U
		3.0000		5.00	A
TOTAL POUNDS OF THIS CHEMICAL	36.6000				
5-CHLORO-2-METHYL-4-ISOTHIAZOLIN-3-ONE		3.6145		7.00	A
		0.5660		6.00	U
TOTAL POUNDS OF THIS CHEMICAL	4.1805				
2,2-DIBROMO-3-NITRILOPROPIONAMIDE		272.8073		11.00	A
		71.8826		3.00	U
TOTAL POUNDS OF THIS CHEMICAL	344.6899				
1,3-DICHLORO-5,5-DIMETHYLHYDANTOIN		15.3440		7.00	U
		1.3700		5.00	A
TOTAL POUNDS OF THIS CHEMICAL	16.7140				
1,3-DICHLORO-5-ETHYL-5-METHYLHYDANTOIN		5.9360		7.00	U
		0.5300		5.00	A
TOTAL POUNDS OF THIS CHEMICAL	6.4660				
DIOCTYL DIMETHYL AMMONIUM CHLORIDE		57.7332		3.00	A
GLUTARALDEHYDE		10,104.6723		722.00	A
		1,720.1450		4.00	U
TOTAL POUNDS OF THIS CHEMICAL	11,824.8173				
1-(2-HYDROXYETHYL)-2-ALKYL-2-IMIDAZOLINE, ALKYL DERIVED FROM TALL OIL FATTY ACIDS		19.1590		1.00	U
2-METHYL-4-ISOTHIAZOLIN-3-ONE		1.2699		7.00	A
		0.1989		6.00	U
TOTAL POUNDS OF THIS CHEMICAL	1.4688				
POLY(OXYETHYLENE) (DIMETHYLIMINO) ETHYLENE (DIMETHYLIMINO) ETHYLENE DICHLORIDE		317.3880		4.00	A
		158.6940		2.00	U
TOTAL POUNDS OF THIS CHEMICAL	476.0820				
SODIUM BROMIDE		863.0513		37.00	A
		571.0490		20.00	U
TOTAL POUNDS OF THIS CHEMICAL	1,434.1003				
SODIUM HYPOCHLORITE		594.6919		37.00	A
		393.4855		20.00	U
TOTAL POUNDS OF THIS CHEMICAL	988.1774				
TETRAKIS (HYDROXYMETHYL) PHOSPHONIUM SULFATE		6,423.8757		2.00	A
Site Total		31,545.7493			
WATER AREA					
BACILLUS THURINGIENSIS, SUBSP. ISRAELENSIS, STRAIN AM 65-52		161.4595		234.00	A
COPPER CARBONATE, BASIC		52.3580		12.00	A
COPPER ETHANOLAMINE COMPLEXES, MIXED		12.7650		12.50	A
COPPER SULFATE (PENTAHYDRATE)		78.5976	8	3.20	A
DIQUAT DIBROMIDE		5.5937	1	1.00	A
Site Total		310.7738	9		
WATERCRESS					
ACETAMIPRID		12.6525	16	118.00	A
ALUMINUM PHOSPHIDE		0.0375	1	1.00	A
AZOXYSTROBIN		8.7536	1	54.00	A
BACILLUS THURINGIENSIS, SUBSP. AIZAWAI, STRAIN SD-1372, LEPIDOPTERAN ACTIVE TOXIN(S)		0.0515	1	1.00	A
BACILLUS THURINGIENSIS, SUBSP. KURSTAKI, STRAIN ABTS-351, FERMENTATION SOLIDS AND SOLUBLES		2.1600	2	2.00	A

Department of Pesticide Regulation
2008 Annual Pesticide Use Report Indexed by Commodity
Ventura County

Commodity	Chemical	Pounds Applied	Agricultural Applications	Amount Treated	Unit Type
WATERCRESS					
	CYPRODINIL	5.1563	1	20.00	A
	DIMETHYLPOLYSILOXANE	51.3631	6	251.75	A
	FLUDIOXONIL	3.4375	1	20.00	A
	GLYPHOSATE, ISOPROPYLAMINE SALT	0.4955	1	1.00	A
	IMIDACLOPRID	8.7385	8	191.75	A
	MALATHION	600.4002	103	453.12	A
	PIPERONYL BUTOXIDE	13.5553	7	124.75	A
	PIPERONYL BUTOXIDE, OTHER RELATED	3.3888	7	124.75	A
	POLYOXYETHYLENE POLYOXYPROPYLENE	17.1210	6	251.75	A
	POTASSIUM PEROXYMONOSULFATE	4.3200	1	1.00	A
	PYRETHRINS	1.7751	8	126.75	A
	SPINOSAD	1.7627	3	14.00	A
	Site Total	735.1691	152		
WATERMELON					
	THIRAM	371.7155		264,881.00	P
		8.7012		3.09	T
	TOTAL POUNDS OF THIS CHEMICAL 380.4167				
	Site Total	380.4167			
	Ventura County Total	**6,437,899.1003**	**80,250**		

Appendix

Ojai Valley Organics Recycling Facility (OVORF)

2009 Groundwater Monitoring Report

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SUMMARY

INTRODUCTION:

The 2009 Annual Groundwater Monitoring Report (Report) for the Ojai Valley Organics Recycling Facility (OVORF) is the second triennial monitoring report since the baseline-monitoring Solid Waste Assessment Testing (SWAT) was conducted between August 1998 and July 1999.

The SWAT monitoring program was required by the California Regional Water Quality Control Board (RWQCB) in Cleanup and Abatement Order No. 97-107. The RWQCB Order required groundwater monitoring, which was implemented by Ventura Regional Sanitation District for the Solid Waste Management Department (now IWMD) for meeting the baseline compliance with the monitoring requirements. The RWQCB deemed the SWAT acceptable and complete in a letter to IWMD dated October 19, 1999.

FINDINGS:

Purging and Sampling

Water samples were collected from the two existing groundwater wells on April 15, 2009. An electric submersible pump was used for purging and sampling of the wells.

Temperature, pH, conductivity and apparent color / turbidity were measured and recorded at regular intervals during purging. Static water levels were measured and recorded for each well.

The following table enumerates the actual purge volumes:

DATE	MW - 1 (Gallons)	MW – 5 (Gallons)
April 15, 2009	27 +	30 +

WATER QUALITY DATA

Groundwater samples were collected and analyzed for the constituents specified by Water Resources Division Condition No. 78 – Groundwater Well Monitoring Protocols contained in CUP 4408-2. The attached laboratory data summarizes the results for this monitoring and reporting period.

WATER LEVEL DATA

Water level data was collected from the two monitoring wells. Water levels were taken from established reference points at each well. The elevations of these reference points were used to determine the water surface elevations.

The water surface elevations at MW-1 and MW-5 are 535.40 and 537.40 feet (above mean sea level), respectively. The direction of the groundwater gradient is due westerly, perpendicular to the direction of flow in the Ventura River. The magnitude (or slope) of the water gradient is -0.002352941 ft. per linear foot [i.e., (535.40 – 537.40) ÷ 850], where 850 ft is the distance between MW-1 and MW-5.

The direction and magnitude of the water gradient for this report have remained relatively consistent with the data obtained during the baseline-monitoring period.

CONCLUSION:

Groundwater level and quality data obtained for this 2009 triennial report are consistent with the data gathered during the SWAT baseline monitoring.

Collection of water level data at each well will continue to be monitored and reported to the Water Resources triennially.

Ojai Valley Organics Recycling Facility

Monitoring / Reporting Program
Condition No. 78 of CUP 4408-2

2009 - Third Year
Groundwater Monitoring Results

Triennial Results	Sample Date: April 15, 2009	
CONSTITUENTS	MW - 1 Upgradient Well	MW - 5 Downgradient Well
pH (Field) (pH Units)	7.3	7.5
pH (Lab) (pH Units)	7.3	7.5
EC (Field) (umhos/cm)	690	642
EC (Lab) (umhos/cm)	720	706
Total Alkalinity	223	180
Sulfate	225	243
Chloride	25.9	30.3
Nitrite as N	< 0.05	< 0.05
Nitrate as N	1.00	0.48
TDS	604	600
Ammonia as N *	< 0.01	< 0.01
Organic Nitrogen as N *	< 0.05	< 0.05

Note:
Unit of measurement in mg/L unless noted.
< X denotes result below X, detection limit of reporting.

Appendix

Business Plan, Hazardous Waste Generator & Underground Storage Tank Sites (BWT) Tables

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TA LE A
INACTIVE UNDERGROUND TAN SITES

ID	Site Name	Address	City
D 1381	Wayne J. Adams	154 Ranch Rd.	Casitas Springs
D 168	Robert & Nickey Gregory	829 El Roblar Dr.	Meiners Oaks
D 1207	Jones, Bob	25 Burnham Rd.	Oak View
D 1332	Henry Ronk	85 Monterey Dr.	Oak View
D 1074	Pacific Bell	290 Old Grade Rd.	Oak View
D 1060	Burl Wilson (George Ryan)	520 Ventura Ave.	Oak View
D 884	VC-Fire Protection Dist	15 Kunkle St.	Oak View
D 1255	Bureau Of Reclamation	10175 Santa Ana Rd.	Oak View
D 1256	Bureau Of Reclamation	Sect. 13, Twnshp 4N, R 24	Oak View
D 666	James Kerwin	2153 Valley Meadow Dr.	Oak View
D 670	Oak View Transmissions	501 Ventura Ave.	Oak View
D 1060	Burl Wilson (George Ryan)	520 Ventura Ave.	Oak View
D 671	Margaret Gilbert	820 Ventura Ave.	Oak View
D 1129	Wright, James	880 Ventura Ave.	Oak View
D 690	Moody s Equipment Rental	8990 Ventura Ave.	Oak View
D 512	Orville Stovall	505 Prospect Ave.	Oak View
D 1552	Chevron 9-5273 (Rock Long's)	805 N. Ventura Ave.	Oak View
D 12H	Hummel & Christianson	102 Aliso St.	Ojai
D 1025	Gabriel's	65 Baldwin Rd.	Ojai
D 1299	Adamsons Automotive & Towing	214 Bryant St.	Ojai
D 48	R.R. Looman	405 Bryant St.	Ojai
D 969	Stan Coburn	408 Canada St.	Ojai
D 1041	Ojai Valley School	723 El Paseo Rd.	Ojai
D 1190	Mr. & Mrs. James Loebl	715 El Toro Rd.	Ojai
D 1231	William B Silson, Estate	111 S. Encinal	Ojai
D 189	Ojai Rubbish Disposal	310 Fulton Avenue.	Ojai
D 188	Len Mann	309 Fulton Avenue, C	Ojai
D 1539	Ojai Valley Texaco	110 Ojai Ave.	Ojai
D 1529	USDA Forest Service	723 Ojai Ave.	Ojai
D 1107	Ward, Roy D	310 Foothill Rd.	Ojai
D 187	Nordhoff Foreign Auto Care	309 Fulton Avenue, B	Ojai

ID	Site Name	Address	City
D 1220	Mann s Industrial	309 Fulton Avenue, C	Ojai
D 198	E. Sydney Mercer	1175 Grand Ave.	Ojai
D 1065	Halpern Trust (Space Metals)	3559 Grand Ave.	Ojai
D 1302	Ojai Land Co	2645 Gridley Rd.	Ojai
D 1450	Milagro De Ladera Lp	3185 Hermitage Rd	Ojai
D 341	U.S. Forest Service-Ozena	Hwy 33	Ojai
D 1154	Truesdell, Lynn	3191 Ladera Ranch Rd.	Ojai
D 851	Doreen M. Dye	210 Lomita Ave.	Ojai
D 1009	Caltrans Ojai	1116 Maricopa Hwy.	Ojai
D 1093	Ojai Valley Hospital	1306 Maricopa Hwy.	Ojai
D 342	Nordhoff High School	1401 Maricopa Hwy.	Ojai
D 1245	Rame, Jack Apache Canyon Ranch	31046 Maricopa Hwy.	Ojai
D 1356	Acacias Care Center	601 Montgomery St.	Ojai
D 400	Jones Markland Et Al	76 Oak St.	Ojai
D 402	Remutulah Merali	220 Oak St.	Ojai
D 412	Clark s Ojai Cardlock	304 Ojai Ave.	Ojai
D 1336	Ojai Unified School Dist	414 Ojai Ave.	Ojai
D 971	Goodyear	423 Ojai Ave.	Ojai
D 406	George E. Friend	469 Ojai Ave.	Ojai
D 413	Ojai Valley Ford	821 Ojai Ave.	Ojai
D 864	Peggy Mantz	900 Ojai Ave.	Ojai
D 1180	Fulton Properties(Wayne Wells)	915 Ojai Ave.	Ojai
D 854	Ojai Foreign Auto	996 Ojai Ave.	Ojai
D 1145	Vreeland, James	1023 Ojai Ave.	Ojai
D 956	Soule Golf Course	1033 Ojai Ave.	Ojai
D 408	Aqua-Flo Supply	1940 Ojai Ave.	Ojai
D 409	St. Joseph s Convalescent Hospital	2464 Ojai Ave.	Ojai
D 411	Holve Ranch	2728 Ojai Ave.	Ojai
D 1213	Mandulay, Mike	1020 Ojai Rd.	Ojai
D 1082	VC Fire Station 21	1201 Ojai Rd.	Ojai
D 423	Ryiyerson, Arthur C.	3277 Ojai-Santa Paula Rd.	Ojai
D 422	Happy Valley School	8585 Ojai-Santa Paula Rd.	Ojai
D 1361	Rancho Shangrila	9340 Ojai-Santa Paula Rd.	Ojai
D 1121	Wood, Ed & Wendy	9866 Ojai-Santa Paula Rd.	Ojai
D 1322	Ivan Axelrod	10924 Ojai-Santa Paula Rd.	Ojai
D 431	Live Oak Ranch	1388 Orange Rd.	Ojai
D 521	K-R Citrus 1	4225 Reeves Rd.	Ojai
D 1214	Leibovitch, Harriet	1204 Rice Rd.	Ojai
D 538	USFS/Rose Valley-Helicopter Base	Rose Valley Rd.	Ojai
D 424	Heifman	10652 Santa Paula/Ojai Rd.	Ojai

ID	Site Name	Address	City
D 590	Chase Bros. Dairy 12	201 Signal Street	Ojai
D 591	Ojai (City)	408 Signal Street	Ojai
D 1095	Tomkinson, Bruce	3511 Thacher Rd.	Ojai
D 1345	Thacher School	5025 Thacher Rd.	Ojai
D 659	Carson Farm Supply Inc.	111 Topa Street	Ojai
D 663	Clayton Wright	12745 Tree Ranch Rd.	Ojai
D 776	Fast Gas	11120 Ventura Ave.	Ojai
D 712	Sheriff Substation	402 Ventura St.	Ojai
D 340	U. S. Forest Service	Wheeler Gorge	Ojai
D 346	Clausen Funeral Home/Ojai AMB	310 Matilija St.	Ojai

TA LE
PERMITTED CERTI IED UNI IED PROGRAM AGENCY (CUPA) ACILITIES
(WT LIST)

ile ID	acility	Address	City	Program(s)
FA0005156	Casitas Lake Recreational Area	11311 Santa Ana Rd	Oak View	4105 – Cupa Underground Tanks
FA0004931	CMWD-Main Office & Workshop	1055 Ventura Ave	Oak View	4105 – Cupa Underground Tanks
FA0005064	Arco/Prestige Stations 9612	795 N Ventura Ave	Oak View	4105 – Cupa Underground Tanks
FA0006756	Rock Long's Automotive	800 N Ventura Ave	Oak View	4105 – Cupa Underground Tanks
FA0005402	Shell – Oakview	905 N Ventura Ave	Oak View	4105 – Cupa Underground Tanks
FA0005691	A&I Mini Mart And Gas	246 W El Roblar Dr	Ojai	4105 – Cupa Underground Tanks
FA0004941	Ojai 76 254764	1124 Maricopa Hwy	Ojai	4105 – Cupa Underground Tanks
FA0005099	GSA/Maintenance Site 7	1768 Maricopa Hwy	Ojai	4105 – Cupa Underground Tanks
FA0004930	Ojai Valley Inn-Golf Maint Fac	1203 W Ojai Ave	Ojai	4105 – Cupa Underground Tanks
FA0005024	SBC	202 W Ojai Ave	Ojai	4105 – Cupa Underground Tanks
FA0005214	Ojai Chevron 90478	360 E Ojai Ave	Ojai	4105 – Cupa Underground Tanks
FA0005393	Ultramar Station 3-754	616 E Ojai Ave	Ojai	4105 – Cupa Underground Tanks
FA0005680	Circle K Corporation 1045	11408 Ventura Ave	Ojai	4105 – Cupa Underground Tanks

TA LE C
LEA ING UNDERGROUND UEL TAN SITES

- Leaking Underground fuel tank (LUFT) and voluntary cleanup program (vcp) June 20088– Present (no status designation per property as shown in Table C)

Case	Site Name	Address	City	Status
91081	Mobil Oil SS (Earl s)	246 El Roblar Dr	Meiners Oaks	9
03019	Arco 9612	795 Ventura Ave	Oak View	5C
03024	Shell Oil SS - Oakview	905 Ventura Ave	Oak View	9
04032	Calleguas Municipal Water District	1055 Ventura Ave	Oak View	
85027	Fast Gas	11120 Ventura Ave	Oak View	9
86017	Shell Oil SS - Ventura	905 Ventura Ave	Oak View	9
88016	Thrifty Oil Co SS 207	795 Ventura Ave	Oak View	9
88151	William Robey	501 Ventura Ave	Oak View	9
89023	V-Fire Protection District 23	15 Kunkle	Oak View	9
89036	William Watkins	Prospect St	Oak View	9
89087	Casitas Municipal Water District	1055 Ventura Ave	Oak View	9
89091	B&D Automotive	800 Ventura Ave	Oak View	9
93019	George Ryan	520 Ventura Ave	Oak View	9
96001	Chevron 9-5273	805 Ventura Ave	Oak View	9
96002	Lake Casitas Mobile Home Park	25 Burnham Rd	Oak View	9
96057	Bureau Of Reclamation	10175 Santa Ana Rd	Oak View	9
01008	Doris Bolyard Residence	9599 Ojai-Santa Paula Rd	Ojai	9
03037	Pacific Bell	202 Ojai Ave	Ojai	9
05016	Chevron S/S 9-0478	360 Ojai Ave	Ojai	8
85021	Fast Gas	616 Ojai Ave	Ojai	9
86095	Ojai Valley Imports	996 Ojai Ave	Ojai	5C
87008	G.E. Friend (Deceased)	469 Ojai Ave	Ojai	9
87061	USFS-Wheeler Gorge	1190 Ojai Ave	Ojai	9
88009	Mike Mandolay	821 Ojai Ave	Ojai	9
88049	Hailwood, Inc.	201 Signal St	Ojai	9
88086	Unocal 4764 (Former Tosco - 76 SS)	1124 Maricopa Hwy	Ojai	7
88107	Chevron 9-0478	360 Ojai Ave	Ojai	9
88147	Kwik Serve	110 Ojai Ave	Ojai	7
88187	VCO Road Maintenance	1768 Maricopa Hwy	Ojai	8
89009	Nordhoff High School	1401 Maricopa Hwy	Ojai	9
89033	Holve Ranch	2728 Ojai Ave	Ojai	9
90052	Landis Inc.	304 Ojai Ave	Ojai	9
90109	V-Fire Station 21	1201 Ojai Rd	Ojai	9
90130	Peggy Mantz	900 Ojai Ave	Ojai	9
91078	Goodyear Tire (Ojai)	423 Ojai Ave	Ojai	9
91090	V-Soule Park Golf Course	1033 Ojai Ave	Ojai	9

Case	Site Name	Address	City	Status
92013	Ojai Valley Community Hospital	1306 Maricopa Hwy	Ojai	9
92037	Caltrans Ojai	1116 Maricopa Hwy	Ojai	5C
94001	Tomkinson Residence	3511 Thacher Rd	Ojai	9
94047	Vreeland-Ojai	1023 Ojai Ave	Ojai	9
95154	Fulton Properties Ltd	915 Ojai Ave	Ojai	9
95177	Mandulay Property	1020 Ojai Ave	Ojai	9
96049	Ojai Valley Wastewater Treatment Plant	6363 Ventura Ave	Ojai	9
98015	Tosco 1045 (Circle K)	11408 Ventura Ave	Ojai	3B
98037	Ivan Axelrod Property	10924 Ojai-Santa Paula Rd	Ojai	9
99019	Ojai Unified School Facility	414 Ojai Ave	Ojai	9
99035	Beacon 3754	616 Ojai Ave	Ojai	8
04011	Ojai Valley Inn Golf Course Maintenance	905 Country Club Dr	Ojai	9
04024	Tony s American Gas & Mini Mart	246 El Roblar Dr	Ojai	9
88088	Hummel & Christianson	Aliso St	Ojai	9
88181	Mann Property (Len)	309 Fulton St	Ojai	8
90108	V-Fire Station 22	466 Laluna Ave	Ojai	9
90124	Gabriels Property (Leo)	65 Baldwin Rd	Ojai	5R
92004	Coburn Property (Stan)	408 Canada St	Ojai	7
93020	Jackie H Ranch	3559 Grand Ave	Ojai	9
95002	Truesdell Ranch	3191 Ladera Rd	Ojai	9
95157	Loebl Residence	715 El Toro Rd	Ojai	9
99028	Acacias Care Center	601 Montgomery St	Ojai	9

EY: 1 Lea Confirmation 3A3 Preliminary Site Assessment 5C Site Characterization 5R Remedial Action Plan 7 Remedial Action 8 Monitoring 9 Closed

TA LE D
PERMITTED CUPA ACILITIES, USINESS PLAN HOLDERS (WT LIST)

ile ID	acility	Address	City	Program(s)
FA0007018	Forest Home Ministries-Ojai Valley	655 Burnham Rd	Oak View	4220 - Business Plan
FA0009159	Verizon Wireless Oakview	655-A Burnham Rd	Oak View	4220 - Business Plan
FA0009756	Logsdon s Mobile Radiator	77 Calle Vista Del Monte	Oak View	4220 - Business Plan
FA0009687	Verizon Wireless-Rincon Mtn. Peak	Rincon Mountain	Oak View	4220 - Business Plan
FA0006922	Greg Rents & Equipment Sales	420 N Ventura Ave	Oak View	4220 - Business Plan
FA0005154	CMWD- 1 Chlorination Station	Casitas Vista Rd	Oak View	4220 - Business Plan
FA0005023	SBC	290 Old Grade Rd	Oak View	4220 - Business Plan
FA0006422	David Jury Automotive	222 Riverside Rd	Oak View	4220 - Business Plan
FA0005156	Casitas Lake Recreational Area	11311 Santa Ana Rd	Oak View	4220 - Business Plan
FA0004931	CMWD-Main Office & Workshop	1055 Ventura Ave	Oak View	4220 - Business Plan
FA0006754	Fred s Tire Man	545 N Ventura Ave	Oak View	4220 - Business Plan
FA0005064	Arco/Prestige Stations 9612	795 N Ventura Ave	Oak View	4220 - Business Plan
FA0006756	Rock Long s Automotive	800 N Ventura Ave	Oak View	4220 - Business Plan
FA0006905	Oak View Auto Center	880 N Ventura Ave	Oak View	4220 - Business Plan
FA0005402	Shell-Oakview	905 N Ventura Ave	Oak View	4220 - Business Plan
FA0004945	Ojai Unified School District	413 E Aliso St	Ojai	4220 - Business Plan
FA0004957	Gabriel's Imports	65 W Baldwin Rd	Ojai	4220 - Business Plan
FA0006253	Ojai Printing & Publishing Co.	111 N Blanche St	Ojai	4220 - Business Plan
FA0006906	Full Spectrum Landscape	108 Bryant St A	Ojai	4220 - Business Plan
FA0006720	Doyle s Auto Service	207 Bryant St	Ojai	4220 - Business Plan
FA0004917	Brue s Body Shop	207 Bryant St	Ojai	4220 - Business Plan
FA0004926	Adamson Automotive & Towing	214 S Bryant St	Ojai	4220 - Business Plan
FA0006714	Antrin Enterprises, Inc.	406 Bryant Cir H	Ojai	4220 - Business Plan

ile ID	acility	Address	City	Program(s)
FA0005170	CMP-One-B&B/Bailey Lease	12510 Creek Rd	Ojai	4220 - Business Plan
FA0009421	New Cingular Wireless -DT Ojai	12540 Creek Rd	Ojai	4220 - Business Plan
FA0009691	Verizon Wireless	12550 Creek Rd	Ojai	4220 - Business Plan
FA0005348	Meiners Oaks County Water Dist.	202 W. El Roblar Dr	Ojai	4220 - Business Plan
FA0005431	Meiners Oaks Co Water Dist- 4, 7	202 W. El Roblar Dr	Ojai	4220 - Business Plan
FA0005691	A&I Mini Mart And Gas	246 W. El Roblar Dr	Ojai	4220 - Business Plan
FA0006765	Roland s Smog Check/Automotive	829 W. El Roblar Dr	Ojai	4220 - Business Plan
FA0005089	Mirada-ADP Nesbitt Lease	End Of Koenigstein Rd	Ojai	4220 - Business Plan
FA0005463	Huntsinger – Ojai	1777 Grand Ave	Ojai	4220 - Business Plan
FA0005706	Southern Calif Water Co	2035 Grand Ave	Ojai	4220 - Business Plan
FA0005531	Sespe Lease, Inc.	Hamp Lease-Shallow	Ojai	4220 - Business Plan
FA0007042	Mirada Petro Inc- Mp Lane Fed Lease	Koenigstein Rd	Ojai	4220 - Business Plan
FA0005852	Meiner s Oaks Auto Repair	102 N La Luna Ave	Ojai	4220 - Business Plan
FA0005218	Senior Canyon Mutual Water Co	Ladera (Senior Cyn) Rd	Ojai	4220 - Business Plan
FA0004924	Caltrans-Ojai Maintenance Yard	1116 Maricopa Hwy	Ojai	4220 - Business Plan
FA0004941	Ojai 76 254764	1124 Maricopa Hwy	Ojai	4220 - Business Plan
FA0005872	Royal Cleaners	1205 Maricopa Hwy B	Ojai	4220 - Business Plan
FA0004916	Ojai Valley Community Hospital	1306 Maricopa Hwy	Ojai	4220 - Business Plan
FA0005119	Nordhoff High School	1401 Maricopa Hwy	Ojai	4220 - Business Plan
FA0005099	GSA/Maintenance Site 7	1768 Maricopa Hwy	Ojai	4220 - Business Plan
FA0005298	Topa Topa Ranch & Nursery	600 McAndrew Rd	Ojai	4220 - Business Plan
FA0004932	Les Hink s Automotive	204 E Oak St	Ojai	4220 - Business Plan
FA0010225	Maverick Oil - Ojai Fee Lease	Off Hwy 150	Ojai	4220 - Business Plan
FA0005358	Mirada-Agnew Lease	Off Koenigstein Rd	Ojai	4220 - Business Plan

ile ID	acility	Address	City	Program(s)
FA0009815	Southern Calif. Water Co	1002-A Ojai Ave	Ojai	4220 - Business Plan
FA0005109	Soule Park Golf Course	1033 E Ojai Ave	Ojai	4220 – Business Plan
FA0005167	U S Forest Service	1190 E Ojai Ave	Ojai	4220 - Business Plan
FA0004930	Ojai Valley Inn-Golf Maint Fac	1203 W Ojai Ave	Ojai	4220 - Business Plan
FA0005024	SBC	202 W Ojai Ave	Ojai	4220 - Business Plan
FA0005217	St Joseph s Convalescent Hospital	2464 E Ojai Ave	Ojai	4220 - Business Plan
FA0005248	Holve Ranch	2728 E Ojai Ave	Ojai	4220 - Business Plan
FA0005267	Long Ranches – Ojai	2788 E Ojai Ave	Ojai	4220 - Business Plan
FA0005629	Ojai Valley Cleaners	345 E Ojai Ave	Ojai	4220 - Business Plan
FA0005214	Ojai Chevron 90478	360 E Ojai Ave	Ojai	4220 - Business Plan
FA0005393	Ultramar Station 3-754	616 E Ojai Ave	Ojai	4220 - Business Plan
FA0006270	A Automotive & Mechanical	915 E Ojai Ave	Ojai	4220 - Business Plan
FA0005404	Ojai Ford	987 W Ojai Ave	Ojai	4220 - Business Plan
FA0005356	Ojai Valley Imports	996 E Ojai Ave	Ojai	4220 - Business Plan
FA0009160	Verizon Wireless Ojai Valley	11811 Ojai-Santa Paula Rd	Ojai	4220 - Business Plan
FA0009422	New Cingular Wireless PCS-14619	11818 Ojai/Santa Paula Rd	Ojai	4220 - Business Plan
FA0006761	Lozano s Auto Repair	106 Park Rd	Ojai	4220 - Business Plan
FA0008329	Verizon Wireless	Red Mountain	Ojai	4220 - Business Plan
FA0004918	Ojai Valley School (Upper Campus)	10820 Reeves Rd	Ojai	4220 - Business Plan
FA0005257	Jerry L. Conrow & Company	3359 Reeves Rd	Ojai	4220 - Business Plan
FA0004927	City Of Ojai	408 S Signal St	Ojai	4220 - Business Plan
FA0006801	Nextel Communications	Skunk Ranch Rd	Ojai	4220 - Business Plan
FA0005621	Mirada Petroleum-Hartman Lease	Sulphur Mountain Rd	Ojai	4220 - Business Plan
FA0005359	Restech-Freeman Lease	Sulphur Mountain Rd	Ojai	4220 - Business Plan

ile ID	acility	Address	City	Program(s)
FA0005169	Maverick Oil - Schroeder Lease	Sulphur Mountain Rd	Ojai	4220 - Business Plan
FA0005489	Twin Peaks Ranch	4403 Thacher Rd	Ojai	4220 - Business Plan
FA0005346	The Thacher School, Inc	5025 Thacher Rd	Ojai	4220 - Business Plan
FA0006717	Ojai Valley Sanitary District	1072 Tico Rd	Ojai	4220 - Business Plan
FA0005869	Quality Muffler	1287 S Tico Rd	Ojai	4220 - Business Plan
FA0004942	Verizon Ca Inc.-Topa Lane RSU	12081 Topa Ln	Ojai	4220 - Business Plan
FA0005000	Valley Equipment	11110 N Ventura Ave	Ojai	4220 - Business Plan
FA0005680	Circle K Corporation 1045	11408 Ventura Ave	Ojai	4220 - Business Plan
FA0006286	Ojai Spring Carwash & Co.	11502 N Ventura Ave	Ojai	4220 - Business Plan
FA0004948	Villanova Preparatory School	12096 N Ventura Ave	Ojai	4220 - Business Plan

TA LE E
PERMITTED CUPA ACILITIES, HA ARDOUS WASTE GENERATORS (WT LIST)

ile ID	acility	Address	City	Program(s)
FA0007947	Kell/Simpson Building	108-110 E Portal St	Oak View	4403 – Medical Hazardous Waste/ - Ray
FA0007677	Animal Clinic Of Oak View	600 N Ventura Ave	Oak View	4403 – Medical Hazardous Waste/ - Ray
FA0007522	Matilija Veterinary Hospital	108 Bryant St	Ojai	4403 – Medical Hazardous Waste/ - Ray
FA0007530	Ojai Pet Hospital	1120 Maricopa Hwy	Ojai	4403 – Medical Hazardous Waste/ - Ray
FA0007179	Garber, David, D.D.S.	411 W Ojai Ave	Ojai	4403 - Medical Hazardous Waste/ - Ray
FA0007156	Saeghi, Ali DDS A Prof Corp	603 W Ojai Ave F	Ojai	4403 - Medical Hazardous Waste/ - Ray
FA0007172	Buck, Thomas DDS	115 Pirie Rd G	Ojai	4403 - Medical Hazardous Waste/ - Ray
FA0007147	Rodriguez, Irina E. DDS	117 Pirie Rd A	Ojai	4403 - Medical Hazardous Waste/ - Ray
FA0007170	Harris, Wyatt A. DDS	204 Pirie Rd B	Ojai	4403 - Medical Hazardous Waste/ - Ray
FA0006271	Happy Valley School	8585 Ojai-Santa Paula Rd	Ojai	4406 - Special Hazardous Waste
FA0009756	Logsdon s Mobile Radiator	77 Calle Vista Del Monte	Oak View	4420 - Hazardous Waste Generator
FA0006922	Greg Rents & Equipment Sales	420 N Ventura Ave	Oak View	4420 - Hazardous Waste Generator
FA0008268	Move N Lube	520 N Ventura Ave	Oak View	4420 - Hazardous Waste Generator
FA0005154	CMWD- 1 Chlorination Station	Casitas Vista Rd	Oak View	4420 - Hazardous Waste Generator
FA0006422	David Jury Automotive	222 Riverside Rd	Oak View	4420 - Hazardous Waste Generator
FA0005156	Casitas Lake Recreational Area	11311 Santa Ana Rd	Oak View	4420 - Hazardous Waste Generator
FA0004931	CMWD-Main Office & Workshop	1055 Ventura Ave	Oak View	4420 - Hazardous Waste Generator
FA0006893	K&C Automotive Repair	520 N Ventura Ave	Oak View	4420 - Hazardous Waste Generator

ile ID	acility	Address	City	Program(s)
FA0006754	Fred s Tire Man	545 N Ventura Ave	Oak View	4420 - Hazardous Waste Generator
FA0006315	Headin West	790 Ventura Ave	Oak View	4420 - Hazardous Waste Generator
FA0005064	Arco/Prestige Stations 9612	795 N Ventura Ave	Oak View	4420 - Hazardous Waste Generator
FA0006756	Rock Long s Automotive	800 N Ventura Ave	Oak View	4420 - Hazardous Waste Generator
FA0006905	Oak View Auto Center	880 N Ventura Ave	Oak View	4420 - Hazardous Waste Generator
FA0005402	Shell - Oakview	905 N Ventura Ave	Oak View	4420 - Hazardous Waste Generator
FA0004945	Ojai Unified School District	413 E Aliso St	Ojai	4420 - Hazardous Waste Generator
FA0004957	Gabriel's Imports	65 W Baldwin Rd	Ojai	4420 - Hazardous Waste Generator
FA0006253	Ojai Printing & Publishing Co	111 N Blanche St	Ojai	4420 - Hazardous Waste Generator
FA0006720	Doyle s Auto Service	207 Bryant St	Ojai	4420 - Hazardous Waste Generator
FA0004917	Brue s Body Shop	207 Bryant St	Ojai	4420 - Hazardous Waste Generator
FA0004926	Adamson Automotive & Towing	214 S Bryant St	Ojai	4420 - Hazardous Waste Generator
FA0006714	Antrin Enterprises, Inc.	406 Bryant Cir H	Ojai	4420 - Hazardous Waste Generator
FA0006765	Roland s Smog Check/Automotive	829 W El Roblar Dr	Ojai	4420 - Hazardous Waste Generator
FA0006334	Mosler Rock-Ojai Quarry	Hwy 33	Ojai	4420 - Hazardous Waste Generator
FA0005852	Meiner s Oaks Auto Repair	102 N La Luna Ave	Ojai	4420 - Hazardous Waste Generator
FA0004924	Caltrans-Ojai Maintenance Yard	1116 Maricopa Hwy	Ojai	4420 - Hazardous Waste Generator
FA0004941	Ojai 76 254764	1124 Maricopa Hwy	Ojai	4420 - Hazardous Waste Generator
FA0005872	Royal Cleaners	1205 Maricopa Hwy B	Ojai	4420 - Hazardous Waste Generator
FA0004916	Ojai Valley Community Hospital	1306 Maricopa Hwy	Ojai	4420 - Hazardous Waste Generator
FA0005119	Nordhoff High School	1401 Maricopa Hwy	Ojai	4420 - Hazardous Waste Generator
FA0004932	Les Hink s Automotive	204 E Oak St	Ojai	4420 - Hazardous Waste Generator
FA0005109	Soule Park Golf Course	1033 E Ojai Ave	Ojai	4420 - Hazardous Waste Generator
FA0005167	U S Forest Service	1190 E Ojai Ave	Ojai	4420 - Hazardous Waste Generator

ile ID	acility	Address	City	Program(s)
FA0004930	Ojai Valley Inn-Golf Maint Fac	1203 W Ojai Ave	Ojai	4420 - Hazardous Waste Generator
FA0005629	Ojai Valley Cleaners	345 E Ojai Ave	Ojai	4420 - Hazardous Waste Generator
FA0006270	A Automotive & Mechanical	915 E Ojai Ave	Ojai	4420 - Hazardous Waste Generator
FA0005404	Ojai Ford	987 W Ojai Ave	Ojai	4420 - Hazardous Waste Generator
FA0005356	Ojai Valley Imports	996 E Ojai Ave	Ojai	4420 - Hazardous Waste Generator
FA0006761	Lozano s Auto Repair	106 Park Rd	Ojai	4420 - Hazardous Waste Generator
FA0004927	City Of Ojai	408 S Signal St	Ojai	4420 - Hazardous Waste Generator
FA0005346	The Thacher School, Inc	5025 Thacher Rd	Ojai	4420 - Hazardous Waste Generator
FA0006717	Ojai Valley Sanitary District	1072 Tico Rd	Ojai	4420 - Hazardous Waste Generator
FA0005869	Quality Muffler	1287 S Tico Rd	Ojai	4420 - Hazardous Waste Generator
FA0005000	Valley Equipment	11110 N Ventura Ave	Ojai	4420 - Hazardous Waste Generator
FA0006286	Ojai Spring Carwash & Co.	11502 N Ventura Ave	Ojai	4420 - Hazardous Waste Generator
FA0004948	Villanova Preparatory School	12096 N Ventura Ave	Ojai	4420 - Hazardous Waste Generator

TA LE
INACTIVE HA ARDOUS MATERIAL SITES

ID	Site Name	Address	City	Yor	o
BP 1174	Shozi Brothers Ranch	Santa Clara La. Ave	Oak View	HMD	S28716
BP 1547	Oak View Animal Clinic	376 N Ventura Ave	Oak View	HMD	S28716
BP 1573	Fred s Tire Man	880 N Ventura Ave	Oak View	HMD	S28716
BP 2399	Professional Automotive	501 Ventura Ave, B	Oak View	HMD	S31929
HM 138	Gene s Mobile Repair	32 Burnham Ave	Oak View	HMD	S10110
HM 1554	Fred s Tire Man	880 N Ventura Ave	Oak View	HMD	S30422
HM 1555	Radiator Shop	880 N Ventura Ave, B	Oak View	HMD	S30422
HM 184	Logsdon Mobile Repair	77 Calle Vista Del Monte	Oak View	HMD	S10110
HM 2361	Logsdon s Mobil	520 N Ventura Ave	Oak View	HMD	S31944
HM 2362	Steve s Brakes & Automotive	520 N Ventura Ave	Oak View	HMD	S31944
HM 3497	Fred s Tire Man	545 N Ventura Ave	Oak View	HMD	HMDO
HM 3499	Headin West	790 Ventura Ave	Oak View	HMD	HMDO
HM 3500	Arco/Prestige Stations 9612	795 N Ventura Ave	Oak View	HMD	HMDO
HM 3502	Oak View Auto Center	880 N Ventura Ave	Oak View	HMD	HMDO
HM 3504	CMWD-Main Office & Workshop	1055 Ventura Ave	Oak View	HMD	HMDO
HM 3783	Casitas Lake Recreational Area	11311 Santa Ana Rd	Oak View	HMD	HMDO
HM 3823	Arco/Prestige Stations 9612	795 N Ventura Ave	Oak View	HMD	HMDO
HM 3824	Rock Long s Automotive	800 N Ventura Ave	Oak View	HMD	HMDO
HM 3825	Chevron 95273-Rock Long s	805 N Ventura Ave	Oak View	HMD	HMDO
HM 3826	Shell-Oakview	905 N Ventura Ave	Oak View	HMD	HMDO
HM 3827	CMWD-Main Office & Workshop	1055 Ventura Ave	Oak View	HMD	HMDO
HM 943	Barb s Type House	210 Mountain Ave	Oak View	HMD	S09790
BP 1018	Phil s Auto Service	204 E Oak St	Ojai	HMD	S01134
BP 110	US Forest Service Ozena Fire Station	Highway 33	Ojai	HMD	BPD1
BP 125	Ojai Concrete Company	403 Bryant St	Ojai	HMD	BPD1
BP 1270	Shell Western Prod-Sespe CMP Plant	Squaw Flat Rd	Ojai	HMD	S28716
BP 1381	Rancho Amorita	3935 Thacher Rd	Ojai	HMD	S28716
BP 1512	Tom Walbridge	177 Vega Way	Ojai	HMD	S28716
BP 1714	James M. Hall	2110 Woodland Ave	Ojai	HMD	S31929
BP 1819	Frontier Paint Company	227 Baldwin Rd	Ojai	HMD	BPD1
BP 1830	Ojai Stone Company	108 Bryant St, A	Ojai	HMD	BPD1
BP 1831	Industrial Tools, Inc.	201 Bryant St, A	Ojai	HMD	BPD1
BP 1863	Accurate Auto Repair	246 El Roblar Dr	Ojai	HMD	BPD1
BP 1963	Southern California Water Co.	2215 Grand Ave	Ojai	HMD	BPD2

ID	Site Name	Address	City	Yor	o
BP 1965	Jonathan & Emma Greene	2855 Grand Ave	Ojai	HMD	BPD2
BP 1980	Pagano s Brake & Tune	102 N La Luna Ave	Ojai	HMD	S01132
BP 199	Carson Orchard	966 Carne Rd	Ojai	HMD	BPD2
BP 202	John Delwiche Ranch	7032 Casitas Pass Rd	Ojai	HMD	BPD2
BP 2155	Quality (Todd s) Auto Repair	1287 S Tico Rd	Ojai	HMD	S28716
BP 2199	Kinko s Of Ojai	11420 N Ventura Ave, 106	Ojai	HMD	S28716
BP 2422	Ojai Valley News	408 Bryant Cir, A	Ojai	HMD	S31929
BP 266	Teague Photo Lab	310 Fox St	Ojai	HMD	BPD2
BP 319	Russell & Ruth Kubovec	1605 Daly Rd	Ojai	HMD	BPD2
BP 431	Camp Ramah	385 Fairview Rd	Ojai	HMD	BPD1
BP 450	Coultas Ranch	2251 Fordyce Rd	Ojai	HMD	BPD2
BP 484	Mabelle Mercer	1175 Grand Ave	Ojai	HMD	BPD2
BP 485	Ben Mercer	1215 Grand Ave	Ojai	HMD	BPD2
BP 494	Don B. Low	2735 Grand Ave	Ojai	HMD	BPD2
BP 496	Jackie H. Ranch	3559 Grand Ave	Ojai	HMD	BPD2
BP 625	Roy L. Vantine	2590 Ladera Rd	Ojai	HMD	S01132
BP 626	Hacienda Ranch Co.	2865 Ladera Rd	Ojai	HMD	S01132
BP 642	J&D Ranch-La Luna	211 N La Luna Ave	Ojai	HMD	S01132
BP 643	Brock Ranch	429 S La Luna Ave	Ojai	HMD	S01132
BP 912	Bronk Vreeland Ojai Ford	821 Ojai Ave	Ojai	HMD	S01134
BP 913	Wayne Wells Tire & Auto Service	915 E Ojai Ave	Ojai	HMD	S01134
BP 952	Eaton Ranch	2149 Mcnell Rd	Ojai	HMD	S01134
BP 977	Bedarl Ranch	10883 Oak Knoll Dr	Ojai	HMD	S01134
BP 991	Don Debusschere	9340 Ojai-Santa Paula Rd	Ojai	HMD	S01134
BP 992	James M. Hall - Farm	9505 Ojai-Santa Paula Rd	Ojai	HMD	S01134
BP 1832	Terry s Auto Craft	212 Bryant St	Ojai	HMD	BPD1
HM 106	Hartmann s Tree Farm	207 Boardman Rd	Ojai	HMD	S10110
HM 107	-Medical	970 Boardman Rd	Ojai	HMD	S10110
HM 1135	K-R Citrus 1	4225 Reeves Rd	Ojai	HMD	S10202
HM 1138	Ralph Copus Asphalt	1370 S Rice Rd	Ojai	HMD	S10202
HM 122	Ojai Stone Company	108 Bryant St, A	Ojai	HMD	S10110
HM 123	Industrial Tools, Inc.	201 Bryant St, A	Ojai	HMD	S10110
HM 124	Terry s Auto Craft	212 Bryant St	Ojai	HMD	S10110
HM 1461	Quality (Todd s) Auto Repair	1287 S Tico Rd	Ojai	HMD	S12177
HM 1620	Water Power Industrial Cleaning	11195 N Ventura Ave	Ojai	HMD	S30422
HM 1621	Kinko s Of Ojai	11420 N Ventura Ave, 106	Ojai	HMD	S30422
HM 2271	Ojai Valley News	408 Bryant Cir, A	Ojai	HMD	S31944
HM 2325	Architectural Iron Works	510 E Ojai Ave	Ojai	HMD	S31944
HM 2473	Ojai Unified School District	413 E. Aliso St	Ojai	HMD	HMDO

ID	Site Name	Address	City	Yor	o
HM 2554	Brue s Body Shop	207 Bryant St	Ojai	HMD	HMDO
HM 2555	Doyle s Auto Service	207 Bryant St	Ojai	HMD	HMDO
HM 2557	Behavior Science Technology	417 Bryant Cir	Ojai	HMD	HMDO
HM 2884	Meiner s Oaks Auto Repair	102 N La Luna Ave	Ojai	HMD	HMDO
HM 3097	Caltrans-Ojai Maintenance Yard	1116 Maricopa Hwy	Ojai	HMD	HMDO
HM 3098	Ojai 76 254764	1124 Maricopa Rd	Ojai	HMD	HMDO
HM 3170	Ojai Valley Cleaners	345 E Ojai Ave	Ojai	HMD	HMDO
HM 3171	A Automotive & Mechanical	915 E Ojai Ave	Ojai	HMD	172511
HM 3172	Ojai Valley Inn - Maintenance Facility	1203 Ojai Ave	Ojai	HMD	HMDO
HM 3220	Lozano s Auto Repair	106 Park Rd	Ojai	HMD	HMDO
HM 3302	City Of Ojai	408 S Signal St	Ojai	HMD	HMDO
HM 3465	Quality Muffler	1287 S Tico Rd	Ojai	HMD	HMDO
HM 3466	Quality Muffler	1287 S Tico Rd	Ojai	HMD	HMDO
HM 3685	Tony s American Gas	246 El Roblar Dr	Ojai	HMD	HMDO
HM 3741	Ojai 76 254764	1124 Maricopa Rd	Ojai	HMD	HMDO
HM 3742	GSA/Maintenance Site 7	1768 Maricopa Hwy	Ojai	HMD	HMDO
HM 3756	Ojai Valley Texaco	110 Ojai Ave	Ojai	HMD	HMDO
HM 3758	SBC/Pacific Bell (Kd103)	202 Ojai Ave	Ojai	HMD	HMDO
HM 3759	Ojai Chevron 90478	360 E Ojai Ave	Ojai	HMD	168837
HM 3760	Ultramar Station 3-754	616 E Ojai Ave	Ojai	HMD	HMDO
HM 3761	Ojai Valley Inn - Maintenance Facility	1203 Ojai Ave	Ojai	HMD	HMDO
HM 3828	Circle K Corp 1045	11408 Ventura Ave	Ojai	HMD	HMDO
HM 412	Creative Concepts	154 E El Roblar Dr	Ojai	HMD	S10110
HM 414	Accurate Auto Repair	246 El Roblar Dr	Ojai	HMD	S10111
HM 415	Steve s Brakes & Automotive	246 El Roblar Dr	Ojai	HMD	S10111
HM 417	Rennsport Cycle	800 El Roblar Dr	Ojai	HMD	S10111
HM 418	Steve s Brakes & Automotive	829 El Roblar Dr	Ojai	HMD	S10111
HM 419	Moon s Service	829 El Roblar Dr	Ojai	HMD	S10111
HM 490	Southern California Water Co.	2215 Grand Ave	Ojai	HMD	S10111
HM 495	Jonathan & Emma Greene	2855 Grand Ave	Ojai	HMD	S10111
HM 641	Pagano s Brake & Tune	102 N La Luna Ave	Ojai	HMD	S10111
HM 644	Ventura Co. Fire Protection District 22	466 S La Luna Ave	Ojai	HMD	S10111
HM 84	Frontier Paint Store	227 Baldwin Rd	Ojai	HMD	S10110
HM 884	Pop s Auto Wrecking	1295 Meyer Rd	Ojai	HMD	S09790
HM 976	Phil s Auto Service	204 E Oak St	Ojai	HMD	S09790

ID	Site Name	Address	City	Yor	o
HM 984	Goodyear Tire Center	423 E Ojai Ave	Ojai	HMD	S09790
HM 985	Bronk Vreeland Ojai Ford	821 Ojai Ave	Ojai	HMD	S09790
HM 994	Ventura Regional Sanitation District	Old Baldwin Rd	Ojai	HMD	S09790
BP 1828	Hartmann s Tree Farm	207 Boardman Rd	Ojai	HMD	BPD1
BP 1864	Steve s Brakes & Automotive	246 El Roblar Dr	Ojai	HMD	BPD1
HM 2556	Adamson Automotive & Towing	214 S Bryant St	Ojai	HMD	HMDO
HM 987	Wayne Wells Tire & Auto Service	915 E Ojai Ave	Ojai	HMD	S09790

Appendix

Ventura County Municipal Storm Water NPDES Permit

(Board Order No. 09-0057; NPDES Permit No. CAS004002)

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STATE OF CALIFORNIA

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
LOS ANGELES REGION

ORDER 09-0057
NPDES PERMIT NO. CAS004002
WASTE DISCHARGE REQUIREMENTS
FOR
STORM WATER (WET WEATHER) AND NON-STORM WATER (DRY WEATHER) DISCHARGES FROM THE MUNICIPAL SEPARATE STORM SEWER SYSTEMS WITHIN THE VENTURA COUNTY WATERSHED PROTECTION DISTRICT, COUNTY OF VENTURA AND THE INCORPORATED CITIES THEREIN.

May 7, 2009

May 7, 2009
Final – Corrected January 13, 2010

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STATE OF CALIFORNIA

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
LOS ANGELES REGION

ORDER 09-0057
NPDES PERMIT NO. CAS004002
WASTE DISCHARGE REQUIREMENTS
FOR
STORM WATER DISCHARGES FROM THE MUNICIPAL SEPARATE STORM SEWER SYSTEM WITHIN THE VENTURA COUNTY WATERSHED PROTECTION DISTRICT, COUNTY OF VENTURA AND THE INCORPORATED CITIES THEREIN

FINDINGS

The California Regional Water Quality Control Board, Los Angeles Region (hereinafter called Regional Water Board), finds that:

A. Permit Parties and History

1. Ventura County Watershed Protection District (Principal Permittee and Copermittee), County of Ventura, cities of Camarillo, Fillmore, Moorpark, Ojai, Oxnard, Port Hueneme, San Buenaventura (Ventura), Santa Paula, Simi Valley and Thousand Oaks (hereinafter referred to separately as Permittees) have joined together to form the Ventura Countywide Storm Water Quality Management Program to discharge wastes. The Permittees discharge or contribute to discharges of storm water and non-storm water from municipal separate storm sewer systems (MS4s), also called storm drain systems, into the Watershed Management Areas of Ventura River, Santa Clara River, Calleguas Creek, Malibu Creek and Miscellaneous Ventura Coastal all within Ventura County and Los Angeles County (see Attachment "A").

2. Prior to the issuance of this permit, storm water discharges from the Ventura County MS4 were covered under the countywide waste discharge requirements contained in Order No. 00-108, adopted by the Regional Water Board on July 27, 2000, which replaced Order No. 94-082, adopted by the Regional Water Board on August 22, 1994. Order No. 00-108 also served as a National Pollutant Discharge Elimination System (NPDES) permit for the discharge of municipal storm water.

3. The Ventura County Board of Supervisors approved the concept of a countywide NPDES permit program and the use of the Flood Management District (presently the Watershed Protection District) benefit assessment authority to finance it on April 14, 1992. On June 30, 1992, the Ventura County Board of Supervisors adopted a benefit assessment levy for storm water and flood management in the unincorporated areas of Ventura County and the cities within the County, to be used in part to finance the

implementation of a countywide NPDES municipal storm water permit program. The Ventura County MS4 Permittees have entered into an agreement with the Watershed Protection District to finance the activities related to the Ventura County MS4 Permit for shared and district wide expenses. The Permittees are also given the option to use the Benefit Assessment Program to finance their respective activities related to reducing the discharge of storm water pollutants under the MS4 Permit.

4. The Regional Water Board may require a separate NPDES permit for any entity that discharges storm water into the watersheds of Ventura County. Such an entity can be any State or Federal facility, special district or other public or private party.

B. Nature of Discharge

1. Storm water discharges consist of surface water runoff generated from various land uses in all the hydrologic drainage basins, which discharge into Waters of the State. The quality of these discharges varies and is affected by geology, land use, season, hydrology, and sequence and duration of hydrologic events. Based on the Ventura Countywide Storm Water Monitoring Program's Water Quality Monitoring Reports which were required under Order No. 00-108, the dry weather and wet weather Pollutants of Concern (POC) in urban stormwater include an anion, bacteria, conventional pollutants, metals, a nutrient, organic compounds, and pesticides. The POC are identified in Attachment "B" of this Order. Many of the POC listed are causing impairments identified on the federal Clean Water Act (CWA) § 303(d) list of impaired waterbodies.

   The State Water Board submits a report (a list of water quality limited segments (§ 303[d] list)) on the State's water quality to the U.S. EPA pursuant to § 305(b) of the 1972 CWA, and Title 40, CFR 130.7, every 2 years. The Report provides water quality information to the general public and serves as the basis for the U.S. EPA's National Water Quality Inventory Report to Congress. Section 303(d) requires that all waters that are not attaining standards after the implementation of those controls required by 1977, shall be included on the list. Title 40 CFR 130.7(b)(3) defines "water quality standard applicable to such waters" as "those water quality standards established under § 303 of the Clean Water Act, including numeric criteria, narrative criteria, waterbody uses, and antidegradation requirements."

2. Common pollutants in urban storm water and their respective sources are: bacteria from animal droppings and illegal discharges; Polycyclic Aromatic Hydrocarbons (PAHs) from the products of internal combustion engine operation and parking lot sealants wash off; nitrates from fertilizer application; pesticides from pest mitigating applications and from plant mitigating applications; bis (2-ethylhexyl) phthalate from the break down of plastic products; mercury from atmospheric fallout and improper disposal of mercury switches; lead from fuels, paints and automotive parts; copper from brake pad wear and roofing materials, zinc from tire wear and galvanized

sheeting and fencing; sediment from land disturbance and erosion; trash; and dioxins as products of combustion.

3. In general, the pollutants that are found in municipal storm water runoff can harm human health and aquatic ecosystems. In addition, the high volumes and high velocities of storm water discharged from MS4s into receiving waters can adversely impact aquatic ecosystems and stream habitat and cause stream bank erosion and physical modifications. These changes are collectively termed hydromodification. Municipal point source discharges of runoff from urbanized areas remain a leading cause of impairment of surface waters in California.

4. Ammonia as Nitrogen, and Nitrate plus Nitrite as Nitrogen are biostimulatory substances that can cause or contribute to eutrophic effects such as low dissolved oxygen and algae growth impairing warm freshwater and wildlife habitats. Ammonia is highly toxic to fish and other aquatic life. Excessive ammonia can cause aquatic life toxicity.

5. Elevated bacterial indicator densities impair the water contact recreation (REC-1) beneficial use at beaches, creeks, estuaries, lagoons, and marinas. Swimming in waters with elevated bacterial indicator densities has been associated with adverse health effects. Specifically, local and national epidemiological studies indicate that there is a causal relationship between adverse health effects and recreational water quality, as measured by bacterial indicator densities (Pruss, 1998, Review of epidemiological studies on health effects from exposure to recreational waters, International Journal of Epidemiology; Haile et al., 1996, An epidemiological study of possible adverse health effects of swimming in Santa Monica Bay, Santa Monica Bay Restoration Project; and Haile et al., 1999, The health effects of swimming in ocean water contaminated by storm drain runoff, Epidemiology"). Sources of elevated bacteria to marine and fresh waters may also include illegal discharges from improperly maintained standard septic systems, on-site wastewater treatment systems (OWTS) and illicit discharges from private drains.

6. Pesticides are substances used to prevent, destroy, repel or mitigate pests such as insects, weeds, and microorganisms. Their effects can be direct (e.g. fish die from exposure to a pesticide entering waterways, or birds do not reproduce after ingesting contaminated fish), or indirect (a hawk becomes sick from eating a mouse dying from pesticide poisoning). Pesticide categories include: Organochlorine, Organophosphorus, Organophosphate, and Pyrethroid.

7. Polychlorinated Biphenyls (PCBs) are a subset of the synthetic organic chemicals known as chlorinated hydrocarbons. Concern over PCBs' toxicity, persistence (chemical stability) in the environment and bioconcentration in aquatic organisms has led to prohibitions on PCBs.

8. Rising groundwater and swimming pool water have been found to be sources of pollutants such as salts (chloride). Salts increase the salinity of otherwise freshwater systems and disrupt physiological processes. The Regional Water Board has waterbodies listed on the CWA § 303(d) list for impairment due to salts and has adopted Basin Plan amendments to include Total Maximum Daily Loads (TMDLs) for salts. This Order includes provisions to control the discharges from these activities in order to directly or indirectly reduce or eliminate the discharge of salts to fresh water systems where salts may impair water quality and beneficial uses.

9. Trash and debris are pervasive pollutants which accumulate in streams, rivers, bays, and ocean beaches throughout Southern California. They pose a serious threat to our oceans and coasts, navigation, biological resources, recreation, human health and safety, aesthetics, and economies.

10. Municipal storm water (wet weather) and non-storm water (dry weather) discharges may contain pollutants that cause or threaten to cause an exceedance of the water quality standards, as outlined in the Los Angeles Region's Basin Plan. Wet weather and dry weather discharges from the MS4 are subject to conditions and requirements established in the Basin Plan for point source discharges. Discharges from the MS4 may not cause or contribute to exceedances of water quality standards.

11. Biological communities act to integrate the effects of water quality conditions in a stream by responding with changes in their population abundances and species composition over time. These populations are sensitive to multiple aspects of water and habitat quality, and provide expressions of ecological health easier to understand than the results of chemical and toxicity tests. Biological assessments and criteria address the cumulative impacts of all stressors, especially habitat degradation, and chemical contamination, which result in a loss of biological diversity. Biological information can help provide an ecologically based assessment of the status of a waterbody. Bioassessment is a cost-effective tool and protocol for assessing the biological and physical habitat conditions of streams and rivers for evaluation of the overall health of a watershed. The Principal Permittee consents to participate in the Southern California Storm Water Monitoring Coalition (SMC) Southern California Regional Bioassessment Monitoring Program.

12. The increased volume, increased velocity, and discharge duration of storm water runoff from developed areas has the potential to accelerate downstream erosion and impair stream habitat in natural drainages. Studies have demonstrated a direct correlation between the degree of imperviousness of an area and the degradation of its receiving waters *(Managing Runoff to Protect Natural Streams: The Latest Development on Investigation and Management of Hydromodification in California; Stein, E. et al, December 2005*; *Effect of Increase in Peak Flows and Imperviousness on the Morphology of Southern California Streams; Coleman, D., April 2005).* Significant declines in the biological integrity and physical habitat of streams and other receiving waters have been found to occur with as little as 3-10 percent

conversion from natural to impervious surfaces in a subwatershed. Percentage impervious cover is a one indicator and predictor of potential water quality degradation expected from new development.

13. Studies indicate that facilities with paved surfaces subject to frequent motor vehicular traffic (such as: strip malls, parking lots, commercial business parks, and fast food restaurants), or facilities that perform vehicle repair, maintenance, or fueling (automotive service facilities) are potential sources of POC in storm water (*California Stormwater Quality Association, Stormwater Best Management Practice Handbook, Municipal, January 2003).*

14. Retail Gasoline Outlets (RGOs) are points of convergence for vehicular traffic and are similar to parking lots and urban roads. Studies indicate that storm water discharges from RGOs have high concentrations of hydrocarbons and heavy metals (*California Stormwater Quality Association, Stormwater Best Management Practice Handbook, Municipal, January 2003).*

15. The industries and businesses listed in this Order that are to be inspected by Permittees have the potential to discharge contaminated storm water into the MS4. This storm water is an environmental threat because it can adversely impact public health and safety, and the quality of receiving waters. For example, pretreatment program compliance inspections and audits performed in the Los Angeles and Ventura Counties indicate that automotive service and food service facilities sometimes discharge polluted storm water to the MS4s. The POC in such wash waters include oil and grease, toxic chemicals, and food waste. Spills from clogged sanitary sewer lines have a high likelihood to reach the receiving waters via MS4s. Overall, the most common POC identified in storm water discharge to the MS4s are: (i) heavy metals, (ii) oil and grease/ PAHs, (iii) sediments, (iv) oxygen demanding substances, (v) litter/ trash/ debris, (vi) nutrients, (vii) other toxic materials, such as pesticides. Municipal storm water monitoring data and industrial storm water monitoring data indicate that industrial and commercial sites continue to contribute significant quantities of pollutants in storm water runoff.

16. Development and urbanization increase pollutant loads, volume, and discharge velocity. First, natural vegetated pervious ground cover is converted to impervious surfaces (paved) such as highways, streets, rooftops and parking lots. Natural vegetated soil can both absorb rainwater and remove pollutants providing an effective natural purification process. In contrast, impervious surfaces (such as pavement and concrete) can neither absorb water nor remove pollutants, and thus the natural purification characteristics are lost. Second, urban development creates new pollution sources as the increased density of human population brings proportionately higher levels of vehicle emissions, vehicle maintenance wastes, municipal sewage waste, pesticides, household hazardous wastes, pet wastes, trash, and other anthropogenic pollutants. Development and urbanization especially threaten environmentally sensitive areas. Such areas have a much lower capacity to withstand pollutant shocks

than might be acceptable in the general circumstance. In essence, development that is ordinarily insignificant in its impact on the environment may become significant in a particularly sensitive environment. These environmentally sensitive areas (ESAs) designated by the State in the Ventura County watershed are defined in Part 6 (Definitions).

17. The implementation of Low Impact Development (LID) techniques across the United States and Canada has demonstrated that the proper implementation of LID techniques not only results in water quality protection benefits and in a reduction of the cost of land development and construction but also bears other positive attributes that go beyond economic benefits such as enhanced property values, improved habitat, aesthetic amenities, and improved quality of life. Reducing Stormwater Costs through Low Impact Development (LID) Strategies and Practices, USEPA Doc No. EPA 841-F-07-006, December 2007. Further, properly implemented LID techniques reduce the volume of runoff leaving a newly developed or re-developed area thereby lowering the peak rate of runoff, and thus minimizing the adverse affects of hydromodification on stream habitat. A Review of Low Impact Development Policies: Removing Institutional Barriers to Adoption, Low Impact Development Center and State of California, State Water Resources Control Board, December 2007. The requirements of this Order facilitate the implementation of LID strategies to protect water quality, reduce runoff volume, and to benefit from these additional enhancements.

18. The Regional Water Board adopted a Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands (Order No. R4-2005-0080) on November 3, 2005. The objective of the program is to monitor runoff from irrigated agriculture facilities in the coastal watersheds of Ventura and Los Angeles Counties. The Basin Plan, which designates beneficial uses and establishes water quality objectives for the Region, recognizes that agricultural activities can generate pollutants such as sediment, pesticides, and nutrients that upon discharge to receiving water can degrade water quality and impair beneficial uses. A category identified by the Conditional Waiver as a source of pollutants is nursery operations. This Order includes requirements for the municipal operator to confirm that nursery operators implement pollutant reduction and control measures with the objective of reducing pollutants in storm water runoff discharges.

19. Staff finds there is a growing acceptance by stormwater professionals to integrate LID principles into stormwater management programs and MS4 permits. However, there remains significant controversy regarding the appropriate requirements and metrics for LID. At the heart of this controversy is a dispute regarding the feasibility and effectiveness of requiring a fixed volume of stormwater to be captured and retained on-site for infiltration, reuse, and evapotranspiration, as opposed to permitting a portion of the stormwater to be released off site after it is treated, when it is infeasible to retain the required stormwater on site due to site specific conditions.

Staff has reviewed extensive technical literature regarding this issue (e.g. R. Horner, *Investigation of the Feasibility and Benefits of Low-Impact Site Design Practices ("LID") for Ventura County* (February 2007); E. Strecker, A. Poresky, D. Christsen, *Memorandum: Rainwater Harvesting and Reuse Scenarios and Cost Consideration*, (April, 2009)). Staff finds that there is consensus in the technical community that site conditions and the type of development can limit the feasibility of retaining, infiltrating, and reusing stormwater at sites due to a variety of site specific conditions. Factors that affect the feasibility of a fixed volume capture standard include, but are not limited to: soils infiltration capacity, subsurface pollution, and locations in urban core centers.

Regarding the effects of capturing a fixed stormwater volume on site, Staff finds the fixed volume approach may be ignoring basic hydrological principles that relate the feasible infiltration volume to the infiltration capacity of local soils. Requirements to capture a fixed volume on site could disturb the natural water balance and lead to unintended engineering and hydrologic consequences. For example, a typical hydrological condition in Ventura County is one of successive storms during the winter which may exceed the stormwater capacity that can be retained on site. This may result in ponded water on-site with attendant health and safety risks, saturation of the near surface soils, and reduction of water resources in Regional waterbodies. These effects could damage site structures, increase groundwater pollution by forcing enhanced pollution spreading, or destroy aquatic habitat. Staff finds these reasonably potential effects are not well evaluated scientifically. Finally, staff cannot find that a fixed retention volume versus a standard that attempts to release surface flows at a predevelopment level would result in a greater reduction of stormwater pollution.

20. Research conducted on the contribution of aerial deposition of trace heavy metals in Los Angeles County watersheds indicates that dry indirect deposition may account for a significant load of pollutants into surface waters. Similar patterns of aerial deposition likely occur in Ventura County. Of the atmospherically deposited pollutants on the watersheds, ten to twenty percent may account for the total load for copper, zinc, nickel, lead, and chromium to the waterbodies. Land reservoirs and sequestration may account for the remaining eighty to ninety percent of the atmospherically deposited pollutants on the watersheds. Emissions of semi-volatile organics such as polycyclic aromatic hydrocarbons (PAHs) and pesticides and their subsequent deposition may contribute to the contamination of receiving waters but appear to be less significant. The remaining percentage is stored in land reservoirs and eventually shows up in receiving waters.

C. Permit Background

1. The essential components of the Storm Water Management Program, as required by the Code of Federal Regulations (CFR) [40 CFR122.26(d)] are:
   (a) Adequate Legal Authority.
   (b) Fiscal Resources.

(c) Storm Water Quality Management Program (SMP)
  (1) Public Information and Participation Program
  (2) Industrial/ Commercial Facilities Program
  (3) Planning and Land Development Program
  (4) Development Construction Program
  (5) Public Agency Activities Program
  (6) Illicit Connection and Illicit Discharges Elimination Program
(d) Reporting Program (Monitoring Report and Program Report)

2. The Ventura County SMP, dated November 2001 (revision 2) identifies seven program areas, which are listed below and were previously approved under Board Order No. 00-108. For purposes of consistency, they are titled as follows:
   (a) Ventura County SMP.
     (1) Program Management
     (2) Programs for Residents
     (3) Programs for Industrial/ Commercial Businesses
     (4) Programs for Planning and Land Development
     (5) Programs for Construction Sites
     (6) Programs for Public Agency Activities
     (7) Programs for Illicit Connections/ Illegal Discharges
   (b) For purposes of region-wide consistency, the program titles are revised and consolidated into the six areas listed in the preceding C.1(c). All Permittee storm water documents submitted to the Regional Water Board are to follow the organization enumerated in C.1(c).

3. The Permittees filed a Report of Waste Discharge (ROWD), dated January 26, 2005. The Permittees applied for renewal of their waste discharge requirements for a 5-year period, which serves as an NPDES permit to discharge wastes to surface waters.

4. The Regional Water Board reviewed the ROWD and determined it to be partially complete under the reapplication policy for MS4s issued by the United States Environmental Protection Agency (U.S. EPA) (61 Fed. Reg. 41697). The Regional Water Board has prepared this Order so that implementation of provisions contained in this Order by Permittees will meet the requirements of the federal NPDES regulations at 40 CFR122.26.

5. The Permittees ROWD contained a proposed Storm Water Management Program and a Monitoring Program to be considered by the Regional Water Board for incorporation into an MS4 NPDES Permit as permit conditions and to demonstrate compliance with federal law.

6. To-date, the monitoring program has consisted of mass emission, receiving water (tributaries), and land-use monitoring stations, toxicity testing, special studies for bioassessment of the Ventura River and hydrology, identification of ESAs, implementation of the Storm Water Quality Urban Impact Mitigation Plan

(SQUIMP), and has provided support for volunteer monitoring programs. This Order requires a monitoring program consisting of mass emission, toxicity, TMDL storm water (wet weather) MS4 water quality-based effluent limits, TMDL non-storm water (dry weather) MS4 water quality-based effluent limits, Pyrethroid assessment study, continuation of the hydromodification study, low impact development study, and participation in the Southern California Regional Bioassessment Program and Southern California Bight Project (SCBP).

7. The Principal Permittee is a member of the Southern California Coastal Water Research Project (SCCWRP) Commission. The Principal Permittee also participates in the Regional Monitoring Programs and research partnerships, such as the Southern California Storm Water Monitoring Coalition (SMC) and the Bioassessment Working Group.

D. Permit Coverage

1. The area covered by this Order includes all areas within Ventura County boundaries and all areas within each co-permittee's boundaries (see Figure 1) that drain into the MS4.

2. The Permittees covered under this Order were designated on a system-wide basis under Phase I of the CWA § 402(p)(3)(B)(i). The action of covering all Ventura County municipalities under a single MS4 permit on a system-wide basis was consistent with the provisions of 40 CFR122.26(a)(3)(iv), which states that one permit application may be submitted for all or a portion of all municipal separate storm sewers within adjacent or interconnected large or medium municipal separate storm sewer systems; and the Regional Water Board may issue one system-wide permit covering all, or a portion of all municipal separate storm sewers in adjacent or interconnected large or medium municipal separate storm sewer systems.

3. Federal, State, Regional, or local entities within the Permittees' boundaries or in jurisdictions outside the Ventura County Watershed Protection District, and not currently named in this Order, may operate storm drain facilities and/ or discharge storm water to storm drains and receiving waters covered by this Order. The Permittees may lack legal jurisdiction over these entities under State and Federal constitutions. The Regional Water Board will coordinate with these entities to implement programs that are consistent with the requirements of this Order. The Regional Board may consider such facilities for coverage under its NPDES permitting scheme pursuant to USEPA Phase II storm water regulations. Permittees have expressed their intention to work cooperatively to control the contribution of pollutants from one portion of the MS4 to another portion of the system. Permittees shall make good faith efforts to control the contribution of pollutants to the MS4 from non-permittee dischargers such as Caltrans, the U.S. Department of Defense, and other state and federal facilities.

4. TMDLs are numerical calculations of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards, and an allocation of that amount to the pollutant's sources. A TMDL is the sum of the allowable loads of a single pollutant from all contributing point sources (Waste Load Allocation (WLA)) and non-point sources (Load Allocation (LA)). Discharges from the MS4s are considered point sources discharges, because the MS4 is a point source.

5. This Order incorporates applicable WLAs that have been adopted by the Regional Water Board and have been approved by the Office of Administrative Law and the U.S. EPA. The TMDL WLAs in the Order are expressed as water quality-based effluent limits in a manner consistent with the assumptions and requirements of the TMDL from which they are derived.

6. The CWA and the California Water Code contain specific provisions on how wastewater discharges from point sources are to be permitted. Stormwater discharges (both dry weather and wet weather) are considered point source discharges.

7. Permittees should work cooperatively to control the contribution of pollutants from one portion of the MS4 to another portion of the system through inter-agency agreements or other formal arrangements.

E. Federal, State and Regional Regulations

1. The Water Quality Act of 1987 added § 402(p) to the CWA (33U.S.C. § 1251-1387). This section requires the U.S. EPA to establish regulations setting forth NPDES requirements for storm water discharges in 2 phases.
   (a) U.S. EPA Phase I storm water regulations were directed at MS4s serving a population of 100,000 or more, including interconnected systems and storm water discharges associated with industrial activities, including construction activities. The Phase 1 Final Rule was published on November 16, 1990 (55 Fed. Reg. 47990).
   (b) U.S. EPA Phase II storm water regulations are directed at storm water discharges not covered in Phase I, including small MS4s (population of less than 100,000), small construction projects (less than 5 acres), municipal facilities with delayed coverage under the Intermodal Surface Transportation Efficiency Act of 1991, and other discharges for which the U.S. EPA Administrator or the State determines that the storm water discharge contributes to a violation of a water quality standard, or is a significant contributor of pollutants to waters of the U.S. The Phase II Final Rule was published on December 8, 1999 (64 Fed. Reg. 68722).

2. The U.S. EPA published an Interpretative Policy Memorandum on Reapplication Requirements for MS4 permits on August 9, 1996 (61 Fed. Reg. 41697). This policy requires that MS4 reapplication for reissuance for a subsequent five-year permit term

contain certain basic information and information for proposed changes and improvements to the storm water management program and monitoring program.

3. The U.S. EPA has entered into a Memorandum of Agreement (MOA) with the U.S. Fish and Wildlife Service, and the National Marine Fisheries Service for enhancing coordination regarding the protection of endangered and threatened species under section 7 of the Endangered Species Act, and the CWA's water quality standards and NPDES programs. Among other actions, the MOA establishes a framework for coordination of actions by the U.S. EPA, the Services, and CWA delegated States on CWA permit issuance under § 402 of the CWA [66 Fed. Reg. 11202-11217].

4. The CWA allows the U.S. EPA to authorize states with an approved environmental regulatory program to administer the NPDES program in lieu of the U.S. EPA. The State of California is a delegated State. The Porter-Cologne Water Quality Control Act (California Water Code) authorizes the State Water Resources Control Board (State Water Board), through the Regional Water Boards, to regulate and control the discharge of wastes that could affect the quality of waters of the State, including waters of the United States, and tributaries thereto.

5. Under CWA § 303(d) of the CWA, States are required to identify a list of impaired water-bodies and develop and implement TMDLs for these waterbodies (33 USC § 1313(d)(1)). The most recent 303(d) list's U.S. EPA approval date was June 28, 2007. The U.S. EPA entered into a consent decree with the Natural Resources Defense Council (NRDC), Heal the Bay, and the Santa Monica Baykeeper on March 22, 1999, under which the Regional Water Board must adopt all TMDLs for the Los Angeles Region within 13 years from that date. This Order incorporates provisions incorporating approved WLAs for municipal storm water discharges and requires amending the SMP after subsequent pollutant loads have been allocated and approved.

6. Collectively, the restrictions contained in the TMDL Provisions for Storm Water (Wet Weather) Discharges and Non-Storm Water (Dry Weather) Discharges of this Order on individual pollutants are no more stringent than required to implement the provisions of the TMDL, which have been adopted and approved in a manner that is consistent with the CWA. Where a TMDL has been approved, NPDES permits must contain effluent limits and conditions consistent with the assumptions and requirements of the available WLAs in TMDLs (40 CFR122.44(d)(1)(vii)(B)).

7. This Order does not constitute an unfunded local government mandate subject to subvention under Article XIIIB, Section (6) of the California Constitution for several reasons, including, but not limited to, the following. This Order implements federally mandated requirements under CWA § 402, subdivision (p)(3)(B)(33 U.S.C. § 1342(p)(3)(B)) This includes federal requirements to effectively prohibit non-storm water discharges, to reduce the discharge of pollutants to the maximum extent practicable, and to include such other provisions as the Administrator or the State

determines appropriate for the control of such pollutants. Federal cases have held these provisions require the development of permits and permit provisions on a case-by-case basis to satisfy federal requirements. (Natural Resources Defense Council, Inc. v. U.S. E.P.A. (9th Cir. 1992) 966 F.2d 1292, 1308, fn. 17.) The authority exercised under this Order is not reserved state authority under the Clean Water Act's savings clause (cf. Burbank v. State Water Resources Control Bd. (2005) 35 Cal.4th 613, 627-628 [relying on 33 U.S.C. § 1370, which allows a state to develop requirements which are not "less stringent" than federal requirements]), but instead, is part of a federal mandate to develop pollutant reduction requirements for municipal separate storm sewer systems. To this extent, it is entirely federal authority that forms the legal basis to establish the permit provisions. (See, City of Rancho Cucamonga v. Regional Water Quality Control Bd.-Santa Ana Region (2006) 135 Cal.App.4th 1377, 1389; Building Industry Ass'n of San Diego County v. State Water Resources Control Bd. (2004) 124 Cal.App.4th 866, 882-883.)

Likewise, the provisions of this Order to implement TMDLs are federal mandates. The CWA requires TMDLs to be developed for waterbodies that do not meet federal water quality standards (33 U.S.C. § 1313(d)). Once the U.S. EPA or a state develops a TMDL, federal law requires that permits must contain effluent limitations consistent with the assumptions of any applicable wasteload allocation.
(40 CFR 122.44(d)(1)(vii)(B)).

Second, the local agency Permittees' obligations under this Order are similar to, and in many respects less stringent than, the obligations of non-governmental dischargers who are issued NPDES permits for storm water discharges. With a few inapplicable exceptions, the Clean Water Act regulates the discharge of pollutants from point sources (33 U.S.C. § 1342) and the Porter-Cologne regulates the discharge of waste (Wat. Code, § 13263), both without regard to the source of the pollutant or waste. As a result, the "costs incurred by local agencies" to protect water quality reflect an overarching regulatory scheme that places similar requirements on governmental and nongovernmental dischargers. (See *County of Los Angeles v. State of California* (1987) 43 Cal.3d 46, 57-58 [finding comprehensive workers compensation scheme did not create a cost for local agencies that was subject to state subvention].)

The Clean Water Act and the Porter-Cologne Water Quality Control Act largely regulate storm water with an even hand, but to the extent there is any relaxation of this even-handed regulation, it is in favor of the local agencies. Except for municipal separate storm sewer systems, the Clean Water Act requires point source dischargers, including discharges of storm water associated with industrial or construction activity, to comply strictly with water quality standards. (33 U.S.C. § 1311(b)(1)(C), *Defenders of Wildlife v. Browner* (1999) 191 F.3d 1159, 1164-1165 [noting that industrial storm water discharges must strictly comply with water quality standards].) As discussed in prior State Water Resources Control Board decisions, in many respects this Order does not require strict compliance with water quality standards. (SWRCB Order No. WQ 2001-15, p. 7.) The Order, therefore, regulates the

discharge of waste in municipal storm water more leniently than the discharge of waste from non-governmental sources.

Third, the local agency Permittees have the authority to levy service charges, fees, or assessments sufficient to pay for compliance with this Order subject to certain voting requirements contained in the California Constitution. (See California Constitution XIII D, section 6, subdivision (c); see also *Howard Jarvis Taxpayers Association v. City of Salinas* (2002) 98 Cal. App. 4th 1351, 1358-1359.). The fact sheet demonstrates that numerous activities contribute to the pollutant loading in the municipal separate storm sewer system. Local agencies can levy service charges, fees, or assessments on these activities, independent of real property ownership. (See, e.g., *Apartment Ass'n of Los Angeles County, Inc. v. City of Los Angeles* (2001) 24 Cal.4th 830, 842 [upholding inspection fees associated with renting property].) The ability of a local agency to defray the cost of a program without raising taxes indicates that a program does not entail a cost subject to subvention. (*County of Fresno v. State of California* (1991) 53 Cal.3d 482, 487-488.)

Fourth, the Permittees have requested permit coverage in lieu of compliance with the complete prohibition against the discharge of pollutants contained in federal Clean Water Act section 301, subdivision (a) (33 U.S.C. § 1311(a)) and in lieu of numeric restrictions on their discharges. (See finding C.5., supra.) To the extent that the local agencies have voluntarily availed themselves of the permit, the program is not a state mandate. (Accord *County of San Diego v. State of California* (1997) 15 Cal.4th 68, 107-108.) Likewise, where MS4 Permittees are regulated under a Best Management Practices (BMP) based storm water management program rather than end-of-pipe numeric limits, there exists no compulsion of a specific regulatory scheme that would violate the 10th Amendment to the United States Constitution. (See *City of Abilene v. U.S. E.P.A.* (5th Cir. 2003) 325 F.3d 657, 662-663 [noting that municipalities can choose between a management permit or a permit with numeric limits].) The local agencies' voluntary decision to file a report of waste discharge proposing a program-based permit is a voluntary decision not subject to subvention. (See *Environmental Defense Center v. USEPA* (9th Cir. 2003) 344 F.3d 832, 845-848.)

Fifth, the local agencies' responsibility for preventing discharges of waste that can create conditions of pollution or nuisance from conveyances that are within their ownership or control under state law predates the enactment of Article XIIIB, Section (6) of the California Constitution.

8. Under § 6217(g) of the Coastal Zone Act Reauthorization Amendments of 1990 (CZARA), Coastal States with approved coastal zone management programs are required to address non-point pollution impacting or threatening coastal water quality. CZARA addresses five sources of non-point pollution: 1) agriculture; 2) silviculture; 3) urban; 4) marinas; and 5) hydromodification. This Waste Discharge Requirement addresses the management measures required for the urban category and the hydromodification category, with the exception of septic systems.

9. The Regional Water Board addresses septic systems through the administration of non-Chapter 15 regulatory programs and the implementation of Regional Water Board Order No.R4-2004-0146. Septic systems are also addressed under State Assembly Bill (AB) 885 (2000). The Regional Water Board will implement and enforce regulations issued by the State Board pursuant to AB 885. Taken together, these State and Local agency requirements when imposed on septic system operators are expected to reduce the bacterial contamination of storm water from improperly maintained septic systems.

10. The State Water Board has issued waste discharge requirements for discharges from utility vaults (CAG990002). The Regional Water Board has issued waste discharge requirements for discharges from well heads and hydrostatic pipe testing (CAG674001). These discharges to the MS4 shall be conducted under coverage of a separate NPDES permit specific to that activity.

11. On May 18, 2000, the U.S. EPA established numeric criteria for priority toxic pollutants for the State of California (California Toxics Rule (CTR) 65 Fed. Reg. 31682 (40 CFR131.38)) for the protection of human health and aquatic life. These apply as ambient water quality criteria for inland surface waters, enclosed bays and estuaries.

12. The State Water Board adopted a revised Water Quality Control Plan for Ocean Waters of California (Ocean Plan) in 2005. The California Ocean Plan establishes water quality objectives for California's ocean waters and provides the basis for regulation of wastes discharged into the State's coastal waters. It applies to point and nonpoint source discharges. The Ocean Plan identifies the applicable beneficial uses of marine waters that include preservation and enhancement of designated Areas of Special Biological Significance (ASBS) (now called "State Water Quality Protection Areas") and establishes a set of narrative and numerical water quality objectives designed to protect beneficial uses. The SWRCB adopted the California Ocean Plan, and both the SWRCB and the six coastal Regional Water Quality Control Boards (RWQCBs) implement and interpret the California Ocean Plan.

13. This Regional Water Board adopted a revised Water Quality Control Plan (Basin Plan) for the Los Angeles Region on June 13, 1994. The Basin Plan specifies the beneficial uses of Ventura County waterbodies and their tributary streams, and contains both narrative and numerical water quality objectives for these receiving waters. The following beneficial uses identified in the Basin Plan apply to all or portions of each watershed covered by this Order:
    (a) Municipal and domestic supply
    (b) Agricultural supply
    (c) Industrial service supply
    (d) Industrial process supply
    (e) Ground water recharge
    (f) Freshwater replenishment

(g) Navigation
(h) Hydropower generation
(i) Water contact recreation
(j) Non-contact water recreation
(k) Ocean commercial and sport fishing
(l) Warm freshwater habitat
(m) Cold freshwater habitat
(n) Preservation of Areas of Special Biological Significance
(o) Saline water habitat
(p) Wildlife habitat
(q) Preservation of rare and endangered species
(r) Marine habitat
(s) Fish migration
(t) Fish spawning
(u) Shellfish harvesting

14. On March 22, 1999 the Consent Decree in Heal the Bay, Inc.; Santa Monica Baykeeper, Inc. v. Browner, Case No. 98-4825 SBA was approved. Under Establishment of TMDLs- The parties understand that California has the initial opportunity pursuant to § 303(d) of the CWA to adopt and submit to U.S. EPA for approval TMDLs to be established under this Consent Decree. TMDLs developed by Regional Water Boards are generally adopted through Basin Plan amendments. Basin plan amendments adopted by the State Board pursuant to Water Code section 13246, and the regulatory portions must be approved by the Office of Administrative Law pursuant to Government Code section 11353(b). TMDLs established pursuant to CWA section 303(d)(1) must be submitted to U.S. EPA for approval pursuant to section 303(d)(2), and incorporated into the state's water quality management plan

15. The Regional Water Board has adopted amendments to the Basin Plan, to incorporate TMDLs for the following:
    (a) The following TMDLs have been or will be incorporated into the Basin Plan within the term of the Order.
        (1) Santa Clara River - Nitrogen Compounds
            (A) Regional Water Board Resolution No. 2003-011
            (B) State Water Board Resolution No. 2003-0073
            (C) OAL file No. 04-0123-35
            (D) U.S. EPA approval date March 18, 2004
            (E) Final fee exemption date March 23, 2004 (effective date).
            (F) Compliance is 1 year after effective date (March 23, 2005)

        (2) Malibu Creek and Lagoon - Bacteria.
            (A) Regional Water Board Resolution No. 2004-019
            (B) State Water Board Resolution No. 2005-0072
            (C) OAL file No. 05-1018-03 S
            (D) U.S. EPA approval date January 10, 2006

(E) Final fee exemption date January 24, 2006 (effective date)
(F) Compliance for Summer Dry is 3 years after effective date (January 24, 2009)
(G) Compliance for Winter Dry is 6 years after effective date (January 24, 2012)
(H) Compliance for Wet Weather is 10 years after effective date (January 24, 2016), which is beyond the term of this Order

(3) Toxicity, Chlorpyrifos and Diazinon in the Calleguas Creek, Its Tributaries and Mugu Lagoon.
(A) Regional Water Board Resolution No. 2005-009
(B) State Water Board Resolution No. 2005-0067
(C) OAL file No. 05-1110-02 S
(D) U.S. EPA approval date March 14, 2006
(E) Final fee exemption date March 24, 2006 (effective date)
(F) Compliance for Toxicity and Interim WLA is effective date (March 24, 2006)
(G) Compliance for Final WLA is 2 years after effective date (March 24, 2008)

(4) Organochlorine (OC) Pesticides, Polychlorinated Biphenyls (PCBs), and Siltation in Calleguas Creek, Its Tributaries and Mugu Lagoon.
(A) Regional Water Board Resolution No. 2005-010
(B) State Water Board Resolution No. 2005-0068
(C) OAL file No. 05-1206-03 S
(D) U.S. EPA approval date March 14, 2006
(E) Final fee exemption date March 24, 2006 (effective date)
(F) Compliance for Interim WLA is effective date (March 24, 2006)
(G) Compliance for Final WLA is 20 years after effective date (March 24, 2026), which is beyond the term of this Order

(5) Calleguas Creek Watershed Metals
(A) Regional Water Board Resolution No. 2006-012
(B) State Water Board Resolution No. 2006-0078
(C) OAL file No. 06-1222-015 S
(D) U.S. EPA approval date March 26, 2007
(E) Final fee exemption date March 27, 2007 (effective date)
(F) Compliance for Interim WLA is effective date (March 27, 2007)
(G) Compliance for Final WLA is Within 15 years after the effective date (March 27, 2022), which is beyond the term of this Order

(6) <u>Revolon Slough & Beardsley Wash Trash TMDL</u>
(A) Regional Water Board Resolution No. 2007-007
(B) State Water Board Resolution No 2007-0076
(C) OAL file No 2007-1227-05 S

(D) U.S. EPA approval date February 27, 2008
(E) Final fee exemption date March 6, 2008 (effective date)
(F) Compliance for Trash Monitoring & Reporting Plan Submittal is 6 months from effective date (September 6, 2008)
(G) Compliance for Final WLA is 8 years from effective date (March 6, 2016)

(7) Ventura River Estuary Trash TMDL
(A) Regional Water Board Resolution No. 2007-008
(B) State Water Board Resolution No 2007-0072
(C) OAL file No 2007-1227-01 S
(D) U.S. EPA approval date February 27, 2008
(E) Final fee exemption date March 6, 2008 (effective date)
(F) Compliance for Trash Monitoring & Reporting Plan Submittal is 6 months from effective date (September 6, 2008)
(G) Compliance for Final WLA is 8 years from effective date (March 6, 2016)

(8) Harbor Beaches of Ventura County Bacteria TMDL
(A) Regional Water Board Resolution No. 2007-017
(B) State Water Board Resolution No 2008-0072
(C) OAL file No 2007-1023-01 S
(D) U.S. EPA approval date December 18, 2008
(E) Final fee exemption date January 17, 2009 (effective date)

16. The Regional Water Board adopted and approved requirements for new development and significant redevelopment projects in Ventura County to control the discharge of storm water pollutants in post-construction storm water, on January 26, 2000, in Board Resolution No. R-00-02. The Regional Water Board Executive Officer issued the approved Standard Urban Storm Water Mitigation Plans (SUSMPs) on March 8, 2000 for Los Angles County and the Cities in Los Angeles County. Since 2000, new development and redevelopment water quality criteria have been implemented by the Permittees to be consistent with SUSMP. The State Board affirmed the Regional Water Board action and SUSMPs in State Board Order No. WQ 2000-11, issued on October 5, 2000.
(a) A statewide policy memorandum (dated December 26, 2000), which interprets the Order to provide broad discretion to Regional Water Boards and identifies potential future areas for inclusion in SUSMPs and the types of evidence and findings necessary. Such areas include ministerial projects, projects in environmentally sensitive areas, and water quality design criteria for Retail Gasoline Outlets (RGOs, see Part 6 for definition). The Regional Water Board properly justified the extensions of SUSMPs and water quality criteria to ministerial projects, projects in environmentally sensitive areas, and RGOs, during the adoption of Regional Water Board Order 01-182. The Regional Water Board's action was upheld by the County of Los Angeles Superior Court (In Re:

County of Los Angeles v. State Water Resources Control Board (2006) 143 Cal.App.4th 985).

(b) The State Water Board's Chief Counsel interpreted the Order to encourage regional solutions and endorsed a mitigation fund or "bank" as alternatives for new development and significant redevelopment. The Regional Water Board has included provisions for regional solutions and the establishment of a mitigation bank in this Order.

17. The Regional Water Board supports Watershed Management planning to address water quality protection in the region. The objective of the Watershed Management planning is to provide a comprehensive and integrated strategy towards water resource protection, enhancement, and restoration while balancing economic and environmental impacts within a hydrologically defined drainage basin or watershed. It emphasizes cooperative relationships between regulatory agencies, the regulated community, environmental groups, and other stakeholders in the watershed to achieve the greatest environmental improvements with available resources.

18. To facilitate compliance with federal regulations, the State Water Board has issued the following 4 Statewide General NPDES Permits associated with storm water:
    (a) Industrial General Permit (IASGP- Industrial Activities Storm Water General Permit), NPDES No. CAS000001, issued on November 19, 1991, reissued on September 17, 1992 and April 17, 1997, currently under review for reissuance.
    (b) Construction General Permit (CASGP- Construction Activities Storm Water General Permit), NPDES No. CAS000002, issued on August 20, 1992, reissued August 19, 1999, currently under review for reissuance.
    (c) Small Linear Underground/ Overhead Construction Projects General Permit (small LUPs), NPDES No. CAS000005, issued on June 18, 2003.
    (d) Small MS4 Permit WQ Order No. 2003-0005-DWQ, NPDES No. CAS000004, adopted on April 30, 2003.

19. Facilities discharging storm water associated with industrial activities, construction projects that disturb one or more acres of soil, or construction projects that disturb less than one acre but are part of a larger common plan of development or sale that in total disturbs 1 or more acres, and construction activities associated with small linear underground/ overhead projects that result in land disturbances greater than one acre, but less than five acres (small LUPs), are all required to obtain individual NPDES permits for storm water discharges, or be covered by the statewide General Permits by completing and filing a Notice of Intent (NOI) with the State Board. The U.S. EPA guidance anticipates coordination of the state-administered programs for industrial and construction activities with the local agency program to reduce pollutants in storm water discharges to the MS4.

20. State Water Board Resolution No. 68-16 contains the state Antidegradation Policy, titled “Statement of Policy with Respect to Maintaining High Quality Waters in California” (Resolution 68-16), which applies to all waters of the state, including

ground waters of the state, whose quality meets or exceeds (is better than) water quality objectives. Resolution No. 68-16 is considered to incorporate the federal Antidegradation Policy (40 CFR131.12) where the federal policy applies, (State Water Board Order WQO 86-17). Administrative policies that implement both, federal and state antidegradation policies acknowledge that an activity that results in a minor water quality lowering, even if incrementally small, can result in violation of Antidegradation Policies through cumulative effects, for example, when the waste is a cumulative, persistent, or bioaccumulative pollutant.

(a) Federal Antidegradation Policy (40 CFR131.12) states that the State shall develop and adopt a statewide antidegradation policy and identify the methods for implementing such policy pursuant to this subpart. The antidegradation policy and implementation methods shall, at a minimum, be consistent with the following:

(1) Existing instream water uses and the level of water quality necessary to protect the existing uses shall be maintained and protected.

(2) Where the quality of the waters exceed levels necessary to support propagation of fish, shellfish, and wildlife and recreation in and on the water, that quality shall be maintained and protected unless the State finds, after full satisfaction of the intergovernmental coordination and public participation provisions of the State's continuing planning process, that allowing lower water quality is necessary to accommodate important economic or social development in the area in which the waters are located. In allowing such degradation or lower water quality, the State shall assure water quality adequate to protect existing uses fully. Further, the State shall assure that there shall be achieved the highest statutory and regulatory requirements for all new and existing point sources and all cost-effective and reasonable best management practices for nonpoint source control.

(3) Where high quality waters constitute an outstanding National resource, such as waters of National and State parks and wildlife refuges and waters of exceptional recreational or ecological significance, that water quality shall be maintained and protected.

(4) In those cases where potential water quality impairment associated with a thermal discharge is involved, the antidegradation policy and implementing method shall be consistent with section 316 of the Act.

(b) State Water Board Resolution No. 68-16 establishes essentially a 2-step process for compliance with the policy.

(1) Step 1- if a discharge will degrade high quality water, the discharge may be allowed if any change in water quality:

(A) Will be consistent with maximum benefit to the people of the State.

(B) Will not unreasonably affect present and anticipated beneficial use of such water.

(C) Will not result in water quality less than that prescribed in state policies (e.g., water quality objectives in Water Quality Control Plans).

(2) Step 2- any activities that result in discharges to high quality waters are required to:

(A) Meet waste discharge requirements that will result in the best practicable treatment or control of the discharge necessary to avoid a pollution or nuisance.
(B) Maintain the highest water quality consistent with the maximum benefit to the people of the State.

21. The State Water Board on June 17, 1999, adopted Order No. WQ 99-05, which specifies standard receiving water limitation language to be included in all municipal storm water permits issued by the State and Regional Water Boards.

22. Cal. Water Code § 13263(a) requires that waste discharge requirements issued by Water Boards shall implement any relevant water quality control plans that have been adopted; shall take into consideration the beneficial uses to be protected and the water quality objectives reasonably required for that purpose; other waste discharges; and the need to prevent nuisance.

23. Clean Water Act section 402(p)(3)(B)(iii) requires municipal separate storm sewer system (MS4) operators to control pollution in storm water to the "maximum extent practicable" (MEP). The MEP requirement is analogous to a technology-based requirement in that it focuses upon the feasibility of pollutant reduction measures rather than achievement of water quality standards in the receiving waters to achieve improvements in the quality of the storm water that is discharged. Compliance with the MEP requirement can range from implementation of structural and nonstructural best management practices to installation of end-of-pipe treatment systems. MEP generally provides the MS4 operators the flexibility to determine what controls should be implemented through the development of a storm water management plan, subject to the Regional Board's approval. Nevertheless, MEP does not define the limits of pollution control measures that may be required of MS4 operators, and the requirement to implement controls that reduce pollutants to the MEP is not limited by the goal of attaining water quality standards. In some circumstances, compliance with MEP may result in controls more stringent than applicable WQS, and in others, less stringent. The Regional Board may use its discretion to impose other provisions beyond MEP, as it determines appropriate for the control of pollutants, including ensuring strict compliance with water quality standards. (Defenders of Wildlife v. Browner (1999) 191 F.3d 1159, 1168.)

24. The California Supreme Court has ruled that although Water Code section 13263 requires the Water Boards to consider the factors set forth in Water Code section 13241 when issuing an NPDES permit, the Water Boards may not consider the factors to justify imposing pollutant restrictions that are less stringent than the applicable federal regulations require (City of Burbank v. State Water Resources Control Bd. (2005) 35 Cal.4th 613). However, when the pollutant restrictions in an NPDES are more stringent than federal law requires, Water Code section 13263 requires that the Water Boards consider the factors described in section 13241 as they apply to those specific restrictions.

25. The City of Burbank case related to NPDES permits for publicly owned treatment works, not permits for municipal separate storm sewer systems (MS4s). Among other requirements, federal law requires MS4 permits to include requirements to effectively prohibit non-storm water discharges into the storm sewers, in addition to requiring controls to reduce the discharge of pollutants to the maximum extent practicable. Therefore, a 13241 analysis is not required for permit requirements that implement the effective prohibition on the discharge of non-storm water into the MS4, or for practicable controls to reduce the discharge of pollutants to the maximum extent, as those requirements are mandated by federal law.

26. The requirements in this Order may be more specific or detailed than those enumerated in federal regulations under 40 CFR122.26 or in U.S. EPA guidance. However, the requirements have been designed to be consistent with and within the federal statutory mandates described in CWA § 402(p)(3)(B)(ii) and (iii) and the related federal regulations. Consistent with federal law, all of the conditions in this permit could have been included in a permit adopted by U.S. EPA in the absence of the in lieu authority of California to issue NPDES permits.

27. The Board finds that all requirements in this order are practicable. Moreover, while commenters have alleged that the permit requirements are "beyond MEP," no commenter has presented evidence that demonstrates that any particular permit requirement is not actually practicable.

28. Notwithstanding findings 23 through 27, the Regional Board has developed an economic analysis of the permit's requirements, consistent with Water Code section 13241. That analysis is contained in the "Economic Considerations of the Proposed Storm Water (Wet Weather) and Non-Storm Water (Dry Weather) Discharges form the Municipal Separate Storm Sewer Systems within the Ventura County Watershed Protection District, County of Ventura and the Incorporated Cities Therein, June 2, 2008, which is contained in the administrative record for this Order. The Regional Board has considered all of the evidence that has been presented regarding the 13241 factors in adopting this permit, both as contained in the economic analysis and as reflected in the fact sheet and comments (and responses thereto) submitted to the many drafts of this permit. The Regional Board finds that the requirements in this Order are reasonably necessary to protect beneficial uses identified in the Basin Plan, and the economic information related to costs of compliance and other 13241 factors are not sufficient to justify failing to protect those beneficial uses. Where appropriate, additional time to implement certain measures and achieve water quality objectives can be provided through the iterative storm water management plan process.

F. Implementation

1. The California Environmental Quality Act (CEQA) (Cal. Pub. Resources Code § 2100 et seq.) requires that public agencies consider the environmental impacts of the projects they approve for development. CEQA applies to projects that are considered discretionary (a governmental agency can use its judgment in deciding whether and how to carry out or approve a project, § 15357) and does not apply to ministerial projects (the law requires a governmental agency to act on a project in a set way without allowing the agency to use its own judgment, § 15369). A ministerial project may be made discretionary by adopting local ordinance provisions or imposing conditions to create decision-making discretion in approving the project. In the alternative, Permittees may establish standards and objective criteria administratively for storm water mitigation for ministerial projects. For water quality purposes regardless of whether a project is discretionary or ministerial, the Regional Water Board considers that all new development and significant redevelopment activity in specified categories, that receive approval or permits from a municipality, are subject to storm water mitigation requirements in a manner that is consistent with and complies with the provisions of CEQA.

2. The objective of this Order is to ensure that discharges from the MS4 in Ventura County comply with water quality standards, including protecting the beneficial uses of receiving waters. To meet this objective, the Order requires that Best Management Practices (BMPs) will be implemented to reduce the discharge of pollutants in storm water to the maximum extent practicable (MEP), and achieve water quality objectives and standards. The U.S. EPA envisioned that municipal storm water programs would be implemented in an iterative manner and improved with each iteration by using information and experience gained during the previous permit term (*Interpretative Policy Memorandum on Reapplication Requirements for MS4 permits* - 61 Fed. Reg. 41697). Municipalities are required to evaluate what is effective and make improvements in order to protect beneficial uses of receiving waters. This Order requires implementation of an effective combination of pollution control and pollution prevention measures, education, public outreach, planning, and implementation of source control BMPs and Structural and Treatment Control BMPs. The better–tailored BMPs combined with the performance objectives outlined in this Order have the purpose of attaining water quality objectives and standards (*Interim Permitting Approach for Water Quality-Based Effluent Limitations in Storm Water Permits*- 61 Fed. Reg. 43761). Where WLAs have been adopted for storm water (wet weather) and non-storm water (dry weather) discharges from MS4s, this Order requires Permittees to implement controls to achieve the WLAs within the compliance schedule provided in the TMDLs.

3. The implementation of measures set forth in this Order are reasonably expected to reduce the discharge of pollutants conveyed in storm water discharges into receiving waters, and to meet the TMDL WLAs for discharges from MS4s that have been adopted by the Regional Water Board.

4. The U.S. EPA has recommended that all future TMDLs and TMDL amendments be expressed as daily increments consistent with a federal court ruling (*Friends of the Earth, Inc. v. EPA, et al*. No. 05-5015 (D.C. Cir. 2006)). However, this interpretation does not affect the discretionary authority of the Regional Water Board to express NPDES permit limits and conditions in non daily terms because there is no express or implied statutory limitation (CWA §502(11)) (*Establishing TMDL "Daily Loads" in Light of the Decision by the U.S. Court of Appeals for the D.C. Circuit in Friends of the Earth, Inc. v. EPA, et al. (April 2006) and Implications for NPDES Permits*, U.S. EPA Office of Water, memorandum, Nov 15, 2006). This Order translates MS4 TMDL WLAs adopted by the Regional Water Board into forms "consistent with the assumptions and requirements of the TMDL".

5. During the term of the Order, the Permittees shall implement all necessary control measures to reduce pollutant(s) which cause or continue to cause or contribute to water quality impairments, but for which TMDLs have not yet been developed or approved, to eliminate the water quality impairment(s). Successful efforts to reverse the wet weather impairments during the permit term for such pollutants, may avoid the need for a WLA for wet weather or the need to develop a TMDL in the future.

6. This Order promotes land development and redevelopment strategies that consider water quality and water management benefits associated with smart growth techniques. Such measures may include hydromodification mitigation requirements, minimization of effective impervious area, integrated water resources planning, and low impact development guidelines. (Reference: *Protecting Water Resources with Smart Grow*th, EPA 231-R- 04-002, U.S. EPA 2004; *Using Smart Growth Techniques as Storm Water Best Management Practices,* EPA 231-B-05-002, U.S. EPA 2005; *Parking Spaces/Community Places: Finding the Balance through Smart Growth Solutions*, EPA 231-K-06-001, U.S. EPA 2006; *Protecting Water Resources with Higher-Density Development*, EPA 231-R-06-001, U.S. EPA 2006.)

7. The implementation of an effective Public Information and Participation Program is a critical component of a storm water management program. While commercial and industrial facilities are traditionally subject to multiple environmental regulations and receive environmental protection guidance from multiple sources, the general public, in comparison, receives significantly less education in environmental protection. An effective Public Information and Participation Program is required because:
   (a) Activities conducted by the public such as vehicle maintenance, improper household waste materials disposal, improper pet waste disposal and the improper application of fertilizers and pesticides have the potential to generate a significant amount of pollutants that could be discharged in storm water.
   (b) An increase in public knowledge of storm water regulations, proper storage and disposal of household wastes, proper disposal of pet wastes and appropriate home vehicle maintenance practices can lead to a significant reduction of pollutants discharged in storm water.

8. This Order also provides flexibility for Permittees to seek authorization from the Regional Water Board Executive Officer to substitute a BMP under this Order with an alternative BMP, if they can provide information and documentation on the effectiveness of the alternative, equal to or greater than the prescribed BMP in meeting the objectives of this Order.

9. This Order contemplates that the Permittees are responsible for considering potential storm water impacts when making planning decisions in order to fulfill the Permittees' CWA requirement to reduce the discharge of pollutants in municipal storm water to the MEP and attain water quality objectives from new development and redevelopment activities. However, the Permittees retain authority to make the final land-use decisions and retain full statutory authority for deciding what land uses are appropriate at specific locations within each Permittee's jurisdiction. This Order and its requirements are not intended to restrict or control local land use decision-making authority.

10. The State Water Board amended the Policy for the Implementation of Toxics Standards In Inland Surface Waters, Enclosed Bays and Estuaries of California (State Implementation Policy – SIP) on February 24, 2005. The SIP does not apply directly to the stormwater discharges. However, this Order includes a Monitoring Program that incorporates Minimum Levels (MLs) established under the State Implementation Policy. The MLs represent the lowest quantifiable concentration for priority toxic pollutants that is measurable with the use of proper method-based analytical procedures and factoring out matrix interference. The SIP's MLs therefore represent the best available science for determining MLs and are appropriate for a storm water monitoring program. The use of MLs allows the detection of toxic priority pollutants at concentrations of concern using recent advances in chemical analytical methods.

11. The International Storm Water Best Management Practices (BMP) Database was established in 1996 as a cooperative initiative between the U.S. EPA and the American Society of Civil Engineers (ASCE) to provide scientifically sound information to improve the design, selection and performance of storm water BMPs. The BMP database includes standardized BMP monitoring and reporting protocols, a storm water BMP database, BMP performance evaluation protocols, and BMP monitoring guidance. The storm water BMP database is updated approximately semi-annually to add new BMP studies and performance data. The International Storm Water Database is now maintained by the Water Environment Research Foundation (WERF).

12. This Order is not intended to prohibit the inspection for or abatement of vectors by the State Department of Public Health or local vector agencies in accordance with CA Health and Safety Code, § 116110 et seq. Certain Treatment Control BMPs if not properly designed, operated or maintained may create habitats for vectors (e.g. mosquitoes and rodents). This Order contemplates that the Permittees will closely cooperate and collaborate with local vector control agencies and the State Department

of Public Health for the implementation, operation, and maintenance of Treatment Control BMPs in order to minimize the risk to public health from vector borne diseases.

13. This Order contemplates that Permittees will ensure that implemented Treatment Control BMPs will not pose a safety or health hazard to the public. This Order contemplates that Permittees will ensure that the maintenance of implemented Treatment Control BMPs will comply with all applicable health and safety regulations, such as, but not limited to requirements for worker entry into confined spaces under OSHA Safety and Training education, § 1926.21(b)(6)(i).

14. This Order incorporates presumptive BMPs to reduce pollutants in storm water discharges from construction sites to the MEP. The BMPs are identified in Table 6 (BMPs at Construction sites less than 1 acre), Table 7 (BMPs at Construction Sites 1 acre or greater but less than 5 acres), and Table 8 (BMPs at Construction sites 5 acres or greater). These BMPs include erosion control, sediment control, and construction site waste management practices. The BMPs listed in part 4.F of the Order were selected based on the Water Boards' experience of regulating such sites since 1992, and are referenced in the *California Stormwater Quality Association (CASQA) Storm Water Best Management Practice Handbook Construction (January 2003)* and from the *Stormwater Quality Handbooks, Project Planning and Design Guide, Stormwater Pollution Prevention Plan (SWPPP) and Water Pollution Control Plan (WPCP) Preparation Manual, Construction Site Best Management Practices (BMPs) Reference Manual, March 2007* (Caltrans Document Number CTSW-RT-06-171.11-1) which serve as an industry standard for California. The BMPs identified in the Tables are technically feasible, practicable, and cost-effective. Where an identified BMP may be impracticable on a particular site, this Order includes a provision to select and implement an alternative BMP, through the BMP substitution provisions in subpart 4.A.2.

15. This Order incorporates presumptive BMPs to reduce pollutants in storm water discharges from commercial and industrial sites to the MEP. The BMPs are identified in Table 2 (BMPs at Restaurants), Table 3 (BMPs at Automotive Service Facilities), Table 4 (BMPs at Retail Gasoline Outlets), and Table 5 (BMPs at Nurseries). These BMPs include the implementation of good housekeeping practices designed to control pollutants at the source, promote the use of proper waste management practices, and implement control practices to keep pollutants away from any entrance to the storm drainage system. The BMPs listed in part 4.D of the Order were selected based on the Water Boards' experience of regulating such sites since 1992 and referenced in the California Stormwater Quality Association (CASQA) Storm Water Best Management Practice Handbook Commercial/Industrial Activity (January 2003) and from the Caltrans Storm Water Quality Handbook Maintenance Staff Guide May 2003 (Caltrans Document Number CTSW-RT-02-057), which serve as an industry standard for California. The BMPs identified in the Tables are technically feasible, practicable, and cost-effective. Where an identified BMP may be

impracticable, this Order includes a provision to select and implement an alternative BMP, through the BMP substitution provisions in subpart 4.A.2.

16. This Order incorporates presumptive BMPs to reduce pollutants in storm water discharges from Public Agency Activities to the MEP. The BMPs are identified in Table 10 (BMPs at Vehicle Maintenance/ Material Storage Facilities/ Corporation Yards). These BMPs include the implementation of good housekeeping practices designed to control pollutants at the source, promote the use of proper waste management practices, implement control practices to keep pollutants away from any entrance to the storm drainage system and from being deposited or discharged directly into waters of the U.S. The BMPs listed in part 4.G of the Order were selected based on the Water Boards' experience of regulating such sites since 1990, and are referenced in the Caltrans Storm Water Quality Handbook Maintenance Staff Guide May 2003 (Caltrans Document Number CTSW-RT-02-057), which serves as a statewide standard for the California Department of Transportation (Caltrans). The BMPs identified in the Table are technically feasible, practicable, and cost-effective, and are the standard of practice for Caltrans sites statewide. Where an identified BMP may be impracticable, this Order includes a provision to select and implement an alternative BMP, through the BMP substitution provisions in subpart 4.A.2.

17. This Order incorporates BMPs to ensure that authorized Non-Storm Water Discharges are not a source of pollutants to the MS4, Table 1 (Required Conditions for Non-Storm Water Discharges). The BMPs included are for the purpose of dechlorination and/or for prevention of erosion and sediment loss, or to reduce other harmful pollutants during the discharge of authorized non-storm water discharges to the MS4. The BMPs listed in part 1.A of the Order were selected from the *American Water Works Association AWWA Guidelines For The Development Of Your Best Management Practices (BMP) Manual For Drinking Water System Releases Developed by the CA-NV AWWA Environmental Compliance Committee (2005)* which serves as an industry standard for California, from the results of studies directed by the Los Angeles Water Board, - *Evaluation of Non-Storm Water Discharges to California Storm Drains and Potential Policies for Effective Prohibition Methods, Final Report*, University of California, Los Angeles, Contract No. 5-104-140-0 (1997), and *Water Quality Concerns and Regulatory Controls for Non Storm Water Discharges to Storm Drains*, Duke L.D. and M. Kihara, Journal of the American Water Resources Association, Vol. 34: 661-676, (1998), and from the Water Boards' experience of controlling authorized non-storm discharges to the MS4 since 1990. The BMPs identified in the Table are technically feasible, practicable, and cost-effective. Where an identified BMP may be impracticable, this Order includes a provision to select and implement an alternative BMP, through the BMP substitution provisions in subpart 4.A.2.

18. In accordance with Federal regulations at 40 CFR 124.8, a Fact Sheet has been prepared to explain the principal facts and the significant factual, legal, methodological, policy, and economic matters considered in preparing the Order. This Fact Sheet has been made a part of the Administrative Record.

19. The State Water Board adopted statewide General Waste Discharge Requirements for Sanitary Sewer Systems, (WQ Order No. 2006-0003) on May 2, 2006, to provide a consistent, statewide regulatory framework to address sanitary sewer overflows ("SSO Orders"). The SSO Order establishes requirements for public agencies that own or operate sanitary sewer systems to develop and implement sewer system management plans and to report SSOs. SSOs that enter MS4s have the potential to impair the recreational use of receiving waters, and to harm public health. This Order establishes coordination, response, and notification requirements for MS4 Permittees when SSOs result in a discharge to the MS4 system.

20. This Order takes into consideration the housing needs in the area under the Permittees' jurisdiction by balancing the implementation of Smart Growth and Low Impact Development techniques with the protection of the water resources of the region. Although not required, the Regional Water Board considered the need for housing and the appropriate techniques to allow for reasonable development while protecting the receiving waters from degradation.

21. This Order may have an effect on costs required for compliance with the provisions contained herein. Although not required, the Regional Water Board has considered costs in preparing this Order. Though also not required, the Regional Water Board has also considered the factors set forth in Water Code section 13241.

G. Public Notification

1. The issuance of waste discharge requirements pursuant to California Water Code section 13370 et seq. is exempt from the California Environmental Quality Act in accordance with California Water Code section 13389. *County of Los Angeles et al., v. California Water Boards et al.*, (2006), 143 Cal.App.4th 985.

2. The Regional Water Board has notified the Permittees, and interested agencies and persons of its intent to issue waste discharge requirements for this discharge, and has provided them with an opportunity to make statements and submit their comments.

3. The Regional Water Board staff has conducted more than 35 meetings from February 9, 2007 through December 19, 2008, with Permittees, their representatives (Larry Walker and Associates, and Somach, Simmons & Dunn), and various stakeholders (Building Industry Association of Southern California/ Greater Los Angeles Ventura Chapter (BIAGLA/ VC), California State Dept. of Health Services, Calleguas Water District, California Stormwater Quality Association (CASQA), City of Downey, City of Los Angeles-EMD, Collation for Practical Regulation (CPR), Construction

Industry Coalition on Water Quality (CICWQ), County of Orange, Geosyntec Consultants, Golden State, Heal The Bay; Local Government commission, Los Angeles City; Los Angeles County Department of Public Works, Los Angeles County-SD, Los Angeles Department of Water & Power, Metropolitan Water District, Natural Resources Defense Council (NRDC), Richard Watson Association, San Bernardino Flood Control District, Santa Monica Bay Restoration Commission, Southern California Coastal Water Research Project, University of California Sea Grant, Ventura CoastKeeper). On April 5, 2007 and September 20, 2007 the Regional Water Board conducted workshops to discuss drafts of the NPDES Order and received input from the Permittees and the public regarding proposed changes.

4. This Order shall serve as a NPDES permit, pursuant to CWA § 402, and shall take effect 90 days from Order adoption date (August 5, 2009) provided the Regional Administrator of the U.S. EPA has no objections.

5. Pursuant to Cal. Water Code § 13320, any aggrieved party may seek review of this Order by filing a petition with the State Board within 30 days of the date of adoption of the Order by the Regional Water Board. A petition must be sent to:

   State Water Resources Control Board
   Office of the Chief Counsel
   P.O. Box 100
   Sacramento, CA 95812-0100

6. This Order may be modified or alternatively revoked or reissued prior to its expiration date or any administrative extension thereto, in accordance with 40 CFR122.41(f) and 122.62.

IT IS HEREBY ORDERED that the Permittees, in order to meet the provisions contained in Division 7 of the Cal. Water Code and regulations adopted thereunder, and the provisions of the CWA and regulations adopted thereunder, shall comply with the following:

PART 1 - DISCHARGE PROHIBITIONS

A. Prohibitions - Non-Storm Water Discharges

1. The Permittees shall, within their respective jurisdictions, effectively prohibit non-storm discharges into the MS4 and receiving waters, except where such discharges:
   (a) Originate from a State, Federal, or other source for which they are pre-empted from regulating by State or Federal law; or
   (b) Are covered by a separate individual or general NPDES permit, or conditional waiver for irrigated lands; or
   (c) Flows from fire fighting activities.

(d) Fall within one of the categories below, are not a source of pollutants that exceed water quality standards, and meet all conditions where specified by the Regional Water Board Executive Officer:
  (1) Category A – Natural flows
    (A) Stream diversions authorized by the State Water Board
    (B) Natural springs and rising ground water
    (C) Uncontaminated ground water infiltration [as defined by 40 CFR35.2005(20)][1]
    (D) Flows from riparian habitats or wetlands
  (2) Category B – Flows incidental to urban activities, providing conditions listed in table below:
    (A) Discharges from potable water sources[2]
    (B) Gravity flow from foundation, footing and crawl space drains.
    (C) Air conditioning condensate
    (D) Reclaimed and potable landscape irrigation runoff
    (E) Dechlorinated/ debrominated swimming pool discharges [see def. part 6]
    (F) Non-commercial car washing by residents or non-profit organizations
    (G) Sidewalk rinsing
    (H) Pooled non-storm water from treatment BMPs[3]

Table 1 – Required Conditions for Non-Storm Water Discharges

Type of Discharges:	**Conditions under which allowed:**	**Required conditions for discharge to occur:**
Stream diversions permitted by the State Board	Authorization by the State Water Board	Permittees shall comply with all conditions in the authorization.
Natural springs and rising ground water	1. Ground water dewatering requires a separate NPDES permit. 2. Segregate flow to prevent introduction of pollutants.	Permittees shall comply with all conditions in the authorization.
Uncontaminated ground water infiltration [as defined by 40 CFR 35.2005(20)]	NPDES permit for ground water dewatering is required within the Los Angeles Region including Ventura County	Permittees shall comply with all conditions in the authorization.

[1] NPDES permit for ground water dewatering is required within the Los Angeles Region including Ventura County.
[2] The term applies to low volume, incidental and infrequent releases that are innocuous from a water quality perspective. Those releases for dewatering or hydro-testing or flushing of water supply and distribution mains and incidental and infrequent releases from well heads shall be allowed with the implementation of appropriate BMPs until such time as a new General Permit is adopted that addresses those types of releases. Discharges from hydrostatic pipe testing shall be subject to separate NPDES general permit coverage (CAG674001) and discharges from utility vaults shall be conducted under coverage of a separate NPDES permit specific to that activity.
[3] All storm water BMPs shall at a minimum be maintained at a frequency as specified by the manufacturer, and designed to drain within 72 hours of the end of a rain. Storm water treatment BMPs may be drained to the MS4 under this Order if the discharge is not a source of pollutants. Sediments shall be disposed of properly, in compliance with all applicable local, state, and federal policies, acts, laws, regulations, ordinances, and statutes.

Type of Discharges:	Conditions under which allowed:	Required conditions for discharge to occur:
(Utility vault dewatering requires a separate NPDES permit.)		
Flows from riparian habitats or wetlands	Provided that all necessary permits or authorizations are received prior to diverting the stream flow.	Permittees shall comply with all conditions in the authorization.
Discharges from potable water sources	See Footnote #2. Provided discharges from water lines and potable water sources shall be dechlorinated, pH adjusted if necessary, reoxygenated, and volumetrically and velocity controlled to prevent resuspension of sediments.	See Footnote #2. To be discharged, this type of water shall be dechlorinated using aeration and/ or sodium thiosulfate and/ or other appropriate means and/or be allowed to infiltrate to the ground. BMPs such as sand bags or gravel bags, or other appropriate means shall be utilized to prevent sediment transport. All sediments shall be collected and disposed of in a legal and appropriate manner.
Drains for foundation, footing and crawl drains	Dewatering requires a separate NPDES permit.	Permittees shall comply with all conditions in the authorization.
Air conditioning condensate	Segregation of flow to prevent introduction of pollutants. Percolation whenever possible.	Permittees shall comply with all conditions in the authorization.
Water from crawl space pumps	Dewatering requires a separate NPDES permit within the Los Angeles Region including Ventura County	Permittees shall comply with all conditions in the authorization.
Reclaimed and potable landscape irrigation runoff	Segregation of flow to prevent introduction of pollutants.	Implement conservation programs to minimize this type of discharge by using less water.
Dechlorinated/ debrominated swimming pool discharges [see definition Part 6]	Where the discharge is not excepted by the sanitary sewer operator. Swimming pool discharges are to be dechlorinated, pH adjusted if necessary, aerated to remove chlorine if necessary, and volumetrically and velocity controlled to prevent resuspension of sediments. Cleaning waste water and filter back wash shall not be discharged to municipal separate storm sewers. No discharges are allowed containing salts in excess of Water Quality Standards.	Pool water may be dechlorinated using time, aeration, and/ or sodium thiosulfate.

Type of Discharges:	Conditions under which allowed:	Required conditions for discharge to occur:
	Chlorine residual in discharge shall not exceed 0.1mg/L.	
Non-commercial car washing by residents or non-profit organizations	Preferably at a commercial carwash or designated area where wash water can percolate. Pumps or vacuums may be used to direct water to pervious areas.	Permittees shall comply with all conditions in the authorization.
Sidewalk rinsing	This may be undertaken only if high pressure low volume is used as described in the glossary under "Sidewalk Rinsing".	
Pooled storm water from treatment BMPs	All storm water BMPs shall at a minimum be maintained at a frequency as specified by the manufacturer. All storm water BMPs shall be designed to drain within 72 hours of the end of the rain event to avoid the breeding of vectors. Storm water treatment BMPs may be drained to the MS4 under this Order if the discharge is not a source of pollutants. The discharge shall cease before the discharge has become a source of a pollutant(s), (bottom sediment included). Sediments shall be disposed of properly, in compliance with all applicable local, state, and federal policies, acts, laws, regulations, ordinances, and statutes.	

2. If the Regional Water Board Executive Officer determines that any of the preceding categories of non-storm water discharges are a source of pollutants that exceed water quality standards, the Permittee(s) shall either:
   (a) Prohibit the discharge from entering the MS4; <u>or</u>
   (b) Authorize the discharge category and require implementation of appropriate or additional BMPs to ensure that the discharge will not be a source of pollutants; <u>or</u>
   (c) Require or obtain coverage under a separate RWQCB or SWRCB permit for discharge into the MS4.

<u>PART 2 – RECEIVING WATER LIMITATIONS</u>

1. Discharges from the MS4 that cause or contribute to a violation of water quality standards are prohibited.

2. Discharges from the MS4 of storm water, or non-storm water, for which a Permittee is responsible, shall not cause or contribute to a condition of nuisance.

3. The Permittee shall comply with Receiving Water Limitations 1 and 2 through timely implementation of control measures and other actions to reduce pollutants in the storm water discharges in accordance with the requirements of this Order including any modifications. The Permittees' Program shall be designed to achieve compliance with Receiving Water Limitations 1 and 2. If exceedance(s) of water quality objectives or water quality standards (collectively WQS) persist, notwithstanding implementation of this permit, the Permittees shall ensure compliance with Receiving Water Limitations 1 and 2 by complying with the following procedure:
   (a) Upon determination by either the Permittees or the Regional Water Board that discharges are causing or contributing to an exceedance of an applicable WQS, the Permittee(s) upstream of the point of discharge shall promptly notify and thereafter submit a report to the Regional Water Board Executive Officer that describes BMPs that are currently being implemented and additional BMPs that will be implemented to prevent or reduce any pollutants that are causing or contributing to the exceedance of WQSs. The report may be included with the Annual Report, unless the Regional Water Board Executive Officer directs an earlier submittal. The Regional Water Board Executive Officer may require modifications to the report.
   (b) Submit any modifications to the report required by the Regional Water Board Executive Officer within 30 days of notification.
   (c) Within 30 days following approval of the Report described above by the Regional Water Board Executive Officer, the Permittees shall revise their Program and monitoring program to incorporate the approved modified BMPs that have been and will be implemented, the implementation schedule, and any additional monitoring required.
   (d) Implement the revised Program and monitoring program according to the approved schedule.

4. Permittees shall annually report the effectiveness of BMPs in reducing exceedances of receiving water limitations. The Regional Board Executive Officer may direct implementation of additional BMPs if there are continuing or recurring exceedances of the same receiving water limitation.

PART 3 - STORM WATER QUALITY MANAGEMENT PROGRAM IMPLEMENTATION

A. General Requirements

1. Each Permittee shall, at a minimum, adopt and implement applicable terms of this Order within its jurisdictional boundary. The Principal Permittee shall be responsible for program coordination as described in this Order as well as compliance with applicable portions of the permit within its jurisdiction. This Order shall be implemented no later than August 5, 2009, unless a later date has been specified for a

particular provision in this Order and provided the Regional Administrator of the U.S. EPA has no objections.

2. Each Permittee shall comply with the requirements of 40 CFR122.26(d)(2) and implement programs and control measures so as to reduce the discharges of pollutants in storm water to the MEP and achieve water quality standards.

3. Each Permittee shall require that treatment control BMPs being implemented under the provisions of this Order shall be designed, at a minimum, to achieve the BMP performance criteria for storm water pollutants likely to be discharged as identified in Attachment "C", for an 85th percentile 24-hour runoff event determined as the maximized capture storm water volume for the area using a 48 to 72-hour draw down time, from the formula recommended in Urban Runoff Quality Management, WEF Manual of Practice No. 23/ASCE Manual of Practice No. 87, (1998). Expected BMP pollutant removal performance for effluent quality was developed from the WERF-ASCE/ U.S. EPA International BMP Database. Permittees shall select Treatment BMPs based on the primary class of pollutants likely to be discharged from the site/facility (e.g. metals from an auto repair shop). Permittees may develop guidance for appropriate Treatment BMPs for project type based on Attachment "C". For the treatment of pollutants causing impairments within the drainage of the impaired waterbody, permittees shall select BMPs from the top three performing BMP categories or alternative BMPs that are designed to meet or exceed the performance of the highest performing BMP for the pollutant causing impairment.

4. Each Permittee shall implement programs and measures to comply with the TMDLs' WLAs for the MS4 as specified in Part 5.

5. If TMDL requirements, including Implementation Plans and Reports, address substantially similar requirements as the MS4 permit, the Executive Officer may approve the applicable reports, plans, data or submittals under the applicable TMDL as fulfilling requirements under the MS4.

B. Legal Authority

1. Permittees shall possess the necessary legal authority to prohibit, including, but not limited to:
   (a) Illicit connections and illicit discharges, and to remove illicit connections.
   (b) The discharge of non-storm water to the MS4 from:
      (1) Washing or cleaning of gas stations, auto repair garages, or other types of automotive service facilities
      (2) Mobile auto washing, carpet cleaning, steam cleaning, sandblasting and other such mobile commercial and industrial operations
      (3) Areas where repair of machinery and equipment which are visibly leaking oil, fluid or antifreeze, is undertaken

(4) Storage areas for materials containing grease, oil, or other hazardous substances, and uncovered receptacles containing hazardous materials
(5) Swimming pools[1] that have a concentration greater than:
  (A) Chlorine/ bromine- 0.1mg/L
  (B) Chloride- 250mg/L
(6) Swimming pool filter backwash
(7) Decorative fountains and ponds
(8) Industrial/ Commercial areas, including restaurant mats
(9) Concrete truck cement, pumps, tools, and equipment washout
(10) Spills, dumping, or disposal of materials other, such as:
  (A) Litter, landscape and construction debris, garbage, food, animal waste, fuel or chemical wastes, batteries, and any other materials which have the potential to adversely impact water quality; <u>and</u>
  (B) Any pesticide, fungicide or herbicide
(11) Stationary and mobile pet grooming facilities
(12) Trash container leachate

2. The Permittees shall possess adequate legal authority to:
(a) Control through interagency agreement, the contribution of pollutants from one portion of the MS4 to another portion of the MS4.
(b) Require persons within their jurisdiction to comply with conditions in the Permittees' ordinances, permits, contracts, model programs, or orders (i.e. hold dischargers to its MS4 accountable for their contributions of pollutants and flows).
(c) Utilize enforcement measures (e.g., stop work orders, notice of violations, fines, referral to City, County, and/ or District Attorneys, referral to strikeforces, etc.) by ordinances, permits, contracts, orders, administrative authority, and civil and criminal prosecution.[2]
(d) Control pollutants, including potential contribution[3] in discharges of storm water runoff associated with industrial activities, including construction activities to its MS4, and control the quality of storm water runoff from industrial sites, including construction sites.

(e) Carry out all inspections, surveillance and monitoring procedures necessary to determine compliance and non-compliance with permit conditions including the prohibition on illicit discharges to the MS4.
(f) Require the use of control measures to prevent or reduce the discharge of pollutants to achieve water quality objectives.
(g) Require that Treatment Control BMPs be properly operated and maintained.

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[1] MS4s discharging directly to the ocean are not subject to this prohibition.
[2] In the case of private responsible parties such as, HOAs, the Permittee must retain enforcement authority.
[3] "Potential contributions" and "potential to discharge," means adequate legal authority to prevent an actual discharge of pollutants to the municipal separate storm sewer system.

3. Each Permittee has adopted a Storm Water Quality Ordinance based upon a countywide model. Each Permittee shall ensure, no later than May 7, 2011, that its Storm Water Quality Ordinance authorizes the Permittee to enforce all requirements of this Order.

4. Each Permittee shall submit no later than two years after Order adoption date, a statement by its legal counsel that the Permittee has obtained and possesses all necessary legal authority to comply with this Order through adoption of ordinances and/ or municipal code modifications.

C. Fiscal Resources

1. The Permittees shall implement the activities required to comply with the provisions of this Order.[1] Each Permittee shall:
   (a) Submit an Annual Budget Summary that shall include:
      (1) Budgets for the upcoming report year (estimated expenditure) for the following specific categories (estimated percentages and written explanations where necessary):
         (A) Program Management Activities.
            (i) Overall Administrative costs
         (B) Program Implementation Activities (permit related activities only). Provide figures breakdown of expenditures for the categories below:
            (i) Illicit connection/ illicit discharge program.
            (ii) Development planning and approval
            (iii) Construction program including inspection activities
            (iv) Industrial/ Commercial program including inspection activities
            (v) Public Agency Activities
               (I) Maintenance and inspection of Treatment Control BMPs
               (II) Municipal Street Sweeping
               (III) Municipal Drainage Maintenance including catch basin clean-outs
               (IV) Other costs associated with storm water management (describe)
            (vi) Public Information and Participation.
            (vii) Monitoring Program
            (viii) Miscellaneous Expenditures (describe)

D. Modifications/ Revisions

1. No later than two years after the Order adoption date, each Permittee shall modify its storm water management programs, protocols, practices, and municipal codes to make them consistent with the requirements herein.

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[1] The sources of funding may be the general funds, and/or Benefit Assessment, plan review fees, permit fees, industrial/ commercial user fee, revenue bonds, grants or other similar funding mechanism.

E. Designation and Responsibilities of the Principal Permittee

1. The Ventura County Watershed Protection District is hereby designated as the Principal Permittee. The Principal Permittee shall:
   (a) Participate in the County Environmental Crimes Task Force
   (b) Coordinate and facilitate activities necessary to comply with the requirements of this Order, but the Principal Permittee is not responsible for ensuring compliance of any other individual Permittee
   (c) Coordinate permit activities among Permittees and act as liaison between the Permittees and the Regional Water Board on permitting issues
   (d) Provide technical and administrative support for committees that will be organized to implement this Order and its requirements
   (e) Evaluate, assess, and synthesize the results of the monitoring program and the effectiveness of the implementation of BMPs
   (f) Convene the Committee Meetings constituted pursuant to subpart 4.F.1., below, upon designation of representatives
   (g) Implement the Countywide Monitoring Program required under the Order and evaluate, assess and synthesize the results of the monitoring program
   (h) Provide personnel and fiscal resources for the collection, processing and submittal to the Regional Water Board of monitoring and annual reports, and summaries of other reports required under this Order

F. Responsibilities of the Permittees

1. Each Permittee is required to comply with the requirements of this Order applicable to discharges within its boundaries (see Findings- Permit Coverage D.1 and D.2). Permittees are not responsible for the implementation of the provisions applicable to the Principal Permittee or other Permittees. Each Permittee shall:
   (a) Comply with the requirements of this Order and any modifications thereto
   (b) Coordinate among its internal departments and agencies, as necessary, to facilitate the implementation of the requirements of this Order applicable to such Permittees in an efficient and cost-effective manner
   (c) Participate in intra-agency coordination (e.g., Planning Department, Fire Department, Building and Safety, Code Enforcement, Public Health, Parks and Recreation, and others) necessary to successfully implement the provisions of this Order
   (d) Report, in addition to the Budget Summary, any supplemental dedicated budgets for the same categories
   (e) Participate in Committee Meetings, as necessary

PART 4 - SPECIAL PROVISIONS (BASELINE)

A. General Requirements

1. This Order and the provisions herein are intended to develop, achieve, and implement a timely, comprehensive, cost-effective storm water pollution control program to reduce the discharge of pollutants in storm water to the MEP and not cause or contribute to exceedances of water quality standards for the permitted areas in the County of Ventura.

2. Best Management Practice Substitution
   (a) The Regional Water Board Executive Officer may approve any site-specific BMP substitution upon written request by a Permittee(s) and after public notice, if the Permittee can document that:
      (1) The proposed alternative BMP or program will meet or exceed the objective of the original BMP or program in the reduction of storm water pollutants.
      (2) The fiscal burden of the original BMP or program is greater than the proposed alternative and does not achieve a greater improvement in storm water quality.
      (3) The proposed alternative BMP or program will be implemented within a similar period of time.
      (4) BMP substitution will be in accordance with the public review provisions of the Order (Part 7.C.1 and Part 7.C.2).

B. Watershed Initiative Participation

1. The Principal Permittee shall participate in water quality meetings for watershed management and planning, including but not limited to the following:
   (a) Southern California Stormwater Monitoring Coalition (SMC)
   (b) Other Watershed planning groups as appropriate

2. The Principal Permittee shall participate in the following regional water quality programs, and projects for watershed management and planning:
   (a) SMC Regional Monitoring Programs
      (1) Southern California Regional Bioassessment
         (A) Level of effort per watershed
            (i) Probabilistic sites per watershed
               (I) Ventura River - Six
               (II) Santa Clara River - Three
               (III) Calleguas Creek - Six
            (ii) Integrator sites per watershed
               (I) Ventura River - One
               (II) Santa Clara River - One
               (III) Calleguas Creek – One
            (iii) Fixed bioassessment sites

(I) The Permittees shall perform bioassessment at one fixed urban site in each major watershed. Site selection shall be determined by the results of the first year SMC results, as approved by the Executive Officer.

(b) Southern California Bight Projects

(1) Regional Monitoring Survey – 2008, and successive years.

C. Public Information and Participation Program (PIPP)

1. The Principal Permittee shall implement a Public Information and Participation Program (PIPP) that includes, but is not limited to, the requirements listed in this part. The Principal Permittee shall coordinate with Permittees to implement specific PIPP requirements. The objectives of the PIPP are as follows:

   (a) To increase the knowledge of the target audience about the MS4, the adverse impacts of storm water pollution on receiving waters and potential solutions to mitigate the impacts

   (b) To change the waste disposal and storm water pollution generation behavior of target audiences by encouraging implementation of appropriate solutions

   (c) To involve and engage communities in Ventura County to participate in mitigating the impacts of storm water pollution

2. Residential Program

   (a) "No Dumping" Message

   Each Permittee shall label all storm drain inlets that they own with a legible "no dumping" message. In addition, signs with prohibitive language discouraging illegal dumping shall be posted at designated public access points to creeks, other relevant waterbodies, and channels. Signage and storm drain messages shall be legible and maintained.

   (b) Public Reporting

   Each Permittee shall identify staff who will serve as the contact person(s) for reporting clogged catch basin inlets and illicit discharges/dumping, faded or missing catch basin labels, and general storm water management information. Permittees shall include this information, updated by July 1 of each year, in public information media such as the government pages of the telephone book, and internet web sites. The Principal Permittee shall compile a list of the general public reporting contacts submitted by all Permittees and make this information available on the web site (http://www.vcstormwater.org/contact.htm) and upon request. Each Permittee is responsible for providing current, updated information to the Principal Permittee.

   (c) Outreach and Education

   (1) Collaboratively, the Permittees shall implement the following activities:

   (A) Conduct a Storm Water pollution prevention advertising campaign.

   (B) Conduct Storm Water pollution prevention public service announcements.

(C) Distribute storm water pollution prevention public education materials within 365 days of the adoption of this Order (i.e. May 7, 2010) to:
  (i) Automotive parts stores
  (ii) Home improvement centers/ lumber yards/ hardware stores
  (iii) Pet shops/ feed stores

(D) Public education materials shall include, but are not limited to information on the proper disposal, storage, and use of:
  (i) Vehicle waste fluids
  (ii) Household waste materials
  (iii) Construction waste materials
  (iv) Pesticides and fertilizers (including integrated pest management practices-IPM)
  (v) Green waste (including lawn clippings and leaves)
  (vi) Animal wastes

(E) Work with existing local watershed groups or organize watershed Citizen Advisory Groups/ Committees to develop effective methods to educate the public about storm water pollution no later than May 7, 2010.

(F) Organize events targeted to residents and population subgroups; and

(G) Maintain the Countywide storm water website (www.vcstormwater.org), which shall include educational material listed in the preceding subpart C.2(c)(1)(D).

(2) The Principal Permittee shall develop a strategy to educate ethnic communities through culturally effective methods. Details of this strategy should be incorporated into the PIPP, and implemented, no later than May 7, 2010.

(3) Each Permittee shall continue the existing outreach program to residents on the proper disposal of litter, green waste, pet waste, proper vehicle maintenance, lawn care and water conservation practices.

(4) Each Permittee shall conduct educational activities within its jurisdiction and participate in countywide events.

(5) The Permittees shall make a minimum of 5 million impressions per year to the general public related to storm water quality, with a minimum of 2.5 million impressions via newspaper, local TV access, local radio and/ or internet access.

(6) The Principal Permittee, in cooperation with the Permittees, shall provide schools within each School District in the County with materials, including, but not limited to, videos, live presentations, and other information necessary to educate a minimum of 50 percent of all school children (K-12) every 2 years on storm water pollution. Alternatively, a Permittee may submit a plan to the Regional Water Board Executive Officer for consideration no later than August 5, 2009 (90 days after adoption of the Order), to provide outreach in lieu of the school curriculum. Pursuant to Water Code section 13383.6, the Permittees, in lieu of providing educational materials/ funding to School Districts in the County, may opt to provide an

equivalent amount of funds or fraction thereof to the Environmental Education Account established within the State Treasury.

(7) Each Permittee shall provide the contact information for their appropriate staff responsible for storm water public education activities to the Principal Permittee and contact information changes no later than 30 days after a change occurs.

(8) The Permittees shall develop and implement a behavioral change assessment strategy no later than May 7, 2010, in order to determine whether the PIPP is demonstrably effective in changing the behavior of the public. The strategy shall be developed based on current sociological data and studies.

(d) Pollutant-Specific Outreach

The Principal Permittee, in cooperation with the Permittees, shall coordinate to develop outreach programs that focus on metals, urban pesticides, bacteria and nutrients as the pollutants of concern no later than May 7, 2010. Metals may be appropriately addressed through the Industrial/ Commercial Facilities Program (e.g. the distribution of educational materials on appropriate BMPs for metal fabrication and recycling facilities that have been identified as a potential source). Region-wide pollutants may be included in the Principal Permittee's mass media outreach program.

3. Businesses Program

(a) Corporate Outreach

(1) The Permittees shall work with other regional or statewide agencies and, associations such as the California Storm Water Quality Association (CASQA), to develop and implement a Corporate Outreach program to educate and inform corporate franchise operators and/or local facility managers about storm water regulations and BMPs. Once developed, the program shall target a minimum of four Retail Gasoline Outlets (RGO) franchisers and cover a minimum of 80% of RGO franchisees in the county, four retail automotive parts franchisers, two home improvement center franchisers and six restaurant franchisers. Corporate outreach for all target facilities shall be conducted not less than twice during the term of this Order, with the first outreach contact to begin no later than two years after Order adoption date. At a minimum, this program shall include:

(A) Confer with franchise operators and/or local facility managers to explain storm water regulations.

(B) Distribution and discussion of educational material regarding storm water pollution and BMPs, and provide managers with recommendations to facilitate employee and facility compliance with storm water regulations.

(b) Business Assistance Program

(1) The Permittees shall implement a Business Assistance Program to provide technical information to small businesses to facilitate their efforts to reduce the discharge of pollutants in storm water. The Program shall include:

(A) On-site, telephone or e-mail consultation regarding the responsibilities of businesses to reduce the discharge of pollutants, procedural requirements, and available guidance documents.
(B) Distribution of storm water pollution prevention education materials to operators of auto repair shops, car wash facilities (including mobile car detailing), mobile carpet cleaning services, commercial pesticide applicator services and restaurants.

D. Industrial/ Commercial Facilities Program

I. Each Permittee shall require implementation of pollutant reduction and control measures, unless precluded by local ordinances, at industrial and commercial facilities, with the objective of reducing pollutants in storm water. Except where specified otherwise in this Order, pollutant reduction and control measures may be used alone or in combination, and may include Treatment Control, Source Control BMPs, and operation and maintenance procedures, which may be applied before, during, and/ or after pollutant generating activities. At a minimum, the Industrial/ Commercial Facilities Control Program shall include requirements to:
(a) Track
(b) Inspect
(c) Ensure compliance with municipal ordinances at industrial and commercial facilities that are critical sources of pollutants in storm water

1. Inventory of Critical Sources
(a) Each Permittee shall maintain a watershed-based inventory or database of all facilities within its jurisdiction that are critical sources of storm water pollution. Critical Sources to be tracked are summarized below, and specified in Attachment "D":
(1) Commercial Facilities
(A) Restaurants
(B) Automotive service facilities
(C) RGOs and automotive dealerships
(D) Nurseries and nursery centers
(2) U.S. EPA Phase I, II Facilities
(3) Other Federally-mandated Facilities [as specified in 40 CFR122.26(d)(2)(iv)(C)]
(A) Municipal landfills
(B) Hazardous waste treatment, disposal, and recovery facilities
(C) Facilities subject to SARA Title III (also known as the Emergency Planning and Community Right-to-Know Act (EPCRA))
(b) Each Permittee shall include the following minimum fields of information for each critical source industrial and commercial facility
(1) Name of facility and name of owner/ operator.
(2) Address of facility

(3) Coverage under the IASGP or other individual or general NPDES permits or any applicable waiver issued by the Regional or State Board pertaining to runoff discharges.

(4) A narrative description including Standard Industrial Classification (SIC) System/ North American Industry Classification System (NAICS) codes that best describe the industrial activities performed and principal products used at each facility and status of exposure to storm water.

(c) The Regional Water Board recommends that Permittees include additional fields of information, such as material usage and/ or industrial output, and discrepancies between SIC System/ NAICS Code designations (as reported by facility operators) and identify the actual type of industrial activity that has the potential to pollute storm water. In addition, the Regional Water Board recommends the use of an automated database system, such as a Geographical Information System (GIS) or Internet-based system.

(d) Each Permittee shall update its inventory of critical sources at least annually. The update may be accomplished through collection of new information obtained through field activities or through other readily available inter and intra-agency informational databases (e.g. business licenses, pretreatment permits, sanitary sewer hook-up permits, and similar information).

2. Inspect Critical Sources

(a) Commercial Facilities

Permittee shall inspect all facilities identified in subpart 4.D.1. twice during the 5-year term of the Order, provided that the first inspection occurs no later than May 7, 2011. A minimum interval of 6 months between the first and the second mandatory compliance inspection is required. In addition, each Permittee shall implement the activities outlined in the following subparts. At each facility, inspectors shall verify that the operator is implementing the source control BMPs. The Permittees may require implementation of additional BMPs where storm water flows from the MS4 discharge to an environmentally sensitive area (ESA, see Part 6 for definition) or a CWA § 303(d) listed waterbody (see subpart 3(b) below).

(1) Restaurants-
Level of inspections: Each Permittee shall inspect all restaurants within its jurisdiction to confirm that storm water BMPs are being effectively implemented in compliance with State law, County and municipal ordinances. BMPs in Table 2 (BMPs at Restaurants) shall be implemented, unless the pollutant generating activity does not occur.

Table 2 - BMPs at Restaurants

Pollutant-Generating Activity	**BMP Narrative Description**	**2003 California Stormwater BMP Handbook Industrial and Commercial BMP Identification #**
Waste/ Hazardous Materials Storage, Handling and Disposal	Implementation of effective storage, handling and disposal procedures for hazardous materials.	By Municipality
Unauthorized Non-Storm Water Discharges	Effective elimination of non-storm water discharges.	SC-10
Accidental Spills/ Leaks	Implementation of effective spills/ leaks prevention and response procedures.	SC-11
Outdoor Storage of Raw Materials	Implementation of effective source control practices and structural devices.	SC-33
Storage and Handling of Solid Waste	Implementation of effective solid waste storage/ handling practices and appropriate control measures	SC-34
Parking/ Storage Area Maintenance	Implementation of effective parking/ storage area designs and housekeeping/ maintenance practices	SC-43
Storm Water Conveyance System Maintenance	Implementation of proper conveyance system operation and maintenance protocols.	SC-44

(2) Automotive Service Facilities-

Level of Inspection: Each Permittee shall confirm that BMPs are being effectively implemented at each facility within its jurisdiction, in compliance with County and municipal ordinances. The inspections shall verify that BMPs in Table 3 (BMPs at Automotive Service Facilities) are being implemented, unless the pollutant generating activity does not occur.

Table 3 - BMPs at Automotive Service Facilities

Pollutant-Generating Activity	**BMP Narrative Description**	**2003 California Stormwater BMP Handbook Industrial and Commercial BMP Identification #**
Unauthorized Non-Storm Water Discharges	Effective elimination of non-storm water discharges.	SC-10
Accidental Spills/ Leaks	Implementation of effective spills/ leaks prevention and response procedures.	SC-11
Vehicle/ Equipment Fueling	Implementation of effective fueling source control devices and practices.	SC-20
Vehicle/ Equipment Cleaning	Implementation of effective equipment/ vehicle cleaning practices and appropriate wash water management practices	SC-21
Vehicle/ Equipment Repair	Implementation of effective vehicle/ equipment repair practices and source control devices.	SC-22
Outdoor Liquid Storage	Implementation of effective outdoor liquid storage source controls and practices.	SC-31
Outdoor Storage of Raw Materials	Implementation of effective source control practices and structural devices.	SC-33
Storage and Handling of Solid Waste	Implementation of effective solid waste storage/ handling practices and appropriate control measures	SC-34
Parking/ Storage Area Maintenance	Implementation of effective parking/ storage area designs and housekeeping/ maintenance practices	SC-43
Storm Water Conveyance System Maintenance Practices	Implementation of proper conveyance system operation and maintenance protocols.	SC-44

(3) Retail Gasoline Outlets and Automotive Dealerships-
Level of Inspections: Each Permittee shall confirm that BMPs are being effectively implemented at each facility within its jurisdiction, in compliance with County and municipal ordinances. The inspections shall verify that BMPs in Table 4 (BMPs at Retail Gasoline Outlets) are being implemented, unless the pollutant generating activity does not occur.

Table 4 - BMPs at Retail Gasoline Outlets

Pollutant-Generating Activity	**BMP Narrative Description**	**2003 California Stormwater BMP Handbook Industrial and Commercial BMP Identification #**
Unauthorized Non-Storm Water Discharges	Effective elimination of non-storm water discharges.	SC-10
Accidental Spills/ Leaks	Implementation of effective spills/ leaks prevention and response procedures.	SC-11
Vehicle/ Equipment Fueling	Implementation of effective fueling source control devices and practices.	SC-20
Vehicle/ Equipment Cleaning	Implementation of effective wash water control devices.	SC-21
Outdoor Storage of Raw Materials	Implementation of effective source control practices and structural devices.	SC-33
Storage and Handling of Solid Waste	Implementation of effective solid waste storage/ handling practices and appropriate control measures	SC-34
Building and Grounds Maintenance	Implementation of effective facility maintenance practices.	SC-41
Parking/ Storage Area Maintenance	Implementation of effective parking/ storage area designs and housekeeping/ maintenance practices	SC-43

(4) Commercial Nurseries and Nursery Centers (Merchant Wholesalers, Nondurable Goods, and Retail Trade)-

Level of Inspection: Each Permittee shall confirm that BMPs are being effectively implemented at each facility within its jurisdiction, in compliance with County and municipal ordinances. The inspections shall verify that BMPs in Table 5 (BMPs at Nurseries) are being implemented, unless the pollutant generating activity does not occur.

Table 5 - BMPs at Nurseries

Pollutant-Generating Activity	BMP Narrative Description	2003 California Stormwater BMP Handbook Industrial and Commercial BMP Identification #
Unauthorized Non-Storm Water Discharges	Effective elimination of non-storm water discharges.	SC-10
Outdoor Loading/ Unloading	Implementation of effective outdoor loading/ unloading practices.	SC-30
Outdoor Liquid Storage	Implementation of effective outdoor liquid storage source controls and practices.	SC-31
Outdoor Equipment Operations	Implementation of effective outdoor equipment source control devices and practices.	SC-32
Outdoor Storage of Raw Materials	Implementation of effective source control practices and structural devices.	SC-33
Building and Grounds Maintenance	Implementation of effective facility maintenance practices.	SC-41

(b) Industrial Facilities

Each Permittee shall conduct compliance inspections as specified below.

(1) **Frequency of Inspection**

(A) Each Permittee shall perform an initial inspection at all industrial facilities identified by the U.S. EPA in 40 CFR122.26(c) no later than 2 years after Order adoption date. After the initial inspection, all facilities determined as having exposure of industrial activities to storm water are subject to a second mandatory compliance inspection. A minimum interval of 6 months between the first and the second compliance inspection is required.

(B) Following the first mandatory compliance inspection, a Permittee shall perform a second mandatory compliance inspection yearly at a minimum of 20% of the facilities determined not to have exposure of industrial activities to storm water. The purpose of this inspection is to verify the continuity of the no exposure status. Facilities determined

as having exposure will be notified that they must obtain coverage under the IASGP. A facility need not be inspected more than twice during the term of the Order unless subject to an enforcement action. A minimum interval of 6 months in between the first and the second compliance inspection is required.

(C) Applicable to all facilities: A Permittee need not inspect facilities that have been inspected by the Regional Water Board within the previous 24 month interval. However, if the Regional Water Board performed only one inspection, the Permittee shall conduct the second required mandatory compliance inspection.

(2) **Level of Inspection:** Each Permittee shall confirm that each operator:

(A) Has a current Waste Discharge Identification (WDID) number for facilities discharging storm water associated with industrial activity, and that a Storm Water Pollution Prevention Plan (SWPPP) is available on-site.

(B) Is effectively implementing BMPs in compliance with County and municipal ordinances. Facilities must implement the source control BMPs identified in subpart 4.D.2. and Appendix D, *California Stormwater Industrial and Commercial BMP Handbook (2003)*; or

(C) Has applied and has a current No Exposure Certification (and WDID number) for facilities subject to this requirement.

3. Ensure Compliance of Critical Sources

(a) **BMP Implementation:** Facilities must implement the source control BMPs identified in Part 4.D.2. and, as applicable, Appendix D, *California Stormwater Industrial and Commercial BMP Handbook (2003)*. In the event that a Permittee determines that a BMP is infeasible at any site, the Permittee shall require implementation of similar BMPs that will achieve the equivalent reduction of pollutants in the storm water discharges. Likewise, for those BMPs that are not protective of water quality standards, Permittees may require additional site-specific controls.

(b) **Environmentally Sensitive Areas (ESAs) and Impaired Waters:** For critical sources that discharge to MS4s that directly discharge to ESAs or to CWA § 303(d) listed impaired waterbodies, the Permittees shall require operators to implement additional pollutant specific controls to reduce pollutants in storm water runoff that are causing or contributing to exceedances of water quality objectives. A Regional Board approved TMDL Implementation Plan for the receiving water will substitute for this requirement.

(c) **Progressive Enforcement:** Each Permittee shall implement a progressive enforcement policy to ensure that facilities are brought into compliance with all storm water requirements within a reasonable time period as specified below.

(1) In the event that a Permittee determines, based on an inspection conducted, that an operator has failed to adequately implement all necessary BMPs, that Permittee shall take progressive enforcement actions which, at a minimum,

shall include a follow-up inspection within 4 weeks from the date of the initial inspection.

(2) In the event that a Permittee determines that an operator has failed to adequately implement BMPs after a follow-up inspection, that Permittee shall take enforcement action as established through authority in its municipal code and ordinances or through the judicial system.

(3) Each Permittee shall maintain records and make them available on request to the Regional Water Board, including inspection reports, warning letters, notices of violations, and other enforcement records, demonstrating a good faith effort to bring facilities into compliance.

4. Interagency Coordination

(a) **Referral of Violations of the Municipal Storm Water Ordinances and California Water Code § 13260:** A Permittee may refer a violation(s) of § 13260 by Industrial and Commercial facilities to the Regional Water Board provided that under its municipal storm water ordinance the Permittee has made a good faith effort of progressive enforcement. At a minimum, a Permittee's good faith effort must be documented with:

(1) Two follow-up inspections
(2) Two warning letters or notices of violation

(b) **Referral of Violations of the Industrial Activities Storm Water General Permit (IASGP), including Requirements to File a Notice of Intent or No Exposure Certification:** For those facilities in violation of the municipal storm water ordinance and subject to the IASGP, Permittees may escalate referral of such violations to the Regional Water Board (electronically on a quarterly basis to the Regional Water Board's Storm Water Site at MS4stormwaterrb4@waterboards.ca.gov) after one inspection and one written notice (copied to the Regional Water Board) to the operator regarding the violation. In making such referrals, Permittees shall include, at a minimum, the following documentation:

(1) Name of the facility
(2) Operator of the facility
(3) Owner of the facility
(4) WDID Number (if applicable)
(5) Industrial activity being conducted at the facility that is subject to the IASGP
(6) Records of communication with the facility operator regarding the violation, which shall include at least an inspection report
(7) The written notice of the violation copied to the Regional Water Board

(c) **Investigation of Complaints Regarding Facilities – Transmitted by the Regional Water Board Staff:** Each Permittee shall initiate, within one business day,[1] investigation of complaints (other than non-storm water discharges) to the MS4 from facilities within its jurisdiction. The initial investigation shall include, at a minimum, a limited inspection of the facility to confirm the complaint to determine if the facility is effectively complying with the municipal storm water urban runoff ordinances and, if necessary, to oversee corrective action.

(d) **Assistance of Regional Water Board Enforcement Actions:** As directed by the Regional Water Board Executive Officer, Permittees shall assist Regional Water Board enforcement actions by: helping in identification of current owners, operators, and lessees of facilities; providing staff, when available, for joint inspections with Regional Water Board inspectors; appearing as witnesses in Regional Water Board enforcement hearings; and providing copies of inspection reports and other progressive enforcement documentation.

(e) **Participation in a Task Force:** The Permittees shall participate with the Regional Water Board, and other public agencies on an enforcement task force such as the Storm Water Task Force, to communicate concerns regarding special cases of storm water violations by industrial and commercial facilities and to develop a coordinated approach to enforcement action.

E. Planning and Land Development Program

I. Purpose

1. The Permittees shall implement a Planning and Land Development Program pursuant to part 4.E. for all New Development and Redevelopment projects subject to this Order to:
   (a) Lessen the water quality impacts of development by using smart growth practices such as compact development, directing development towards existing communities via infill or redevelopment, safeguarding of environmentally sensitive areas, mixing of land uses (e.g., homes, offices, and shops), transit accessibility, and better pedestrian and bicycle amenities.
   (b) Minimize the adverse impacts from storm water runoff on the biological integrity of Natural Drainage Systems and the beneficial uses of waterbodies in accordance with requirements under CEQA (Cal. Pub. Resources Code § 21100).
   (c) Minimize the percentage of effective impervious surfaces on land developments to mimic predevelopment water balance through infiltration, evapotranspiration and reuse.
   (d) Minimize pollutant loadings from impervious surfaces such as roof-tops, parking lots, and roadways through the use of properly designed, technically appropriate

[1] Permittees may comply with the Permit by taking initial steps (such as logging, prioritizing, and tasking) to "initiate" the investigation within that one business day. However, the Regional Water Board would expect that the initial investigation, including a site visit, to occur within four business days.

BMPs (including Source Control BMPs such as good housekeeping practices), Low Impact Development Strategies, and Treatment Control BMPs.

(e) Properly select, design and maintain Treatment Control BMPs and Hydromodification Control BMPs to address pollutants that are likely to be generated, assure long-term function, and to avoid the breeding of vectors.[1]

(f) Prioritize the selection of BMPs suites to remove storm water pollutants, reduce storm water runoff volume, and beneficially reuse storm water to support an integrated approach to protecting water quality and managing water resources in the following order of preference:
   (1) Infiltration BMPs
   (2) BMPs that store and reuse storm water runoff.
   (3) BMPs that incorporate vegetation to promote pollutant removal and runoff volume reduction and integrate multiple uses
   (4) BMPs which percolate runoff through engineered soil and allow it to discharge downstream slowly
   (5) Approved modular/ proprietary treatment control BMPs that are based on LID concepts and that meet pollution removal goals

II. Applicability

1. New Development Projects.

(a) Development projects subject to Permittee conditioning and approval for the design and implementation of post-construction controls to mitigate storm water pollution, prior to completion of the project(s), are:
   (1) All development projects equal to 1 acre or greater of disturbed area and adding more than 10,000 square feet of impervious surface area
   (2) Industrial park 10,000 square feet or more of surface area
   (3) Commercial strip mall 10,000 square feet or more of impervious surface area
   (4) Retail gasoline outlet 5,000 square feet or more of surface area
   (5) Restaurant (SIC 5812) 5,000 square feet or more of surface area
   (6) Parking lot 5,000 square feet or more of impervious surface area, <u>or</u> with 25 or more parking spaces
   (7) Streets, roads, highways, and freeway construction of 10,000 square feet or more of impervious surface area shall incorporate USEPA guidance regarding Managing Wet Weather with Green Infrastructure: Green Streets to the maximum extent practicable.
   (8) Automotive service facilities (SIC 5013, 5014, 5511, 5541, 7532-7534 and 7536-7539) [5,000 square feet or more of surface area]
   (9) Redevelopment projects in subject categories that meet Redevelopment thresholds (identified in subpart E.II.2 below)

[1] Treatment BMPs when designed to drain within 72 hours of the end of rainfall minimize the potential for the breeding of vectors.

(10) Projects located in or directly adjacent to, or discharging directly to an Environmentally Sensitive Area (ESA), where the development will:
  (A) Discharge storm water runoff that is likely to impact a sensitive biological species or habitat; and
  (B) Create 2,500 square feet or more of impervious surface area

(11) Single-family hillside homes. To the extent that a Permittee may lawfully impose conditions, mitigation measures or other requirements on the development or construction of a single-family home in a hillside area as defined in the applicable Permittee's Code and Ordinances, each Permittee shall require that during the construction of a single-family hillside home, the following measures to be implemented:
  (A) Conserve natural areas
  (B) Protect slopes and channels
  (C) Provide storm drain system stenciling and signage
  (D) Divert roof runoff to vegetated areas before discharge unless the diversion would result in slope instability
  (E) Direct surface flow to vegetated areas before discharge unless the diversion would result in slope instability

2. Redevelopment Projects

(a) Redevelopment projects subject to Permittee conditioning and approval for the design and implementation of post-construction controls to mitigate storm water pollution, prior to completion of the project(s), are:
  (1) Land-disturbing activity that results in the creation or addition or replacement of 5,000 square feet or more of impervious surface area on an already developed site on development categories identified in subpart 4.E.III.1.
  (2) Where Redevelopment results in an alteration to more than fifty percent of impervious surfaces of a previously existing development, and the existing development was not subject to post development storm water quality control requirements, the entire project must be mitigated.
  (3) Where Redevelopment results in an alteration to less than fifty percent of impervious surfaces of a previously existing development, and the existing development was not subject to post development storm water quality control requirements, only the alteration must be mitigated, and not the entire development.

(b) Redevelopment does not include routine maintenance activities that are conducted to maintain original line and grade, hydraulic capacity, original purpose of facility or emergency redevelopment activity required to protect public health and safety. Impervious surface replacement, such as the reconstruction of parking lots and roadways which does not disturb additional area and maintains the original grade and alignment, is considered a routine maintenance activity. Redevelopment does not include the repaving of existing roads to maintain original line and grade.

(c) Existing single-family dwelling and accessory structures are exempt from the Redevelopment requirements unless such projects create, add, or replace 10,000 square feet of impervious surface area.

3. Effective Date –The New Development and Redevelopment requirements contained in Section E of the Order shall begin 90 calendar days after Regional Board Executive Officer approval of the changes to the Technical Guidance Manual needed to comply with this permit. After that date all discretionary permit projects or project phases that have not been deemed complete for processing, or discretionary permit projects without vesting tentative maps that have not requested and received an extension of previously granted approvals must comply with the requirements in Section E. Projects that have been deemed complete prior to the update of the technical design manual are not subject to this section. For Permittee's projects the effective date shall be the date the governing body or their designee approves initiation of the project design.

III. New Development/ Redevelopment Performance Criteria

1. Integrated Water Quality/ Flow Reduction/Resources Management Criteria
   (a) Except as provided in subpart 4.E.III.1.(c) below, Permittees shall require all New Development and Redevelopment projects identified in subpart 4.E.II to control pollutants, pollutant loads, and runoff volume emanating from impervious surfaces through infiltration, storage for reuse, evapotranspiration, or bioretention/ biofiltration by reducing the percentage of Effective Impervious' Area (EIA) to 5 percent or less of the total project area.
   (b) Impervious surfaces may be rendered "ineffective", and thus not count toward the 5 percent EIA limitation, if the stormwater runoff from those surfaces is fully retained on-site for the design storm event specified in provision (c), below. To satisfy the EIA limitation and low-impact development requirements, the permittees must require stormwater runoff to be infiltrated, reused, or evapotranspired on-site through a stormwater management technique allowed under the terms of this permit and implementing documents.
   (c) The permittees shall require all features constructed or otherwise utilized to render impervious surfaces "ineffective", as described in provision (b), above, to be properly sized to infiltrate, store for reuse, or evapotranspire, without any runoff at least the volume of water that results from:
      (1) The 85th percentile 24-hour runoff event determined as the maximized capture stormwater volume for the area using a 48 to 72-hour draw down time, from the formula recommended in Urban Runoff Quality Management, WEF Manual of Practice No. 23/ASCE Manual of Practice No. 87, (1998);
      (2) The volume of annual runoff based on unit basin storage water quality volume, to achieve 80 percent or more volume treatment by the method recommended in the Ventura County Technical Guidance Manual for Storm Water Quality Control Measures (July 2002 and its revisions); or
      (3) The volume of runoff produced from a 0.75 inch storm event.

(d) To address any impervious surfaces that may not be rendered "ineffective", surface discharge of stormwater runoff if any, that results from New Development and Redevelopment projects identified in subpart 4.E.II which have complied with subparts 4.E.III.1.(a)-(c), above, shall be mitigated in accordance with subpart 4.E.III.4.

2. Alternative Compliance for Technical Infeasibility

(a) To encourage smart growth and infill development of existing urban centers where on-site compliance with post-construction requirements may be technically infeasible, the permittees may allow projects that are unable to meet the Integrated Water Quality/Flow Reduction/Resources Management Criteria in subpart 4.E.III.1, above, to comply with this permit through the alternative compliance measures described in subpart 4.E.III.2.(c), below.

(b) To utilize alternative compliance measures, the project applicant must demonstrate that compliance with the applicable post-construction requirements would be technically infeasible by submitting a site-specific hydrologic and/or design analysis conducted and endorsed by a registered professional engineer, geologist, architect, and/or landscape architect. Technical infeasibility may result from conditions including the following:

(1) Locations where seasonal high groundwater is within 5 feet of the surface
(2) Locations within 100 feet of a groundwater well used for drinking water
(3) Brownfield development sites or other locations where pollutant mobilization is a documented concern
(4) Locations with potential geotechnical hazards
(5) Smart growth and infill or redevelopment locations where the density and/ or nature of the project would create significant difficulty for compliance with the on-site volume retention requirement
(6) Other site or implementation constraints identified in the LID Technical Guidance document required by subpart 4.E.IV.4.

(c) Alternative Compliance Measures. When a permittee finds that a project applicant has demonstrated technical infeasibility, the permittee shall identify alternative compliance measures that the project will need to comply with as a substitute for the otherwise applicable post-construction requirements listed in subparts 4.E.III.1.(a)-(c) of this permit. The Ventura County Technical Guidance Manual shall be revised to identify the alternative compliance measures and shall include the following requirement:

(1) Minimum on-site requirement. The project must reduce the percentage of Effective Impervious Area to no more than 30 percent of the total project area and treat all remaining runoff pursuant to the design and sizing requirements of subparts 4.E.III.1.(b)-(d).
(2) Offsite mitigation volume. The difference in volume between the amount of stormwater infiltrated, reused, and/ or evapotranspired by the project on-site and the otherwise applicable requirements of subparts 4.E.III.1.(a)-(c) (the "offsite mitigation volume'), above, must be mitigated by the project applicant either by performing offsite mitigation that is approved by the

permittee or by providing sufficient funding for public or private offsite mitigation to achieve equivalent stormwater volume and pollutant load reduction through infiltration, reuse, and/ or evapotranspiration.

(3) Location of off site mitigation. Offsite mitigation projects must be located in the same sub-watershed (defined as draining to the same hydrologic area in the Basin Plan) as the new development or redevelopment project. A list of eligible public and private offsite mitigation projects available for funding shall be identified by the Permittees and provided to the project applicant. Off site mitigation projects include green streets projects, parking lot retrofits, other site specific LID BMPs, and regional BMPs. Project applicants seeking to utilize these alternative compliance provisions may propose other offsite mitigation projects, which the Permittees may approve if they meet the requirements of this subpart.

(4) Timing and Reporting Requirements for Offsite Mitigation Projects. The Permittee(s) shall develop a schedule for the completion of offsite mitigation projects, including milestone dates to identify fund, design, and construct the projects. Offsite mitigation projects shall be completed as soon as possible, and at the latest, within 4 years of the certificate of occupancy for the first project that contributed funds toward the construction of the offsite mitigation project, unless a longer period is otherwise authorized by the Executive Officer. For public offsite mitigation projects, the permittees must provide in their annual reports a summary of total offsite mitigation funds raised to date and a description (including location, general design concept, volume of water expected to be retained, and total estimated budget) of all pending public offsite mitigation projects. Funding sufficient to address the offsite mitigation volume must be transferred to the permittee (for public offsite mitigation projects) or to an escrow account (for private offsite mitigation projects) within one year of the initiation of construction.

(5) The project applicant must demonstrate that the EIA achieved on-site is as close to 5 percent EIA as technically feasible, given the site's constraints.

(d) Watershed equivalence. Regardless of the methods through which permittees allow project applicants to implement alternative compliance measures, the sub-watershed -wide (defined as draining to the same hydrologic area in the Basin Plan) result of all development must be at least the same level of water quality protection as would have been achieved if all projects utilizing these alternative compliance provisions had complied with subparts 4.E.III.1.(a)-(d) of the permit. The permittees shall provide in their annual report to the Regional Board a list of mitigation project descriptions and pollutant and flow reduction analyses (compiled from design specifications submitted by project applicants and approved by the permittee(s)) comparing the expected aggregate results of alternative compliance projects to the results that would otherwise have been achieved by meeting the 5 percent EIA requirement on-site.

3. Hydromodification (Flow/ Volume/ Duration) Control Criteria
   (a) Each Permittee shall require all New Development and Redevelopment projects identified in subpart 4.E.II to implement hydrologic control measures, to prevent accelerated downstream erosion and to protect stream habitat in natural drainage systems. The purpose of the hydrologic controls is to minimize changes in post-development hydrologic storm water runoff discharge rates, velocities, and duration. This shall be achieved by maintaining the project's pre-project storm water runoff flow rates and durations.
      (1) Description
         (A) Hydromodification control in natural drainage systems shall be achieved by maintaining the Erosion Potential (E_p) in streams at a value of 1, unless an alternative value can be shown to be protective of the natural drainage systems from erosion, incision, and sedimentation that can occur as a result of flow increases from impervious surfaces and damage stream habitat (see Attachment "E" - Determination of Erosion Potential)
         (B) Hydromodification control may include one, or a combination of on-site, regional subregional hydromodification control BMPs, LID strategies, or stream restoration measures, with preference given to LID strategies and hydromodification control BMPs. Any in-stream restoration measure shall not adversely affect the beneficial uses of the natural drainage systems
         (C) Natural drainage systems, which include unlined or unimproved (not engineered) creeks, streams, rivers and their tributaries, are located in the following watersheds:
            (i) Ventura River
            (ii) Santa Clara River
            (iii) Calleguas Creek
            (iv) Malibu Creek
            (v) Miscellaneous Ventura Coastal
         (D) The Southern California Storm Water Monitoring Coalition (SMC) is developing a regional methodology to eliminate or mitigate the adverse impacts of hydromodification as a result of urbanization, including hydromodification assessment and management tools.
            (i) The SMC has identified the following objectives for the Hydromodification Control Study (HCS):
               (I) Establishment of a stream classification for Southern California streams
               (II) Development of a deterministic or predictive relationship between changes in watershed impervious cover and stream-bed/ stream bank enlargement
               (III) Development of a numeric model to predict stream-bed/ stream bank enlargement and evaluate the effectiveness of mitigation strategies

(E) The Permittees shall participate in the SMC HCS to develop:
  (i) A regional stream classification system
  (ii) A numerical model to predict the hydrological changes resulting from new development
  (iii) A numerical model to identify effective mitigation strategies
(F) Until the completion of the SMC HCS, Permittees shall implement the Interim Hydromodification Control Criteria, described in subpart 4.E.III.3(a)(3)(A) below, to control the potential adverse impacts of changes in hydrology that may result from new development and redevelopment projects identified in subpart 4.E.II
(G) Existing single-family structures are exempt from the Hydromodification control requirements unless such projects disturb one acre or more of land or create, add, or replace 10,000 square feet or more of impervious surface area

(2) Exemptions to Hydromodification Controls. Permittees may exempt the following New Development and Redevelopment projects from implementation of Hydromodification controls where assessments of downstream channel conditions and proposed discharge hydrology indicate that adverse Hydromodification effects to present and future beneficial uses of Natural Drainage Systems are unlikely:
  (A) All projects that disturb less than one acre.
  (B) Projects that are replacement, maintenance or repair of a Permittee's existing flood control facility, storm drain, or transportation network.
  (C) Redevelopment Projects in the Urban Core that do not increase the effective impervious area or decrease the infiltration capacity of pervious areas compared to the pre-project conditions.
  (D) Projects that have any increased discharge go directly or via a storm drain to a sump, lake, area under tidal influence, into a waterway that has a 100-year peak flow (Q100) of 25,000 cfs or more, or other receiving water that is not susceptible to Hydromodification impacts;
  (E) Projects that discharge directly or via a storm drain into concrete or improved (not natural) channels (e.g., rip rap, sackcrete, etc.), which, in turn, discharge into receiving water that is not susceptible to Hydromodification impacts (as in D above).

(3) Interim Hydromodification Control Criteria
  (A) The Interim Hydromodification Control Criteria to protect natural drainage systems until Permittees complete Hydromodification Control Plans (HCPs), described in subpart 4.E.III.3(a)(4) below, are as follows:
    (i) **<u>Projects disturbing land area of less than fifty acres</u>** will be subject to LID and/or source or treatment BMPs as addressed in this permit. The combined effects of LID and the treatment BMPs are considered adequate for Hydromodification control for projects that disturb less than 50 acres.

(ii) **Projects disturbing land areas of fifty acres or greater**
Projects in this category shall develop and implement a Hydromodification Analysis Study (HAS) that demonstrates that post development conditions are expected to approximate the pre-project erosive effect of sediment transporting flows in receiving waters. The HAS must lead to the incorporation into the project design features intended to approximate, to the extent feasible, an Erosion Potential value of 1 or any alternative value that can be shown to be protective of the natural drainage systems from erosion, incision, and sedimentation that can occur as a result of flow increases from impervious surfaces and damage stream habitat in natural drainage systems, or

(I) Alternatively, project proponents in this category may elect to develop, in partnership with Permittees, an equivalent implementation method based on flow duration control in the form of nomographs relating planned impervious area and local soil type (infiltration rates) to determine hydromodification control BMP volume and land area requirements for the proposed project. The nomographs shall be derived from continuous simulation modeling using Ventura County specific rain gauge records and soil types, and calibrated using data from a local undeveloped watershed with similar conditions; or

(II) Alternatively, the Co-Permittees may revise the Ventura County Technical Guidance Manual for Stormwater Quality Control Measures to address projects that disturb more than 50 acres.

(4) Final Criteria

(A) The Permittees shall develop and implement watershed specific HCPs no later than 180 days after the completion of the SMC HCS.

(i) The HCP shall identify:

(I) Stream classifications

(II) Flow rate and duration control methods

(III) Sub-watershed mitigation strategies

(IV) Stream restoration measures, which will maintain the stream and tributary Erosion Potential at 1 unless an alternative value can be shown to be protective of the natural drainage systems from erosion, incision, and sedimentation that can occur as a result of flow increases from impervious surfaces and damage stream habitat in natural drainage system tributaries

(B) The HCP shall contain the following elements:

(i) Hydromodification Management Standards

(ii) Natural Drainage Areas and Hydromodification Management Control Areas

(iii) New Development and Redevelopment Projects subject to the HCP
(iv) Description of authorized Hydromodification Management Control BMPs
(v) Hydromodification Management Control BMP Design Criteria.
(vi) For flow duration control methods, the range of flows to control for, and goodness of fit criteria
(vii) Allowable low critical flow, Q_c, which initiates sediment transport
(viii) Description of the approved Hydromodification Model.
(ix) Any alternate Hydromodification Management Model and Design
(x) Stream Restoration Measures Design Criteria
(xi) Monitoring and Effectiveness Assessment
(xii) Record Keeping

(C) The HCP shall be deemed in effect upon Executive Officer approval.

4. Water Quality Mitigation Criteria

(a) Each Permittee shall require all New Development and Redevelopment projects identified in subpart 4.E.II to implement post-construction storm water treatment BMPs and control measures to mitigate storm water pollution as follows:

(1) Projects disturbing land areas less than 50 acres

(A) Volumetric Treatment Control BMP

(i) The 85th percentile 24-hour runoff event determined as the maximized capture storm water volume for the area using a 48 to 72-hour draw down time, from the formula recommended in *Urban Runoff Quality Management, WEF Manual of Practice No. 23/ASCE Manual of Practice No. 87, (1998*); or

(ii) The volume of annual runoff based on unit basin storage water quality volume, to achieve 80 percent or more volume treatment by the method recommended in the Ventura County Technical Guidance Manual for Storm Water Quality Control Measures (July 2002 and its revisions); or

(iii) The volume of runoff produced from a 0.75 inch storm event, prior to its discharge to a storm water conveyance system;[1] and/ or

(B) Flow Based Treatment Control BMP

(i) The flow of runoff produced from a rain event equal to at least 0.2 inches per hour intensity; or

(ii) The flow of runoff produced from a rain event equal to at least 2 times the 85th percentile hourly rainfall intensity as determined from local rainfall records; or

[1] This option is available only for construction projects that disturb land area less than 5 acres.

(iii) Eight percent of the 50-year storm design flow rate as determined from the method recommended in the Ventura County Technical Guidance Manual for Storm Water Quality Control Measures (July 2002 and its revisions)

(2) Projects disturbing land area of 50 acres or greater

(A) Eighty percent of the average runoff volume using an appropriate public domain continuous flow model (such as Storm Water Management Model (SWMM) or Hydrologic Engineering Center – Hydrologic Simulation Program – Fortran (HEC-HSPF), using the local rainfall record and relevant BMP Performance data.

IV. Implementation

1. Maintenance Agreement and Transfer

(a) Prior to issuing approval for final occupancy each Permittee shall require that all new development and redevelopment projects subject to post-construction BMP requirements provide an operation and maintenance plan and verification of ongoing maintenance provisions for LID practices, Treatment Control BMPs, and Hydromodification Control BMPs including but not limited to: final map conditions, legal agreements, covenants, conditions or restrictions, CEQA mitigation requirements, conditional use permits, and/ or other legally binding maintenance agreements.

(1) Verification at a minimum shall include the developer's signed statement accepting responsibility for maintenance until the responsibility is legally transferred; <u>and either</u>

(A) A signed statement from the public entity assuming responsibility for BMP maintenance; <u>or</u>

(B) Written conditions in the sales or lease agreement, which require the property owner or tenant to assume responsibility for BMP maintenance and conduct a maintenance inspection at least once a year; <u>or</u>

(C) Written text in project covenants, conditions, and restrictions (CCRs) for residential properties assigning BMP maintenance responsibilities to the Home Owners Association (HOA); <u>or</u>

(D) Any other legally enforceable agreement or mechanism that assigns responsibility for the maintenance of BMPs.

(b) Each Permittee shall require all development projects subject to post-construction BMP requirements to provide a plan for the operation and maintenance of all structural and treatment controls. The Operation and Maintenance plan shall follow the Technical Guidance Manual Appendix D "Maintenance Plan Guidance" (or subsequent guidance manual) for each BMP component. The plan shall be submitted for examination of relevance to keeping the BMPs in proper working order. Where BMPs are transferred to Permittee for ownership and maintenance, the plan shall also include all relevant costs for upkeep of BMPs in the transfer. Operation and Maintenance

plans for private BMPs shall be kept on-site for periodic review by Permittee inspectors.

2. Tracking, Inspection, and Enforcement of Post-Construction BMPs
   (a) Each Permittee shall implement a tracking system and an inspection and enforcement program for new development and redevelopment post-construction storm water BMPs as set fort in part 4.E. no later than May 7, 2010.
      (1) Implement a GIS or other electronic system for tracking projects that have been conditioned for post-construction BMPs. The electronic system, at a minimum, should contain the following information:
         (A) Municipal Project ID
         (B) State WDID No
         (C) Project Acreage
         (D) BMP Type and Description
         (E) BMP Location (coordinates)
         (F) Date of Acceptance
         (G) Date of Maintenance Agreement
         (H) Maintenance Records
         (I) Inspection Date and Summary
         (J) Corrective Action
         (K) Date Certificate of Occupancy Issued
         (L) Replacement or Repair Date
   (b) Inspect all development sites upon completion of construction and prior to the issuance of occupancy certificates to ensure proper installation of LID measures, structural BMPs, treatment control BMPs and Hydromodification control BMPs. The inspection may be combined with other inspections provided it is conducted by trained personnel.
   (c) Verify proper maintenance and operation of post-construction BMPs previously approved for new development and redevelopment and operated by the Permittees. The post construction BMP maintenance inspection program shall incorporate the following elements:
      (1) Post-construction BMP Maintenance Inspection checklist.
      (2) Inspection at least once every 2 years, beginning May 7, 2010, of post-construction BMPs to assess operation conditions with particular attention to:
      (3) Criteria and procedures for post construction Treatment Control and Hydromodification Control BMP repair, replacement, or re-vegetation.
   (d) For post construction BMPs operated and maintained by parties other than the Permitees the Permittees shall require annual reports by the other parties demonstrating proper maintenance and operations.
   (e) Undertake enforcement as appropriate based on the results of the inspection.

3. Alternative Post Construction Storm Water Mitigation Programs
   (a) A Permittee or a coalition of Permittees may apply to the Regional Water Board for approval of a Redevelopment Project Area Master Plan (RPAMP) for

redevelopment projects within the Redevelopment Project Areas, in consideration of exceptional site constraints that inhibit site-by-site or project-by-project implementation of post-construction requirements.

(b) Upon review and a determination by the Regional Water Board Executive Officer that the proposal is technically valid and appropriate, the Regional Water Board may consider for approval such a program if its implementation will:
   (1) Result in equivalent or superior reduction of storm water pollutant loads in comparison to individual projects regulated by this permit.
   (2) Satisfy, on a Redevelopment Project Area-wide basis, the hydromodification criteria of this section.
   (3) Reduce the percentage of Effective Impervious Area (EIA) to a target of 5 percent or less of the Redevelopment Project Area, using properly sized storm water treatment/ collection features, as described in this Section.
   (4) Be fiscally sustainable and have secure funding; and
   (5) Be completed in four years of the adoption date of this permit.

(c) The RPAMP should prioritize the implementation of LID storm water mitigation measures, as described in this section.

(d) A Permittee or a coalition of Permittees may apply to the Regional Water Board for approval of a Redevelopment Project Area Master Plan (RPAMP) that takes into consideration the balancing of water quality protection with the needs for adequate housing, population growth, public transportation and management, land recycling, and urban revitalization.

(e) For the RPAMP to be considered, a technical panel of the Local Government Commission or an equivalent state or regional planning agency must have reviewed and approved the proposed RPAMP, prior to its submittal to the Regional Water Board. The Regional Water Board Executive Officer may then consider the RPAMP for approval, or elect to submit it to the Regional Water Board for consideration.

(f) The RPAMP, on approval, may substitute in part or wholly for post-construction requirements.

(g) Redevelopment Project Areas include the following:
   (1) City Center areas
   (2) Historic District areas
   (3) Brownfield areas
   (4) Infill Development areas
   (5) Urban Transit Villages
   (6) Any other redevelopment area so designated by the Regional Water Board

(h) Nothing in these provisions shall be construed as to delay the implementation of post-construction control requirements, as approved in this Order.

4. Developer Technical Guidance and Information

(a) The Permittees shall update the Ventura County Technical Guidance Manual for Storm Water Quality Control Measures to include, at a minimum, the following:
   (1) Hydromodification Control criteria described in this Order, including numerical criteria.

(2) Expected BMP pollutant removal performance including effluent quality (ASCE/ U.S. EPA International BMP Database, CASQA New Development BMP Handbook, technical reports, local data on BMP performance, and the scientific literature appropriate for southern California geography and climate).
(3) Selection of appropriate BMPs for storm water pollutants of concern.
(4) Data on Observed Local Effectiveness and performance of implemented BMPs.
(5) BMP Maintenance and Cost Considerations.
(6) Guiding principles to facilitate integrated water resources planning and management in the selection of BMPs, including water conservation, groundwater recharge, public recreation, multipurpose parks, open space preservation, and redevelopment retrofits.
(7) LID principles and specifications, including the objectives and specifications for integration of LID strategies in the areas of:
(A) Site Assessment.
(B) Site Planning and Layout.
(C) Vegetative Protection, Revegetation, and Maintenance.
(D) Techniques to Minimize Land Disturbance.
(E) Techniques to Implement LID Measures at Various Scales
(F) Integrated Water Resources Management Practices.
(G) LID Design and Flow Modeling Guidance.
(H) Hydrologic Analysis.
(I) LID Credits.

(b) Permittees shall update the Technical Guidance Manual within 365 days of the adoption of this Order (May 7, 2010).
(c) The Permittees shall facilitate implementation of LID by providing key industry, regulatory, and other stakeholders with information regarding LID objectives and specifications contained in the LID Technical Guidance Section through a training program. The LID training program will include the following:
(1) LID targeted sessions and materials for builders, design professionals, regulators, resource agencies, and stakeholders
(2) A combination of awareness on national efforts and local experience gained through LID pilot projects and demonstration projects
(3) Materials and data from LID pilot projects and demonstration projects including case studies
(4) Guidance on how to integrate LID requirements into the local regulatory program(s) and requirements
(5) Availability of the LID Technical Guidance regarding integration of LID measures at various project scales
(6) Guidance on the relationship among LID strategies, Source Control BMPs, Treatment Control BMPs, and Hydromodification Control requirements
(d) The Permittees shall submit revisions to the Ventura County Technical Guidance Manual to the Regional Board for Executive Officer approval.

5. Project Coordination
   (a) Each Permittee shall facilitate a process for effective approval of post-construction storm water control measures. The process shall include:
      (1) Detailed BMP review including BMP sizing calculations, BMP pollutant removal performance, and municipal approval; and
      (2) An established structure for communication and delineated authority between and among municipal departments that have jurisdiction over project review, plan approval, and project construction through memoranda of understanding (MOU) or an equivalent agreement.

V. State Statute Conformity

1. California Environmental Quality Act (CEQA) Document Update
   (a) Each Permittee shall incorporate into its CEQA process no later than November 7, 2009 those additional procedures necessary for considering potential storm water quality impacts and providing for appropriate mitigation when preparing and reviewing CEQA documents.
      (1) The procedures shall require consideration of the following:
         (A) Potential impact of project construction on storm water runoff.
         (B) Potential impact of project post-construction activity on storm water runoff.
         (C) Potential for discharge of storm water from areas from material storage, vehicle or equipment fueling, vehicle or equipment maintenance (including washing), waste handling, hazardous materials handling or storage, delivery areas or loading docks, or other outdoor work areas.
         (D) Potential for discharge of storm water to impair the beneficial uses of the receiving waters.
         (E) Potential for the discharge of storm water to cause significant harm on the biological integrity of the waterways and waterbodies.
         (F) Potential for significant changes in the flow velocity or volume of storm water runoff to cause harm to or impair the beneficial uses of natural drainage systems.
         (G) Potential for significant increases in erosion at the project site or surrounding areas.

2. General Plan Update
   (a) Each Permittee shall amend, revise or update its General Plan to include watershed and storm water quality and quantity management considerations and policies when any of the following General Plan elements are updated or amended:
      (1) Land Use
      (2) Housing
      (3) Conservation
      (4) Open Space

(b) Each Permittee shall provide the Regional Water Board with the draft amendment or revision when a listed General Plan element or General Plan is noticed for comment in accordance with Cal. Govt. Code § 65350 *et seq*.

F. Development Construction Program

(I) Each Permittee shall implement a construction program that prevents illicit construction-related discharges of pollutants into the MS4, implements and maintains structural and non-structural BMPs to reduce pollutants in stormwater runoff from construction sites, reduces construction site discharges of pollutants from the MS4 to the MEP, and prevents construction site discharges from the MS4 from causing or contributing to a violation of water quality standards.

1. BMP Implementation - Construction Sites Less Than One Acre
   (a) Each Permittee shall require the implementation of an effective combination of erosion and sediment control BMPs from Table 6 to prevent erosion and sediment loss, and the discharge of construction wastes.[1]

Table 6 - BMPs at Construction sites less than 1 acre

Minimum Set of BMPs for All Construction Sites	**CASQA Handbook**	**Caltrans Handbook**
For Erosion Control		
Scheduling	EC-1	SS-1
Preservation of Existing Vegetation	EC-2	SS-2
Sediment Controls		
Silt Fence	SE-1	SC-1
Sand Bag Barrier	SE-8	SC-8
Stabilized Construction Site Entrance/Exit	TC-1	TC-1
Non-Storm Water Management		
Water Conservation Practices	NS-1	NS-1
Dewatering Operations (Groundwater dewatering only under NPDES Permit No. CAG994004).[2]	NS-2	NS-2
Waste Management		
Material Delivery and Storage	WM-1	WM-1
Stockpile Management	WM-3	WM-2
Spill Prevention and Control	WM-4	WM-4
Solid Waste Management	WM-5	WM-5
Concrete Waste Management	WM-8	WM-8
Sanitary/ Septic Waste Management	WM-9	WM-9

[1] The BMPs are taken from the *California BMP Handbook, Construction, January 2003* and the *Caltrans Stormwater Quality Handbooks, Construction Site Best Management Practices (BMPs) Manual, March 2003*, and addenda.
[2] Ponded storm water may be discharged at a concentration of Total Suspended Solids (TSS) of 100mg/L or less.

2. BMP Implementation - Construction Sites One Acre but Less than 5 acres.
   (a) Each Permittee shall require the implementation of an effective combination of appropriate erosion and sediment control BMPs from Table 7 in addition to the ones identified in Table 6 to prevent erosion and sediment loss, and the discharge of construction wastes:

Table 7 - BMPs at Construction sites 1acre or greater but less than 5 acres

BMPs	**CASQA Handbook**	**Caltrans Handbook**
For Erosion Control		
Hydraulic Mulch	EC-3	SS-3
Hydroseeding	EC-4	SS-4
Soil Binders	EC-5	SS-5
Straw Mulch	EC-6	SS-6
Geotextiles and Mats	EC-7	SS-7
Wood Mulching	EC-8	SS-8
Sediment Controls		
Fiber Rolls	SE-5	SC-5
Gravel Bag Berm	SE-6	SC-6
Street Sweeping and/ or Vacuum	SE-7	SC-7
Storm Drain Inlet Protection	SE-10	SC-10
Additional Controls		
Wind Erosion Controls	WE-1	WE-1
Stabilized Construction Entrance/ Exit	TC-1	TC-1
Stabilized Construction Roadway	TC-2	TC-2
Entrance/ Exit Tire Wash	TC-3	TC-3
Non-Storm Water Management		
Vehicle and Equipment Washing	NS-8	NS-8
Vehicle and Equipment Fueling	NS-9	NS-9

3. BMP Implementation - Construction Sites 5 acres and Greater
   (a) Each Permittee shall require the implementation of an effective combination of the following BMPs in Table 8 (BMPs at Construction sites 5 acres or greater) in addition to the ones identified in Table 6 (BMPs at Construction sites less than 1 acre) and Table 7 (BMPs at Construction sites 1acre or greater but less than 5 acres) at all construction sites 5 acres and greater to prevent erosion and sediment loss, and the discharge of construction wastes. Erosion control BMPs shall be preferred to sediment control BMPs.

Table 8 - BMPs at Construction sites 5 acres or greater

BMPs	**CASQA Handbook**	**Caltrans Handbook**
Sediment Controls		
Sediment Basin	SE-2	SC-2
Check Dam	SE-4	SC-4
Tracking Control BMPs		
Stabilized Construction Entrance/ Exit	TR-1	TC-1
Non-Storm Water Management		
Vehicle and Equipment Maintenance	NS-10	NS-10
Waste Management		
Material Delivery and Storage	WM-1	WM-1
Spill Prevention and Control	WM-4	WM-4
Concrete Waste Management	WM-8	WM-8
Sanitary/ Septic Waste Management	WM-9	WM-9

4. Enhanced Construction BMP Implementation.
   (a) Each Permittee shall implement, or require implementation of, enhanced practices that preclude impacts to water quality posed by all construction sites on hillsides as defined in this Order and construction sites that directly discharge to a waterbody listed on the CWA § 303 (d) list for siltation or sediment, or that occur within or directly adjacent to an Environmentally Sensitive Area (ESAs). Construction sites located on hillsides, adjacent to CWA 303(d) listed waters for siltation or sediment, and directly adjacent to ESAs are termed "High risk sites."
   (b) Each Permittee shall require implementation of enhanced practices for high risk sites which shall include increased BMP inspection and maintenance requirements.
      (1) Each Permittee shall require that high risk sites shall be inspected by the project proponent's Qualified SWPPP Developer or Qualified SWPPP Practitioner or personnel or consultants who are Certified Professionals in Erosion and Sediment Control (CPESC) at the time of BMP installation, at least weekly during the wet season, and at least once each 24 hour period during a storm event that generates runoff from the site, to identify BMPs that need maintenance to operate effectively, that have failed or could fail to operate as intended.
      (2) During the wet season, the area of disturbance shall be limited to the area that can be controlled with an effective combination of erosion and sediment control BMPs. Enhanced sediment controls should be used in combination

with erosion controls and should target portions of the site that cannot be effectively controlled by standard erosion controls described above. Effective sediment and erosion control BMPs proposed by the proponent shall include the BMPs listed in Table 9 below. The project proponents are responsible to implement the BMPs below unless shown unnecessary. The Permittee shall require that the project proponent retain records of the inspection and a determination and rationale of the BMPs selected to control runoff.

Table 9 **-** Enhanced Construction BMP Implementation.

CONSTRUCTION SITE BMPs	**CASQA Handbook**	**Caltrans Handbook**
Erosion Controls		
Scheduling	EC-1	SS-1
Preservation of Existing Vegetation	EC-2	SS-2
Hydraulic Mulch	EC-3	SS-3
Hydroseeding	EC-4	SS-4
Soil Binders	EC-5	SS-5
Straw Mulch	EC-6	SS-6
Geotextiles and Mats	EC-7	SS-7
Wood Mulching	EC-8	SS-8
Slope Drains	EC-11	SS-11
Sediment Controls		
Silt Fence	SE-1	SC-1
Fiber Rolls	SE-5	SC-5
Sediment Basin	SE-2	SC-2
Check Dam	SE-4	SC-4
Gravel Bag Berm	SE-6	SC-6
Street Sweeping and/or Vacuum	SE-7	SC-7
Sand Bag Barrier	SE-8	SC-8
Storm Drain Inlet Protection	SE-10	SC-10
Additional Controls		
Wind Erosion Controls	WE-1	WE-1
Stabilized Construction Entrance/Exit	TC-1	TC-1
Stabilized Construction Roadway	TC-2	TC-2
Entrance/Exit Tire Wash	TC-3	TC-3
Advanced Treatment Systems[1]		
Non-Storm Water Management		
Water Conservation Practices	NS-1	NS-1
Dewatering Operations (Groundwater dewatering only under NPDES Permit No. CAG994004).19	NS-2	NS-2
Vehicle and Equipment Washing	NS-8	NS-8
Vehicle and Equipment Fueling	NS-9	NS-9

[1] If appropriate given natural background stormwater runoff and receiving water quality conditions.

CONSTRUCTION SITE BMPs	CASQA Handbook	Caltrans Handbook
Vehicle and Equipment Maintenance	NS-10	NS-10
Waste Management		
Material Delivery and Storage	WM-1	WM-1
Stockpile Management	WM-3	WM-2
Spill Prevention and Control	WM-4	WM-4
Solid Waste Management	WM-5	WM-5
Concrete Waste Management	WM-8	WM-8
Sanitary/Septic Waste Management	WM-9	WM-9

5. Local Agency Requirements
   (a) Each Permittee shall require for all construction sites 1 acre or greater, compliance with all conditions identified in the preceding subparts F.1 - F.4, and the following requirements:
      (1) Local Storm Water Pollution Prevention Plan (Local SWPPP),
         (A) Each Permittee shall require the preparation and submittal of a Local SWPPP, for the Permittee's review and written approval prior to issuance of a grading or construction permit for construction or demolition projects. The Permittees' approval signature shall be contained within the first pages of the Local SWPPP
            (i) The Permittee shall not approve any Local SWPPP unless it contains appropriate site-specific construction site BMPs, specific locations, and maintenance schedules.
            (ii) The Local SWPPP must include the rationale used for selecting or rejecting BMPs for various construction phases and weather conditions. The project architect, or engineer of record, or authorized qualified designee, must sign a statement on the Local SWPPP to the effect:
               (I) *"As the architect/ engineer of record, I have selected appropriate BMPs to effectively minimize the negative impacts of this project's construction activities on storm water quality. The project owner and contractor are aware that the selected BMPs must be installed, monitored, and maintained to ensure their effectiveness. The BMPs not selected for implementation are redundant or deemed not applicable to the proposed construction activity."*
      (2) <u>Certification Statement</u>
         (A) Each Permittee shall require that each landowner or the landowner's agent sign a statement on the Local SWPPP to the effect:
            (i) *"I certify that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to ensure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, to the best of*

my knowledge and belief, the information submitted is true, accurate, and complete. I am aware that submitting false and/ or inaccurate information, failing to update the Local SWPPP to reflect current conditions, or failing to properly and/ or adequately implement the Local SWPPP may result in revocation of grading and/ or other permits or other sanctions provided by law."

(ii) The Local SWPPP certification shall be signed by the property owner or owner's representative/designee. If the Local SWPPP or SWPPP is being prepared by the local agency then the appropriate authority of the local agency shall sign the document.

6. Roadway Paving or Repaving Operations (For Private or Public Projects)
   (a) Each Permittee shall require that for any project that includes roadbed or street paving, repaving, patching, digouts, or resurfacing roadbed surfaces, that the following BMPs be implemented for each project:
      (1) Restrict paving and repaving activity to exclude periods of rainfall or predicted rainfall unless required by emergency conditions
      (2) Install sand bags or gravel bags and filter fabric at all susceptible storm drain inlets and at manholes to prevent spills of paving products and tack coat
      (3) Prevent the discharge of release agents including soybean oil, other oils, or diesel to the storm water drainage system or receiving waters.
      (4) Minimize non storm water runoff from water use for the roller and for evaporative cooling of the asphalt
      (5) Clean equipment over absorbent pads, drip pans, plastic sheeting or other material to capture all spillage and dispose of properly
      (6) Collect liquid waste in a container, with a secure lid, for transport to a maintenance facility to be reused, recycled or disposed of properly
      (7) Collect solid waste by vacuuming or sweeping and securing in an appropriate container for transport to a maintenance facility to be reused, recycled or disposed of properly
      (8) Cover the "cold-mix" asphalt (i.e., pre-mixed aggregate and asphalt binder) with protective sheeting during a rainstorm
      (9) Cover loads with tarp before haul-off to a storage site, and do not overload trucks
      (10) Minimize airborne dust by using water spray during grinding
      (11) Avoid stockpiling soil, sand, sediment, asphalt material and asphalt grindings materials or rubble in or near storm water drainage system or receiving waters
      (12) Protect stockpiles with a cover or sediment barriers during a rain

7. Electronic Site Tracking System
   (a) Each Permittee shall use an electronic system to track grading permits, encroachment permits, demolition permits, building permits, or construction

permits (and any other municipal authorization to move soil and/ or construct or destruct that involves land disturbance) issued by each Permittee. To satisfy this requirement, the use of a database or GIS system is encouraged, but not required.

8. Inspections
   (a) Each Permittee shall inspect all construction sites for the implementation of storm water quality controls a minimum of once during the wet season. Concurrently, each Permittee shall ensure that:
      (1) The Local SWPPP is reviewed for compliance with local codes, ordinances, and permits.
      (2) A follow-up inspection takes place within two weeks for inspected sites that have not adequately implemented their Local SWPPP.
   (b) Each Permittee shall take additional enforcement actions to achieve compliance as specified in municipal codes, if compliance with municipal codes, ordinances, or permits has not been attained.
   (c) Each Permittee can refer sites to the Regional Water Board for joint enforcement actions for violation of municipal storm water ordinances and the Construction Activities Storm Water General Permit (CASGP), or Small Linear Underground/ Overhead Construction Projects General Permit (small LUPs), after conducting a minimum of 2 site inspections and issuing a minimum of 2 written notices to the operator regarding the violation (copied to the Regional Water Board). In making such referrals, Permittees shall include, at a minimum, the following documentation:
      (1) Name of the site
      (2) WDID number
      (3) Site developer
      (4) Site owner
      (5) Records of communication with the site operator regarding the violation(s), which shall include at least an inspection report
      (6) Written notice of the violation copied to the Regional Water
   (d) Prior to approving and/ or signing off for occupancy and issuing the Certificate of Occupancy for all construction projects subject to post-construction controls, each Permittee shall inspect the constructed site design, source control and treatment control BMPs to verify that they have been constructed in compliance with all specifications, plans, permits, ordinances, and this Order. The initial/ acceptance BMP verification inspection does not constitute a maintenance and operation inspection, as required in the preceding subpart E.IV.2(c).

9. State Conformity Requirements
   (a) Each Permittee shall ensure that no grading permit, encroachment permit, demolition permit, building permit, electrical permit, or construction permit (or any other municipal authorization to move soil and/ or construct or destruct

that involves land disturbance) is issued for any project requiring coverage under the CASGP or Small LUP General Permit[1] unless:

(1) Proof of filing a Notice of Intent for coverage under a State NPDES permit is demonstrated).
(2) Demonstration or Certification that a SWPPP has been prepared by the project developer.
(3) Proof of Change of Information form (COI) and a copy of the modified SWPPP(s) at any time a transfer of ownership takes place for the entire development or portions of the common plan of development where construction activities are still on-going.

10. Interagency Coordination

(a) **Referral of Violations:**
A Permittee may refer a violator of the municipal storm water ordinance and CWC § 13260 to the Regional Water Board provided that the Permittee has made a good faith effort at progressive enforcement consistent with the preceding subpart F.8(c). At a minimum, the Permittee's good faith effort shall be documented with:
(1) A minimum of 2 follow-up inspection reports (inspections completed within 3 months).
(2) A minimum of two warning letters or NOVs.

(b) **Referral of Non-filers under the CASGP or the Small LUP General Permit:**
Each Permittee shall refer non-filers (i.e., those projects which cannot demonstrate that they have a WDID number) under the CASGP or Small LUP General Permit, to the Regional Water Board, no later than 15 days after making a determination of failure to file. In making such referrals, Permittees shall include, at a minimum, the following documentation:
(1) Project location address
(2) Project description
(3) Developer or owners name with complete mailing address
(4) Project size
(5) Records of communication with the developer or owner regarding filing requirements

(c) **Investigation of Complaints Regarding Facilities – Transmitted by the Regional Water Board Staff:**
(1) Each Permittee shall initiate, within one business day,[2] an initial investigation of complaint(s) (other than non-storm water discharges) on the construction site(s) within its jurisdiction.

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[1] NPDES Permit No. CAS000005, Waste Discharge Requirements For Discharges of Storm Water Runoff Associated with Small Linear Underground/ Overhead Construction Projects (Small LUP General Permit) for any linear land disturbing activity or activities (cumulatively) that will cause one acre or more of land disturbance but not more than 5 acres.

[2] Permittees may comply with the Permit by taking initial steps (such as logging, prioritizing, and tasking) to "initiate" the investigation within that one business day. However, the Regional Water Board would expect that the initial investigation, including a site visit, to occur within four business days.

(A) The initial investigation shall include, at a minimum, an inspection on the facility and its perimeter to confirm the complaint and to determine if the site operator is effectively complying with the municipal storm water/ urban runoff ordinances, and to oversee corrective action.

(d) **Support of Regional Water Board Enforcement Actions – As directed by the Regional Water Board Executive Officer:**

(1) Each Permittee shall support Regional Water Board enforcement actions by:

(A) Assisting in identification of current owners, operators, and lessees of properties and sites.

(B) Providing staff, when available, for joint inspections with Regional Water Board inspectors.

(C) Appearing to testify as witnesses in Regional Water Board enforcement hearings.

(D) Providing copies of inspection reports and other progressive enforcement documentation.

G. Public Agency Activities Program

I. Each Permittee shall implement a Public Agency Activities Program to minimize storm water pollution impacts from public agency activities. Public Agency requirements consist of:

i. Public Construction Activities Management.
ii. Vehicle Maintenance/ Material Storage Facilities/ Corporation Yards Management/ Municipal Operations.
iii. Vehicle and Equipment Wash Areas
iv. Landscape and Recreational Facilities Management
v. Storm Drain Operation and Management
vi. Streets and Roads Maintenance
vii. Public Industrial Activities Management
viii. Emergency Procedures
ix. Employee Training
x. Infrastructure Maintenance

1. Public Construction Activities Management

(a) Each Permittee shall implement and comply with the Planning and Land Development Program requirements in part 4.E. of this Order at Permittee owned or operated public construction projects for project types identified in part 4.E of this Order.

(b) Each Permittee shall implement and comply with the appropriate Development Construction Program requirements in part 4.F. of this Order at Permittee owned or operated construction projects as applicable.

(c) For public projects including those under a Capital Improvement Project Plan that disturb less than one acre of soil the Permittees shall require the development and implementation of a Storm Water Pollution Control Plan. The SWPCP shall include BMPs as identified in Table 6.

2. Vehicle Maintenance/ Material Storage Facilities/ Corporation Yards Management/ Long Term Maintenance Programs
   (a) Each Permittee shall implement the activity specific BMPs[1] listed in Table 10 when such activities occur at Permittee owned/leased facilities and job sites including but not limited to vehicle/ equipment maintenance facilities, material storage facilities, and corporation yards, and at any area that includes the activities as described in the following Tables. Additionally, for any activity or area described in the footnote below,[2] each Permittee shall also implement the BMPs in the Caltrans Storm Water Quality Handbook Maintenance Staff Guide described as B-4 in Table 10 (BMPs at Vehicle Maintenance/ Material Storage Facilities/ Corporation Yards).

Table 10 - BMPs at Vehicle Maintenance/ Material Storage Facilities/ Corporation Yards
From the Caltrans Storm Water Quality Handbook Maintenance Staff Guide **Appendix B**

Activity Specific BMPs	**Page**
General BMPs	B-4
Flexible Pavement	B-9
Asphalt Cement Crack and Joint Grinding/ Sealing	B-9
Asphalt Paving	B-10
Structural Pavement Failure (Digouts) Pavement Grinding and Paving	B-11
Emergency Pothole Repairs	B-13
Sealing Operations	B-14
Rigid Pavement	B-15
Portland Cement Crack and Joint Sealing	B-15
Mudjacking and Drilling	B-16
Concrete Slab and Spall Repair	B-17
Slope/ Drains/ Vegetation	B-19
Shoulder Grading	B-19
Nonlandscaped Chemical Vegetation Control	B-21
Nonlandscaped Mechanical Vegetation Control/ Mowing	B-23
Nonlandscaped Tree and Shrub Pruning, Brush Chipping, Tree and Shrub Removal	B-24
Fence Repair	B-25
Drainage Ditch and Channel Maintenance	B-26
Drain and Culvert Maintenance	B-28
Curb and Sidewalk Repair	B-30
Litter/ Debris/ Graffiti	B-32
Sweeping Operations	B-32
Litter and Debris Removal	B-33
Emergency Response and Cleanup Practices	B-34
Graffiti Removal	B-36
Landscaping	B-37

[1] These BMPs are identified in Appendix B of the *Caltrans Storm Water Quality Handbook Maintenance Staff Guide, May 2003*, and its addenda. Other BMPs may be substituted upon approval by the Executive Officer.
[2] Scheduling and Planning; Spill Prevention and Control; Sanitary/ Septic Waste Management; Material Use; Safer Alternative Products; Vehicle/ Equipment Cleaning, Fueling, and Maintenance; Illicit Connections Detection, Reporting and Removal; Illegal Spill / Discharge Control and Maintenance Facility Housekeeping Practices.

Activity Specific BMPs	**Page**
Chemical Vegetation Control	B-37
Manual Vegetation Control	B-39
Landscaped Mechanical Vegetation Control/ Mowing	B-40
Landscaped Tree and Shrub Pruning, Brush Chipping, Tree and Shrub Removal	B-41
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Irrigation (Watering), Potable and Nonpotable	B-43
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Public Facilities	B-50
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Tow Truck Operations	B-63
Toll Booth Lane Scrubbing Operations	B-64
Electrical	B-65
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Raised/ Recessed Pavement Marker Application and Removal	B-70
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Storm Maintenance	B-78
Minor Slides and Slipouts Cleanup/ Repair	B-78
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Building and Grounds Maintenance	B-80
Storage of Hazardous Materials (Working Stock)	B-82
Material Storage Control (Hazardous Waste)	B-84
Outdoor Storage of Raw Materials	B-85
Vehicle and Equipment Fueling	B-86
Vehicle and Equipment Cleaning	B-87
Vehicle and Equipment Maintenance and Repair	B-88

Activity Specific BMPs	Page
Aboveground and Underground Tank Leak and Spill Control	B-90

3. Vehicle and Equipment Wash Areas
   (a) Each Permittee shall eliminate discharges of wash waters from vehicle and equipment washing no later than May 7, 2010 by implementing any of the following measures at existing facilities with vehicle or equipment wash areas:
      (1) Self-contain, and haul off for disposal
      (2) Equip with a clarifier
      (3) Equip with an alternative pre-treatment device; <u>or</u>
      (4) Plumb to the sanitary sewer
   (b) Each Permittee shall ensure that any municipal facilities constructed, redeveloped, or replaced has all vehicle and equipment wash areas plumbed to the sanitary sewer or be self contained and all wastewater/ washwater hauled for legal disposal.

4. Landscape, Park, and Recreational Facilities Management
   (a) Integrated Pest Management (IPM)
   IPM is an ecosystem-based strategy that focuses on long-term prevention of pests or their damage through a combination of techniques such as biological control, habitat manipulation, modification of cultural practices, and use of resistant varieties. Each Permittee shall implement an IPM program within 365 days of the adoption of this Order (May 7, 2010) that includes the following:
      (1) Pesticides are used only if monitoring indicates they are needed according to established guidelines.
      (2) Treatments are made with the goal of removing only the target organism.
      (3) Pest controls are selected and applied in a manner that minimizes risks to human health, beneficial, non-target organisms, and the environment.
      (4) Its use of pesticides, including Organophosphates and Pyrethroids do not threaten water quality.
      (5) Partner with other agencies and organizations to encourage the use of IPM.
      (6) Adopt and verifiably implement policies, procedures, and/ or ordinances requiring the minimization of pesticide use and encouraging the use of IPM techniques (including beneficial insects) in the Permittees' overall operations and on municipal property.
      (7) Policies, procedures, and ordinances shall include commitments and timelines to reduce the use of pesticides that cause impairment of surface waters by implementing the following procedures:
         (A) Quantify pesticide use by its staff and hired contractors.
         (B) Prepare and annually update an inventory of pesticides used by all internal departments, divisions, and other operational units.
         (C) Demonstrate reductions in pesticide use.
   (b) Each Permittee shall implement the following requirements no later than November 3, 2009:

(1) Use a standardized protocol for the routine and non-routine application of pesticides (including pre-emergents), and fertilizers.
(2) Ensure no application of pesticides or fertilizers are applied to an area immediately prior to, during, or immediately after a rain event, or when water is flowing off the area.
(3) Ensure that no banned or unregistered pesticides are stored or applied.
(4) Ensure that all staff applying pesticides are certified in the appropriate category by the California Department of Pesticide Regulation, or are under the direct supervision of a pesticide applicator certified in the appropriate category.
(5) Implement procedures to encourage the retention and planting of native vegetation to reduce water, pesticide and fertilizer needs; and
(6) Store pesticides and fertilizers indoors or under cover on paved surfaces or use secondary containment.
    (A) Reduce the use, storage, and handling of hazardous materials to reduce the potential for spills.
    (B) Regularly inspect storage areas.
(7) Comply with the provisions and the monitoring requirements for application of aquatic pesticides to surface waters (WQ Order No. 2004-0008-DWQ) (Vector Control) and Order No. 2004-0009-DWQ (Weed Control).

5. Storm Drain Operation and Management
   (a) Catch Basin Cleaning
   (1) Each Permittee shall designate catch basin inlets within its jurisdiction as one of the following:
   Priority A: Catch basins that are designated as consistently generating the highest volumes of trash.
   Priority B: Catch basins that are designated as consistently generating moderate volumes of trash.
   Priority C: Catch basins that are designated as generating low volumes of trash.
   Within one year of Order adoption (May 7, 2010), Permittees shall submit a map or list of Catch Basins with their GPS coordinates and their designations. The map or list shall contain the rationale or data to support designations.
   (2) Each Permittee shall inspect catch basins according to the following schedule:
   Priority A: A minimum of 3 times during the wet season and once during the dry season every year.
   Priority B: A minimum of once during the wet season and once during the dry season every year.
   Priority C: A minimum of once per year.
   Catch basins shall be cleaned as necessary on the basis of inspections. Permittees shall maintain inspection records for Regional Board review.

(3) In addition to the preceding schedule, Permittees shall ensure that any catch basin that is determined to be at least 25% full of trash shall be cleaned out.

(b) Trash Management at Public Events

(1) Each Permittee shall require for any event in the public right of way or wherever it is foreseeable that substantial quantities of trash and litter may be generated, the following measures:

(A) Proper management of trash and litter generated; and

(B) Arrangement for temporary screens to be placed on catch basins; or

(C) Provide clean out of catch basins, trash receptacles, and grounds in the event area within 24 hours subsequent to the event.

(c) Trash Receptacles

(1) Each Permittee shall install trash receptacles, or equivalent trash capturing devices in areas subject to high trash generation within its jurisdiction no later than May 7, 2010.

(2) Each Permittee shall ensure that all trash receptacles are cleaned out and maintained as necessary to prevent trash overflow.

(d) Catch Basin Labels

(1) Each Permittee shall inspect the legibility of the catch basin stencil or label nearest each catch basin and inlet before the wet season begins.

(2) Each Permittee shall record and re-stencil or re-label within 15 days of inspection, catch basins with illegible stencils.

(e) Additional Trash Management Practices

(1) Each Permittee shall install trash excluders, or equivalent devices on or in catch basins or outfalls to prevent the discharge of trash to the storm drain system or receiving water no later than two years after Order adoption date in areas defined as Priority A (subpart 5(a)(1)) except in sites where the application of such BMP(s) alone will cause flooding. Lack of maintenance that causes flooding is not an acceptable exception to the requirement to install BMPs. Alternatively the Permittee may implement alternative or enhanced BMPs beyond the provisions of this permit (such as but not limited to increased street sweeping, adding trash cans near trash generation sites, prompt enforcement of trash accumulation, increased trash collection on public property, increased litter prevention messages or trash nets within the MS4) that provide substantially equivalent removal of trash. Permittees shall demonstrate that BMPs, which substituted for trash excluders provide equivalent trash removal performance as excluders. When outfall trash capture is provided, revision of the schedule for inspection and cleanout of catch basins in task 5.(a)(2) may be proposed by the Permittee for approval by the Executive Officer.

(f) Storm Drain Maintenance

(1) Each Permittee shall implement a program for Storm Drain Maintenance no later than November 3, 2009 that includes the following:

(A) Visual monitoring of Permittee-owned open channels and other drainage structures for debris at least annually.

(B) Remove trash and debris from open channel storm drains a minimum of once per year before the wet season.
(C) Eliminate the discharge of contaminants during MS4 maintenance and clean outs.
(D) Quantify the amount of materials removed using techniques appropriate for quantifying solid waste and ensure the materials are properly disposed of.

(g) Spill Response Plan
(1) Each Permittee shall implement a response plan for spills to the MS4 within their respective jurisdiction. The response Plan shall clearly identify agencies responsible and telephone numbers and e-mail address for contact and shall contain at a minimum the following:
(A) Investigation of all complaints received within 24 hours of the incident report.
(B) Response within 2 hours to spills for containment upon notification, except where such overflows occur on private property, in which case the response should be within 2 hours of gaining legal access to the property.
(C) Notification to appropriate public health agencies and the Office of Emergency Services (OES).

(h) Permittee Owned Treatment Control BMPs
(1) Each Permittee shall implement an inspection and maintenance program for all Permittee owned treatment control BMPs, including post-construction treatment control BMPs.
(2) Each Permittee shall ensure proper operation of all treatment control BMPs and maintain them as necessary for proper operation, including all post-construction treatment control BMPs.
(3) Any residual water produced by a treatment control BMP and not being internal to the BMP performance when being maintained shall be:
(A) Hauled away and legally disposed of; or
(B) Applied to the land without runoff; or
(C) Discharged to the sanitary sewer system (with permits or authorization); or
(D) Treated or filtered to remove bacteria, sediments, nutrients, and meet the limitations set in Table 11 (Discharge Limitations for Dewatering Treatment BMPs) prior to discharge to the MS4.

Table 11 - Discharge Limitations for Dewatering Treatment BMPs[1]

Parameter	Units	Limitation
Total Suspended Solids	mg/L	100
Turbidity	NTU	50
Oil and Grease	mg/L	10

[1] Technology based effluent limits.

6. Streets and Roads Maintenance
   (a) Maintenance
      (1) Each Permittee shall perform street sweeping of curbed streets in commercial areas and areas subject to high trash generation to control trash and debris at least two times per month.
   (b) Road Reconstruction
      (1) Each Permittee shall require that for any project that includes roadbed or street paving, repaving, patching, digouts, or resurfacing roadbed surfaces, that the following BMPs be implemented for each project.
         (A) Restrict paving and repaving activity to exclude periods of rainfall or predicted rainfall[1] unless required by emergency conditions.
         (B) Install sand bags or gravel bags and filter fabric at all susceptible storm drain inlets and at manholes to prevent spills of paving products and tack coat;
         (C) Prevent the discharge of release agents including soybean oil, other oils, or diesel to the storm water drainage system or receiving waters.
         (D) Minimize non storm water runoff from water use for the roller and for evaporative cooling of the asphalt.
         (E) Clean equipment over absorbent pads, drip pans, plastic sheeting or other material to capture all spillage and dispose of properly.
         (F) Collect liquid waste in a container, with a secure lid, for transport to a maintenance facility to be reused, recycled or disposed of properly.
         (G) Collect solid waste by vacuuming or sweeping and securing in an appropriate container for transport to a maintenance facility to be reused, recycled or disposed of properly.
         (H) Cover the "cold-mix" asphalt (i.e., pre-mixed aggregate and asphalt binder) with protective sheeting during a rainstorm.
         (I) Cover loads with tarp before haul-off to a storage site, and do not overload trucks.
         (J) Minimize airborne dust by using water spray during grinding.
         (K) Avoid stockpiling soil, sand, sediment, asphalt material and asphalt grindings materials or rubble in or near storm water drainage system or receiving waters.
         (L) Protect stockpiles with a cover or sediment barriers during a rain.

7. Emergency Procedures
   (a) Each Permittee may conduct repairs of essential public service systems and infrastructure in emergency situations with a self-waiver of the provisions of this Order.
      (1) Where the self-waiver has been invoked, the Permittee shall submit to the Regional Water Board Executive Officer a statement of the occurrence of the emergency, an explanation of the circumstances, and the measures that were implemented to reduce the threat to water quality, no later than

[1] A probability of precipitation (POP) of 50% is required.

30 business days after the situation of emergency has passed.

(2) Minor repairs of essential public service systems and infrastructure in emergency situations (can be completed in less than one day) are not subject to the notification provisions. Appropriate BMPs to reduce the threat to water quality shall be implemented.

8. Municipal Employee and Municipal Contractor Training

(a) Each Permittee shall, no later than May 7, 2010 and annually thereafter before June 30, train all of their employees and contractors in targeted positions (whose interactions, jobs, and activities affect storm water quality) on the requirements of the overall storm water management program to:

(1) Promote a clear understanding of the potential for activities to pollute storm water.

(2) Identify opportunities to require, implement, and maintain appropriate BMPs in their line of work.

(b) Each Permittee shall, no later than May 7, 2010 and annually thereafter before June 30, train all of their employees and contractors who use or have the potential to use pesticides or fertilizers (whether or not they normally apply these as part of their work). Training programs shall address:

(1) The potential for pesticide-related surface water toxicity.

(2) Proper use, handling, and disposal of pesticides.

(3) Least toxic methods of pest prevention and control, including IPM.

(4) Reduction of pesticide use.

(c) Each Permittee shall, no later than May 7, 2010 and annually thereafter before June 30, train all of their employees and contractors who are responsible for illicit connections and illicit/ illegal discharges. Training programs shall address:

(1) Identification

(2) Investigation

(3) Termination

(4) Cleanup

(5) Reporting of Incidents

(6) Documentation of Incidents

H. Illicit Connections and Illicit Discharges Elimination Program

I. Each Permittee shall implement an Illicit Connections and Illicit Discharges (IC/ IDs) program to eliminate IC/IDs to the storm drain system, and shall document, track, and report all such cases in accordance with the elements and performance measures specified in the following subsections.

1. General

(a) Implementation - Each Permittee shall implement an IC/ ID Program. The IC/ ID procedures shall be documented and made available for public review.

(b) Tracking - All Permittees shall, no later than May 7, 2012, map at a scale and in a format specified by the Principal Permittee all known connections to their storm drain system. All Permittees shall map at a scale and in a format specified by the

Principal Permittee incidents of illicit connections and discharges since January 2009 on their baseline maps, and shall transmit this information to the Principal Permittee no later than May 7, 2012. Permittees shall use this information to identify priority areas for further investigation and elimination of IC/ ID.

2. Public Reporting
   (a) Permittees shall establish and maintain a phone hotline and internet site to receive all reports of IC/ ID complaints.
   (b) Permittees shall document the location of the reported IC/ ID and the actions undertaken in response to all IC/ ID complaints.

3. Illicit Connections
   (a) Screening for Illicit Connections
      (1) Each Permittee shall submit to the Principal Permittee:
         (A) A map at a scale and in a format specified by the Principal Permittee showing the location and length of underground pipes 18 inches and greater in diameter, and channels within their permitted area and operated by the Permittee in accordance with the following schedule:
            (i) All channeled portions of the storm drain system no later than May 7, 2010.
            (ii) All portions of the storm drain system consisting of storm drain pipes 36 inches in diameter or greater, no later than May 7, 2012. This provision is not meant to exclude Permittees from using equally effective alternative methods not listed in the manual.
            (iii) All portions of the storm drain system consisting of storm drain pipes 18 inches in diameter or greater, no later than May 7, 2014.
         (B) The status of suspected, confirmed, and terminated illicit connections.
      (2) Permittees shall conduct field screening of their storm drain systems in accordance with screening procedures described in the Illicit Discharge Detection and Elimination, A Guidance Manual for Program Development and Technical Assessments (2004)[1]. Permittees shall conduct field screening of their storm drain system that has not been previously screened and reported to the Regional Board, for illicit connections in accordance with the following schedule:
         (A) All portions of the storm drain system consisting of storm drain pipes 36 inches in diameter or greater, no later than May 7, 2012.
         (B) High priority areas identified during the mapping of illicit connections and discharges, no later than May 7, 2012.
         (C) All portions of storm drain systems 50 years or older in age, no later than May 7, 2012.
      (3) Each Permittee shall maintain a list containing all connections under investigation for possible illicit connection and their status.

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[1] *Illicit Discharge Detection and Elimination, A Guidance Manual for Program Development and Technical Assessments*. The Center for Watershed Protection, Pitt R., October 2004. Chapter 13, 13.1,13.2, 13.3, 13.4

(b) Response to Illicit Connections
(1) Investigation -
Each Permittee, upon discovery or upon receiving a report of a suspected illicit connection, shall complete an investigation within 21 days, to determine the following:
(A) Source of the connection.
(B) Nature and volume of discharge through the connection.
(C) Responsible party for the connection.
(2) Termination -
Each Permittee, upon confirmation of an illicit storm drain connection, shall ensure the following:
(A) Termination of the connection within 180 days of completion of the investigation, using formal enforcement authority to eliminate the illicit connection.
(3) Documentation -
Each Permittee shall keep records of all illicit connection investigations and the formal enforcement taken to eliminate all illicit connections.

4. Illicit Discharges
(a) Investigation -
Each Permittee shall investigate an illicit/ illegal discharge during or immediately following containment and cleanup activities, and shall take appropriate enforcement action to eliminate the illegal discharge.
(b) Abatement and Cleanup -
Each Permittee shall respond, within 1 business day of discovery or a report of a suspected illicit/ illegal discharge, with actions to abate, contain, and/or clean up all illegal discharges, including hazardous waste.
(c) Documentation -
Each Permittee shall maintain records of all illicit/ illegal discharge discoveries, reports of suspected illicit/ illegal discharges, their response to the illicit/ illegal discharges and suspected illicit/ illegal discharges, and the formal enforcement taken to eliminate all illicit/ illegal discharges.

I. REPORTING PROGRAM

1. The Principal Permittee in consultation with the Permittees and Regional Water Board staff shall convene an adhoc working group to develop an Electronic Reporting Program, the basis of which shall be the requirements in this Order. The Committee shall no later than May 7, 2010 submit the electronic reporting form in each subsequent year.

2. Each Permittee shall submit information required in the Reporting Program in a method as appropriate to the format approved by the Regional Water Board Executive Officer.

3. The Principal Permittee shall submit by December 15th of each year, an Annual Report to the Regional Water Board Executive Officer in the form one hard copy and three compact disk (CD) copies (or an electronic equivalent).

4. The Annual Report shall document the status of the Municipal Storm Water Program, an integrated summary of the results of analyses from:
   (a) The monitoring program described under Part 1- Monitoring Report.
   (b) The requirements described under Part 2- Program Report.

5. Plans shall be submitted to the Regional Water Board Executive Officer in the form of one hard copy and three compact disk (CD) copies (or an electronic equivalent).

6. Study Reports shall be submitted to the Regional Water Board Executive Officer in the form of one hard copy and three compact disk (CD) copies (or an electronic equivalent).

7. Progress Reports shall be submitted to the Regional Water Board Executive Officer in the form of one hard copy and three compact disk (CD) copies (or an electronic equivalent).

PART 5 - TOTAL MAXIMUM DAILY LOAD PROVISIONS

I. Part 56 of this Order incorporates provisions to assure that Ventura County MS4 Permittees comply with WLAs and other requirements of TMDLs covering impaired waters impacted by the Permittees' discharges.

II. Each Permittee shall attain the storm water WLAs incorporated into this Order by implementing BMPs in accordance with the TMDL Technical Reports, Implementation Plans, or as identified as a result of TMDL special studies specified in the Basin Plan Amendment.

III. The Permittees shall comply with the following Wasteload Allocations, consistent with the assumptions and requirements of the Wasteload Allocations documented in the Implementation Plans, including compliance schedules, associated with the State adoption and approval of the TMDL at compliance monitoring points established in each TMDL (40CFR122.44(d)(1)(vii)(B).

IV. TMDLs in effect and covered in this Order are the following:
   1. TMDL for Nutrients for Malibu Creek Watershed (Effective date: March 21, 2003)
   2. TMDL for Nitrogen Compounds and Related Effects in Calleguas Creek (Effective date: July 16, 2003)
   3. TMDL for Nitrogen Compounds for the Santa Clara River (Effective date: March 23, 2004).
   4. TMDL for Chloride in Santa Clara River, Reach 3 (Effective date: June 18, 2003)
   5. TMDL for Chloride in Upper Santa Clara River (Effective date: May 4, 2005)

6. TMDL for Toxicity, Chlorpyrifos and Diazinon in the Calleguas Creek, its Tributaries and Mugu Lagoon - (Effective date: March 24, 2006).
7. TMDL for Organochlorine Pesticides, Polychlorinated Biphenyls, and Siltation in Calleguas Creek, its Tributaries and Mugu Lagoon (Effective date: March 24, 2006).
8. TMDL for Bacteria in Malibu Creek and Lagoon (Effective date: January 24, 2006).
9. TMDL for Metals and Selenium in the Calleguas Creek, its Tributaries and Mugu Lagoon (Effective date: March 26, 2007)
10. TMDL for Trash in Revolon Slough and Beardsley Wash (Effective date: March 6, 2008).
11. TMDL for Boron, Chloride, Sulfate, and TDS in Calleguas Creek Watershed (Effective date: December 2, 2008)
12. TMDL for Trash in the Ventura River Estuary (Effective date: March 6, 2008).
13. TMDL for Bacteria in Harbor Beaches of Ventura County (Effective date: September 23, 2008).

IV. TMDL Interim WLAs incorporated into this Order due to compliance dates which exceed the term of this Order are the following:

1. Final Wet Weather Bacteria WLAs for Malibu Creek and Lagoon – (Compliance date: January 24, 2016).
2. Final Chloride WLAs for Upper Santa Clara River – (Compliance date: May 4, 2016)
3. Final Organochlorine Pesticides, Polychlorinated Biphenyls, and Siltation WLAs for Calleguas Creek, its Tributaries and Mugu Lagoon – (Compliance date: March 24, 2026).
4. Final Metals and Selenium WLAs for Calleguas Creek, its Tributaries and Mugu Lagoon (Compliance date: March 26, 2022)
5. Final Boron, Chloride, Sulfate, and TDS WLAs for Calleguas Creek watershed (Compliance date: December 2, 2023)

V. TMDL WLAs and Other TMDL Provisions Incorporated into this Order are as follows:

1. TMDL for Nutrients for Malibu Creek Watershed

(a) Summer Load Allocations

	Nitrogen (lbs/day)	Phosphorus (lbs/day)
- Runoff from developed areas	26	2.6
- Golf Course Fertilization	37	6.6
- Dry Weather Urban Runoff	52	4.6
- Other	56	4.1

(b) Winter concentration-based Load Allocations

	Nitrogen (Nitrate-N + Nitrite-N) (mg/L)
- Runoff from Developed Areas	8

- Golf Course Fertilization	8
- Dry Weather Urban Runoff	8
- Other	8

(c) Compliance Monitoring:
This TMDL was established and approved by U.S. EPA and did not include an implementation plan.

(d) Actions and Special Studies required for Malibu Creek MS4 permittees
(1) Extent of algal impairment. EPA recommends studies to investigate the current extent of impairment due to excessive algal growth in the creek by surveying algal biomass and species composition at multiple sites within the creek.
(2) Limiting factor analysis. EPA recommends further study to assess whether total nitrogen or total phosphorus or other parameters such as flow and light limit algal growth in the Malibu Creek watershed.
(3) Fate of nutrients in Malibu Lagoon. EPA recommends this special study to determine if the expected upstream reductions in nutrient loadings would result in desired improvements in water quality in the lagoon.

2. TMDL for Nitrogen Compounds and Related Effects in Calleguas Creek Watershed

The stormwater permitted discharges were considered minor sources of nitrogen to the Calleguas Creek. Therefore, WLAs are not assigned to storm water permitted discharges. The monitoring program of this TMDL includes data collection to quantify loadings and associated WLAs from these sources.

3. TMDL for Nitrogen Compounds in the Santa Clara River

(a) Waste Load Allocations:
(1) The Ventura County MS4 permittees discharging to the Santa Clara River (the cities of Fillmore and Santa Paula) ("Santa Clara MS4 permittees") shall implement BMPs to achieve the following MS4 wasteload allocations applicable to River Reach 3:

Ammonia nitrogen 30-day average	2.0 mg/L
Ammonia nitrogen 1-hour average	4.2 mg/L
Nitrate + Nitrite nitrogen 30-day average	8.1 mg/L

(b) Compliance Monitoring:
(1) Compliance with the WLAs is to be determined through receiving water monitoring conducted in accordance with the Santa Clara River Nitrogen TMDL Monitoring Program approved by the Executive Officer.
(2) If any WLA is exceeded at a compliance monitoring site, permittees shall implement BMPs in accordance with the TMDL Technical Reports, Implementation Plans or as identified as a result of TMDL special studies identified in the Basin Plan Amendment. Following these actions, Regional Water Board staff will evaluate the need for enforcement action.

(c) Actions and Special Studies required of Santa Clara MS4 permittees:
(1) Annual Progress Reports. Santa Clara River MS4 permittees, either independently or in conjunction with other stakeholders, shall submit an annual progress report with respect to achievement of the WLAs.

4. TMDL for Chloride in Santa Clara River, Reach 3

(a) Waste Load Allocation:
MS4 permittees discharging to Santa Clara River, Reach 3 shall implement BMPs to achieve the following MS4 WLAs:
Chloride (mg/L) 80
(b) Compliance Monitoring: This TMDL was established and approved by U.S. EPA and did not include an implementation plan.
(c) Actions and Special Studies required of Santa Clara MS4 permittees:
(1) Annual Progress Reports. Santa Clara River MS4 permittees, either independently or in conjunction with other stakeholders, shall submit an annual progress report with respect to achievement of the WLAs.

5. TMDL for Chloride in Upper Santa Clara River

(a) Waste Load Allocation:
MS4 permittees discharging to Upper Santa Clara River shall implement BMPs to achieve the following WLAs
Chloride (mg/L) 100
(b) Compliance monitoring:
(1) Compliance with the WLAs is to be determined through receiving water monitoring conducted in accordance with the Santa Clara River Nitrogen TMDL Monitoring Program approved by the Executive Officer.
(2) If any WLA is exceeded at a compliance monitoring site, permittees shall implement BMPs in accordance with the TMDL Technical Reports and Implementation Plans. Following these actions, Regional Water Board staff will evaluate the need for enforcement action.
(c) Actions and Special Studies required of Santa Clara MS4 permittees:
(1) Annual Progress Reports. Santa Clara River MS4 permittees, either independently or in conjunction with other stakeholders, shall submit an annual progress report with respect to achievement of the WLAs.

6. TMDL for Toxicity, Chlorpyrifos, and Diazinon in the Calleguas Creek, its Tributaries and Mugu Lagoon.

(a) Waste Load Allocations:
(1) MS4 permittees discharging to Calleguas Creek, its tributaries and Mugu Lagoon (Ventura County Watershed Protection District, County of Ventura and the cities of Camarillo, Moorpark, Oxnard, Simi Valley and Thousand

Oaks) ("Calleguas MS4 permittees") shall implement BMPs to achieve the following MS4 WLAs:

Toxicity WLA	1.0 TUc
Chlorpyrifos WLA	0.014 ug/L
Diazinon WLA	0.10 ug/L

(2) Pursuant to the TMDL, the final storm water WLAs for Toxicity, Chlorpyrifos and Diazinon, listed above, are receiving water concentrations measured in-stream at the base of each subwatershed within the Calleguas Creek watershed.

(b) Compliance Monitoring:

(1) Compliance with the WLAs is to be determined through the measurement of in-stream water quality at the base of each of the Calleguas Creek subwatersheds, in accordance with the Calleguas Creek Watershed TMDL Monitoring Program approved by the Executive Officer.

(2) If any WLA is exceeded at a compliance monitoring site, permittees shall implement BMPs in accordance with the TMDL Technical Reports, Implementation Plans or as identified as a result of TMDL special studies identified in the Basin Plan Amendment. Following these actions, Regional Water Board staff will evaluate the need for enforcement action.

(3) If as a result of compliance monitoring and subsequent investigations it is determined that a Calleguas MS4 permittee is responsible for exceedance of the in-stream Toxicity WLA, that permittee shall initiate the TRE/TIE process as outlined in U.S. EPA's "Understanding and Accounting for Method Variability in Whole Effluent Toxicity Applications Under the National Pollutant Discharge Elimination System Program" (2000) or the approved Toxicity TMDL monitoring plan, and take appropriate action to eliminate the identified source of the toxicity.

(c) Actions and Special Studies required of Calleguas MS4 permittees:

(1) Special Study #1. Together with Calleguas POTW permittees, investigate the pesticides that will replace diazinon and chlorpyrifos in the urban environment, their potential impact on receiving waters and potential control measures. Special Study #1 was completed by March 24, 2008.

(2) Special Study #2. Together with Calleguas Agricultural Dischargers, consider results of monitoring of sediment concentrations by source/land use type through the special study required in the Calleguas OC Pesticide, PCB and Siltation TMDL Implementation Plan. Complete within 6 months of completion of the OCs TMDL special study #1.

(3) Pesticide Collection Program. Together with Calleguas POTW permittees, develop and implement a collection program for diazinon and chlorpyrifos and an educational program. Collection and education could occur through existing programs such as household hazardous waste collection events. The Pesticide Collection Program is to be implemented by March 24, 2009.

(4) Special Study #3. Together with Calleguas Agricultural Dischargers, consider the findings of transport rates developed through the OC Pesticide,

PCB and Siltation TMDL Implementation Plan. Complete within 6 months of completion of the OCs TMDL special study #1.

7. TMDL for Organochlorine (OC) Pesticides, Polychlorinated Biphenyls (PCBs) and Siltation in the Calleguas Creek, its Tributaries and Mugu Lagoon.
   (a) Waste Load Allocations:
      (1) MS4 permittees discharging to Calleguas Creek, its tributaries or Mugu Lagoon (Ventura County Watershed Protection District, County of Ventura and the cities of Camarillo, Moorpark, and Simi Valley) ("Calleguas MS4 permittees") shall implement BMPs to achieve the interim WLAs listed in Table 12.

Table 12 - Interim Sediment Concentration WLAs (ng/g)

Constituent	Subwatershed					
	Mugu Lagoon	Calleguas Creek	Revolon Slough	Arroyo Las Posas	Arroyo Simi	Conejo Creek
Chlordane	25	17	48	3.3	3.3	3.4
4,4-DDD	69	66	400	290	140	5.3
4,4-DDE	300	470	1600	950	170	20
4.4-DDT	39	110	690	670	25	2
Dieldrin	19	3	5.7	1.1	1.1	3
PCBs	180	3800	7600	25700	25700	3800
Toxaphene	22900	260	790	230	230	260

      (2) Pursuant to the TMDL, the interim storm water WLAs for OC Pesticides, PCBs and Siltation, listed above, are annual average, sediment-based concentrations measured in surface waters at the base of each subwatershed within the Calleguas Creek watershed.
   (b) Compliance Monitoring:
      (1) Compliance with the WLAs is to be determined through the measurement of in-stream water quality at the base of each of the Calleguas Creek subwatersheds, in accordance with the Calleguas Creek Watershed TMDL Monitoring Program approved by the Executive Officer.
      (2) If any WLA is exceeded at a compliance monitoring site, permittees shall implement BMPs in accordance with the TMDL Technical Reports, Implementation Plans or as identified as a result of TMDL special studies identified in the Basin Plan Amendment. Following these actions, Regional Water Board staff will evaluate the need for enforcement action.
   (c) Actions and Special Studies required of Calleguas MS4 permittees:
      (1) Pesticide Collection Program. Together with Calleguas POTW permittees, implement a collection program and source control measures pursuant to a work plan approved by the Executive Officer. The Pesticide Collection Program is to be implemented by March 24, 2011.
      (2) Special Study #1. Together with Calleguas POTW permittees, Calleguas Agricultural Dischargers, and the Point Mugu Naval Base, submit a work

plan to quantify sedimentation in the Calleguas Creek Watershed, evaluate management methods to control siltation and contaminated sediment transport to Calleguas Creek, identify appropriate BMPs to reduce sediment loadings and evaluate the effect of sediment on habitat preservation in Mugu Lagoon for approval by the Executive Officer. This special study is also to evaluate the concentration of OC pesticides and PCBs in sediments from various sources/land use types. Special Study #1 is to be completed by March 24, 2014.

(3) Special Study #2. Together with Calleguas Agricultural Dischargers, identify areas of high OC concentrations and evaluate the effects of watershed protection and land use practices on water quality. Such practices include but are not limited to management of sediment reduction practices and structures, streambank stabilization, and other projects related to stormwater conveyance and flood control improvements in the Calleguas Creek watershed. Special Study #2 is to be completed based on the schedule provided in the workplan, submitted in March, 2007

(4) Special Study #3 – Together with Calleguas POTW permittees, Calleguas Agricultural Dischargers, and the Point Mugu Naval Base, evaluate natural attenuation rates and evaluate methods to accelerate organochlorine pesticide and polychlorinated biphenyl attenuation and examine the attainability of wasteload and load allocations in the Calleguas Creek Watershed. Special Study #3 is to be completed by March 24, 2016.

8. TMDL for Metals and Selenium in the Calleguas Creek, its Tributaries and Mugu Lagoon.

(a) Waste Load Allocations:

(1) MS4 permittees discharging to Calleguas Creek, its tributaries or Mugu Lagoon (Ventura County Watershed Protection District, County of Ventura and the cities of Camarillo, Moorpark, Oxnard, Simi Valley and Thousand Oaks) ("Calleguas MS4 permittees") shall implement BMPs to achieve the interim WLAs listed in Table 13 and Table 14.

Table 13 - Interim WLAs for Copper, Nickel and Selenium (ug/L)

Constituent	Calleguas and Conejo Creek (a)			Revolon Slough		
	Dry Daily Maximum (ug/L)	Dry Monthly Average (ug/L)	Daily Maximum (ug/L)	Dry Daily Maximum (ug/L)	Dry Monthly Average (ug/L	Daily Maximum (ug/L)
Copper	23	19	204	23	19	204
Nickel	15	13	(a)	15	13	(a)
Selenium	(b)	(b)	(b)	14(c)	13(c)	(a)

(A) The current loads do not exceed the TMDL under wet conditions, interim limits are not required
(B) Selenium allocations have not been developed for this reach as it is not on the 303(d) list
(C) Attainment of interim limits will be evaluated in consideration of background loading data, if available

(2) Pursuant to the TMDL, the interim storm water WLAs for copper, nickel, and selenium are receiving water concentrations measured in-stream at the base of Calleguas Creek and Revolon Slough and in Mugu Lagoon.

Table 14 - Mass-based WLAs for copper, nickel and selenium

Annual Cumulative Flow (million gallons per year)	Calleguas Creek (lbs/yr)	Revolon Slough (lbs/yr)
0-15,000	3.3	1.7
15,000-25,000	10.5	4
Above 25,000	64.6	10.2

(3) Pursuant to the TMDL, the interim storm water WLAs for mercury are suspended sediment loads measured in-stream at the base of Calleguas Creek and Revolon Slough and in Mugu Lagoon.
(4) Determination of the applicable interim WLA will be determined by calculating the total annual flow (October 1-September 30) in the Calleguas Creek watershed as measured by the flow gage at CSUCI.

(b) Compliance Monitoring:
(1) Compliance with the WLAs is to be determined through the measurement of in-stream water quality and total suspended solids (TSS) at the base of Calleguas Creek, Revolon Slough and in Mugu Lagoon, in accordance with the Calleguas Creek Watershed TMDL Monitoring Program approved by the Executive Officer.
(2) If any WLA is exceeded at a compliance monitoring site, permittees shall implement BMPs in accordance with the TMDL Technical Reports, Implementation Plans or as identified as a result of TMDL special studies identified in the Basin Plan Amendment. Following these actions, Regional Water Board staff will evaluate the need for enforcement action.

(c) Actions and Special Studies required of Calleguas MS4 permittees:
(1) Conduct a source control study, develop and submit an Urban Water Quality Management Program (UWQMP) for copper, mercury, nickel, and selenium. Complete by March 26, 2009.
(2) Implement the UWQMP within one year of approval by Executive Officer.
(3) In cooperation with agricultural dischargers, evaluate the results of the OCs TMDL special study on sediment transport rates for applicability to the metals and selenium TMDL. Complete within 6 months of completion of the OCs TMDL special study #1.

(4) In cooperation with agricultural dischargers, include monitoring for copper, mercury, nickel and selenium in the OC pesticides TMDL special study – Monitoring of Sediment by Source and Land Use Type. The special study is to be completed by March 26, 2014.
(5) Evaluate the results of the OC Pesticides TMDL Special Study – Effects of BMPs on Sediment and Siltation, to determine the impacts on metals and selenium. Complete within 6 months of completion of the OC Pesticides special study #1.
(6) Evaluate the effectiveness of BMPs implemented under the UWQMP in controlling metals and selenium discharges. This is to be completed by March 26, 2013.
(7) Re-evaluate agricultural and urban waste load allocations for copper, mercury, nickel and selenium based on the evaluation of BMP effectiveness. By March 26, 2012, urban dischargers will have a required 25% reduction in the difference between the loadings at the time of the TMDL preparation and the final WLAs effective in 2022.
(8) In cooperation with POTW permittees and agricultural dischargers, conduct a study to identify selenium contaminated groundwater sources. Special Study is to be completed within one year of the approval of the workplan.
(9) In cooperation with agricultural dischargers, conduct a study to investigate metals "hot spots" and natural soils concentrations. This special study is to be completed within 2 years of the approval of the workplan.

9. TMDL for Bacteria in Malibu Creek and Lagoon
(a) Waste Load Allocations:
(1) MS4 permittees discharging to Malibu Creek or its tributaries (Ventura County Watershed Protection District, County of Ventura and the cities of Thousand Oaks and Simi Valley) ("Malibu MS4 permittees") shall achieve the WLAs identified in Resolution 2004-19. These WLAs are expressed as the number of daily or weekly sample days that may exceed the single sample limits or 30-day geometric mean bacteria targets in Resolution 2004-19.

Table 15 - Bacteria Targets

Parameters	Unit	Fresh Water Targets	
		Geometric Mean	Single Sample
E. coli	mg	126/ 100	235/ 100
Fecal coliform	mg	200/ 100	400/ 100

(2) The wasteload allocations are to be achieved no later than January 26, 2012.
(b) Compliance Monitoring:
(1) Achievement of the WLAs is to be determined through receiving water monitoring conducted in accordance with the Malibu Creek and Lagoon Bacteria TMDL Compliance Monitoring Program approved by the Executive Officer.

(2) If any WLA is exceeded at a compliance monitoring site, permittees shall implement BMPs in accordance with the TMDL Technical Reports, Implementation Plans or as identified as a result of TMDL special studies identified in the Basin Plan Amendment. Following these actions, Regional Water Board staff will evaluate the need for enforcement action.

(c) Actions and Special Studies required of Malibu MS4 permittees:

(1) If TMDL compliance monitoring indicates that the Malibu MS4 permittees are causing or contributing to an exceedance of the WLAs in the receiving waters, the permittees shall conduct a source identification study and implement additional controls sufficient to achieve the WLAs in the receiving waters.

10. TMDL for Trash in Revolon Slough and Beardsley Wash

(a) Wasteload Allocations

(1) MS4 permittees discharging to Revolon Slough and Beardsley Wash (Ventura County Watershed Protection District, County of Ventura and the cities of Camarillo and Oxnard) shall implement BMPs to achieve the WLAs of zero trash.

(b) Compliance Monitoring

(1) Responsible jurisdictions will develop a TMRP for Executive Officer approval that describes the methodologies that will be used to assess and monitor trash in Revolon Slough and Beardsley Wash and/or within responsible jurisdiction land areas. The TMRP shall include a plan to establish the trash Baseline WLAs.

(2) If any WLA is exceeded at a compliance monitoring site, permittees shall implement BMPs in accordance with the TMDL Technical Reports, Implementation Plans or as identified as a result of TMDL special studies identified in the Basin Plan Amendment. Following these actions, Regional Water Board staff will evaluate the need for enforcement action.

(c) Actions and Special Studies required of Revolon Slough and Beardsley Wash MS4 permittees

(1) Per the adopted Basin Plan Amendment, compliance with the TMDL may be either through a progressive implementation schedule of full capture devices or implementation of other measures to attain the required trash reduction.

11. TMDL for Trash in the Ventura River Estuary

(a) Wasteload Allocations

(1) MS4 permittees discharging to the Ventura River Estuary (Ventura County Watershed Protection District, County of Ventura and the City of Ventura) shall implement BMPs to achieve the WLAs of zero trash.

(b) Compliance Monitoring

(1) Responsible jurisdictions will develop a TMRP for Executive Officer approval that describes the methodologies that will be used to assess and monitor trash in the Ventura River Estuary and/or within responsible

jurisdiction land areas. The TMRP shall include a plan to establish the trash Baseline WLAs.

(2) If any WLA is exceeded at a compliance monitoring site, permittees shall implement BMPs in accordance with the TMDL Technical Reports, Implementation Plans or as identified as a result of TMDL special studies identified in the Basin Plan Amendment. Following these actions, Regional Water Board staff will evaluate the need for enforcement action.

(c) Actions and Special Studies required of Revolon Slough and Beardsley Wash MS4 permittees

(1) Per the adopted Basin Plan Amendment, compliance with the TMDL may be either through a progressive implementation schedule of full capture devices or implementation of other measures to attain the required trash reduction.

12. TMDL for Boron, Chloride, Sulfate and TDS in Calleguas Creek Watershed

(a) Waste Load Allocation

Table 16 - Interim Dry Weather WLAs for Permitted Stormwater Dischargers

Constituent	Interim Limit 30-day average (mg/L)
Boron Total	1.3
Chloride Total	230
Sulfate Total	1289
TDS Total	1720

Table 17 - Final Dry Weather WLAs for Permitted Stormwater Dischargers

Subwatershed	Critical Condition Flow Rate (mgd)	Chloride Allocation (lb/day)	TDS Allocation (lb/day)	Sulfate Allocation (lb/day)	Boron Allocation (lb/day)
Simi	1.39	1,738	9,849	2,897	12
Las Posas	0.13	157	887	261	N/A
Conejo	1.26	1,576	8,931	2,627	N/A
Camarillo	0.06	72	406	119	N/A
Pleasant Valley (Calleguas)	0.12	150	850	250	N/A
Pleasant Valley (Revolon)	0.25	314	1,778	523	2

(b) Compliance Monitoring

(1) A monitoring plan will be submitted to the RWQCB for Executive Officer approval on June 2, 2009. Monitoring will begin one year after Executive

Officer approval of the monitoring plan to allow time for the installation of automated monitoring equipment.

(2) Compliance with the WLAs is to be determined through the measurement of in-stream water quality at the base of each of the Calleguas Creek subwatersheds, in accordance with the Calleguas Creek Watershed TMDL Monitoring Program approved by the Executive Officer.

(3) If any WLA is exceeded at a compliance monitoring site, permittees shall implement BMPs in accordance with the TMDL Technical Reports, Implementation Plans or as identified as a result of TMDL special studies identified in the Basin Plan Amendment. Following these actions, Regional Water Board staff will evaluate the need for enforcement action.

(c) Actions and Special Studies required of Calleguas Creek Watershed MS4 permittees

Responsible jurisdictions including MS4 permittees shall submit compliance monitoring plan to the Los Angeles Regional Board for Executive Officer approval on June 2, 2009. Monitoring shall begin monitoring as outlined in the approved monitoring plan six months after approval of the work plan.

Responsible jurisdictions including MS4 permittees shall demonstrate that implementation actions have reduced the boron, sulfate, TDS, and chloride imbalance by 20%, 40%, 70% by December 2 of 2011, 2015, and 2018 respectively. Stormwater dischargers shall achieve WLAs, which shall be expressed as NPDES mass-based limits specified in accordance with federal regulations and state policy on water quality control by December 2, 2023.

13. TMDL for Bacteria in Harbor Beaches of Ventura County

(a) Waste Load Allocations

(1) MS4 permittees discharging to the Channel Islands Harbor Beaches (the County of Ventura, the Ventura County Watershed Protection District (VCWPD) and associated Municipal Separate Storm Sewer System (MS4) permittees in the Channel Islands Harbor subwatershed, and the City of Oxnard shall implement BMPs to achieve the interim WLAs listed in Table 18. All WLAs for summer dry-weather single sample bacteria densities at the Harbor Beaches of Ventura County are zero (0) days of allowable exceedances; winter dry weather and wet weather final WLAs are listed in Table 19 below.

The Basin Plan objectives that serve as the numeric targets for this TMDL are (single sample limits):

a. Total coliform density shall not exceed 10,000/100 ml.
b. Fecal coliform density shall not exceed 400/100 ml.
c. Enterococcus density shall not exceed 104/100 ml.
d. Total coliform density shall not exceed 1,000/100ml, if the ratio of fecal-to-total coliform exceeds 0.1.

Table 18 - Interim WLAs for Single Sample Exceedance Days

Location	Summer Dry Weather		Winter Dry Weather		Wet Weather	
	Daily Sampling	Weekly Sampling	Daily Sampling	Weekly Sampling	Daily Sampling	Weekly Sampling
Kiddie Beach	54	8	23	4	32	5
Hobie Beach	40	6	25	4	38	6

Table19 - Final Allowable Exceedance Days by Location

Location	Summer Dry-weather		Winter Dry-weather		Wet-weather	
	Daily Sampling	Weekly Sampling	Daily Sampling	Weekly Sampling	Daily Sampling	Weekly Sampling
Hobie Beach	0	0	3	1	17	3
Kiddie Beach	0	0	3	1	17	3

(2) Pursuant to the TMDL, the interim storm water WLAs for bacteria are from samples taken at existing monitoring sites in ankle to knee- high depths.

(b) Compliance Monitoring

(1) Compliance and monitoring for Harbor Beaches of Ventura County is based on existing monitoring protocols and locations. Monitoring shall continue at sampling locations (VCEHD 36000 and VCEHD37000) and at the current weekly monitoring frequency, consistent with AB411 compliance monitoring. Monitoring shall be conducted on a year-round basis at the current monitoring locations including the summer months (i.e., April to October) and winter months (i.e., November to March). Bacteria sampling shall be conducted in ankle- to knee-high water, consistent with AB411. However, if additional monitoring stations are added or if changes are made to the sampling frequencies or existing monitoring locations, then submittal of a monitoring plan is required for Executive Officer approval.

(2) If any WLA is exceeded at a compliance monitoring site, permittees shall implement BMPs in accordance with the TMDL Technical Reports, Implementation Plans or as identified as a result of TMDL special studies identified in the Basin Plan Amendment. Following these actions, Regional Water Board staff will evaluate the need for enforcement action.

(c) Actions and Special Studies required of Harbor Beaches of Ventura County MS4 permittees

(1) Per the adopted Basin Plan Amendment, compliance with the TMDL may be either through structural and non-structural BMPs or implementation of other measures to attain the required source control.

(2) Special studies are not required for implementation of the TMDL though conducting special studies is within the discretion of the responsible parties.

PART 6 - DEFINITIONS

The following are definitions for terms in this Order:

Adverse Impact - means a detrimental effect upon water quality or beneficial uses caused by a discharge or loading of a pollutant or pollutants.

Agriculture - means the science, art, and business of cultivating the soil, producing crops, and raising livestock.

Antidegradation Policies - means policies which protect surface and ground waters from degradation, and federal policies, which protect high quality surface waters. In particular, this policy protects waterbodies where existing quality is higher than that necessary for the protection of beneficial uses including the protection of fish and wildlife propagation and recreation on and in the water (*Statement of Policy with Respect to Maintaining High Quality Water in California*, State Board Resolution No. 68-16; 40 CRF 131.12).

Applicable Standards and Limitations - means all State, interstate, and Federal standards and limitations to which a "discharge" or a related activity is subject under the CWA, including effluent limitations, water quality standards, standards of performance, toxic effluent standards or prohibitions, best management practices, and pretreatment standards under § 301, § 302, § 303, § 304, § 306, § 307, § 308, § 403, and § 404 of CWA.

Areas of Special Biological Significance (ASBS) - means all those areas of this state listed as ASBS, listed specifically within the California Ocean Plan or so designated by the State Board which, among other areas, includes the area from Mugu Lagoon to Latigo Point: Oceanwater within a line originating from Laguna Point at 34° 5' 40" north, 119° 6'30" west, thence southeasterly following the mean high tideline to a point at Latigo Point defined by the intersection of the mean high tide line and a line extending due south of Benchmark 24; thence due south to a distance of 1000 feet offshore or to the 100 foot isobath, whichever distance is greater; thence northwesterly following the 100 foot isobath or maintaining a 1,000-foot distance from shore, whichever maintains the greater distance from shore, to a point lying due south of Laguna Point, thence due north to Laguna Point.

Authorized Discharge - means any discharge that is authorized pursuant to an NPDES permit, waste discharge requirement, conditional waiver from waste discharge requirements, or meets the conditions set forth in this Order.

Automotive Repair Shop - means a facility that is categorized in any one of the following Standard Industrial Classification (SIC) codes: 5013, 5014, 5541, 7532-7534, or 7536-7539.

Automotive Service Facilities - means a facility that is categorized in any one of the following Standard Industrial Classification (SIC) and North American Industry Classification System (NAICS) codes. For inspection purposes, Permittees need not inspect facilities with SIC codes 5013, 5014, 5541, 5511, provided that these facilities have no outside activities or materials that may be exposed to storm water.

SIC Code	Corresponding NAICS Code
5013	425120, 441310, 425110, & 423120
5014	425120, 425110, 423130, & 441320
5511	441110
5541	447110, & 447190
7532	811121
7533	811112
7534	326212, & 811198
7536	811122
7537	811113
7538	811111
7539	811198, & 811118

Bacteria Total Maximum Daily Load (TMDL) Dry Weather - defined in the Bacteria TMDLs as those days with less than 0.1 inch of rainfall and those days occurring more than 3 days after a rain.

Bacteria Total Maximum Daily Load (TMDL) Wet Weather - defined in the Bacteria TMDLs as a day with 0.1 inch or more of rain and 3 days following the rain event.

Basin Plan - means the Water Quality Control Plan, Los Angeles Region, Basin Plan for the Coastal Watersheds of Los Angeles and Ventura Counties, adopted by the Regional Water Board on June 13, 1994 and subsequent amendments.

Beneficial Uses - means the existing or potential uses of receiving waters in the permit area as designated by the Regional Water Board in the Basin Plan.

Best Management Practices (BMPs) - means methods, measures, or practices designed and selected to reduce or eliminate the discharge of pollutants to surface waters from point and nonpoint source discharges including storm water. BMPs include structural and nonstructural controls, and operation and maintenance procedures, which can be applied before, during, and/or after pollution producing activities.

California Environmental Quality Act (CEQA) - means a California statute that requires state and local agencies to identify significant environmental impacts of their actions and to avoid or mitigate those impacts, if feasible (Reference: California Public Resources Code § 21000 et seq.)

Channel - means an open conduit either naturally or artificially created which periodically or continuously contains moving water, or which forms a connecting link between two waterbodies.

Chronic Toxicity - means a measurement of a sublethal effect (e.g., reduced growth, reproduction) to experimental test organisms exposed to an effluent or ambient waters compared to that of the control organisms.

Commercial Area(s) - means any geographic area of the Permittees' jurisdiction that is not heavy industrial or residential. A commercial area includes, but is not limited to areas surrounding: commercial activity, hospitals, laboratories and other medical facilities, educational institutions, recreational facilities, plant nurseries, car wash facilities, mini-malls and other business complexes, shopping malls, hotels, office buildings, public warehouses and other light industrial complexes.

Commercial Development - means any development on private land that is not heavy industrial or residential. The category includes, but is not limited to: hospitals, laboratories and other medical facilities, educational institutions, recreational facilities, plant nurseries, car wash facilities, mini-malls and other business complexes, shopping malls, hotels, office buildings, public warehouses and other light industrial complexes.

Construction - Construction activity includes any construction or demolition activity, clearing, grading, grubbing, or excavation or any other activity that results in a land disturbance. Construction does not include emergency construction activities required to immediately protect public health and safety or routine maintenance activities required to maintain the integrity of structures by performing minor repair and restoration work, maintain original line and grade, hydraulic capacity, or original purpose of the facility. See "Routine Maintenance" definition for further explanation. Where clearing, grading or excavating of underlying soil takes place during a repaving operation, State General Construction Permit coverage is required if more than one acre is disturbed or the activities are part of a larger plan.

Construction Activities Storm Water General Permit (CASGP) - means the general NPDES permit adopted by the State Board, which authorizes the discharge of storm water from construction activities under certain conditions.

Control - means to minimize, reduce, eliminate, or prohibit by technological, legal, contractual or other means, the discharge of pollutants from an activity or activities.

Critical Sources - means commercial facilities and businesses that have a potential to contribute pollutants to stormwater runoff if effective BMPs are not implemented. Attachment "D" specifies the commercial facilities and businesses that have been identified as Critical Sources.

Dechlorinated/ Debrominated Swimming Pool Discharge - means any swimming pool discharge with a residual chlorine or bromine level of 0.1mg/L or less; and does not contain any detergents, wastes, algaecides, or cyanuric acid in excess of 50 ppm, or any other chemicals including salts from pools commonly referred to as "salt water pools". The term does not include swimming pool filter backwash or swimming pool water containing bacteria.

Development - means any construction, rehabilitation, redevelopment or reconstruction of any public or private residential project (whether single-family, multi-unit or planned unit development); industrial, commercial, retail and any other non-residential projects, including public agency projects; or mass grading for future construction.

Directly Adjacent - means situated within 200 feet of the contiguous zone required for the continued maintenance, function, and structural stability of the environmentally sensitive area.

Directly Discharging - means outflow from a drainage conveyance system that is composed entirely or predominately of flows from the subject, property, development, subdivision, or industrial facility and not commingled with the flows from adjacent lands.

Discharge - means when used without qualification the "discharge of a pollutant."

Discharging Directly - means outflow from a drainage conveyance system that is composed entirely or predominantly of flows from the subject, property, development, subdivision, or industrial facility, and not commingled with the flows from adjacent lands.

Discharge of a Pollutant - means any addition of any "pollutant" or combination of pollutants to "waters of the United States" from any "point source" or, any addition of any pollutant or combination of pollutants to the waters of the "contiguous zone" or the ocean from any point source other than a vessel or other floating craft, which is being used as a means of transportation. The term discharge includes additions of pollutants into waters of the United States from: surface runoff which is collected or channeled by man; discharges through pipes, sewers, or other conveyances owned by a State, municipality, or other person which do not lead to a treatment works; and discharges through pipes, sewers, or other conveyances, leading into privately owned treatment works.

Disturbed Area - means any area that is altered as a result of land disturbance. Examples include but are not limited to: clearing, grading, grubbing, stockpiling and/ or excavation, etc...

Dry Day - means a non-wet day for Malibu Creek and Lagoon Bacteria TMDL WLA. A wet day is defined as a day with a 0.1 inch or more of rain and 3 days following the rain event.

Effect Concentration (EC) - means a point estimate of the toxicant concentration that would cause an observable adverse effect (e.g., death, immobilization, or serious incapacitation) in a given percent of the test organisms, calculated from a continuous model (e.g., Probit Model). EC_{25} is a point estimate of the toxicant concentration that would cause an observable adverse effect in 25 percent of the test organisms.

Effective Impervious Surface - means that portion of the surface area that is hydrologically connected via sheet flow over a hardened conveyance or impervious surface without any intervening medium to mitigate flow volume.

Effluent limitation - means any restriction imposed by the Permitting Authority (PA) on quantities, discharge rates, concentrations, and/ or mass loadings of "pollutants" which are "discharged" from "point sources" into "waters of the United States," the waters of the "contiguous zone," or the ocean.

Emergency - means a sudden, unexpected occurrence, involving a clear and imminent danger, demanding immediate action to prevent or mitigate loss of, or damage to, life, health, property, or essential public services. "Emergency" includes such occurrences as fire, flood, earthquake, or other soil or geologic movements, as well as such occurrences as riot, accident, or sabotage. (Reference: California Public Resources Code § 21060.3. Emergency).

End-of-Pipe - means the end of the major outfall as defined in 40 CFR122.26 (b)(5) and 40 CFR122.26 (b)(6).

Endpoint - means a biological measurement used to quantify the results obtained from analytical methods such as whole effluent toxicity testing [e.g., lethal concentration (LC_{50}); inhibition concentration (IC_{25}); and no observed effect concentration (NOEC)]. Such endpoints are quantitative measurements of the responses of test organisms (e.g., survival, growth, mobility, reproduction, and weight gain or loss) in response to exposure to a serial dilution of effluent.

Environment - means the physical conditions, which exist within the area and which will be affected by a proposed project including land, air, water, minerals, flora, fauna, ambient noise, and objects of historical or aesthetic significance. The area involved shall be the area in which significant effects would occur either directly or indirectly as a result of the project. The "environment" includes both natural and man-made conditions.

Environmentally Sensitive Area (ESA) - means an area "in which plant or animal life or their habitats are either rare or especially valuable because of their special nature or role in an ecosystem and which would be easily disturbed or degraded by human activities and developments" (Reference: California Public Resources Code § 30107.5). ESAs will include Clean Water Act 303d Listed Water Bodies in all reaches that are unimproved, all California Coastal Commission's Environmentally Sensitive Habitat Areas as delineated on maps in Local Coastal Plans and Regional Water Quality Control Board's Basin Plan Rare, Threatened or Endangered Species (RARE) and Preservation of Biological Habitats (BIOL) designated waterbodies. The California Department of Fish and Game's Significant Natural Areas map will be considered for inclusion as the department field verifies the designated locations. Watershed restoration projects will be considered for inclusion as the department field verifies the designated locations.

Erosivity Factor - The Erosivity Factor is a criterion that to assess the risk of erosion on disturbed land. It is described in "Predicting soil erosion by water: A guide to conservation planning with the Revised Universal Soil Loss Equation (RUSLE), Agricultural Handbook 703, USDA-ARS, U.S. Government Printing Office, Washington, D.C., 1997 by Renard, K.C., G.R. Foster, G.A. Weesies, D.K. McCool, and D.C. Yoder.

Federal Clean Water Act (CWA) - means (formerly referred to as the Federal Water Pollution Control Act or Federal Water Pollution Control Act Amendments of 1972) Public Law 92—500, as amended by Public Law 95—217, Public Law 95—576, Public Law 96—483 and Public Law 77—117, codified at 33 U.S.C. 1251 et seq.

First Storm Event - means the first storm event of the wet season that produces at least 0.25 inches of rain.

Forest Land - means land at least 10 percent stocked with live trees, or land that had this minimum tree stocking in the past and is not currently developed for nonforest use. The minimum area recognized is 1 acre.

Groundwater Dewatering - means the active practice of removing standing water from soil excavations using a pump(s) or other means.

Hillside - means property located in an area with known erosive soil conditions, where the development will result in grading on any slope that is 20% or greater or an area designated by the Municipality under a General Plan or ordinance as a "hillside area".

Horse Stables - means a property where at least one horse is stabled at least part of the year.

Hydromodification - means the alteration away from a natural state of stream flows or the beds or banks of rivers, streams, or creeks, including ephemeral washes, which results in hydrogeomorphic changes.

Illegal Discharge - means any discharge to the municipal separate storm sewer (storm drain system) that is prohibited under local, state, or federal statutes, ordinances, codes, or regulations. The term illegal discharge includes all non-storm water discharges not composed entirely of storm water except discharges pursuant to an NPDES permit, discharges that are identified in part 1, “Discharge Prohibitions” of this order, or discharges authorized by the Regional Water Board Executive Officer.

Illicit Connection - means any engineered conveyance that is connected to the storm drain system without a permit or municipal authorization. It also means any engineered conveyance through which discharges of pollutants to the separate storm drainage systems, which are not composed entirely of storm water or are not authorized by an NPDES permit, may occur.

Illicit Discharge - means any discharge to a municipal separate storm sewer (storm drain system) that is prohibited under local, state, or federal statutes, ordinances, codes, or regulations. The term illicit discharge includes all non-storm water discharges not composed entirely of storm water except discharges pursuant to a NPDES permit (other than the NPDES permit for discharges from the municipal separate storm sewer) and discharges that are identified in part 1, “Discharge Prohibitions” of this order, or authorized by the Regional Water Board Executive Officer.

Illicit Disposal - means any disposal, either intentionally or unintentionally, of material(s) or waste(s) that can pollute storm water.

Industrial/ Commercial Facility - means any facility involved and/ or used in the production, manufacture, storage, transportation, distribution, exchange or sale of goods and/ or commodities, and any facility involved and/ or used in providing professional and non-professional services. This category of facilities includes, but is not limited to, any facility defined by either the Standard Industrial Classifications (SIC) or the North American Industry Classification System (NAICS). Facility ownership (federal, state, municipal, private) and profit motive of the facility are not factors in this definition.

Industrial Activities Storm Water General Permit (IASGP) - means the general NPDES permit adopted by the State Board, which authorizes the discharge of storm water from certain industrial activities under certain conditions.

Industrial Park - means a land development that is set aside for industrial development. Industrial parks are usually located close to transport facilities, especially where more than one transport modalities coincide: highways, railroads, airports, and navigable rivers. It includes office parks, which have offices and light industry.

Inhibition Concentration (IC) - means a point estimate of the toxicant concentration that would cause a given percent reduction in a non-lethal biological measurement (e.g., reproduction or growth), calculated from a continuous model (i.e., Interpolation Method). IC25 is a point estimate of the toxic concentration that would cause a 25-percent reduction in a non-lethal biological measurement.

Inspection - means entry and the conduct of an on-site review of a facility and its operations, at reasonable times, to determine compliance with specific municipal or other legal requirements. The steps involved in performing an inspection, include, but are not limited to:

1. Pre-inspection documentation research
2. Request for entry
3. Interview of facility personnel
4. Facility walk-through
5. Visual observation of the condition of facility premises
6. Examination and copying of records as required
7. Sample collection (if necessary or required)
8. Exit conference (to discuss preliminary evaluation)
9. Report preparation, and if appropriate, recommendations for coming into compliance

Integrated Pest Management (IPM) - means a sustainable approach to managing pests by combining biological, cultural, physical and chemical tools in a way that minimizes economic, health, and environmental risks.

Large Municipal Separate Storm Sewer System (MS4) - means all MS4s that serve a population greater than 250,000 (1990 Census) as defined in 40 CFR122.26 (b)(4). The Regional Water Board designated Ventura County as a large MS4 in 1990, based on: (i) the U.S. Census Bureau 1990 population count of 669,016 thousand, and (ii) the interconnectivity of the MS4s in the incorporated and unincorporated areas within the County.

Local SWPPP - means the Local Storm Water Pollution Prevention Plan (LSWPPP) required by the local agency for a project that disturbs one or more acres of land. Shall mean a plan identifying potential pollutant sources from a construction site and describing proposed design, placement and implementation of BMPs, to effectively prevent non-storm water discharges and reduce pollutants in storm water discharges to the storm drain system, during construction activities. Also referred as a Storm Water Pollution Control Plan (SWPCP).

Low Impact Development (LID) – means a design strategy with the goal of maintaining or replicating the pre-development hydrologic regime through the use of design techniques to create a functionally equivalent hydrologic site design. Hydrologic functions of storage, infiltration and ground water recharge, as well as the volume and frequency of discharges are maintained through the use of integrated and distributed micro-scale storm water retention and detention areas, reduction of impervious surfaces, and the lengthening of runoff flow paths and flow time. Other strategies include the preservation/protection of environmentally sensitive site features such as riparian buffers, wetlands, steep slopes, valuable (mature) trees, flood plains, woodlands, and highly permeable soils.

Major Municipal Separate Storm Sewer Outfall ("or major outfall") - means a major municipal separate storm sewer outfall that discharges from a single pipe with an inside diameter of 36 inches or more or its equivalent (discharge from a single conveyance other than circular pipe which is associated with a drainage area of more than 50 acres); or for municipal separate storm sewers that receive storm water from lands zoned for industrial activity (based on comprehensive zoning plans or the equivalent), an outfall that discharges from a single pipe with an inside diameter of 12 inches or more or from its equivalent (discharge from other than a circular pipe associated with a drainage area of 2 acres or more), as defined in 40 CFR122.26 (b)(5).

Major Outfall - means a major municipal separate storm sewer outfall, as defined in 40 CFR122.26 (b)(6).

Maximum Extent Practicable (MEP) – The technology-based permit requirement established by Congress in CWA section 402(p)(3)(B)(iii) that municipal dischargers of storm water must meet. Technology-based requirements, including MEP, establish a level of pollutant control that is derived from available technology or other controls. MEP requires municipal dischargers to perform at maximum level that is practicable. Compliance with MEP may be achieved by emphasizing pollution prevention and source control BMPs in combination with structural and treatment methods where appropriate. The MEP approach is an ever evolving and advancing concept, which considers technical and economic feasibility.

Method Detection Limit (MDL) - means the minimum concentration of a substance that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero, as defined in 40 CFR136, Appendix "G" of this Order.

Minimum Level (ML) - means the concentration at which the entire analytical system must give a recognizable signal and acceptable calibration point. The ML is the concentration in a sample that is equivalent to the concentration of the lowest calibration standard analyzed by a specific analytical procedure, assuming that all the method specified sample weights, volumes, and processing steps have been followed. The ML value represents the lowest quantifiable concentration in a sample based on the proper application of all method-based analytical procedures and the absence of any matrix interferences. Assuming that all method-specific analytical steps are followed, the ML value will also represent, after the appropriate application of method-specific factors, the lowest standard in the calibration curve for that specific analytical technique.

Minimum Significant Difference (MSD) - means a measure of test sensitivity that establishes the minimum difference required between a control and a test treatment in order for that difference to be considered statistically significant.

Municipal Separate Storm Sewer System (MS4) - means a conveyance or system of conveyances (including roads w/ drainage systems, municipal streets, catch basins, curbs, gutters, ditches, manmade channels, or storm drains), as defined in 40 CFR122.26(b)(8):

1. Owned or operated by a State, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to State law) including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under § 208 of the Federal Clean Water Act (CWA) that discharges into waters of the United States
2. Designed or used for collecting or conveying storm water
3. Which is not a combined sewer
4. Which is not part of a Publicly Owned Treatment Works (POTW), as defined in 40 CFR122.2

NAICS - means North American Industry Classification System.

National Pollutant Discharge Elimination System (NPDES) - means the national program for issuing, modifying, revoking and reissuing, terminating, monitoring and enforcing permits, and imposing and enforcing pretreatment requirements, under CWA § 307, 402, 318, and 405.

Natural Drainage Systems - means unlined or unimproved (not engineered) creeks, streams, rivers or similar waterways.

New Development - means land disturbing activities; structural development, including construction or installation of a building or structure, creation and replacement of impervious surfaces; and land subdivision.

Non-Storm Water Discharge - means any discharge to a storm drain that is not composed entirely of storm water.

No Observed Effect Concentration (NOEC) - means the highest tested concentration of an effluent or toxicant that causes no observable adverse effect on the test organisms (i.e., the highest concentration of toxicant at which the values for the observed responses are not statistically different from the controls).

Nuisance - means anything that meets all of the following requirements: (1) is injurious to health, or is indecent or offensive to the senses, or an obstruction to the free use of property, so as to interfere with the comfortable enjoyment of life or property; (2) affects at the same time an entire community or neighborhood, or any considerable number of persons, although the extent of the annoyance or damage inflicted upon individuals may be unequal; (3) occurs during, or as a result of, the treatment or disposal of wastes.

Nursery - means NAICS classification to describe nursery operations and determine the type of operations covered under this Order and those covered under the Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands (Conditional Waiver).

1. There are 3 broad NAICS sectors available to classify nurseries:
   (1) 111xxx - Crop Production - Agriculture
   (a) 424xxx - Merchant Wholesalers, Nondurable Goods
   (b) 44xxxx - Retail Trade
      (1) **Nursery (Agricultural Facilities - Crop Production) -** means Nursery and Floriculture Production under NAICS Code 11142x. These operations are subject to the **Conditional Waiver**. This industry comprises establishments primarily engaged in (1) growing nursery and floriculture products (e.g., nursery stock, shrubbery, cut flowers, flower seeds, foliage plants, sod) under cover or in open fields and/ or (2) growing short rotation woody trees with a growing and harvesting cycle of 10 years or less for pulp or tree stock (e.g., cut Christmas trees, cottonwoods).
      (2) **Nursery (Commercial Facilities - Merchant Wholesalers, Nondurable Goods, and Retail Trade) -** means industries Flower, Nursery Stock, and Florists' Supplies Merchant Wholesalers under NAICS Code 424930; and Nursery, Garden Center, and Farm Supply Stores under NAICS Code 444220. This Order <u>covers</u> these types of operations. The industry in NAICS Code 424930 comprises establishments primarily engaged in the merchant wholesale distribution of flowers, florists' supplies, and/ or nursery stock (except plant seeds and plant bulbs). The industry in NAICS Code 444220 comprises establishments primarily engaged in retailing nursery and garden products, such as trees, shrubs, plants, seeds, bulbs, floriculture products and sod, which are predominantly grown elsewhere. These establishments may sell a limited amount of a product they grow themselves.

Open Channel - means a storm drainage channel that is not a natural water course.

Parking Lot - means land area or facility for the parking or storage of motor vehicles used for businesses, commerce, industry, or personal use.

Percent Minimum Significant Difference (PMSD) - means the minimum significant difference divided by the control mean, expressed as a percent (see minimum significant difference).

Permit - means an authorization, license, or equivalent control document issued by U.S. EPA or an "approved State" to implement the requirements of 40 CFR Parts 122, 123, and 124. "Permit" includes an NPDES "general permit" (§ 122.28). Permit does not include any permit, which has not yet been the subject of final agency action, such as a "draft permit" or a "proposed permit."

Permittee(s) - means co-permittee(s) and any agency named in this Order as being responsible for permit conditions within its jurisdiction, as defined by Federal Regulation. Permittees to this Order include the Ventura Water Protection District, Ventura County, and the cities of Camarillo, Fillmore, Moorpark, Ojai, Oxnard, Port Hueneme, San Buenaventura, Santa Paula, Simi Valley and Thousand Oaks.

Point Source - means any discernible, confined and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, or vessel or other floating craft, from which pollutants are or may be discharged. This term does not include agricultural storm water discharges and return flows from irrigated agriculture.

Point Zero - means in the context of the TMDLs, the point at which water from the storm drain or creek initially mixes with water.

Pollutants - means those "pollutants" defined in CWA § 502(6) (33.U.S.C.§ 1362(6)), and incorporated by reference into California Water Code § 13373.

Pollutants of Concern - means constituents that have exceeded Basin Plan Objectives, and CTR- Chronic or Acute Objectives during monitoring at Mass Emission, Receiving Water, and Land Use stations.

Potable Water Sources - means the potable water system for the treatment, distribution, and provision of water for residential, commercial, industrial, or institutional use that meets all California safe drinking water regulatory standards for human consumption.

Pre-Developed Condition - means native vegetation and soils that existed at a site prior to first development. The pre-developed condition may be assumed to be an area with the typical vegetation, soil, and storm water runoff characteristics of open space areas in coastal Southern California unless reasonable historic information is provided that the area was atypical.

Priority Pollutants - means those constituents referred to in 40 CFR401.15 and listed in the U.S. EPA NPDES Application Form 2C, pp. V-3 through V-9.

Project - means all development, redevelopment, and land disturbing activities. The term is not limited to "Project" as defined under CEQA (Reference: California Public Resources Code § 21065).

Qualified SWPPP Developer or Qualified SWPPP Practitioner – refer to State of California General Construction Stormwater Permit for definition.

Rare, Threatened, or Endangered Species (RARE) - means a beneficial use for waterbodies in the Los Angeles Region, as designated in the Basin Plan (Tables 2-1, 2-3, and 2-4), that supports habitats necessary, at least in part, for the survival and successful maintenance of plant or animal species established under state or federal law as rare, threatened, or endangered.

Redevelopment - means land-disturbing activity that results in the creation, addition, or replacement of 5,000 square feet or more of impervious surface area on an already developed site. Redevelopment includes, but is not limited to: the expansion of a building footprint; addition or replacement of a structure; replacement of impervious surface area that is not part of a routine maintenance activity; and land disturbing activities related to structural or impervious surfaces. It does not include routine maintenance to maintain original line and grade, hydraulic capacity, or original purpose of facility, nor does it include emergency construction activities required to immediately protect public health and safety.

Regional Administrator - means the Regional Administrator of the Regional Office of the U.S. EPA or the authorized representative of the Regional Administrator.

Report of Waste Discharge (ROWD) - means an application for renewal of the NPDES Permit for Waste Discharge Requirements for Municipal Separate Storm Sewer Discharges Within the Ventura County Watershed Protection District, County of Ventura and the Incorporated Cities Therein.

Restaurant - means a facility that sells prepared foods and drinks for consumption, including stationary lunch counters and refreshment stands selling prepared foods and drinks for immediate consumption (SIC Code 5812).

Restoration - means the reestablishment of predisturbance aquatic functions and related physical, chemical and biological characteristics (Reference: National Research Council. 1992. Restoration of Aquatic Ecosystems: Science, Technology and Public Policy. National Academy Press, Washington, D.C.).

Retail Gasoline Outlet (RGO) - means any facility engaged in selling gasoline and lubricating oils- SIC 5541 and NAICS 447110 & 447190.

1. RGOs: 447190 Other Gasoline Stations:
   This industry comprises establishments known as gasoline stations (except those with convenience stores) primarily engaged in one of the following: (1) retailing automotive fuels (e.g., diesel fuel, gasohol, gasoline) or (2) retailing these fuels in combination with activities,

such as providing repair services; selling automotive oils, replacement parts, and accessories; and/ or providing food services.
2. RGOs: 447110 Gasoline Stations with Convenience Stores:
   Retailing automotive fuels in combination with a convenience store or food mart.

Routine Maintenance – Routine maintenance projects include, but are not limited to projects conducted to:
1. Maintain the original line and grade, hydraulic capacity, or original purpose of the facility.
2. Perform as needed restoration work to preserve the original design grade, integrity and hydraulic capacity of flood control facilities.
3. Includes road shoulder work, regrading dirt or gravel roadways and shoulders and performing ditch cleanouts.
4. Update existing lines* and facilities to comply with applicable codes, standards, and regulations regardless if such projects result in increased capacity.
5. Repair leaks

Routine maintenance does not include construction of new** lines or facilities resulting from compliance with applicable codes, standards and regulations.
* Update existing lines includes replacing existing lines with new materials or pipes.
** New lines are those that are not associated with existing facilities and are not part of a project to update or replace existing lines.

Screening - means using proactive methods to identify illicit connections through a continuously narrowing process. The methods may include: performing baseline monitoring of open channels, conducting special investigations using a prioritization approach, analyzing maintenance records for catch basin and storm drain cleaning and operation, and verifying all permitted connections into the storm drains. Special investigation techniques may include: dye testing, visual inspection, smoke testing, flow monitoring, infrared, aerial and thermal photography, and remote control camera operation.

Sidewalk Rinsing - means only sidewalk rinsing using high pressure and low volume of water with no additives and at an average usage of 0.006 gallons per square foot of surface area to be rinsed. Any waste generated from the activity must be collected and properly and legally disposed of. It does not mean hosing of any sidewalk or street with a garden hose with a pressure nozzle.

Site - means the land or water area where any "facility or activity" is physically located or conducted, including adjacent land used in connection with the facility or activity.

Small Construction - means any soil disturbing activities less than 5 acres.
Smart Growth - development in or near cities intended to lessen or reverse suburban sprawl, decrease the use of automobiles, and shorten daily travel. It uses compact building design to cluster together residential, shopping, and work areas and encourages walking and public transportation. Smart Growth is considered a stormwater BMP in the 2005 publication *Using Smart Growth Techniques as Stormwater Best Management Practices*, EPA 231-B-05-002.

Source Control BMP - means any schedules of activities, prohibitions of practices, maintenance procedures, managerial practices or operational practices that aim to prevent storm water pollution by reducing the potential for contamination at the source of pollution.

Southern California Stormwater Monitoring Coalition (SMC) - means the Stormwater Monitoring Coalition, which is a collaborative research/ monitoring partnership of the Southern California Water Boards, Municipal Storm Water Agencies, and municipalities to develop the methodologies and assessment tools to more effectively understand urban storm water and non-storm water (anthropogenic) impacts to receiving waters and to conduct research/ monitoring through Subsequent Research Implementation Agreements. The first original cooperative agreement was entered into on February 8, 2001.

Stream - means a body of flowing water; natural water course containing water at least part of the year. In hydrology, it is generally applied to the water flowing in a natural channel as distinct from a canal (Reference: US Geological Survey).

Strip Mall - means a commercial development that is a shopping center where the stores are arranged in a row, with a sidewalk in front. Strip malls are typically developed as a unit and have large parking lots in front. They face major traffic arterials and tend to be self-contained with few pedestrian connections to surrounding neighborhoods. It is also called a plaza.

Storm Event Monitoring - means a rainfall event that produces more than 0.25 inch of precipitation and is separated from the previous storm event by at least 1 week of dry weather, for the purpose of monitoring.

Storm Water - means storm water runoff, snow melt runoff, and surface runoff and drainage, as defined in 40 CFR122.26(b)(13).

Storm Water Discharge Associated with Industrial Activity - means industrial discharge, as defined in 40 CFR122.26(b)(14).

Storm Water Quality Management Program - means the Ventura Countywide Storm Water Quality Management Plan, which includes descriptions of programs, collectively developed by the Permittees in accordance with provisions of the NPDES Permit, to comply with applicable federal and state law, as the same is amended from time to time.

Structural BMP - means any structural facility designed and constructed to mitigate the adverse impacts of storm water runoff pollution (e.g. canopy, structural enclosure). The category may include both Treatment Control BMPs and Source Control BMPs.
Summer Dry Weather - means dry weather days occurring from April 1 through October 31 of each year.

t-Test (formally Student's t-test) - means a statistical analysis comparing two sets of replicate observations, in the case of WET, only two test concentrations (e.g., a control and 100% effluent). The purpose of this test is to determine if the means of the two sets of observations are

different [e.g., if the 100% effluent concentration differs from the control (i.e., the test pass or fails)].

Targeted Employees - means management and staff who perform or direct activities that directly or indirectly have an effect of storm water quality. The employees generally are employed in the following areas: department of public works, engineering, sanitation, storm water maintenance, drainage and flood control, transportation, streets and roads, parks and recreation, public landscaping and corporation yards, planning or community development, code enforcement, building and safety, harbor or port departments, airports, or general services and fleet services.

Total Maximum Daily Load (TMDL) - means the sum of the individual waste load allocations for point sources and load allocations for nonpoint sources and natural background.

Toxicity Identification Evaluation (TIE) - means a set of procedures to identify the specific chemical(s) responsible for toxicity through a process of chemical/ physical manipulations of samples followed by toxicity tests. These procedures are performed in 3 phases (Phase I- Toxicity Characterization Procedure, Phase II- Toxicity Identification Procedure, and Phase III- Toxicity Confirmation Procedure) using aquatic organism toxicity tests.

Toxicity Reduction Evaluation (TRE) - means a study conducted in a step-wise process to identify the causative agents of effluent or ambient toxicity, isolate the sources of toxicity, evaluate the effectiveness of toxicity control options, and then confirm the reduction in toxicity.

Toxicity Test - means a procedure using living organisms to determine whether a chemical or an effluent is toxic. A toxicity test measures the degree of the effect of a specific chemical or effluent on exposed test organisms.

Toxic Unit (TU) - means a measure of toxicity in an effluent as determined by the acute toxicity units (TUa) or chronic toxicity units (TUc) measured. The larger the TU, the greater the toxicity.

Toxic Unit - Chronic (TUc) - means 100 times the reciprocal of the effluent concentration that causes no observable effect on the test organisms in a chronic toxicity test (TUc = 100/NOEC or 100/EC25*)* (see NOEC).

Treatment - means the application of engineered systems that use physical, chemical, or biological processes to remove pollutants. Such processes include, but are not limited to, filtration, gravity settling, media absorption, biodegradation, biological uptake, chemical oxidation and UV radiation.
Treatment Control BMP - means any engineered system designed to remove pollutants by simple gravity settling of particulate pollutants, filtration, biological uptake, media absorption or any other physical, biological, or chemical process.

Urbanization - means the process of changing of land use and land patterns from rural characteristics to urban (city-like) characteristics. These changes include (i) the replacement of

pervious surfaces with impervious surfaces such as rooftops and buildings, and impervious materials such as asphalt and concrete; and (ii) the conversion of rural land to house new residents, support new businesses, and facilitate vehicular traffic flow.

U.S. EPA Phase I Facilities - means facilities in specified industrial categories that are required to obtain an NPDES permit for storm water discharges, as required by 40 CFR122.26(c). These categories include:

1. Facilities subject to storm water effluent limitation guidelines, new source performance standards, or toxic pollutant effluent standards (40 CFR N)
2. Manufacturing facilities
3. Oil and gas/ mining facilities
4. Hazardous waste treatment, storage, or disposal facilities
5. Landfills, land application sites, and open dumps
6. Recycling facilities
7. Steam electric power generating facilities
8. Transportation facilities
9. Sewage of wastewater treatment works
10. Light manufacturing facilities

Vehicle Maintenance/ Material Storage Facilities/ Corporation Yards - means any Permittee owned or operated facility or portion thereof that:

1. Conducts industrial activity, operates or stores equipment or materials, and provides services similar to Federal Phase I facilities;
2. Performs fleet vehicle service/ maintenance including repair, maintenance, washing, or fueling;
3. Performs maintenance and/ or repair of machinery/ equipment; or
4. Stores chemicals, raw materials, or waste materials.

Waste Load Allocations (WLAs) - means a portion of a receiving water's Total Maximum Daily Pollutant Load (TMDL) that is allocated to one of its existing or future point sources of pollution (Reference: 40 CFR130.2(h)).

Water Quality Objectives - means water quality criteria contained in the Basin Plan, the California Ocean Plan, the National Toxics Rule, the California Toxics Rule, and other state or federally approved surface water quality plans. Such plans are used by the Regional Water Board to regulate all discharges, including storm water discharges.

Water Quality Standards - means the State Water Quality Standards, which are comprised of beneficial uses, water quality objectives and the State's Antidegradation Policy.
Waters of the State - means any surface water or groundwater, including saline waters, within boundaries of the state (Reference: California Water Code § 13050).

Waters of the United States or Waters of the US - means:

1. All waters that are currently used, were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the

ebb and flow of the tide;
2. All interstate waters, including interstate "wetlands";
3. All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, "wetlands," sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds where the use, degradation, or destruction of which would affect or could affect interstate or foreign commerce including any such waters:
   a. Which are or could be used by interstate or foreign travelers for recreational or other purposes
   b. From which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or
   c. Which are used or could be used for industrial purposes by industries in interstate commerce
4. All impoundments of waters otherwise defined as waters of the United States under this definition;
5. Tributaries of waters identified in the preceding paragraph (1) through (4) of this definition;
6. The territorial sea; and
7. "Wetlands" adjacent to waters (other than waters that are themselves wetlands) identified in the preceding paragraph (1) through (6) of this definition. (Reference: 33 CFR328)

Watercourse - means any natural or artificial channel for passage of water, including the VCFCD jurisdictional channels included in the List of Channels within the Comprehensive Plan of the VCFCD, as approved by the Board of Supervisors of the VCFCD on October 4, 1993, and any amendments thereto.

Watershed Management - means approach for water resources protection. It is a strategy for integrating and managing resources, both human and fiscal that focuses on regulation of point sources, to a more regional approach that acknowledges environmental impacts from other activities.

Watershed Management Areas (WMA) - means the geographically-defined watershed areas where the Regional Water Board will implement the watershed approach. These generally involve a single large watershed within which exists smaller subwatersheds but in some cases may be an area that does not meet the strict hydrologic definition of a watershed e.g., several small Ventura coastal waterbodies in the region are grouped together into one WMA.

Wet Season - means the calendar period beginning October 1 through April 15.

Winter Dry Weather - means dry weather days occurring from November 1 - March 31 of each year.

Whole Effluent Toxicity - means the aggregate toxic effect of an effluent measured directly by a toxicity test.

PART 7 - STANDARD PROVISIONS

A. General Requirements

1. The Permittee shall comply with all provisions and requirements of this Order.

2. Should the Permittee discover that it failed to submit any relevant facts or that it submitted incorrect information in a report it shall promptly submit the missing or correct information.

3. The Permittee shall report all instances of non-compliance not otherwise reported at the time monitoring reports are submitted.

4. This Order includes Attachment "H", the Reporting Program, which is a part of this Order and must be complied with.

B. Regional Water Board Review

1. The Regional Water Board may review any formal determinate or approval made by the Regional Water Board Executive Officer pursuant to the provisions of this Order.
   (a) Permittee(s) or a member of the public may request such review upon petition within 30 day of the effective date of the notification of such decision to the Permittee(s) and interested parties on file at the Regional Water Board.

C. Public Review

1. All documents submitted to the Regional Water Board in compliance with the terms and conditions of this Order shall be made available to members of the public pursuant to the Freedom of Information Act (5 U.S.C. § 552), as amended, and the Public Records Act (California Government Code § 6250 et seq.).

2. All documents submitted to the Regional Water Board Executive Officer for approval shall be made available to the public for a 30-day period to allow for public comment.

D. Duty to Comply [40 CFR122.41(a)]

1. Each Permittee must comply with all of the terms, requirements, and conditions of this Order. Any violation of this order constitutes a violation of the Clean Water Act, its regulations and the California Water Code, and is grounds for enforcement action, Order termination, Order revocation and reissuance, denial of an application for reissuance, or a combination thereof [40 CFR122.41(a), CAL. WATER CODE § 13261, 13263, 13265, 13268, 13300, 13301, 13304, 13340, 13350].

2. A copy of these waste discharge specifications shall be maintained by each Permittee so as to be available during normal business hours to Permittee employees and members of the public.

3. Any discharge of wastes at any point(s) other than specifically described in this Order is prohibited, and constitutes a violation of the Order.

E. Duty to Mitigate [40 CFR122.41 (d)]

1. Each Permittee shall take all reasonable steps to minimize or prevent any discharge that has a reasonable likelihood of adversely affecting human health or the environment.

F. Inspection and Entry; Investigations; Responsibilities [40 CFR122.41(i), Cal. Water Code § 13225 and § 13267]

1. The Regional Water Board, U.S. EPA, and other authorized representatives shall be allowed:
   (a) Entry upon premises where a regulated facility is located or conducted, or where records are kept under conditions of this Order;
   (b) Access to copy any records, at reasonable times that are kept under the conditions of this Order;
   (c) To inspect at reasonable times any facility, equipment (including monitoring and control equipment), practices, or operations regulated or required under this Order;
   (d) To photograph, sample, and monitor at reasonable times for the purpose of assuring compliance with this Order, or as otherwise authorized by the CWA and the CAL. WATER CODE;
   (e) To review any water quality control plan or waste discharge requirements, or in connection with any action relating to any plan or requirement to investigate the quality of any waters of the state within its region; and,
   (f) To require as necessary any state or local agency to investigate and report on any technical factors involved in water quality control or to obtain and submit analyses of water.

G. Proper Operation and Maintenance [40 CFR122.41 (e), Cal. Water Code § 13263(f)]

1. The Permittees shall at all times properly operate and maintain all facilities and systems of treatment (and related appurtenances) that are installed or used by the Permittees to achieve compliance with this Order. Proper operation and maintenance includes:
   (a) adequate laboratory controls; and
   (b) appropriate quality assurance procedures.

2. This provision requires the operation of backup or auxiliary facilities or similar system that are installed by a Permittee only when necessary to achieve compliance with the conditions of this Order.

H. Signatory Requirements [40 CFR122.41(k) & 122.22]

1. Except as otherwise provided in this Order, all applications, reports, or information submitted to the Regional Water Board shall be signed by the City Manager or Mayor, or authorized designee and certified as set forth in 40 CFR122.22.

I. Reopener and Modification [40 CFR122.41(f) & 122.62]

1. This Order may only be modified, revoked, or reissued, prior to the expiration date, by the Regional Water Board, in accordance with the procedural requirements of the CAL. WATER CODE and CCR Title 23 for the issuance of waste discharge requirements, 40 CFR122.62, and upon prior notice and hearing, to:
   (a) Address changed conditions identified in the required reports or other sources deemed significant by the Regional Water Board;
   (b) Incorporate applicable requirements or statewide water quality control plans adopted by the State Board or amendments to the Basin Plan, including TMDLs;
   (c) Comply with any applicable requirements, guidelines, and/ or regulations issued or approved pursuant to CWA § 402(p); and/ or,
   (d) Consider any other federal, or state laws or regulations that became effective after adoption of this Order.

2. After notice and opportunity for a hearing, this Order may be terminated or modified for cause, including, but not limited to:
   (a) Violation of any term or condition contained in this Order;
   (b) Obtaining this Order by misrepresentation, or failure to disclose all relevant facts; <u>or</u>,
   (c) A change in any condition that requires either a temporary or permanent reduction or elimination of the authorized discharge.

3. The filing of a request by the Principal Permittee or Permittees for a modification, revocation and re-issuance, or termination, or a notification of planned changes or anticipated noncompliance does not stay any condition of this Order.

4. This Order may be modified to make corrections or allowances for changes in the permitted activity listed in this section, following the procedures at 40 CFR122.63, if processed as a minor modification. Minor modifications may only:
   (a) Correct typographical errors; or
   (b) Require more frequent monitoring or reporting by the Permittee.

J. Severability

1. The provisions of this Order are severable; and if any provision of this Order or the application of any provision of this Order to any circumstance is held invalid, the application of such provision to other circumstances and the remainder of this Order shall not be affected.

K. Duty to Provide Information [40 CFR122.41(h)]

1. The Permittees shall furnish, within a reasonable time, any information the Regional Water Board or U.S. EPA may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this Order.

2. The Permittees shall also furnish to the Regional Water Board, upon request, copies of records required to be kept by this Order.

L. Twenty-Four Hour Reporting [40 CFR122.41(l)(6)][1]

1. The Permittees shall report to the Regional Water Board any noncompliance that may endanger health or the environment. Any information shall be provided orally within 24 hours from the time any Permittee becomes aware of the circumstances. A written submission shall also be provided within 5 days of the time the Permittee becomes aware of the circumstances. The written submission shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times and, if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

2. The Regional Water Board may waive the required written report on a case-by-case basis.

M. Bypass [40 CFR122.41(m)][2]

1. Bypass (the intentional diversion of waste streams from any portion of a treatment facility) is prohibited. The Regional Water Board may take enforcement action against Permittees for bypass unless:
   (a) Bypass was unavoidable to prevent loss of life, personal injury or severe property damage. (Severe property damage means substantial physical damage to property, damage to the treatment facilities that causes them to become inoperable, or substantial and permanent loss of natural resources that can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.);
   (b) There were no feasible alternatives to bypass, such as the use of auxiliary treatment facilities, retention of untreated waste, or maintenance during normal periods of equipment down time. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering

[1] This provision applies to incidents where effluent limitations (numerical or narrative) as provided in this Order or in the Ventura County SMP are exceeded, and which endanger public health or the environment.
[2] This provision applies to the operation and maintenance of storm water controls and BMPs as provided in this Order or in the Ventura County SMP.

judgment to prevent a bypass that could occur during normal periods of equipment downtime or preventive maintenance;

(c) The Permittee submitted a notice at least ten days in advance of the need for a bypass to the Regional Water Board; or,

(d) Permittees may allow a bypass to occur that does not cause effluent limitations to be exceeded, but only if it is for essential maintenance to assure efficient operation. In such a case, the above bypass conditions are not applicable. The Permittee shall submit notice of an unanticipated bypass as required.

N. Upset [40 CFR122.41(n)][1]

1. Upset means an exceptional incident in which there is unintentional and temporary noncompliance with technology based permit effluent limitations because of factors beyond the reasonable control of the Permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.
2. A Permittee that wishes to establish the affirmative defense of an upset in an action brought for non compliance shall demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:
   (a) An upset occurred and that the Permittee can identify the cause(s) of the upset;
   (b) The permitted facility was being properly operated by the time of the upset;
   (c) The Permittee submitted notice of the upset as required; and,
   (d) The Permittee complied with any remedial measures required.
3. No determination made before an action for noncompliance, such as during administrative review of claims that non-compliance was caused by an upset, is final administrative action subject to judicial review.
4. In any enforcement proceeding, the Permittee seeking to establish the occurrence of an upset has the burden of proof.

O. Property Rights [40 CFR122.41(g)]

1. This Order does not convey any property rights of any sort, or any exclusive privilege.

[1] This provision applies to incidents where effluent limitations (numerical or narrative) as provided in this Order or in the Ventura County SMP are exceeded, and which endanger public health or the environment.

P. Enforcement

1. Violation of any of the provisions of the NPDES permit or any of the provisions of this Order may subject the violator to any of the penalties described herein, or any combination thereof, at the discretion of the prosecuting authority; except that only one kind of penalties may be applied for each kind of violation. The CWA provides the following:
   (a) Criminal Penalties for:
      (1) Negligent Violations [CWA 309 (c)(1)(B)]:
      The CWA provides that any person who negligently violates permit conditions implementing CWA § 301, 302, 306, 307, 308, 318, or 405 is subject to a fine of not less than $2,500 nor more than $25,000 per day for each violation, or by imprisonment for not more than 1 year, or both.
      (2) Knowing Violations [CWA 309 (c)(2)(B)]:
      The CWA provides that any person who knowingly violates permit conditions implementing CWA § 301, 302, 306, 307, 308, 318, or 405 is subject to a fine of not less than $5,000 nor more than $50,000 per day of violation, or by imprisonment for not more than 3 years, or both.
      (3) Knowing Endangerment [CWA 309 (c)(3)(A)]:
      The CWA provides that any person who knowingly violates permit conditions implementing CWA § 301, 302, 307, 308, 318, or 405 and who knows at that time that he is placing another person in imminent danger of death or serious bodily injury is subject to a fine of not more than $250,000, or by imprisonment for not more than 15 years, or both.
      (4) False Statement [CWA 309 (c)(4)]:
      The CWA provides that any person who knowingly makes any false material statement, representation, or certification in any application, record, report, plan, or other document filed or required to be maintained under the Act or who knowingly falsifies, tampers with, or renders inaccurate, any monitoring device or method required to be maintained under the Act, shall upon conviction, be punished by a fine of not more than $10,000 or by imprisonment for not more than two years, or by both. If a conviction is for a violation committed after a first conviction of such person under this paragraph, punishment shall be by a fine of not more than $20,000 per day of violation, or by imprisonment of not more than four years, or by both.
   (b) Civil Penalties [[CWA 309 (d)]
   The CWA provides that any person who violates a permit condition implementing CWA § 301, 302, 306, 307, 308, 318, or 405 is subject to a civil penalty not to exceed $27,500 per day for each violation.

2. Violation of any of the provisions of the NPDES permit or any of the provisions of this Order may subject the violator to any of the penalties described herein, or any combination thereof, at the discretion of the prosecuting authority; except that only one kind of penalties may be applied for each kind of violation. The Cal Water Code §13885 provides the following:
   (a) Any person who violates any of the following shall be liable civilly in accordance with this section:
      (1) Section 13375 or 13376.
      (2) Any waste discharge requirements or dredged or fillmaterial permit issued pursuant to this chapter or any water quality certification issued pursuant to Section 13160.
      (3) Any requirements established pursuant to Section 13383.
      (4) Any order or prohibition issued pursuant to Section 13243 or Article 1 (commencing with Section 13300) of Chapter 5, if the activity subject to the order or prohibition is subject to regulation under this chapter.
      (5) Any requirements of Section 301, 302, 306, 307, 308, 318, 401, or 405 of the Clean Water Act, as amended.
      (6) Any requirement imposed in a pretreatment program approved pursuant to waste discharge requirements issued under Section 13377 or approved pursuant to a permit issued by the administrator.

Q. Need to Halt or Reduce Activity not a Defense [40 CFR122.41(c)]

1. It shall not be a defense for a Permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this Order.

R. Termination of Board Order

1. Regional Water Board Order No. 00-108 is hereby terminated.

S. Board Order Expiration Date

1. This Order expires on May 7, 2014. The Permittees must submit a Report of Waste Discharge (ROWD) and a proposed Storm Water Quality Management Program in accordance with CCR Title 23 as application for reissuance of waste discharge requirements no later than 180 days in advance of such date.

T. MS4 Annual Reporting Program [40 CFR122.42(c)]

1. The Annual Program Reporting shall include the following information:
   (a) *Municipal separate storm sewer systems.*
   The operator of a large or medium municipal separate storm sewer system or a municipal separate storm sewer that has been designated by the Director under 40 CFR122.26(a)(1)(v) of this part must submit an annual report by the anniversary of the date of the issuance of the permit for such system. The report shall include:
   (1) The status of implementing the components of the storm water management program that are established as permit conditions;
   (2) Proposed changes to the storm water management programs that are established as permit condition. Such proposed changes shall be consistent with 40 CFR122.26(d)(2)(iii) of this part;
   (3) Revisions; if necessary, to the assessment of controls and the fiscal analysis reported in the permit application under 40 CFR122.26(d)(2)(iv) and (d)(2)(v) of this part;
   (4) A summary of data, including monitoring data that is accumulated throughout the reporting year;
   (5) Annual expenditures and budget for year following each annual report;
   (6) A summary describing the number and nature of enforcement actions, inspections, and public education programs; and
   (7) Identification of water quality improvements or degradation.

I, Tracy J. Egoscue, Executive Officer, do hereby certify that the foregoing is a full, true, and correct copy of an order adopted by the California Regional Water Quality Control Board, Los Angeles Region, on May 7, 2009.

Tracy J. Egoscue
Executive Officer

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DRAFT

Appendix

RWQCB 2007 Watershed Management Initiative

Report Excerpt

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California
Regional Water Quality Control Board
Los Angeles Region

Watershed Management Initiative Chapter
December 2007

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No policy or regulation is either expressed or intended.

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EXECUTIVE SUMMARY

LOS ANGELES REGIONAL WATER QUALITY CONTROL BOARD
WATERSHED MANAGEMENT INITIATIVE CHAPTER
December 2007

OVERVIEW

Water resource protection efforts of the State Water Resources Control Board and the Regional Water Quality Control Boards are guided by a five-year Strategic Plan. A key component of the Strategic Plan is utilization of a watershed management approach for water resources protection.

To protect water resources within a watershed context, a mix of point and nonpoint source discharges, ground and surface water interactions, and water quality/water quantity relationships must be considered. These complex relationships present considerable challenges to water resource protection programs. The State and Regional Boards respond to these challenges within the context of our organization's Watershed Management Initiative (WMI). The WMI is designed to integrate various surface and ground water regulatory programs while promoting cooperative, collaborative efforts within a watershed. It is also designed to focus limited resources on key issues and use sound science.

Previously, State and Regional Board programs tended to be directed at site-specific problems. This approach was reasonably effective for controlling pollution from point sources. However, with diffuse nonpoint sources of pollutants, a new regulatory strategy was needed. The WMI uses a strategy to draw solutions from all interested parties within a watershed, and to more effectively coordinate and implement measures to control both point and nonpoint sources.

For the initial implementation of the WMI, during the late 1990s, each Regional Board identified the watersheds in their Region, prioritized water quality issues, and developed watershed management strategies. These strategies and the State Board's overall coordinating approach to WMI are contained in the *Integrated Plan for Implementation of the WMI* which is updated on an as-needed basis. In following years, the Regional Boards have continued to build upon their early efforts to utilize this approach. The full version of our WMI Chapter outlines our ongoing efforts to continue implementation of the WMI.

The Los Angeles Regional Board and Watershed Management

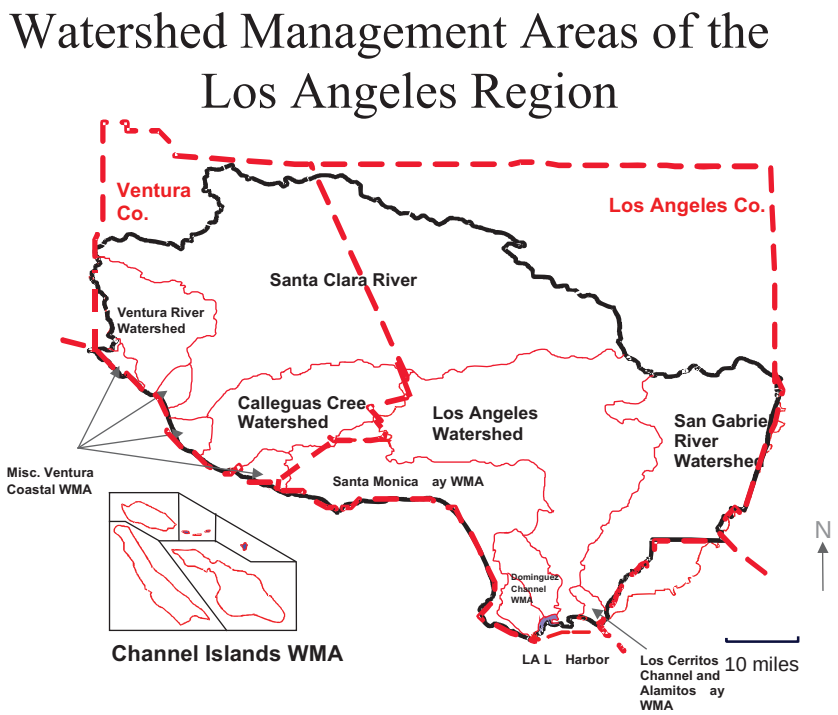
The Los Angeles Region has jurisdiction over all coastal drainages flowing to the Pacific Ocean between Rincon Point (on the coast in western Ventura County) and the eastern Los Angeles County line, as well as the drainages of five coastal islands (Anacapa, San Nicolas, Santa Barbara, Santa Catalina, and San Clemente). The Regional Board's jurisdiction also includes all coastal waters within three miles of the continental and island coastlines.

The Los Angeles Region is the State's most densely populated and industrialized region. Over 1,000 discharges of wastewater from point sources in this Region are regulated by the Los Angeles Regional Board. Over 700 of these point source discharges are discharged to surface waters, and are regulated under the National Pollutant Discharge Elimination System (NPDES). In addition, the Regional Board prescribes Waste Discharge Requirements (WDRs) for the remaining discharges, which are primarily to ground waters and landfills. However, the quality of many waters continue to be degraded from pollutants discharged from diffuse and diverse nonpoint sources. Future success in reducing pollutants from nonpoint sources and achieving additional reductions in pollutants from point sources requires a shift to a more geographically-targeted approach.

Our watershed management approach integrates activities across the Regional Board's many diverse programs, to the extent feasible, particularly permitting, planning, and other surface-water oriented programs which have tended to operate somewhat independent of each other. This approach enables us to better assess cumulative impacts of

pollutants from all (point and nonpoint) sources, and more efficiently develop watershed-specific solutions that balance the environmental and economic impacts of our actions.

We have designated ten watershed management areas in the Los Angeles Region as shown in the figure below.



Initially, implementation of watershed management in the Los Angeles Region occurred in phases over a seven-year cycle for our pilot watersheds Ventura River and Calleguas Creek. We now utilize a five-year cycle to be in line with the standard permit life (of an NPDES permit). This shift in our watershed cycle is illustrated in the table below.

It should be pointed out that the involvement of stakeholders is critical to the success of watershed management; however, the process to involve stakeholders demands more of regulators in terms of public outreach, education, and consensus building.

Watershed Management Initiative Timeline

Dominguez Channel-LA/LB Harbor	FY 2007/08
Santa Monica Bay	FY 2008/09
Los Angeles River	FY 2009/10
San Gabriel River Los Cerritos Channel Channel Islands	FY 2010/11
Ventura River Misc. Ventura Coastal Santa Clara River Calleguas Creek	FY 2011/12

The Watershed Management Initiative Chapter

This document is the eighth iteration of what we call our "Chapter" which is part of the integrated WMI document for the whole state. The participants in implementation of the WMI in California (the nine Regional Boards, State Board, and USEPA) were asked in 1996 to begin preparation of a document which identified priorities and resource needs, across programs, in a watershed context. The Chapter is currently used both as an outreach and as a planning tool to identify the Region's priorities, as well as, where we need additional resources. The Chapter is organized into sections including the Introduction, Watershed Sections, and Region-wide Section. Included in each Watershed Section is an overview of that watershed, a description of its water quality concerns and issues, past significant Regional Board activities in the watershed, current (funded) activities, near-term (usually unfunded) activities that would benefit the watershed, and activities which may happen on a longer time-scale (usually unfunded). The Region-wide Section includes a description of activities not easily associated with particular watersheds.

Programs and Funding Under WMI

Programs covered under WMI include core regulatory, monitoring and assessment, basin planning and water quality standards, watershed management, wetlands, TMDLs, 401 certifications, groundwater, and nonpoint source management activities, as appropriate. Many of these programs also have region-wide components. It turns out most of our highest priority needs fall into areas that have little to no funding. Areas with particular shortages include nonpoint source management, CEQA review, basin planning, 401 certifications, stormwater, and more than minimal work on NPDES pretreatment, enforcement, compliance, and monitoring report review. This watershed effort is intended to result in resource flexibility and augmentation to address these deficiencies.

Integration of Multiple Mandates Under WMI

While the Watershed Management Initiative strives to integrate and coordinate the various Regional and State Board programs and address the highest priority funding needs for those programs, there is also need to respond to and accommodate priorities established by the individual Regional and State Boards' members, priorities established prior to the WMI which run on their own timelines, legal or legislative mandates, or other new mandates which may affect the way the WMI is implemented in a Region. It is important to re-state here that the WMI is not a program but rather an approach to integrating existing and newly evolving programs and mandates.

For example, a high priority statewide mandate is development of TMDLs. High priority Regional Board activities include implementation of an effective enforcement strategy, development of a septic tank policy initiative, development and implementation of a strategy to assess nonpoint source loadings, TMDLs, and better communication and coordination of Board programs and policies through improved outreach. More information is included in the Introduction of the full chapter. It is clear many of the Regional Board high priority activities are of primary importance in fulfilling not only the WMI but also Board mandates.

However, some mandates present challenges to fully implementing watershed management. These include USEPA, State Board, and legislative requirements for reducing permit backlog, conflicts with the timing of scheduled TMDLs, lengthy delays incurred by public processes (e.g., hearings, workshops), and insufficient funding or staff.

SUMMARY OF SIGNIFICANT WATERSHED ISSUES

The Region encompasses ten Watershed Management Areas (WMAs) which are the geographically-defined watershed areas where the Regional Board implements the watershed approach. These generally involve a single large watershed, within which exist smaller subwatersheds. However, in some cases they may be an area that does not meet the strict hydrologic definition of a watershed (e.g., several small Ventura coastal waterbodies in the region are grouped together into one WMA). Watersheds in the strictest sense are geographic areas draining into a river system, ocean or other body of water through a single outlet and include the receiving waters. They are usually bordered, and separated from other watersheds, by mountain ridges or other naturally elevated areas.

Many of the watersheds in this Region range over large areas that are highly diverse. A Designated Wilderness Area may occur in one part of a watershed while extensive development dominates another part and possibly agriculture exists in yet a different area of the watershed. This results in a great diversity of issues of concern to this agency in any particular watershed with the concomitant need to balance priorities among existing stakeholders. The following summarizes significant watershed issues in our watershed management areas. More detail may be found by consulting the full version of the WMI Chapter

Watershed Management Areas
Significant Watershed Issues

1) Dominguez Channel/LA-LB Harbor WMA

- Eight major NPDES discharges: one POTW, two generating stations, five refineries (five Channel discharges, three Harbor discharges)
- 38 minor individual permits (15 Channel, 23 Harbor)
- 56 discharges covered by general NPDES permits (32 Channel, 24 Harbor)
- Industrial storm water – 448 discharges
- Construction storm water – 214 discharges
- Historical deposits of DDT and PCBs in sediment
- Discharges from POTW & refineries
- Spills from ships and industrial facilities
- Leaching of contaminated groundwater
- Stormwater runoff
- 96 impairments including: metals, PCBs, PAHs, historic pesticides, coliform, trash, nitrogen
- Completed TMDL: LA Harbor bacteria (2005)
- Currently scheduled TMDLs: Machado Lake trash, harbor metals and toxics

2) Santa Monica Bay WMA

- Key recreational resource (beaches)
- Seven major NPDES discharges: three POTWs, one refinery, and three generating stations
- Eleven minor discharges
- 176 discharges covered by general NPDES permits
- Industrial storm water – 100 discharges
- Construction storm water – 401 discharges
- 224 impairments including: mercury, selenium, other metals, historical pesticides, PAHs, PCBs, nitrogen, coliform, trash, habitat alteration, exotic vegetation, salts

Coastline

- Acute health risk associated with swimming in runoff-contaminated surfzone waters
- Chronic risk associated with consumption of seafood in areas impacted by DDT and PCB contamination
- Reduction of loadings from the two major POTWs in light of projected population increases
- Other impacts from urban runoff/storm water
- Historic deposits of DDT and PCBs in sediment
- Loadings of pollutants from other sources: sediment resuspension, atmospheric deposition
- The need to have a better understanding of the Bay's resources
- Completed TMDLs: Santa Monica Bay beaches dry weather coliform (2003), Santa Monica Bay beaches wet weather coliform (2003)

Malibu Creek Watershed

- Excessive freshwater, nutrients, and coliform in lagoon; contributions from POTW and other sources
- Urban runoff from upper watershed
- Impacts to swimmers/surfers from lagoon water
- Septic tanks in lower watershed
- Appropriate restoration and management of lagoon
- Access to creek and lagoon by endangered fish
- Completed TMDL: Malibu Creek coliform (2006)
- Currently scheduled TMDLs: Malibu Creek nutrients

Ballona Creek Watershed

- Trash loading from creek
- Wetlands restoration
- Sediment contamination by heavy metals from creek to Marina del Rey Harbor and offshore)
- Sediment contamination by heavy metals and trace organics within Ballona Creek Entrance Channel
- Toxicity of both dry weather and storm runoff in creek
- High bacterial indicators at mouth of creek
- Completed TMDLs: Marina del Rey back basins coliform (2004); Ballona Creek trash (2005); Ballona Creek metals (2006); Ballona Creek Estuary toxics (2006); Marina del Rey toxics (2006); Ballona Creek coliform (2006)

3) Los Angeles River Watershed

- Six major NPDES discharges (four POTWs)
- 15 minor individual permits
- 114 discharges covered by general NPDES permits
- Industrial storm water – 1,365 discharges
- Construction storm water - 759 discharges
- Nitrogen and coliform contributions from septic systems
- Other nonpoint sources (horse stables, golf courses)
- Cross-contamination between surface and groundwater
- Protection and enhancement of fish and wildlife habitat and recreational areas
- Removal of exotic vegetation
- Balancing removal of vegetation for flood control with the need for urban habitat
- Attaining a balance between water reclamation and minimum flows to support habitat
- leakage of MTBE from underground storage tanks
- Contaminated sediments within the LA River estuary
- 111 impairments including: nitrogen, trash, selenium, other metals, coliform, PCBs, historic pesticides, chlorpyrifos
- Completed TMDLs: LA River nutrients (2004); LA River metals (2005)

4) San Gabriel River Watershed

- Six major NPDES discharges (four POTWs)
- Eleven minor individual NPDES permits
- 58 discharges covered under general NPDES permits
- 570 discharges covered by the industrial storm water permit
- 446 discharges covered by the construction storm water permit
- Sluicing and disposal of sediments from reservoirs
- Protection of groundwater recharge areas
- Ambient toxicity
- Excessive trash in recreational areas of upper watershed
- Mining/stream modifications
- Extensive stream modification for mining and water reclamation
- Urban and storm water runoff quality
- Nonpoint source loadings from nurseries and horse stables
- Lack of understanding of estuary dynamics (e.g. salinity profile)
- Septic systems
- 39 impairments including: nitrogen and effects, trash, metals, historic pesticides, coliform, chlorides, PCBs
- Completed TMDL: East Fork trash (2000)
- Currently scheduled TMDLs: Legg Lake trash

5) Los Cerritos Channel/Alamitos Bay WMA

- Two minor NPDES discharges
- Twelve discharges covered under general NPDES permits
- 37 discharges covered by the industrial storm water permit
- 31 discharges covered by the general construction storm water permit
- Loss of wetlands habitat in Los Cerritos area
- Impacts from antifouling paint in marinas
- Urban and storm water runoff impacts on isolated water bodies
- Loss of tidal exchange
- 19 impairments including: ammonia, metals, historic pesticides and effects, PCBs, PAHs

6) The Channel Islands WMA

- Five islands
- One major NPDES discharge, four minor discharges
- One discharge covered by general NPDES permit
- Four discharges covered by the industrial storm water permit
- One discharge covered by the construction storm water permit
- Areas offshore of islands designated as Areas of Special Biological Significance
- High quality marine and rocky intertidal habitat
- Heavy use by marine mammals and endangered species
- Impairment: coliform (Avalon Beach)
- Lack of information on water quality

7) Ventura River Watershed

- Eutrophication, especially in estuary
- TDS concerns in some subwatersheds
- One major NPDES discharge (POTW)
- Eight discharges covered under general NPDES permits
- Industrial storm water – 36 discharges
- Construction storm water – 33 discharges
- Impediments (dams, diversions) to steelhead trout migration
- 15 impairments including: DDT, algae, coliform, low DO, diversions, selenium, other metals, trash
- Currently scheduled TMDLs:: Ventura River Estuary trash

8) Miscellaneous Ventura Coastal WMA

- Three major NPDES discharges (one POTW), six minor NPDES discharges, and eight discharges covered by general NPDES permits
- Industrial storm water – 67 discharges
- Construction storm water – 91 discharges
- 21 impairments

The harbors

- Accumulation of metals, PCBs, and historic pesticides in sediment and tissue
- Considerable marine life subject to impacts
- Impairments: DDT, PCBs, PAHs, metals, TBT, coliform
- Currently scheduled TMDLs: pesticides FY08/09 and coliform FY08/09

The wetlands and coast

- Historic pesticide contamination
- Loss of quality habitat
- Impacts from oil spills and agriculture
- Use by endangered species
- Impairments: historic pesticides and effects, coliform
- Currently scheduled TMDLs: Ventura beaches coliform

9) Santa Clara River Watershed

- High quality natural resource
- Four major NPDES discharges (POTWs)
- Eight minor NPDES discharges
- 48 discharges covered under general NPDES permits
- Industrial storm water – 125 dischargers
- Construction storm water – 367 dischargers
- Impacts from exotic vegetation
- Impacts from agriculture
- Increasing urbanization, flows, and channelization in upper watershed; impacts on middle and lower watershed
- 43 impairments including: nitrogen and effects, salts, coliform, trash, historic pesticides
- Completed TMDLs: Upper Santa Clara chloride (2005); nutrients (2004)
- Currently scheduled TMDLs: Lake Elizabeth, Munz Lake, Lake Hughes trash

10) Calleguas Creek Watershed

- Five major NPDES discharges (POTWs)
- Three minor NPDES discharges
- Thirteen discharges covered under general permits
- Industrial storm water – 90 dischargers
- Construction storm water – 292 dischargers
- Highly modified watershed
- Impacts from agriculture and naval facility
- Sediment inputs to Mugu Lagoon, one of the largest wetlands in southern California
- Competing urban uses; development pressures, particularly in upper watershed
- Severe lack of benthic and riparian habitat in watershed
- 159 impairments including: nitrogen and effects, water-soluble pesticides and effects, salts, historic pesticides, PCBs, siltation, selenium, mercury, other metals, trash
- Completed TMDLs: nitrogen (2003); toxicity (2006); organochlorine pesticides, PCBs, and siltation (2006); metals and selenium (2006)
- Currently scheduled TMDLs: trash; salts

SUMMARY OF REGIONWIDE ACTIVITIES

There are many activities conducted at the Region which do not apply to a specific watershed; instead they represent ongoing regionwide strategies and policies, or programs which are not directly linked to the rotating watershed cycle. Also, statutory, regulatory, or funding requirements may dictate completion of some activities at odd intervals throughout the five-year watershed cycle (such as increased emphasis on pretreatment inspections). The table below gives examples of watershed versus non-watershed related activities.

Watershed Tasks	*Non-Watershed Tasks*
Renew permits	Issue new permits
	Develop new general permits, reduce backlog, pretreatment
Integrate municipal storm water program	Issue individual industrial and storm water permits
Conduct inspections for watershed permits	Conduct inspections on new permits
Enforcement (in-cycle compliance)	Enforcement (spills, out of cycle compliance)
Implement NPS controls	Develop regional strategies to address NPS problems
TMDL/WLAs	
Develop, coordinate and implement watershed monitoring	Coordinate monitoring on a regional scale
Water Quality Assessments (State of the Watershed Reports, partial updates to 305(b) by watershed)	Biennial 305(b) Reports to USEPA
Develop watershed policies	Develop regional policies
Watershed-specific Basin Plan Updates	Regional Basin Plan Updates, Triennial Reviews
Data management (input and use by watershed)	Regional Database management
GIS (input of watershed-specific layers and information)	GIS (development and input of regional layers and Maintenance of system)
Watershed-specific outreach/education	General outreach education
Incorporation of CEQA and 401 Decisions into watershed planning (as groups are formed, and as timing permits)	Timely review of CEQA documents, 401 certifications per statutory deadlines

While the Watershed Management Initiative strives to integrate and coordinate the various Regional and State Board programs and address the highest priority funding needs for those programs, there is also need to respond to and accommodate priorities established by the individual Regional and State Boards' members, priorities established prior to the WMI which run on their own timelines, or other new mandates which may affect the way the WMI is implemented in a Region. The following briefly describes our overall approach to implementing a subset of programs (some statewide mandates) and other Board priorities on a regionwide scale.

Core Regulatory – General Permits

There are many dischargers in this Region covered by general permits for discharges to surface water through a letter issued by the Executive Officer. This activity occurs independent of the watershed cycle as the need arises. Many of these are for short-term projects such as dewatering. 40 CFR §122.28 provides for issuance of general permits to regulate a category of point sources if the sources: a) involve the same or substantially similar types of operations, b) discharge the same type of waste, c) require the same type of effluent limitations or operating conditions, d) require similar monitoring, and e) are more appropriately regulated under a general permit rather than individual permits.

Core Regulatory – Storm Water Permits

Storm water activities include those involving the three municipal permits (and Standard Urban Storm Water Mitigation Plans associated with the two urban ones) in the Region, the 2842 facilities regulated under the State's general industrial permit, and the approximately 2678 construction sites regulated under the State's general construction permit.

Wetlands Protection and Management – Water Quality Certification

A key wetlands regulatory tool for the Regional Board is the CWA Section 401 Water Quality Certification Program which regulates discharges of dredge and fill materials to waters. The 401 certification program is one of the most effective tools the state has for regulating hydrologic modification projects, especially those which directly impact the region's diminishing acres of wetlands and riparian habitat.

Key program activities should include CEQA documents review/response, pre-construction meetings with applicants, site visits, application processing, follow-up monitoring and inspections, and enforcement. Unfortunately, the program is currently severely underfunded with only application processing being undertaken. Approximately 150-200 applications are processed each year

Management of Nonpoint Source Pollution

Management of NPS pollution is based upon the requirements of the Porter-Cologne Water Quality Control Act (Porter-Cologne Act). The Porter-Cologne Act, Division 7 of the California Water Code, establishes a comprehensive program for the protection of water quality and beneficial uses of the State's waters and makes explicitly clear the law applies to nonpoint as well as point source discharges. The Porter-Cologne Act also establishes the administrative permitting authority—in the form of Waste Discharge Requirements (WDRs), waivers of WDRs or basin plan prohibitions—to be used to control NPS discharges. Additional legislative requirements state that all waivers must be conditional, they are to be re-evaluated and subsequently reissued every five years, and the RWQCBs must require compliance with waiver conditions.

California's Nonpoint Source (NPS) Pollution Control Program has been in effect since 1988 and was updated in January, 2000. In August 2004 the Office of Administrative Law approved the NPS Policy. The policy supersedes certain elements of the NPS Program Plan and formally eliminates the "three-tiered approach" in informal use.

Our long-term goal for the NPS program is to improve water quality by implementing the management measures identified in *the California Management Measures for Polluted Runoff Report (CAMMPR)* by 2013.

Major current nonpoint source program priorities are: 1) oversight of workplans for grant-funded projects, 2) establishment of regional strategies to address agriculture, marinas, and septic tanks (the latter will be focused on densely populated communities and areas where ground water is a source of drinking water), 3) investigation of loading contributions from agriculture, nurseries, golf course, and horse stables (in aid of TMDL work), and 4) expansion of our public education and outreach.

Enforcement Strategy

The statewide Water Quality Enforcement Policy adopted by State Board in 1996 and revised in 2002 is intended to make all enforcement consistent, predictable, and fair throughout the state. The Regional Board adopted a resolution in 1997 which confirmed the Regional Board's desire to carry out enforcement in a manner consistent with State Board's enforcement policy and that Regional Board staff prepare a regional enforcement strategy consistent with State Board's enforcement policy.

The enforcement policy states that the Regional Board staff must bring to the attention of their Regional Board for possible enforcement action, at a minimum, an array of permit violations for a variety of dischargers as well as failure to submit reports or deficient reports, and spills. Our increased efforts have resulted in an improved enforcement record for the region and has contributed to increased compliance in some programs (e.g. industrial stormwater). The quarterly violations report is available to the public as part of the Executive Officer's Report; and is also available on the Board's web page.

Beaches/Coastal Watersheds Activities

Due to the great resource and economic value associated with the beaches and coastal watersheds of this Region, a number of activities occur that are specific to the coastal areas. Among these are a number of monitoring programs as well as a program to manage contaminated sediments. Monitoring programs include: several regional surveys of the Southern California Bight which evaluated a number of constituents to determine the spatial extent and magnitude of ecological disturbances and the Surface Water Ambient Monitoring Program (SWAMP).

Additionally, a Contaminated Sediments Task Force developed a long-term strategy to manage contaminated sediments found in the ports and marinas of Los Angeles County. This five-year effort was funded by the Karnette bill (SB 671) beginning in FY97/98.

FOR ADDITIONAL INFORMATION

Contact the Regional Board's Watershed Coordinator, Shirley Birosik, at (213) 576-6679 or sbirosik@waterboards.swrcb.ca.gov for additional information or consult the Regional Board's website at http://www.waterboards.ca.gov/losangeles/html/programs/regional_programs.html#Watershed .

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Section 1 . INTRODUCTION

THE REGIONAL WATER QUALITY CONTROL BOARD - WHY THE WATERSHED MANAGEMENT APPROACH?

The nine Regional Water Quality Control Boards (Regional Boards) are each semi-autonomous and comprised of up to nine part-time Board Members appointed by the Governor. Regional Board boundaries are primarily based on watersheds. Each Regional Board makes water quality decisions for its region. These decisions include setting water quality standards, issuing waste discharge permits, adopting policies, and taking enforcement actions.

The Los Angeles Region has jurisdiction over all coastal drainages flowing to the Pacific Ocean between Rincon Point (on the coast in western Ventura County) and the eastern Los Angeles County line, as well as the drainages of five coastal islands (Anacapa, San Nicolas, Santa Barbara, Santa Catalina, and San Clemente). The Regional Board's jurisdiction also includes all coastal waters within three miles of the continental and adjacent island coastlines. The topography of the Region is quite variable as seen in the figure below.

Topography of the Los Angeles Region

The Region is the State's most densely populated and industrialized area. Over 1,000 discharges of wastewater from point sources in this Region are regulated by the Los Angeles Regional Board. Over 700 of these point source discharges are discharged to surface waters, and are regulated under the National Pollutant Discharge Elimination System. Permits issued under this program are referred to as NPDES permits. In addition, the Regional Board prescribes Waste Discharge Requirements (WDRs) for the remaining discharges which are primarily to ground waters and landfills. Despite the large number of discharges and highly industrialized nature of some watersheds, overall, land use within the Region is quite diverse (see Watershed Sections for detailed maps).

In recent years, watershed issues have become much more complex and this has resulted in the need to respond with more coordinated solutions for water quality problems. The increased emphasis on TMDL development has resulted in the need for more cumulative assessments of pollutant loadings to waterbodies and impacts to beneficial uses. This requires acknowledgment of the growing importance of nonpoint sources to watershed pollutant loadings. And, recognizing the value of stakeholder group involvement in solving watershed problems.

Managing water quality by watershed, as much as possible within program funding and scheduling constraints, allows the Los Angeles Regional Board to address these varied demands in a more coordinated and effective manner. The control of point source pollutants through NPDES permits and WDRs is central to the Los Angeles Regional Board's strategy to protect water quality; participation in watershed stakeholder groups, and active solicitation of their involvement in TMDL, permit, and nonpoint source activities, and awarding of grant monies, allow for additional coordination.

THE WATERSHED MANAGEMENT INITIATIVE

Watershed management is not program; it is a strategy for integrating and managing resources, both human and fiscal. The goal of the state's Watershed Management Initiative (WMI) is to integrate or coordinate water quality monitoring, assessment, planning, standards, permit writing, nonpoint source management, ground water protection, and other programs at the State and Regional Boards as much as practicable to promote a more efficient use of personnel and fiscal resources while ensuring maximum water quality protection benefits. The State's watershed work integrates and supports, to the extent possible, local community watershed protection efforts to implement cost-effective strategies for natural resource protection. As characteristics and resources vary widely from watershed to watershed, this approach customizes efforts to manage resources and address problems unique to each watershed while offering stakeholders the opportunity to implement the most cost-effective solutions to problems within their watersheds.

Watershed management represents a shift from a traditional approach that focuses on regulation of point sources, to a more regional approach that acknowledges environmental impacts from other activities. Over the last thirty years, permitting programs have significantly reduced pollutants that are discharged to California's waters from point sources. However, the quality of many waters continues to be degraded from pollutants discharged from diffuse sources, referred to as nonpoint sources, and from the cumulative impacts of multiple point sources. Future success in reducing pollutants from nonpoint sources and achieving additional cost-effective reductions in pollutants from point sources requires a shift to a more geographically-targeted approach. Activities particularly amenable to a rotating cycle include monitoring, reporting, and water quality assessments.

THE WATERSHED MANAGEMENT INITIATIVE CHAPTER

This document is the eighth iteration of the Chapter. The participants in implementation of the WMI in California (the nine Regional Boards, State Board, and USEPA) were asked in 1996 to begin preparation of a document which identified priorities and resource needs, across programs, in a watershed context. The Chapter is primarily used as an information and outreach tool to describe the Regional Board's watersheds and their major water quality issues, as well as, describe the Board's program responsibilities in aid of program workplan development and grant applicants needs. This also allows for highlighting where priorities are poorly funded in this Region and can be in support of requests for additional resources through Budget Change Proposals. It turns out many of our highest priority needs fall into areas that have little to no funding. This effort will hopefully result in flexibility and augmentation to address this deficiency.

The Chapter itself is not a commitment to complete work but provides a framework to identify priorities and resource needs which should form the basis for formal commitments which are made in fund-source and program-specific workplans on an annual basis. Determinations of which activities will be funded by specific workplans may be negotiated on the basis of the information in the Chapters. Annual program workplans and grant applications will still be prepared by program managers to identify which activities are going to be funded in a particular year based on the fiscal decisions made.

And, although the Chapter identifies specific projects or types of projects we would like to see funded through grant programs, these are not complete or exclusive lists. At the heart of any request for funding from a grant program should be a proposal to solve (or get to the solution of) water quality problems identified in this Chapter as high priorities; doing so in the context of watershed management is both desirable and, increasingly, a requirement of many grant programs; the Integrated Regional Water Management Plan grant program initiated through Proposition 50 is one example.

The Chapter is organized into sections including the Introduction, Watershed Sections, and Region-wide Section. Included in each Watershed Section is an overview of that watershed, a description of its water quality concerns and issues, maps showing locations of permitted discharges, past significant Regional Board activities in the watershed, current (funded) activities, near-term (usually unfunded) activities that would benefit the watershed, and activities which may happen on a longer time-scale (also usually unfunded). The Region-wide Section includes a description of activities not easily associated with particular watersheds as well as more detailed information on implementation of certain programs (such as nonpoint source) in the Region. Lists of permits organized by watershed are available as separate documents on the Regional Board website.

WMI DEFINITIONS

The following represent commonly used terms and definitions utilized throughout the document:

A **watershed** is the geographic area draining into a river system, ocean or other body of water through a single outlet and includes the receiving waters. Watersheds are usually bordered, and separated from other watersheds, by mountain ridges or other naturally elevated areas.

The **watershed management approach** is the specific method by which the Regional Board implements watershed management. Features include the targeting of priority problems, stakeholder involvement, developing integrated solutions, and evaluating measures of success. The entire watershed, including the land mass draining into the receiving water, is considered.

Watershed Management Areas (WMAs) are the geographically-defined watershed areas where the Regional Board will implement the watershed approach. These generally involve a single large watershed within which exists smaller subwatersheds but in some cases may be an area that does not meet the strict hydrologic definition of a watershed e.g. several small Ventura coastal waterbodies in the region are grouped together into one WMA.

State of the Watershed Reports are reference documents produced by Regional Board staff that describe the existing water quality conditions, data gaps, and sources of pollutants within a WMA. Strategies to resolve the water quality concerns, either in progress or proposed, are described. Preliminary versions of these reports are produced by the Regional Board in order to stimulate discussion and input on issues from other stakeholders. These documents will be updated as needed. First edition reports have been prepared for Calleguas Creek, Santa Monica Bay, Los Angeles River, San Gabriel River, Ventura River, and Santa Clara River Watersheds.

A **Watershed Management Plan** is a planning document often produced by watershed stakeholder groups which addresses water quality, land use, economic, habitat, recreation, and other concerns and recommends specific management strategies to resolve identified problems in a cooperative and coordinated manner. Few of these existed prior to 2000. Grants recently awarded under Proposition 13 to develop watershed management plans are beginning to fill in the gaps.

Nonpoint sources of pollution are those with no single point of origin. Pollutants may often be carried off the land by stormwater or be part of urban runoff. Common nonpoint sources are agricultural, urban (runoff from residential areas, parking lots, streets, etc.), and construction activities. **Point sources**, on the other hand, by definition originate from a discrete source such as a pipe or outfall through which a facility may discharge while regulated by a NPDES permit.

Beneficial uses are those uses of water identified in state and regional water quality control plans that must be achieved and maintained. Uses include contact water recreation, municipal water supply, navigation, agricultural supply, wildlife habitat, and groundwater recharge, among others. **Designated** beneficial uses, together with water quality objectives, form water quality standards as mandated under the California Water Code and Federal Clean Water Act.

The California Water Code defines **water quality objectives** as "the allowable limits or levels of water quality constituents or characteristics which are established for the reasonable protection of beneficial uses of water or prevention of nuisance within a specific area." These objectives are both narrative

(descriptive) and numerical and appear in each Regional Board's water quality control plan (**Basin Plan**) which also describes implementation programs to protect all waters in the Region.

Best Management Practices (BMPs) are intended to reduce the amount of pollutants and prevent pollutants from leaving a facility and reaching a waterbody. BMPs include good facility housekeeping methods and such things as scheduling certain types of work around periods of rainfall or high winds, controlling runoff from a facility and modifying practices to reduce the possibility of pollutants leaving a facility. These are often used in regulating stormwater and other nonpoint sources.

The **Total Maximum Daily Load (TMDL)** is a number that represents the assimilative capacity of a receiving water to absorb a pollutant. The TMDL is the sum of the individual wasteload allocations for point sources, load allocations for nonpoint sources plus an allotment for natural background loading, and a margin of safety. TMDLs can be expressed in terms of mass per time (the traditional approach) or in other ways such as toxicity or a percentage reduction or other appropriate measure relating to a state water quality objective. A TMDL is implemented by reallocating the total allowable pollution among the different pollutant sources(through the permitting process or other regulatory means) to ensure that the water quality objectives are achieved.

- **TMDLs** establish the loading capacity of a watershed, identify needed reductions, identify sources, and recommend allocations for point and nonpoint sources.

- The **Margin of Safety** is a required component of the TMDL that accounts for the uncertainty about the relationship between the pollutant loads and the quality of the receiving waterbody.

- **Grouping TMDLs** is a reasonable and logical way to collapse the total number of individual TMDLs to make the most effective use of resources we currently have and any which we may obtain in the future. This is largely due to the fact that some of the "pollutants" for which a water may be listed are actually "effects" of pollutants. The TMDL chart in each watershed section of this report reflects this collapsed approach. For example, many reaches of the Los Angeles River are listed for ammonia. Some of the same reaches are listed for pH problems while other reaches are listed for algae, scum, and odors. It is very likely the presence of these "pollutants" are interrelated. Excessive nitrogen (reflected here as high levels of ammonia) may lead to a condition of eutrophication (excessive nutrient loading) which can influence pH levels as well as promote increased algal growth. Scum may be evident due to floating algal material and odors may result when excessive algae starts to die off. Thus, it makes sense to group these TMDLs and approach the problem by determining the sources of nitrogen loading into the watershed and the appropriate allocations in order to reduce loadings.

OVERVIEW OF ONGOING REGIONAL BOARD PROGRAMS AND ACTIVITIES

The Regional Board implements a wide variety of programs with different mandates, requirements, etc. Many of these (primarily surface water programs) are already fully or partially integrated into the watershed approach; others (primarily ground water) may be incorporated later and a few will likely remain separate from the WMI process. The following gives a brief description of these major program areas, current priority activities for each, and whether they are considered Category One or Two activities. **Category One** activities are those of high priority which are required by federal or state statute or regulation that need to be completed at least once during the 5-year planning cycle. **Category Two** activities are considered very important but are not required by statute or regulation. Additionally, more specific program objectives and implementation activities are included in the watershed or region-wide sections as appropriate. Updated information on Regional Board activities and programs may be also found on the Board's webpage at http://www.waterboards.ca.gov/losangeles.

SURFACE WATER

Core Regulatory (Category One)

Core regulatory activities include NPDES (individual permits - updates and revisions, issuance of general permits, stormwater permits/program, enforcement actions, response to complaints, compliance and pretreatment inspections, pretreatment audits, and review of monitoring reports), groundwater protection activities (issuance of Waste Discharge Requirements), issuance of Water Reclamation Requirements, and land disposal under Chapter 15 California Code of Regulations.

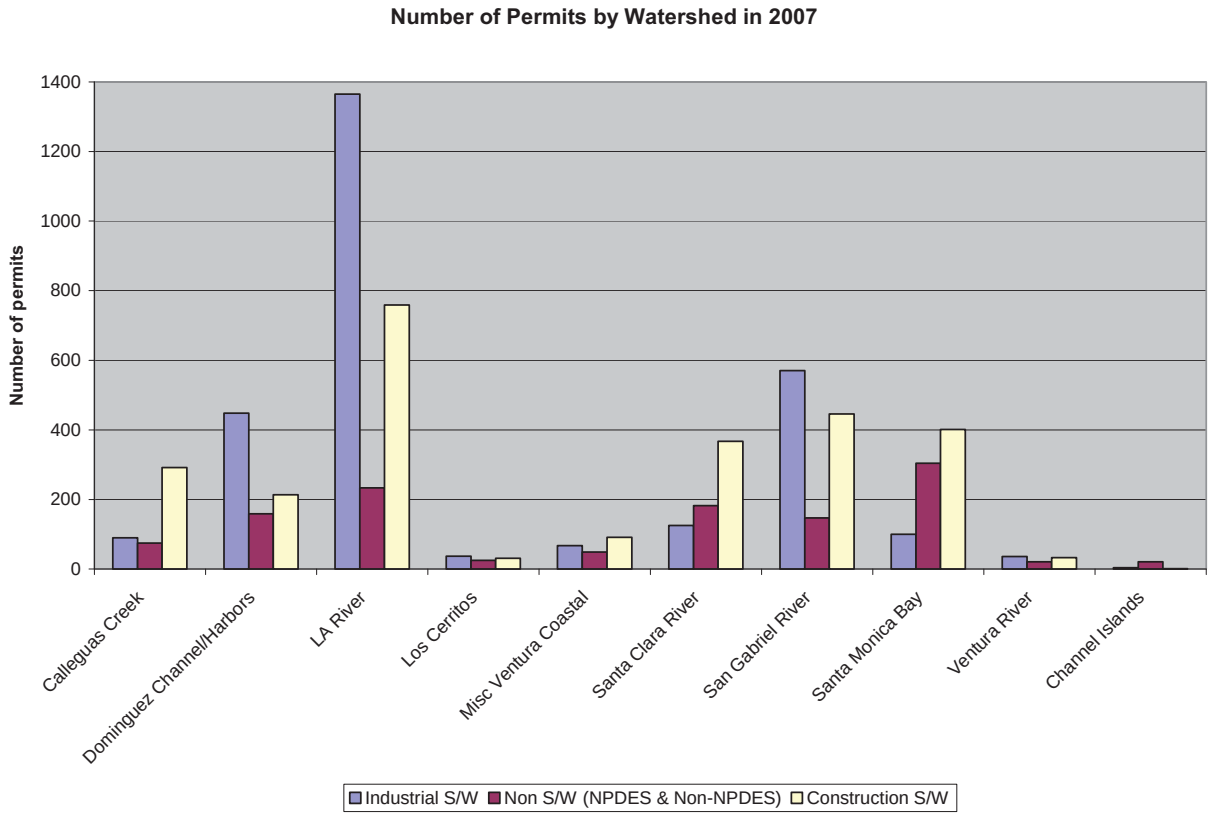
Issuance of new permits continues to be a high priority. Reduction of backlog and increased efforts in compliance and enforcement are also very high priorities. Currently, POTW permits are being renewed in a timely manner but there are shortages in staff resources for renewals of industrial general permits which are experiencing backlogs. The goal is to inspect major NPDES dischargers at least once annually and inspect minor NPDES dischargers at least once in each permit reissuance cycle (20% of the total per year). However, since 19 staff are needed to fully implement the inspections on that schedule as well as review discharger self-monitoring reports, conduct enforcement, and enter data into CIWQS, our data management system, while only four are available, inspections have been prioritized to focus on the 25 major and 35 minor NPDES dischargers considered problem facilities. Investigation and followup on spills are also severely limited due to need for the additional identified PYs.

Our watershed efforts will focus on coordinating receiving water monitoring and implementing bioassessment. This involves integrating receiving water monitoring with the Surface Water Ambient Monitoring Program to the extent practicable through periodic reallocation of discharger receiving water monitoring resources to accomplish watershed-wide monitoring.

Core regulatory must also implement waste load allocations established by TMDLs during renewal of existing permits or issuance of new permits.

The number of permits by watershed are shown in the following figure. Currently, there are a total of 1,216 non-stormwater permits being managed in the Region. In addition, 2,842 facilities are covered by the general industrial stormwater permit, and 2,678 facilities are covered by the general construction stormwater permit (the number of facilities covered by the construction stormwater permit will change

frequently as construction is completed and new projects are started). Most permitting activity, including stormwater permits related to construction, continues to be focused in the urban areas of the Region.



Monitoring and Assessment ***(Categories One and Two)***

Category One activities include preparation of the biennial Water Quality Assessment 305(b) Report and implementation of the Surface Water Ambient Monitoring Program (SWAMP). Category Two activities include Los Angeles Basin Contaminated Sediment Task Force work (a former Category One activity), involvement with special studies (e.g., Bight-wide regional surveys), and assistance with volunteer monitoring.

Monitoring and/or assessment efforts are occurring on both regional and watershed scales. Implementation of SWAMP is the major regional monitoring activity with direct coordination provided by Regional Board staff (SWAMP and the Contaminated Sediment Task Force are both described in more detail in the Region-wide Section of this document while activities specific to each watershed are described in the appropriate watershed sections). Also, every two years an update of the 305(b) report is required; emphasis will be put on updating targeted watersheds at those times but all data received will be evaluated. The next update is scheduled for 2008 and is currently underway.

Monitoring can have a number of goals. It may be used to assess trends over time and obtain general assessment information on a regional scale. It may be used to pinpoint "hot spots" and track sources on a watershed scale. It may also be used to assess loadings for TMDLs. An increasing use will be to better

judge impairments of beneficial uses on a watershed scale and to assess effectiveness of nonpoint source BMPs and other water quality improvement strategies.

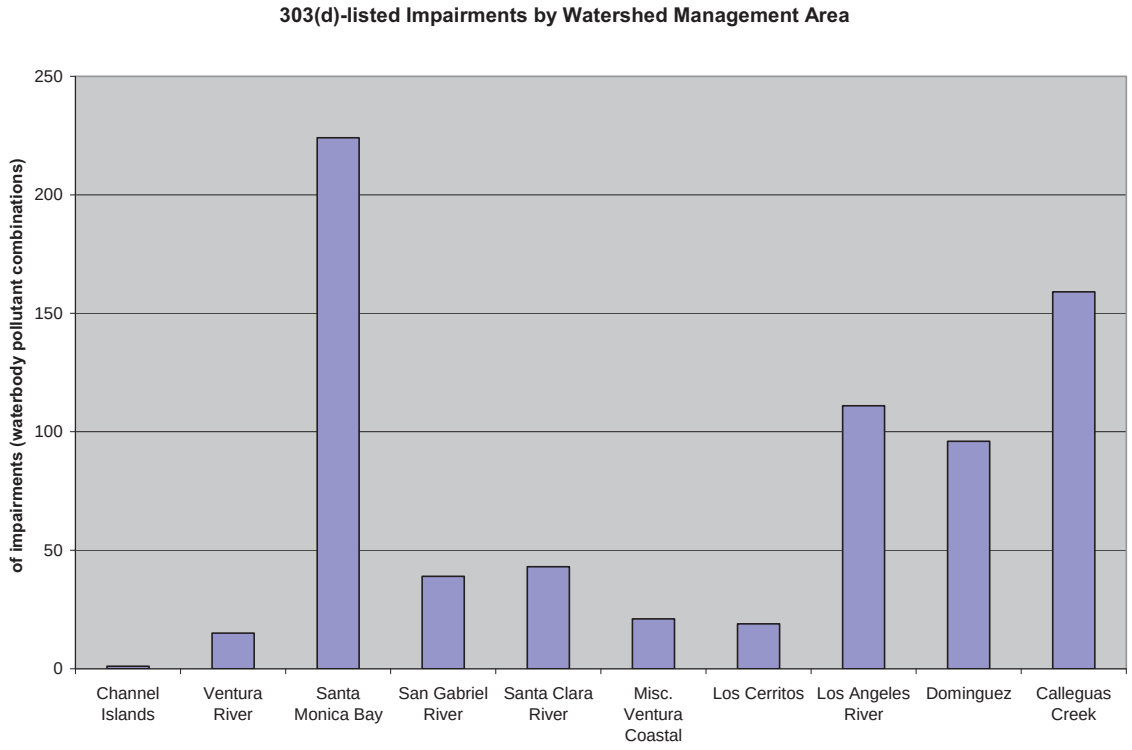
A major long-term monitoring and assessment goal is to increase utilization of biological assessments including incorporating them in monitoring requirements for dischargers.

Basin Planning and TMDLs *(Categories One and Two)*

Category One basin planning activities include conducting triennial reviews of planning priorities, development of water quality standards and implementation plans and policies, development of TMDLs, and preparation of Basin Plan amendments (some of which follow from development of TMDLs).

A triennial review is a fundamental planning function at Regional Boards. This activity provides the Board with the opportunity to review the status of water quality, identify issues and problems, and solicit direction and comment from concerned parties as well as the public in general. The triennial review process sets the stage for possible changes (i.e. amendments) to the Basin Plan, which may be needed to more effectively protect water quality. Amendments to the Basin Plan also ensure that the Regional Board's approach to protecting water quality is legally sound. The current triennial review is from 2005-2007; the next triennial review will begin shortly.

There are 728 total reach/constituent impairments; TMDLs will be completed on the approximately 95 grouped impairments. About eleven percent of the impairments are based on excessive indicator bacteria while historic DDT and PCBs contribute to somewhat lesser numbers of impairments (9% and 7.5%, respectively). The number of current impairments (2006 303(d) list) by watershed is reflected in the figure below:



Another important planning function is interaction with the public and other agencies that are planning projects that may impact the environment. Under the California Environmental Quality Act, the Regional Board has an opportunity and responsibility to work with the public to ensure projects that may affect water quality are properly designed to reasonably mitigate adverse impacts. This responsibility to participate in the planning processes at other agencies extends to the development of regulations (such as the California Toxics Rule and State Implementation Policy) and guidelines (such as irrigation practices). Review of environmental documents is a Category Two activity.

Wetlands Protection and Management *(Categories One and Two)*

Wetlands acres in the Region have diminished greatly over the past several decades as coastal development, in particular, has increased. Wetlands provide habitat, serve to slow down water flow, decrease total volume through infiltration, and filter out a number of pollutants through active uptake by plants as well as deposition in sediments. Wetlands such as coastal estuaries are a buffer zone between ocean and inland water resources and are heavily utilized by aquatic organisms. Continuous stretches of riparian habitat function as wildlife corridors to allow animal movement between increasingly isolated populations. They also serve as popular recreational destinations for residents and visitors. Unfortunately, many of our Region's wetlands are impacted by varying kinds and amounts of pollutants and alterations.

The Regional Board participates in the Southern California Wetlands Recovery Project (WRP), which for the first phase effort, conducted an inventory of coastal wetlands from Santa Barbara to the U.S.-Mexico border. This inventory included information on twelve wetlands in seven watersheds for our region. When compared to estimated historical acreages, Los Angeles County has lost 93% of its wetlands while Ventura County has lost 58% of its wetlands. A regional wetland plan and strategy for prioritizing and restoring sites has been developed. Currently, the WRP funds wetlands projects which involve planning, restoration, or acquisition. More information about the Project may be found on its webpage at http://www.scwrp.org. This is a Category Two activity.

Our wetlands regulatory tools include:

1. **Wetlands beneficial use designation**: The Region's Basin Plan includes a beneficial use category for Wetland Habitat.

2. **Water Quality Objective**: The Region's Basin Plan has a narrative objective for wetlands protection which addresses the protection of hydrologic conditions and physical habitats to sustain the functional values of regional wetlands.

3. **Water Quality Certification (401) Program**: A key Category One activity associated with wetlands protection and management is CWA Section 401 certification which regulates discharges of dredge and fill materials to waters. The 401 certification program is one of the most effective tools the state has for regulating hydrologic modification projects, especially those which directly impact the region's diminishing acres of wetlands and riparian habitat.

Additionally, in Spring 2007, the State Water Resources Control Board began public scoping meetings on a proposed Wetland and Riparian Area Protection Policy that would apply throughout the state. An information document released for the scoping meetings outlined four alternative approaches to wetlands

protection. The website http://www.waterboards.ca.gov/cwa401/ contains information on both the 401 program and proposed Wetlands Policy. There is also a statewide effort underway to develop a wetlands monitoring program (estuarine wetlands to begin with) and develop regional databases to support tracking of wetlands mitigation and restoration – the Integrated Wetlands Regional Assessment Program (IWRAP).

Nonpoint Source Program (Categories One and Two)

Nonpoint source Category One activities include coordination of 319(h) grant project activities; and implementing the Plan for California Nonpoint Source Pollution Control Program, TMDLs, and Coastal Zone Act Reauthorization Amendments provisions. Participation in stakeholder/watershed groups meetings and activities and public/agency outreach are Category Two activities.

Management of NPS pollution is based upon the requirements of the Porter-Cologne Water Quality Control Act (Porter-Cologne Act). The Porter-Cologne Act, Division 7 of the California Water Code, establishes a comprehensive program for the protection of water quality and beneficial uses of the State's waters and makes explicitly clear the law applies to nonpoint as well as point source discharges. The Porter-Cologne Act also establishes the administrative permitting authority—in the form of Waste Discharge Requirements (WDRs), waivers of WDRs or basin plan prohibitions—to be used to control NPS discharges. Additional legislative requirements state that all waivers must be conditional, they are to be re-evaluated and subsequently reissued every five years, and the RWQCBs must require compliance with waiver conditions.

California's Nonpoint Source (NPS) Pollution Control Program has been in effect since 1988 and was updated in January, 2000. In August 2004 the Office of Administrative Law approved the NPS Policy. The policy supersedes certain elements of the NPS Program Plan and formally eliminates the "three-tiered approach" in informal use.

The NPS Program has also been upgraded to conform with the Clean Water Act Section 319 (CWA 319) and Section 6217 of the Coastal Zone Act Reauthorization Amendments (CZARA). The lead State agencies for the NPS Program are the SWRCB, the nine RWQCBs, and the California Coastal Commission.

The Plan for California's Nonpoint Source Pollution Control Program includes requirements for Critical Coastal Area (CCA) designation. The intent of CCA designation is to direct needed attention to coastal areas of special biological, social, and environmental significance and to provide an impetus for these areas to receive special support and resources. These areas include Environmentally Sensitive Habitat Areas (ESHAs) currently designated in California's Coastal Zone Management (CZM) program, as well as areas adjacent to Areas of Special Biological Significance (ASBS), California's National Estuarine Research Reserves (NERRs), National Estuary Program (NEP), and National Marine Sanctuaries. The 2002 CCA Draft Strategic Plan identifies 101 CCAs statewide of which 13 are in the Los Angeles Region. These will be described further in later sections of this document.

Our long-term goal for the NPS program is to improve water quality by implementing the management measures identified in the California Management Measures for Polluted Runoff Report (CAMMPR) by 2013. The short-term plan to achieve this goal is to identify, educate, and promote stakeholder involvement.

Current nonpoint source program priorities are: 1) oversight of workplans for 319(h) and bond fund projects, and 2) establishment of regional strategies addressing agriculture and marinas.

GROUND WATER

The following programs under our Groundwater Division are currently not managed under our watershed schedule but some aspects are integrated to some degree with other watershed activities, particularly with regard to coordination of monitoring and assessment activities and GIS. Steps taken to date include the mapping of drinking water wells and underground storage tank and Well Investigation Program (WIP) sites in a Geographic Information System (GIS).

Underground Storage Tanks Regulation and Remediation (Category One)

Responsibilities include oversight of investigations into groundwater pollution and any corrective actions which may be needed which result from leaking underground storage tanks. Cases are roughly organized along watershed boundaries.

SLIC Program (Category One)

Response to reports of unauthorized discharges, such as spills and leaks from above-ground storage tanks which may impact any of the region's waterbodies, are investigated through the Spills, Leaks, Investigation and Cleanup (SLIC) Program and remediation actions are implemented.

DOD and DOE Sites Cleanup Program (Category Two)

The Regional Board works with a number of other agencies involved with remedial investigation and cleanups at U.S. Department of Defense (DOD) and U.S. Department of Energy (DOE) sites. Agreements with the DOD and DOE provide for accelerated cleanups at military bases and other Defense sites schedule for closure.

Well Investigation Program (Category One).

Followup investigation of volatile organic compounds in public water supply wells is conducted through the Well Investigation Program (WIP). Investigations focus on identification and elimination of sources of pollutants in public water supply wells, the identification of responsible parties, and oversight of soil and ground water remediation. This program is somewhat watershed-based as it focuses on two areas – the San Gabriel and San Fernando Valleys – that fall within two watersheds, the Los Angeles River (upper) and Gabriel River Watersheds.

FUNDING

Many high priority (in terms of Regional Board as well as statutory priorities) activities are unfunded or underfunded. For example, monitoring and assessment, basin planning, and nonpoint source activities are grossly underfunded. Some resources must be utilized for required activities such as triennial Basin Plan reviews and Water Quality Assessments. The latter activity tells us where our impaired waters are and there are federal requirements to conduct TMDLs on 303(d)-listed waters although more money is needed to do TMDL work on the problem waters. If a TMDL is completed and a remediation strategy developed

despite this, there is then little money for followup work, particularly with regards to dealing with nonpoint source contributions. This means that our involvement in nonpoint sources must be very time-conservative. While it may take years of work to cooperatively fix a nonpoint source problem, direct enforcement could take a lot less time and be an immediate action. However, the latter is contrary to the cooperative spirit of watershed management. Each watershed will require difference site-specific approaches depending on a variety of factors. Additionally, enforcement is another underfunded activity, particularly when dealing with nonpoint source discharges. On the other hand, priorities may shift due to the influx of "new" money to fund a previously underfunded, and often times, lower priority activity. Use of the new money may be specific to certain activities such as increased pretreatment inspections in the core regulatory program. See the table below for the funding status and priority of Regional Board activities and programs in greater detail.

Funding Status of Major Regional Board Activities and Programs

Program/Activity (and Subcategories)	**Import-ance (High, Med, Low)**	**Man-dated?**	**Current Funding**	**What We Can Do With Existing Funds**	**What Could Be Done with More Funds**
Basin Planning					
Triennial reviews	H	Y	*Under-funded*	*Delayed and/or limited Triennial Reviews*	*Conduct more regular comprehensive reviews of the Basin Plan and associated issues; act on an increased number of triennial review-listed items*
Evaluation of beneficial uses	H	Y	*Under- to unfunded*	*Field observations in conjunction with other activities, limited studies*	*Comprehensive beneficial use surveys on a more frequent basis(necessary to set and refine use designations)*
Development of WQ objectives	H	Y	*Under- to unfunded*	*Utilize existing objectives.*	*Develop new and/or site-specific objectives; participate on State/Federal Task Forces; develop regional policies for implementation of water quality standards*
Development of watershed/ regional priorities	H	N	*Under-funded*	*Solve the easiest problems*	*Development of complex watershed solutions*
Watershed Coordination and Plan Development					
Development of watershed plans	M	N	*Under to unfunded*	*Rely on stakeholders to do most of the work*	*Provide staffing better support to watershed groups to guide and prepare integrated plans for water quality along with flood protection, habitat protection, etc.*
Coordination	H	N	*Under-funded*	*Limited outreach*	*Provide staff to participate in all watershed groups*
TMDL Development	H	Y	*Under-funded*	*TMDLs with only the required elements in order to meet deadlines*	*More time spent developing TMDLs with site-specific information*

Program/Activity (and Subcategories)	Import-ance (High, Med, Low)	Man-dated?	Current Funding	What We Can Do With Existing Funds	What Could Be Done with More Funds
Water Quality Assessment					
Monitoring — Ambient watershed	H	Y (SWAMP)	*Under-funded*	*Do the basics required by the SWAMP; minimal staff sampling; rely on stakeholder sampling with minimal oversight; develop collaborative discharger watershed monitoring programs*	*Collect better data to assess impacts, assess for more constituents with more robust sampling; develop priorities, and evaluate successes; actively solicit and coordinate stakeholder monitoring; move beyond "snapshot" monitoring; advance special programs like biomonitoring/biocriteria*
Lab support	H	N/A	*Under-funded*	*Evaluate small subset of waters; analyze inexpensive constituents; often inadequate for decision-making*	*Collect and analyze for more constituents; have better datasets for decision-making*
Biomonitoring (training /field wk.)	H	N	*Under-funded*	*Use effluent chronic toxicity testing as surrogate*	*Real assessment of impacts to Beneficial Uses through field surveys, multiple assessment techniques*
Assessment	H	Y (WQA)	*Unfunded*	*Compile and assess as time permits ("back-burner")*	*Utilization as a critical element in watershed decision-making*
Computer data storage	H	Y	*Under-funded*	*Data stored in many locations*	*More efficient and comprehensive analyses*
Analyze data (for regional trends or for SWAMP)	H	Y (SWAMP)	*Under-funded*	*Simple statistics*	*More rigorous analyses*
Prepare state of watershed reports	M	N	*Under-funded*	*Summarize available info*	*Info sharing/priority setting/better data collection and augmentation*
Prepare biennial 305b report	M	Y	*Under-funded*	*Limited to targeted watersheds (minimal info)*	*Regular and more comprehensive updates/ better data for quality decisions*
Reporting	H	Y (SWAMP)	*Under-funded*	*Utilize established report card format; encourage other groups to develop indicators that would be useful for our Region*	*Research and develop additional indicators; prepare water quality "report cards"*

Program/Activity (and Subcategories)	Import-ance (High, Med, Low)	Man-dated?	Current Funding	What We Can Do With Existing Funds	What Could Be Done with More Funds
CEQA Review	M-H	Y	*Unfunded*	*Limited to highest priority projects with the greatest potential impacts*	*Provide early, meaningful comments; pre-401 coord.; early notification; be aware of piecemealing of projects*
401 Review	M-H	Y	*Under-funded*	*Review and process applications*	*Follow-up work (monitoring and enforcement), pre-construction meetings, site visits, review of draft CEQA documents, development of regional policies*
Nonpoint Source/CZARA					
Outreach	H	N	*Under-funded*	*Minimal effort - usually associated with group meetings*	*More active cooperation and outreach with individuals and groups in the watershed*
Contract/Project Management	H	N	*Under-funded*	*Minimum needed to get project through funding process*	*Receive better products and leverage from successful projects, hands on involvement and advertisement of successful projects*
Development of NPS Solutions	H	Y	*Under-funded*	*Little to none on our own: some involvement with others' work, and initiation of regulatory mechanisms (Tiers II and III)*	*Work with watershed communities to develop and implement nonpoint pollution control strategies, evaluate success of best management practices and management measures*
Permitting - Point Source (NPDES and WDRs)					
Permit development	H	Y	*Under-funded*	*Reduce backlog; process major and minor permits on watershed schedule/transfer minor permits to general permits as time allows*	*Have resources to solicit more stakeholder involvement; use higher level tools (modeling) to develop limits;have more resources for increasingly complex permits*
Inspections	H	Y	*Under-funded*	*Minimum required*	*More field presence/outreach/may reduce need for enforcement*
Enforcement	H	Y	*Under-funded*	*Only high profile major spills/violations*	*More enforcement actions taken on spills/violations that are not high profile*
Spill/complaint follow-up	H	Y/N	*Under-funded*	*Only major spills*	*Better customer service, follow-up on complaints, successful cleanups*

OUR REGION'S APPROACH TO WATERSHED MANAGEMENT

We have designated ten watershed management areas in the Los Angeles Region seen in the figure below. "State of the Watershed Reports" will be prepared or updated for the major watersheds. These reports have become very useful tools for local watershed groups for general educational value and in setting priorities.

Timeline for Watershed Management Initiative

Dominguez Channel-LA/LB Harbor	FY 2007/08
Santa Monica Bay	FY 2008/09
Los Angeles River	FY 2009/10
San Gabriel River Los Cerritos Channel Channel Islands	FY 2010/11
Ventura River Misc. Ventura Coastal Santa Clara River Calleguas Creek	FY 2011/12

The formation of a balanced group of stakeholders for each watershed is critical to the success of watershed management, especially for resolving issues arising from nonpoint source pollutants. The major watersheds and many of the larger subwatersheds now have active stakeholder groups and, in many cases, watershed management plans have been developed. Working in partnership with stakeholders, we expect that we can achieve the following goals within each of our watershed management areas or have at least partially done so already.

- **Work with stakeholder group** or an infrastructure of stakeholder contacts which represents a range of key interest groups in the watershed but with involvement is not a barrier to timely resolution of a water quality problem.
- **Compilation of reasonably available water quality data** and related information in the form of a 'State of the Watershed Report.'
- **Assessment of data gaps** and a plan to fill the gaps.
- **Development of a** coordinated, cost-effective **watershed-wide monitoring program.**
- **Identification of high priority issues** and consensus among stakeholders as to how to proceed to resolve them.
- **Implementation of watershed-based solutions**.
- **Evaluate** success.

Some tasks may have less emphasis than others depending on the watershed, its problems, and the relative influence of point versus nonpoint source contributors.

What is important is the basic tenets of watershed management are being implemented:

- *The effort has a geographic focus,*
- *The highest priority issues are being identified and addressed,*
- *Stakeholder involvement is occurring, and*
- *A scientific basis for water quality management decisions is being created.*

This is an idealized model; many factors often change what can be done for each step such as regulatory or statutory mandates, consent decrees, legislation, and changes in Board priorities or funding.

OUR HIGH PRIORITY ISSUES

This Regional Board establishes priorities on an annual basis. While some of these priorities fall outside of the watershed management arena (it is acknowledged that some activities will likely always remain outside of the WMI), the bulk of these priorities are clearly of primary importance in fulfilling not only the WMI but also development of TMDLs and other mandates. In addition to Regional Board-directed priorities, priorities are mandated by legislation, statute, regulation, State Board, Cal-EPA, USEPA, and from sheer need to protect, restore, or enhance water quality. A list of the highest of these collective priorities follows.

TMDLs

- Development, adoption, and implementation of **TMDLs** – about 20 TMDLs (with implementation plans) have been approved by USEPA and about 10 are awaiting approval; about 10 more are scheduled for development over the short-term
- Addressing **beach closures** – a number of beach bacteria TMDLs have been adopted including the Santa Monica Bay wet weather and dry weather TMDLs. Upcoming will be the potential adjustment of implementation schedules based on development of integrated water resources approaches and a re-evaluation of the reference system approach for setting allowable exceedance days.
- Implementation of **agricultural waiver** – good success in Ventura County (80% enrollment and WQ monitoring instituted) thus far; now need increased enrollment in LA County and overall strategic implementation of BMPs

Non Point Sources

- Need for strategies to address **agriculture** and **septic systems** - implementation of the agricultural waiver to further TMDL compliance is also helping fulfill NPS program goals; new septic systems located in areas without sufficient separation from groundwater and nearby surface waters must install advanced treatment; the next challenge for septic systems will be to address cumulative effects which occur with infilling new systems in areas already dense with existing systems.

Basin Planning and Standards

- Full implementation of our **water quality standards** program is a necessity – site-specific objectives were adopted for ammonia in the Santa Clara, San Gabriel, and Los Angeles Rivers Watersheds while a water effects ratio was adopted for copper in the Calleguas Creek Watershed.
- Work is ongoing to target a **design storm** for implementation of wet weather BMPs
- **Tiered Aquatic Life Uses**, in relation to biocriteria, are in development

NPDES Permits

- Controlling compounds from point sources which continue to cause instream toxicity and/or accumulate in sediments or biota – pthalates and other **emerging chemicals**, including pharmaceuticals are becoming major issues.
- **Power plants** – the nine facilities in the Region are conducting plankton studies and investigating possible alternatives to once-through cooling water discharges
- Municipal stormwater/urban runoff – the LA County **MS4 permit** was reopened twice to incorporate the summer dry weather provisions of two bacteria TMDLs; renewals of permits are in progress.
- **New/re-development** – proactively addressing water quality issues through CEQA, 401 certifications, or stormwater permits; ensuring wet weather compliance with construction permits.

Water Reclamation Requirements/Water Conservation

- Reduce, reuse, and **recycle water** – maximize water conservation in Region.

- Addressing the **regional salt management**/salt imbalance issue which is becoming increasingly critical in the region, and balancing this issue with the need to promote the use of reclaimed water.

Habitat Protection

- Preservation of high quality habitats – ensure maintenance of beneficial uses at these sites through support of **low-impact development** coupled with minimized/avoided hydromodification
- **Habitat loss/restoration** – even with strides in improving instream water quality, unless habitat is restored (riparian/wetlands, in particular), in many cases beneficial uses can not be fully restored.

Monitoring

- Coordination of existing resources and participation in the Surface Water Ambient Monitoring Program is of great importance as is more use of **bioassessment** as a tool.
- **Coordinated watershed-wide monitoring** programs exist in the San Gabriel River, Calleguas Creek, and Malibu Creek Watersheds while programs are being developed in the Los Angeles River and Santa Clara River Watersheds.

Contaminated Sediments/Waste Discharge Requirements

- Many of the impairments in the Region, particularly in harbors, are related to **contaminated sediments**. While source reduction will decrease pollutant levels over time, remediation of these sediments will also be needed which will be a long-term project. Cleanup of contaminated sediments in Consolidated Slip in Los Angeles Harbor will be a long-term project.
- Accurately characterizing the threat from contaminated sediments throughout the Region will be aided with adoption of **sediment quality objectives** in the near future by State Board.

These Board priorities are further highlighted in the watershed and region-wide sections as appropriate. In addition, the State and Regional Board's Strategic Plan is in the process of being reviewed and updated. Stakeholder input so far has indicated basin planning, impaired water bodies, water rights, enforcement effectiveness, groundwater, and water conservation/reuse/recycling as programmatic priority areas.

Section 2 . Activities Organized on a Watershed Basis

This section describes activities organized on a watershed basis. An **overview** of each watershed or WMA is provided, its **water quality problems and issues** are described, **past significant activities** (as appropriate), **current activities** (funded activities), **near-term activities** (planned or projected high priority activities that may need funding), and **potential long-term activities** (long-term goals, beyond two years).

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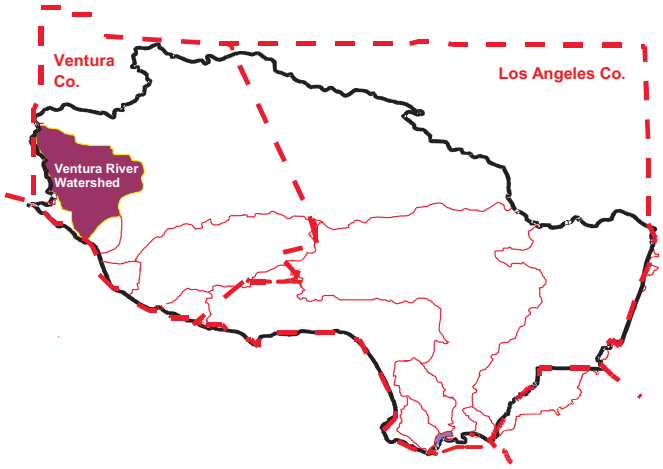
2.7 VENTURA RIVER WATERSHED

This watershed will be targeted in FY2011/2012.

Overview of Watershed



The Ventura River and its tributaries drain a coastal watershed in western Ventura County. The watershed covers a fan-shaped area of 235 square miles, which is situated within the western Transverse Ranges (the only major east-west mountain ranges in the continental U.S.). From the upper slopes of the Transverse Ranges, the surface water system in the Ventura River watershed generally flows in a southerly direction to an estuary, located at the mouth of the Ventura River. Groundwater basins composed of alluvial aquifers deposited along the surface water system, are highly interconnected with the surface water system and are quickly recharged or depleted, according to surface flow conditions. Topography in the watershed is rugged and as a result, the surface waters that drain the watershed have very steep gradients, ranging from 40 feet per mile at the mouth to 150 feet per mile at the headwaters.

Precipitation varies widely in the watershed. Most occurs as rainfall during just a few storms, between November and March. Summer and fall months are typically dry. Although snow occurs at higher elevations, melting snowpack does not sustain significant runoff in warmer months. The erratic weather pattern, coupled with the steep gradients throughout most of the watershed, result in high flow velocities with most runoff reaching the ocean.

Beneficial Uses in Watershed:

Estuary	*Above Estuary*
Navigation	Municipal supply
Commercial & sportfishing	Industrial service supply
Estuarine habitat	Industrial process supply
Marine habitat	Agricultural supply
Contact & noncontact water recreation	Contact & noncontact water recreation
Warmwater habitat	Warmwater habitat
Wildlife habitat	Wildlife habitat
Preservation of rare & endangered species	Preservation of rare & endangered species
Migratory & spawning habitat	Migratory & spawning habitat
Wetlands habitat	Wetlands habitat
Shellfish harvesting	Coldwater habitat
	Groundwater recharge
	Freshwater replenishment

Water Quality Problems and Issues

The majority of water quality problems involve eutrophication (excessive nutrients and effects), especially in the estuary/lagoon. A large storm drain enters the river near the estuary and homeless persons live in and frequent the river bed. Sediment in the estuary, however, appears relatively uncontaminated and in laboratory tests conducted through the Bay Protection and Toxic Cleanup Program, little sediment toxicity was found. In some subwatersheds, high TDS concentrations impair the use of water for agriculture. The watershed's water quality problems are, for the most part, nonpoint source-related. There have also been incidents of releases of toxic materials into storm drains entering the lower river.

The Ventura River Watershed

- Eutrophication concerns, especially in lagoon
- Some bioaccumulation of DDT and metals
- TDS concerns in some subwatersheds
- Impediments to steelhead trout migration (but much high quality habitat)
- More nonpoint source rather than

There is only one major discharger, a small POTW (3.0 MGD) in the middle reach of the Ventura River. For much of the year, the facility's effluent can make up two-thirds of the total river flow.

The locations of facilities with discharges to surface water or to the ground (other than those covered by general industrial or construction stormwater permits) are shown in the following figure. Major NPDES discharges are from either POTWs with a yearly average flow of over 0.5 MGD, from an industrial source with a yearly average flow of over 0.1 MGD, or are those discharges with lesser flows but with potential acute or adverse environmental impacts to surface waters. Minor NPDES discharges are all other discharges to surface waters that are not categorized as a Major. Minor discharges may be covered by general NPDES permits, which are issued administratively, for those that meet the conditions specified by the particular general permit. Non-Chapter 15 discharges are those to land or groundwater such as commercial septic systems or percolation ponds that are covered by Waste Discharge Requirements, a State permitting activity. Chapter 15 discharges generally relate to land disposal (landfills) under Chapter 15 of the California Code of Regulations, again an exclusively State permitting activity.

Permitted discharges:

- 9 NPDES discharges: one major (POTW) and eight discharges covered by general permits
- 37 dischargers covered under the industrial storm water permit
- 33 dischargers covered under the construction storm water permit

Most of the nine NPDES permittees in the watershed discharge to the main river.

Of the 36 dischargers enrolled under the general industrial storm water permit in the watershed, the majority are in the city of Ventura. Wholesale trade-durable goods, trucking and warehousing, and food and kindred products (including wineries) are most prominently represented based on their Standard Industrial Classification (SIC) codes. Most of the facilities are under ten acres in size. The locations of facilities with discharges covered by the general industrial stormwater permit are shown in the following figure.

About one-half of the 33 dischargers under the general construction storm water permit are on residential sites; most of the sites are 5 acres or greater in size and range up to 100 acres.

Water diversions, dams, and groundwater pumping also are thought to limit surface water resources needed to support a high quality fishery. Reduced water supplies affect water quality and thus beneficial uses, particularly with regards to the endangered steelhead trout (steelhead trout are known to utilize the River and some of its tributaries historically supported annual steelhead runs of 5000 – 6000 adults). Removal of the Matilija Dam in the upper watershed is a high priority.

Land use is the watershed is predominantly open space with a mix of residential, agriculture and industrial along the mainstem of the river as shown in the following figure.

The table below shows the water quality impairments from the 2006 303(d) list:

Water Quality Limited Segment Name	Pollutant
Canada Larga (Ventura River Watershed)	Fecal Coliform Low Dissolved Oxygen
Matilija Creek Reach 1 (Jct. With N. Fork to Reservoir)	Fish Barriers (Fish Passage)
Matilija Creek Reach 2 (Above Reservoir)	Fish Barriers (Fish Passage)
Matilija Reservoir	Fish Barriers (Fish Passage)
San Antonio Creek (Tributary to Ventura River Reach 4)	Nitrogen
Ventura River Estuary	Algae Eutrophic Total Coliform Trash
Ventura River Reach 1 and 2 (Estuary to Weldon Canyon)	Algae
Ventura River Reach 3 (Weldon Canyon to Confl. w/ Coyote Cr)	Pumping Water Diversion

Ventura River Reach 4 (Coyote Creek to Camino Cielo Rd)	Pumping Water Diversion

Stakeholder Groups

Ventura River Watershed Council The group originally was formed to aid the Trust for Public Land in development of a lower river parkway. It has become a formal part of the Integrated Regional Water Management Plan (IRWMP) process as one of three watershed groups in the Ventura County water management area.

Ventura River Steelhead Restoration and Recovery Plan Group A Plan was developed in response to the listing of steelhead trout as an endangered species by the National Marine Fisheries Service (NMFS) in August 1997. The plan was developed 1) to identify measures to mitigate impacts of ongoing operations and maintenance activities, 2) to identify future projects and, 3) identify and evaluate opportunities to promote recovery and restoration of the steelhead trout in the watershed. One staff person will continue to remain involved with the group, as needed.

Ventura River Habitat Conservation Plan (HCP) Group: The group, mostly comprised of resource agencies, cities, and water districts, began meeting in 2000. The cities and water districts involved all operate and maintain facilities that may affect sensitive resources or their habitats in the river. In order to comply with the Endangered Species Act they are engaging in consultation with the National marine Fisheries Service and US Fish and Wildlife Service and are in the process of developing a HCP that, with monitoring program and implementation agreements, would serve as the basis for an Incidental Take Permit.

Matilija Dam Steering and Executive Committees: The USACE, Ventura County Flood Control District, US Bureau of Reclamation, and other agencies and entities began convening in 2000 to begin discussions on the possible removal of Matilija Dam as part of an ecosystem restoration. An USACE and VCFCD sponsored ecosystem restoration feasibility study was completed in summer 2004 and a favored alternative will be further pursued. More information may be found at http://www.matilijadam.org/.

Matilija Coalition: The Coalition is a local group committed to removal of Matilija Dam and subsequent ecosystem restoration. More information about the group may be found at http://www.matilija-coalition.org/ .

Significant Past Activities

In August 1997, the National Marine Fisheries Service (NMFS) listed the steelhead trout in Southern California as endangered under the Federal Endangered Species Act (ESA). The listing means that any project or action that may affect steelhead trout or their habitats will require consultation with NMFS to obtain an incidental take permit. In order to prepare for the listing and deal with possible regulatory requirements as a result of the listing, the Casitas Municipal Water District, City of Ventura, Ventura County Flood Control District, and seven other local public and private agencies collaborated and developed the **Ventura River Steelhead Restoration and Recovery Plan** in December 1997 (see above). The plan also contains large amount of background information on the watershed such as hydrology, biology, steelhead habitat conditions, and the operations and maintenance of water wastewater, solid waste, transportation and flood control facilities of the sponsoring agencies. The

regulatory activities by the Regional Water Quality Control Board in the watershed were briefly reviewed in the plan.

Regional Board staff produced a *State of the Watershed Report* for the Ventura River in 2002. This document is available on the Regional Board's website.

No SWAMP monitoring of the Ventura River Watershed occurred as existing monitoring efforts adequately characterized conditions.

The Wetlands Recovery Project funded two planning projects in the watershed, the Matilija Dam Evaluation Project and the Matilija Dam Removal Feasibility Study..

Current Activities

The following is a summary of current regional board activities and strategies for dealing with point and nonpoint source pollution as well as other issues of concern in the Ventura River Watershed.

CORE REGULATORY

Continuing core regulatory activities include compliance inspections, reviewing of monitoring reports, response to complaints, and enforcement actions as needed. Key regulatory staff will continue to remain involved in the Ventura River Watershed Team for purposes of coordinating watershed activities in-house and working on any needed State of the Watershed Report updates.

Additionally, most urban areas in Ventura County, including this watershed, are implementing Best Management Practices (BMPs) under the Municipal Storm Water Permit (revised in 2000). The "Discharger" consists of the co-permittees Ventura County Flood Control District, the County of Ventura, and the Cities of Camarillo, Fillmore, Moorpark, Ojai, Oxnard, Port Hueneme, San Buenaventura, Santa Paula, Simi Valley, and Thousand Oaks. The Discharger is required to implement the Ventura Countywide Stormwater Quality Urban Impact Mitigation Plan (SQUIMP), which requires the implementation of BMPs to reduce the discharge of pollutants in storm water from new development and significant redevelopment. Other requirements of the Municipal Storm Water Permit include a public education program, an educational site inspection program for industrial and commercial facilities, program for construction sites, public agency activities, and a storm water monitoring program.

The storm water monitoring program has consisted of land-use based monitoring, receiving water and mass emission station monitoring, and bioassessment. The Discharger also participates in regional monitoring activities, such as the Storm Water Monitoring Coalition, organized by the Southern California Coastal Water Research Project. Furthermore, the Discharger participates in the development and implementation of volunteer monitoring programs in the Ventura Coastal watersheds.

The Ventura River receives municipal storm drain discharges from the City of Ojai, City of San Buenaventura (part), and unincorporated Ventura County (part).

Currently under consideration are agreements with sister agencies in regulatory-based encouragement of Best Management Practices. Most notably is the use of a GIS layer for pesticides application available from the Department of Pesticide Regulation (DPR). Reduction of pesticides identified as contaminants of concern for a watershed might be addressed through a Management Agency Agreement (MAA) with

the DPR, or through waiving adoption of waste discharge requirements on an individual basis using information gathered in databases provided by the Ventura County Agricultural Commission office.

MONITORING AND ASSESSMENT

A receiving water monitoring program is implemented by the Ojai Valley Sanitary District, supplemented by ambient or special monitoring conducted by Regional Board staff. The monitoring supports compliance evaluation, nonpoint source identification, and potential TMDL development. In conjunction with the receiving water monitoring, land-use based monitoring is done as part of the Ventura County Municipal Storm Water Program as well as bioassessment. The County's work is integrated and coordinated with citizen monitoring being conducted by the Ventura River Stream Team.

The Ventura County Environmental Health Department conducts weekly coastline bacteriological monitoring for total and fecal coliform and enterococcus at a number of stations along the Ventura County coast. There are two stations in the immediate vicinity of the Ventura River, one upcoast and one downcoast. Monitoring results are at posted at http://www.ventura.org/env_hlth/ocean.htm.

WETLANDS PROTECTION AND MANAGEMENT

The Wetlands Recovery Project has listed the Matilija Dam Removal Engineering and Design project and acquisitions for the Ventura River Parkway as high priority projects on the current workplan. The Ventura River Arundo Removal Project is also listed on the workplan. Being listed on the workplan is not a guarantee of funding however. More information about the workplan may be found at http://www.scwrp.org.

NONPOINT SOURCE PROGRAM

A priority issue is continued work to determine the scope of water quality impacts from agricultural runoff in the Region. Some agricultural activities occur in the Ventura River Watershed. Development of solutions to any impacts is also a high priority and will be a major concern of the nonpoint source program and, by extension, watershed groups which will be addressing this as well as other problems.

BASIN PLANNING

Several high priority issues were identified in the 2005 - 2007 Triennial Review which affect this watershed management area and will require Basin Planning resources. As in all watersheds, adopting TMDLs as Basin Plan amendments is required under the Consent Decree with an estimated resource need of 0.5 PY/TMDL. This is considered a currently funded activity. The ongoing Tiered Aquatic Life Uses Pilot Project may affect many watersheds in the Region. The purpose of tiered aquatic life uses (TALUs) is to have more appropriate goals for protecting aquatic life that account for these inherent physical limitations. The purpose of this pilot project is to develop more tailored water quality standards (through beneficial use designations and associated biocriteria) to protect the biological communities of semi-arid urban coastal streams and, If deemed appropriate, recommend appropriate tiered aquatic life uses for these semi-arid urban coastal streams. Other high priority issues identified by the Triennial Review common to multiple watersheds may be found in the Region-wide Section.

Review and comment on EIRs for the highest priority projects within the watershed will continue; however, there is currently no funding for this program.

WATERSHED MANAGEMENT

The Ventura County Watershed Protection District received a Proposition 50 IRWMP implementation grant of $25 million which includes as one project development of a watershed protection plan and formation of a stakeholder group.

Near-term Activities

Specific resource needs are described in the Region-wide Section of this document.

Near-term **Basin Planning** issues include addressing impacts from hydromodification and pumping, particularly in steelhead trout restoration and dam removal efforts, and developing nutrient standards for the lagoon.

Potential Long-term Activities

Grant funding to help support this largely natural watershed's natural resources will be an important component of any long-term restoration and preservation process.

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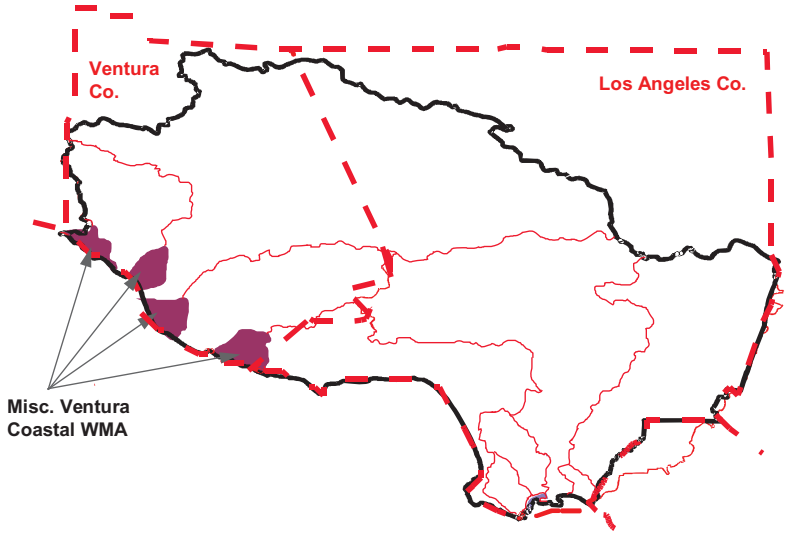
2.8 MISCELLANEOUS VENTURA COASTAL WMA

This Watershed Management Area will be targeted in FY2011/2012.

Overview of WMA

The WMA is composed of four separate coastal drainage areas located between the Regional boundary, the Ventura River, Santa Clara River, and Calleguas Creek Watersheds, as well as, the Santa Monica Bay WMA. The drainage areas are typified by either small coastal streams, wetlands, or marinas/urban centers.

Channel Islands Harbor: Channels Islands Harbor is located south of the Santa Clara River and is in the immediate vicinity of considerable residential development and some agricultural land. The Southern California Edison inlet canal to the Ormond Beach Generating Station is located at the north end of the harbor. The harbor is home to many recreational boats and two boatyards.



Port Hueneme Harbor: Port Hueneme is a medium-sized deepwater harbor located in Ventura County, north of Mugu Lagoon. Part of it was operated by a U.S. Navy Construction Battalion until very recently while the rest of the harbor serves as a commercial port operated by the Oxnard Harbor District. The construction of a majority of the harbor was completed in 1975. The commercial side generally serves ocean-going cargo vessels and oil supply boats; the latter serve the oil platforms in the Santa Barbara Channel. Two endangered bird species may use the harbor, the California Brown Pelican and the California Least Tern.

Ventura Marina: Ventura Marina is a small craft harbor located between the mouths of the Ventura and Santa Clara Rivers. It is home to numerous small boats and two boatyards. The "Ventura Keys" area of the marina is a residential area situated along three canals. The marina is surrounded by agricultural land and a large unlined ditch drains into the Keys area. Since the marina is between the mouths of two rivers which discharge large sediment loads from their relatively undeveloped watersheds, the marina has a constant problem with keeping the entrance channel open.

McGrath Lake: McGrath Lake is a small brackish waterbody located just south of the Santa Clara River. The lake is located partially on State Parks land and partially on privately-owned oilfields in current production. A number of agricultural ditches drain into the lake. A state beach is located off the coastal side of the lake. The habitat around the lake is considered to be quite unique and it is utilized by a large number of overwintering migratory birds.

Beneficial Uses in WMA

Channel Islands Harbor
Industrial service supply
Contact & noncontact water recreation
Navigation
Commercial & sportfishing
Marine habitat
Wildlife habitat

Port Hueneme Harbor
Process water supply
Contact & noncontact water recreation
Navigation
Commercial & sportfishing
Marine Habitat
Wildlife habitat

Ventura Marina
Industrial service supply
Contact & noncontact water recreation
Navigation
Commercial & sportfishing
Marine habitat
Wildlife habitat
Shellfish harvesting

Ormond Beach
Industrial water supply
Contact & noncontact water recreation
Wildlife habitat
Wetlands habitat
Protection of rare & endangered species
Navigation
Power generation
Commercial & sportfishing
Marine habitat
Shellfish harvesting

Ormond Beach Wetlands and McGrath Lake
Estuarine habitat
Contact & noncontact water recreation
Wildlife habitat
Wetlands habitat
Protection of rare & endangered species

Open Coastline: A major feature of the coastline north of Mugu Lagoon is Ormond Beach and Ormond Beach Wetlands. There are a number of scenarios under consideration for restoration of this degraded yet valuable wetlands.

Water Quality Problems and Issues

Channel Islands Harbor: The harbor is on the 2006 303(d) list for lead and zinc. During the early to mid-1980s, the State Mussel Watch Program (SMWP) found low to intermediate levels of metals and organics except for one especially high accumulation of DDT. Sediment sampling for metals conducted by Regional Board staff in 1988 revealed slightly to moderately elevated levels. Copper at one site was nearly 50 ppm and zinc was as high as 76 ppm. Arsenic was slightly elevated (4 ppm) at a sampling site located next to a drain possibly connected to a nearby agricultural field. Under the Bay Protection and Toxic Cleanup Program (BPTCP), the harbor is listed as site of concern due to DDT and silver sediment concentrations and sediment toxicity; further monitoring is needed here.

Port Hueneme Harbor: The harbor is on the 2006 303(d) list for DDT and PCBs. The SMWP found elevated levels of these parameters. An Army Corps DEIR released in 1985 covering extension of one channel stated that water quality was good. The document also briefly discussed the port's biota which CDFG found to be "fairly healthy" and typical of southern California harbors. Sediment core samples were collected in 1985 and 1996 as part of a proposed dredge project. Relatively low levels of metals were found and no pesticides were detected. It may well be that flushing is good in the harbor and only locating a station directly next to a source will result in bioaccumulation. The BPTCP found fairly minimal levels of sediment toxicity but the harbor is considered a site of concern under the program due to accumulation of DDT, PCBs, TBT, PAHs, and zinc in mussel tissue. However, more recent monitoring conducted as part of dredging projects have found much lower concentrations of many pollutants, at least in sediment.

The harbors
- One deepwater harbor and two small-craft marinas
- Accumulation of metals, PCBs, and historic pesticides in sediment and tissue
- Support considerable marine life

The wetlands and coast
- Historic pesticide contamination
- Loss of quality habitat
- Impacts from oil spills
- Use by endangered species

Ventura Marina: The marina (the Keys area) is on the 2006 303(d) list for coliform problems. The City of Ventura monitors six stations within the Keys and the nearby Arundell Barranca (open drain carrying mostly agricultural runoff) for coliform on a regular basis. There are currently ongoing discussions concerning the possibility of re-rerouting the barranca away from the marina. The SMWP has found moderately elevated levels of metals, DDT, and chlordane in the marina from sampling conducted in the late 1980s; however, it is not listed as a site of concern under the BPTCP.

McGrath Lake: The lake is on the 2006 303(d) list for several legacy pesticides. The BPTCP found varying amounts of sediment toxicity and sediment levels of many pesticides were very high; the lake is listed as a toxic hot spot due to sediment concentrations of DDT, chlordane, dieldrin, toxaphene and endosulfan above sediment quality guidelines. A major crude oil spill into the lake occurred in late 1993 and runoff from nearby agricultural fields is ongoing. A characterization study revealed the large extent to which the sediment is contaminated; however, since the likelihood of cleanup is currently low, planning for habitat restoration is proceeding on its own track.

Permitted discharges:

- 17 NPDES discharges including three major discharges (one POTW and one generating stations), 6 minor discharges, and 8 covered by general NPDES permits
- 82 dischargers covered under the industrial storm water permit
- 91 dischargers covered under the construction storm water permit

Open Coastline: Little is known of water quality in the Ormond Beach area. The Oxnard Treatment Plant discharges secondary effluent to the ocean off of Oxnard. The facility is currently investigating approaches to remove upstream brine dischargers in order to move toward water reclamation. Part of the reclaimed water is proposed for use in a seawater intrusion barrier project to protect the Oxnard Plain ground water basin. The ocean immediately off of the coast was part of Bight ’03, Bight ’98 and the 1994 Southern California Bight Pilot Project. The Ormond Beach Wetlands is being characterized as part of a wetlands restoration planning process being led by the Coastal Conservancy. New samples of water and soil have been collected and data from previous sampling efforts (mostly in relation to a scrap metal facility nearby, Halaco) are being assessed for data gaps.

The locations of facilities with discharges to surface water or to the ground (other than those covered by general industrial or construction stormwater permits) are shown in the following figure. Major NPDES discharges are from either POTWs with a yearly average flow of over 0.5 MGD, from an industrial source with a yearly average flow of over 0.1 MGD, or are those discharges with lesser flows but with potential acute or adverse environmental impacts to surface waters. Minor NPDES discharges are all other discharges to surface waters that are not categorized as a Major. Minor discharges may be covered by general NPDES permits, which are issued administratively, for those that meet the conditions specified by the particular general permit. Non-Chapter 15 discharges are those to land or groundwater such as commercial septic systems or percolation ponds that are covered by Waste Discharge Requirements, a State permitting activity. Chapter 15 discharges generally relate to land disposal (landfills) under Chapter 15 of the California Code of Regulations, again an exclusively State permitting activity.

Most of the 17 NPDES permittees in the watershed management area discharge to coastal streams; there two major NPDES discharges, a POTW and a generating station, to the ocean.

Of the 67 dischargers enrolled under the general industrial storm water permit in the watershed, the majority occur in the city of Oxnard. Many of these businesses are involved with trucking and warehousing, local and interurban passenger transit, food and kindred products, and oil and gas extraction according to their Standard Industrial Classification (SIC) codes. The locations of facilities with discharges covered by the general industrial stormwater permit are shown in the following figure.

There are 91 construction sites enrolled under the general construction storm water permit on a mix of residential, industrial, and commercial sites primarily in the Oxnard area. About one-half of the sites are five acres or larger in size on up to about 100 acres.

Land use in the four parts of this WMA trends heavily to either open space or urban uses as shown in the figure below.

The table below lists the 2006 303(d) list of water quality impairments:.

Water Quality Limited Segment Name	Pollutant
Channel Islands Harbor	Lead (sediment) Zinc (sediment)
Channel Islands Harbor Beach	Indicator bacteria
Hobie Beach (Channel Islands Harbor)	Indicator bacteria
McGrath Beach	Coliform Bacteria
McGrath Lake	Chlordane (sediment) DDT (sediment) Dieldrin (sediment) Fecal Coliform PCBs Sediment Toxicity
Ormond Beach (3 segments: J St; Oxnard Drain; Arnold Rd)	Indicator bacteria
Peninsula Beach (Area affected is beach area north of South Jetty)	Indicator bacteria

Port Hueneme Harbor (Back Basins)	DDT (tissue) PCBs
Port Hueneme Pier	PCBs
Rincon Beach (Area affected is 50 and 150 yards south of mouth of Rincon Creek, and at the end of the footpath)	Indicator bacteria
San Buenaventura Beach (4 segments/drains: Kalorama; San Jon Rd; Dover Ln; Weymouth)	Indicator bacteria
Ventura Harbor: Ventura Keys	Coliform Bacteria
Ventura Marina Jetties	DDT PCBs

CURRENTLY SCHEDULED TMDLS

- pesticides (Ventura Marina)-FY08/09
- coliform (Ventura Marina)-FY08/09

Stakeholder Group

Ormond Beach Task Force Ormond Beach is part of the Miscellaneous Ventura Coastal WMA; the area includes a somewhat degraded wetlands a large part of which has recently been acquired by the State for protection and restoration planning which has begun. The Task Force was formed in 1993 and currently meets monthly to address issues and projects which may affect the beach and wetlands.

Past Significant Activities

NONPOINT SOURCE

A recently concluded project funded by CWA Section 319(h) funds involved demonstrated advanced treatment processes of nutrients and pathogens utilizing septic systems.

MONITORING AND ASSESSMENT

SWAMP: SWAMP monitoring of the Miscellaneous Ventura Coastal Watershed Management Area occurred during FY 2005/2006. Monitoring sites included 4 sampling stations in Port Hueneme, 4 sampling stations in Ventura Marina/Ventura Keys and 5 sampling stations in Channel Islands Harbor/Mandalay Bay (benthic infaunal community, sediment chemistry, sediment toxicity), as well as a total of 17 sampling stations within coastal streams (bioassessment, water column toxicity, water column chemistry). No SWAMP monitoring of the coastal waters of the watershed management area occurred as this area has been sampled by the Bight-wide comprehensive monitoring projects conducted in 1994, 1998 and 2003.

McGrath Lake: A Consent Decree established a settlement with the responsible party in a 1993 crude oil spill. The settlement created a Trustee Council (California Department of Fish and Game, U.S. Fish and Wildlife Service, and California Department of Parks and Recreation) to determine how to spend $1.315 million targeted for natural resource restoration.

The Trustee Council formally requested assistance from the Regional Board to perform a study to characterize the water quality and sediments within the lake, as well as sources of contaminant inputs to the lake. The main objectives of the study were to determine whether it would be necessary or beneficial to dredge the lake to remove contaminated sediments, and whether it would be beneficial to spend funds on habitat improvement projects in and around the lake, given the ongoing potential contaminant inputs and uncontrolled water management activities. The Regional Board funded the characterization study (contributing $100,000) using some of the money the Board received from the oil spill settlement.

A preliminary study was conducted in August 1998 to aid in selection of sampling sites for the characterization study. The characterization study was conducted in October 1998 and included:

1) water quality measurements at several locations in the lake (temperature, dissolved oxygen, pH, and nutrient data)
2) surficial sediment samples at 10 stations in the lake will be analyzed for grain size, sediment chemistry (pesticides, petroleum hydrocarbons, metals) and sediment toxicity
3) deep sediment cores at 7 stations in the lake will be subsampled for sediment chemistry analyses
4) water column measurements at one station in an agricultural drain entering the lake (pesticides, metals, and nutrients)
5) sediment chemistry (pesticides and metals) at 2 stations in agricultural drains

WETLANDS PROTECTION AND MANAGEMENT

The Wetlands Recovery Project has funded an acquisition project in the WMA, the Ormond Beach Edison Acquisition.

Current Activities

CORE REGULATORY

Continuing core regulatory activities that will be integrated into the watershed management approach include (but are not limited to) necessary renewal/revision of NPDES permits. Compliance inspections, review of monitoring reports, response to complaints, and enforcement actions relative to the watershed's NPDES permits will continue.

Additionally, most urban areas in Ventura County, including this watershed, are implementing Best Management Practices (BMPs) under the Municipal Storm Water Permit (revised in 2000). The "Discharger" consists of the co-permittees Ventura County Flood Control District, the County of Ventura, and the Cities of Camarillo, Fillmore, Moorpark, Ojai, Oxnard, Port Hueneme, San Buenaventura, Santa Paula, Simi Valley, and Thousand Oaks. The Discharger is required to implement the Ventura Countywide Stormwater Quality Urban Impact Mitigation Plan (SQUIMP), which requires the implementation of BMPs to reduce the discharge of pollutants in storm water from new development and significant redevelopment. Other requirements of the Municipal Storm Water Permit include a public education program, an educational site inspection program for industrial and commercial facilities, program for construction sites, public agency activities, and a storm water monitoring program.

The storm water monitoring program has consisted of land-use based monitoring, receiving water and mass emission station monitoring, and bioassessment. The Discharger also participates in regional monitoring activities, such as the Storm Water Monitoring Coalition, organized by the Southern

California Coastal Water Research Project. Furthermore, the Discharger participates in the development and implementation of volunteer monitoring programs in the Ventura Coastal watersheds.

The Miscellaneous Ventura Coastal WMA receives municipal storm drain discharges from the City of Oxnard (part), City of Port Hueneme, and City of San Buenaventura (part).

MONITORING AND ASSESSMENT

The monitoring needs in this WMA include staff to evaluate coastal receiving water data, sediment data analysis and interpretation, resources to integrate surface and ground water data, and resources to evaluate other information (e.g., pesticide and fertilizer use databases as well as those for grower/crop and crop timing).

McGrath Lake: The characterization study previously conducted demonstrated widespread sediment contamination throughout most of the lake, including high concentrations of several trace metals and pesticides. Due to likely long delays in adequate funding for cleanup of contaminated sediments, the Trustee has decided to proceed with restoration planning and released a draft restoration plan in summer 2004.

Shoreline: Beginning in 1999, a new law (AB411) requires public health officials in coastal counties to conduct weekly testing, between April 1 and October 31, at beaches visited annually by more than 50,000 people and at adjacent storm drains (including natural creeks, streams, and rivers, that flow during the summer. Due to the popularity of Ventura County beaches for year-round activities, the Ventura County Board of Supervisors authorized the implementation of a program that expanded the monitoring program to all 12 months of the year. Ventura County Environmental Health Department conducts weekly surf zone sampling at 52 beach locations for total and fecal coliform and enterococcus. Data will be reviewed by the Regional Board and used to assess current conditions of Ventura County beaches for future 305(b) reports. Monitoring results are at posted at http://www.ventura.org/env_hlth/ocean.htm.

Open Coastline: Our source of data for the coastal areas comes chiefly from the one POTW and two generating stations which discharge offshore as well as regional data from Bight'98 and the 1994 SCBPP. These data support compliance evaluation.

WETLANDS PROTECTION AND MANAGEMENT

The Wetlands Recovery Project has listed additional acquisitions in the Ormond Beach Wetlands area and preparation of a restoration plan as priority projects for funding on the current workplan. Development of the restoration plan is underway. Being listed on the workplan is not a guarantee of funding however. More information about the workplan may be found at http://www.scwrp.org.

BASIN PLANNING

Several high priority issues were identified in the 2005 - 2007 Triennial Review which affect this watershed management area and will require Basin Planning resources. As in all watersheds, adopting TMDLs as Basin Plan amendments is required under the Consent Decree with an estimated resource need of 0.5 PY/TMDL. This is considered a currently funded activity. The ongoing Tiered Aquatic Life Uses Pilot Project may affect many watersheds in the Region. The purpose of tiered aquatic life uses (TALUs) is to have more appropriate goals for protecting aquatic life that account for these inherent physical

limitations. The purpose of this pilot project is to develop more tailored water quality standards (through beneficial use designations and associated biocriteria) to protect the biological communities of semi-arid urban coastal streams and, If deemed appropriate, recommend appropriate tiered aquatic life uses for these semi-arid urban coastal streams. Other high priority issues identified by the Triennial Review common to multiple watersheds may be found in the Region-wide Section.

Review and comment on EIRs for the highest priority projects within the watershed will continue; however, there is currently no funding for this program.

NONPOINT SOURCE PROGRAM

We are encouraging application for Proposition 13 funding for use in preparation of a watershed management plan for this watershed management area.

Groundwater

The Oxnard Forebay is a prime groundwater recharge area that is impacted by nitrogen discharges, mainly from densely populated communities using septic systems, and agricultural areas. The Regional Board undertook a study of septic systems in the area during FY98/99; in August 1999 the Board adopted a Basin Plan amendment to prohibit septic systems in the Oxnard Forebay. The amendment immediately prohibits the installation of new septic systems or the expansion of existing septic systems on lot sizes of less than five acres. Discharges from septic systems on lot sizes of less than five acres must cease by January 1, 2008. This prohibition will affect up to 3,000 septic systems and ten to fifteen thousand people. The County of Ventura has applied for Small Community Grant funding to provide adequate sewage treatment on behalf of the Saticoy and El Rio communities.

Another **319(h)** project is underway which also involves septic tanks. This project involves the evaluation of several systems for nutrient removal.

A well head protection and demonstration project in the Fox Canyon Groundwater Management Area is being funded with **319(h)** monies. This project is destroying disused drinking water wells which may serve as a conduit for contamination to reach the deep water aquifer.

Currently under consideration are agreements with sister agencies in regulatory-based encouragement of Best Management Practices. Most notably is the use of a GIS layer for pesticides application available from the Department of Pesticide Regulation (DPR). Reduction of pesticides identified as contaminants of concern for a watershed might be addressed through a Management Agency Agreement (MAA) with the DPR, or through waiving adoption of waste discharge requirements on an individual basis using information gathered in databases provided by the Ventura County Agricultural Commission office.

Marinas

There are a number of marinas in this WMA, all with well-documented levels and types of pollution consistent with nonpoint sources. We have initiated enforcement actions on several commercial fishing operations to ensure compliance with state discharge requirements. We will be focusing our 319(h) priorities for the upcoming application period on a number of areas of concern in the Region including development of education and outreach programs and implementation of management measures which are intended to reduce pollution from these nonpoint sources in marinas. A particular area of concern in Port Hueneme has been management of squid wastes from fishing vessels.

Near-term Activities

Specific resource needs are described in the Region-wide Section of this document.

A preliminary review of resources for core regulatory activities against cost factors has determined that our region is seriously underfunded for our baseline program. We will be seeking more funding for our core program activities.

Most watershed programs look to the Regional Board as the information management agency for the collected data. To meet that need, we require additional resources related to data management and interpretation. Some of the expenditures under NPDES support the monitoring that will ultimately be used to identify and quantify nonpoint source inputs.

We will maintain involvement with stakeholder activities and pursue funding options, especially those involving implementation of nonpoint source measures as well as other outreach activities such as speeches, meetings, and participation in environmental events. With additional resources we propose conducting a number of education and outreach activities including holding regional workshops and conferences with other Regional Boards as well as experts in the field, contacting marina operators individually, and offering an incentives program.

Potential Long-term Activities

Arundell Barranca: The Regional Board staff have been approached by the City of San Buenaventura for input on a potential project to re-route the Arundell Barranca from Ventura Harbor to the Santa Clara River estuary. The proposal calls for a constructed wetlands near the estuary to treat the Barranca's water before entering the Santa Clara River. The project is proposed as a method of dealing with periodic coliform exceedances in areas of the Ventura Harbor/Ventura Keys.

Seawater Intrusion into the Oxnard Plain: The City of Oxnard is attempting to remove high TDS inputs to their treatment plant with the ultimate goal of reuse of the wastewater for a seawater intrusion barrier project in the Oxnard Plain.

Implementation of watershed-wide biological monitoring: This is a long-term goal for all of our watersheds.

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Section 3 . Regionwide Activities

There are many activities conducted at the Regional Board which do not apply to a specific watershed; instead they represent ongoing regionwide strategies and policies, or programs which are not directly linked to the rotating watershed cycle. Also, statutory, regulatory, or funding requirements may dictate completion of some activities at odd intervals throughout the five-year watershed cycle (such as increased emphasis on pretreatment inspections). We expect that some of these activities, which include triennial reviews, water quality assessment (305(b)) reports, updating lists of impaired waterbodies (e.g. the federal 303(d) list), can be negotiated into a watershed. See the table below for more examples of watershed versus non-watershed related activities.

Watershed Tasks	*Non-Watershed Tasks*
Renew permits	Issue new permits
	Develop new general permits
Integrate municipal storm water program	Issue individual industrial and storm water permits
Conduct inspections for watershed permits	Conduct inspections on new permits
Enforcement (in-cycle compliance)	Enforcement (spills, out of cycle compliance)
Implement NPS controls	Develop regional strategies to address NPS problems
TMDL/WLAs	
Develop, coordinate and implement watershed monitoring	Coordinate monitoring on a regional scale
Water Quality Assessments (State of the Watershed Reports, partial updates to 305(b) by watershed)	Biennial 305(b) Reports to USEPA
Develop watershed policies	Develop regional policies
Watershed-specific Basin Plan Updates	Regional Basin Plan Updates, Triennial Reviews
Data management (input and use by watershed)	Regional Database management
GIS (input of watershed-specific layers and information)	GIS (development and input of regional layers and Maintenance of system)
Watershed-specific outreach/education	General outreach education
Incorporation of CEQA and 401 Decisions into watershed planning (as groups are formed, and as timing permits)	Timely review of CEQA documents, 401 certifications per statutory deadlines

And, while the Watershed Management Initiative strives to integrate and coordinate the various Regional and State Board programs and address the highest priority funding needs for those programs, there is also need to respond to and accommodate priorities established by the individual Regional and State Boards' members, priorities established prior to the WMI which run on their own timelines, or other new mandates which may affect the way the WMI is implemented in a Region. It is important to re-state here that the WMI is not a new program but rather a way to describe our approach to integrating existing and newly evolving programs and mandates. The following describes our overall approach to implementing a number of programs (some statewide mandates) and other Board priorities.

Core Regulatory

One activity involves renewing individual permits in a timely fashion. General permits (see below) are also renewed to incorporate Basin Plan amendments and fine-tune other requirements. Other activities include inspections and audits. Major NPDES dischargers are inspected at least once per year while minor dischargers are inspected at least once during the life of the permit. There are twelve POTWs with pretreatment programs which are either inspected or audited once per year. The twelve programs are: Burbank, Camarillo SD, Las Virgenes MWD, Los Angeles CSD, City of Los Angeles, Ojai Valley SD, Oxnard, San Buenaventura, Simi Valley CSD, Thousand Oaks, Moorpark WTP, and Santa Paula. Major discharges are POTWs with a yearly average flow of over 0.5 MGD or an industrial source with a yearly average flow of over 0.1 MGD and those with lesser flows but with acute or potential adverse environmental impacts. Minor discharges are all other discharges that are not categorized as a Major. Minor discharges may be covered by a general permit, which are issued administratively, for those that meet the conditions specified by the particular general permit.

Another activity which has taken up considerable time, and contributes to backlogged permits, is responding to appeals and lawsuits. At issue for a number of permits is a lack of regional nutrient objectives which has translated into a lack of permit limitations and subsequent petitions and/or lawsuits. Ideally, TMDLs would be adopted in the year proceeding permit renewals for a particular watershed. Permit limitations could then be based on allocations from the TMDLs. Also ideally, we would have state-adopted water quality objectives (or an implementation plan for federal numbers) or ecologically-relevant regional objectives for parameters such as nitrogen and phosphorus to use for development of permit limitations. Nutrient objectives will likely be available in the near future but, in the meantime, we continue to experience challenges to their absence.

Core Regulatory – Region 4 General Permits

There are many dischargers in this Region covered by general permits for discharges to surface water through a letter issued by the Executive Officer. This activity occurs as often outside as within the watershed cycle. 40 CFR §122.28 provides for issuance of general permits to regulate a category of point sources if the sources:

a) Involve the same or substantially similar types of operations;

b) Discharge the same type of waste;

c) Require the same type of effluent limitations or operating conditions;

d) Require similar monitoring; and

e) Are more appropriately regulated under a general permit rather than individual permits.

General NPDES permits currently in effect include:

- NPDES Permit No. CAG914001 – for discharges of treated volatile organic compound contaminated groundwater to surface waters (threat/complexity rating 2B)

- NPDES Permit No. CAG994004 – for discharges of groundwater (treated or untreated) from construction and project dewatering to surface waters (threat/complexity rating to be determined)

- NPDES Permit No. CAG994005 – for discharges of groundwater from potable water supply wells to surface waters (threat/complexity rating to be determined)

- NPDES Permit No. CAG674001 – for discharges of low-threat hydrostatic test water to surface waters (threat/complexity rating 3C)

- NPDES Permit No. CAG834001 – for discharges of treated groundwater and other wastewaters from investigation and/or cleanup of petroleum fuel pollution to surface waters (threat/complexity rating 2B)

- NPDES Permit No. CAG994003 – for discharges of nonprocess wastewaters not requiring treatment systems to surface waters (threat/complexity rating 3C)

As a point of comparison, the highest threat/complexity rating is 1A and the lowest 3C.

General waste discharge requirements currently in effect include:

- Order No. R4-2007-0019 and Resolution No. R07-001 – groundwater remediation at petroleum hydrocarbon fuel, volatile organic compound and/or hexavalent chromium impacted sites

- Order No. R4-2004-0146 – waste discharge requirements for residential onsite wastewater treatment systems

- Order No. 01-031 – small commercial and multifamily residential subsurface sewage disposal systems

- Order No. 93-010 – specified discharges to groundwater in Santa Clara River and Los Angeles River Basins. Examples of the activities leading to a discharge of water that, because of its characteristics, results in little or no pollution when discharged to groundwater include: hydrostatic testing of tanks, pipes, and storage vessels; construction dewatering; dust control application; water irrigation storage systems, subterranean seepage dewatering; well development and test pumping; aquifer testing; and monitoring well construction.

- Order No. 91-94 – private subsurface sewage disposal systems in areas where groundwater is used or may be used for domestic purposes

- Order No. 91-93 – discharge of non-hazardous contaminated soils and other waste in Los Angeles and Santa Clara River Basins

Core Regulatory – State Board General Permit

In 2001, State Board adopted a general NPDES permit (NPDES Permit No. CAG990003) for discharges of aquatic pesticides. The permit covers the uses of properly registered and applied aquatic pesticides; it does not cover indirect or nonpoint source discharges from agricultural or other applications of pesticides to land that may be conveyed in storm water or irrigation runoff. It also does not cover applications of pesticides that are not registered for use on aquatic sites.

Although Notices of Intent (NOIs) to be covered under this general permit will be handled by State Board, the Regional Board is responsible for approving monitoring plans, reviewing monitoring reports, conducting compliance inspections, and conducting any appropriate enforcement actions.

Core Regulatory – Storm Water

Storm water activities include those involving the three municipal permits in the Region, facilities regulated under the State's general industrial permit, and construction sites regulated under the State's general construction permit.

Municipal permits

Municipal storm water regulations at 40CFR 122.26 require that pollutants in storm water discharges be reduced to the maximum extent practicable (MEP). The definition of MEP has generally been applied to mean implementation of controls to reduce the discharge of pollutants to the maximum extent practicable using appropriate management practices, control techniques and system, design and engineering methods. Municipalities are required to implement or require the implementation of the most effective combination of BMPs for storm water/urban runoff pollution control.

Municipal permits currently in effect include:

- NPDES Permit No. CAS004003 – adopted in 1999 this is the permit for municipal storm water and urban runoff discharges within the city of Long Beach

- NPDES Permit No. CAS004002 – adopted in 2000 this is the permit for municipal storm water and urban runoff discharges within the Ventura County Flood Control District, county of Ventura, and cities of Ventura County

- NPDES Permit No. CAS004001 – revised in 2001 (and amended in 2006 and 2007) this is the permit for municipal storm water and urban runoff discharges within the county of Los Angeles

An important part of the municipal permits (Los Angeles County and City of Long Beach) are the Standard Urban Storm Water Mitigation Plans (SUSMPs) and numerical design standards for Best Management Practices (BMPs) which were adopted on March 8, 2000 and implemented by municipalities beginning in February 2001. The SUSMPs are designed to ensure that storm water pollution is addressed in one of the most effective ways possible, i.e., by incorporating BMPs in the design phase of new development and redevelopment. It provides for numerical design standards to ensure that storm water runoff is managed for water quality and quantity concerns. The purpose of the SUSMP requirements is to minimize, to the maximum extent practicable, the discharge of pollutants of concern from new development and redevelopment.

The numerical design standard is that post-construction treatment BMPs be designed to mitigate (infiltrate or treat) storm water runoff from the first ¾ inch of rainfall, prior to its discharge to a storm water conveyance system. Other standards also apply; additional information on the SUSMP may be found on the Regional Board Storm Water website at http://www.waterboards.ca.gov/losangeles/html/programs/stormwater/susmp/susmp_details.html.

The Ventura County Municipal Storm Water Permit co-permittees are required to implement similar requirements under the Ventura Countywide Stormwater Quality Urban Impact Mitigation Plan (SQUIMP). The SQUIMP similarly addresses conditions and requirements for new development and significant redevelopment.

Monitoring has indicated that mass emissions of pollutants to the ocean are significant from the urban watersheds such as the Los Angeles River, Ballona Creek, and Coyote Creek. Studies have found chemical concentrations of pollutants that exceed state and federal water quality criteria in storm drains

flowing to the ocean and that beach water quality standards for bacteria indicators (Assembly Bill 411) are often exceeded. The presence of these high levels of bacteria indicate the existence of other pathogenic microorganisms that pose a health risk to humans. A 1996 epidemiological study, conducted by USC under the direction of the Santa Monica Bay Restoration Project, confirmed that swimming in water with significant concentrations of bacteria indicators increases the potential for contracting illnesses, such as stomach flu, ear infection, upper respiratory infection or major skin rash.

Industrial permit

The 1987 amendments to the Clean Water Act established a framework for regulating municipal and industrial storm water discharges under the NPDES Program. In 1990, the USEPA published final regulations that established application requirements for storm water permits. The regulations require that storm water associated with industrial activity that discharges either directly to surface waters or indirectly through municipal storm drains must be regulated by an NPDES permit.

State Board adopted the Industrial Activities Storm Water General Permit in 1997 (Order 97-03-DWQ). The permit requires facility operators to (1) eliminate unauthorized nonstorm water discharges through implementation of management measures that will achieve the performance standard of best available technology economically achievable (BAT) and best conventional pollutant control technology (BCT), (2) develop and implement a Storm Water Pollution Prevention Plan (SWPPP), and (3) perform monitoring of storm water discharges and authorized nonstorm water discharges. Facility operators may be able to participate in group monitoring program. Facilities that discharge storm water associated with industrial activity requiring a General Permit are listed by category in the Code of Federal Regulations. These categories include manufacturing, mining/oil, recycling, steam electric generating, and light industry, among others. There are approximately 2,800 facilities in this Region covered by the general industrial permit. Most of these sites are in the Los Angeles River Watershed with the San Gabriel River Watershed and the Dominguez Channel and LA/LB Harbor WMA also containing a considerable number. There has been a general increase in the number of facilities covered by the permit over time. More information about the permit may be found at http://www.waterboards.ca.gov/losangeles/html/programs/stormwater/sw_industrial.html.

Construction permit

In 1990, USEPA published final regulations that establish storm water permit application requirements for specified categories of industries. The regulations provide that discharges of storm water to waters of the United States from construction projects that encompass five or more acres of soil disturbance are effectively prohibited unless the discharge is in compliance with an NPDES permit.

State Board adopted a general permit for storm water discharges associated with construction activity in 1999 (State Board order No. 99-08-DWQ). It contains narrative effluent limitations and requirements to implement appropriate Best Management Practices (BMPs) which emphasize source controls. Dischargers from sites of one acre in size or larger are required to be covered by the construction stormwater permit.

Elimination or reduction of nonstorm water discharges is a major goal of the general permit. It prohibits the discharge of materials other than storm water and authorized nonstorm water discharges. It also requires development of a Storm Water Pollution Prevention Plan (SWPPP) and monitoring program.

There are approximately 2,680 sites covered under the construction storm water permit as of October 2007; this is almost twice the number covered at the time of the 2004 update of the WMI Chapter. The majority of sites are in the Los Angeles River Watershed (759), up from 456 sites three years ago. The San Gabriel River Watershed also has a large number of construction sites at 446 as well as the Santa Monica Bay Watershed Management Area (401), and Santa Clara River Watershed (367). About half of the sites in most watersheds are at least 5 acres or larger with some sites up to 1,000 acres in size.

The Construction General Permit was modified in 2001 by State Board Resolution No. 2001-046. The modifications require that a sampling and analysis strategy and sampling schedule for discharges from construction activity be developed and included in projects' Storm Water Pollution Prevention Plans. Additional information may be found on the Regional Board Storm Water website at http://www.waterboards.ca.gov/losangeles/html/programs/stormwater/sw_construction.html.

Monitoring and Assessment

Surface Water Ambient Monitoring Program: California Water Code Section 13192 required the SWRCB to assess and report on the State monitoring programs and to prepare a proposal for a comprehensive surface water quality monitoring program. It was envisioned that implementation of the Surface Water Ambient Monitoring Program (SWAMP) would utilize a scientifically-sound monitoring design with meaningful indicators of the environment and the results would be readily available to the public.

Ambient monitoring serves as a measure of the overall quality of water resources and the overall effectiveness of Regional Boards prevention, regulatory, and remedial actions, and the SWAMP is intended to meet four goals:

1) Identify specific problems preventing the SWRCB, RWQCBs, and the public from realizing beneficial uses in targeted watersheds.

2) Create an ambient monitoring program that addresses all hydrologic units of the State using consistent and objective monitoring, sampling and analysis methods; consistent data quality assurance protocols; and centralized data management.

3) Document ambient water quality conditions in potentially clean and polluted areas.

4) Provide the data to evaluate the effectiveness of water quality regulatory programs in protecting beneficial uses of waters of the State.

Each of the pre-existing SWRCB and RWQCBs existing monitoring programs (e.g., the State Mussel Watch Program, Toxic Substances Monitoring Program, Coastal Fish Contamination Program, and toxicity studies) have been incorporated into SWAMP to ensure a coordinated approach without duplication.

During the first five years of the SWAMP, we focused on monitoring each of our 10 watersheds. Due to funding constraints, we spent most of our funding allocation on monitoring of wadeable streams, relying upon a triad of indicators to assess whether the aquatic life beneficial use was being supported (benthic macroinvertebrate community, water column toxicity, water column chemistry [primarily conventional pollutants, such as nitrates and phosphates]). At a small subset of sampling stations (integrator or

confluence sites), trace metal and trace organic analyses, bioaccumulation sampling and sediment chemistry/sediment toxicity analyses were conducted.

The review of SWAMP conducted by the Scientific Planning and Review Committee (SPARC) in 2005 concluded that SWAMP had focused too much on regional issues during its first five years and that there was too much inconsistency between the regional monitoring designs to allow monitoring results to be integrated into a meaningful statewide assessment. Consequently, SWAMP is shifting its focus to ensure the development of robust statewide monitoring programs to assess three categories of beneficial uses (recreational use, fishing uses, aquatic life support) for each of the six major waterbody types present in the state (ocean waters, estuaries, lakes/reservoirs, large rivers, wadeable streams, wetlands). At the same time, SWAMP intends to continue to provide some funding to allow the Regional Boards to conduct local monitoring (but possibly at a reduced level compared to previous years).

It is impossible for SWAMP to develop 18 statewide monitoring programs all at once with the current level of funding. Therefore, SWAMP has decided to focus on two high priority issues: aquatic life protection in wadeable streams and fishing uses in lakes and reservoirs. Once statewide monitoring programs have been designed and implemented for these 2 areas, SWAMP will develop a plan to address the remaining monitoring needs.

The Nonpoint Source Program has been supporting a wadeable stream program based on a randomized design for the past five years (California Monitoring and Assessment Program, or CMAP), and most of the regional boards have been conducting bioassessment monitoring in wadeable streams (although most have employed targeted, rather than randomized, sampling designs), so SWAMP simply plans to expand the scope of CMAP into a more comprehensive statewide program (Perennial Streams Survey). Design of the statewide program still is underway, but plans call for approximately 500 random stations to be sampled statewide each year plus a smaller number of targeted integrator sites. Concurrently, the Stormwater Monitoring Coalition (SMC) is developing a monitoring plan for Southern California (Regions 4, 8 and 9), which also would be based on a random design of 510 stations within 17 watershed management areas to be sampled over a 5-year period, plus a small number of integrator sites. The Statewide Perennial Streams Survey and the SMC monitoring are scheduled to commence in 2008.

Under the old Toxic Substances Monitoring Program, many of the Regional Boards conducted bioaccumulation sampling of fish from lakes and reservoirs, but without a coordinated design. SWAMP's Bioaccumulation Oversight Group is nearing completion on a statewide monitoring program, based on a randomized design, which is scheduled to commence in spring 2007. Approximately 200 of the most popular fishing lakes where anglers consume their catch will be sampled in 2007 and 2008, targeting a predator species (preferably largemouth bass) and a bottom feeder (preferably catfish). During 2007, fifty of the lakes in the other category will be sampled randomly. The statewide program should provide a useful framework for implementing this type of sampling in the Los Angeles Region where we have identified 31 lakes and reservoirs that meet these criteria. We propose to sample these 31 lakes in our region so that we can assess this significant issue for all of our fishable lakes. The statewide design still is under development, but it appears that additionally several of our lakes would be sampled via the random station draw.

Bight monitoring of ocean waters conducted in 1994, 1998, 2003 has provided sufficient data to assess recreational use of coastal waters (1998 survey included a randomized sampling design to assess shoreline conditions) and aquatic life protection (all three surveys), and the study planned for 2008 probably will

include fishing uses as well. Therefore, we have not needed to expend SWAMP resources for this type of monitoring.

As SWAMP develops statewide monitoring programs for other waterbody/beneficial use combinations, we expect to contribute a portion of our regional allocation to expand the monitoring effort within the Los Angeles Region. SWAMP currently is assessing the need for a statewide monitoring program focused on recreational use in wadeable streams. Once the design for the bioaccumulation study in lakes and reservoirs has been completed, the SWAMP Bioaccumulation Oversight Group will consider the need for statewide programs to assess fishing uses in ocean waters, estuaries, large rivers, wadeable streams and wetlands.

The U.S. Environmental Protection Agency (USEPA) will be conducting a national lake study during 2007, which includes 21 lakes in California. SWAMP concluded that it would not be useful to augment that study with SWAMP funds (due to funding constraints and monitoring design issues). However, SWAMP is interested in developing a statewide monitoring program to assess recreational use and aquatic life protection in lakes and reservoirs. That effort probably will occur in 2008 or later, after we have reviewed the results of the EPA study.

The table below summarizes the monitoring programs underway or under development. Many gaps still exist, as evidenced by the blanks in the table. As SWAMP develops statewide monitoring programs for other waterbody/beneficial use combinations, we expect to contribute a portion of our regional allocation to expand the monitoring effort within the Los Angeles Region. SWAMP currently is assessing the need for a statewide monitoring program focused on recreational use in wadeable streams. Once the design for the bioaccumulation study in lakes and reservoirs has been completed, the SWAMP Bioaccumulation Oversight Group will consider the need for statewide programs to assess fishing uses in ocean waters, estuaries, large rivers, wadeable streams and wetlands.

Waterbody Type	Recreational Use (e.g., is it safe to swim)	Fishing Uses (e.g., is it safe to eat seafood)	Aquatic Life Protection
Ocean	Bight 94, Bight 98, Bight 03, AB 411 monitoring, shoreline monitoring network for Santa Monica Bay	Coastal Fish Contamination Program 1999-2001; Probably will be added to Bight 08	Bight 94, Bight 98, Bight 03, Bight 08
Estuaries		Coastal Fish Contamination Program 1999-2001; Probably will be added to Bight 08 for certain estuaries	Bight 94, Bight 98, Bight 03, Bight 08
Lakes/Reservoirs	SWAMP may develop statewide design in future	SWAMP statewide monitoring in 2007/2008	EPA Lake Study in 2007, SWAMP statewide design expected in near future
Large Rivers	None in Region 4	None in Region 4	None in Region 4
Wadeable Streams	SWAMP may develop statewide design in future	SWAMP statewide design expected in near future	SWAMP statewide monitoring in 2008; Stormwater Monitoring Coalition Monitoring in 2008
Wetlands			Probably will be added to Bight 08 for coastal wetlands; SWAMP statewide monitoring in 2008 will provide some assessment of riparian habitat in wadeable streams

Another major focus of SWAMP, per SPARC recommendations, will be to leverage other monitoring program resources to augment the limited SWAMP funds. The Regional Board already has done this very successfully with the San Gabriel Watershed Regional Monitoring Program. To help get the program started, we subsidized about half of the 2005 monitoring program with funds from our SWAMP allocation (the other half came from dischargers, EPA, SCCWRP, and volunteers), but the 2006 sampling was conducted without financial assistance from SWAMP and the program now is self-sufficient and will be conducting coordinated and integrated regional monitoring of wadeable streams each year. Our goal is to facilitate the implementation of similar programs in other watersheds, namely Calleguas Creek, Ventura River, Santa Clara River, Malibu Creek, Ballona Creek, Los Angeles River and Dominguez Channel. By taking advantage of existing monitoring required by POTWs and stormwater dischargers, TMDL-mandated monitoring, and volunteer monitoring programs, we hope to redesign monitoring programs and reallocate existing resources to create self-sufficient regional monitoring programs. However, these programs may require some contribution of SWAMP funds from our regional allocation to get started or to continue monitoring.

Coastal Fish Contamination Program: Governor Wilson's Executive Order W-162-97 (issued October 8, 1997) required Cal/EPA to inventory existing ocean and coastal water quality monitoring programs and make recommendations for a comprehensive program for monitoring water quality and reducing pollution within coastal watersheds, bays, estuaries, lagoons and nearshore ocean waters. The State Water Resources Control Board was assigned the responsibility to implement this mandate (funded by AB 1581 and AB 1429). SB 753 required the SWRCB to establish a statewide monitoring program to assess human health risks associated with recreational fishing and seafood consumption. A screening study was initiated during 1999 to assess approximately ten sites and supplement the information already available

for Santa Monica Bay. However, oceanic conditions associated with an El Nino event precluded adequate collection of fish samples during 1999, so the screening study was extended into 2000. Sampling during 2001 and 2002 was geared towards collecting additional data for areas where fish tissue contamination levels were high. The ultimate goal was to develop a regional (Region 4 coastline, not just Santa Monica Bay) sampling program, which would keep most of the original framework created by the Bay Restoration Project, but expand it throughout the region. An inventory of coastal water quality monitoring programs has been prepared for Southern California with the assistance of SCCWRP; it can be accessed at: http://www.sfei.org/camp. This program is now under the auspices of SWAMP.

State Mussel Watch/Toxic Substances Monitoring Programs (SMW/TSMP): Water column monitoring for toxic substances can be unreliable since toxic substances are often transported intermittently and can be missed with standard "grab" sampling of water. In addition, harmful levels of toxicants are often present in such low concentrations that detecting them can be difficult and expensive. In some cases, a more realistic and cost-effective approach is to test the flesh of fish and other aquatic organisms that bioaccumulate these compounds in their tissues and concentrate toxicants through the food web.

In 1977, two biomonitoring programs were initiated by State Board: the Toxic Substances Monitoring and State Mussel Watch Programs. The Los Angeles Region is active in both programs which are implemented jointly by the State Board and the California Department of Fish and Game. Tissue samples collected under the TSMP are usually fish but can also include benthic invertebrates. The tissue is analyzed for trace metals and synthetic organic chemicals. The fish are generally collected from inland fresh waters but are occasionally collected from estuaries. The SMWP provides similar documentation of the quality of coastal marine and estuarine waters. Mussels, which are sessile (attached) bivalve invertebrates, serve as indicator organisms and provide a localized measurement of water quality, as they accumulate trace metals and synthetic organic chemicals in their tissues. Mussels are generally transplanted into the test site from "clean" areas of the state (generally Bodega Bay) although occasionally local, "resident" mussels are collected. Other types of shellfish can be used at times and sediments have, at times, been collected. The focus of TSMP sampling in the region has tended to be trend monitoring while the SMWP has been used more for "hot spot" identification although with lesser resources available in recent years, the SMWP has moved away from hot spot identification in favor of long-term trend monitoring at fewer sites in recent years. Data from these two programs have been critical in determining beneficial use impairments in coastal waters. These programs are now under the auspices of SWAMP; their data may be found on the State Board's website at: http://www.waterboards.ca.gov/swamp/mussel_watch.html .

Basin Planning

Water Quality Legislation

The Porter-Cologne Water Quality Control Act (California Water Code) was enacted by the State in 1969 and became effective January 1, 1970. This legislation authorizes the State Board to adopt, review, and revise policies for all waters of the state and directs the Regional Boards to develop regional Basin Plans.

The Clean Water Act (CWA), enacted by the federal government in 1972, was designed to restore and maintain the chemical, physical, and biological integrity of the Nation's waters. One of the national goals states that wherever attainable, water quality should provide for the protection and propagation of fish, shellfish, and wildlife, and provide for recreation in and on the water (i.e., fishable, swimmable). The

CWA directs states to establish water quality standards for all "waters of the United States" and review and update such standards on a triennial basis.

The USEPA has delegated responsibility for implementation of portions of the CWA to the State and Regional Boards, including water quality planning and control programs such as the National Pollutant Discharge Elimination System (NPDES).

Besides state and federal laws, several court decisions provide guidance for basin planning. One decision reaffirmed the public trust doctrine, holding that the public trust is "an affirmation of the duty of the state to protect the people's common heritage in streams, lakes, marshlands, and tidelands, surrendering that right of protection only in rare cases when the abandonment of that right is consistent with the purposes of the trust." Public trust encompasses uses of water for commerce, navigation, fisheries, and recreation.

Basin Plans

Regional Board Basin Plans are designed to preserve and enhance water quality and protect the beneficial uses of all regional waters by providing consistent long-term standards and program guidance for the Region. Specifically, Basin Plans (i) designate beneficial uses for surface and ground waters, (ii) set narrative and numerical objectives that must be attained or maintained to protect the designated beneficial uses and conform to the state's antidegradation policy, and (iii) describe implementation programs to protect all waters in the Region. In addition, Basin Plan incorporate (by reference) all applicable State and Regional Board plans and policies and other pertinent water quality policies and regulations. A copy of the Basin Plan may be found at http://www.waterboards.ca.gov/losangeles/html/meetings/tmdl/Basin_plan/basin_plan.html .

As part of the State's Continuing Planning Process, components of Basin Plans are reviewed as new data and information become available or as specific needs arise. Comprehensive updates of Basin Plans occur in response to state and federal legislative requirements and as funding becomes available. State Board and other governmental entities' (federal, state and local) plans, that can affect water quality, are incorporated into the planning process. Following adoption by Regional Boards, the Basin Plans and subsequent amendments are subject to approval by the State Board, the State Office of Administrative Law (OAL), and the United States Environmental Protection Agency (USEPA).

Basin Plan Amendments

Basin Plan amendments will be completed periodically as new standards, policies, and other information are developed. TMDLs will also be adopted as Basin Plan amendments and will generate a significant workload over the next 13 years. We also anticipate that watershed efforts utilized, in part, to accomplish TMDLs will identify other possibilities for Basin Plan studies and amendments (e.g., new or revised standards, new policies).

A Basin Plan amendment updating municipal and domestic water supply designations was brought to the Board for consideration in late 1998. In November 1998, the Regional Board voted to amend the Water Quality Control Plan for the Los Angeles Region (Basin Plan), by adopting a resolution to "Incorporate Changes in Beneficial Use Designations for Selected Waters." This amendment removed the beneficial use designation for "Municipal and Domestic Supply" (MUN) from eight surface waters and two ground water areas along the coast. The State Board voted to approve this amendment at the February 1999 Board hearing, however, in July 1999, the State Office of Administrative Law (OAL) issued a

Notification of Disapproval due to a number of details including our responses to comments. The Regional Board resubmitted groundwater portion of the amendment, which was approved by OAL in 2000.

In 1990, the Regional Board adopted Resolution No. 90-004 (Drought Policy) which had a term of three years and provided interim relief to dischargers who experienced difficulty meeting chloride objectives because of a state-wide drought. The policy adjusted effluent limits to the lesser of 1) 250 mg/l or 2) the chloride concentration in the water supply plus 85 mg/l. In 1995, the Regional Board extended the interim limits for three years and directed staff to develop a long-term solution to deal with the impact of changing water supply, especially during droughts. In 1997, the Regional Board adopted Resolution No. 97-002 (Chloride Policy) which amended the Basin Plan by setting the chloride objective at 190 mg/l except in the Calleguas Creek and Santa Clara River Watersheds where, due to the great concern for protection of agriculture, staff were directed to determine the chloride concentrations sufficient to protect agricultural beneficial uses. The Chloride Policy has since been approved by the State Board and Office of Administrative Law (OAL).

Recent Basin Plan amendments may be found on the Regional Board's website at http://www.waterboards.ca.gov/losangeles/html/meetings/tmdl/Basin_plan/basin_plan_amendment_tmdl.htm.

Water Quality Objectives

The CWA (§303) requires states to develop water quality standards for all waters and to submit to the USEPA for approval all new or revised water quality standards are established for inland surface and ocean waters. Water quality standards consist of a combination of beneficial uses and water quality objectives, as well as an antidegradation policy. Water quality objectives may be expressed as either numeric limits or a narrative statement.

In addition to the federal mandate, the California Water Code (§13241) specifies that each Regional Board shall establish water quality objectives. The Water Code defines water quality objectives as "the allowable limits or levels of water quality constituents or characteristics which are established for the reasonable protection of beneficial uses of water or the prevention of nuisance within a specific area." Thus, water quality objectives are intended (i) to protect the public health and welfare and (ii) to maintain or enhance water quality in relation to the designated existing and potential beneficial uses of the water. Water quality objectives are achieved through Waste Discharge Requirements and other programs. These objectives, when compared with future water quality data, also provide the basis for identifying trends toward degradation or enhancement of regional waters.

Triennial Review Process

The California Water Code, (§13240), directs the State and Regional Boards to periodically review and update Basin Plans. Furthermore, the CWA (§303 [c]) directs states to review water quality standards every three years (triennial review) and, as appropriate, modify and adopt new standards.

In the Triennial Review Process, basin planning issues are formally identified and ranked during the public hearing process. These and other modifications to the Basin Plan are implemented through Basin Plan amendments as described below. In addition, the Regional Board can amend the Basin Plan as needed. Such amendments need not coincide with the Triennial Review Process.

The 2005 - 2007 Triennial Review identified 56 new basin planning priorities (24 issues were identified as high priorities, 14 as medium priorities, and 10 as low priorities); an additional eight projects are ongoing from the previous triennial review. The Basin Planning Program currently operates with less than two PYs (1.8 PYs) per year or 5.4 PYs over a three-year period. Completing all 56 over the next three years would require an estimated 18.65 PYs. A total of 2.6 Basin Planning PYs are needed to complete the eight ongoing projects leaving 2.8 Basin Planning PYs available over the following three years to address the highest priorities identified during this Triennial Review. Given these resource constraints, staff further ranked the 24 high priorities relative to each other. An estimated 7.95 Basin Planning PYs would be necessary to complete all 24 high priority issues. Ultimately, staff recommended addressing the eight ongoing projects (Basin Planning resource commitment of 2.6 PYs) along with the top eleven high priorities (Basin Planning resource commitment of 2.9 PYs) over the next three years.

The ongoing projects include: 1) develop & oversee pilot project on "tiered aquatic life uses"; 2) clarification of uses related to fish consumption, development of new use(s) and or subcategories of use; 3) oversee stakeholder-led studies to develop copper site-specific objectives (SSOs); 4) evaluate appropriate averaging period(s) for mineral quality objectives; 5) evaluate groundwater MUN de-designation requests, consider as an alternative maintaining the MUN use, but suspending objectives for natural constituents where it can be demonstrated the source is natural in origin; 6) adopt ammonia SSO (in the San Gabriel River, Los Angeles River, and Santa Clara River Watersheds); 7) participate in statewide effort to adopt total residual chlorine objectives and implementation provisions; and 8) develop a regional policy on hydromodification of watercourses in the Los Angeles Region, consider including criteria and evaluation requirements to be used by Board staff when evaluating projects for certification or WDRs.

The new high priority projects to be addressed are: 1) adopt the upcoming TMDLs as Basin Plan Amendments; 2) develop a general policy for interpreting narrative objectives, identify and prioritize narrative objectives for addition or revision, address one or two of the identified priorities; 3) consider developing a regional policy, or work with State Board staff on a statewide policy, on interpreting narrative toxicity objectives; 4) work with State Board staff to develop numeric or narrative objectives for sediment quality and sediment toxicity; 5) continue groundwork, including participation in RTAG, in support of developing nutrient criteria as required by USEPA; 6) update maps in Basin Plan; 7) evaluate what hardness value(s) should be used in the calculation of permit limits (or TMDLs) for hardness-dependent metals; 8) assess what temperature and pH values of what waters should be used in determining the ammonia objective for a waterbody, clarify how the 30-day objectives are evaluated; 9) continue groundwork in support of developing numeric biocriteria, develop a narrative objective for biological integrity (statewide effort); 10) clarify application of the tributary rule; and 11) participate in Statewide effort on Effluent-Dominated Waters Policy. Many of these issues were raised due to EPA recommendations, new legislation, court orders, or stakeholder input. The 2007 Triennial Review Process is currently underway.

Additional information on triennial reviews may be found on the Regional Board website at http://www.waterboards.ca.gov/losangeles/html/meetings/tmdl/Basin_plan/2004Triennial/2004Triennial.html.

Waivers

Regional Boards may issue both categorical and individual waivers. In the case of categorical waivers, the Regional Board must approve and issue categorical waiver criteria either through adopting a specific resolution or Basin Plan amendment. Once a categorical waiver is approved by the Regional Board, Regional Board staff may be delegated the responsibility to review and approve categorical waivers. Four categorical waivers have been approved in the Region, as set forth in Resolution No. 53-5 (adopted in 1953). These are: septic tanks, swimming pool discharges, on-site drilling mud discharges from single oil wells, and discharges from private impoundments or lakes. Individual waivers are typically for construction or development projects that are short-term or one-time events.

Section 13269, Paragraph (a), of the Water Code states that certain Water Code provisions "may be waived" by a Regional Board for a specific discharge or a specific type of discharge "if the waiver is not against the public interest." However, recent legislation (Senate Bill 390, amending Section 13269) requires that all waivers or waiver categories be evaluated and renewed every 5 years. The legislation stated that, initially, Regional Boards must evaluate and renew all waivers and waiver categories by January 1, 2003, otherwise they will automatically terminate. After this initial evaluation and renewal, Regional Boards must conduct on-going compliance monitoring and renew, every 5 years, all waivers and waiver categories. The evaluation of waivers requires an initial review of all waivers and waiver categories, as well as validation of the adequacy of waiver conditions through field sampling at a representative number of discharges granted waivers. Depending on the data generated from this exercise, the Regional Board may decide to renew the waiver category (based on the adequacy of waiver conditions and their observance), amend the conditions (based on their inadequacy as documented through field tests), or allow the waiver category to automatically terminate on 1/1/2003 (based on the documented impact on water quality). If the last option is chosen, the Regional Board will then have to determine how those discharges should be regulated—either through general WDRs or individual WDRs.

Conditional Waiver for Onsite Wastewater Treatment Systems (OSWS)

The septic tank waiver involved many complexities. The Regional Board issued waivers for residential onsite wastewater treatment systems (septic systems) in the early 1950's as Resolution Nos. 52-4 and 53-6. Through these waivers, the Regional Board delegated its septic system permitting responsibility to Los Angeles and Ventura Counties, among other local agencies with land use and planning powers. Recent legislation amending section 13269 of the CWC required that the Regional Board review its septic system waivers and either renew or terminate them by June 30, 2004. The Regional Board would need to issue general or individual WDRs for ongoing discharges in the event waivers were not renewed. The revised section also requires that the Regional Board enforce the waivers and renew and/or terminate them every five years.

According to section 13269 of the CWC and the Basin Plan, in order for the Regional Board to renew the waivers, they must find that discharges from residential septic systems pose a minimal threat to water quality. At the June 10, 2004 regular Board meeting, the Regional Board approved Resolution No. R4-008, adopting waivers and a template memorandum of understanding (MOU) for residential and certain de minimis commercial septic systems. The waivers were in effect for a period of 60 days in the unincorporated portion of the County of Los Angeles and the City of Malibu and 120 days in the remaining areas of the Region. Local agencies were required to enter MOUs with the Regional Board based on the template MOU in order for the waivers to be extended beyond these deadlines.

According to the template MOU, local agencies shall amend their municipal plumbing code and permitting program to be substantially equivalent to upcoming statewide standards for septic systems

adopted pursuant to sections 13290 and 13291 of the California Water Code. The template MOU also requires local agencies to conduct an inventory of all septic systems under their jurisdiction and take additional interim measures to ensure that septic systems pose a minimal threat to water quality. The MOUs shall be reviewed every five years. The Regional Board adopted general WDRs on September 2, 2004 (Order No. R4-2004-0146) to issue to homeowners in cities without waivers.

The Regional Board will issue Order No. R4-2004-0146 in cities where there is no MOU and where residents apply for permits for new or repaired systems.

AB 885 was passed in 2000 and requires the State Water Board to draft and implement statewide regulations for siting, installation, operation, and maintenance of OWTS. A draft of these regulations is available at http://www.waterboards.ca.gov/ab885/docs/ab885_draftrule.pdf.

Conditional Waiver for Irrigated Lands

The Los Angeles Regional Water Quality Control Board adopted the Conditional Waiver for Irrigated Lands at its November 3, 2005, Board meeting.

Statewide monitoring has shown the presence of chemicals associated with agriculture operations in waters of the state. And, in Ventura County, the Regional Board has observed water quality impairments related to agriculture. Under Section 13269 of the Porter Cologne Water Quality Control Act, waivers are appropriate when they are consistent with other water quality control plans and are in the public interest and are not to exceed 5 years in duration. The overall goal of the Conditional Waiver program is to improve and protect water quality in the Region through extensive water quality monitoring and implementation of Best Management Practices (BMPs). If the monitoring results show an exceedance of a water quality benchmark, development of a Water Quality Management Plan (WQMP) is triggered which will include the implementation of BMPs to mitigate the impairment.

The first year focused on enrollment and initiation of the program and identified the location of the Dischargers and monitoring sites. Once enrollment documents were reviewed, the Regional Board's Executive Officer issued the Notice of Applicability (NOA), which is the formal notice that the enrollment documents are approved. Water quality monitoring started in January 2007.

Dischargers can enroll in the program as an Individual or as a member of a Discharger Group. The majority of growers have enrolled as members of a Discharger group. The waiver program also requires 8 hours of educational training for growers.

There are currently two established Discharger Groups participating in the Conditional Waiver program. The Group representing growers in Ventura County is the Ventura County Agriculture Irrigated Lands group which consists of 1,080 landowner members representing 73,697 acres. There are 27,000 acres enrolled in the Santa Clara River Watershed.

Seven monitoring sites have been selected to characterize agriculture inputs in the watershed within Ventura County. The monitoring locations are generally located at the lower end of mainstem tributaries or agricultural drainages and were selected in areas that were primarily influenced by irrigated agriculture and unlikely to receive inputs from other land uses.

The Nursery Growers Association – Los Angeles County Irrigated Lands Group is the Discharger Group formed to represent growers in Los Angeles County.

Water Quality Priorities

Our major water quality priorities, as first described in the Introduction of this document, and roughly organized along program lines are reiterated below. In addition to those that are Regional Board-directed, priorities are mandated by legislation, statute, regulation, State Board, Cal-EPA, USEPA, and from sheer need to protect, restore, or enhance water quality. A list of the highest of these collective priorities follows along with brief highlights of past successes and future issues as appropriate. TMDL-related work is considered the highest statewide, as well as, regional priority. These Board priorities are further highlighted in the watershed and region-wide sections as appropriate. Grant funding may aid in addressing some of these priorities, at least in part, while other of these priorities will need to remain within the sole purview of the Board's regulatory programs. Some priorities that are seemingly associated with a single program, such as municipal stormwater permitting or TMDL development, in fact affect work in multiple programs which can make funding these priorities a complex task. Basin Planning, in particular, is often impacted by work done in other programs.

TMDLs

- Development, adoption, and implementation of **TMDLs** – about 20 TMDLs (with implementation plans) have been approved by USEPA and about 10 are awaiting approval; about 10 more are scheduled for development over the short-term
- Addressing **beach closures** – a number of beach bacteria TMDLs have been adopted including the Santa Monica Bay wet weather and dry weather TMDLs. Upcoming will be the potential adjustment of implementation schedules based on development of integrated water resources approaches and a re-evaluation of the reference system approach for setting allowable exceedance days.
- Implementation of **agricultural waiver** – good success in Ventura County (80% enrollment and WQ monitoring instituted) thus far; now need increased enrollment in LA County and overall strategic implementation of BMPs

Non Point Sources

- Need for strategies to address **agriculture** and **septic systems** - implementation of the agricultural waiver to further TMDL compliance is also helping fulfill NPS program goals; new septic systems located in areas without sufficient separation from groundwater and nearby surface waters must install advanced treatment; the next challenge for septic systems will be to address cumulative effects which occur with infilling new systems in areas already dense with existing systems.

Basin Planning and Standards

- Full implementation of our **water quality standards** program is a necessity – site-specific objectives were adopted for ammonia in the Santa Clara, San Gabriel, and Los Angeles Rivers Watersheds while a water effects ratio was adopted for copper in the Calleguas Creek Watershed.
- Work is ongoing to target a **design storm** for implementation of wet weather BMPs
- **Tiered Aquatic Life Uses**, in relation to biocriteria, are in development

NPDES Permits

- Controlling compounds from point sources which continue to cause instream toxicity and/or accumulate in sediments or biota – pthalates and other **emerging chemicals**, including pharmaceuticals are becoming major issues.

- **Power plants** – the nine facilities in the Region are conducting plankton studies and investigating possible alternatives to once-through cooling water discharges
- Municipal stormwater/urban runoff – the LA County **MS4 permit** was reopened twice to incorporate the summer dry weather provisions of two bacteria TMDLs; renewals of permits are in progress.
- **New/re-development** – proactively addressing water quality issues through CEQA, 401 certifications, or stormwater permits; ensuring wet weather compliance with construction permits.

Water Reclamation Requirements/Water Conservation

- Reduce, reuse, and **recycle water** – maximize water conservation in Region.
- Addressing the **regional salt management**/salt imbalance issue which is becoming increasingly critical in the region, and balancing this issue with the need to promote the use of reclaimed water.

Habitat Protection

- Preservation of high quality habitats – ensure maintenance of beneficial uses at these sites through support of **low-impact development** coupled with minimized/avoided hydromodification
- **Habitat loss/restoration** – even with strides in improving instream water quality, unless habitat is restored (riparian/wetlands, in particular), in many cases beneficial uses can not be fully restored.

Monitoring

- Coordination of existing resources and participation in the Surface Water Ambient Monitoring Program is of great importance as is more use of **bioassessment** as a tool.
- **Coordinated watershed-wide monitoring** programs exist in the San Gabriel River, Calleguas Creek, and Malibu Creek Watersheds while programs are being developed in the Los Angeles River and Santa Clara River Watersheds.

Contaminated Sediments/Waste Discharge Requirements

- Many of the impairments in the Region, particularly in harbors, are related to **contaminated sediments**. While source reduction will decrease pollutant levels over time, remediation of these sediments will also be needed which will be a long-term project. Cleanup of contaminated sediments in Consolidated Slip in Los Angeles Harbor will be a long-term project.
- Accurately characterizing the threat from contaminated sediments throughout the Region will be aided with adoption of **sediment quality objectives** in the near future by State Board.

Potential Projects, Activities, or Needs to Meet Board Priorities or Otherwise Improve Water Quality

The table below contains a cumulative list of activities, projects, or needs which we, or our stakeholders, see as ways to improve water quality and beneficial uses in the various watersheds (or region-wide). Those activities, projects, or needs most directly involved with our water quality priorities listed above are highlighted in **bold**. In general, funding is available from a large variety of state and federal agencies as well as private groups and these should be utilized as fully as possible even when a proposal involves addressing one of our water quality priorities. Funding source requirements should be carefully researched to ensure a good match with potential projects. Consulting the California Watershed Funding Database at http://calwatershedfunds.org/ may be helpful.

Our long-term, cumulative list of potential grant projects

Project/Activity/Needs Type and Description	San Gabriel River	Los Angeles River	Santa Monica Bay	Ventura River	Calleguas Creek	Santa Clara River	Misc. Ventura Coastal	Dominguez Ch/Harbors	Los Cerritos/Alamitos Bay	Region-wide
TMDLs										
Implement TMDLs & projects supporting TMDLs										X
Investigate loading contributions from septic systems			X			X	X			
Evaluate impacts of antifouling paints and pump-outs in marinas			X					X	X	
Evaluate impacts from large-scale development in the upper river, and integration of sustainable land uses and landscape designs						X				
Identify conflicts between water supply and water quality in lower watershed						X				
Loading contributions from agricultural activities:					X	X				
Quantify & characterize nitrogen and salt loading contributions to ground and surface water					X	X				
Quantify & characterize historic pesticides loading					X	X				
Quantify & characterize chlorpyrifos & diazinon loading					X	X				
Quantify & characterize sediment loading					X					
Investigate toxicity from agriculture loading					X	X				
Quantify & characterize crop- or practice-specific pollutant loading contributions (i.e., strawberries or nurseries)	X	X	X	X	X	X	X			
Agricultural practices:										
Quantify & characterize irrigation practices										X
Quantify & characterize pesticide application rates					X	X	X		X	X
Quantify & characterize tile drains					X				X	
Quantify & characterize existing Agriculture Management Measures										X
Loading contributions from urban activities:										X
Investigate loading contributions from residential and urban activities					X	X	X			
Quantify & characterize organics and/or metals accumulation and loadings				X	X			X	X	
Evaluate and identify sources of urban runoff toxicity			X							
Prioritize storm drains needing diversion; focus efforts on major problem drains for coliform TMDL implementation	X		X							
Identify and evaluate opportunities to promote recovery and restoration of steelhead trout			X	X		X				
Develop TMDLs										X
Investigate loading contributions from golf courses										X
Evaluate impacts of reservoir cleaning on water quality	X									

Evaluate impacts of reclaimed water on surface/groundwater	**X**									
Evaluate impacts of urban runoff on isolated water bodies									**X**	
Evaluate impacts of loss of tidal exchange									**X**	
Evaluate peak storm water runoff discharge control to reduce erosion			**X**							
Assess fish contamination levels in entire Santa Monica Bay			**X**							
Investigate eutrophication in the Ventura River Estuary				**X**						
Investigate sedimentation in Mugu Lagoon					**X**					
Non Point Sources										
Nonpoint pollution control strategies:										**X**
Implement Irrigation Management Measures										**X**
Implement septic corrective measures		**X**	**X**				**X**			
Implement management measures to reduce NPS pollution in marinas			X				X	X		
Implement Erosion & Sediment Control Management Measures (natural/non-structural) to reduce erosion while increasing wildlife habitat			**X**	**X**	**X**	**X**	**X**			
Urban nonpoint pollution control:										**X**
Implement trash reduction BMPs	**X**	**X**	**X**							
Implement urban runoff reduction BMPs	**X**	**X**	**X**					**X**	**X**	
Manage urban runoff	**X**	**X**	**X**		**X**	**X**	**X**	**X**		
Agricultural nonpoint source control:	**X**	**X**	**X**	**X**	**X**	**X**	**X**			
Implement Ag waiver BMP program				**X**	**X**	**X**	**X**			
Implement Integrated Farm Management Plans				**X**	**X**	**X**	**X**			
Implement Nutrient Management Measures				**X**	**X**	**X**	**X**			
Implement agricultural buffer BMPs				**X**	**X**	**X**	**X**			
Pesticide Management:										**X**
Implement Integrated Pest Management Practices					**X**	**X**				
Implement chlorpyrifos & diazinon loading control measures					**X**	**X**				
Manage horse corral runoff	**X**	**X**	**X**	**X**						
Manage golf course irrigation runoff		**X**			**X**				**X**	
Manage nursery runoff	**X**	**X**								
Research management measures to reduce NPS pollution in marinas							X			
Evaluate which BMPs are most effective for the various industrial sectors										**X**
Study effectiveness of non-structural BMPs (public outreach)			X							
Evaluate design and performance standards for implementation of storm water BMPs										**X**
Analyze storm water quality data and trends from various industrial sectors (e.g. metal yards, waste management facilities, etc.)										**X**
Develop nonpoint pollution control strategies										**X**
Basin Planning and Standards										
Further investigate efficacy of Tiered Aquatic Life Uses										**X**

Support continued work in development of nutrient objectives										**X**
NPDES Permits										
Septic tank education/outreach			**X**				**X**			
Implement Agriculture Management Measures Education/Outreach					**X**	**X**	**X**			
Conduct activities to increase public awareness of nonpoint source pollution and the related solutions available										**X**
Implement watershed education and outreach										**X**
Water Reclamation Requirements/Water Conservation										
Expand water recycling/conservation facilities										**X**
Habitat Protection										
Restore pocket wetlands along highly altered waterways where there were historic wetlands	**X**	**X**						**X**	**X**	
Restoration impaired riparian and aquatic habitats (i.e. Malibu Lagoon, McGrath Lake, Topanga Lagoon, Ormond Beach area, Colorado Lagoon, Dominguez Ch. soft bottom)	**X**	**X**	**X**		**X**	**X**	**X**	**X**	**X**	
Restore river channels and habitat following impacts from mining	**X**					**X**				
Enhance/restore steelhead trout habitat			**X**	**X**		**X**				
Enhance the water's beneficial and recreational uses	**X**	**X**	**X**				**X**			
Implement mitigation measures for floodplain development						**X**				
Monitoring										
Implement a watershed wide monitoring program								**X**		
Implement biological & toxicity monitoring	**X**		**X**		**X**	**X**	**X**	**X**	**X**	
Implement ag waiver monitoring program										**X**
Research and develop indicators and a "report card" format										**X**
Develop practical sanitation survey tools			**X**							
Implement citizen monitoring	**X**								**X**	
Contaminated Sediments/Waste Discharge Requirements										
Mitigate groundwater overdraft						**X**	**X**			
Investigate nitrogen and salt loading contributions to ground and surface water					**X**	**X**			**X**	**X**
Demonstrate water reuse projects to lower demand on supply										**X**
Identify conflicts between water supply and water quality in lower watershed						**X**				

Watersheds where projects/activities/needs to be addressed are of the greatest important *independent o hether a ater ua ity priority is ein addressed* are marked with an " ". We would prefer the identified projects/activities/needs in these watersheds specifically be funded.

Since many funding sources require proposed projects be consistent with watershed management, restoration, or other plans for the watershed (otherwise collectively identified here as "Watershed Restoration Action Strategies"), the table below list those we know about, whether final, draft, or in process. Additionally, many State grant funding sources are now requiring a proposed project be included in an Integrated Regional Water Management Plan (IRWMP).

Watershed Restoration Action Strategies in the Los Angeles Region

Watershed or Watershed Management Area	Watershed Restoration Action Strategies or Equivalent Documents (in progress, draft, or final)
Los Angeles River Watershed	US Forest Service. *Forest Plan, Angeles National Forest*. (Final) http://www.fs.fed.us/r5/scfpr/projects/lmp/index.htm San Gabriel and Lower Los Angeles Rivers and Mountains Conservancy. *Guiding Principles Watershed and Open Space Plan* (Final) http://www.rmc.ca.gov/ City of Los Angeles, US Army Corps of Engineers, et al. *Los Angeles River Revitalization Master Plan*, 2007. (Final) http://www.lariver.org Northeast Trees. *Arroyo Seco Watershed Management and Restoration Plan* (Final), 2006. http://www.waterboards.ca.gov/losangeles/html/programs/funding/ArroyoSeco%20WMRP.pdf San Gabriel Valley Council of Governments. *Rio Hondo Watershed Management Plan*, 2004 (Final) http://www.rmc.ca.gov/rio_hondo/rh_index.html The River Project. *Tujunga Watershed Management Plan* (in progress) http://www.theriverproject.org/tujunga/ Los Angeles and San Gabriel Rivers Watershed Council. *Compton Creek Watershed Management Plan* (Final) http://www.lasgrwc.org/ComptonCreek.htm
Calleguas Creek Watershed	Natural Resources Conservation Service. *Calleguas Creek Watershed Erosion and Sediment Control Plan for Mugu Lagoon*, 1995. (Final) Calleguas Creek Watershed Management Plan Committee. *Draft Calleguas Creek Watershed Management Plan* (draft) http://www.calleguas.com/ccbrochure/cc.htm David Magney Environmental Consulting. *Calleguas Creek Watershed Wetland Restoration Plan*, 2000. (Final) http://www.calleguas.com/ccbrochure/ccwrp.pdf
Santa Monica Bay WMA	Santa Monica Bay Restoration Project. *Santa Monica Bay Restoration Plan*, 1995. (Final) RCD of the Santa Monica Mountains. *Topanga Creek Watershed Management Plan*, 2002 (Final) http://www.topangaonline.com/twc/index.html Natural Resources Conservation Service. *Malibu Creek Watershed Natural Resources Plan*, 1995. (Final) Los Angeles County Department of Public Works. *Watershed Management Area Plan for the Malibu Creek Watershed* (Draft) Los Angeles County Department of Public Works. *Ballona Creek Watershed Management Plan*, 2004 (Final) http://www.ladpw.org/wmd/watershed/bc/
San Gabriel River Watershed	US Forest Service. *Forest Plan, Angeles National Forest*. (Final) http://www.fs.fed.us/r5/scfpr/projects/lmp/index.htm Los Angeles County Department of Public Works. *San Gabriel River Master Plan* (Final) http://www.sangabrielriver.com San Gabriel and Lower Los Angeles Rivers and Mountains Conservancy. *Guiding Principles Watershed and Open Space Plan* (Final) http://www.rmc.ca.gov/ *Coyote Creek Watershed Management Plan* (Final) http://www.ocwatersheds.com/watersheds/coyotecreek.asp
Los Cerritos Channel/Alamitos Bay WMA	*Colorado Lagoon Restoration Feasibility Study* (Final). http://www.longbeach.gov/news/displaynews.asp?NewsID=561

Watershed or Watershed Management Area	Watershed Restoration Action Strategies or Equivalent Documents (in progress, draft, or final)
Dominguez Channel WMA	Los Angeles County Department of Public Works. *Dominguez Channel Watershed Management Area Plan*, 2004. (Final) http://ladpw.org/wmd/watershed/dc City of LA Department of Recreation and Parks and Palos Verdes/South Bay Audubon Society. *Ken Malloy Harbor Regional Park Development Program. Volume I. Habitat Restoration and Lake Water Quality Improvement Design Development Report*, Prepared by Parsons. 2001. (Final)
Channel Islands WMA	Department of Navy. *San Clemente Island Integrated Natural Resources Management Plan.* 2002 (Final)
Santa Clara River Watershed	Santa Clara River Enhancement and Management Plan Steering Committee. *Santa Clara River Enhancement and Management Plan.* (Final) http://www.vcwatershed.org/Watersheds_SantaClara.html City of Santa Clarita. *Santa Clara River Corridor Plan.* (Final) US Forest Service. *Forest Plan, Los Padres National Forest*. (Final) http://www.fs.fed.us/r5/scfpr/projects/lmp/index.htm Upper Santa Clara River IRWMP (in progress) http://www.ladpw.org/wmd/scr/
Ventura River Watershed	Entrix, Inc. *Steelhead Trout Restoration and Recovery Plan*, 1997. (Final) US Forest Service. *Forest Plan, Los Padres National Forest*. (Final) http://www.fs.fed.us/r5/scfpr/projects/lmp/index.htm
Regionwide	California Regional Water Quality Control Board, Los Angeles Region. *Watershed Management Initiative Chapter*, 2007. (Final) http://www.waterboards.ca.gov/losangeles/html/programs/regional_programs.html California Regional Water Quality Control Board, Los Angeles Region. Adopted TMDLs. http://www.waterboards.ca.gov/losangeles/html/meetings/tmdl/tmdl.html Los Angeles County IRWMP (Final) http://www.lawaterplan.org/ Ventura County IRWMP (Final) http://www.watershedscoalition.org/
Regionwide, wetlands	Current fiscal year workplan adopted by Board of Governors of the Southern California Wetlands Recovery Project. (Final) http://www.scwrp.org

Wetlands Protection and Management

Wetlands acres in the Region have diminished greatly over the past several decades as coastal development, in particular, has increased. Wetlands provide habitat, serve to slow down water flow, decrease total volume through infiltration, and filter out a number of pollutants through active uptake by plants as well as deposition in sediments. Wetlands such as coastal estuaries are a buffer zone between ocean and inland water resources and are heavily utilized by aquatic organisms. Continuous stretches of riparian habitat function as wildlife corridors to allow animal movement between increasingly isolated populations. They also serve as popular recreational destinations for residents and visitors. Unfortunately, many of our Region's wetlands are impacted by varying kinds and amounts of pollutants and alterations.

Over the past approximately 15 years, we have embarked on a number of efforts to inventory and evaluate our Region's wetlands. These efforts have included the following:

- We funded a 1993 study, entitled *Waterbodies, Wetlands, and their Beneficial Uses in the Los Angeles Region* which provides descriptions, maps, photos, and functional values of wetlands throughout the region.

- The Santa Monica Bay Restoration Project funded a wetlands inventory in 1993 which outlines historical changes in wetlands in the Santa Monica watershed, an inventory of current wetlands in the watershed, and potential restoration and creation projects in the watershed.

- The Regional Board continues involvement in the Southern California Wetlands Recovery Project (WRP) which is a partnership of public agencies working cooperatively to acquire, restore, and enhance coastal wetlands and watersheds between Point Conception and the International border with Mexico. Using a non-regulatory approach and an ecosystem perspective, the WRP works to identify wetland acquisition and restoration priorities, prepare plans for these priority sites, pool funds to undertake these projects, implement priority plans, and oversee post-project maintenance and monitoring. When compared to estimated historical acreages, Los Angeles County has lost 93% of its wetlands while Ventura County has lost 58% of its wetlands. Currently, the Project funds wetlands projects which involve planning, restoration, or acquisition. Some of the this region's wetlands given a high priority for funding include Los Cerritos Wetlands, Malibu Lagoon, Ormond Beach Wetlands, and the Ventura River estuary. More information about the Project may be found on its webpage at http://www.scwrp.org.

  Several major recent activities of the WRP (and partners) has direct relevance to our wetlands protection efforts. The WRP participated in development of a method to assess the condition of wetlands, the California Rapid Assessment Method (CRAM). It is envisioned that this method will eventually be incorporated into monitoring for various regulatory programs such as 401 certifications. It will also serve as a major component of the Integrated Wetlands Regional Assessment Program (IWRAP) which is under development by the WRP in coordination with similar efforts elsewhere in the State. Coordination with Bight '08 is in the planning stages. Finally, remaining activities include the mapping of existing wetland and riparian acreages to serve as a baseline in the IWRAP since monitoring will include a regional survey every ten years, the digitizing of historic topographic maps to help inform restoration work, and development of a Wetlands Tracker database to aid in tracking gains and losses of wetlands acres across both regulatory and non-regulatory programs.

Water Quality Certification (401) Program

A key wetlands regulatory tool for the Regional Board is the CWA Section 401 Water Quality Certification Program which regulates discharges of dredge and fill materials to waters. The 401 certification program is one of the most effective tools the state has for regulating hydrologic modification projects, especially those which directly impact the region's diminishing acres of wetlands and riparian habitat. Program work is conducted in conjunction with U.S. Army Corps of Engineers and the California Department of Fish & Game.

Key program activities should include CEQA documents review/response (possibly involvement as lead agency), pre-construction meetings with applicants, site visits, application processing, follow-up monitoring and inspections, and enforcement. Unfortunately, the program is currently severely underfunded with only application processing being undertaken. Any incremental increases in the baseline PYs would go first toward follow-up work and enforcement, then toward increased support of application processing, then coordination meetings, site visits, and CEQA documents review/response. Follow-up work is especially critical since mitigation wetlands often do not function as well as projected during the planning phase. Another very important activity that could be funded is the development of policies regarding in-stream gravel mining and use of in-stream sediment basins.

Furthermore, beginning in FY00/01, the program began requiring in-house certification rather than sign-off by State Board. This has resulted in more detailed review of all projects, even those which would previously have been given less attention (those with little likelihood of producing impacts) with less time then being available for large projects likely to produce impacts. Another program change which occurred during FY00/01 was allowing third-party petitions of certification decisions; previously, only the applicant was allowed to do this. This leads to potentially needing to divert scarce resources from application processing to litigation work.

Approximately 150-200 applications are processed each year. Information about projects and the program in general is available on the Regional Board website at http://www.waterboards.ca.gov/losangeles/html/meetings/401wqc.html. Additional information may be found on the State Board website at http://www.waterboards.ca.gov/cwa401/index.html

It is envisioned that the eventual use of CRAM and Wetland Tracker as a condition of granting a 401 certification will lead to better information on the effectiveness of mitigation projects in replacing wetlands acres and lost ecosystem values.

Management of Nonpoint Source Pollution

Background

Management of NPS pollution is based upon the requirements of the Porter-Cologne Water Quality Control Act (Porter-Cologne Act). The Porter-Cologne Act, Division 7 of the California Water Code, establishes a comprehensive program for the protection of water quality and beneficial uses of the State's waters and makes explicitly clear the law applies to nonpoint as well as point source discharges. The implementation portion of this comprehensive program should provide for the attainment of water quality standards. The Porter-Cologne Act also establishes the administrative permitting authority—in the form of Waste Discharge Requirements (WDRs), waivers of WDRs or basin plan prohibitions—to be used to control NPS discharges. Additional legislative requirements state that all waivers must be conditional, they are to be re-evaluated and subsequently reissued every five years, and the RWQCBs must require compliance with waiver conditions.

California's Nonpoint Source (NPS) Pollution Control Program has been in effect since 1988 and was updated in 2000. In August 2004 the Office of Administrative Law approved the NPS Policy. The policy supersedes certain elements of the NPS Program Plan and formally eliminates the "three-tiered approach" in informal use.

The two primary federal statutes that establish a framework for addressing nonpoint source pollution in this Region are **Clean Water Act (CWA) Section 319** and the **Coastal Zone Act Reauthorization Amendments (CZARA) of 1990 Section 6217**. Together these statutes encourage states to assess water quality problems associated with nonpoint sources of pollution and to develop programs to control these sources.

- CWA Section 319 requires that, in order to be eligible for federal funding, states develop an assessment report detailing the extent of nonpoint source pollution, and a management program specifying nonpoint source controls.

- CZARA Section 6217(a) requires the state to develop and implement management measures for nonpoint source pollution to restore and protect coastal waters; establish coastal nonpoint source programs.

These programs are being implemented through changes to the state's nonpoint source control program approved by USEPA under CWA Section 319 and through the state's coastal zone management program (implemented in this state by the California Coastal Commission) approved by NOAA under Coastal Zone Management Act Section 306.

Under CZARA, California must (1) provide for the implementation of management measures that are in conformity with the USEPA *Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters* (1993) and (2) provide a process for developing and revising management measures to be applied in critical coastal areas and in areas where necessary to attain and maintain water quality standards.

Management measures are defined in CZARA as: "economically achievable measures to control the addition of pollutants from existing and new categories and classes of nonpoint sources of pollution, which reflect the greatest degree of pollution reduction achievable through application of the best available nonpoint pollution control practices, technologies, processes, siting criteria, operating methods, or other available alternatives." Mechanisms for implementation of these management measures may include, for example, permit programs, zoning, enforceable water quality standards, and general environmental laws and prohibitions by which a state exerts control over private and public lands and water uses and natural resources in the coastal zone (including those which may be implemented by agencies other than the State Water Resources Control Board and the California Coastal Commission). States may also use voluntary approaches like economic incentives if they are backed by appropriate regulations.

The State's updated nonpoint source management plan includes a 5-year implementation plan as well as a longer-term 15-year implementation strategy. The plan was adopted by USEPA and NOAA in July 2000. Implementation of the plan will entail the use of considerable resources at the Regional Board level. The "Policy For Implementation And Enforcement Of The Nonpoint Source Pollution Control Program" was adopted by State Board in 2004.

Documents relating to the management plan as well as other useful information may be found at http://www.waterboards.ca.gov/nps/index.html .

The Plan for California's Nonpoint Source Pollution Control Program includes requirements for Critical Coastal Area (CCA) designation. The intent of CCA designation is to direct needed attention to coastal areas of special biological, social, and environmental significance and to provide an impetus for these areas to receive special support and resources. The goal was to identify areas of the coast that are adjacent to coastal water bodies impacted by nonpoint source pollution, or adjacent to high quality waters threatened but not yet impacted by nonpoint source pollution. Documents relating to CCAs can be found at http://www.coastal.ca.gov/nps/cca-nps.html .

While it is clear nonpoint sources of pollution are difficult to manage, the state's current nonpoint source management plan approach which can be tailored to the particular situation:

- Regulatory-based encouragement of management practices (MPs), may occur when voluntary implementation is lacking. Encouragement may be effected through Regional Board waiving of waste discharge requirements if compliance with MPs occurs. Or, MPs may be enforced indirectly by entering into management agency agreements (MAAs) with agencies which have the authority to enforce. These MAAs would reference the specific MPs to be used and the means of implementation.

- The Regional Board can adopt and enforce requirements on any waste discharge including those from nonpoint sources. This involves prescribing effluent limitations which would in turn require implementation of MPs in order to insure compliance.

Specific nonpoint source issues and implementation activities relative to individual watersheds are described in the appropriate watershed section while a general outline of our approach in addressing nonpoint pollution follows.

Our Approach

The State's Nonpoint Source Management Plan puts an emphasis on prioritization of nonpoint source categories as well as those waters impacted by nonpoint source pollution. It also states that management activities and implementation schedules needs are to be identified (e.g. monitoring for source identification, education, training, regulation, interagency agreements, and employment of MPs). As is discussed elsewhere, many of these activities are severely underfunded. However, with that in mind, the following presents this Region's goals and objectives for the implementation of the State's Nonpoint Source Management Plan. Program objectives which apply most specifically to particular watersheds are highlighted and enlarged upon in the appropriate watershed section, as appropriate. The following program objectives will serve as a basis for workplan development; the final list of tasks will be dependent on the level of funding.

Nonpoint Source Program Goals

Long-term Program Goal: improve water quality by implementing the management measures identified in the California Management Measures for Polluted Runoff Report (CAMMPR) by 2013

- Coordinate the nonpoint source program
- Manage Clean Water Act Section 319(h) nonpoint source control contracts
- Implement the Region's Waiver of Waste Discharge Requirements for Irrigated Agriculture
- Reduce pollutant loadings through atmospheric deposition control

Nonpoint Source Program Objectives

1) Program coordination – To coordinate 319(h) work plan activities to reflect Water Board priorities; to better coordinate our resources with other divisions and agencies; and implement a strategy that reflects all the NPS Programs contributions to improve water quality.

2) Contract management - Continue focusing 319(h) grant management effort toward building measurable water quality improvements.

3) Agricultural waiver implementation - Continue with first year of agricultural waiver water quality monitoring, review Discharger Group and Individual Discharger 1st annual monitoring reports (includes monitoring data). Initiate development of Water Quality Management Plans as necessary and oversee first round of BMP implementation (irrigation management, pesticide management, nutrient management and erosion control.). Continue grower education and outreach meetings, particularly in LA County to increase enrollment. Set up database to house water quality data generated by the Ag Waiver program

4) Atmospheric deposition control - Collection of data and rigorous and comprehensive assessment of the contribution of atmospheric deposition to water quality impairments; establishment of a working group with local air quality agencies to participate on the Los Angeles and Long Beach Harbors metals TMDL; development of parts of an implementation plan/guidance which addresses air deposition.

REGIONAL NPS* PROBLEMS BY MANAGEMENT MEASURE CATEGORY

	Pollutants impairing or threatening Beneficial Uses arranged by Management Measure Category					
Watershed	Agriculture	Silviculture	Urban	Marinas & Recreational Boating	Hydromodification	Wetlands & Vegetated Treatment Systems
Calleguas Creek Watershed	nitrogen sediment toxicity siltation toxicity salts selenium historic pesticides chlorpyrifos		nitrogen sediment toxicity siltation toxicity mercury other metals historic pesticides chlorpyrifos PCBs trash		siltation	
Los Angeles River Watershed	nitrogen chlorpyrifos historic pesticides coliform		nitrogen chlorpyrifos historic pest. trash selenium other metals coliform PCBs oil VOCs			
Miscellaneous Ventura Coastal Waters WMA	sediment toxicity historic pesticides		sediment toxicity historic pesticides coliform PCBs metals	coliform PCBs TBT metals		
Santa Clara River Watershed	historic pesticides nitrogen salts toxicity chlorpyrifos diazinon		historic pesticides nitrogen coliform toxicity chlorpyrifos diazinon trash			
San Gabriel River Watershed	nitrogen coliform toxicity diazinon		nitrogen coliform toxicity PCBs trash chloride diazinon selenium mercury other metals			

REGIONAL NPS* PROBLEMS BY MANAGEMENT MEASURE CATEGORY (cont'd)

	Pollutants impairing or threatening Beneficial Uses arranged by Management Measure Category					
Watershed	Agriculture	Silviculture	Urban	Marinas & Recreational Boating	Hydromodification	Wetlands & Vegetated Treatment Systems
Santa Monica Bay WMA	coliform nitrogen		coliform nitrogen PCBs sediment toxicity benthic community effects toxicity PAHs arsenic mercury other metals historic pesticides trash fish consumption advisory debris salts	coliform metals PCBs sediment toxicity benthic community effects toxicity PAHs TBT	exotic vegetation habitat alteration hydromodification reduced tidal flushing fish barriers	reduced tidal flushing exotic vegetation
Dominguez Channel and LA/LB Harbors WMA			coliform sediment toxicity benthic comm. effects PCBs historic pesticides PAHs metals nitrogen trash	coliform sediment toxicity benthic comm. effects PCBs historic pesticides PAHs metals TBT		
Los Cerritos Channel and Alamitos Bay WMA			historic pesticides PCBs sediment toxicity PAHs metals nitrogen coliform			
Ventura River Watershed	eutrophication DDT selenium		eutrophication metals trash		diversions	diversions

* Problems may be partially or fully due to NPS. Point sources may also be contributing to the problem.

Regional Board Enforcement Strategy

The statewide Water Quality Enforcement Policy adopted by State Board in 1996 and revised again in 2002 is intended to make all enforcement consistent, predictable, and fair throughout the state. On March 3, 1997, the Regional Board adopted Resolution No. 97-005 which confirmed the Board's desire to carry out enforcement in a manner consistent with State Board's enforcement policy and that Regional Board staff prepare a regional enforcement strategy consistent with State Board's enforcement policy. The Resolution directed staff to implement the Regional Enforcement Strategy.

The statewide Water Quality Enforcement Policy upon which the Region Board Enforcement Strategy is based states that "(v)iolations of Waste Discharge Requirements (WDRs) or applicable statutory or regulatory requirements should result in a prompt enforcement response against the discharger. At a minimum, the Regional Board staff must bring the following to the attention of their Regional Board for possible enforcement action:" effluent limit violations/other permit violations - major dischargers; effluent limit violations/other permit violations - other NPDES/WDR dischargers; toxicity violations - all NPDES dischargers; violations of compliance schedules and enforcement orders - all dischargers; failure to submit reports/deficient reports (excluding stormwater); violations of POTW pretreatment programs; stormwater permit violations/deficiencies/failure to submit reports; other violations and enforcement actions; and spills (generally, non-permittees).

Priority violations include: all NPDES violations that the United States Environmental Protection Agency (USEPA) requires to be reported on the Quarterly Non-Compliance Report (QNCR) for the purpose of tracking significant non-compliance; all violations subject to mandatory minimum penalties pursuant to California Water Code section 13385; and other violations that the SWRCB and/or RWQCB considers to be significant and therefore high priority. Depending on the circumstances, violations that are not included on this list could nonetheless be considered “priority” as well. A copy of the Policy may be found at http://www.waterboards.ca.gov/plnspols/index.html .

Board staff are also involved in a number of interagency environmental task/strike forces including the U.S.EPA Environmental Strike Force, Los Angeles County Strike Force, Ventura County Strike Force, and Santa Monica Mountains Task Force.

Data Management And GIS

Historically, the State Water Information Management system (SWIM) was used as an organizational-wide database designed to facilitate electronic reporting, tracking, and analysis of regional data and information. The California Integrated Water Quality System (CIWQS) has succeeded SWIM as the computer system used by the Water Boards. CIWQS tracks permits, inspections, violations, and enforcement actions. CIWQS also allows on-line submittal of information by Permittees within certain programs and makes data available to the public through reports. A link to CIWQS can be found at http://www.waterboards.ca.gov/ciwqs/index.html. Of great importance is collection of location information so that data and information can be portrayed in layers in a Geographic Information System(GIS).

Other Region-wide Activities

Other activities may be undertaken at odd intervals during the watershed cycle. These include, among others, reviewing CEQA and NEPA documents, reviewing and commenting on requests for Section 401 water quality certification, landfill regulation, site (including DOD/DOE) cleanups, well investigation program activities, leaking underground storage tank cleanups, routine public outreach, and responding to spills, complaints (unrelated to permits), and special requests from the Regional Board. Some of the other region-wide strategies and programs the Regional Board implements are described in more detail below.

BEACHES/COASTAL WATERSHED ACTIVITIES

This Region's coastal resources support many of our most valuable beneficial uses. Our beaches, from Ventura through Zuma, Malibu, Venice and Long Beach are world-renowned. The Region's coastal estuaries, dunes, and wetlands are nearly gone and what is left are highly degraded. These resources, while inherently valuable as natural resources, also have a high economic value to the State with many vacationers naming beaches and lakes as their prime vacation destination. These beaches and coastal resources are a huge tourist dollar generator.

Concurrently, our Region's ports and marinas support valuable beneficial uses providing important avenues of trade as well as recreational boating opportunities and marine habitat. They too are impacted by the need to dredge and dispose of sediments often contaminated by upstream watershed sources.

It is clear the impacts to beaches, bays, coastal wetlands and estuaries, and nearshore waters is especially critical to address from both an economic and ecological perspective. The Regional Board is focusing on protecting these resources through a combination of integrated coastal planning and an aggressive effort to assess and control watershed loadings of key pollutants which continue to degrade coastal areas and increase the costs of dredging. Specific elements of our Beaches/Coastal Watersheds activities that have funding are described below.

Contaminated Sediment Long-term Management Strategy

The Los Angeles County's coastline includes two of the nation's largest commercial ports and several major marina complexes and small-vessel harbors. Maintenance of authorized depths in existing channels and berthing areas and expansion and modernization of ports, harbors, and marinas, requires periodic dredging in virtually all of these facilities. Some of the sediments dredged from these harbors contain elevated levels of heavy metals, pesticides, and other contaminants. In most cases, the concentrations of these contaminants do not approach hazardous levels. However, the sediments contain enough contaminants that they are not suitable for unconfined ocean disposal. The State's Bay Protection and Toxic Cleanup Program identified bays and estuaries containing areas with contaminated sediments. Remediation of these sites may require dredging and disposal of this material. Disposal of any contaminated dredged materials requires special management, such as placement in a confined aquatic disposal site, capping, or disposal in an upland site. Additionally, some ports and harbors have considered other management techniques, such as treatment and beneficial re-use.

The ports and harbors have at times delayed or canceled dredging projects because of contaminated sediment issues. The regulatory agencies were evaluating disposal options for these projects on a case-by-case basis without the benefit of a regional perspective on management alternatives, cumulative impacts, and long-term solutions to prevent re-contamination of sediment. This approach has led to

public concern over the ecological and human health implications of contaminated dredged material disposal. To resolve these issues, the regulatory and resource agencies, ports and harbors, environmental groups, and other interested parties agreed to establish a task force. The mission of the **Contaminated Sediment Task Force** (CSTF) is to prepare a Contaminated Sediment Long-Term Management Strategy (Strategy) for the Los Angeles Region (limited to Los Angeles County). Past projects suggest that the major sources of contaminated dredge material will continue to be Marina del Rey Harbor, the ports of Los Angeles and Long Beach, and the mouth of the Los Angeles River.

The members of the CSTF agreed that the Strategy will consider confined aquatic and upland disposal, sediment treatment, beneficial re-use, other management techniques, and contamination source control. The CSTF agreed on a number of goals including identifying the scope of the contaminated sediment problem, an analysis of management and disposal alternatives, development of a unified regulatory approach, and identify inputs of contaminants to coastal waters and ongoing regional efforts to reduce such inputs with a view towards promoting efforts that would reduce the inflow of contaminants. Initially, the CSTF will work with existing watershed management programs.

The CSTF was established through a Memorandum of Understanding (MOU) among the state and federal agencies with regulatory jurisdiction over dredging and disposal activities, as identified by SB 673, and other agencies representing ports, harbors, and marinas. The following agencies are signatory to that MOU: U.S. Army Corps of Engineers; U.S. Environmental Protection Agency; California Coastal Commission; Regional Water Quality Control Board, Los Angeles Region; County of Los Angeles Department of Beaches and Harbors; City of Long Beach; Port of Long Beach; and Port of Los Angeles.

The CSTF is carrying out its operation by two main committees (Executive and Management Committees), and five strategy development committees (Watershed Management and Source Reduction, Aquatic Disposal and Dredging Operations, Upland and Beneficial Re-use, Sediment Screening Thresholds, and Implementation Committees). The membership of the Management Committee includes those parties that signed the MOU and one organization selected to represent the environmental community (Heal the Bay). This committee is the main decision-making group with the CSTF. The Executive Committee consists of the chief executives of the four major agencies that regulate and manage dredging and disposal in Southern California. This committee will facilitate final agency concurrence, adoption, and implementation of the completed strategy. The strategy development committees will develop specific elements of the long-term management plan.

The CSTF completed a Contaminated Sediment Long-Term Management Strategy in 2005 and the document is available at http://www.coastal.ca.gov/sediment/long-term-mgmt-strategy-5-2005.pdf . Other relevant documents may be found at http://www.coastal.ca.gov/sediment/sdindex.html.

Areas of Special Biological Significance

The California Ocean Plan (Ocean Plan) establishes water quality objectives for California's ocean waters and provides the basis for regulation of wastes discharged into the State's coastal waters. It applies to point and non-point source discharges. The State Board adopts the Ocean Plan, and both the State Board and the six coastal Regional Boards implement the Ocean Plan. In 1972 the Ocean Plan stated: "Waste shall be discharged a sufficient distance from areas designated as being of special biological significance to assure maintenance of natural water quality conditions in these areas."
In the mid-1970's, thirty-four areas on the coast of California were designated as requiring protection by the State Board and were called Areas of Special Biological Significance (ASBS). The ASBS were

intended to afford special protection to marine life through prohibition of waste discharges within these areas. Similar to previous versions of the Ocean Plan, the 2005 Ocean Plan states: "Waste shall not be discharged to areas designated as being of special biological significance. Discharges shall be located a sufficient distance from such designated areas to assure maintenance of natural water quality conditions in these areas."

During the latter half of the 20th century, various state agencies and the Legislature designated some 18 different major categories of Marine Protected Areas and Marine Managed Areas. The Marine Managed Areas Improvement Act added sections to the Public Resources Code (PRC) that simplified the nomenclature and created a system of six defined categories of Marine Managed Areas (MMAs): Marine Reserves, Marine Parks, Marine Conservation Areas, Marine Recreation Management Areas, Marine Cultural Preservation Areas, and State Water Quality Protection Areas (SWQPAs). Under state law the Reserves, Parks, and Conservation Areas are further categorized as Marine Protected Areas (MPAs).

The PRC defines a SWQPA as "a non-terrestrial marine or estuarine area designated to protect marine species of biological communities from an undesirable alteration in natural water quality, including, but not limited to, areas of special biological significance that have been designated by State Board through its water quality control planning process." The PRC goes on to state: "In a state water quality protection area point source waste and thermal discharges shall be prohibited or limited by special conditions. Non-point source pollution shall be controlled to the extent practicable. No other use is restricted." The classification of ASBS as SWQPAs went into effect on January 1, 2003.

Senate Bill 512 later amended the marine managed areas portion of the PRC, effective January 1, 2005, to clarify that ASBS are a subset of SWQPAs and require special protection as determined by the State Board pursuant to the Ocean Plan and the California Thermal Plan. SB 512 also replaced the prior language that required point sources into ASBS to be prohibited or limited by special conditions, but allowed non-point sources to be controlled to the extent practicable. Instead, the absolute discharge prohibition in the Ocean Plan is maintained, unless an exception is granted.

In 2005, the Ocean Plan was amended to change the names of specific ASBS and incorporate the classification of ASBS as SWQPAs pursuant to the PRC. In addition, the Ocean Plan was amended to state that exceptions would be reviewed during the Triennial Review.

Despite the designation of these areas for protection, little was known about the presence and types of discharges occurring within ASBS. And, State Board hearings on the 2001 Ocean Plan amendments brought to light the fact that there are storm water and non-point source discharges into ASBS, despite the Ocean Plan prohibition. The State Board decided in 2001 to fund a study to assess the extent of storm water and non-point source discharges into ASBS/SWQPAs. In July of 2003, the Southern California Coastal Water Research Project (SCCWRP) issued its final report on these discharges. Information gained from the study was intended to be used to guide future action on these discharges. However a more comprehensive monitoring program is necessary to fully determine the status and protection of beneficial uses in ASBS over time. State Board Ocean Unit staff presented an initial set of monitoring requirements in a June 2006 draft Special Protections document to address storm water and nonpoint source discharges. Ocean Unit staff intends to continue working with the Natural Water Quality Committee, the Multi Agency Rocky Intertidal Network (MARINe), and Water Board's Surface Water Ambient Monitoring Program (SWAMP) staff to further design and plan an ASBS monitoring program. Coordination and/or integration with Bight '08 monitoring may also play an important role in an ASBS monitoring program.

There are eight ASBS within the Los Angeles Region.

- In the Mugu Lagoon to Latigo Point ASBS, 538 drainages were identified. Most of the drainages in this ASBS are discharges, 88 of which are considered a higher threat. Responsible parties include Los Angeles County Department of Public Works, City of Malibu Department of Public Works, California Department of Parks and Recreation, and California Department of Transportation.

- The San Nicolas Island and Begg Rock ASBS has 47 drainages; twelve are discharges, eleven of which are considered a higher threat. The island is owned and operated by the U.S. Navy; there is no access to the public.

- The Santa Barbara and Anacapa Islands ASBS and has two discharges, both of which are considered a higher threat. The islands are managed by the National Park Service.

- The San Clemente Island ASBS has 123 drainages with 23 discharges, fourteen of which are considered a higher threat. The island is owned and operated by the U.S. Navy; there is no access to the public.

- Santa Catalina Island:
  - Subarea One, Isthmus Cove to Catalina Head - This is the largest of the four subareas on Catalina covering approximately 17 miles on the west end. This area has 58 drainages, 38 of which are discharges and are all considered to be a higher threat. The Two Harbors is served by a sewage treatment plant; the effluent is disposed of via spraying on a hillside. In addition, Two Harbors has marina facilities.
  - Subarea Two, North End of Little Harbor to Ben Weston Point - This subarea is relatively small covering approximately 2.7 miles and ranging from the north end of Little Harbor to Ben Weston Point. This area has three discharges, all of which are considered to be a higher threat. This area is used primarily for recreation by islanders and boaters and consists of areas used for camping, picnicking, hiking, and surfing.
  - Subarea Three, Farnsworth Bank Ecological Reserve - This subarea's location offshore precludes it from having any direct land-based anthropogenic inputs. There are no discharges. This area is popular for such activities as scuba diving and fishing
  - Subarea Four, Binnacle Rock to Jewfish Point - This subarea covers approximately 2.8 miles and ranges from Binnacle Rock to Jewfish Point on the east end of the island. It has two discharges , both of which are considered a higher threat. Its major source of anthropogenic inputs most likely would come from a large quarry.

Drainages include both outlets (naturally occurring streams) and discharges, which have an anthropogenic source. Higher threat discharges include municipal, transportation (including stream crossings), construction and industrial storm water, marine operations and piers, agricultural discharges, contaminated surface seeps, sources of human sewage, fish cleaning stations, and marine laboratories and aquaria. Higher threat sources of wastes should be addressed immediately. The State Board report, *Status Report - Areas of Special Biological Significance - August 2006*, describes actions underway to address higher threat discharges. The results of the statewide survey may be found in the report, *Discharges Into State Water Quality Protection Areas* produced in 2003 by SCCWRP for the State Board. Both reports and other information about ASBS may be found at http://www.waterboards.ca.gov/plnspols/asbs.html .

Regional Monitoring of Ocean Waters

The Southern California Bight Pilot Project conducted a survey in 1994 to assess the spatial extent and magnitude of ecological disturbances on the mainland shelf between Point Conception in Central California to the California-Mexico border. The survey was a cooperative effort between four large discharger agencies (City of Los Angeles, County Sanitation Districts of Los Angeles County, Orange County Sanitation District, and City of San Diego), regulators (U.S. Environmental Protection Agency, State Water Resources Control Board, and Los Angeles, Santa Ana, and San Diego Regional Water Quality Control Boards), as well as the Southern California Coastal Water Research Project, and the Santa Monica Bay Restoration Project. Monitoring focused on benthic infauna, sediment chemistry, sediment toxicity, demersal fish/invertebrate populations (trawling), water quality (CTD measurements), and bioaccumulation (fish tissue with species not consumed by humans). Final reports were published in 1998.

A second regional survey of the Southern California Bight was conducted in 1998. Rather than simply repeat the 1994 survey, the participants in the 1998 survey agreed to expand the monitoring program to include a larger geographic scope (including enclosed bays, harbors and estuaries, the Mexican coastline south of California, and offshore channel islands), new monitoring components (microbiology, greater emphasis on stormwater runoff impacts) and additional participants (small point source dischargers, stormwater groups and other interested parties, including volunteer monitoring programs being implemented by environmental organizations). Most of the sampling occurred over a six-week period from late July to early September, although certain components (water quality, microbiology) were performed during different time periods. Sampling of benthic infauna and sediment chemistry took place at approximately 250 stations, sediment toxicity at approximately 200 stations, and demersal fish/invertebrate populations and bioaccumulation at approximately 175 stations. The microbiology sampling was conducted at approximately 250 stations once per week over a 5-week period in August-September 1998 (dry season) and February-March 1999 (wet season). The water quality component included sampling once during dry weather (September-October) and twice during wet weather along several transect lines throughout the Bight.

A third regional survey was conducted in 2003 and planning for Bight ’08 has begun. More information about the Bight and other related projects may be found on the SCCWRP webpage http://www.sccwrp.org/.

Other Regional Monitoring Programs (BPCTP)

Bay Protection and Toxic Cleanup Program (BPTCP): In 1989, state legislation added Sections 13390 through 13396 to the California Water Code which established the BPTCP. The program has four main goals: 1) to provide protection of existing and future beneficial uses of bays and estuarine waters, 2) to identify and characterize toxic hot spots, 3) to plan for cleanup or other mitigating actions of toxic hot spots, and 4) to develop effective strategies to control toxic pollutants, abate existing sources of toxicity, and prevent new sources of toxicity.

While in its identification and characterization phase, the program implemented regional monitoring at each of the coastal Regions. Sediment toxicity tests, chemical analyses, and benthic community surveys were used to classify each bay or estuarine waterbody. Waters were generally "pre-screened" for contamination using toxicity tests; if enough was found, more intensive monitoring followed to confirm

the existence and spatial extent of monitoring. Using this approach, the Santa Monica Bay/Palos Verdes Shelf, parts of, Consolidated Slip/Dominguez Channel, Cabrillo Pier, Mugu Lagoon/Calleguas Creek, McGrath Lake, Los Angeles River Estuary, Marina Del Rey, and Marina Del Rey Entrance Channel were identified as candidate toxic hot spots. A number of other waters were identified as sites of concern.

State Board adopted a statewide, consolidated cleanup plan in June 1999 with Office of Administrative approval following in November 1999. Regional cleanup plans deal specifically with high priority candidate toxic hot spots; detailed cleanup plans were not required for moderate priority candidate toxic hot spots or sites of concern although listed in the document. Identified remediation/cleanup alternatives for toxic hot spots range from specific actions such as in-situ capping, issuing waste discharge requirements, or dredging to more regional/watershed activities such as long-term management of contaminated sediments or proactive application of the watershed management approach as a preventive measure. At this point, no specific funding source has been identified to pay for remediation activities although potential funding mechanisms are addressed in the statewide consolidated cleanup plan. The best chance for obtaining funds for cleanup appears to be through the use of Supplemental Environmental Projects (SEPs) from enforcement actions or by partnering with other groups within the context of the watershed management approach to take advantage of local efforts. Funding for staff resources ended in June 1999.

After the Consolidated Plan was approved, the Regional Board was required to reevaluate WDRs in compliance with Water Code Section 13395. The reevaluation was to consist of (1) an assessment of the WDRs that may influence the creation or further pollution of the known toxic hot spot; (2) an assessment of which WDRs need to be modified to improve environmental conditions at the known toxic hot spot; and (3) a schedule for completion of any WDR modifications deemed appropriate. We evaluated WDRs associated with high priority known toxic hot spots (i.e., Palos Verdes Shelf, Consolidated Slip, Cabrillo Beach, Mugu Lagoon, McGrath Lake) and did not identify any existing WDRs which required modifications Similarly, we did not need to modify any WDRs associated with moderate and low priority known toxic hot spots. As we renew, modify, or issue new WDRs, we need to include a finding that the discharge may contribute to the pollution present at the toxic hot spot.

The program also has a website which may be consulted for additional information: http://www.waterboards.ca.gov/bptcp.

TMDL Scheduling And Development

The 303(d)-listed waterbodies/reaches were listed in the watershed sections. The TMDLs scheduled in the near-term were also listed. Clearly, there are a large number of waters in the Region which are impaired by a number of constituents (over 700 individual impairments). All TMDLs covered by a consent decree must be completed by 2011. The overriding problem associated with TMDL development needs to be reiterated here, namely, staff resources at the Regional Board to either directly conduct or be involved in stakeholder-led TMDL investigations and in general stay dedicated to nonpoint source activities are still minimal. **In general, depending on the watershed, it is anticipated that 0.5 - 2.0 PYs/watershed more will be needed** at a minimum to make additional headway on TMDLs and implementation of our nonpoint source strategy (as well as augment point source regulation, where needed); this need will increase as we add more TMDLs in the next two years to fully accomplish our TMDL mandate. Additionally, AB1740 (Ducheny) was enacted in 2000 and requires that to the extent interest is expressed by the public, and resources are available, each Regional Board shall establish for each watershed where a water body is listed as impaired, an Advisory Committee consisting of the public

and interested stakeholders who wish to be involved in the process of adoption and implementation of the corrective actions necessary to eliminate the impairment.

However, with a seemingly impossible workload before us, there is a reasonable and logical way to collapse or group TMDLs to make the most effective use of resources we currently have and any which we may obtain in the future. This is largely due to the fact that some of the "pollutants" for which a water may be listed are actually "effects" of pollutants. For example, many reaches of the Los Angeles River are listed for ammonia. Some of the same reaches are listed for pH problems while other reaches are listed for algae, scum, and odors. It is very likely the presence of these "pollutants" are interrelated. Excessive nitrogen (reflected here as high levels of ammonia) may lead to a condition of eutrophication (excessive nutrient loading) which can influence pH levels as well as promote increased algal growth. Scum may be evident due to floating algal material and odors may result when excessive algae starts to die off. Thus, it is reasonable to group together these TMDLs (calling it a "nitrogen and related effects" TMDL) and approach the problem by determining the sources of nitrogen loading into the watershed and the appropriate allocations in order to reduce loadings.

Another example relates to the Malibu Creek Watershed. Many of its reaches are listed as impaired due to coliform. Other reaches are listed for swimming restrictions or shellfish harvesting advisories (an effect of elevated coliform levels). It is reasonable to group together these various reaches and "pollutants" together when performing a TMDL. USEPA has produced a number of documents relating to TMDL development; these may be found at http://www.epa.gov/owow/tmdl/.

Appendix

Ventura County General Plan 2010 Excerpt

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VENTURA COUNTY GENERAL PLAN

GOALS, POLICIES AND PROGRAMS

Last Amended by the Ventura County oard of Supervisors
on
April 6, 2010

Ventura County General Plan
GOALS, POLICIES AND PROGRAMS

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VENTURA COUNTY GENERAL PLAN

GOALS, POLICIES AND PROGRAMS

Adopted by the Ventura County Board of Supervisors – May 24, 1988 (GPA 88-1)

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General Plan Appendices & Area Plans

The General Plan appendices and area plans are separate documents and are listed below:

Document Title	Date adopted or last amended
Appendices:	
Resources Appendix	04-06-10
Hazards Appendix	11-15-05
Land Use Appendix	11-15-05
Public Facilities and Services Appendix	11-15-05
Area Plans:	
Ahmanson Ranch Area Plan	12-15-92
Coastal Area Plan	11-20-01
El Rio/Del Norte Area Plan	11-15-05
Lake Sherwood/Hidden Valley Area Plan	04-06-10
North Ventura Avenue Area Plan	12-11-90
Oak Park Area Plan	11-15-05
Ojai Valley Area Plan	11-15-05
Piru Area Plan	11-15-05
Saticoy Area Plan	12-10-96
Thousand Oaks Area Plan	04-06-10

Introduction

Purpose

Section 65300 of the California Government Code states; Each planning agency shall prepare and the legislative body of each county and city shall adopt a comprehensive, long-term general plan for the physical development of the county or city, and of any land outside its boundaries which in the planning agency s judgment bears relation to its planning. Further, as stated in Section 65300.5 of the Government Code, it is the intent of the State Legislature that the general plan and elements and parts thereof comprise an integrated, internally consistent and compatible statement of policies for the adopting agency.

The Ventura County General Plan is intended to fulfill these requirements of State Law.

orm and Content

Section 65301 of the Government Code states:

(a) …The general plan may be adopted in any format deemed appropriate or convenient by the legislative body, including the combining of elements. The legislative body may adopt all or part of a plan of another public agency in satisfaction of all or part of the requirements of Section 65302 if the plan of the other public agency is sufficiently detailed and its contents are appropriate, as determined by the legislative body, for the adopting city or county.

(b) The general plan may be adopted as a single document or as a group of documents relating to subjects or geographic segments of the planning area.

(c) The general plan shall address each of the elements specified in Section 65302 to the extent that the subject of the element exists in the planning area. The degree of specificity and level of detail of the discussion of each such element shall reflect local conditions and circumstances...

Section 65302 of the Government Code states that the general plan shall consist of a statement of development policies and shall include a diagram or diagrams and text setting forth objectives, principles, standards, and plan proposals. The section then goes on to list seven mandated elements, and describes the purpose and content of each of the elements.

Te t

Ventura County has found that preparing a General Plan in the form of separate elements creates a General Plan which is disjointed, awkward to use, and redundant. Furthermore, much of the General Plan consists of background information and data which is necessary for the understanding of the subject matter and serves as justification for specific development policies, but is generally not needed for the day-to-day administration and implementation of the General Plan s development policies. Lastly, because Ventura County is so large and diverse, it is impossible to prepare a single, countywide General Plan of sufficient detail to cover all areas adequately.

Because of these concerns, Ventura County has formatted its General Plan in a manner which is clear, concise, logical and usable, while meeting the requirements of the Government Code. Specifically, the County General Plan consists of: (a) Countywide Goals, Policies and Programs containing four chapters (Resources, Hazards, Land Use, and Public Facilities and Services), (b) four Appendices (Resources, Hazards, Land Use, and Public Facilities and Services) which contain background information and data in support of the Countywide Goals, Policies and Programs, and (c) several Area Plans which contain specific goals, policies and programs for specific geographical areas of the County. The following table lists the seven mandated elements and the required content of each (as described in Section 65302 of the Government Code), and references which chapter of the Countywide Goals, Policies and Programs and/or Appendix of the Ventura County General Plan where the requirements for each element can be found:

	Ventura County General Plan Chapter And Appendi Location			
State Requirements	**Resources**	**Hazards**	**Land Use**	**Public acilities and Services**
Land Use Element:				
Housing				
Business				
Industry				
Open Space				
Agriculture				
Scenic Beauty				
Education				
Public Buildings & Grounds				
Solid & Liquid Wastes				
Population Density/Building Intensity				
Flooding				
Timberland Production				
Circulation Element:				
Major Thoroughfares				
Transportation Routes				
Terminals				
Utilities				
Housing Element				
Conservation Element:				
Water				
Hydraulic Force				
Forests				
Soils				
Rivers				
Harbors				
Fisheries				
Wildlife				
Minerals				
Open Space Element				
Noise Element				
Safety Element				

Maps

The Ventura County General Plan Goals, Policies and Programs contain four sets of maps which relate to specific policies: Resource Protection Maps, Hazard Protection Maps, General Land Use Maps and Public Facilities Maps. These map sets are located on the County's Geographic Information System (GIS) and are available from the Resource Management Agency's Mapping, GIS and Graphic Services.

In addition to the above maps, there are several maps within the text of the General Plan Goals, Policies and Programs that illustrate specific policies or depict important information. These maps are 8 x 11 and display various scales.

Within the General Plan Appendices, there are several maps, of various scales, that are illustrative of information discussed within the text. These maps are illustrative only and should not be used for policy interpretation or administration.

Within the Area Plans, there are several maps, of various scales, which depict information discussed within the text or illustrate specific policies within each Area Plan.

Definitions

Unless the provision(s) or context otherwise requires, the definitions of words and terms as found in the Glossary of the General Plan Goals, Policies and Programs govern the construction of the General Plan The words shown in *ita ics* in the body of the text are defined in the Glossary.

oa The ultimate purpose of the County s effort stated in a way that is general in nature. Example: Increase housing opportunities for households of all income levels, with special emphasis on lower-income households, the elderly, mentally ill, single heads of household, large families, farmworkers, handicapped and homeless.

The term objectives, which are referred to in State Law, are goals that are quantified. Example: "Promote and facilitate at least a 2.3 percent market vacancy rate in owner-occupied housing and 5 percent market vacancy rate in rental housing.."

o icy: A specific statement guiding day-to-day actions and implying clear commitment to carry out the goals of the General Plan in a prescribed manner. Example: The County shall give priority in providing housing assistance to those groups with demonstrated special needs, such as the elderly, mentally ill, handicapped, large families, single heads of household, farmworkers and the homeless.

ro ra : A coordinated set of actions to carry out the goals of the Plan. Example: The County Executive Office will continue to administer Federal and State funds and grants in order to facilitate the development of affordable housing for *o er-inco e* households, and for those with identified special needs (farmworkers, elderly, mentally ill, handicapped, homeless), and notify other housing agencies and non-profit organizations of the availability of funding for lower-income families and special needs housing.

An asterisk ( ) next to a program means that particular program will not be pursued until the specified county agency/department is given direction by the Board of Supervisors to proceed with the program

Determining Consistency with the General Plan

Section 65860 of the Government Code states; County or city zoning ordinances shall be consistent with the general plan of the county or city.... A zoning ordinance shall be consistent with a city or county general plan only if:

(i) the city or county has officially adopted such a plan, and

(ii) the various land uses authorized by the ordinance are compatible with the objectives, policies, general land uses, and programs specified in such a plan.

Furthermore, Section 66473.5 of the Government Code states; No local agency shall approve a tentative map, or a parcel map for which a tentative map was not required, unless the legislative body finds that the proposed subdivision, together with the provisions for its design and improvement, is consistent with the general plan. A proposed subdivision shall be consistent with a general plan or a specific plan only if the local agency has officially adopted such a plan and the proposed subdivision or land use is compatible with the objectives, policies, general land uses, and programs specified in such a plan.

Also, Section 65401 of the Government Code states that all proposed public works (facilities) of any county, city, special district or school district, shall be reviewed for consistency with the appropriate local city or county general plan. Furthermore, Section 65402(a) states that no real property shall be acquired for public purposes and no real property shall be disposed of, until the location, purpose and extent of such acquisition or disposition has been reviewed for conformity with the appropriate local city or county general plan. Section 65403(c) concludes by stating, A district or local agency shall not carry out its capital improvement program or any part of the program if the planning agency finds that the capital improvement program is not consistent with the applicable general plan, any specific plans, and all elements and parts of the plan. A district or local agency may overrule the finding and carry out its capital improvement program.

Lastly, Section 65454 states; No specific plan may be adopted or amended unless the proposed plan or amendment is consistent with the general plan.

At the local level, the Ventura County oning Ordinance states that no Planned Development Permit, Conditional Use Permit, or oning Clearance may be approved which is inconsistent with the County General Plan. Furthermore, the Ventura County Subdivision Ordinance states that no subdivision may be approved which is inconsistent with the County General Plan.

Hence, in the unincorporated area of Ventura County, zoning and any permits issued thereunder, any subdivision of land, any public works project, any public (County, Special District, or Local Government) land acquisition or disposition, and any specific plan, must be consistent with the Ventura County General Plan Goals, Policies and Programs, and where applicable, the adopted Area Plan.

Interpretations

Although every effort has been made to provide *oa s po icies* and *pro ra s* that are clear, the necessity of interpreting such goals, policies and programs in light of specific and unusual cases will occur from time to time. When such interpretations are necessary, the Planning Director is responsible for the review and interpretation of the General Plan Goals, Policies and Programs (with the right of appeal to the Planning Commission and the Board of Supervisors).

Since goals are general in nature, the goals should not be interpreted in the same way as policies and programs. Goals are meant as targets toward which the County's actions are directed, but do not serve as absolute standards. In other words, although the County is committed to strive toward attaining a particular goal, a goal may not always be attainable in an absolute sense. Policies and programs, on the other hand, are to be read as the specific means by which the County will move toward carrying out its goals.

The goals, policies and programs of the General Plan are cumulative and, as such, individual goals, policies and programs should be used and interpreted in the context of other goals, policies and programs. Since a goal may be implemented through multiple policies and/or programs, and a specific policy or program may serve to implement more than one goal, the goals, policies and programs for a subject (e.g., biological resources), should be read in the context of other similar goals, policies and programs. In cases where there are multiple goals (or policies or programs), and two or more goals (or policies or programs) address the same subject, the more specific and restrictive goal (or policy or program) would take precedence. In this regard, goals are compared to goals, policies are compared to policies, and programs are compared to programs.

General Plan Amendments

According to Section 65358 of the Government Code:

(a) If it deems it to be in the public interest, the legislative body (of a City or County) may amend all or part of an adopted general plan. An amendment to the general plan shall be initiated in the manner specified by the legislative body. A legislative body that permits persons to request an amendment of the general plan may require that an amount equal to the estimated cost of preparing the amendment be deposited with the planning agency prior to the preparation of the amendment.

(b) Except as otherwise provided in subdivision (c) or (d), no mandatory element of a general plan shall be amended more frequently than four times during any calendar year. Subject to that limitation, an amendment may be made at any time, as determined by the legislative body. Each amendment may include more than one change to the general plan.

(c) The limitation of the frequency of amendments to a general plan contained in subdivision (b) does not apply to amendments of the general plan requested and necessary for a single development of residential units, at least 25 percent of which will be occupied by or available to persons and families of low or moderate income, as defined by Section 50093 of the Health and Safety Code. The specified percentage of low- or moderate-income housing may be developed on the same site as the other residential units proposed for development, or on another site or sites encompassed by the general plan, in which case the combined total number of residential units shall be considered a single development proposal for purposes of this section.

(d) This section does not apply to the adoption of any element of a general plan or to the amendment of any element of a general plan in order to comply with any of the following:

(1) A court decision made pursuant to Article 14 (commencing with Section 65750). i.e. Challenges to Plan s validity

(2) Subdivision (b) of Section 65302.3. i.e. Airport Land Use Plan

(3) Subdivision (d) of Section 56032 of the Health and Safety Code. i.e. Large Scale Comprehensive Development Plan

(4) Subdivision (b) of Section 30500 of the Public Resources Code. i.e. Local Coastal Plan

Ventura County allows owners, lessees or buyers (in escrow) of land to make application for amendments to the Ventura County General Plan for land they own, lease or are buying. General Plan Amendment applications must contain all information required by the Planning Division and must be accompanied by all application processing fees/deposits as specified by the Board of Supervisors. Furthermore, all privately initiated General Plan Amendments are screened by the Board of Supervisors to determine if the amendment is appropriate for further processing.

According to Government Code Section 65588(b), The Housing Element shall be revised as appropriate, but not less than every five years... Except for the Housing Element, State Law does not establish a mandatory time schedule for comprehensive updates. According to the State General Plan Guidelines, A jurisdiction is expected to make running changes to its General Plan as they are necessary. As a general rule, major General Plan revisions should occur at least every four to five years. With regard to the Ventura County General Plan, the Planning Division, with the support of other County agencies, is responsible for annually reviewing the General Plan and reporting to the Board of Supervisors on the status of the plan and progress in its implementation.

Municipal Anne ations Sphere of Influence and State or ederal acility Changes

In order to maintain the timeliness of various general plan land use maps and tables, the Planning Director is authorized to update the appropriate maps and tables to reflect:

- Local Agency Formation Commission (LAFCO) approved and recorded municipal boundary or Sphere of Influence changes without the need to process such changes through the General Plan Amendment process; and

- Property acquired by the State or Federal government for expansion of a State or Federal Facility.

Notwithstanding the above, LAFCO approved municipal detachments or detachments from a State or Federal Facility shall require a general plan amendment in order to establish the detachment's land use designation and zoning.

Limitations on General Plan Amendments Relating to Agricultural, Open Space and Rural Designations

Pursuant to the provisions of the SAVE OPEN-SPACE and AGRICULTURAL RESOURCES (S.O.A.R.) ORDINANCE, the following shall obtain until December 31, 2020:

a) The provisions setting forth the Agricultural, Open Space and Rural land use designations, and the goals and policies as they specifically apply to those land use designations in Sections 3.1 and 3.2 of this General Plan shall not be further amended unless such amendment is approved by vote of the people or by the Board of Supervisors pursuant to the procedures set forth herein.

b) Those lands designated as Agricultural, Open Space or Rural on the "General Land Use Maps" adopted by the Board of Supervisors for Ventura County on May 24, 1988, and amended through September 16, 1997 shall remain so designated unless redesignated to another general plan land use category by vote of the people, or redesignated by the Board of Supervisors pursuant to the procedures set forth herein.

c) The Board of Supervisors, following at least one public hearing for presentations by an applicant and the public, and after compliance with the California Environmental Quality Act, may place any amendment to land use designations of Agricultural, Open Space or Rural, or any provision, goal or policy as set forth in subsection "a", above, on the ballot pursuant to the mechanisms provided by State Law.

d) The Board of Supervisors without a vote of the people may reorganize, reorder, or renumber individual provisions of the General Plan, as well as the provisions herein, in the course of ongoing updates of the General Plan in accordance with the requirements of state law. Additional technical, non-substantive language modifications may be made to the General Plan with reference to Agricultural, Open Space or Rural designations for clarification and internal consistency provided such modifications are consistent with the Findings and Purpose of the ordinance creating these provisions.

e) The Board of Supervisors, without a vote of the people, may redesignate Rural designated properties to either Agricultural or Open Space, or may redesignate Open Space to Agriculture pursuant to the provisions for making such amendments set forth in state law and Board adopted policies.

f) The Board of Supervisors, without a vote of the people, may redesignate Agricultural designated properties to Open Space if the Board of Supervisors makes all of the following findings supported by substantial evidence:

   i) The land proposed for redesignation has not been used for agricultural purposes in the past 2 years and is unusable for agriculture due to its topography, drainage, flooding, adverse soil conditions or other physical reasons;

   ii) The land proposed for redesignation is immediately adjacent to areas developed in a manner compatible with the uses allowed under Open Space;

   iii) Adequate public services and facilities are available and have the capacity and capability to accommodate the Open Space uses allowed;

   iv) The proposed redesignation is compatible with agricultural uses, does not interfere with accepted agricultural practices, and does not adversely affect the stability of land use patterns in the area; and

   v) The land proposed for redesignation does not exceed 40 acres for any one landowner in any calendar year, and one landowner may not obtain redesignation pursuant to this subdivision (f) more often than every other year. Landowners with any unity of interest are considered one landowner for purposes of this limitation.

g) The Board of Supervisors, without a vote of the people, may redesignate Agricultural, Open Space or Rural properties provided the Board complies with the following two conditions:

i) The Board makes a finding based upon the advice of the County Counsel that the designation of the property effects an unconstitutional taking of the landowners' property; and

ii) In permitting the redesignation, the Board allows a less restrictive designation to be applied to the property only to the extent necessary to avoid the unconstitutional taking of the landowner's property.

h) The Board of Supervisors, without a vote of the people, may amend the provisions of the General Plan which apply to the Agricultural, Open Space or Rural designations, as set forth in subsection "a", above, for the express purpose of further protecting and preserving resources identified in the General Plan, provided that said amendment(s) are consistent with the Findings and Purpose of the ordinance adopting these provisions of the General Plan.

i) In recognition of the urban nature of the Piru community and to provide essential flexibility to the Board of Supervisors to address the special needs of that community, the Board of Supervisors, without a vote of the people, may amend the land use designations on the General Land Use Map, as set forth in subsection "b", above, for land located within the Piru Redevelopment Area or land described by the following Assessor Parcel Numbers:

056-0-180-01	056-0-180-08
056-0-180-02	056-0-190-05
056-0-180-06	056-0-190-06
056-0-180-07	056-0-190-09

The total land represented by this subsection "i" is set forth on Exhibit "A"

j) The Board of Supervisors, without a vote of the people, may amend the land use designations on the General Land Use Map, as set forth in subsection "b", above, to any Existing Community designation for land which, prior to the effective date of the ordinance setting forth these provisions, is found to contain lawfully established urban building intensities or urban land uses, to the minimum extent necessary to validate such pre-existing uses consistent with the Findings and Purpose of the ordinance adopting these provisions of the General Plan.

k) Following December 31, 2020, redesignations of then existing General Plan designations may be occasioned by the Board of Supervisors without a vote of the people, Until then, approval by a vote of the people is accomplished when a General Plan amendment is placed on the ballot through any procedure provided for in the Election Code, and a majority of the voters vote in favor of it. Whenever the Board of Supervisors adopts an amendment requiring approval by a vote of the people pursuant to the provisions of this subsection, the Board's action shall have no effect until after such a vote is held and a majority of the voters vote in favor of it.

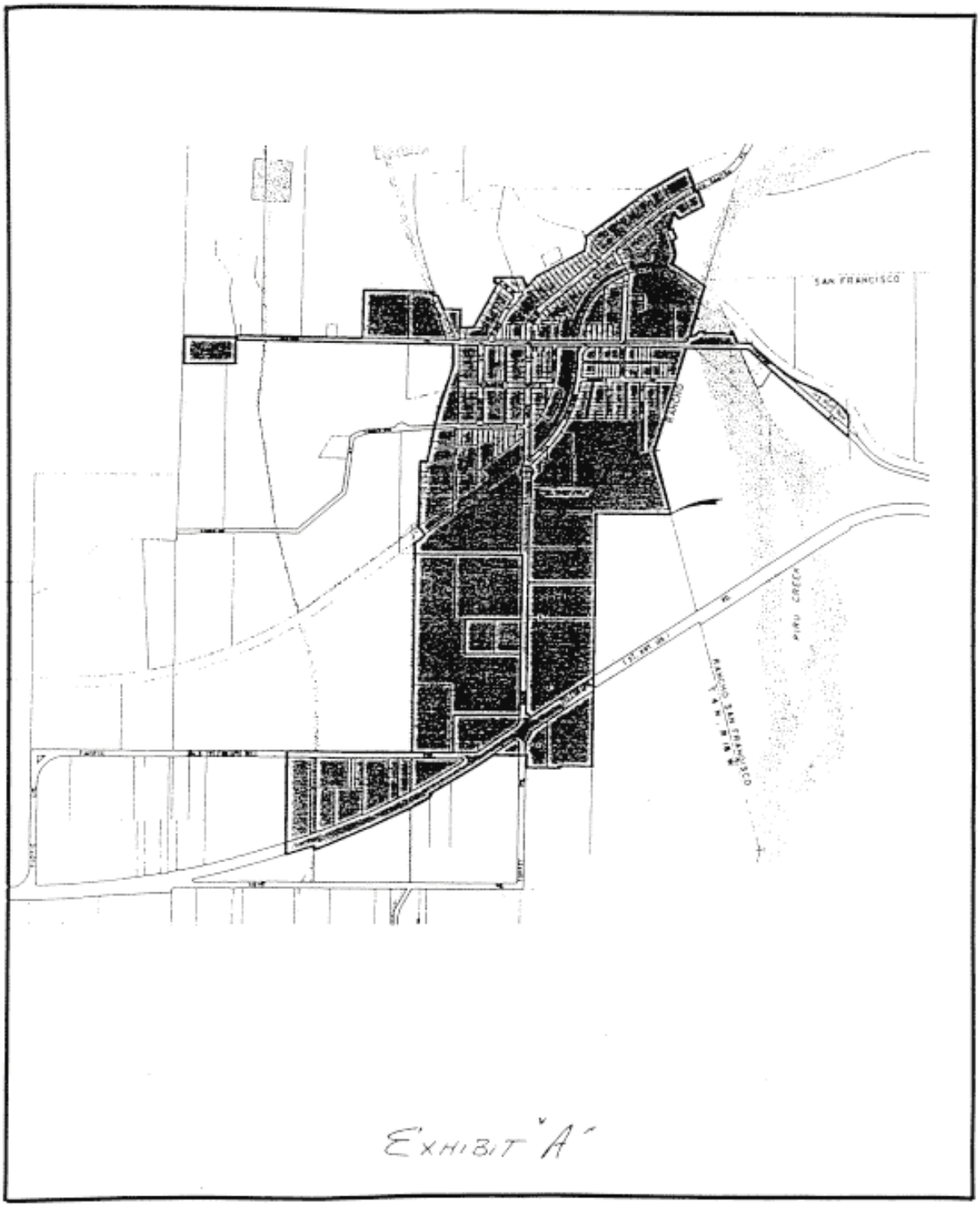
Planning Horizon

The planning horizon for this General Plan is the year 2020.

FIGURE A

S.O.A.R. ORDINANCE - PIRU AREA MAP

AREA EXEMPT FROM S.O.A.R.



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1. Resources

This Chapter of the General Plan identifies *oa s po icies* and *pro ra s* relating to the preservation, conservation, production and utilization of resources in Ventura County. The specific goals, policies, and programs are listed under the following major headings: General goals, policies and programs, Air Quality, Water Resources, Mineral Resources, Biological Resources, Farmland, Scenic Resources, Cultural Resources, Energy Resources, and Coastal Beaches and Sand Dunes.

1.1 General Goals, Policies and Programs

The following are the general goals, policies and program which apply to Resources:

1.1.1 Goals

1. Inventory and monitor the natural and man-made (e.g., cultural) resources of Ventura County.
2. Plan for the *preservation*, *conservation*, efficient use of, enjoyment of, and access to resources, as appropriate, within Ventura County for present and future generations.
3. Identify and work with all entities responsible for the protection, management and enhancement of the County s resources.

1.1.2 Policies

1. All General Plan amendments, zone changes and *discretionary deve op ent* shall be evaluated for their individual and cumulative impacts on resources in compliance with the California Environmental Quality Act.
2. Except as otherwise covered by a more restrictive *po icy* within the Resources Chapter, significant adverse impacts on resources identified in environmental assessments and reports shall be mitigated to less than significant levels or, where no feasible mitigation measures are available, a statement of overriding considerations shall be adopted.

1.1.3 Program

The Planning Division, with the technical support of other appropriate agencies, will annually review the Resources Appendix to identify what information needs to be updated and, when appropriate, shall submit a budget request as part of the next year s County budget.

1.2 Air uality

The Federal government has established ambient air quality standards to protect public health (primary standards) and welfare (secondary standards). The State of California has established separate, more stringent standards. Federal and State standards have been established for ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, suspended particulate matter (e.g. dust) and lead. In addition, California has standards for ethylene, hydrogen sulfide, sulfates and visibility-reducing particles.

Ventura County frequently exceeds federal and state ambient air quality standards for ozone. Under both federal and state Clean Air Acts, the County is a severe (worst category) *nonattain ent area*. Ozone is a highly chemically reactive gas that poses a serious threat to human health. People who suffer from cardiopulmonary and respiratory diseases such as asthma, emphysema, and chronic bronchitis are particularly susceptible to ozone. However, athletes and physically active people also can be adversely affected by ozone. Ozone also causes extensive damage to agricultural crops and various materials, such as paints, rubber, and metals.

Ventura County also has elevated ambient levels of very fine dust particles called PM-10 (10 macrons or less in diameter). Concern for PM-10 is based on the ability of small particles to reach deep into the lungs, posing a threat to the respiratory system. As with ozone, people most sensitive to particulates are those with chronic respiratory and cardiovascular diseases, the elderly, and children. Ventura County is an attainment area for the federal PM-10 standard, but nonattainment for the more stringent state PM-10 standard.

The first study of air pollution in Ventura County occurred in 1966. That study found that Ventura County had a serious air pollution problem. Consequently, the Ventura County Air Pollution Control District was formed in 1968. The District s mission is to protect public health and agriculture from the adverse effects of air pollution by identifying air pollution problems and developing a long-range comprehensive program to achieve and maintain state and federal air quality standards. Ventura County s latest Air Quality Management Plan is the 1994 AQMP (adopted 10/9/95). The primary purpose of the 1994 AQMP is to satisfy the planning requirements of the 1990 federal Clean Air Act Amendments and to outline a strategy for meeting the federal ozone clean air standard by 2005.

Further, discussion of air pollution and measures being undertaken to achieve air quality standards can be found in the Air Quality Management Plan, which is available for review at the Ventura County Air Pollution Control District office, 702 County Square Drive, Ventura, California.

The goals, policies and programs which apply to air quality are as follows:

1.2.1 Goals

1. Diligently seek and promote a level of air quality that protects public health, safety, and welfare, and seek to attain and maintain the State and Federal Ambient Air Quality standards.
2. Ensure that any adverse air quality impacts, both long-term and short-term, resulting from *discretionary deve op ent* are mitigated the maximum extent feasible.

1.2.2 Policies

1. *iscretionary deve op ent* that is inconsistent with the Air Quality Management Plan (AQMP) shall be prohibited, unless overriding considerations are cited by the decision-making body.
2. The air quality impacts of *discretionary deve op ent* shall be evaluated by use of the Guidelines for the Preparation of Air Quality Impact Analysis.
3. *iscretionary deve op ent* that would have a significant adverse air quality impact shall only be approved if it is conditioned with all reasonable mitigation measures to avoid, minimize or compensate (offset) for the air quality impact. Developers shall be encouraged to employ innovative methods and technologies to minimize air pollution impacts.
4. Where deemed necessary by the APCD, *discretionary deve op ent* shall be conditioned to develop, implement, and maintain over time, Transportation Demand Management (TDM) programs consistent with APCD s trip reduction rule 210. TDM programs shall include a requirement for annual performance reporting to and approval by the APCD.
5. *eve op ent* subject to APCD permit authority shall comply with all applicable APCD rules and permit requirements, including the use of best available control technology (BACT) as determined by the APCD.

1.2.3 Programs

1. The Ventura County Air Pollution Control District (APCD) will periodically update the Ventura County Air Quality Management Plan per the requirements of the Federal Clean Air Act and the California Clean Air Act.
2. The APCD will require employers subject to APCD s Trip Reduction Rule 210 to prepare and implement trip reduction plans. The purpose of these plans is to reduce the number of solo drivers commuting to work. Trip reduction strategies may include, but are not limited to, ridesharing promotion, modified work schedules, preferential parking, telecommuting, parking management and van pools. The APCD will continue to be involved with the annual review of the Congestion Management Program and has State mandated responsibility regarding review of deficiency plans.
3. The APCD will continue the program to assist cities in the development and implementation of local Transportation Control Measure (TCM) policies and programs. The assistance program shall include, but not be limited to, periodic meetings to facilitate coordination of efforts between local jurisdictions.

4. The County Air Pollution Control District will continue to monitor and comment on *discretionary deve op ent* requests under City, State and/or Federal jurisdiction, to help ensure that they do not significantly impact air quality in Ventura County.
5. The Planning Division and the Public Works Agency will submit, for Board budget consideration, *pro ra s* to implement Transportation Control Measures as outlined in the AQMP.

1.3 Water Resources

There are three local water sources in the County: groundwater, surface water and reclaimed water. Imported water, which is not considered an in-County water resource, is discussed in the Water Supply Facilities Section (4.3).

Groundwater is the single most important source of water in the County. In 1985, it provided about 67 of the water utilized in the County. It is pumped extensively by individual well owners as well as purveyors who sell it at either retail sales to individuals or at wholesale to other purveyors. Since, overall, more groundwater is used than is replaced, the County s groundwater reserves are slowly decreasing (i.e., water is being extracted more rapidly than it is being replaced).

The largest groundwater supplies in the County are contained within major aquifers which underlie most of the Oxnard Plain, and the Las Posas and Santa Clara Valleys. These are, in order of increasing depth, the Oxnard, Mugu, Hueneme, Fox Canyon, and Grimes Canyon aquifer zones. Both the Oxnard aquifer in the Oxnard Plain area and the Fox Canyon aquifer are being overdrafted. Long term overdrafting has caused serious seawater intrusion of the Oxnard aquifer. A Seawater Intrusion Abatement Project is currently underway to remedy this problem. The United Water Conservation District and County, with the support of local cities, are carrying out this project which includes removal of wells from the intruded Oxnard aquifer and operation of the Freeman diversion structure on the Santa Clara River which, together with new wells in the Fox Canyon zone and the new pumping trough pipeline, will deliver water to users on the Oxnard Plain.

Surface water resources in Ventura County are divided into two major hydrologic units (Ventura River and Santa Clara-Calleguas Units) and into four other smaller hydrologic units (Rincon Creek, Cuyama, San Joaquin, and Malibu Hydrologic Units).

Streams in Ventura County that generally flow for the entire year include Sespe Creek, Piru Creek, Reyes Creek, Matilija Creek, the North Fork of the Ventura River, the Ventura River below Foster Park and the upper portion of the Santa Clara River. However, the year-round flow in the Ventura River below Foster Park, the upper reach of the Santa Clara River and the Arroyo Simi are due primarily to waste water treatment plant discharges. These creeks plus other, small tributaries have extensive riparian zones and provide habitat for a variety of vertebrates such as rainbow trout.

The Casitas Municipal Water District provides wholesale and retail water distribution from Lake Casitas. The United Water Conservation District is responsible for groundwater recharge throughout most of the Santa Clara River Valley and for the wholesale distribution of water to purveyors on the Oxnard Plain. Lake Piru is United s reservoir for water which is released into the Santa Clara River for subsequent recharge into the underground aquifers for later urban and agricultural use. The Calleguas Municipal Water District is responsible for providing imported water for wholesale purposes to retail water purveyors serving municipal/industrial customers in the southeastern portions of the County.

Groundwater quality in Ventura County is gradually being degraded, primarily by agricultural runoff and *eachate*. Water quality can be estimated through the concentration of total dissolved solids (TDS). This value represents the concentration of all minerals and trace elements. Separate standards for individual pollutants also apply.

Improperly designed, installed and maintained septic systems could potentially contaminate groundwater and surface water supplies in some areas of the County. Also, industrial and commercial developments on septic systems could potentially lead to degradation of groundwater supplies from intentional or unintentional discharges of hazardous wastes into these systems. This potential problem is more critical in aquifer recharge areas.

The best quality water is in portions of the Fox and Grimes Canyon aquifer zones, while the worst is in the upper aquifers along the edges of the Santa Clara Valley and in seawater intruded portions of the Oxnard aquifer zone. Water quality of the major reservoirs (Lake Casitas and Lake Piru) has remained constant and is generally of high quality. Surface water quality such as rivers and tributaries fluctuates from season to season, but is adequate in most areas for agricultural uses.

The Countywide Wastewater Reuse (201) Plan identifies reclaimed water from *se a e treat ent aci ities* as being a potential source of 18,000 acre feet/year. The County is pursuing funding to implement this plan.

There are many agencies that are responsible for the management of water resources at the Federal, State and local levels. Federal agencies include the Forest Service, Army Corps of Engineers, Bureau of Reclamation and the Environmental Protection Agency; State agencies include the Resources Agency and its many departments, the State Department of Public Health, Department of Water Resources and the Water Resources Control Board; and local agencies include the County Departments of Public Works, Environmental Health, Planning, Flood Control Districts, Sanitation Districts, Fox Canyon Groundwater Management Agency, cities, and water retailers and wholesalers.

The goals, policies, and programs which apply to water resources are as follows:

1.3.1 Goals

1. Inventory and monitor the quantity and quality of the County s water resources.
2. Effectively manage the water resources of the County by adequately planning for the development, *conservation* and protection of water resources for present and future generations.
3. Maintain and, where feasible, restore the chemical, physical and biological integrity of surface and groundwater resources.
4. Ensure that the demand for water does not exceed available water resources.
5. Protect and, where feasible, enhance watersheds and aquifer recharge areas.
6. Promote reclamation and reuse of wastewater for recreation, irrigation and to recharge aquifers.
7. Promote efficient use of water resources through water conservation.

1.3.2 Policies

1. *iscretionary deve op ent* which is inconsistent with the goals and policies of the County s Water Management Plan (WMP) shall be prohibited, unless overriding considerations are cited by the decision-making body.
2. *iscretionary deve op ent* shall comply with all applicable County and State water regulations.
3. The installation of *on-site septic syste s* shall meet all applicable State and County regulations.
4. *iscretionary deve op ent* shall not significantly impact the quantity or quality of water resources within watersheds, groundwater recharge areas or groundwater basins.
5. Landscape plans for *discretionary deve op ent* shall incorporate water conservation measures as prescribed by the County s Guide to Landscape Plans, including use of low water usage landscape plants and irrigation systems and/or low water usage plumbing fixtures and other measures designed to reduce water usage.
6. The use of the Santa Clara River as a multiple resource (i.e., source of supply for water, concrete aggregates and biological habitat) shall be permitted to continue; with the use of the River as a water resource having priority over all other uses.

7. Out-of-river mining below the historic or predicted high groundwater level in the Del Norte/El Rio (Oxnard Forebay Basin) area may be permitted if the applicant can demonstrate to the satisfaction of the County of Ventura that the excavation activity will not interfere with or affect groundwater quality and quantity.

8. All *discretionary deve op ent* shall be conditioned for the proper drilling and construction of new oil, gas and water wells and destruction of all abandoned wells on-site.

9. New wells in the Oxnard Plain pressure basin shall not be allowed if they would increase seawater intrusion in the Oxnard or Mugu aquifers.

10. All new golf courses shall be conditioned to prohibit landscape irrigation with water from groundwater basins or inland surface waters identified as Municipal and Domestic Supply or Agricultural Supply in the California Regional Water Quality Control Board s Water Quality Control Plan unless either: a) the existing and planned water supplies for a Hydrologic Area, including interrelated Hydrologic Areas and Subareas, are shown to be adequate to meet the projected demands for existing uses as well as reasonably foreseeable probable future uses within the area, or b) it is demonstrated that the total groundwater extraction/recharge for the golf course will be equal to or less than the historic groundwater extraction/recharge (as defined in the Ventura County Initial Study Assessment Guidelines) for the site. Where feasible, reclaimed water shall be utilized for new golf courses.

1.3.3 Programs

1. The Public Works Agency and the United Water Conservation District will continue to support the Seawater Intrusion Abatement Project.

2. The County Public Works Agency will continue to enforce Chapter 70 (Excavation and Grading) of the Uniform Building Code, as incorporated by reference in and amended by the Ventura County Building Code, to ensure that any proposed grading in a waterway or wetland is adequately investigated and that any *deve op ent* incorporates appropriate design provisions to protect waterways or wetlands.

3. The County will continue to support the Fox Canyon Groundwater Management Agency Plan for both the Upper and Lower Aquifer Systems.

4. The County Environmental Health Division will take all administrative, fiscal and legal measures necessary to provide the services of County Service Area 32.

5. The Planning Division and Public Works Agency will continue to coordinate with water districts and other appropriate agencies to establish a data base on actual available supply, projected use factors for types of land use and *deve op ent*, and threshold limits for *deve op ent* within available water resources.

6. The Planning Division will continue to promote the efficient use of water through the Landscape Design Criteria Program.

7. The Public Works Agency, in cooperation with the Environmental Health Division, will continue to pursue the use of reclaimed water for agricultural irrigation.

8. The Environmental Health Division will continue to monitor, inspect and regulate underground storage tanks.

9. The Environmental Health Division will continue to identify *aste disposa sites* and seek to mitigate impacts to water resources.

10. The Planning Division will prepare, for the consideration of the Board of Supervisors, a Countywide water conservation retrofit program to fund the installation of water conservation fixtures (defined as 1.6 gallons per flush toilets, one gallon per flush urinals and 2.5 gallons per minute showerheads) for businesses and residents located within Ventura County.

1.4 Mineral Resources

The two principal mineral resources located in Ventura County and inventoried in the Resources Appendix are petroleum (oil and gas) and aggregate (principally sand and gravel). Other minerals of

commercial value within Ventura County are: asphalt, clay, expansible shale, gypsum, limestone, and phosphate.

In terms of gross dollars, petroleum production accounted for approximately 75 of the total mineral production of Ventura County. Ventura County produced 15,659,398 barrels of oil and 16,130,168 million cubic feet (mcf) of natural gas in 1987 (excluding Outer Continental Shelf OCS production). This was the third highest production total among California counties (only Kern and Orange counties produced more). The petroleum resource areas identified in Figure 1.4.7 of the Resources Appendix are derived from maps prepared by the State Division of Oil and Gas which depict the boundaries of known petroleum fields.

Aggregates represent the other significant type of mineral resource extracted within the County. Aggregates include sand, gravel and rock which are used for fill, construction-grade concrete and riprap, among others. Although many sand and gravel sites exist throughout the County, most of the extraction sites are located in and along the Santa Clara River bed. Transportation, being a major cost in this industry, dictates that extraction sites be in close to areas of use and demand. For this reason, it is important to utilize close-in aggregate resources before urbanization precludes their extraction.

River *inin* standards in the Santa Clara River currently include: depth/profile standards, establishment of a river corridor, slope and setback restrictions, buffer zones, and protection measures for fish and riparian habitats. The objective of the depth/profile standards are to stabilize the riverbed of the Santa Clara River, thus protecting major structures, and promoting downstream transport of sediment from the upper reaches of the river to the degraded lower reaches of the river.

The aggregate resource areas (see the Resources Appendix) are based on Mineral Resource one maps developed by the State Division of Mines and Geology. These maps were prepared in response to the Surface Mining and Reclamation Act of 1975 (SMARA). This Act mandated that aggregate resources throughout the State be mapped so that local governments could make land use decisions in light of the presence of the resources and the need to preserve access to them. SMARA s basic objectives are to ensure proper reclamation of mineral land and safeguard access to mineral resources of regional and statewide significance in the face of competing land uses and urban expansion. Its initial focus was on aggregate necessary for construction grade concrete.

The County s mechanism for carrying out SMARA s objective of safeguarding access to mineral resources is the designation of appropriate areas as a Mineral Resource Area on the Resource Protection Maps. These designated areas are then made subject to the Mineral Resource Protection Overlay one (see oning Ordinance). In order to be so designated, an area must meet the criteria listed in this section, not be committed to alternative uses, nor be within a city s *vie shed*

The goals, policies and programs which apply to mineral resources are as follows:

1.4.1 Goals

1. Manage mineral resources in a manner which effectively plans for the access to, development and conservation of mineral resources for existing and future generations.
2. Identify and manage mineral resources in order to:
   - Safeguard future access to the resource.
   - Facilitate a long-term supply of mineral resources within the County.
   - Minimize incompatibility between the extraction and production of the resource and neighboring land uses and the environment.
   - Provide notice to landowners and the general public of the presence of significant mineral resource deposits.
3. Promote the utilization of mineral resources located close to urbanized areas before their extraction is precluded by urbanization.
4. Ensure that all mineral extractions are conducted in a manner which protects the environment and the public s health, safety and welfare.

1.4.2 Policies

1. Applications for *inera resource deve op ent* shall be reviewed to assure minimal disturbance to the environment and to assure that lands are reclaimed for appropriate uses which provide for and protect the public health, safety and welfare.

2. *inin* operations shall comply with the requirements of the County oning Ordinance and standard conditions, and State laws and guidelines relating to mining and reclamation.

3. All *discretionary per its* for in-river *inin* shall be conditioned to incorporate all feasible measures to mitigate flooding and erosion impacts as well as impacts to water resources, biological resources, and beach sediment transport.

4. Petroleum exploration and production shall comply with the requirements of the County oning Ordinance and standard conditions, and State laws and guidelines relating to oil and gas exploration and production.

5. As existing petroleum permits are modified, they shall be conditioned so that production will be subject to appropriate environmental and jurisdictional review.

6. All General Plan amendments, zone changes, and discretionary developments shall be evaluated for their individual and cumulative impacts on access to and extraction of recognized mineral resources, in compliance with the California Environmental Quality Act.

7. Mineral Resource Areas may be established, in whole or part, in accordance with the following criteria:

   - Any area designated by the State Board of Mines and Geology as an area of statewide or regional significance pursuant to the provisions of the Surface Mining and Reclamation Act of 1975.

   - Any area covered by a *discretionary per it* (e.g. CUP) for mining of aggregate minerals determined to be of Statewide or regional significance.

8. *iscretionary deve op ent* within a Mineral Resource Area (see Resource Protection Map) shall be subject to the provisions of the Mineral Resource Protection (MRP) Overlay one, and is prohibited if the use will significantly hamper or preclude access to or the extraction of mineral resources.

9. The County is not obligated to approve *discretionary entit e ents* for the development of mineral resources located in a Mineral Resource Area nor is it the County s intent to preclude mineral resource development from occurring outside of Mineral Resource Areas as identified on the Resource Protection Map (Figure 1).

1.4.3 Programs

1. As new information regarding mineral resources is received from authoritative sources, the Planning Division will update the Mineral Resources Section of the County General Plan, where appropriate.

2. The Planning Division will continue to check for the existence of abandoned oil and gas wells on parcels of land before *deve op ent* occurs, with the highest priority being in those areas where there are existing or historic oil fields.

3. The Planning Division will continue the Oil Enforcement Program to ensure compliance with the requirements of the oning Ordinance and conditions of *discretionary per its*.

4. The Planning Division will prepare, and update as necessary, maps and other data indicating oil and gas reserves and production areas.

1.5 iological Resources

io o ica resources include plant and animal species and their habitats, plant communities and ecosystems.

Vegetation

The diverse topography and climate of Ventura County provide an environment where a range of vegetation communities (from Coastal sage-scrub to subalpine forest, from desert chaparral to riparian woodland) can maintain successful populations. Native vegetation in Ventura County can be categorized into seven general plant communities: grasslands, coastal sage-scrub, chaparral, oak woodland, riparian, pinyon-juniper, and timber-conifer (see Resources Appendix).

Most native vegetation in the north half of the County has been preserved as a result of the low level of development in this area (outside of Lockwood Valley). The exceptions are the large expanses of native grasslands that were eliminated by cattle ranching operations several decades ago. Development in the Lockwood Valley area has impacted the pinyon-juniper community; however, the higher elevations surrounding the valley contain nearly undisturbed stands of timber-conifer vegetation.

A large portion of the native vegetation in the south half of the County has been displaced as a result of urban and agricultural development. For the most part, this development is confined to the fertile valleys and plains, and along the coastline. Consequently, most of the mountainous areas in the south half still support significant native plant communities.

Chaparral is the most common plant community in the County. This community consists of woody shrubs and herbaceous plants, is generally located on steep slopes with rocky or heavy soils, and is characteristically dense and subject to fires. Large expanses of chaparral are found in the Santa Monica Mountains.

The Coastal sage-scrub community is located below the chaparral community, generally below 3000 feet, on dry, rocky slopes. It consists of woody shrubs, and is a more open community than the Chaparral. Substantial areas of this community remain on South Mountain and in the Simi Hills and Santa Susana Knolls areas; however, these populations are threatened by encroaching residential development.

Grassland vegetation is not common, and as groundcover, is usually associated with oak-woodland or open areas. The La Jolla Valley in Point Mugu State Park is the only area in the County that still contains native bunch grasses in pure stands, and is considered a locally unique habitat.

The oak woodland community in Ventura County contains the easily identifiable valley oaks, with trees 20 to 60 feet tall and grassland and soft shrubs as groundcover, as found in the Thousand Oaks, Lake Casitas, and Hidden Valley areas. A large area of foothill oak woodland is found on Sulphur Mountain.

Riparian vegetation is found in *et ands* along most of the permanent and ephemeral streams within the County. Typical trees of this community include sycamores, willows, cottonwoods, and alders. Extensive riparian growth now lines Piru, Sespe, and Santa Paula Creeks, and the Santa Clara and Ventura Rivers. These riparian areas provide both essential habitat and migration corridors for wildlife in Ventura County.

ish and Wildlife

The naturally vegetated areas of the County provide shelter, food, and nesting areas to create habitats for a wide variety of animal species. Each plant community has different characteristics which support different species of wildlife, although an animal species may use various habitats at different times of the year or at various stages in the animal s life cycle.

The low-elevation, drier plant communities, such as the grasslands, coastal sage-scrub, and chaparral, support a wildlife population which includes rodents, insectivores, hares, foxes, coyotes, raptors (such as hawks, falcon, owls, and eagles) and numerous perching birds, from hummingbirds to ravens. The upland plant communities, such as the oak woodlands, pinyon-juniper, and timber-conifer, provide habitats for larger animals, and include populations of bobcat and mountain lion, mule deer, and black bear, in addition to a game population of quail, rabbit, tree squirrel, band-tailed pigeon, dove, turkey, and chukar (partridge). Reptiles are commonly found throughout the County.

Several hundred species of vertebrates find permanent and transitory range in the varied habitats and topography of the Los Padres National Forest. These species are listed in the U.S. Forest Service

Wildlife Survey of 1982. The number of individuals of many of these species is below optimum replacement levels, a result of the declining quality of habitats and deficient vegetation management.

Riparian areas support a great intensity and diversity of species. These species include the bank swallow, western yellow-billed cuckoo, southern rubber boa, and migratory waterfowl. Populations of these species have greatly diminished as a result of human intrusion and degradation of their habitats.

Locally Unique Habitats

Ventura County contains several unique habitats that support a variety of plants and animals found nowhere else in the country.

The coastal wetlands and lagoons found along the south coast of the County provide shelter, forage, and nesting areas for thousands of birds, fish, mollusks, crabs, seals, and many other marine organisms and plants. The wetland area with the richest diversity is the Mugu Lagoon, which shelters the remnants of many plant, bird, fish, and insect populations which once inhabited the coast from the Ventura River to the Santa Monica Mountains. Other wetlands include the McGrath Lake and Ormond Beach areas, and the mouths of the Ventura and Santa Clara Rivers. These areas are considered significant biological resources.

Ventura County also has two large areas set aside as sanctuaries for the California condor. Although there are (as of 1986) no longer any of these birds living in the wild, the U.S. Fish and Wildlife Service remains hopeful that its Condor Recovery program, involving captive breeding and eventual release, will again allow the condor to safely exist and repopulate in Southern California. As a result, both Matilija and Sespe Condor Sanctuaries remain as significant biological habitats, as shown on the Biological Resources Map in the Resources Appendix.

The Hopper Mountain National Wildlife Refuge is just outside of the Los Padres National Forest, east and south of, and adjacent to, the Sespe Condor Sanctuary. It is a traditional feeding site for the California condor, and is currently operated as a cattle ranch. In addition, a variety of raptors, including prairie falcons, and red-tailed and Cooper s hawks, populate this area.

The Sespe Creek is designated as a Wild Trout Stream by the State of California. The steelhead trout, an anadromous fish, uses this stream as its spawning area. The Pacific lamprey, an anadromous fish, also uses the Sespe Creek and the Santa Clara River for its spawning area. The creek also supports a significant population of rainbow trout, cousin to the steelhead. The Wild Trout Stream designation affords some protection of water flows and riparian vegetation, both threatened by water development projects. In addition, the Forest Service has proposed that a 28 mile portion of Sespe Creek receive a Wild and Scenic River designation. The Sespe is also mapped as a significant biological resource.

Endangered, Threatened and Rare Species

Ventura County is host to numerous species of plants and animals that are *endan ered threatened rare* or considered to be a *candidate species* for one of those designations. A full listing of these species, with their State and Federal designations, and a general description of their locations is found in the Resources Appendix. The areas where these species are located are also designated on the Significant Biological Resources Map in the Resources Appendix.

Although fish and wildlife are generally renewable resources, the rates of renewal are usually very slow and are often impeded by the disruptive forces or urbanization, human harassment, predator control, and pollution. The species and ecosystems in this County are of aesthetic, ecological, educational, historic, recreational and scientific value to the people of Ventura County and the nation as a whole.

The goal, policies and programs which apply to biological resources are as follows:

1.5.1 Goal

Preserve and protect significant biological resources in Ventura County from incompatible land uses and development. Significant biological resources include *endan ered threatened* or *rare species* and their habitats, *et and ha itats coasta ha itats i d i e i ration corridors* and *oca y i portant species/co unities*

1.5.2 Policies

1. *iscretionary deve op ent* which could potentially impact *io o ica resources* shall be evaluated by a qualified biologist to assess impacts and, if necessary, develop mitigation measures.

2. *iscretionary deve op ent* shall be sited and designed to incorporate all feasible measures to mitigate any significant impacts to *io o ica resources*. If the impacts cannot be reduced to a less than significant level, findings of overriding considerations must be made by the decision-making body.

3. *iscretionary deve op ent* that is proposed to be located within 300 feet of a marsh, small wash, intermittent lake, intermittent stream, spring, or perennial stream (as identified on the latest USGS 7 minute quad map), shall be evaluated by a County approved biologist for potential impacts on *et and* habitats. *iscretionary deve op ent* that would have a significant impact on significant *et and* habitats shall be prohibited, unless mitigation measures are adopted that would reduce the impact to a less than significant level; or for lands designated Urban or Existing Community , a statement of overriding considerations is adopted by the decision-making body.

4. Discretionary development shall be sited a minimum of 100 feet from significant *et and* habitats to mitigate the potential impacts on said habitats. Buffer areas may be increased or decreased upon evaluation and recommendation by a qualified biologist and approval by the decision-making body. Factors to be used in determining adjustment of the 100 foot buffer include soil type, slope stability, drainage patterns, presence or absence of endangered, threatened or rare plants or animals, and compatibility of the proposed development with the wildlife use of the wetland habitat area. The requirement of a buffer (setback) shall not preclude the use of replacement as a mitigation when there is no other feasible alternative to allowing a permitted use, and if the replacement results in no net loss of wetland habitat. Such replacement shall be in kind (i.e. same type and acreage), and provide wetland habitat of comparable biological value. On-site replacement shall be preferred wherever possible. The replacement plan shall be developed in consultation with California Department of Fish and Game.

5. The California Department of Fish and Game, the U.S. Fish and Wildlife Service, National Audubon Society and the California Native Plant Society shall be consulted when *discretionary deve op ent* may affect significant *io o ica resources*. The National Park Service shall also be consulted regarding *discretionary deve op ent* within the Santa Monica Mountains or Oak Park Area.

6. Based on the review and recommendation of a qualified biologist, the design of road and floodplain improvements shall incorporate all feasible measures to accommodate wildlife passage.

1.5.3 Programs

1. The Planning Division, in conjunction with State and Federal agencies, will identify those areas of the County that are considered to be critical habitats of *endan ered threatened* or *rare species* as well as for other significant *io o ica resources*.

2. The Planning Division will retain a list of qualified biological consultants for the purpose of providing information to complete Initial Studies and Environmental Impact Reports.

3. The Fire Protection District, in conjunction with the California Department of Forestry (CDF), will, under the California Vegetation Management Program, continue the use of prescribed burning to mimic the effects of natural fires in order to reduce the fire hazard to human residents and to enhance the health of biotic communities.

4. The Planning Division shall prepare a program proposal, for Board of Supervisors consideration, to map significant *et and ha itat* areas and amend the General Plan and oning Ordinance in order to establish a Biological Resource Protection Overlay designation/zone which would require all development in said overlay areas to be evaluated for impacts on significant *et and ha itat* areas.

1.6 armland Resources

Agriculture plays an important role in the National, State, and County economy. Ventura County is one of the principal agricultural counties in the State, ranking tenth in 1987, with a total income of over 610 million dollars and ranked seventeenth in farm earnings out of 3,175 counties nationally.

This high productivity is made possible by the County s abundance of the natural resources required for agricultural production; primarily soils, water, climate and topography.

The first step in evaluating and preserving farmland is to inventory existing resources. For inventorying County farmlands, the Federal Important Farmlands Inventory (IFI) system is used. This system generally evaluates farmland in light of its productive capabilities rather than the mere presence of ideal soil conditions. The system effectively recognizes a great deal of land in California and Ventura County which would not ordinarily be classified as prime under the old evaluation system, but which is, nevertheless, among the most productive land in the country.

The Important Farmland Inventory uses five classifications: *ri e ar and ar and o State ide portance ni ue ar and ar and o oca portance* and *ra in and* The minimum mapping unit is 10 acres, except for *ra in and* which is 40 acres. Areas smaller than the minimum mapping unit are not considered as agricultural land.

Prime Farmland and Farmland of Statewide Importance were identified by the Department of Conservation in cooperation with the United States Department of Agriculture Soil Conservation Service. Both Unique Farmland and Farmland of Local Importance are identified by local advisory committees composed of members of the agricultural community, citizens groups, and concerned public agencies. (For a map of Important Farmlands Inventory, refer to Resources Appendix.)

Erosion of soil is a problem in much of the County. This erosion problem is closely correlated with steep slopes or areas subject to flooding. Agricultural development on hillsides has caused erosion and the subsequent siltation.

The County has adopted a number of programs designed to preserve farmland. These programs include:

- The Agricultural land use designation (see Land Use Chapter), which established a forty acre minimum parcel size and A-E zoning;
- Participation in *reen e t A ree ents* and the *uide ines or rder y eve op ent* with the cities which seek to prevent urban encroachment into agricultural areas (see Land Use Chapter).
- Widespread use of Land Conservation Act Contracts to provide tax rate reductions as an incentive for maintaining agriculture.
- Participation in numerous water resource development and conservation programs to ensure long-term availability of water for agriculture.

The goals, policies, and programs which apply to farmland are as follows:

1.6.1 Goals

1. Preserve and protect irrigated agricultural lands as a nonrenewable resource to assure the continued availability of such lands for the production of food, fiber and ornamentals.
2. Encourage the continuation and development of facilities and programs that enhance the marketing of County grown agricultural products.

1.6.2 Policies

1. *iscretionary deve op ent* located on land designated as Agricultural (see Land Use Chapter) and identified as *ri e ar and* or *ar and o State ide portance* on the State s Important Farmland Inventory, shall be planned and designed to remove as little land as possible from potential agricultural production and to minimize impacts on topsoil.
2. Hillside agricultural grading shall be regulated by the Public Works Agency through the Hillside Erosion Control Ordinance.

3. Land Conservation Act (LCA) Contracts shall be encouraged on irrigated farmlands.
4. The Public Works Agency shall plan transportation capital improvements so as to mitigate impacts to important farmlands to the extent feasible.
5. The County shall preserve agricultural land by retaining and expanding the existing *reen e t A ree ents* and encouraging the formation of additional *reen e t A ree ents*.
6. *iscretionary deve op ent* adjacent to Agricultural-designated lands shall not conflict with agricultural use of those lands.

1.6.3 Programs

1. The Planning Division, in conjunction with the Agricultural Commissioner, Farm Advisor, Agricultural Advisory Committee and Assessor s Office, will administer, periodically review, and update as necessary the County s Land Conservation Act Guidelines and standard contract language.
2. The Planning Division, in conjunction with the Agricultural Commissioner, Farm Advisor and Agricultural Advisory Committee, will develop and implement standards governing *deve op ent* adjacent to agricultural uses. The standards should address fencing and spray buffers between agricultural areas and residences, off-site flood control measures, siltation control from grading operations and the development of a standard County-imposed entitlement condition which notifies new property owners of County and State laws protecting agricultural operations. After the development of standards, they could be added as *po icies* into the General Plan to guide future land use decisions.
3. The Planning Division will continue to work with State and Federal agencies to periodically update the Important Farmlands Inventory Map to reflect current conditions.
4. The Planning Division will prepare an annual status report on Land Conservation Act Contracts (LCA), agricultural acreage, and other agriculture related information.

1.7 Scenic Resources

The visual beauty and aesthetic quality of the natural landscape in Ventura County are significant resources. The County s natural visual resources are largely composed of the varied topography, exposed geological formations, heterogeneous vegetation, beaches and waterways. The man-made environment of parks, golf courses, harbors, public buildings, and major commercial, industrial, and residential developments can also contribute to, or detract from, scenic resource quality. The scenic resources of Ventura County, especially the coastline, within the *vie shed* of the County s lakes, and along designated State and County Scenic Highways, are of considerable value both in providing a pleasurable environment for local citizens and in stimulating tourism. Coastline resources are discussed in the Coastal Area Plan, and the viewshed of lakes and scenic highways are discussed herein.

Conservation of scenic resources is most critical where the resources will be frequently and readily viewed, as from a highway, or where the resource is particularly unique.

Ventura County has identified the *vie sheds* of lakes (excluding land designated Existing Community) and State or County designated scenic highways as being worthy of special protection. These protected areas are described as *Scenic Resource Areas* which are depicted in Resource Protection Map (Figure 1). In addition, area plans may identify local scenic resources as *Scenic Resource Areas* unique or of significant importance to that area.

The goals, policies and programs which apply to scenic resources include:

1.7.1 Goals

1. Preserve and protect the significant open views and visual resources of the County.
2. Protect the visual resources within the *vie shed* of lakes and State and County designated scenic highways, and other scenic areas as may be identified by an area plan.
3. Enhance and maintain the visual appearance of buildings and *deve op ents*

1.7.2 Policies

1. Notwithstanding Policy 1.7.2-2, *discretionary deve op ent* which would significantly degrade visual resources or significantly alter or obscure public views of visual resources shall be prohibited unless no feasible mitigation measures are available and the decision-making body determines there are overriding considerations.

2. *Scenic Resource Areas* which are depicted on the Resource Protection Map (Figure 1), shall be subject to the Scenic Resource Protection (SRP) Overlay one provisions and standards set forth in the Non-Coastal oning Ordinance, which include the following:

   (1) Any request for grading, structures or vegetation removal per the standards of the SRP Overlay one shall be evaluated through a discretionary permit.

   (2) Removal, damaging or destruction of protected trees shall be in compliance with the County s Tree Protection Regulations of the Non-Coastal oning Ordinance.

   (3) All *discretionary deve op ent* shall be sited and designed to:

      a. Prevent significant degradation of the scenic view or vista;

      b. Minimize alteration of the natural topography, physical features and vegetation;

      c. Utilize native plants indigenous to the area for re-vegetation, whenever possible;

      d. Avoid silhouetting of structures on ridge tops that are within public view.

      e. Use colors and materials that are designed to blend in with the natural surroundings.

      f. Minimize lighting that causes glare, illuminates adjacent properties, or is directed skyward in rural areas

   (4) No on-site freestanding advertising signs in excess of four feet in height and no freestanding off-site advertising signs shall be permitted.

   Federally-owned land is not subject to the Scenic Resource Protection Overlay one and is not subject to any permit requirements as specified under (1) or (2) above. To the extent possible, the agencies responsible for the administration of land use activities on Federally owned land should consider Policies 1.7.2-2(3) and (4) above in the planning and administration of new land uses within Scenic Resource Areas.

3. Proposed undergrounding of overhead utilities within *Scenic Resource Areas* shall be given first priority by the Public Works Agency in utilizing the County s allocation of Utility Undergrounding Funds.

4. The Planning Division shall continue to implement the landscaping requirements of the oning Ordinance and the Guide to Landscape Plans to enhance the appearance of *discretionary deve op ent*

1.7.3 Programs

1. The Planning Division, in coordination with appropriate State and local agencies, will inventory and take steps to preserve and maintain unique natural features, and other scenic resources. These areas could be included in future *Scenic Resource Areas* for consideration by the Board of Supervisors to be incorporated into the Resource Protection Map.

2. The Planning Division will continue to seek official State Scenic Highway designations for County designated Scenic Highways.

1.8 Paleontological and Cultural Resources

a eonto o ica resources are the fossilized remains of ancient plants and animals.

A wide variety of *pa eonto o ica resources* exist in both the North and South halves of the County. The diverse geology of the Transverse Ranges encompasses many different kinds of fossil organisms. These fossil remains provide a record of lifeforms over millions of years, as well as having potential economic value.

The term *cu tura resources* is most frequently identified with prehistoric (archaeological) or historic material items. These include prehistoric and historic districts, sites, structures, artifacts and other evidence of human use considered to be of importance to a culture, subculture, or a community for traditional, religious, scientific or other reasons. *Cu tura resources* in Ventura County include: prehistoric aboriginal Indian sites, historic areas of occupation and activity, or features of the natural environment. *Cu tura resources* also include less tangible, nonmaterial resources. These may include cognitive systems (including meanings and values attached to items of material culture, biota, and the physical environment), religion and world views, traditional or customary behavior patterns, kinship and social organization, folklore, and so on.

Archaeo o ica resources refer to the material remains (artifacts, structures, refuse, etc.) produced purposely or accidentally by human beings. The scientific study of these remains can result in the identification of activities, types of adaptation to the environment, and changes in activities and organization that were experienced by groups of people in the past. Furthermore, these remains often have special significance to Native Americans, ethnic groups, special interest groups (i.e., avocational archaeologists), and the general public.

Archaeological sites exist throughout the County, particularly adjacent to existing and previously existing natural water and food sources. Many sites have been located, and according to existing data, many potential sites remain undiscovered.

In the North Half there are 106 *cu tura resource* sites which are recorded with Ventura County numbers in the official clearinghouse (at the University of California - Los Angeles). The Forest Service has surveyed and recorded an additional 71 sites and the Bureau of Land Management surveyed the Hungry Valley area and recorded 57 for a total of 234 known sites as of 1987. Two archaeological sites in the North Half are listed on the National Register of Historic Places and are characterized by a variety of remains including shells and shark's teeth.

Several Chumash villages in the North Half contain caves with elaborate artwork. A preliminary list of special management properties compiled by the Forest Service in the Los Padres National Forest (as of March, 1985) included both Mount Pinos and Frazier Mountain as sites of value to the practice of Indian religion. These sites are considered by many Native Americans to be the center of the Chumash world. Sespe Hot Springs and Nordhoff Peak are also significant religious sites.

In the South Half there are three archaeological sites on the National Register: Burro Flats Painted Cave, Calleguas Creek Archaeological Site and a lithic scatter (the remnants of stone implement fabrication) in Senior Canyon. In addition, many other significant sites are located in the South Half, including many large villages located near the coast and along major waterways.

istorica resources refer to the material and nonmaterial expressions of human adaptations which characterized the post-contact or historic period. These resources include historic event or activity sites, historic archaeological sites, standing architecture and other significant properties, and documents and other sources of historical information, objects of material culture, and, secondarily, the more nonmaterial cultural qualities such as folklore, social organization, and value systems which are associated with these properties.

The Ventura County Cultural Heritage Board recommends *cu tura archaeo o ica* and *historica resources* for designation as County Historical Landmarks. The 42 landmark categories range from adobes to wharf sites. There are 156 sites designated Countywide. In the North Half, four sites are so designated. Sites in the South Half include homes, oil industry workings, ranches, groves of trees, cemeteries, portions of the Mission Aqueduct, and others. The list is quite diverse and properties are regularly considered for addition to the Landmarks list by the Cultural Heritage Board.

There are 16 historic sites listed on the National Register of Historic Places. Thirteen of these are also designated as County Landmarks and five of the 13 are California Historical Landmarks.

The goals, policies and programs which apply to *pa eonto o ica* and *cu tura resources* are as follows:

1.8.1 Goals

1. Identify, inventory, preserve and protect the *pa eonto o ica* and *cu tura resources* of Ventura County (including *archaeo o ica historica* and Native American resources) for their scientific, educational and cultural value.

2. Enhance cooperation with cities, special districts, other appropriate organizations, and private landowners in acknowledging and preserving the County s *pa eonto o ica* and *cu tura resources*.

1.8.2 Policies

1. *iscretionary deve op ents* shall be assessed for potential *pa eonto o ica* and *cu tura resource* impacts, except when exempt from such requirements by CEQA. Such assessments shall be incorporated into a Countywide paleontological and cultural resource data base.

2. *iscretionary deve op ent* shall be designed or re-designed to avoid potential impacts to significant *pa eonto o ica* or *cu tura resources* whenever possible. Unavoidable impacts, whenever possible, shall be reduced to a less than significant level and/or shall be mitigated by extracting maximum recoverable data. Determinations of impacts, significance and mitigation shall be made by qualified archaeological (in consultation with recognized local Native American groups), historical or paleontological consultants, depending on the type of resource in question.

3. Mitigation of significant impacts on *cu tura* or *pa eonto o ica resources* shall follow the Guidelines of the State Office of Historic Preservation, the State Native American Heritage Commission, and shall be performed in consultation with professionals in their respective areas of expertise

4. Confidentiality regarding locations of archaeological sites throughout the County shall be maintained in order to preserve and protect these resources from vandalism and the unauthorized removal of artifacts.

5. During environmental review of *discretionary deve op ent* the reviewing agency shall be responsible for identifying sites having potential archaeological, architectural or historical significance and this information shall be provided to the County Cultural Heritage Board for evaluation.

6. The Building and Safety Division shall utilize the State Historic Building Code for preserving historic sites in the County.

1.8.3 Programs

1. The County Cultural Heritage Board will continue to assist the County of Ventura in identifying and preserving significant County architectural and historical landmarks.

2. The Planning Division will continue to compile and retain a list of qualified archaeological, historical, and paleontological consultants to provide additional information to complete Initial Studies and Environmental Analyses

3. The General Services Agency will continue to develop a *cu tura resources* program at Oakbrook Park emphasizing Chumash history and heritage.

1.9 Energy Resources

Energy is an equally essential resource to the modern day world as are land, air, and water resources. It is required for all human activity and provides the power necessary to operate and maintain our way of life.

Ventura County relies primarily on an interrelated energy system. Electricity and natural gas are the primary forms of household energy while petroleum is the primary energy source for most modes of transportation. The utilization of each of these energy sources raises energy resource availability, environmental and conservation issues.

Considerable energy can be saved in new and existing buildings through efficient design, more efficient appliances, and the use of *rene a e ener y* resources. Buildings use 40 of the nation s energy. Much of this energy can be saved by fitting existing buildings with energy conservation systems and utilization of *rene a e ener y* such as solar energy. Other *rene a e ener y* resources include: hydroelectricity, biomass (organic matter), wind and cogeneration. The sun is the most

abundant source of *rene a e ener y*. Efficient use of public transportation and the encouragement of van pools and carpools could make significant energy conservation contributions.

Land use patterns and development practices have a profound effect on energy usage. New buildings can be expected to have a natural life span of 50 years or more. For energy planning purposes, building size, design and arrangement, the mix of land uses, and the geographic extent of the built environment are critical factors with long-term implications. Because land use patterns determine distances between residential, commercial and industrial developments, they influence an individual s decision to walk, bicycle, drive or use public transit. Development practices directly affect the amount of energy needed to operate a building. Building orientation, color, shading, windows and landscaping are among the many factors that can be manipulated to optimize opportunities for energy conservation.

The goals, policies and programs which apply to energy resources are as follows:

1.9.1 Goals

1. Promote land use patterns which minimize energy consumption.
2. Encourage the use of *rene a e* sources of *ener y* and energy conservation techniques in new development.
3. Encourage retrofit programs for energy conservation.
4. Encourage increased fuel efficiency of vehicles and decreased number and length of vehicle trips.

1.9.2 Policies

1. *iscretionary deve op ent* shall be evaluated for impact to energy resources and utilization of energy conservation techniques.
2. Land use policies in area plans should be developed to promote energy conservation and should include the following:

   (1) The pattern of residential, commercial and industrial land use should be compact, relate to transit routes and centers and minimize vehicular travel.

   (2) The infill of vacant lots should be encouraged over step-out developments.
3. Energy efficiency and *rene a e ener y* use shall be included as factors in designing capital improvement projects of all County agencies, departments and service areas.
4. The Building and Safety Division shall continue to implement Title 24 energy efficiency standards for buildings.
5. Tentative subdivision maps shall provide, to the extent feasible, for passive or natural heating or cooling opportunities in the subdivision.

1.9.3 Programs

1. The General Services Agency will review its energy consumption performance and implement programs designed to increase energy efficiency in County buildings, including, but not limited to:

   - installation of insulation where feasible,
   - installation of plumbing flow restrictors,
   - reduced operating hours for heating, ventilating and lighting systems,
   - installation of weather stripping on all openable doors and windows,
   - development of energy audit and energy management programs,
   - implementation of operation and maintenance programs which contribute to energy conservation,
   - develop energy audits and energy management programs for all County facilities,
   - develop a plan to re-invest utility company rebates and utility savings into a long range funding program for on-going conservation projects,

- implement operational and maintenance programs which contribute to energy conservation,
- investigate and implement new energy technologies such as solar and fuel cells,
- install energy management systems in all County facilities to control air conditioning and lighting systems,
- install ceiling, wall, and roof insulation whenever feasible,
- install plumbing flow restrictors in toilets, lavatories and showers, and
- provide energy conservation training and literature to all County agencies.

2. The Solid Waste Management Department will seek to reduce the amount of waste disposed and energy consumed and implement where viable:

   - source reduction,
   - recycling programs,
   - waste composting programs, and
   - public information programs.

3. The County will continue to implement the Air Pollution Control District s Trip Reduction Rule 210 which reduces energy consumption and improves air quality. This would include, but is not limited to:

   - promotion of park-and-ride lots,
   - promotion of Countywide Transit Information Center,
   - promotion of Commuter Rail System,
   - ridesharing promotion,
   - modified work schedules,
   - parking management programs,
   - employer-sponsored van pools, and
   - public transit promotion.

1.10 Coastal eaches and Sand Dunes

Sandy beaches are nourished largely by the weathering of coastal bluffs and dunes, and by riverine transport of material to the sea. Ventura County has three major sources of beach sand: the Santa Clara River (contributing 60), the other rivers and streams (10), and beaches upcoast of the Ventura River (30). The total volume of sand contributed by these sources is estimated to vary from 200,000 to 1,700,000 cubic yards or 1,000,000 cubic yard average per year (Ventura County Flood Control District, 1979). This sand becomes part of the Santa Barbara *ittora ce* in which the north to south littoral drift terminates in the Mugu and Hueneme submarine canyons.

A *ittora ce* is a section of shoreline where the flow of sand begins at a major sediment source and terminates at a major sediment sink, such as submarine canyon. In Ventura County, waves moving in the direction of prevailing westerly to northwesterly winds generally meet the beaches at a slight angle because of the shoreline s orientation from northwest to southeast. The resultant effect is a net movement of sand over time from northwest to southeast along the beaches.

The maintenance of sandy beaches is critical because beaches serve as natural buffers between wave action and easily eroded uplands. Sandy beaches tend to dissipate wave energy, yet incur very little damage. Naturally occurring buffer zones (such as coastal sand dunes) are generally much more effective at reducing wave damage and protecting the coastline than are man-made protective devices (Department of Navigation and Ocean Development, 1979).

The recreation value of beaches and their contribution to the County tourist industry is significant. Loss of recreation and private beaches has occurred along the North Coast of the County with attendant loss of surfing areas as well. Loss of beach homes from storm damage has occurred in areas of beach depletion. Countywide, beaches are eroding at the rate of 0.7 feet per year (Army Corps of Engineers, Ventura County Survey Report for Beach Erosion Control, May 1980).

Sand dunes constitute another important coastal resource. Major sand dune communities are found in the McGrath-Mandalay area, at Ormond Beach, in the vicinity of Point Mugu, and near the mouths of the Santa Clara and Ventura Rivers.

Generally, sand dunes form as windblown sand collects on an object of obstruction. Coastal sand dunes are extremely fragile, yet highly protective. They inhibit beach erosion and form a protective buffer from both wind and wave action for areas and resources, both natural and man-made, immediately inland. They also protect coastal salt marshes and wetlands. Coastal dunes also have biological significance. In this County, they provide nesting habitat for the snowy plover, the California least tern (an *endan ered species*), and a number of other shore birds. They also support a variety of coastal plant species, including the sand verbena, the sea rocket, the sea fig, and others. Vegetation is particularly important to the maintenance of the dunes, insofar as it serves to stabilize the dunes and promote dune formation.

Coastal dune formations are dynamic in nature, migrating and reforming, depending on wind and wave patterns and coastal topography. Development in the vicinity of dunes is therefore, often subject to sand encroachment, which results in increased costs for street sweeping and sand removal.

The ecological as well as protective characteristics of dune communities can be easily altered by human activities, especially development and off-road vehicle use. Additionally, unrestricted pedestrian access may, on a cumulative basis, result in the trampling and loss of dune vegetation and ultimately in the degradation of the community and loss of the dune.

For a discussion of coastal wave and beach erosion hazards, refer to Section 2.11 of the Hazards Chapter.

The goal, policies and program which apply to coastal beaches and sand dunes are as follows:

1.10.1 Goal

Protect and conserve coastal beaches and sand dunes.

1.10.2 Policies

1. *iscretionary deve op ent* which would cause significant impacts to coastal beaches or sand dunes shall be prohibited unless the *deve op ent* is conditioned to mitigate the impacts to less than significant levels.
2. *iscretionary deve op ents* which would result in the removal of dune vegetation shall be conditioned to replace the vegetation.
3. All *shore ine protective structures* which alter natural shoreline processes shall be designed to eliminate or mitigate adverse impacts on local shoreline sand supplies.
4. Discretionary permits for all mining activities in County streams and rivers shall incorporate all feasible measures to mitigate beach sand replenishment impacts.

1.10.3 Program

Ventura County will continue to participate in the BEACON (Beach Erosion Authority for Control Operations and Nourishment) Joint Powers Agreement, created in 1986 with Santa Barbara County and all coastal Cities, to promote beach sand replenishment and coordinate government funding efforts to fight beach erosion.

igure 1a
Resources Protection Map (North Half)
(separate document)

Click above to go to map

igure 1b
Resources Protection Map (South Half)
(separate document)

Click above to go to map

2. Hazards

This Chapter of the County General Plan identifies *oa s po icies*, and *pro ra s* relating to known existing and potential hazards, and other significant physical constraints to development/land use. The specific goals, policies, and programs are organized under the following major headings: (1) general goals, policies and programs, (2) fault rupture, (3) ground shaking, (4) liquefaction, (5) seiche, (6) tsunami, (7) landslides/mudslides, (8) expansive soils, (9) subsidence, (10) flood hazard, (11) inundation from dam failure, (12) coastal wave and beach erosion, (13) fire hazards, (14) transportation-related hazards, (15) hazardous materials and waste, (16) noise hazards, and (17) civil disturbance

More detailed information about the identified hazards and the County's emergency management practices may be found in the *u tiha ard unctiona an* maintained by the Sheriff's Office of Emergency Services.

2.1 General Goals, Policies and Programs

The following general *oa s po icies* and *pro ra s* apply to hazards:

2.1.1 Goals

1. Identify all major hazards and other physical constraints to development in Ventura County, and convey this information to all appropriate parties.
2. Protect public health, safety and general welfare from identified hazards and potential disasters.
3. Shield public and private property and *essentia aci ities* from identified hazards and potential disasters.
4. Minimize loss of life, injury, damage to structures, and economic and social dislocations resulting from identified hazards and potential disasters.

2.1.2 Policies

1. Applicants for land use and *deve op ent* permits shall provide all necessary information relative to identified hazards that may affect or be affected by their proposed project. Applicants shall also specify how they intend to mitigate identified hazards.
2. All geologic and soil engineering reports submitted with land use and *deve op ent* permit applications, including recommendations for measures to eliminate or mitigate possible hazards, shall be signed by qualified personnel registered and certified by the State in the appropriate discipline, such as Professional Engineers and/or Certified Engineering Geologists.
3. *ssentia aci ities specia occupancy structures* and *ha ardous ateria s stora e aci ities* shall be designed and constructed to resist forces generated by earthquakes, gravity, precipitation, fire and winds.
4. Develop, maintain and enhance mutual training and aid agreements with other public agencies, and cooperatively plan to prevent and respond to regional emergencies.

2.1.3 Programs

1. The County Planning Division, with the technical support of the Public Works Agency and other applicable agencies, should periodically review the Hazards Appendix to identify what information needs to be updated, and where appropriate, will submit a budget request as part of the next year s County budget.

2. CEO-Risk Management, Health, Safety & Loss Prevention (HSLP) will continue to provide advisory guidance to GSA-Facilities & Materials in administration of the Seismic Management Program. The program, which is applicable to all County-owned buildings and facilities, addresses structural, nonstructural, lifelines and life safety issues related to earthquake events.

3. The County Building and Safety Division should prepare a program for Board consideration to reduce structural deficiencies through the removal, reinforcement, or modification of the structures whose failure could cause significant numbers of injuries, substantial loss of life, or unacceptable level of economic loss.

4. California Geologic Survey (CGS) maps are periodically revised and updated and will be subsequently incorporated into the General Plan, within the budgetary limitations of the Planning Division.

5. The County Sheriff s Department Office of Emergency Services (OES) will continue to maintain and periodically update the Ventura County *u tiha ard unctiona an*, including mitigation measures and preparedness, response, and recovery strategies for the following twelve hazard specific contingency sections (i.e., plans): Earthquake Hazards, Hazardous Materials and Waste, Flood and Flood Hazards, Inundation from Dam Failure, Transportation Related Hazards, Civil Unrest, Terrorism, National Security Emergency, Landslides/Mudslides, Tsunami, Marine Oil Spill, and Fire Hazards. To the extent feasible, County agencies will, and other public agencies are encouraged to, participate in joint emergency planning and response training, and cooperatively respond to emergencies when they occur.

6. All agencies involved in warning and evacuation activities should periodically review and, if necessary, update their plans and procedures for the hazards defined and described in this Chapter, and shall provide updated hazard and constraint information to the Planning Division when available.

7. The Building and Safety Division will continue to enforce requirements of the California Building Code pertaining to earthquake-resistant design and construction.

8. The Building and Safety Division will comply with applicable provisions of Chapter 12.2 (commencing with Sec. 8875), Division 1, of Title 2 of the Government Code, pertaining to identification of potentially *ha ardous ui din s* in the unincorporated area of Ventura County, and establishment of a mitigation program for such potentially *ha ardous ui din s*.

9. The Planning Division and the Resource Management Agency Mapping, GIS and Graphic Services should maintain the Hazards Maps on the Geographic Information System and should update changes as needed.

2.2 ault Rupture

A *au t* is a fracture in the earth s crust accompanied by displacement of one side of the fracture with respect to the other side. Most faults result from repeated displacement that has taken place suddenly or by slow creep over time.

An *active au t* (or Holocene Fault) is a fault that shows evidence of movement during the Holocene Epoch (within the last 11,000 years) and can be expected to move within the next 100 years.

A *potentia y active au t* is either: (1) a fault known to have been active in the Pleistocene Epoch (Between 11,000 and 1.6 million years before the present date), but cannot be shown to be inactive in the Holocene Epoch or is shown by direct geologic evidence to be inactive during the Holocene Epoch, or; (2) a fault which, because it is judged to be still capable of ground rupture or shaking, poses an unacceptable risk for an existing or proposed structure.

An *inactive au t* is a fault that shows no evidence of movement in the last 1.6 million years. A *au t one* is a zone of related faults that may be braided or sub-parallel and the zone has a significant width.

The County of Ventura lies within the seismically active region of Southern California and is transected by many faults. Currently, there are 14 active *au t ha ard ones* in the South Half of the County. The Big Pine Fault, located in proximity to the northeast County boundary and bisecting Lockwood Valley, is the only currently known active fault located in the North Half of the County. The San Andreas Fault extends just outside of the northern County boundary.

Additional fault hazard areas will most likely be designated in the future as additional information becomes available.

The State Legislature, concerned about public safety near hazardous faults, enacted the Alquist-Priolo Special Studies ones Act in 1972 (now known as the Alquist-Priolo Earthquake Fault oning Act of 1994). To assure that structures for human occupancy are not built across or on *active au ts*, the Act requires a geological investigation before local governments can approve most development projects located in the Act s earthquake fault zones. In 1975 the State Geologist made a policy decision to zone faults that have a relatively high potential for ground rupture and utilizes the terms of "sufficiently active" and "well-defined" to constitute the criteria for zoning faults. "Sufficiently active" requires evidence of Holocene surface displacement along one or more of the fault segments or branches. Displacement need not be present along the entire fault for the fault to be zoned. "Well defined" requires that the trace of the fault be clearly detectable by a trained geologist as a physical feature at or just below the ground surface.

The *oa po icies* and *pro ra s* that apply to fault rupture are as follows:

2.2.1 Goal

Minimize the risk of loss of life, injury, collapse of *ha ita e structures*, and economic and social dislocations resulting from fault rupture.

2.2.2 Policies

1. Detailed geologic investigations performed by Certified Engineering Geologists are required for all proposed *ha ita e structures* in *arth uake au t a ard ones* as defined by the Alquist-Priolo Earthquake Fault oning Act. Development will not be allowed unless the investigation confirms that the proposed *ha ita e structures* are not subject to fault rupture hazard. Proposed developments that are located at the ends of the *arth uake au t a ard ones* may be required, at the discretion of the Public Works Agency Certified Engineering Geologist, to be evaluated for earthquake fault rupture hazards.

2. No habitable structures shall be located across or on any active fault zone as defined by the Alquist-Priolo Earthquake Fault oning Act. Furthermore, no habitable structures shall be located within 50 feet of the mapped trace of an active fault unless an appropriate geologic investigation and report demonstrates that the site is not subject to a fault rupture hazard.

3. All development projects involving construction within Earthquake Fault Hazard ones (as depicted on the State of California, Earthquake Fault Hazards Map for County of Ventura; Figure 2), shall be reviewed by the Public Works Agency Certified Engineering Geologist in accordance with the requirements of the Alquist-Priolo Earthquake Fault oning Act and the policies and criteria established by the State pursuant to said Act.

4. Land in *arth uake au t a ard ones* and *potentia y active au t* areas should, where feasible, be designated Open Space or Agriculture on the General Land Use Maps.

5. Roads, streets, highways, utility conduits, and oil and gas pipelines, shall be planned to avoid crossing *active au ts* where feasible. When such location is unavoidable, the design shall include measures to reduce the effects of any fault movement as much as possible.

6. No new *essentia aci ities specia occupancy structures*, or *ha ardous ateria s stora e aci ities* shall be located within *active au t ones* unless it can be adequately demonstrated that the facilities are not subject to fault rupture hazard.

2.2.3 Programs

1. The Fault Rupture chapter should be updated as part of every update to the Hazards Appendix of the County General Plan.

2. The *u tiha ard unctiona an* - Major Earthquake Contingency section will be reviewed and revised annually by the County Sheriff s Office of Emergency Services. The Office of Emergency Services will continue to provide public information programs and pamphlet information on earthquake preparedness.

3. The Building and Safety Division, with the support of the General Services Agency-Facilities & Materials Division and CEO- Risk Management, Health, Safety & Loss Prevention (HSLP) will implement the requirements of the Essential Services Buildings Seismic Safety Act of 1986.

2.3 Ground Sha ing

Ground shaking is the physical movement of the land surface due to earthquakes. Ground shaking is the most hazardous effect of earthquakes because it is most widespread and accompanies all earthquakes. The largest loss of life and property damage during an earthquake is due to ground shaking. The primary effects of ground shaking are damage to structures (ranging from minor cracking of plaster to total destruction) and infrastructure (roads, bridges, power lines, oil, gas, water and sewer lines, etc.), and the potential related human injury and loss of life. The secondary effects of ground shaking (including *i ue action*, *tsuna is*, *seiche* and earthquake induced *ands ides/ uds ides*) are evaluated as separate hazards.

Ventura County lies within the active earthquake region of Southern California. Available geologic information indicates that the potential of strong ground shaking occurring over much of the County as a result of an earthquake along one of the major *au ts* within the County, within the useful life of existing structures, is high when compared to other areas of the State. This is because of the close proximity of many fault systems. Exactly where, when, and how strong the next earthquake will be cannot be determined.

The ground shaking hazard exists throughout Ventura County and is most significant wherever there are subsurface conditions that result in greater earthquake wave amplitude or a longer duration of ground shaking. Ground shaking hazard areas are areas that can be expected to experience intense ground shaking during a maximum probable earthquake.

Ground shaking intensity depends on the earthquake magnitude, distance and direction from the site, depth, type of earthquake, the soil and bedrock conditions beneath the site, and the topography of the site and vicinity. The potential for the highest amplification of ground shaking occurs in the Oxnard Plain and the Santa Clara River Valley in the south half of the County, and in the Lockwood, Cuyama, and Cuddy Valleys in the north half.

Hazards associated with ground shaking events include *i ue action seiche tsuna i* and *ands ide/ uds ide***,** which also may occur without an associated earthquake or ground-shaking event.

The effects of the hazard can be reduced by prudent location and design of structures and *essentia aci ities*, and evaluation of existing structures and facilities that should be strengthened, replaced or modified in use, as necessary.

The goal, policy and programs that apply to ground shaking are as follows:

2.3.1 Goal

Minimize the risk of loss of life, injury, collapse of *ha ita e structures*, and economic and social dislocations resulting from ground shaking.

2.3.2 Policy

All structures designed for human occupancy shall incorporate engineering measures to mitigate against risk of collapse from ground shaking.

2.3.3 Programs

1. The Ground Shaking Hazard chapter should be updated as part of every update to the Hazards Appendix of the County General Plan.

2. The Building and Safety Division will be responsible for implementing the requirements of the California Building Code to reduce the effects of ground shaking on *ha ita e structures***.**

2.4 Liquefaction

i ue action is a process by which loose, water-saturated granular materials (silt, sand or gravel) behave for a short time as a dense fluid rather than as a solid mass, usually as a result of ground shaking of high intensity and long duration. Liquefaction is manifested either by the formation of sand boils and mud spouts at the ground surface and the seepage of water through ground cracks, or, in some cases, by the development of quicksand-like conditions over substantial areas. When the quicksand-like conditions occur, buildings may sink substantially or tilt into the ground and lightweight buried facilities may float to the surface. An additional manifestation of liquefaction is movement of blocks of earth referred to as lateral spreads which can move hundreds of feet.

The liquefaction hazard generally exists throughout the Oxnard Plain and Pleasant Valley. The hazard areas extend up the Ventura and Santa Clara Rivers, mainly in the areas underlain by extensive alluvial deposits. Some of the valleys in the Thousand Oaks area are also affected, as is the Arroyo Santa Rosa downstream of the City of Thousand Oaks-Hill Canyon Wastewater Treatment Plant. Simi Valley is affected at both the east and west ends. Both the upper and lower Ojai Valleys are in the hazard areas as well as San Antonio Creek from Ojai to the Ventura River. The low-lying areas north of Lake Casitas are also subject to liquefaction. There are other scattered locations affected by liquefaction hazard; they are usually in stream canyons, tributary to the major areas.

Many riparian (streamside or lakeside) areas could be disrupted by liquefaction. These areas include (1) San Antonio and Thacher Creeks; (2) Ventura River; (3) Lake Casitas and low lying areas of the Casitas watershed; (4) the Santa Clara River and Piru Creek area; (5) Calleguas Creek including Arroyo Simi from Simi Valley to beyond Virginia Colony; (6) Arroyo Conejo from the Thousand Oaks Hill Canyon Sewage Treatment Plant through most of the Santa Rosa Valley; (7) Mugu Lagoon and coastal areas north of the lagoon which were originally tidal estuaries; and (8) coastal beach areas.

The goal, policy and programs that apply to *i ue action* are as follows:

2.4.1 Goal

Minimize the risk of loss of life, injury, collapse of *ha ita e structures*, and economic and social dislocations resulting from *i ue action*.

2.4.2 Policy

Prior to the issuance of building or grading permits for *essentia aci ities*, *specia occupancy structures*, two-story single family residences, or *ha ardous ateria s stora e aci ities* located within areas prone to *i ue action*, a geotechnical report that includes a seismic analysis and evaluation of liquefaction in accordance with the State of California Guidelines shall be prepared in order to assess the liquefaction potential and provide recommendations for mitigation.

2.4.3 Programs

1. The Liquefaction chapter should be updated as part of all updates to the Hazards Appendix of the County General Plan.
2. The Building and Safety Division will implement the requirements of the California Building Code to reduce the effects of *i ue action* on *ha ita e structures*.

2.5 Seiche

A *seiche* is a long wave that oscillates in an enclosed or partially enclosed body of water as a result of seismic events, landslides or atmospheric disturbances. Seiches typically occur in lakes and bays, and are normally caused by unusual tides, winds or currents, but can also be produced by earthquake ground motion. The shaking oscillates the water back and forth, causing seiche waves.

The primary threat from a *seiche* is to structures and boats in or very near a lake, harbor or bay. Boats and their moorings can be heavily damaged by seiches, and buildings and campgrounds can be inundated. Only in the case of a severe seiche or unusual circumstances would loss of life be likely from the seiche itself. The secondary effects of a seiche can often produce more damage than the seiche itself. Large seiches can overtop the dams of man-made lakes or reservoirs, causing flood in the areas downstream. This overtopping can also wash out unprotected earth-fill dams, causing their

complete collapse. Most modern earth fill dams have a spillway or other outlet that will help to reduce the potential for overtopping.

The *Seiche a ard Area* surrounds all of the County s reservoirs and lakes. The height of the hazard above the water level is dependent on the subsurface topography of the reservoir or lake and a general estimate for smaller bodies of water is a height of 10 feet. The lakes that are impounded by earth-fill dams could have the greatest hazard potential. These lakes are Lake Bard (Wood Ranch Reservoir), Lake Piru and Lake Casitas. The Santa Clara River Valley could also be affected should a seiche-caused dam failure occur on Castaic Reservoir or Pyramid Reservoir. In addition, some of the homes at Lake Sherwood could be inundated during a seiche.

The goal, policies and programs that apply to *seiche* hazards are as follows:

2.5.1 Goal

Minimize the risk of loss of life, injury, collapse of *ha ita e structures* and economic and social dislocations resulting from a *seiche*.

2.5.2 Policies

1. The *Seiche a ard Area* shall be considered during the preparation of regional and area plans and special studies, and used to guide future investigations of the hazard.
2. The *seiche* hazard shall be taken into account in the design of all development within a *Seiche a ard Area*.

2.5.3 Programs

1. The County Sheriff s Department Office of Emergency Services will annually review and revise the *u tiha ard unctiona an* s Tsunami/Seiche Contingency section.
2. The Building and Safety Division will implement the requirements of the California Building Code to reduce the effects of *seiche* hazard on *ha ita e structures*.

2.6 Tsunami

A *tsuna i* is a traveling ocean wave generated by disturbances associated with earthquakes, volcanoes or major submarine landslides. Man-made tsunamis have been generated by the explosion of underwater nuclear bombs at Bikini atoll and elsewhere. These waves have a long wavelength (distance from the crest of one wave to the crest of the succeeding wave), normally over 100 miles, and a very low amplitude (height from crest to trough). As these waves approach shallow water, the speed decreases from a deep water speed of over 600 m.p.h. to less than 30 m.p.h., and their energy is transferred from wave speed (velocity) to wave height (amplitude); waves as high as 80 feet can be formed. Although the arrival time of waves can be predicted, the intensity of the wave when it reaches shore cannot be predicted.

Tsunamis are a threat, not because they are extensive or frequent, but because the destruction they cause can be devastating. Tsunamis can cause loss of life from drowning, and they can cause extensive damage to structures on or near beaches and river mouths. In addition, water systems can be contaminated, power supplies disrupted, transportation systems blocked or dislocated, and oil and gas pipelines along the coast destroyed. There can also be an increased occurrence of fire from broken oil or gas tanks or lines, as well as flooding from blocked rivers, etc. The danger is compounded by the fact that the intensity of the wave is unpredictable and the threat is intermittent over many hours. The waves can arrive onshore in intervals of up to an hour, and since there are usually a number of waves (rather than just one), the threat usually exists for as long as ten to twelve hours. Tsunamis are sometimes preceded by a trough which appears to be similar to an extremely low tide. The wave itself may follow the trough by 15 to 45 minutes.

The tsunami threat is mainly confined to the immediate beach areas and river mouths (deltas). All of the coastal areas in Ventura County are susceptible to tsunamis. Most of the land between the beach and the cliffs on both the north and south coasts is included within the hazard zone. The hazard zone is delineated as roughly the elevation of 30 feet (10 meters); however, effects of structures and topography may locally affect the inland extent of the tsunami (run-up). Existing structures located

below an elevation of 30 feet mean sea level (msl) cannot be mitigated against damage or destruction resulting from tsunamis.

The goal, policy and program that apply to *tsuna i* hazards are as follows:

2.6.1 Goal

Minimize the risk of loss of life, injury, and collapse of *ha ita e structures*, and economic and social dislocations resulting from a *tsuna i*.

2.6.2 Policy

Essential facilities, special occupancy structures and hazardous materials storage facilities should not be located in tsunami hazard areas.

2.6.3 Program

The County Sheriff s Department Office of Emergency Services will annually review and revise the County *u tiha ard unctiona an* s Tsunami/Seiche Contingency section.

2.7 Landslides Mudslides

ands ide is a general term for the dislodging and falling of a mass of soil or rocks along a sloped surface, or the dislodged mass itself. A *uds ide* is a flow of very wet rock and soil. Various scientists define the terms of mudslide, debris flow, landslide, soil slump, and rock fall differently, but in this usage they are considered the same.

Almost all sites with potential for landslides/mudslides lie within the hillside and coastal areas of Ventura County. Many slopes in the County are only marginally stable and landsliding could occur. A significant landslide destroyed nine homes in the community of La Conchita on March 4, 1995. Geologists have stated that the remaining earth over the community is still capable of moving and causing extensive damage. The County Public Works Agency enforces Chapter 70 (excavation and grading) of the California Building Code to ensure that areas of landslide or hillside areas are adequately identified and investigated prior to development.

The primary effects of landsliding or mudsliding can include:

- Human injury and loss of life;
- Abrupt depression and lateral displacement of hillside surfaces over large distances;
- Disruption of surface drainage;
- Blockage of flood control channels, transportation routes; and
- Displacement or destruction of man-made facilities such as roadways, buildings, oil and water wells, oil and gas pipelines and facilities, etc.

Since the primary land use within hillside and coastal areas is residential, the hazard primarily impacts dwellings and the associated utility facilities.

The hazard from landsliding is also considered to exist within the areas of the County that were developed prior to present-day grading and building codes. The level of hazard cannot readily be determined without detailed investigation of individual sites.

The goal, policies and programs that apply to *ands ides/ uds ides* are as follows:

2.7.1 Goal

Minimize the risk of life, injury, collapse of *ha ita e structures*, and economic and social dislocations resulting from *ands ides/ uds ides*.

2.7.2 Policies

1. Development in mapped *ands ide/ uds ide ha ard areas* shall not be permitted unless adequate geotechnical engineering investigations are performed, and appropriate and sufficient safeguards are incorporated into the project design.

2. In *ands ide/ uds ide ha ard areas*, there shall be no alteration of the land which is likely to increase the hazard, including concentration of water through drainage, irrigation or septic systems, removal of vegetative cover, and no undercutting of the bases of slopes or other improper grading methods.

3. Drainage plans that direct runoff and drainage away from slopes shall be required for construction in hillside areas.

2.7.3 Programs

1. The Landslides/Mudslides chapter should be updated as part of every update to the Hazards Appendix of the County General Plan.

2. The Public Works Agency will continue to enforce Chapter 70 (Excavation and Grading) of the California Building Code to ensure that areas of mapped *ands ides/ uds ides* or hillside areas are adequately investigated. Proposed development must incorporate appropriate design provisions to prevent landsliding and demonstrate that an adequate factor of safety against landsliding exists or will exist upon completion of the proposed development.

3. The Public Works Agency will enforce the requirements of the State of California Seismic Hazards Act and for all sites within potential earthquake induced *ands ide* areas as mapped by the State Geologist. Project proponents for these sites must submit a geotechnical report that addresses the potential for earthquake induced landslides or rock falls to the Public Works Agency for review prior to obtaining a grading or building permit.

2.8 E pansive Soils

xpansive soi s are soils that have a high shrink-swell potential; such soils expand when wet and contract when dry. Wetting can occur naturally in a number of ways (e.g., rainfall, groundwater fluctuations) as well as from other sources, such as lawn watering, broken water or sewer lines, etc. Local soils can be expected to shrink or swell if they typically contain significant clay content. The effects of the volume change in expansive soil may be slow, progressing over a period of years, or may be more rapid. Commonly, this movement is associated with seasonal or even longer wet/dry cycles, and is affected by applied irrigation and improper drainage.

Soil expansion can cause structural damage to structures, pavement and utilities in two ways. First, the expansion of the soil can heave a lightly loaded structure, or a structure with various loading conditions may result in different heave amounts or elevation changes. Second, soil expansion can lead to the loss of support under part of a structure. This can occur during dry conditions if the soil shrinks and support is withdrawn. Records exist of expansive soils causing damage to highways, buildings, reservoirs, swimming pools, canals and utilities of all types.

The goal and policies that apply to *expansive soi s* are as follows:

2.8.1 Goal

Minimize the risk of damage to structures from the effects of *expansive soi s*.

2.8.2 Policies

1. Construction must conform to established standards of the Ventura County Building Code, adopted from the California Building Code.

2. A geotechnical report, prepared by a registered civil engineer and based upon adequate soil testing of the materials to be encountered at the sub-grade elevation, shall be submitted to the County Surveyor, Environmental Health Division, and Building and Safety for every applicable subdivision and Building Permit application (as required by the California Building Code).

3. No *ha ita e structures* or *individua se a e disposa syste s* shall be placed on or in expansive soils unless suitable mitigation measures to prevent the adverse effect of these conditions are incorporated into the project.

2.9 Subsidence

Su sidence is any settling or sinking of the ground surface arising from surface or subsurface causes. Its usual form is a dish-shaped or bowl-shaped large region of downward surface displacements. Some types of subsidence can be the result of natural processes, including natural compaction of loosely consolidated alluvium (consolidation refers to the gradual compression of a soil under load), as well as ground shaking from earthquakes. Other types of subsidence are caused by human activities. In California, four types of the latter have been identified; they are named according to the action that causes the subsidence: groundwater withdrawal subsidence, oil or gas withdrawal subsidence, hydro-compaction subsidence and peat oxidation subsidence. Only the first two types are known to be causing problems in Ventura County; evidence of subsidence hazard caused by peat oxidation or hydro-compaction (the wetting and subsequent collapse of loose soil structures) has not been found. Of all the types, groundwater withdrawal subsidence, which generally occurs in valley areas underlain by alluvium, is the most extensive and the impacts most costly. The subsidence problem exists mainly in the Oxnard Plain area of the County.

The goal, policies and programs that apply to *su sidence* are as follows:

2.9.1 Goal

Minimize the risk of damage to structures, transportation corridors, and infrastructure from the effects of *su sidence*.

2.9.2 Policies

1. Potential *su sidence* shall be evaluated prior to approval of new oil, gas, water or other extraction well drilling permits.
2. Structural design of buildings and other structures shall recognize the potential for hydro-compaction *su sidence* and provide mitigation recommendations for structures that may be affected.
3. No structure which is needed for public safety or emergency services shall be located where an interruption in service could result from structural failure due to *su sidence*. If such location in an area subject to potential *su sidence* is unavoidable, the structure shall be designed to mitigate the hazard.

2.9.3 Programs

1. The Subsidence chapter should be updated as part of all updates to the Hazards Appendix of the County General Plan.
2, The Building and Safety Division will implement the requirements of the California Building Code to reduce the effects of *su sidence* on *ha ita e structures* as required by the California Building Code.

2.10 lood Hazards

A flood is an overflow of water onto land that is normally dry. The most common type of flood, and the major subject of this section, is the rainstorm-river flood. A second major type is a coastal flood, resulting from a relative increase in sea level that may be caused by a storm, by a tsunami, or by subsidence. Other potential causes of floods in Ventura County include dam or levee failure, *ands ides/ uds ides* and *seiches*.

The size and frequency of occurrence of a rainstorm-river flood in a particular channel depend on a complex combination of conditions, including the amount, intensity, and distribution of rainfall, previous moisture conditions, and drainage patterns. The area subject to inundation is generally referred to as the *ood p ain*. The flood plain is divided into two hazard areas: (1) the *ood ay*, which is the portion of the flood plain that carries the deep and fast-moving water of a 100-year storm; and (2) the *ood rin e area*, which is the remainder of the flood plain, subject to shallow, slower moving water.

The magnitude of a flood is measured in terms of its peak discharge, which is the maximum volume of water (in cubic feet per second) passing a point along a channel. Floods are usually referred to in terms of their frequency of occurrence, which is related to discharge; for example, the 100-year flood for a particular channel is the size flood that has a probability of being equaled or exceeded once in 100 years. Another way of defining the term is that the "100-year flood" has a 1% chance of being equaled or exceeded in any given year. The magnitude of the flood selected by a governmental agency for planning purposes (usually 50-year or 100-year) is referred to as the *se ected ood* or *re u atory ood*.

The duration and extent of a rainstorm-river flood depend on the specific physical characteristics and conditions of the watershed and the intensity and duration of the storm. Generally, in Ventura County, a flood builds up to a peak and then begins to recede, with the entire process lasting from an hour to a week, depending largely upon the size and slope of the watershed.

Flooding is a natural occurrence, with some long-range beneficial effects such as replenishment of sand to beaches and of nutrients to agricultural lands. It is a hazard only because people find flood plains a desirable place to live and use. Human encroachment on flood plains can also increase the hazard: structures may obstruct the flood flow, thus increasing flood heights, and the covering of the ground with impervious surfaces (e.g., pavement) increases the rate and quantity of stormwater runoff.

The County s three major rivers (Santa Clara River, Ventura River, and Calleguas Creek) and all of their major tributaries, as well as many smaller channels, are located in unincorporated areas over much of their courses. The 100-year floodplain as defined by the Federal Emergency Management Agency (FEMA) is depicted on the Hazards Protection Maps.

Located in the 100-year flood plain of the Ventura River are the communities of Live Oak Acres, Casitas Springs and Hawthorne Acres. In addition, there are sewer mains and water lines along much of the length of the Ventura River and San Antonio Creek. The rest of the Ventura River watershed hazard area is undeveloped or in agriculture. The unincorporated parts of the Santa Clara River watershed flood plain are primarily in agriculture, with some undeveloped and industrially developed areas. The unincorporated portion of the Calleguas Creek floodplain contains water and sewer mains and a sewage treatment plant, but is primarily undeveloped and agricultural land.

The goals, policies and programs that apply to *ood ha ards areas* are as follows:

2.10.1 Goals

1. Minimize the risk of loss of life, injury, damage to property, and economic and social dislocations resulting from flood hazards.
2. Design and construct appropriate surface drainage and flood control facilities as funding permits.
3. Prevent incompatible land uses and development within *ood p ains*.

2.10.2 Policies

1. Land use in the *ood ay* should be limited to open space, agriculture, or passive to low intensity recreational uses, subject to the approval of the County Watershed Protection District. The *ood ay*'s principal use is for safely conveying floodwater away from people and property.
2. Within areas subject to flooding, the County shall require the recordation of a *otice o ood a ard* or dedication of a *o a e ease ent* with the County Recorder for all divisions of land and *discretionary per its*.
3. *eve op ent* shall be protected from a 100-year flood if built in the *ood p ain* areas.
4. The design of any structures which are constructed in *ood p ain* areas as depicted on the Hazards Protection Maps (Figure 2), shall be governed by Federal regulations as well as the County Flood Plain Management Ordinance and shall incorporate measures to reduce flood damage to the structure and to eliminate any increased potential flood hazard in the general area due to such construction.

2.10.3 Programs

1. The County Sheriff s Department Office of Emergency Services will continue to provide public education and evacuation notification and response information. It will also annually review and revise the *u tiha ard unctiona an* s Flood Hazard Contingency section.
2. Federal Flood Insurance Rate Map and Floodway Map information will continue to be available from the Public Works Agency.
3. The *ood p ain* limits will be reviewed annually, as required by Government Code Sec. 65302(a), by the Public Works Agency. All changes will be conveyed to the Planning Division, which will process an amendment to the Hazards Protection Maps Figure 2.
4. The Public Works Agency will make information available to property owners and residents in coastal inundation areas to encourage participation in the Federal Flood Insurance Program.

2.11 Inundation from Dam ailure

This section deals with the flooding that may occur as the result of structural failure of a *da* . Structural failure may be caused by seismic activity, an extreme flooding event, or by landslides flowing into a *reservoir*.

Lake Casitas and the Santa Felicia (Lake Piru) dams are the largest dams in the County. Bouquet Canyon Dam, Castaic Dam, Drinkwater Reservoir, Dry Canyon Dam, Elderberry Flood Basin, and Pyramid Dam in Los Angeles County are other large dams upstream within the Santa Clara River drainage system. Due to the locations of dams and watercourses in Ventura and Los Angeles Counties, dam inundation could occur in these areas: Santa Clara River Valley, Ventura River Valley, Ojai Valley, Simi Valley and the Westlake area.

Other dams or reservoirs creating potential inundation problems include: Bard Reservoir (Wood Ranch), Ferro Debris Basin (Ventura County Watershed Protection District), Lake Eleanor, Lake Sherwood, Las Llajas Reservoir (Ventura County Watershed Protection District), Las Virgenes Reservoir (Ventura County portion of Westlake), Matilija Dam (Ventura County Watershed Protection District), Potrero Dam (Westlake Village), Runkle Debris Basin (Ventura County Watershed Protection District), Senior Canyon Reservoir, Sinaloa Lake and Sycamore Canyon (Ventura County Watershed Protection District).

Because of existing development patterns and trends, particularly in the south half of the County, and the large amount of land area that is potentially subject to dam inundation, it would be infeasible to preclude future development from locating in *da inundation* areas.

The goal, policy and programs that apply to inundation from *da* failure are as follows:

2.11.1 Goal

Minimize the risk of loss of life, injury, damage to property, and economic and social dislocations resulting from inundation by *da* failure.

2.11.2 Policy

a s shall be designed to withstand catastrophic events. The dams should be located to ensure their safety from all maximum credible seismic events.

2.11.3 Programs

1. The County will conduct *da* break studies for County-owned facilities and prepare inundation maps. Both the dam break studies and inundation maps should be updated periodically. New dams will be required to have inundation studies.
2. The County Sheriff s Department Office of Emergency Services will annually review and revise the Dam Failure Contingency section of the *u tiha ard unctiona an*. The Office of Emergency Services will continue to provide public information on dam failure preparedness and response.

3. Dam Inundation Maps will be maintained by the Sheriff s Department, Office of Emergency Services, and will be available to the public.

2.12 Coastal Wave and each Erosion Hazards

Coastal wave hazards can exist at shorelines as a result of the strong and damaging wave actions that can occur during storms. Damage to properties can result from high wave run-up, wave splashes and flying debris tossed by waves breaking at the beach or on coastal structures. The County Coastline Wave Hazard Areas are identified in the Flood Insurance Rate Map for Ventura County (unincorporated areas). The Federal Emergency Management Agency (FEMA) through the National Flood Insurance Program (NFIP) defines these areas as "V" zones.

Numerous residences are located adjacent to the beach erosion and wave hazard areas identified by the V zones, and may be in danger of being destroyed or damaged as a result of being undermined by erosion or from wave and flooding damage. Most of these residences are located in the communities of Rincon, Mussel Shoals (Punta Gorda), Seacliff, Faria, Solimar and Solromar. Five parks in the Ventura County unincorporated area (Hobson County Park, Faria County Park, Emma Wood Beach Park, Point Mugu State Park and Leo Carrillo State Beach) also lie within or adjacent to the Coastal Wave Hazard Area.

The erosion of coastal beaches is a very complex problem. The beach is in a perpetual state of dynamic disequilibria, adjusting to changes in waves, currents, tides and sediment deposition. The force that moves sand along the shoreline, creating the phenomenon known as the littoral drift , is provided by waves breaking at an angle along the beaches. The sand found on Ventura County beaches travels with the littoral drift from the northwest to southeast.

Man-made shoreline alteration can have severe effects on this natural process and must be closely monitored. Shortsighted solutions may aggravate erosion problems and pose secondary erosion impacts. Effective beach erosion management requires a comprehensive understanding of the erosion process, as well as technically oriented, long-term management plans.

In addition to the littoral drift, there is an onshore-offshore movement of sand. Waves that are small or spaced far apart tend to move sand from the ocean bottom towards the beach, building it out. Large, closely spaced waves tend to cut back the beach and move the eroded sand seaward, forming sand bars in shallow water.

All beaches in Ventura County are subject to erosion to a certain degree. Even beaches stabilized by groins can erode, although they do so at a slower pace. Erosion will increase in the future at all beaches if sand supplies to the coast are decreased.

Intermittent portions of the County coastline are in the Beach Erosion Hazard Area. In the County unincorporated beaches, the Beach Erosion Hazard Areas are generally located at Rincon Point, Punta Gorda, Seacliff Colony, Pitas Point and Faria Colony, Solimar Beach, Bass Rock, and Solromar. The Naval Base Ventura County, Point Mugu is also within the Hazard Area.

For a discussion of coastal beaches and sand dunes as a resource, refer to Section 1.10 of the Resource Chapter.

The goals, policies and program that apply to coastal wave and beach erosion hazards are as follows:

2.12.1 Goals

1. Minimize the risk from the damaging effects of coastal wave hazards and beach erosion.
2. Reduce the rate of beach erosion.

2.12.2 Policies

1. All permits for seawalls, revetments, groins, retaining walls, pipelines and coastal outfalls shall be designed to mitigate wave hazards and protect against further beach erosion, and shall be referred to the County Public Works Agency to be reviewed for possible impacts on the beach area and ocean floor.

2. *iscretionary deve op ent* in areas adjacent to coastal beaches shall be allowed only if the Public Works Agency determines that wave action and beach erosion are not hazards to the proposed development, or that the hazard would be mitigated to a less-than-significant level, and that the project will not contribute significantly to beach erosion.

2.12.3 Program

Ventura County will continue to participate in the BEACON (Beach Erosion Authority for Control Operations and Nourishment) Joint Powers Agreement, to promote beach sand replenishment and coordinate government funding efforts to fight beach erosion.

2.13 ire Hazards

Ventura County experiences fires of a variety of types: wildland, structural, chemical, petroleum, electrical, vehicle and other human-caused material fires. Each is unique in its source of fuel, area of ignition, and degree of hazard. The Ventura County Fire Protection District constantly monitors the fire hazard in the County. There are ongoing programs for investigation and alleviation of hazardous situations.

The Fire Hazards chapter focuses on the rural or wildland areas of the County. The *ire ha ard area* extends into all areas where native brush can be found growing in pure natural stands, which is most common on undeveloped hillside areas. The extreme fire hazard zone includes all areas of high brush and woodland and all steep slopes regardless of vegetation. The following areas of the County are particularly hazardous due to the length of time since the last fire, the build-up of flammable brush, and vegetation and inaccessibility:

- Yerba Buena Road - Carlisle Canyon area
- Lake Sherwood area
- Sulphur Mountain
- Matilija Canyon area
- Los Padres National Forest
- Santa Monica Mountains

On the north coast, the communities of La Conchita, Seacliff and Solimar and the south coast area abut the *hi h ire ha ard area*. The communities on the Ventura River, including Oak View and Meiners Oaks, and the community of Piru are also interspersed with, or are adjacent to, high *ire ha ard areas*. Oil production and storage facilities are located in the fire hazard areas but are usually well protected.

The goals, policies and programs that apply to fire hazards are as follows:

2.13.1 Goals

1. Minimize the risk of loss of life injury, damage to structures, and economic and social dislocations resulting from fire hazards.
2. Ensure that *deve op ent* in high *ire ha ard areas* is designed and constructed in a manner that minimizes the risk from fire hazards.

2.13.2 Policies

1. All discretionary permits shall be required, as a condition of approval, to provide adequate water supply and access for fire protection and evacuation purposes.
2. All *discretionary per its* in *ire ha ard areas* shall be conditioned to include fire-resistant vegetation, cleared *ire reaks*, or a long-term comprehensive fuel management program as a condition of approval. Fire hazard reduction measures shall be incorporated into the design of any project in a *ire ha ard area*.

3. New residential subdivisions shall provide not less than two means of access for emergency vehicles and resident evacuation. A deviation from this policy is only allowed when the proposed road conforms to the County Road Standards and when the County Fire Chief approves the proposed road.
4. All applicants for subdivisions, multi-unit residential complexes, and commercial and industrial complexes shall be required to obtain, prior to permit approval, certification from the Fire Protection District that adequate fire protection is available, or will be available prior to occupancy.

2.13.3 Programs

1. The County Fire Protection District is responsible for the prescribed burn program as mandated by the Vegetation Management Program (VMP) SB 1704, along with fuel breaks and other fire prevention measures.
2. The Fire Protection District will continue to enforce regulations for clearance of vegetation around oil production facilities.
3. The County Fire Protection District will continue to work cooperatively with the U.S. Forest Service, California Department of Forestry, adjacent county fire departments, and local city fire departments, towards managing wildland fires.
4. The County Fire Protection District will continue to revise, maintain, and make available to the Planning Division their historical burn area maps in conjunction with the State Division of Forestry.
5. The County Fire Protection District and Public Works Agency will continue to coordinate their street naming procedures with the cities in the County.
6. The Ventura County Sheriff s Department Office of Emergency Services will annually review and revise the County *u tiha ard unctiona an* s Wildland Fire Contingency section in conjunction with the County Fire Protection District. The Office of Emergency Services will continue to provide public information on emergency response notification, evacuation and sheltering due to fire.

2.14 Transportation Related Hazards

Hazards associated with movement of goods and people or conveyance of hazardous materials have been grouped together and are addressed below. These include aircraft incidents, railroads, trucking, marine oil transport, and onshore oil pipelines.

Aircraft Incident

A major air crash that occurs in a heavily populated residential area can result in considerable loss of life and property. The impact of a disabled aircraft as it strikes the ground creates the likely potential for multiple explosions, resulting in intense fires. Regardless of where the crash occurs, the resulting explosions and fires have the potential to cause injuries, fatalities and the destruction of property at and adjacent to the impact point. The time of day when the crash occurs may have a profound affect on the number of dead and injured. Damage assessment and disaster relief efforts associated with an air crash incident will require support from other local governments, private organizations and in certain instances from the state and federal governments.

It is impossible to totally prepare, either physically or psychologically, for the aftermath of a major air crash. Since Southern California has become one of the nation s most complex air spaces, as complexity and operations increase, so does the probability of an occurrence of an air crash incident.

Although airplane crashes can occur anywhere, crashes that affect life and property on the ground occur most frequently in airport approach and departure zones. Residences, schools, and other buildings occupied by people that are located in such zones are subject to an ever-present risk from airplane accidents. Hazard zones have been identified for the four airports within the County: 1) Ventura County Airport at Oxnard; 2) Ventura County Airport at Camarillo; 3) Santa Paula Airport; and 4) Naval Base Ventura County, Point Mugu. These zones represent the general areas most frequently

impacted by aircraft emergency or crash landing during the take-off or approach phase. They also represent the areas that, based on aircraft operations and accident probability, should be controlled for the safety of persons both on the ground and in the aircraft. The determination of the hazard areas is based on landing and take-off patterns and clear zones extending beyond the runway as recommended by the Federal Aviation Administration.

Railroad Incident

A major train derailment that occurs in a heavily populated industrial area can result in considerable loss of life and property. As a train leaves its track, there is no longer any control as to the direction it will travel. Potential hazards could be overturned rail cars, direct impact into an industrial building or entering into normal street traffic. Each of these hazards encompasses many threats, such as a hazardous materials incident, fire, severe damage to either adjacent buildings or vehicles and loss of life of those in either adjacent buildings or vehicles and pedestrians.

Truc ing Incident

A major truck incident that occurs in a heavily populated industrial area or residential area can result in considerable loss of life and property. Potential hazards could be overturned tank trailers, direct impact either into a residence or industrial building, or entering into the normal flow of traffic. Each of these hazards encompasses many threats, such as hazardous materials incident, fire, severe damage to either adjacent buildings or vehicles, and loss of life of pedestrians or those in either the adjacent buildings or vehicles.

US 101, one of the two major North-South routes in California, traverses Ventura County. Additionally, there are several major State Highways that connect other routes and cities, including Highway 33, Highway 118, and Highway 126. This presents a concern for possible multiple vehicular and truck transportation accidents.

Marine Oil Spill

The potential exists for offshore oil accidents and spills in Ventura County involving petroleum products due to the oil and gas development, transportation of liquid bulk products by tanker, and other vessel traffic carrying petroleum products for fuel. An offshore spill can result in oil-contaminated beaches. The major potential sources of offshore spills are separated into the following categories:

Oil Platform Production - There are four platforms in federal waters offshore Ventura County. They are Chevron s Platforms Grace and Gail and Unocal s Platforms Gina and Gilda. There are no platforms in state waters (i.e., within three miles of shore). Rincon Island, owned by Bush Oil, contains 68 well ports. There are additional platforms in state and federal waters offshore Santa Barbara County. The probability of an oil spill from a platform is small but possible. As a result of the Santa Barbara Oil well blowout in 1969, operating and safety requirements were substantially strengthened. During drilling, all offshore wells are equipped with redundant blowout protectors that can be closed hydraulically from a remote control station in the event of a blowout.

Vessel Traffic - The number of liquid bulk carriers presently transiting the Santa Barbara Channel is estimated to be between one and three per day. The Alaskan tankers may each carry as much as 1.5 million barrels of oil although the average is about 675,000 barrels. The other tankers are much smaller carrying 100,000 to 300,000 barrels. Although the probability of a tanker spill is low, it is possible. Potential causes of spills include collisions, rammings, groundings, and structural failures. The other commercial vessels transiting the channel carry fuel (bunkers), which can be released in the event of an accident.

Subsea Pipelines - All of the platforms listed in the oil platform production section ship their oil to shore via subsea pipelines. Potential causes of pipeline spills include corrosion, mechanical defects, and ruptures caused by events such as anchor dragging or earthquakes. Oil pipelines are normally equipped with various sensors and/or valves that will allow the pipeline to be shut down rapidly and automatically in the event of a rupture.

Marine Terminals - Fuel is off-loaded at the Port of Hueneme for the Ormond Beach power plant. Spills from marine terminals can be caused by operation errors or a rupture or leak in the loading/unloading lines.

Onshore Oil Pipeline Spill - Similar to a marine oil spill, an onshore oil pipeline spill can be a serious hazard to surface and groundwater resources, property, animals and human life. Oil and gas transport lines have been mapped on the County's Geographic Information System to allow improved response to spills in the event of pipeline system failure or a seismic event. Although available to emergency responders and planners, GIS information on the location of these transport lines is proprietary and contact must be first made with the California State Fire Marshall.

The goals, policies and programs that apply to transportation-related hazards are as follows:

2.14.1 Goals

1. Minimize the loss of life, injury, damage to structures, and economic and social dislocations resulting from hazards created by proximity to airports, railroads and truck routes.
2. To reduce or mitigate the effects of marine oil spills or onshore oil pipeline spills upon the population and environment.

2.14.2 Policies

1. Ventura County agencies shall respond to aircraft crashes in accordance with all applicable regulations and safety practices, and provide support to Federal and State agencies responsible for the investigation and management of aircraft incidents.
2. The following policies apply to airports and land in proximity to airports:

   (1) To avoid accidents, land located within Airport Hazard ones as depicted on the Hazards Protection Maps (Figure 2), shall be designated Agriculture or Open Space on the General Plan Land Use Map (Figure 3.1) and shall be limited to the following uses:

   - Agriculture and agricultural operations.
   - Cemeteries.
   - Energy production from renewable resources.
   - Mineral resource development.
   - Public utility facilities.
   - Temporary storage of building materials.
   - Waste treatment and disposal.
   - Water production and distribution facilities.

   (2) Development within the Airport Hazard ones shall comply with Part 77 of the Federal Aviation Regulations (objects affecting navigable airspace).

   (3) Private airstrips and agricultural landing fields shall be sited so as not to conflict with the flight paths of existing airports and outside of areas that would present significant hazard or an annoyance to existing or planned land uses.

   (4) *iscretionary deve op ent* within the Airport Hazard ones shall be reviewed by the Ventura County Transportation Commission (VCTC) for consistency with the Ventura County Comprehensive Airport Land Use Plan.
3. New *discretionary deve op ent* shall be conditioned to minimize, to the maximum extent practical through site design or setbacks, the risk for exposure to railroad and trucking hazards.
4. The County's Planning Division shall review and analyze all permit applications for compliance with local, state and federal oil spill prevention regulations.

2.14.3 Programs

1. The County Sheriff s Department Office of Emergency Services will annually review and revise the *u tiha ard unctiona an* s Major Air Crash, Train Derailment, and Trucking Incident Contingency sections.
2 Emergency Response agencies will review or develop plans, and participate in such exercises as are required by the FAA and requested by local authorities.

3. The County Department of Airports will periodically update the County Airport Master Plans, and will pursue the airport safety/improvement projects described in the current approved master plans.
4. The Sheriff's Office of Emergency Services will annually review the County's Marine Oil Spill Response Plan. The County will continue to participate in the U.S. Coast Guard Area Contingency Plan process.
5. County facilities that could potentially be the source of a marine oil spill and onshore oil spill will develop, exercise, review and share their prevention and response plans with regulatory and emergency agencies.

2.15 Hazardous Materials and Waste

a ardous ateria means any material that, because of its quantity, concentration, or physical or chemical characteristics, poses a significant present or potential hazard to human health and safety to the workplace or the environment. Hazardous materials include, but are not limited to, hazardous substances, *ha ardous aste*, and any material that the administering agency (Certified Unified Program Agency - CUPA) determines to be potentially injurious to the health and safety of persons or harmful to the environment if released into the workplace or the environment.

Agencies responsible for hazardous materials/waste management include the Environmental Health Division, Fire District, Public Works Environmental & Energy Resources Department and Sheriffs Office of Emergency Services.

The Countywide Emergency Response Plan, which is continuously being updated, identifies specific actions to be taken and the resources available for the protection of public health and the environment in the event of accidental and/or illegal release of hazardous substances.

Several catastrophic incidents over the past 20 years involving human illnesses, loss of life and environmental destruction caused by hazardous materials and wastes, as well as gradual long term groundwater pollution from leaking dumps and tanks, have led to the enactment of hundreds of Federal and State laws which place limits and prohibitions on the way hazardous wastes are managed from the point of generation to the point of disposal. Increased regulatory requirements and the increased costs associated with the proper disposal of all classifications of waste have led to illegal disposal operations countywide. The County Planning Division has inventoried all past and current waste disposal sites that may pose health or land use problems by adversely affecting land, water or air resources.

Proposition 65, approved by the voters in 1986, became operative January 1, 1987. Among other things it adds 25180.7 to the Health & Safety Code. Specifically, it requires each designated employee to disclose to the Board of Supervisors and to the local Health Officer any illegal discharge or threatened illegal discharge of a hazardous waste within the County of which the employee obtains knowledge in the course of his or her employment and which the employee knows is likely to cause substantial injury to the public health or safety.

The goals, policies and programs that apply to *ha ardous ateria s* and *ha ardous aste* are as follows:

2.15.1 Goals

1. Minimize the risk of loss of life, injury, serious illness, damage to property, and economic and social dislocations resulting from the use, transport, treatment and disposal of *ha ardous ateria s* and *ha ardous astes*.
2. Locate potentially hazardous facilities and operations in areas that would not expose the public to a significant risk of injury, loss of life, or property damage.

2.15.2 Policies

1. *a ardous astes* and *ha ardous ateria s* shall be managed in such a way that waste reduction through alternative technology is the first priority, followed by recycling and on-site treatment, with disposal as the last resort.

2. Site plans for *discretionary deve op ent* that will generate *ha ardous astes* or utilize *ha ardous ateria s* shall include details on hazardous waste reduction, recycling and storage.

3. Any business that handles a *ha ardous ateria* shall establish a plan for emergency response to a release or threatened release of a hazardous material. The County Fire Protection District is designated as the agency responsible for implementation of this policy.

4. Applicants shall provide a statement indicating the presence of any *ha ardous astes* on a site, prior to development. The applicant must demonstrate that the waste site is properly closed, or will be closed before the project is inaugurated.

5. Commercial or industrial uses which generate, store or handle *ha ardous aste* and/or *ha ardous ateria s* shall be located in compliance with the County Hazardous Waste Management Plan s siting criteria.

2.15.3 Programs

1. To assure that the use of *ha ardous ateria s* are in compliance with Federal, State and local safety provisions, the County Fire Protection District and Environmental Health Division will continue to limit and control the manufacture, storage and use of *ha ardous astes* and *ha ardous ateria s* in the County through the development review process.

2. The County Environmental Health Division is responsible for the following on-going programs involving *ha ardous ateria s* and *ha ardous aste*:

   - Monitor underground tanks to ensure that groundwater supplies are free from the intrusion of *ha ardous ateria s* from that source.
   - Respond to reports of suspected and known illegal dumping of wastes and coordinate with the District Attorney s Office in enforcement and the prosecution of known offenders.
   - Maintain an emergency response program to deal with *ha ardous aste* spills in conjunction with the Sheriff s Department, Fire Protection District, Highway Patrol and all city fire and law enforcement departments.
   - Inspect all *ha ardous astes* generators to ensure that such wastes are properly stored and disposed of in accordance with State and local ordinances and regulations.

3. The 1986 Right To Know Law requires a plan for response to the release or threatened release of a *ha ardous ateria* (California Health & Safety Code Section 25503. (c)). The Environmental Health Division will be responsible for preparation, coordination and implementation of this plan.

4. County Health and Safety/Loss Prevention (General Service Agency) is responsible for monitoring *ha ardous ateria s* in the work place for all County employees through the Hazardous Materials Abatement Program.

5. CEO-Risk Management, Health, Safety & Loss Prevention (HSLP) will continue administration of the Asbestos Management Program which provides a full range of asbestos abatement surveillance guidance and regulatory compliance advisory services applicable to all County owned facilities and operations.

6. The County Agricultural Commissioner s Office is responsible for enforcing all pesticide regulations, issuing licenses to applicators, distributors and dealers who handle pesticides and conducting inspections of all application and distribution facilities.

7. The County Environmental Health Division will continue to work with the appropriate State agencies to assess the public health and environmental impacts of identified waste disposal sites in the County, including abandoned and illegal sites.

8. The County Sheriff s Department Office of Emergency Services, in cooperation with the County Fire Protection District will annually review and revise the County *u tiha ard unctiona an* s Major Hazardous Materials Incident Contingency section.

9. The County Public Works Agency Environmental & Energy Resources Department will maintain a CHWMP that includes goals, policies, programs and an implementation schedule for management of household *ha ardous aste* for action by the County and participating cities.

10. The County Sheriff s Department Office of Emergency Services, will coordinate with local, state and federal agencies regarding off shore oil incidents and onshore oil pipeline incidents and annually update the County *u tiha ard unctiona an* s Off Shore Oil Incidents Contingency section.

11. The Environmental Health Division is responsible to implement the requirements of Division 20, Chapter 6.5, Section 25189.5 (Health and Safety Code), involving any illegal discharge or threatened illegal discharge of a *ha ardous aste* within the County.

12. The Environmental & Energy Resources Department and the Environmental Health Division will continue to coordinate with the Ventura Regional Sanitation District and local cities on the Household Hazardous Waste Program, which involves a) the collection of unused household products and pesticides that are considered hazardous, and b) a community education program on the safe use and disposal of household chemical products.

2.16 Noise

For purposes of this Plan, noise can be defined as any sound having an intensity (in terms of volume, pitch or duration) at the point of human perception that has the potential to stress or damage the organs of human hearing or to cause unwanted or unhealthy physiological effects, or is otherwise considered unwanted or annoying by the listener. The effects of noise accumulate over time, so it is necessary to deal not only with the intensity of sound but also the duration of human exposure to the sound.

Noise can be annoying and physically harmful to human beings and to animals. Human exposure to intense noise can result in irreversible hearing damage, and has been linked to other physiological effects including headaches, nausea, irritability, constriction of peripheral blood vessels, changes in heart and respiratory rates and in glandular and gastrointestinal activity and increased muscular tension. The effects of noise exposure in residential environments can include coughs and hoarseness caused by the strain of shouting above the noise. Noise can also affect accuracy at work, and has been found to be linked to job-related accidents and absenteeism.

High levels of noise can have effects on animals that are similar to those on humans, in terms of tissue damage, changes in blood pressure and chemistry, and hormonal changes. Hatching failures (in birds) and other changes in reproductive processes have also been reported. Additional effects on wildlife can include panicking, disruption of breeding and nesting behavior, birth defects, changes in migratory patterns, and even changes in the size of bodily organs. Noise can also mask animals auditory signals and interfere with some animals communication of necessary information. Adverse effects of noise on farm animals can include changes in milk production, incubation behavior, mating behavior, and animal size and weight.

Noise can also have adverse effects on materials and structures, particularly as a result of sonic booms and related aircraft noises. These aircraft generated noises can excite buildings to vibrate and can break windows and crack plaster.

While any number of individual measures have been proposed, mitigation measures for identifiable noise problems fall into three categories:

- Reduction of the noise at its source.
- Modification of the path of the noise.
- Reduction of noise at the receiver with various types of insulation.

Noise is directly associated with human activity, and is primarily a function of traffic, machinery and airports. On a generalized basis, motor vehicles, as a group, are the most pervasive contributors to urban noise, while aircraft, railroads and certain high intensity industrial noise generators may produce the most aggravated community annoyance reactions. Due to wide distribution and the types of machinery used, industrial sources are the second greatest noise generator. Airports are regarded as

the third greatest noise generator. Other significant noise sources are powered gardening equipment, amplified music, power tools and air conditioners.

Land uses considered *noise sensitive uses* include residential, educational, and health facilities, research institutions, certain recreational, and entertainment facilities (typically, indoor theaters and parks for passive activities) and churches. Uses considered less sensitive to noise include commercial and industrial facilities and certain noise-generating recreational facilities such as playgrounds and gymnasiums.

The goal, policies and programs that apply to noise are as follows:

2.16.1 Goal

To protect the health, safety and general welfare of County residents by elimination or avoidance of adverse noise impacts on existing and future *noise sensitive uses*

2.16.2 Policies

1. All *discretionary deve op ent* shall be reviewed for noise compatibility with surrounding uses. Noise compatibility shall be determined from a consistent set of criteria based on the standards listed below. An acoustical analysis by a qualified acoustical engineer shall be required of *discretionary deve op ents* involving noise exposure or noise generation in excess of the established standards. The analysis shall provide documentation of existing and projected noise levels at on-site and off-site receptors, and shall recommend noise control measures for mitigating adverse impacts.

   (1) *oise sensitive uses* proposed to be located near highways, truck routes, heavy industrial activities and other relatively continuous noise sources shall incorporate noise control measures so that:

   a. Indoor noise levels in habitable rooms do not exceed CNEL 45.

   b. Outdoor noise levels do not exceed CNEL 60 or L_{eq}1H of 65 dB(A) during any hour.

   (2) *oise sensitive uses* proposed to be located near railroads shall incorporate noise control measures so that:

   a. Guidelines (1)a. and (1)b. above are adhered to.

   b. Outdoor noise levels do not exceed L_{10} of 60 dB(A).

   (3) *oise sensitive uses* proposed to be located near airports:

   a. Shall be prohibited if they are in a CNEL 65 or greater, noise contour.

   b. Shall be permitted in the CNEL 60 to CNEL 65 noise contour area only if means will be taken to ensure interior noise levels of CNEL 45 or less.

   (4) Noise generators, proposed to be located near any *noise sensitive use*, shall incorporate noise control measures so that ongoing outdoor noise levels received by the noise sensitive receptor, measured at the exterior wall of the building, does not exceed any of the following standards:

   a. L_{eq}1H of 55dB(A) or ambient noise level plus 3dB(A), whichever is greater, during any hour from 6:00 a.m. to 7:00 p.m.

   b. L_{eq}1H of 50dB(A) or ambient noise level plus 3dB(A), whichever is greater, during any hour from 7:00 p.m. to 10:00 p.m.

   c. L_{eq}1H of 45dB(A) or ambient noise level plus 3dB(A), whichever is greater, during any hour from 10:00 p.m. to 6:00 a.m.

   Section 2.16.2(4) is not applicable to increased traffic noise along any of the roads identified within the 2020 Regional Roadway Network (Figure 4.2.3) Public Facilities Appendix of the Ventura County General Plan (see 2.16.2-1(1)). In addition, State and Federal highways, all railroad line operations, aircraft in flight, and public utility facilities are noise generators having Federal and State regulations that preempt local regulations.

(5) Construction noise shall be evaluated and, if necessary, mitigated in accordance with the County Construction Noise Threshold Criteria and Control Plan.

2. Discretionary development which would be impacted by noise, or generate project related noise which cannot be reduced to meet the standards prescribed in Policy 2.16.2-1., shall be prohibited. This policy does not apply to noise generated during the construction phase of a project.

3. The priorities for noise control shall be as follows:

   (1) Reduction of noise emissions at the source.

   (2) Attenuation of sound transmission along its path, using barriers, landforms modification, dense plantings, and the like.

   (3) Rejection of noise at the reception point via noise control building construction, hearing protection or other means.

2.16.3 Programs

1. The Oxnard and Camarillo Airport Master Plans recommend the preparation of noise abatement plans, the formation of local noise abatement committees with input from local citizens, and distribution of a periodic newsletter documenting noise abatement policies to aircraft operators and other interested parties. The airport plans also recommend periodic sampling measurements and updating of the CNEL noise model parameters, and discussion of alternative approaches for noise abatement.

   In addition, the Oxnard plan recommends publication of a map of recommended noise abatement flight tracks and operating procedures, for distribution to area airports and other interested parties.

2. The Public Works Agency will continue to work with CalTrans and City transportation offices to optimize signal timings and arterial stop sign location so that stop-go truck traffic is minimized in areas surrounded by noise-sensitive uses.

3. The noise *oa s po icies* and *pro ra s* as well as the noise appendix, will be reviewed by the Planning Division as needed.

4. The Public Works Agency will prepare a proposal for consideration by the Board of Supervisors to study the feasibility of constructing noise barriers in areas containing existing *noise sensitive uses* which are or will be significantly impacted by traffic noise.

5. The Building and Safety Division will continue to enforce Appendix Chapter 35 of the Uniform Building Code (UBC) and UBC Appendix 3501 of the Ventura County Building Code for the purposes of protecting persons within new hotels, motels, apartment houses, and dwelling units from effects of excessive noise including external community noise.

6. The Building and Safety Division and Public Works Agency shall prepare a budgetary proposal for Board consideration to amend the County Building Code, including Excavation and Grading Standards, to impose the noise criteria and mitigation measures contained within the County Construction Noise Threshold Criteria and Control Plan.

2.17 Civil Disturbance

Civil unrest, terrorism, and national security emergency hazards are forms of civil disturbance, which are of major public concern and necessitate a planned and coordinated response by a number of public agencies.

Civil Unrest

Civil unrest is the spontaneous disruption of normal, orderly conduct and activities in urban areas, or outbreak of rioting or violence that is of a large-scale nature. Civil unrest can be spurred by specific events, such as large sporting events or criminal trials, or can be the result of long-term disfavor with authority. Civil unrest is usually noted by the fact that normal on-duty police and safety forces cannot

adequately deal with the situation until additional resources can be acquired. This is the time period when civil unrest can grow to large proportions.

Threat to law enforcement and safety personnel can be severe and bold in nature. Securing of *essentia aci ities* and services is necessary. Looting and fires can take place as a result of perceived or actual non-intervention by authorities.

The various agencies that are vested with providing emergency response services within their respective jurisdictions are very adept at dealing with ordinary and routine emergency incidents. There are, however, incidents and circumstances that by their very nature exceed the ability and capacity of a single jurisdiction to cope with the situation. When this occurs, a request for additional resources is initiated and is accommodated through mutual aid agreements. Incidents, whether they are natural (e.g., flooding, earthquakes), or civil disturbances that occur simultaneously in a widespread manner affecting multiple jurisdictions, require a greater degree of coordination and organization. The Ventura County Law Enforcement Mutual Aid Manual addresses the mechanics of mutual aid activation and level of response. It also speaks to the establishment of a unified command structure organized to deal with incidents that affect the entire operational area whether in a direct or indirect fashion.

Active participation in the unified command and incident command system is essential if a coordinated effort is to be initiated and maintained.

The entire County, consisting of residential, industrial and commercial properties, is vulnerable to the effects of civil unrest.

Terrorism

Terrorism is defined as the use of fear for intimidation, usually for political goals. Terrorism is a crime where the threat of violence is often as effective as the commission of the violent act itself. Terrorism affects us through fear, physical injuries, economic losses, psychological trauma, and erosion of faith in government. Terrorism is not an ideology. Terrorism is a strategy used by individuals or groups to achieve their goals.

In the wake of the 1993 World Trade Center bombing in New York and the Oklahoma City bombing in 1995, terrorism became a serious concern for emergency management, emergency responders, and the public at large. However, the 2001 attack on the World Trade Center and the Pentagon has now elevated our concern about terrorism to a level we never imagined, and requires us to be prepared to respond to situations that go beyond the terrorist incident scenarios that we are familiar with.

Terrorists espouse a wide range of causes. They can be for or against almost any issue, religious belief, political position, or group of people of one national origin or another. Because of the tremendous variety of causes supported by terrorists and the wide variety of potential targets, there is no place that is truly safe from terrorism. Throughout California there is nearly limitless number of potential targets, depending on the perspective of the terrorist. Some of these targets include: medical facilities/clinics, religious facilities, government offices, public places (such as shopping centers), schools, power plants, refineries, utility infrastructures, water storage facilities, dams, private homes of prominent individuals, financial institutions and other businesses.

In response to this tremendous challenge, the Ventura County Sheriff's Office of Emergency Services, in conjunction with the Ventura County Terrorism Working Group, has developed the Ventura County Terrorism Response Plan.

National Security Emergency

A national security emergency is defined as the potential use of or threat of use of weapons of mass destruction (WMD) whether by terrorists, insurgents, or a foreign government. A WMD is any device, material, or substance used in a manner, in a quantity or type, or under circumstances evidencing intent to cause death or serious injury to persons or significant damage to property.

Today, the likelihood of nuclear war is considered slight. However, terrorist activities could utilize radiological materials or other weapons of mass destruction (chemical, biological). Terrorist activities could result in the security of nuclear weapons being compromised.

Various types of nuclear detonation that could pose a threat include an airburst, surface burst and blast. Subsequent effects of such detonations include damaging and life threatening exposures to thermal radiation, initial radiation, fallout and electromagnetic pulse. These effects are more fully described in the Technical Appendix.

In addition to the goals, policies and programs contained in Section 4.7 (Law Enforcement and Emergency Services) the following goal, policies and program apply to civil unrest, terrorism and national security emergency hazards are as follows:

2.17.1 Goal

Minimize the loss of life and/or property, rescue victims, identify and protect evidence associated with civil unrest, terrorist attack or national security emergency.

2.17.2 Policies

1. County law enforcement agencies shall utilize all available resources at the outbreak of disorder to suppress the outbreak and restore the peace.
2. Ventura County shall continue to participate in the National Alert and Warning System, and provide as much warning and direction to the County's population as is available.

2.17.3 Programs

1. The County Sheriff s Department Office of Emergency Services will annually review and revise the *u tiha ard unctiona an* s Civil Unrest and Terrorism Contingency Sections and the National Security Emergency section.
2. The County's Terrorism Early Warning Group will continue to meet, analyze intelligence and develop response plans for potential or actual threats to Ventura County.
3. The County Sheriff will continue to review discretionary development with regard to potential terrorism and national security emergency hazards.

igure 2a
Hazards Protection Map (North Half)
(separate document)

Click above to go to map

igure 2b
Hazards Protection Map (South Half)
(separate document)

Click above to go to map

3. Land Use

The purpose of the Land Use Chapter is to set *goals policies* and *programs* to guide future growth and development in the unincorporated area of Ventura County in a manner consistent with State legal mandates and requirements and in a manner consistent with the goals and quality of life desired by Ventura County citizens. The *policies* of the Land Use Chapter provide the basis for all decisions related to the use of the land and the further expansion of the various communities within the County. They also provide the basis for the establishment of zoning and subdivision regulations, the review of capital improvement programs, the development of housing and redevelopment programs, and other programs related to land use.

In accordance with Section 65302(a) of the Government Code, the Land Use Chapter of the General Plan identifies the goals, policies and programs which guide the distribution, general location and extent of uses of land for housing, business, industry, open space, including agriculture, and other categories of public and private uses of land in the County. This Chapter also establishes the standards of population density and building intensity for various land use designations covered by the plan.

To avoid duplication of material presented in other chapters of this General Plan, not all of the issues listed in Section 65302(a) are included in this chapter. The goals, policies and programs which apply to natural resources and scenic beauty are addressed in the Resources Chapter. The goals, policies and programs which apply to areas subject to flooding are addressed in the Hazards Chapter. The goals, policies and programs which apply to solid and liquid waste disposal facilities, education, recreation, and other public buildings and grounds are addressed in the Public Facilities and Services Chapter.

This Chapter also includes the goals, policies, and programs governing open space as required by Sections 65302(e) and 65560 et seq. of the Government Code. Furthermore, this Chapter includes the goals, policies, and programs governing housing as required by Sections 65302(c) and 65580 et seq. of the Government Code.

The specific goals, policies and programs are listed under the major headings of General goals, policies and programs, Land Use Designations, Population and Housing, and Employment and Commerce/Industry. The official General Land Use Maps are not physically bound as part of this text, but are presented as companion materials accompanying the text. For reference purposes, these maps are identified as Figure 3.1.

The Land Use Appendix summarizes the land use designations, the acreages for each designation, and the corresponding population densities and building intensities for each. The tables in the Appendix include the land use designations for the incorporated and unincorporated areas for use in comprehensive Countywide programs such as air quality management, and water quality management planning, solid waste planning, transportation planning and housing planning. The tables are based on the General Land Use Map included in this Plan, as well as the currently-adopted land use plan maps from each city General Plan and currently-adopted County Area Plans.

3.1 General Goals, Policies and Programs

The following general goals, policies, and programs apply to land use:

3.1.1 Goals

1. Ensure that the County can accommodate anticipated future growth and *development* while maintaining a safe and healthful environment by preserving valuable natural resources, guiding development away from hazardous areas, and planning for adequate public facilities and services. Promote planned, well-ordered and efficient land use and *development* patterns.
2. Promote the establishment of reasonable city boundaries and Spheres of Influence and prevent step-out urban *development*

3. Promote appropriate and orderly growth and *deve op ent* while protecting desirable existing land uses and a desired quality of life.

4. Ensure that land uses are appropriate and compatible with each other, and guide *deve op ent* in a pattern that will minimize land use conflicts between adjacent land uses.

5. Ensure that Countywide growth and *deve op ent* is consistent with the *uide ines or rder y eve op ent*

3.1.2 Policies

1. **General Land Use Maps**: The *oa s* and locational criteria set forth in this Chapter are general guidelines for determining whether land should be within a particular land use designation depicted on the General Land Use Maps (Figure 3.1). The land use designation applied to a specific parcel of land shall be as designated on the General Land Use Maps, whether or not such parcel meets all of the applicable criteria.

   The General Land Use maps cover the mainland only. Anacapa Island is designated Open Space and San Nicholas Island is designated State or Federal Facility.

2. **Consistency of oning**: oning shall be consistent with the General Land Use Maps (Figure 3.1) and the oning Consistency Matrix (Figures 3.2a & b). Where the zoning and subdivision criteria applicable to a particular land use category require a specific subzone, zoning shall be considered consistent with such land use category only if the specified subzone is adopted. To determine the appropriate zone and subzone designation (from among those consistent with the appropriate land use designation), the following factors shall apply:

   - Recognizing the desirability of retaining existing uses and densities on the subject land;
   - Recognizing the desirability of accommodating anticipated uses on the subject land;
   - Maintaining continuity with neighboring zoning, land uses and parcel sizes;
   - Implementing the recommendations of any specific zoning and land use studies of the area in question;
   - Recognizing and addressing the presence and significance of resources and hazards; and
   - Evaluating the ability to provide public services and facilities.

3. **Consistency of Land Use**: Any land use shall be deemed consistent with the General Plan if it is permitted under a zoning designation which is consistent with Policy Number 2 above, and if the land use does not conflict with any other policy of the County General Plan.

4. **Area Plans**: Plans for specific geographic subareas of the County may be adopted as part of the County General Plan. Area Plans shall be consistent with the General Land Use Map, although the Area Plans may be more specific. Figure 3.3 indicates the areas covered by the Area Plan maps.

   uilding Intensity and Population Density: Except for Affordable/Elderly Housing developments that are eligible for density bonuses as specified in Article 16 of the Non-Coastal oning Ordinance, and Cultural Heritage Sites that are eligible for deviation as specified in the Non-Coastal Ordinance, the following building intensity and population density standards apply to the unincorporated areas of the County:

   - For Area Plans, the building intensity and population density standards that appear in each respective plan shall apply to lands covered by the Area Plan maps.

   - For Existing Communities (as defined and discussed in Section 3.2), the building intensity and population density standards shall be as specified on the tables which accompany each Existing Community map contained in this Chapter commencing with Figure 3.7.

   - For all other unincorporated areas, the building intensity and population density standards shall be as specified in Figure 3.4.

6. **Minimum Parcel Size** Except as provided below, subdivisions of land shall meet the most restrictive minimum parcel size requirements established by Figures 3.1 and 3.2a & b, by the applicable oning Compatibility Matrix established by the respective Area Plans or by the applicable Existing Community Map contained in this Chapter commencing with Figure 3.7.

- A water well site or sites may be created on a lot for the sole purpose of transferring, by lease or sale, possession of the well and so much of the land around the well as may be necessary for its operation. Such wells shall be for agricultural purposes only.
- Parcels for public purposes such as, but not limited to, fire, police, water wells, flood control and other public health and safety facilities, are exempt from these minimum parcel size requirements.
- Affordable/Elderly Housing developments that are eligible for density bonuses as specified in Article 16 of the County Non-Coastal oning Ordinance may be granted a reduction from the minimum parcel size requirements in accordance with the provisions of Article 16.
- Parcels designated Cultural Heritage Sites may be granted a reduction from the minimum parcel size requirements in accordance with the Non-Coastal oning Ordinance.
- Parcels subdivided for natural resource conservation purposes in accordance with the Parcel Map Waiver/Conservation Subdivision process established in the Subdivision Ordinance.

7. **Nonconforming Parcel Size**: The use or development of a parcel which is a legal lot for the purposes of the County Subdivision Ordinance, but which fails to meet the minimum parcel size requirements of the applicable land use category, shall not be prohibited solely by reason of such failure. However, this policy shall not be construed to permit the subdivision of any parcel into two or more lots if any of the new lots fails to meet the minimum parcel size requirements.

8. **Interpretation of oundaries**: Because of the scale of the General Land Use, Area Plan and Existing Community maps, it is not always possible to show boundaries of land use designations precisely enough to exactly represent property lines or geographic features. Where the precise location of boundaries depicted on the General Land Use, Area Plan or Existing Community Map is uncertain, the Planning Director is authorized to resolve the uncertainty. The Map lines or boundaries should follow natural or man-made boundaries. Where the scheme of the map in the immediate area in question is to follow a certain type of natural or man-made boundary, the uncertainty should be resolved consistently with that scheme. The following list contains examples of natural or man-made boundaries:

   - water courses,
   - ridge lines,
   - toes of slopes,
   - lines marking changes in vegetation,
   - lines marking changes in slope,
   - parcel boundaries,
   - roads,
   - rail lines,
   - utility corridors,
   - lines separating different land uses,
   - lines marking the separation between a group of large lots from a group of small lots, and
   - lines marking features or designations referenced in the definitions and criteria of the various land use categories.

9. **Concurrent Processing**: one changes, if necessary, shall be processed concurrently with General Plan Amendments to assure zoning consistency.

10. **Variances**: Variances to minimum parcel size requirements and building intensity standards, height and setback standards applicable to a given property may be granted provided that all of the following conditions are met:

    (1) There are special circumstances or exceptional characteristics applicable to the subject property with regard to size, shape, topography, location, or surroundings, which do not apply generally to comparable properties in the same vicinity and land use designation;

(2) Granting the requested variance will not confer a special privilege inconsistent with the limitations upon other properties in the same vicinity and land use designation;

(3) Strict application of the minimum parcel size requirements and building intensity standards as they apply to the subject property will result in practical difficulties or unnecessary hardships inconsistent with the general purpose of such requirements and standards; and

(4) The granting of such variances will not be detrimental to the public health, safety, or general welfare, nor to the use, enjoyment or valuation of neighboring properties.

Any such variance shall be processed in the same manner and subject to the same standards as a variance respecting zoning regulations.

11. **Guidelines for Orderly Development**: *iscretionary deve op ent* shall be consistent with the *uide ines or rder y eve op ent*.

3.1.3 Programs

Greenbelt Agreements: In order to maintain the integrity of separate, distinct cities and to prevent inappropriately placed development between city boundaries, some cities and the County have entered into joint *reen e t a ree ents* These agreements protect open space and agricultural lands and reassure property owners located within these areas that land will not be prematurely converted to uses which are incompatible with agriculture or open space uses. In addition, the *reen e t a ree ents* reinforce the County *uide ines or rder y eve op ent*. Traditionally, agreements have been executed as joint or co-adopted resolutions by mutually interested cities and, in cases where the County is a party to it, by the Board of Supervisors.

reen e t a ree ents have been adopted for the following areas:

- Between the cities of Ventura and Santa Paula.
- Between the cities of Santa Paula and Fillmore.
- Between Fillmore and the Los Angeles County Line (excluding the Community of Piru).
- Between the cities of Ventura and Oxnard westerly of Oxnard to Harbor Blvd.
- Between the cities of Oxnard and Camarillo.
- East of the City of Camarillo for the westerly portion of the Santa Rosa Valley.
- Tierra Rejada Valley.

Additional *reen e t a ree ents* should be considered by the County and the appropriate cities for the following respective areas:

- Las Posas Valley.
- Hidden Valley.
- Upper Ojai Valley.
- Between Moorpark and Simi Valley north of Highway 118.

3.2 Land Use Designations

Six basic land use designations are utilized on the General Land Use Map: Urban, Existing Community, Rural, Agricultural, Open Space, and State and Federal Facilities. In addition, the General Land Use Map includes an overlay designation of Urban Reserve. These designations are defined as follows:

- The **Urban** land use designation is utilized to depict existing and planned urban centers which include commercial and industrial uses as well as residential uses where the building intensity is greater than one principal dwelling unit per two acres.

  This designation has been applied to all incorporated lands within a city s Sphere of Influence as established by the Local Agency Formation Commission (LAFCO), and unincorporated urban centers within their own Areas of Interest which may be candidates for future incorporation.

- An *nincorporated r an Center* is an existing or planned community which is located in an Area of Interest where no city exists. The unincorporated urban center represents the focal center for community and planning activities within the Area of Interest. For example, the Community of Piru represents the focal center in the Piru Area of Interest.
- An *Area o nterest* is a major geographic area reflective of community and planning identity. Within each Area of Interest there should be no more than one city or Unincorporated Urban Center, but there will not necessarily be a city or Unincorporated Urban Center in each Area of Interest. Figure 3.5 shows the current Area of Interest boundaries for the County.
- A *Sphere o n uence*, as used in this General Plan, is an area determined by LAFCO to represent the probable ultimate boundary of a city (LAFCO also recognizes Spheres of Influence for special districts, which are not discussed in this Chapter). The adoption of Spheres of Influence is required by Government Code Section 56425.

- The **E isting Community** designation identifies existing urban residential, commercial or industrial enclaves located outside Urban designated areas. An Existing Community may include uses, densities, building intensities, and zoning designations which are normally limited to Urban designated areas but do not qualify as urban centers. This designation has been established to recognize existing land uses in unincorporated areas which have been developed with urban building intensities and urban land uses; to contain these enclaves within specific areas so as to prevent further expansion; and to limit the building intensity and land use to previously established levels.

- The **Rural** designation identifies areas suitable for low-density and low-intensity land uses such as residential estates of two acres or greater parcel size and other rural uses which are maintained in conjunction with agricultural and horticultural uses or in conjunction with the keeping of farm animals for recreational purposes.

  The Rural designation also identifies institutional uses such as boarding and non-boarding elementary and secondary schools. Additionally, the designation is utilized for recreational uses such as retreats, camps, recreational vehicle parks and campgrounds.

  The designation of areas for Rural land uses is intended to accommodate the need for low density rural residential *deve op ent***,** which, in conjunction with the higher density development of the Urban designated land uses, will provide a full range of residential environments.

  The areas considered for inclusion in the Rural designation are existing clusters of rural development and areas deemed appropriate for future rural residential development.

- The **Agricultural** designation is applied to irrigated lands which are suitable for the cultivation of crops and the raising of livestock.

  Because of the inherent importance of agriculture as a land use in and of itself, agriculture is not subsumed under the Open Space land use designation, but has been assigned a separate land use designation.

- The **Open Space** designation encompasses land as defined under Section 65560 of the State Government Code as any parcel or area of land or water which is essentially unimproved and devoted to an open-space use as defined in this section, and which is designated on a local, regional or State open-space plan as any of the following:
  - Open space for the preservation of natural resources including, but not limited to, areas required for the preservation of plant and animal life, including habitat for fish and wildlife species; areas required for ecologic and other scientific study purposes; rivers, streams, bays and estuaries; and coastal beaches, lakeshores, banks of rivers and streams, and watershed lands.

- Open space used for the managed production of resources, including but not limited to, forest lands, rangeland, agricultural lands not designated agricultural; areas required for recharge of groundwater basins; bays, estuaries, marshes, rivers and streams which are important for the management of commercial fisheries; and areas containing major mineral deposits, including those in short supply.
- Open space for outdoor recreation, including but not limited to, areas of outstanding scenic, historic and cultural value; areas particularly suited for park and recreation purposes, including access to lakeshores, beaches, and rivers and streams; and areas which serve as links between major recreation and open-space reservations, including utility easements, banks of rivers and streams, trails, and scenic highway corridors.
- Open space for public health and safety, including, but not limited to, areas which require special management or regulation because of hazardous or special conditions such as earthquake fault zones, unstable soil areas, flood plains, watersheds, areas presenting high fire risks, areas required for the protection of water quality and water reservoirs and areas required for the protection and enhancement of air quality.

- For purposes of the County General Plan, open space also includes the following:
  - Open space to promote the formation and continuation of cohesive communities by defining the boundaries and by helping to prevent urban sprawl.
  - Open space to promote efficient municipal services and facilities by confining urban *deve op ent* to defined development areas.
- The **State or ederal acility** land use designation is included on the General Land Use Map to recognize Federal or State facilities, excluding forest and park lands, over which the County has no or limited land use authority. Areas so designated include lands under Federal or State ownership on which governmental facilities are located.
- The **Urban Reserve overlay** designation is applied to all unincorporated land within a city s adopted Sphere of Influence. Although LAFCO has determined these areas to be appropriate for eventual annexation and urbanization, the Urban designation was not applied to all lands within the LAFCO sphere boundaries because it could result in urban development being permitted without annexation. Accordingly, unincorporated lands within spheres have been designated under this General Plan as Existing Community, Rural, Agricultural or Open Space. Under these designations, therefore, more intense development could not occur on affected lands until they are annexed.

The following goals and policies apply to land use designations:

3.2.1 Goals

1. **Urban:**

   (1) Recognize areas within the County planned for urban *deve op ent* which are currently incorporated or which are candidates for future incorporation.

   (2) Direct urban *deve op ent* to existing cities and unincorporated urban centers within their own Area of Interest, and maintain open space between urban areas.

   (3) Discourage outward expansion of urban *deve op ent* when suitable developable areas exist within cities and unincorporated urban centers.

2. **E isting Community:**

   Recognize and confine existing urban enclaves which are outside Urban designated areas, even though the enclaves may include uses, densities, and zoning designations normally limited to Urban designated areas.

3. **Rural**:

   Recognize and plan for low density rural residential and recreational *deve op ent* while preserving resources, avoiding hazards, and providing adequate public facilities and services.

4. **Agricultural**:

   (1) Identify the *ar ands* within the County that are critical to the maintenance of the local agricultural economy and which are important to the State and Nation for the production of food, fiber and ornamentals.

   (2) Preserve and protect agricultural lands as a nonrenewable resource to assure their continued availability for the production of food, fiber and ornamentals.

   (3) Maintain agricultural lands in parcel sizes which will assure that viable farming units are retained.

   (4) Establish *po icies* and regulations which restrict agricultural land to farming and related uses rather than other *deve op ent* purposes.

   (5) Restrict the introduction of conflicting uses into farming areas.

5. **Open Space**:

   (1) Preserve for the benefit of all the County s residents the continued wise use of the County s renewable and nonrenewable resources by limiting the encroachment into such areas of uses which would unduly and prematurely hamper or preclude the use or appreciation of such resources.

   (2) Acknowledge the presence of certain hazardous features which urban *deve op ent* should avoid for public health and safety reasons, as well as for the possible loss of public improvements in these areas and the attendant financial costs to the public.

   (3) Retain open space lands in a relatively undeveloped state so as to preserve the maximum number of future land use options.

   (4) Retain open space lands for outdoor recreational activities, parks, trails and for scenic lands.

   (5) Define urban areas by providing contrasting but complementary areas which should be left generally undeveloped.

   (6) Recognize the intrinsic value of open space lands and not regard such lands as areas waiting for urbanization.

6. **State and ederal acilities**:

   (1) Recognize lands devoted to governmental uses which are under the authority of the State or Federal government and over which the County has no effective land use jurisdiction.

   (2) Encourage proper planning of governmental lands so that uses on these lands are compatible with existing and planned uses on adjacent privately owned lands

7. **Urban Reserve**:

   Acknowledge the interests of cities and recognize the LAFCO adopted Spheres of Influence as areas in which urbanization will occur under the cities authority.

3.2.2 Policies

1. **Urban**:

   (1) The Urban land use designation shall include existing incorporated lands within a city s Sphere of Influence, and unincorporated urban centers within their own Area of Interest. No more than one city or unincorporated urban center shall be designated within an adopted Area of Interest.

   (2) The appropriate zoning, maximum residential building intensity, and the minimum parcel size consistent with the Urban land use designation for unincorporated land shall be that allowed by the adopted Area Plan.

(3) If a suitable amount of developable land exists within a city s Sphere of Influence then outward expansion of urban development into the city s Area of Interest shall be discouraged. If a suitable amount of developable land exists within an unincorporated urban center then expansion of the unincorporated urban center shall be prohibited.

2. **E isting Community**:

(1) The Existing Community designation shall include existing unincorporated urban enclaves located outside cities and unincorporated urban centers.

(2) The Existing Community designation may recognize the range of zones present in the area, be they residential, commercial, or industrial, as well as the range of existing population densities and building intensities. The appropriate zoning, population densities, and building intensities shall be that allowed by the adopted Area Plan or, where no Area Plan exists, by the applicable Existing Community Map contained in this Chapter commencing with Figure 3.7. Because of the degree of specificity on the Existing Community Maps, any zone change within an Existing Community covered by a oning Map shall require a General Plan amendment.

3. **Rural**:

(1) Lands designated Rural are those located outside areas designated Urban or Existing Community which are deemed suitable and appropriate for low-density rural residential or recreational development.

(2) The smallest minimum parcel size consistent with the Rural land use designation is two acres. Subzones may require larger minimum parcel sizes.

4. **Agricultural**:

(1) The Agricultural land use designation shall primarily include lands which are designated as *ri e ar ands*, *ar ands o State ide portance* or *ni ue ar ands* in the State s Important Farmland Inventory (IFI), although land may not be designated Agricultural if small areas of agricultural land are isolated from larger blocks of farming land (in such cases, the agricultural land is assigned to the Open Space or Rural designation of the surrounding properties).

(2) The smallest minimum parcel size consistent with the Agricultural land use designation is 40 acres. Subzones may require larger minimum parcel sizes.

(3) Agricultural land shall be utilized for the production of food, fiber and ornamentals; animal husbandry and care; uses accessory to agriculture and limited temporary or public uses which are consistent with agricultural or agriculturally related uses.

5. **Open Space**:

(1) Open Space should include areas of land or water which are set aside for the preservation of natural resources, including, but not limited to, areas required for the preservation of plant and animal life, including habitat for fish and wildlife species; areas required for ecologic and other scientific study purposes; rivers, streams, bays, and estuaries; and coastal beaches, lakeshores, banks of rivers and streams, and important watershed lands.

(2) Open Space should also include areas set aside for managed production of resources, including, but not limited to, forest lands, rangeland, agricultural lands not otherwise designated Agricultural; areas required for the recharge of groundwater basins; bays, estuaries, marshes, rivers, and streams which are important for the management of commercial fisheries; and areas containing major mineral deposits, including those in short supply.

(3) Open Space should also include areas within which recreational activities can be pursued, including, but not limited to, areas of outstanding scenic, historic, and cultural value; areas particularly suited for park and recreation purposes, including access to lakeshores, beaches, and rivers and streams; and areas which serve as links between major recreation and open space reservations, including utility easements, banks of rivers and streams, trails, and scenic highway corridors.

(4) Open Space should also include areas of land or water which are set aside for public health and safety, thereby safeguarding humans and property from certain natural hazards, including, but not limited to, areas which require special management or regulation because of hazardous or special conditions such as earthquake fault zones, unstable soil areas, flood plains, watersheds, areas presenting high fire risks, areas required for the protection of water quality and water reservoirs, and areas required for the protection and enhancement of air quality.

(5) Open Space should also include undeveloped natural areas surrounding urban-designated areas which have been set aside to define the boundaries of the urban-designated areas, to prevent urban sprawl, and to promote efficient municipal services and facilities by confining the areas of urban development.

(6) The smallest minimum parcel size consistent with the Open Space land use category is 10 acres. Subzones may require larger minimum parcel sizes.

(7) The minimum parcel size for Open Space properties contiguous with the Agricultural land use designation shall be 20 acres.

6. **State or ederal acility**:

(1) The State or Federal Facility land use designation shall include State or Federally owned lands on which a significant governmental use is located, and which are under the control of the State or Federal government and, therefore, effectively beyond the land use jurisdiction of the County.

(2) Whenever land designated State or Federal Facility is transferred to a private party or another public entity, the land shall be redesignated to an appropriate land use designation through the General Plan Amendment process.

7. **Urban Reserve**:

(1) The Urban Reserve overlay designation shall be applied to all unincorporated land within a city s adopted Sphere of Influence.

(2) Applicants for General Plan amendments, zone changes, and *discretionary deve op ent* should apply to the appropriate city and shall be discouraged from applying to the County.

3.3 Population and Housing

State law requires the preparation of a Housing Element as part of a jurisdiction s General Plan Government Code Section 65302(c) . The Element is to consist of identification and analysis of existing and projected housing needs, and a statement of *oa s* (including quantified objectives), *po icies* and scheduled *pro ra s* for the preservation, improvement and development of housing. It is also required to identify adequate sites for housing and to make adequate provision for the existing and projected needs of all economic segments of the County (Government Code Section 65583).

In addition to State law, the guidelines adopted by the Department of Housing and Community Development are also to be considered in the preparation of the Housing Element (Government Code Section 65585). Periodic review of the Element is required to evaluate:

(1) The appropriateness of its goals, policies and programs in contributing to the attainment of the State housing goals;

(2) Its effectiveness in attaining the County s housing goals and objectives; and

(3) The progress of its implementation (Section 65588).

The Population and Housing Section of the Land Use Chapter of the Goals, Policies and Programs and Land Use Appendix of the County General Plan are intended to fulfill the requirements of State law regarding Housing Elements.

The following goals, policies and programs apply to population and housing:

3.3.1 Goals

1. **Population and Dwelling Unit orecast Goal**: Monitor the rate and distribution of growth within the cities and unincorporated area of the County, and ensure that the population and dwelling unit forecasts of the County General Plan are periodically updated and are consistent with the cities and County s General Plans and the ability to provide adequate public facilities and services.

2. **Consistency with Public acilities and Services Capacity Goal**: Ensure that the rate and distribution of growth within the County does not exceed the capacity of public facilities and services to meet the needs of the County s population and to protect the public health, safety, and welfare.

3. **Housing Preservation Goals**: Preserve the condition of the existing housing stock and the continuing affordability of currently affordable units:

   (1) Encourage preservation of the existing housing stock (30,301 units), with special emphasis on mobile homes in mobile home parks (1,383 units) and multi-family rental units (2,178 units). The preservation objectives by income category are as follows:

Extremely Low-Income **Units**	*Very Low-Income* **Units**	*Low-Income* **Units**	*Moderate-Income* **Units**	*Upper-Income* **Units**
3,454	2,666	4,168	7,180	12,833

   (2) Assure, where feasible, the continued affordability of the existing affordable housing stock.

   (3) Assure, where feasible, that affordable housing in the Coastal one is replaced in proximity when demolished or converted.

4. **Housing Rehabilitation Goals**: Continue and expand, where feasible, existing housing rehabilitation programs:

   (1) Continue the existing code enforcement and housing grant/loan *pro ra s* to improve the condition of existing substandard housing (183 units without adequate plumbing), and housing otherwise in need of rehabilitation within the Piru RDA. The rehabilitation objectives within the Piru RDA by income category are as follows:

Extremely Low-Income **Units**	*Very Low-Income* **Units**	*Low-Income* **Units**	*Moderate-Income* **Units**	*Upper-Income* **Units**
0	8	23	14	0

   (2) Promote the improvement of existing housing by informing the public about existing energy conservation and weatherization retrofit.

   (3) Promote the development of room additions and second dwelling units to reduce overcrowding for *o er-inco e* households.

5. **Housing Opportunities Goals**: Increase housing opportunities for households of all income levels, with special emphasis on *o er-inco e* households, the elderly, mentally ill, single heads of household, large families, farmworkers, handicapped and homeless:

   (1) Promote and facilitate at least a 2.3 percent market vacancy rate in owner-occupied housing and 5 percent market vacancy rate in rental housing.

(2) Facilitate the construction of the following number of new dwelling units by income category in the unincorporated area of Ventura County between January 1, 2006 and June 30, 2014:

Extremely Low-Income **Units**	*Very Low-Income* **Units**	*Low-Income* **Units**	*Moderate-Income* **Units**	*Upper-Income* **Units**
152	153	250	291	558

(3) Promote and facilitate the construction of housing which is suited to the specific needs of other *o er-inco e* groups (i.e., farmworkers, elderly, mentally ill, handicapped, single heads of households, large families or homeless) both Countywide and within the unincorporated areas of the County.

(4) Assist *o er-inco e* households to purchase or rent homes.

6. **Housing Diversity Goals**: Promote a diversity of housing types, *tenure*, and price:

(1) Increase the number of single-family attached, multi-family, and rental units in unincorporated communities that have a disproportionately high percentage of single-family detached and owner-occupied housing units.

(2) Strive for an equitable distribution of housing types and prices throughout the Urban and Existing Community designated areas of the unincorporated County.

(3) Continue the utilization of mobilehomes and manufactured homes in the unincorporated County as a means of providing dwelling units for *o er-inco e* households.

7. **Housing Equality Goal**: Promote housing opportunities for all persons regardless of race, religion, sex, marital status, age, ancestry, national origin, color, or socio-economic status by attempting to eliminate discrimination in housing by supporting Federal, State and local fair housing laws and policies.

8. **Area Plans and Other County Policies Goal**: Ensure that the Population and Housing Section of the County General Plan and new housing *deve op ents* are consistent with the *oa s* objectives and *po icies* of the various Area Plans and other County adopted plans and *po icies* and ensure that Area Plans are consistent with the *oa s* objectives and *po icies* of the Population and Housing Section of the County General Plan.

9. **Population and Housing Section Update Goal**: Ensure that the Population and Housing Section of the County General Plan is kept current by updating population data on an ongoing basis by reassessing the *oa s* objectives and *po icies* of the Population and Housing Section, and evaluating the effectiveness of the Section s *pro ra s* every five years or as otherwise specified by State law.

3.3.2 Policies

1. **orecasts Policy**: The population and dwelling unit forecasts (Figures 3.29 and 3.30) do not constitute absolute ceilings for growth in the various subareas of the County. However, they do constitute a framework for general growth patterns and provide a means of evaluating the cumulative effect of projects within each subarea and in the County as a whole. Any project or combination of projects which would cause the forecasts to be exceeded in a given forecast year of a given subarea shall be reviewed to ensure that growth does not exceed the capacity of the public facilities or public services. The purpose of the forecasts is not to impose artificial limits on the rate or form of growth, but to provide a logical basis for planning public facilities and services, and to assist public decision-making bodies in ensuring that public needs will be addressed and accommodated in a comprehensive and long-term manner.

2. **Housing Preservation Policies**:

(1) Existing residentially developed neighborhoods shall not be designated under Area Plans to land uses that would eliminate or degrade the existing housing stock.

(2) *o er-* and *oderate-inco e* rental housing located in the Coastal one shall be concurrently replaced within three miles, if feasible, when two or more such units are converted or demolished.

(3) The County shall support the efforts of private and public agencies to preserve the existing housing stock.

3. **Housing Rehabilitation Policy**: The County shall coordinate its housing rehabilitation *pro ra s* with those of other public and private agencies.

4. **Housing Opportunities and Diversity Policies**:

(1) As Area Plans are developed or updated, the County shall attempt to accomplish the following to encourage greater housing opportunities:

- Increase density, where appropriate, to reduce the cost of land per unit.
- Ensure a mix of residential densities (i.e., single family attached and multi-family as well as single-family detached).
- Redesignate, where appropriate, any commercial, industrial or public land which has been determined to be surplus for the community needs, to a residential land use designation in order to increase the land available for housing.
- Discourage the conversion of existing residentially developed or designated areas to other land uses.
- Ensure that there is enough residential land to meet planned employment opportunities and that there is a balanced amount of commercial, industrial and residential land use designations.
- Develop a Master Environmental Assessment or Environmental Impact Report for the area encompassed by the Area Plan which could reduce processing time associated with subsequent environmental documents for residential projects.

(2) The County shall give priority in providing housing assistance to those groups with demonstrated special needs, such as the elderly, mentally ill, handicapped, large families, single heads of household, farmworkers and the homeless.

(3) County-owned land that is no longer necessary for the purpose for which it is was acquired or previously used shall be evaluated for its suitability for *o er-inco e* housing and emergency shelters using criteria including, but not limited to, compatibility with surrounding existing land uses and economic viability. If suitable, such land shall be made available to public or private non-profit organizations for the construction of *o er-inco e* housing or emergency shelter.

(4) The County shall offer, under Article 16 of the oning Ordinance, a density bonus and other concessions for those residential projects that provide a minimum percentage of the units for *o er-inco e* and *oderate-inco e* households, and senior households per the requirements of State law. These units shall have resale or rental controls attached to them.

(5) The County shall offer, under Article 19 of the oning Ordinance, a density bonus for condominium conversion projects that provide a minimum percentage of the units to *o er-inco e* and *oderate-inco e* households per the requirements of State law. These units shall have resale controls attached to them.

5. **Housing Equality Policies**:

(1) The County shall continue to promote equal opportunity in the housing market for all persons regardless of race, color, religion, sex, age, marital status, ancestry or national origin, employment, physical condition, family size or other arbitrary factors.

(2) The County shall continue to encourage and support the enforcement of laws and regulations prohibiting discrimination in lending practices and the sale or rental of housing.

6. **Area Plans and Other County Policies**:

   (1) As Area Plans are developed or updated, they shall be consistent with the *oa s* and *po icies* of the Population and Housing Section of the County General Plan.

   (2) The *oa s* objectives, and *po icies* of the Area Plans and other adopted County plans and *po icies* shall be considered at the time of permit application for housing *deve op ent* especially with regard to the following:

   - Consistency with adopted regional population forecasts.
   - Balance of residential *deve op ent* with employment opportunities.
   - *reservation* and *conservation* of natural resources and agricultural lands.
   - Recognition of environmental hazards and constraints.
   - *reservation* and promotion of community character.
   - Availability of existing and planned infrastructure and urban services.

7. **Population and Housing Section Update Policy**: The Housing Section of the General Plan shall be revised every five years, or as otherwise prescribed by State law. The entire Housing Section and Land Use Appendix shall be reviewed as necessary to identify changes in the County s housing *oa s*, objectives *po icies* and *pro ra s* that may be appropriate based upon changing needs or priorities.

3.3.3 Programs

An attempt has been made not to duplicate *pro ra s* under separate headings. For example, some *pro ra s* which will provide housing opportunity would also add to housing diversity , but have not been repeated. It is recommended, therefore, that all *pro ra s* be reviewed to gain an understanding of how the *pro ra s* interrelate and how, together, they will bring Ventura County closer to attaining its housing *oa s* and objectives.

1. **Population and Dwelling Unit orecast Program**: The County Planning Division will continue to update the population and dwelling unit forecasts of the County General Plan periodically, in consultation with the cities, and subject to the approval of the Board of Supervisors. The County General Plan will be periodically updated to incorporate the updated forecasts and to revise County *oa s po icies* and *pro ra s* as necessary.

2. **Population and Dwelling Unit Monitoring Program**: The County Planning Division will monitor population and dwelling unit growth to evaluate consistency of actual *deve op ent* patterns with adopted forecasts for the various subareas of the County. In cases where it appears that *discretionary deve op ent* would individually or cumulatively exceed the forecasts in a given subarea of the County, the Planning Division will bring the information to the attention of the decision-making body (ongoing).

3. **Housing Preservation Programs**:

   (1) The Resource Management Agency (Planning, Building and Safety, Environmental Health) will continue the enforcement of zoning, building and safety and public health codes on a complaint or voluntary request basis (ongoing).

   (2) To the extent that Federal and State grants and local housing funds are available, the County Executive Office with the assistance of the Resource Management Agency will continue to administer grant/loan programs to assist households with resolving housing health and safety code violations, i.e., building and safety, fire, or public health (ongoing).

   (3) The Planning Division will continue the Mobile Home Park Rent Review Program to assure that the amount of rent does not increase more than set forth in the Mobile Home Park Rent Review Ordinance (ongoing).

4. **Housing Rehabilitation Programs**:

   (1) The Resource Management Agency (Planning, Building and Safety, Environmental Health) will continue to notify and direct affected property owners to the County Executive Office regarding possible grants/loans to resolve health and safety code violations involving housing (ongoing). To the extent that Federal and State grants and local housing funds are available, the County Executive Office will continue to provide low cost loans to *o er-inco e* households for the rehabilitation of housing units that have health and safety code violations (ongoing).

   (2) The Planning Division will continue to maintain the existing "Build It Smart" information and news web site to encourage energy- and resource-efficient building practices. The Community Action of Ventura County should continue its energy conservation, energy education, appliance repair or replacement, home weatherization and home rehabilitation *pro ra s* for existing eligible homeowners and renters housing units (ongoing).

   (3) To the extent that Federal, State or local funds are available, the County Executive Office will provide low cost loans to *o er-inco e* households for room additions or second dwelling units to help reduce overcrowding (ongoing).

5. **Housing Opportunity and Diversity Programs**:

   (1) The County Executive Office will continue to administer available Federal and State grants and local housing funds in order to facilitate the development of affordable owner-occupied and rental housing for *o er-inco e* households, and for those households with identified special needs (farmworkers, elderly, mentally ill, handicapped, homeless), and notify other interested housing agencies and non-profit organizations annually and as funding becomes available for *o er-inco e* and special needs housing (ongoing).

   (2) The Area Housing Authority should continue to administer subsidies to assist eligible *o er-inco e* households in renting affordable housing (ongoing).

   (3) The Planning Division will pursue the following actions during FY 2008-2009 to promote special needs housing:

      - Process an amendment to the Non-Coastal and Coastal oning Ordinances to clarify which zones allow special needs housing (e.g., emergency shelters, transitional housing, supportive housing, SROs), and to expressly establish a process to approve deviations from zoning standards to meet the reasonable accommodation provisions of the American Disabilities Act.

      - Update the Planning Division's website to include information regarding special needs housing.

   (4) Appropriate non-profit organizations (e.g., Community Action of Ventura County and Project Understanding) should continue to provide loans and/or grants to *o er-inco e* individuals, families, senior citizens, handicapped or disabled persons who are either homeless or "at risk of becoming homeless" (ongoing).

   (5) The Community Action of Ventura County should continue to:

      - Annually survey the number of persons in the County;

      - Seek feasible and effective strategies to prevent homelessness and house homeless persons and families;

      - Research the funding sources available to deal with homelessness; and

      - Participate on the Interagency Council on Homelessness to implement the 10-Year Strategy to End Homelessness for Ventura County (ongoing).

(6) Ventura County Health Services Agency will continue to financially support, and the County Executive Office will continue to actively participate on, the Ventura County Interagency Council on Homelessness and with each of the cities within Ventura County to facilitate the implementation of the 10-Year Strategy to End Homelessness for Ventura County (ongoing).

(7) During FY 2008-2009, the County Executive Office and Planning Division will complete the recommended actions of the County Redevelopment Agency's Piru Housing Plan. Residential projects within the Redevelopment Area and Piru expansion area will provide for the construction or rehabilitation of *very o -inco e o -inco e* and/or *oderate-inco e* housing per the requirements of California Redevelopment Law and Piru Area Plan policies, as applicable.

(8) During FY 2008-2009, the Planning Division, in consultation with farmworker housing organizations, will pursue the following actions to encourage the construction of *extre e y o -inco e* and *very o -inco e* farmworker housing:

- Process an amendment to the General Plan and oning Ordinance to allow the creation of parcels less than 40 acres in the AE zone for Farmworker Housing Complexes within or adjacent to City Spheres of Influence or adjacent to city boundaries.
- Prepare informational brochure and website information regarding Farmworker and Animal Caretaker Dwelling Units and Farmworker Housing Complexes.

(9) During FY 2009-2010, the Planning Division will pursue the following actions to promote the construction of second dwelling units for *o er-inco e* households:

- Solicit and assemble pre-approved building plans for Second Dwelling Units, and update informational brochures and website to include this information.
- Process an amendment to the Non-Coastal oning Ordinance to allow second dwelling units on non-conforming lots subject to the same standards as conforming lots, and increase the size of second dwelling units to 1,800 square feet on parcels of 40 acres or more to accommodate larger, non-farmworker families.

(10) During FY 2009-2010, the Planning Division will process an amendment to Articles 16 and 19 of the Non-Coastal oning Ordinance to conform with the provisions of State law, and evaluate the deferment of processing fees (excluding EIRs), reduction of development standards, and improvement fees (e.g., Park, Flood Control, Sheriff, Fire, Water Service and Sanitation) for qualified affordable housing.

(11) By March 31, 2010 (statutory due date of the 2010 Annual Report), if the County of Ventura has not approved farmworker housing complex projects or other *o er-inco e* housing projects totaling at least 102 *o er-inco e* dwelling units and the County is not meeting its *o er-inco e* housing objectives as set forth in goal 3.3.1-5(2), the Planning Division will pursue the following actions to increase the supply of unincorporated vacant land zoned for a minimum of 20 dwelling units per acre, subject to inclusionary housing policies for *extre e y o -inco e very o -inco e*, and *o -inco e* households:

- Inventory, assess and propose to the Board of Supervisors a list of potential parcels suitable for residential development of 16 or more dwelling units with a minimum density of 20 dwelling units per acre (June 2010).
- Prepare an EIR covering the development impacts of the Board-selected parcels (FY 2010-2011).

- Process amendments to a) the General Plan and Area Plans to increase density on selected parcels and incorporate inclusionary housing policies, b) Non-Coastal oning Ordinance Code text to allow ministerial residential permits on selected parcels (e.g., overlay zone, commercial/residential mixed-use) and c) change the zoning of the selected parcels (FY2011-2012).

(12) During FY 2009-2010, the Planning Division will prepare and process an amendment to the Non-Coastal and Coastal oning Ordinances to require that residential development projects of 10 or more dwelling units provide *o er-inco e* residential units.

(13) The Planning Division will continue to monitor State legislation regarding housing, and will submit budgetary proposals to the Board of Supervisors as necessary to amend the County General Plan and oning Ordinance to ensure consistency with State law (ongoing).

6. **Housing Equality Programs**:

(1) The County will continue to fund, along with the cities, the Fair Housing Program to provide counseling and referral, affirmative action, and publications relative to fair housing laws, and tenant-landlord rights (ongoing).

(2) Community Action of Ventura County's legal department should continue to advise, or refer for legal counseling, constituents regarding tenant-landlord rights (ongoing).

7. **Population and Housing Section Update Programs**:

(1) The Planning Division, with the help of other public and private organizations, will continue to monitor Countywide construction and demolitions and estimate population trends, and periodically assess the progress in attaining County s housing *oa s po icies* and *pro ra s* Housing factors that should be monitored/estimated include:

- Housing construction and demolition by dwelling unit type and affordability category.
- Housing *tenure* and vacancy rates.
- Population increases and distribution.
- Employment generation and housing demand of proposed projects.
- Number of homeless persons and their distribution.
- Land available for the construction of *o er-* and *oderate-inco e* housing and farmworker housing.
- Evaluation of General Plan housing *oa s po icies* and *pro ra s* annually as required by the Government Code.

(2) The Planning Division will periodically prepare an update to the Population and Housing Section of the General Plan as appropriate, but not less than that required by State law, to reflect the results of the periodic reassessment of the County s housing needs, objectives, and implementation *pro ra s*.

3.4 Employment and Commerce Industry

Commerce and industry are the principal means by which County residents are employed and are the financial foundation upon which our communities are based.

Commercial and industrial uses are generally considered to be urban land uses that require public services and facilities. Commercial uses are located in cities and unincorporated urban centers or Existing Communities, and serve the needs of the residents and visitors of the respective city, urban center or Existing Community. Similarly, industrial uses are principally located in cities and unincorporated urban centers and Existing Communities, and they serve as the foundation of the local economy and are an integral part of the regional and global economies.

The following goals, policies, and programs govern commercial and industrial uses and development:

3.4.1 Goals

1. Encourage adequate commercial uses to develop within the incorporated cities, unincorporated urban centers and designated Existing Communities to meet the shopping, service and entertainment needs of area residents and visitors.
2. Encourage adequate industrial uses to develop within the incorporated cities, unincorporated urban centers and designated industrial Existing Communities, to meet the manufacturing, processing, fabrication and service needs of the local, regional and global economy, and to meet the employment needs of County residents.
3. Ensure that commercial and industrial uses develop in a manner compatible with neighboring residential and agricultural land uses, and natural resources.
4. Ensure that new commercial and industrial development does not adversely impact existing public facilities and services.
5. Ensure that commercial and industrial uses are developed to high standards of urban design and environmental quality.
6. Provide for the orderly distribution of employment opportunities within the County commensurate with housing opportunities.

3.4.2 Policies

1. Commercial and industrial *deve op ent* shall be located within cities, existing unincorporated urban centers or designated Existing Communities which provide maximum access to the public and where appropriate public facilities and services can be provided to serve such *deve op ent*.
2. All applications for commercial and industrial *deve op ent* located within a city s Sphere of Influence shall be referred to the city for possible annexation.
3. Commercial and industrial *deve op ents* shall be designed to be generally compact, grouped and consolidated into functional units providing for sufficient off-street parking and loading facilities, maximizing pedestrian and vehicle safety and minimizing the impacts on traffic congestion.
4. Commercial and industrial *deve op ents* shall be designed to provide adequate buffering (e.g., walls, landscaping, setbacks), and on-site activities (e.g., hours of operation, scheduling of deliveries) shall be regulated to minimize adverse impacts (e.g., noise, glare, odors) on adjoining residential areas.
5. Retail sales and service type commercial and office facilities should locate in shopping centers or established commercial areas.
6. Industrial *deve op ent* shall be located within city or existing unincorporated area industrial parks that have the necessary public facilities and services to support most industrial *deve op ent*.
7. Commercial and industrial uses shall be designed and conducted in a manner that is compatible with surrounding land uses such that potential impacts are mitigated to less than significant levels, or, where no feasible mitigation measures are available, a statement of overriding considerations shall be adopted.
8. As Area Plans are prepared or updated, planned industrial and commercial areas shall be evaluated to assess the impact on jobs/housing balance within the community and region.
9. Employment generating discretionary development resulting in 30 or more new full-time and full-time-equivalent employees shall be evaluated to assess the project's impact on lower-income housing demand within the community in which the project is located or within a 15-minute commute distance of the project, whichever is more appropriate. At such time as program 3.4.3-3 is completed, this policy shall no longer apply.

3.4.3 Programs

1. As necessary, the County Planning Division shall review, amend and enforce performance standards contained within zoning regulations.
2. The Planning Division will initiate a *pro ra* to monitor commercial and industrial *deve op ent* and to estimate current employment levels.
3. During FY 2008-2009, the Planning Division will develop and process a Housing Impact Mitigation Fee ordinance for Board of Supervisors consideration. Any fees imposed on agricultural related development should be set aside for only farmworker housing.

igure 3.1a
General Land Use Map (North Half)
(separate document)

Click above to go to map

igure 3.1b
General Land Use Map (South Half)
(separate document)

Click above to go to map

igure 3.2a
oning Compatibility Matri
- Non-Coastal ones

General Plan Map Land Use Designations	OS (10 Ac min.)	AE (40 Ac min.)	RA (1 Ac min.)	RE (10,000 S. . min.)	RO (20,000 S. . Min.)	R1 (6,000 S. . Min.)	R2 (3,500 S. . DU)	RPD	SP	TP	CO	C1	CPD	M1	M2	M3
Open Space (10 Ac Min.)	○	○								○						
Agriculture (40 Ac Min.)		○								○						
Rural (2 Ac Min.)			2 Ac	2 Ac	2 Ac											
E isting Community			○	○	○	○	○	○			○	○	○	○	○	○
Urban	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
State ederal acility	40 Ac															

OPEN SPACE INTERPRETATIONS – Open Space Interpretations granted prior to May 17, 1983, and permitting parcel sizes less than those specified in this Plan, shall be considered consistent with this Plan. Furthermore, zoning which is consistent with the purpose and intent of these Open Space Interpretations shall be considered consistent with this Plan.

Legend:

- Not compatible with plan
- ○ Compatible with plan
- U Compatible only with zone suffix equal to or more restrictive than that shown in circle
- Ac acre minimum lot size
- ○ thousand square feet min. lot size
- U units per acre maximum

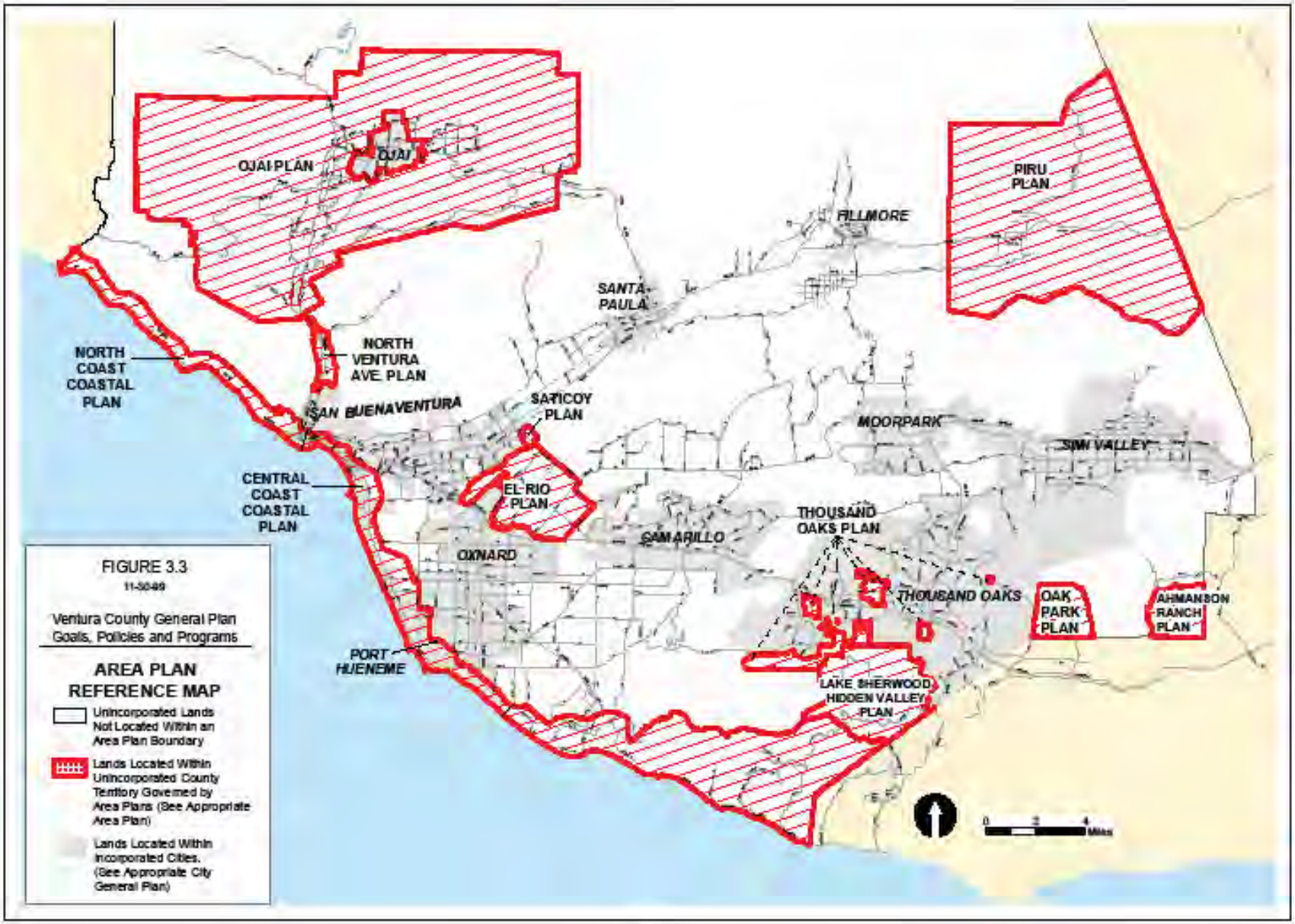
igure 3.2b
oning Compatibility Matri
- Coastal ones

General Plan Map Land Use Designations	COS (10 Ac min.)	CA (40 Ac min.)	CR (1 Ac min.)	CRE (20,000 S. . min.)	CR-1 (7,000 S. . min.)	CR-2 (3,500 S. . min.)	R (3,000 S. . min.)	R H	CR-PD	CC	CM
Open Space (10 Ac Min.)	○	○									
Agriculture (40 Ac Min.)		○									
Rural (2 Ac Min.)			2 Ac	2 Ac							
E isting Community			○	○	○	○	○	○	○	○	○
Urban			○	○	○	○	○	○	○	○	○
State ederal acility	40 Ac										

1,750 S.F. per single-family dwelling/3,000 S.F. per two-family dwelling.

Legend

- Not compatible with plan
- ○ Compatible with plan
- U Compatible only with zone suffix equal to or more restrictive than that shown in circle
- Ac acre minimum lot size
- ○ thousand square feet min. lot size
- U units per acre maximum


OJAI PLAN
OJAI
PIRU PLAN
FILLMORE
SANTA PAULA
NORTH COAST COASTAL PLAN
NORTH VENTURA AVE PLAN
SAN BUENAVENTURA
SATICOY PLAN
MOORPARK
SIMI VALLEY
CENTRAL COAST COASTAL PLAN
EL RIO PLAN
THOUSAND OAKS PLAN
SAMARILLO
OXNARD
THOUSAND OAKS
OAK PARK PLAN
AHMANSON RANCH PLAN
PORT HUENEME
LAKE SHERWOOD HIDDEN VALLEY PLAN
FIGURE 3.3
11-5049
Ventura County General Plan Goals, Policies and Programs
AREA PLAN REFERENCE MAP
Unincorporated Lands Not Located Within an Area Plan Boundary
Lands Located Within Unincorporated County Territory Governed by Area Plans (See Appropriate Area Plan)
Lands Located Within Incorporated Cities. (See Appropriate City General Plan)

igure 3.4
General Residential uilding Intensity Standards Population Density Range Table

Designation-	Rural	Open Space	Agriculture
1. Acres[1]	3,878	205,122	80,519
2. Low Range DU s/Ac[2]	1 DU/5Ac	1 DU/80Ac	1 DU/160Ac
3. High Range DU s/Ac[2] (Policy Standard)	1 DU/2Ac	1 DU/10Ac	1 DU/40Ac
4. Low Range DU s (Line 1 times Line 2)	776	2,564	503
5. High Range DU s (Line 1 times Line 3)	1,939	20,512	2,013
6. Average Pop/DU (Year 2020 Forecast for Unincorporated Area)	2.82	2.82	2.82
7. Low Range Population (Line 4 times Line 6)	2,188	7,230	1,418
8. High Range Population (Line 5 times Line 6)	5,468	57,844	5,677
9. Low Range Pop/Acre (Line 7 divided by Line 1)	0.564	0.035	0.176
10. High Range Pop/Acre (Line 8 divided by Line 1)	1.410	0.282	0.071
11. Maximum Building Coverage[3] (Percent of Lot Area)	25 [4]	5 [5]	5 [5]

ootnotes

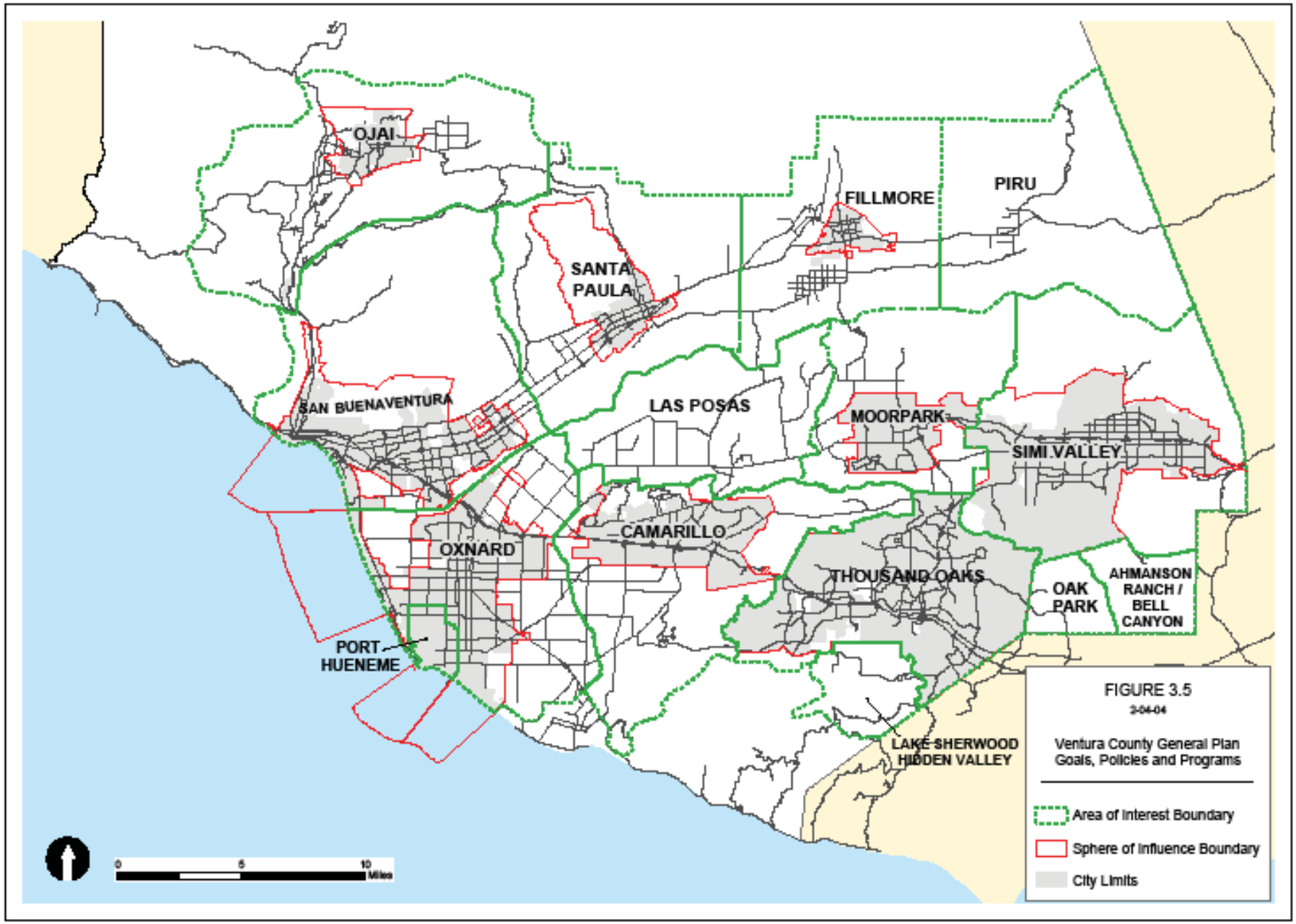
1 Excludes acreage from Area Plans and land owned by public agencies.

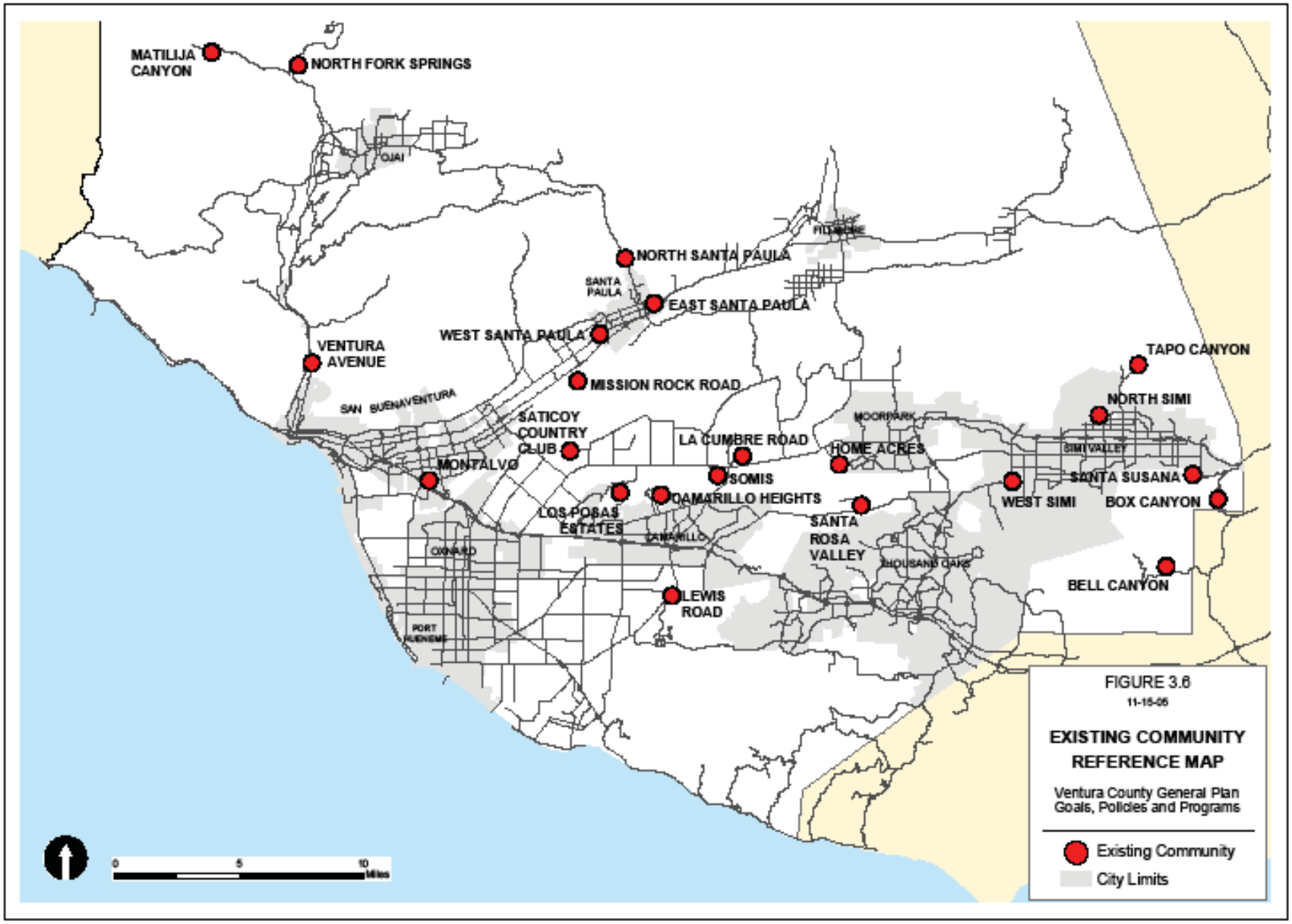
2 Excludes second dwelling units (in accordance with State Government Code Section 65852.2) and farmworker dwellings.

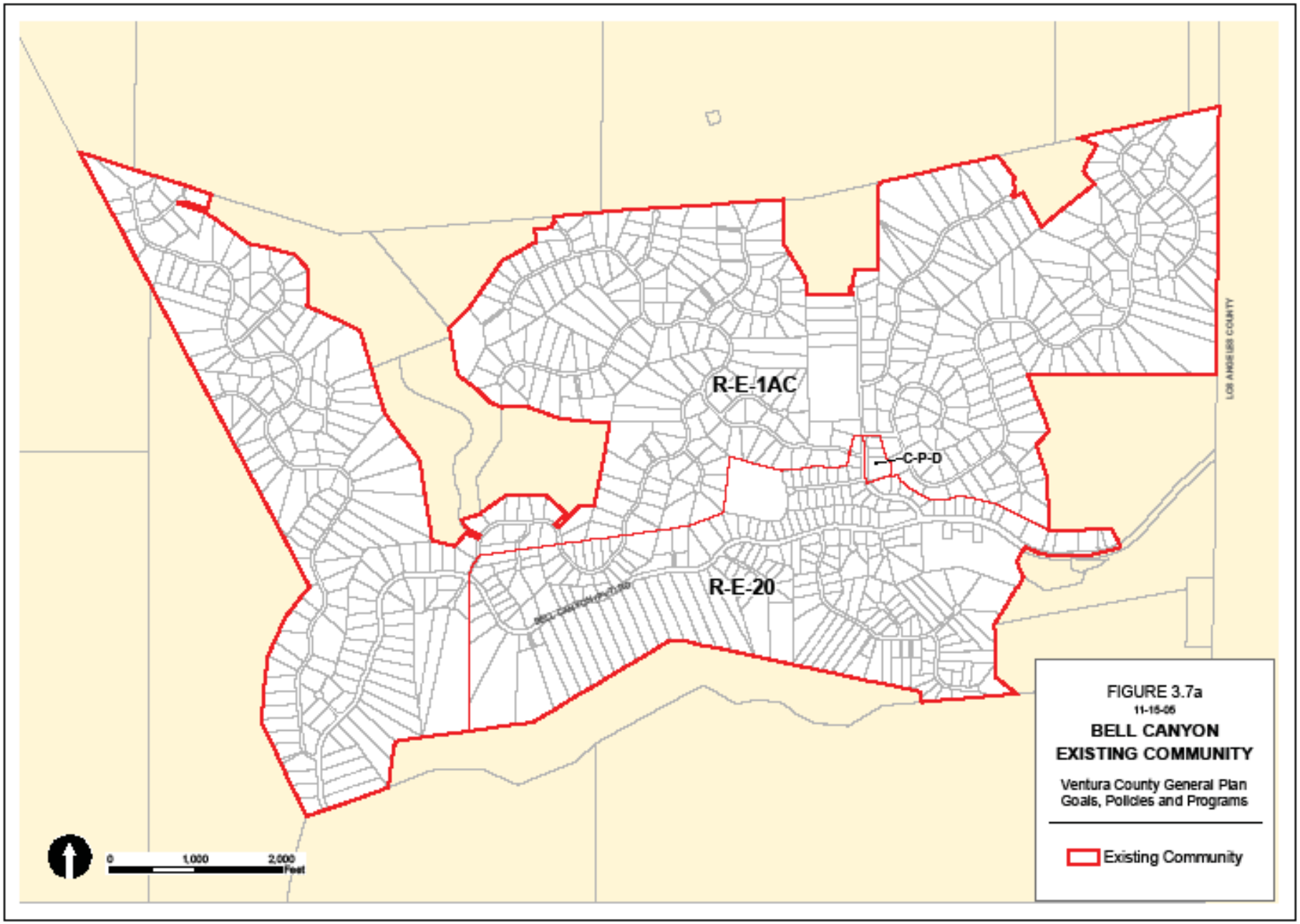
3 Excludes structures used for growing plants such as greenhouses, hothouses, and agricultural shade/mist structures. This exclusion does not include structures used for preliminary packing, storage and preservation of produce and similar structures. Additionally, greater building coverage may be allowed under discretionary permits for Farmworker Housing Complexes.

4 For nonconforming lots of less than one acre in area, maximum *ui din covera e* shall be 2,500 square feet, plus 1 square foot of building area for each 4.596 square feet of lot area over 5,000 square feet.

5 For nonconforming lots of less than 10 acres in area, maximum *ui din covera e* shall be 2,500 square feet, plus 1 square foot for each 22.334 square feet of lot area over 5,000 square feet. Greater building coverage may be allowed under discretionary permits for Farmworker Housing Complexes and existing uses listed in the Non-Coastal Zoning Ordinance under the heading of “Crop and Orchard Production”.


OJAI
FILLMORE
PIRU
SANTA PAULA
SAN BUENAVENTURA
LAS POSAS
MOORPARK
SIMI VALLEY
CAMARILLO
OXNARD
THOUSAND OAKS
OAK PARK
AHMANSON RANCH / BELL CANYON
PORT HUENEME
LAKE SHERWOOD HIDDEN VALLEY
0
5
10
Miles
FIGURE 3.5
3-04-04
Ventura County General Plan
Goals, Policies and Programs
Area of Interest Boundary
Sphere of Influence Boundary
City Limits


MATILIJA CANYON
NORTH FORK SPRINGS
OJAI
NORTH SANTA PAULA
SANTA PAULA
EAST SANTA PAULA
WEST SANTA PAULA
VENTURA AVENUE
MISSION ROCK ROAD
SAN BUENAVENTURA
SATICOY COUNTRY CLUB
MONTALVO
LA CUMBRE ROAD
SOMIS
HOME ACRES
MOORPARK
SIMI VALLEY
TAPO CANYON
NORTH SIMI
SANTA SUSANA
WEST SIMI
BOX CANYON
BELL CANYON
CAMARILLO HEIGHTS
LOS POSAS ESTATES
CAMARILLO
SANTA ROSA VALLEY
THOUSAND OAKS
OXNARD
LEWIS ROAD
PORT HUENEME
0
5
10
Miles
FIGURE 3.6
11-15-05
EXISTING COMMUNITY REFERENCE MAP
Ventura County General Plan Goals, Policies and Programs
Existing Community
City Limits


R-E-1AC
C-P-D
R-E-20
LOS ANGELES COUNTY
0
1,000
2,000
Feet
FIGURE 3.7a
11-15-05
BELL CANYON
EXISTING COMMUNITY
Ventura County General Plan
Goals, Policies and Programs
Existing Community

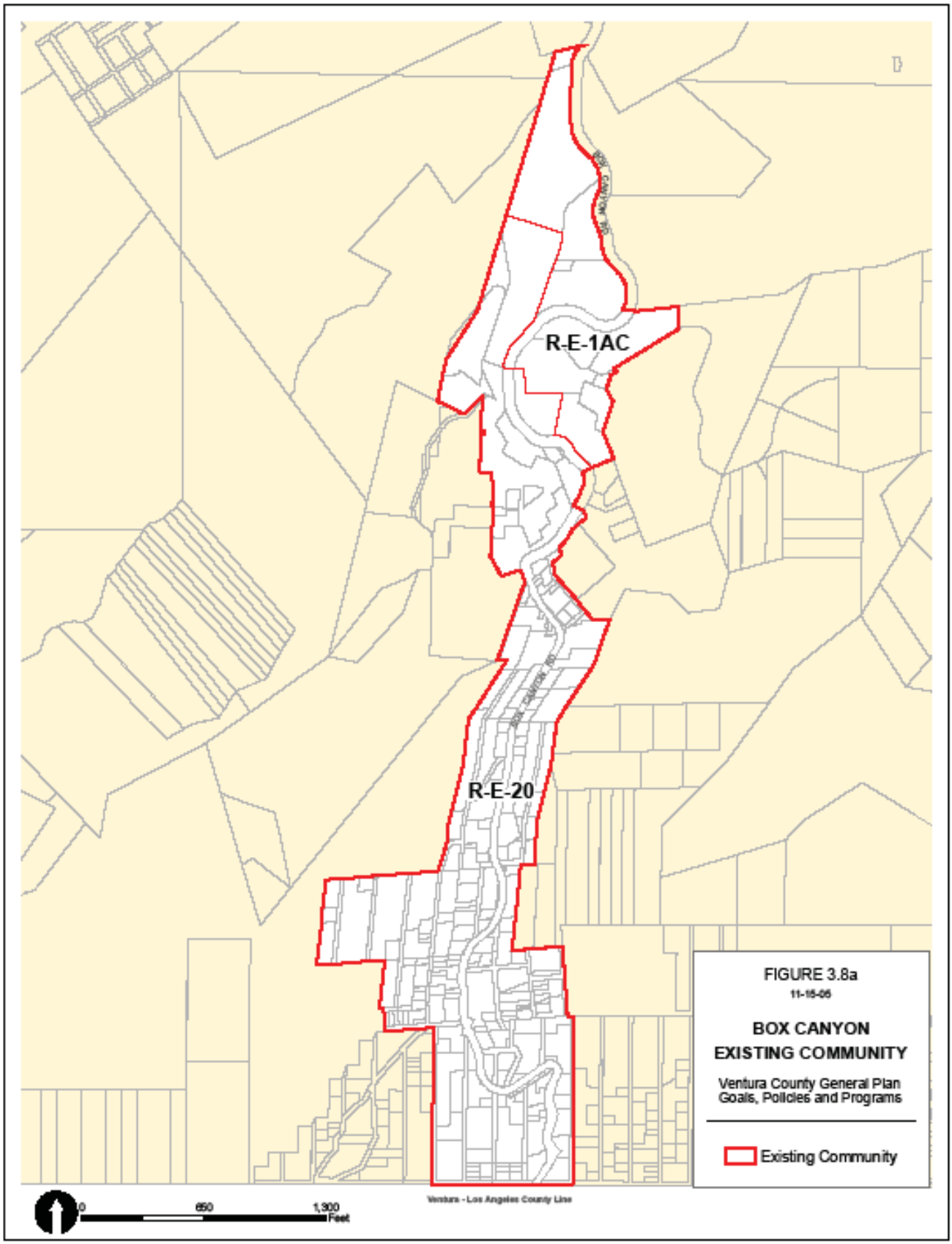
igure 3.7b
uilding Intensity Population Density Table -
ell Canyon E isting Community

Residential							
Designation	**Acres**	**Ma . ldg. Coverage (of Lot Area)[1]**	**Ma imum Intensity (DU Ac)[2]**	**Dwelling Units**	**Average Pop DU[3]**	**Population**	**Average Pop. Density (Pop Acre)**
RE-1Ac	865.47	25	1.00	865	2.69	2,326	2.69
RE-20	265.76	29	2.18	579	2.69	1,557	5.86
Total	1,131.23			1,444		3,883	
Commercial Industrial							
Designation	**Acres**	**Ma . ldg. Coverage (of Lot Area)**	**Pro ected loor Area (1000 S)**	**Average Employees 1000 S**	**Employees**	**Average Employees Acre**	
CPD	2.05	60	13.4	2.0	26	12.68	

[1]The maximum *ui din covera e* for lots of less than one acre in area shall be as specified, or 2,500 square feet plus 1 square foot for each 4.596 square feet of lot area over 5,000 square feet, whichever is greater.

[2]Excludes second dwelling units per Section 65852.2 of the State Government Code.

[3]Year 2000 Forecast for Oak Park Non-Growth Area.


R-E-1AC
R-E-20
FIGURE 3.8a
11-15-06
BOX CANYON
EXISTING COMMUNITY
Ventura County General Plan
Goals, Policies and Programs
Existing Community
Ventura - Los Angeles County Line
0
650
1,300
Feet

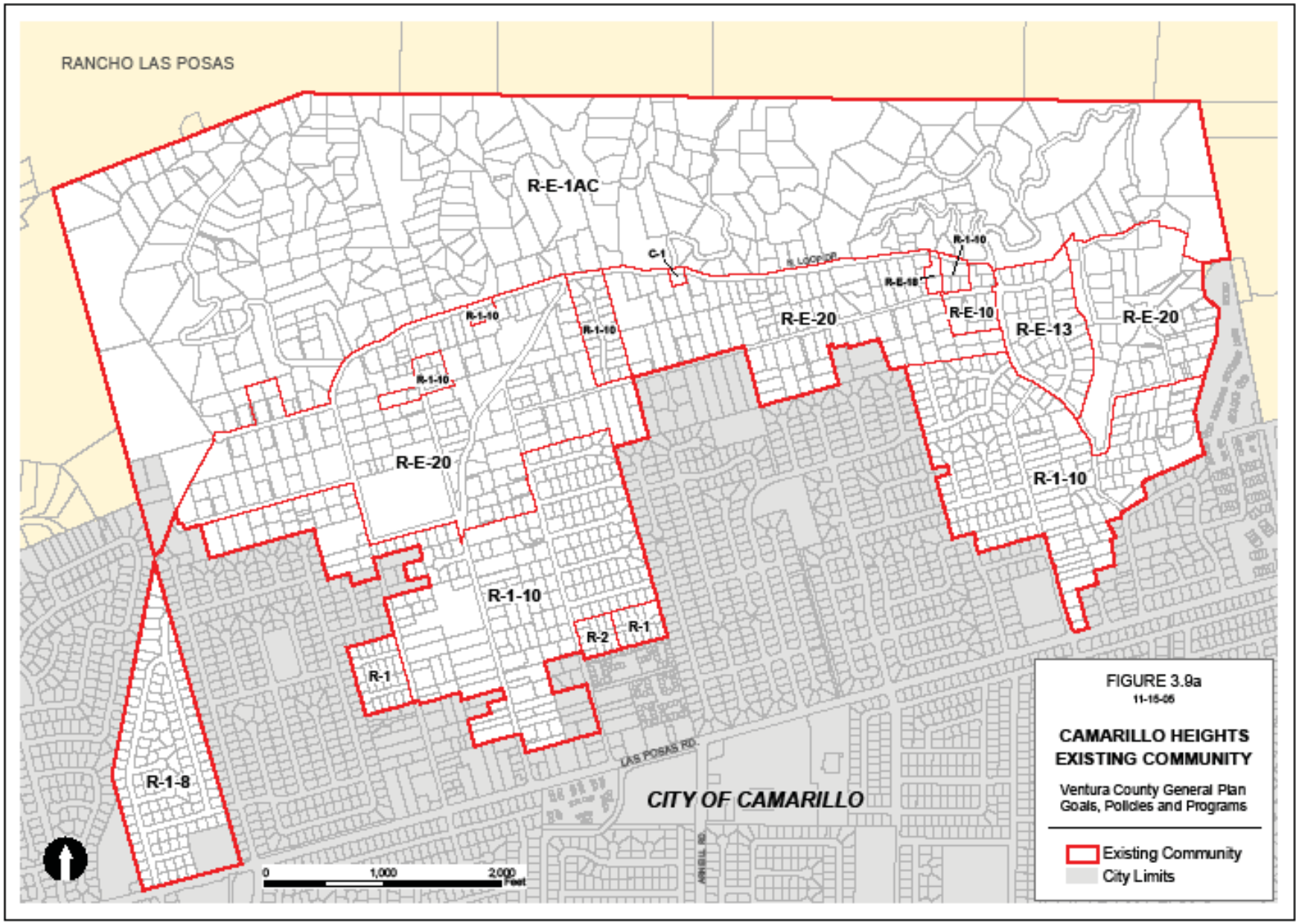
igure 3.8b
uilding Intensity Population Density Table -
o Canyon E isting Community

Residential							
Designation	**Acres**	**Ma . ldg. Coverage (of Lot Area)[1]**	**Ma imum Intensity (DU Ac)[2]**	**Dwelling Units**	**AveragePop DU[3]**	**Population**	**Average Pop. Density (Pop Acre)**
RE-1Ac	12.0	25	1.00	12	2.31	27	2.25
RE-20	56.0	29	2.18	122	2.31	281	5.02
Total	68.0			134		308	

[1]The maximum *ui din covera e* for lots of less than one acre in area shall be as specified, or 2,500 square feet plus 1 square foot for each 4.596 square feet of lot area over 5,000 square feet, whichever is greater.

[2]Excludes second dwelling units per Section 65852.2 of the State Government Code.

[3]Year 2000 Forecast for Simi Valley Non-Growth Area.


RANCHO LAS POSAS
R-E-1AC
C-1
R-1-10
R-E-20
R-E-10
R-E-13
R-E-20
R-1-10
R-E-20
R-1-10
R-1-10
R-2
R-1
R-1
R-1-8
LAS POSAS RD
CITY OF CAMARILLO
0
1,000
2,000
Feet
FIGURE 3.9a
11-15-05
CAMARILLO HEIGHTS
EXISTING COMMUNITY
Ventura County General Plan
Goals, Policies and Programs
Existing Community
City Limits

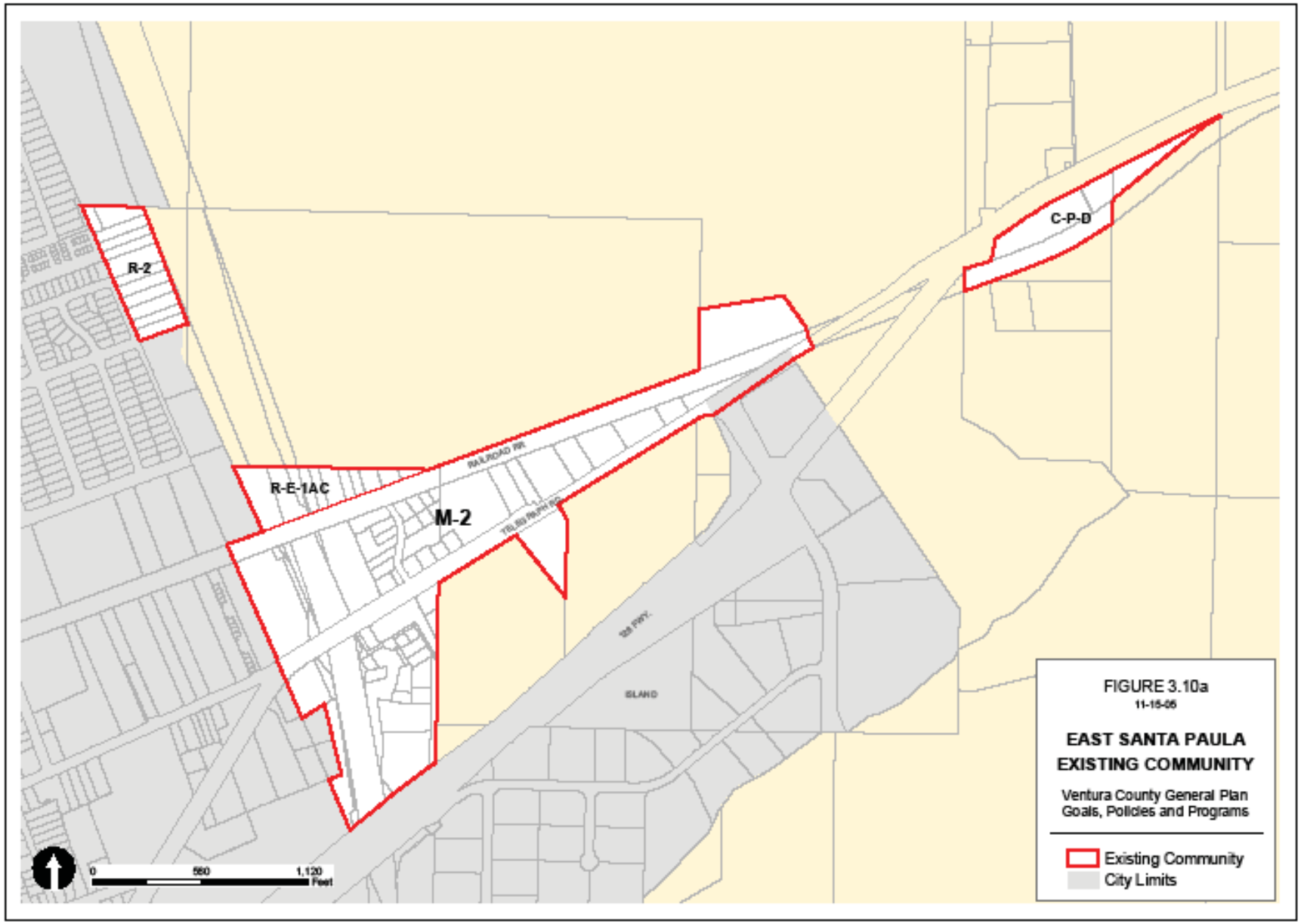
igure 3.9b
uilding Intensity Population Density Table - Camarillo Heights E isting Community

Residential							
Designation	Acres	Ma . ldg. Coverage (of Lot Area)[1]	Ma imum Intensity (DU Ac)[2]	Dwelling Units	Average Pop DU[3]	Population	Average Pop. Density (Pop Acre)
RE-1Ac	362.02	25	1.00	362	2.52	912	2.52
RE-20	187.66	29	2.18	408	2.52	1,028	5.48
RE-18	0.90	30	2.43	2	2.52	5	5.55
RE-13	13.00	33	3.35	43	2.52	108	8.31
RE-10	1.30	36	4.36	5	2.52	12	9.23
R1-10	167.21	36	4.36	729	2.52	1,837	10.98
R1-8	27.12	39	5.45	147	2.52	370	13.64
R1	7.06	45	7.26	51	2.52	128	18.13
R2	1.93	50	12.45	24	2.52	60	31.34
Total	768.20			1,771		4,460	

[1]The maximum *ui din covera e* for lots of less than one acre in area shall be as specified, or 2,500 square feet plus 1 square foot for each 4.596 square feet of lot area over 5,000 square feet, whichever is greater.

[2]Excludes second dwelling units per Section 65852.2 of the State Government Code.

[3]Year 2000 Forecast for Camarillo Growth Area.


R-2
R-E-1AC
M-2
C-P-D
RAILROAD RR
TELEGRAPH RD
SR FWY.
ISLAND
0
560
1,120
Feet
FIGURE 3.10a
11-15-06
EAST SANTA PAULA
EXISTING COMMUNITY
Ventura County General Plan
Goals, Policies and Programs
Existing Community
City Limits

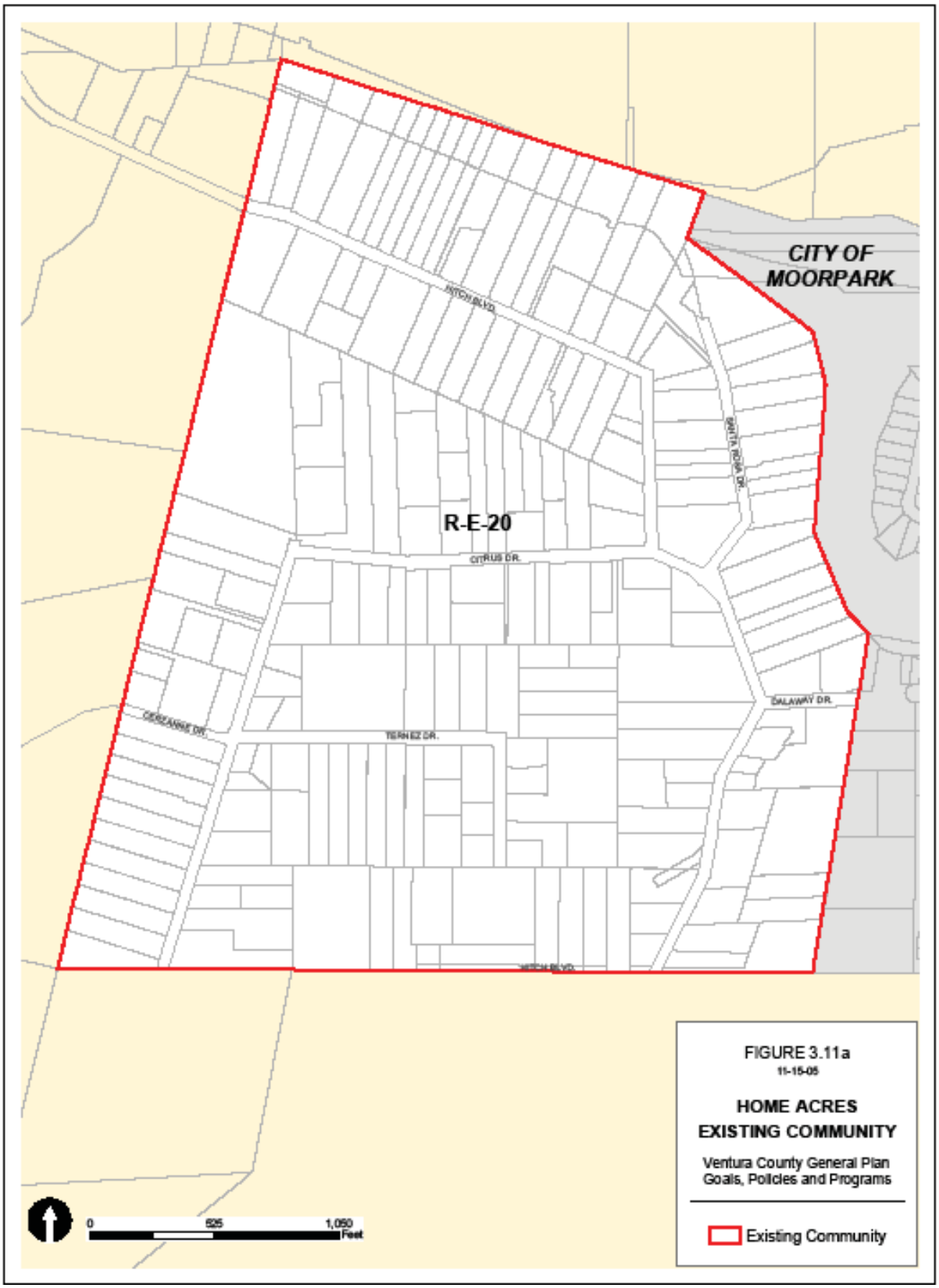
igure 3.10b
uilding Intensity Population Density Table -
East Santa Paula E isting Community

Residential							
Designation	**Acres**	**Ma . ldg. Coverage (of Lot Area)[1]**	**Ma imum Intensity (DU Ac)[2]**	**Dwelling Units**	**Average Pop DU[3]**	**Population**	**Average Pop. Density (Pop Acre)**
RE-1Ac	3.84	25	1.00	3	2.65	7	1.82
R2	4.24	50	12.45	52	2.65	413	97.41
Total	8.08			55		420	
Commercial Industrial							
Designation	**Acres**	**Ma . ldg. Coverage (of Lot Area)**	**Pro ected loor Area (1000 S)**	**Average Employees 1000 S**	**Employees**	**Average Employees Acres**	
CPD	2.42	60	15.8	2.0	31	12.81	
M2	40.49	50	352.7	2.0	705	17.41	
Total	42.91		368.5		736		

[1]The maximum *ui din covera e* for lots of less than one acre in area shall be as specified, or 2,500 square feet plus 1 square foot for each 4.596 square feet of lot area over 5,000 square feet, whichever is greater.

[2]Excludes second dwelling units per Section 65852.2 of the State Government Code.

[3]Year 2000 Forecast for Santa Paula Growth Area.


CITY OF MOORPARK
R-E-20
HITCH BLVD.
SANTA ROSA DR.
CITRUS DR.
DALAWAY DR.
GERANIUM DR.
TERNEZ DR.
0
525
1,050
Feet
FIGURE 3.11a
11-15-05
HOME ACRES
EXISTING COMMUNITY
Ventura County General Plan
Goals, Policies and Programs
Existing Community

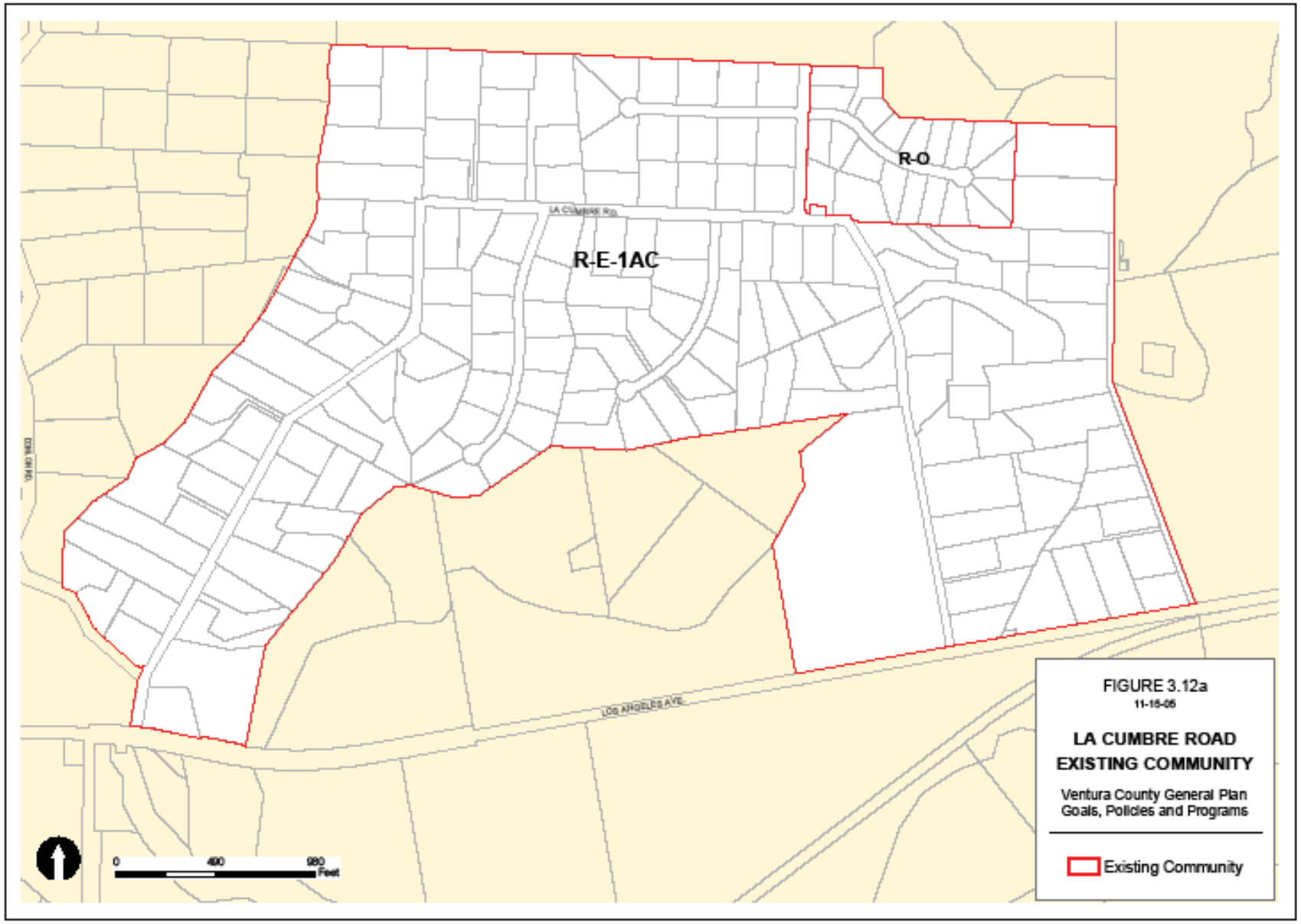
igure 3.11b
uilding Intensity Population Density Table - Home Acres E isting Community

Residential							
Designation	Acres	Ma . ldg. Coverage (of Lot Area)[1]	Ma imum Intensity (DU Ac)[2]	Dwelling Units	Average Pop DU[3]	Population	Average Pop. Density (Pop Acre)
RE-20	207	29	2.18	451	2.91	1,312	6.34

[1]The maximum *ui din covera e* for lots of less than one acre in area shall be as specified, or 2,500 square feet plus 1 square foot for each 4.596 square feet of lot area over 5,000 square feet, whichever is greater.

[2]Excludes second dwelling units per Section 65852.2 of the State Government Code.

[3]Year 2000 Forecast for Moorpark Growth Area.


R-O
R-E-1AC
LA CUMBRE RD.
LOS ANGELES AVE.
0
400
800
Feet
FIGURE 3.12a
11-15-05
LA CUMBRE ROAD
EXISTING COMMUNITY
Ventura County General Plan
Goals, Policies and Programs
Existing Community

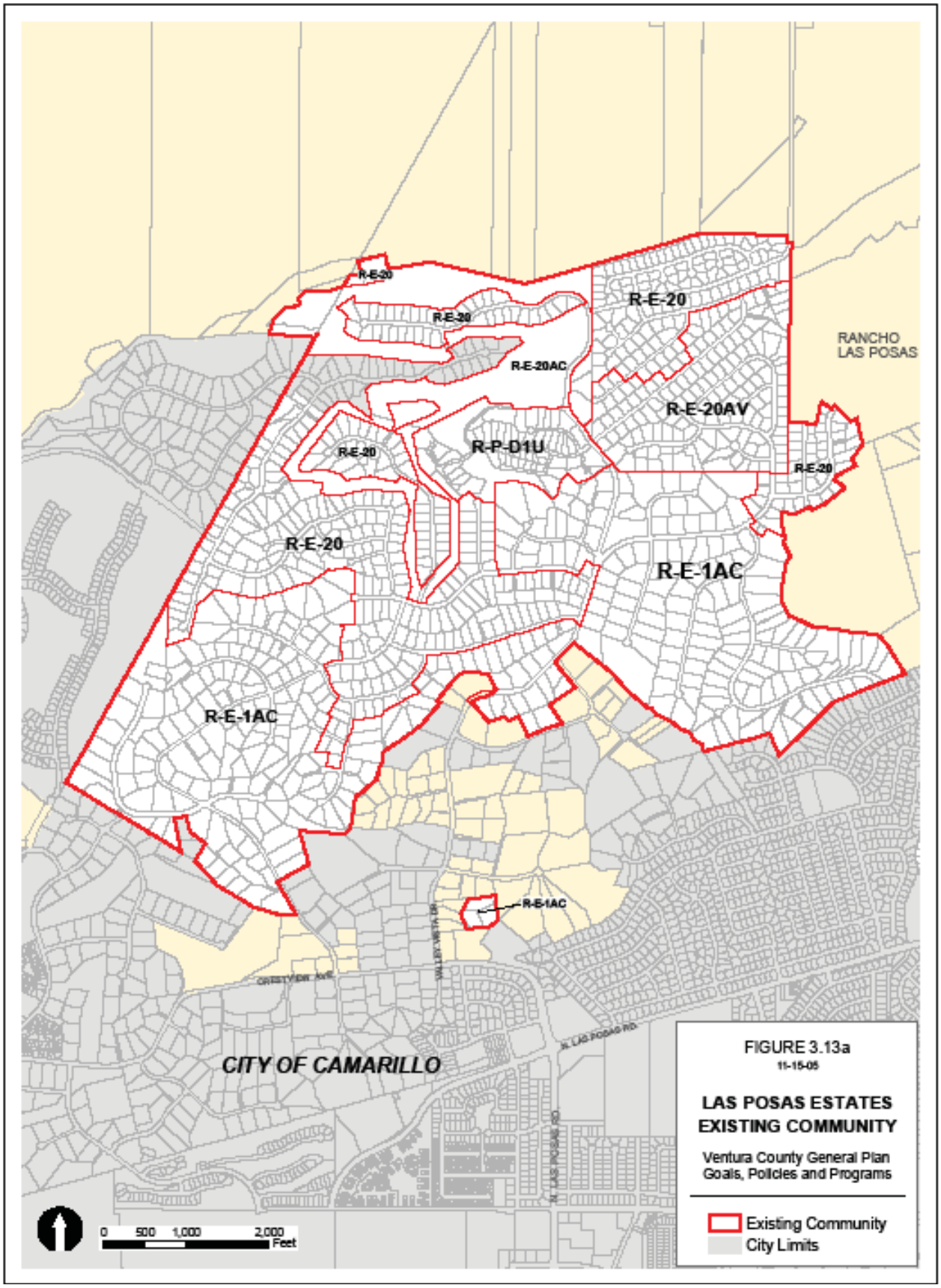
igure 3.12b
uilding Intensity Population Density Table -
La Cumbre Road E isting Community

Residential							
Designation	**Acres**	**Ma . ldg. Coverage (of Lot Area)[1]**	**Ma imum Intensity (DU Ac)[2]**	**Dwelling Units**	**Average Pop DU[3]**	**Population**	**Average Pop. Density (Pop Acre)**
RE-1Ac	216.64	25	1.00	216	3.24	699	3.23
RO	18.72	29	2.18	40	3.24	129	6.89
Total	235.36			256		828	

[1]The maximum *ui din covera e* for lots of less than one acre in area shall be as specified, or 2,500 square feet plus 1 square foot for each 4.596 square feet of lot area over 5,000 square feet, whichever is greater.

[2]Excludes second dwelling units per Section 65852.2 of the State Government Code.

[3]Year 2000 Forecast for Las Posas Non-Growth Area.


R-E-20
R-E-20
R-E-20
R-E-20AC
R-E-20
R-E-20AV
RANCHO
LAS POSAS
R-P-D1U
R-E-20
R-E-20
R-E-1AC
R-E-1AC
R-E-1AC
CITY OF CAMARILLO
0 500 1,000 2,000
Feet
FIGURE 3.13a
11-15-05
LAS POSAS ESTATES
EXISTING COMMUNITY
Ventura County General Plan
Goals, Policies and Programs
Existing Community
City Limits

igure 3.13b
uilding Intensity Population Density Table -
Las Posas Estates E isting Community

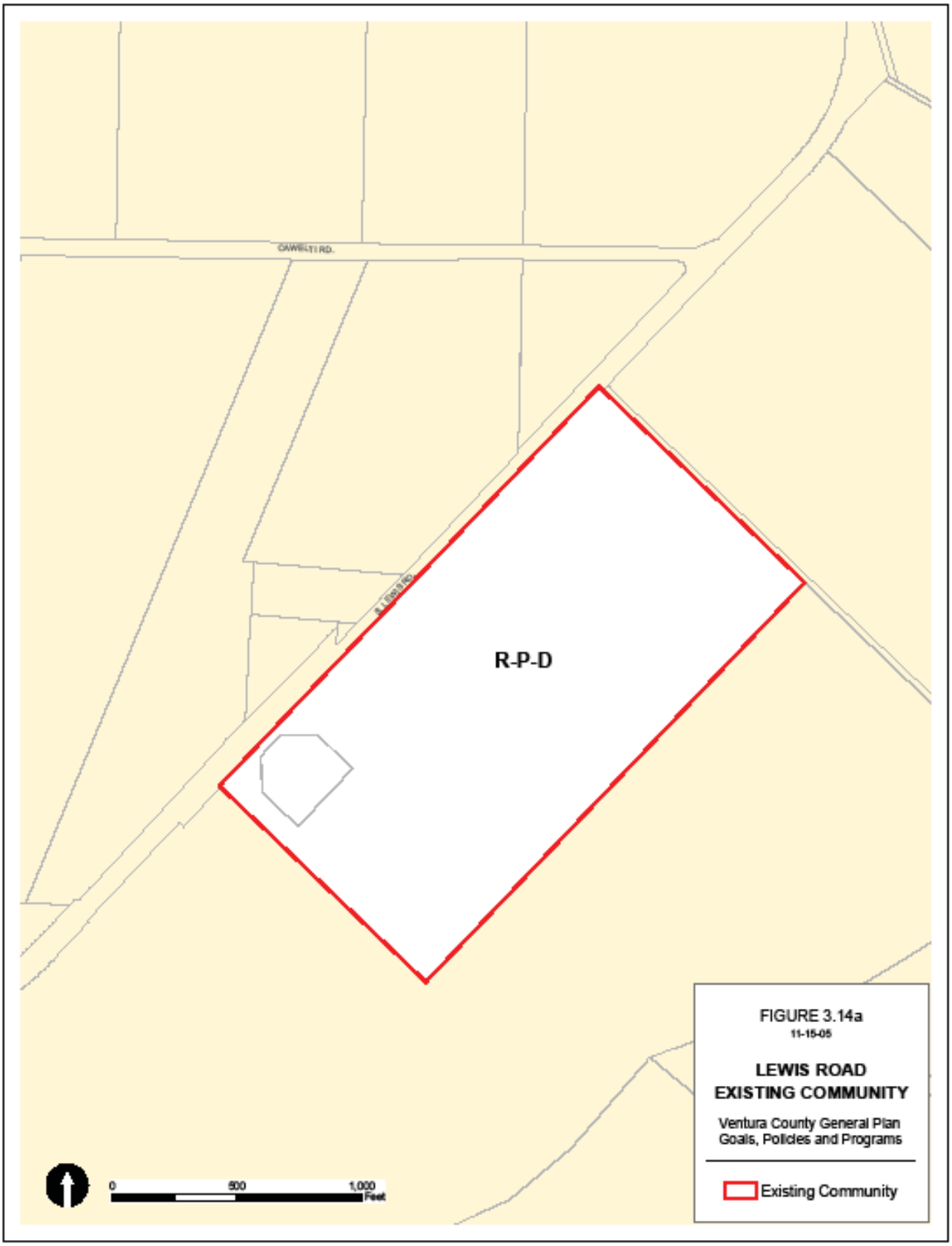
Residential							
Designation	Acres	Ma . ldg. Coverage (of Lot Area)[1]	Ma imum Intensity (DU Ac)[2]	Dwelling Units	Average Pop DU[3]	Population	Average Pop. Density (Pop Acre)
RE-20Ac	90.30	5 [4]	0.05	4	2.52	10	0.11
RA	5.10	25	1.00	5	2.52	12	2.35
RE-1Ac	329.52	25	1.00	329	2.52	829	2.52
RPD 1U	27.36	25	1.00	27	2.52	68	2.49
RE-20	251.67	29	2.18	548	2.52	1,380	5.48
RE-20 AV	77.22	29	2.18	168	2.52	423	5.48
Total	781.17			1,081		2,722	

[1]The maximum *ui din covera e* for lots of less than one acre in area shall be as specified, or 2,500 square feet plus 1 square foot for each 4.596 square feet of lot area over 5,000 square feet, whichever is greater.

[2]Excludes second dwelling units per Section 65852.2 of the State Government Code.

[3]Year 2000 Forecast for Camarillo Growth Area.

[4]Excludes greenhouses, hothouses, and the like.

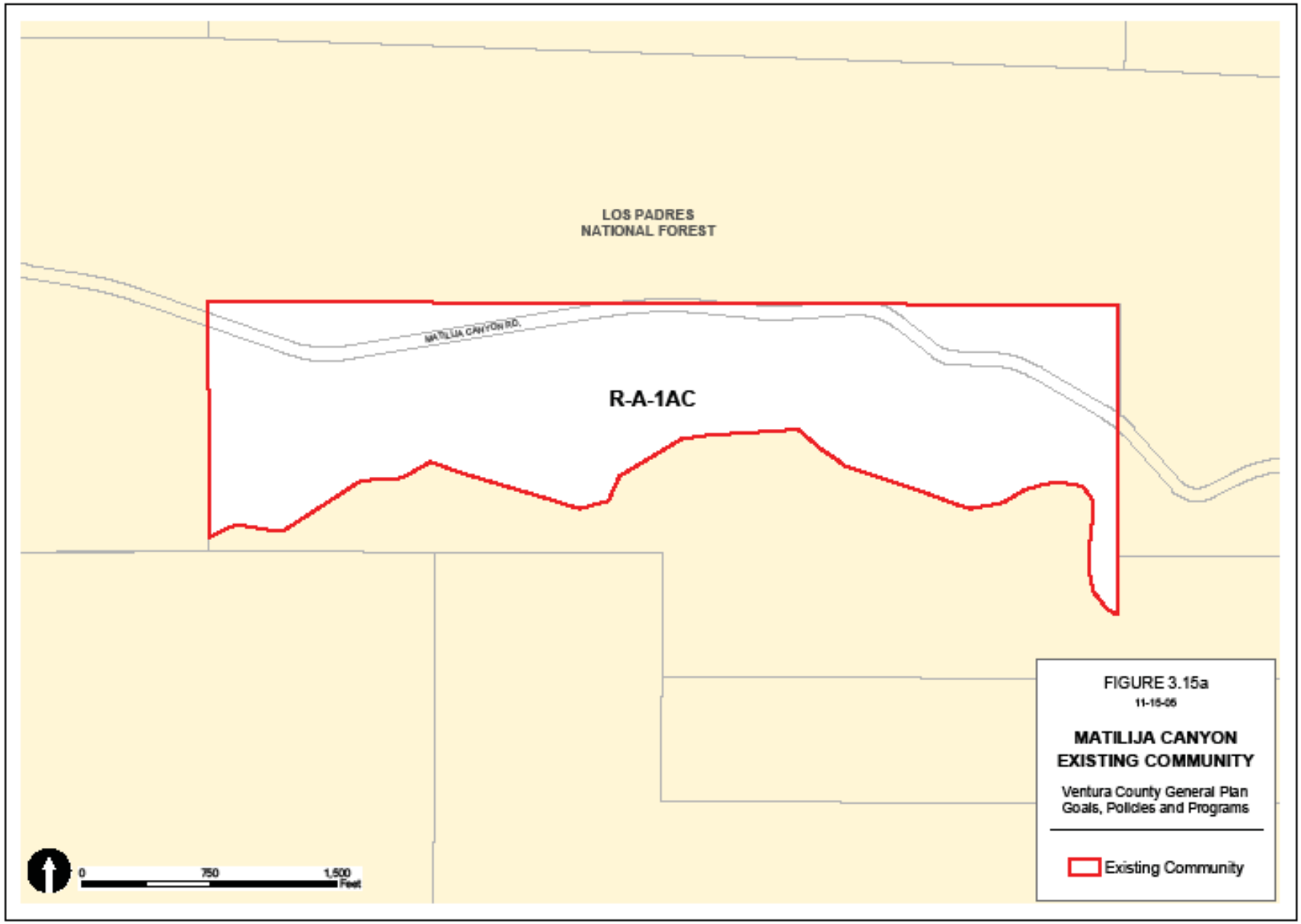

R-P-D
0
500
1,000
Feet
FIGURE 3.14a
11-15-05
LEWIS ROAD
EXISTING COMMUNITY
Ventura County General Plan
Goals, Policies and Programs
Existing Community

igure 3.14b
uilding Intensity Population Density Table -
Lewis Road E isting Community

Residential							
Designation	Acres	Ma . ldg. Coverage (of Lot Area)	Ma imum Intensity (DU Ac)[1]	Dwelling Units	Average Pop DU[2]	Population	Average Pop. Density (Pop Acre)
RPD	57.65	60	30	1,729	3.11	5,377	93.27

[1]Excludes second dwelling units per Section 65852.2 of the State Government Code.

[2]Year 2000 Forecast for Camarillo Non-Growth Area.


LOS PADRES
NATIONAL FOREST
MATILIJA CANYON RD.
R-A-1AC
0
750
1,500
Feet
FIGURE 3.15a
11-15-05
MATILIJA CANYON
EXISTING COMMUNITY
Ventura County General Plan
Goals, Policies and Programs
Existing Community

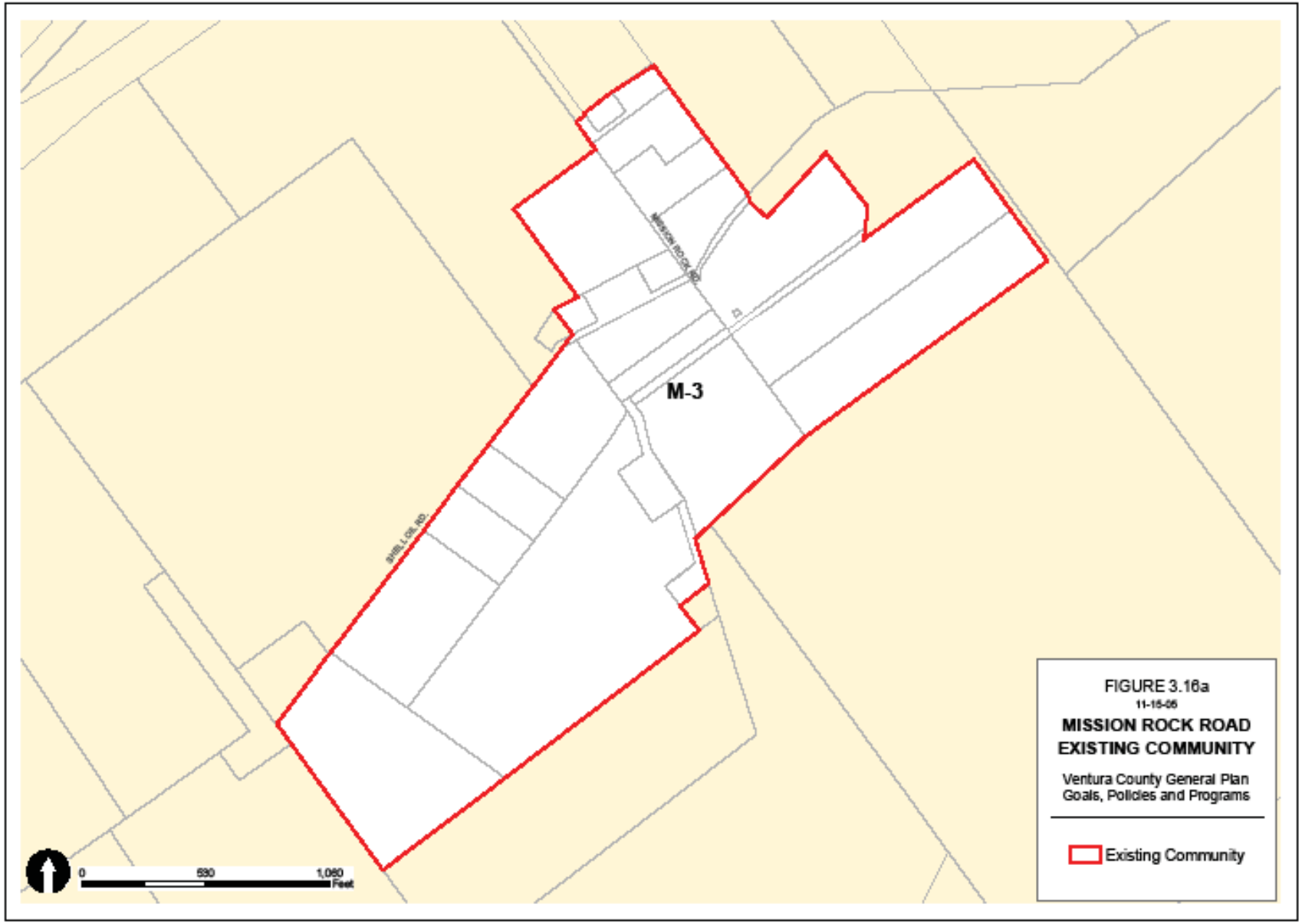
igure 3.15b
uilding Intensity Population Density Table -
Matili a Canyon E isting Community

Residential							
Designation	**Acres**	**Ma . ldg. Coverage (of Lot Area)[1]**	**Ma imum Intensity (DU Ac)[2]**	**Dwelling Units**	**Average Pop DU[3]**	**Population**	**Average Pop. Density (Pop Acre)**
RA-1Ac	131.64	25	1.00	131	1.63	213	1.62

[1]The maximum *ui din covera e* for lots of less than one acre in area shall be as specified, or 2,500 square feet plus 1 square foot for each 4.596 square feet of lot area over 5,000 square feet, whichever is greater.

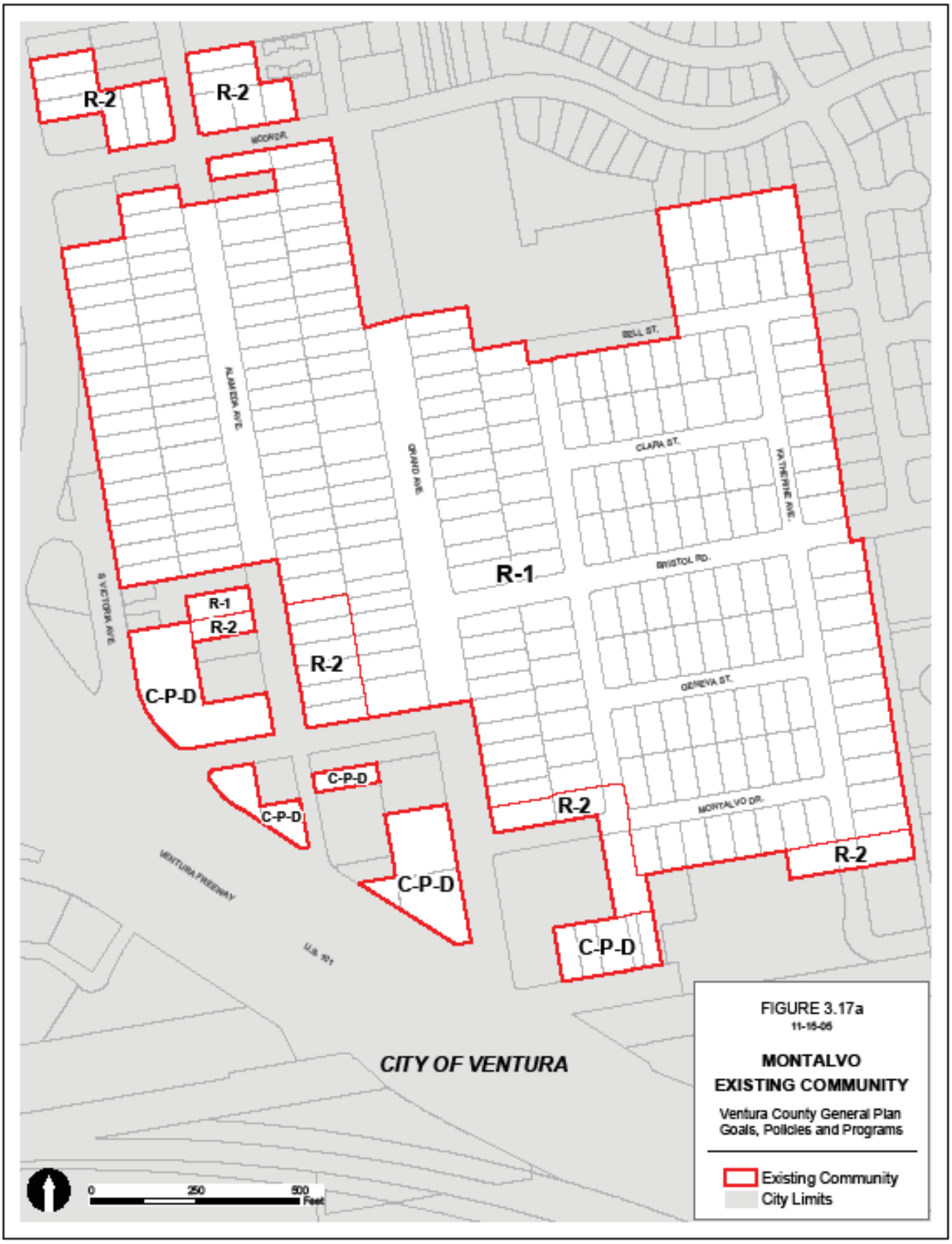
[2]Excludes second dwelling units per Section 65852.2 of the State Government Code.

[3]Year 2000 Forecast for North Half Non-Growth Area.


M-3
0
530
1,060
Feet
FIGURE 3.16a
11-15-06
MISSION ROCK ROAD
EXISTING COMMUNITY
Ventura County General Plan
Goals, Policies and Programs
Existing Community

igure 3.16b
uilding Intensity Employment Density Table -
Mission Roc Road E isting Community

Commercial Industrial						
Designation	Acres	Ma . ldg. Coverage (of Lot Area)	Pro ected loor Area (1000 S)	Average Employees 1000 S	Employees	Average Employees Acres
M3	91.1	40	258	2.0	516	5.66


R-2
R-2
MOORE DR.
BELL ST.
ALAMEDA AVE.
GRAND AVE.
CLARA ST.
KATHERINE AVE.
BRISTOL RD.
R-1
S VICTORIA AVE.
R-1
R-2
R-2
C-P-D
GENEVA ST.
C-P-D
C-P-D
R-2
MONTALVO DR.
R-2
VENTURA FREEWAY
C-P-D
U.S. 101
C-P-D
CITY OF VENTURA
0
250
500
Feet
FIGURE 3.17a
11-15-06
MONTALVO
EXISTING COMMUNITY
Ventura County General Plan
Goals, Policies and Programs
Existing Community
City Limits

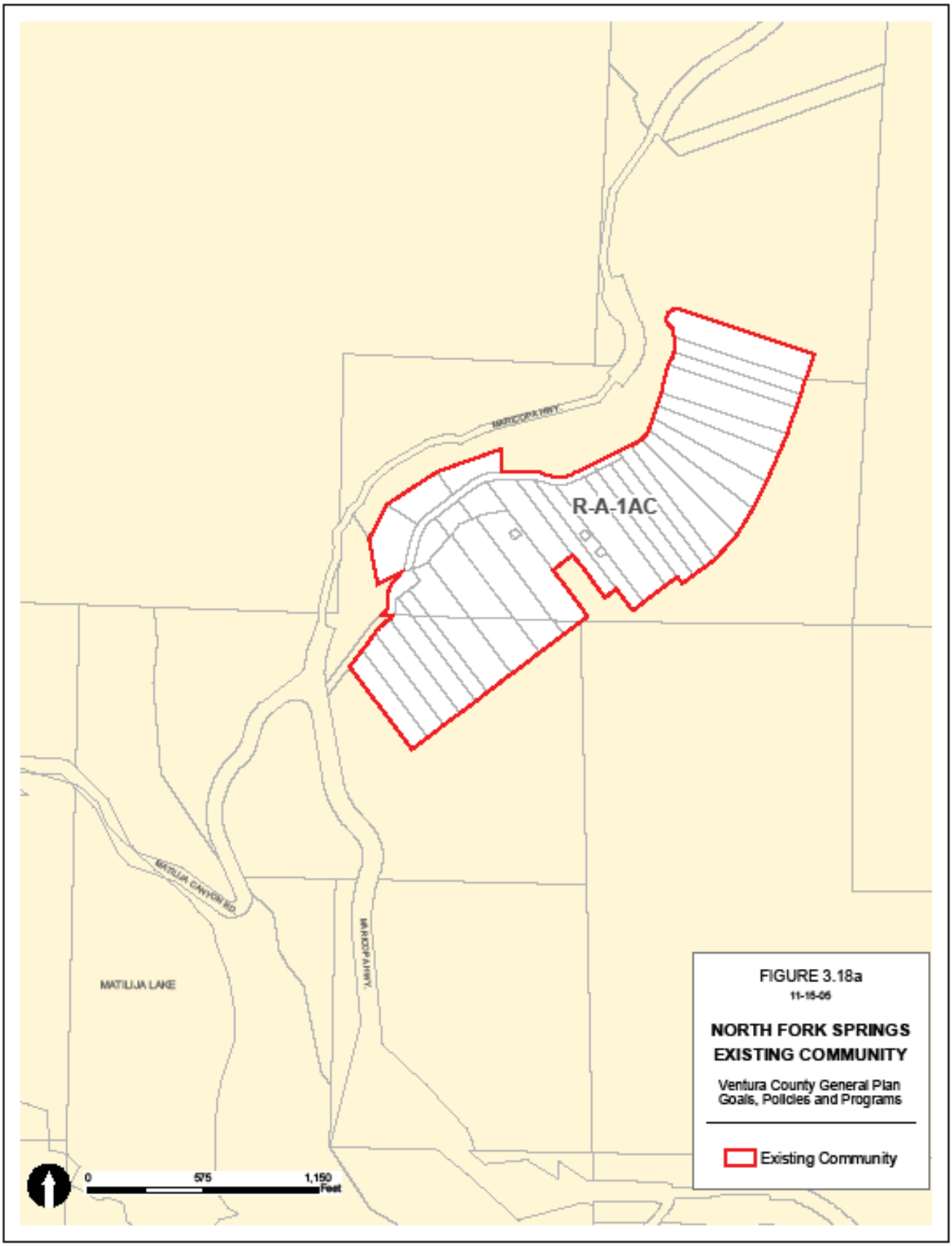
igure 3.17b
uilding Intensity Population Density Table - Montalvo E isting Community

Residential							
Designation	**Acres**	**Ma . ldg. Coverage (of Lot Area)[1]**	**Ma imum Intensity (DU Ac)[2]**	**Dwelling Units**	**Average Pop DU[3]**	**Population**	**Average Pop. Density (Pop Acre)**
R1	30.0	45	7.26	217	2.34	507	16.90
R2	16.0	50	12.45	199	2.34	466	29.13
Total	46.0			416		973	
Commercial Industrial							
Designation	**Acres**	**Ma . ldg Coverage (of Lot Area)**	**Pro ected loor Area (1000 S)**	**Average Employees 1000 S**	**Employees**	**Average Employee Acre**	
CPD	2.9	60	19.0	2.0	38	13.10	

[1]The maximum *ui din covera e* for lots of less than one acre in area shall be as specified, or 2,500 square feet plus 1 square foot for each 4.596 square feet of lot area over 5,000 square feet, whichever is greater.

[2]Excludes second dwelling units per Section 65852.2 of the State Government Code.

[3]Year 2000 Forecast for Ventura Growth Area.


R-A-1AC
MATILIJA LAKE
0
575
1,150
Feet
FIGURE 3.18a
11-15-06
NORTH FORK SPRINGS
EXISTING COMMUNITY
Ventura County General Plan
Goals, Policies and Programs
Existing Community

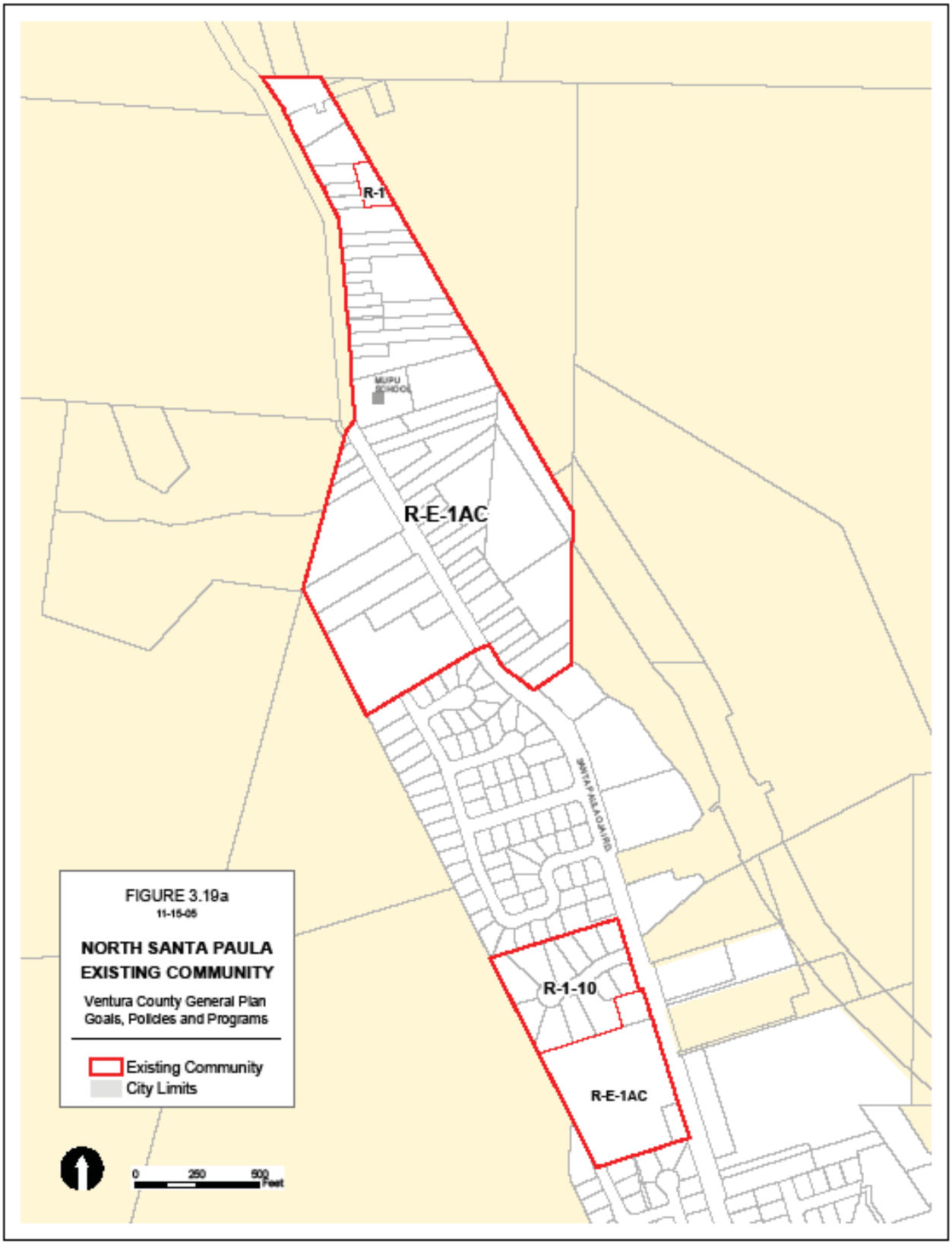
igure 3.18b
uilding Intensity Population Density Table - North or Springs E isting Community

Residential							
Designation	Acres	Ma . ldg. Coverage (of Lot Area)[1]	Ma imum Intensity (DU Ac)[2]	Dwelling Units	Average Pop DU[3]	Population	Average Pop. Density (Pop Acre)
RA-1Ac	46.44	25	1.00	46	1.63	28	0.60

[1]The maximum *ui din covera e* for lots of less than one acre in area shall be as specified, or 2,500 square feet plus 1 square foot for each 4.596 square feet of lot area over 5,000 square feet, whichever is greater.

[2]Excludes second dwelling units per Section 65852.2 of the State Government Code.

[3]Year 2000 Forecast for North Half Non-Growth Area.


R-1
MUPU SCHOOL
R-E-1AC
SANTA PAULA OJAI RD
R-1-10
R-E-1AC
FIGURE 3.19a
11-15-05
NORTH SANTA PAULA
EXISTING COMMUNITY
Ventura County General Plan
Goals, Policies and Programs
Existing Community
City Limits
0
250
500
Feet

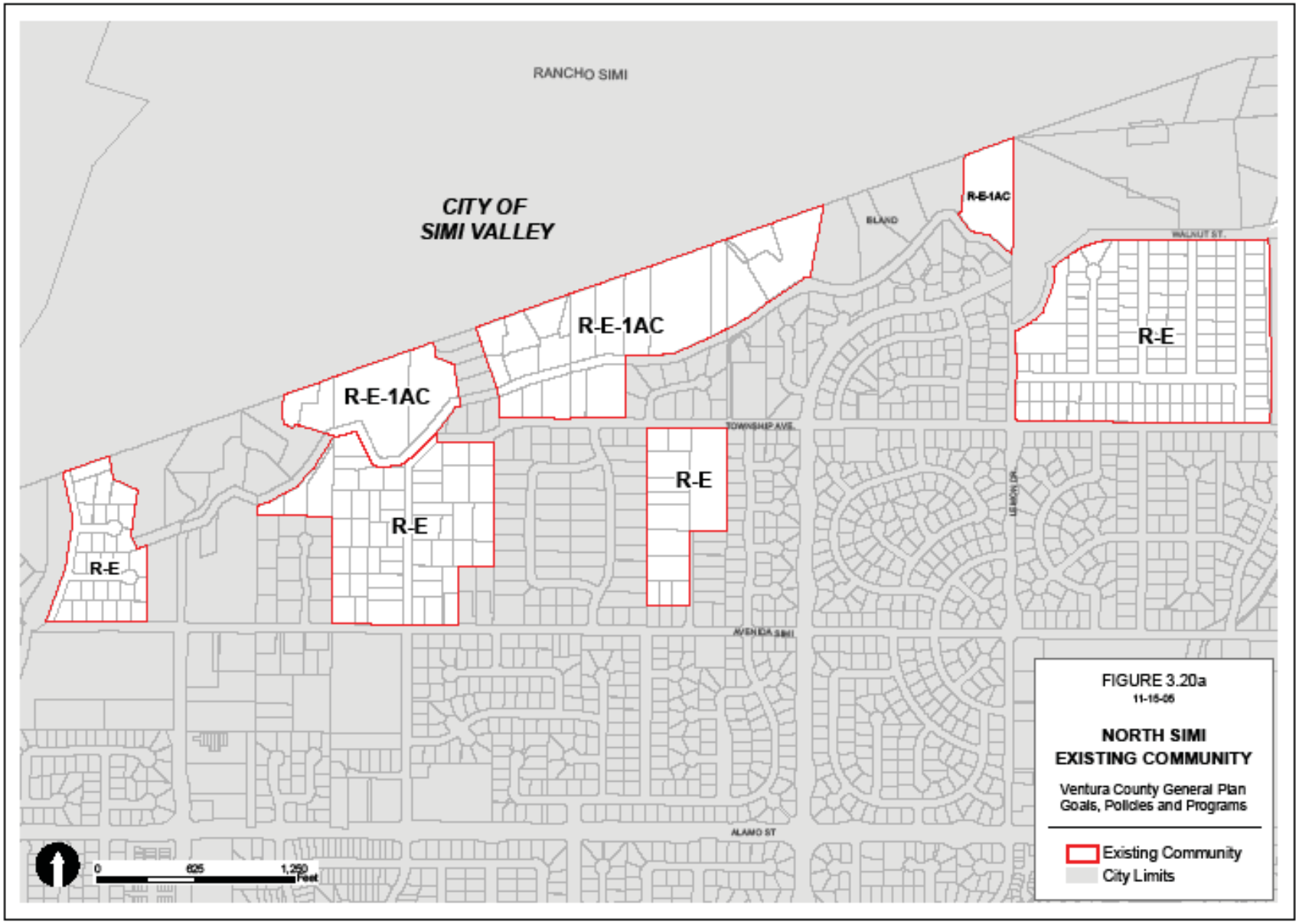
igure 3.19b
uilding Intensity Population Density Table -
North Santa Paula E isting Community

Residential							
Designation	Acres	Ma . ldg. Coverage (of Lot Area)[1]	Ma imum Intensity (DU Ac)[2]	Dwelling Units	Average Pop DU[3]	Population	Average Pop. Density (Pop Acre)
RE-1Ac	38.55	25	1.00	38	2.65	100	2.59
R1	0.38	45	7.26	2	2.65	5	13.16
	38.93			40		105	

[1]The maximum *ui din covera e* for lots of less than one acre in area shall be as specified, or 2,500 square feet plus 1 square foot for each 4.596 square feet of lot area over 5,000 square feet, whichever is greater.

[2]Excludes second dwelling units per Section 65852.2 of the State Government Code.

[3]Year 2000 Forecast for Santa Paula Growth Area.


RANCHO SIMI
CITY OF
SIMI VALLEY
R-E-1AC
R-E-1AC
R-E-1AC
R-E
R-E
R-E
R-E
BLAND
WALNUT ST.
TOWNSHIP AVE.
LEMON DR.
AVENIDA SIMI
ALAMO ST
0
625
1,250
Feet
FIGURE 3.20a
11-15-05
NORTH SIMI
EXISTING COMMUNITY
Ventura County General Plan
Goals, Policies and Programs
Existing Community
City Limits

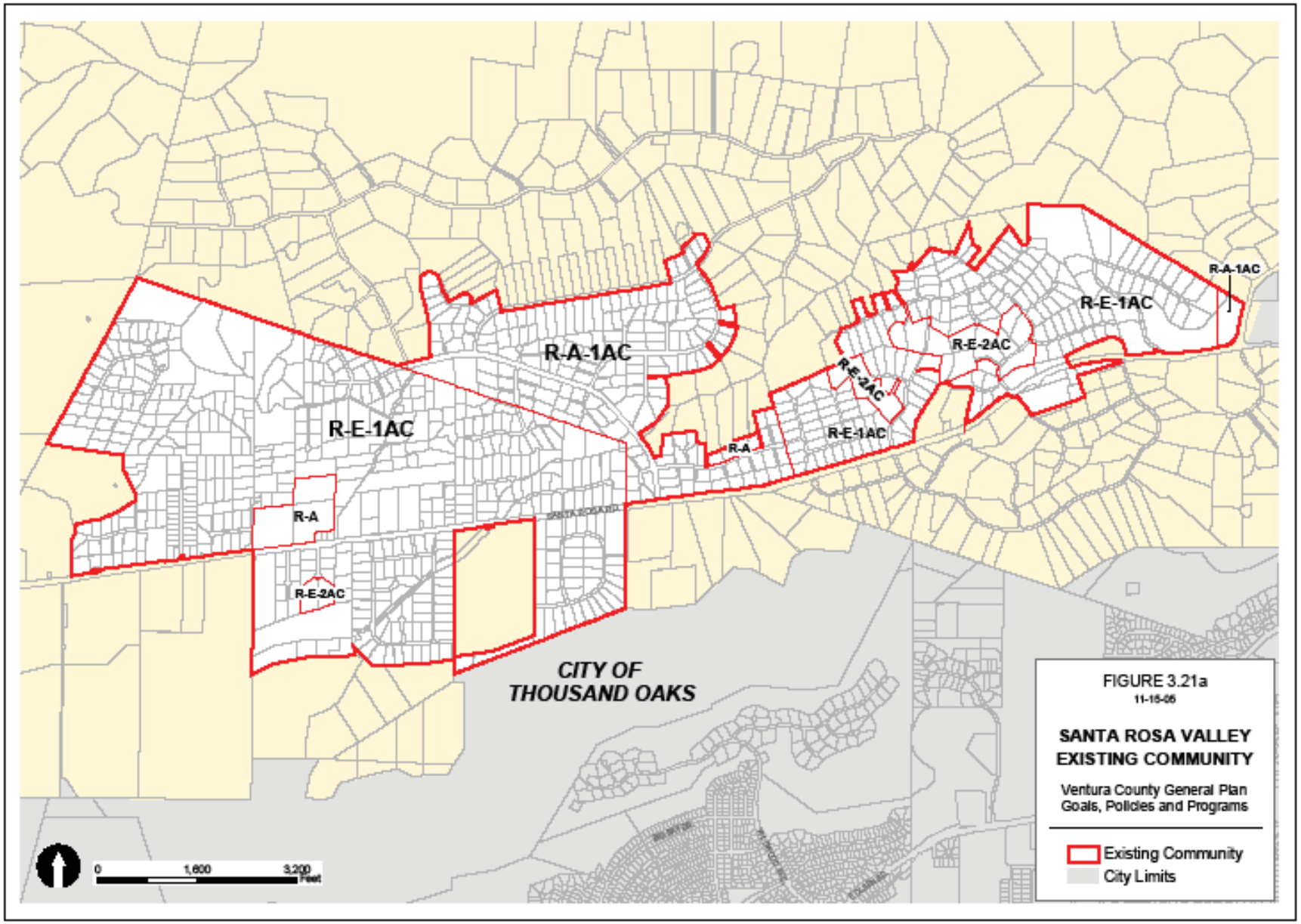
igure 3.20b
uilding Intensity Population Density Table - North Simi E isting Community

Residential							
Designation	**Acres**	**Ma . ldg. Coverage (of Lot Area)[1]**	**Ma imum Intensity (DU Ac)[2]**	**Dwelling Units**	**Average Pop DU[3]**	**Population**	**Average Pop. Density (Pop Acre)**
R-E-1Ac	45.84	25	1.00	45	3.03	136	2.97
R-E	75.00	36	4.36	327	3.03	990	13.19
	120.84			372		1,126	

[1]The maximum *ui din covera e* for lots of less than one acre in area shall be as specified, or 2,500 square feet plus 1 square foot for each 4.596 square feet of lot area over 5,000 square feet, whichever is greater.

[2]Excludes second dwelling units per Section 65852.2 of the State Government Code.

[3]Year 2000 Forecast for Simi Valley Growth Area.


R-A-1AC
R-E-1AC
R-A-1AC
R-E-2AC
R-E-2AC
R-E-1AC
R-A
R-E-1AC
R-A
R-E-2AC
CITY OF
THOUSAND OAKS
0
1,600
3,200
Feet
FIGURE 3.21a
11-15-06
SANTA ROSA VALLEY
EXISTING COMMUNITY
Ventura County General Plan
Goals, Policies and Programs
Existing Community
City Limits

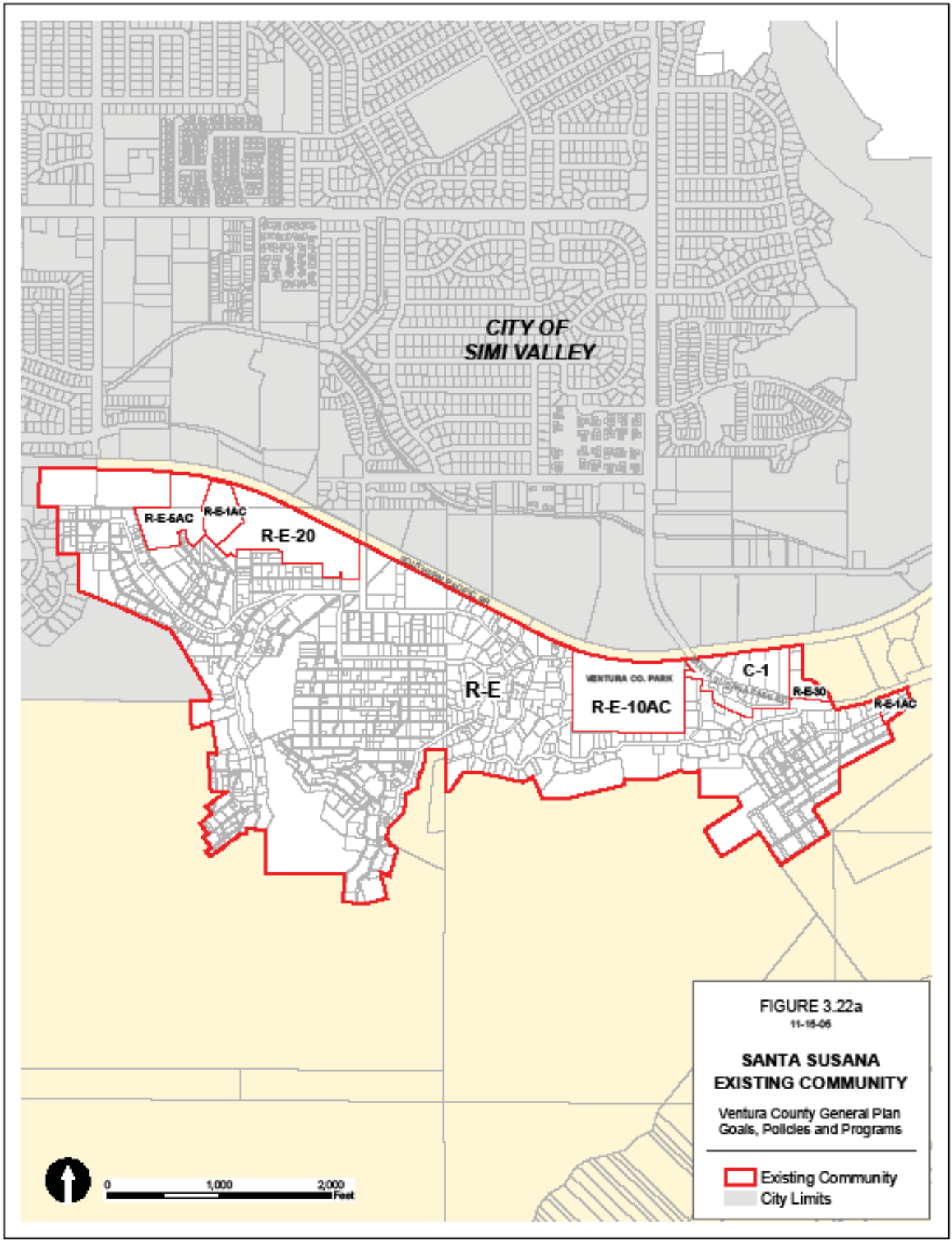
igure 3.21b
uilding Intensity Population Density Table -
Santa Rosa Valley E isting Community

Residential							
Designation	**Acres**	**Ma . ldg. Coverage (of Lot Area)[1]**	**Ma imum Intensity (DU Ac)[2]**	**Dwelling Units**	**Average Pop DU[3]**	**Population**	**Average Pop. Density (Pop Acre)**
RE-2Ac	51.90	25	0.50	25	3.11	78	1.50
RE-1Ac	910.88	25	1.00	910	3.11	2,830	3.11
RA and RA-1Ac	228.77	25	1.00	228	3.11	709	3.10
Total	1,191.55			1,163		3,617	

[1]The maximum *ui din covera e* for lots of less than one acre in area shall be as specified, or 2,500 square feet plus 1 square foot for each 4.596 square feet of lot area over 5,000 square feet, whichever is greater.

[2]Excludes second dwelling units per Section 65852.2 of the State Government Code.

[3]Year 2000 Forecast for Camarillo Non-Growth Area.


CITY OF
SIMI VALLEY
R-E-5AC
R-E-1AC
R-E-20
R-E
VENTURA CO. PARK
R-E-10AC
C-1
R-E-30
R-E-1AC
0
1,000
2,000
Feet
FIGURE 3.22a
11-15-06
SANTA SUSANA
EXISTING COMMUNITY
Ventura County General Plan
Goals, Policies and Programs
Existing Community
City Limits

igure 3.22b
uilding Intensity Population Density Table - Santa Susana E isting Community

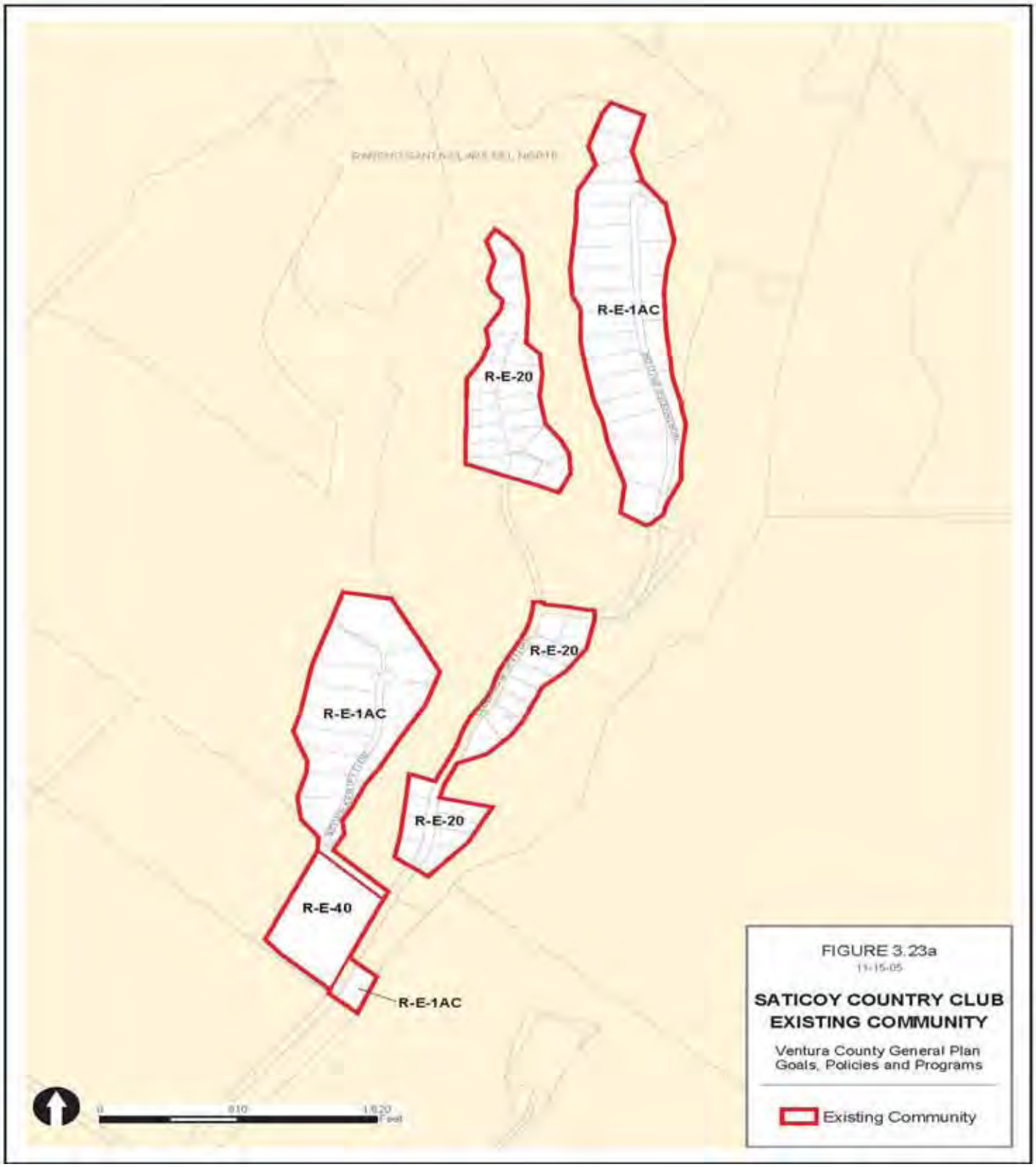
Residential							
Designation	**Acres**	**Ma . ldg. Coverage (of Lot Area)[1]**	**Ma imum Intensity (DU Ac)[2]**	**Dwelling Units**	**Average Pop DU[3]**	**Population**	**Average Pop. Density (Pop Acre)**
RE-10Ac	16.1	5	0.10[4]	1	3.03	3	0.19
RE-5Ac	5.3	25	0.20	1	3.03	3	0.57
RE-1Ac	3.7	25	1.00	3	3.03	9	2.43
RE-30	1.4	26	1.45	2	3.03	6	4.29
RE-20	14.6	29	2.18	31	3.03	93	6.37
RE	180.0	36	4.36	784	3.03	2,375	13.19
Total	221.1			822		2,489	
Commercial Industrial							
Designation	**Acres**	**Ma . ldg. Coverage (of Lot Area)**	**Pro ected loor Area (1000 S)**	**Average Employees 1000 S**	**Employees**	**Average Employees Acres**	
C1	8.2	60	53.3	2.0	106	12.93	

[1]The maximum *ui din covera e* for lots of less than one acre in area shall be as specified, or 2,500 square feet plus 1 square foot for each 4.596 square feet of lot area over 5,000 square feet, whichever is greater.

[2]Excludes second dwelling units per Section 65852.2 of the State Government Code.

[3]Year 2000 Forecast for Simi Valley Growth Area.

[4]Excludes greenhouses, hothouses and the like.


R-E-1AC
R-E-20
R-E-20
R-E-1AC
R-E-20
R-E-40
R-E-1AC
FIGURE 3.23a
11-15-05
SATICOY COUNTRY CLUB
EXISTING COMMUNITY
Ventura County General Plan
Goals, Policies and Programs
Existing Community

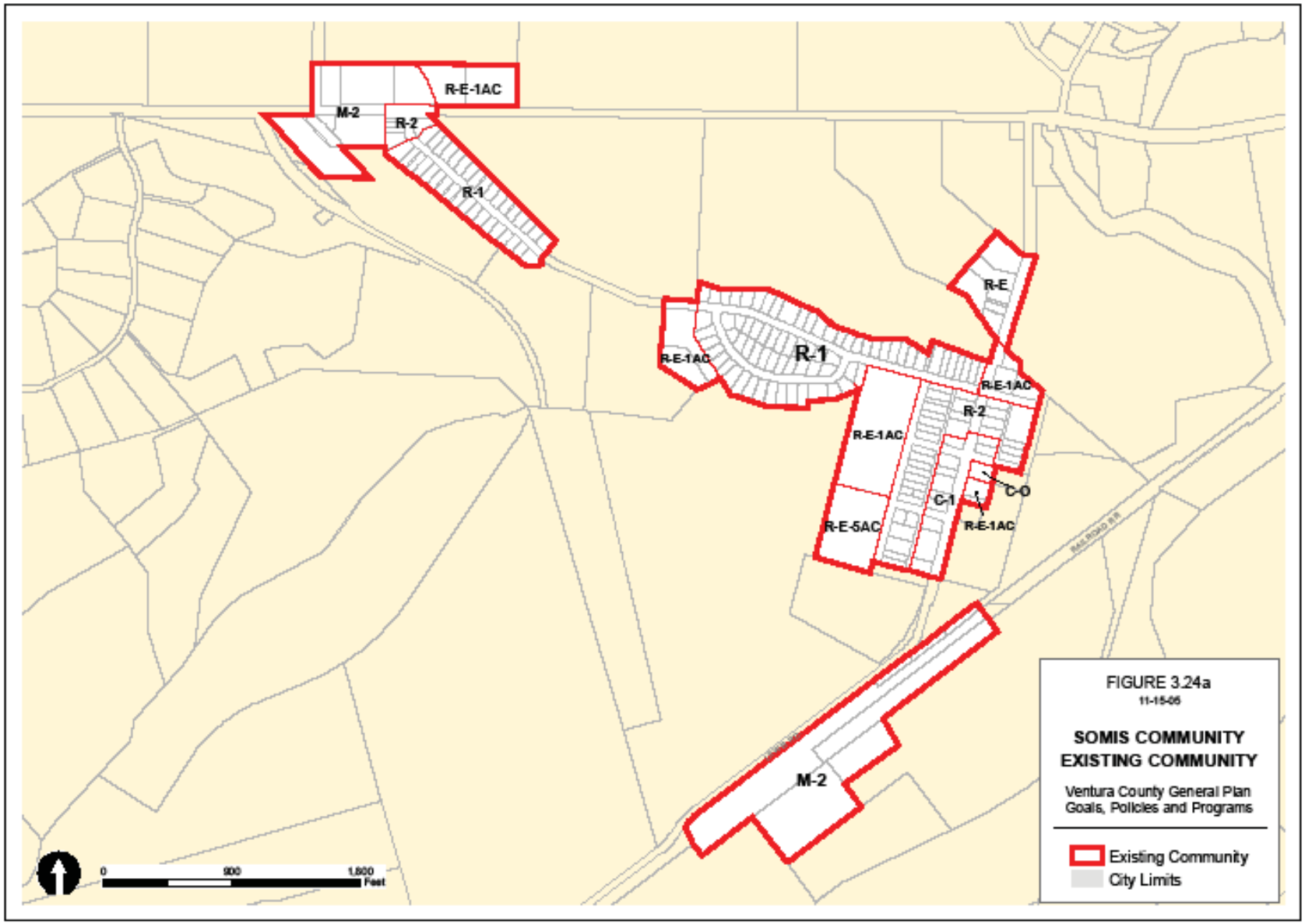
igure 3.23b
uilding Intensity Population Density Table - Saticoy Country Club E isting Community

Residential							
Designation	**Acres**	**Ma . ldg. Coverage (of Lot Area)[1]**	**Ma imum Intensity (DU Ac)[2]**	**Dwelling Units**	**Average Pop DU[3]**	**Population**	**Average Pop. Density (Pop Acre)**
RE-1Ac	45.12	25	1.00	45	3.24	145	3.21
RE-20	24.11	29	2.18	52	3.24	168	6.97
Total	69.23			97		313	

[1]The maximum *ui din covera e* for lots of less than one acre in area shall be as specified, or 2,500 square feet plus 1 square foot for each 4.596 square feet of lot area over 5,000 square feet, whichever is greater.

[2]Excludes second dwelling units per Section 65852.2 of the State Government Code.

[3]Year 2000 Forecast for Las Posas Non-Growth Area.


R-E-1AC
M-2
R-2
R-1
R-E
R-E-1AC
R-1
R-E-1AC
R-2
R-E-1AC
C-O
C-1
R-E-1AC
R-E-5AC
M-2
0
900
1,800
Feet
FIGURE 3.24a
11-15-06
SOMIS COMMUNITY
EXISTING COMMUNITY
Ventura County General Plan
Goals, Policies and Programs
Existing Community
City Limits

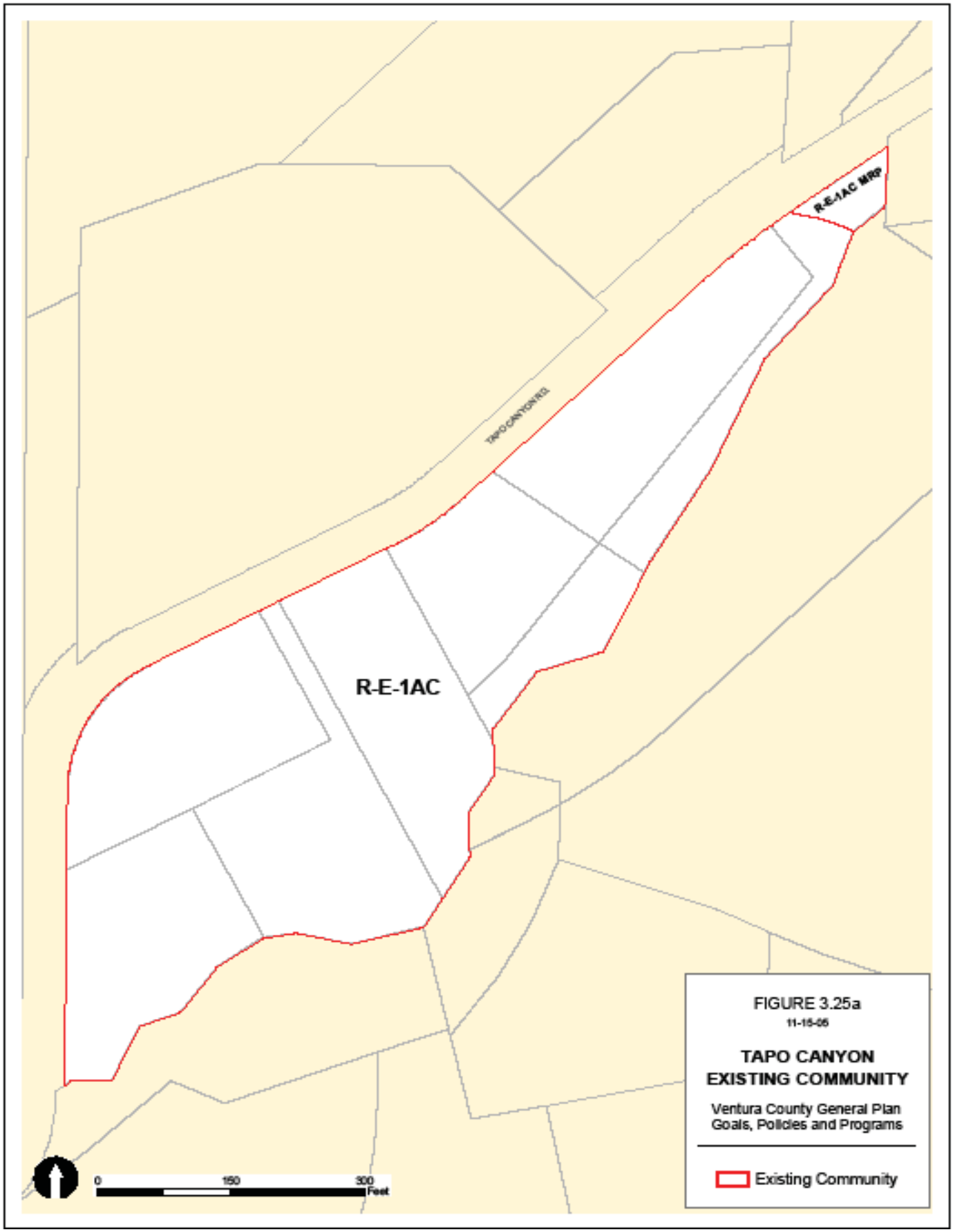
igure 3.24b
uilding Intensity Population Density Table - Somis E isting Community

Residential							
Designation	**Acres**	**Ma . ldg. Coverage (of Lot Area)[1]**	**Ma imum Intensity (DU Ac)[2]**	**Dwelling Units**	**Average Pop DU[3]**	**Population**	**Average Pop. Density (Pop Acre)**
RE-5Ac	5.0	25	0.20	1	3.24	3	0.60
RE-1Ac	15.0	25	1.00	15	3.24	48	3.20
RE	4.0	36	4.36	17	3.24	55	13.75
R1	25.0	45	7.26	181	3.24	586	23.44
R2	5.0	50	12.45	62	3.24	200	40.00
Total	54.0			276		892	
Commercial Industrial							
Designation	**Acres**	**Ma . ldg. Coverage (of Lot Area)**	**Pro ected loor Area (1000 S)**	**Average Employees 1000 S**	**Employees**	**Average Employees Acres**	
CO	4.1	50	62.5	4.0	250	61.0	
C1	2.2	60	14.4	2.0	29	13.2	
M2	35.7	50	311.0	2.0	622	17.4	
Total	42.0		387.9		901		

[1]The maximum *ui din covera e* for lots of less than one acre in area shall be as specified, or 2,500 square feet plus 1 square foot for each 4.596 square feet of lot area over 5,000 square feet, whichever is greater.

[2]Excludes second dwelling units per Section 65852.2 of the State Government Code.

[3]Year 2000 Forecast for Las Posas Non-Growth Area.


R-E-1AC MRP
TAPO CANYON RD
R-E-1AC
0
150
300
Feet
FIGURE 3.25a
11-15-05
TAPO CANYON
EXISTING COMMUNITY
Ventura County General Plan
Goals, Policies and Programs
Existing Community

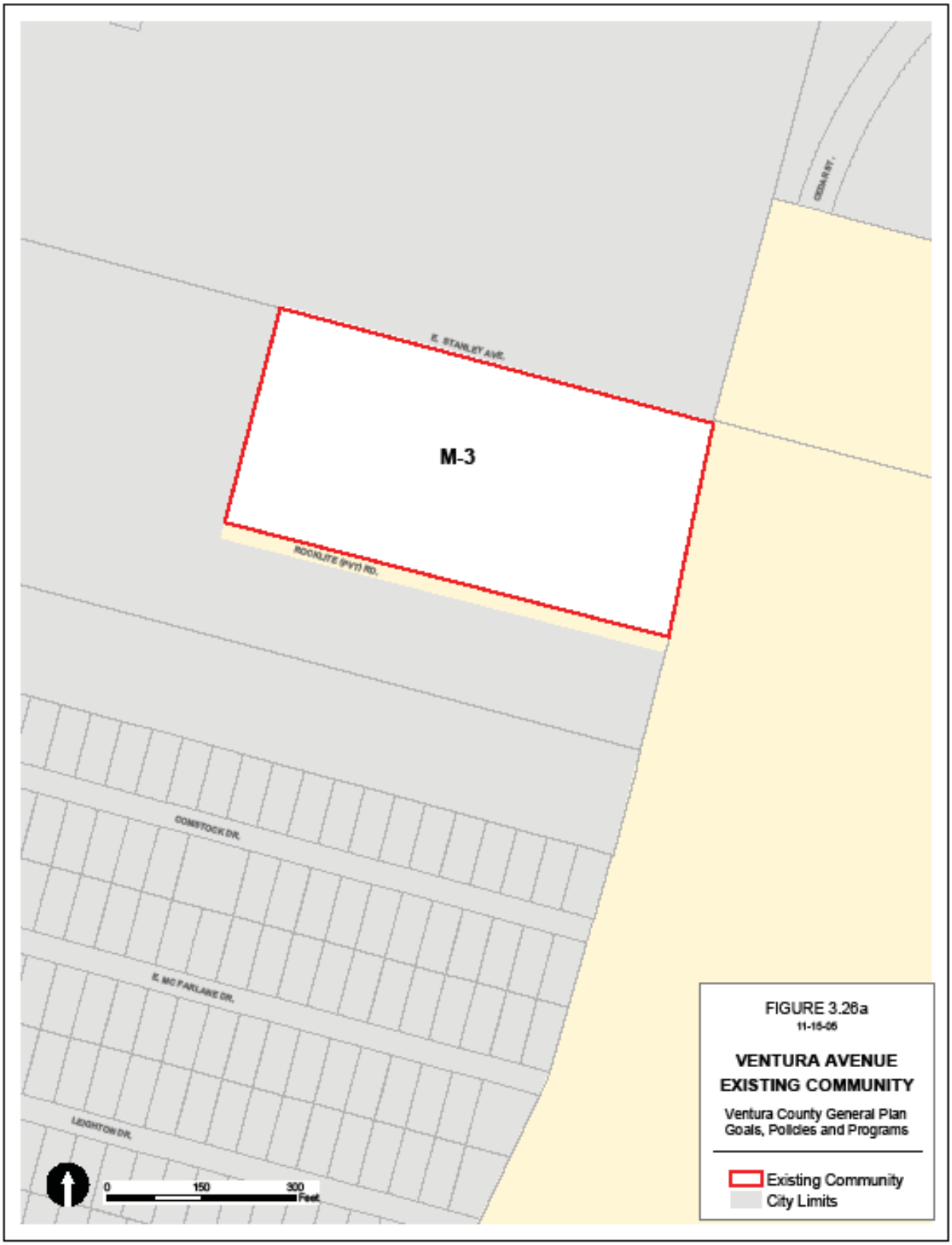
igure 3.25b
uilding Intensity Population Density Table -
Tapo Canyon E isting Community

Residential							
Designation	**Acres**	**Ma . ldg. Coverage (of Lot Area)[1]**	**Ma imum Intensity (DU Ac)[2]**	**Dwelling Units**	**Average Pop DU[3]**	**Population**	**Average Pop. Density (Pop Acre)**
RE-1Ac/MRP and RE-1Ac	6.93	25	1.00	6	3.31	13	1.88

[1]The maximum *ui din covera e* for lots of less than one acre in area shall be as specified, or 2,500 square feet plus 1 square foot for each 4.596 square feet of lot area over 5,000 square feet, whichever is greater.

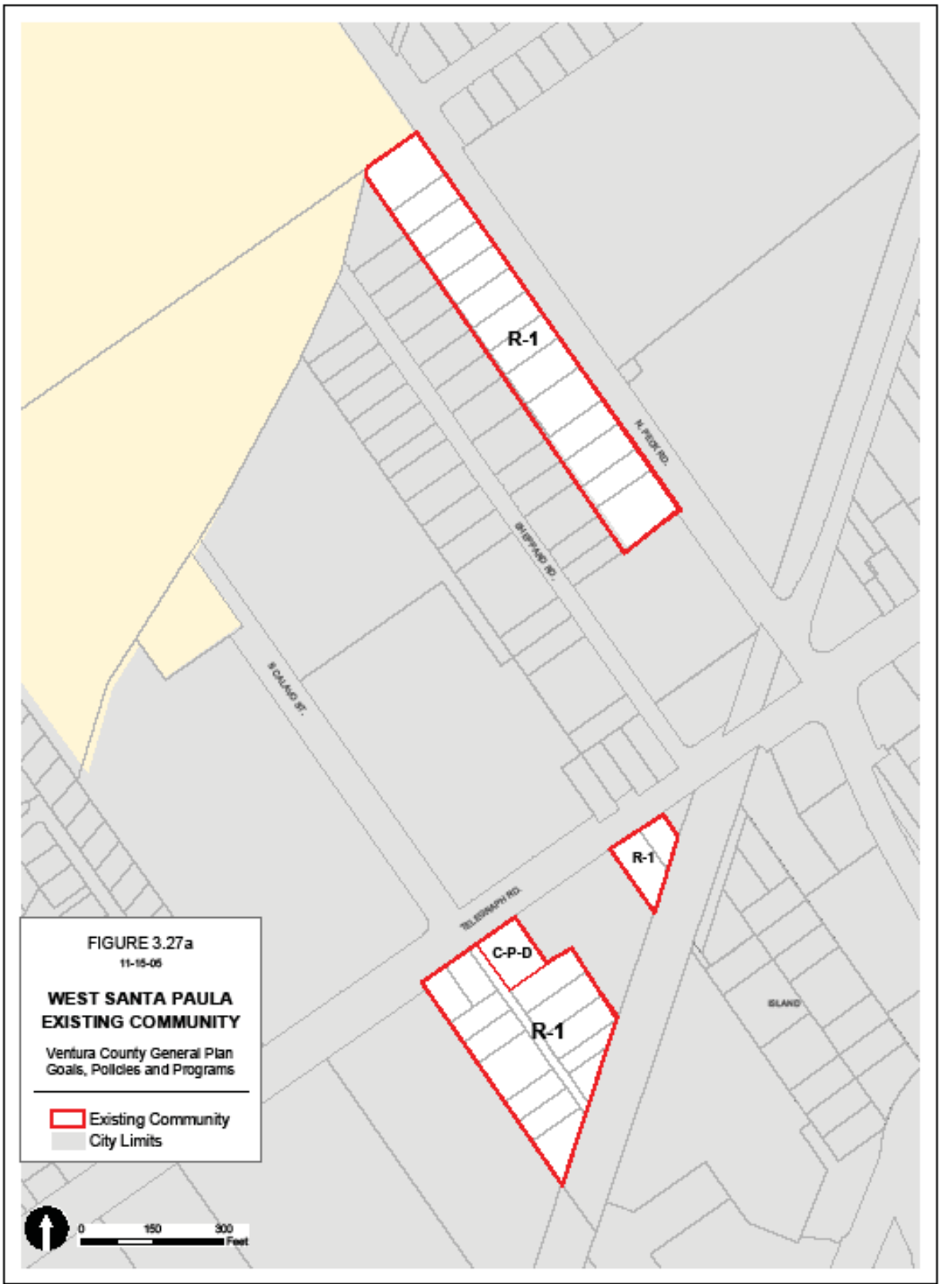
[2]Excludes second dwelling units per Section 65852.2 of the State Government Code.

[3]Year 2000 Forecast for Simi Valley Non-Growth Area.


E. STANLEY AVE.
M-3
ROCKLITE (PVT) RD.
COMSTOCK DR.
E. MC FARLANE DR.
LEIGHTON DR.
0
150
300
Feet
FIGURE 3.26a
11-15-05
VENTURA AVENUE
EXISTING COMMUNITY
Ventura County General Plan
Goals, Policies and Programs
Existing Community
City Limits

igure 3.26b
uilding Intensity Population Density Table - Ventura Avenue E isting Community

Commercial Industrial							
Designation	Acres	Ma . ldg. Coverage (of Lot Area)	Pro ected loor Area (1000 S)	Average Employees 1000 S	Employees	Average Employees Acres	
M3	6.5	40	57	2.0	113	17.38	


R-1
N. PEAK RD.
SILVERHAND RD.
S CALIAO ST.
R-1
SILVERHAPH RD.
C-P-D
R-1
ISLAND
FIGURE 3.27a
11-15-06
WEST SANTA PAULA
EXISTING COMMUNITY
Ventura County General Plan
Goals, Policies and Programs
Existing Community
City Limits
0
150
300
Feet

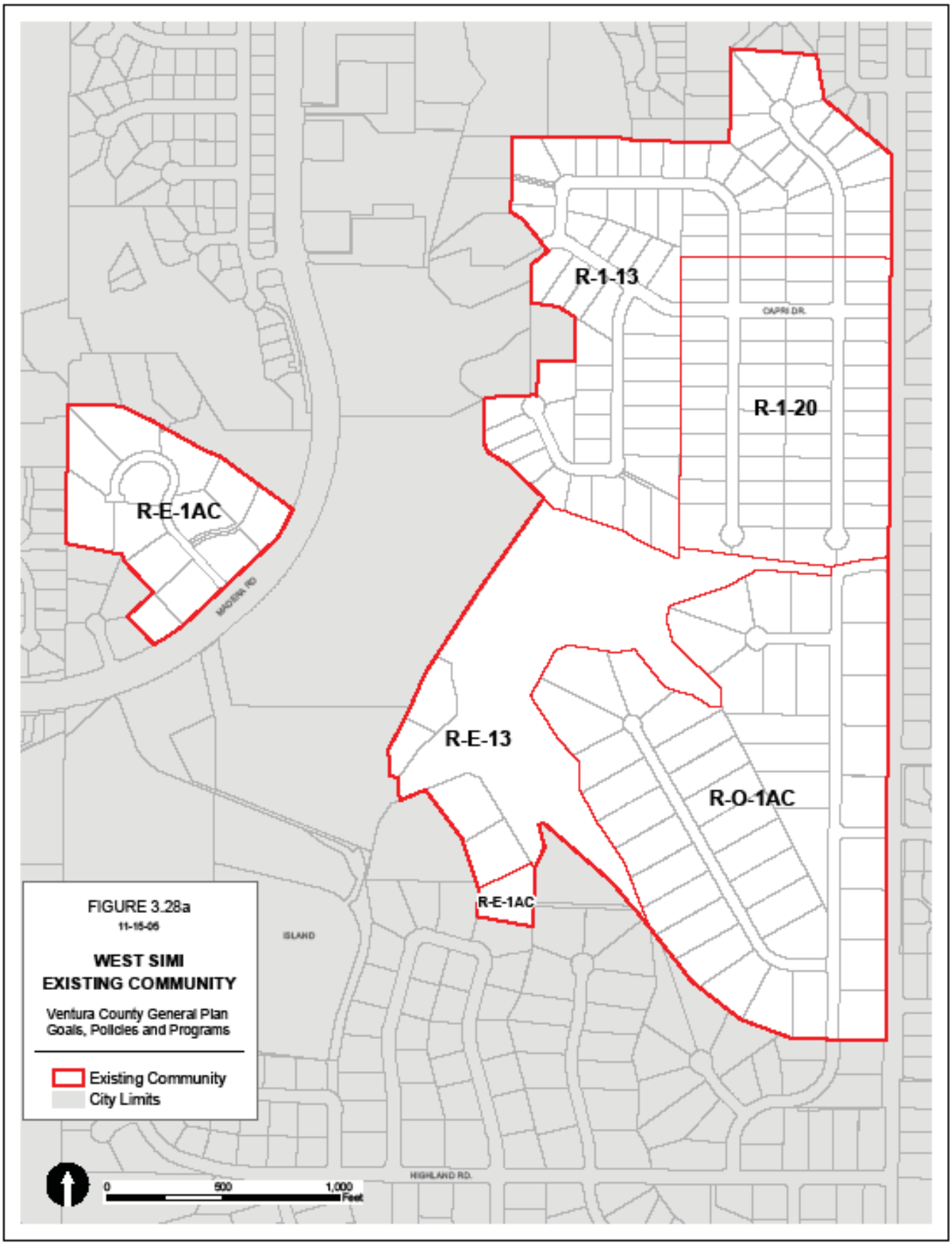
igure 3.27b
uilding Intensity Population Density Table -
West Santa Paula E isting Community

Residential							
Designation	Acres	Ma . ldg. Coverage (of Lot Area)[1]	Ma imum Intensity (DU Ac)[2]	Dwelling Units	Average Pop DU[3]	Population	Average Pop. Density (Pop Acre)
R1	3.18	45	5.35	17	2.65	45	14.17

[1]The maximum *ui din covera e* for lots of less than one acre in area shall be as specified, or 2,500 square feet plus 1 square foot for each 4.596 square feet of lot area over 5,000 square feet, whichever is greater.

[2]Excludes second dwelling units per Section 65852.2 of the State Government Code.

[3]Year 2000 Forecast for Santa Paula Growth Area.


R-1-13
R-1-20
R-E-1AC
R-E-13
R-O-1AC
R-E-1AC
CAPRI DR.
MADERA RD
ISLAND
HIGHLAND RD.
FIGURE 3.28a
11-15-06
WEST SIMI
EXISTING COMMUNITY
Ventura County General Plan
Goals, Policies and Programs
Existing Community
City Limits
0
500
1,000
Feet

igure 3.28b
uilding Intensity Population Density Table - West Simi E isting Community

Residential							
Designation	Acres	Ma . ldg. Coverage (of Lot Area)[1]	Ma imum Intensity (DU Ac)[2]	Dwelling Units	Average Pop DU[3]	Population	Average Pop. Density (Pop Acre)
RE-1Ac	13.38	25	1.00	13	3.03	39	2.91
RO-1Ac	44.81	25	1.00	44	3.03	133	2.97
R1-20	22.22	29	2.18	48	3.03	145	6.53
RE-13	33.96	33	3.35	113	3.03	342	10.07
R1-13	26.41	33	3.35	88	3.03	266	10.07
Total	140.78			306		925	

[1]The maximum *ui din covera e* for lots of less than one acre in area shall be as specified, or 2,500 square feet plus 1 square foot for each 4.596 square feet of lot area over 5,000 square feet, whichever is greater.

[2]Excludes second dwelling units per Section 65852.2 of the State Government Code.

[3]Year 2000 Forecast for Simi Valley Growth Area.

igure 3.29
2000 – 2020 Population orecast

Area	Census 4 1 2000	orecast 2005	orecast 2010	orecast 2015	orecast 2020
Camarillo Area	67,042	82,809	89,084	93,014	96,949
(Camarillo City)	(57,077)	(66,958)	(72,220)	(76,060)	(79,186)
illmore Area	15,145	16,534	18,068	20,628	23,038
(illmore City)	(13,643)	(14,689)	(16,187)	(18,619)	(20,964)
Las Posas Area	3,232	3,666	3,788	3,911	4,034
Moorpar Area	32,566	31,777	32,561	33,346	42,108
(Moorpar City)	(31,415)	(30,355)	(31,018)	(31,684)	(40,322)
North Half Area	752	1,072	1,140	1,207	1,274
Oa Par Area	14,215	13,541	13,541	13,541	13,541
O ai Area	29,617	32,106	32,901	33,866	34,190
(O ai City)	(7,862)	(8,251)	(8,490)	(8,719)	(9,006)
O nard Area	186,118	175,076	183,819	194,392	205,301
(O nard City)	(170,358)	(159,301)	(168,025)	(176,413)	(186,901)
Piru Area	2,380	2,360	2,596	4,152	4,388
Port Hueneme Area	23,097	23,512	23,512	23,512	23,512
(Port Hueneme City)	(21,845)	(23,176)	(23,176)	(23,176)	(23,176)
Santa Paula Area	31,554	34,724	37,515	40,625	43,443
(Santa Paula City)	(28,598)	(30,135)	(32,730)	(35,325)	(37,920)
Simi Valley Area	115,787	131,099	135,621	140,994	145,700
(Simi Valley City)	(111,351)	(126,582)	(131,205)	(135,826)	(140,452)
Thousand Oa s Area	125,082	129,550	135,736	138,619	139,213
(Thousand Oa s City)	(117,005)	(125,000)	(129,000)	(131,000)	(131,500)
Ventura Area	106,197	114,193	119,652	125,454	130,696
(Ventura City)	(100,916)	(108,397)	(113,397)	(118,397)	(123,397)
Ahmanson Ranch Area	410	410	410	410	410
(Incorporated Total)	(660,070)	(692,844)	(725,448)	(755,219)	(792,824)
Unincorporated Total	93,124	99,585	104,496	112,452	114,973
Countywide Total	753,194	792,429	829,944	867,671	907,797

(Numbers in Parentheses) City numbers

Source VC Septe er 2000

igure 3.30
2000 – 2020 Dwelling Unit orecast

Area	Census 4 1 2000	orecast 2005	orecast 2010	orecast 2015	orecast 2020
Camarillo Area	25,443	28,006	30,110	31,444	32,779
(Camarillo City)	(21,946)	(23,179)	(24,999)	(26,199)	(27,400)
illmore Area	4,387	4,897	5,389	6,212	7,009
(illmore City)	(3,852)	(4,295)	(4,775)	(5,558)	(6,342)
Las Posas Area	1,072	1,194	1,234	1,274	1,314
Moorpar Area	9,458	9,779	10,020	10,262	12,958
(Moorpar City)	(9,094)	(9,340)	(9,544)	(9,749)	(12,407)
North Half Area	563	383	407	431	455
Oa Par Area	5,123	5,665	5,665	5,665	5,665
O ai Area	11,289	12,433	12,998	13,563	14,128
(O ai City)	(3,229)	(3,395)	(3,596)	(3,801)	(4,062)
O nard Area	49,766	51,568	55,121	59,368	64,077
(O nard City)	(45,166)	(46,689)	(50,113)	(53,605)	(58,066)
Piru Area	651	805	885	1,325	1,405
Port Hueneme Area	8,173	8,397	8,397	8,397	8,397
(Port Hueneme City)	(7,908)	(8,277)	(8,277)	(8,277)	(8,277)
Santa Paula Area	9,101	10,558	11,388	12,287	13,124
(Santa Paula City)	(8,341)	(9,644)	(10,452)	(11,260)	(12,068)
Simi Valley Area	38,858	43,905	46,825	48,680	50,304
(Simi Valley City)	(37,272)	(42,194)	(45,088)	(46,675)	(48,265)
Thousand Oa s Area	45,906	46,666	49,238	49,929	50,148
(Thousand Oa s City)	(42,958)	(44,845)	(46,598)	(47,010)	(47,216)
Ventura Area	41,786	43,721	45,131	46,797	48,221
(Ventura City)	(39,803)	(41,362)	(42,699)	(44,044)	(45,389)
Ahmanson Ranch Area	134	134	134	134	134
(Incorporated Total)	(219,569)	(233,220)	(246,141)	(256,178)	(269,492)
Unincorporated Total	32,141	34,891	36,801	39,590	40,626
Countywide Total	251,710	268,111	282,942	295,768	310,118

(Numbers in Parentheses) **City numbers**

Source VC Septe er 2000

igure 3.31
2000 – 2020 Employment orecast

Area	Estimate 2000	orecast 2005	orecast 2010	orecast 2015	orecast 2020
Camarillo Area	35,808	36,870	38,041	39,213	40,384
(Camarillo City)	(31,414)	(32,198)	(32,982)	(34,433)	(36,117)
illmore Area	4,387	5,033	5,678	6,324	6,969
(illmore City)	(3,624)	(4,213)	(4,800)	(5,410)	(6,117)
Las Posas Area	1,320	1,325	1,330	1,335	1,340
Moorpar Area	7,949	9,500	11,720	13,604	13,673
(Moorpar City)	(7,513)	(9,044)	(11,219)	(13,035)	(13,035)
North Half Area	37	43	49	54	60
Oa Par Area	840	880	920	960	1,000
O ai Area	6,686	6,790	6,894	6,998	7,102
(O ai City)	(3,620)	(3,802)	(4,015)	(4,179)	(4,368)
O nard Area	71,716	74,965	76,762	82,274	88,915
(O nard City)	(51,951)	(55,093)	(56,831)	(62,162)	(68,350)
Piru Area	427	470	512	577	619
Port Hueneme Area	16,870	17,154	17,438	17,721	18,005
(Port Hueneme City)	(16,496)	(16,710)	(16,924)	(17,138)	(17,352)
Santa Paula Area	9,394	10,497	11,599	12,702	13,821
(Santa Paula City)	(6,829)	(7,802)	(8,775)	(9,748)	(10,720)
Simi Valley Area	34,128	41,668	49,211	56,754	64,333
(Simi Valley City)	(33,944)	(41,444)	(48,944)	(56,444)	(63,944)
Thousand Oa s Area	71,320	76,288	80,610	84,592	89,213
(Thousand Oa s City)	(69,810)	(74,646)	(78,849)	(82,718)	(87,208)
Ventura Area	60,965	64,931	67,097	71,560	76,827
(Ventura City)	(57,604)	(61,343)	(63,381)	(67,590)	(72,474)
Ahmanson Ranch Area	0	0	0	0	0
(Incorporated Total)	(282,805)	(306,295)	(326,720)	(352,857)	(379,685)
Unincorporated Total	39,042	40,119	41,141	41,811	42,576
Countywide Total	321,847	346,414	367,861	394,668	422,261

(Numbers in Parentheses) City numbers

Source VC Septe er 2000

4. Public acilities and Services

The Public Facilities and Services Chapter of the General Plan identifies *oa s po icies* and *pro ra s* applicable to public facilities and services throughout Ventura County at both a local and regional level. The specific goals, policies and programs are listed under the major headings of General Goals, Policies and Programs, Transportation/Circulation, Water Supply, Waste Disposal Facilities, Utilities, Flood Control and Drainage, Law Enforcement and Emergency Services, Fire Protection, Education, Parks and Recreation, and Other Public Buildings and Grounds. In some instances, facilities and services are owned and/or operated by the County of Ventura, or may be provided by an agency governed by the Board of Supervisors. In other cases, facilities and services are owned and operated by independent governmental entities or private companies. The headings listed above are the types of public facilities and services most directly related to the physical development of the County.

Tables, maps, and narrative in the Public Facilities and Services Appendix provide the background information and analysis necessary to establish the goals, policies and programs which are part of the Public Facilities and Services Chapter of the County of Ventura General Plan, with the overall goal of providing necessary public facilities and services to the residents of Ventura County.

The following general goals, policies and programs apply to public facilities and services:

4.1 General Goals, Policies and Programs

4.1.1 Goals

1. Plan for public facilities and services which will adequately serve the existing and future residents of the County.
2. Promote the cost effective operation, equitable distribution, and funding and development of public facilities and services to meet the County s existing and future needs.
3. Ensure that public facilities and services are consistent with the land use and development goals, policies and programs of the County General Plan.

4.1.2 Policies

1. *iscretionary deve op ent* shall be conditioned to contribute land, improvements or funds toward the cost of needed public improvements and services related to the proposed development.
2. *eve op ent* shall only be permitted in those locations where adequate public services are available (functional), under physical construction or will be available in the near future.
3. The location, design and operation of public facilities in the unincorporated area of the County shall be consistent with the Ventura County General Plan.
4. Within a City s Sphere of Influence, annexation to the City is preferable to formation of new or expansion of existing County Service Areas.
5. Within a City s Sphere of Influence, public facility requirements imposed by the County for new or expanding developments, should not be less than those imposed by the City.
6. Within a City s Area of Interest, but outside that City s Sphere of Influence, unincorporated Existing Communities should financially support County-administered urban services which are comparable to those services provided by cities.

4.1.3 Programs

1. All public facility improvements and projects proposed to be located in the unincorporated area of the County shall be included in a comprehensive five year Capital Improvement Program. The Capital Improvement Program shall be updated annually and reviewed by the County Planning Division for conformity to the County General Plan.

2. The General Services Agency, along with the Building and Safety Division of the Resource Management Agency, will continue the ongoing program to inventory all County owned and County occupied (leased) buildings for compliance with State and Federal Handicapped Accessibility laws, including the Federal Americans with Disabilities Act (ADA) of 1990, as required by HUD for Block Grant Funds.
3. The Planning Division with the technical support of other appropriate agencies, will periodically review the Public Facilities and Services Chapters goals, policies and programs as well as the Public Facilities and Services Appendix to identify what information needs to be updated and, when appropriate, will submit a budget request to the Board of Supervisors.

4.2 Transportation Circulation

The Transportation/Circulation section identifies *oa s po icies* and *pro ra s* related to: roads and highways, transit, rail service, airports and pipelines.

Roads and Highways

The *Re iona Road et ork*, together with the *oca Road et ork* provides the principal means for the movement of persons and goods within Ventura County.

In order to accommodate projected traffic resulting from the implementation of the land use policies of the General Plan, improvements to the *Re iona Road et ork* and the *oca Road et ork* will be necessary. The Regional Road Network anticipated for the year 2020, shown on Public Facilities Map (Figure 4), will function at an acceptable *eve o Service S* in the unincorporated area of the County if development occurs in accordance with the General Land Use Map (Figure 3.1) at the projected rate of development. In addition to automobiles, trucks, buses and bicycles use some roads in the Regional Road Network and require accommodation where feasible.

Transit

There are several public transportation systems available in Ventura County. These include: South Coast Area Transit (SCAT), Ventura Intercity Service Transit Authority (VISTA), Camarillo Area Transit (CAT), Moorpark Transit, the City of Ojai trolley, Simi Valley Transit and Thousand Oaks Transit (TOT).

Private transit operators include: Greyhound Bus Lines, which provides regular long distance travel service with stops at three cities in Ventura County: Oxnard, Thousand Oaks and Ventura, and Great American Stageline, an airport bus company that makes trips to Los Angeles International Airport and provides intercity service to Ventura, Oxnard, Camarillo, Thousand Oaks, Westlake and Woodland Hills.

The Senior Survivalmobile serves senior citizens Countywide during medical emergencies, with the help of volunteers. In addition, every Ventura County community has a program to transport senior citizens to meal sites and meals to seniors.

Rail Service

Freight rail service is provided by Union Pacific Transportation Company and the local Ventura County Railroad Company, headquartered in Port Hueneme.

Union Pacific Transportation Company provides intra-state and trans-continental rail freight service from its main coast line which runs from the Santa Barbara County line along the coast south through Ventura to Oxnard and then east through Camarillo, Moorpark, and Simi Valley to the Los Angeles County line. A branch line travels along the Santa Clara River Valley from Montalvo in a northeasterly direction through Santa Paula and Fillmore to Piru.

The Ventura County Railroad Company is a short line local railroad connecting the Union Pacific tracks in Oxnard with the Navy Base Ventura County (U.S. Naval Construction Battalion Center) and the deep seaport in Port Hueneme, including industrial parks in Oxnard, south of Fifth Street.

Passenger rail service includes Amtrak and Metrolink. Amtrak's Coast Starlight rail service is provided once a day, north and south, between Los Angeles and Portland, Oregon. The Coast Starlight stops in Oxnard and Simi Valley. Amtrak's San Diegan passenger rail service provides several round trips

per day between San Diego and San Luis Obispo. The San Diegan stops in Ventura County at Simi Valley, Moorpark, Camarillo, Oxnard and Ventura. Metrolink Commuter Rail operates Monday through Friday between Montalvo and Los Angeles and connects to five counties in Southern California. Currently, there are eight round trips daily to Simi Valley and Moorpark, with two of these trips also stopping in Camarillo, Oxnard and Montalvo.

Airports

There are four airports in Ventura County, which include County owned and operated airports at Camarillo and Oxnard, a private airport at Santa Paula and the Federally operated Navy Base Ventura County, formerly known as Point Mugu Naval Air Weapons Station (NAWS), including its runway at San Nicholas Island. The California Air National Guard operates from a facility adjacent to and utilizes the runways at Navy Base Ventura County Point Mugu. In addition, there are a few privately owned landing strips scattered throughout the County.

Harbors

The Port of Hueneme is the County s only deepwater harbor. It is located entirely within the City of Port Hueneme, about seven miles southeast of the mouth of the Santa Clara River. Serving as California s only deepwater port between Los Angeles and San Francisco, the Port of Hueneme s area of influence extends far into the southwestern United States and Western Canada. The Port is administered by the Oxnard Harbor District, which has jurisdiction over approximately 120 acres of onshore area and 10 acres of waterway; the remainder of the harbor is under U.S. Navy jurisdiction. Ventura and Channel Islands harbors provide facilities for recreational boating and commercial fishing.

Pipelines

Major pipelines within Ventura County carry crude oil and natural gas, generally along highways and railroad lines. ARCO, Chevron, Mobil, Shell, Texaco and Union Oil own the major crude oil and natural gas pipelines traversing Ventura County, and such ownership is transferred from time to time. Most oil companies, which have operations in Ventura County, have pipelines located within their oil/gas lease areas, but do not operate major transporting pipelines. Four Corners Pipeline Company, a subsidiary of ARCO, is a private pipeline company regulated by the Public Utilities Commission that transports crude oil through their own lines and connects to other pipelines as needed. There is an existing Southern California Edison fuel line originating within the Oxnard Harbor District which connects to the Ormond Beach Generating Station. Four Corners Pipeline Company operates only their own pipeline facilities, and does not own any crude oil.

The goals, policies and programs that apply to transportation/circulation are as follows:

4.2.1 Goals

1. Facilitate the safe and efficient movement of persons and goods by encouraging the design, construction, and maintenance of an integrated transportation and circulation system consisting of regional and local roads, bus transit, bike paths, ridesharing, rail transit and freight service, airports and harbors.

2. Facilitate the safe and efficient movement of persons and goods by designing, constructing, and maintaining a *Re iona Road et ork* and *oca Road et ork* that is consistent with the County road standards and that will function at an acceptable *eve o Service S*

3. Ensure that the design, sequencing and timing of road widening projects are consistent with the goals, policies and programs of the General Plan, and that County road widening projects have adequate public review.

4. Ensure that as *discretionary deve op ent* creates the need, existing roads within the *Re iona Road et ork* and *oca Road et ork* are improved, and additional roads needed to complement the *Re iona Road et ork* and *oca Road et ork* are constructed, so as to keep all such roads safe and functioning at an acceptable *S*.

5. Ensure that *deve op ent* which would contribute to the cumulative need for improvements or additions to the *Re iona Road et ork* bears its pro-rata share of the costs of all such improvements or additions.

6. Promote measures to reduce vehicle miles traveled and disperse peak traffic to better utilize the existing transportation infrastructure.

7. Promote the expansion of a safe, efficient, convenient, integrated and economical community, intercommunity and countywide bus transit system.

8. Encourage transit providers and the Ventura County Transportation Commission to increase ridership and meet the needs of the commuting public and the special transportation needs of the elderly, school children, low income, physically handicapped, other low mobility groups, and bicyclists.

9. Encourage the use of bicycling and ridesharing (e.g., carpooling, vanpooling, and bus pooling) as a percentage of total employee commute trips throughout the County in order to reduce vehicular trips and miles traveled and consequently vehicular emissions, traffic congestion, energy usage, and ambient noise levels.

10. In cooperation with the ten cities and the Ventura County Transportation Commission, plan a system of bicycle lanes and trails linking all county cities, unincorporated communities, and CSUCI.

11. Support the continued expanded operation and use of a rail system that offers efficient, safe, convenient and economical transport of people and commodities throughout the region.

12. Encourage the Union Pacific Transportation Company and the Ventura County Railroad Company to continue to improve their railroad grade crossing surfaces with such improvements as the installation of concrete railroad grade crossing surface panels.

13. Provide facilities at Oxnard and Camarillo Airports to meet the general aviation and commuter service needs of the citizens of Ventura County.

14. Strive to minimize adverse environmental and safety effects of County Airports on the surrounding communities.

4.2.2 Policies

1. *County thorou h ares* and County maintained *oca roads* shall be designed and constructed in accordance with County road standards or better and should primarily serve in-county transportation needs. County roads should not be widened for the purpose of relieving congestion on Federal or State highways or accommodate interregional traffic that is more appropriately served by the Federal and State highway systems.

2. The County road standards, five-year capital improvement programs, and road-improvement design, sequencing and timing shall be consistent with the goals, policies and programs of the General Plan. County road improvement design for safety and level-of-service capacity should, if possible, avoid increasing the number of travel lanes, and the improvements should not be constructed before the need has been demonstrated based on evaluation of current and projected traffic conditions.

3. The minimum acceptable *eve o Service S* for road segments and intersections within the *Re iona Road et ork* and *oca Road et ork* shall be as follows:

   (a) *S-* for all *County thorou h ares* and *edera hi h ays* and *State hi h ays* in the unincorporated area of the County, except as otherwise provided in subparagraph (b);

   (b) *S-* for State Route 33 between the northerly end of the Ojai Freeway and the City of Ojai, Santa Rosa Road, Moorpark Road north of Santa Rosa Road, State Route 34 north of the City of Camarillo and State Route 118 between Santa Clara Avenue and the City of Moorpark;

   (c) *S- C* for all County-maintained *oca roads*; and

   (d) The *S* prescribed by the applicable city for all *edera hi h ays State hi h ays city thorou h ares* and city-maintained *oca roads* located within that city, if the city has formally adopted General Plan policies, ordinances, or a reciprocal agreement with the County (similar to Policies 4.2.2-3 through 4.2.2-6) respecting *deve op ent* in the city that

would individually or cumulatively affect the *S* of *edera hi h ays State hi h ays County thorou h ares* and County-maintained *oca roads* in the unincorporated area of the County.

At any intersection between two roads, each of which has a prescribed minimum acceptable *S*, the lower *S* of the two shall be the minimum acceptable *S* for that intersection.

4. Except as otherwise provided in the Ojai Area Plan, County General Plan land use designation changes and zone changes shall be evaluated for their individual and cumulative impacts, and *discretionary deve op ent* shall be evaluated for its individual impact, on existing and future roads, with special emphasis on the following:

   (a) Whether the project would cause existing roads within the *Re iona Road et ork* or *oca Road et ork* that are currently functioning at an acceptable *S* to function below an acceptable *S*;

   (b) Whether the project would add traffic to existing roads within the *Re iona Road et ork* or the *oca Road et ork* that are currently functioning below an acceptable *S*; and

   (c) Whether the project could cause future roads planned for addition to the *Re iona Road et ork* or the *oca Road et ork* to function below an acceptable *S*.

5. Except as otherwise provided in the Ojai Area Plan and below, County General Plan land use designation changes and zone changes that would cumulatively cause any of the impacts identified in subparagraphs (a) through (c) of Policy 4.2.2-4 shall be prohibited unless the Board of Supervisors adopts a Statement of Overriding Considerations. County General Plan land use designation changes, zone changes and *discretionary deve op ent* that would individually cause any of the impacts identified in subparagraphs (a) through (c) of Policy 4.2.2-4 shall be prohibited unless feasible mitigation measures are adopted that would ensure that the impact does not occur or unless a project completion schedule and full funding commitment for road improvements are adopted which ensure that the impact will be eliminated within a reasonable period of time. This policy does not apply to *city thorou h ares*, city-maintained *oca roads*, or *edera or State hi h ays* located within a city unless the applicable city has formally adopted General Plan *po icies*, ordinances, or a reciprocal agreement with the County (similar to Policies 4.2.2-3 through 4.2.2-6) respecting *deve op ent* in the city that would affect the *S* of *County thorou h ares*, County-maintained *oca roads*, and *edera and State hi h ays* located within the unincorporated area of the County. If a Specific Plan for a project has been determined to be consistent with this policy, any subsequent development that is consistent with the Specific Plan will also be determined to be consistent with this policy. Exceptions to the prohibitions of this policy include the following:

   (a) Farmworker Housing Complexes, Affordable Housing development per Article 16 of the Non-Coastal oning Ordinance, and other housing exclusively for *o er-inco e* households, where such developments are served by roads that are currently operating at LOS "E" or better.

   (b) Additional dwellings and lots on Cultural Heritage Sites as permitted in the Non-Coastal oning Ordinance.

   (c) Agriculture and Agricultural Operations as permitted in the Coastal and Non-Coastal oning Ordinances where such developments are served by roads that are currently operating at LOS "E" or better.

6. Development that would generate additional traffic shall pay its pro rata share of the costs of necessary improvements to the *Re iona Road et ork* per the County's Traffic Impact Mitigation Fee Ordinance as amended time to time.

7. The County shall oppose *discretionary deve op ent* within cities, and annexation to cities for the purposes of *deve op ent*, where such *deve op ent* would individually or cumulatively cause:

(a) Any existing road within the *Re iona Road et ork*, or any existing County-maintained *oca road*, that is currently functioning at an acceptable *S* to function below an acceptable *S*

(b) Any existing road within the *Re iona Road et ork*, or any existing County-maintained *oca road*, that is currently operating below an acceptable *S* to have a worsening of traffic conditions; or

(c) Any future road planned for addition to the *Re iona Road et ork*, or any planned future County-maintained *oca road*, to function below an acceptable *S*.

This policy does not apply to those cities which have formally adopted General Plan policies, ordinances, or a reciprocal agreement with the County similar to Policies 4.2.2-3 through 4.2.2-6.

8. *iscretionary deve op ent* shall be conditioned, where feasible, to minimize traffic impacts by incorporating pedestrian and bicycle pathways, bicycle racks and lockers, ridesharing programs, transit improvements (bus turnouts, shelters, benches), and/or transit subsidies for employees or residents of the proposed *deve op ent*.

9. In the event that any railroad right-of-way within Ventura County is abandoned in the future, the County Public Works Agency and the General Services Agency shall evaluate the feasibility of acquiring such land for public use such as transit, bicycle and equestrian paths.

10. *iscretionary deve op ent* that would endanger the efficient, safe operation of an airport or would result in significant land use incompatibility with an airport shall be prohibited.

11. The Ventura County General Plan shall remain consistent with the Ventura County Transportation Commission's Airport Comprehensive Land Use Plan for Ventura County.

4.2.3 Programs

1. The County Planning Division will periodically recommend updates to the County General Plan s Transportation/Circulation Section and the Public Facilities Map. This effort will be coordinated with the PWA Transportation Department and the Ventura County Transportation Commission which provides the Congestion Management Program.

2. The County Public Works Agency (PWA) will coordinate with the County Planning Division, cities in Ventura and Los Angeles Counties and CalTrans to develop a program to fund needed improvements to the *Re iona Road et ork* that includes all sources of funding available to both the County and the cities for inter-city road-building purposes. The program would include a mechanism to determine the total amount required to construct the needed improvements and could include a trip rate fee structure to collect the required funds. Roads which are impacted by new *deve op ent* should have the needed improvements financed by *deve op ent* fees and developer contributions. Roads not impacted by new *deve op ent* should have needed improvements financed by revenue sources dedicated for transportation purposes, such as State and Federal gasoline taxes, Transportation Development Act funds, etc. Where these funding sources prove inadequate to meet projected needs, they should be augmented by other sources such as special assessment districts, area of benefit funds, etc.

3. The Public Works Agency will submit the project scope for all road-improvement projects that increase the number of travel lanes to the Board of Supervisors for their concurrence at a noticed public hearing prior to proceeding with preparation of environmental review documents or engineering plans and specifications.

4. The County Public Works Agency will continue to review environmental documents for *deve op ent* projects within cities and adjoining counties to ensure that all individual and cumulative adverse impacts to the *Re iona Road et ork* and County-maintained *oca roads* have been adequately evaluated and mitigated to insignificant levels. If it appears potential impacts are identified, PWA will bring this information to the attention of the Board of Supervisors.

5. The County s Legislative Analyst, with the support of the Public Works Agency, will continue to lobby for passage of Federal and State legislation/appropriations which would improve the *Re iona Road et ork* consistent with the County General Plan.

6. The Ventura County Transportation Commission (VCTC) is the agency responsible for transit operation and planning in the County of Ventura. The County, Public Works Agency, Transportation Department, will assist and coordinate as necessary to ensure that transit needs in the unincorporated area are considered and implemented.

7. The Public Works Agency, General Services Agency and Planning Division, will participate in and support the Ventura County Transportation Commission in its development of a countywide Bicycle Path and Trail Master Plan, which will link all county cities, unincorporated communities, and CSUCI.

8. The County Department of Airports will periodically update the Camarillo and Oxnard Airport Master Plans.

9. The Public Works Agency will continue to coordinate with the Port of Hueneme-Oxnard Harbor District, the cities of Port Hueneme and Oxnard, and CalTrans to ensure an adequate road network is available to accommodate projected harbor related commerce.

10. The County Sheriff s Department Office of Emergency Services will annually review and revise the Major Transportation Accidents Contingency section of the County Multihazard Functional Plan.

4.3 Water Supply acilities

Ventura County s water supplies are primarily obtained from three major sources: groundwater, surface water, and imported water. A small amount of reclaimed water also is used when and where available.

There are three major water wholesalers that supply the various retail water purveyors throughout Ventura County. The Casitas Municipal Water District delivers wholesale water from Lake Casitas to many small local purveyors in the Ventura River and Ojai Valley areas. The United Water Conservation District is responsible for collection and distribution of wholesale water throughout most of the Santa Clara River Valley and the Oxnard Plain. Water stored in United s Lake Piru reservoir is periodically released into the Santa Clara River via Piru Creek. Downstream, the water is diverted into several percolation ponds or groundwater recharge basins near Saticoy and El Rio in order to recharge the underlying aquifers for subsequent pumping to urban and agricultural users. The Calleguas Municipal Water District is one of the 14 member agencies of the Metropolitan Water District of Southern California (MWD), and is responsible for providing imported water from the Sacramento-San Joaquin delta area to retail water purveyors in the southeastern portions of Ventura County.

There are presently 178 water purveyors in Ventura County, which include 6 city or municipal systems, 57 privately-owned systems, 25 public or special use water purveyors, 22 special water districts, and 63 mutual water companies, or other public and private systems of varying sizes (Navy bases, Navy housing, mobile home parks, etc.).

The goals, policies and programs that apply to water supply facilities are as follows:

4.3.1 Goals

1. Ensure the provision of water in quantities sufficient to satisfy current and projected demand.

2. Encourage the employment of water conservation measures in new and existing *deve op ent*.

3. Encourage the continued cooperation among water suppliers in the County in meeting the water needs of the County as a whole.

4.3.2 Policies

1. *eve op ent* that requires potable water shall be provided a *per anent pota e ater supp y* of adequate quantity and quality that complies with applicable County and State water

regulations. Water systems operated by or receiving water from Casitas Municipal Water District, the Calleguas Municipal Water District or the United Water Conservation District will be considered permanent supplies unless an Urban Water Management Plan (prepared pursuant to Part 2.6 of Division 6 of the Water Code) or a water supply and demand assessment (prepared pursuant to Part 2.10 of Division 6 of the Water Code) demonstrates that there is insufficient water supply to serve cumulative development within the district's service area. When the proposed water supply is to be drawn exclusively from wells in areas where groundwater supplies have been determined by the Environmental Health Division or the Public Works Agency to be questionable or inadequate, the developer shall be required to demonstrate the availability of a permanent potable water supply for the life of the project.

2. *iscretionary deve op ent* as defined in section 10912 of the Water Code shall comply with the water supply and demand assessment requirements of Part 2.10 of Division 6 of the Water Code.

3. *iscretionary deve op ent* shall be conditioned to incorporate water *conservation* techniques and the use of drought resistant native plants pursuant to the County s Guide to Landscape Plans.

4.3.3 Programs

1. The Public Works Agency will coordinate with water districts to establish a data base on actual available supply, projected use factors for types of *deve op ent* and threshold limits for *deve op ent* within available water resources.

2. The County Public Works Agency (Water Resources and Development Department) and the three major water wholesale agencies (Casitas, Calleguas and United) will continue to pursue the use of reclaimed water as a long-term source for agricultural irrigation.

3. The County Building and Safety Division will enforce the County s Efficient Plumbing Devices Ordinance (low water use plumbing fixtures).

4.4 Waste Treatment and Disposal acilities

The Waste Treatment and Disposal Facilities Section of the Public Facilities and Services Chapter satisfies the requirement of California Government Code Section 65302(a) for the designation of solid waste disposal facilities in the Land Use Element of the General Plan. This code requires that the land use element designate "the proposed general distribution and general location and extent of the uses of the land for solid and liquid waste disposal facilities."

Section 65302(a) also provides, in part, the means necessary for determining consistency between proposed facilities and the General Plan (required by Public Resources Code section 41702) and for determining consistency between the Countywide Siting Element of the Countywide Integrated Waste Management Plan and the General Plan (required by Public Resources Code section 41720).

With the passage of the California Integrated Waste Management Act (AB939) in 1989, local jurisdictions in California have new mandates related to solid waste that go beyond disposal. Programs to minimize and recover discarded resources are now required, and to achieve these mandates, "non-disposal" facilities, such as transfer stations, composting facilities and waste processing facilities (material recovery facilities), are necessary.

AB939 requires cities and/or counties to prepare and adopt a Countywide Integrated Waste Management Plan (CIWMP). The CIWMP must provide: a summary of the significant waste management problems facing the jurisdiction, an overview of the specific steps that local agencies will take to meet the goals of the Act and a statement of jurisdiction's goals and objectives relative to waste management. Ventura County, in cooperation with the cities and the county, prepared a CIWMP that was approved in April 2000.

The Countywide Siting Element of the CIWMP contains:

- Goals and policies for the environmentally safe transformation or disposal of solid waste that cannot be reduced, recycled or composted.

- An estimate of the total capacity that will be needed for a 15-year planning period to handle solid wastes generated within the county that cannot be reduced, recycled or composted.
- A statement of the remaining capacity of existing solid waste transformation and disposal facilities at the time that the element was prepared or revised.
- Specified siting criteria for new or expanded solid waste transformation or disposal facilities, consistent with the applicable county or city general plan.

The CIWMP and its Countywide Siting Element are Board of Supervisors' approved documents that express the intent of the Board regarding goals, policies and short-, medium- and long-range objectives, and siting criteria, for solid waste disposal or transformation facilities in Ventura County. The Public Facilities and Services Appendix of the General Plan complements the adopted policies of these documents.

In Ventura County, the private sector has traditionally serviced solid waste collection and disposal needs. Collection service providers in the unincorporated areas are privately owned. Disposal facilities are either privately owned or owned by a special district. The role of government in solid waste management is to provide planning, administration, facility approval and condition compliance. New facilities or expansions and other landfill uses require private sector initiative.

Wastes are categorized by the state into four general types: Hazardous, Designated, Municipal and Inert waste. As of 2001, only facilities for certain Designated, all Non-hazardous and Inert wastes exist in Ventura County. Hazardous wastes and certain types of Designated waste must be transported outside the county for disposal.

The following types of waste treatment and disposal facilities are included in this Section:

- **On-Site Septic Systems -** On-site septic systems, also referred to as individual sewage disposal systems (ISDS), are those liquid waste systems which dispose of sewage generated by individual residences and businesses in un-sewered areas. A conventional ISDS usually includes a septic tank and either a seepage pit or leach lines. Mound systems and subsurface sand filtration systems are two alternative ISDS that may be approved for use in areas where there are shallow soils over bedrock, high groundwater (either seasonal or permanent), or fractured bedrock. They are restricted for use only under specific conditions and guidelines in those areas of the County where community sewer systems are not available and on-site conditions preclude the use of conventional septic tank/soil absorption systems. Only domestic sewage (i.e., human waste from everyday living activities) can be discharged into a septic system.
- **Sewage Treatment acilities** - Sewage treatment facilities collect water used for domestic, commercial and industrial purposes, treat it to remove organic and inorganic waste materials, and discharge the treated effluent to the environment. Operation of these facilities is regulated by State and Federal agencies to protect the County s surface and groundwater from biological and chemical pollutants. There are two categories of Sewage Treatment Facilities. They are as follows:

  Co unity Se a e reat ent aci ities are plants that treat liquid waste that is received from off of the plant site. They include public agency and privately owned facilities. These facilities are identified on the General Plan s Public Facilities Map (Figure 4).

  n-Site Waste ater reat ent aci ities are plants that treat liquid waste that is generated on the same project site where the plant is located, with both the plant and the project site under common ownership. These plants are sized and explicitly restricted to serve only the project site, and cannot serve uses off-site or under different ownership.
- **Solid Waste Disposal Sites -** Solid waste disposal sites are those facilities for the final deposition of wastes onto land. Wastes are categorized by the State into four general types: Hazardous, Designated, Municipal and Inert Waste. Currently, only certain Designated, all Nonhazardous and Inert wastes can be legally disposed of to land in Ventura County. Hazardous and certain types of Designated wastes must be transported outside of the County for disposal. Waste management units (disposal sites) for designated and nonhazardous wastes are operated pursuant to requirements and criteria established by the State Water Resources Control Board (SWRCB) and the California Integrated Waste Management Board (CIWMB) as well as many other agencies.

They are regulated and inspected by the staff of the Regional Water Quality Control Board (RWQCB), and the Ventura County Environmental Health Division, which is the Local Enforcement Agency (LEA) for the CIWMB.

- **Waste Transfer Stations -** Waste transfer stations are those facilities utilized to receive wastes from outside their permit boundaries to temporarily store and/or separate wastes or transfer the solid wastes directly from smaller to larger vehicles for transport.
- **Off-Site Waste Treatment acilities -** Off-site waste treatment facilities are those facilities which accept wastes from outside their permit boundaries for treatment to change the physical, chemical, or biological characteristics of the waste so as to render it less harmful to the quality of the waters of the State, safer to handle, easier to contain or manage, including use as a fuel, nutrient or soil amendment.

Section 4.4 of the Public Facilities and Services Appendix describes each type of waste treatment and disposal facility by location and waste handled.

The goals, policies and programs that apply to waste treatment and disposal facilities are as follows:

4.4.1 Goals

1. Ensure the provision of adequate individual and public sewage/ waste collection, treatment and disposal facilities to meet the County s current and future needs in a manner which will protect the natural environment and ensure protection of the public s health, safety and welfare.
2. Ensure continuous waste disposal capacity to meet the County s current and projected waste disposal needs.

4.4.2 Policies

1. *Co unity se a e treat ent aci ities* and *so id aste disposa sites* shall be deemed consistent with the General Plan only if they are designated on the Public Facilities Map. *n-site septic syste s* (i.e., *individua se a e disposa syste s*), *on-site aste ater treat ent aci ities*, *aste trans er stations*, *o -site aste treat ent aci ities* and on-site storage facilities are consistent with the General Plan if they conform to the *oa s po icies* and *pro ra s* of the General Plan.
2. Any subdivision, or discretionary change in land use having a direct effect upon the volume of sewage, shall be required to connect to a public sewer system. Exceptions to this policy to allow the use of septic systems may be granted in accordance with County Sewer Policy. Installation and maintenance of septic systems shall be regulated by the County Environmental Health Division in accordance with the County s Sewer Policy, County Building Code, and County Service Area 32.
3. In order to reduce the need for additional wastewater treatment capacity, the County shall:
   - require new *discretionary deve op ent* to utilize water-conserving design features;
   - encourage the retrofitting of existing uses and buildings with water-conserving devices;
   - require that new wastewater lateral and trunk collection lines be designed to allow the minimum feasible amount of inflow and infiltration into the wastewater collection system.
   - periodically inspect existing lateral and trunk collection lines to identify areas subject to excessive inflow and infiltration and remedy identified problems as feasible.
4. *iscretionary deve op ent* adjacent to existing and proposed waste treatment, transfer and disposal sites, as identified in the Countywide Integrated Waste Management Plan, shall not conflict with the current and anticipated future use of these waste facilities.
5. Waste treatment and disposal operations shall be designed and conducted in a manner that is compatible with surrounding land uses such that the potential impacts are mitigated to less than significant levels, or, where no feasible mitigation measures are available, a statement of

overriding considerations consistent with CEQA shall be adopted. At the end of such operations, the site shall be restored to a use compatible with surrounding land uses.

6. Applicants for *discretionary deve op ent* shall be encouraged to employ practices that reduce the quantities of wastes generated and shall be requested to engage in recycling activities to further reduce the volume of waste disposed of in landfills.

4.4.3 Programs

1. The Public Works Agency, with the support of the Planning Division, will periodically update the County s Water Quality Management (208) Plan to incorporate revised population, land use and sewer plant capacity forecasts.
2. The County Public Works Agency will continue to work cooperatively with sanitation districts in the County toward the improvement and expansion of the existing public sewer systems consistent with the County General Plan.
3. The Environmental Health Division will continue to pursue the implementation of a *pro ra* of regular inspection, monitoring and maintenance of *individua se a e disposa syste s* with an emphasis on public education.
4. The Solid Waste Management Department will investigate long-range solutions to solid waste management, emphasizing ecologically and environmentally sensitive solutions, including source separation, recycling, composting and the like.
5. The Solid Waste Management Department will prepare, maintain and update the Countywide Integrated Waste Management Plan as necessary.

4.5 Public Utilities

Public utilities, as addressed in this section, include electrical power, natural gas, telephone service, cable television service and communication equipment.

Electrical power to Ventura County is provided by the Southern California Edison Company, which owns and operates substations and transmission lines, and purchases electricity from a variety of different generating sources (e.g., oil and gas fired, solar, hydro-electric, geo-thermal and nuclear generators).

Southern California Gas Company supplies natural gas to all of Ventura County through a fixed transmission and distribution system.

Telephone service is provided by SBC California and Verizon Communications. Communities served by SBC include Fillmore, Moorpark, Ojai, Simi Valley, and Ventura; plus the unincorporated areas of Oak View, Piru and Saticoy. Verizon Communications is the result of a merger of GTE and Atlantic Bell telephone companies in 2000. They retained the GTE Western Regional Headquarters, which is located in Thousand Oaks. Verizon provides phone service to the cities of Camarillo, Oxnard, Port Hueneme, Santa Paula and Thousand Oaks; plus the unincorporated areas of Newbury Park, Somis and Westlake.

The television broadcast industry is in a state of flux in the early 21st Century. Satellite dish systems, with reduced dish sizes and hundreds of channels for viewing, are challenging cable television systems. Yet cable companies are expanding their cable systems to meet more communication flexibility, including computer services and “on demand” television technology.

By 2003, Adelphia Communications had taken over operations of all cable systems throughout Ventura County with the exception of the west side of the City of Ventura. That cable provider was the locally owned and operated Avenue Cable Company. By the end of 2003, both Adelphia and Avenue Cable companies had filed for bankruptcy. In mid-2005, it is unclear as to who the final owners and operators of local cable television will be, but Adelphia will continue to own and operate the majority of cable systems in the cities and the unincorporated portions of the County for the short run.

County communication equipment, operated by the County’s Information Systems Department, includes radio, microwave, and telephone switching equipment, which is located at 17 separate sites, including each of the three community colleges. In addition, there are other governmental and

privately operated communications equipment facilities (including radio and television transmitting and receiving antennas, radar stations, and microwave towers) scattered throughout the County s hilltops.

The goal and policies which apply to public utilities are as follows:

4.5.1 Goal

Promote the efficient distribution of public utility facilities and transmission lines to assure that public utilities are adequate to service existing and projected land uses, avoid hazards and are compatible with the natural and human resources.

4.5.2 Policies

1. New gas, electric, cable television and telephone utility transmission lines shall use or parallel existing utility rights-of-way where feasible and avoid scenic areas when not in conflict with the rules and regulations of the California Public Utilities Commission. When such areas cannot be avoided, transmission lines should be designed and located in a manner to minimize their visual impact.
2. All transmission lines should be located and constructed in a manner which minimizes disruption of natural vegetation and agricultural activities and avoids unnecessary grading of slopes when not in conflict with the rules and regulations of the California Public Utilities Commission.
3. *iscretionary deve op ent* shall be conditioned to place utility service lines underground wherever feasible.

4.6 lood Control and Drainage acilities

The Ventura County Flood Control District is a special district that was created in 1944 for the purpose of providing for the control of floods and storm waters originating within the District (County) or originating outside the District and flowing into it, to conserve such waters for beneficial use, to prevent waste or exportation of waters and to reclaim drainage, storm, and flood waters. The District includes all of Ventura County except the offshore Channel Islands of Anacapa and San Nicolas. The County is divided into four numbered flood zones: ones 1-4. Boundaries of the first three zones generally follow the limits of the three major drainage systems of Ventura County:

one 1: Ventura River Watershed

one 2: Santa Clara River Watershed

one 3: Calleguas Creek Watershed

one 4: Includes the Cuyama River Basin and the remainder of the County.

In addition to the Ventura County Flood Control District, several other agencies responsible for providing drainage of storm waters from, or conveyance of storm waters through, the County include: (a) the various cities; (b) drainage and storm drain districts, and (c) Ventura County itself.

The Ventura County Flood Control District defines *red ine channe s* as channels over which the Flood Control District exercises regulatory jurisdiction. Regulatory jurisdiction does not imply ownership as some of the *red ine channe s* are owned by the Flood Control District and some are owned by others. These *red ine channe s* can either be improved or unimproved.

According to the County Flood Control District, there are a total of 486.46 miles of channels under County Flood Control regulatory jurisdiction.

The County Flood Control channels run the gamut from fully improved concrete channels to unimproved, natural channels. Fully improved channels include: rectangular, trapezoidal, box and pipe. Other channels include natural, shaped (but maintained) and pipe and wire channels.

The staff for the County Flood Control District is the Flood Control Department of the Public Works Agency. The Flood Control Department is also the responsible sponsoring local agency for Federal flood control projects throughout the County, and provides coordination for the Federal Flood

Insurance Program. In addition, the Department is coordinating with the Federal Government in studying coastal erosion and control.

Other functions include coordination of the importation of water into the County, flood fighting and disaster operations, review of land *deve op ents* for flood hazards and effects on water quality, issuance of Watercourse Permits, and operation of a Flood Warning System.

The goal, policies and program which apply to flood control and drainage facilities are as follows:

4.6.1 Goal

Provide adequate and appropriate flood control and drainage facilities to protect life and property from damage or destruction from flood and storm waters.

4.6.2 Policies

1. All necessary flood control and drainage facilities shall be constructed to meet the minimum standards of the Public Works Agency and the County Flood Control District consistent with the *oa s po icies* and *pro ra s* of the General Plan.

2. *iscretionary deve op ent* shall be conditioned to provide flood control and drainage facilities deemed by the Public Works Agency and Flood Control District as necessary for the development, and shall be required to contribute toward flood control facilities necessitated by cumulative *deve op ent*

4.6.3 Program

The Ventura County Flood Control District will periodically update the Comprehensive Plan for Flood Control.

4.7 Law Enforcement and Emergency Services

The Sheriff is the Chief Law Enforcement Officer for the County of Ventura and, as such, has jurisdiction over its unincorporated areas. In 1965, the Sheriff, through a contract, began to provide law enforcement services for the Cities of Thousand Oaks and Camarillo. In 1980, the City of Ojai also contracted for law enforcement services. The City of Moorpark became the fourth municipality to contract in July 1984. More recently, the City of Fillmore contracted for police services in June 1987. To accommodate the responsibilities of the Office of the Sheriff, the department is comprised of seven major divisions: Support Services, West County Patrol, East Valley Patrol, Central County Patrol, Special Services, Custody, and Court Services. The Sheriff s Department is headquartered in Ventura and maintains stations in Camarillo, Fillmore, Lockwood Valley, Moorpark, Ojai, and Thousand Oaks. A new East Valley Law Enforcement Facility located between Thousand Oaks and Simi Valley opened in 1989. As of the summer of 1996, the Sheriff s Department was staffed by 1,126 personnel; including 711 sworn officers.

Inmates in Ventura County are housed at three major facilities: the Pre-Trial Detention Facility located at the Ventura County Government Center in Ventura, the Todd Road Jail located south of Highway 126 between Ventura and Santa Paula and at the Ventura County Branch Jail-Honor Farm Facility at 370 West Baldwin Road in the Ojai Valley. The East Valley Substation at 2201 E. Olsen Road in Simi Valley has a temporary jail holding facility.

Both the Municipal Court and Superior Court are located in the Hall of Justice, located at the Ventura County Government Center Complex at 800 South Victoria Avenue, Ventura. Simi Valley also has a Municipal Court Branch located at 3855F Alamo Street, Simi Valley.

According to County Ordinance 2538, the Sheriff is Director of Disaster (Emergency) Services. Emergency Services planning in Ventura County is conducted in the Sheriff s Department, Support Services Division, Office of Emergency Services. The staff coordinates planning at each government level.

The eight major elements of the Office of Emergency Services work program includes:

1. Emergency Organization Planning and Management.

2. Direction, Control and Warning.

3. Population Protection.
4. Radioactive Contamination, Monitoring and Control.
5. Public Disaster Related Public Education and Emergency Public Information.
6. Emergency Support Services.
7. Hazard Analysis and Mitigation.
8. Multihazards Functional Planning Guidance.

The goals, policies and programs which apply to law enforcement and emergency services are as follows:

4.7.1 Goals

1. Provide for the protection of the public through effective law enforcement and emergency services.
2. Ensure that *discretionary deve op ent* provides adequate private security for the prevention of local crime.
3. The *oa s* of the Sheriff s Department are to:
   - Provide optimum and efficient law enforcement services within the department s jurisdiction.
   - Provide full investigative services including major crime and crime lab services as requested Countywide.
   - Maintain and operate both pre-trial and sentenced custodial facilities and services for all adult clientele.
   - Provide court services and security for both the Superior and Municipal Courts. Provide all aspects of civil court process services.
4. The overall *oa* of the Corrections Services Agency is to provide for community protection by unifying and coordinating correctional services in Ventura County.
5. The overall *oa* of the Municipal Court is to:
   - Process all vehicular violations, and certain parking violations originating from municipal police agencies, Sheriff, Highway Patrol, and various other State and district enforcement agencies.
   - Process all filings involving small claims wherein the jurisdiction does not exceed 1,500, and civil process involving suits not exceeding 25,000.
   - Process misdemeanor offenses punishable by fine or imprisonment in County Jail, not to exceed one year. Offenses classified as infractions, and has jurisdiction over felony preliminary hearings.
6. The overall *oa* of the Superior Court is to provide trial court judicial services for all cases presented to it within its constitutionally established jurisdiction.
7. The overall *oa* of the Ventura County Sheriff s Department Office of Emergency Services is to save lives and protect property by developing *pro ra s* and emergency operational capabilities that mitigate, prepare for, respond to, and recover from any emergency or disaster - whether peacetime or war-related.

4.7.2 Policies

1. The Sheriff s Department shall continue to review *discretionary* permits to ensure that an adequate level of law enforcement can be provided.
2. *iscretionary deve op ent* shall be conditioned to provide adequate site security during the construction phase (e.g., licensed security guard and/or fencing around the construction site,

and all construction equipment, tools, and appliances to be properly secured and serial numbers recorded for identification purposes).

3. *iscretionary deve op ent* shall be conditioned to provide adequate security lighting (e.g., parking lots to be well lighted with a minimum 1 foot candle of light at ground level, lighting devices to be protected from the elements and constructed of vandal resistant materials and located high enough to discourage anyone on the ground from tampering with them).

4. *iscretionary deve op ent* shall be conditioned to avoid landscaping which interferes with police surveillance (e.g., landscaping must not cover any exterior door or window, landscaping at entrances and exits or at any parking lot intersection must not block or screen the view of a seated driver from another moving vehicle or pedestrian, trees must not be placed underneath any overhead light fixture which would cause a loss of light at ground level).

5. The County Sheriff s Department shall maintain mutual aid agreements with incorporated cities to assure efficient service delivery and law protection to all areas of the County.

4.7.3 Programs

1. The County Sheriff s Department will continue to support efforts to organize neighborhood, rural, and industrial crime prevention programs, and conduct residential security surveys.

2. The County Sheriff s Department Office of Emergency Services will maintain and periodically update the Ventura County Multihazard Functional Plan including mitigation measures, preparedness, response, and recovery for the following ten hazard specific contingency sections (i.e. plans):

   - Major Earthquake
   - Major Hazardous Material Incident
   - Flood Hazard
   - Dam Failure
   - Nuclear Defense Emergencies (Nuclear Attack Threat Assessment)
   - Wildland Fire
   - Major Transportation Accidents
   - Landslide
   - Tsunami (& Seiche)
   - Off Shore Oil Incidents

3. The Office of Emergency Services will conduct public education *pro ra s* for the citizens of the County on prevention and preparedness of natural and war-related hazards.

4.8 ire Protection

The Ventura County Fire Protection District is a special district formed on May 16, 1928, and governed by the Board of Supervisors. The Ventura County Fire Protection District protects life and property by providing fire prevention, fire education, fire suppression, and rescue services. The Ventura County Fire Protection District operates 31 fire stations that serve the cities of Camarillo, Moorpark, Ojai, Port Hueneme, Simi Valley, and Thousand Oaks, and all unincorporated regions of Ventura County. The Fire Protection District, in 2004, had a staff of 554 full-time employees, including 419 uniformed employees. The Ventura County Fire Protection District is a partner in the California Master Mutual Aid system and maintains mutual aid agreements with other adjoining fire agencies. Besides the actual fighting of fires, a great deal of time is spent by the Fire Protection District on preventive measures and preparation for combating fires. Fire prevention consists of making inspections of buildings, schools, and homes, making recommendations for fire safety, and enforcing the Uniform Fire Code. Fire Prevention programs are also sponsored through the schools, service clubs, and other organizations.

The goal, policies and programs which apply to fire protection facilities and services are as follows:

4.8.1 Goal

Strive to reduce the loss of life and property by providing effective fire prevention, suppression and rescue services and facilities.

4.8.2 Policies

1. *iscretionary deve op ent* shall be permitted only if adequate water supply, access and response time for fire protection can be made available.
2. Fire stations shall be sited in locations central to the area served and on or near arterial highways so as to minimize call response time.

4.8.3 Programs

1. The Fire Protection District Bureau of Fire Prevention will continue to review all new *deve op ent* to ensure that an adequate level of fire protection can be provided.
2. The Fire Protection District will continue to retain mutual aid-agreements with all adjacent cities, and counties, incorporated cities within the County, military installations and other appropriate Federal agencies such as the U.S. Forest Service. The Ventura County Fire Protection District is a partner in the California Master Mutual Aid system.
3. The Fire Protection District will continue to participate in coordinating efforts of other Federal, State and local agencies to accomplish joint arson investigation and resource sharing.

4.9 Education and Library acilities and Services

There are 20 public school districts serving the elementary and secondary school needs in Ventura County:

- Conejo Valley Unified School District (Thousand Oaks, Newbury Park and Westlake)
- Fillmore Unified School District (Fillmore, Bardsdale, Piru and Northeast portion of the County)
- Moorpark Unified School District (Moorpark)
- Oak Park Unified School District (Oak Park and Agoura)
- Ojai Unified School District (Ojai Valley)
- Simi Valley Unified School District (Simi Valley)
- Ventura Unified School District (Ventura, Montalvo, Oak View and Saticoy)
- Hueneme Elementary School District (Oxnard, Port Hueneme, and Hollywood Beach)
- Ocean View Elementary School District (Southern portion of Ventura County including Santa Monica Mountains Area)
- Oxnard Elementary School District (Oxnard and beach areas)
- Rio Elementary School District (El Rio and Oxnard areas)
- Mesa Union Elementary School District (rural area between Saticoy and Somis)
- Pleasant Valley Elementary School District (Camarillo, Camarillo Heights and Las Posas)
- Somis Union Elementary (Somis)
- Briggs Elementary School District (West rural Santa Paula)
- Mupu Elementary School District (North rural Santa Paula)
- Santa Clara Elementary School District (East rural Santa Paula)
- Santa Paula Elementary School District (Incorporated Santa Paula)
- Oxnard Union High School District (Oxnard, Port Hueneme and Camarillo area)
- Santa Paula Union High School District (Santa Paula area)

The primary function of the County Superintendent of Schools is to act as an intermediary agency between the Federal and State Government and the local school districts and private schools. In this capacity, the office assists school districts and private schools with administrative, business and fiscal, and educational affairs through the implementation of special programs, services, and legislative mandates.

The Ventura County Superintendent of Schools also provides a special education program, occupational training program and the Gateway Community Schools and Court School.

California State University Channel Islands opened its Camarillo campus in fall 2002. The state funded university will serve residents in Ventura, western Los Angeles, and southeastern Santa Barbara counties.

Ventura County Community College District is responsible for providing public community college education in Ventura County. The Community College District operates three colleges: Ventura College, Moorpark College, and Oxnard College. These colleges serve all communities in the County, except for an area to the northwest of the County that is served by the Kern Community College District.

Ventura County is served by four independent public library jurisdictions: the Ventura County Library, the City of Oxnard, Blanchard-Santa Paula Public Library and the City of Thousand Oaks.

The Ventura County Library operates 15 community, and special libraries. The County Library administrative office is located at 646 County Square Drive, Suite 150, Ventura. The ordering, automation, and cataloging facility is located at 196 South Fir Street, Ventura. Community and special libraries are located as follows:

- Avenue Library (Ventura)
- Camarillo
- Albert H. Soliz
- Fillmore
- E. P. Foster (Ventura)
- Historical Museum Library (Ventura)
- Meiners Oaks
- Moorpark
- Oak Park
- Oak View
- Ojai
- Piru
- R. D. Prueter (Port Hueneme)
- Saticoy
- Simi Valley
- H.P. Wright Library (Ventura)

The goals, policies and programs which apply to education and library facilities and services are as follows:

4.9.1 Goals

1. Promote quality public education services and educational facilities in order to achieve maximum opportunity for the education of residents of all ages and socioeconomic levels.
2. Goals of the Office of the County Superintendent of Schools are:
   - To provide leadership and direction in the development and implementation of the best possible educational programs throughout Ventura County.
   - To provide services, programs, and support for the purpose of maintaining the efficient and effective operation of district and County educational programs.
   - To operate Countywide educational programs for students when it is not feasible or practical for local districts to do so.
   - To maintain a public information program on educational matters.
   - To assist school district implementation of educational programs or procedures as mandated, requested or recommended by the State Department of Education.
3. The overall goal of the Ventura County Community College District is to meet the educational needs of all eligible students by offering comprehensive programs and services.
4. The goal of the California State University System is to provide eligible California students with high-quality, affordable access to higher education.
5. The goal of the Ventura County Library is to provide to all individuals free access to books, other materials, and services to support their informational, recreational, cultural and self-education needs.

4.9.2 Policies

1. School sites should be integrated with parks wherever possible.

2. School facilities should be available for community activities when feasible.
3. Community library facilities shall be sited in central locations of the community to be served. Site selection criteria shall consider:
   - Convenient access, preferably on or near the Community s major vehicular and pedestrian traffic routes.
   - Adequate off-street parking.

4.9.3 Programs

1. The Planning Division will continue to work with the County Superintendent of Schools Office and the various school districts in the County concerning school site dedications and fee assessments.
2. The County Planning Division will continue to coordinate an exchange of information with local school districts regarding school facilities needs and site planning for new schools in conjunction with new residential *deve op ents*.
3. The Building and Safety Division will continue to collect the duly authorized *deve op ent* fees for school district projects prior to issuance of building permits.
4. School districts should continue to pursue conversion of those facilities that are no longer needed for public education to community uses such as parks, recreation center or private schools.
5. The Library Services Agency will continue to work with cities served in the development of financial partnerships to expand or replace existing facilities.

4.10 Par s and Recreation

In Ventura County the abundance of natural recreation resources has given rise to establishment of many recreation facilities. A wide variety of agencies provide these facilities. At the Federal level, Ventura County contains the Los Padres National Forest, the Santa Monica Mountains National Recreation Area and the Channel Islands National Monument. State parks and open space lands are located along the coast, within the Santa Monica Mountains area and at Hungry Valley State Recreation Area. The above facilities attract patronage from a much greater area than Ventura County alone. The Casitas Municipal Water District and United Water Conservation District provide facilities at Lake Casitas and Lake Piru respectively. At the local level, facilities are provided by the County, the cities and three recreation and park districts.

Recreation facilities can be divided into two main categories: regional and local. A *re iona recreation area* is an extent of land which, by its unique natural character or unusual or extensive development, offers recreation opportunities that attract patronage from beyond the local vicinity without regard to physical, political or municipal boundaries. *oca parks* provide facilities to serve the daily needs of a neighborhood or group of neighborhoods within an urban community. The specific facilities should be determined by assessing the needs of the community. Recreation areas can also serve the ancillary purposes of preserving open space, providing water resources, buffering urban land uses and preserving biological, cultural and scenic resources.

The majority of County residents receive local park service from a local city or recreation and park district. The Pleasant Valley Recreation and Park District provides local park facilities in the Camarillo area. The Rancho Simi Recreation and Park District serves the Simi Area and the Rancho Conejo Recreation and Park District provides local and some regional facilities and an extensive trail system in the Thousand Oaks vicinity. The above District s service areas extend into unincorporated territory outside the principal cities. Other incorporated cities provide recreation services through their own recreation departments. Some cities also operate regional recreation facilities. The Public Facilities and Services Appendix contains a more extensive listing of recreation facilities.

The County of Ventura provides recreation services through the General Services Agency, Recreation Services. The primary focus of the County is to provide regional recreation facilities. The County also provides local park facilities in unincorporated areas of the County not served by other agencies. The County operates community recreation centers in Oak View, Casitas Springs, El Rio, Saticoy and Piru.

Trails are another category of recreation facility. The Los Padres National Forest and Santa Monica Mountains National Recreational Area contain extensive trail systems. Local trails exist in many areas of the County. The County, and many other public and private organizations, have been attempting to establish an interconnected trail network throughout the County. Trails can be established on public lands and easements or by obtaining easements through private lands.

Funding limitations on recreation services are a perennial problem. Decreasing availability of Federal and State revenues together with local funding shortages threaten the ability of the County to keep pace with service demand. Innovative utilization of donations, grant sources, volunteer labor and public-private joint ventures can fill the revenue gap. The County has adopted local parkland dedication requirements, (Quimby Ordinance), pursuant to the State Subdivision Map Act to fund the development and renovation of neighborhood and community recreation facilities.

The goals, policies and programs which apply to recreation facilities are as follows:

4.10.1 Goals

1. Acquire, develop and operate a system of recreation facilities to meet the recreation needs of County residents.
2. Pursue an equitable, independent, and reliable method of financing the planning, acquisition, *deve op ent*, operation and maintenance of recreation facilities.
3. Promote a coordinated effort by all government entities to assure the provision of a complete range of recreational opportunities for all ages and interests in all areas of Ventura County.
4. Promote the multi-use of existing physical resources through coordination with other public and quasi-public agencies (i.e., utility easements, flood control easements, school district facilities, etc.).
5. Establish or assist in the establishment of a Countywide network of trails which will meet the needs of equestrians, bicyclists, hikers and other trail user groups.
6. Provide, or encourage the provision of, *oca park* and recreation facilities and *pro ra s* to serve the residents of the unincorporated territory of Ventura County where an equitable financing plan can be established with minimal use of County General Fund revenues.
7. Ensure compatibility between recreation facilities and adjoining land uses.

4.10.2 Policies

1. The County shall maintain and enforce the local parkland dedication requirements (Quimby Ordinance), to acquire and develop neighborhood and community recreation facilities. Parkland dedication shall be based on a standard of five acres of local parkland per thousand population, including neighborhood and community parks.
2. *iscretionary deve op ent* which would obstruct or adversely impact access to a public recreation resource shall be conditioned to provide public access as appropriate.
3. Developers shall be encouraged to make unused open space available for recreation.
4. The County shall require reservation of land for public purchase, pursuant to the County Subdivision Ordinance, where requested by a recreation agency.
5. County facilities (e.g., flood control channels and easements) shall be made available for recreational use as appropriate.
6. New recreation facilities shall be consistent with the General Plan and oning Ordinance.

4.10.3 Programs

1. The General Services Agency will prepare and update a County Recreation Plan to evaluate demand, establish facility needs, and prioritize proposed facility development.
2. The General Services Agency will develop, implement and maintain an ordinance to collect development fees to provide for regional recreation facility development.

3. The General Services Agency will coordinate the location, planning, and functional use of all County recreation facilities with affected local governmental entities and, where feasible, promote joint acquisition and/or development to assure effective coverage of all needs.
4. The General Services Agency and Planning Division will review discretionary entitlement requests for impact to recreation opportunities and resources.
5. The General Services Agency shall prepare, for consideration by the Board of Supervisors, a Regional Recreation Facilities Fee Ordinance to fund regional recreational facilities. The proposed funds would finance acquisition of land and construction of a variety of facilities along the regional trails within the General Services Agency's jurisdiction, including equestrian, hiking and backpacking trailheads.

4.11 Other Public uildings and Grounds

Federal installations, facilities and lands include defense installations (Point Mugu Pacific Missile Test Center and Naval Air Weapons Station and Port Hueneme s Naval Construction Battalion Center) and recreation and conservation oriented facilities and lands, including Los Padres National Forest. San Nicolas Island is part of the Navy s Pacific Missile Test Center Sea Test Range and is also one of the State s key wildlife and environmental preservation areas. Other Federal lands and facilities, including the Santa Monica Mountains National Recreation Area, Anacapa Island and the Channel Islands National Park Visitor Center, are discussed in the Public Facilities and Services Appendix (Section 4.10 on Parks and Recreation).

- Point Mugu Pacific Missile Test Center and Naval Air Weapons Station: The 4,500 acre Point Mugu facility is located at the western end of the agricultural lands of the Oxnard Plain, six miles southeast of Oxnard and 7 miles southwest of Camarillo. Approximately 8,000 military and civilian personnel work at Point Mugu with an additional 3,000 dependents living in the area near the base. The main base complex houses extensive test laboratory and support facilities, and two runways capable of handling all modern aircraft types.
- Naval Construction Battalion Center Port Hueneme: Another Federal defense installation located in Ventura County is the U.S. Naval Construction Battalion Center located within the City of Port Hueneme. The center is home of the Navy s famous Seabees. This base covers more than 1,600 acres, has more than 40 miles of roads and streets and 26 miles of railroad tracks.
- Los Padres National Forest: The Los Padres National Forest covers 555,618 acres or 868.15 square miles of the 1,884 square mile area of Ventura County (approximately 46 of the land area of the County). Facilities within Los Padres National Forest include roads, trails, campgrounds, dams and buildings.
- San Nicolas Island: The 14,000 acre (21.875 square miles) island is located approximately 60 miles off the coast of Point Mugu. San Nicolas Island is part of the Navy s Pacific Missile Test Center Sea Test Range. Approximately 350 employees, including military and civilian, staff the outlying landing field and the Naval Facility at San Nicolas Island. San Nicolas Island is also one of the California s key wildlife and environmental preservation areas.

State public facilities and lands include the Camarillo State Hospital and California State Youth Authority (Ventura School). Hungry Valley State Vehicular Recreation Area and the various State parks and beaches are discussed in Section 4.10 of the Public Facilities and Services Appendix.

- Camarillo State Hospital: Camarillo State Hospital, built in 1932, is located 4 miles southeast of Camarillo on a 976 acre site, with the farm portion of 435 acres leased out. The State Hospital is licensed for 1,503 beds for the mentally disabled and developmentally disabled.
- California State Youth Authority (CYA) - Ventura School: CYA is located on a 110 acre site at the southwest corner of Wright Road and Beardsley Road, Camarillo, approximately 3 miles northwest of Camarillo City Hall. This site was formerly a Youth Authority institution for female offenders only. It presently a co-ed institution for youthful offenders ages 17-25.

Ventura County owns or leases a multitude of buildings and facilities. Most of these have been addressed in previous section of the Public Facilities and Services Chapter and in the Public Facilities and Services Appendix.

Ventura County buildings and facilities not previously discussed in earlier portions of the Public Facilities and Services Chapter are owned or leased by the following County agencies and/or departments:

- Agricultural Department (Agricultural Commissioner)
- Animal Regulation Department
- General Services Agency (GSA)
- Health Care Agency (HCA)
- Personnel Department
- Public Social Services Agency (PSSA)
- Public Works Agency (PWA)
- Resource Management Agency (RMA)

The goals, policy and programs which apply to other public buildings and grounds are as follows:

4.11.1 Goals

1. Ensure a continuing, cooperative planning and working relationship between the County of Ventura and the respective State and Federal Government Agencies in sharing information relative to existing and proposed State and Federal facilities.
2. Ensure that Federal and State facility planners are adequately informed of applicable County regulations, standards and land use *po icies* in order to minimize conflicts with the County Planning Program.
3. Ensure that the location and design of new County buildings and grounds are consistent with the *oa s po icies* and *pro ra s* of the General Plan.

4.11.2 Policy

Proposed County buildings and grounds in the unincorporated area of the County shall be consistent with the *oa s po icies* and *pro ra s* of the County General Plan.

4.11.3 Programs

1. The County will continue to provide input on environmental documents for proposed modifications to Federal and State facilities to ensure all adverse consequences are adequately identified and mitigated as feasible.
2. The County will cooperatively work together with Federal and State Government Agencies to ensure that new expansions to existing State and Federal facilities or new facilities are compatible with the County General Plan and meet the needs of the County residents.
3. County agencies and departments will encourage Federal and State agencies to fully comply with the County General Plan and other County adopted regulations, standards and policies.

igure 4
Public acilities Map
(separate document)

Click above to go to map

Glossary

An attempt has been made to define all technical words contained in the text. If a technical word is not defined, often the word can be found in a standard dictionary. In using the glossary, the reader will note that many technical words appear within the definitions themselves. Definitions of these words can also be found in this glossary.

Acre-foot: A unit of volume of water equal to 325,900 gallons (43,560 cubic feet).

Active Fault: See *au t*.

Active Fault Zone: See *au t* : *au t one*

Airport: Any area of land or water which is used, or intended for use, for the landing and take-off of aircraft, and any appurtenant areas which are used, or intended for use, for airport buildings or other airport facilities or rights of way, and all airport buildings and facilities located thereon.

Archaeological Resources: The material remains (artifacts, structures, refuse, etc.) produced purposely or accidentally by human beings.

Attainment Area: An area which is shown by monitorial data or which is calculated by air quality modeling to be in compliance with any national ambient air quality standard.

Average Daily Traffic (ADT): The year-round daily average number of vehicle movements, combined for both directions, past a given point.

Bikeway: Means all facilities that provide primarily for bicycle travel. The following categories of bikeways are defined in Section 2373 of the Streets and Highways Code:

> *Class I Bikeway* A bike path or trail within a completely separated right-of-way designated for the exclusive use of bicycles and pedestrians with cross flows by motorists minimized.
>
> *Class II Bikeway*: A bike lane within a restricted road right-of-way designated for the exclusive or semi-exclusive use of bicycles with thorough travel by motor vehicles or pedestrians prohibited, but with vehicle parking and cross flows by pedestrians and motorists permitted.
>
> *Class III Bikeway*: A bike route within a road right-of-way designated by signs or permanent markings and shared with pedestrians or motorists.

Biological Resources: Includes plant and animal species and their habitats, plant communities and ecosystems.

Building Coverage: The ratio of the area of land covered by buildings to total lot area, expressed as percent coverage. For purposes of this definition, building is any structure having a roof supported by columns or walls, and building area is the area included within the surrounding exterior walls or columns of a building, exclusive of courts.

Catastrophic Earthquake: An earthquake having a magnitude (M) of 8.3 or greater.

Candidate Species: Any species that is under consideration for a Federal designation by the Secretary of the Interior, but has not yet received that designation and is designated candidate by the U.S. Fish and Wildlife Service.

City Thoroughfare: A *thorou h are* located within and maintained by a city.

Coastal Habitat: Environmentally sensitive habitat areas in the Coastal one which support plant or animal life, including coastal waters, intertidal areas, estuaries, lakes, wetlands and sand dunes.

Community Sewage Treatment Facilities: Plants that treat liquid waste that is received from off of the plant site. They include public agency and privately owned facilities. See *n-Site Waste ater reat ent aci ities*.

Conservation: The management of natural resources to prevent waste, destruction, or neglect.

County thoroughfare: A *thorou h are* located within the unincorporated area and maintained by the County.

Cultural Resources: Is most frequently identified with prehistoric or historic items. These include prehistoric districts, sites, structures, artifacts and other evidence of human use considered to be of importance to a culture, subculture, or a community for traditional, religious, scientific or other reasons.

Dam: Any artificial barrier, together with appurtenant works, which impounds or may impound or divert water, and which either:

(a) is or will be 25 feet or more in height from the natural bed of the stream or watercourse at the downstream toe of the barrier, as determined by the State Department of Water Resources, or from the lowest elevation of the outside limit of the barrier, as determined by the State Department of Water Resources, if it is not across a stream channel or watercourse, to the maximum possible water storage elevation, or

(b) has or will have an impounding capacity of 50 acre-feet or more.

Dam Inundation: The flooding that occurs as the result of structural failure of a dam.

Development: The subdivision of land; construction or alteration of structures, roads, utilities, and other facilities; installation of septic systems; grading activities; depositing of refuse; disposal of any material; dredging or mineral extraction, debris or fill materials; and the clearing of natural vegetation with the exception of agricultural activities. Routine repair and maintenance activities are not included.

Discretionary Development: Any development proposal, project or permit which requires the exercise of judgment, deliberation, or decision on the part of the decision-making authority in the process of approving or disapproving a particular activity, as distinguished from situations where the decision-making authority merely has to determine whether there has been conformity with applicable statutes, ordinances, or regulations.

Disposal Site: The location where any final abandonment, discard, or deposition of waste occurs.

Drilling Mud: A dense colloidal slurry or gel used in oil and gas drilling, and circulated through the well bore to facilitate the drilling process. Drilling mud is generally composed of bentonite clay, fresh water or saturated salt mixtures, and barite or naturally occurring barium sulphate ore. Oil-based drilling muds are considered hazardous wastes because they usually contain heavy metals or other toxic substances.

Earthquake Fault Hazard Zone(s): ones delineated by the California State Geologist to encompass *active au ts*. The Alquist-Priolo Earthquake Fault oning Act is intended to provide policies and criteria to assist local and state agencies in regulating development near active faults so as to mitigate the hazard of surface fault rupture. Note: The Act was amended resulting in a name change from Alquist-Priolo Special Studies one Act to Alquist-Priolo Earthquake Fault oning Act.

Endangered Species: A species listed as Endangered by the State or U.S. Fish and Wildlife Service. Generally, any native species or subspecies of a bird, mammal, fish, amphibian, reptile or plant which is in serious danger of becoming extinct throughout all, or a significant portion, of its range other than a species of the Class Insecta determined by the Secretary of the Interior or Commerce to constitute a pest whose protection under the provisions of this Chapter 35 of Title 16 of the U.S. Code would present an overwhelming and overriding risk to man.

Environmentally Sensitive Biological Resource Area: Any area in which plant or animal life or their habitats are either rare or especially valuable because of their special nature or role in an ecosystem and which could be easily disturbed or degraded by human activities and developments.

Essential Facilities: Structures or buildings that must be safe and usable for emergency purposes after a natural or human-induced disaster in order to preserve the health and safety of the general public. Such facilities, as defined in the California Building Code, are:

- Hospitals and other medical facilities having surgery or emergency treatment areas.
- Fire, police, and sheriff stations.
- Tanks or other structures containing, housing or supporting water or other fire-suppression materials or equipment required for protection of essential or hazardous materials facilities or special occupancy structures.

- Emergency vehicle shelters and garages.
- Structures and equipment in emergency-preparedness centers.
- Stand-by power generating equipment for essential facilities.
- Structures and equipment in government communication centers and other facilities required for emergency response.

  (see Special Occupancy Structure)

Expansive Soils: Soils that expand or swell (increase in volume) when wet and contract or shrink (decrease in volume) when dried.

Expressways: Roadways similar to freeways except that they do not have grade separated interchanges.

Extinct: Ceased to exist. No longer living.

Farmland of Local Importance: A category of the Important Farmlands Inventory. Generally includes lands of importance to the local agricultural economy, as determined by each County. Such lands support a crop that is crucial key to the local economy. This farmland is not irrigated and includes such dry land crops as beans or grain.

Farmland of Statewide Importance: A category of the Important Farmlands Inventory. Generally includes lands with a good combination of physical and chemical features for the production of agricultural crops. The criterion is basically like that of prime farmland but there is no minimum soil depth limitation and no permeability restriction. They have broader water holding capacity and moderate erosion hazard.

Fault: A fracture in the earth s crust accompanied by displacement of one side of the fracture with respect to the other side. This term is used in the following contexts:

Active Fault: A *au t* that has had surface displacement within the last 11,000 years (Holocene Time). Faults that lack evidence for Holocene displacement at a particular locality may be determined to be active based on data from another locality.

Fault Hazard Area: Land within about 660 feet of *active au ts*. These areas generally require the evaluation of the fault hazard prior to any planned development for human occupancy.

Fault Trace: The line formed by the intersection of a *au t* with the earth s surface.

Fault Zone: A fault that is exposed as a zone of numerous fractures or breaks.

Inactive Fault: A fault that shows no evidence of movement in the last 1.6 million years.

Potentially Active Fault: A fault known to have been active in the Pleistocene Epoch (last 1.6 million years), but cannot be shown to be inactive in the Holocene Period, or a fault that has a high potential for surface rupture and is well defined as a physical surface feature.

Federal Highway: A numbered federal route (i.e., U.S. 101 - Ventura Freeway).

Fire Break: A natural or artificial barrier where vegetation has been removed for fire control purposes. (see *ue reak*)

Fire Hazard Area: An area where, due to slope, fuel, weather, or other fire-related conditions, the potential loss of life and property from fire necessitates special fire protection measures and planning before development occurs.

Flood Plain: A plain bordering a river or stream subject to flooding. The flood plain is divided into two hazard areas:

Floodway: The portion of the flood plain that carries the deep and fast-moving water (usually defined as the area needed to contain a 100-year storm flow).

Flood Fringe Area: The remainder of the flood plain, subject to shallow, slow moving water.

Flowage Easement: An easement that is utilized to define an area subject to flooding and which allows an agency to inundate the land with flood water and prevent obstruction of flow.

Freeways: Roadways that primarily carry intercity and regional traffic via controlled access divided roads with grade-separated interchanges and no access to adjacent properties.

Fuel Break: Wide strips of land on which plants have been thinned, trimmed or pruned, or have been changed to types, which burn with lower intensity so that fires can be more easily extinguished. (see *ire reak*)

Fuel Modification Zone: See *ue reak*.

Gas Scrubber Sludge: The liquid or slushy waste remaining after wet gas is put through a water or chemical wash to remove impurities and debris such as silt and clay. This waste can be considered hazardous because of Sulphur and hydrocarbon content.

Goal: The ultimate purpose of an effort stated in a way that is general in nature.

Grazing Land: Lands on which the existing vegetation is suited to the grazing of livestock.

Greenbelt Agreement: A joint resolution between interested cities and/or the County to protect open space and agricultural lands and to reassure property owners located within these areas that lands will not be prematurely converted to agriculturally incompatible uses.

Guidelines for Orderly Development: A policy document adopted by the County, cities and LAFCO. The intent of the Guidelines is to clarify the roles and responsibilities of the cities, the County and LAFCO regarding urban development within the Spheres of Influence of the various cities and Areas of Interest.

Habitable Structure: A building or structure suitable for living, sleeping, eating or cooking.

Hazardous Building: A substandard, unsafe or dangerous building as defined in the codes adopted by reference in the Ventura County Building Code.

Hazardous Materials Storage Facilities: Structures, as defined in the Building Code, for housing, supporting or containing sufficient quantities of toxic or explosive substances to be dangerous to the safety of the general public if released.

Hazardous Material: Any material that because of its quantity, concentration, or physical or chemical characteristics, poses a significant present or potential hazard to human health and safety or to the environment if released into the workplace or the environment. Hazardous materials include hazardous substances, *ha ardous aste*, and any material which a handler or the administration agency has a reasonable basis for believing that it would be injurious to the health and safety of persons or harmful to the environment if released into the workplace or the environment (California Health and Safety Code section 25501). Such material may be classified as poisons, corrosive chemicals, flammable material, explosives and oxidizers and reactive materials or substances when tested in accordance with the criteria in California Code of Regulations, Title 22.

Hazardous Waste: Any waste or combination of wastes, which because of its quantity, concentration, physical or chemical, or infectious characteristics, (a) may either cause or significantly contribute to serious illness or death or an increase in serious irreversible or incapacitating reversible, illness (Hazardous Waste Control Act), or (b) may pose a substantial present or potential threat to human health or the environment when improperly managed. These substances may be poisons, corrosive chemicals, flammable materials, explosives and oxidizers and reactive materials or substances when tested in accordance with the criteria in California Code of Regulations, Title 22.

Hazardous Waste Site: The location where hazardous waste is handled, stored, treated or disposed.

High Fire Hazard Area: An area in the unincorporated territory of the County designated by the County Fire Protection District as an area of uncultivated brush, grass, or forest-covered land, and land within 500 feet of such area, wherein authorized representatives of said District deem a potential fire hazard to exist due to the presence of such flammable material.

Historical Resources: The material and nonmaterial expressions of human adaptations that characterized the post-contact or historic period. These resources include historic event or activity

sites, historic archaeological sites, standing architecture and other significant properties and documents and other sources of historical information, objects of material culture, and secondarily, the more nonmaterial cultural qualities such as folklore, social organization, and value systems which are associated with these properties.

Inactive Fault: See *au t*.

Incident: Any occurrence that causes the use of emergency resources.

Income Categories: Various categories of income as defined by the U.S. Department of Housing and Urban Development (HUD):

Upper-Income: Greater than 120 of County median income.

Moderate-Income: Less than 120 , but greater than 80 of County median income.

Lower-income: Category of income comprised of low-income, very low-income, and extremely low-income.

Low-income: Less than 80 , but greater than 50 of County median income.

Very low-income: Less than 50 , but greater than 30 of County median income.

Extremely low-income: Less than 30 of County median income.

Individual Sewage Disposal System (ISDS): See *n Site Septic Syste s*.

Landslide/Mudslide: The movement of a mass of rock, soil, or mixture of both (debris/mud flow) down a slope. Landslides can be classified in two ways: the first describes the material and the second describes the type of movement (e.g. rock fall, mudflow). The type of material is usually one of three; rock, debris, soil. The movement is grouped into one of five types: falls, topples, slides, spreads, and flows.

Landslide/Mudslide Hazard Area: An area with a high potential for landsliding, such as landslide deposits, very steep slopes, areas within or adjacent to fault zones, areas with adverse geological formations which are susceptible to failure and areas where the availability of water influences the strength of the slope forming materials.

Lanes: The number of through traffic lanes exclusive of merging and acceleration/deceleration lanes.

Leachate: Contaminants such as fertilizer residues, industrial chemicals and landfill wastes percolate through soil by the action of a liquid, such as water.

Level of Service (LOS): The traffic condition of a road/intersection based on a six-step hierarchy outlined as follows:

LOS	Traffic Conditions
A	Free uninterrupted low volume flow at high speeds with no restriction on maneuverability (lane changing) and with little or no delays.
	Stable flow with some restrictions to operating speed occurring.
C	Stable flow but with speed and maneuverability restricted by higher traffic volumes. Satisfactory operating speed for urban locations with some delays at signals.
D	Approaching unstable flow with tolerable operating speeds subject to considerable and sudden variation, little freedom to maneuver and with major delays at signals.
E	Unstable flow with volume at or near capacity, lower operating speeds and major delays and stoppages.

Forced flow operation with low speeds and stoppages for long periods due to downstream congestion. Volumes below capacity.

Liquefaction: A process by which water-saturated granular soils change from a solid to a liquid state, usually as a result of ground shaking.

Liquefaction Hazard Area: An area with a potential for liquefaction.

Littoral Cell: A section of shoreline where the flow of sand begins at a major sediment source and terminates at a major sediment sink, such as a submarine canyon.

Locally Important Community: A plant or animal community that is considered by qualified biologists to be a quality example characteristic of or unique to the County or region.

Locally Important Species: A plant or animal species that is not an endangered, threatened or rare species, but which is considered by qualified biologists to be a quality example or unique species within the County or region. This term includes any species that is under consideration for a designation of endangered , threatened or rare .

Local Park: Is a facility that provides recreation opportunities, including programmed activities and/or passive leisure facilities to serve the daily needs of a neighborhood or group of neighborhoods within an urban community.

Local Road Network: The road system in Ventura County consisting of County and city maintained *oca streets/roads*

Local Streets/Roads: Roads not depicted on the Public Facilities Map (Ventura County General Plan Goals, Policies and Programs – Figure 4). Most such roads are intended primarily to provide direct access to adjacent properties and do not convey substantial volumes of through traffic.

LOS: See *eve o Service*.

Major Collectors: County or city *thorou h ares* that carry traffic between local streets/roads and arterials and have access to adjacent properties.

Mineral Resource Development: The exploration for or extraction of surface or subterranean compounds and materials; this includes oil and gas exploration and production, and the mining of metallic and nonmetallic minerals, sand, gravel and rock.

Mineral Resource Zones (MRZ's): The County s aggregate resources are classified by the State as one of several different mineral resource zone categories (MR -1, MR -2, MR -3, MR -3(a) and MR -4). These classifications are generally based upon the relative knowledge concerning the resource s presence and the quality of the material. The State-adopted definitions of each classification follow:

MRZ-1: Areas where adequate information indicates that no significant mineral deposits are present, or where it is judged that little likelihood exists for their presence. This zone shall be applied where well developed lines of reasoning, based upon economic geologic principles and adequate data, demonstrate that likelihood for occurrence of significant mineral deposits is nil or slight.

MRZ-2: Areas where adequate information indicates that significant mineral deposits are present or where it is judged that a high likelihood for their presence exists. This zone shall be applied to known mineral deposits or where well-developed lines of reasoning, based upon economic geologic principles and adequate data, demonstrate that the likelihood for occurrence of significant mineral deposits is high.

MRZ-3: Areas containing mineral deposits, the significance of which cannot be evaluated from available data.

MRZ-3(a): Areas, judged on the basis of the limited available geologic data and fieldwork, to have higher potential as sources of aggregate material suitable for Portland cement concrete than other deposits classified MR -3.

MRZ-4: Areas where available information is inadequate for assignment to any other MR zone.

Mining: A form of mineral resource development involving the extraction and removal of more than 1,000 cubic yards of material from the same site, through such activities and uses as borrow areas, sand, gravel and rock quarries, etc. Mining does not include extraction and removal of material from construction sites or following floods, landslides or natural disasters where the land is being restored to its prior condition.

Minor Collectors: Roads which are similar to major collectors but do not function as thoroughfares (not shown on the Regional Road Network maps).

Multihazard Functional Plan: A State mandated planning document prepared and maintained by the Sheriff's Office of Emergency Services that includes mitigation measures, preparedness responses and recovery strategies for twelve specific hazard contingency areas of concern.

Noise Sensitive Use: Dwellings, schools, hospitals, nursing homes, churches and libraries.

Nonattainment Area: An area which is shown by monitorial data or which is calculated by air quality modeling to exceed any national ambient air quality standard.

Nonpoint Source Pollutants: Pollutants that wash off, run off, or seep from broad areas of land or water.

Notice of Hazards: A recorded notice filed with the County Recorder based upon a geologic and/or soil report, which identifies a known hazard located on a portion of the described property. This Notice of Hazard is recorded to protect potential buyers of real estate in areas of known natural hazards. Examples of natural hazards include: fault hazard, ground shaking, liquefaction, landslide/mudslide, subsidence, expansive soil, flood hazards and coastal wave hazards and erosion.

Off-Site Waste Treatment Facilities: Those facilities which accept wastes from outside their permit boundaries for treatment to change the physical, chemical or biological characteristics of the waste so as to render it less harmful to the quality of the waters of the State, safer to handle, easier to contain or manage, including use as a fuel, nutrient or soil amendment.

On-Site Septic Systems: Those liquid waste systems that dispose of sewage generated by individual residences and businesses in unsewered areas. A conventional *ndividua Se a e isposa Syste S S* usually includes a septic tank and either a seepage pit or leach lines. Mound systems and subsurface sand filtration systems are two alternative ISDS that may be approved for use in areas where there are shallow soils over bedrock, high groundwater (either seasonal or permanent), or fractured bedrock. They are restricted for use only under specific conditions and guidelines in those areas of the County where community sewer systems are not available and on-site conditions preclude the use of conventional septic tank/soil absorption systems. Only domestic wastes (i.e., human waste from everyday living activities) can be discharged into a septic system.

On-Site Wastewater Treatment Facilities: Plants that treat liquid waste that is generated on the same project site where the plant is located, with both the plant and the project site under common ownership. These plants are sized to serve only the project site, and cannot serve uses off-site or under different ownership.

Open Space: Is any parcel or area of land or water which is essentially undeveloped for human use and devoted to an open space use, such as the preservation of natural resources, managed production of resources, outdoor recreation, and preservation of public health and safety.

Paleontological Resources: The fossilized remains of ancient plants and animals.

Permanent potable water supply - A continuous water supply source and delivery system that will serve a *deve op ent* for its expected life span. "Life span" means the period of time that the land uses and structures are expected to be in existence or utilized.

Point Source Pollutants: Pollutants that enter the water from discernible, confined, and discrete conveyances (such as sewer pipes, culverts, tunnels, or other channels or conduits). These include seawater intrusion, agricultural erosion, septic tanks, and storm water runoff.

Policy: A specific statement guiding action and implying clear commitment.

Potentially Active Fault: See *au t*.

Preservation: Use of long-term or permanent safeguards to guarantee the viability of natural or man-made resources.

Primary Arterials: County or city thoroughfares (usually six or more lanes- divided) primarily for the purpose of the movement of through traffic with limited access to abutting property.

Prime Farmlands: A category of the Important Farmlands Inventory. Generally includes land with the best combination of physical and chemical characteristics for the production of crops. Prime farmlands are irrigated soils over 40 inches deep with a water holding capacity of four inches or more. They are generally well drained, free from frequent flooding, and have very slow sub-soil permeability or freezing soil temperature.

Program: A coordinated set of measures to carry out goals and policies.

Protected Resource: Is a mapped designation that appears on the Resource Protection Map and serves to identify areas of the County that contain resources identified in the Resources Chapter as needing special regulatory measures.

Rare Species: A species listed as Rare by the State. Generally any species that exists in such small numbers, or is so limited geographically, or that is unable to displace other species in competition, or is under protection or management programs, such that it may be endangered if its habitat was reduced or significantly altered.

Red Line Channels: Channels over which the Watershed Protection District exercises regulatory jurisdiction.

Regional Recreation Area: An extent of land which, by its unique natural character or unusual or extensive development, offers recreation opportunities that attract visitors from beyond the local vicinity without regard to physical, political or municipal boundaries.

Regional Road Network: The road system in Ventura County consisting of the following roads:

- Federal highways
- State highways
- County thoroughfares
- City thoroughfares

Regulatory Flood: The magnitude of the flood chosen by a governmental agency for planning purposes.

Release of Hazardous Material: Any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing into the environment of a hazardous material.

Renewable Energy: Energy sources that are not depleted by use and are available as natural flows of energy and materials in the environment, e.g. solar, wind, falling water, plant matter, and by-products of human activities.

Renewable Resources: Self-perpetuating types of resources; living or biotic resources and resources that are finite in quantity but can be reused, such as air and water. Other renewable natural resources include solar, wind, biomass, and water resources.

Reservoir: Any receptacle that contains or will contain the water impounded by a dam.

Resource Protection Map: The policy map of the Goals, Policies and Programs Resources Chapter (Figure 1), that delineates Mineral Resource Areas, Scenic Resource Areas and Scenic Highway Areas.

Road Cross Section: See *anes*.

Selected Flood: See *Re u atory ood*.

Scenic Highway Area: The viewshed corridor one-half mile on both sides of a state or County designated scenic highway as shown on the Goals, Policies and Programs Resource Protection Map (Figure 1).

Scenic Resource Area: 1) Scenic resource areas are areas as may be identified by an area plan; and 2) The area encompassing lakes and the viewshed extending from the lakes to the highest ridgeline surrounding the lakes. The County lakes included are: Lake Casitas, Lake Matilija, Lake Piru, and Lake Sherwood. Scenic Resource Areas are depicted on the Resource Protection Map (Figure 1).

Scenic Route: A street, drive, road, highway, or freeway deemed scenic.

Secondary Arterials: County or city thoroughfares (usually four lanes-divided) that connect other arterials and major collectors for the purpose of through traffic with some access to commercial/industrial developments but generally restricted access to residential areas.

Seiche (saysh): A wave that oscillates in an enclosed or partially enclosed body of water.

Seiche Hazard Area: An area surrounding all existing reservoirs and lakes. For smaller water bodies the hazard area is arbitrarily set to an elevation of ten feet above the normal water level.

Service Level: See *eve s o Service*.

Sewage Treatment Facilities: Facilities that collect water used for domestic, commercial and industrial purposes, treat it to remove organic and inorganic waste materials, and discharge the treated effluent to the environment. (See *Co unity Se a e reat ent aci ities* and *n-Site Waste ater reat ent aci ities*).

Shoreline Protective Devices: Seawalls, revetments, breakwaters, and other such construction that alters shoreline processes.

Site: One or more lots planned and developed as a unit under one permit.

Soils Capability Classes: Classification of the suitability of soils are designated by Roman numerals I through VIII. The numerals include progressively greater limitations and narrower choices for practical use. The groups are made according to the limitations of soils when used for field crops, the risk of damage when they are used, and the way they respond to treatment.

Class I Soils: Have few limitations that restrict their use.

Class II Soils: Have some limitations that reduce the choice of plants or require moderate conservation practices.

Solid Waste Disposal Sites: Are those facilities for the final deposition of wastes onto land. Wastes are categorized into four general types: Class I (Hazardous); Class II (Designated Wastes); Class III (Municipal); and inert waste.

Special Occupancy Structure: A category of structures as defined in the California Building Code. They are:

- Covered structures whose primary occupancy is public assembly with a capacity of more than 300 persons.
- Buildings for schools through secondary or day-care center with a capacity of more than 250 students.
- Buildings for colleges or adult education schools with a capacity for more than 500 students.
- Medical facilities with 50 or more resident incapacitated patients; but not including hospitals and other medical facilities having surgery and emergency treatment areas, which are *ssentia aci ities*.
- Structures and equipment in power generating stations and other public utility facilities that are not identified as *ssentia aci ities*, and required for continued operation.
- Jails and detention facilities.

- All structures with an occupancy of more than 5,000 persons.

(See *ssentia aci ities*)

State Highway: A numbered state route.

Subsidence: Any settling or sinking of the ground surface arising from the withdrawal of fluids, typically oil, gas and water or from decay of materials (peat oxidation).

Surface Mining and Reclamation Act of 1975 (SMARA): The State Legislature in 1975 enacted this act to ensure the proper reclamation of surface mining operations and to safeguard access to mineral resources of regional and statewide significance in the face of competing land uses and urban expansion.

Tank Bottoms: Clay and other solids that separate out of well fluid components. These solids contain mineral salts, organic compounds, and a fraction of dense, oil-based compounds.

Tenure: The ownership or rental status of a unit.

Thoroughfare: A road that is either a primary arterial, a secondary arterial or a major collector and is depicted on the Public Facilities Map (Ventura County General Plan Goals, Policies and Program – Figure 4).

Threatened Species: A species listed as Threatened by the State or U.S. Fish and Wildlife Services. Generally, any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Tsunami tsoo naa e : A traveling ocean wave of extremely long wavelength and period, generated by disturbances of the ocean floor, typically associated with earthquakes, volcanoes or major submarine landslides.

Unique Biological Resources: A biotic resource whose presence is unusual and of special interest due to extremities of range, special soil types, or unusual associations with other species.

Unique Farmlands: A category of the Important Farmlands Inventory. Generally includes lands of lesser quality soils used for the production of the State s leading agricultural cash crops. It has the special combination of soil quality, location, growing, season, and moisture supply needed to produce sustained high quality or high yields of a specific crop when treated and managed according to current farming methods.

Viewshed: The area within view from a defined observation point.

Waste Site: The location where waste is stored, collected, processed, reused, converted or disposed.

Waste Transfer Stations: Those facilities utilized to receive wastes from outside their permit boundaries to temporarily store and/or separate wastes, or transfer the solid wastes directly from smaller to larger vehicles for transport.

Water Reclamation: The recycling or reuse of either treatment plant effluent (wastewater) or industrial process water.

Wetland Habitats: Plant communities that are associated with *et ands*.

Wetlands: Lands that are transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is periodically covered with shallow water. The frequency of occurrence of water is sufficient to support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands include marshes, bogs, sloughs, vernal pools, wet meadows, river and stream overflows, mudflats, ponds, springs and seeps.

Wildlife Migration Corridor: Linear spaces that connect the various areas of an animal s habitat, and serve as links between feeding, watering, resting and breeding places. These corridors are especially important to larger, wider- ranging animal species.

Williamson Act: A California Statute which allows local government to enter into long-term contracts with agricultural landowners by lowering property taxes as an incentive to continue agricultural use of the land. Also known as the California Land Conservation Act of 1965.

Appendix

Ventura County Agricultural Irrigated Lands Group 2008 Water Quality Monitoring Plan

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August 15, 2009

VENTURA COUNTY AGRICULTURAL IRRIGATED LANDS GROUP (VCAILG)

2008 WATER QUALITY MANAGEMENT PLAN

submitted to:

LOS ANGELES REGIONAL WATER QUALITY CONTROL BOARD

prepared by:

LARRY WALKER ASSOCIATES

On behalf of the:

VENTURA COUNTY AGRICULTURAL IRRIGATED LANDS GROUP (VCAILG)

LARRY WALKER ASSOCIATES

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A n

BMP	Best Management Practice
CC	Calleguas Creek
CCWTMP	Calleguas Creek Watershed TMDL Monitoring Program
CWA	Clean Water Act
DPR	Department of Pesticide Regulation
DQO	Data Quality Objective
EPA	Environmental Protection Agency
IPM	Integrated Pest Management
LARWQCB	Los Angeles Regional Water Quality Control Board (Regional Board)
MRP	Monitoring and Reporting Program
NOA	Notice of Applicability
NOI	Notice of Intent
NRCS	Natural Resources Conservation Service
OC	Organochlorine
OP	Organophosphorus
QAPP	Quality Assurance Project Plan
RCD	Resource Conservation District
SCR	Santa Clara River
TDS	Total Dissolved Solids
TIE	Toxicity Identification Evaluation
TMDL	Total Maximum Daily Load
TSS	Total Suspended Solids
UCCE	University of California Cooperative Extension
USDA	United Stated Department of Agriculture
VCAILG	Ventura County Agricultural Irrigated Lands Group
VR	Ventura River
WQMP	Water Quality Management Plan

n d i n

On November 3, 2005 the Los Angeles Regional Water Quality Control Board (Regional Board) adopted a *Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands within the Los Angeles Region* ("Conditional Waiver", Order No. R4-2005-0080). The purpose of the Conditional Waiver is to assess the effects of and control discharges from irrigated agricultural lands in Los Angeles and Ventura Counties, including irrigation return flows, flows from tile drains, and stormwater runoff. These discharges can affect water quality by transporting nutrients, pesticides, sediment, salts, and other pollutants from cultivated fields into surface waters, potentially impairing designated beneficial uses. Owners and operators of agricultural lands in Ventura and Los Angeles Counties must comply with provisions contained in the Conditional Waiver or be regulated under other Regional Board programs.

The Conditional Waiver allows individual landowners and growers to comply with its provisions by working collectively as a Discharger Group, or as an individual. A Discharger Group is defined by the Conditional Waiver as "any group of dischargers and/or organizations that form to comply with this Conditional Waiver. Discharger Groups can be, but are not limited to, organizations formed on a geographic basis or formed with other factors in common such as commodities." The primary purpose of allowing Discharger Groups is to encourage collaboration on monitoring and reporting and to increase the effectiveness of management practices throughout a watershed to attain water quality standards. Those landowners and growers choosing to comply with the Conditional Waiver as a Discharger Group must signify by submitting a Group Notice of Intent and by developing a Discharger Group monitoring program.

To assist agricultural landowners and growers that farm within the boundaries of Ventura County, various agricultural organizations, water districts and individuals joined together to form the Ventura County Agricultural Irrigated Lands Group (VCAILG), which is intended to act as one unified "Discharger Group" for those agricultural landowners and growers that wish to participate. A Notice of Intent (NOI) to comply with the Conditional Waiver was submitted to the Regional Board by the VCAILG on August 3, 2006. The NOI included the VCAILG membership roster, as well as the required Quality Assurance Project Plan (QAPP) and Monitoring and Reporting Program Plan (MRP), which detail the water quality monitoring and reporting procedures being conducted in compliance with the terms of the Conditional Waiver. The Regional Board responded by issuing the Notice of Applicability (NOA) to the VCAILG on December 18, 2006, signifying the Regional Board's approval of the VCAILG and its Monitoring Program.

The first Annual Monitoring Report was submitted by the VCAILG to the Regional Board on February 15, 2008 and provided a detailed summary of activities of the VCAILG during 2007, including administration of the VCAILG, an overview of farming in Ventura County and obstacles faced by the VCAILG members, coursework offered to Group members to fulfill the Conditional Waiver's education requirement, a list of education hours completed to date by each member, and monitoring data collected during the three monitoring events conducted. Also included in the Annual Monitoring Report was a discussion of monitoring results that exceeded water quality benchmarks.

As specified in the Conditional Waiver, if the monitoring results show that an applicable water quality benchmark has not been met, then a Water Quality Management Plan (WQMP) must be

developed. As outlined in the Monitoring and Reporting Program for discharger groups, the WQMP is designed to:

1. Assess the impacts of waste discharges from irrigated lands to surface waters through source identification.
2. Determine the degree of implementation of management practices to reduce discharge of specific wastes that impact water quality.
3. Determine the effectiveness of management practices and strategies to reduce discharges of waste that impact water quality.
4. Determine concentration and load of waste in these discharges to surface waters.
5. Construct or implement management practices to alleviate the impacts of the waste discharges.
6. Evaluate compliance with existing narrative and numeric water quality objectives to determine if additional implementation of management practices are necessary to improve and/or protect water quality.
7. Construct or implement additional management practices or provide technical documentation of natural, historical, or existing conditions.

The Conditional Waiver also includes language in various sections that require the WQMP to include:

- Concrete steps with specific milestones that work toward attainment of water quality objectives with best management practices.
- Plan to implement specific management measures and management practices to improve the discharge quality, including a date-specific time line.

On August 15, 2008, the 2007 VCAILG WQMP was submitted to address exceedances of water quality benchmarks that occurred during the 2007 monitoring year. All of the constituents for which benchmarks were exceeded were included in this WQMP. Also discussed were the water quality problems that can be caused by the benchmark exceedance and the degree to which agricultural discharges are contributing to the problem (where feasible and appropriate).

In addition, for the Calleguas Creek watershed, WQMPs are also required to be developed for the TMDLs that are effective in the watershed. Where WQMPs are also required by TMDLs, the 2007 plan included all necessary information to meet the TMDL requirement as well.

The 2007 WQMP contained four major sections. The first section provided a discussion of the VCAILG monitoring sites and monitoring results detailing benchmark exceedances. Constituent-specific information was provided in the second section to summarize the currently available information on sources of the constituents, discuss the water quality problems associated with the benchmark exceedances, and where feasible, the degree to which agriculture is contributing to the water quality problem. The third section discussed the process by which priority areas would be targeted to implement management practices, and how implementation would be tracked and used to evaluate management practice effectiveness through water quality monitoring efforts. The final section provided references and resource agency contact information to assist growers in implementing specific management measures to improve water quality.

This update to the 2007 WQMP provides information on benchmark exceedances that occurred during the 2008 monitoring year (as discussed in the 2008 Annual Monitoring Report) and

progress made in implementation of the WQMP. Additionally, Management Practice Surveys collected from growers within the first tier priority drainage areas are discussed. Second tier priority drainages were updated according to monitoring information collected in the past year.

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This section provides a summary of information that was included in the VCAILG 2008 Annual Monitoring Report. For more detailed information about monitoring sites, locations, and water quality monitoring results, please refer to that report.

MONITORING O JECTIVES

The objectives of the VCAILG Monitoring Program are as follows:

- Assess the impact on waters of the State from wastes discharged from irrigated lands;
- Determine concentration and loading (where practicable) of pollutants present in surface waterbodies influenced primarily by irrigated agriculture land use;
- Evaluate compliance with applicable water quality benchmarks to determine whether modifying management practices is necessary to improve surface water quality;
- Attempt to identify pollutant sources, if necessary;
- Provide feedback to growers in areas where benchmarks are exceeded to facilitate implementation and monitoring of management practices employed for controlling pollutant loads, if necessary;
- Report results and other required information as specified in the Monitoring and Reporting Program (CI-8836);
- Monitor trends in ambient water quality over time (long term objective);
- Coordinate monitoring efforts with existing and future monitoring programs so that data generated are complementary and not duplicative (*e.g.*, coordinate monitoring sites and sampling events with the Calleguas Creek Watershed TMDL Monitoring Program).

SAMPLING SITE DESCRIPTIONS AND LOCATIONS

The first step toward fulfilling monitoring program objectives was selecting appropriate monitoring sites. Because the focus of the program is on impacts to surface waterbodies from discharges from irrigated agricultural lands, monitoring sites were selected to best characterize agricultural inputs and are generally located at the lower ends of mainstem tributaries or agricultural drainages in areas associated primarily with agricultural activity. In some cases, sites were also located to facilitate distinguishing agricultural inputs from other sources, such as golf courses or landscaped areas – these are referred to herein as “background” (“BKGD”) sites.

Additional site selection criteria included the following:

- Sub-watershed representation
- Acreage of agricultural irrigated lands represented
- Drainage into waterbodies included on the federal Clean Water Act 303(d) list of impaired waterbodies
- Safe access during dry and wet weather

Appendix C includes drainage area maps for each of the VCAILG monitoring sites. These maps will be used in mailings and outreach materials to assist growers in identifying where their property drains and if they are contributing to any water quality benchmark exceedances.

Monitoring site selection in the Calleguas Creek Watershed was coordinated with monitoring sites identified in the Calleguas Creek Watershed TMDL Monitoring Program (CCWTMP). Data collected at these coordinated sites are designed to augment TMDL implementation monitoring in that watershed by establishing loadings from agricultural inputs.

The format for the monitoring site ID/code is XXXA_YYYYY_ZZZZZ, where:

- "XXX" is a 2- or 3- character code that identifies the mainstem receiving water reach (where applicable) into which the monitored waterbody drains;
- "A" identifies the monitored waterbody as an agricultural discharge (D) or a tributary (T) to the receiving water;
- YYYYY is a 3-, 4- or 5-character abbreviation for the site location;
- ZZZZZ is an optional 3-, 4- or 5-character abbreviation that provides additional site location information (*e.g.,* "BKGD" indicates a background site).

Examples:

05D_SANT_VCWPD signifies that the monitoring site is located in on the Santa Clara Drain, which is an agricultural discharge that flows into Calleguas Creek Watershed Reach 5 (Beardsley Channel). The site is located at the Ventura County Watershed Protection District stream gage.

SO4T_TAPO_BKGD signifies that this a background monitoring site located on Tapo Creek, which is a tributary to the Santa Clara River, Reach 4.

Table 1 contains a detailed list of monitoring sites selected for the VCAILG Monitoring Program. Monitoring site IDs in bold type indicate CCW TMDL monitoring sites that were coordinated with that monitoring program starting in August 2008.

Maps of monitoring sites located in the Calleguas Creek / Oxnard Coastal, Santa Clara River and Ventura River watersheds are presented in Figure 1, Figure 2, and Figure 3 respectively.

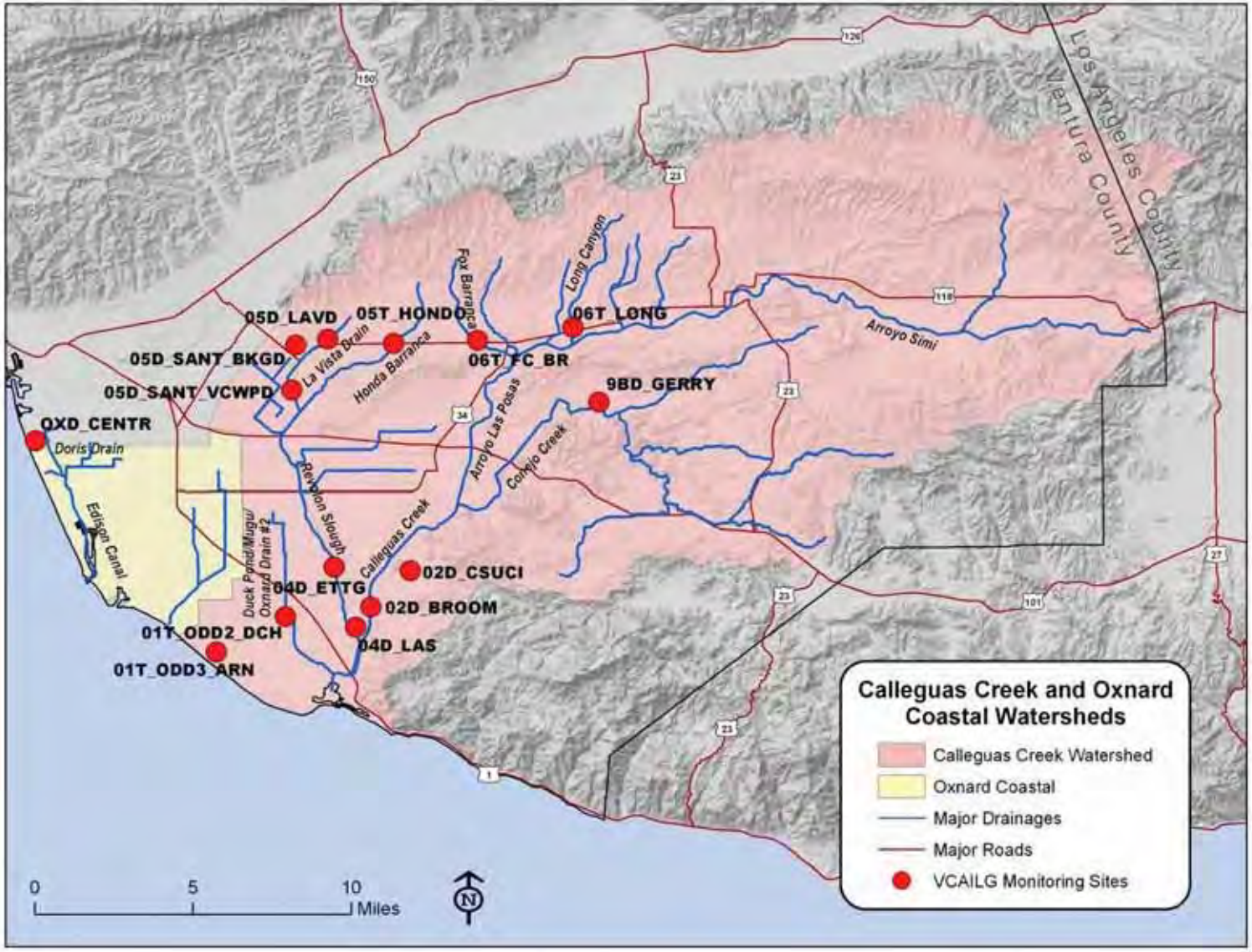
Table 2 provides estimates of irrigated acreage by crop type represented by each monitoring site selected.

Maps of crops grown in the vicinity of each monitoring site in the Calleguas Creek / Oxnard Coastal, Santa Clara River and Ventura River watersheds are presented in Figure 4, Figure 5, and Figure 6, respectively.

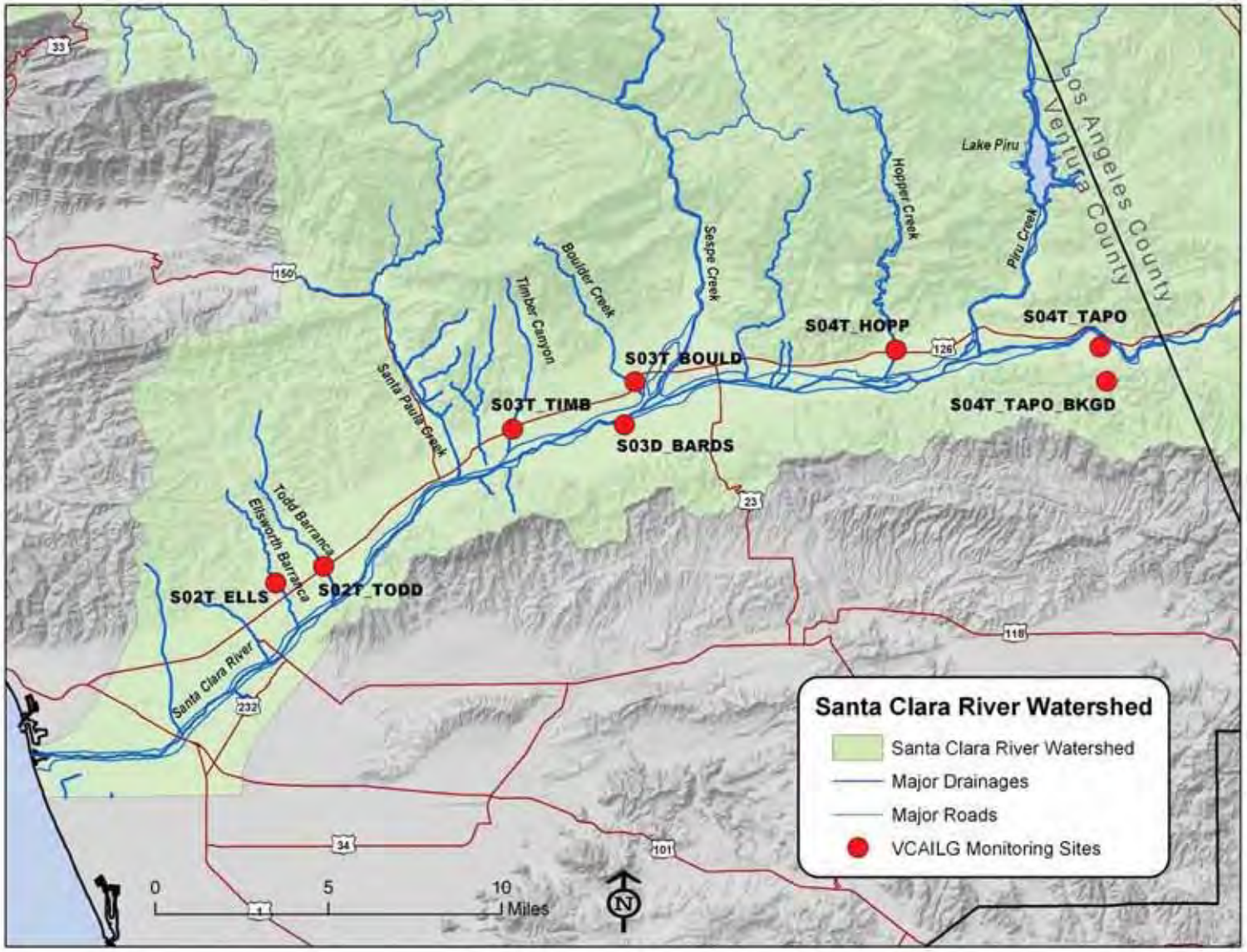
Table 1. VCAILG Monitoring Program Monitoring Site Locations

Watershed Subwatershed	Station ID [1]	Reach	Water-body Type [2]	Station Location	GPS Coordinates [3] Latitude	Longitude
Calleguas Creek / Mugu Lagoon	**01T ODD2 DCH**	1	T	Duck Pond/Oxnard Drain 2/Mugu Drain S. of Hueneme Rd.	34.139514	-119.118330
	01T ODD3 ARN	1	T	Rio de Santa Clara/Oxnard Drain 3 at Arnold Rd.	34.123564	-119.156514
Calleguas Creek / Calleguas Creek	02D BROOM	2	D	Discharge to Calleguas Creek at Broome Ranch Rd.	34.143353	-119.071306
	02D CSUCI	2	B	02D BROOM background site near CSUCI	34.159860	-119.049375
Calleguas Creek / Revolon Slough	04D ETTG	4	D	Discharge to Revolon Slough at Etting Rd.	34.161797	-119.091419
	04D LAS	4	D	Discharge to Revolon Slough at S. Las Posas Rd.	34.134208	-119.079767
Calleguas Creek / Beardsley Channel	**05D SANT VCWPD**	5	D	Santa Clara Drain at VCWPD Gage 781	34.242667	-119.113736
	05D SANT BKGD	5	B	05D SANT VCWPD background site near the golf course	34.263213	-119.111314
	05D LAVD	5	T	La Vista Drain at La Vista Ave.	34.265950	-119.093589
	05T HONDO	5	T	Hondo Barranca at Hwy. 118	34.263608	-119.057431
Calleguas Creek / Arroyo Las Posas	**06T C R**	6	T	Fox Canyon at Bradley Rd.	34.264653	-119.011128
	06T LONG	6	T	Long Canyon at Hwy. 118	34.270083	-118.958664
Calleguas Creek / Conejo Creek	**9 D GERRY**	9B	D	Drain Crossing Santa Rosa Rd. at Gerry Rd.	34.235847	-118.944675
Oxnard Coastal	O D CENTR	--	D	Central Ditch at Harbor Blvd.	34.220555	-119.254983
Santa Clara River	S02T ELLS	2	T	Ellsworth Barranca at Telegraph Rd.	34.306805	-119.141275
	S02T TODD	2	T	Todd Barranca at Hwy. 126	34.313584	-119.117095
	S03T TIMB	3	T	Timber Canyon at Hwy. 126	34.370172	-119.020939
	S03T BOULD	3	T	Boulder Creek at Hwy. 126	34.389578	-118.958738
	S03D BARDS	3	D	Discharge along Bardsdale Ave. upstream of confluence with Santa Clara River	34.371535	-118.964470
	S04T HOPP	4	T	Hopper Creek at Hwy. 126	34.401616	-118.826799
	S04T TAPO	4	T	Tapo Canyon Creek	34.401717	-118.723706
	S04T TAPO BKGD	4	B	S04T TAPO background site upstream of agricultural operations	34.387316	-118.7204509
Ventura River	VRT THACH	--	T	Thacher Creek at Ojai Avenue	34.446719	-119.210893
	VRT SANTO	--	T	San Antonio Creek at Grand Avenue	34.454455	-119.221723

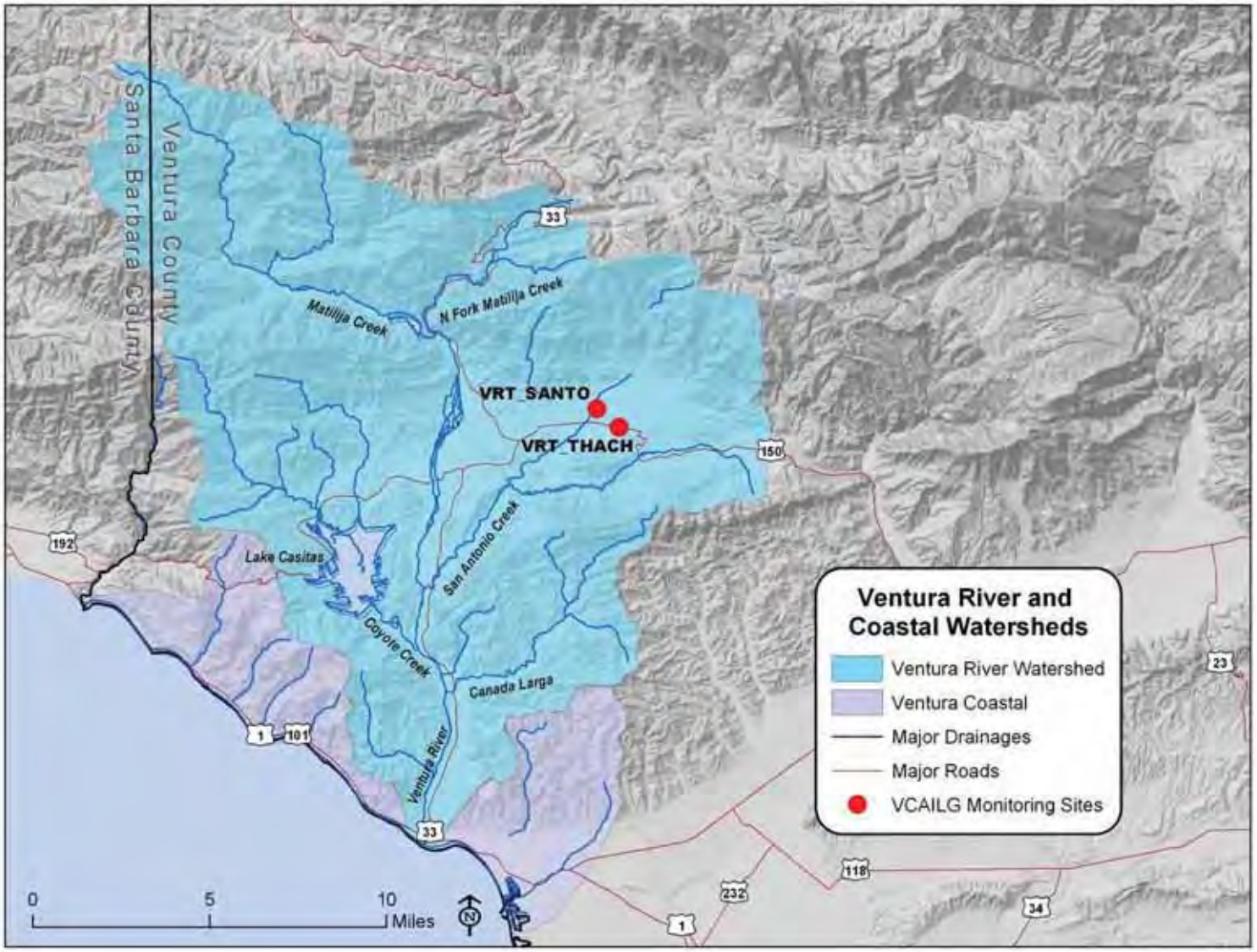
1 Station IDs indicated in **bold** type signify Calleguas Creek Watershed TMDL Monitoring Program sites that will be monitored through that program once that program is underway.
2 T Tributary to receiving water; D agricultural Drain; B Background site.
3 All GPS coordinates presented in decimal degrees latitude and longitude in North American Datum 1983 (NAD83).



igure 1. VCAILG Monitoring Sites Located in the Calleguas Cree O nard Coastal Watersheds



igure 2. VCAILG Monitoring Sites Located in the Santa Clara River Watershed



igure 3. VCAILG Monitoring Sites Located in the Ventura River Watershed

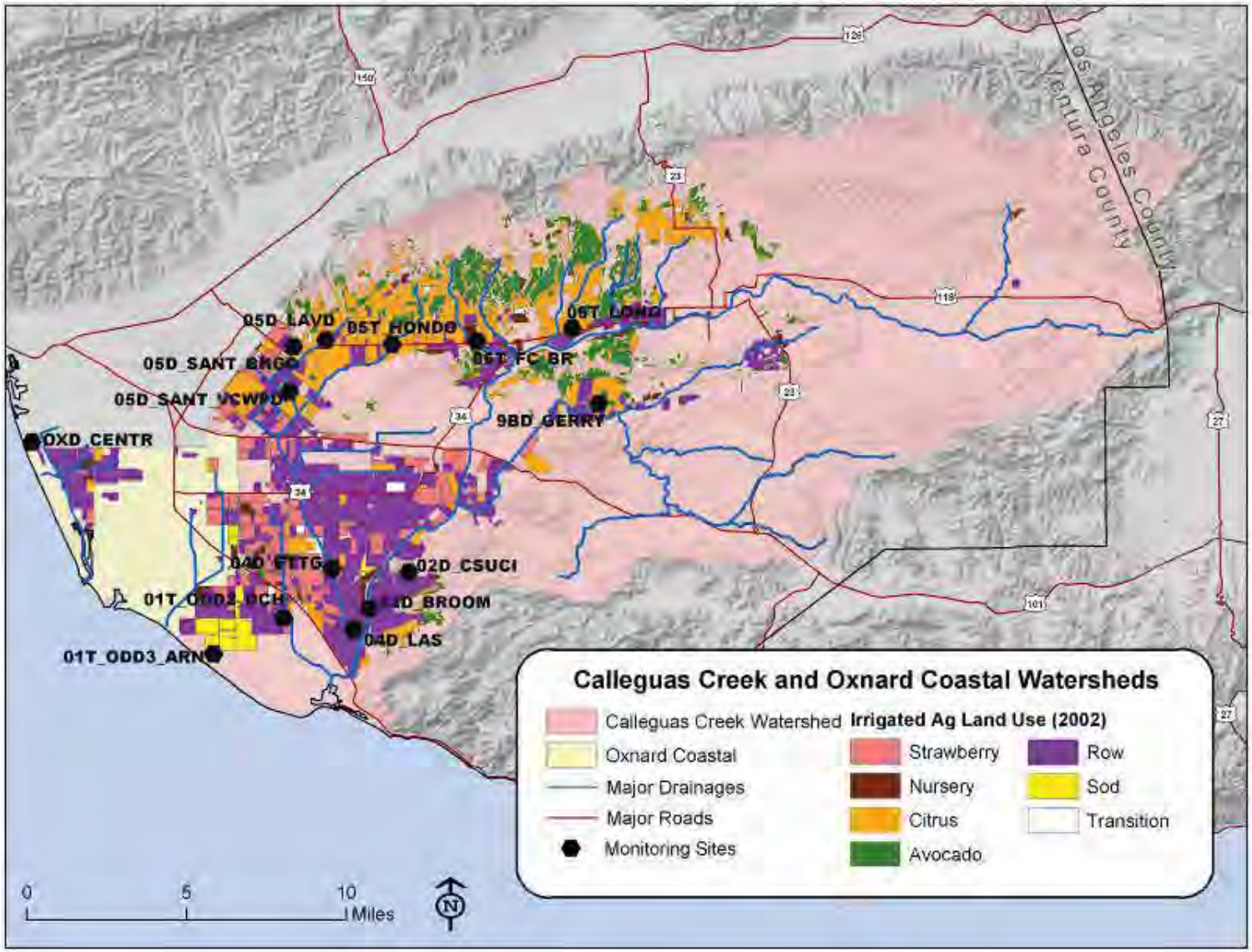
Table 2. Estimated Irrigated Acreage Represented at Each VCAILG Monitoring Site

Station ID[1]	Irrigated Agricultural Acreage [2, 3]									Total Acres Drained
	Row Crops	Cut lowers	Citrus	Avocados	Other Tree Crops	Strawberries	Other erries	Sod	Nursery	
01T ODD2 DCH	2,874	3	17			665		368		1,564
01T ODD3 ARN	818					39		578		800
02D BROOM	3,639		378	344		283	177		21	8,236
04D ETTG	6,271		116			952	77			3,779
04D LAS	2,212	42				209	41	178		1,339
05D LAVD	12		219	139		199	77			877
05D SANT VCWPD	725		502	146		447				1,154
05T HONDO	16	4	740	475	1	78	48		9	3,267
06T FC BR	129	19	1,029	117	2	15	72		65	3,121
06T LONG	12		501	692		24	28		48	2,935
9BD GERRY			58	100			91			447
O D CENTR	435	67	35			943			11	1,243
S02T ELLS	74		277	524	1		21			9,015
S02T TODD	51	33	227	160	1					5,748
S03D BARDS	30		725	74					17	2,214
S03T BOULD			165	680					167	3,764
S03T TIMB	9		102	363	3					2,183
S04T HOPP			7						14	15,141
S04T TAPO	28		34						50	3,686
VRT SANTO			279	251	13					7,220
VRT THACH	6		620	130	8				2	6,003

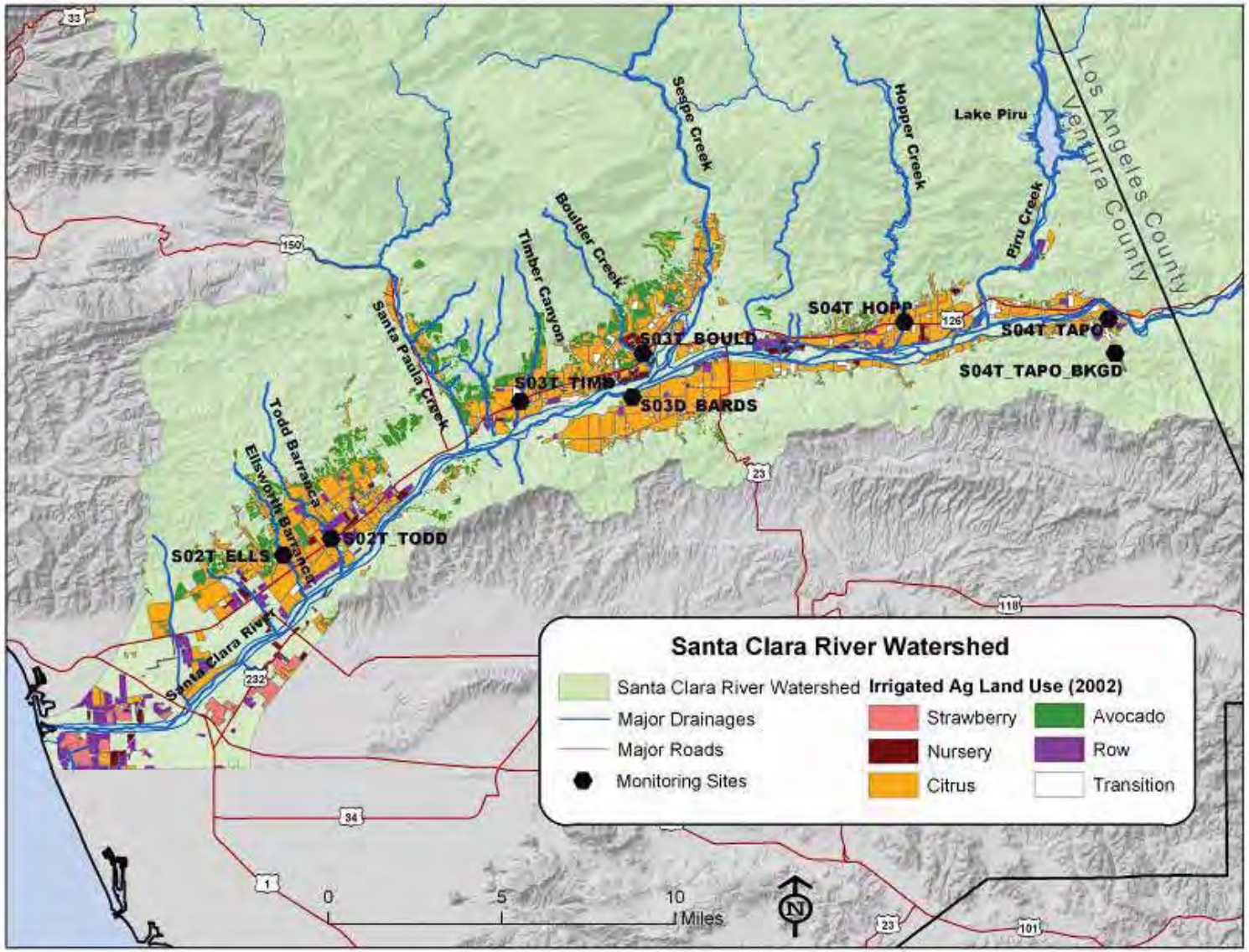
1 Background sites 02D CSUCI (primarily runoff from the university), 05D SANT BKGD (runoff from a golf course and residential area), and S04T TAPO BKGD (runoff from non-irrigated agriculture) are not included in this table.

2 Data Source Ventura Agricultural Commissioner's Office

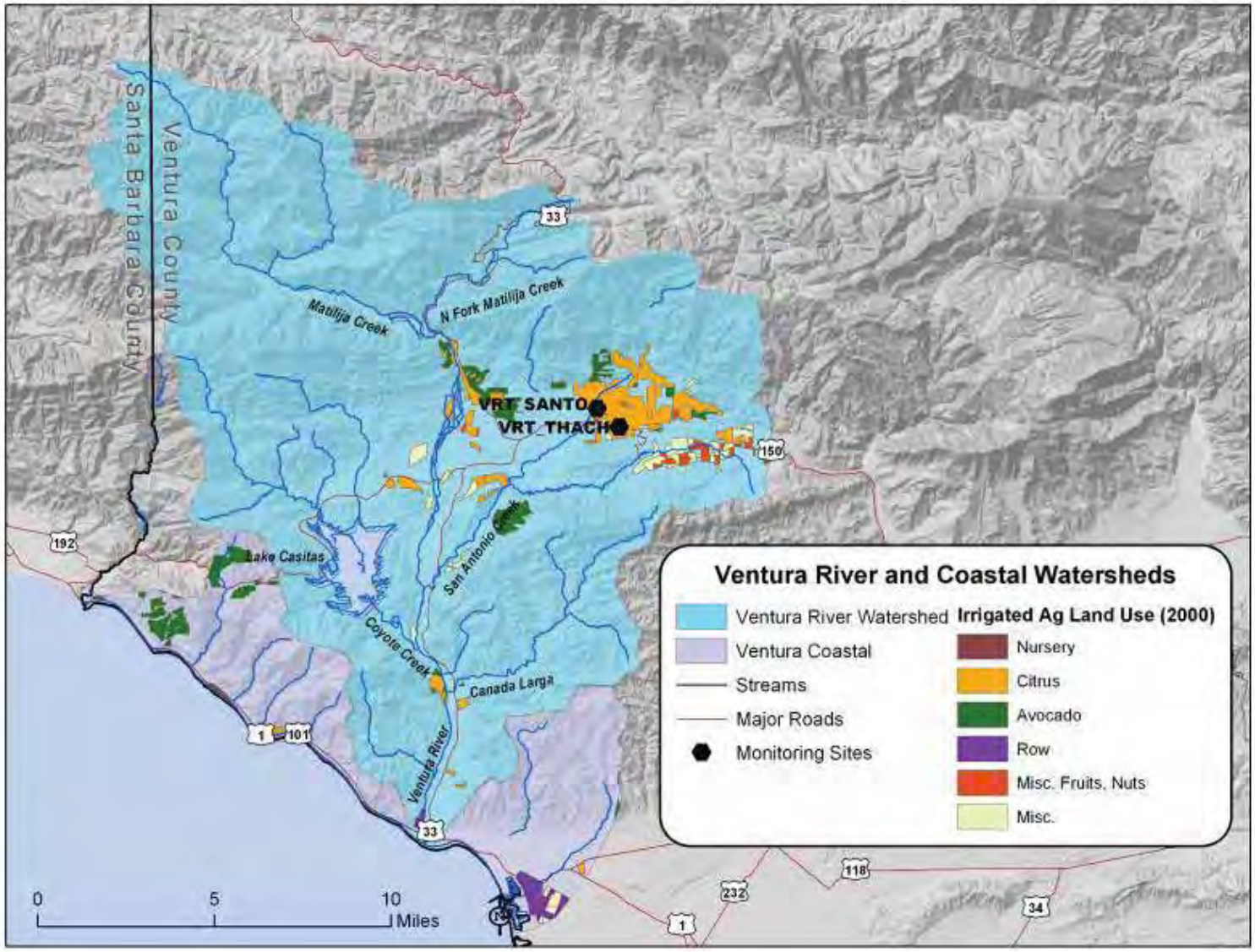
3 Some acreage is double or triple counted due to multi-cropping practices.



igure 4. Calleguas Cree Watershed Monitoring Sites and Agricultural Land Use



igure 5. Santa Clara River Watershed Monitoring Sites and Agricultural Land Use



igure 6. Ventura River Watershed Monitoring Sites and Agricultural Land Use

WATER UALITY ENCHMAR S

This section presents the water quality benchmarks used to evaluate monitoring data collected at the VCAILG monitoring sites in 2008. Benchmarks used for this purpose include numeric and narrative water quality objectives contained in Appendix 1 and Appendix 2 in the Conditional Waiver, which includes narrative and numeric Basin Plan objectives and water quality standards from the California Toxics Rule (CTR). TMDL load allocations were not used as benchmarks to determine whether WQMPs are necessary to reduce water quality impacts from irrigated agriculture. Rather, because effective TMDLs already contain the requirement to develop WQMPs regardless of whether monitoring data exceed benchmarks identified in the Conditional Waiver, all TMDL requirements are included in this WQMP.

Several of the narrative water quality objectives contained in the Basin Plan specify that discharges of wastes to receiving waters cannot alter "natural" or "ambient" conditions above or below a stated level. Many of the VCAILG monitoring sites are located in agricultural drains that discharge to receiving waters. Because "natural" and "ambient" conditions have not been established in receiving waters or are non-existent on agricultural drains and ephemeral streams, monitoring data from sites located on agricultural drains were evaluated in the AMR based on the assumption that if benchmarks are not exceeded in the agricultural drain, it is unlikely that the discharge from that drain will cause benchmark exceedances in the receiving water.

Conditional Waiver benchmarks applicable to VCAILG monitoring sites are presented in Table 3 through Table 7.

Table 3. Conditional Waiver Benchmarks Derived From Narrative Objectives and Toxicity

Constituent	Watershed [1]	Narrative Objective[2]	Applicable Benchmark
p		e p of inland surface waters s all not be depressed below 6.5 or raised above 8.5 as a result of waste disc ar es. mbient p levels s all not be c an ed by more t an 0.5 p units from natural conditions as a result of waste disc ar es.	6.5 _ p _ 8.5 an es to ambient receivin water conditions are not assessed ambient or natural conditions ave not been establis ed
emperature		or waters desi nated water temperature s all not be altered by more t an 5° above t e natural temperature. t no time s all -desi nated waters be raised above 80° as a result of waste disc ar es.	: _ 80° an es to ambient receivin water conditions are not assessed ambient or natural conditions ave not been establis ed
		or waters desi nated water temperature s all not be altered by more t an 5° above t e natural temperature.	: o numeric benc mar . an es to ambient receivin water conditions are not assessed ambient or natural conditions ave not been establis ed
issolved xy en		o sin le dissolved oxy en determination s all be less t an 5 m except w en natural conditions cause lesser concentrations.	_ 5 m
		e dissolved oxy en content of all surface waters desi nated as s all not be depressed below 5 m as a result of waste disc ar es.	: _ 5 m
		e dissolved oxy en content of all surface waters desi nated as and s all not be depressed below 7 m as a result of waste disc ar es.	: _ 7 m
urbidity		aters s all be free of c an es in turbidity t at cause nuisance or adversely affect beneficial uses. ncreases in natural turbidity attributable to controllable water uality factors s all not exceed t e followin limits: ▪ ere natural turbidity is between 0 and 50 increases s all not exceed 20 ▪ ere natural turbidity is reater t an 50 increases s all not exceed 10 .	o numeric benc mar s. an es to ambient receivin water conditions are not assessed ambient or natural conditions ave not been establis ed
iostimulatory ubstances		aters s all not contain biostimulatory substances in concentrations t at promote a uatic rowt to t e extent t at suc rowt causes nuisance or adversely affects beneficial uses.	o numeric benc mar s. aterbody-specific benc mar s for nutrients are listed in ables 12 and 1 .
otal uspended olids		astes s all not contain suspended material in concentrations t at cause nuisance or adversely affect beneficial uses.	o numeric benc mar s.
esticides		o individual pesticide or combination of pesticides s all be present in concentrations t at adversely affect beneficial uses.	o numeric benc mar s. pplicable benc mar s for specific pesticides are listed in ables 14 15 and 16
oxicity		ll waters s all be free of toxic substances in concentrations t at are toxic to or t at produce detrimental p ysiolo ical responses in uman plant animal or a uatic life. ere s all be no c ronic toxicity in ambient waters outside mixin ones.	_ 1.0 c enc mar s for specific potentially toxic constituents are listed in ables 12 t rou 16.

1 CC Calleguas Creek Watershed O D Oxnard Coastal Watershed SCR Santa Clara River Watershed VR Ventura River Watershed
2 Source: Water Quality Control Plan, Los Angeles Region (Basin Plan), 1994.
3 Source: "Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands," Order No. R4-2005-0077, Los Angeles Regional Water Quality Control Board, adopted November 3, 2005.

Table 4. Conditional Waiver Benchmarks for Salts and Nutrients (Basin Plan Table 3-8 Numeric Water Quality Objectives)

Watershed / Reach	Reach Description	Chloride (mg/L)	Sulfate (mg/L)	TDS (mg/L)	Nitrogen [1] (mg/L)	Ammonia [2] (mg/L)	Phosphate (mg/L)
below otrero d.	-----	-----	-----	-----	10	p temperature dependent	-----
above otrero d. [5]	-----	150	250	850	10	p temperature dependent	-----
	-----	-----	-----	-----	10	p temperature dependent	-----
eac 1	idally-influenced mout of anta lara iver upstream to 101 rid e	-----	-----	-----	10	p temperature dependent	-----
eac 2	pstream of wy 101 rid e to reeman iversion	150	600	1200	10	p temperature dependent	-----
eac	pstream of reeman iversion to treet rid e in illmore	100 [4]	650	1 00	5	p temperature dependent	-----
eac 4	pstream of treet rid e in illmore to lue ut a in tation	100	600	1 00	5	p temperature dependent	-----
eac 4	etween amino ielo d. and asitas ista d.	60	00	800	5	p temperature dependent	-----

Watersheds: CC Calleguas Creek O D Oxnard Coastal SCR Santa Clara River VR Ventura River

1 The Nitrogen benchmarks listed are as Nitrate-N plus Nitrite-N.

2 Ammonia benchmarks are based on 1) freshwater ammonia objectives as calculated according to LARWQCB Resolutions 2002-011 and 2005-014, and 2) saltwater ammonia objectives as calculated according to LARWQCB Resolution 2004-022. Ammonia objectives are calculated based on the pH and temperature of the receiving water measured at the time of sample collection for ammonia analysis. Ammonia objectives used as benchmarks are chronic, 30-day averages.

3 There is no site-specific nitrogen objective in the Basin Plan (Table 3-8) applicable to this reach. The Basin Plan objective of 10 mg/L Nitrate-N Nitrite-N was used for comparison with VCAILG data collected at monitoring sites in this reach.

4 The 100 mg/L benchmark for chloride is the revised water quality objective adopted by the Regional Board in Resolution 2003-015.

5 In the 1997 Chloride Policy, the Basin Plan objectives for salts were defined to apply to Calleguas Creek above Potrero, Conejo Creek, Arroyo Las Posas, Arroyo Simi, and upstream tributaries. The Basin Plan objectives were not identified as applicable to Revolon Slough in the 1997 Basin Plan Amendment. However, the CCW Salts TMDL applied the Basin Plan Amendment as targets upstream of Laguna Road on Revolon Slough to be above the tidal influence. As a result, the benchmarks in this table are applied upstream of Laguna Road on Revolon Slough.

Table 5. Conditional Waiver Benchmarks for Organochlorine Pesticides

Constituent	CC Watershed		OXD, SCR Watersheds		VR Watershed	
	Benchmark (ug/L)	Benchmark Source [1]	Benchmark (ug/L)	Benchmark Source [1]	Benchmark (ug/L)	Benchmark Source [1]
ldrin	0.00014		0.00014		0.0001	
lp a-	0.01		0.01		0.00 9	
eta-	0.046		0.046		0.014	
amma- indane	0.06		0.06		0.019	
elta-	-----	-----	-----	-----	-----	-----
lordane-alp a	-----	-----	-----	-----	-----	-----
lordane- amma	-----	-----	-----	-----	-----	-----
lordane sum	0.00059		0.00059		0.00057	
2 4 -	-----	-----	-----	-----	-----	-----
2 4 -	-----	-----	-----	-----	-----	-----
2 4 -	-----	-----	-----	-----	-----	-----
4 4 -	0.00084		0.00084		0.0008	
4 4 -	0.00059		0.00059		0.00059	
4 4 -	0.00059		0.00059		0.00059	
ieldrin	0.00014		0.00014		0.00014	
ndosulfan	0.056		0.056		0.056	
ndosulfan	0.056		0.056		0.056	
ndosulfan ulfate	240		240		110	
ndrin	0.0 6		0.0 6		0.0 6	
ndrin lde yde	0.81		0.81		0.76	
ndrin etone	-----	-----	-----	-----	-----	-----
oxap ene	0.0002		0.0002		0.0002	

Watersheds: CC Calleguas Creek O D Oxnard Coastal SCR Santa Clara River VR Ventura River

1 CTR California Toxics Rule (USEPA, May 18, 2000).
HHO Human Health for Consumption of Organisms Only (30-day average)
HHWO Human Health for Consumption of Water and Organisms (MUN-designation) (30-day average)
AFWC Aquatic Life, Freshwater Chronic (4-day average)

Table 6. Conditional Waiver Benchmarks for Organophosphorus Pesticides

Constituent	CC, OXD, SCR, VR Watersheds Benchmark (ug/L) [1]
olstar	-----
lorpyrifos	0.025
emeton	-----
ia inon	0.10
ic lorovos	-----
imet oate	-----
isulfoton	-----
t oprop	-----
enc lorop os	-----
ensulfot ion	-----
ent ion	-----
alat ion	-----
erp os	-----
et yl arat ion	-----
evinp os	-----
orate	-----
etrac lorvinp os	-----
o ut ion	-----
ric loronate	-----

Watersheds: CC Calleguas Creek O D Oxnard Coastal SCR Santa Clara River VR Ventura River
1 Benchmarks are from Appendix 1 of the Conditional Waiver

Table 7. Conditional Waiver Benchmarks for Pyrethroid Pesticides

Constituent	CC, OXD, SCR, VR Watersheds Benchmark (ug/L) [1]
llet rin	-----
ifent rin	-----
yflut rin	-----
l- y alot rin	-----
ypermet rin	-----
eltamet rin	-----
sfenvalerate	-----
enpropat rin anitol	-----
envalerate	-----
luvalinate	-----
ermet rin	-----
rallet rin	-----
esmet rin	-----

Watersheds: CC Calleguas Creek O D Oxnard Coastal SCR Santa Clara River VR Ventura River
1 There are currently no Conditional Waiver benchmarks in effect for these watersheds.

SUMMARY OF BENCHMARK EXCEEDANCES

Monitoring data from samples collected at 17 of the 21 VCAILG monitoring sites exceeded benchmarks and triggered the requirement to write this update to the VCAILG WQMP, which addresses the additional exceedances. Background sites are not included in the total number of monitoring sites because they are located upstream of irrigated agricultural operations. Exceedances of water quality benchmarks occurred in all watersheds.

Because TMDLs require the development of WQMPs regardless of whether monitoring data exceed TMDL load allocations, TMDL WQMP requirements are discussed separately in the next section.

Table 8 contains a summary of benchmark exceedances that occurred at each site during 2008. Table 8 also identifies sites that were sampled but where no exceedances occurred, as well as sites that were not sampled. Table 9 contains the same exceedance summary organized by constituent and by watershed. Organochlorine (legacy) pesticides, primarily DDT compounds, caused the highest number of exceedances overall, followed by nitrogen, organophosphorus pesticides, salts, and chronic toxicity. During the wet events there were fewer sites with flow that had exceedances than during the two dry events. However, during the dry events there are less total sites that are sampled.

Pesticides

Exceedances of benchmarks for organochlorine (OC) pesticides occurred at 16 VCAILG sites, 10 of which are located in the Calleguas Creek Watershed. Exceedances of benchmarks for DDT compounds occurred during all 3 events at the sites located in the Oxnard Coastal Watershed and at 4 sites in the Calleguas Creek Watershed. There were 10 sites with OP pesticides exceedances during 2008, 7 of those sites are in the Calleguas Creek Watershed. Chlorpyrifos was the most frequently detected OP pesticide. Also of note, there are OC and OP pesticides TMDLs in the Calleguas Creek Watershed.

Salts

Exceedances of salts benchmarks (TDS, chloride, sulfate, or any combinations thereof) occurred at 9 sites, six of which are located in the Santa Clara River Watershed. The Salts TMDL in the Calleguas Creek Watershed includes load allocations for boron, chloride, sulfate, and TDS. All of these constituents, except for boron are monitoring as part of the VCAILG Conditional Waiver monitoring program. A Chloride TMDL exists for the Santa Clara River Watershed; however, it does not include load allocations or implementation actions for agricultural dischargers.

Chronic Toxicity

Toxicity was detected at 7 sites during event 4. Toxicity was not detected in any of the event 7 samples. Only one site triggered a TIE during 2008 monitoring.

Nitrogen

Exceedances of nitrate-N and ammonia-N occurred at 12 VCAILG sites, 8 of which are in the Calleguas Creek Watershed. The nitrate-N benchmark applicable to the Oxnard Coastal monitoring site was exceeded during all four monitoring events. In the Santa Clara River Watershed, nitrogen objectives were exceeded at 4 monitoring sites. It should be noted here that there are nitrogen compounds TMDLs in both the Calleguas Creek and Santa Clara River Watersheds for which the VCAILG monitoring results can be compared to load allocations; exceedances of the applicable load allocations are discussed in the next section.

Dissolved Oxygen

An exceedance of the dissolved oxygen benchmark occurred during Event 7 at one site in the Calleguas Creek Watershed.

Temperature

An exceedance of the temperature benchmark occurred during Event 6 at one site in the Calleguas Creek Watershed.

pH

An exceedance in pH occurred during Event 7 at one site in the Santa Clara River Watershed. The pH at the site was slightly too basic to meet the water quality objective.

Table 8. Water Quality Benchmark Exceedances in 2008 – by Site & Event

Site ID	Event 4 – *Wet* January 5, 2008	Event 5 – *Wet* January 24, 2008	Event 6 – *Dry* May 20, 2008	Event 7 – *Dry* Sept. 16, 2008
01T_ODD2_DCH	itrate- lorpyrifos ronic oxicity	itrate- lordane 4 4 - 4 4 - 4 4 - lorpyrifos	itrate- 4 4 -	itrate- 4 4 - oxap ene
01T_ODD3_ARN	itrate- 4 4 - 4 4 - 4 4 -	itrate- lordane 4 4 - 4 4 - 4 4 -	itrate- lordane 4 4 - 4 4 -	*FTO*
02D_BROOM	itrate- 4 4 - 4 4 - 4 4 -	itrate- lordane 4 4 - 4 4 - 4 4 - ieldrin	itrate- 4 4 - 4 4 -	issolved xy en itrate- lordane 4 4 - 4 4 - 4 4 - oxap ene
04D_ETTG	itrate- lordane 4 4 - 4 4 - 4 4 - lorpyrifos	itrate- lordane 4 4 - 4 4 - 4 4 - lorpyrifos	itrate- 4 4 - 4 4 - 4 4 -	mmonia- itrate- 4 4 - 4 4 - 4 4 - oxap ene lorpyrifos
04D_LAS	itrate- lordane 4 4 - 4 4 - 4 4 - lorpyrifos	itrate- lordane 4 4 - 4 4 - 4 4 - lorpyrifos	emperature itrate- 4 4 - 4 4 - 4 4 - ia inon	itrate- lordane 4 4 - 4 4 - 4 4 - oxap ene lorpyrifos
05D_SANT_VCWPD	loride ulfate itrate- lordane 4 4 - lorpyrifos	loride ulfate itrate- lordane 4 4 - 4 4 - 4 4 - lorpyrifos	loride ulfate itrate- 4 4 -	loride ulfate itrate- 4 4 - 4 4 - oxap ene lorpyrifos
05D_LAVD	*NS*	lordane 4 4 - 4 4 - 4 4 - lorpyrifos	*NS*	*NS*
05T_HONDO	ulfate 4 4 - 4 4 - ronic oxicity	lordane 4 4 - 4 4 - 4 4 - lorpyrifos	*NS*	*NS*
06T_FC_BR	ulfate itrate- ronic oxicity	lordane 4 4 - 4 4 -	*NS*	*NS*
06 _	*NS*	*NS*	*NS*	*NS*
9 _	*NS*	*NS*	*NS*	*NS*
OXD_CENTR	itrate- 4 4- 4 4 - 4 4 - lorpyrifos	itrate- lordane 4 4- 4 4 - 4 4 - lorpyrifos	itrate- 4 4 -	itrate- 4 4 - 4 4 - oxap ene
S02T_ELLS	loride ulfate ronic oxicity	ulfate	*NS*	p lorpyrifos
S02T_TODD	ulfate ronic oxicity	ulfate 4 4 -	ulfate itrate-	*FTO*
S03T_TIMB	itrate- lorpyrifos ronic oxicity	ulfate 4 4 -	*NS*	*NS*
S03T_ BOULD	ronic oxicity	lordane	loride ulfate mmonia- itrate-	*FTO*
S03D_BARDS	*NS*	lordane 4 4 - 4 4 - 4 4 - lorpyrifos ia inon	*NS*	*NS*
04 _	*None*	*None*	ulfate	*NS*
S04T_TAPO	loride ulfate 4 4 -	loride ulfate lordane 4 4 - 4 4 -	loride ulfate itrate-	loride ulfate itrate-
VRT_THACH	*None*	4 4 -	*NS*	*NS*
_	*None*	*None*	*NS*	*NS*
Total Number of Sites Sampled	**17**	**19**	**11**	**8**
Total Number of Sites with Exceedances	**14**	**17**	**11**	**8**

NS Not Sampled; insufficient or no flow. FTO Fish Tissue Offset; site not visited.

Table 9. Water Quality Benchmark Exceedances in 2008 – by Pollutant & Watershed

Pollutant	VCAILG Monitoring Sites with Benchmark Exceedances		
	CC / OXN	SCR	VR
alts	05 _ _ 05 _ 06 _ _	02 _ 02 _ 0 _ 0 _ 04 _ 04 _	one
itro en	01 _ 2- 01 _ _ 02 _ 04 _ 04 _ 05 _ _ 06 _ _ _	02 _ 0 _ 0 _ 04 _	one
ronic oxicity	01 _ 2_ 05 _ 06 _ _	02 _ 02 _ 0 _ 0 _	one
esticides	01 _ 2_ 01 _ _ 02 _ 04 _ 04 _ 05 _ _ 05 _ 05 _ 06 _ _ _	02 _ 0 _ 0 _ 0 _ 04 _	_
esticides	01 _ 2- 04 _ 04 _ 05 _ _ 05 _ 05 _ _	02 _ 0 _ 0 _	one
issolved xy en	02 _	one	one
p	one	02 _	one
emperature	04 _	one	one

CC Calleguas Creek O N Oxnard Coastal SCR Santa Clara River VR Ventura River

Monitoring results organized by constituent and site for each water quality benchmark exceedance can be found in Appendix B.

Table 10 is a comparison of water quality benchmark exceedances in each of eight constituent classes: salts, nitrogen, chronic toxicity, organochlorine pesticides, organophosphorus pesticides, dissolved oxygen, pH, and temperature, between the 2007 and 2008 monitoring years. The following sites had exceedances in the same classes of constituents during both years:

- 04D_ETTG
- OXD_CENTR

- S02T_TODD
- S03T_BOULD
- S03D_BARDS

Four sites had less exceedances in 2008 than previously, considering the constituents by class, not necessarily overall number; they are:

- 01T_ODD3_ARN
- 05D_SAND_VCWPD
- 05D_LAVD
- S04T_TAPO

05D_LAVD showed significant improvement between the two monitoring years. In 2007 there were exceedances in five classes of constituents and in 2008, only two. There are three sites that continue to not have any water quality benchmark exceedances, they are as follows:

- 06T_LONG
- 9BD_GERRY
- VRT_SANTO

The remaining sites showed an increase in benchmark exceedances by constituent class. All of the information presented in Table 10 was considered as part of the monitoring site drainage area prioritization for determining tier 2 drainages.

Table 10. Water Quality Benchmark Exceedance Comparison between 2007 and 2008 Monitoring Years

Site [1]	Sampling Year	Salts	Nitrogen	Chronic Toxicity	OC Pesticides	OP Pesticides	Dissolved Oxygen	pH	*Temperature*
01 _ 2_	2007		x		x	x			
	2008		x	x	x	x			
01 _ _	2007		x	x	x				
	2008		x		x				
02 _	2007		x		x				
	2008		x		x		x		
04 _	2007		x		x	x			
	2008		x		x	x			
04 _	2007		x		x	x			
	2008		x		x	x			*x*
05 _ _	2007	x	x		x	x			*x*
	2008	x	x		x	x			
05 _	2007	x	x	x	x	x			
	2008				x	x			
05 _	2007				x	x			
	2008	x		x	x	x			
06 _ _	2007				x	x			
	2008	x	x	x	x	x			
_	2007		x		x	x			
	2008		x		x	x			
02 _	2007	x				x			
	2008	x		x		x		x	
02 _	2007	x	x	x		x			
	2008	x	x	x	x				
0 _	2007	x							
	2008		x	x	x	x			
0 _	2007	x	x	x			x		
	2008	x	x	x	x				
0 _	2007				x	x			
	2008				x	x			
04 _	2007								
	2008	x							
04 _	2007	x	x	x	x				
	2008	x	x		x				
_	2007								
	2008				*x*				

x Water quality benchmark exceedance during the corresponding year for the constituent noted in the above column.

1 06T LONG and 9BD GERRY are not included in the above table since they were not sampled during either monitoring year due to a lack of flow. VRT SANTO is not included in this table because there were not any exceedances in water quality benchmarks during 2007 or 2008.

TMDL WATER QUALITY MANAGEMENT PLAN REQUIREMENTS

Because TMDLs require the development of WQMPs regardless of whether monitoring data exceed TMDL load allocations, all of the areas covered by a TMDL that require a WQMP are addressed by this plan. This section discusses the TMDLs that require WQMPs, other TMDLs that are effective in Ventura County, but do not require WQMPs and provides a comparison of the TMDL WQMP requirements to the Conditional Waiver benchmark exceedances.

The process and BMPs outlined in the 2007 WQMP are designed to result in compliance with the TMDL load allocations. Like the Conditional Waiver benchmarks, TMDL allocations are designed to result in receiving waters achieving water quality objectives. As a result, actions taken to achieve water quality benchmarks will also help achieve TMDL load allocations.

The schedule for achieving TMDL load allocations will, in most cases, be longer than the schedule assigned to address water quality benchmark exceedances in the WQMP because TMDL implementation schedules are generally longer than the Conditional Waiver time frame. As a result, TMDL exceedances that do not correspond with prioritized Conditional Waiver benchmark exceedance locations will be addressed during future implementation phases within the time frame of the TMDL implementation schedules. TMDL exceedances within the prioritized Conditional Waiver areas will begin BMP implementation prior to November 2010 (See Table 13). All TMDL load allocations will be addressed using the process and BMPs outlined in the 2007 WQMP and referenced in this 2008 update.

The Conditional Waiver currently does not include monitoring for metals and selenium. However, in the Calleguas Creek watershed, a Metals and Selenium TMDL is effective and requires the development of a WQMP. As a result, metals and selenium were included in the previous 2007 WQMP to meet the requirements of the TMDL. Due to the fact that metals and selenium are not currently monitored under the waiver program, metals and selenium will not be specifically addressed during the first phase of WQMP implementation. However, BMPs are identified that address metals and selenium. Growers in priority areas in the Calleguas Creek watershed will be notified that a Metals and Selenium TMDL is in place and provided with BMP information. As many BMPs address multiple pollutants, actions taken to address other constituents are likely to address discharges of metals and selenium as well. Monitoring conducted as part of the Calleguas Creek Watershed TMDL Monitoring Program will be used to assess metals and selenium discharges from agriculture.

Table 11. Effective TMDLs in Calleguas Creek Watershed Requiring WQMPs

Constituent	Arroyo Simi	Arroyo Las Posas	Conejo Creek	Calleguas Creek [1, 2]	Revolon Slough [2]	Mugu Lagoon [2]
Organochlorine Pesticides and PCBs TMDL						
lordane						
4 4 -						
4 4 -						
4 4 -						
ieldrin						
s						
oxap ene						
ediment						
Toxicity TMDL						
ia inon						
lorpyrifos						
oxicity						
Metals and Selenium TMDL						
opper						
ic el						
ercury						
elenium						
Salts TMDL						
loride						
ulfate						
oron						

Blanks in table indicate constituent is not included in TMDL for that subwatershed.

1. Calleguas Creek covers Camarillo and Pleasant Valley subwatersheds for Salts TMDL.
2. Salts TMDL doesn't apply to Mugu Lagoon and only applies to Calleguas Creek above Potrero Road and Revolon Slough above Laguna Road.

Table 12. Other Effective TMDLs in Ventura County Not Requiring WQMPs [1]

Constituent	Arroyo Simi	Arroyo Las Posas	Conejo Creek	Calleguas Creek	Revolon Slough	Mugu Lagoon	Santa Clara River [2]	Ventura River Estuary
Nitrogen TMDL								
mmonia								
itrate								
itrite								
itrate itrite								
mmonia itrate itrite								
Chloride TMDL								
Trash TMDL								

1. Although WQMPs are not required for these TMDLs, BMPs may be needed to meet the requirements of the TMDLs. This WQMP may assist with agricultural compliance with these TMDLs, but specific activities will not be outlined in this WQMP to address these TMDLs above and beyond where the TMDLs overlap with benchmark exceedances.
2. For the Nitrogen TMDL, the Santa Clara River includes Reach 3, Mint Canyon Reach 1, Wheeler Canyon/Todd Barranca, Brown Barranca/Long Canyon.
3. The Chloride TMDL is effective in the Santa Clara River Reach 3, but does not include any requirements for agricultural actions.

The following table summarizes where TMDL requirements for the development of WQMPs overlaps with agricultural waiver benchmark exceedances that trigger WQMPs. The table addresses the Calleguas Creek TMDLs that require the development of WQMPs and the nitrogen TMDLs for the Calleguas Creek and Santa Clara River watershed. Although the nitrogen TMDLs do not require the development of WQMPs, benchmark exceedances of nitrogen exist and BMP implementation in those areas will assist with TMDL implementation. This table provides a mechanism for comparing where nitrogen BMPs will be implemented as compared to TMDL requirements. As growers implement BMPs to address the water quality benchmark exceedances, they will also be implementing actions to achieve TMDL load allocations. The Trash TMDLS and Santa Clara Chloride TMDL are not addressed in this WQMP and are not included in the table.

Table 13. Comparison of Effective TMDLs to Waiver Monitoring Location Benchmark Exceedances

WQMP TMDL Subwatershed and Corresponding VCAILG Monitoring Sites	Organochlorine Pesticides	Organophosphorus Pesticides	Salts	Toxicity	Nitrogen	Metals and Selenium
Arroyo Simi	**T**	**T**	**T**	**T**	**T**	
one						
Arroyo Las Posas	**T**	**T**	**T**	**T**	**T**	
06 _ _						
06 _						
Conejo Creek	**T**	**T**	**T**	**T**	**T**	**T**
9 _						
Calleguas Creek	**T**	**T**	**T** [1]	**T**	**T**	**T**
02 _						
Revolon Slough	**T**	**T**	**T** [2]	**T**	**T**	**T**
04 _						
04 _						
05 _ _						
05 _						
05 _						
Mugu Lagoon	**T**	**T**	[3]	**T**	**T**	**T**
01 _ 2_						
01 _ _						
Santa Clara Reach 3					**T**	
0 _						
0 _						
0 _						
Mint Canyon Reach 1					**T**	
one						
Brown Barranca/Long Canyon					**T**	
one						
Wheeler Canyon/Todd Barranca					**T**	
02 _						
Other Santa Clara River Sites						
02 _						
04 _						
04 _						

Note: VCAILG monitoring sites (except background sites and those in the Ventura River Watershed) are listed under their appropriate reach or subwatershed to allow for easy comparison with where TMDLs are in effect.
T TMDL in effect for the corresponding reach or subwatershed
A Ag Waiver benchmark exceedance
Blank cell Either samples were collected and an exceedance was not found or the site has been dry and therefore not sampled

1. Salts TMDL only applies to discharges above Potrero Road.
2. Salts TMDL only applies to discharges above Laguna Road.
3. Salts objectives and TMDL do not apply to these locations because they are tidally influenced.

n i en pe i i e i e nd e

The example WQMP in Appendix 7 of the Conditional Waiver includes requirements to discuss the water quality problem, including a discussion of the potential sources of the constituents. In the 2007 WQMP, the "Constituent Specific Water Quality Problems and Sources" section provided a discussion of the following aspects of the example WQMP:

- Describe the water quality problem identified by monitoring or other methods
- Describe the pollutant associated with this water quality problem
- Describe the sources of the pollutant or water quality problem

For each constituent group, characteristics of the pollutant and a summary of potential sources were discussed in the 2007 WQMP and are not repeated in this document. Details of the monitoring sites where exceedances of benchmarks occurred are presented in the previous section and exceedance results for 2008 are summarized in Appendix B. Specifically for chronic toxicity, the Conditional Waiver requires that the WQMP propose the most relevant species for toxicity testing. VCAILG submitted recommendations for subsequent toxicity testing in a letter to the Executive Officer on July 30, 2008. On September 11, 2008, VCAILG received instructions regarding single species tests for future toxicity monitoring; therefore, a proposal of sensitive species is not included in this report.

n e en i e den i i in pe en i n nd in

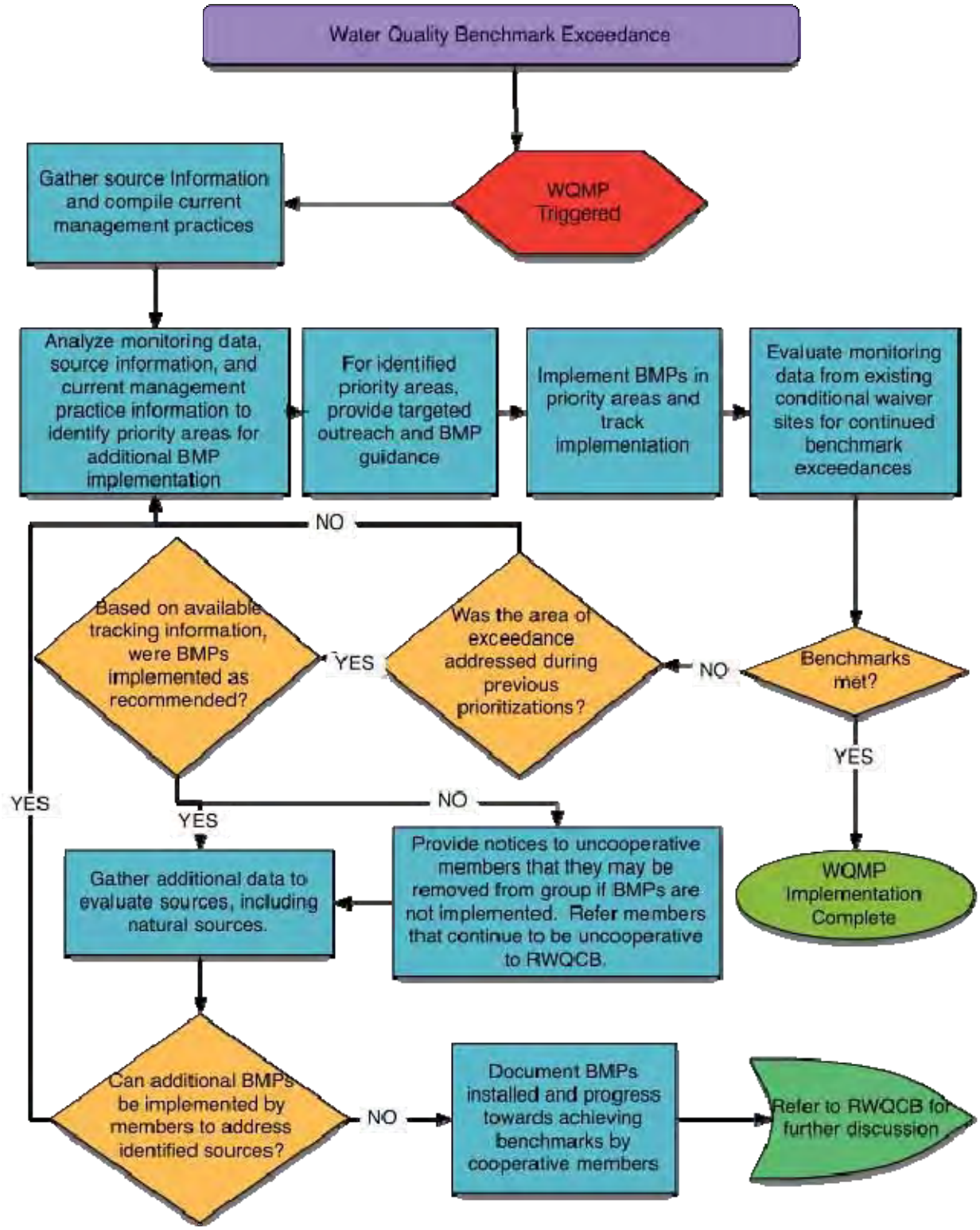
This section of the 2007 WQMP defined the process to be utilized by VCAILG to identify the need for management practices, implement specific management practices, and track the implementation and effectiveness of those management practices to mitigate water quality benchmark exceedances and achieve TMDL load allocations. The process that was identified addressed required elements of the WQMP (as provided in Appendix 7 to the Conditional Waiver) and included a timeline during which VCAILG and its members would carry out the approved steps.

The VCAILG 2007 WQMP should be referred to regarding plan specifics, detailed explanations of the process, and mechanisms for completing implementation actions. However, integral figures and some components of the WQMP implementation process are duplicated in this 2008 WQMP for easy reference. Accomplishments in WQMP implementation since submittal of the 2007 plan are described in the following section.

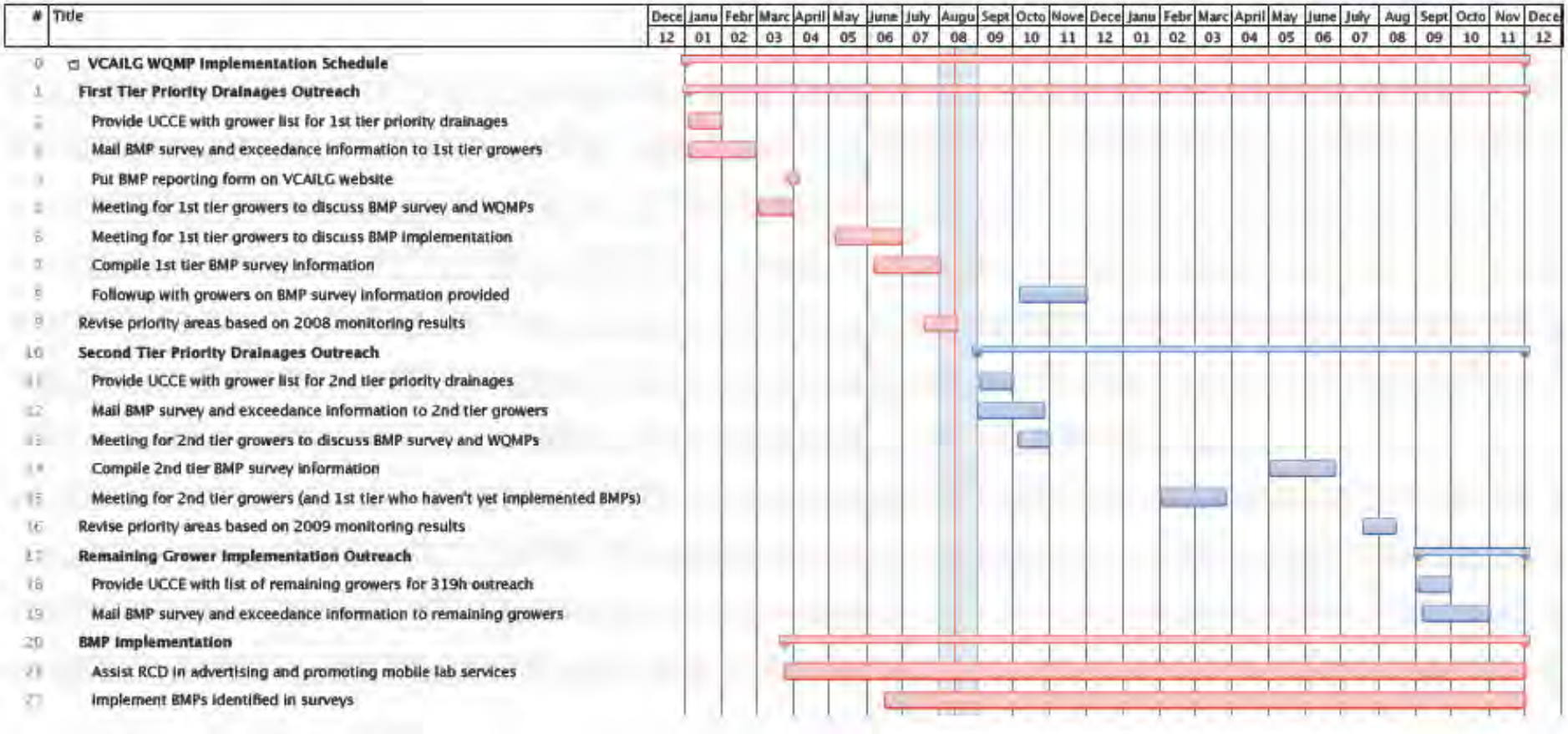
W MP IMPLEMENTATION PROCESS

Figure 7 outlines the WQMP implementation process and Figure 8 provides a timeline for task completion as well as how and when each priority tier will be targeted. New in this WQMP are Figure 9 and Table 14, which list the implementation achievements since submittal of the 2007 WQMP. Many outreach tasks were completed by VCAILG in addition to the steps required by the WQMP. Table 14 summarizes the education outreach classes, which were approved for Conditional Waiver education credits, only two of which were required by the WQMP.

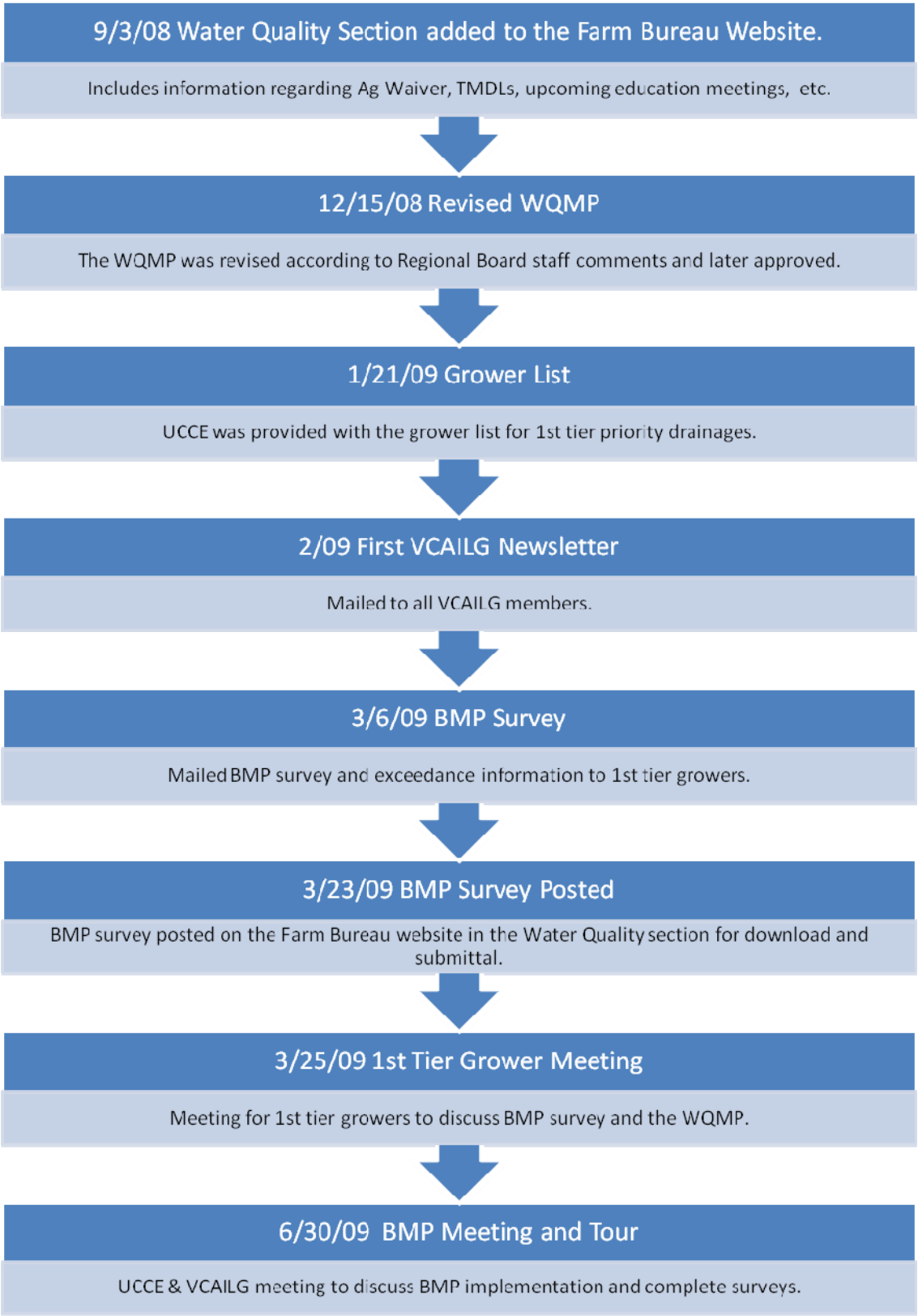
Most completed tasks were focused on outreach to the first tier priority growers, however outreach to the entire VCAILG membership and some specific commodities also took place. An explanation of each element of the WQMP process is discussed in the 2007 report.



igure 7. W MP Implementation Process



igure 8. Tas and Date-specific Implementation Timeline



igure 9. W MP Specified Implementation Actions

Table 14. Education Outreach Classes

Date	Class	VCAILG Members in Attendance	Course Topics
11/13/08	Water and Agriculture in Ventura County: The Conditional Waiver and You	4	Hosted by the Strawberry Commission, this meeting summarized up to date monitoring information and explained the WQMP process. BMPs to address benchmark exceedances were also discussed and information was provided regarding resources and agencies available to assist with BMP implementation.
3/25/09	**Water uality Management Plan Survey: irst Priority**	44	Growers and landowners in the first tier priority drainages were invited to this meeting. VCAILG representatives and consultants explained the WQMP process and what it means to be in a first tier drainage. Finally, the Management Practice Survey was explained in detail and attendees were given the opportunity to complete their survey or ask questions.
4/2/09	CORF IPM Practices for Bedding Plants and Container Color	10	Hosted by CORF and UCCE, this meeting provided Integrated Pest Management practice information specifically for nursery crops.
4/15/09	California Avocado Grower's Seminar: Creating Our Future	37	Hosted by the Avocado Commission and UCCE, this meeting focused on pest research and updates relevant to avocados.
6/10/09	Water Best Management Practices	54	Hosted by the Strawberry Commission with support from the Ventura County RCD and VCAILG, presentations were given regarding the Mobile Irrigation Lab and the importance of effective irrigation scheduling for plant health and runoff reduction. VCAILG representatives gave a short introduction of the Management Practice Survey and provided assistance as needed.
6/30/09	**Vegetated Treatment Systems: Seminar and Tour**	58	Growers and landowners in the first tier priority drainages were invited to this meeting hosted by VCAILG, UCCE, and RCD. The seminar and tour focused on the uses and implementation of vegetated treatment systems as a BMP to address a variety of water quality issues. Time was also allotted for filling out the Management Practice Survey.

Education classes held to fulfill 2007 WQMP implementation are noted in **bold**.

IDENTI ICATION O PRIORITY AREAS

Identifying priority areas is important for focusing outreach efforts and promoting the implementation of BMPs in the areas with water quality benchmark exceedances. Four criteria categories were used to determine first, second, and third tier priority drainage areas:

- The total number of constituent exceedances at the monitoring site. This is the exceedance total from each site as listed in Table 8.
- Number of classes of pollutants with exceedances at the monitoring site. The pollutant classes are those listed in Table 9 (salts, nitrogen, chronic toxicity, OC pesticides, OP pesticides, dissolved oxygen, and temperature).
- The number of TMDLs effective at the monitoring site as shown in Table 11.
- Percentage of agricultural acreage enrolled in VCAILG. Figure 10 through Figure 12 show the drainage areas of each VCAILG monitoring site and the location of parcels that are not currently enrolled in VCAILG (as of July 15, 2009). Area close-ups of VCAILG monitoring site drainages can be found in Appendix C. This fourth category will be considered when determining the feasibility of monitoring water quality improvements at current VCAILG monitoring sites. In cases where a monitoring site drainage area has a significant proportion of un-enrolled landowners or there are un-enrolled parcels adjacent to the monitoring site location, those drainages' priority level may be downgraded until enrollment in VCAILG improves.

The following two tables detail the results of monitoring site drainage prioritization based on the above criteria. Prioritizations determined according to 2007 monitoring data and presented in the previous WQMP can be found in Table 15. In Table 16 the prioritization information is updated according to 2008 information. Two changes were made in site prioritization, 02D_BROOM was upgraded from third to second tier due to a significant increase in constituent exceedances and S03T_BOULD was downgraded to third tier because of low VCAILG enrollment in the drainage area.

Table 15. Monitoring Site Drainage Area Prioritizations-2007

Site ID	Category 1 Total # Constituent Exceedances	Category 2 # of Classes of Pollutants with Exceedances	Category 3 # of Effective TMDLs	Category 4a Total Ag Acres in Drainage Area	Category 4 % Ag Acres Enrolled in VCAILG
01 _ 2_	9		5	1700.85	95.7
01 _ _	10		5	690.50	100.0
02 _	4	2	5	5867.56	99.9
04 _	11		5	4060.51	99.9
04 _	11		5	192.6	96.1
05 _ _	19	5	6	16 .98	90.1
05 _	12	5	6	200 .92	100.0
05 _	5	2	6	208.98	97.
06 _ _	4	2	5	2405.24	99.4
06 _	0	0	5	2628.89	96.0
9 _	0	0	6	1066.76	100.0
_	10		0	1589.22	100.0
02 _	4	2	0	8 5.15	99.6
02 _	10	4	1	2797.71	99.6
0 _		1	1	16 2.74	100.0
0 _	7	4	1	2514.05	7 .6
0 _	2	2	1	1628.88	91.6
04 _	0	0	0	508.22	92.
04 _	19	4	0	768.47	100.0
_	0	0	0	17 4.67	98.0
_	0	0	0	1208.01	91.8

	i riority	1: 10	2: 4	: 4
	edium riority	1: 5-10	2: 2-	: 2-
	ow riority	1: 5	2: 2	: 2

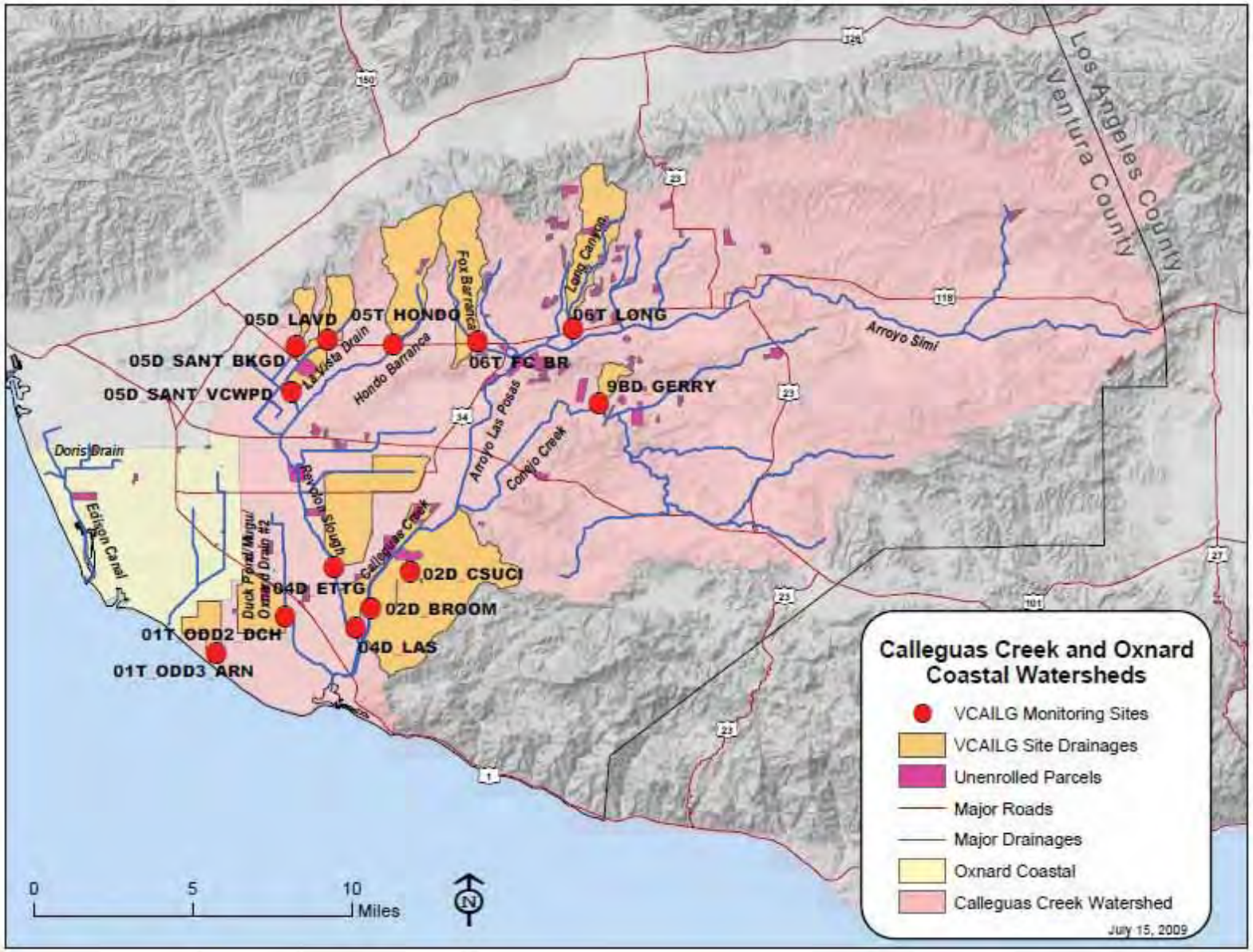
	1st tier prioriti ed draina es
	2nd tier prioriti ed draina es
	rd tier prioriti ed draina es

Table 16. Monitoring Site Drainage Area Prioritizations-updated with 2008 data

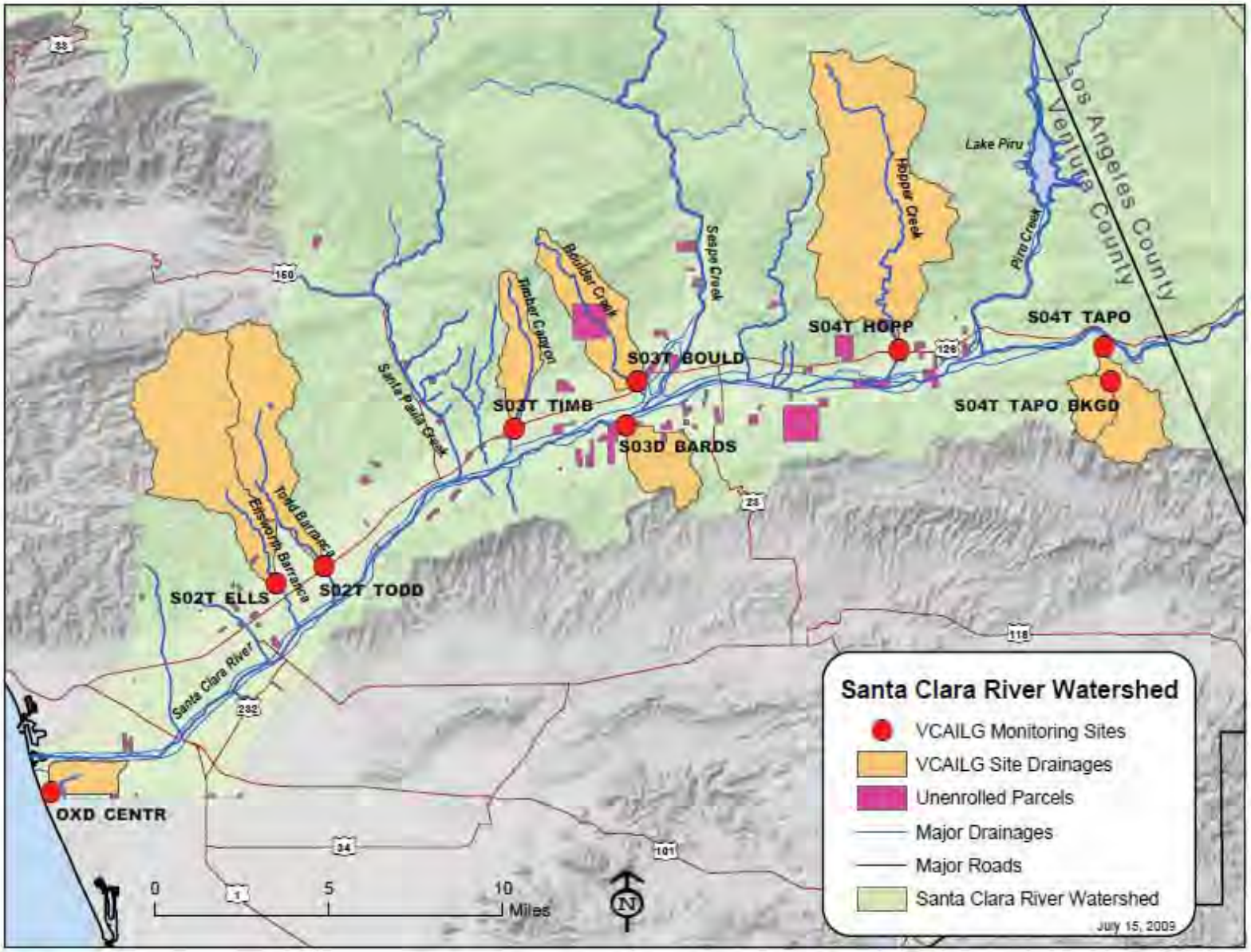
Site ID	Category 1 Total # Constituent Exceedances	Category 2 # of Classes of Pollutants with Exceedances	Category 3 # of Effective TMDLs	Category 4a Total Ag Acres in Drainage Area	Category 4 % Ag Acres Enrolled in VCAILG
01 _ 2_	14	4	5	1700.85	95.7
01 _ _	1	2	5	708.72	100.0
02 _	20		5	5478.45	96.5
04 _	2		5	857.58	99.9
04 _	25	4	5	2 50.57	88.4
05 _ _	29	4	6	1114.1	85.5
05 _	5	2	6	1086.25	100.0
05 _	9	4	6	112.78	98.6
06 _ _	7	4	5	2 96.27	99.8
06 _	0	0	5	2665.67	9 .6
9 _	0	0	6	1066.76	97.9
_	17		0	1266.8	100.0
02 _	8	4	0	909.81	99.6
02 _	9	4	1	2111.55	99.5
0 _	5	5	1	1504.29	100.0
0 _	7	4	1	2516.0	7 .6
0 _	6	2	1	1769.98	92.2
04 _	2	1	0	508.22	92.
04 _	18		0	2091.67	100.0
_	1	1	0	17 6.17	98.0
_	0	0	0	1165.7	95.1

	i riority	1: 10	2: 4	: 4
	edium riority	1: 5-10	2: 2-	: 2-
	ow riority	1: 5	2: 2	: 2

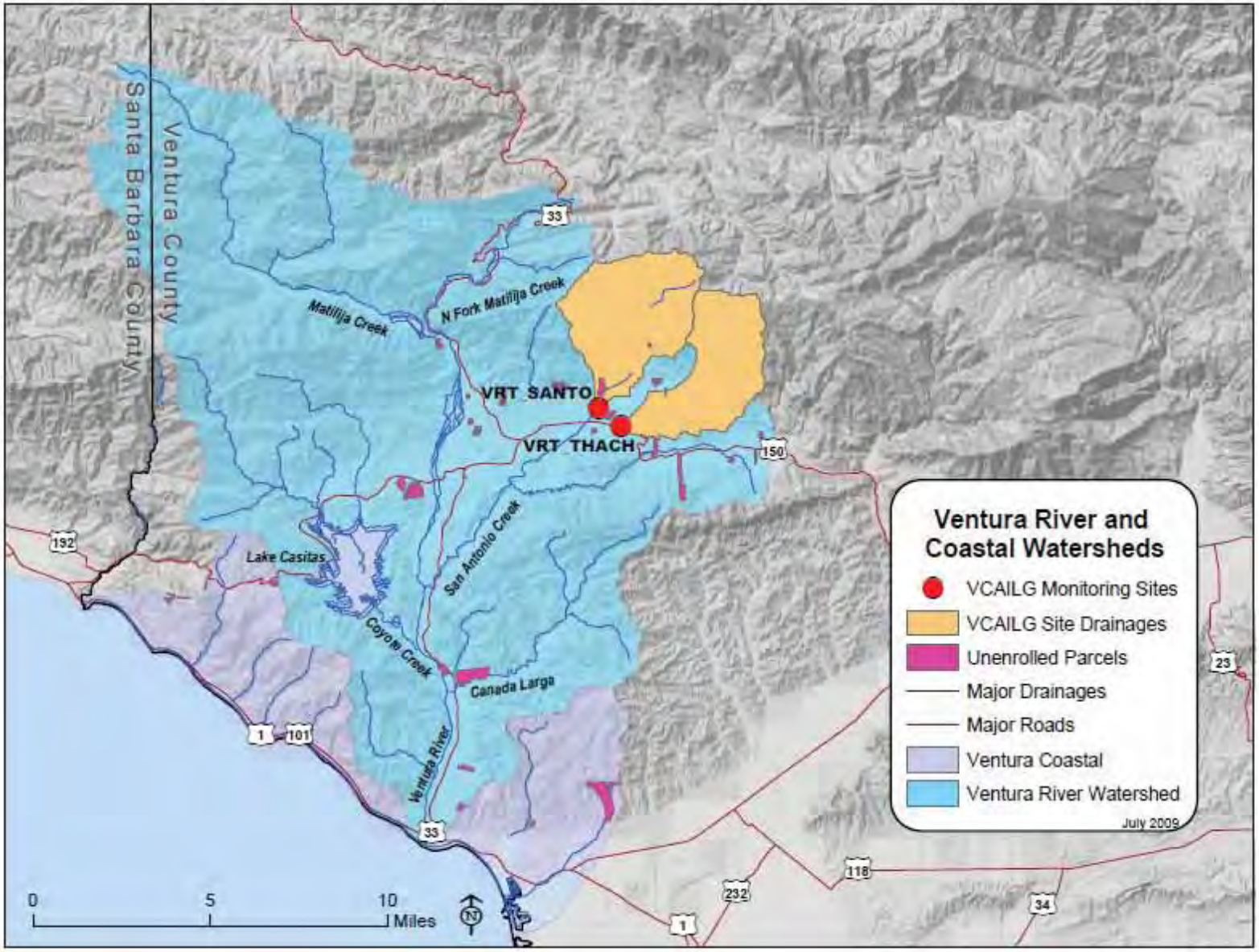
	1st tier prioriti ed draina es
	2nd tier prioriti ed draina es
	rd tier prioriti ed draina es



igure 10. Calleguas Cree and O nard Coastal Watersheds Monitoring Site Drainages and Un-enrolled Parcels



igure 11. Santa Clara River Watershed Monitoring Site Drainages and Un-enrolled Parcels



igure 12. Ventura River Watershed Monitoring Site Drainages and Un-enrolled Parcels

First tier priority drainage areas were targeted for BMP implementation and management practice survey reporting during the past year according to the timeline and task list presented in the 2007 WQMP, which can also be found as Figure 8 in this version. The revised second tier priority drainage areas can be found Table 16 and are listed as follows:

- 01T_ODD2_DCH
- 01T_ODD3_ARN
- 02D_BROOM
- 04D_ETTG
- 04D_LAS
- S03T_BOULD

Landowners and growers within the second tier priority areas will be receiving outreach and BMP information beginning in August. Follow-up with those in the priority areas will take place as part of the 319h grant outreach. Additionally, VCAILG maintains contact with those submitting surveys to ensure completion and accuracy of submitted documents. Appendix C shows the drainage areas for each VCAILG monitoring site, which are also the priority area boundaries.

Growers that are not in priority areas will be notified of the need to implement management practices, provided with resources for selecting appropriate management measures, and may download and complete and Management Practice Survey for inclusion in the VCAILG grower database. However, they will not receive targeted outreach or BMP assistance during this Conditional Waiver.

Priority areas will continue to evolve (as shown in the flow chart) as future monitoring data becomes available; sites that are currently a priority may show significant water quality improvements and areas where there has previously been no runoff could have water quality impairments that will need to be addressed. Any changes to priority tier status of a monitoring site drainage will be noted in subsequent WQMPs, including the rational for the change, as was noted for tier 2 in this document.

The following two sections are evaluation steps of the WQMP process. The first section includes a compilation of pesticide use data as a first step in assessing trends in pesticide application and water quality data. An analysis of the Management Practice Survey results for the first tier priority areas can be found following the pesticide use evaluation.

2008 PESTICIDE USE EVALUATION

As stated in the Conditional Waiver, should pesticide concentrations exceed a benchmark, an assessment of pesticide usage in relation to amount and timing of applications must be completed. To fulfill this requirement, the following is an analysis of pesticide use records for 2007 and 2008 as compared with VCAILG monitoring data for the same years. The evaluation focuses on diazinon and chlorpyrifos since those are the only two presently permitted pesticides with water quality benchmarks. Site specific application data was obtained from the Ventura County Agricultural Commissioner's office for 2007 and 2008, whereas County-wide application totals were available only for 2007 from DPR. To evaluate the pesticide use records, first site application locations had to be linked to the appropriate monitoring site drainage area. Not all pesticide applications took place within a monitoring drainage area. Additional manipulation of the pesticide use data included converting the percent concentration of active

ingredient based on the product name to an amount of active ingredient applied during each application. Depending on the product formulation, the conversion was either into gallons or pounds of active chlorpyrifos or diazinon. In the following discussion, the pounds of pesticide refer to pounds of active ingredient applied. The dates and amounts of pesticides applied were then compared to any benchmark exceedances. Table 17 through Table 20 include the available pesticide application information for 2007 and 2008 that occurred within the VCAILG monitoring drainages as compared to the monitoring data.

Chlorpyrifos

For agricultural application, chlorpyrifos is the active ingredient in Lorsban. Use of chlorpyrifos is common on lemons in Ventura County. Based on the 2007 DPR Annual Pesticide Use Report for Ventura County, 18,610 pounds of chlorpyrifos were applied to 5,251 acres of lemons. These applications account for 68% of the chlorpyrifos used in Ventura County for the year. Strawberries are second to lemons in pounds of chlorpyrifos applied with 6,489 pounds spread over 6,702 acres. Other commodities, separately under 800 pounds of chlorpyrifos each, accounted for the remaining 2,143 pounds applied to agricultural crops throughout the County for the year.

In 2007 and 2008, chlorpyrifos was applied within 19 out of 21 VCAILG monitoring sites (not including background sites). S04T_HOPP and S04T_TAPO are the two sites that did not have any chlorpyrifos applications during either of the monitoring years. Of the 19 sites with chlorpyrifos applications, 11 had exceedances of the water quality benchmark during the 2007 monitoring year and 10 had exceedances in 2008. All exceedances in 2007 occurred during the December 19th storm event, except for the dry weather exceedances at 05D_LAVD. During 2008, four dry weather chlorpyrifos exceedances took place, though the majority were during wet weather as in the previous monitoring year. The following factors are likely to contribute to the likelihood chlorpyrifos is transported off-site: pesticide formulation and application method, date of application in relation to subsequent rain events, mobilization of sediment during rain events, and proximity to a drainage channel, stream, or tributary. Table 17 and Table 18 provide chlorpyrifos application details within the VCAILG monitoring site drainage areas and exceedances of the 0.025 µg/L benchmark that occurred during 2007 and 2008.

Table 17. Chlorpyrifos Applications and E ceedances by Monitoring Site for 2007

Site	Date	Commodity	Amount of Active Ingredient Applied (gal)	Amount of Active Ingredient Applied (lbs.)	Total Amount of Active Ingredient Applied per Site in 2007 (gal)	Total Amount of Active Ingredient Applied per Site in 2007 (lbs)	2007 Date enchmar E ceeded	Dry or Wet Event	E ceedance Date Concentration (ug L)	Total Drainage Area (ac.)
	1/6/2007	Broccoli		41.43			12/19/2007	Wet	2.146	
01T ODD2 DCH	11/19/2007	Strawberry	7.97		12.46	41.43				1,564
	12/13/2007	Strawberry	4.49							
01T ODD3 ARN	7/5/2007	Cabbage		2.50	0.00	2.50	none		N/A	800
	3/26/2007	Lemon	85.88				none		N/A	
	4/17/2007	Cabbage		21.38						
02D BROOM	8/24/2007	Lemon	22.49		141.15	21.38				8,236
	10/12/2007	Lemon	32.78							
	1/10/2007	Broccoli		89.25			12/19/2007	Wet	1.38	
	1/11/2007	Broccoli	7.70							
	1/17/2007	Broccoli/Cabbage		88.87						
	1/22/2007	Broccoli	1.01							
	6/7/2007	Cabbage		29.93						
04D ETTG	6/28/2007	Cabbage		35.25	32.62	368.92				3,779
	7/20/2007	Cabbage		114.00						
	8/7/2007	Cabbage		11.63						
	8/11/2007	Strawberry	3.03							
	11/5/2007	Strawberry	18.07							
	11/21/2007	Strawberry	2.81							
	8/17/2007	Strawberry	2.81				12/19/2007	Wet	0.033	
04D LAS	8/17/2007	Strawberry	10.96		13.77	30.92				1,339
	10/3/2007	Cabbage		30.92						

Site	Date	Commodity	Amount of Active Ingredient Applied (gal)	Amount of Active Ingredient Applied (lbs.)	Total Amount of Active Ingredient Applied per Site in 2007 (gal)	Total Amount of Active Ingredient Applied per Site in 2007 (lbs)	2007 Date enchmar E ceeded	Dry or Wet Event	E ceedance Date Concentration (ug L)	Total Drainage Area (ac.)
05D LAVD[1]	4/25/2007	Lemon	2.25		22.65	0.00	6/5/2007	Dry	0.1094	877
	9/5/2007	Lemon	14.86				6/5/2007	Dry	0.0775	
	11/2/2007	Strawberry	3.30							
	11/19/2007	Strawberry	2.25							
05D SANT VCWPD	5/2/2007	Lemon	19.03		48.66	6.39	12/19/2007	Wet	0.292	1,154
	6/11/2007	Kale/Collard		6.39						
	11/9/2007	Lemon	23.46							
	11/10/2007	Strawberry	4.27							
	11/20/2007	Strawberry	1.91							
05T HONDO	11/10/2007	Lemon	25.93		91.33	0.00	12/19/2007	Wet	0.192	3,267
	8/29/2007	Lemon	7.61							
	8/31/2007	Lemon	3.82							
	11/30/2007	Lemon	13.47							
	8/29/2007	Lemon	40.50							
06T FC BR	9/10/2007	Lemon	45.68		105.61	0.00	12/19/2007	Wet	0.054	3,121
	9/24/2007	Lemon	18.32							
	9/28/2007	Lemon	9.52							
	10/19/2007	Lemon	14.79							
	10/19/2007	Tangerine	5.97							
	11/2/2007	Orange	1.23							
	11/9/2007	Lemon	10.10							

Site	Date	Commodity	Amount of Active Ingredient Applied (gal)[2]	Total Amount of Active Ingredient Applied per Site in 2007 (gal)	2007 Date enchmar E ceeded	Dry or Wet Event	E ceedance Date Concentration (ug L)	Total Drainage Area (ac.)
06T LONG	5/17/2007	Lemon	5.06	76.33	none		N/A	2,935
	7/17/2007	Orange	0.08					
	10/5/2007	Lemon	0.39					
	10/10/2007	Lemon	4.21					
	10/26/2007	Lemon	44.14					
	11/18/2007	Lemon	2.25					
	12/13/2007	Lemon	20.21					
9BD GERRY	10/31/2007	Lemon	7.39	43.31	none		N/A	447
	11/29/2007	Lemon	35.92					
O D CENTR	7/28/2007	Strawberry	50.40	50.40	12/19/2007	Wet	1.452	1,243
S02T ELLS	8/28/2007	Lemon	4.49	22.45	12/19/2007	Wet	0.038	9,015
	10/5/2007	Lemon	17.96					
S02T TODD	8/9/2007	Lemon	4.71	25.48	12/19/2007	Wet	0.16	5,748
	10/1/2007	Lemon	20.77					
S03D BARDS	4/4/2007	Orange	0.88	30.16	12/19/2007	Wet	0.322	2,214
	4/9/2007	Orange	0.01					
	4/16/2007	Orange	2.92					
	10/31/2007	Tangerine/Lemon	26.35					
S03T BOULD	10/4/2007	Lemon	9.77	9.77	none		N/A	3,764
S03T TIMB	10/4/2007	Lemon	7.37	7.37	none		N/A	2,183
VRT SANTO	10/30/2007	Lemon	2.69	2.69	none		N/A	7,220
VRT THACH	10/29/2007	Lemon	12.12	12.12	none		N/A	6,003

[1] There are two exceedance concentrations for LAVD on 6/5/07 because the site was sampled twice in the same day.
[2] Site listed on this page did not have any chlorpyrifos applications weighted in pounds.

Table 18. Chlorpyrifos Applications and E ceedances by Monitoring Site for 2008

Site	Date	Commodity	Amount of Active Ingredient Applied (gal)	Amount of Active Ingredient Applied (lbs)	Total Amount of Active Ingredient Applied per Site in 2008 (gal)	Total Amount of Active Ingredient Applied per Site in 2008 (lbs)	2008 Date enchmar E ceeded	Dry or Wet Event	E ceedance Date Concentration (ug L)	Total Drainage Area (ac.)
01T ODD2 DCH	3/19/2008	Cabbage		89.78	7.97	179.04	1/5/2008	Wet	1.2828	1,564
	5/14/2008	Cabbage		10.13			1/24/2008	Wet	0.9837	
	9/16/2008	Broccoli		79.14						
	11/22/2008	Strawberry	7.97							
01T ODD3 ARN	2/17/2008	Broccoli		75.81		75.81	none		N/A	800
02D BROOM	6/25/2008	Lemon	100.58		102.48	1.50	none		N/A	8,236
	7/24/2008	Cabbage		1.50						
	11/1/2008	Strawberry	1.91							
04D ETTG	1/7/2008	Broccoli		34.91	41.31	295.90	1/5/2008	Wet	0.5481	3,779
	1/15/2008	Broccoli		69.00			1/24/2008	Wet	0.8757	
	2/6/2008	Broccoli		9.98			9/16/2008	Dry	0.0561	
	2/27/2008	Broccoli		21.28						
	6/24/2008	Cabbage		99.00						
	7/2/2008	Cabbage		7.98						
	7/9/2008	Cabbage		14.25						
	8/22/2008	Cabbage		24.00						
	8/24/2008	Strawberry	2.25							
	9/2/2008	Kale		1.38						
	9/17/2008	Lemon	16.16							
	10/2/2008	Cabbage		14.12						
	10/10/2008	Lemon	17.96							
	11/11/2008	Strawberry	0.22							
	11/19/2008	Strawberry	4.71							

Site	Date	Commodity	Amount of Active Ingredient Applied (gal)	Amount of Active Ingredient Applied (lbs)	Total Amount of Active Ingredient Applied per Site in 2008 (gal)	Total Amount of Active Ingredient Applied per Site in 2008 (lbs)	2008 Date enchmar E ceeded	Dry or Wet Event	E ceedance Date Concentration (ug L)	Total Drainage Area (ac.)
	4/11/2008	Onion		49.88			1/5/2008	Wet	0.0654	
04D LAS	10/8/2008	Cabbage		3.00	0.00	88.88	1/24/2008	Wet	0.0586	1,339
	11/10/2008	Cabbage		36.00			9/16/2008	Dry	0.1307	
	9/12/2008	Lemon	91.06				1/24/2008	Wet	0.3984	
	10/30/2008	Lemon	38.17							
05D LAVD	11/17/2008	Strawberry	0.70		398.73	0.00				877
	11/25/2008	Lemon	268.80							
	4/26/2008	Cabbage		13.50			1/5/2008	Wet	0.2254	
	9/2/2008	Lemon	28.29				1/24/2008	Wet	0.2442	
	9/24/2008	Lemon	302.40				9/16/2008	Dry	0.2695	
05D SANT VCWPD	11/20/2008	Strawberry	1.12		405.15	13.50				1,154
	11/20/2008	Strawberry	4.94							
	11/24/2008	Strawberry	1.21							
	11/25/2008	Lemon	67.20							
	7/21/2008	Lemon	3.04				1/24/2008	Wet	0.2482	
	8/28/2008	Lemon	46.47							
	9/2/2008	Lemon	30.53							
	9/4/2008	Lemon	3.82							
05T HONDO	10/1/2008	Lemon	25.54		469.51	0.00				3,267
	10/6/2008	Lemon	344.16							
	10/6/2008	Lemon	12.60							
	11/22/2008	Lemon	3.36							

Site	Date	Commodity	Amount of Active Ingredient Applied (gal)	Amount of Active Ingredient Applied (lbs)	Total Amount of Active Ingredient Applied per Site in 2008 (gal)	Total Amount of Active Ingredient Applied per Site in 2008 (lbs)	2008 Date enchmar E ceeded	Dry or Wet Event	E ceedance Date Concentration (ug L)	Total Drainage Area (ac.)
	7/23/2008	Lemon	2.69				none		N/A	
	8/11/2008	Lemon	0.76							
	8/27/2008	Lemon	18.51							
	8/29/2008	Lemon	3.23							
06T FC BR	9/29/2008	Orange	0.45		70.86	0.00				3,121
	10/31/2008	Lemon	15.15							
	11/12/2008	Lemon	26.94							
	11/19/2008	Lemon	0.60							
	11/19/2008	Lemon	2.53							
	6/24/2008	Lemon	2.81				none		N/A	
	8/5/2008	Lemon	47.77							
	9/17/2008	Lemon	50.29							
	9/18/2008	Lemon	2.92							
	9/30/2008	Lemon	28.35							
	10/8/2008	Lemon	37.80							
06T LONG	10/10/2008	Lemon	123.48		582.53	0.00				2,935
	10/25/2008	Lemon	4.20							
	10/28/2008	Lemon	245.70							
	11/8/2008	Lemon	17.60							
	11/12/2008	Lemon	10.51							
	11/30/2008	Lemon	11.11							

Site	Date	Commodity	Amount of Active Ingredient Applied (gal)	Amount of Active Ingredient Applied (lbs)	Total Amount of Active Ingredient Applied per Site in 2008 (gal)	Total Amount of Active Ingredient Applied per Site in 2008 (lbs)	2008 Date enchmar E ceeded	Dry or Wet Event	E ceedance Date Concentration (ug L)	Total Drainage Area (ac.)
9BD GERRY	7/18/2008	Lemon	23.12		89.35	0.00	none		N/A	447
	9/12/2008	Lemon	35.92							
	10/11/2008	Lemon	30.24							
	11/2/2008	Lemon	0.07							
O D CENTR	7/8/2008	Cabbage		252.00	157.15	252.00	1/5/2008	Wet	0.6766	1,243
	8/9/2008	Strawberry	157.15				1/25/2008	Wet	4.9679	
S02T ELLS	4/28/2008	Cabbage	1.57		279.83	0.00	9/16/2008	Dry	0.225	9,015
	8/28/2008	Lemon	64.26							
	9/3/2008	Lemon	52.92							
	9/15/2008	Lemon	12.60							
	9/15/2008	Lemon	67.20							
	10/28/2008	Lemon	22.30							
	10/31/2008	Lemon	58.98							
S02T TODD	4/28/2008	Cabbage	1.57		102.52	0.00	none		N/A	5,748
	8/11/2008	Lemon	23.94							
	9/4/2008	Lemon	12.52							
	10/11/2008	Lemon	31.88							
	10/26/2008	Lemon	32.61							
S03D BARDS	10/27/2008	Orange	0.56		1.68	0.00	1/24/2008	Wet	2.6776	2,214
	11/6/2008	Orange	1.12							

Site	Date	Commodity	Amount of Active Ingredient Applied (gal)	Amount of Active Ingredient Applied (lbs)	Total Amount of Active Ingredient Applied per Site in 2008 (gal)	Total Amount of Active Ingredient Applied per Site in 2008 (lbs)	2008 Date enchmar E ceeded	Dry or Wet Event	E ceedance Date Concentration (ug L)	Total Drainage Area (ac.)
S03T BOULD	9/10/2008	Lemon	147.51		290.35	0.00	none		N/A	3,764
	9/30/2008	Lemon	111.53							
	10/14/2008	Lemon	0.34							
	11/10/2008	Lemon	30.98							
S03T TIMB	8/27/2008	Lemon	152.66		189.62	0.00	1/5/2008	Wet	0.1123	2,183
	10/21/2008	Lemon	36.96							
VRT SANTO	2/8/2008	Orange		1.50	15.12	4.50	none		N/A	7,220
	2/27/2008	Orange		3.00						
	11/8/2008	Lemon	15.12							
VRT THACH	2/7/2008	Orange		0.75	45.36	7.35	none		N/A	6,003
	2/11/2008	Orange		0.30						
	6/2/2008	Orange		4.50						
	9/19/2008	Orange		1.80						
	11/7/2008	Lemon	45.36							

Diazinon

Diazinon usage by weight was much less than chlorpyrifos in 2007, with 3,183 pounds applied as compared to 27,242 pounds of chlorpyrifos.[1] The commodity receiving the most diazinon was raspberries with 1,780 pounds applied to 676 acres. Applications of diazinon occurred within 9 VCAILG monitoring site drainage areas in 2007 and only 7 drainages in 2008. There was one exceedance of the 0.10 µg/L benchmark during the December 19, 2007 storm event. Two diazinon exceedances occurred during 2008, one during the January 24th storm event and the second during the dry season on May 20th. In 2007 most applications of diazinon were completed in the early months of the year, January through March, with a few applications in early summer. Diazinon applications during 2008, were during the dry months of April through September. As compared to chlorpyrifos, most of the 2007 applications of diazinon were small, with less than 10 gallons of active ingredient broadcast. In 2008 there was a wider range of application amounts (0.30 to 57.60 gallons of active ingredient). Table 19 and Table 20 include diazinon application information for the VCAILG monitoring site drainages and the water quality benchmark exceedances.

[1] California Department of Pesticide Regulation. "2007 Annual Pesticide Use Report Indexed by Chemical, Ventura County."

Table 19. Diazinon Applications and E ceedances by Monitoring Site for 2007

Site	Date	Commodity	Amount of Active Ingredient Applied (gal)	Amount of Active Ingredient Applied (lbs)	Total Amount of Active Ingredient Applied per Site in 2007 (gal)	Total Amount of Active Ingredient Applied per Site in 2007 (lbs)	2007 Date enchmar E ceeded	Dry or Wet Event	E ceedance Date Concentration (ug L)	Total Drainage Area (ac.)
01T ODD2 DCH	3/19/2007	Lettuce Head	0	84	0	84	none		N/A	1,564
02D BROOM	2/21/2007	Raspberry	2.28	0	46.79	34	none		N/A	8,236
	2/21/2007	Raspberry	11.32	0						
	3/5/2007	Cabbage	3.24	0						
	3/20/2007	Beet/Bok Choy	6.85	4						
	4/4/2007	Cabbage/Bok Choy/Soil Fumigation Prep	23.1	0						
	7/10/2007	Corn, Human Consumption	0	30						
04D ETTG	5/4/2007	Cabbage	0.48	0.5	1.01	0.5	none		N/A	3,779
	9/7/2007	Mustard	0.53	0						
04D LAS	1/11/2007	Cabbage	0.84	0	0.99	0	none		N/A	1,339
	5/11/2007	Cabbage	0.15	0						
05D SANT VCWPD	7/3/2007	Collard	0.955	0	0.955	0	none		N/A	1,154
05T HONDO	6/5/2007	Nursery-Outdoor Plant	0.228	0	0.228	0	12/19/2007	Wet	0.125	3,267
06T LONG	3/20/2007	Raspberry	2.04	0	2.04	0	none		N/A	2,935
O D CENTR	7/29/2007	Nursery-Outdoor Flower	0	1	0	1	none		N/A	1,243
S03D BARDS	3/6/2007	Radish/Beet	0.375	0	0.375	0	none		N/A	2,214

Table 20. Diazinon Applications and E ceedances by Monitoring Site for 2008

Site	Date	Commodity	Amount of Active Ingredient Applied (gal)	Amount of Active Ingredient Applied (lbs)	Total Amount of Active Ingredient Applied per Site in 2008 (gal)	Total Amount of Active Ingredient Applied per Site in 2008 (lbs)	2008 Date enchmar E ceeded	Dry or Wet Event	E ceedance Date Concentration (ug L)	Total Drainage Area (ac.)
02D BROOM	7/8/2008	Corn	NA	16.50	NA	30.50	none		N/A	8,236
	4/10/2008	Cabbage	NA	14.00						
04D ETTG	7/12/2008	Tomato	57.60	NA	64.32	NA	none		N/A	3,779
	4/22/2008	Tomato	6.72	NA						
04D LAS	4/10/2008	Cabbage	NA	10.50	NA	10.50	5/20/2008	Dry	0.1933	1,339
05D SANT VCWPD	9/24/2008	Collard	2.88	NA	2.88	NA	none		N/A	1,154
05T HONDO	8/21/2008	Raspberry	0.73	NA	0.73	NA	none		N/A	3,267
S03T TIMB	5/24/2008	Parsley	0.30	NA	0.30	NA	none		N/A	2,183
S03D BARDS	5/1/2008	Parsley	0.42	NA	0.42	NA	1/24/2008	Wet	0.1231	2,214

Pesticide Use Summary

Within the VCAILG monitoring drainages, chlorpyrifos and diazinon are applied at opposite times of the year. Application timing, but also amount, may sufficiently explain the discrepancy between these two pesticides in terms of rate of exceedance. Chlorpyrifos, while being applied at greater volumes, is typically used in the fall and winter when there is greater potential for pesticide transport offsite as stormwater runoff. Diazinon is applied during the spring and summer, which minimizes the likelihood of transport to drainage channels, or adjacent streams. It is also applied in smaller volumes. There are additional differences in soil sorption and half-life. Chlorpyrifos attaches more strongly to sediment surfaces and is not readily soluble in water. It's half-life in soil is between 60 and 120 days[2]. The half-life of diazinon in soil ranges from 2 to 4 weeks[3]. Evaluation of diazinon and chlorpyrifos reports for subsequent years will provide insight into the continued usage or replacement of these pesticides with other alternatives. A synthesis of the information from pesticide use reports and BMP surveys can be found in the section following the BMP Survey Evaluation.

MP SURVEY EVALUATION

ac ground

As part of the VCAILG 2007 WQMP, a Survey of Management Practices was developed for distribution to VCAILG enrollees. The survey was modified and submitted in the December 15, 2008 revised version of the 2007 WQMP. It was then approved by the Regional Board Executive officer February, 3, 2009. Once approved, the finalized survey and drainage specific exceedance information (Appendix E, 2007) were mailed to all landowners and growers within the first tier priority drainage on March 6, 2009 (Figure 9). Completed surveys were provided by the first tier landowners and growers between March and June 2009.

The VCAILG Survey of Management Practices was designed, in part, to gather information about the extent of use of 100 BMPs, each of which was assigned to one of the following management practices categories[4]:

- Sediment and Erosion Management
- Irrigation Management
- Pest Management
- Nutrient Management
- Salinity Management and Leaching
- Property Management

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[2] EXTOXNET. "Chlorpyrifos." June 1996. < http://extoxnet.orst.edu/pips/chlorpyr.htm>

[3] EXTOXNET. "Diazinon." June 1996. < http://extoxnet.orst.edu/pips/diazinon.htm>

[4] The list of BMPs, and the contaminants potentially mitigated by each BMP, is provided in Appendix D as approved in the 2007 WQMP, revised December 15, 2008.

As part of the survey, respondents were asked to assign one of the following five descriptors (scores) to each of the BMPs:

- Yes, used prior to Jan. 2008
- Yes, new since Jan. 2008
- Planned for Future
- No, not currently used
- Not Applicable

The design of the survey resulted in associations between Ventura County Assessor's Parcel Numbers (APNs) and the scores for each of the 100 BMPs.

As previously described, the areas draining to the following five monitoring sites were designated as first tier priority drainages:

1. 05D_SANT_VCWPD
2. 05D_LAVD
3. OXD_CENTR
4. S02T_TODD
5. S04T_TAPO

First tier priority drainage survey responses are evaluated below.

Level of Response

As of August 2008, 40 surveys had been returned which described management practices on the irrigated land within 92 parcels. The geographic distribution of the surveyed parcels is presented in Table 21.

Table 21. Geographic Distribution of Irrigated Parcels for Which Surveys Were Returned

VCAILG Monitoring Site Associated with Irrigated Parcel	Number of Parcels Surveyed
05D LAVD	7
05D SANT BKGD	1
05D SANT VCWPD	7
O D CENTR	19
S02T ELLS	8
S02 TODD	17
S03D BARDS	1
S04T TAPO	4
S04T TAPO BKGD	1
Outside a VCAILG monitoring site drainage	27

Detail about the response rate (pegged to acreage, not grower) for the surveys from the priority drainages is provided in Table 22.

Table 22. Details about the Surveyed Acreage in the Priority Drainages

Priority Drainage	Irrigated Acres for Which Surveys Were Received	Irrigated Acres in Drainage Area Enrolled in VCAILG	Percent of Enrolled Acres for which Surveys were Received	Total Assessed Agricultural Parcel Acres in Drainage Area
S02T TODD	1231.12	1345.03	92	2111.55
S04T TAPO	751.76	751.76	100	2091.67
O D CENTR	946.07	945.57	100	1266.83
05D SANT VCWPD	478	798	60	1114.13
05D LAVD	546.4	738.7	74	1086.25

Evaluation of Survey Results

BMPs were evaluated separately for specific constituents of concern. In order to focus the analysis, BMPs were evaluated only for constituents that produced water quality benchmark exceedances during VCAILG monitoring in both 2007 and 2008. Table 23 shows the combinations of drainages and constituents that resulted from this prioritization. Exceedances in dissolved oxygen, pH, temperature, and chronic toxicity benchmarks were not evaluated using survey results, since these are not specific pollutants targeted by implementing survey management practices; though some management practices may have a positive impact in addressing these exceedances.

Table 23. Cases for which Survey Results were Evaluated

Priority Drainage	Salts	Nitrogen	OC Pesticides	OP Pesticides
S02T TODD				
S04T TAPO				
O D CENTR				
05D SANT VCWPD				
05D LAVD				

Survey results were entered into an Access database. For the analyses contained herein, the database was queried on the basis of drainage area and APN. In the majority of cases, a single set of management practices (scores for the 100 BMPs) applied to an entire parcel. In these cases, the irrigated acreage assigned to a set of BMP scores was that reported for the parcel during the original VCAILG enrollment process. In a few cases where more than one survey was returned that applied to a single parcel (e.g., when an owner and a tenant reported management practices for subsets of the same parcel), the irrigated acreage within the parcel was

subdivided after consultation with owners and tenants, and assigned to the pertinent sets of BMP scores.

The BMP scores and associated parcel acreage were used to derive the following parameters for each BMP, for each priority drainage:

A_{Unused}	Surveyed acres in the priority drainage applicable to a BMP that are currently not managed using the BMP
A_{2007}	Surveyed acres in the priority drainage already managed using a BMP prior to Jan. 2008
A_{2008}	Surveyed acres in the priority drainage managed using a BMP only after Jan. 2008
A_{Future}	Surveyed acres in the priority drainage planned for future management using a BMP
A_{Total}	Surveyed acres in the priority drainage in which the BMP is potentially applicable: $(A_{Unused} + A_{2007} + A_{2008} + A_{Future})$

Next, these parameters were used to calculate two types of percentages (P) for each BMP:

1. Percent of total applicable acres in the drainage on which a BMP was employed *by the time of the Survey*:

   $$P_{current} = (A_{2007} + A_{2008})/A_{Total}$$

2. Percent of applicable acres unmanaged prior to Jan. 2008 that *became* managed after Jan. 2008 using the BMP:

   $$P_{new} = A_{2008} /(A_{Total} - A_{2007})$$

The first parameter ($P_{current}$) serves as an index of the current prevalence of BMP use, regardless of when the BMP was instituted by the grower. The second parameter (P_{new}) serves as an indicator of improvement in BMP use during 2008. Values for $P_{current}$ and P_{new} for each BMP, stratified by constituent and drainage area, are presented in Appendix E.

In order to simplify results, $P_{current}$ and P_{new} were averaged for the BMPs within management categories to provide single percentages for each priority drainage and management category. These results are provided in Table 24 and Table 25.

In order to identify which individual BMPs are under-used that apply to specific constituents, $P_{current}$ for BMPs were averaged across the priority drainages applicable to each of the four constituents of concern (salts, nutrients, OC pesticides, and OP pesticides). This procedure resulted in a new parameter, *mean* $P_{current}$, for each combination of BMP and constituent. BMPs for each constituent were then ranked according to *mean* $P_{current}$. In Table 26 cases are presented for which *mean* $P_{current}$ was less than 50% -- in other words, cases in which a BMP is currently being utilized, on average, on less than 50% of the applicable acreage in the priority drainages.

Table 24. Percent of Surveyed Acres Employing MPs by the Time of the Survey (averaged within MP categories)

Targeted Constituent	Category of MPs	Number of Applicable MPs	Priority Drainage				
			05D SANT VCWPD	S02T TODD	O D CENTR	S04T TAPO	05D LAVD
Nitrogen	Sediment and Erosion	12	44	69	74	66	
	Irrigation	23	86	92	85	86	
	Nutrient	13	78	93	94	85	
	Salinity/Leaching	2	76	42	97	68	
	Property Management	5	84	96	98	100	
Salts	Sediment and Erosion	12	44	69		66	
	Irrigation	23	88	95		100	
	Pest Management	1	88	95		100	
	Nutrient	13	78	93		85	
	Salinity/Leaching	4	55	71		84	
	Property Management	5	84	96		100	
OC Pesticides	Sediment and Erosion	19	57		73	58	74
	Irrigation	22	81		84	85	85
	Property Management	4	88		100	100	95
OP Pesticides	Sediment and Erosion	19	57		73		74
	Irrigation	22	81		84		85
	Pest Management	28	88		95		90
	Property Management	5	84		96		93

Table 25. Percent of Surveyed Acres with New MPS, Implemented After Jan. 2008 (averaged within MP categories for targeted constituents)

Targeted Constituent	Category of MPs	Number of Applicable MPs	Priority Drainage				
			05D SANT VCWPD	S02T TODD	O D CENTR	S04T TAPO	05D LAVD
Nitrogen	Sediment and Erosion	12	2	17	24	0	
	Irrigation	23	39	45	11	0	
	Nutrient	13	39	13	46	0	
	Salinity/Leaching	2	34	5	0	0	
	Property Management	5	0	75	78	NA	
Salts	Sediment and Erosion	12	2	17		0	
	Irrigation	23	39	45		0	
	Pest Management	1	0	0		NA	
	Nutrient	13	39	13		0	
	Salinity/Leaching	4	17	5		0	
	Property Management	5	0	75		NA	
OC Pesticides	Sediment and Erosion	19	0		16	0	53
	Irrigation	22	31		11	0	64
	Property Management	4	0		100	NA	84
OP Pesticides	Sediment and Erosion	19	0		16		53
	Irrigation	22	31		11		64
	Pest Management	28	6		60		81
	Property Management	5	0		73		77

Table 26. est Management Practices (MPs) Used on Less Than 50 of the Surveyed Acreage, when Results for All Priority Drainages are Averaged

Constituent	MP Code from Survey	MP Description	Mean Percent Use
Nitrogen	17	Stormwater runoff is captured or kept on the property.	2
	16	Irrigation runoff is captured or kept on the property.	11
	35	Evapotranspiration (ET) values are used to determine irrigation requirements. Values are obtained from CIMIS, onsite atmometers, or other appropriate devices.	24
	18	Sediment traps are used at the end of the field to retain sediments in runoff.	27
	34	Soil moisture is measured with equipment such as gypsum block soil moisture sensors (such as Watermarks), tensiometers, soil probe, or neutron probe.	36
	19	Devices are in place to treat runoff before it leaves the property, such as grassed waterways, vegetated filter strips, and tailwater recycling systems.	37
	21	Utilize the services of the Irrigation Mobile Lab or a professional irrigation consultant for evaluating irrigation system performance.	46
OC Pesticides	17	Stormwater runoff is captured or kept on the property.	2
	16	Irrigation runoff is captured or kept on the property.	4
	35	Evapotranspiration (ET) values are used to determine irrigation requirements. Values are obtained from CIMIS, onsite atmometers, or other appropriate devices.	11
	1	Consult with local agencies (NRCS, RCD, UCCE, or county planning) to develop a soil conservation plan.	21
	18	Sediment traps are used at the end of the field to retain sediments in runoff.	23
	19	Devices are in place to treat runoff before it leaves the property, such as grassed waterways, vegetated filter strips, and tailwater recycling systems.	24
	21	Utilize the services of the Irrigation Mobile Lab or a professional irrigation consultant for evaluating irrigation system performance.	29
	2	Know your soil series and its erosion hazard rating.	48

Constituent	MP Code from Survey	MP Description	Mean Percent Use
OP Pesticides	17	Stormwater runoff is captured or kept on the property.	2
	16	Irrigation runoff is captured or kept on the property.	3
	35	Evapotranspiration (ET) values are used to determine irrigation requirements. Values are obtained from CIMIS, onsite atmometers, or other appropriate devices.	11
	1	Consult with local agencies (NRCS, RCD, UCCE, or county planning) to develop a soil conservation plan.	28
	18	Sediment traps are used at the end of the field to retain sediments in runoff.	29
	19	Devices are in place to treat runoff before it leaves the property, such as grassed waterways, vegetated filter strips, and tailwater recycling systems.	32
	55	Personnel are familiar with the UC online databases for comparing the risks of different pesticides moving with water and sediment and affecting non-target organisms (WaterTox or Pesticide Wise).	37
	21	Utilize the services of the Irrigation Mobile Lab or a professional irrigation consultant for evaluating irrigation system performance.	39
	45	Use UC IPM guidelines as a resource (www.ipm.ucdavis.edu).	44
Salts	17	Stormwater runoff is captured or kept on the property.	0
	16	Irrigation runoff is captured or kept on the property.	12
	18	Sediment traps are used at the end of the field to retain sediments in runoff.	23
	19	Devices are in place to treat runoff before it leaves the property, such as grassed waterways, vegetated filter strips, and tailwater recycling systems.	24
	35	Evapotranspiration (ET) values are used to determine irrigation requirements. Values are obtained from CIMIS, onsite atmometers, or other appropriate devices.	32
	21	Utilize the services of the Irrigation Mobile Lab or a professional irrigation consultant for evaluating irrigation system performance.	34
	74	Chemical properties of the soil, including pH and electrical conductivity (EC), are routinely measured.	39
	34	Soil moisture is measured with equipment such as gypsum block soil moisture sensors (such as Watermarks), tensiometers, soil probe, or neutron probe.	41

Of the five-first tier priority drainages, 05D_LAVD showed significant improvements between the two monitoring years within the constituent categories of salts and nitrogen. There were no exceedances in either salts or nitrogen in 2008 and therefore an additional analysis of BMP implementation within these two constituent categories is provided. Fifty-five of the 100-surveyed management practices may address nitrogen exceedances. Those same management practices with the addition of three more apply to salts (BMP codes from survey: 71, 88, and 89). The following table lists all the surveyed management practices that address nitrogen and salts, with the additional three practices specific to salts constituents. Percentages are provided regarding implementation of each practice within the 05D_LAVD drainage area. Within the newly implemented since January 2008 category, management practices which were recently utilized on greater than 25% of the acreage in the 05D_LAVD drainage area are highlighted in yellow. Five management practices fall into this category, they include:

- The grower knows the infiltration rate of the soil, the available water holding capacity of the soil, and the crop rooting depth.
- Flow meters are used to measure actual water use and is coupled with known crop use values or other measurements to conserve water as appropriate.
- Most recent nutrient recommendations for your particular crops and growing practices are used.
- Soil fertility is routinely monitored through measurements of nitrogen, phosphorus, potassium, and micronutrients.
- Fertilization rates are adjusted based on the results of soil fertility measurements.

The newly implemented BMPs bring the total coverage of these practices up to 100% utilization for all except the first practice listed above. Twenty-four, which is almost half of the 58 potential salts or 55 potential nitrogen management practices, have 100% use within the surveyed acreage. There are also many BMPs noted as being newly implemented within an area of 18% or greater of the 546.4 surveyed-irrigated acres.

Table 27. Salts and Nitrogen MP Implementation within the 05D LAVD Drainage Area

MP Code from Survey	MP Description	Overall Percent Use	Percent Use New Since Jan. 2008
5	Riparian areas or other areas of natural vegetation were retained or expanded during site development.	65.6	18.3
6	Avoid bare fields using cover crops, leaving plant debris, or planting subsequent crops.	100.0	18.3
8	Apply mulch, compost, or green waste to improve soil characteristics, especially for sandy or clayey soils.	100.0	18.3
10	In sloped production areas, management practices to minimize erosion such as contour farming, contoured buffer strips, or terracing are used.	65.6	18.3
11	Berms, culverts, or flow channels are in place to divert water away from roads.	100.0	18.3
13	Erosion management practices such as terracing, water diversions, and critical area plantings are used for non-production areas that are sloped or hilly.	55.9	18.3
14	Ditch banks are protected from erosion with vegetation, rock protection, or geotextiles.	81.7	0.0
15	Non-cropped areas with bare soil are protected from erosion with vegetation, mulch, gravel, or by diverting water.	100.0	18.3
16	Irrigation runoff is captured or kept on the property.	0.0	0.0
17	Stormwater runoff is captured or kept on the property.	0.0	0.0
18	Sediment traps are used at the end of the field to retain sediments in runoff.	13.7	4.0
19	Devices are in place to treat runoff before it leaves the property, such as grassed waterways, vegetated filter strips, and tailwater recycling systems.	19.3	0.0
20	At least annually test the irrigation system for distribution uniformity by monitoring water delivery or pressure differences within a block.	100.0	18.3
21	Utilize the services of the Irrigation Mobile Lab or a professional irrigation consultant for evaluating irrigation system performance.	32.0	18.3
22	Implement appropriate improvements based on your own irrigation system test or the recommendations of the Irrigation Mobile Lab or other appropriate irrigation professionals.	100.0	18.3
23	When drip irrigation is used, the distribution uniformity is 90 or better.	81.7	0.0
24	Irrigation main and lateral lines are regularly inspected for breaks, leaks, or clogs.	100.0	18.3
25	Filters are inspected and cleaned regularly.	100.0	18.3
26	Lines are flushed or cleaned chemically to prevent clogging.	66.4	0.0

MP Code from Survey	MP Description	Overall Percent Use	Percent Use New Since Jan. 2008
27	Pressure regulators or pressure compensating emitters are used.	100.0	18.3
28	Sprinkler heads and drip emitters of the same gallonage are used within each block and replaced with the same heads or emitters when necessary.	84.7	18.3
29	Consistent riser heights are used.	66.4	4.0
30	Water is diverted from non-crop areas by adjusting sprinkler head arcs or using sprinkler guards.	56.7	0.0
31	When irrigating for frost protection, the proper timing and amount of irrigation is used.	38.4	0.0
32	Alternative equipment such as tunnels, air circulation, heaters, or smudge pots are used for frost protection.	66.4	18.3
33	The grower knows the infiltration rate of the soil, the available water holding capacity of the soil, and the crop rooting depth.	65.6	27.1
34	Soil moisture is measured with equipment such as gypsum block soil moisture sensors (such as Watermarks), tensiometers, soil probe, or neutron probe.	66.4	8.8
35	Evapotranspiration (ET) values are used to determine irrigation requirements. Values are obtained from CIMIS, onsite atmometers, or other appropriate devices.	32.0	8.8
36	If irrigation must be based on a set schedule due to water availability, the amount of irrigation is varied according to the weather and plant growth stage.	47.3	0.0
37	Flow meters are used to measure actual water use and is coupled with known crop use values or other measurements to conserve water as appropriate.	100.0	52.7
38	Irrigation is halted if significant runoff occurs.	90.5	18.3
39	Harvested or unplanted areas are not irrigated.	66.4	18.3
40	Irrigation water quality is tested for parameters of interest including: pH, electrical conductivity (EC), sodium (Na), chloride (Cl), bicarbonate (HCO3), and boron (B).	100.0	18.3
41	Well head is protected from surface contamination (located high in the landscape so that surface water drains away from well head; located away from potential contaminants; the space between the casing and sides of hole is grouted; casing regularly inspected for leaks; vermin-proof well cap with screened vent).	65.6	18.3
42	Irrigation duties are performed only by personnel who understand and practice appropriate irrigation scheduling, application, and crop management practices related to runoff management.	100.0	18.3
71	Copper sulfate is not applied prior to extensive irrigation or expected rainfall.	53.7	0.0
73	Most recent nutrient recommendations for your particular crops and growing practices are used.	100.0	27.1

MP Code from Survey	MP Description	Overall Percent Use	Percent Use New Since Jan. 2008
74	Chemical properties of the soil, including pH and electrical conductivity (EC), are routinely measured.	65.6	18.3
75	Soil fertility is routinely monitored through measurements of nitrogen, phosphorus, potassium, and micronutrients.	100.0	27.1
76	Fertilization rates are adjusted based on the results of soil fertility measurements.	100.0	27.1
77	Crop plants are visually assessed for signs of nutrient deficiency or toxicity.	100.0	18.3
78	Leaf or petiole analyses are used as a guide for fertilizer application.	100.0	18.3
79	Fertilizer applications are split into multiple smaller applications rather than applying all that is required for a crop in one large application.	100.0	18.3
80	Fertilizer levels in fertigation water are tested to ensure that injectors are correctly calibrated.	66.4	18.3
81	Fertilizer applications are timed to maximize plant uptake, taking into consideration the life stage of the crop, potential rain events, and irrigation timing.	100.0	18.3
82	Slow-release fertilizers are used.	37.6	0.0
83	Fertilizer applications are adjusted to account for other nutrient sources, such as: irrigation water, cover crops, and residuals from previous fertilizations.	100.0	18.3
84	Fertilizers are stored where they are protected from rain and on an impermeable pad with a curb to contain spills.	100.0	18.3
85	Mixing and loading of fertilizers occurs in a covered area on an impermeable surface and more than 100 feet down slope from any wells.	55.9	18.3
86	Leaching is performed only when necessary, as determined by measuring soil solution electrical conductivity (EC).	66.3	18.3
87	Leaching is done only when fertilizer injectors are turned off.	48.0	0.0
88	Fertilizers and amendments with a low salt index are used.	100.0	18.3
89	Saline or high selenium wells are decommissioned and other sources of water are used.	4.0	0.0
90	Landowner, grower, or other personnel regularly attend UC Cooperative Extension, Commodity Board, or other industry educational meetings concerning management practices that protect water resources.	81.7	18.3
91	Landowner, grower, or other responsible personnel subscribe to and read farming, trade, and industry journals containing articles about water quality, fertilizer, pest and erosion management.	100.0	18.3

MP Code from Survey	MP Description	Overall Percent Use	Percent Use New Since Jan. 2008
92	Employees receive training on the following: wearing protective clothing, understanding fertilizer/pesticide signage, MSDS and label information, personal hygiene and sanitation, trash disposal and recycling, use storage and disposal of fertilizers and pesticides, pest and disease scouting, spill cleanup, and irrigation.	100.0	18.3
93	Training is provided in the employees native language.	91.2	18.3
95	Spill cleanup materials are readily accessible and maintained for all potential types and sizes of spills.	81.7	18.3

Survey Conclusions

The surveys that were received reflect management practices on large percentages (90-100%) of the enrolled acreage in three of the five priority drainages (S02T_TODD, S04T_TAPO, OXD_CENTR; see Table 22). Survey coverage was lower in the 05D_SANT_VCWPD drainage (60%) and the 05D_LAVD drainage (74%). Because all four of the priority constituents (salts, nutrients, OC pesticides, OP pesticides) are of concern in 05D_SANT_VCWPD, this drainage area is a priority for further survey work.

Inspection of the results in Table 25 reveals that growers in the S04T_TAPO drainage employed no new BMPs on irrigated acreage since Jan. 2008. Respondents in the OXD_CENTR and 05D_LAVD drainages report recently increased use of BMPs in almost all of the management categories pertinent to the constituents of local concern. Respondents in the 05D_SANT_VCWPD drainage reported almost no new use of BMPs for sediment and erosion management and property management (the latter entailing training and education activities).

Although only one year of monitoring data is available for review, the implementation of a broad range of management practices in the 05D_LAVD drainage area appears to be assisting with reducing benchmark exceedances in this drainage area. In future years when more monitoring data are available, similar analyses will be able to be completed for priority one and priority two drainage areas to assess the effectiveness of BMP implementation.

Inspection of the results in Table 24 indicates BMPs designed for sediment/erosion management and salinity/leaching management are less widely used in the priority drainages than BMPs designed for management of irrigation, pests, nutrients, and property (such as training and education). Several of the least used BMPs play a role in the control of all four of the constituents of concern. This suggests that it might be useful to focus outreach on the lesser used BMPs in order to decrease exceedances of water quality benchmarks. However, without knowing how prevalent the under-used BMPs are in drainage areas where water quality exceedances are *not* as frequently observed, it is difficult to determine the extent to which these patterns in BMP use explain water quality problems in the priority drainages.

SYNTHESIS O PESTICIDE USE AND SURVEY IN ORMATION WITHIN APPLICA LE IRST TIER PRIORITY DRAINAGES

The following is an initial attempt to integrate information regarding pesticide usage with Management Practice Survey results for the three-first tier priority drainages with OP pesticides exceedances: 05D_SANT_VCWPD, 05D_LAVD, and OXD_CENTR. With only two years of monitoring data and one initial round of surveys, only general assessments regarding the observed exceedances and implemented or potential BMPs, can be made at this time. Of the two OP pesticides with water quality benchmarks, diazinon did not cause any exceedances during either of the two monitoring years at the previously mentioned sites. However, the chlorpyrifos benchmark was exceeded on at least two occasions at all three monitoring sites.

Within 05D_LAVD, chlorpyrifos was applied to lemons and strawberries. Exceedances at this monitoring site occurred during a dry event in 2007 and a wet event in 2008. According to the survey results covering 7 parcels and 74% of acres enrolled in VCAILG, BMPs that may address OP pesticides are being well executed in the categories of irrigation management, pest management, and property management. All BMPs within those three categories are currently implemented within greater than 85% of the surveyed acreage. Sediment and erosion

management practices had the lowest rate of implementation with 74% of all potential BMPs in that category being utilized. However, as shown in Table 25, many of the BMPs applicable to OP pesticides were newly implemented (after January 2008). During the two dry weather monitoring events in 2008, 05D_LAVD was dry and therefore no additional exceedances occurred at this site. 2009 monitoring will provide results on whether the previously implemented and new BMPs sufficiently mitigate OP pesticide transport. Additionally, VCAILG will work to obtain completed surveys from the 26% of acreage within the 05D_LAVD drainage area that are currently not covered.

Chlorpyrifos was applied to the following crops within the 05D_SANT_VCWPD drainage area: lemons, strawberries, kale, and cabbage. Exceedances of the chlorpyrifos benchmark occurred during the 2007 storm event, and both storm events and a single dry event in 2008. A significantly greater amount of chlorpyrifos was applied during 2008 than in 2007 within this drainage area, 405.15 gallons as compared to 48.66 and 13.5 pounds as compared to 6.39 pounds, respectively. Seven out of twelve chlorpyrifos applications within the years of 2007 and 2008, occurred during the month of November. Within this drainage area, surveys were returned for 7 parcels covering 60% of the VCAILG enrolled acres. Obtaining surveys to cover the additional 40% of the VCAILG acres will be the first step in assessing whether appropriate BMPs are being utilized to address OP pesticides within the 05D_SANT_VCWPD drainage area. Based on the currently available results, over 80% of surveyed acreage have implemented appropriate BMPs in the categories of irrigation, pest management, and property management (Table 24). Sediment and erosion BMPs are currently utilized at a rate of 57%, which leaves room for recommendations and improvement. No new BMPs were implemented on the surveyed acreage to control sediment and erosion.

Within the OXD_CENTR drainage area, chlorpyrifos was applied on three occasions to strawberries and cabbage within the months of July and August. Though applications took place in the summer, exceedances were only found during the three storm events. This lag in application time and water quality benchmark exceedances could be attributed to the transport time between application locations and the monitoring site. Additionally, if effective irrigation timing and application measures are in place, runoff and/or sediment transport may only occur during storm events. Based on the survey information, which covers 19 parcels and 100% of the VCAILG enrolled acreage, BMPs for irrigation, pest, and property management have all been implemented on over 80% of the drainage area acreage. However, sediment and erosion control is the category with the lowest implementation rate within this drainage area. Adding new BMPs in this category may help address the pesticide exceedances during wet weather. New BMPs, implemented after January 2008, were noted in the categories of irrigation and pest management.

GROWER OUTREACH AND MP IMPLEMENTATION

In order to inform VCAILG members of their obligations under the Conditional Waiver and this WQMP, continued grower outreach is imperative. Outreach will continue to target growers according to the priority tiers and timeline described in previous sections. Methods of outreach to be carried out by the VCAILG include the following:

- Provide 319h grant team with lists of growers in each of the priority drainages according to the WQMP timeline (Figure 8). This will allow the grant team to provide on-site consultations, workshops, and demonstration tours for those growers in the areas which need the most assistance in achieving water quality benchmarks.

- Mail management practice surveys to growers in priority drainages according to the WQMP timeline (Figure 8). This will provide them with an opportunity to report their existing management practices, management practices that are newly implemented, and planned practices to address exceedances in their drainage area.
- The management practice survey is available online in the Water Quality section of the Farm Bureau website to enable any VCAILG member to report their current, new, and planned management practices.
- Host additional meetings according to the WQMP timeline (Figure 8). These meetings will focus on filling out the management practice survey, informing growers of water quality exceedances in their area, and discussing the importance of new management practice implementation and reporting.
- Provide growers with Mobile Irrigation Testing Lab information.

Uncooperative growers who do not participate in outreach opportunities or provide requested information may be removed from VCAILG and reported to the Regional Board at the discretion of the VCAILG Steering Committee.

MP IMPLEMENTATION TRAC ING

As detailed in the 2007 WQMP, VCAILG has created a database of BMP survey information to track established, new, and planned BMPs. Additional information will be gathered from the following sources:

- Management Practice Surveys
- VCAILG direct communication with grower members through mailings, meetings, and phone calls.
- VCAILG indirect communication with members using crop commission mailings and education outreach as a tool to gather management practice information.
- 319h grant communications with growers, including surveys, on-site consultations, workshops, tours, phone calls, other mailings. To enable efficient follow-up of BMP implementation, the VCAILG will provide UCCE with a list of its members who previously filled out a survey and are located within the priority drainage areas.
- Growers participating in the RCD's Irrigation Audits will be contacted in regard to changes they have made to their wells, pumps, and/or irrigation system following the recommendations outlined in their audit report.

Evaluation of survey results to date, show exceptional VCAILG member participation in submitting the Management Practice Survey within three of the first tier priority drainage areas (Table 22). Follow-up with growers within 05D_SANT_VCWPD and 05D_LAVD will take place to ensure survey completion by the remaining VCAILG members. Additionally, the 319h grant team will be provided with the survey results, which will allow them to target their site visits and outreach within the priority drainages and recommend BMPs that are not implemented as widely and may assist with achieving water quality benchmarks, such as sediment management practices (Table 26).

MONITORING RESULTS EVALUATION AND NE T STEPS

The WQMP implementation has been designed based on the existing Conditional Waiver monitoring location drainage areas. As a result, the existing monitoring program can be utilized to determine if BMP implementation is effective in reducing water quality benchmark exceedances. Utilizing the existing monitoring sites and their identified drainage areas to prioritize, track, and implement management practices to address water quality impairments enables the VCAILG to build the existing dataset utilizing consistent sites that have been determined to represent agricultural discharges.

The evaluation of BMP survey results as compared to monitoring results discussed above has provided preliminary information on the effectiveness of BMPs in addressing benchmark exceedances. Additional monitoring data under the existing monitoring program is needed to further this evaluation. At this time, changes to the monitoring program are not necessary to further evaluate BMP effectiveness. Rather, additional years of monitoring data following BMP implementation will provide sufficient information to assess BMP effectiveness and compare water quality results with current field conditions and future improvements.

In this section of the 2007 WQMP, a process was presented for addressing continued exceedances and determining implementation completion. The WQMP implementation is still in the early stages and evaluation under the scenarios above cannot be completed until outreach to the first priority tier has been completed and monitoring results are available to determine if benchmark exceedances are still occurring. In the 2009 WQMP, the priority one drainages will be evaluated based on the procedure above to determine if additional actions or monitoring is needed.

With the participation of its members in this WQMP, the VCAILG will be able to document the efforts and progress towards improving water quality in Ventura County.

SU MITTAL O VCAILG MEM ER IN ORMATION

Information regarding existing and newly installed BMPs, as well as other operational information relevant to water quality obtained from VCAILG members will be compiled on a monitoring site drainage or subwatershed basis for submittal to the Regional Board. All member information will be maintained should an inspection of the records be requested by Regional Board staff as required by the Conditional Waiver.

n in nd e end i n

This 2008 WQMP addresses the exceedances of all constituents observed during the 2008 VCAILG Conditional Waiver Monitoring Program and requirements to have WQMPs in place for effective TMDLs in Ventura County. The WQMP implementation process was developed and presented in the 2007 WQMP, this plan provides information on 2008 benchmark exceedances, information regarding WQMP implementation achievements, and a detailed evaluation of Management Practice Survey results from the first tier priority drainages.

One VCAILG monitoring site location has been changed as requested in the April 9, 2009 letter, approving the 2008 Annual Monitoring Report. 06T_LONG has been moved upstream due to a lack of flow for two subsequent monitoring years. For details regarding this change in the VCAILG Monitoring Program, please refer to the VCAILG MRP Amendment dated May 19, 2009. No additional modifications to the MRP are proposed at this time.

Appendix A

Photos of Sites When Exceedances Occurred During 2008

CALLEGUAS CREE WATERSHED

01T_ODD2_DCH

Event 4

View upstream

View downstream

Event 5

View upstream

View downstream

01T_ODD2_DCH

Event 6

View upstream

Event 7

View upstream

View downstream

01T_ODD3_ARN

Event 4

View upstream

View downstream

Event 5

View upstream

View downstream

01T_ODD3_ARN

Event 6

View upstream

View downstream

02D_BROOM

Event 4

No photos available, though exceedances occurred.

Event 5

View upstream

View downstream

Event 6

Pipe discharge at site

Event 7

Pipe Discharge at site

Pipe Discharge at site

04D_ETTG

Event 4

View upstream

View downstream

Event 5

View upstream

View downstream

04D_ETTG

Event 6

View upstream

View downstream

Event 7

View upstream

View downstream

04D_LAS

Event 4

View upstream

View downstream

Event 5

View upstream

View downstream

04D_LAS

Event 6

View upstream

View downstream

Event 7

View upstream

View downstream

05D_SANT_VCWPD

Event 4

View upstream

View downstream

Event 5

View upstream

View downstream

05D_SANT_VCWPD

Event 6

View upstream

View downstream

Event 7

View upstream

View downstream

05D_LAVD

Event 5

View upstream

05T_HONDO

Event 4

View upstream

Event 5

View upstream

View downstream

06T_FC_BR

Event 4

View downstream

Event 5

View upstream

View downstream

O NARD COASTAL WATERSHED

OXD_CENTR

Event 4

View upstream

View downstream

Event 5

View upstream

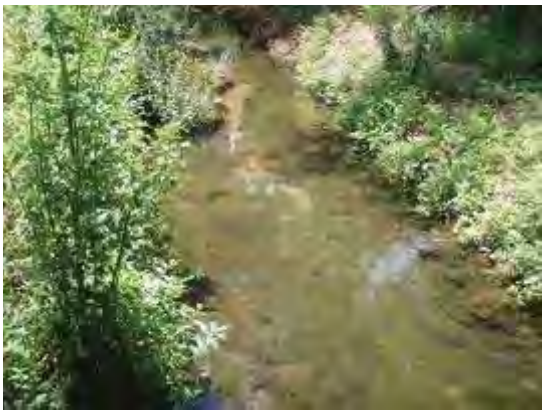
View downstream

OXD_CENTR

Event 6

View upstream

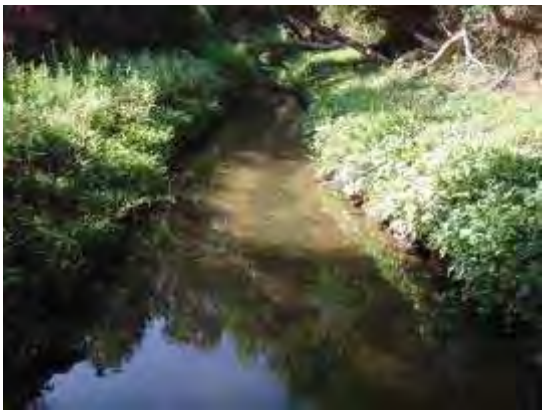
View downstream



Event 7

View upstream

View downstream



SANTA CLARA RIVER WATERSHED

S02T_ELLS

Event 4

View upstream

View downstream

Event 5

View upstream

View downstream

S02T_ELLS

Event 7

View upstream

View downstream

S02T_TODD

Event 4

View upstream

View downstream

Event 5

View upstream

Event 6

View upstream

View downstream

S03T_TIMB

Event 4

View upstream

View downstream

Event 5

View upstream

View downstream

S03T_BOULD

Event 4

View upstream

View downstream

Event 5

View upstream

View downstream

S03T_BOULD

Event 6

View upstream (high flow)

View upstream (low flow)

View downstream

S03D_BARDS

Event 5

View upstream

View downstream

S04T_HOPP

Event 6

View upstream

View downstream

S04T_TAPO

Event 4

View upstream

View downstream

Event 5

View upstream

View downstream

S04T_TAPO

Event 6

View upstream

View downstream

Event 7

View upstream

View downstream

VENTURA RIVER WATERSHED

VRT_THACH

Event 5

View upstream

View downstream

Appendix B

Benchmark Exceedance Data by Constituent and Site–2008

ORGANOCHLORINE PESTICIDES E CEEDANCES

Calleguas Cree Watershed

01T_ODD2_DCH

Duck Pond Agricultural Drains / Mugu Drain / Oxnard Drain No. 2. The monitoring site is located on an agricultural drain just south of Hueneme Road near the Duck Ponds. Flow from this drain eventually discharges into the western arm of Mugu Lagoon (Calleguas Creek Reach 1).

Table 28. 01T ODD2 DCH Organochlorine Pesticides E ceedances for 2008

Constituent	Units	Benchmark	Results		
			Event 5 1 24 2008	Event 6 5 20 2008	Event 7 9 16 2008
otal lordane		0.00059	***0.0799***		
4 4 -		0.00084	***0.2558***		
4 4 -		0.00059	***0.7365***	***0.0052***	***0.006***
4 4 -		0.00059	***0.4435***		
oxap ene		0.0002			***0.0292***

ND Not Detected

01T_ODD3_ARN

Rio de Santa Clara / Oxnard Drain No. 3. The monitoring site is located on an agricultural drain just upstream from the Arnold Road Bridge. Flow from this drain eventually discharges into the western arm of Mugu Lagoon (Calleguas Creek Reach 1). Because the site is tidally influenced, an attempt is made to conduct monitoring at this site approximately one-half our after low tide.

Table 29. 01T ODD3 ARN Organochlorine Pesticides E ceedances for 2008

Constituent	Units	Benchmark	Results		
			Event 4 1 5 2008	Event 5 1 24 2008	Event 6 5 20 2008
otal lordane		0.00059		***0.025***	***0.0061***
4 4 -		0.00084	***0.0198***	***0.0646***	***0.0255***
4 4 -		0.00059	***0.0992***	***0.1772***	***0.0439***
4 4 -		0.00059	***0.0377***	***0.0917***	*ND*

ND Not Detected

02D_BROOM

The monitoring site is located on an agricultural drain that discharges into Calleguas Creek Reach 2 at Broome Ranch Road.

Table 30. 02D ROOM Organochlorine Pesticides E ceedances for 2008

Constituent	Units	Benchmark	Results			
			Event 4 1 5 2008	Event 5 1 24 2008	Event 6 5 202008	Event 7 9 16 2008
otal lordane		0.00059		***0.0148***		***0.0285***
4 4 -		0.00084	***0.0155***	***0.0113***	***0.0051***	***0.0134***
4 4 -		0.00059	***0.0511***	***0.0866***	***0.0168***	***0.0547***
4 4 -		0.00059	***0.0140***	***0.034***		***0.0144***
ieldrin		0.00014		***0.0108***		
oxap ene		0.0002				***0.178***

ND Not Detected

04D_ETTG

This monitoring site is located on an agricultural drain just upstream from its confluence with Revolon Slough, just east of the intersection of Wood Road and Etting Road. Flow from this drain eventually discharges into Calleguas Creek Reach 4 (Revolon Slough).

Table 31. 04D ETTG Organochlorine Pesticides E ceedances for 2008

Constituent	Units	Benchmark	Results			
			Event 4 1 5 2008	Event 5 1 24 2008	Event 6 5 20 2008	Event 7 9 16 2008
otal lordane		0.00059	***0.0071***	***0.0353***		
4 4 -		0.00084	***0.0839***	***0.1679***	***0.007***	***0.0078***
4 4 -		0.00059	***0.599***	***0.9049***	***0.023***	***0.0342***
4 4 -		0.00059	***0.1388***	***0.5552***	***0.0078***	***0.0092***
oxap ene		0.0002				***0.110***

ND Not Detected

04D_LAS

This monitoring site is located on an agricultural drain just upstream of its confluence with Revolon Slough just upstream of South Las Posas Road. A tile drain discharge is intermittently pumped into this ag drain upstream of the monitoring site. Flow from this drain eventually flows into Calleguas Creek Reach 4 (Revolon Slough).

Table 32. 04D LAS Organochlorine Pesticides E ceedances for 2008

Constituent	Units	Benchmark	Results			
			Event 4 1 5 2008	Event 5 1 24 2008	Event 6 5 20 2008	Event 7 9 16 2008
otal lordane		0.00059	***0.0169***	***0.0438***		***0.0088***
4 4 -		0.00084	***0.0449***	***0.0928***	***0.0083***	***0.02***
4 4 -		0.00059	***0.4073***	***0.5177***	***0.0217***	***0.0583***
4 4 -		0.00059	***0.0701***	***0.1695***	***0.0073***	***0.0109***
oxap ene		0.0002				***0.177***

ND Not Detected

05D_SANT_VCWPD

This monitoring site is located on the Santa Clara Drain east of Santa Clara Avenue at the Ventura County Watershed Protection District's Stream Gage #781. Flow from this drain eventually discharges into Calleguas Creek Reach 5 (Beardsley Channel).

Table 33. 05D SANT VCWPD Organochlorine Pesticides E ceedances for 2008

Constituent	Units	Benchmark	Results			
			Event 4 1 5 2008	Event 5 1 24 2008	Event 6 5 20 2008	Event 7 9 16 2008
otal lordane		0.00059	***0.0081***	***0.0244***		
4 4 -		0.00084		***0.0427***		
4 4 -		0.00059	***0.0509***	***0.1827***	***0.0175***	***0.0456***
4 4 -		0.00059		***0.1078***		***0.0164***
oxap ene		0.0002				***0.142***

ND Not Detected

05D_LAVD

This monitoring site is located on the La Vista Drain just east of La Vista Avenue, north of Hwy 118. Flow from this drain eventually discharges into Calleguas Creek Reach 5 (Beardsley Channel). The Ventura County Watershed Protection District maintains a stormwater monitoring station just downstream of the VCAILG monitoring site.

Table 34. 05D LAVD Organochlorine Pesticides E ceedances for 2008

Constituent	Units	Benchmark	Results Event 5 1 24 2008
otal lordane		0.00059	***0.0069***
4 4 -		0.00084	***0.0136***
4 4 -		0.00059	***0.1011***
4 4 -		0.00059	***0.0429***

05T_HONDO

This monitoring site is located on Hondo Barranca just downstream of the Hwy 118 Bridge. Hondo Barranca is a tributary to Calleguas Creek Reach 5 (Beardsley Channel).

Table 35. 05T HONDO Organochlorine Pesticides E ceedances for 2008

Constituent	Units	Benchmark	Results Event 4 1 5 2008	Event 5 1 24 2008
otal lordane		0.00059		***0.0257***
4 4 -		0.00084		***0.2694***
4 4 -		0.00059	***0.0299***	***1.0013***
4 4 -		0.00059	***0.0116***	***0.494***

ND Not Detected

06T_FC_BR

This monitoring site is located on Fox Barranca just upstream of the Bradley Road bridge, north of Hwy 118. Fox Barranca is a tributary to Calleguas Creek Reach 6 (Arroyo Las Posas).

Table 36. 06T C R Organochlorine Pesticides E ceedances for 2008

Constituent	Units	Benchmark	Results Event 5 1 24 2008
otal lordane		0.00059	***0.0367***
4 4 -		0.00059	***0.3005***
4 4 -		0.00059	***0.1066***

O nard Coastal Watershed

OXD_CENTR

This is the only VCAILG monitoring site in the Oxnard Coastal Watershed. The site is located on the Central Ditch, which flows under Harbor Blvd and into McGrath Lake. Water from McGrath Lake is pumped periodically into the ocean to prevent the Central Ditch from backing up and flooding Harbor Blvd.

Table 37. O D CENTR Organochlorine Pesticides E ceedances for 2008

			Results			
			Event 4	Event 5	Event 6	Event 7
Constituent	Units	Benchmark	1 5 2008	1 24 2008	5 20 2008	9 16 2008
otal lordane		0.00059		***0.1802***		
4 4 -		0.00084	***0.0128***	***1.0772***		***0.0053***
4 4 -		0.00059	***0.1029***	***2.1452***	***0.0079***	***0.0093***
4 4 -		0.00059	***0.0439***	***1.0539***		

ND Not Detected

Santa Clara River Watershed

S02T_TODD

This monitoring site is located on Todd Barranca upstream of Hwy 126. Todd Barranca drains the Wheeler Canyon area and is a tributary to Santa Clara River Reach 2.

Table 38. SO2T TODD Organochlorine Pesticides E ceedances for 2008

			Results
			Event 5
Constituent	Units	Benchmark	1 24 2008
4 4 -		0.00059	***0.0186***

S03T_TIMB

This monitoring site is located on Timber Canyon Creek just upstream of Hwy 126, east of Santa Paula. Timber Creek is a tributary to Santa Clara River Reach 3.

Table 39. S03T TIM Organochlorine Pesticides E ceedances for 2008

			Results
			Event 5
Constituent	Units	Benchmark	1 24 2008
4 4 -		0.00059	***0.0081***

S03T_BOULD

This monitoring site is located on Boulder Creek just upstream of Hwy 126, west of Fillmore. Boulder Creek is a tributary to Santa Clara River Reach 3.

Table 40. S03T OULD Organochlorine Pesticides E ceedances for 2008

	Constituent	Units	Benchmark	Results Event 5 1 24 2008
otal	lordane		0.00059	***0.0066***

S03D_BARDS

This monitoring site is located near the end of the agricultural drain that runs parallel to Bardsdale Avenue in Bardsdale. The drain is located on the south side of the Santa Clara River and eventually discharges into Santa Clara River Reach 3.

Table 41. S03D ARDS Organochlorine Pesticides E ceedances for 2008

	Constituent	Units	Benchmark	Results Event 5 1 24 2008
otal	lordane		0.00059	***0.0186***
4 4 -			0.00084	***0.0141***
4 4 -			0.00059	***0.1001***
4 4 -			0.00059	***0.0553***

S04T_ TAPO

This monitoring site is located on Tapo Creek near the Ventura / Los Angeles County line, south of Hwy 126 and the Santa Clara River. Tapo Creek is a tributary to Santa Clara River Reach 4.

Table 42. S04T TAPO Organochlorine Pesticides E ceedances for 2008

	Constituent	Units	Benchmark	Results Event 4 1 5 2008	Results Event 5 1 24 2008
otal	lordane		0.00059		***0.0353***
4 4 -			0.00084		***0.079***
4 4 -			0.00059	***0.0777***	***0.2578***

ND Not Detected

Ventura River Watershed

VRT_THACH

This monitoring site is located on Thacher Creek just upstream of Ojai Avenue in Ojai. Thacher Creek is a tributary to San Antonio Creek, which is tributary to the Ventura River.

Table 43. VRT THACH Organochlorine Pesticides E ceedances for 2008

Constituent	Units	Benchmark	Results Event 5 1 24 2008
4 4 -	n	0.00059	***0.0069***

ORGANOPHOSPHORUS PESTICIDES E CEEDANCES

Calleguas Cree Watershed

01T_ODD2_DCH

Duck Pond Agricultural Drains / Mugu Drain / Oxnard Drain No. 2. The monitoring site is located on an agricultural drain just south of Hueneme Road near the Duck Ponds. Flow from this drain eventually discharges into the western arm of Mugu Lagoon (Calleguas Creek Reach 1).

Table 44. 01T ODD2 DCH Organophosphorus Pesticides E ceedances for 2008

Constituent	Units	Benchmark	Results	
			Event 4 1 5 2008	Event 5 1 24 2008
lorpyrifos		0.025	***1.2828***	***0.9837***

04D_ETTG

This monitoring site is located on an agricultural drain just upstream from its confluence with Revolon Slough, just east of the intersection of Wood Road and Etting Road. Flow from this drain eventually discharges into Calleguas Creek Reach 4 (Revolon Slough).

Table 45. 04D ETTG Organophosphorus Pesticides E ceedances for 2008

Constituent	Units	Benchmark	Results	
			Event 4 1 5 2008	Event 5 1 24 2008
lorpyrifos		0.025	***0.5481***	***0.8757***

04D_LAS

This monitoring site is located on an agricultural drain just upstream of its confluence with Revolon Slough just upstream of South Las Posas Road. A tile drain discharge is intermittently pumped into this ag drain upstream of the monitoring site. Flow from this drain eventually flows into Calleguas Creek Reach 4 (Revolon Slough).

Table 46. 04D LAS Organophosphorus Pesticides E ceedances for 2008

Constituent	Units	Benchmark	Results			
			Event 4 1 5 2008	Event 5 1 24 2008	Event 6 5 20 2008	Event 7 9 16 2008
lorpyrifos		0.025	***0.0654***	***0.0586***		***0.1307***
ia inon		0.10	o exceedance	o exceedance	***0.1933***	

ND Not Detected

05D_SANT_VCWPD

This monitoring site is located on the Santa Clara Drain east of Santa Clara Avenue at the Ventura County Watershed Protection District's Stream Gage #781. Flow from this drain eventually discharges into Calleguas Creek Reach 5 (Beardsley Channel).

Table 47. 05D SANT VCWPD Organophosphorus Pesticides E ceedances for 2008

Constituent	Units	Benchmark	Results		
			Event 4 1 5 2008	Event 5 1 24 2008	Event 7 9 16 2008
lorpyrifos		0.025	***0.2254***	***0.2442***	***0.2695***

05D_LAVD

This monitoring site is located on the La Vista Drain just east of La Vista Avenue, north of Hwy 118. Flow from this drain eventually discharges into Calleguas Creek Reach 5 (Beardsley Channel). The Ventura County Watershed Protection District maintains a stormwater monitoring station just downstream of the VCAILG monitoring site.

Table 48. 05D LAVD Organophospohorus Pesticides E ceedances for 2008

Constituent	Units	Benchmark	Results
			Event 5 1 24 2008
lorpyrifos		0.025	***0.3984***

05T_HONDO

This monitoring site is located on Hondo Barranca just downstream of the Hwy 118 Bridge. Hondo Barranca is a tributary to Calleguas Creek Reach 5 (Beardsley Channel).

Table 49. 05T HONDO Organophosphorus Pesticides E ceedances for 2008

Constituent	Units	Benchmark	Results
			Event 5 1 24 2008
lorpyrifos		0.025	***0.2482***

O nard Coastal Watershed

OXD_CENTR

This is the only VCAILG monitoring site in the Oxnard Coastal Watershed. The site is located on the Central Ditch, which flows under Harbor Blvd and into McGrath Lake. Water from McGrath Lake is pumped periodically into the ocean to prevent the Central Ditch from backing up and flooding Harbor Blvd.

Table 50. O D CENTR Organophosphorus Pesticides E ceedances for 2008

			Results	
			Event 4	Event 5
Constituent	Units	Benchmark	1 5 2008	1 24 2008
lorpyrifos		0.025	***0.6766***	***4.9679***

Santa Clara River Watershed

S02T_ELLS

This monitoring site is located on Ellsworth Barranca just downstream of the Telegraph Road Bridge. Ellsworth Barranca drains the Aliso Canyon area and is a tributary to Santa Clara River Reach 2.

Table 51. S02T ELLS Organophosphorus Pesticides E ceedances for 2008

			Results
Constituent	Units	Benchmark	Event 7 9 16 2008
lorpyrifos		0.025	***0.225***

ND Not Detected

S03T_TIMB

This monitoring site is located on Timber Canyon Creek just upstream of Hwy 126, east of Santa Paula. Timber Creek is a tributary to Santa Clara River Reach 3.

Table 52. S03T TIM Organophosphorus Pesticides E ceedances for 2008

			Results
Constituent	Units	Benchmark	Event 4 1 5 2008
lorpyrifos		0.025	***0.1123***

S03D_BARDS

This monitoring site is located near the end of the agricultural drain that runs parallel to Bardsdale Avenue in Bardsdale. The drain is located on the south side of the Santa Clara River and eventually discharges into Santa Clara River Reach 3.

Table 53. S03D ARDS Organophosphorus Pesticides E ceedances for 2008

Constituent	Units	Benchmark	Results Event 5 1 24 2008
lorpyrifos		0.025	***2.6776***
ia inon		0.10	***0.1231***

SALTS E CEEDANCES

Calleguas Cree Watershed

05D_SANT_VCWPD

This monitoring site is located on the Santa Clara Drain east of Santa Clara Avenue at the Ventura County Watershed Protection District's Stream Gage #781. Flow from this drain eventually discharges into Calleguas Creek Reach 5 (Beardsley Channel).

Table 54. 05D SANT VCWPD Salts E ceedances for 2008

Constituent	Units	Benchmark	Results			
			Event 4 1 5 2008	Event 5 1 24 2008	Event 6 5 20 2008	Event 7 9 16 2008
otal issolved olids	m	850	***2960***	***2260***	***2650***	***2310***
loride	m	150	***220***	***155***	***220***	***210***
ulfate	m	250	***1430***	***1150***	***1110***	***1040***

05T_HONDO

This monitoring site is located on Hondo Barranca just downstream of the Hwy 118 Bridge. Hondo Barranca is a tributary to Calleguas Creek Reach 5 (Beardsley Channel).

Table 55. 05T HONDO Salts E ceedances for 2008

Constituent	Units	Benchmark	Results
			Event 4 1 5 2008
ulfate	m	250	***335***

06T_FC_BR

This monitoring site is located on Fox Barranca just upstream of the Bradley Road bridge, north of Hwy 118. Fox Barranca is a tributary to Calleguas Creek Reach 6 (Arroyo Las Posas).

Table 56. 06T C R Salts E ceedances for 2008

Constituent	Units	Benchmark	Results
			Event 4 1 5 2008
otal issolved olids	m	850	***1600***
ulfate	m	250	***958***

Santa Clara River Watershed

S02T_ELLS

This monitoring site is located on Ellsworth Barranca just downstream of the Telegraph Road Bridge. Ellsworth Barranca drains the Aliso Canyon area and is a tributary to Santa Clara River Reach 2.

Table 57. S02T ELLS Salts E ceedances for 2008

Constituent	Units	Benchmark	Results	
			Event 4 1 5 2008	Event 5 1 24 2008
otal issolved olids	m	1200	***1510***	***1530***
loride	m	150	***157***	o exceedance
ulfate	m	600	***740***	***776***

S02T_TODD

This monitoring site is located on Todd Barranca upstream of Hwy 126. Todd Barranca drains the Wheeler Canyon area and is a tributary to Santa Clara River Reach 2.

Table 58. S02T TODD Salts E ceedances for 2008

Constituent	Units	Benchmark	Results		
			Event 4 1 5 2008	Event 5 1 24 2008	Event 6 5 20 2008
otal issolved olids	m	1200	***1770***	***1710***	***2120***
ulfate	m	600	***880***	***875***	***1050***

S03T_TIMB

This monitoring site is located on Timber Canyon Creek just upstream of Hwy 126, east of Santa Paula. Timber Creek is a tributary to Santa Clara River Reach 3.

Table 59. S03T TIM Salts E ceedances for 2008

Constituent	Units	Benchmark	Results
			Event 5 1 24 2008
ulfate	m	650	***677***

S03T_BOULD

This monitoring site is located on Boulder Creek just upstream of Hwy 126, west of Fillmore. Boulder Creek is a tributary to Santa Clara River Reach 3.

Table 60. S03T OULD Salts E ceedances for 2008

Constituent	Units	Benchmark	Results Event 6 5 20 2008
otal issolved olids	m	1 00	***1940***
loride	m	100	***105***
ulfate	m	650	***905***

S04T_HOPP

This monitoring site is located on Hopper Creek just upstream of Hwy 126 and the railroad bridge. Hopper Creek is a tributary to Santa Clara River Reach 4.

Table 61. S04T HOPP Salts E ceedances for 2008

Constituent	Units	Benchmark	Results Event 6 5 20 2008
otal issolved olids	m	1 00	***1560***
ulfate	m	600	***805***

S04T_ TAPO

This monitoring site is located on Tapo Creek near the Ventura / Los Angeles County line, south of Hwy 126 and the Santa Clara River. Tapo Creek is a tributary to Santa Clara River Reach 4.

Table 62. S04T TAPO Salts E ceedances for 2008

Constituent	Units	Benchmark	Results			
			Event 4 1 5 2008	Event 5 1 24 2008	Event 6 5 20 2008	Event 7 9 16 2008
otal issolved olids	m	1 00	***4080***	***3030***	***4200***	***3660***
loride	m	100	***190***	***137***	***203***	***200***
ulfate	m	600	***2160***	***1530***	***1870***	***1810***

NITROGEN E CEEDANCES

Calleguas Cree Watershed

01T_ODD2_DCH

Duck Pond Agricultural Drains / Mugu Drain / Oxnard Drain No. 2. The monitoring site is located on an agricultural drain just south of Hueneme Road near the Duck Ponds. Flow from this drain eventually discharges into the western arm of Mugu Lagoon (Calleguas Creek Reach 1).

Table 63. 01T ODD2 DCH Nitrogen E ceedances for 2008

Constituent	Units	Benchmark	Results			
			Event 4 1 5 2008	Event 5 1 24 2008	Event 6 5 20 2008	Event 7 9 16 2008
itrate-	m	10 [1]	***45.05***	***40.44***	***60.37***	***59.6***

1 There is no site-specific nitrogen objective in the Basin Plan (Table 3-8) applicable to this reach. The Basin Plan objective of 10 mg/L Nitrate-N Nitrite-N was used for comparison with VCAILG data collected at monitoring sites in this reach.

01T_ODD3_ARN

Rio de Santa Clara / Oxnard Drain No. 3. The monitoring site is located on an agricultural drain just upstream from the Arnold Road Bridge. Flow from this drain eventually discharges into the western arm of Mugu Lagoon (Calleguas Creek Reach 1). Because the site is tidally influenced, an attempt is made to conduct monitoring at this site approximately one-half hour after low tide.

Table 64. 01T ODD3 ARN Nitrogen E ceedances for 2008

Constituent	Units	Benchmark	Results		
			Event 4 1 5 2008	Event 5 1 24 2008	Event 6 5 20 2008
itrate-	m	10 [1]	***28.47***	***10.69***	***46.78***

1 There is no site-specific nitrogen objective in the Basin Plan (Table 3-8) applicable to this reach. The Basin Plan objective of 10 mg/L Nitrate-N Nitrite-N was used for comparison with VCAILG data collected at monitoring sites in this reach.

02D_BROOM

The monitoring site is located on an agricultural drain that discharges into Calleguas Creek Reach 2 at Broome Ranch Road.

Table 65. 02D ROOM Nitrogen E ceedances for 2008

Constituent	Units	Benchmark	Results			
			Event 4 1 5 2008	Event 5 1 24 2008	Event 6 5 202008	Event 7 9 16 2008
itrate-	m	10 [1]	***43.95***	***49.22***	***36.82***	***48.23***

1 There is no site-specific nitrogen objective in the Basin Plan (Table 3-8) applicable to this reach. The Basin Plan objective of 10 mg/L Nitrate-N Nitrite-N was used for comparison with VCAILG data collected at monitoring sites in this reach.

04D_ETTG

This monitoring site is located on an agricultural drain just upstream from its confluence with Revolon Slough, just east of the intersection of Wood Road and Etting Road. Flow from this drain eventually discharges into Calleguas Creek Reach 4 (Revolon Slough).

Table 66. 04D ETTG Nitrogen E ceedances for 2008

			Results			
			Event 4	Event 5	Event 6	Event 7
Constituent	Units	Benchmark	1 5 2008	1 24 2008	5 20 2008	9 16 2008
otal mmonia-	m	.77 4.7 1.56 1.74 [1]	o exceedance	o exceedance	o exceedance	***1.91***
itrate-	m	10 [2]	***75.65***	***56.85***	***74.66***	***114.92***

1 The benchmarks for Ammonia-N are listed in order of monitoring event and were calculated based the April 2002 Basin Plan Amendment chronic equation (ELS absent) and are dependent upon the pH and temperature of the water at the time of collection.
2 There is no site-specific nitrogen objective in the Basin Plan (Table 3-8) applicable to this reach. The Basin Plan objective of 10 mg/L Nitrate-N Nitrite-N was used for comparison with VCAILG data collected at monitoring sites in this reach.

04D_LAS

This monitoring site is located on an agricultural drain just upstream of its confluence with Revolon Slough just upstream of South Las Posas Road. A tile drain discharge is intermittently pumped into this ag drain upstream of the monitoring site. Flow from this drain eventually flows into Calleguas Creek Reach 4 (Revolon Slough).

Table 67. 04D LAS Nitrogen E ceedances for 2008

			Results			
Constituent	Units	Benchmark	Event 4 1 5 2008	Event 5 1 24 2008	Event 6 5 20 2008	Event 7 9 16 2008
itrate-	m	10	***27.49***	***45.23***	***26.36***	***22.09***

05D_SANT_VCWPD

This monitoring site is located on the Santa Clara Drain east of Santa Clara Avenue at the Ventura County Watershed Protection District's Stream Gage #781. Flow from this drain eventually discharges into Calleguas Creek Reach 5 (Beardsley Channel).

Table 68. 05D SANT VCWPD Nitrogen E ceedances for 2008

			Results			
Constituent	Units	Benchmark	Event 4 1 5 2008	Event 5 1 24 2008	Event 6 5 20 2008	Event 7 9 16 2008
itrate-	m	10 [1]	***40.88***	***55***	***40.08***	***39.62***

1 There is no site-specific nitrogen objective in the Basin Plan (Table 3-8) applicable to this reach. The Basin Plan objective of 10 mg/L Nitrate-N Nitrite-N was used for comparison with VCAILG data collected at monitoring sites in this reach.

06T_FC_BR

This monitoring site is located on Fox Barranca just upstream of the Bradley Road bridge, north of Hwy 118. Fox Barranca is a tributary to Calleguas Creek Reach 6 (Arroyo Las Posas).

Table 69. 06T C R Nitrogen E ceedances for 2008

Constituent	Units	Benchmark	Results Event 4 1 5 2008
itrate-	m	10	***17.19***

O nard Coastal Watershed

OXD_CENTR

This is the only VCAILG monitoring site in the Oxnard Coastal Watershed. The site is located on the Central Ditch, which flows under Harbor Blvd and into McGrath Lake. Water from McGrath Lake is pumped periodically into the ocean to prevent the Central Ditch from backing up and flooding Harbor Blvd.

Table 70. O D CENTR Nitrogen E ceedances for 2008

Constituent	Units	Benchmark	Results Event 4 1 5 2008	Event 5 1 24 2008	Event 6 5 20 2008	Event 7 9 16 2008
itrate-	m	10 [2]	***19.7***	***19.35***	***14.68***	***14.88***

2 There is no site-specific nitrogen objective in the Basin Plan (Table 3-8) applicable to this reach. The Basin Plan objective of 10 mg/L Nitrate-N Nitrite-N was used for comparison with VCAILG data collected at the monitoring sites in this reach.

Santa Clara River Watershed

S02T_TODD

This monitoring site is located on Todd Barranca upstream of Hwy 126. Todd Barranca drains the Wheeler Canyon area and is a tributary to Santa Clara River Reach 2.

Table 71. S02T TODD Nitrogen E ceedances for 2008

Constituent	Units	Benchmark	Results Event 6 5 20 2008
itrate-	m	10	***10.25***

S03T_TIMB

This monitoring site is located on Timber Canyon Creek just upstream of Hwy 126, east of Santa Paula. Timber Creek is a tributary to Santa Clara River Reach 3.

Table 72. S03T TIM Nitrogen E ceedances for 2008

Constituent	Units	Benchmark	Results Event 4 1 5 2008
itrate-	m	5	***6.65***

S03T_BOULD

This monitoring site is located on Boulder Creek just upstream of Hwy 126, west of Fillmore. Boulder Creek is a tributary to Santa Clara River Reach 3.

Table 73. S03T OULD Nitrogen E ceedances for 2008

Constituent	Units	Benchmark	Results Event 6 5 20 2008
otal mmonia-	m	.9 4.21 1.45 --[1]	***6.42***[2]
itrate-	m	5	***54.42***

1 The benchmarks for Ammonia-N are listed in order of monitoring event and were calculated based the April 2002 Basin Plan Amendment chronic equation (ELS present) and are dependent upon the pH and temperature of the water at the time of sample collection.

2 Ammonia was detected in the lab blank and one of the two field blanks below the RL but above the MDL. The second field blank was bottled Arrowhead water instead of lab water, this field blank came back as ND for ammonia.

S04T_ TAPO

This monitoring site is located on Tapo Creek near the Ventura / Los Angeles County line, south of Hwy 126 and the Santa Clara River. Tapo Creek is a tributary to Santa Clara River Reach 4.

Table 74. S04T TAPO Nitrogen E ceedances for 2008

Constituent	Units	Benchmark	Results Event 6 5 20 2008	Event 7 9 16 2008
itrate-	m	5	***8.03***	***13.56***

DISSOLVED O YGEN E CEEDANCES

Calleguas Cree Watershed

02D_BROOM

The monitoring site is located on an agricultural drain that discharges into Calleguas Creek Reach 2 at Broome Ranch Road.

Table 75. 02D ROOM Dissolved O ygen E ceedances for 2008

Constituent	Units	Benchmark	Results Event 7 9 16 2008
issolved oxy en	m	_ 5	***1.95***

TEMPERATURE E CEEDANCES

Calleguas Cree Watershed

04D_LAS

This monitoring site is located on an agricultural drain just upstream of its confluence with Revolon Slough just upstream of South Las Posas Road. A tile drain discharge is intermittently pumped into this ag drain upstream of the monitoring site. Flow from this drain eventually flows into Calleguas Creek Reach 4 (Revolon Slough).

Table 76. 04D LAS Temperature E ceedances for 2008

Constituent	Units	Benchmark	Results Event 6 5 20 2008
emperature		_ 26.67 [1]	***29.95***

1 The temperature limit for waterbodies designated as WARM is 80 F (26.7 C).

PH E CEEDANCES

Santa Clara River Watershed

S02T_ELLS

This monitoring site is located on Ellsworth Barranca just downstream of the Telegraph Road Bridge. Ellsworth Barranca drains the Aliso Canyon area and is a tributary to Santa Clara River Reach 2.

Table 77. S02T ELLS PH E ceedances for 2008

Constituent	Units	Benchmark	Results Event 7 9 16 2008
p		6.5 _ p _8.5	***8.56***

CHRONIC TO ICITY E CEEDANCES

Toxicity samples were collected during monitoring Events 4 and 7. During 2008 monitoring, some sites still required 3-species screen tests to determine the most sensitive species; these tests were performed at 05T_HONDO, 06T_FC_BR, S02T_ELLS, S03T_TIMB, S04T_HOPP, VRT_THACH, and VRT_SANTO. Chronic toxicity was detected at four of these sites and the exceedance results are shown in the table below.

Table 78. Chronic To icity E ceedances for 3-Species Screen for 2008

Site	Event	*Selenastrum*		*Ceriodaphnia*		
		Cell Growth To icity	Growth Reduct.	Survival To icity	Reprod. To icity	Reprod. Reduct.
05T HONDO	4: Jan 2008	N	----	N	Y	**16.6**
06T FC BR	4: Jan 2008	Y	**39.5**	N	Y	**25.6**
S02T ELLS	4: Jan 2008	N	----	N	Y	**32.4**
S02T ELLS dup	4: Jan 2008	N	----	N	Y	**29.7**
S03T TIMB	4: Jan 2008	Y	**14.7**	N	Y	**18.2**

1 *Se enastru capricornutu* (algae) is evaluated for the growth endpoint.
2 *Ceriodaphnia du ia* (invertebrate – water flea) is evaluated for the survival and reproduction endpoints.
3 *i epha es pro e as* (vertebrate – fathead minnow) is evaluated for survival and biomass endpoints.

Single-species tests were completed at five sites during the Event 4 sampling. Chronic toxicity exceedance results for single-species can be found in Table 79.

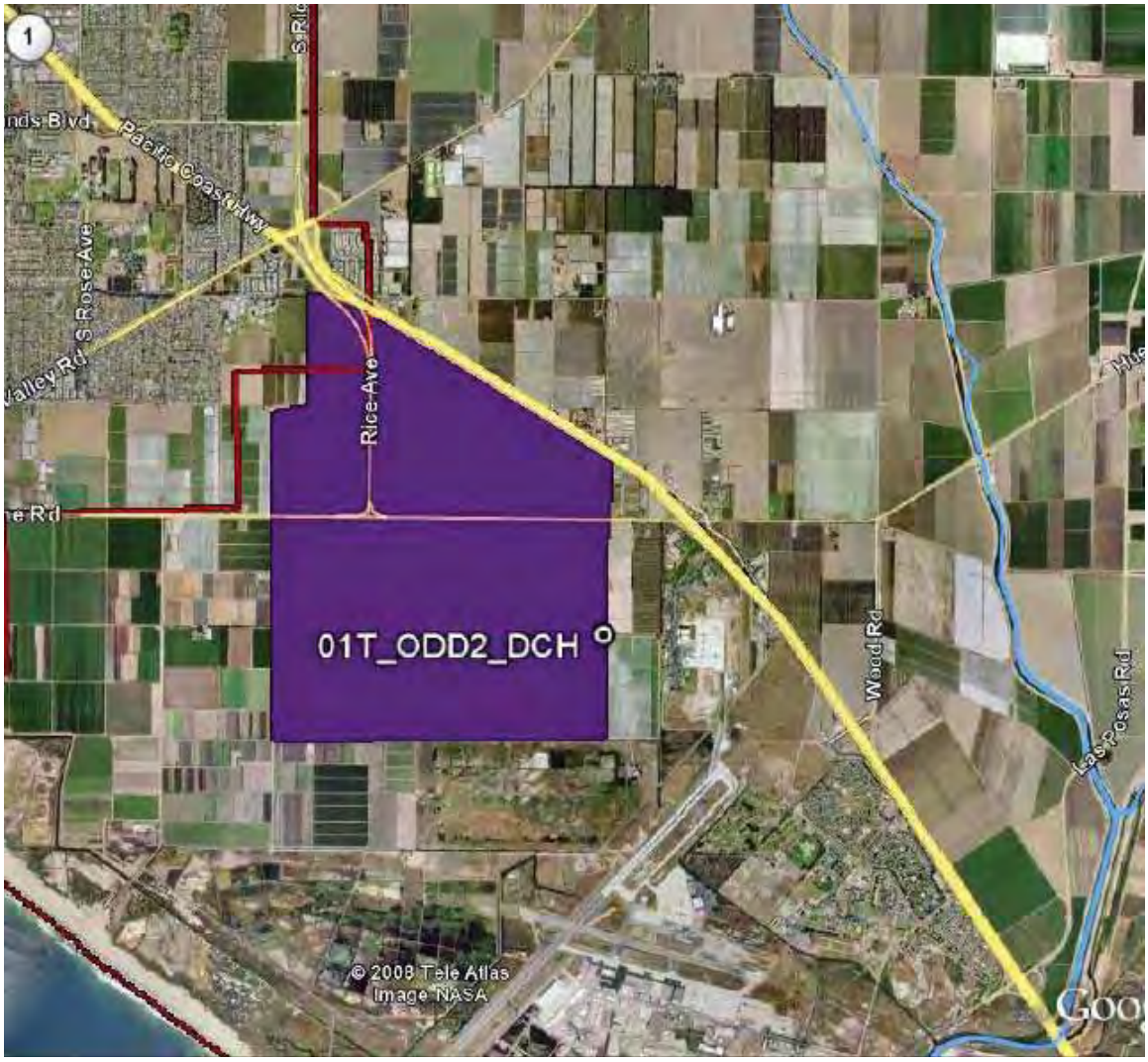
Table 79. Chronic To icity E ceedances for Single-Species Testing at reshwater Sites for 2008

Site	Event	*Ceriodaphnia* [1]				TIE Triggered
		Survival To icity	Survival Reduction	Reproduction To icity	Reproduction Reduction	
01T ODD2 DCH	4: Jan 2008	Y	**100.0**	---	---	Y
S02T TODD	4: Jan 2008	N		Y	**100.0**	N [2]
S03T BOULD	4: Jan 2008	N		Y	**48.8**	N

1 *Ceriodaphnia du ia* (invertebrate – water flea) is evaluated for the survival and reproduction endpoints.
2 A TIE was not triggered for this sample since we are evaluating chronic toxicity and survival was not significantly different from the control.

Appendix C

Drainage Areas for VCAILG Monitoring Sites



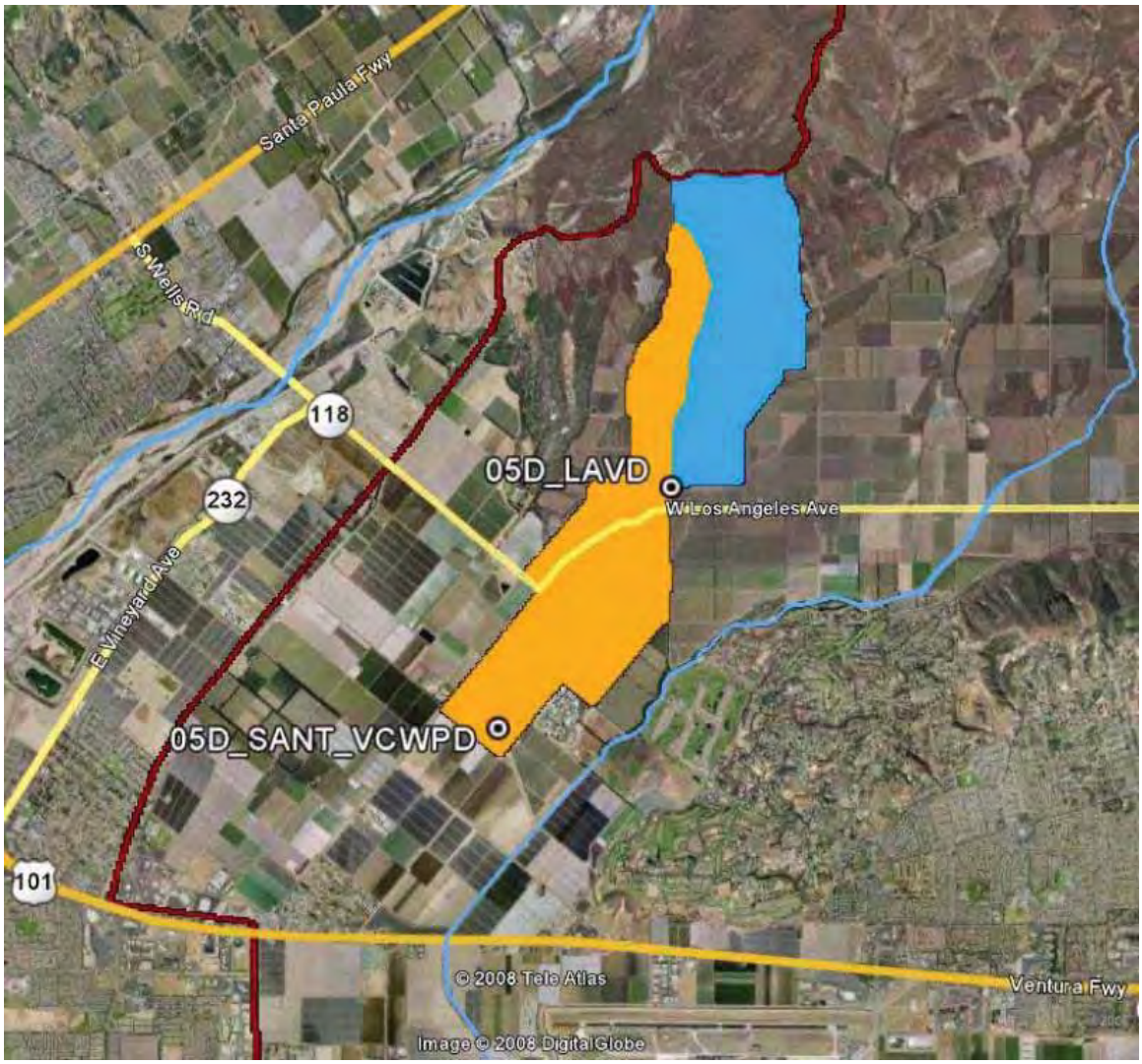
igure 13. 01T ODD2 DCH Drainage Area

igure 14. 01T ODD3 ARN Drainage Area

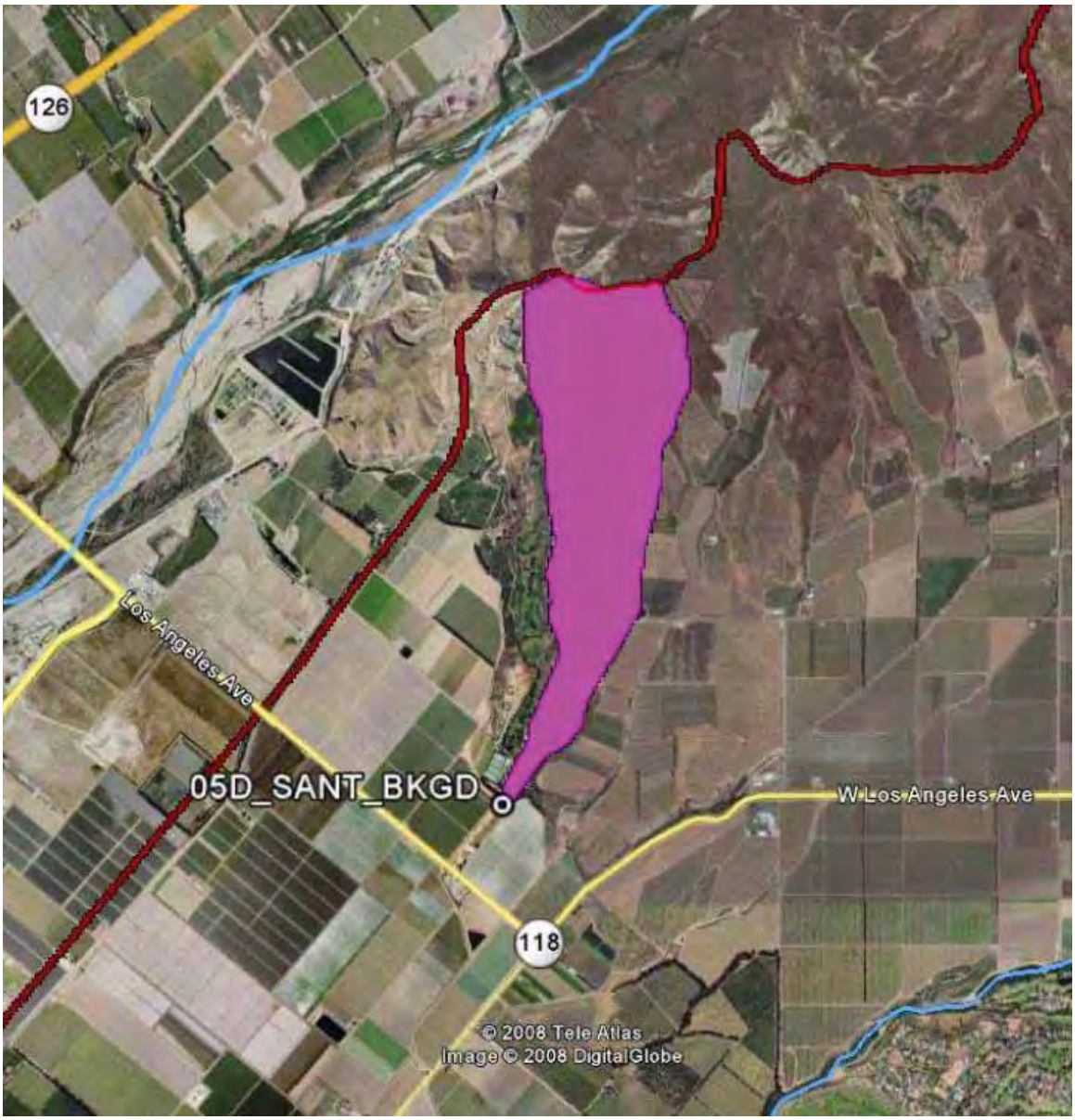
igure 15. 02D ROOM and 02D CSUCI Drainage Areas

igure 16. 04D ETTG Drainage Area

igure 17. 04D LAS Drainage Area

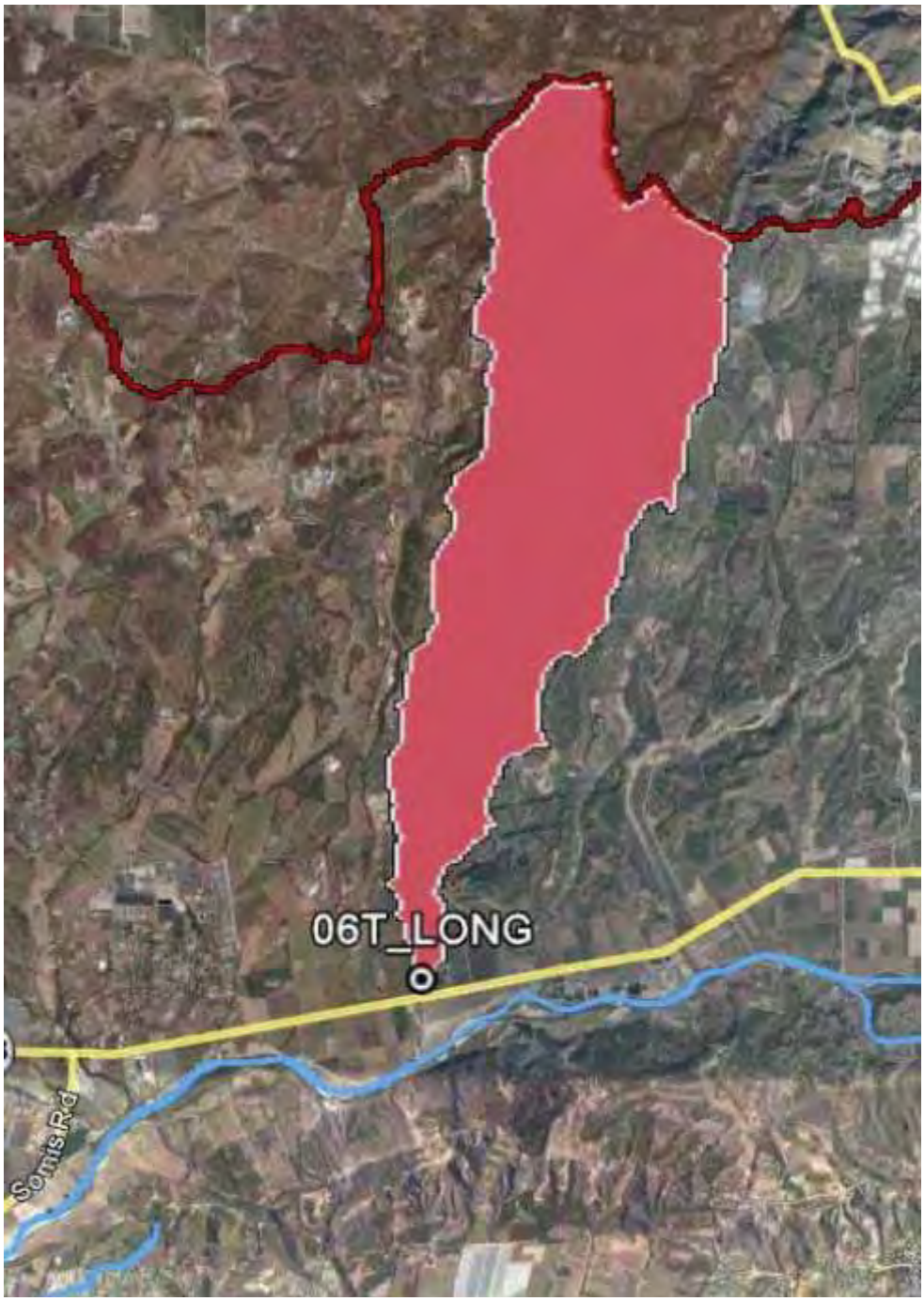


igure 18. 05D SANT VCWPD and 05D LAVD Drainage Areas



igure 19. 05D SANT GD Drainage Area

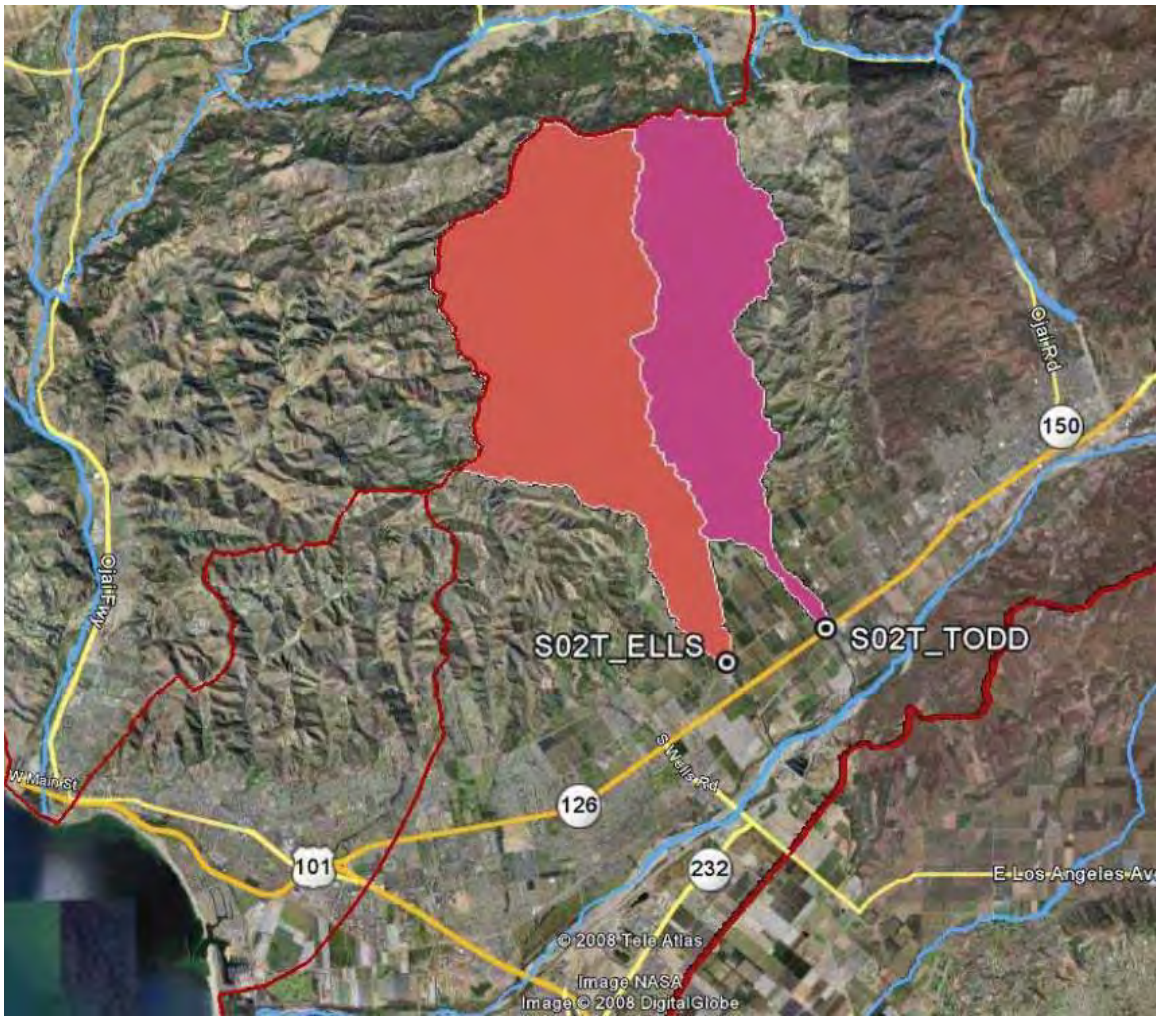
igure 20. 05T HONDO and 06T C R Drainage Areas



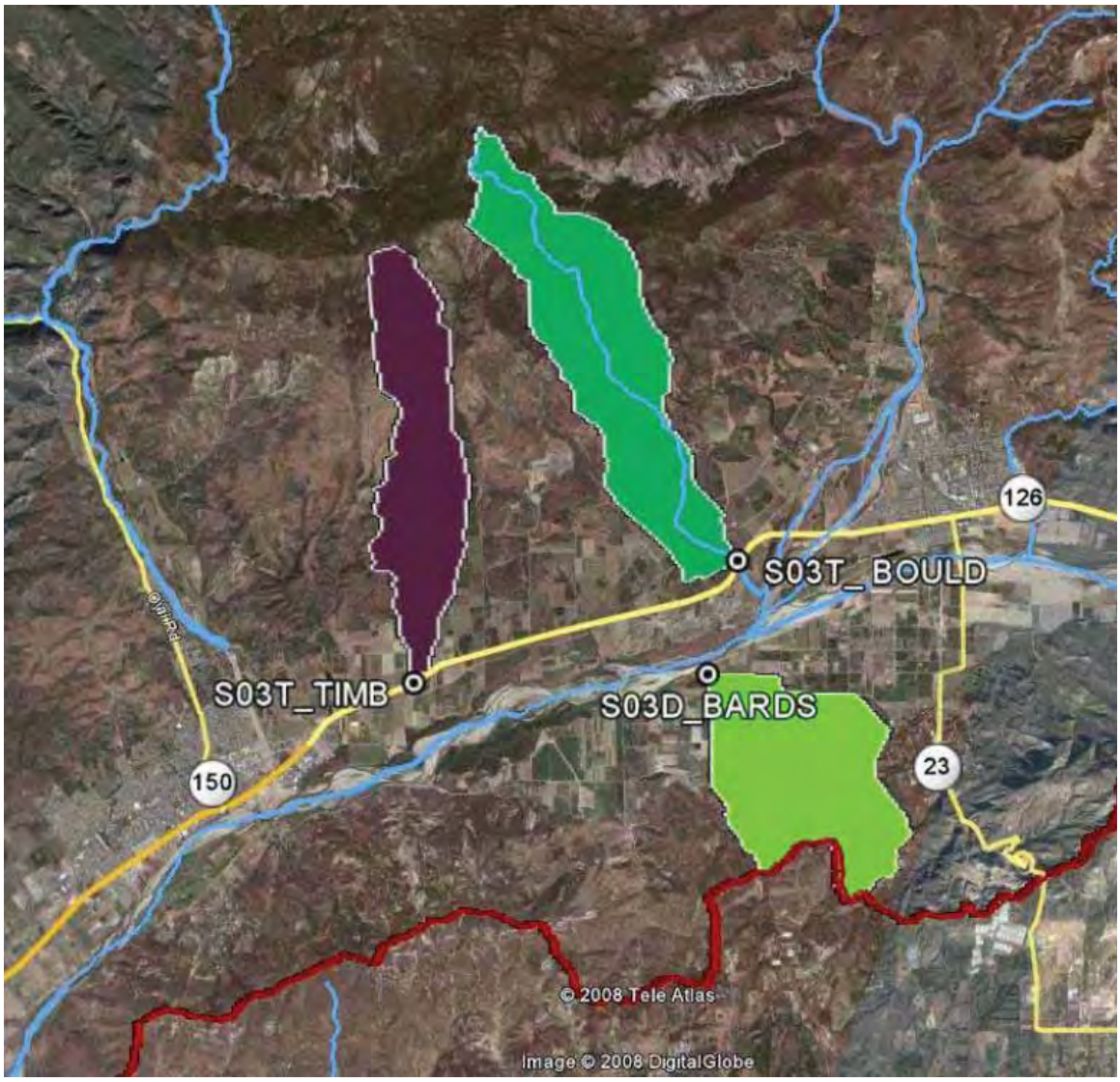
igure 21. 06T LONG Drainage Area

igure 22. 09 D GERRY Drainage Area

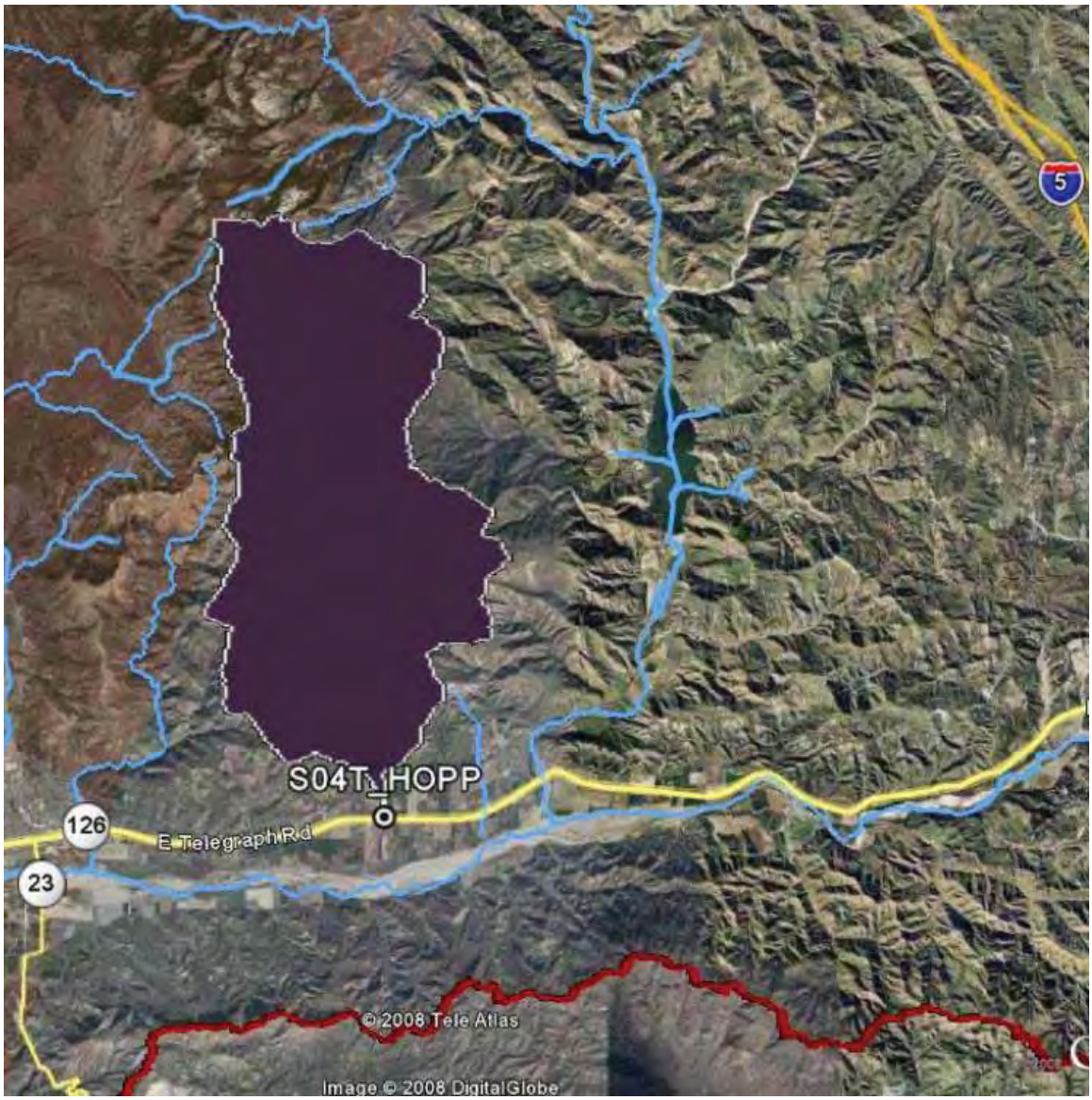
igure 23. O D CENTR Drainage Area



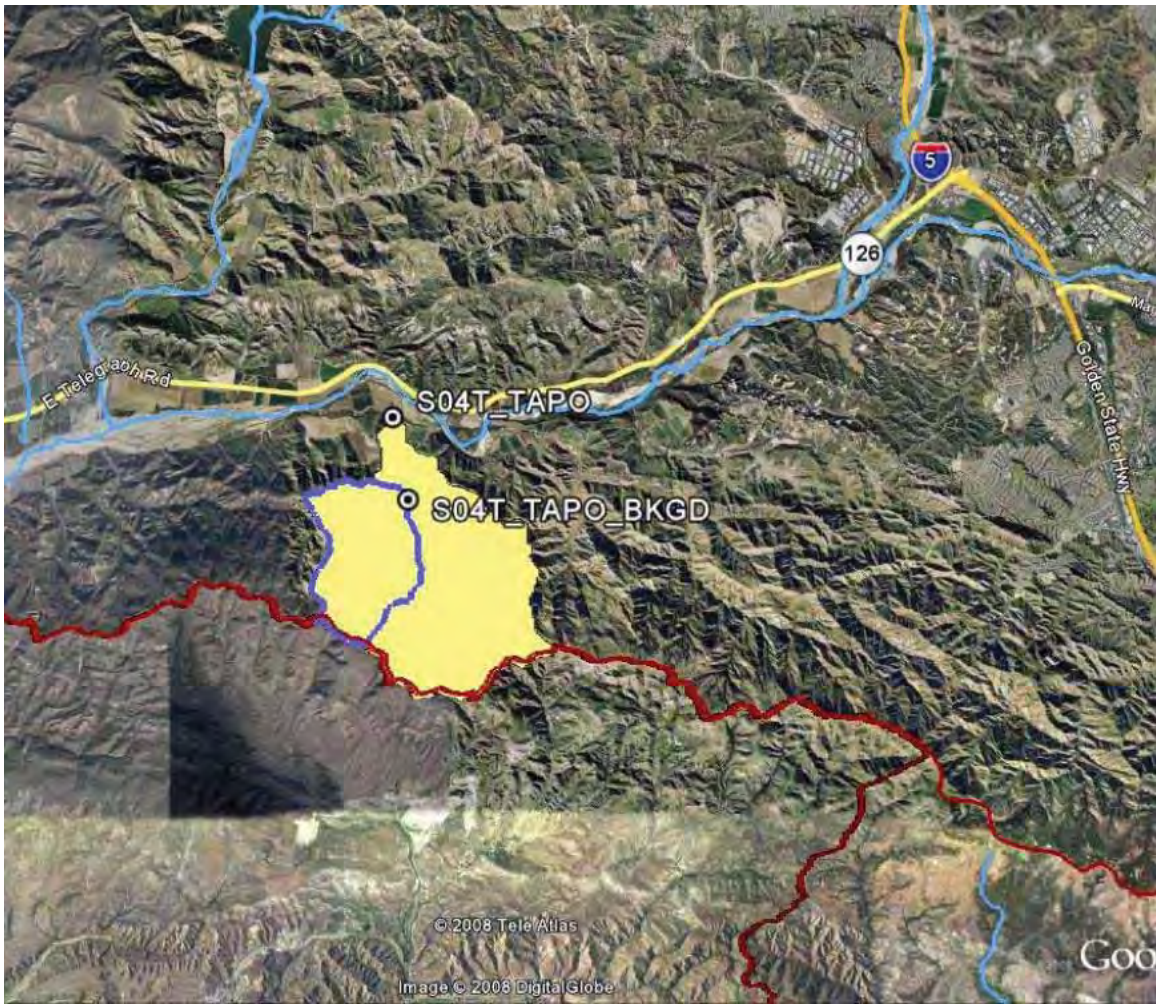
igure 24. S02T ELLS and S02T TODD Drainage Areas



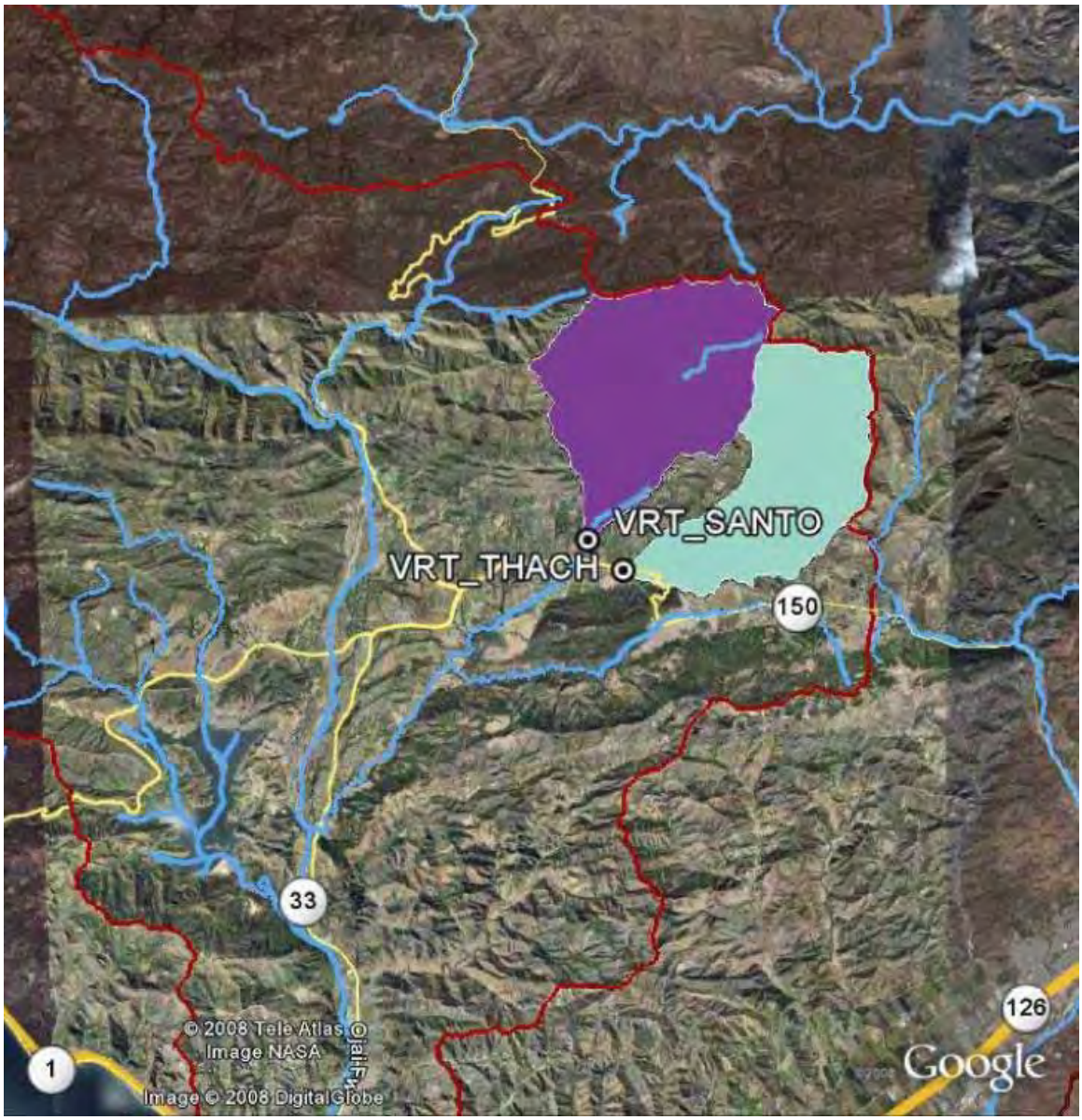
igure 25. S03T TIM , S03T OULD, and S03D ARDS Drainage Areas



igure 26. S04T HOPP Drainage Area



igure 27. S04T TAPO and S04T TAPO GD Drainage Areas



igure 28. VRT THACH and VRT SANTO Drainage Areas

Appendix D

VCAILG Management Practice Survey

Management Practices		Practice Trac ing					Pollutants eing Targeted Controlled				
		Yes, Prior to Jan. 2008	Yes, New since Jan. 2008	Planned for future	No, Not currently used	N A	ertilization, Irrigation, & Runoff Control		Sediment Transport & Runoff Control [1]		
Sediment and Erosion Management							*Nitrogen*	*Salts*	*OC Pesticides*	*OP Pesticides*	*Metals*
1	Consult with local agencies (NRCS, RCD, UCCE, or county planning) to develop a soil conservation plan.								x	x	x
2	Know your soil series and its erosion hazard rating.								x	x	x
3	Consider erosion hazard rating and prevailing winds when choosing row orientation.								x	x	x
4	Long runs of production area are broken up by access roads or buffer strips.								x	x	x
5	Riparian areas or other areas of natural vegetation were retained or expanded during site development.						x	x	x	x	x
6	Avoid bare fields using cover crops, leaving plant debris, or planting subsequent crops.						x	x	x	x	x
7	Minimize compaction by using drive rows, reducing tractor passes, reducing cultivation, and avoiding driving on or tilling wet ground.								x	x	x
8	Apply mulch, compost, or green waste to improve soil characteristics, especially for sandy or clayey soils.						x	x	x	x	x
9	Windbreaks or shelterbelts are used in areas prone to wind erosion.								x	x	x

Sediment and Erosion Management continued		**Yes, Prior to Jan. 2008**	**Yes, New since Jan. 2008**	**Planned for future**	**No, Not currently used**	**N A**	*Nitrogen*	*Salts*	*OC Pesticides*	*OP Pesticides*	*Metals*
10	In sloped production areas, management practices to minimize erosion such as contour farming, contoured buffer strips, or terracing are used.						x	x	x	x	x
11	Berms, culverts, or flow channels are in place to divert water away from roads.						x	x	x	x	x
12	Road erosion is minimized by grading, using gravel or mulch on roads, or constructing water bars or drainways.								x	x	x
13	Erosion management practices such as terracing, water diversions, and critical area plantings are used for non-production areas that are sloped or hilly.						x	x	x	x	x
14	Ditch banks are protected from erosion with vegetation, rock protection, or geotextiles.						x	x	x	x	x
15	Non-cropped areas with bare soil are protected from erosion with vegetation, mulch, gravel, or by diverting water.						x	x	x	x	x
16	Irrigation runoff is captured or kept on the property.						x	x	x	x	x
17	Stormwater runoff is captured or kept on the property.						x	x	x	x	x
18	Sediment traps are used at the end of the field to retain sediments in runoff.						x	x	x	x	x
19	Devices are in place to treat runoff before it leaves the property, such as grassed waterways, vegetated filter strips, and tailwater recycling systems.						x	x	x	x	x

	Irrigation Management	**Yes, Prior to Jan. 2008**	**Yes, New since Jan. 2008**	**Planned for future**	**No, Not currently used**	**N A**	*Nitrogen*	*Salts*	*OC Pesticides*	*OP Pesticides*	*Metals*
20	At least annually test the irrigation system for distribution uniformity by monitoring water delivery or pressure differences within a block.						x	x	x	x	x
21	Utilize the services of the Irrigation Mobile Lab or a professional irrigation consultant for evaluating irrigation system performance.						x	x	x	x	x
22	Implement appropriate improvements based on your own irrigation system test or the recommendations of the Irrigation Mobile Lab or other appropriate irrigation professionals.						x	x	x	x	x
23	When drip irrigation is used, the distribution uniformity is 90 or better.						x	x	x	x	x
24	Irrigation main and lateral lines are regularly inspected for breaks, leaks, or clogs.						x	x	x	x	x
25	Filters are inspected and cleaned regularly.						x	x	x	x	x
26	Lines are flushed or cleaned chemically to prevent clogging.						x	x	x	x	x
27	Pressure regulators or pressure compensating emitters are used.						x	x	x	x	x
28	Sprinkler heads and drip emitters of the same gallonage are used within each block and replaced with the same heads or emitters when necessary.						x	x	x	x	x
29	Consistent riser heights are used.						x	x	x	x	x

	Irrigation Management continued	**Yes, Prior to Jan. 2008**	**Yes, New since Jan. 2008**	**Planned for future**	**No, Not currently used**	**N A**	*Nitrogen*	*Salts*	*OC Pesticides*	*OP Pesticides*	*Metals*
30	Water is diverted from non-crop areas by adjusting sprinkler head arcs or using sprinkler guards.						x	x	x	x	x
31	When irrigating for frost protection, the proper timing and amount of irrigation is used.						x	x	x	x	x
32	Alternative equipment such as tunnels, air circulation, heaters, or smudge pots are used for frost protection.						x	x	x	x	x
33	The grower knows the infiltration rate of the soil, the available water holding capacity of the soil, and the crop rooting depth.						x	x	x	x	x
34	Soil moisture is measured with equipment such as gypsum block soil moisture sensors (such as Watermarks), tensiometers, soil probe, or neutron probe.						x	x	x	x	x
35	Evapotranspiration (ET) values are used to determine irrigation requirements. Values are obtained from CIMIS, onsite atmometers, or other appropriate devices.						x	x	x	x	x
36	If irrigation must be based on a set schedule due to water availability, the amount of irrigation is varied according to the weather and plant growth stage.						x	x	x	x	x
37	Flow meters are used to measure actual water use and is coupled with known crop use values or other measurements to conserve water as appropriate.						x	x	x	x	x

	Irrigation Management continued	**Yes, Prior to Jan. 2008**	**Yes, New since Jan. 2008**	**Planned for future**	**No, Not currently used**	**N A**	*Nitrogen*	*Salts*	*OC Pesticides*	*OP Pesticides*	*Metals*
38	Irrigation is halted if significant runoff occurs.						x	x	x	x	x
39	Harvested or unplanted areas are not irrigated.						x	x	x	x	x
40	Irrigation water quality is tested for parameters of interest including: pH, electrical conductivity (EC), sodium (Na), chloride (Cl), bicarbonate (HCO3), and boron (B).						x	x			
41	Well head is protected from surface contamination (located high in the landscape so that surface water drains away from well head; located away from potential contaminants; the space between the casing and sides of hole is grouted; casing regularly inspected for leaks; vermin-proof well cap with screened vent).						x	x	x	x	x
42	Irrigation duties are performed only by personnel who understand and practice appropriate irrigation scheduling, application, and crop management practices related to runoff management.						x	x	x	x	x

	Pest Management	**Yes, Prior to Jan. 2008**	**Yes, New since Jan. 2008**	**Planned for future**	**No, Not currently used**	**N A**	*Nitrogen*	*Salts*	*OC Pesticides*	*OP Pesticides*	*Metals*
43	Proper scouting methods are used to determine the population densities of insect pests, snails, slugs, and weeds and the incidence of diseases. Methods include use of yellow sticky traps, use of pheromone traps, plant inspection, beating, or net sweeping or other appropriate scouting tools and methods .									x	x
44	Use weather data or degree days to determine when to control pests.									x	x
45	Use UC IPM guidelines as a resource (www.ipm.ucdavis.edu).									x	
46	Diagnostic lab services or other professional assistance is used to identify unknown pathogens, pests, or growth problems before implementing a control measure.									x	x
47	All transplants, plugs, or plant material is inspected for pests before planting or introduction in the growing area.									x	x
48	Natural enemy populations are considered when choosing pesticides, application rates, and timing.									x	x
49	Beneficial insects or mites are released in the field.									x	x
50	Personnel are aware of the causal agents of diseases in the field and their methods of spread.									x	x
51	Personnel are familiar with methods and timing of disease control.									x	x

	Pest Management continued	**Yes, Prior to Jan. 2008**	**Yes, New since Jan. 2008**	**Planned for future**	**No, Not currently used**	**N A**	*Nitrogen*	*Salts*	*OC Pesticides*	*OP Pesticides*	*Metals*
52	Disease resistance or disease tolerant crop varieties are used.									x	x
53	Classes of pesticides are rotated to avoid resistance.									x	
54	The grower or pesticide applicator considers selectivity and effectiveness against the target organism before choosing a pesticide.									x	
55	Personnel are familiar with the UC online databases for comparing the risks of different pesticides moving with water and sediment and affecting non-target organisms (WaterTox or Pesticide Wise).									x	
56	Spray timing is based on economic thresholds of pest incidence.									x	x
57	Hot spots are identified and sprayed rather than treating an entire field.									x	x
58	Sprayers are routinely calibrated to ensure accurate application rates.									x	x
59	Worn nozzles and screens are replaced to ensure the best coverage of pesticide applications.									x	x
60	Treatment rate, water volume, and driving speed are optimized to attain the coverage needed for specific pests.									x	x
61	Pesticides are applied only according to the label and environmental hazards are followed.									x	x
62	Pesticides are applied at the lowest effective labeled rate.									x	x

	Pest Management continued	**Yes, Prior to Jan. 2008**	**Yes, New since Jan. 2008**	**Planned for future**	**No, Not currently used**	**N A**	*Nitrogen*	*Salts*	*OC Pesticides*	*OP Pesticides*	*Metals*
63	Pesticide use records are submitted monthly to the county Agricultural Commissioner.									x	x
64	Pesticides are stored where they are protected from rain and contained on an impermeable pad with curb to contain spills or leaks.									x	x
65	Pesticide mixing and loading is done on an impermeable surface and more than 100 feet down slope from any wells.									x	x
66	Pesticide disposal methods are environmentally safe and in accordance to label instructions.									x	x
67	Reduced risk pesticides are used.									x	
68	Choose selective pesticides for the target pest species and avoid using broad-spectrum pesticides.									x	
69	Avoid applying pesticides when wind could move them off-target as drift.									x	x
70	Avoid applying pesticides when rain or scheduled irrigation will move the pesticides as runoff and ground percolation.									x	x
71	Copper sulfate is not applied prior to extensive irrigation or expected rainfall.							x			x
72	Copper containing pesticides are replaced with alternatives.										x

	Nutrient Management	**Yes, Prior to Jan. 2008**	**Yes, New since Jan. 2008**	**Planned for future**	**No, Not currently used**	**N A**	*Nitrogen*	*Salts*	*OC Pesticides*	*OP Pesticides*	*Metals*
73	Most recent nutrient recommendations for your particular crops and growing practices are used.						x	x			
74	Chemical properties of the soil, including pH and electrical conductivity (EC), are routinely measured.						x	x			
75	Soil fertility is routinely monitored through measurements of nitrogen, phosphorus, potassium, and micronutrients.						x	x			
76	Fertilization rates are adjusted based on the results of soil fertility measurements.						x	x			
77	Crop plants are visually assessed for signs of nutrient deficiency or toxicity.						x	x			
78	Leaf or petiole analyses are used as a guide for fertilizer application.						x	x			
79	Fertilizer applications are split into multiple smaller applications rather than applying all that is required for a crop in one large application.						x	x			
80	Fertilizer levels in fertigation water are tested to ensure that injectors are correctly calibrated.						x	x			
81	Fertilizer applications are timed to maximize plant uptake, taking into consideration the life stage of the crop, potential rain events, and irrigation timing.						x	x			
82	Slow-release fertilizers are used.						x	x			

	Nutrient Management continued	**Yes, Prior to Jan. 2008**	**Yes, New since Jan. 2008**	**Planned for future**	**No, Not currently used**	**N A**	*Nitrogen*	*Salts*	*OC Pesticides*	*OP Pesticides*	*Metals*
83	Fertilizer applications are adjusted to account for other nutrient sources, such as: irrigation water, cover crops, and residuals from previous fertilizations.						x	x			
84	Fertilizers are stored where they are protected from rain and on an impermeable pad with a curb to contain spills.						x	x			
85	Mixing and loading of fertilizers occurs in a covered area on an impermeable surface and more than 100 feet down slope from any wells.						x	x			
	Salinity Management and Leaching										
86	Leaching is performed only when necessary, as determined by measuring soil solution electrical conductivity (EC).						x	x			
87	Leaching is done only when fertilizer injectors are turned off.						x	x			
88	Fertilizers and amendments with a low salt index are used.							x			
89	Saline or high selenium wells are decommissioned and other sources of water are used.							x			

	Property Management	**Yes, Prior to Jan. 2008**	**Yes, New since Jan. 2008**	**Planned for future**	**No, Not currently used**	**N A**	*Nitrogen*	*Salts*	*OC Pesticides*	*OP Pesticides*	*Metals*
90	Landowner, grower, or other personnel regularly attend UC Cooperative Extension, Commodity Board, or other industry educational meetings concerning management practices that protect water resources.						x	x	x	x	x
91	Landowner, grower, or other responsible personnel subscribe to and read farming, trade, and industry journals containing articles about water quality, fertilizer, pest and erosion management.						x	x	x	x	x
92	Employees receive training on the following: wearing protective clothing, understanding fertilizer/pesticide signage, MSDS and label information, personal hygiene and sanitation, trash disposal and recycling, use storage and disposal of fertilizers and pesticides, pest and disease scouting, spill cleanup, and irrigation.						x	x	x	x	x
93	Training is provided in the employees native language.						x	x	x	x	x
94	Fuel tanks are checked and maintained to prevent leaks.										x
95	Spill cleanup materials are readily accessible and maintained for all potential types and sizes of spills.						x	x		x	x
96	All vehicles, trucks, and tractors are regularly maintained to detect and prevent fluid leaks.										x
97	Vehicles, machinery, and tanks no longer in use are drained of fluids, and those fluids properly disposed.										x

	Property Management continued	**Yes, Prior to Jan. 2008**	**Yes, New since Jan. 2008**	**Planned for future**	**No, Not currently used**	**N A**	*Nitrogen*	*Salts*	*OC Pesticides*	*OP Pesticides*	*Metals*
98	The property is kept clean and free of debris.										
99	The property has an adequate number of waste containers that are regularly collected to prevent overflow and are kept covered to prevent scattering of trash.										
100	Restrooms or portable toilets are available where needed and regularly maintained.										

[1] Previous samplings have shown pesticides and metals to have caused toxicity. Therefore, BMPs that address these classes of constituents will also mitigate toxicity exceedances.

Appendix E

VCAILG Management Practice Survey Results

Salts Related Management Practices Survey Results

		Current Status			Improvement		
		Percent of Applicable Acres Employing the MP by the Time of the Survey			Percent of Applicable Acres Unmanaged efore Jan 2008 that ecame Managed After Jan 2008		
	Sediment and Erosion Management	**05D SANT VCWPD**	**S02T TODD**	**S04T TAPO**	**05D SANT VCWPD**	**S02T TODD**	**S04T TAPO**
5	Riparian areas or other areas of natural vegetation were retained or expanded during site development.	36	88	100	0	0	NA
6	Avoid bare fields using cover crops, leaving plant debris, or planting subsequent crops.	100	100	100	NA	100	NA
8	Apply mulch, compost, or green waste to improve soil characteristics, especially for sandy or clayey soils.	88	77	100	0	0	NA
10	In sloped production areas, management practices to minimize erosion such as contour farming, contoured buffer strips, or terracing are used.	0	100	100	0	NA	NA
11	Berms, culverts, or flow channels are in place to divert water away from roads.	0	96	100	0	0	NA
13	Erosion management practices such as terracing, water diversions, and critical area plantings are used for non-production areas that are sloped or hilly.	41	100	100	0	NA	NA
14	Ditch banks are protected from erosion with vegetation, rock protection, or geotextiles.	100	100	87	0	NA	0
15	Non-cropped areas with bare soil are protected from erosion with vegetation, mulch, gravel, or by diverting water.	100	68	88	0	57	0
16	Irrigation runoff is captured or kept on the property.	17	11	7	17	0	0
17	Stormwater runoff is captured or kept on the property.	0	0	0	0	0	0
18	Sediment traps are used at the end of the field to retain sediments in runoff.	42	20	7	0	0	0
19	Devices are in place to treat runoff before it leaves the property, such as grassed waterways, vegetated filter strips, and tailwater recycling systems.	0	71	0	0	0	0

	Irrigation Management	05D SANT VCWPD	S02T TODD	S04T TAPO	05D SANT VCWPD	S02T TODD	S04T TAPO
20	At least annually test the irrigation system for distribution uniformity by monitoring water delivery or pressure differences within a block.	100	75	88	100	69	0
21	Utilize the services of the Irrigation Mobile Lab or a professional irrigation consultant for evaluating irrigation system performance.	12	91	0	12	87	0
22	Implement appropriate improvements based on your own irrigation system test or the recommendations of the Irrigation Mobile Lab or other appropriate irrigation professionals.	83	96	88	41	0	0
23	When drip irrigation is used, the distribution uniformity is 90 or better.	100	90	100	100	0	NA
24	Irrigation main and lateral lines are regularly inspected for breaks, leaks, or clogs.	100	100	100	NA	NA	NA
25	Filters are inspected and cleaned regularly.	100	100	100	NA	NA	NA
26	Lines are flushed or cleaned chemically to prevent clogging.	71	95	88	0	0	0
27	Pressure regulators or pressure compensating emitters are used.	100	95	88	100	0	0
28	Sprinkler heads and drip emitters of the same gallonage are used within each block and replaced with the same heads or emitters when necessary.	100	100	100	NA	NA	NA
29	Consistent riser heights are used.	100	100	100	NA	NA	NA
30	Water is diverted from non-crop areas by adjusting sprinkler head arcs or using sprinkler guards.	100	100	100	NA	NA	NA
31	When irrigating for frost protection, the proper timing and amount of irrigation is used.	100	100	100	NA	NA	NA
32	Alternative equipment such as tunnels, air circulation, heaters, or smudge pots are used for frost protection.	83	82	100	0	0	NA
33	The grower knows the infiltration rate of the soil, the available water holding capacity of the soil, and the crop rooting depth.	100	96	93	0	57	0
34	Soil moisture is measured with equipment such as gypsum block soil moisture sensors (such as Watermarks), tensiometers, soil probe, or neutron probe.	83	21	19	0	0	0

	Irrigation Management continued	05D SANT VCWPD	S02T TODD	S04T TAPO	05D SANT VCWPD	S02T TODD	S04T TAPO
35	Evapotranspiration (ET) values are used to determine irrigation requirements. Values are obtained from CIMIS, onsite atmometers, or other appropriate devices.	12	73	12	12	0	0
36	If irrigation must be based on a set schedule due to water availability, the amount of irrigation is varied according to the weather and plant growth stage.	100	100	100	NA	100	NA
37	Flow meters are used to measure actual water use and is coupled with known crop use values or other measurements to conserve water as appropriate.	51	100	100	45	100	NA
38	Irrigation is halted if significant runoff occurs.	100	100	100	NA	100	NA
39	Harvested or unplanted areas are not irrigated.	75	100	100	0	NA	NA
40	Irrigation water quality is tested for parameters of interest including: pH, electrical conductivity (EC), sodium (Na), chloride (Cl), bicarbonate (HCO3), and boron (B).	100	95	100	99	64	NA
41	Well head is protected from surface contamination (located high in the landscape so that surface water drains away from well head; located away from potential contaminants; the space between the casing and sides of hole is grouted; casing regularly inspected for leaks; vermin-proof well cap with screened vent).	100	100	100	NA	NA	NA
42	Irrigation duties are performed only by personnel who understand and practice appropriate irrigation scheduling, application, and crop management practices related to runoff management.	100	100	100	NA	100	NA
	Pest Management						
71	Copper sulfate is not applied prior to extensive irrigation or expected rainfall.	88	95	100	0	0	NA

	Nutrient Management	05D SANT VCWPD	S02T TODD	S04T TAPO	05D SANT VCWPD	S02T TODD	S04T TAPO
73	Most recent nutrient recommendations for your particular crops and growing practices are used.	83	96	100	0	0	NA
74	Chemical properties of the soil, including pH and electrical conductivity (EC), are routinely measured.	12	86	19	12	0	0
75	Soil fertility is routinely monitored through measurements of nitrogen, phosphorus, potassium, and micronutrients.	83	96	100	41	0	NA
76	Fertilization rates are adjusted based on the results of soil fertility measurements.	83	100	100	41	NA	NA
77	Crop plants are visually assessed for signs of nutrient deficiency or toxicity.	100	100	100	NA	NA	NA
78	Leaf or petiole analyses are used as a guide for fertilizer application.	83	100	93	0	NA	0
79	Fertilizer applications are split into multiple smaller applications rather than applying all that is required for a crop in one large application.	100	100	100	100	NA	NA
80	Fertilizer levels in fertigation water are tested to ensure that injectors are correctly calibrated.	100	91	7	98	86	0
81	Fertilizer applications are timed to maximize plant uptake, taking into consideration the life stage of the crop, potential rain events, and irrigation timing.	100	100	100	NA	NA	NA
82	Slow-release fertilizers are used.	12	69	100	0	7	NA
83	Fertilizer applications are adjusted to account for other nutrient sources, such as: irrigation water, cover crops, and residuals from previous fertilizations.	100	95	100	100	0	NA
84	Fertilizers are stored where they are protected from rain and on an impermeable pad with a curb to contain spills.	100	74	100	NA	0	NA
85	Mixing and loading of fertilizers occurs in a covered area on an impermeable surface and more than 100 feet down slope from any wells.	61	100	81	0	NA	0

	Salinity Management and Leaching	05D SANT VCWPD	S02T TODD	S04T TAPO	05D SANT VCWPD	S02T TODD	S04T TAPO
86	Leaching is performed only when necessary, as determined by measuring soil solution electrical conductivity (EC).	83	42	36	41	11	0
87	Leaching is done only when fertilizer injectors are turned off.	69	42	100	28	0	NA
88	Fertilizers and amendments with a low salt index are used.	69	100	100	0	NA	NA
89	Saline or high selenium wells are decommissioned and other sources of water are used.	0	100	100	0	NA	NA
	Property Management						
90	Landowner, grower, or other personnel regularly attend UC Cooperative Extension, Commodity Board, or other industry educational meetings concerning management practices that protect water resources.	51	100	100	0	100	NA
91	Landowner, grower, or other responsible personnel subscribe to and read farming, trade, and industry journals containing articles about water quality, fertilizer, pest and erosion management.	100	100	100	0	NA	NA
92	Employees receive training on the following: wearing protective clothing, understanding fertilizer/pesticide signage, MSDS and label information, personal hygiene and sanitation, trash disposal and recycling, use storage and disposal of fertilizers and pesticides, pest and disease scouting, spill cleanup, and irrigation.	100	100	100	NA	100	NA
93	Training is provided in the employees native language.	100	100	100	NA	100	NA
95	Spill cleanup materials are readily accessible and maintained for all potential types and sizes of spills.	69	78	100	0	0	NA

Nitrogen Related Management Practices Survey Results

		Current Status				Improvement			
		Percent of Applicable Acres Employing the MP by the Time of the Survey				Percent of Applicable Acres Unmanaged efore Jan 2008 that ecame Managed After Jan 2008			
	Sediment and Erosion Management	**05D SANT VCWPD**	**S02T TODD**	**O D CENTR**	**S04T TAPO**	**05D SANT VCWPD**	**S02T TODD**	**O D CENTR**	**S04T TAPO**
5	Riparian areas or other areas of natural vegetation were retained or expanded during site development.	36	88	100	100	0	0	100	NA
6	Avoid bare fields using cover crops, leaving plant debris, or planting subsequent crops.	100	100	100	100	NA	100	100	NA
8	Apply mulch, compost, or green waste to improve soil characteristics, especially for sandy or clayey soils.	88	77	93	100	0	0	38	NA
10	In sloped production areas, management practices to minimize erosion such as contour farming, contoured buffer strips, or terracing are used.	0	100	100	100	0	NA	NA	NA
11	Berms, culverts, or flow channels are in place to divert water away from roads.	0	96	93	100	0	0	0	NA
13	Erosion management practices such as terracing, water diversions, and critical area plantings are used for non-production areas that are sloped or hilly.	41	100	100	100	0	NA	NA	NA
14	Ditch banks are protected from erosion with vegetation, rock protection, or geotextiles.	100	100	76	87	0	NA	0	0
15	Non-cropped areas with bare soil are protected from erosion with vegetation, mulch, gravel, or by diverting water.	100	68	93	88	0	57	0	0
16	Irrigation runoff is captured or kept on the property.	17	11	7	7	17	0	0	0
17	Stormwater runoff is captured or kept on the property.	0	0	7	0	0	0	0	0
18	Sediment traps are used at the end of the field to retain sediments in runoff.	42	20	39	7	0	0	0	0
19	Devices are in place to treat runoff before it leaves the property, such as grassed waterways, vegetated filter strips, and tailwater recycling systems.	0	71	76	0	0	0	0	0

	Irrigation Management	05D SANT VCWPD	S02T TODD	O D CENTR	S04T TAPO	05D SANT VCWPD	S02T TODD	O D CENTR	S04T TAPO
20	At least annually test the irrigation system for distribution uniformity by monitoring water delivery or pressure differences within a block.	100	75	90	88	100	69	0	0
21	Utilize the services of the Irrigation Mobile Lab or a professional irrigation consultant for evaluating irrigation system performance.	12	91	80	0	12	87	30	0
22	Implement appropriate improvements based on your own irrigation system test or the recommendations of the Irrigation Mobile Lab or other appropriate irrigation professionals.	83	96	93	88	41	0	38	0
23	When drip irrigation is used, the distribution uniformity is 90 or better.	100	90	93	100	100	0	0	NA
24	Irrigation main and lateral lines are regularly inspected for breaks, leaks, or clogs.	100	100	93	100	NA	NA	0	NA
25	Filters are inspected and cleaned regularly.	100	100	93	100	NA	NA	0	NA
26	Lines are flushed or cleaned chemically to prevent clogging.	71	95	89	88	0	0	0	0
27	Pressure regulators or pressure compensating emitters are used.	100	95	100	88	100	0	NA	0
28	Sprinkler heads and drip emitters of the same gallonage are used within each block and replaced with the same heads or emitters when necessary.	100	100	100	100	NA	NA	NA	NA
29	Consistent riser heights are used.	100	100	100	100	NA	NA	NA	NA
30	Water is diverted from non-crop areas by adjusting sprinkler head arcs or using sprinkler guards.	100	100	97	100	NA	NA	0	NA
31	When irrigating for frost protection, the proper timing and amount of irrigation is used.	100	100	100	100	NA	NA	NA	NA
32	Alternative equipment such as tunnels, air circulation, heaters, or smudge pots are used for frost protection.	83	82	28	100	0	0	0	NA

	Irrigation Management continued	05D SANT VCWPD	S02T TODD	O D CENTR	S04T TAPO	05D SANT VCWPD	S02T TODD	O D CENTR	S04T TAPO
33	The grower knows the infiltration rate of the soil, the available water holding capacity of the soil, and the crop rooting depth.	100	96	91	93	0	57	0	0
34	Soil moisture is measured with equipment such as gypsum block soil moisture sensors (such as Watermarks), tensiometers, soil probe, or neutron probe.	83	21	20	19	0	0	0	0
35	Evapotranspiration (ET) values are used to determine irrigation requirements. Values are obtained from CIMIS, onsite atmometers, or other appropriate devices.	12	73	0	12	12	0	0	0
36	If irrigation must be based on a set schedule due to water availability, the amount of irrigation is varied according to the weather and plant growth stage.	100	100	100	100	NA	100	NA	NA
37	Flow meters are used to measure actual water use and is coupled with known crop use values or other measurements to conserve water as appropriate.	51	100	97	100	45	100	58	NA
38	Irrigation is halted if significant runoff occurs.	100	100	93	100	NA	100	38	NA
39	Harvested or unplanted areas are not irrigated.	75	100	97	100	0	NA	0	NA
40	Irrigation water quality is tested for parameters of interest including: pH, electrical conductivity (EC), sodium (Na), chloride (Cl), bicarbonate (HCO3), and boron (B).	100	95	100	100	99	64	NA	NA
41	Well head is protected from surface contamination (located high in the landscape so that surface water drains away from well head; located away from potential contaminants; the space between the casing and sides of hole is grouted; casing regularly inspected for leaks; vermin-proof well cap with screened vent).	100	100	100	100	NA	NA	NA	NA

	Irrigation Management continued	05D SANT VCWPD	S02T TODD	O D CENTR	S04T TAPO	05D SANT VCWPD	S02T TODD	O D CENTR	S04T TAPO
42	Irrigation duties are performed only by personnel who understand and practice appropriate irrigation scheduling, application, and crop management practices related to runoff management.	100	100	100	100	NA	100	NA	NA
	Nutrient Management								
73	Most recent nutrient recommendations for your particular crops and growing practices are used.	83	96	100	100	0	0	100	NA
74	Chemical properties of the soil, including pH and electrical conductivity (EC), are routinely measured.	12	86	100	19	12	0	NA	0
75	Soil fertility is routinely monitored through measurements of nitrogen, phosphorus, potassium, and micronutrients.	83	96	100	100	41	0	100	NA
76	Fertilization rates are adjusted based on the results of soil fertility measurements.	83	100	100	100	41	NA	100	NA
77	Crop plants are visually assessed for signs of nutrient deficiency or toxicity.	100	100	100	100	NA	NA	NA	NA
78	Leaf or petiole analyses are used as a guide for fertilizer application.	83	100	97	93	0	NA	0	0
79	Fertilizer applications are split into multiple smaller applications rather than applying all that is required for a crop in one large application.	100	100	100	100	100	NA	NA	NA
80	Fertilizer levels in fertigation water are tested to ensure that injectors are correctly calibrated.	100	91	100	7	98	86	100	0
81	Fertilizer applications are timed to maximize plant uptake, taking into consideration the life stage of the crop, potential rain events, and irrigation timing.	100	100	93	100	NA	NA	0	NA
82	Slow-release fertilizers are used.	12	69	89	100	0	7	0	NA
83	Fertilizer applications are adjusted to account for other nutrient sources, such as: irrigation water, cover crops, and residuals from previous fertilizations.	100	95	89	100	100	0	0	NA

	Nutrient Management continued	05D SANT VCWPD	S02T TODD	O D CENTR	S04T TAPO	05D SANT VCWPD	S02T TODD	O D CENTR	S04T TAPO
84	Fertilizers are stored where they are protected from rain and on an impermeable pad with a curb to contain spills.	100	74	97	100	NA	0	58	NA
85	Mixing and loading of fertilizers occurs in a covered area on an impermeable surface and more than 100 feet down slope from any wells.	61	100	54	81	0	NA	0	0
	Salinity Management and Leaching								
86	Leaching is performed only when necessary, as determined by measuring soil solution electrical conductivity (EC).	83	42	100	36	41	11	NA	0
87	Leaching is done only when fertilizer injectors are turned off.	69	42	93	100	28	0	0	NA
	Property Management								
90	Landowner, grower, or other personnel regularly attend UC Cooperative Extension, Commodity Board, or other industry educational meetings concerning management practices that protect water resources.	51	100	100	100	0	100	100	NA
91	Landowner, grower, or other responsible personnel subscribe to and read farming, trade, and industry journals containing articles about water quality, fertilizer, pest and erosion management.	100	100	100	100	0	NA	100	NA
92	Employees receive training on the following: wearing protective clothing, understanding fertilizer/pesticide signage, MSDS and label information, personal hygiene and sanitation, trash disposal and recycling, use storage and disposal of fertilizers and pesticides, pest and disease scouting, spill cleanup, and irrigation.	100	100	100	100	NA	100	NA	NA
93	Training is provided in the employees native language.	100	100	100	100	NA	100	NA	NA
95	Spill cleanup materials are readily accessible and maintained for all potential types and sizes of spills.	69	78	91	100	0	0	34	NA

OC Pesticides Management Practices Survey Results

		Current Status				Improvement			
		Percent of Applicable Acres Employing the MP by the Time of the Survey				Percent of Applicable Acres Unmanaged efore Jan 2008 that ecame Managed After Jan 2008			
	Sediment and Erosion Management	05D LAVD	05D SANT VCWPD	O D CENTR	S04T TAPO	05D LAVD	05D SANT VCWPD	O D CENTR	S04T TAPO
1	Consult with local agencies (NRCS, RCD, UCCE, or county planning) to develop a soil conservation plan.	29	12	43	0	0	0	0	0
2	Know your soil series and its erosion hazard rating.	82	51	40	18	0	0	0	0
3	Consider erosion hazard rating and prevailing winds when choosing row orientation.	100	100	89	0	NA	0	0	0
4	Long runs of production area are broken up by access roads or buffer strips.	100	88	100	100	NA	0	NA	NA
5	Riparian areas or other areas of natural vegetation were retained or expanded during site development.	66	36	100	100	35	0	100	NA
6	Avoid bare fields using cover crops, leaving plant debris, or planting subsequent crops.	100	100	100	100	100	NA	100	NA
7	Minimize compaction by using drive rows, reducing tractor passes, reducing cultivation, and avoiding driving on or tilling wet ground.	100	100	100	100	100	NA	NA	NA
8	Apply mulch, compost, or green waste to improve soil characteristics, especially for sandy or clayey soils.	100	88	93	100	100	0	38	NA
9	Windbreaks or shelterbelts are used in areas prone to wind erosion.	100	83	40	1	NA	0	0	0
10	In sloped production areas, management practices to minimize erosion such as contour farming, contoured buffer strips, or terracing are used.	100	0	100	100	100	0	NA	NA
11	Berms, culverts, or flow channels are in place to divert water away from roads.	100	100	93	100	100	NA	0	NA
12	Road erosion is minimized by grading, using gravel or mulch on roads, or constructing water bars or drainways.	85	100	93	99	54	NA	0	0

	Sediment and Erosion Management	05D LAVD	05D SANT VCWPD	O D CENTR	S04T TAPO	05D LAVD	05D SANT VCWPD	O D CENTR	S04T TAPO
13	Erosion management practices such as terracing, water diversions, and critical area plantings are used for non-production areas that are sloped or hilly.	100	1	100	100	100	0	NA	NA
14	Ditch banks are protected from erosion with vegetation, rock protection, or geotextiles.	100	95	76	87	NA	0	0	0
15	Non-cropped areas with bare soil are protected from erosion with vegetation, mulch, gravel, or by diverting water.	100	92	93	88	100	0	0	0
16	Irrigation runoff is captured or kept on the property.	0	0	7	7	0	0	0	0
17	Stormwater runoff is captured or kept on the property.	0	0	7	0	0	0	0	0
18	Sediment traps are used at the end of the field to retain sediments in runoff.	19	28	39	7	6	0	0	0
19	Devices are in place to treat runoff before it leaves the property, such as grassed waterways, vegetated filter strips, and tailwater recycling systems.	19	0	76	0	0	0	0	0
	Irrigation Management								
20	At least annually test the irrigation system for distribution uniformity by monitoring water delivery or pressure differences within a block.	100	95	90	88	100	89	0	0
21	Utilize the services of the Irrigation Mobile Lab or a professional irrigation consultant for evaluating irrigation system performance.	38	0	80	0	26	0	30	0
22	Implement appropriate improvements based on your own irrigation system test or the recommendations of the Irrigation Mobile Lab or other appropriate irrigation professionals.	100	84	93	88	100	41	38	0
23	When drip irrigation is used, the distribution uniformity is 90 or better.	100	100	93	100	NA	100	0	NA
24	Irrigation main and lateral lines are regularly inspected for breaks, leaks, or clogs.	100	100	93	100	100	NA	0	NA
25	Filters are inspected and cleaned regularly.	100	100	93	100	100	NA	0	NA

	Irrigation Management continued	05D LAVD	05D SANT VCWPD	O D CENTR	S04T TAPO	05D LAVD	05D SANT VCWPD	O D CENTR	S04T TAPO
26	Lines are flushed or cleaned chemically to prevent clogging.	81	83	89	88	0	0	0	0
27	Pressure regulators or pressure compensating emitters are used.	100	100	100	88	100	100	NA	0
28	Sprinkler heads and drip emitters of the same gallonage are used within each block and replaced with the same heads or emitters when necessary.	85	100	100	100	54	NA	NA	NA
29	Consistent riser heights are used.	100	100	100	100	100	NA	NA	NA
30	Water is diverted from non-crop areas by adjusting sprinkler head arcs or using sprinkler guards.	100	100	97	100	NA	NA	0	NA
31	When irrigating for frost protection, the proper timing and amount of irrigation is used.	53	100	100	100	0	NA	NA	NA
32	Alternative equipment such as tunnels, air circulation, heaters, or smudge pots are used for frost protection.	66	82	28	100	35	0	0	NA
33	The grower knows the infiltration rate of the soil, the available water holding capacity of the soil, and the crop rooting depth.	66	56	91	93	44	0	0	0
34	Soil moisture is measured with equipment such as gypsum block soil moisture sensors (such as Watermarks), tensiometers, soil probe, or neutron probe.	81	78	20	19	36	0	0	0
35	Evapotranspiration (ET) values are used to determine irrigation requirements. Values are obtained from CIMIS, onsite atmometers, or other appropriate devices.	32	0	0	12	11	0	0	0
36	If irrigation must be based on a set schedule due to water availability, the amount of irrigation is varied according to the weather and plant growth stage.	100	100	100	100	NA	NA	NA	NA
37	Flow meters are used to measure actual water use and is coupled with known crop use values or other measurements to conserve water as appropriate.	100	40	97	100	100	39	58	NA
38	Irrigation is halted if significant runoff occurs.	90	100	93	100	66	NA	38	NA

	Irrigation Management continued	05D LAVD	05D SANT VCWPD	O D CENTR	S04T TAPO	05D LAVD	05D SANT VCWPD	O D CENTR	S04T TAPO
39	Harvested or unplanted areas are not irrigated.	66	72	97	100	35	0	0	NA
41	Well head is protected from surface contamination (located high in the landscape so that surface water drains away from well head; located away from potential contaminants; the space between the casing and sides of hole is grouted; casing regularly inspected for leaks; vermin-proof well cap with screened vent).	100	100	100	100	100	NA	NA	NA
42	Irrigation duties are performed only by personnel who understand and practice appropriate irrigation scheduling, application, and crop management practices related to runoff management.	100	100	100	100	100	NA	NA	NA
	Property Management								
90	Landowner, grower, or other personnel regularly attend UC Cooperative Extension, Commodity Board, or other industry educational meetings concerning management practices that protect water resources.	90	51	100	100	68	0	100	NA
91	Landowner, grower, or other responsible personnel subscribe to and read farming, trade, and industry journals containing articles about water quality, fertilizer, pest and erosion management.	100	100	100	100	100	0	100	NA
92	Employees receive training on the following: wearing protective clothing, understanding fertilizer/pesticide signage, MSDS and label information, personal hygiene and sanitation, trash disposal and recycling, use storage and disposal of fertilizers and pesticides, pest and disease scouting, spill cleanup, and irrigation.	100	100	100	100	100	NA	NA	NA
93	Training is provided in the employees native language.	91	100	100	100	68	NA	NA	NA

OP Pesticides Management Practices Survey Results

		Current Status			Improvement		
		Percent of Applicable Acres Employing the MP by the Time of the Survey			Percent of Applicable Acres Unmanaged efore Jan 2008 that ecame Managed After Jan 2008		
	Sediment and Erosion Management	05D LAVD	05D SANT VCWPD	O D CENTR	05D LAVD	05D SANT VCWPD	O D CENTR
1	Consult with local agencies (NRCS, RCD, UCCE, or county planning) to develop a soil conservation plan.	29	12	43	0	0	0
2	Know your soil series and its erosion hazard rating.	82	51	40	0	0	0
3	Consider erosion hazard rating and prevailing winds when choosing row orientation.	100	100	89	NA	0	0
4	Long runs of production area are broken up by access roads or buffer strips.	100	88	100	NA	0	NA
5	Riparian areas or other areas of natural vegetation were retained or expanded during site development.	66	36	100	35	0	100
6	Avoid bare fields using cover crops, leaving plant debris, or planting subsequent crops.	100	100	100	100	NA	100
7	Minimize compaction by using drive rows, reducing tractor passes, reducing cultivation, and avoiding driving on or tilling wet ground.	100	100	100	100	NA	NA
8	Apply mulch, compost, or green waste to improve soil characteristics, especially for sandy or clayey soils.	100	88	93	100	0	38
9	Windbreaks or shelterbelts are used in areas prone to wind erosion.	100	83	40	NA	0	0
10	In sloped production areas, management practices to minimize erosion such as contour farming, contoured buffer strips, or terracing are used.	100	0	100	100	0	NA
11	Berms, culverts, or flow channels are in place to divert water away from roads.	100	100	93	100	NA	0
12	Road erosion is minimized by grading, using gravel or mulch on roads, or constructing water bars or drainways.	85	100	93	54	NA	0
13	Erosion management practices such as terracing, water diversions, and critical area plantings are used for non-production areas that are sloped or hilly.	100	1	100	100	0	NA

	Sediment and Erosion Management	05D LAVD	05D SANT VCWPD	O D CENTR	05D LAVD	05D SANT VCWPD	O D CENTR
14	Ditch banks are protected from erosion with vegetation, rock protection, or geotextiles.	100	95	76	NA	0	0
15	Non-cropped areas with bare soil are protected from erosion with vegetation, mulch, gravel, or by diverting water.	100	92	93	100	0	0
16	Irrigation runoff is captured or kept on the property.	0	0	7	0	0	0
17	Stormwater runoff is captured or kept on the property.	0	0	7	0	0	0
18	Sediment traps are used at the end of the field to retain sediments in runoff.	19	28	39	6	0	0
19	Devices are in place to treat runoff before it leaves the property, such as grassed waterways, vegetated filter strips, and tailwater recycling systems.	19	0	76	0	0	0
	Irrigation Management						
20	At least annually test the irrigation system for distribution uniformity by monitoring water delivery or pressure differences within a block.	100	95	90	100	89	0
21	Utilize the services of the Irrigation Mobile Lab or a professional irrigation consultant for evaluating irrigation system performance.	38	0	80	26	0	30
22	Implement appropriate improvements based on your own irrigation system test or the recommendations of the Irrigation Mobile Lab or other appropriate irrigation professionals.	100	84	93	100	41	38
23	When drip irrigation is used, the distribution uniformity is 90 or better.	100	100	93	NA	100	0
24	Irrigation main and lateral lines are regularly inspected for breaks, leaks, or clogs.	100	100	93	100	NA	0
25	Filters are inspected and cleaned regularly.	100	100	93	100	NA	0
26	Lines are flushed or cleaned chemically to prevent clogging.	81	83	89	0	0	0
27	Pressure regulators or pressure compensating emitters are used.	100	100	100	100	100	NA

	Irrigation Management continued	05D LAVD	05D SANT VCWPD	O D CENTR	05D LAVD	05D SANT VCWPD	O D CENTR
28	Sprinkler heads and drip emitters of the same gallonage are used within each block and replaced with the same heads or emitters when necessary.	85	100	100	54	NA	NA
29	Consistent riser heights are used.	100	100	100	100	NA	NA
30	Water is diverted from non-crop areas by adjusting sprinkler head arcs or using sprinkler guards.	100	100	97	NA	NA	0
31	When irrigating for frost protection, the proper timing and amount of irrigation is used.	53	100	100	0	NA	NA
32	Alternative equipment such as tunnels, air circulation, heaters, or smudge pots are used for frost protection.	66	82	28	35	0	0
33	The grower knows the infiltration rate of the soil, the available water holding capacity of the soil, and the crop rooting depth.	66	56	91	44	0	0
34	Soil moisture is measured with equipment such as gypsum block soil moisture sensors (such as Watermarks), tensiometers, soil probe, or neutron probe.	81	78	20	37	0	0
35	Evapotranspiration (ET) values are used to determine irrigation requirements. Values are obtained from CIMIS, onsite atmometers, or other appropriate devices.	32	0	0	11	0	0
36	If irrigation must be based on a set schedule due to water availability, the amount of irrigation is varied according to the weather and plant growth stage.	100	100	100	NA	NA	NA
37	Flow meters are used to measure actual water use and is coupled with known crop use values or other measurements to conserve water as appropriate.	100	40	97	100	39	58
38	Irrigation is halted if significant runoff occurs.	90	100	93	66	NA	38
39	Harvested or unplanted areas are not irrigated.	66	72	97	35	0	0

	Irrigation Management continued	05D LAVD	05D SANT VCWPD	O D CENTR	05D LAVD	05D SANT VCWPD	O D CENTR
41	Well head is protected from surface contamination (located high in the landscape so that surface water drains away from well head; located away from potential contaminants; the space between the casing and sides of hole is grouted; casing regularly inspected for leaks; vermin-proof well cap with screened vent).	100	100	100	100	NA	NA
42	Irrigation duties are performed only by personnel who understand and practice appropriate irrigation scheduling, application, and crop management practices related to runoff management.	100	100	100	100	NA	NA
	Pest Management						
43	Proper scouting methods are used to determine the population densities of insect pests, snails, slugs, and weeds and the incidence of diseases. Methods include use of yellow sticky traps, use of pheromone traps, plant inspection, beating, or net sweeping or other appropriate scouting tools and methods .	100	100	100	100	NA	NA
44	Use weather data or degree days to determine when to control pests.	100	69	100	100	0	100
45	Use UC IPM guidelines as a resource (www.ipm.ucdavis.edu).	32	61	40	0	0	0
46	Diagnostic lab services or other professional assistance is used to identify unknown pathogens, pests, or growth problems before implementing a control measure.	100	100	90	100	NA	0
47	All transplants, plugs, or plant material is inspected for pests before planting or introduction in the growing area.	100	100	100	100	NA	NA
48	Natural enemy populations are considered when choosing pesticides, application rates, and timing.	100	100	100	100	NA	100
49	Beneficial insects or mites are released in the field.	82	39	93	50	0	38
50	Personnel are aware of the causal agents of diseases in the field and their methods of spread.	100	100	90	100	NA	0
51	Personnel are familiar with methods and timing of disease control in the growing region.	100	100	90	100	NA	0

	Pest Management continued	05D LAVD	05D SANT VCWPD	O D CENTR	05D LAVD	05D SANT VCWPD	O D CENTR
52	Disease resistance or disease tolerant crop varieties are used.	100	100	96	100	NA	0
53	Classes of pesticides are rotated to avoid resistance.	82	100	100	0	NA	100
54	The grower or pesticide applicator considers selectivity and effectiveness against the target organism before choosing a pesticide.	100	100	100	100	NA	NA
55	Personnel are familiar with the UC online databases for comparing the risks of different pesticides moving with water and sediment and affecting non-target organisms (WaterTox or Pesticide Wise).	14	12	85	5	0	0
56	Spray timing is based on economic thresholds of pest incidence.	100	100	96	100	NA	62
57	Hot spots are identified and sprayed rather than treating an entire field.	85	39	100	80	39	100
58	Sprayers are routinely calibrated to ensure accurate application rates.	91	100	100	68	NA	NA
59	Worn nozzles and screens are replaced to ensure the best coverage of pesticide applications.	100	100	100	100	NA	NA
60	Treatment rate, water volume, and driving speed are optimized to attain the coverage needed for specific pests.	100	100	100	100	NA	100
61	Pesticides are applied only according to the label and environmental hazards are followed.	100	100	100	100	NA	NA
62	Pesticides are applied at the lowest effective labeled rate.	90	83	89	66	0	22
63	Pesticide use records are submitted monthly to the county Agricultural Commissioner.	91	100	100	68	NA	100
64	Pesticides are stored where they are protected from rain and contained on an impermeable pad with curb to contain spills or leaks.	100	100	100	100	NA	NA
65	Pesticide mixing and loading is done on an impermeable surface and more than 100 feet down slope from any wells.	56	61	97	29	0	69

	Pest Management continued	05D LAVD	05D SANT VCWPD	O D CENTR	05D LAVD	05D SANT VCWPD	O D CENTR
66	Pesticide disposal methods are environmentally safe and in accordance to label instructions.	100	100	100	100	NA	100
67	Reduced risk pesticides are used.	100	100	100	100	NA	100
68	Choose selective pesticides for the target pest species and avoid using broad-spectrum pesticides.	100	100	100	100	NA	100
69	Avoid applying pesticides when wind could move them off-target as drift.	100	100	100	100	NA	NA
70	Avoid applying pesticides when rain or scheduled irrigation will move the pesticides as runoff and ground percolation.	100	100	100	100	NA	100
	Property Management						
90	Landowner, grower, or other personnel regularly attend UC Cooperative Extension, Commodity Board, or other industry educational meetings concerning management practices that protect water resources.	90	51	100	68	0	100
91	Landowner, grower, or other responsible personnel subscribe to and read farming, trade, and industry journals containing articles about water quality, fertilizer, pest and erosion management.	100	100	100	100	0	100
92	Employees receive training on the following: wearing protective clothing, understanding fertilizer/pesticide signage, MSDS and label information, personal hygiene and sanitation, trash disposal and recycling, use storage and disposal of fertilizers and pesticides, pest and disease scouting, spill cleanup, and irrigation.	100	100	100	100	NA	NA
93	Training is provided in the employees native language.	91	100	100	68	NA	NA
95	Spill cleanup materials are readily accessible and maintained for all potential types and sizes of spills.	82	69	81	50	0	19

Appendix F

Management Practice Survey Cover Sheets

Management Practice Survey:
Supplemental Information for the Duc Pond (01T ODD2 DCH)

The VCAILG developed a Water Quality Management Plan to address exceedances in water quality objectives found during 2007 and 2008 water sampling. Because your property drains to one of the high priority areas, the VCAILG is asking that you comply with the Water Quality Management Plan by doing the following:

- Review the information on this sheet to become familiar with the water quality issues in your area.
- Complete the Management Practice Survey.
- Pay particular attention to management practices you are not currently implementing and start using new practices to address the water quality exceedances listed below.

our property drains to the Duck Pond/Oxnard Drain 2 monitoring site

These are the water quality benchmark exceedances found at 1T ODD2 DCH:

Dry Weather

- Nitrogen
- OC Pesticides (ie. DDT)

Wet Weather

- Nitrogen
- OC Pesticides (ie. DDT)
- OP Pesticides (chlorpyrifos/lorsban)
- Chronic Toxicity

Management Practice Survey:
Supplemental Information for O nard Drain 3 at Arnold Road (01T ODD3 ARN)

The VCAILG developed a Water Quality Management Plan to address exceedances in water quality objectives found during 2007 and 2008 water sampling. Because your property drains to one of the high priority areas, the VCAILG is asking that you comply with the Water Quality Management Plan by doing the following:

- Review the information on this sheet to become familiar with the water quality issues in your area.
- Complete the Management Practice Survey.
- Pay particular attention to management practices you are not currently implementing and start using new practices to address the water quality exceedances listed below.

our property drains to the Oxnard Drain 3 at Arnold Road monitoring site

These are the water quality benchmark exceedances found at 1T ODD3 ARN:

Dry Weather

- Nitrogen
- OC Pesticides (ie. DDT, toxaphene)

Wet Weather

- Nitrogen
- OC Pesticides (ie. DDT)

Management Practice Survey:
Supplemental Information for the Central Ditch (02D ROOM)

The VCAILG developed a Water Quality Management Plan to address exceedances in water quality objectives found during 2007 and 2008 water sampling. Because your property drains to one of the high priority areas, the VCAILG is asking that you comply with the Water Quality Management Plan by doing the following:

- Review the information on this sheet to become familiar with the water quality issues in your area.
- Complete the Management Practice Survey.
- Pay particular attention to management practices you are not currently implementing and start using new practices to address the water quality exceedances listed below.

our property drains to the Broome Ranch Road monitoring site

These are the water quality benchmark exceedances found at 2D BROOM:

Dry Weather

- Nitrogen
- OC Pesticides (ie. DDT)
- Dissolved Oxygen

Wet Weather

- Nitrogen
- OC Pesticides (ie. DDT)

Management Practice Survey:
Supplemental Information for Revolon Slough at Etting Road (04D ETTG)

The VCAILG developed a Water Quality Management Plan to address exceedances in water quality objectives found during 2007 and 2008 water sampling. Because your property drains to one of the high priority areas, the VCAILG is asking that you comply with the Water Quality Management Plan by doing the following:

- Review the information on this sheet to become familiar with the water quality issues in your area.
- Complete the Management Practice Survey.
- Pay particular attention to management practices you are not currently implementing and start using new practices to address the water quality exceedances listed below.

our property drains to Revolon Slough at Etting Road

These are the water quality benchmark exceedances found at 4D ETTG:

Dry Weather

- Nitrogen
- OC Pesticides (ie. DDT)
- OP Pesticides (chlorpyrifos/lorsban)

Wet Weather

- Nitrogen
- OC Pesticides (ie. DDT)
- OP Pesticides (chlorpyrifos/lorsban)

Management Practice Survey:
Supplemental Information for Revolon Slough at S. Las Posas Road (04D LAS)

The VCAILG developed a Water Quality Management Plan to address exceedances in water quality objectives found during 2007 and 2008 water sampling. Because your property drains to one of the high priority areas, the VCAILG is asking that you comply with the Water Quality Management Plan by doing the following:

- Review the information on this sheet to become familiar with the water quality issues in your area.
- Complete the Management Practice Survey.
- Pay particular attention to management practices you are not currently implementing and start using new practices to address the water quality exceedances listed below.

our property drains to Revolon Slough at South Las Posas Road

These are the water quality benchmark exceedances found at 4D LAS:

Dry Weather

- Nitrogen
- OC Pesticides (DDT, toxaphene)
- OP Pesticides (chlorpyrifos, diazinon)
- Temperature

Wet Weather

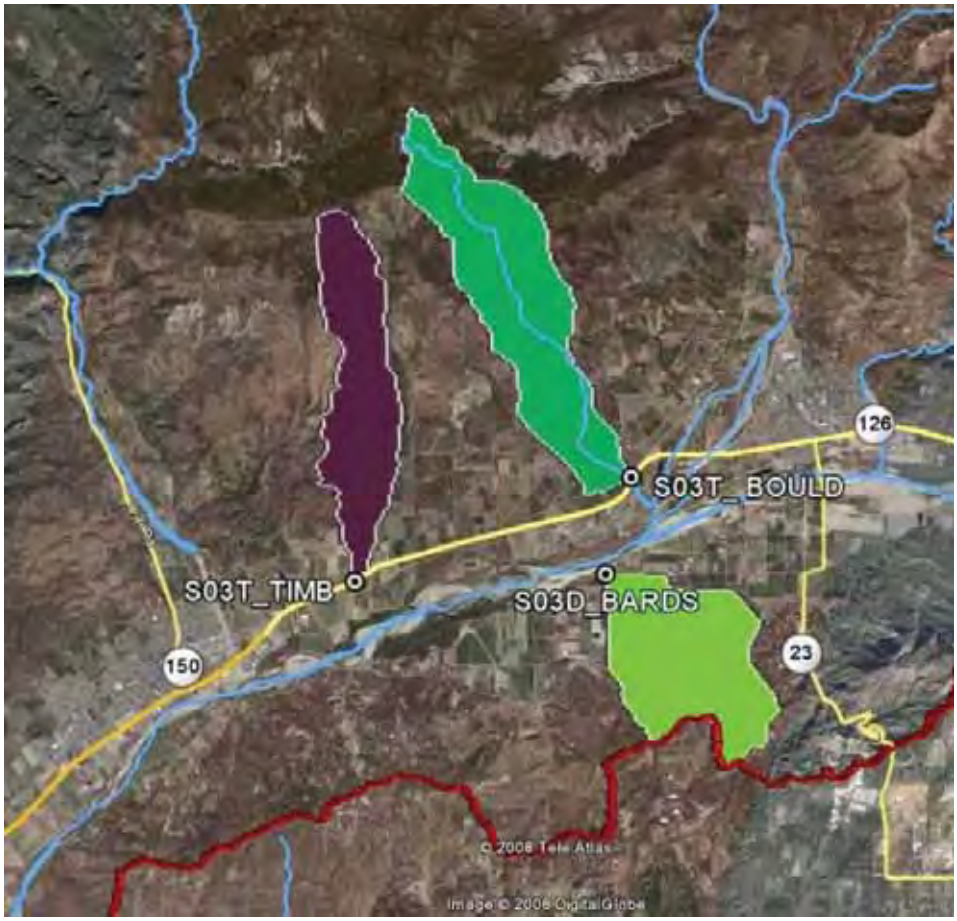
- Nitrogen
- OC Pesticides (DDT, chlordane)
- OP Pesticides (chlorpyrifos/lorsban)

Management Practice Survey:
Supplemental Information for Boulder Creek (S03T_BOULD)

The VCAILG developed a Water Quality Management Plan to address exceedances in water quality objectives found during 2007 and 2008 water sampling. Because your property drains to one of the high priority areas, the VCAILG is asking that you comply with the Water Quality Management Plan by doing the following:

- Review the information on this sheet to become familiar with the water quality issues in your area.
- Complete the Management Practice Survey.
- Pay particular attention to management practices you are not currently implementing and start using new practices to address the water quality exceedances listed below.

our property drains to the Boulder Creek monitoring site.



These are the water quality benchmark exceedances found at S 3T BOULD:

Dry Weather

- Nitrogen
- Salts

Wet Weather

- Chronic Toxicity
- OC Pesticides (chlordane)

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Appendix N

Federal Primary and Secondary Drinking Water Standards

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National Primary Drinking Water Regulations

	Contaminant	MCL or TT[1] (mg/L)[2]	Potential health effects from long-term[3] exposure above the MCL	Common sources of contaminant in drinking water	Public Health Goal (mg/L)[2]
OC	Acrylamide	TT[4]	Nervous system or blood problems; increased risk of cancer	Added to water during sewage/ wastewater treatment	zero
OC	Alachlor	0.002	Eye, liver, kidney or spleen problems; anemia; increased risk of cancer	Runoff from herbicide used on row crops	zero
R	Alpha/photon emitters	15 picocuries per Liter (pCi/L)	Increased risk of cancer	Erosion of natural deposits of certain minerals that are radioactive and may emit a form of radiation known as alpha radiation	zero
IOC	Antimony	0.006	Increase in blood cholesterol; decrease in blood sugar	Discharge from petroleum refineries; fire retardants; ceramics; electronics; solder	0.006
IOC	Arsenic	0.010	Skin damage or problems with circulatory systems, and may have increased risk of getting cancer	Erosion of natural deposits; runoff from orchards; runoff from glass & electronics production wastes	0
IOC	Asbestos (fibers >10 micrometers)	7 million fibers per Liter (MFL)	Increased risk of developing benign intestinal polyps	Decay of asbestos cement in water mains; erosion of natural deposits	7 MFL
OC	Atrazine	0.003	Cardiovascular system or reproductive problems	Runoff from herbicide used on row crops	0.003
IOC	Barium	2	Increase in blood pressure	Discharge of drilling wastes; discharge from metal refineries; erosion of natural deposits	2
OC	Benzene	0.005	Anemia; decrease in blood platelets; increased risk of cancer	Discharge from factories; leaching from gas storage tanks and landfills	zero
OC	Benzo(a)pyrene (PAHs)	0.0002	Reproductive difficulties; increased risk of cancer	Leaching from linings of water storage tanks and distribution lines	zero
IOC	Beryllium	0.004	Intestinal lesions	Discharge from metal refineries and coal-burning factories; discharge from electrical, aerospace, and defense industries	0.004
R	Beta photon emitters	4 millirems per year	Increased risk of cancer	Decay of natural and man-made deposits of certain minerals that are radioactive and may emit forms of radiation known as photons and beta radiation	zero
DBP	Bromate	0.010	Increased risk of cancer	Byproduct of drinking water disinfection	zero
IOC	Cadmium	0.005	Kidney damage	Corrosion of galvanized pipes; erosion of natural deposits; discharge from metal refineries; runoff from waste batteries and paints	0.005
OC	Carbofuran	0.04	Problems with blood, nervous system, or reproductive system	Leaching of soil fumigant used on rice and alfalfa	0.04
OC	Carbon tetrachloride	0.005	Liver problems; increased risk of cancer	Discharge from chemical plants and other industrial activities	zero
D	Chloramines (as Cl_2)	MRDL=4.0[1]	Eye/nose irritation; stomach discomfort; anemia	Water additive used to control microbes	MRDLG=4[1]
OC	Chlordane	0.002	Liver or nervous system problems; increased risk of cancer	Residue of banned termiticide	zero
D	Chlorine (as Cl_2)	MRDL=4.0[1]	Eye/nose irritation; stomach discomfort	Water additive used to control microbes	MRDLG=4[1]
D	Chlorine dioxide (as ClO_2)	MRDL=0.8[1]	Anemia; infants, young children, and fetuses of pregnant women: nervous system effects	Water additive used to control microbes	MRDLG=0.8[1]
DBP	Chlorite	1.0	Anemia; infants, young children, and fetuses of pregnant women: nervous system effects	Byproduct of drinking water disinfection	0.8
OC	Chlorobenzene	0.1	Liver or kidney problems	Discharge from chemical and agricultural chemical factories	0.1
IOC	Chromium (total)	0.1	Allergic dermatitis	Discharge from steel and pulp mills; erosion of natural deposits	0.1
IOC	Copper	TT[5]; Action Level = 1.3	Short-term exposure: Gastrointestinal distress. Long-term exposure: Liver or kidney damage. People with Wilson's Disease should consult their personal doctor if the amount of copper in their water exceeds the action level	Corrosion of household plumbing systems; erosion of natural deposits	1.3
M	*Cryptosporidium*	TT[7]	Short-term exposure: Gastrointestinal illness (e.g., diarrhea, vomiting, cramps)	Human and animal fecal waste	zero

LEGEND

- D — Disinfectant
- DBP — Disinfection Byproduct
- IOC — Inorganic Chemical
- M — Microorganism
- OC — Organic Chemical
- R — Radionuclides

	Contaminant	MCL or TT[1] (mg/L)[2]	Potential health effects from long-term[3] exposure above the MCL	Common sources of contaminant in drinking water	Public Health Goal (mg/L)[2]
IOC	Cyanide (as free cyanide)	0.2	Nerve damage or thyroid problems	Discharge from steel/metal factories; discharge from plastic and fertilizer factories	0.2
OC	2,4-D	0.07	Kidney, liver, or adrenal gland problems	Runoff from herbicide used on row crops	0.07
OC	Dalapon	0.2	Minor kidney changes	Runoff from herbicide used on rights of way	0.2
OC	1,2-Dibromo-3-chloropropane (DBCP)	0.0002	Reproductive difficulties; increased risk of cancer	Runoff/leaching from soil fumigant used on soybeans, cotton, pineapples, and orchards	zero
OC	o-Dichlorobenzene	0.6	Liver, kidney, or circulatory system problems	Discharge from industrial chemical factories	0.6
OC	p-Dichlorobenzene	0.075	Anemia; liver, kidney or spleen damage; changes in blood	Discharge from industrial chemical factories	0.075
OC	1,2-Dichloroethane	0.005	Increased risk of cancer	Discharge from industrial chemical factories	zero
OC	1,1-Dichloroethylene	0.007	Liver problems	Discharge from industrial chemical factories	0.007
OC	cis-1,2-Dichloroethylene	0.07	Liver problems	Discharge from industrial chemical factories	0.07
OC	trans-1,2-Dichloroethylene	0.1	Liver problems	Discharge from industrial chemical factories	0.1
OC	Dichloromethane	0.005	Liver problems; increased risk of cancer	Discharge from drug and chemical factories	zero
OC	1,2-Dichloropropane	0.005	Increased risk of cancer	Discharge from industrial chemical factories	zero
OC	Di(2-ethylhexyl) adipate	0.4	Weight loss, liver problems, or possible reproductive difficulties	Discharge from chemical factories	0.4
OC	Di(2-ethylhexyl) phthalate	0.006	Reproductive difficulties; liver problems; increased risk of cancer	Discharge from rubber and chemical factories	zero
OC	Dinoseb	0.007	Reproductive difficulties	Runoff from herbicide used on soybeans and vegetables	0.007
OC	Dioxin (2,3,7,8-TCDD)	0.00000003	Reproductive difficulties; increased risk of cancer	Emissions from waste incineration and other combustion; discharge from chemical factories	zero
OC	Diquat	0.02	Cataracts	Runoff from herbicide use	0.02
OC	Endothall	0.1	Stomach and intestinal problems	Runoff from herbicide use	0.1
OC	Endrin	0.002	Liver problems	Residue of banned insecticide	0.002
OC	Epichlorohydrin	TT[4]	Increased cancer risk; stomach problems	Discharge from industrial chemical factories; an impurity of some water treatment chemicals	zero
OC	Ethylbenzene	0.7	Liver or kidney problems	Discharge from petroleum refineries	0.7
OC	Ethylene dibromide	0.00005	Problems with liver, stomach, reproductive system, or kidneys; increased risk of cancer	Discharge from petroleum refineries	zero
M	Fecal coliform and *E. coli*	MCL[6]	Fecal coliforms and *E. coli* are bacteria whose presence indicates that the water may be contaminated with human or animal wastes. Microbes in these wastes may cause short term effects, such as diarrhea, cramps, nausea, headaches, or other symptoms. They may pose a special health risk for infants, young children, and people with severely compromised immune systems.	Human and animal fecal waste	zero[6]
IOC	Fluoride	4.0	Bone disease (pain and tenderness of the bones); children may get mottled teeth	Water additive which promotes strong teeth; erosion of natural deposits; discharge from fertilizer and aluminum factories	4.0
M	*Giardia lamblia*	TT[7]	Short-term exposure: Gastrointestinal illness (e.g., diarrhea, vomiting, cramps)	Human and animal fecal waste	zero
OC	Glyphosate	0.7	Kidney problems; reproductive difficulties	Runoff from herbicide use	0.7
DBP	Haloacetic acids (HAA5)	0.060	Increased risk of cancer	Byproduct of drinking water disinfection	n/a[9]
OC	Heptachlor	0.0004	Liver damage; increased risk of cancer	Residue of banned termiticide	zero
OC	Heptachlor epoxide	0.0002	Liver damage; increased risk of cancer	Breakdown of heptachlor	zero
M	Heterotrophic plate count (HPC)	TT[7]	HPC has no health effects; it is an analytic method used to measure the variety of bacteria that are common in water. The lower the concentration of bacteria in drinking water, the better maintained the water system is.	HPC measures a range of bacteria that are naturally present in the environment	n/a

LEGEND

D	Disinfectant	IOC	Inorganic Chemical	OC	Organic Chemical
DBP	Disinfection Byproduct	M	Microorganism	R	Radionuclides

Contaminant		MCL or TT[1] (mg/L)[2]	Potential health effects from long-term[3] exposure above the MCL	Common sources of contaminant in drinking water	Public Health Goal (mg/L)[2]
OC	Hexachlorobenzene	0.001	Liver or kidney problems; reproductive difficulties; increased risk of cancer	Discharge from metal refineries and agricultural chemical factories	zero
OC	Hexachlorocyclopentadiene	0.05	Kidney or stomach problems	Discharge from chemical factories	0.05
IOC	Lead	TT5; Action Level=0.015	Infants and children: Delays in physical or or mental development; children could show slight deficits in attention span and learning abilities; Adults: Kidney problems; high blood pressure	Corrosion of household plumbing systems; erosion of natural deposits	zero
M	*Legionella*	TT7	Legionnaire's Disease, a type of pneumonia	Found naturally in water; multiplies in heating systems	zero
OC	Lindane	0.0002	Liver or kidney problems	Runoff/leaching from insecticide used on cattle, lumber, gardens	0.0002
IOC	Mercury (inorganic)	0.002	Kidney damage	Erosion of natural deposits; discharge from refineries and factories; runoff from landfills and croplands	0.002
OC	Methoxychlor	0.04	Reproductive difficulties	Runoff/leaching from insecticide used on fruits, vegetables, alfalfa, livestock	0.04
IOC	Nitrate (measured as Nitrogen)	10	Infants below the age of six months who drink water containing nitrate in excess of the MCL could become seriously ill and, if untreated, may die. Symptoms include shortness of breath and blue-baby syndrome.	Runoff from fertilizer use; leaching from septic tanks, sewage; erosion of natural deposits	10
IOC	Nitrite (measured as Nitrogen)	1	Infants below the age of six months who drink water containing nitrite in excess of the MCL could become seriously ill and, if untreated, may die. Symptoms include shortness of breath and blue-baby syndrome.	Runoff from fertilizer use; leaching from septic tanks, sewage; erosion of natural deposits	1
OC	Oxamyl (Vydate)	0.2	Slight nervous system effects	Runoff/leaching from insecticide used on apples, potatoes, and tomatoes	0.2
OC	Pentachlorophenol	0.001	Liver or kidney problems; increased cancer risk	Discharge from wood-preserving factories	zero
OC	Picloram	0.5	Liver problems	Herbicide runoff	0.5
OC	Polychlorinated biphenyls (PCBs)	0.0005	Skin changes; thymus gland problems; immune deficiencies; reproductive or nervous system difficulties; increased risk of cancer	Runoff from landfills; discharge of waste chemicals	zero
R	Radium 226 and Radium 228 (combined)	5 pCi/L	Increased risk of cancer	Erosion of natural deposits	zero
IOC	Selenium	0.05	Hair or fingernail loss; numbness in fingers or toes; circulatory problems	Discharge from petroleum and metal refineries; erosion of natural deposits; discharge from mines	0.05
OC	Simazine	0.004	Problems with blood	Herbicide runoff	0.004
OC	Styrene	0.1	Liver, kidney, or circulatory system problems	Discharge from rubber and plastic factories; leaching from landfills	0.1
OC	Tetrachloroethylene	0.005	Liver problems; increased risk of cancer	Discharge from factories and dry cleaners	zero
IOC	Thallium	0.002	Hair loss; changes in blood; kidney, intestine, or liver problems	Leaching from ore-processing sites; discharge from electronics, glass, and drug factories	0.0005
OC	Toluene	1	Nervous system, kidney, or liver problems	Discharge from petroleum factories	1
M	Total Coliforms	5.0 percent[8]	Coliforms are bacteria that indicate that other, potentially harmful bacteria may be present. See fecal coliforms and *E. coli*	Naturally present in the environment	zero
DBP	Total Trihalomethanes (TTHMs)	0.080	Liver, kidney or central nervous system problems; increased risk of cancer	Byproduct of drinking water disinfection	n/a[9]
OC	Toxaphene	0.003	Kidney, liver, or thyroid problems; increased risk of cancer	Runoff/leaching from insecticide used on cotton and cattle	zero
OC	2,4,5-TP (Silvex)	0.05	Liver problems	Residue of banned herbicide	0.05
OC	1,2,4-Trichlorobenzene	0.07	Changes in adrenal glands	Discharge from textile finishing factories	0.07
OC	1,1,1-Trichloroethane	0.2	Liver, nervous system, or circulatory problems	Discharge from metal degreasing sites and other factories	0.2
OC	1,1,2-Trichloroethane	0.005	Liver, kidney, or immune system problems	Discharge from industrial chemical factories	0.003
OC	Trichloroethylene	0.005	Liver problems; increased risk of cancer	Discharge from metal degreasing sites and other factories	zero

LEGEND

- D — Disinfectant
- DBP — Disinfection Byproduct
- IOC — Inorganic Chemical
- M — Microorganism
- OC — Organic Chemical
- R — Radionuclides

Contaminant	MCL or TT[1] (mg/L)[2]	Potential health effects from long-term[3] exposure above the MCL	Common sources of contaminant in drinking water	Public Health Goal (mg/L)[2]
M Turbidity	TT[7]	Turbidity is a measure of the cloudiness of water. It is used to indicate water quality and filtration effectiveness (e.g., whether disease-causing organisms are present). Higher turbidity levels are often associated with higher levels of disease-causing microorganisms such as viruses, parasites and some bacteria. These organisms can cause short term symptoms such as nausea, cramps, diarrhea, and associated headaches.	Soil runoff	n/a
R Uranium	30µg/L	Increased risk of cancer, kidney toxicity	Erosion of natural deposits	zero
OC Vinyl chloride	0.002	Increased risk of cancer	Leaching from PVC pipes; discharge from plastic factories	zero
M Viruses (enteric)	TT[7]	Short-term exposure: Gastrointestinal illness (e.g., diarrhea, vomiting, cramps)	Human and animal fecal waste	zero
OC Xylenes (total)	10	Nervous system damage	Discharge from petroleum factories; discharge from chemical factories	10

LEGEND

D Disinfectant	IOC Inorganic Chemical	OC Organic Chemical
DBP Disinfection Byproduct	M Microorganism	R Radionuclides

NOTES

1 Definitions

Maximum Contaminant Level Goal (MCLG)—The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety and are non-enforceable public health goals.

Maximum Contaminant Level (MCL)—The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to MCLGs as feasible using the best available treatment technology and taking cost into consideration. MCLs are enforceable standards.

Maximum Residual Disinfectant Level Goal (MRDLG)—The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.

Maximum Residual Disinfectant Level (MRDL)—The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.

Treatment Technique (TT)—A required process intended to reduce the level of a contaminant in drinking water.

2 Units are in milligrams per liter (mg/L) unless otherwise noted. Milligrams per liter are equivalent to parts per million (ppm).

3 Health effects are from long-term exposure unless specified as short-term exposure.

4 Each water system must certify annually, in writing, to the state (using third-party or manufacturers certification) that when it uses acrylamide and/or epichlorohydrin to treat water, the combination (or product) of dose and monomer level does not exceed the levels specified, as follows: Acrylamide 0.05 percent dosed at 1 mg/L (or equivalent); Epichlorohydrin 0.01 percent dosed at 20 mg/L (or equivalent).

5 Lead and copper are regulated by a Treatment Technique that requires systems to control the corrosiveness of their water. If more than 10 percent of tap water samples exceed the action level, water systems must take additional steps. For copper, the action level is 1.3 mg/L, and for lead is 0.015 mg/L.

6 A routine sample that is fecal coliform-positive or *co i*-positive triggers repeat samples--if any repeat sample is total coliform-positive, the system has an acute MCL violation. A routine sample that is total coliform-positive and fecal coliform-negative or *co i*-negative triggers repeat samples--if any repeat sample is fecal coliform-positive or *co i*-positive, the system has an acute MCL violation. See also Total Coliforms.

7 EPA's surface water treatment rules require systems using surface water or ground water under the direct influence of surface water to (1) disinfect their water, and (2) filter their water or meet criteria for avoiding filtration so that the following contaminants are controlled at the following levels:

Cryptosporidiu : 99 percent removal for systems that filter. Unfiltered systems are required to include Cryptosporidium in their existing watershed control provisions.

Giardia lamblia: 99.9 percent removal/inactivation

Viruses: 99.99 percent removal/inactivation

e ione a: No limit, but EPA believes that if *iardia* and viruses are removed/inactivated according to the treatment techniques in the surface water treatment rule, *e ione a* will also be controlled.

Turbidity: For systems that use conventional or direct filtration, at no time can turbidity (cloudiness of water) go higher than 1 nephelolometric turbidity unit (NTU), and samples for turbidity must be less than or equal to 0.3 NTU in at least 95 percent of the samples in any month. Systems that use filtration other than conventional or direct filtration must follow state limits, which must include turbidity at no time exceeding 5 NTU.

HPC: No more than 500 bacterial colonies per milliliter

Long Term 1 Enhanced Surface Water Treatment; Surface water systems or ground water systems under the direct influence of surface water serving fewer than 10,000 people must comply with the applicable Long Term 1 Enhanced Surface Water Treatment Rule provisions (e.g. turbidity standards, individual filter monitoring, *Cryptosporidiu* removal requirements, updated watershed control requirements for unfiltered systems).

Long Term 2 Enhanced Surface Water Treatment; This rule applies to all surface water systems or ground water systems under the direct influence of surface water. The rule targets additional *Cryptosporidiu* treatment requirements for higher risk systems and includes provisions to reduce risks from uncovered finished water storages facilities and to ensure that the systems maintain microbial protection as they take steps to reduce the formation of disinfection byproducts. (Monitoring start dates are staggered by system size. The largest systems (serving at least 100,000 people) will begin monitoring in October 2006 and the smallest systems (serving fewer than 10,000 people) will not begin monitoring until October 2008. After completing monitoring and determining their treatment bin, systems generally have three years to comply with any additional treatment requirements.)

Filter Backwash Recycling: The Filter Backwash Recycling Rule requires systems that recycle to return specific recycle flows through all processes of the system's existing conventional or direct filtration system or at an alternate location approved by the state.

8 No more than 5.0 percent samples total coliform-positive in a month. (For water systems that collect fewer than 40 routine samples per month, no more than one sample can be total coliform-positive per month.) Every sample that has total coliform must be analyzed for either fecal coliforms or *co i*. If two consecutive TC-positive samples, and one is also positive for *co i* or fecal coliforms, system has an acute MCL violation.

9 Although there is no collective MCLG for this contaminant group, there are individual MCLGs for some of the individual contaminants:

Haloacetic acids: dichloroacetic acid (zero); trichloroacetic acid (0.3 mg/L)

Trihalomethanes: bromodichloromethane (zero); bromoform (zero); dibromochloromethane (0.06 mg/L)

National Secondary Drinking Water Regulation

National Secondary Drinking Water Regulations are non-enforceable guidelines regarding contaminants that may cause cosmetic effects (such as skin or tooth discoloration) or aesthetic effects (such as taste, odor, or color) in drinking water. EPA recommends secondary standards to water systems but does not require systems to comply. However, some states may choose to adopt them as enforceable standards.

Contaminant	Secondary Maximum Contaminant Level
Aluminum	0.05 to 0.2 mg/L
Chloride	250 mg/L
Color	15 (color units)
Copper	1.0 mg/L
Corrosivity	noncorrosive
Fluoride	2.0 mg/L
Foaming Agents	0.5 mg/L
Iron	0.3 mg/L
Manganese	0.05 mg/L
Odor	3 threshold odor number
pH	6.5-8.5
Silver	0.10 mg/L
Sulfate	250 mg/L
Total Dissolved Solids	500 mg/L
Zinc	5 mg/L

For More Information

EPA's Safe Drinking Water Web site:
http://www.epa.gov/safewater/

EPA's Safe Drinking Water Hotline:
(800) 426-4791

To order additional posters or other ground water and drinking water publications, please contact the National Service Center for Environmental Publications at :
(800) 490-9198, or
email: nscep@bps-lmit.com.

United States Environmental Protection Agency

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Appendix O

Water Quality Data

City of Ventura

Table O-1A 2006-10 Watershed Monitoring Results
Table O-2A & 2B 2010 Total Halocetic Acids and Trihalomethane Quarterly Monitoring Summary
Table O-2C 2006 Initial Distribution System Evaluation Plan

Ojai Valley Sanitary District

Table O-3A 2005-10 Monthly Effluent & River Results
Table O-3B 2005-10 Toxicity Data
Table O-3C 2005-10 Annual River Results

Table O-4 Southern California Costal Water Research Project 2009 Bioassessment

Table O-5 Regional Board Surface Water Ambient Monitoring Program

Table O-6 US EPA Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWT)

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TABLE O-1A
City of Ventura
Watershed Monitoring Results 2006-2010
San Antonio Creek (SA1)

Year 2006	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
TKN	ppm	0.4	NS	0.5									
NH4	ppm	0.3		0.1									
NO3	ppm	1.9		1.9	NS	2.4	2.4	2.9	0.4	1.1	1.1	0.8	1.00
NO2	ppm	<0.4		ND	ND	ND	ND	ND	0.07	0.006	ND	<0.4	<0.4
PO4	ppm	<0.05		<0.05	NS	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Chloride	ppm	75		70	NS	50	50	53	29	57	60	64	67.00
Cond.	umho/cm+	1257		1206	NS	1134	1467	1113	1138	1118	1158	1169	1,193.00
T. Coli	MPN	3080		5794	NS	1789	>2420	1733	2602	2987	2147	2382	1,236.00
F. Coli	MPN	30		156	NS	74	64	28	<1	50	52	52	31.00
F. Strep	MPN	65		548	NS								
Giardia				<0.05	NS			<0.09	<0.026		<0.09	<0.07	<0.05
Crypto				<0.05	NS			<0.09	<0.026		<0.09	<0.07	<0.05
E. Coli													31.00

Year 2007	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
NO3	ppm	0.8	0.7	0.4	<0.4	,0.4	<.4	<.4	<0.4	<0.4	<0.4	<0.4	<0.4
NO2	ppm	ND	ND	ND	ND	ND	<0.4	<0.4	<0.4	<0.04	<0.4	<0.4	<0.4
PO4	ppm	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<.05	<.05	<0.5	<0.05	<0.05
Chloride	ppm	74	80	83	80	91.4	88	91.3	93.2	98.7	101	99	97.5
Cond.	umho/cm+	1243	1146	1253	1269	1301	1394	1353	1355	1393	1398	1434	1338
T. Coli	MPN	766	2615	1616	1725	1664	24192	2142	11199	7270	15531	5170	1439
F. Coli	MPN	10	<10	<1	10	41	41	51	20	74	816	10	86
Giardia		<0.05	0.2	<0.02	0	0		0	0	0	0	0	0
Crypto		<0.05	<0.05	<0.02	0	1		0	0	1	0	0	0
E. Coli													

Year 2008	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
NO3	ppm	2.9	2.9	1.6	1	0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
NO2	ppm	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
PO4	ppm	0.14	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Chloride	ppm	71.4	57.8	65.7	76.4	78	77	82.1	85	82.9	39.6	90.7	83.9
Cond.	umho/cm+	1182	1184	1209	1296	1371	1179	1319	1285	1282	1371	1299	1361
T. Coli	MPN	2419	52	1017	1669	1726	3076	3130	4884	5172	2247	2613	1483
F. Coli	MPN	816.4	6.3	100	<10	41	20	52	20	62	41	63	<1.0
Giardia		0	0	0	0	0	0	0	0	0	0	0	0
Crypto		1	0	0	0	0	0	0	0	0	0	0	0
E. Coli													

Year 2009	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
NO3	ppm	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	NS	NS	NS	NS
NO2	ppm	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4				
PO4	ppm	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05				
Chloride	ppm	92.2	94.2	115	105	107	111	117	122				
Cond.	umho/cm+	1299	1401	1332	1373	1649	1411	1488	1494				
T. Coli	MPN	860	933	3255	1313	3873	3076	15531	15531				
F. Coli	MPN	<10	<10.0	73	63	20	41	41	73				
Giardia		0	0	0	0	0	0	0	NS	NS			0
Crypto		0	0	0	0	0	1	0	NS	NS			0
E. Coli													

Year 2010	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
NO3	ppm	NS	1.9	1.4	0.5	<0.4	<0.4	<0.4	<0.04	<0.4	<0.4		
NO2	ppm		<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.04	<0.4	<0.4		
PO4	ppm		<0.05	0.08	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05		
Chloride	ppm		100	77	106	100	104	107	111	113	113		
Cond.	umho/cm+		1448	1309	1353	1429	1398	1464	1651	1510	1522		
T. Coli	MPN		2359	2755	7270	2187	4106	2382	2602	6130	1046		
F. Coli	MPN		31	243	226	160	63	243	<10	74	3.1		
Giardia			0	0	0	0	0	0	0	0	0		
Crypto			0	2	4	1	0	0	0	0	0		
E. Coli													

Not Sampled (NS)
Not Detected (ND)

TABLE O-1A
City of Ventura
Watershed Monitoring Results 2002-2006
Thacher/San Antonio Creek (SA2)

Year: 2002	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
TKN	ppm					0.6			2.53				1.07
NH4	ppm					0.6			0.7				1.07
NO3	ppm					4.9			4.7				3.90
NO2	ppm					<.4			<0.4				<0.40
PO4	ppm					0.06			0.06				0.08
Chloride	ppm					90			126				117
Conductivity	umho/cm+					1199			1247				1235
T. Coli	MPN					6000			17330				>2419
F. Coli	MPN					120			60				120
F. Strep	MPN					86.00			119.00				

Year 2003	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
TKN	ppm	0.6	-	1.03	-	1.6	-	2.1		0.6		2.8	
NH4	ppm	0.3		1.08		0.4		0.7		0.9		<.4	
NO3	ppm	4.3		3.7		2.6		2.6		3.1		<.4	
NO2	ppm	<0.4		<0.4		nd		<0.4		nd		nd	
PO4	ppm	0.3		0.05		0.07		0.26		0.07		0.09	
Chloride	ppm	107		107		79		134		133		129	
Cond.	umho/cm+	1195		1207		1066		1313		1371		1314	
T. Coli	MPN	2000		>24,000		2400		5750		2412		13000	
F. Coli	MPN	20		130		130		180		246		130	
F. Strep	MPN	*		<10		70.00		146.00		74.00		520.00	

Year 2004	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
TKN	ppm			1.7		0.5		0.4	0.3			0.3	
NH4	ppm			0.4		0.3		<.1	0.4			0.3	
NO3	ppm			2.0		1.2		<0.4	2.5			2.6	
NO2	ppm			ND		0.01		ND	ND			ND	
PO4	ppm			0.22		0.33		0.15	0.06			0.09	
Chloride	ppm			216		147		104	156			135	
Cond.	umho/cm+			1701		1620		1558	1377			1331	
T. Coli	MPN			4,110		2,100		6490	2850			5750	
F. Coli	MPN			130		105		<10	31			110	
F. Strep	MPN			510.00		180.00		540.00	345.00			70.00	

Year 2005	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
TKN	ppm	NS	2.7	NS	NS	0.3	NS	0.4		0.6	NS	NS	NS
NH4	ppm		1.2			0.13		0.2		<.2			
NO3	ppm		3.3			7		7.1		4.2			
NO2	ppm		0.01			ND		0.01		ND			
PO4	ppm		0.07			<.05		<0.05		<0.05			
Chloride	ppm		80			40		45		64			
Cond.	umho/cm+		1384			1078		1132		1154			
T. Coli	MPN		1396			19180		4352		1413			
F. Coli	MPN		84			41		63		18			
F. Strep	MPN		10.00			31.00		489.00		22.00			

Year 2006	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
TKN	ppm	0.4	NS	0.2									
NH4	ppm	0.3		0.3									
NO3	ppm	5.3		5									
NO2	ppm	<0.04		ND									
PO4	ppm	<0.05		<0.05									
Chloride	ppm	52		46									
Cond.	umho/cm+	1052		995									
T. Coli	MPN	2990		2602									
F. Coli	MPN	20		52									
F. Strep	MPN	NS		130.00									

Not Sampled (NS)
Not Detected (ND)

TABLE O-1A
City of Ventura
Watershed Monitoring Results 2002-2005
San Antonio Creek @ Soule Park (SA3)

Year 2005	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
TKN	ppm	NS	0.5	NS	0.4	0.5	0.2						
NH4	ppm		0.4		0.2	0.1	0.2						
NO3	ppm		6.30		5.7	6.9	8.5						
NO2	ppm		0.01		ND	ND	ND						
PO4	ppm		0.1		<.05	<.05	<.05						
Chloride	ppm		35		27	31	52						
Cond.	umho/cm+		1022		985	1033	1180						
T. Coli	MPN		663		2595	3873	2280						
F. Coli	MPN		20		10	20	<10						
F. Strep	MPN		<10		14	22	3650						

Not Sampled (NS)
Only sampled for 2005.
Terminated sampling in July 2005 due to problems at the golf course.

TABLE O-1A
City of Ventura
Watershed Monitoring Results 2005-2006
Upper San Antonio Creek @ Grand Avenue (SA4)

Year 2005	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
TKN	ppm	2	0.5	0.24	1.3	0.5	NS	NS	NS	NS	NS	NS	NS
NH4	ppm	0.3	0.8	0.15	0.2	0.1							
NO3	ppm	0.9	0.3	0.4	0.5	<.4							
NO2	ppm	<.4	ND	ND	ND	ND							
PO4	ppm	0.34	0.1	0.06	<.05	<.05							
Chloride	ppm	14	14	11	12	12							
Conductivity	umho/cm+	416	783	729	792	774							
T. Coli	MPN	>2400	457	320	218	>2419							
F. Coli	MPN	>2400	97	<10	<10	15							
F. Strep	MPN	NS	31	<10	6	33							

Year 2006	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
TKN	ppm	NS	NS	0.5									
NH4	ppm	NS		0.1									
NO3	ppm	1.9		0.5									
NO2	ppm	<0.4		ND									
PO4	ppm	<0.05		<0.05									
Chloride	ppm	75		15									
Conductivity	umho/cm+	NS		751									
T. Coli	MPN	NS		373									
F. Coli	MPN	NS		<10									
F. Strep	MPN	NS		28									

Not Detected (ND)
Not Sampled (NS)

TABLE O-1A
City of Ventura
Watershed Monitoring Results 2005-2006
Thacher Creek @ Soule Park (TC1)

Year 2005	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
TKN	ppm	NS	0.5	NS	0.4	0.4	0.2	NS	NS	NS	NS	NS	NS
NH4	ppm		0.3		0.2	0.1	0.2						
NO3	ppm		6.3		7.4	7.8	4.6						
NO2	ppm		ND		ND	ND	ND						
PO4	ppm		0.02		<.05	<.05	<0.05						
Chloride	ppm		35		25	26	52						
Conductivity	umho/cm+		1020		1001	1030	1180						
T. Coli	MPN		733		2987	5475	2280						
F. Coli	MPN		52		<10	109	<10						
F. Strep	MPN		<10		10.00	130.00	58.00						

Year 2006	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
TKN	ppm	NS	NS	NS									
NH4	ppm												
NO3	ppm												
NO2	ppm												
PO4	ppm												
Chloride	ppm												
Conductivity	umho/cm+												
T. Coli	MPN												
F. Coli	MPN												
F. Strep	MPN												

Not Detected (ND)
Not Sampled (NS)
Only sampled for 2005.

TABLE O-1A
City of Ventura
Watershed Monitoring Results 2002-2005
Lion Canyon Creek (LC1)

Year: 2002	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
TKN	ppm						1.40						0.99
NH4	ppm						0.60						0.85
NO3	ppm						<.4						<0.40
NO2	ppm						<.4						<0.40
PO4	ppm						0.27						0.39
Chloride	ppm						134.00						171.00
Conductivity	umho/cm+						1725.00						2010.00
T. Coli	MPN						3100.00						>2419
F. Coli	MPN						10.00						68.00
F. Strep	MPN						36.00						

Year: 2003	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
TKN	ppm	0.60		0.75		0.70		1.60					
NH4	ppm	0.60		0.80		0.40		0.60					
NO3	ppm	<0.4		<0.4		ND		<0.4					
NO2	ppm	<0.4		<0.4		ND		<0.4					
PO4	ppm	0.31		0.29		0.44		0.48					
Chloride	ppm	173.00		129.00		85.00		122.00					
Conductivity	umho/cm+	2200.00		1814.00		1591.00		2040.00					
T. Coli	MPN	4600.00		6500.00		11000.00		5170.00					
F. Coli	MPN	<10		220.00		800.00		488.00					
F. Strep	MPN	NS		<10		100.00		135.00					

Year: 2004	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
TKN	ppm	1.73		1.00		0.50		2.10			0.50		0.50
NH4	ppm	0.21		0.20		0.40		<.1			0.10		0.40
NO3	ppm	0.60		0.60		1.20		<0.4			<0.4		<.4
NO2	ppm	ND		ND		ND		ND			ND		0.04
PO4	ppm	0.16		0.24		0.27		<.01			0.09		0.05
Chloride	ppm	136.00		136.00		132.00		130.00			195.00		155.00
Conductivity	umho/cm+	1516.00		1404.00		2020.00		2220.00			1575.00		2080.00
T. Coli	MPN	3080.00		2480.00		1612.00		14140.00			4350.00		1607.00
F. Coli	MPN	50.00		60.00		340.00		<10			20.00		20.00
F. Strep	MPN	220.00		80.00		150.00		390.00			61.00		<10

Year: 2005	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
TKN	ppm	2.20	NS	0.70	NS	0.80	NS						
NH4	ppm	0.10		0.20		0.10							
NO3	ppm	0.60		2.30		0.60							
NO2	ppm	<.4		ND		ND							
PO4	ppm	1.01		0.97		<.05							
Chloride	ppm	14.00		43.00		62.00							
Conductivity	umho/cm+	410.00		1784.00		1776.00							
T. Coli	MPN	>2400		19860.00		1898.00							
F. Coli	MPN	>2400		170.00		98.00							
F. Strep	MPN	NS		90.00		31.00							

Not Detected (ND)
Not Sampled (NS)

Terminated sampling in July 2005 due to property access.

TABLE O-1A
City of Ventura
Watershed Monitoring Results 2002-2006
Stewart/Fox Creek (PC1)

Year: 2002	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
TKN	ppm						0.80		1.88				0.75
NH4	ppm						0.40		0.17				1.22
NO3	ppm						1.60		0.70				0.90
NO2	ppm						<.4		<0.4				<0.40
PO4	ppm						0.34		0.41				0.37
Chloride	ppm						130.00		161.00				215.00
Conductivity	umho/cm+						1498.00		1474.00				1774.00
T. Coli	MPN						9800.00		9800.00				>2419
F. Coli	MPN						31.00		10.00				130.00
F. Strep	MPN						160.00		118.00				

Year: 2003	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
TKN	ppm	0.50		1.47		1.10		1.20		0.90		0.50	
NH4	ppm	0.40		0.76		0.40		1.00		0.80		<0.4	
NO3	ppm	1.40		1.40		1.50		1.20		0.50		1.00	
NO2	ppm	<.4		<0.4		ND		<0.4		ND		ND	
PO4	ppm	0.29		0.24		0.24		0.56		0.37		0.30	
Chloride	ppm	195.00		171.00		134.00		153.00		137.00		165.00	
Conductivity	umho/cm+	1788.00		1705.00		1505.00		1638.00		1599.00		1650.00	
T. Coli	MPN	3100.00		14000.00		6500.00		2480.00		5794.00		>24190	
F. Coli	MPN	120.00		260.00		380.00		110.00		97.00		640.00	
F. Strep	MPN	NS		110.00		170.00		197.00		41.00		1070.00	

Year: 2004	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
TKN	ppm	0.45		1.10		0.40		0.50	0.70		0.30		NS
NH4	ppm	0.13		0.20		0.50		<.1	0.10		0.10		
NO3	ppm	2.30		3.80		<.4		2.90	0.40		<0.4		
NO2	ppm	ND		ND		ND		ND	ND		ND		
PO4	ppm	0.15		0.18		0.36		<.01	0.35		0.34		
Chloride	ppm	139.00		142.00		147.00		125.00	141.00		120.00		
Conductivity	umho/cm+	1361.00		1338.00		1612.00		1398.00	1428.00		1478.00		
T. Coli	MPN	1730.00		4110.00		2250.00		3130.00	4540.00		1670.00		
F. Coli	MPN	50.00		50.00		70.00		70.00	150.00		210.00		
F. Strep	MPN	40.00		230.00		210.00		670.00	640.00		90.00		

Year: 2005	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
TKN	ppm	2.20	NS	0.50	NS	1.00	NS	0.30	NS	1.40	NS	0.90	NS
NH4	ppm	0.10		0.20		0.10		0.20		<.2		0.10	
NO3	ppm	1.50		1.80		2.20		2.60		1.90		1.70	
NO2	ppm	<.4		ND		ND		0.00		ND		ND	
PO4	ppm	1.00		0.13		<.05		<0.05		<0.05		0.10	
Chloride	ppm	23.00		52.00		93.00		134.00		145.00		153.00	
Conductivity	umho/cm+	381.00		1031.00		1370.00		1591.00		1622.00		1665.00	
T. Coli	MPN	>2400		3870.00		2400.00		9208.00		3448.00		2419.00	
F. Coli	MPN	>2400		120.00		712.00		97.00		146.00		147.00	
F. Strep	MPN	NS		100.00		172.00		649.00		42.00		613.00	

Year 2006	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
TKN	ppm	6.8	NS	0.5									
NH4	ppm	4.1		0.4									
NO3	ppm	2.1		1.8									
NO2	ppm	<0.4		ND									
PO4	ppm	<0.05		<0.05									
Chloride	ppm	176		141									
Cond.	umho/cm+	1725		1464									
T. Coli	MPN	3040		14136									
F. Coli	MPN	85		413									
F. Strep	MPN	NS		1733.00									

Not Detected (ND)
Not Sampled (NS)

TABLE O-1A
City of Ventura
Watershed Monitoring Results 2002-2006
Ventura River @ Casitas Springs (VR1)

Year: 2002	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
TKN	ppm						0.90						
NH4	ppm						0.50						
NO3	ppm						1.30						
NO2	ppm						<.4						
PO4	ppm						0.08						
Chloride	ppm						38.00						
Conductivity	umho/cm+						947.00						
T. Coli	MPN						3200.00						
F. Coli	MPN						31.00						
F. Strep	MPN						20.00						

Year: 2003	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
TKN	ppm					0.50		2.50		1.00			
NH4	ppm					0.40		0.50		0.80			
NO3	ppm					0.90		<0.4		0.40			
NO2	ppm					ND		<0.4		ND			
PO4	ppm					0.18		0.29		0.06			
Chloride	ppm					37.00		40.00		29.00			
Conductivity	umho/cm+					892.00		896.00		932.00			
T. Coli	MPN					7000.00		>24000		4884.00			
F. Coli	MPN					110.00		20.00		30.00			
F. Strep	MPN					2.00		108.00		41.00			

Year: 2004	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
TKN	ppm	0.42		1.10		0.30			0.20		0.60		NS
NH4	ppm	0.17		0.40		0.70			0.30		0.10		
NO3	ppm	0.10		0.70		1.40			0.90		1.10		
NO2	ppm	ND		ND		0.02			ND		ND		
PO4	ppm	0.10		0.07		0.05			0.07		0.04		
Chloride	ppm	52.00		52.00		47.00			42.00		47.00		
Conductivity	umho/cm+	1091.00		1031.00		998.00			955.00		928.00		
T. Coli	MPN	1460.00		7270.00		1660.00			2490.00		3650.00		
F. Coli	MPN	20.00		10.00		10.00			20.00		90.00		
F. Strep	MPN	50.00		100.00		20.00			80.00		40.00		

Year: 2005	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
TKN	ppm	3.00	NS	0.50	NS	0.50	NS	0.40	NS	1.00	NS	0.70	NS
NH4	ppm	0.20		0.20		0.10		0.30		<.2		0.10	
NO3	ppm	0.60		1.90		1.80		1.30		0.50		<0.4	
NO2	ppm	<.4		ND		ND		ND		ND		ND	
PO4	ppm	0.86		0.34		<.05		<0.05		<0.05		<0.05	
Chloride	ppm	14.00		22.00		27.00		31.00		33.00		34.00	
Conductivity	umho/cm+	346.00		921.00		935.00		953.00		956.00		981.00	
T. Coli	MPN	>2400		19860.00		649.00		1733.00		>2419		2419.00	
F. Coli	MPN	>2400		220.00		15.00		19.00		9.00		30.00	
F. Strep	MPN	NS		420.00		20.00		219.00		56.00		61.00	
Crypto									<0.07				
Giardia									<0.07				

Year 2006	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
TKN	ppm	<.1	NS	0.3									
NH4	ppm	0.3		0.3									
NO3	ppm	1.3		1.2									
NO2	ppm	<0.4		ND									
PO4	ppm	<0.05		<0.05									
Chloride	ppm	33		35									
Cond.	umho/cm+	923		912									
T. Coli	MPN	>2420		>2419									
F. Coli	MPN	56		21									
F. Strep	MPN	67		58									
Crypto				<0.05									
Giardia									<0.07				

Not Detected (ND)
Not Sampled (NS)
Started to perform Crypto/Giardia in August 2005.

TABLE O-1A
City of Ventura
Watershed Monitoring Results 2003-2006
Ventura River @ Santa Ana Bridge (VR2)

Year: 2003	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
TKN	ppm				0.50	1.30	0.70						
NH4	ppm				0.20	0.30	1.92						
NO3	ppm				1.60	0.50	0.90						
NO2	ppm				<0.4	ND	ND						
PO4	ppm				0.12	0.11	0.20						
Chloride	ppm				29.00	19.00	26.00						
Conductivity	umho/cm+				833.00	794.00	851.00						
T. Coli	MPN				24000.00	NS	2600.00						
F. Coli	MPN				10.00	NS	10.00						
F. Strep	MPN				10.00	NS	80.00						

Year: 2004	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
TKN	ppm			1.10									NS
NH4	ppm			0.30									
NO3	ppm			0.40									
NO2	ppm			ND									
PO4	ppm			0.07									
Chloride	ppm			18.00									
Conductivity	umho/cm+			760.00									
T. Coli	MPN			2050.00									
F. Coli	MPN			4.00									
F. Strep	MPN			410.00									

Year: 2005	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
TKN	ppm	3.00	NS	0.30	0.50	0.50	0.10	0.20	0.70	NS	NS	NS	NS
NH4	ppm	0.20		0.10	0.20	<.1	0.10	0.20	0.10				
NO3	ppm	0.40		0.50	0.40	<.4	0.60	7.10	0.60				
NO2	ppm	<.4		ND	ND	ND	ND	0.02	ND				
PO4	ppm	0.05		0.04	<.05	<.05	<0.05	<0.05	<0.05				
Chloride	ppm	12.00		13.00	14.00	16.00	18.00	45.00	21.00				
Conductivity	umho/cm+	401.00		772.00	801.00	778.00	808.00	805.00	810.00				
T. Coli	MPN	>2400		250.00	153.00	517.00	3080.00	>2419	921.00				
F. Coli	MPN	>2400		<10	30.00	4.00	20.00	11.00	291.00				
F. Strep	MPN	NS		<10	31.00	4.00	56.00	73.00	24.00				

Year: 2006	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
TKN	ppm	<.1	0.70	0.20									
NH4	ppm	0.20	0.20	0.40									
NO3	ppm	1.30	1.30	0.60									
NO2	ppm	<.4	<0.4	ND									
PO4	ppm	<0.05	<0.05	<0.05									
Chloride	ppm	23.00	25.60	20.00									
Cond.	umho/cm+	792.00	868.00	750.00									
T. Coli	MPN	1730.00	326.00	921.00									
F. Coli	MPN	40.00	2.00	21.00									
F. Strep	MPN	NS		<10	31.00	4.00	56.00	73.00	24.00				

Not Detected (ND)
Not Sampled (NS)

TABLE O-1A
City of Ventura
Watershed Monitoring Results 2006-2010
Ventura River/Foster Park-surface (VR3)

Year 2006	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
TKN	ppm	<.1	0.2	0.1									
NH4	ppm	0.4	0.2	0.3									
NO3	ppm	1.1	0.8	1.1	0.7	0.9	0.7	0.5	0.4	<0.04	<0.04	<0.04	<0.4
NO2	ppm	<0.4	<.4	ND	ND	ND	<0.4	0.01	0.05	<0.04	ND	<0.04	<0.4
PO4	ppm	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Chloride	ppm	35	34.2	32	28	29	28	30	30	30	31	31	32
Cond.	umho/cm+	929	1004	893	893	887	842	875	906	894	932	882	909
T. Coli	MPN	2420	1986	143	>2419	1300	>2420	1300	2282	>2419	>2419	1860	2613
F. Coli	MPN	20	9	21	81	12	23	34	74	33	27	10	63
F. Strep	MPN	276	10	365									
TOC	ppm	1.39	NS	NS	NS	1.93	1.61	1.69	1.62	1.44	1.46	1.39	1.32
Bromide	ppm	ND	NS	NS									
Giardia				<0.09									
Crypto				<0.09		<.04			<0.09				

Year 2007	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
NO3	ppm	0.4	0.4	0.4	0.5	0.5	0.5	0.4	0.4	0.4	0.5	<0.4	<0.4
NO2	ppm	ND	ND	ND	ND	ND	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
PO4	ppm	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Chloride	ppm	34	39	40	36	35.5	34	34.6	34.5	34.5	35	36	3504
Cond.	umho/cm+	942	1020	941	943	955	1011	874	933	987	970	1012	910
T. Coli	MPN	933	1170	<1	2098	4352	3968	1989	3448	5794	8164	4350	1989
F. Coli	MPN	<10	10	<1	<10	20	10	20	<10	<10	10	52	10
TOC	MPN	1.41	1.33	1.51	1.29	1.45							
Bromide	ppm												
Giardia													
Crypto													

Year 2008	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
NO3	ppm	2.7	2.5	1.8	1.4	1	0.6	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
NO2	ppm	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
PO4	ppm	0.14	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Chloride	ppm	54.5	29.6	84.5	28.5	31	31	32.6	33.3	31.8	38.2	30	35.9
Cond.	umho/cm+	1783	950	880	944	998	864	884	910	870	874	911	1003
T. Coli	MPN	7490	1201	554	2035	2909	4611	3255	4884	14136	2755	2755	1968
F. Coli	MPN	200	31	31	<10	20	20	10	<1	31	20	10	10
TOC	MPN	3.05	2.22	1.62	1.59	1.97	1.51	1.52	1.98	1.52	1.31	1.41	1.26
Bromide	ppm												
Giardia													
Crypto													

Year 2009	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
NO3	ppm	<0.4	<0.4	0.4	0.7	0.5	0.4	<0.4	<0.4	<0.4	<0.4	<0.4	0.5
NO2	ppm	<0.4	<0.4	,0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
PO4	ppm	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Chloride	ppm	40.6	39.1	54.1	41	39.5	40.1	39.8	39.6	39	41	42	42
Cond.	umho/cm+	976	1012	1011	970	978	959	959	957	966	978	969	949
T. Coli	MPN	1153	2247	3448	5794	>24192	3130	3441	7270	7701	7701	5170	15,531
F. Coli	MPN	10	10	10	<10	98	31	10	63	84	84	41	766
TOC	MPN	1.27	1.08	2.26	1.34	1.44	1.1	1.35	1.59	1.45	1.45	3.06	1.3
Bromide	ppm												
Giardia													
Crypto													

Year 2010	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
NO3	ppm	<0.40	1.3	1.1	0.9	0.6	<0.4	0.4	0.4	0.4	0.4		
NO2	ppm	<0.40	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4		
PO4	ppm	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05		
Chloride	ppm	47	37	37	45	36	37	37	36	35	34		
Cond.	umho/cm+	1037	960	913	923	932	925	933	1013	959	967		
T. Coli	MPN	1169	2481	2987	1274	5172	4351	2851	2282	4884	5794		
F. Coli	MPN	10	<10	408	41	20	10	20	52	131	63		
TOC	MPN	1.88	1.79	2.05	1.89	1.76	2.08	1.5	1.6	1.45	0.97		
Bromide	ppm												
Giardia													
Crypto													

Not Detected (ND)
Not Sampled (NS)

TABLE O-1A
City of Ventura
Watershed Monitoring Results 2006-2010
Nye Well 8 Source (NW8)

Year 2006	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
TKN	ppm	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
NH4	ppm												
NO3	ppm												
NO2	ppm												
PO4	ppm												
Chloride	ppm												
Cond.	umho/cm+												
T. Coli	MPN												
F. Coli	MPN												
F. Strep	MPN												
TOC	ppm												
Bromide	ppm												
Giardia													
Crypto													

Year 2007	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
TKN	ppm	NS	NS	NS	NS	NS	NS	NS		NS	NS	NS	NS
NH4	ppm												
NO3	ppm								0.9				
NO2	ppm								<0.4				
PO4	ppm								<0.05				
Chloride	ppm								34.9				
Cond.	umho/cm+								961				
T. Coli	MPN								517				
F. Coli	MPN								1				
F. Strep	MPN												
TOC	ppm												
Bromide	ppm												
Giardia													
Crypto													

Year 2008	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
NO3	ppm	NS	2	2	1.8	1.5	1.3	0.9	0.5	0.5	0.5	NS	0.5
NO2	ppm		<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	NS	<0.4
PO4	ppm		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	NS	<0.05
Chloride	umho/cm+		32.4	31.9	30	30	30	31.9	33.1	32	24.8	NS	35.8
Cond.	MPN		2330	1981	922	979	865	941	930	913	893	NS	1002
T. Coli	MPN		187.2	8.5	4.1	<1	<1	117.8	<1	<1	1	NS	3.1
F. Coli	MPN		2	<1	<1	<1	<1	<1	<1	<1	<1	NS	<1.0
TOC	ppm	NS	NS	1.08	1.28	1.24	1.1	1.24	1.22	1.13	1.08	NS	NS

Year 2009	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
NO3	ppm	NS	NS	0.7	1	1	0.7	0.6	0.6	NS	NS	0.7	NS
NO2	ppm			<0.4	<0.4	<0.4	<0.4	<0.4	<0.4			<0.4	
PO4	ppm			<0.05	<0.05	<0.05	<0.05	<0.05	<0.05			<0.05	
Chloride	umho/cm+			51	41.6	39.5	40	40	40			41	
Cond.	MPN			983	963	1192	958	976	965			963	
T. Coli	MPN	<1		4	1	<1	<1.0	<1.0	2			8.6	
F. Coli	MPN	<1		<1	<1	<1	<1.0	<1.0	<1.0			<1.0	
TOC	ppm	1.07	NS	NS	NS	NS	NS	0.98					

Year 2010	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
NO3	ppm	NS	NS	1.2	1.2	1	0.9	0.6	0.6	NS	0.4		
NO2	ppm			<0.4	<0.4	<0.4	<0.4	<0.4	<0.40		<0.04		
PO4	ppm			<0.05	<0.05	<0.05	<0.05	<0.05	<0.05		<0.05		
Chloride	umho/cm+			40	45	37	37	36	37		35		
Cond.	MPN			888	946	950	945	977	1018		976		
T. Coli	MPN			6.3	<1.0	4.1	3.1	<1	<1		<1		
F. Coli	MPN			<1.0	<1.0	<1.0	<1.0	<1	<1		<1		
TOC	ppm			1.21	1.21	1.51	1.64	1.13	1.32		NS		

Not Detected (ND)
Not Sampled (NS)

TABLE O-1A
City of Ventura
Watershed Monitoring Results 2002-2005
Nye Well 1A Source (NW1A)

Year: 2002	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
TKN	ppm									NS	0.10	0.10	0.22
NH4	ppm									NS	<.1	0.20	0.41
NO3	ppm									1.40	1.40	1.40	1.70
NO2	ppm									<0.4	<0.4	<0.4	<0.40
PO4	ppm									0.10	0.13	0.08	0.17
Chloride	ppm									40.00	39.00	39.00	50.00
Conductivity	umho/cm+									935.00	955.00	967.00	971.00
T. Coli	MPN									<2	49.00	11.00	7.00
F. Coli	MPN									<2	<2	<2	2.00
F. Strep	MPN										NS	NS	<1
TOC	ppm							0.90	ND		0.93	2.45	1.34
Bromide	ppm							ND	ND		ND	ND	ND

Year: 2003	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
TKN	ppm	0.60	0.05	1.97	0.10	1.00	2.00	1.30	1.70	0.20	0.70	0.60	0.90
NH4	ppm	0.50	0.05	0.79	0.20	0.50	0.50	0.70	0.50	1.20	<0.4	0.40	0.60
NO3	ppm	2.00	2.00	1.80	2.40	2.20	1.70	1.30	0.90	0.90	0.70	0.80	0.80
NO2	ppm	<0.4	<0.4	<0.4	<0.4	ND	ND	<0.4	<0.4	ND	<0.4	ND	ND
PO4	ppm	0.12	0.08	0.07	0.12	0.16	0.13	0.19	0.10	0.10	0.30	0.14	0.09
Chloride	ppm	49	51.00	54.00	47.00	42.00	43.00	42.00	42.00	34.00	32.00	34.00	34.00
Conductivity	umho/cm+	1005	1,047.00	1,059.00	1,058.00	991.00	1,002.00	984.00	996.00	969.00	969.00	964.00	956.00
T. Coli	MPN	2	5.00	17.00	14.00	70.00	<2	2.00	<2	17.00	2.00	<2	<2
F. Coli	MPN	<2	<2.0	2.00	<2	5.00	<2	<2	<2	<2	<2	<2	<2
F. Strep	MPN	<1	<1	<1	<1	<1	<1	<1	5.00	<1		<1	<1
TOC	ppm	1.30	1.30	1.15		2.03	1.70	1.73	1.09	1.00	0.91	0.92	1.06
Bromide	ppm	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Giardia										<.05			
Crypto										<.05			

Year: 2004	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
TKN	ppm	0.32	0.29	1.80	1.10	0.40	0.40	1.00	0.20	0.50	0.20	0.50	0.30
NH4	ppm	0.27	0.63	0.20	0.20	0.30	0.30	0.20	0.20	0.30	0.10	0.30	0.40
NO3	ppm	1.10	1.00	1.40	1.40	1.30	1.30	1.00	0.90	0.90	1.10	1.50	1.20
NO2	ppm	ND	<0.4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PO4	ppm	0.39	0.08	0.11	0.08	0.09	0.11	<.01	0.12	0.12	0.08	0.10	0.04
Chloride	ppm	38	48.00	48.00	51.00	48.00	47.60	43.00	43.00	42.00	44.00	50.00	49.00
Conductivity	umho/cm+	967.00	988.00	983.00	1,049.00	1,023.00	1,023.00	958.00	959.00	962.00	1,020.00	999.00	1,019.00
T. Coli	MPN	<2	<2	240.00	2.00	2.00	<2	<2	2.00	<2	49.00	79.00	<2
F. Coli	MPN	<2	<2	5.00	2.00	<2	<2	<2	<2	<2	<2	7.00	<2
F. Strep	MPN	<1	4.10	9.00	1.00	<1	<1	<1	<1	<1	<1	2.00	<1
TOC	ppm	1.32	1.16	1.57	1.42	1.18	1.51	0.96	1.23	1.46	0.88	1.60	1.62
Bromide	ppm	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.21	0.24
Giardia				<.06		<.07		<.05				<.07	
Crypto				<.06		<.07		<.05				<.07	

Year: 2005	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
TKN	ppm	0.60	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
NH4	ppm	0.10											
NO3	ppm	1.70											
NO2	ppm	<.4											
PO4	ppm	0.10											
Chloride	ppm	37.00											
Conductivity	umho/cm+	897.00											
T. Coli	MPN	920.00											
F. Coli	MPN	49.00											
F. Strep	MPN	89.00											
TOC	ppm	2.15											
Bromide	ppm	ND											
Giardia													
Crypto													

Not Detected (ND)
Not Sampled (NS)

In Feb 2005, the well was destroyed by a storm.

TABLE O-1A
City of Ventura
Watershed Monitoring Results 2006-2010
Nye Well 11 Source (NW1A)

Year 2006	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
TKN	ppm			0.1									
NH4	ppm			0.2									
NO3	ppm			1.9	1.7	NS	2.9	2.4	1.8	1.5	<0.04	1.1	0.9
NO2	ppm			ND	ND	NS	<0.04	ND	ND	ND	ND	<0.04	<0.4
PO4	ppm			<0.05	<0.05	NS	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.5
Chloride	ppm			36	34	NS	37	35	32	33	32	32	31
Cond.	umho/cm+			1061	1069	NS	1216	1151	1092	1035	1039	1008	997
T. Coli	MPN			1	30	30	<1	<1	4	<1	<1	<1	15
F. Coli	MPN			<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
F. Strep	MPN			NS									
TOC	ppm	NS	NS	2.38	NS	NS	2.34	2.06	1.86	1.74	1.81	1.55	1.51
Bromide	ppm												
Giardia													
Crypto													

Year 2007	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
NO3	ppm	0.9	1	1.2	1.2	1.2	1.2	1.1	1.3	1.3	1.3	1.3	1.3
NO2	ppm	ND	ND	ND	ND	ND	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
PO4	ppm	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Chloride	ppm	32	33	36	33	35.1	35	34.3	36.1	35.9	36	36	36
Cond.	umho/cm+	1006	1005	959	1116	1034	940	995	1033	1015	1007	1026	962
T. Coli	MPN	<1	NS	NS	<1	<1	436	16	1	<1	<1	<1	<1
F. Coli	MPN	<1	NS	NS	<1	<1	<1	<1.0	<1	<1	<1	<1	<1
Crypto													

Year 2007	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
NO3	ppm	1.9	2.7	4.1	3.9	3.1	2.5	2	1.6	1.2	1	NS	0.7
NO2	ppm	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	NS	<0.4
PO4	ppm	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	NS	<0.05
Chloride	ppm	34.8	32.8	43	44.2	42	38	37	37.5	35.3	26.9	NS	35.5
Cond.	umho/cm+	1021	2220	1291	1289	1289	1060	1126	1070	1021	985	NS	1069
T. Coli	MPN	3.1	2	<1	<1	<1	<1	<1	<1	<1	<1	NS	<1.0
F. Coli	MPN	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NS	<1.0
TOC	ppm	1.61	2.62	2.21	2.37	2.05	1.75	1.82	1.77	1.57	1.43	NS	1.37

Year 2009	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
NO3	ppm	0.7	NS	NS	1.4	1.5	1.3	1.1	1.1	0.9	NS	1	NS
NO2	ppm	<0.4			<0.4	<0.4	<0.4	<0.4	<0.4	<0.4		<0.4	
PO4	ppm	<0.05			<0.05	<0.05	<0.05	<0.05	<0.05	<0.05		<0.05	
Chloride	ppm	33.6			42.3	42.8	44	43.9	42.7	41		42	
Cond.	umho/cm+	1009			1080	1123	1060	974	1043	1034		1029	
T. Coli	MPN	<1			<1	<1	<1.0	<1.0	<1.0	<1.0		<1.0	
F. Coli	MPN	<1			<1	<1	<1.0	<1.0	<1.0	<1.0		<1.0	
TOC	ppm	1.36			NS	1.65	1.2	1.3	1.44	1.55	NS	1.01	NS

Year 2010	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
NO3	ppm	NS	NS						1.2	0.9	0.8		
NO2	ppm								<0.4	<0.4	<0.4		
PO4	ppm								<0.05	<0.05	<0.05		
Chloride	ppm								39	38	37		
Cond.	umho/cm+								1088	1040	1038		
T. Coli	MPN								1	1	<1		
F. Coli	MPN								<1	<1	<1		
TOC	ppm	2.1			2.07			1.5	1.7	1.63	1.03		

Not Detected (ND)
Not Sampled (NS)

Table O-1A
City of Ventura
Watershed Monitoring Results 2006-2010
Intake Subsurface (SC1)

Year 2006	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
TKN	ppm	1.3	0.3	1.6									
NH4	ppm	0.7	0.1	0.2									
NO3	ppm	0.9	0.7	1	NS	NS	0.8	0.7	0.6	0.4	<0.04	<0.04	<0.34
NO2	ppm	<0.4	<0.4	ND	NS	NS	<0.4	ND	ND	ND	ND	<0.04	<0.4
PO4	ppm	<0.05	<0.05	<0.05	NS	NS	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Chloride	ppm	33	32.8	32	NS	NS	30	30	29	30	30	30	31
Cond.	umho/cm+	924	1018	992	NS	NS	917	915	933	919	932	931	936
T. Coli	MPN	26	1	24	NS	NS	23	12	47	31	16	16	16
F. Coli	MPN	<1	<1	<1	NS	NS	<1	<1	1	<1	<1	<1	<1
F. Strep	MPN	2	<1	1									
TOC	ppm		NS	1.57	NS	NS	1.35	1.25	1.21	1.24	1.26	1.22	1.33
Bromide	ppm		NS										
Giardia				<0.05									
Crypto				<0.05									

Year 2007	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
NO3	ppm	<0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.6	0.7
NO2	ppm	ND	ND	ND	ND	ND	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
PO4	ppm	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.5	<0.05	<0.05
Chloride	ppm	32	34	36	34	34.8	35	34.3	34.6	34.2	35	35	35
Cond.	umho/cm+	950	968	959	1057	988	940	995	969	961	963	1015	926
T. Coli	MPN	<1	16	NS	43	39	436	16	8.5	6.3	13.2	4	1
F. Coli	MPN	<1	<1	NS	<1	<1	<1	<1	<1	1	<1.0	<1	<1
TOC	ppm	1.27	1.15	1.21	1.16	1.19							

Year 2008	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
NO3	ppm	NS	1.6	1.6	NS	1.4	1.1	0.8	0.6	0.5	0.4	0.4	0.4
NO2	ppm		<0.4	<0.4		<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
PO4	ppm		<0.05	<0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Chloride	ppm		30	31.8		31	31	32.4	33.4	32.5	38.2	33.2	35.5
Cond.	umho/cm+		911	989		1023	889	978	949	930	916	947	1010
T. Coli	MPN		52	6.3		9.6	5.2	2	3	1	1	6.3	>2420
F. Coli	MPN		6.3	<1		<1	<1	<1	<1	<1	<1	<1.0	5.2
TOC	ppm	2.09	1.74	1.11	NS	NS	1.21	1.26	1.35	1.21	1.15	1.15	1.14

Year 2009	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
NO3	ppm	0.8	0.4	0.5	0.8	0.8	0.5	0.4	0.4	0.4	0.4		0.5
NO2	ppm	0.8	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4		<0.4
PO4	ppm	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05		<0.05
Chloride	ppm	37.8	37.3	47.9	41.1	40	40.5	40.7	40.2	40	41		40
Cond.	umho/cm+	965	1038	993	981	1048	961	1003	985	99	1001		1001
T. Coli	MPN	<1	4.1	3.1	<1	5.2	5.2	9.8	5.2	3	8.4		<1.0
F. Coli	MPN	<1	<1	<1	<1	<1	<1.0	<1.0	<1.0	<1.0	<1.0		<1.0
TOC	ppm	1.04	0.89	1.49	1.14	1.27	0.89	2.76	1.16	1.29	1.32	0.90	1.24

Year 2010	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
NO3	ppm	0.6	NS	NS	NS	2.1	0.7	0.5	0.04	<0.4	<0.4		
NO2	ppm	<0.40				<0.4	<0.4	<0.4	<0.4	<0.4	<0.4		
PO4	ppm	0.13				<0.05	<0.05	<0.05	<0.05	<0.05	<0.05		
Chloride	ppm	44				44	37	37	37	36	36		
Cond.	umho/cm+	1028				1144	955	977	1010	991	999		
T. Coli	MPN	24.3				33.6	5.2	3.1	4.1	3.1	6		
F. Coli	MPN	<1				<1.0	<1.0	<1	<1.0	<1.0	1		
TOC	ppm	ND				2.10	1.65	1.22	1.36	1.38	0.87		

Not Detected (ND)
Not Sampled (NS)

TABLE O-1A
City of Ventura
Watershed Monitoring Results 2006-2010
Treatment Influent (TPI)

Year 2006	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
TKN	ppm	0.7	0.5	0.5									
NH4	ppm	0.3	1.3	0.4									
NO3	ppm	NS	NS	NS									
PO4	ppm	NS	NS	NS									
Chloride	ppm	NS	NS	NS									
Cond.	umho/cm+	NS	NS	NS									
T. Coli	MPN	<1	<1	<1	<1	<1	<1	<1	980	<1	<1	<1	<1
F. Coli	MPN	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
F. Strep	MPN	NS	NS	NS									
TOC	ppm	2.29	NS	2.2	2.2	1.75	1.94	1.48	2.21	2.08	1.82	1.35	1.44
Bromide	ppm	ND	NS	0.246	0.246	0.296	NS						
Giardia		NS	NS	<0.05									
Crypto		NS	NS	<0.05									

Year 2007	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
T. Coli	MPN	<1	<1	<1	<1	<1	<1	<1	<1	31.8	<1.0	4	2
F. Coli	MPN	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1.0	<1	1
TOC	ppm	1.44	1.34	1.34	1.25	1.38							

Year 2008	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
T. Coli	MPN	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
F. Coli	MPN	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
TOC	ppm	1.96	1.92	1.14	1.56	1.75	1.38	1.34	1.39	1.54	1.79	2.03	1.27

Year 2009	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
T. Coli	MPN	3.1	<1	<1	<1	<1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
F. Coli	MPN	<1	<1	<1	<1	<1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
TOC	ppm	1.23	1.27	1.44	1.14	1.44	0.99	0.81	1.64	1.98	1.60	1.27	1.40

Year 2010	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
T. Coli	MPN	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1		
F. Coli	MPN	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1		
TOC	ppm	2.60	2.09	1.26	1.25	1.60	1.70	1.33	1.52	1.61	1.19		

Not Detected (ND)
Not Sampled (NS)

TABLE O-1A
City of Ventura
Watershed Monitoring Results 2006-2010
27 Kingston Reservoir Raw Water @ Flume (27-Flume)

Year 2006	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
TKN	ppm	NS	NS	NS									
NH4	ppm	NS	NS	NS	0.4	0.1	0.4	1.3	0.038	0.22	<0.1	<0.1	0.5
NO3	ppm	0.9	0.8	0.9	0.8	1	1.2	0.9	0.7	0.05	0.4	<0.4	<0.4
NO2	ppm	<0.4	<0.4	ND	ND	ND	<0.4	ND	0.05	<0.04	ND	<0.4	<0.4
PO4	ppm	<0.05	0.08	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Chloride	ppm	33	32.4	33	30	30	31	31	30	31	31	31	31
Cond.	umho/cm+	922	1019	920	938	942	972	953	949	922	937	932	931
T. Coli	MPN	34	15	26	147	24	70	12	67	28	28	23	16
F. Coli	MPN	<1	<1	<1	10	<1	3	<1	1	<1	<1	1	<1
F. Strep	MPN	NS	NS	NS		<1	6	1	3	3	<1	1	1
TOC	ppm	1.09	NS	2.48	2.48	1.42	1.45	1.29	1.34	1.22	1.3	1.2	1.2
Bromide	ppm	ND	NS	NS	NS	NS	ND	ND	ND	ND	ND	0.201	0.062
Giardia								<0.09	<0.026		<0.09	<0.07	<0.04
Crypto								<0.09	<0.026		<0.09	<0.07	<0.04
E Coli									2				
T Coliform									48.00				

Year 2007	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
NH4	ppm	0.4	0.1	0.3	<.1	0.1	0.8	<.1	0.2	<0.1	<0.1	<.1	0
NO3	ppm	0.4	1.7	0.5	0.6	0.6	0.6	0.5	0.5	0.5	0.6	0.6	0.8
NO2	ppm	ND	ND	ND	ND	ND	<0.4	<0.4	<.4	<0.4	<0.4	<0.4	<0.4
PO4	ppm	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Chloride	ppm	32	34	35	34	34.7	35	34.5	34.2	34.4	35	35	35
Cond.	umho/cm+	950	990	971	1077	982	1034	1010	972	1037	965	999	933
T. Coli	MPN	4	8	7	28	27	119	16.1	21.1	8.6	20.1	18	2
F. Coli	MPN	<1	2	<1	<1	<1	1	<1	<1	<1	<1	<1	<1
F. Strep	MPN	<1	<1	2	<1	1	6.2	<1	<1	2	<1	<1	<1
TOC	ppm	1.19	1.16	1.23	1.15	1.14							
Bromide	ppm	ND	ND	ND	ND	ND							
Giardia		<0.05	<0.05	<0.02	0	0		0	0	0	0	0	0
Crypto		<0.05	<0.05	<0.02	0	0		0	0	0	0	0	0
E Coli													
T Coliform													

Year 2008	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
NH4	ppm	0.14	0.14	0.14	0.6	<.1	?	0.23	0.4	0.1	0.1	NS	<0.1
NO3	ppm	1.4	1.8	2	1.9	1.6	1.3	<0.4	0.7	0.6	0.5	0.5	0.4
NO2	ppm	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
PO4	ppm	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Chloride	ppm	40.1	31	32.5	31.8	31	31	32.1	32.8	32.1	36.9	25.9	34.6
Cond.	umho/cm+	1029	927	32.2	971	1017	885	908	955	936	907	974	1025
T. Coli	MPN	256	34.5	961	10.9	6.3	1	46.4	<1	<1	7.4	8.6	9.7
F. Coli	MPN	<10	3	12.1	<1	<1	<1	<1	<1	<1	<1	<1.0	<1.0
F. Strep	MPN	26.2	1	<1	<1	<1	1	<1	<1	1	1	<1.0	<1.0
TOC	ppm	2.04	2.91	1.17	1.43	1.36	1.23	1.64	1.29	1.17	1.11	1.23	1.19
Bromide	ppm	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Giardia		0	0	0	0	0	0	0	0	0	0	0	0
Crypto		0	0	0	0	0	0	0	0	0	0	0	0
E Coli													
T Coliform													

Year 2009	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
NH4	ppm	0.12	NS	0.2	0.16	0.2	0.1	<0.1	<0.1	0.2	0.1		0.1
NO3	ppm	0.4	0.4	0.6	0.9	0.9	0.7	0.6	0.5	0.1	0.4		0.5
NO2	ppm	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4		<0.4
PO4	ppm	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05		<0.05
Chloride	ppm	35.1	37.2	48.5	41.6	39.5	40.3	39.8	39.7	39	41		40
Cond.	umho/cm+	984	1020	985	981	1009	969	991	971	991	994		974
T. Coli	MPN	5.1	9.8	7.4	8.6	7.4	3.1	7.3	20	6.2	4.1		131
F. Coli	MPN	<1	<1	<1	<1	<1	<1.0	<1.0	<1.0	<1.0	<1		<1.0
F. Strep	MPN	<1	<1	<1	<1	<1	<1.0	<1.0	<1.0	<1.0	NS		NS
TOC	ppm	1.1	0.88	1.35	1.15	1.26	0.93	0.8	1.05	1.29	1.27	0.8	1.22
Bromide	ppm	ND	ND	ND	0.232	ND	ND	ND	ND	ND	ND	ND	ND
Giardia		0	0	0	0	0	0	0	0	0	0	0	0
Crypto		0	0	0	0	0	0	0	0	0	0	0	0
E Coli													
T Coliform													

Year 2010	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
NH3	ppm	NS	0.2	0.2	0.2	0.3	0.3	0.1	0.3	0.3	0.3		
NO3	ppm	0.6	1	1.1	1.2	1	0.9	0.7	0.6	0.5	0.4		
NO2	ppm	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4		
PO4	ppm	0.21	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05		
Chloride	ppm	44	42	40	45	37	37	37	37	36	35		
Cond.	umho/cm+	1049	1020	910	963	946	961	976	986	982	987		
T. Coli	MPN	6.3	88.2	36.4	6.2	25.3	6.3	8.6	1	3.1	4.1		
F. Coli	MPN	<1	2	6.1	<1.0	1	<1.0	<1	<1	<1	<1.0		
F. Strep	MPN	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS		
TOC	ppm	1.84	1.55	1.3	1.3	1.54	NS	1.21	1.36	1.29	0.82		
Bromide	ppm			ND	ND	0.375	ND	ND	ND	ND	ND		
Giardia		0	0	0	0	0	0	0	0	0	0		
Crypto		0	0	0	0	0	0	0	0	0	0		
E Coli				88.2									
T Coliform				2.00									

Not Detected (ND)
Not Sampled (NS)

TABLE O-1A
City of Ventura
Watershed Monitoring Results 2006-2010
Treatment Effluent (TPE)

Year 2006	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
TKN	ppm	0.6	0.2	0.3									
NH4	ppm	0.3	0.2	0.3									
NO3	ppm	NS	NS	NS	NS								
PO4	ppm	NS	NS	NS	NS								
Chloride	ppm	NS	NS	NS	NS								
Cond.	umho/cm+	NS	NS	NS	NS								
T. Coli	MPN	<1	<1	<1	NS	<1	<1						
F. Coli	MPN	<1	<1	<1	NS	<1	<1						
F. Strep	MPN	NS	NS	NS									
TOC	ppm	2.10	NS	2.00	2.00	1.59	1.67	1.50	2.10	2.28	1.87	1.34	1.43
Bromide	ppm	ND		0.0269	0.269	0.296	NS						
Giardia				<0.08									
Crypto				<0.08									
NDMA			ND						ND				

Year 2007	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
T. Coli	MPN												
F. Coli	MPN												
F. Strep	MPN												
TOC	ppm	1.17	1.36	1.32	1.26	140							
NDMA			ND										

Year 2008	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
T. Coli	MPN												
F. Coli	MPN												
F. Strep	MPN												
TOC	ppm	2.13	1.86	1.11	1.53	1.72	1.39	1.31	1.4	1.63	1.76	2.01	1.34
NDMA									ND				

Year 2009	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
T. Coli	MPN												
F. Coli	MPN												
F. Strep	MPN												
TOC	ppm	1.18	1.35	1.53	1.15	1.43	0.65	0.78	1.7	2.13	1.74	1.37	1.5
NDMA													

Year 2010	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
T. Coli	MPN												
F. Coli	MPN												
F. Strep	MPN												
TOC	ppm	2.1	1.7	1.27	1.38	1.6	1.8	1.34					
NDMA									ND				

Not Sampled (NS)
Not Detected (ND)
In Dec 2005, Avenue Water Treatment Plant was only purchasing CMWD water.

TABLE O-1A
City of Ventura
Watershed Monitoring Results 2006-2010
Casitas Municipal Water District #1 (CMD)

Year 2006	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
TKN	ppm												
NH4	ppm												
NO3	ppm												
PO4	ppm												
Chloride	ppm												
Cond.	umho/cm+												
T. Coli	MPN												
F. Coli	MPN												
F. Strep	MPN												
TOC	ppm	2.60		3.26	3.58	3.16	2.99	3.02	2.96	2.89	3.01	2.96	3.14

Year 2007	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
TKN	ppm												
NH4	ppm												
NO3	ppm												
PO4	ppm												
Chloride	ppm												
Cond.	umho/cm+												
T. Coli	MPN												
F. Coli	MPN												
F. Strep	MPN												
TOC	ppm	3.22	2.98	2.98	3.08	3.04							

Year 2008	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
TKN	ppm												
NH4	ppm												
NO3	ppm												
PO4	ppm												
Chloride	ppm												
Cond.	umho/cm+												
T. Coli	MPN												
F. Coli	MPN												
F. Strep	MPN												
TOC	ppm	3.39	3.32	2.81	3.10	2.99	2.93	3.07	3.37	3.16	3.20	3.37	3.17

Year 2009	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
TKN	ppm												
NH4	ppm												
NO3	ppm												
PO4	ppm												
Chloride	ppm												
Cond.	umho/cm+												
T. Coli	MPN												
F. Coli	MPN												
F. Strep	MPN												
TOC	ppm	3.22	3.14	3.36	2.95	3.24	2.89	2.76	3.09	3.03	3.21	3.30	3.28

Year 2010	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
TKN	ppm												
NH4	ppm												
NO3	ppm												
PO4	ppm												
Chloride	ppm												
Cond.	umho/cm+												
T. Coli	MPN												
F. Coli	MPN												
F. Strep	MPN												
TOC	ppm	3.87	3.16	3.01	3.20	3.24	3.29	2.87					

Table O-2A
City Of Ventura
Public Works
Utilities/Water Division

Total Halocetic Acids
and Trihalomethane
Quarterly Monitoring Summary

City's Multi-zone Distribution System **Report for October, 2010**

Sample Station Number	Sample Station Name	Zone	Chlorine Residual ppm	pH	Alkalinity ppm	TTHM ppb	HAA5 ppb
22	Harbor	210	2.4	7.5	166	54	44
9	Fir	210	3.1	7.5	162	45	43
31	Katherine	260	2.3	7.5	124	42	35
34	Seneca	400	2.9	7.6	194	48	57
17	Olivas	330	2.5	7.4	214	1	3
4	Ralston	330	3.0	7.4	214	11	3
26	Palma	330	2.7	7.3	213	35	31
10	Grand	330	2.7	7.4	213	1	3
1	Hospital	430	3.0	7.5	119	58	39
16	Wells	535	1.9	7.5	164	13	6
35	Highpoint	860	1.8	7.4	136	23	13
23	Colina Vista	1035	2.7	7.4	134	37	28
Averages			***2.6***	***7.4***	***171***	***31***	***25***

City Distribution System Summary

Sample Date	*Janurary-10*	*April-10*	*July-10*	*October-10*
HAA5 in ppb				
Quarterly Average	17	18	21	25
Running Annual Average		18	19	**20**
TTHM in ppb				
Quarterly Average	20	23	26	31
Running Annual Average		22	23	**25**

Water Treatment Supervisor DATE

System # 5610017

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Table O-2B
City of Ventura
Public Works
Utilities/Water Division
Saticoy Country Club
Total Halocetic Acids and Trihalomethane
Quarterly Monitoring Report

Saticoy Country Club

Report for July, 2010

Sample Station	Sample Station Name	Zone	Chlorine Residual ppm	pH	Alkalinity	TTHM ppb	HAA5 ppb
24	Clubhouse	SCC	0.9	7.31	249	**42**	**16**

Saticoy Country Club Summary

	October-09	January-10	April-10	July-10
HAA5 in ppb				
Quarterly Average	10	8	8	16
Running Annual Average		9	9	**11**
TTHM in ppb				
Quarterly Average	32	47	34	42
Running Annual Average		40	38	**39**

Water Treatment Supervisor

DATE

System # 5602140

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Table O-2C

2006 Initial Distribution System Evaluation Plan

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Standard Monitoring Plan Entry

I. IDSE General Information

Please review the information provided below. If you feel any of the information displayed is incorrect and you are unable to change it please contact your State or EPA representative.

I. General
II. IDSE Rec
III. Selection
IV. Justifica
V. Peak His Schedule
VI. Planned Schedule
VII & VIII Sc Attachment
Preview/Su

*PWS ID	CA5610017
*PWS Name	VENTURA WATER DEPARTMENT
*PWS Address	JIM PASSANISI
	P.O. BOX 99
*City	VENTURA
*State	CA
*Zip	93002
*Population Served	102346
*System Type	CWS
*Source Water Type	SW
*Buying / Selling Relationships	Consecutive System

C. PWS Operations

Residual Disinfectant Type: ☐ Chlorine ☑ Chloramines ☐ Other

Number of Disinfected Sources				
	Surface	0	GWUDI	1
	Ground	2	Purchased	1

D. Contact Person

*Contact Name	Mike Oakley
Title	Treatment Supervisor
Phone Number	(805) 652-4574 ext.
Fax	(805) 643-6436
E-mail Address	moakley@ci.ventura.ca.us

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Standard Monitoring Plan Entry

II. IDSE Requirements

A. Number of Required Standard Monitoring Sites

High TTHM	5
High HAA5	4
Near Entry Point Sites	3
Average Residence Time Sites	4
Total	16

Note: If you have fewer entry points than required near entry point sites, you will sample at more TTHM and/or HAA5 sites, but your total number of sites will not change. See chapter 7 step 2 of the IDSE Guidance Manual for more information.

B. Schedule

Schedule 1

C. Required Standard Monitoring Frequency

- ○ During peak historical month (1 monitoring period)
- ○ Every 90 days (4 monitoring periods)
- ◉ Every 60 days (6 monitoring periods)

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Preview/Su

Standard Monitoring Plan Entry

III. Selecting Standard Monitoring Sites

I. General I
II. IDSE Rec
III. Selectir
IV. Justifica
V. Peak His Schedule
VI. Planned Schedule
VII & VIII Sc Attachment
Preview/Su

A. Data Evaluated. Check each box corresponding to the data that you used to select each type of standard monitoring site.

Data Type	Type of Site: Near Entry Point	Average Residence Time	High TTHM	High HAA5
System Configuration:				
Pipe layout, locations of storage facilities	☑	☑	☑	☑
Locations of sources and consecutive system entry points	☑	☑	☑	☑
Pressure zones	☑	☑	☑	☑
Information on population density	☐	☑	☑	☑
Locations of large customers	☐	☑	☑	☑
Water Quality and Operational Data:				
Disinfectant residual data	☑	☑	☑	☑
Stage 1 DBP data	☑	☑	☑	☑
Other DBP data	☐	☐	☐	☐
Microbial monitoring data	☐	☐	☐	☐
Tank levels data, pump run times	☑	☑	☑	☑
Customer billing records	☐	☐	☐	☐
Advanced Tools:				
Water distribution system model	☐	☐	☐	☐
Tracer study	☐	☐	☐	☐

B. Summary of Data.* Provide a summary of data you relied on to justify standard monitoring site selection.

Weekly total chlorine residuals were evaluated at 29 sampling stations that are represnetative of all pressure zones in the distribution system. The westend of the City that receives short residence (young) surface water has a total chlorine residual around 3.0 ppm. The total chlorine residual of water with average residence time is about 2.0 ppm, and older water with a long residence time is near 1.0 ppm.

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Standard Monitoring Plan Entry

IV. Justification of Standard Monitoring Sites *

You are required to complete this section in its entirety before submitting the Plan.

#	Standard Monitoring Site ID (from map)1	Site Type	Justification
1	E5porter	High TTHM	Furthest portion of the east end of the 210 Zone in the central part of the city away from the river source. Is
2	E32breaker	High TTHM	Old river water in the small 605V Zone with low residential demand. Water passes through two BPSs
3	N38kalorama	High TTHM	Very old river water in the small 605K Zone with low residential demand. Water passes through a BPS prior
4	E29buenavista	High TTHM	Old river water in the 466 Zone with residential demand. Water passes through two BPSs and two
5	E36gosnel	High TTHM	River water in the 400 Zone with residential & commercial demand. Water passes through a BPS and one tank
6	N39mckee	High HAA5	River water in the 400 Zone with residential & commercial demand. Water passes through a BPS and one tank
7	N40beachmont	High HAA5	Portion of the lower 210 Zone in the beach area. Is middle aged water in a residential & commercial
8	E2ashwood	High HAA5	Middle aged water in the residential & commercial area of the 430 Zone based on pipe layout. The are no
9	N41mintlane	High HAA5	Middle aged water in the residential area of the 588 Zone based on pipe layout. The are no other sampling
10	N42AWTP	Near Entry Point	Entry location of river water or CMWD CM1 water after the Avenue Water Treatment Plant Power Reservoir into
11	E3norway	Near Entry Point	

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IV. Justifi
V. Peak Hi Schedule
VI. Plannie Schedule
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Preview/S

			Entry location of river water or CMWD CM1 water after the Avenue Water Treatment Plant Power Reservoir into
11	N43330bps	Near Entry Point	Entry location of CMWD CM2 water into Hall Canyon Reservoir. Total Chlorine residual is near 3 ppm or
12	E7avenue	Average Residence Time	Location based on pipe layout which is at the south end of Ventura Avenue near downtown half way through
14	E6seaward	Average Residence Time	Location based on pipe layout which is at the south end of Seaward Avenue past the downtown area. Water
15	E3victoria	Average Residence Time	Location based on pipe layout which is at the north end of Victoria Avenue. Water flows through large
16	N44sanjon	Average Residence Time	Location based on pipe layout which is at the central part of the 210 Zone in residential and commercial

1 Verify that site IDs match IDs in Section IV and on your distribution system schematic (See Section VII of this form).

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Standard Monitoring Plan Entry

V. Peak Historical Month and Standard Monitoring Dates

A. *Peak Historical Month September

B. If multiple Sources, Source Used to Determine Peak Historical Month (enter "N/A" if only one source in your system). N/A is automatically entered for you, please ensure you review this field and update accordingly prior to submitting.

The City receives 50% of its surface water from Casitas Municipal Water District (CMWD). The TOC for the City's Foster Park surface water is less that the CMWD surface water. The City's highest DDBP's occur when CMWD water is used, and especially when it is breakpoint chlorinated at the Avenue Plant. Water temperature data collected by CMWD for Lake Casitas was evaluated by CMWD and determine

C. *Peak Historical Month Based On (check all that apply):

- [x] High TTHM
- [x] Warmest water temperature
- [ ] High HAA5

If you used other information to select your peak historical month, explain here:

D. Proposed Standard Monitoring Schedule

You are required to complete this section in its entirety before submitting the Plan.

Standard Monitoring Site ID (from map)*	Projected Sampling Date (date or week)**					
	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6
E5porter	9/2007, wk 2	11/2007, wk 2	1/2008, wk 2	3/2008, wk 2	5/2008, wk 2	7/2008, wk
E32breaker	9/2007, wk 2	11/2007, wk 2	1/2008, wk 2	3/2008, wk 2	5/2008, wk 2	7/2008, wk
N38kalorama	9/2007, wk 2	11/2007, wk 2	1/2008, wk 2	3/2008, wk 2	5/2008, wk 2	7/2008, wk
E29buenavista	9/2007, wk 2	11/2007, wk 2	1/2008, wk 2	3/2008, wk 2	5/2008, wk 2	7/2008, wk
E36gosnel	9/2007, wk 2	11/2007, wk 2	1/2008, wk 2	3/2008, wk 2	5/2008, wk 2	7/2008, wk
N39mckee	9/2007, wk 2	11/2007, wk 2	1/2008, wk 2	3/2008, wk 2	5/2008, wk 2	7/2008, wk
N40beachmont	9/2007, wk 2	11/2007, wk 2	1/2008, wk 2	3/2008, wk 2	5/2008, wk 2	7/2008, wk
E2ashwood	9/2007, wk 2	11/2007, wk 2	1/2008, wk 2	3/2008, wk 2	5/2008, wk 2	7/2008, wk
N41mintlane	9/2007, wk 2	11/2007, wk 2	1/2008, wk 2	3/2008, wk 2	5/2008, wk 2	7/2008, wk
N42AWTP	9/2007, wk 2	11/2007, wk 2	1/2008, wk 2	3/2008, wk 2	5/2008, wk 2	7/2008, wk
E8norway	9/2007, wk 2	11/2007, wk 2	1/2008, wk 2	3/2008, wk 2	5/2008, wk 2	7/2008, wk
N43330bps	9/2007, wk 2	11/2007, wk 2	1/2008, wk 2	3/2008, wk 2	5/2008, wk 2	7/2008, wk
E7avenue	9/2007, wk 2	11/2007, wk 2	1/2008, wk 2	3/2008, wk 2	5/2008, wk 2	7/2008, wk
E6seaward	9/2007, wk 2	11/2007, wk 2	1/2008, wk 2	3/2008, wk 2	5/2008, wk 2	7/2008, wk

E3victoria	9/2007, wk 2	11/2007, wk 2	1/2008, wk 2	3/2008, wk 2	5/2008, wk 2	7/2008, wk
N44sanjon	9/2007, wk 2	11/2007, wk 2	1/2008, wk 2	3/2008, wk 2	5/2008, wk 2	7/2008, wk

** Site IDs should match IDs on your distribution system schematic (See Section VII).*

*** period = monitoring period. Complete for the number of periods from Section II.C.*

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Standard Monitoring Plan Entry

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VI. Planned Stage 1 DBPR Compliance Monitoring Schedule*

If you are a consecutive system that is not required to conduct Stage 1 DBPR compliance monitoring, enter none under Stage 1 DBPR Monitoring Site ID and none under Period 1

Add Monitoring Site

Stage 1 DBPR Monitoring Site ID (from map)1	Projected Sampling Date (date or week)2			
	Period 1	Period 2	Period 3	Period 4
1hospital	8/2007, wk2	11/2007, wk2	2/2008, wk2	5/2008, wk2
4ralston	8/2007, wk2	11/2007, wk2	2/2008, wk2	5/2008, wk2
9fir	8/2007, wk2	11/2007, wk2	2/2008, wk2	5/2008, wk2
10grand	8/2007, wk2	11/2007, wk2	2/2008, wk2	5/2008, wk2
16wells	8/2007, wk2	11/2007, wk2	2/2008, wk2	5/2008, wk2
17olivas	8/2007, wk2	11/2007, wk2	2/2008, wk2	5/2008, wk2
22harbor	8/2007, wk2	11/2007, wk2	2/2008, wk2	5/2008, wk2
23colinavi	8/2007, wk2	11/2007, wk2	2/2008, wk2	5/2008, wk2
26palma	8/2007, wk2	11/2007, wk2	2/2008, wk2	5/2008, wk2
31katherin	8/2007, wk2	11/2007, wk2	2/2008, wk2	5/2008, wk2
34seneca	8/2007, wk2	11/2007, wk2	2/2008, wk2	5/2008, wk2
35highpoin	8/2007, wk2	11/2007, wk2	2/2008, wk2	5/2008, wk2

1 Verify that site IDs match IDs on your distribution system schematic (See Section VII of this form). Add additional monitoring sites if you are required to monitor at more than 8 Stage 1 DBPR sites.
2 period = monitoring period. Complete for the number of periods in which you must conduct Stage 1 DBPR monitoring during IDSE monitoring. Can list exact date or week (e.g., week of 7/9/07)

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Standard Monitoring Plan Entry

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I. General Information
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IV. Justification
V. Peak Historical Mth & Schedule
VI. Planned Stage 1 DBPR Schedule
VII & VIII Schematic & Attachments
Preview/Submit

VII & VIII Schematic & Attachments

Select Browse to locate the file you would like to attach to your plan. Click Save to upload your attachments. The following file types are acceptable formats for your attachments: .xls, .doc, .jpeg, .gif, .jpg, .txt, .wpd, and .pdf. All systems must submit a Distribution System Schematic with their plan unless they have selected the option to send by hardcopy. (* = required field)

*Distribution System Schematic [ ] Browse...

Attachment Name: [ ]
[ ] Browse...

Attachment Name: [ ]
[ ] Browse...

Attachment Name: [ ]
[ ] Browse...

The following is a list of attachments that have already been submitted.

File Name	Date Uploaded
Distribution System Schematic	2006-08-24 12:55:10.0
Distribution System Schematic	2006-08-24 12:58:49.0

If you prefer to send attachments via mail or e-mail, please check the box for "Sending attachments by mail". You may mail your attachments to one of the following addresses:

Mailing Address:
US EPA-IPMC
PO Box 98
Dayton, OH 45401-0098

E-mail Address:
stage2mdbp@epa.gov

☑ **Sending Attachments by Mail**

Enter a description of the items that will be mailed.

Distribution System Schematic.

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Table O-3A

OJAI VALLEY SANITARY DISTRICT WWTP
Monthly Effluent & River Stations
January, 2005

Sample ID			Effluent	R-3	R-4	R-5
Date & Time Sampled: 1-19-05			0700	1105	1120	1035
Constituent	Units	RL				
Ammonia-N	mg/L	0.2	0.3			
Nitrate-N	mg/L	0.1	8.1			
Nitrite-N	mg/L	0.012	0.02			
Organic-N	mg/L	2.5	12.7			
Total-N	mg/L		21.1			
Total Phosphorus	mg/L	0.1	1.5			
Phosphate as P	mg/L	0.1	1.6			
Thallium	ug/L	0.1	ND			
Cyanide	ug/L	3	DNQ**			
Dibromochloromethane	ug/L	NA	*			
Dichlorobromomethane	ug/L	NA	*			
Bis (2-ethylhexyl)phthalate	ug/L	3	ND			
Lindane	ug/L	0.01	ND			
Flow	MGD			103	106	106
Dissolved Oxygen	mg/L	0.1		7.8	8.2	9.6
pH	Units	0.1		8.2	8.3	8.3
Temperature	°F			67	65	58
Total Coliform	MPN/100mL	2		>1600	1600	>1600
Fecal Coliform	MPN/100mL	2		170	300	300
Turbidity	NTU	0.2		109	113	94
Hardness	mg/L	2.5		389		

*No Chlorine is being used
DNQ = Detected, but Not Quantified
Est. Conc. = Estimated Concentration
**DNQ, Less Than Reporting Limit 3.0, Estimated Cyanide Concentration 1.4

OJAI VALLEY SANITARY DISTRICT WWTP
Monthly Effluent & River Stations
February, 2005

Sample ID			Effluent	R-3	R-4	R-5
Date & Time Sampled: 2-9-05			1050	850	840	820
Constituent	Units	RL				
Ammonia-N	mg/L	0.2	ND			
Nitrate-N	mg/L	0.1	3.8			
Nitrite-N	mg/L	0.012	ND			
Organic-N	mg/L		0.7			
Total-N	mg/L		4.5			
Total Phosphorus	mg/L	0.1	1.3			
Phosphate as P	mg/L	0.1	1.2			
Thallium	ug/L	0.012	ND			
Cyanide	ug/L	3	DNQ**			
Dibromochloromethane	ug/L	NA	*			
Dichlorobromomethane	ug/L	NA	*			
Bis (2-ethylhexyl)phthalate	ug/L	3	ND			
Lindane	ug/L	0.01	ND			
Flow	MGD			94.0	97.0	97.0
Dissolved Oxygen	mg/L	0.1		10.1	11.0	11.1
pH	Units	0.1		8.3	8.3	8.3
Temperature	°F			57	53	54
Total Coliform	MPN/100mL	2		170	70	220
Fecal Coliform	MPN/100mL	2		50	11	17
Turbidity	NTU	0.2		3.1	1.4	1.1
Hardness	mg/L	2.5		413		

*No Chlorine is being used
DNQ = Detected, but Not Quantified RL = Reporting Limit
Est. Conc. = Estimated Concentration
DNQ**, Less than reporting limit 3.0, estimated concentration 2.2

Table O-3A

OJAI VALLEY SANITARY DISTRICT WWTP
MONTHLY EFFLUENT & RIVER STATIONS
MARCH, 2005

Sample ID			Effluent	R-3	R-4	R-5
Date & Time Sampled: 3-18-05			0830	0850	0840	0820
Constituent	Units	RL				
Ammonia-N	mg/L	0.2	ND			
Nitrate-N	mg/L	0.1	4.4			
Nitrite-N	mg/L	0.012	ND			
Organic-N	mg/L		0.7			
Total-N	mg/L		5.1			
Total Phosphorus	mg/L	0.1	1.5			
Phosphate as P	mg/L	0.1	1.5			
Thallium	ug/L	0.1	ND			
Cyanide	ug/L	3	*DNQ			
Dibromochloromethane	ug/L		*			
Dichlorobromomethane	ug/L		*			
Bis (2-ethylhexyl)phthalate	ug/L	3	ND			
Lindane	ug/L	0.01	ND			
Flow	MGD			138	141	141
Dissolved Oxygen	mg/L	0.1		10.4	10.4	9.6
pH	Units	0.1		8.4	8.4	8.4
Temperature	°F			56	56	59
Total Coliform	MPN/100mL	2		300	300	500
Fecal Coliform	MPN/100mL	2		23	13	30
Turbidity	NTU	0.2		7.9	8.1	7.5
Hardness	mg/L	2.5		410		

*No Chlorine is being used
ND = Non Detect
*DNQ, Less Than Reporting Limit 3.0, Estimated Concentration 1.6 ug/L

OJAI VALLEY SANITARY DISTRICT WWTP
MONTHLY EFFLUENT & RIVER STATIONS
April, 2005

Sample ID			Effluent	R-3	R-4	R-5
Date & Time Sampled: 4-13-05			0830	0830	0810	0750
Constituent	Units					
Ammonia-N	mg/L	0.2	0.2			
Nitrate-N	mg/L	0.1	3.6			
Nitrite-N	mg/L	0.012	ND			
Organic-N	mg/L		0.8			
Total-N	mg/L		4.6			
Total Phosphorus	mg/L	0.1	1.5			
Phosphate as P	mg/L	0.1	1.4			
Thallium	ug/L	0.1	DNQ			
Cyanide	ug/L	3	DNQ			
Dibromochloromethane	ug/L		*			
Dichlorobromomethane	ug/L		*			
Bis (2-ethylhexyl)phthalate	ug/L	3	ND			
Lindane	ug/L	0.05	ND			
Flow	MGD			124	126	126
Dissolved Oxygen	mg/L	0.1		11.0	11.2	10.3
pH	Units	0.1		8.0	8.1	8.2
Temperature	°F	°F		55	55	57
Total Coliform	MPN/100mL	2		300	300	500
Fecal Coliform	MPN/100mL	2		70	23	70
Turbidity	NTU	0.2		1.1	1.3	1.3
Hardness	mg/L	2.5		433		

*No Chlorine is being used
Tl - DNQ, Less than reporting limit of 0.1, Estimated Concentration 0.08
CN - DNQ, Less than reporting limit of 3, Estimated Concentration 2.4; Note:CN was rerun as initial analysis was 12 ug/L, which is an abnormality. Initial sample was outside the holding time, but reanalyzed with subsequent DNQ as noted above.

Table O-3A

OJAI VALLEY SANITARY DISTRICT WWTP
MONTHLY EFFLUENT & RIVER STATIONS
MAY, 2005

Sample ID			Effluent	R-3	R-4	R-5
Date & Time Sampled: 5-11-05			0800	0830	0815	0800
Constituent	Units	MDL				
Ammonia-N	mg/L	0.2	0.3			
Nitrate-N	mg/L	0.1	5.0			
Nitrite-N	mg/L	0.012	ND			
Organic-N	mg/L	Calc	0.2			
Total-N	mg/L	0.5	5.5			
Total Phosphorus	mg/L	0.1	1.8			
Phosphate as P	mg/L	0.1	1.9			
Thallium	ug/L	0.1	ND			
Cyanide	ug/L	0.8	DNQ			
Dibromochloromethane	ug/L		*			
Dichlorobromomethane	ug/L		*			
Bis (2-ethylhexyl)phthalate	ug/L	0.5	ND			
Lindane	ug/L	0.003	ND			
Flow	MGD			90	92	92
Dissolved Oxygen	mg/L	0.1		11.0	11.0	10.6
pH	Units	0.1		8.3	8.3	8.2
Temperature	°F			58	57	61
Total Coliform	MPN/100mL	2		500	170	900
Fecal Coliform	MPN/100mL	2		30	17	50
Turbidity	NTU	0.1		0.4	0.6	0.6
Hardness	mg/L	2.5		402		

*No Chlorine is being used
DNQ, Less than reporting limit. Estimated concentration 2.3 ug/L.

OJAI VALLEY SANITARY DISTRICT WWTP
MONTHLY EFFLUENT & RIVER STATIONS
June, 2005

Sample ID			Effluent	R-3	R-4	R-5
Date & Time Sampled: 6-8-05			0730	0845	0820	0800
Constituent	Units	RL	Results			
Ammonia-N	mg/L	0.2	0.3			
Nitrate-N	mg/L	0.1	2.6			
Nitrite-N	mg/L	0.012	ND			
Organic-N	mg/L	Calc	0.7			
Total-N	mg/L	0.5	3.6			
Total Phosphorus	mg/L	0.1	1.7			
Phosphate as P	mg/L	0.1	1.8			
Thallium	ug/L	0.1	ND			
Cyanide	ug/L	0.8	DNQ			
Dibromochloromethane	ug/L		*			
Dichlorobromomethane	ug/L		*			
Bis (2-ethylhexyl)phthalate	ug/L	0.5	ND			
Lindane	ug/L	0.003	ND			
Flow	MGD			64	66	66
Dissolved Oxygen	mg/L	0.1		10.4	10.9	10.8
pH	Units	0.1		8.0	8.0	8.1
Temperature	°F			64	61	62
Total Coliform	MPN/100mL	2		**300	**900	**500
Fecal Coliform	MPN/100mL	2		**4	**50	**30
Turbidity	NTU	0.1		0.3	0.4	0.4
Hardness	mg/L	2.5		394		

*No Chlorine is being used
DNQ, Less than reporting limit. Estimated concentration was 2.2 ug/L.
**Resampled 06/28 due to analysis holding time exceeded by outside laboratory.

Table O-3A

OJAI VALLEY SANITARY DISTRICT WWTP
MONTHLY EFFLUENT & RIVER STATIONS
July, 2005

Sample ID			Effluent	R-3	R-4	R-5
Date & Time Sampled: 7-6-05				840	830	810
Constituent	Units	RL				
Ammonia-N	mg/L	0.2	0.2			
Nitrate-N	mg/L	0.1	3.5			
Nitrite-N	mg/L	0.012	ND			
Organic-N	mg/L	Calc	1.1			
Total-N	mg/L	0.5	4.8			
Total Phosphorus	mg/L	0.1	2.5			
Phosphate as P	mg/L	0.1	2.3			
Thallium	ug/L	10	ND			
Cyanide	ug/L	3	ND			
Dibromochloromethane	ug/L		*			
Dichlorobromomethane	ug/L		*			
Bis (2-ethylhexyl)phthalate	ug/L	3	ND			
Lindane	ug/L	0.01	ND			
Flow	MGD			45	47	47
Dissolved Oxygen	mg/L	0.1		10.1	10.2	10.1
pH	Units	0.1		8.1	8.1	8.1
Temperature	°F			65	65	65
Total Coliform	MPN/100mL	2		110	170	1600
Fecal Coliform	MPN/100mL	2		30	30	70
Turbidity	NTU	0.1		0.5	0.5	0.6
Hardness	mg/L	2.5		407		

*No Chlorine is being used
Nitrogen Series and Phosphate-P values are two week average 7-6 & 7-13-05
Priority Pollutants were sampled 7-20-05
Performance goal of 2 mg/L for Phosphorus-P was exceeded, and an investigative report will be provided.

OJAI VALLEY SANITARY DISTRICT WWTP
MONTHLY EFFLUENT & RIVER STATIONS
August, 2005

Sample ID			Effluent	R-3	R-4	R-5
Date & Time Sampled: 8-10-05			0800	0835	0815	0750
Constituent	Units	RL				
Ammonia-N	mg/L	0.2	0.3			
Nitrate-N	mg/L	0.1	NT			
Nitrite-N	mg/L	0.1	ND			
Organic-N	mg/L	0.5	1.3			
Total-N	mg/L	0.2	NT			
Total Phosphorus	mg/L	0.5	0.9			
Phosphate as P	mg/L	0.1	0.9			
Thallium	ug/L	0.1	ND			
Cyanide	ug/L	3	ND			
Dibromochloromethane	ug/L	0.5	*			
Dichlorobromomethane	ug/L	0.5	*			
Bis (2-ethylhexyl)phthalate	ug/L	5	ND			
Lindane	ug/L	0.01	ND			
Flow	MGD			20	22	22
Dissolved Oxygen	mg/L			8.5	8.7	8.4
pH	Units			8.0	8.0	8.0
Temperature	°F			66	66	68
Total Coliform	MPN/100mL			500	240	>1600
Fecal Coliform	MPN/100mL			50	50	130
Turbidity	NTU			1.2	0.9	1.8
Hardness	mg/L	2.5		370		

*No Chlorine is being used
NT = Not Tested due to Lab error

Table O-3A

OJAI VALLEY SANITARY DISTRICT WWTP
MONTHLY EFFLUENT & RIVER STATIONS
September, 2005

Sample ID			Effluent	R-3	R-4	R-5
Date & Time Sampled: 9-7-05			0730	0905	0845	0820
Constituent	Units	RL				
Ammonia-N	mg/L	0.2	0.3			
Nitrate-N	mg/L	0.1	3.5			
Nitrite-N	mg/L	0.1	ND			
Organic-N	mg/L	0.5	0.7			
Total-N	mg/L	0.2	4.5			
Total Phosphorus	mg/L	0.5	0.7			
Phosphate as P	mg/L	0.17	0.9			
Thallium	ug/L	0.1	ND			
Cyanide	ug/L	3	DNQ**			
Dibromochloromethane	ug/L	0.5	*			
Dichlorobromomethane	ug/L	0.5	*			
Bis (2-ethylhexyl)phthalate	ug/L	5	ND			
Lindane	ug/L	0.01	ND			
Flow	MGD			15.0	17.0	17.0
Dissolved Oxygen	mg/L			9.8	10.0	9.2
pH	Units			8.1	8.1	8.0
Temperature	°F			63	64	65
Total Coliform	MPN/100mL			300	300	1600
Fecal Coliform	MPN/100mL			300	170	27
Turbidity	NTU			1.3	1.7	1.2
Hardness	mg/L	2.5		386		

*No Chlorine is being used
DNQ = Detected, but Not Quantified
**DNQ, Less Than Reporting Limit 3.0, Estimated Concentration 1.7 ug/L

OJAI VALLEY SANITARY DISTRICT WWTP
MONTHLY EFFLUENT & RIVER STATIONS
October, 2005

Sample ID			Effluent	R-3	R-4	R-5
Date & Time Sampled:	10/5/2005		0730	0850	0825	0805
Constituent	Units	RL				
Ammonia-N	mg/L	0.2	ND			
Nitrate-N	mg/L	0.1	3.6			
Nitrite-N	mg/L	0.1	ND			
Organic-N	mg/L	0.5	1.0			
Total-N	mg/L	0.2	4.6			
Total Phosphorus	mg/L	0.5	1.3			
Phosphate as P	mg/L	0.17	1.0			
Thallium	ug/L	0.1	DNQ**			
Cyanide	ug/L	3	DNQ***			
Dibromochloromethane	ug/L	0.5	*			
Dichlorobromomethane	ug/L	0.5	*			
Bis (2-ethylhexyl)phthalate	ug/L	5	ND			
Lindane	ug/L	0.01	ND			
Flow	MGD			16.0	18.0	18.0
Dissolved Oxygen	mg/L			10.2	10.6	9.0
pH	Units			8.4	8.2	8.0
Temperature	°F			56	56.8	60
Total Coliform	MPN/100mL			300	240	900
Fecal Coliform	MPN/100mL			50	30	140
Turbidity	NTU			0.9	1.1	1.7
Hardness	mg/L	2.5		397		

*No Chlorine is being used
**DNQ, Less Than Reporting Limit 0.1, Estimated Concentration 0.04 ug/L
***DNQ, Less Than Reporting Limit 3.0, Estimated Concentration 2.3 ug/L

Table O-3A

OJAI VALLEY SANITARY DISTRICT WWTP
MONTHLY EFFLUENT & RIVER STATIONS
November, 2005

Sample ID			Effluent	R-3	R-4	R-5
Date & Time Sampled:	11/9/2005		0800	0910	0850	0830
Constituent	Units	RL				
Ammonia-N	mg/L	0.2	ND			
Nitrate-N	mg/L	0.1	3.9			
Nitrite-N	mg/L	0.012	ND			
Organic-N	mg/L	0.5	1.5			
Total-N	mg/L		5.4			
Total Phosphorus	mg/L	0.1	1.2			
Phosphate as P	mg/L	0.1	1.4			
Thallium	ug/L	0.1	ND			
Cyanide	ug/L	3	DNQ*			
Dibromochloromethane	ug/L	0.5	*			
Dichlorobromomethane	ug/L	0.5	*			
Bis (2-ethylhexyl)phthalate	ug/L	3	ND			
Lindane	ug/L	0.01	ND			
Flow	MGD			22.3	24.6	24.6
Dissolved Oxygen	mg/L			9.7	10.0	9.6
pH	Units			8.1	8.2	8.1
Temperature	°F			61	61	62
Total Coliform	MPN/100mL			>1600	>1600	1600
Fecal Coliform	MPN/100mL			>1600	500	300
Turbidity	NTU			1.2	1.5	2.6
Hardness	mg/L	2.5		403		

*No Chlorine is being used
*DNQ, Less Than Reporting Limit 3.0, Estimated Concentration 2.7 ug/L

OJAI VALLEY SANITARY DISTRICT WWTP
MONTHLY EFFLUENT & RIVER STATIONS
December, 2005

Sample ID			Effluent	R-3	R-4	R-5
Date & Time Sampled:	12/7/2005		0800	0840	0825	0800
Constituent	Units	RL				
Ammonia-N	mg/L	0.2	ND			
Nitrate-N	mg/L	0.1	5.0			
Nitrite-N	mg/L	0.012	ND			
Organic-N	mg/L	0.5	0.9			
Total-N	mg/L		5.9			
Total Phosphorus	mg/L	0.1	0.5			
Phosphate as P	mg/L	0.1	1.6			
Thallium	ug/L	0.1	ND			
Cyanide	ug/L	3	DNQ*			
Dibromochloromethane	ug/L	0.5	*			
Dichlorobromomethane	ug/L	0.5	*			
Bis (2-ethylhexyl)phthalate	ug/L	3	ND			
Lindane	ug/L	0.01	ND			
Flow	MGD			17.6	19.5	19.5
Dissolved Oxygen	mg/L			12.2	12.0	10.4
pH	Units			8.0	8.0	7.9
Temperature	°F			47	48	52
Total Coliform	MPN/100mL			170	500	500
Fecal Coliform	MPN/100mL			50	17	80
Turbidity	NTU			0.9	0.7	0.9
Hardness	mg/L	2.5		382		

*No Chlorine is being used
*DNQ,Less ThanReporting Limit 3.0, Estimated Concentration 1.8 ug/L

Table O-3A

OJAI VALLEY SANITARY DISTRICT WWTP
Monthly Effluent & River Stations
January, 2006

Sample ID			Effluent	R-3	R-4	R-5
Date & Time Sampled: 1-18-06			0730	0840	0825	0810
Constituent	Units	RL				
Ammonia-N	mg/L	0.2	ND			
Nitrate-N	mg/L	0.1	6.0			
Nitrite-N	mg/L	0.012	ND			
Organic-N	mg/L	2.5	0.9			
Total-N	mg/L		6.9			
Total Phosphorus	mg/L	0.1	1.8			
Phosphate as P	mg/L	0.1	1.8			
Thallium	ug/L	0.1	ND			
Cyanide	ug/L	3	DNQ**			
Dibromochloromethane	ug/L	NA	*			
Dichlorobromomethane	ug/L	NA	*			
Bis (2-ethylhexyl)phthalate	ug/L	3	ND			
Lindane	ug/L	0.01	ND			
Flow	MGD			24	26	26
Dissolved Oxygen	mg/L	0.1		13.0	12.7	11.6
pH	Units	0.1		7.8	7.8	7.8
Temperature	°F			50	51	54
Total Coliform	MPN/100mL	2		500	900	900
Fecal Coliform	MPN/100mL	2		80	30	80
Turbidity	NTU	0.2		0.5	0.4	0.5
Hardness	mg/L	2.5		386		

*No Chlorine is being used
DNQ = Detected, but Not Quantified
**DNQ, Less Than Reporting Limit 3.0, Estimated Cyanide Concentration 1.5

OJAI VALLEY SANITARY DISTRICT WWTP
Monthly Effluent & River Stations
February, 2006

Sample ID			Effluent	R-3	R-4	R-5
Date & Time Sampled: 2-8-06			1050	850	840	820
Constituent	Units	RL				
Ammonia-N	mg/L	0.2	ND			
Nitrate-N	mg/L	0.4	5.9			
Nitrite-N	mg/L	0.012	ND			
Organic-N	mg/L		3.3			
Total-N	mg/L		9.2			
Total Phosphorus	mg/L	0.1	1.5			
Phosphate as P	mg/L	0.1	1.4			
Thallium	ug/L	0.1	DNQ[1]			
Cyanide	ug/L	3	ND			
Dibromochloromethane	ug/L	NA	*			
Dichlorobromomethane	ug/L	NA	*			
Bis (2-ethylhexyl)phthalate	ug/L	3	ND			
Lindane	ug/L	0.01	ND			
Flow	MGD			21.6	23.6	23.6
Dissolved Oxygen	mg/L	0.1		12.4	12.4	11.3
pH	Units	0.1		8.1	8.0	7.7
Temperature	°F			51	50	52
Total Coliform	MPN/100mL	2		110	60	240
Fecal Coliform	MPN/100mL	2		110	60	50
Turbidity	NTU	0.2		3.1	1.4	1.1
Hardness	mg/L	2.5		430		

*No Chlorine is being used
DNQ = Detected, but Not Quantified RL = Reporting Limit
DNQ[1], Less than reporting limit 0.01 ug/L, estimated concentration 0.006 ug/L

Table O-3A

OJAI VALLEY SANITARY DISTRICT WWTP
MONTHLY EFFLUENT & RIVER STATIONS
MARCH, 2006

Sample ID			Effluent	R-3	R-4	R-5
Date & Time Sampled: 3-15-06			0800	0855	0930	0815
Constituent	Units	RL				
Ammonia-N	mg/L	0.2	ND			
Nitrate-N	mg/L	0.1	5.0			
Nitrite-N	mg/L	0.012	ND			
Organic-N	mg/L		0.9			
Total-N	mg/L		5.9			
Total Phosphorus	mg/L	0.1	1.1			
Phosphate as P	mg/L	0.1	0.7			
Thallium	ug/L	0.1	DNQ			
Cyanide	ug/L	3	ND			
Dibromochloromethane	ug/L		*			
Dichlorobromomethane	ug/L		*			
Bis (2-ethylhexyl)phthalate	ug/L	3	ND			
Lindane	ug/L	0.01	ND			
Flow	MGD			62	64	64
Dissolved Oxygen	mg/L	0.1		12.7	11.8	12.0
pH	Units	0.1		8.0	7.8	7.9
Temperature	°F			51	56	55
Total Coliform	MPN/100mL	2		80	170	300
Fecal Coliform	MPN/100mL	2		17	50	50
Turbidity	NTU	0.2		0.5	0.6	0.6
Hardness	mg/L	2.5		415		

*No Chlorine is being used
ND = Non Detect
DNQ = Detected Not Quantified
Thallium DNQ: Less Than Reporting Limit 0.1, Estimated Concentration 0.009 ug/L

OJAI VALLEY SANITARY DISTRICT WWTP
MONTHLY EFFLUENT & RIVER STATIONS
April, 2006

Sample ID			Effluent	R-3	R-4	R-5
Date & Time Sampled: 4-19-06			0700	0900	0930	0830
Constituent	Units	RL				
Ammonia-N	mg/L	0.2	ND			
Nitrate-N	mg/L	0.1	5.6			
Nitrite-N	mg/L	0.012	ND			
Organic-N	mg/L		0.6			
Total-N	mg/L		6.2			
Total Phosphorus	mg/L	0.1	1.8			
Phosphate as P	mg/L	0.1	1.8			
Thallium	ug/L	0.1	ND			
Cyanide	ug/L	3	DNQ			
Dibromochloromethane	ug/L		*			
Dichlorobromomethane	ug/L		*			
Bis (2-ethylhexyl)phthalate	ug/L	3	ND			
Lindane	ug/L	0.05	ND			
Flow	MGD			145	148	148
Dissolved Oxygen	mg/L	0.1		11.3	10.7	10.2
pH	Units	0.1		7.7	7.7	7.7
Temperature	°F	°F		57	60	59
Total Coliform	MPN/100mL	2		900	500	300
Fecal Coliform	MPN/100mL	2		50	80	130
Turbidity	NTU	0.2		0.6	1.4	0.6
Hardness	mg/L	2.5		411		

*No Chlorine is being used
DNQ = Detected, but Not Quantified
CN - DNQ, Less than reporting limit of 3, Estimated Concentration 1.6 ug/L

Table O-3A

OJAI VALLEY SANITARY DISTRICT WWTP
MONTHLY EFFLUENT & RIVER STATIONS
MAY, 2006

Sample ID			Effluent	R-3	R-4	R-5
Date & Time Sampled: 5-10-06			0915	0830	900	815
Constituent	Units	RL				
Ammonia-N	mg/L	0.2	ND			
Nitrate-N	mg/L	0.1	5.6			
Nitrite-N	mg/L	0.002	ND			
Organic-N	mg/L	Calc	0.8			
Total-N	mg/L	0.5	6.4			
Total Phosphorus	mg/L	0.1	1.2			
Phosphate as P	mg/L	0.02	1.2			
Thallium	ug/L	0.1	ND			
Cyanide (CN)	ug/L	3	*DNQ			
Dibromochloromethane	ug/L		*			
Dichlorobromomethane	ug/L		*			
Bis (2-ethylhexyl)phthalate	ug/L	3	ND			
Lindane	ug/L	0.01	ND			
Flow	MGD			60	62	62
Dissolved Oxygen	mg/L	0.1		10.8	11.9	10.5
pH	Units	0.1		7.9	8.0	7.7
Temperature	°F			60	61	62
Total Coliform	MPN/100mL	2		240	240	500
Fecal Coliform	MPN/100mL	2		30	50	130
Turbidity	NTU	0.1		0.6	1.4	0.6
Hardness	mg/L	2.5		396		

*No Chlorine is being used
DNQ = Detected, but Not Quantified
*DNQ - CN, Less than reporting limit of 3, Estimated Concentration 2.9 ug/L

OJAI VALLEY SANITARY DISTRICT WWTP
MONTHLY EFFLUENT & RIVER STATIONS
June, 2006

Sample ID			Effluent	R-3	R-4	R-5
Date & Time Sampled: 6-7-06			0700	0930	0900	0815
Constituent	Units	RL	Results			
Ammonia-N	mg/L	0.2	ND			
Nitrate-N	mg/L	0.1	5.1			
Nitrite-N	mg/L	0.012	DNQ[1]			
Organic-N	mg/L	Calc	1.4			
Total-N	mg/L	0.5	6.5			
Total Phosphorus	mg/L	0.1	1.2			
Phosphate as P	mg/L	0.1	0.9			
Thallium	ug/L	0.1	ND			
Cyanide	ug/L	0.8	ND			
Dibromochloromethane	ug/L		*			
Dichlorobromomethane	ug/L		*			
Bis (2-ethylhexyl)phthalate	ug/L	0.6	ND			
Lindane	ug/L	0.003	ND			
Flow	MGD			30	32	32
Dissolved Oxygen	mg/L	0.1		9.5	10.3	9.6
pH	Units	0.1		7.9	7.9	7.9
Temperature	°F			62	65	66
Total Coliform	MPN/100mL	2		170	300	130
Fecal Coliform	MPN/100mL	2		50	130	30
Turbidity	NTU	0.1		0.4	0.5	0.5
Hardness	mg/L	2.5		378		

*No Chlorine is being used
DNQ[1], Less than reporting limit. Estimated concentration was .0034 ug/L.

Table O-3A

OJAI VALLEY SANITARY DISTRICT WWTP
MONTHLY EFFLUENT & RIVER STATIONS
July, 2006

Sample ID			Effluent	R-3	R-4	R-5
Date & Time Sampled: 7-6-06				0820	0850	0800
Constituent	Units	RL				
Ammonia-N	mg/L	0.2	ND			
Nitrate-N	mg/L	0.1	5.2			
Nitrite-N	mg/L	0.012	DNQ			
Organic-N	mg/L	Calc	0.6			
Total-N	mg/L	0.5	5.8			
Total Phosphorus	mg/L	0.1	1.8			
Phosphate as P	mg/L	0.1	2.0			
Thallium	ug/L	0.1	ND			
Cyanide	ug/L	3	ND			
Dibromochloromethane	ug/L		*			
Dichlorobromomethane	ug/L		*			
Bis (2-ethylhexyl)phthalate	ug/L	3	ND			
Lindane	ug/L	0.01	ND			
Flow	MGD			16	18	18
Dissolved Oxygen	mg/L	0.1		9.8	10.2	9.1
pH	Units	0.1		7.8	7.9	7.8
Temperature	°F			63	65	66
Total Coliform	MPN/100mL	2		240	300	240
Fecal Coliform	MPN/100mL	2		50	50	130
Turbidity	NTU	0.1		0.3	0.4	0.6
Hardness	mg/L	2.5		399		

*No Chlorine is being used
Nitrite detected not quantified. Est. Conc. = 0.0046 mg/l

OJAI VALLEY SANITARY DISTRICT WWTP
MONTHLY EFFLUENT & RIVER STATIONS
August, 2006

Sample ID			Effluent	R-3	R-4	R-5
Date & Time Sampled: 8-9-06			0800	0820	0900	0800
Constituent	Units	RL				
Ammonia-N	mg/L	0.2	ND			
Nitrate-N	mg/L	0.1	5.4			
Nitrite-N	mg/L	0.012	DNQ[1]			
Organic-N	mg/L	0.5	0.5			
Total-N	mg/L	0.5	5.9			
Total Phosphorus	mg/L	0.1	1.8			
Phosphate as P	mg/L	0.1	1.8			
Thallium	ug/L	0.1	DNQ[2]			
Cyanide	ug/L	3	ND			
Dibromochloromethane	ug/L	0.5	*			
Dichlorobromomethane	ug/L	0.5	*			
Bis (2-ethylhexyl)phthalate	ug/L	3	ND			
Lindane	ug/L	0.01	ND			
Flow	MGD			16	18	18
Dissolved Oxygen	mg/L			9.6	11.0	10.6
pH	Units			7.5	7.8	7.4
Temperature	°F			61	64	64
Total Coliform	MPN/100mL			240	300	240
Fecal Coliform	MPN/100mL			80	80	23
Turbidity	NTU			0.7	0.5	0.7
Hardness	mg/L	2.5		368		

*No Chlorine is being used
DNQ - Detected but not Quantified
DNQ[1] = Less than reporting limit, Estimated concentration 0.0053 mg/l
DNQ[2] = Less than reporting limit, Estimated Concentration 0.08 ug/l

Table O-3A

OJAI VALLEY SANITARY DISTRICT WWTP
MONTHLY EFFLUENT & RIVER STATIONS
September, 2006

Sample ID			Effluent	R-3	R-4	R-5
Date & Time Sampled: 9-6-06			0900	0905	0845	0820
Constituent	Units	RL				
Ammonia-N	mg/L	0.2	ND			
Nitrate-N	mg/L	0.1	7.1			
Nitrite-N	mg/L	0.1	DNQ[1]			
Organic-N	mg/L	0.5	1.1			
Total-N	mg/L	0.2	8.2			
Total Phosphorus	mg/L	0.5	NT			
Phosphate as P	mg/L	0.17	3.5			
Thallium	ug/L	0.1	ND			
Cyanide	ug/L	3	DNQ[2]			
Dibromochloromethane	ug/L	0.5	*			
Dichlorobromomethane	ug/L	0.5	*			
Bis (2-ethylhexyl)phthalate	ug/L	3	ND			
Lindane	ug/L	0.05	ND			
Flow	MGD			19.0	21.0	21.0
Dissolved Oxygen	mg/L			10.0	9.2	9.8
pH	Units			7.8	8.0	7.8
Temperature	°F			65	67	67
Total Coliform	MPN/100mL			>1600	>1600	>1600
Fecal Coliform	MPN/100mL			>1600	>1600	>1600
Turbidity	NTU			0.7	0.6	1.2
Hardness	mg/L	2.5		371		

*No Chlorine is being used
DNQ = Detected, but Not Quantified
DNQ[1], Less Than Reporting Limit 0.012, Estimated Concentration 0.0052 ug/L
NT= Not Tested. Contract lab lost data.
DNQ[2] Less than reporting Limit of 3. Estimated concentration = 1.5 ug/L

OJAI VALLEY SANITARY DISTRICT WWTP
MONTHLY EFFLUENT & RIVER STATIONS
October, 2006

Sample ID			Effluent	R-3	R-4	R-5
Date & Time Sampled:	10/4/2006		0830	840	905	815
Constituent	Units	RL				
Ammonia-N	mg/L	0.2	ND			
Nitrate-N	mg/L	0.1	5.8			
Nitrite-N	mg/L	0.012	DNQ**			
Organic-N	mg/L	0.5	0.7			
Total-N	mg/L	0.2	6.5			
Total Phosphorus	mg/L	0.5	1.1			
Phosphate as P	mg/L	0.17	1.1			
Thallium	ug/L	0.1	DNQ***			
Cyanide	ug/L	3	DNQ****			
Dibromochloromethane	ug/L	0.5	*			
Dichlorobromomethane	ug/L	0.5	*			
Bis (2-ethylhexyl)phthalate	ug/L	5	ND			
Lindane	ug/L	0.01	ND			
Flow	MGD			12.0	14.0	14.0
Dissolved Oxygen	mg/L			8.7	9.4	9.6
pH	Units			7.6	7.8	7.6
Temperature	°F			58	60	62
Total Coliform	MPN/100mL			300	240	300
Fecal Coliform	MPN/100mL			30	80	80
Turbidity	NTU			0.7	0.7	0.7
Hardness	mg/L	2.5		391		

*No Chlorine is being used
**DNQ, Less Than Reporting Limit 0.012, Estimated Concentration 0.0045 ug/L
***DNQ, Less Than Reporting Limit 0.1, Estimated Concentration 0.03 ug/L
****DNQ, Less Than Reporting Limit 3.0, Estimated Concentration 2.5 ug/L

Table O-3A

OJAI VALLEY SANITARY DISTRICT WWTP
MONTHLY EFFLUENT & RIVER STATIONS
November, 2006

Sample ID			Effluent	R-3	R-4	R-5
Date & Time Sampled:	11/8/2006		0930	0850	0910	0830
Constituent	Units	RL				
Ammonia-N	mg/L	0.2	ND			
Nitrate-N	mg/L	0.1	7.2			
Nitrite-N	mg/L	0.012	0.057			
Organic-N	mg/L	0.5	0.8			
Total-N	mg/L		8.1			
Total Phosphorus	mg/L	0.1	2.0			
Phosphate as P	mg/L	0.1	1.78**			
Thallium	ug/L	0.1	ND			
Cyanide	ug/L	3	3.6			
Dibromochloromethane	ug/L	0.5	*			
Dichlorobromomethane	ug/L	0.5	*			
Bis (2-ethylhexyl)phthalate	ug/L	3	ND			
Lindane	ug/L	0.01	ND			
Flow	MGD			8.2	10.5	10.5
Dissolved Oxygen	mg/L			10.3	10.9	10.6
pH	Units			7.8	8.0	7.6
Temperature	^{o}F			59	61	60
Total Coliform	MPN/100mL			170	1600	220
Fecal Coliform	MPN/100mL			50	220	220
Turbidity	NTU			0.7	0.7	0.6
Hardness	mg/L	2.5		423		

*No Chlorine is being used
** Monthly Average based on 5 samples taken weekly.

OJAI VALLEY SANITARY DISTRICT WWTP
MONTHLY EFFLUENT & RIVER STATIONS
December, 2006

Sample ID			Effluent	R-3	R-4	R-5
Date & Time Sampled:	12/6/2006		0800	0840	0825	0800
Constituent	Units	RL				
Ammonia-N	mg/L	0.2	ND			
Nitrate-N	mg/L	0.1	7.4			
Nitrite-N	mg/L	0.012	0.035			
Organic-N	mg/L	0.5	ND			
Total-N	mg/L		7.4			
Total Phosphorus	mg/L	0.1	1.5			
Phosphate as P	mg/L	0.1	1.5			
Thallium	ug/L	0.1	ND			
Cyanide	ug/L	3	DNQ*			
Dibromochloromethane	ug/L	0.5	*			
Dichlorobromomethane	ug/L	0.5	*			
Bis (2-ethylhexyl)phthalate	ug/L	3	ND			
Lindane	ug/L	0.01	ND			
Flow	MGD			8.5	10.5	10.5
Dissolved Oxygen	mg/L			11.1	11.2	9.8
pH	Units			7.8	7.9	7.6
Temperature	^{o}F			46	48	53
Total Coliform	MPN/100mL			300	900	500
Fecal Coliform	MPN/100mL			30	500	300
Turbidity	NTU			0.6	0.6	0.5
Hardness	mg/L	2.5		419		

*No Chlorine is being used
*DNQ,Less ThanReporting Limit 3.0, Estimated Concentration 1.9 ug/L

Table O-3A

OJAI VALLEY SANITARY DISTRICT WWTP
Monthly Effluent & River Stations
January, 2007

Sample ID			Effluent	R-3	R-4	R-5
Date & Time Sampled: 1-3-07			0945	0825	0845	0820
Constituent	Units	RL				
Ammonia-N	mg/L	0.2	0.2			
Nitrate-N	mg/L	0.1	7.4			
Nitrite-N	mg/L	0.012	DNQ[1]			
Organic-N	mg/L	0.5	0.5			
Total-N	mg/L		8.1			
Total Phosphorus	mg/L	0.1	1.2			
Phosphate as P	mg/L	0.1	0.7			
Thallium	ug/L	0.1	ND			
Cyanide	ug/L	3	DNQ[2]			
Dibromochloromethane	ug/L	NA	*			
Dichlorobromomethane	ug/L	NA	*			
Bis (2-ethylhexyl)phthalate	ug/L	3	ND			
Lindane	ug/L	0.01	ND			
Flow	MGD			7	9	9
Dissolved Oxygen	mg/L	0.1		10.8	10.6	8.2
pH	Units	0.1		7.9	8.0	7.6
Temperature	°F			48	50	53
Total Coliform	MPN/100mL	2		110	500	300
Fecal Coliform	MPN/100mL	2		70	80	130
Turbidity	NTU	0.2		0.7	0.6	0.5
Hardness	mg/L	2.5		416		

*No Chlorine is being used
DNQ = Detected, but Not Quantified
DNQ[1], Less Than Reporting Limit 0.012, Estimated Nitrite Concentration 0.006 mg/L
DNQ[2], Less Than Reporting Limit 3, Estimated Cyanide Concentration 2.9 mg/L

OJAI VALLEY SANITARY DISTRICT WWTP
Monthly Effluent & River Stations
February, 2007

Sample ID			Effluent	R-3	R-4	R-5
Date & Time Sampled: 2-7-07			0930	0835	0900	0815
Constituent	Units	RL				
Ammonia-N	mg/L	0.2	**			
Nitrate-N	mg/L	0.4	6.5			
Nitrite-N	mg/L	0.012	ND			
Organic-N	mg/L		**			
Total-N	mg/L		**			
Total Phosphorus	mg/L	0.1	**			
Phosphate as P	mg/L	0.1	1.9			
Thallium	ug/L	0.1	DNQ[1]			
Cyanide	ug/L	3	ND			
Dibromochloromethane	ug/L	NA	*			
Dichlorobromomethane	ug/L	NA	*			
Bis (2-ethylhexyl)phthalate	ug/L	3	ND			
Lindane	ug/L	0.01	ND			
Flow	MGD			6.0	8.0	8.0
Dissolved Oxygen	mg/L	0.1		14.2	13.8	13.5
pH	Units	0.1		7.8	7.9	7.4
Temperature	°F			48	50	53
Total Coliform	MPN/100mL	2		1600	300	300
Fecal Coliform	MPN/100mL	2		500	130	80
Turbidity	NTU	0.2		0.9	0.7	0.6
Hardness	mg/L	2.5		404		

*No Chlorine is being used
** Tests not run due to contract lab error. Did not find out tests not run untill March.
DNQ = Detected, but Not Quantified RL = Reporting Limit
DNQ[1], Less than reporting limit 0.1 ug/L, estimated concentration 0.01 ug/L

Table O-3A

OJAI VALLEY SANITARY DISTRICT WWTP
MONTHLY EFFLUENT & RIVER STATIONS
MARCH, 2007

Sample ID			Effluent	R-3	R-4	R-5
Date & Time Sampled: 3-7-07			800	850	915	830
Constituent	Units	RL				
Ammonia-N	mg/L	0.2	ND			
Nitrate-N	mg/L	0.1	5.5			
Nitrite-N	mg/L	0.012	ND			
Organic-N	mg/L		0.9			
Total-N	mg/L		6.4			
Total Phosphorus	mg/L	0.1	2.0			
Phosphate as P	mg/L	0.1	1.7			
Thallium	ug/L	0.1	ND			
Cyanide	ug/L	3	DNQ			
Dibromochloromethane	ug/L		*			
Dichlorobromomethane	ug/L		*			
Bis (2-ethylhexyl)phthalate	ug/L	3	8.9			
Lindane	ug/L	0.01	ND			
Flow	MGD			8	10	10
Dissolved Oxygen	mg/L	0.1		10.4	9.2	9.4
pH	Units	0.1		7.6	7.7	7.5
Temperature	°F			60	61	63
Total Coliform	MPN/100mL	2		300	900	900
Fecal Coliform	MPN/100mL	2		70	300	110
Turbidity	NTU	0.2		1.0	0.9	4.2
Hardness	mg/L	2.5		448		

*No Chlorine is being used
ND = Non Detect
DNQ = Detected Not Quantified
Cyanide DNQ: Less Than Reporting Limit 3 ug/l, Estimated Concentration 1.6 ug/L

OJAI VALLEY SANITARY DISTRICT WWTP
MONTHLY EFFLUENT & RIVER STATIONS
April, 2007

Sample ID			Effluent	R-3	R-4	R-5
Date & Time Sampled: 4-11-07			0930	0830	0850	0810
Constituent	Units	RL				
Ammonia-N	mg/L	0.2	0.4			
Nitrate-N	mg/L	0.1	5.2			
Nitrite-N	mg/L	0.012	ND			
Organic-N	mg/L		ND			
Total-N	mg/L		5.6			
Total Phosphorus	mg/L	0.1	3.3			
Phosphate as P	mg/L	0.1	0.5			
Thallium	ug/L	0.1	DNQ			
Cyanide	ug/L	3	DNQ			
Dibromochloromethane	ug/L		*			
Dichlorobromomethane	ug/L		*			
Bis (2-ethylhexyl)phthalate	ug/L	3	ND**			
Lindane	ug/L	0.05	ND			
Flow	MGD			7	9	9
Dissolved Oxygen	mg/L	0.1		10.3	9.6	8.6
pH	Units	0.1		7.6	7.7	7.3
Temperature	°F	20		54	58	58
Total Coliform	MPN/100mL	2		300	900	300
Fecal Coliform	MPN/100mL	2		80	110	300
Turbidity	NTU	0.2		0.6	0.6	0.6
Hardness	mg/L	2.5		491		

*No Chlorine is being used
DNQ = Detected, but Not Quantified
** From median of 3 samples as per SIP section 2.4.5
Thallium - DNQ, Less than reporting limit of 0.1, Estimated Concentration 0.03 ug/L
CN - DNQ, Less than reporting limit of 3, Estimated Concentration 1.6 ug/L

Table O-3A

OJAI VALLEY SANITARY DISTRICT WWTP
MONTHLY EFFLUENT & RIVER STATIONS
MAY, 2007

Sample ID			Effluent	R-3	R-4	R-5
Date & Time Sampled: 5-9-07			1000	0830	0850	0815
Constituent	Units	RL				
Ammonia-N	mg/L	0.2	ND			
Nitrate-N	mg/L	0.1	5.6			
Nitrite-N	mg/L	0.002	ND			
Organic-N	mg/L	Calc	0.9			
Total-N	mg/L	0.5	6.5			
Total Phosphorus	mg/L	0.1	0.8			
Phosphate as P	mg/L	0.02	0.7			
Thallium	ug/L	0.1	0.2			
Cyanide (CN)	ug/L	3	ND			
Dibromochloromethane	ug/L		*			
Dichlorobromomethane	ug/L		*			
Bis (2-ethylhexyl)phthalate	ug/L	3	ND**			
Lindane	ug/L	0.01	ND			
Flow	MGD			7.7	9.6	9.6
Dissolved Oxygen	mg/L	0.1		10.1	9.5	8.0
pH	Units	0.1		7.4	7.5	7.0
Temperature	^{o}F			60	63	62
Total Coliform	MPN/100mL	2		80	1600	900
Fecal Coliform	MPN/100mL	2		23	130	170
Turbidity	NTU	0.1		0.42	0.56	0.48
Hardness	mg/L	2.5		409		

*No Chlorine is being used
DNQ = Detected, but Not Quantified
** = Results are the mean of 2 results in May calculated as instructed by the SIP

OJAI VALLEY SANITARY DISTRICT WWTP
MONTHLY EFFLUENT & RIVER STATIONS
June, 2007

Sample ID			Effluent	R-3	R-4	R-5
Date & Time Sampled: 6-6-07			0730	0840	0900	0820
Constituent	Units	RL	Results			
Ammonia-N	mg/L	0.2	ND			
Nitrate-N	mg/L	0.1	4.7			
Nitrite-N	mg/L	0.012	ND			
Organic-N	mg/L	Calc	0.8			
Total-N	mg/L	0.5	5.5			
Total Phosphorus	mg/L	0.1	1.0**			
Phosphate as P	mg/L	0.1	0.4			
Thallium	ug/L	0.1	ND			
Cyanide	ug/L	0.8	ND			
Dibromochloromethane	ug/L		*			
Dichlorobromomethane	ug/L		*			
Bis (2-ethylhexyl)phthalate	ug/L	0.6	ND			
Lindane	ug/L	0.003	ND			
Flow	MGD			8	10	10
Dissolved Oxygen	mg/L	0.1		10.3	10.6	7.5
pH	Units	0.1		7.7	7.8	7.3
Temperature	^{o}F			63	64	64
Total Coliform	MPN/100mL	2		500	1600	>1600
Fecal Coliform	MPN/100mL	2		50	500	50
Turbidity	NTU	0.1		0.45	0.56	0.63
Hardness	mg/L	2.5		392		

*No Chlorine is being used
** Average of three tests

Table O-3A

OJAI VALLEY SANITARY DISTRICT WWTP
MONTHLY EFFLUENT & RIVER STATIONS
July, 2007

Sample ID			Effluent	R-3	R-4	R-5
Date & Time Sampled: 7-5-07				0835	0900	0820
Constituent	Units	RL				
Ammonia-N	mg/L	0.2	ND			
Nitrate-N	mg/L	0.1	5.9			
Nitrite-N	mg/L	0.012	ND			
Organic-N	mg/L	Calc	**			
Total-N	mg/L	0.5	**			
Total Phosphorus	mg/L	0.1	2.18***			
Phosphate as P	mg/L	0.1	1.5			
Thallium	ug/L	0.1	ND			
Cyanide	ug/L	3	DNQ			
Dibromochloromethane	ug/L		*			
Dichlorobromomethane	ug/L		*			
Bis (2-ethylhexyl)phthalate	ug/L	3	ND			
Lindane	ug/L	0.01	ND			
Flow	MGD			5	7	7
Dissolved Oxygen	mg/L	0.1		10.2	9.7	7.7
pH	Units	0.1		7.6	7.7	7.4
Temperature	°F			64	68	67
Total Coliform	MPN/100mL	2		900	900	900
Fecal Coliform	MPN/100mL	2		50	70	50
Turbidity	NTU	0.1		0.5	0.7	1.0
Hardness	mg/L	2.5		401		

*No Chlorine is being used
**TKN was not tested within holding time due to lab error. Data not valid.
*** Average of 4 samples.
CN - DNQ, Less than reporting limit of 3, Estimated Concentration 1.2 ug/L

OJAI VALLEY SANITARY DISTRICT WWTP
MONTHLY EFFLUENT & RIVER STATIONS
August, 2007

Sample ID			Effluent	R-3	R-4	R-5
Date & Time Sampled: 8-8-07			0700	0845	0920	0815
Constituent	Units	RL				
Ammonia-N	mg/L	0.1	ND			
Nitrate-N	mg/L	0.1	7.5			
Nitrite-N	mg/L	0.1	ND			
Organic-N	mg/L	0.1	0.9			
Total-N	mg/L	0.5	8.4			
Total Phosphorus	mg/L	0.1	3.35**			
Phosphate as P	mg/L	0.1	2.9			
Thallium	ug/L	0.1	ND			
Cyanide	ug/L	3	ND			
Dibromochloromethane	ug/L	0.5	*			
Dichlorobromomethane	ug/L	0.5	*			
Bis (2-ethylhexyl)phthalate	ug/L	3	ND			
Lindane	ug/L	0.01	ND			
Flow	MGD			3.9	5.8	5.8
Dissolved Oxygen	mg/L			8.8	9.2	7.0
pH	Units			7.7	7.8	7.5
Temperature	°F			66	69	67
Total Coliform	MPN/100mL			500	1600	>1600
Fecal Coliform	MPN/100mL			30	900	110
Turbidity	NTU			0.8	0.8	0.9
Hardness	mg/L	2.5		432		

*No Chlorine is being used
**Two sample average

Table O-3A

OJAI VALLEY SANITARY DISTRICT WWTP
MONTHLY EFFLUENT & RIVER STATIONS
September, 2007

Sample ID			Effluent	R-3	R-4	R-5
9/5/2007			0715	0855	0915	0840
Constituent	Units	RL				
Ammonia-N	mg/L	0.2	0.2			
Nitrate-N	mg/L	0.1	5.5			
Nitrite-N	mg/L	0.1	ND			
Organic-N	mg/L	0.5	0.4			
Total-N	mg/L	0.2	6.1			
Total Phosphorus	mg/L	0.5	3.9			
Phosphate as P	mg/L	0.17	3.8			
Thallium	ug/L	0.1	ND			
Cyanide	ug/L	3	ND			
Dibromochloromethane	ug/L	0.5	*			
Dichlorobromomethane	ug/L	0.5	*			
Bis (2-ethylhexyl)phthalate	ug/L	3	ND			
Lindane	ug/L	0.05	ND			
Flow	MGD			2.3	4.2	4.2
Dissolved Oxygen	mg/L			7.4	8.3	6.2
pH	Units			7.5	7.6	7.3
Temperature	°F			66	68	71
Total Coliform	MPN/100mL			1600	>1600	>1600
Fecal Coliform	MPN/100mL			80	500	130
Turbidity	NTU			0.7	0.8	0.8
Hardness	mg/L	2.5		394		

*No Chlorine is being used

OJAI VALLEY SANITARY DISTRICT WWTP
MONTHLY EFFLUENT & RIVER STATIONS
October, 2007

Sample ID			Effluent	R-3	R-4	R-5
Date & Time Sampled:	10/3/2007		0830	0830	0815	0850
Constituent	Units	RL				
Ammonia-N	mg/L	0.1	ND			
Nitrate-N	mg/L	0.1	6.6			
Nitrite-N	mg/L	0.012	DNQ**			
Organic-N	mg/L	0.1	1.0			
Total-N	mg/L	0.2	7.6			
Total Phosphorus	mg/L	0.5	3.1			
Phosphate as P	mg/L	0.17	3.1			
Thallium	ug/L	0.1	ND			
Cyanide	ug/L	3	DNQ***			
Dibromochloromethane	ug/L	0.5	*			
Dichlorobromomethane	ug/L	0.5	*			
Bis (2-ethylhexyl)phthalate	ug/L	5	ND			
Lindane	ug/L	0.01	ND			
Flow	MGD			1.7	3.5	3.5
Dissolved Oxygen	mg/L			8.5	10.0	7.4
pH	Units			7.4	7.5	7.1
Temperature	°F			57	62	64
Total Coliform	MPN/100mL			>1600	>1600	>1600
Fecal Coliform	MPN/100mL			240	>1600	240
Turbidity	NTU			0.7	1.0	0.5
Hardness	mg/L	2.5		499		

*No Chlorine is being used
**DNQ, Less Than Reporting Limit 0.012, Estimated Concentration 0.0039 ug/L
***DNQ, Less Than Reporting Limit 3.0, Estimated Concentration 1.8 ug/L

Table O-3A

OJAI VALLEY SANITARY DISTRICT WWTP
MONTHLY EFFLUENT & RIVER STATIONS
November, 2007

Sample ID			Effluent	R-3	R-4	R-5
Date & Time Sampled:	11/7/2007		800	820	845	805
Constituent	Units	RL				
Ammonia-N	mg/L	0.1	ND			
Nitrate-N	mg/L	0.1	6.5**			
Nitrite-N	mg/L	0.012	ND			
Organic-N	mg/L	0.5	0.8			
Total-N	mg/L		7.3			
Total Phosphorus	mg/L	0.1	3.2			
Phosphate as P	mg/L	0.1	3.1			
Thallium	ug/L	0.1	ND			
Cyanide	ug/L	3	DNQ			
Dibromochloromethane	ug/L	0.5	*			
Dichlorobromomethane	ug/L	0.5	*			
Bis (2-ethylhexyl)phthalate	ug/L	3	ND			
Lindane	ug/L	0.01	ND			
Flow	MGD			1.0	2.9	2.9
Dissolved Oxygen	mg/L			8.7	9.1	7.1
pH	Units			7.5	7.6	7.3
Temperature	°F			56	60	62
Total Coliform	MPN/100mL			>1600	>1600	1600
Fecal Coliform	MPN/100mL			900	500	130
Turbidity	NTU			3.5	2.2	1.0
Hardness	mg/L	2.5		478		

*No Chlorine is being used
** Monthly Average based on 2 samples
Effluent cyanide = 0.88 ug/l estimated concentration

OJAI VALLEY SANITARY DISTRICT WWTP
MONTHLY EFFLUENT & RIVER STATIONS
December, 2007

Ojai Valley Sanitary District
Monthly Effluent and River Stations
December 2007

Sample ID			Effluent	R-3	R-4	R-5
Date & Time Sampled:	12/5/2007		0800	0820	0840	0800
Constituent	Units	RL				
Ammonia-N	mg/L	0.2	ND			
Nitrate-N	mg/L	0.1	4.3			
Nitrite-N	mg/L	0.03	ND			
Organic-N	mg/L	0.5	0.5			
Total-N	mg/L		4.8			
Total Phosphorus	mg/L	0.1	0.5			
Phosphate as P	mg/L	0.1	0.4			
Thallium	ug/L	0.1	ND			
Cyanide	ug/L	3	ND			
Dibromochloromethane	ug/L	0.5	*			
Dichlorobromomethane	ug/L	0.5	*			
Bis (2-ethylhexyl)phthalate	ug/L	3	ND			
Lindane	ug/L	0.01	ND			
Flow	MGD			0.7	2.5	2.5
Dissolved Oxygen	mg/L			9.4	10.2	8.4
pH	Units			7.5	7.6	7.3
Temperature	°F			52	57	59
Total Coliform	MPN/100mL			900	>1600	1600
Fecal Coliform	MPN/100mL			50	80	130
Turbidity	NTU			1.0	1.1	0.8
Hardness	mg/L	2.5		458		

*No Chlorine is being used

Table O-3A

OJAI VALLEY SANITARY DISTRICT WWTP
Monthly Effluent & River Stations
January, 2008

Sample ID				Effluent	R-3	R-4	R-5
Date & Time Sampled: 1-16-08				0800	0840	0905	0820
Constituent	Units	RL	MDL				
Ammonia-N	mg/L	0.1	0.04	ND			
Nitrate-N	mg/L	0.1	0.01	4.6			
Nitrite-N	mg/L	0.03	0.004	DNQ[1]			
Organic-N	mg/L	0.1	0.08	1.0			
Total-N	mg/L			5.6			
Total Phosphorus	mg/L	0.1	0.01	1.5			
Phosphate as P	mg/L	0.1	0.018	1.4			
Thallium	ug/L	0.1	0.04	ND			
Cyanide	ug/L	3	0.8	DNQ[2]			
Dibromochloromethane	ug/L	NA	NA	*			
Dichlorobromomethane	ug/L	NA	NA	*			
Bis (2-ethylhexyl)phthalate	ug/L	3	0.6	DNQ[3]			
Lindane	ug/L	0.01	0.002	ND			
Flow	MGD				5	7	7
Dissolved Oxygen	mg/L	0.1	0.1		11.2	11.4	11.1
pH	Units	0.1	0.1		7.6	7.7	7.5
Temperature	°F				47	49	50
Total Coliform	MPN/100mL	2	2		900	900	280
Fecal Coliform	MPN/100mL	2	2		11	80	80
Turbidity	NTU	0.2	0.003		0.4	0.9	0.7
Hardness	mg/L	20	15		500		

*No Chlorine is being used
DNQ = Detected, but Not Quantified
DNQ[1], Less Than Reporting Limit 0.03, Estimated Nitrite Concentration 0.0070 mg/L
DNQ[2], Less Than Reporting Limit 3, Estimated Cyanide Concentration 2.2 mg/L
DNQ[3], Less Than Reporting Limit 3, Estimated Cyanide Concentration 1.84 mg/L. 1.69 mg/l detected in blank

OJAI VALLEY SANITARY DISTRICT WWTP
Monthly Effluent & River Stations
February, 2008

Sample ID				Effluent	R-3	R-4	R-5
Date & Time Sampled: 2-6-08				1000	0830	0915	0805
Constituent	Units	RL	MDL				
Ammonia-N	mg/L	0.1	0.04	ND			
Nitrate-N	mg/L	0.1	0.01	4.1			
Nitrite-N	mg/L	0.03	0.004	DNQ[1]			
Organic-N	mg/L	0.1	0.08	0.58			
Total-N	mg/L			4.7			
Total Phosphorus	mg/L	0.1	0.01	1.4			
Phosphate as P	mg/L	0.1	0.018	1.4			
Thallium	ug/L	0.1	0.04	ND			
Cyanide	ug/L	3	0.8	DNQ[2]			
Dibromochloromethane	ug/L	NA	NA	*			
Dichlorobromomethane	ug/L	NA	NA	*			
Bis (2-ethylhexyl)phthalate	ug/L	3	0.6	DNQ[3]			
Lindane	ug/L	0.01	0.002	ND			
Flow	MGD				64	67	67
Dissolved Oxygen	mg/L	0.1	0.1		11.1	10.8	10.7
pH	Units	0.1	0.1		7.8	8.0	7.6
Temperature	°F				48	51	51
Total Coliform	MPN/100mL	2	2		130	80	170
Fecal Coliform	MPN/100mL	2	2		50	30	80
Turbidity	NTU	0.2	0.003		0.7	0.9	0.9
Hardness	mg/L	20	15		430		

*No Chlorine is being used
DNQ = Detected, but Not Quantified RL = Reporting Limit
DNQ[1] =Estimated concentration 0.0060 mg/L
DNQ[2] = Estimated concentration 1.6 ug/L
DNQ[3] = Estimated concentration 0.9 ug/L

Table O-3A

OJAI VALLEY SANITARY DISTRICT WWTP
MONTHLY EFFLUENT & RIVER STATIONS
MARCH, 2008

Sample ID				Effluent	R-3	R-4	R-5
Date & Time Sampled: 3-5-08				800	830	900	810
Constituent	Units	RL	MDL				
Ammonia-N	mg/L	0.1	0.04	ND			
Nitrate-N	mg/L	0.1	0.01	5.1			
Nitrite-N	mg/L	0.03	0.004	DNQ			
Organic-N	mg/L	0.1	0.08	0.9			
Total-N	mg/L			6.0			
Total Phosphorus	mg/L	0.1	0.01	1.7			
Phosphate as P	mg/L	0.1	0.018	1.7			
Thallium	ug/L	0.1	0.04	ND			
Cyanide	ug/L	3	0.8	DNQ			
Dibromochloromethane	ug/L	NA	NA	*			
Dichlorobromomethane	ug/L	NA	NA	*			
Bis (2-ethylhexyl)phthalate	ug/L	3	0.6	ND			
Lindane	ug/L	0.01	0.002	ND			
Flow	MGD				53	55	55
Dissolved Oxygen	mg/L	0.1	0.1		11.5	12.0	11.1
pH	Units	0.1	0.1		7.9	8.2	7.6
Temperature	°F				52	54	54
Total Coliform	MPN/100mL	2	2		300	140	80
Fecal Coliform	MPN/100mL	2	2		4	23	23
Turbidity	NTU	0.2	0.003		0.8	0.8	0.8
Hardness	mg/L	20	15		490		

*No Chlorine is being used
ND = Non Detect
DNQ = Detected Not Quantified
Cyanide DNQ: Less Than Reporting Limit 3 ug/l, Estimated Concentration 1.1 ug/L
Nitrite Estimated Concentration = 0.006 mg/l

OJAI VALLEY SANITARY DISTRICT WWTP
MONTHLY EFFLUENT & RIVER STATIONS
April, 2008

Sample ID				Effluent	R-3	R-4	R-5
Date & Time Sampled: 4-09-08				0815	0845	0920	0830
Constituent	Units	RL	MDL				
Ammonia-N	mg/L	0.1	0.04	DNQ			
Nitrate-N	mg/L	0.1	0.01	4.9			
Nitrite-N	mg/L	0.03	0.004	ND			
Organic-N	mg/L	0.1	0.08	0.8			
Total-N	mg/L			5.7			
Total Phosphorus	mg/L	0.1	0.02	1.9			
Phosphate as P	mg/L	0.1	0.018	1.8			
Thallium	ug/L	0.1	0.04	ND			
Cyanide	ug/L	3	0.8	DNQ			
Dibromochloromethane	ug/L	NA	NA	*			
Dichlorobromomethane	ug/L	NA	NA	*			
Bis (2-ethylhexyl)phthalate	ug/L	3	0.6	ND			
Lindane	ug/L	0.01	0.002	ND			
Flow	MGD				29	31	31
Dissolved Oxygen	mg/L	0.1	0.1		10.2	12.0	9.9
pH	Units	0.1	0.1		7.6	8.0	7.3
Temperature	°F				55	56	57
Total Coliform	MPN/100mL	2	2		300	900	140
Fecal Coliform	MPN/100mL	2	2		8	50	17
Turbidity	NTU	0.2	0.003		0.4	0.3	0.6
Hardness	mg/L	20	15		460		

*No Chlorine is being used
DNQ = Detected, but Not Quantified
Ammonia -N: DNQ, Less than reporting limit of 0.1, Estimated Concentration 0.077 ug/L
CN - DNQ, Less than reporting limit of 3, Estimated Concentration 0.9 ug/L

Table O-3A

OJAI VALLEY SANITARY DISTRICT WWTP
MONTHLY EFFLUENT & RIVER STATIONS
MAY, 2008

Sample ID				Effluent	R-3	R-4	R-5
Date & Time Sampled: 5-7-08				0800	0840	0910	0825
Constituent	Units	RL	MDL				
Ammonia-N	mg/L	0.1	0.04	ND			
Nitrate-N	mg/L	0.1	0.01	3.5			
Nitrite-N	mg/L	0.03	0.004	DNQ			
Organic-N	mg/L	0.1	0.06	0.7			
Total-N	mg/L			4.2			
Total Phosphorus	mg/L	0.1	0.01	1.4			
Phosphate as P	mg/L	0.1	0.018	0.6			
Thallium	ug/L	0.1	0.02	ND			
Cyanide (CN)	ug/L	3	0.8	ND			
Dibromochloromethane	ug/L	NA	NA	*			
Dichlorobromomethane	ug/L	NA	NA	*			
Bis (2-ethylhexyl)phthalate	ug/L	3	0.6	ND			
Lindane	ug/L	0.01	0.002	ND			
Flow	MGD				27	29	29
Dissolved Oxygen	mg/L	0.1	0.1		9.8	10	9.6
pH	Units	0.1	0.1		7.6	7.7	7.4
Temperature	°F				60	61	63
Total Coliform	MPN/100mL	2	2		80	170	110
Fecal Coliform	MPN/100mL	2	2		27	33	21
Turbidity	NTU	0.2	0.003		0.36	0.30	0.36
Hardness	mg/L	20	15		490		

*No Chlorine is being used
DNQ = Detected, but Not Quantified
Nitrite Estimated Concentration = 0.005 mg/l

OJAI VALLEY SANITARY DISTRICT WWTP
MONTHLY EFFLUENT & RIVER STATIONS
June, 2008

Sample ID				Effluent	R-3	R-4	R-5
Date & Time Sampled: 6-4-08				0930	0835	0905	0820
Constituent	Units	RL	MDL	Results			
Ammonia-N	mg/L	0.1	0.04	0.14			
Nitrate-N	mg/L	0.1	0.01	3.7			
Nitrite-N	mg/L	0.03	0.004	DNQ			
Organic-N	mg/L	0.1	0.06	0.6			
Total-N	mg/L			4.4			
Total Phosphorus	mg/L	0.1	0.01	1.4			
Phosphate as P	mg/L	0.1	0.018	0.8			
Thallium	ug/L	0.1	0.02	ND			
Cyanide	ug/L	3	0.8	DNQ			
Dibromochloromethane	ug/L	NA	NA	*			
Dichlorobromomethane	ug/L	NA	NA	*			
Bis (2-ethylhexyl)phthalate	ug/L	3	0.6	DNQ			
Lindane	ug/L	0.01	0.002	ND			
Flow	MGD				16	18	18
Dissolved Oxygen	mg/L	0.1	0.1		8.5	9.6	8.9
pH	Units	0.1	0.1		7.6	7.8	7.3
Temperature	°F				60	61	62
Total Coliform	MPN/100mL	2	2		350	540	140
Fecal Coliform	MPN/100mL	2	2		23	79	17
Turbidity	NTU	0.2	0.003		0.90	1.04	1.08
Hardness	mg/L	20	15		500		

*No Chlorine is being used
Nitrite Estimated Concentration = 0.007 mg/l
CN - DNQ, Less than reporting limit of 3, Estimated Concentration 0.92 ug/L
Bis(2-Ethylhexyl)phthalate Estimated Concentration = 0.601 ug/l

Table O-3A

OJAI VALLEY SANITARY DISTRICT WWTP
MONTHLY EFFLUENT & RIVER STATIONS
July, 2008

Sample ID				Effluent	R-3	R-4	R-5
Date & Time Sampled: 7-2-08					0835	0900	815
Constituent	Units	RL	MDL				
Ammonia-N	mg/L	0.1	0.04	DNQ			
Nitrate-N	mg/L	0.1	0.01	3.1			
Nitrite-N	mg/L	0.03	0.004	DNQ			
Organic-N	mg/L	0.1	0.06	0.5			
Total-N	mg/L			3.8			
Total Phosphorus	mg/L	0.1	0.01	1.2			
Phosphate as P	mg/L	0.1	0.018	1.1			
Thallium	ug/L	0.1	0.02	ND			
Cyanide	ug/L	3	0.8	DNQ			
Dibromochloromethane	ug/L	NA	NA	*			
Dichlorobromomethane	ug/L	NA	NA	*			
Bis (2-ethylhexyl)phthalate	ug/L	3	0.6	ND			
Lindane	ug/L	0.01	0.002	ND			
Flow	MGD				13	15	15
Dissolved Oxygen	mg/L	0.1	0.1		10.6	9.1	8.1
pH	Units	0.1	0.1		7.4	7.7	7.3
Temperature	°F				65	66	66
Total Coliform	MPN/100mL	2	2		1600	110	900
Fecal Coliform	MPN/100mL	2	2		350	50	900
Turbidity	NTU	0.2	0.003		0.9	1.4	1.1
Hardness	mg/L	20	15		480		

*No Chlorine is being used
Est Conc Nitrite = 0.0040 mg/l
Est Conc Ammonia-N = 0.077 mg/l
Estimated Concentration Cyanide = 0.91 ug/L

OJAI VALLEY SANITARY DISTRICT WWTP
MONTHLY EFFLUENT & RIVER STATIONS
August, 2008

Sample ID				Effluent	R-3	R-4	R-5
Date & Time Sampled: 8-6-08				0900	0830	0900	0810
Constituent	Units	RL					
Ammonia-N	mg/L	0.1		DNQ			
Nitrate-N	mg/L	0.1		4.2			
Nitrite-N	mg/L	0.1		DNQ			
Organic-N	mg/L	0.1		0.8			
Total-N	mg/L	0.5		5.0			
Total Phosphorus	mg/L	0.1		1.0			
Phosphate as P	mg/L	0.1		0.9			
Thallium	ug/L	0.1		ND			
Cyanide	ug/L	3		DNQ			
Dibromochloromethane	ug/L	0.5		*			
Dichlorobromomethane	ug/L	0.5		*			
Bis (2-ethylhexyl)phthalate	ug/L	3		ND			
Lindane	ug/L	0.01		ND			
Flow	MGD				9.2	11.1	11.1
Dissolved Oxygen	mg/L				8.6	9.9	8.4
pH	Units				7.7	7.9	7.4
Temperature	°F				67	69	69
Total Coliform	MPN/100mL				300	900	1600
Fecal Coliform	MPN/100mL				30	140	130
Turbidity	NTU				1.2	1.7	1.4
Hardness	mg/L	2.5			470		

*No Chlorine is being used
Est Conc Ammonia-N = 0.066 mg/l
Est Conc Nitrite = 0.007 mg/l
Estimated Concentration Cyanide = 2.1 ug/L

Table O-3A

OJAI VALLEY SANITARY DISTRICT WWTP
MONTHLY EFFLUENT & RIVER STATIONS
September, 2008

Sample ID				Effluent	R-3	R-4	R-5
9/3/2008				0730	0810	0830	0750
Constituent	Units	RL	MDL				
Ammonia-N	mg/L	0.1	0.05	ND			
Nitrate-N	mg/L	0.1	0.02	5.1			
Nitrite-N	mg/L	0.03	0.002	ND			
Organic-N	mg/L	0.1	0.06	0.9			
Total-N	mg/L	0.2		6.0			
Total Phosphorus	mg/L	0.1	0.01	0.5			
Phosphate as P	mg/L	0.17	0.018	0.8			
Dibromochloromethane	ug/L	NA	NA	*			
Dichlorobromomethane	ug/L	NA	NA	*			
Bis (2-ethylhexyl)phthalate	ug/L	3	0.95	ND			
Flow	MGD				8.4	10.3	10.3
Dissolved Oxygen	mg/L	0.1	0.1		7.6	8.8	7.6
pH	Units	0.1	0.1		7.4	7.9	7.4
Temperature	°F				62	65	65
Total Coliform	MPN/100mL	2	2		1600	>1600	>1600
Fecal Coliform	MPN/100mL	2	2		50	300	500
Turbidity	NTU	0.2	0.003		0.6	0.7	0.6
Hardness	mg/L	5	3	360	450		

*No Chlorine is being used

OJAI VALLEY SANITARY DISTRICT WWTP
MONTHLY EFFLUENT & RIVER STATIONS

Sample ID				Effluent	R-3	R-4	R-5
Date & Time Sampled:	10/8/2008			0830	0830	0815	0850
Constituent	Units	RL	MDL				
Ammonia-N	mg/L	0.1	0.05	ND			
Nitrate-N	mg/L	0.1	0.02	5.2			
Nitrite-N	mg/L	0.03	0.002	DNQ**			
Organic-N	mg/L	0.1	0.06	1.0			
Total-N	mg/L	0.2		6.2			
Total Phosphorus	mg/L	0.1	0.01	0.24			
Phosphate as P	mg/L	0.17	0.018	0.16			
Dibromochloromethane	ug/L	NA	NA	*			
Dichlorobromomethane	ug/L	NA	NA	*			
Bis (2-ethylhexyl)phthalate	ug/L	3	0.95	ND			
Flow	MGD				3.7	5.5	5.5
Dissolved Oxygen	mg/L	0.1	0.1		8.6	8.6	8.1
pH	Units	0.1	0.1		7.7	8.0	7.6
Temperature	°F				62	63	65
Total Coliform	MPN/100mL	2	2		500	>1600	1600
Fecal Coliform	MPN/100mL	2	2		80	170	170
Turbidity	NTU	0.2	0.003		0.7	0.8	0.6
Hardness	mg/L	5	3	340	420		

*No Chlorine is being used
**DNQ, Less Than Reporting Limit 0.03, Estimated Concentration 0.008 ug/L

Table O-3A

OJAI VALLEY SANITARY DISTRICT WWTP
MONTHLY EFFLUENT & RIVER STATIONS
November, 2008

Sample ID				Effluent	R-3	R-4	R-5
Date & Time Sampled:	11/13/2008			845	835	855	815
Constituent	Units	RL	MDL				
Ammonia-N	mg/L	0.1	0.05	DNQ			
Nitrate-N	mg/L	0.1	0.01	5.7			
Nitrite-N	mg/L	0.03	0.002	DNQ			
Organic-N	mg/L	0.1	0.06	0.6			
Total-N	mg/L	0.2		6.3			
Total Phosphorus	mg/L	0.1	0.01	0.2			
Phosphate as P	mg/L	0.17	0.018	0.1			
Dibromochloromethane	ug/L	NA	NA	*			
Dichlorobromomethane	ug/L	NA	NA	*			
Bis (2-ethylhexyl)phthalate	ug/L	3	0.95	ND			
Flow	MGD				4.6	6.5	6.5
Dissolved Oxygen	mg/L	0.1	0.1		9.0	8.9	8.8
pH	Units	0.1	0.1		8.0	8.2	7.7
Temperature	°F				56	58	61
Total Coliform	MPN/100mL	2	2		500	500	500
Fecal Coliform	MPN/100mL	2	2		30	230	300
Turbidity	NTU	0.2	0.003		0.7	0.8	0.7
Hardness	mg/L	20	15	350	440		

*No Chlorine is being used
Ammonia Estimated Concentration = 0.066 mg/l
Nitrite-N Estimated Concentration = 0.0040 mg/l

OJAI VALLEY SANITARY DISTRICT WWTP
MONTHLY EFFLUENT & RIVER STATIONS

Sample ID				Effluent	R-3	R-4	R-5
Date & Time Sampled:	12/10/2008			0830	0810	0830	0755
Constituent	Units	RL	MDL				
Ammonia-N	mg/L	0.1	0.05	0.31			
Nitrate-N	mg/L	0.2	0.05	4.6			
Nitrite-N	mg/L	0.03	0.002	ND			
Organic-N	mg/L	0.1	0.06	2.1			
Total-N	mg/L	0.2		7.0			
Total Phosphorus	mg/L	0.1	0.01	0.12			
Phosphate as P	mg/L	0.17	0.018	0.07			
Dibromochloromethane	ug/L	NA	NA	*			
Dichlorobromomethane	ug/L	NA	NA	*			
Bis (2-ethylhexyl)phthalate	ug/L	3	0.95	ND			
Flow	MGD				3.6	5.4	5.4
Dissolved Oxygen	mg/L	0.1	0.1		9.9	11.3	8.8
pH	Units	0.1	0.1		8.2	8.2	7.7
Temperature	°F				46	48	55
Total Coliform	MPN/100mL	2	2		300	1600	1600
Fecal Coliform	MPN/100mL	2	2		50	50	80
Turbidity	NTU	0.2	0.003		0.5	0.8	0.5
Hardness	mg/L	20	8.5	330	450		

*No Chlorine is being used

Table O-3A

OJAI VALLEY SANITARY DISTRICT WWTP
Monthly Effluent & River Stations
January, 2009

Sample ID				Effluent	R-3	R-4	R-5
Date & Time Sampled:	1/7/2009			0815	0830	0835	0800
Constituent	Units	RL	MDL				
Ammonia-N	mg/L	0.1	0.05	DNQ			
Nitrate-N	mg/L	0.2	0.05	4.6			
Nitrite-N	mg/L	0.03	0.002	DNQ			
Organic-N	mg/L	0.1	0.06	0.8			
Total-N	mg/L	0.2		5.4			
Total Phosphorus	mg/L	0.1	0.01	1.80			
Phosphate as P	mg/L	0.17	0.018	1.56			
Dibromochloromethane	ug/L	NA	NA	*			
Dichlorobromomethane	ug/L	NA	NA	*			
Bis (2-ethylhexyl)phthalate	ug/L	3	0.95	ND			
Flow	MGD				3.9	5.8	5.8
Dissolved Oxygen	mg/L	0.1	0.1		10.9	11.0	9.1
pH	Units	0.1	0.1		7.9	8.0	7.6
Temperature	^{o}F				47	50	55
Total Coliform	MPN/100mL	2	2		500	900	500
Fecal Coliform	MPN/100mL	2	2		70	140	50
Turbidity	NTU	0.2	0.003		1.0	0.7	0.4
Hardness	mg/L	50	17	430	540		

*No Chlorine is being used
DNQ = Detected, but Not Quantified
Nitrite-N Estimated Concentration 0.0060 mg/L
Ammonia Estimated Concentration 0.066 mg/L

OJAI VALLEY SANITARY DISTRICT WWTP
Monthly Effluent & River Stations
February, 2009

Sample ID				Effluent	R-3	R-4	R-5
Date & Time Sampled: 2-4-09				0940	820	850	800
Constituent	Units	RL	MDL				
Ammonia-N	mg/L	0.1	0.05	0.26			
Nitrate-N	mg/L	0.1	0.01	5.5			
Nitrite-N	mg/L	0.03	0.002	DNQ			
Organic-N	mg/L	0.1	0.06	0.59			
Total-N	mg/L	0.1		6.4			
Total Phosphorus	mg/L	0.1	0.01	0.38			
Phosphate as P	mg/L	0.17	0.018	0.1			
Dibromochloromethane	ug/L	NA	NA	*			
Dichlorobromomethane	ug/L	NA	NA	*			
Bis (2-ethylhexyl)phthalate	ug/L	3	0.95	ND			
Flow	MGD	0.1	0.1		3.6	5.4	5.4
Dissolved Oxygen	mg/L	0.1	0.1		11.1	10.7	9.1
pH	Units	2	2		8.1	8.1	7.8
Temperature	^{o}F				47	51	55
Total Coliform	MPN/100mL	2	2		240	900	240
Fecal Coliform	MPN/100mL	2	2		240	130	50
Turbidity	NTU	0.2	0.003		0.3	0.5	0.6
Hardness	mg/L	50	1.7	360	460		

*No Chlorine is being used
DNQ = Detected, but Not Quantified RL = Reporting Limit
Nitrite Estimated concentration 0.015 mg/L

Table O-3A

OJAI VALLEY SANITARY DISTRICT WWTP
MONTHLY EFFLUENT & RIVER STATIONS
MARCH, 2009

Sample ID				Effluent	R-3	R-4	R-5
Date & Time Sampled: 3-4-09				815	830	900	810
Constituent	Units	RL	MDL				
Ammonia-N	mg/L	0.1	0.05	0.12			
Nitrate-N	mg/L	0.1	0.01	4.8			
Nitrite-N	mg/L	0.03	0.002	DNQ			
Organic-N	mg/L	0.1	0.06	0.62			
Total-N	mg/L	0.1		5.5			
Total Phosphorus	mg/L	0.1	0.01	0.27			
Phosphate as P	mg/L	0.17	0.018	0.2			
Dibromochloromethane	ug/L	NA	NA	*			
Dichlorobromomethane	ug/L	NA	NA	*			
Bis (2-ethylhexyl)phthalate	ug/L	3	0.95	ND			
Flow	MGD	0.1	0.1		10.7	13.0	13.0
Dissolved Oxygen	mg/L	0.1	0.1		8.6	10.2	8.4
pH	Units	2	2		7.9	8.1	7.8
Temperature	^{o}F				58	57	63
Total Coliform	MPN/100mL	2	2		900	900	500
Fecal Coliform	MPN/100mL	2	2		23	80	50
Turbidity	NTU	0.2	0.003		0.9	0.8	1.0
Hardness	mg/L	50	1.7	410	460		

*No Chlorine is being used
ND = Non Detect
DNQ = Detected Not Quantified
Nitrite Estimated Concentration = 0.004 mg/l

OJAI VALLEY SANITARY DISTRICT WWTP
MONTHLY EFFLUENT & RIVER STATIONS
April, 2009

Sample ID				Effluent	R-3	R-4	R-5
Date & Time Sampled: 4-08-09				0815	0830	0850	0815
Constituent	Units	RL	MDL				
Ammonia-N	mg/L	0.1	0.05	DNQ			
Nitrate-N	mg/L	0.1	0.05	4.3			
Nitrite-N	mg/L	0.03	0.002	DNQ			
Organic-N	mg/L	0.1	0.06	0.7			
Total-N	mg/L			5.0			
Total Phosphorus	mg/L	0.1	0.01	0.24			
Phosphate as P	mg/L	0.1	0.018	0.19			
Dibromochloromethane	ug/L	NA	NA	*			
Dichlorobromomethane	ug/L	NA	NA	*			
Bis (2-ethylhexyl)phthalate	ug/L	3	0.95	ND			
Flow	MGD				11	13	13
Dissolved Oxygen	mg/L	0.1	0.1		10.0	10.0	9.0
pH	Units	0.1	0.1		7.9	8.1	8.0
Temperature	^{o}F				55	55	59
Total Coliform	MPN/100mL	2	2		300	900	140
Fecal Coliform	MPN/100mL	2	2		8	50	17
Turbidity	NTU	0.2	0.003		0.5	0.5	0.7
Hardness	mg/L	5	1.7	390	460		

*No Chlorine is being used
DNQ = Detected, but Not Quantified
Ammonia -N: DNQ, Less than reporting limit of 0.1, Estimated Concentration 0.055 ug/L
Nitrite - DNQ, Less than reporting limit of 0.03, Estimated Concentration 0.0040 ug/L

Table O-3A

OJAI VALLEY SANITARY DISTRICT WWTP
MONTHLY EFFLUENT & RIVER STATIONS
MAY, 2009

Sample ID				Effluent	R-3	R-4	R-5
Date & Time Sampled: 5-6-09				0830	0815	0825	0830
Constituent	Units	RL	MDL				
Ammonia-N	mg/L	0.1	0.06	0.15			
Nitrate-N	mg/L	0.1	0.01	4.9			
Nitrite-N	mg/L	0.03	0.002	DNQ			
Organic-N	mg/L	0.1	0.07	0.76			
Total-N	mg/L			5.8			
Total Phosphorus	mg/L	0.1	0.01	0.3			
Phosphate as P	mg/L	0.1	0.018	0.2			
Dibromochloromethane	ug/L	NA	NA	*			
Dichlorobromomethane	ug/L	NA	NA	*			
Bis (2-ethylhexyl)phthalate	ug/L	3	0.95	ND			
Flow	MGD				5.8	7.4	7.4
Dissolved Oxygen	mg/L	0.1	0.1		8.2	8.4	6.7
pH	Units	0.1	0.1		7.9	8.0	7.9
Temperature	^{o}F				62	63	65
Total Coliform	MPN/100mL	2	2		1600	500	300
Fecal Coliform	MPN/100mL	2	2		23	50	50
Turbidity	NTU	0.2	0.003		0.5	1.4	1.1
Hardness	mg/L	5	1.7	390	460		

*No Chlorine is being used
DNQ = Detected, but Not Quantified
Nitrite Estimated Concentration = 0.005 mg/l

OJAI VALLEY SANITARY DISTRICT WWTP
MONTHLY EFFLUENT & RIVER STATIONS
June, 2009

Sample ID				Effluent	R-3	R-4	R-5
Date & Time Sampled: 6-10-09				0830	0840	0900	0815
Constituent	Units	RL	MDL	Results			
Ammonia-N	mg/L	0.1	0.06	DNQ			
Nitrate-N	mg/L	0.1	0.01	4.4			
Nitrite-N	mg/L	0.03	0.002	DNQ			
Organic-N	mg/L	0.1	0.07	ND			
Total-N	mg/L			4.4			
Total Phosphorus	mg/L	0.1	0.01	2.6			
Phosphate as P	mg/L	0.1	0.018	1.7			
Dibromochloromethane	ug/L	NA	NA	*			
Dichlorobromomethane	ug/L	NA	NA	*			
Bis (2-ethylhexyl)phthalate	ug/L	3	0.95	ND			
Flow	MGD				4.3	6.0	6.0
Dissolved Oxygen	mg/L	0.1	0.1		9.0	9.1	7.3
pH	Units	0.1	0.1		7.8	8.1	7.9
Temperature	^{o}F				62	64	65
Total Coliform	MPN/100mL	2	2		1600	>1600	900
Fecal Coliform	MPN/100mL	2	2		110	240	80
Turbidity	NTU	0.2	0.003		0.79	1.81	1.26
Hardness	mg/L	5	1.7	360	460		

*No Chlorine is being used
NH3-N - Estimated Concentration 0.099 mg/L
Nitrite Estimated Concentration = 0.0070 mg/l

Table O-3A

OJAI VALLEY SANITARY DISTRICT WWTP
MONTHLY EFFLUENT & RIVER STATIONS
July, 2009

Sample ID				Effluent	R-3	R-4	R-5
Date & Time Sampled: 7-1-08					0815	0840	0800
Constituent	Units	RL	MDL				
Ammonia-N	mg/L	0.1	0.06	0.21			
Nitrate-N	mg/L	0.1	0.01	3.1			
Nitrite-N	mg/L	0.03	0.002	DNQ			
Organic-N	mg/L	0.1	0.07	0.66			
Total-N	mg/L			4.0			
Total Phosphorus	mg/L	0.1	0.01	0.63			
Phosphate as P	mg/L	0.1	0.018	0.54			
Dibromochloromethane	ug/L	NA	NA	*			
Dichlorobromomethane	ug/L	NA	NA	*			
Bis (2-ethylhexyl)phthalate	ug/L	3	0.95	ND			
Flow	MGD				4.1	5.9	5.9
Dissolved Oxygen	mg/L	0.1	0.1		7.8	8.6	7.1
pH	Units	0.1	0.1		7.9	7.9	7.9
Temperature	^{o}F				64	63	67
Total Coliform	MPN/100mL	2	2		300	500	900
Fecal Coliform	MPN/100mL	2	2		34	80	50
Turbidity	NTU	0.2	0.003		0.49	0.95	1.03
Hardness	mg/L	5	1.7	350	460		

*No Chlorine is being used
Est Conc Nitrite = 0.0050 mg/l

OJAI VALLEY SANITARY DISTRICT WWTP
MONTHLY EFFLUENT & RIVER STATIONS
August, 2009

Sample ID				Effluent	R-3	R-4	R-5
Date & Time Sampled: 8-5-09				0830	0820	0900	0750
Constituent	Units	RL					
Ammonia-N	mg/L	0.1	0.06	DNQ			
Nitrate-N	mg/L	0.1	0.01	3.2			
Nitrite-N	mg/L	0.03	0.002	DNQ			
Organic-N	mg/L	0.1	0.07	1.80			
Total-N	mg/L			5.0			
Total Phosphorus	mg/L	0.1	0.01	0.40			
Phosphate as P	mg/L	0.1	0.018	0.35			
Dibromochloromethane	ug/L	NA	NA	*			
Dichlorobromomethane	ug/L	NA	NA	*			
Bis (2-ethylhexyl)phthalate	ug/L	3	0.95	ND			
Flow	MGD				1.9	3.6	3.6
Dissolved Oxygen	mg/L	0.1	0.1		7.7	9.1	7.5
pH	Units	0.1	0.1		8.0	8.1	7.9
Temperature	^{o}F				62	65	68
Total Coliform	MPN/100mL	2	2		1600	1600	1600
Fecal Coliform	MPN/100mL	2	2		240	240	130
Turbidity	NTU	0.2	0.003		1.79	1.54	1.31
Hardness	mg/L	5	1.7	350	490		

*No Chlorine is being used
Est Conc Ammonia-N = 0.099 mg/l
Est Conc Nitrite = 0.007 mg/l
Estimated Concentration Cyanide = 2.1 ug/L

Table O-3A

OJAI VALLEY SANITARY DISTRICT WWTP
MONTHLY EFFLUENT & RIVER STATIONS
September, 2009

Sample ID				Effluent	R-3	R-4	R-5
9/17/2009				0830	0815	0840	0800
Constituent	Units	RL	MDL				
Ammonia-N	mg/L	0.1	0.06	0.11			
Nitrate-N	mg/L	0.1	0.02	3.5			
Nitrite-N	mg/L	0.03	0.002	ND			
Organic-N	mg/L	0.1	0.07	1.1			
Total-N	mg/L			4.7			
Total Phosphorus	mg/L	0.1	0.01	0.6			
Phosphate as P	mg/L	0.1	0.018	0.6			
Dibromochloromethane	ug/L	NA	NA	*			
Dichlorobromomethane	ug/L	NA	NA	*			
Bis (2-ethylhexyl)phthalate	ug/L	3	0.95	ND			
Flow	MGD				2.3	4.2	4.2
Dissolved Oxygen	mg/L	0.1	0.1		7.5	8.5	7.1
pH	Units	0.1	0.1		7.9	8.0	7.8
Temperature	^{o}F				63	65	68
Total Coliform	MPN/100mL	2	2		500	1600	900
Fecal Coliform	MPN/100mL	2	2		300	170	80
Turbidity	NTU	0.2	0.003		0.3	1.3	0.7
Hardness	mg/L	5	1.7	410	470		

*No Chlorine is being used

OJAI VALLEY SANITARY DISTRICT WWTP
MONTHLY EFFLUENT & RIVER STATIONS
October, 2009

Sample ID				Effluent	R-3	R-4	R-5
Date & Time Sampled:	10/7/2009			0830	0820	845	805
Constituent	Units	RL	MDL				
Ammonia-N	mg/L	0.1	0.06	DNQ			
Nitrate-N	mg/L	0.1	0.01	4.7			
Nitrite-N	mg/L	0.03	0.002	DNQ			
Organic-N	mg/L	0.1	0.07	0.96			
Total-N	mg/L	0.2		5.7			
Total Phosphorus	mg/L	0.1	0.017	1.30			
Phosphate as P	mg/L	0.1	0.02	1.02			
Dibromochloromethane	ug/L	NA	NA	*			
Dichlorobromomethane	ug/L	NA	NA	*			
Bis (2-ethylhexyl)phthalate	ug/L	3	0.95	ND			
Flow	MGD				1.9	3.7	3.7
Dissolved Oxygen	mg/L	0.1	0.1		9.5	10.6	7.5
pH	Units	0.1	0.1		8.0	8.1	7.9
Temperature	^{o}F				55	57	63
Total Coliform	MPN/100mL	2	2		1600	900	1600
Fecal Coliform	MPN/100mL	2	2		130	240	300
Turbidity	NTU	0.2	0.03		0.4	1.0	0.8
Hardness	mg/L	5	1.7	390	470		

*No Chlorine is being used
DNQ = Detected Not Quantified
Ammonia- N Estimated Concentration = 0.088 mg/l
Nitrite- N Estimated Concentration = 0.0060 mg/l

Table O-3A

OJAI VALLEY SANITARY DISTRICT WWTP
MONTHLY EFFLUENT & RIVER STATIONS
November, 2009

Sample ID				Effluent	R-3	R-4	R-5
Date & Time Sampled:	11/4/2009			0830	0825	0845	0805
Constituent	Units	RL	MDL				
Ammonia-N	mg/L	0.1	0.06	0.14			
Nitrate-N	mg/L	0.1	0.01	3.4			
Nitrite-N	mg/L	0.03	0.002	DNQ			
Organic-N	mg/L	0.1	0.07	1.9			
Total-N	mg/L	0.2		5.4			
Total Phosphorus	mg/L	0.1	0.017	1.7			
Phosphate as P	mg/L	0.1	0.02	1.4			
Dibromochloromethane	ug/L	NA	NA	*			
Dichlorobromomethane	ug/L	NA	NA	*			
Bis (2-ethylhexyl)phthalate	ug/L	3	0.95	ND			
Flow	MGD				1.9	3.7	3.7
Dissolved Oxygen	mg/L	0.1	0.1		8.6	9.8	8.5
pH	Units	0.1	0.1		7.9	8.1	8.0
Temperature	^{o}F				58	59	64
Total Coliform	MPN/100mL	2	2		900	1600	1600
Fecal Coliform	MPN/100mL	2	2		300	240	240
Turbidity	NTU	0.2	0.03		0.5	1.2	1.0
Hardness	mg/L	5	1.7	400	480		

*No Chlorine is being used
Nitrite-N Estimated Concentration = 0.011 mg/l
DNQ = Detected not quantified

OJAI VALLEY SANITARY DISTRICT WWTP
MONTHLY EFFLUENT & RIVER STATIONS
December, 2009

Sample ID				Effluent	R-3	R-4	R-5
Date & Time Sampled:	12/9/2009			0830	0825	0845	0805
Constituent	Units	RL	MDL				
Ammonia-N	mg/L	0.1	0.06	0.13			
Nitrate-N	mg/L	0.2	0.05	4.6			
Nitrite-N	mg/L	0.03	0.002	DNQ			
Organic-N	mg/L	0.1	0.06	1.5			
Total-N	mg/L	0.2		6.2			
Total Phosphorus	mg/L	0.1	0.017	1.1			
Phosphate as P	mg/L	0.1	0.02	1.0			
Dibromochloromethane	ug/L	NA	NA	*			
Dichlorobromomethane	ug/L	NA	NA	*			
Bis (2-ethylhexyl)phthalate	ug/L	3	0.95	ND			
Flow	MGD				2.4	4.2	4.2
Dissolved Oxygen	mg/L	0.1	0.1		11.6	11.8	10.0
pH	Units	0.1	0.1		8.0	8.1	7.9
Temperature	^{o}F				44	48	54
Total Coliform	MPN/100mL	2	2		500	900	1600
Fecal Coliform	MPN/100mL	2	2		34	130	50
Turbidity	NTU	0.2	0.003		0.9	0.6	0.9
Hardness	mg/L	5	1.7	350	480		

*No Chlorine is being used
Nitrite-N Estimated Concentration= 0.0080 mg/l
DNQ = Detected not quantified

Table O-3A

OJAI VALLEY SANITARY DISTRICT WWTP
Monthly Effluent & River Stations
January, 2010

Sample ID				Effluent	R-3	R-4	R-5
Date & Time Sampled:	1/6/2010			0830	0835	0900	0820
Constituent	Units	RL	MDL				
Ammonia-N	mg/L	0.1	0.06	0.21			
Nitrate-N	mg/L	0.1	0.01	4.1			
Nitrite-N	mg/L	0.03	0.002	ND			
Organic-N	mg/L	0.1	0.06	1.1			
Total-N	mg/L	0.2		5.4			
Total Phosphorus	mg/L	0.1	0.017	1.30			
Phosphate as P	mg/L	0.17	0.018	1.39			
Dibromochloromethane	ug/L	NA	NA	*			
Dichlorobromomethane	ug/L	NA	NA	*			
Bis (2-ethylhexyl)phthalate	ug/L	3	0.95	ND			
Flow	MGD				3.4	5.1	5.1
Dissolved Oxygen	mg/L	0.1	0.1		11.6	9.2	9.2
pH	Units	0.1	0.1		8.1	8.1	8.0
Temperature	^{o}F				54	55	57
Total Coliform	MPN/100mL	2	2		110	500	500
Fecal Coliform	MPN/100mL	2	2		50	130	50
Turbidity	NTU	0.1	0.03		0.5	0.9	1.0
Hardness	mg/L	50	1.7	360	480		

*No Chlorine is being used
DNQ = Detected, but Not Quantified

OJAI VALLEY SANITARY DISTRICT WWTP
Monthly Effluent & River Stations
February, 2010

Sample ID				Effluent	R-3	R-4	R-5
Date & Time Sampled: 2-3-10				0830	0830	**	0810
Constituent	Units	RL	MDL				
Ammonia-N	mg/L	0.1	0.06	DNQ			
Nitrate-N	mg/L	0.1	0.01	3.4			
Nitrite-N	mg/L	0.03	0.002	ND			
Organic-N	mg/L	0.1	0.07	0.87			
Total-N	mg/L	0.1		4.3			
Total Phosphorus	mg/L	0.1	0.017	0.36			
Phosphate as P	mg/L	0.1	0.02	0.3			
Dibromochloromethane	ug/L	NA	NA	*			
Dichlorobromomethane	ug/L	NA	NA	*			
Bis (2-ethylhexyl)phthalate	ug/L	3	0.95	ND			
Flow	MGD	0.1	0.1		29		31
Dissolved Oxygen	mg/L	0.1	0.1		11.0		10.3
pH	Units	2	2		8.1		8.7
Temperature	^{o}F				50		55
Total Coliform	MPN/100mL	2	2		1600		900
Fecal Coliform	MPN/100mL	2	2		170		80
Turbidity	NTU	0.1	0.03		1.6		1.1
Hardness	mg/L	50	1.7	410	450		

*No Chlorine is being used
DNQ = Detected, but Not Quantified RL = Reporting Limit
Ammonia-N Estimated Concentration 0.099 mg/L
**R4 location no longer exists to to recent heavy rains. River splits above outfall and now does not recombine untill just up from R5.

Table O-3A

OJAI VALLEY SANITARY DISTRICT WWTP
MONTHLY EFFLUENT & RIVER STATIONS
MARCH, 2010

Sample ID				Effluent	R-3	R-4	R-5
Date & Time Sampled: 3-10-10				830	830		810
Constituent	Units	RL	MDL				
Ammonia-N	mg/L	0.1	0.06	ND			
Nitrate-N	mg/L	0.1	0.01	3.5			
Nitrite-N	mg/L	0.03	0.002	DNQ			
Organic-N	mg/L	0.1	0.06	0.85			
Total-N	mg/L	0.1		4.4			
Total Phosphorus	mg/L	0.1	0.01	0.62			
Phosphate as P	mg/L	0.17	0.018	0.6			
Dibromochloromethane	ug/L	NA	NA	*			
Dichlorobromomethane	ug/L	NA	NA	*			
Bis (2-ethylhexyl)phthalate	ug/L	3	0.95	ND			
Flow	MGD	0.1	0.1		40.4	**	42.6
Dissolved Oxygen	mg/L	0.1	0.1		10.8	**	9.4
pH	Units	2	2		8.1	**	8.1
Temperature	^{o}F				53	**	59
Total Coliform	MPN/100mL	2	2		>1600	**	900
Fecal Coliform	MPN/100mL	2	2		30	**	130
Turbidity	NTU	0.2	0.003		1.2	**	1.3
Hardness	mg/L	5	1.7	430	430		

*No Chlorine is being used
ND = Non Detect
DNQ = Detected Not Quantified
Nitrite Estimated Concentration = 0.006 mg/l
**R4 location no longer exists to to recent heavy rains. River splits above outfall and now does not recombine untill just up from R5.

OJAI VALLEY SANITARY DISTRICT WWTP
MONTHLY EFFLUENT & RIVER STATIONS
April, 2010

Sample ID				Effluent	R-3	R-4	R-5
Date & Time Sampled: 4-14-10				0830	0825		0800
Constituent	Units	RL	MDL				
Ammonia-N	mg/L	0.1	0.06	0.21			
Nitrate-N	mg/L	0.1	0.05	3.1			
Nitrite-N	mg/L	0.03	0.002	DNQ			
Organic-N	mg/L	0.1	0.06	0.71			
Total-N	mg/L			4.0			
Total Phosphorus	mg/L	0.1	0.01	0.66			
Phosphate as P	mg/L	0.1	0.018	0.72			
Dibromochloromethane	ug/L	NA	NA	*			
Dichlorobromomethane	ug/L	NA	NA	*			
Bis (2-ethylhexyl)phthalate	ug/L	3	0.95	ND			
Flow	MGD				38	**	40
Dissolved Oxygen	mg/L	0.1	0.1		10.4	**	8.9
pH	Units	0.1	0.1		8.0	**	8.0
Temperature	^{o}F				53	**	60
Total Coliform	MPN/100mL	2	2		1600	**	500
Fecal Coliform	MPN/100mL	2	2		240	**	170
Turbidity	NTU	0.2	0.003		3.7	**	3.8
Hardness	mg/L	5	1.7	400	430		

*No Chlorine is being used
DNQ = Detected, but Not Quantified
Nitrite - DNQ, Less than reporting limit of 0.03, Estimated Concentration 0.0060 ug/L
**R4 location no longer exists to to recent heavy rains. River splits above outfall and now does not recombine untill just up from R5.

Table O-3A

OJAI VALLEY SANITARY DISTRICT WWTP
MONTHLY EFFLUENT & RIVER STATIONS
MAY, 2010

Sample ID				Effluent	R-3	R-4	R-5
Date & Time Sampled: 5-5-10				0830	0815	**	0830
Constituent	Units	RL	MDL				
Ammonia-N	mg/L	0.1	0.04	0.14			
Nitrate-N	mg/L	0.1	0.01	3.7			
Nitrite-N	mg/L	0.03	0.002	ND			
Organic-N	mg/L	0.1	0.07	0.68			
Total-N	mg/L			4.5			
Total Phosphorus	mg/L	0.1	0.017	0.97			
Phosphate as P	mg/L	0.1	0.018	1.1			
Dibromochloromethane	ug/L	NA	NA	*			
Dichlorobromomethane	ug/L	NA	NA	*			
Bis (2-ethylhexyl)phthalate	ug/L	3	0.95	ND			
Flow	MGD				25.0	**	27.0
Dissolved Oxygen	mg/L	0.1	0.1		9.0	**	8.2
pH	Units	0.1	0.1		7.9	**	7.9
Temperature	^{o}F				59	**	63
Total Coliform	MPN/100mL	2	2		350	**	130
Fecal Coliform	MPN/100mL	2	2		27	**	17
Turbidity	NTU	0.2	0.003		0.5	**	0.5
Hardness	mg/L	5	1	400	420		

*No Chlorine is being used
DNQ = Detected, but Not Quantified
**R4 location no longer exists due to heavy rains in January 2010. River splits above outfall and now does not recombine untill just up from R5.

OJAI VALLEY SANITARY DISTRICT WWTP
MONTHLY EFFLUENT & RIVER STATIONS
June, 2010

Sample ID				Effluent	R-3	R-4	R-5
Date & Time Sampled: 6-16-10				0830	0820	**	0800
Constituent	Units	RL	MDL	Results			
Ammonia-N	mg/L	0.1	0.04	DNQ			
Nitrate-N	mg/L	0.1	0.01	3.5			
Nitrite-N	mg/L	0.03	0.002	DNQ			
Organic-N	mg/L	0.1	0.07	0.34			
Total-N	mg/L			3.8			
Total Phosphorus	mg/L	0.1	0.01	1.6			
Phosphate as P	mg/L	0.1	0.018	1.4			
Dibromochloromethane	ug/L	NA	NA	*			
Dichlorobromomethane	ug/L	NA	NA	*			
Bis (2-ethylhexyl)phthalate	ug/L	3	0.95	DNQ			
Flow	MGD				10.1	**	12.0
Dissolved Oxygen	mg/L	0.1	0.1		8.5	**	8.1
pH	Units	0.1	0.1		8.0	**	8.0
Temperature	^{o}F				61	**	65
Total Coliform	MPN/100mL	2	2		1600	**	350
Fecal Coliform	MPN/100mL	2	2		140	**	79
Turbidity	NTU	0.2	0.003		1.13	**	1.07
Hardness	mg/L	5	1.7	370	440		

*No Chlorine is being used
Ammonia-N estimated concentration = 0.099 mg/L
Nitrite-N estimated concentration = 0.0040 mg/L
Bis (2-ethylhexyl)phthalate estimated concentration = 2.88 mg/L
**R4 location no longer exists due to heavy rains in January 2010. River splits above outfall and now does not recombine untill just up from R5.

Table O-3A

OJAI VALLEY SANITARY DISTRICT WWTP
MONTHLY EFFLUENT & RIVER STATIONS
July, 2010

Sample ID				Effluent	R-3	R-4	R-5
Date & Time Sampled: 7-21-10					0840	0900	0805
Constituent	Units	RL	MDL				
Ammonia-N	mg/L	0.1	0.04	0.12			
Nitrate-N	mg/L	0.1	0.01	3.4			
Nitrite-N	mg/L	0.03	0.002	DNQ			
Organic-N	mg/L	0.1	0.07	0.87			
Total-N	mg/L			4.4			
Total Phosphorus	mg/L	0.1	0.017	0.78			
Phosphate as P	mg/L	0.1	0.018	0.74			
Dibromochloromethane	ug/L	NA	NA	*			
Dichlorobromomethane	ug/L	NA	NA	*			
Bis (2-ethylhexyl)phthalate	ug/L	3	0.95	ND			
Flow	MGD				6.3	8.1	8.1
Dissolved Oxygen	mg/L	0.1	0.1		8.3	8.9	8.3
pH	Units	0.1	0.1		7.9	8.0	8.0
Temperature	^{o}F				63	68	68
Total Coliform	MPN/100mL	2	2		1600	540	>1600
Fecal Coliform	MPN/100mL	2	2		70	79	540
Turbidity	NTU	0.2	0.003		0.98	1.86	1.23
Hardness	mg/L	5	1.7	370	440		

*No Chlorine is being used
Est Conc Nitrite = 0.0060 mg/l

OJAI VALLEY SANITARY DISTRICT WWTP
MONTHLY EFFLUENT & RIVER STATIONS
August, 2010

Sample ID				Effluent	R-3	R-4	R-5
Date & Time Sampled: 8-4-10				0830	830	0900	810
Constituent	Units	RL	MDL				
Ammonia-N	mg/L	0.1	0.04	0.3			
Nitrate-N	mg/L	0.1	0.01	3.1			
Nitrite-N	mg/L	0.03	0.002	DNQ			
Organic-N	mg/L	0.1	0.07	0.90			
Total-N	mg/L			4.3			
Total Phosphorus	mg/L	0.1	0.017	0.59			
Phosphate as P	mg/L	0.1	0.018	0.56			
Dibromochloromethane	ug/L	NA	NA	*			
Dichlorobromomethane	ug/L	NA	NA	*			
Bis (2-ethylhexyl)phthalate	ug/L	3	0.95	ND			
Flow	MGD				4.4	6.3	6.3
Dissolved Oxygen	mg/L	0.1	0.1		8.0	9.6	8.1
pH	Units	0.1	0.1		7.9	8.0	8.0
Temperature	^{o}F				63	64	66
Total Coliform	MPN/100mL	2	2		>1600	>1600	>1600
Fecal Coliform	MPN/100mL	2	2		1600	280	130
Turbidity	NTU	0.2	0.003		1.20	2.53	1.96
Hardness	mg/L	5	1.7	360	430		

*No Chlorine is being used
Est Conc Nitrite = 0.006 mg/l

Table O-3A

OJAI VALLEY SANITARY DISTRICT WWTP
MONTHLY EFFLUENT & RIVER STATIONS
September, 2010

Sample ID				Effluent	R-3	R-4	R-5
9/15/2010				0830	0820	0835	0800
Constituent	Units	RL	MDL				
Ammonia-N	mg/L	0.1	0.04	DNQ			
Nitrate-N	mg/L	0.1	0.01	3.8			
Nitrite-N	mg/L	0.03	0.002	DNQ			
Organic-N	mg/L	0.1	0.07	0.9			
Total-N	mg/L			4.7			
Total Phosphorus	mg/L	0.1	0.017	0.5			
Phosphate as P	mg/L	0.1	0.018	0.5			
Dibromochloromethane	ug/L	NA	NA	*			
Dichlorobromomethane	ug/L	NA	NA	*			
Bis (2-ethylhexyl)phthalate	ug/L	3	0.95	ND			
Flow	MGD				4.7	6.3	6.3
Dissolved Oxygen	mg/L	0.1	0.1		8.8	9.3	8.2
pH	Units	0.1	0.1		8.0	8.0	8.0
Temperature	^{o}F				57	58	63
Total Coliform	MPN/100mL	2	2		540	1600	3500
Fecal Coliform	MPN/100mL	2	2		49	70	920
Turbidity	NTU	0.2	0.003		1.7	1.8	1.0
Hardness	mg/L	5	1.7	360	460		

*No Chlorine is being used
Est Conc Nitrite = 0.015 mg/l
Est Conc Ammonia-N = 0.099 mg/l

OJAI VALLEY SANITARY DISTRICT WWTP
MONTHLY EFFLUENT & RIVER STATIONS
October, 2009

Sample ID				Effluent	R-3	R-4	R-5
Date & Time Sampled:	10/7/2009			0830	0820	845	805
Constituent	Units	RL	MDL				
Ammonia-N	mg/L	0.1	0.06	DNQ			
Nitrate-N	mg/L	0.1	0.01	4.7			
Nitrite-N	mg/L	0.03	0.002	DNQ			
Organic-N	mg/L	0.1	0.07	0.96			
Total-N	mg/L	0.2		5.7			
Total Phosphorus	mg/L	0.1	0.017	1.30			
Phosphate as P	mg/L	0.1	0.02	1.02			
Dibromochloromethane	ug/L	NA	NA	*			
Dichlorobromomethane	ug/L	NA	NA	*			
Bis (2-ethylhexyl)phthalate	ug/L	3	0.95	ND			
Flow	MGD				1.9	3.7	3.7
Dissolved Oxygen	mg/L	0.1	0.1		9.5	10.6	7.5
pH	Units	0.1	0.1		8.0	8.1	7.9
Temperature	^{o}F				55	57	63
Total Coliform	MPN/100mL	2	2		1600	900	1600
Fecal Coliform	MPN/100mL	2	2		130	240	300
Turbidity	NTU	0.2	0.03		0.4	1.0	0.8
Hardness	mg/L	5	1.7	390	470		

*No Chlorine is being used
DNQ = Detected Not Quantified
Ammonia- N Estimated Concentration = 0.088 mg/l
Nitrite- N Estimated Concentration = 0.0060 mg/l

Table O-3A

OJAI VALLEY SANITARY DISTRICT WWTP
MONTHLY EFFLUENT & RIVER STATIONS
November, 2009

Sample ID				Effluent	R-3	R-4	R-5
Date & Time Sampled:	11/4/2009			0830	0825	0845	0805
Constituent	Units	RL	MDL				
Ammonia-N	mg/L	0.1	0.06	0.14			
Nitrate-N	mg/L	0.1	0.01	3.4			
Nitrite-N	mg/L	0.03	0.002	DNQ			
Organic-N	mg/L	0.1	0.07	1.9			
Total-N	mg/L	0.2		5.4			
Total Phosphorus	mg/L	0.1	0.017	1.7			
Phosphate as P	mg/L	0.1	0.02	1.4			
Dibromochloromethane	ug/L	NA	NA	*			
Dichlorobromomethane	ug/L	NA	NA	*			
Bis (2-ethylhexyl)phthalate	ug/L	3	0.95	ND			
Flow	MGD				1.9	3.7	3.7
Dissolved Oxygen	mg/L	0.1	0.1		8.6	9.8	8.5
pH	Units	0.1	0.1		7.9	8.1	8.0
Temperature	^{o}F				58	59	64
Total Coliform	MPN/100mL	2	2		900	1600	1600
Fecal Coliform	MPN/100mL	2	2		300	240	240
Turbidity	NTU	0.2	0.03		0.5	1.2	1.0
Hardness	mg/L	5	1.7	400	480		

*No Chlorine is being used
Nitrite-N Estimated Concentration = 0.011 mg/l
DNQ = Detected not quantified

OJAI VALLEY SANITARY DISTRICT WWTP
MONTHLY EFFLUENT & RIVER STATIONS
December, 2009

Sample ID				Effluent	R-3	R-4	R-5
Date & Time Sampled:	12/9/2009			0830	0825	0845	0805
Constituent	Units	RL	MDL				
Ammonia-N	mg/L	0.1	0.06	0.13			
Nitrate-N	mg/L	0.2	0.05	4.6			
Nitrite-N	mg/L	0.03	0.002	DNQ			
Organic-N	mg/L	0.1	0.06	1.5			
Total-N	mg/L	0.2		6.2			
Total Phosphorus	mg/L	0.1	0.017	1.1			
Phosphate as P	mg/L	0.1	0.02	1.0			
Dibromochloromethane	ug/L	NA	NA	*			
Dichlorobromomethane	ug/L	NA	NA	*			
Bis (2-ethylhexyl)phthalate	ug/L	3	0.95	ND			
Flow	MGD				2.4	4.2	4.2
Dissolved Oxygen	mg/L	0.1	0.1		11.6	11.8	10.0
pH	Units	0.1	0.1		8.0	8.1	7.9
Temperature	^{o}F				44	48	54
Total Coliform	MPN/100mL	2	2		500	900	1600
Fecal Coliform	MPN/100mL	2	2		34	130	50
Turbidity	NTU	0.2	0.003		0.9	0.6	0.9
Hardness	mg/L	5	1.7	350	480		

*No Chlorine is being used
Nitrite-N Estimated Concentration= 0.0080 mg/l
DNQ = Detected not quantified

Table O-3B

Ojai Valley Sanitary District WWTP
Effluent Toxicity Data
2005

Test species: *Selenastrum capricornutum*

Monthly Plant Effluent Chronic Toxicity

Month	Growth			
	NOEC	TU_C	IC_{25}	IC_{50}
Jan	100%	1.00	>100%	>100%
Feb	100%	1.00	>100%	>100%
Mar	100%	1.00	>100%	>100%
Apr	100%	1.00	>100%	>100%
May	100%	1.00	>100%	>100%
Jun	100%	1.00	>100%	>100%
Jul	100%	1.00	72.84%	>100%
Aug	100%	1.00	>100%	>100%
Sep	100%	1.00	>100%	>100%
Oct	100%	1.00	>100%	>100%
Nov	18%	5.56	35.70%	>100%
Dec*	100%	1.00	>100%	>100

* Median of 3 samples - (2) additional chronic toxitiy tests were conducted as followup performance testing for November.

Quarterly Effluent Acute Toxicity

Test species: Fathead Minnows

Month	Survival	
	% Survival	TU(a)
Feb	95%	0.41
May	100%	0.00
Aug	100%	0.00
Nov	100%*	0.00

* Actually sampled 12/22/05 due to lab error

Quarterly River Station Chronic Toxicity

R-3 Test species: Selenastrum capricornutum

Month	Growth			
	NOEC	TU_C	IC_{25}	IC_{50}
Feb	100%	1.00	>100%	>100%
May	100%	1.00	>100%	>100%
Aug	100%	1.00	>100%	>100%
Nov	100%	1.00	>100%	>100%

R-4 Test species: Selenastrum capricornutum

Month	Growth			
	NOEC	TU_C	IC_{25}	IC_{50}
Feb	100%	1.00	>100%	>100%
May	100%	1.00	>100%	>100%
Aug	100%	1.00	>100%	>100%
Nov	100%	1.00	>100%	>100%

Table O-3B

Ojai Valley Sanitary District WWTP
Effluent Toxicity Data
2006

Test species: *Pimephales promelas* (Fathead minnow)

Monthly Plant Effluent Chronic Toxicity

Month	Survival				Growth			
	NOEC	TU_C	IC_{25}	IC_{50}	NOEC	TU_C	IC_{25}	IC_{50}
Jan	<10.00 %	<10.00	6.33%	15.05%	>100.00 %	1.00	>100.00	>100.00 %
Feb *	100%	1.00	81%	>100%	66%	2.06	77%	>100%
Mar	100%	1.00	100%	>100%	100%	1.00	100%	>100%
Apr	100%	1.00	100%	>100%	100%	1.00	100%	>100%
May **	100%	1.00	100%	>100%	100%	1.00	100%	>100%
Jun	100%	1.00	100%	>100%	100%	1.00	100%	>100%
Jul	100%	1.00	100%	>100%	100%	1.00	100%	>100%
Aug	100%	1.00	8%	>100%	100%	1.00	100%	>100%
Sep	100%	1.00	4.35%	8.70%	100%	1.00	4.05%	8.09%
Oct	100%	1.00	100%	>100%	100%	1.00	89%	>100%
Nov	100%	1.00	100%	>100%	100%	1.00	100%	>100%
Dec	100%	1.00	100%	>100%	100%	1.00	100%	>100%

*February values are average of (2) tests
**May - Median of (3) tests

Quarterly Effluent Acute Toxicity
Test species: Fathead Minnows

Month	Survival	
	% Survival	TU(a)
Feb	100%	1.00
May	100%	1.00
Aug	100%	1.00
Nov	100%	1.00

Quarterly River Station Chronic Toxicity

R-3 Test species: Pimephales promelas (Fathead minnow)

Month	Survival				Growth			
	NOEC	TU_C	IC_{25}	IC_{50}	NOEC	TU_C	IC_{25}	IC_{50}
Feb *	55%	5.50	10%	59.00%	78%	1.40	7%	44.28%
May	18%	5.56	23.82%	31.72%	100%	1.00	>100%	>100%
Aug	100%	1.00	10%	>100%	100%	1.00	7%	>100%
Nov	100%	1.00	3.93%	7.86%	100%	1.00	5.75%	>100%

*February values are average of (2) tests

R-4 Test species: Pimephales promelas (Fathead minnow)

Month	Survival				Growth			
	NOEC	TU_C	IC_{25}	IC_{50}	NOEC	TU_C	IC_{25}	IC_{50}
Feb *	88%	2.46	17%	46.35%	66%	2.07	30%	58.27%
May	100%	1.00	5.79%	>100%	100%	1.00	15.49%	>100%
Aug	100%	1.00	29%	>100%	100%	1.00	27%	>100%
Nov	100%	1.00	5.42%	>100%	100%	1.00	8.02%	>100%

*February values are average of (2) tests

Table O-3B

Ojai Valley Sanitary District WWTP
Effluent Toxicity Data
2007

Test species: *Pimephales promelas* (Fathead minnow)

Monthly Plant Effluent Chronic Toxicity

Month	Survival				Growth			
	NOEC	TU_C	IC_{25}	IC_{50}	NOEC	TU_C	IC_{25}	IC_{50}
Jan	100%	1.00	>100%	>100%	100%	1.00	>100%	>100%
Feb	100%	1.00	>100%	>100%	100%	1.00	>100%	>100%
Mar	100%	1.00	>100%	>100%	100%	1.00	>100%	>100%
Apr	100%	1.00	>100%	>100%	100%	1.00	>100%	>100%
May	100%	1.00	>100%	>100%	100%	1.00	>100%	>100%
Jun	100%	1.00	>100%	>100%	100%	1.00	>100%	>100%
Jul	100%	1.00	>100%	>100%	100%	1.00	>100%	>100%
Aug	100%	1.00	>100%	>100%	100%	1.00	>100%	>100%
Sep	100%	1.00	>100%	>100%	100%	1.00	>100%	>100%
Oct	100%	1.00	>100%	>100%	100%	1.00	>100%	>100%
Nov	100%	1.00	>100%	>100%	100%	1.00	>100%	>100%
Dec	100%	1.00	9.42%	>100%	100%	1.00	7.66%	>100%

* Two tests conducted in December as part of bi-annual test species re-screening.

Quarterly Effluent Acute Toxicity

Test species: Fathead Minnows

Month	Survival	
	% Survival	TU(a)
Feb	100%	1.00
May	100%	1.00
Aug	100%	1.00
Nov	100%	1.00

Quarterly River Station Chronic Toxicity

R-3 Test species: Pimephales promelas (Fathead minnow)

Month	Survival				Growth			
	NOEC	TU_C	IC_{25}	IC_{50}	NOEC	TU_C	IC_{25}	IC_{50}
Feb	100%	1.00	9.67%	15.67%	100%	1.00	11.90%	16.89%
May	100%	1.00	46.55%	>100%	100%	1.00	>100%	>100%
Aug	100%	1.00	27%	>100%	100%	1.00	10%	>100%
Nov	<10%	>10	8.38%	32.86%	18%	5.56	8.33%	32.14%

R-4 Test species: Pimephales promelas (Fathead minnow)

Month	Survival				Growth			
	NOEC	TU_C	IC_{25}	IC_{50}	NOEC	TU_C	IC_{25}	IC_{50}
Feb	18%	5.56	4.67%	9.36%	100%	1.00	5.99%	25.56%
May	<10%	>10	4.69%	9.38%	100%	1.00	6.58%	>100%
Aug	100%	1.00	>100%	>100%	100%	1.00	>100%	>100%
Nov	100%	1.00	78.15%	>100%	100%	1.00	72.24%	>100%

Table O-3B

Ojai Valley Sanitary District WWTP
Effluent Toxicity Data
2008

Test species: *Pimephales promelas* (Fathead minnow)

Monthly Plant Effluent Chronic Toxicity

Month	Survival				Growth			
	NOEC	TU_C	IC_{25}	IC_{50}	NOEC	TU_C	IC_{25}	IC_{50}
Jan	100%	1.00	7.37%	>100%	100%	1.00	6.45%	>100%
Feb	100%	1.00	>100%	>100%	100%	1.00	>100%	>100%
Mar	100%	1.00	>100%	>100%	100%	1.00	>100%	>100%
Apr	*100%	*1.00	*8.19%	*>100%	*100%	*1.00	*>100%	*>100%
May	100%	1.00	>100%	>100%	100%	1.00	>100%	>100%
Jun	100%	1.00	>100%	>100%	100%	1.00	>100%	>100%
Jul	**100%	**1.00	**100%	**100%	**100%	**1.00	**100%	**100%
Aug	100%	1.00	100%	100%	100%	1.00	100%	100%
Sep	100%	1.00	>100%	>100%	100%	1.00	>100%	>100%
Oct	100%	1.00	>100%	>100%	100%	1.00	>100%	>100%
Nov	100%	1.00	>100%	>100%	100%	1.00	>100%	>100%
Dec	100%	1.00	>100%	>100%	100%	1.00	>100%	>100%

* The upper bound percent minimum significant difference (PMSD) limit for growth was exceeded making this an invalid test. The data presented is for information purposes only.

** Median of three consecutive weekly samples

Quarterly Effluent Acute Toxicity

Test species: Fathead Minnows

Month	Survival	
	% Survival	TU(a)
Feb	100%	0.00
May	100%	0.00
Aug	100%	0.00
Nov	100%	0.00

Quarterly River Station Chronic Toxicity

R-3 Test species: Pimephales promelas (Fathead minnow)

Month	Survival				Growth			
	NOEC	TU_C	IC_{25}	IC_{50}	NOEC	TU_C	IC_{25}	IC_{50}
Feb*	100%	1.00	7.87%	>100%	100%	1.00	5.64%	>100%
May	100%	1.00	>100%	>100%	100%	1.00	8.40%	>100%
Aug	32%	3.13	38.60%	56.00%	32%	3.13	7.89%	97.56%
Nov	56%	1.79	>100%	>100%	100%	1.00	>100%	>100%

R-4 Test species: Pimephales promelas (Fathead minnow)

Month	Survival				Growth			
	NOEC	TU_C	IC_{25}	IC_{50}	NOEC	TU_C	IC_{25}	IC_{50}
Feb*	10%	10.00	10.84%	16.74%	10%	10.00	6.43%	13.23%
May	100%	1.00	>100%	>100%	100%	1.00	9.90%	>100%
Aug	<10%	>10	7.25%	>100%	100%	1.00	5.39%	>100%
Nov	100%	1.00	>100%	>100%	100%	1.00	>100%	>100%

* First Quarter River samples actually taken in January due to scheduling error. Used by permission of Raul Medina

Table O-3B

Ojai Valley Sanitary District WWTP
Effluent Toxicity Data
2009

Test species: *Pimephales promelas* (Fathead minnow)

Monthly Plant Effluent Chronic Toxicity

Month	Survival				Growth			
	NOEC	TU_C	IC_{25}	IC_{50}	NOEC	TU_C	IC_{25}	IC_{50}
Jan	100%	1.00	>100%	>100%	100%	1.00	>100%	>100%
Feb	100%	1.00	>100%	>100%	100%	1.00	>100%	>100%
Mar	100%	1.00	>100%	>100%	100%	1.00	>100%	>100%
Apr	100%	1.00	>100%	>100%	100%	1.00	>100%	>100%
May	100%	1.00	>100%	>100%	100%	1.00	>100%	>100%
Jun	100%	1.00	>100%	>100%	100%	1.00	>100%	>100%
Jul	100%	1.00	>100%	>100%	100%	1.00	>100%	>100%
Aug	100%	1.00	>100%	>100%	100%	1.00	>100%	>100%
Sep	100%	1.00	>100%	>100%	100%	1.00	>100%	>100%
Oct *	100%	1.00	>100%	>100%	100%	1.00	>100%	>100%
Nov	100%	1.00	>100%	>100%	100%	1.00	>100%	>100%
Dec	100%	1.00	>100%	>100%	100%	1.00	>100%	>100%

Bi-ennial (3) species re-screening started during October and extended into November. Ceriodaphnia exhibited toxicity in reproduction during the maximum of (5) three species re-screening tests. Therefore, Ceriodaphnia will be used as the most sensitive species starting in December for monthly testing vs November as listed in previous report.
Three species re-screeing results included with the November monthly report.

Quarterly Effluent Acute Toxicity

Test species: Fathead Minnows

Month	Survival	
	% Survival	TU(a)
Feb	100%	0.00
May	100%	0.00
Aug	100%	0.00
Nov	100%	0.00

Quarterly River Station Chronic Toxicity

R-3 Test species: Pimephales promelas (Fathead minnow)

Month	Survival				Growth			
	NOEC	TU_C	IC_{25}	IC_{50}	NOEC	TU_C	IC_{25}	IC_{50}
Feb	100%	1.00	>100%	>100%	100%	1.00	>100%	>100%
May	100%	1.00	>100%	>100%	100%	1.00	>100%	>100%
Aug	100%	1.00	>100%	>100%	100%	1.00	>100%	>100%
Nov	100%	1.00	>100%	>100%	100%	1.00	>100%	>100%

R-4 Test species: Pimephales promelas (Fathead minnow)

Month	Survival				Growth			
	NOEC	TU_C	IC_{25}	IC_{50}	NOEC	TU_C	IC_{25}	IC_{50}
Feb	100%	1.00	>100%	>100%	100%	1.00	>100%	>100%
May	100%	1.00	>100%	>100%	100%	1.00	>100%	>100%
Aug	100%	1.00	>100%	>100%	100%	1.00	>100%	>100%
Nov	100%	1.00	>100%	>100%	100%	1.00	>100%	>100%

Table O-3B

Ojai Valley Sanitary District WWTP
Effluent Toxicity Data
2010

Test species: *Ceriodaphnia dubia*

Monthly Plant Effluent Chronic Toxicity

Month	Survival				Reproduction			
	NOEC	TU_C	IC_{25}	IC_{50}	NOEC	TU_C	IC_{25}	IC_{50}
Jan	100%	1.00	>100%	>100%	100%	1.00	24.96%	>100%
Feb	100%	1.00	>100%	>100%	100%	1.00	>100%	>100%
Mar	100%	1.00	>100%	>100%	100%	1.00	>100%	>100%
Apr	100%	1.00	>100%	>100%	100%	1.00	>100%	>100%
May	100%	1.00	>100%	>100%	100%	1.00	>100%	>100%
Jun	100%	1.00	>100%	>100%	100%	1.00	>100%	>100%
Jul	100%	1.00	>100%	>100%	100%	1.00	>100%	>100%
Aug	100%	1.00	>100%	>100%	100%	1.00	>100%	>100%
Sep	100%	1.00	>100%	>100%	100%	1.00	>100%	>100%
Oct								
Nov								
Dec								

Quarterly Effluent Acute Toxicity

Test species: Fathead Minnow

Month	Survival	
	% Survival	TU(a)
Feb	100%	0.00
May	100%	0.00
Aug	100%	0.00
Nov		

Quarterly River Station Chronic Toxicity

R-3 Test species: Ceriodaphnia

Month	Survival				Growth			
	NOEC	TU_C	IC_{25}	IC_{50}	NOEC	TU_C	IC_{25}	IC_{50}
Feb	100%	1.00	>100%	>100%	100%	1.00	>100%	>100%
May	100%	1.00	>100%	>100%	100%	1.00	>100%	>100%
Aug	100%	1.00	>100%	>100%	100%	1.00	>100%	>100%
Nov								

R-4 Test species: Ceriodaphnia

Month	Survival				Growth			
	NOEC	TU_C	IC_{25}	IC_{50}	NOEC	TU_C	IC_{25}	IC_{50}
Feb *	100%	1.00	>100%	>100%	100%	1.00	>100%	>100%
May*	100%	1.00	>100%	>100%	100%	1.00	>100%	>100%
Aug	100%	1.00	>100%	>100%	100%	1.00	>100%	>100%
Nov								

* Chronic tox sampled at R5 due to river split above R4

Table O-3C

OJAI VALLEY SANITARY DISTRICT
2005 ANNUAL RIVER PRIORITY POLLUTANTS RESULTS

METALS / INORGANICS

		R3				R5			
Laboratory:		**Caltest Analytical**				**Caltest Analytical**			
Date Sampled: August 10, 2005									
Constituent	**Units**	**Method**	**RL***	**MDL****	**Result*****	**Method**	**RL***	**MDL****	**Result*****
Flow (Estimated)	MGD				20.3				22
Aluminum (Al)	ug/L	200.8	10	0.7	11	200.8	10	0.7	37
Antimony (Sb)	ug/L	200.8	0.5	0.14	ND	200.8	0.5	0.14	DNQ
Arsenic (As)	ug/L	200.8	0.5	0.14	DNQ	200.8	0.5	0.20	DNQ
Barium (Ba)	ug/L	200.8	0.1	0.03	53	200.8	0.1	0.03	53
Beryllium (Be)	ug/L	200.8	0.1	0.60	ND	200.8	0.1	0.60	ND
Cadmium (Cd)	ug/L	200.8	0.1	0.03	ND	200.8	0.1	0.03	DNQ
Chromium (Cr)	ug/L	200.8	0.5	0.20	ND	200.8	0.5	0.20	DNQ
Chromium VI	ug/L	SM3500CR	10	0.50	ND	SM3500CR	10	0.90	DNQ
Cobalt (Co)	ug/L	200.8	0.5	0.20	ND	200.8	0.5	0.20	ND
Copper (Cu)	ug/L	200.8	0.5	0.28	1.2	200.8	0.5	0.28	1.6
Iron (Fe)	mg/L	200.7	0.05	0.01	ND	200.7	0.05	0.010	DNQ
Lead (Pb)	ug/L	200.8	0.25	0.040	ND	200.8	0.25	0.040	DNQ
Mercury (Hg)	ug/L	1631E	0.0008	0.00020	0.0008	1631E	0.0005	0.00020	0.0009
Molybdenum (Mo)	ug/L	200.8	0.25	0.2	7.6	200.8	0.25	0.20	13
Nickel (Ni)	ug/L	200.8	0.5	0.14	3.1	200.8	0.5	0.14	3.6
Selenium (Se)	ug/L	200.8	1	0.50	2	200.8	1	0.50	2
Silver (Ag)	ug/L	200.8	0.1	0.03	ND	200.8	0.1	0.030	ND
Thallium (Tl)	ug/L	200.8	0.1	0.03	ND	200.8	0.1	0.030	ND
Vanadium (V)	ug/L	200.8	2	0.80	DNQ	200.8	2	0.80	DNQ
Zinc (Zn)	ug/L	200.8	1	0.3	DNQ	200.8	2	0.30	6
Cyanide (Cn)	ug/L	335.2	3	0.9	DNQ	335.2	3	0.80	ND

R3 Arsenic	DNQ:0.24 Est. Conc.
R3 Vanadium	DNQ:0.7 Est. Conc.
R3 Zinc	DNQ=0.9 Est Conc
R3 Cyanide	DNQ=0.87 Est Conc

R5 Antimony	DNQ:0.1 Est. Conc.
R5 Arsenic	DNQ=0.29 Est Conc
R5 Cadmium	DNQ=0.04 Est Conc
R5 Iron	DNQ=0.04 Est Conc
R5 Chromium	DNQ=0.4 Est Conc
R5 Lead	DNQ=0.07 Est Conc
R5 Cobalt	DNQ=0.4 Est Conc
R5 Vanadium	DNQ=0.9 Est Conc

* RL = Reporting Limit
** ND = Not Detected
*** MDL = Method Detection Limit
DNQ = Detected, but Not Quantified
Est. Conc. = Estimated Concentration

Table O-3C

OJAI VALLEY SANITARY DISTRICT
2005 ANNUAL RIVER PRIORITY POLLUTANTS RESULTS

CHLORINATED PESTICIDES / PCBs

			R3			R5		
Laboratory:			**Caltest Analytical**					
Date Sampled: August 10, 2005								
Constituent	**Units**	**EPA Method**	**RL***	**MDL*****	**Result****	**RL***	**MDL*****	**Result****
Flow (Estimated)	MGD				20.3			22
Aldrin	ug/L	608	0.005	0.003	ND	0.005	0.003	ND
Alpha-BHC	ug/L	608	0.01	0.003	ND	0.01	0.003	ND
Beta-BHC	ug/L	608	0.005	0.003	ND	0.005	0.003	ND
Delta-BHC	ug/L	608	0.005	0.003	ND	0.005	0.003	ND
Gamma-BHC (Lindane)	ug/L	608	0.01	0.003	ND	0.01	0.003	ND
Chlordane	ug/L	608	0.02	0.02	ND	0.02	0.02	ND
p,p'-DDD	ug/L	608	0.01	0.002	ND	0.01	0.002	ND
p,p'-DDE	ug/L	608	0.01	0.003	ND	0.01	0.003	ND
p,p'-DDT	ug/L	608	0.01	0.003	ND	0.01	0.003	ND
Dieldrin	ug/L	608	0.01	0.002	ND	0.01	0.002	ND
Endosulfan I	ug/L	608	0.01	0.002	ND	0.01	0.002	ND
Endosulfan II	ug/L	608	0.01	0.002	ND	0.01	0.002	ND
Endosulfan Sulfate	ug/L	608	0.01	0.003	ND	0.01	0.003	ND
Endrin	ug/L	608	0.01	0.002	ND	0.01	0.002	ND
Endrin Aldehyde	ug/L	608	0.01	0.003	ND	0.01	0.003	ND
Endrin Ketone	ug/L	608	0.01	0.002	ND	0.01	0.002	ND
Heptachlor	ug/L	608	0.01	0.003	ND	0.01	0.003	ND
Heptachlor Epoxide	ug/L	608	0.01	0.002	ND	0.01	0.002	ND
Methoxychlor	ug/L	608	0.01	0.003	ND	0.01	0.003	ND
PCB 1016	ug/L	608	0.1	0.03	ND	0.1	0.03	ND
PCB 1221	ug/L	608	0.1	0.05	ND	0.1	0.05	ND
PCB 1232	ug/L	608	0.1	0.06	ND	0.1	0.06	ND
PCB 1242	ug/L	608	0.1	0.04	ND	0.1	0.04	ND
PCB 1248	ug/L	608	0.1	0.05	ND	0.1	0.05	ND
PCB 1254	ug/L	608	0.1	0.06	ND	0.1	0.06	ND
PCB 1260	ug/L	608	0.1	0.03	ND	0.1	0.03	ND
Toxaphene	ug/L	608	0.5	0.2	ND	0.5	0.2	ND

* RL = Reporting Limit
** ND = Not Detected
*** MDL = Method Detection Limit

OJAI VALLEY SANITARY DISTRICT
2005 ANNUAL RIVER PRIORITY POLLUTANTS RESULTS

VOLATILE ORGANICS

Lab: Caltest Analytical			R3			R4			R5		
Date Sampled: August 10, 2005											
Constituent	Units	EPA Method	RL*	MDL***	Result**	RL*	MDL***	Result**	RL*	MDL***	Result**
Flow (Estimated)	MGD				20.3			22			22
Acrolein	ug/L	624	5	0.5	ND	5	0.5	ND	5	0.5	ND
Acrylonitrile	ug/L	624	2	0.6	ND	2	0.6	ND	2	0.6	ND
Benzene	ug/L	624	0.5	0.03	ND	0.5	0.03	ND	0.5	0.03	ND
Bromodichloromethane	ug/L	624	0.5	0.04	ND	0.5	0.04	ND	0.5	0.04	ND
Bromoform	ug/L	624	0.5	0.03	DNQ	0.5	0.03	DNQ	0.5	0.03	DNQ
Bromomethane	ug/L	624	0.5	0.08	ND	0.5	0.08	ND	0.5	0.08	ND
Carbon Tetrachloride	ug/L	624	0.5	0.04	ND	0.5	0.04	ND	0.5	0.04	ND
Chlorobenzene	ug/L	624	0.5	0.03	ND	0.5	0.03	ND	0.5	0.03	ND
Chloroethane	ug/L	624	0.5	0.03	ND	0.5	0.03	ND	0.5	0.03	ND
2-Chloroethylvinyl ether	ug/L	624	1	0.1	ND	1	0.1	ND	1	0.1	ND
Chloroform	ug/L	624	0.5	0.04	ND	0.5	0.04	ND	0.5	0.04	DNQ
Chloromethane	ug/L	624	0.5	0.06	ND	0.5	0.06	ND	0.5	0.06	ND
Dibromochloromethane	ug/L	624	0.5	0.03	ND	0.5	0.03	ND	0.5	0.03	ND
1,2 Dichlorobenzene	ug/L	624	0.5	0.03	ND	0.5	0.03	ND	0.5	0.03	ND
1,3 Dichlorobenzene	ug/L	624	0.5	0.03	ND	0.5	0.03	ND	0.5	0.03	ND
1,4 Dichlorobenzene	ug/L	624	0.5	0.04	ND	0.5	0.04	ND	0.5	0.04	ND
Dichlorodifluromethane	ug/L	624	0.5	0.08	ND	0.5	0.08	ND	0.5	0.08	ND
1,1-Dichloroethane	ug/L	624	0.5	0.04	ND	0.5	0.04	ND	0.5	0.04	ND
1,2-Dichloroethane	ug/L	624	0.5	0.04	ND	0.5	0.04	ND	0.5	0.04	ND
1,1-Dichloroethene	ug/L	624	0.5	0.07	ND	0.5	0.07	ND	0.5	0.07	ND
cis-1,2-Dichloroethene	ug/L	624	0.5	0.07	ND	0.5	0.07	ND	0.5	0.07	ND
trans-1,2-Dichloroethene	ug/L	624	0.5	0.06	ND	0.5	0.06	ND	0.5	0.06	ND
1,2-Dichloropropane	ug/L	624	0.5	0.03	ND	0.5	0.03	ND	0.5	0.03	ND
cis-1,3-Dichloropropene	ug/L	624	0.5	0.03	ND	0.5	0.03	ND	0.5	0.03	ND
trans-1,3-Dichloropropene	ug/L	624	0.5	0.05	ND	0.5	0.05	ND	0.5	0.05	ND
Dichlorotrifluroethane	ug/L	624	0.5	0.05	ND	0.5	0.05	ND	0.5	0.05	ND
Ethylbenzene	ug/L	624	0.5	0.04	ND	0.5	0.04	ND	0.5	0.04	ND
MTBE	ug/L	624	0.5	0.05	ND	0.5	0.05	ND	0.5	0.05	ND
Methylene chloride	ug/L	624	0.5	0.08	ND	0.5	0.08	ND	0.5	0.08	ND
1,1,2,2-Tetrachloroethane	ug/L	624	0.5	0.04	ND	0.5	0.04	ND	0.5	0.04	ND
Tetrachloroethene	ug/L	624	0.5	0.06	ND	0.5	0.06	ND	0.5	0.06	ND
Toluene	ug/L	624	0.5	0.06	ND	0.5	0.06	ND	0.5	0.06	ND
1,1,2-Trichloroethane	ug/L	624	0.5	0.05	ND	0.5	0.05	ND	0.5	0.05	ND
1,1,1-Trichloroethane	ug/L	624	0.5	0.03	ND	0.5	0.03	ND	0.5	0.03	ND
Trichloroethene	ug/L	624	0.5	0.05	ND	0.5	0.05	ND	0.5	0.05	ND
Trichlorofluromethane	ug/L	624	0.5	0.08	ND	0.5	0.08	ND	0.5	0.08	ND
1,2,3-Trichoropropane	ug/L	624	0.5	0.05	ND	0.5	0.05	ND	0.5	0.05	ND
Trichlorotrifluroethane	ug/L	624	1	0.07	ND	1	0.07	ND	1	0.07	ND
Vinyl Chloride	ug/L	624	0.5	0.06	ND	0.5	0.06	ND	0.5	0.06	ND
Xylenes (Total)	ug/L	624	0.5	0.13	ND	0.5	0.13	ND	0.5	0.13	ND

R3 Bromoform: 0.1 ug/L Est. Conc.
R4 Bromoform: 0.1 ug/L Est. Conc.
R5 Bromoform: 0.09 ug/L Est. Conc.
R5 Chloroform: 0.05 ug/L Est. Conc.

* RL = Practical Quantitation Limit
** ND = Not Detected
*** MDL = Method Detection Limit

OJAI VALLEY SANITARY DISTRICT
2005 ANNUAL RIVER PRIORITY POLLUTANTS RESULTS

GRAB SEMI-VOLATILE ORGANICS

Lab: Caltest Analytical			R3			R4			R5		
Date Sampled: August 10, 2005											
Constituent	Units	EPA Method	RL*	MDL***	Result**	RL*	MDL***	Result**	RL*	MDL***	Result**
Flow (Estimated)	MGD				20.3			22			22
Benzidine	ug/L	625	5.0	1.00	ND	5.0	1.00	ND	5.0	1.00	ND
Benzylbutylphthalate	ug/L	625	5.0	2.00	ND	5.0	2.00	ND	5.0	2.00	ND
4-Bromophenylphenylether	ug/L	625	5.0	2.00	ND	5.0	2.00	ND	5.0	2.00	ND
Bis(2-chloroethoxy)methane	ug/L	625	5.0	0.80	ND	5.0	0.80	ND	5.0	0.80	ND
Bis(2-chloroethyl)ether	ug/L	625	1.0	0.70	ND	1.0	0.70	ND	1.0	0.70	ND
Bis(2-chloroisopropyl)ether	ug/L	625	2.0	0.70	ND	2.0	0.70	ND	2.0	0.70	ND
4-Chloro-3-methylphenol	ug/L	625	1.0	0.93	ND	1.0	0.93	ND	1.0	0.93	ND
2-Chloronaphthalene	ug/L	625	5.0	0.60	ND	5.0	0.60	ND	5.0	0.60	ND
2-Chlorophenol	ug/L	625	2.0	1.20	ND	2.0	1.20	ND	2.0	1.20	ND
4-Chlorophenylphenylether	ug/L	625	5.0	2.00	ND	5.0	2.00	ND	5.0	2.00	ND
1,2-Dichlorobenzene	ug/L	625	2.0	0.40	ND	2.0	0.40	ND	2.0	0.40	ND
1,3-Dichlorobenzene	ug/L	625	1.0	0.99	ND	1.0	0.99	ND	1.0	0.99	ND
1,4-Dichlorobenzene	ug/L	625	1.0	0.96	ND	1.0	0.96	ND	1.0	0.96	ND
3,3-Dichlorobenzidine	ug/L	625	5.0	0.60	ND	5.0	0.60	ND	5.0	0.60	ND
2,4-Dichlorophenol	ug/L	625	1.0	0.90	ND	1.0	0.90	ND	1.0	0.90	ND
Diethylphthalate	ug/L	625	2.0	0.90	ND	2.0	0.90	ND	2.0	0.90	ND
2,4-Dimethylphenol	ug/L	625	2.0	1.10	ND	2.0	1.10	ND	2.0	1.10	ND
Dimethylphthalate	ug/L	625	2.0	0.60	ND	2.0	0.60	ND	2.0	0.60	ND
Di-n-butylphthalate	ug/L	625	5.0	0.60	ND	5.0	0.60	ND	5.0	0.60	ND
2,4-Dinitrophenol	ug/L	625	5.0	2.00	ND	5.0	2.00	ND	5.0	2.00	ND
2,4-Dinitrotoluene	ug/L	625	5.0	0.90	ND	5.0	0.90	ND	5.0	0.90	ND
2,6-Dinitrotoluene	ug/L	625	5.0	0.50	ND	5.0	0.50	ND	5.0	0.50	ND
Di-n-octylphthalate	ug/L	625	5.0	0.70	ND	5.0	0.70	ND	5.0	0.70	ND
1,4 Dioxane	ug/L	625	5.0	5.00	ND	5.0	5.00	ND	5.0	5.00	ND
1,2-Diphenylhydrazine	ug/L	625	1.0	0.90	ND	1.0	0.90	ND	1.0	0.90	ND
Bis(2-ethylhexyl)phthalate	ug/L	625	3.0	0.50	ND	3.0	0.50	ND	3.0	0.50	ND
Hexachlorobenzene	ug/L	625	1.0	0.80	ND	1.0	0.80	ND	1.0	0.80	ND
Hexachlorobutadiene	ug/L	625	1.0	0.80	ND	1.0	0.80	ND	1.0	0.80	ND
Hexachlorocyclopentadiene	ug/L	625	1.0	0.80	ND	1.0	0.80	ND	1.0	0.80	ND
Hexachloroethane	ug/L	625	1.0	0.90	ND	1.0	0.90	ND	1.0	0.90	ND
Isophorone	ug/L	625	1.0	0.50	ND	1.0	0.50	ND	1.0	0.50	ND
2-Methyl-4,6-dinitrophenol	ug/L	625	5.0	2.00	ND	5.0	2.00	ND	5.0	2.00	ND
Nitrobenzene	ug/L	625	1.0	0.70	ND	1.0	0.70	ND	1.0	0.70	ND
2-Nitrophenol	ug/L	625	5.0	1.10	ND	5.0	1.10	ND	5.0	1.10	ND
4-Nitrophenol	ug/L	625	5.0	1.00	ND	5.0	1.00	ND	5.0	1.00	ND
N-Nitrosodimethylamine	ug/L	625	5.0	0.60	ND	5.0	0.60	ND	5.0	0.60	ND
N-Nitrosodi-N-propylamine	ug/L	625	5.0	0.80	ND	5.0	0.80	ND	5.0	0.80	ND
N-Nitrosodiphenylamine	ug/L	625	1.0	0.60	ND	1.0	0.60	ND	1.0	0.60	ND
Pentachlorophenol	ug/L	625	1.0	0.98	ND	1.0	0.98	ND	1.0	0.98	ND
Phenol	ug/L	625	1.0	0.80	ND	1.0	0.80	ND	1.0	0.80	ND
1,2,4-Trichlorobenzene	ug/L	625	5.0	1.30	ND	5.0	1.30	ND	5.0	1.30	ND
2,4,6-Trichlorophenol	ug/L	625	5.0	2.00	ND	5.0	2.00	ND	5.0	2.00	ND

* RL = Reporting Limit
** ND = Not Detected
*** MDL = Method Detection Limit

Table O-3C

OJAI VALLEY SANITARY DISTRICT
2005 ANNUAL RIVER PRIORITY POLLUTANTS RESULTS

ORGANOPHOSPHORUS PESTICIDES

Lab: Caltest Analytical			R3			R4			R5		
Date Sampled: August 10, 2005											
Constituent	Units	EPA Method	RL*	MDL***	Result**	RL*	MDL***	Result**	RL*	MDL***	Result**
Flow (Estimated)	MGD				20.3			22			22
Azinphos methyl (Guthion)	ug/L	614	2.5	0.030	ND	2.5	0.030	ND	2.5	0.030	ND
Chlorpyrifos (Dursban)	ug/L	614	0.05	0.030	ND	0.05	0.030	ND	0.05	0.030	ND
Demeton-O and S	ug/L	614	0.5	0.050	ND	0.5	0.050	ND	0.5	0.050	ND
Diazinon	ug/L	614	0.05	0.040	ND	0.05	0.040	ND	0.05	0.040	ND
Disulfoton (Di-syston)	ug/L	614	0.5	0.030	ND	0.5	0.030	ND	0.5	0.030	ND
Ethion	ug/L	614	0.5	0.030	ND	0.5	0.030	ND	0.5	0.030	ND
Malathion	ug/L	614	0.5	0.030	ND	0.5	0.030	ND	0.5	0.030	ND
Parathion (Ethyl Parathion)	ug/L	614	0.5	0.030	ND	0.5	0.030	ND	0.5	0.030	ND
Parathion methyl	ug/L	614	0.5	0.030	ND	0.5	0.030	ND	0.5	0.030	ND

* RL = Reporting Limit
** ND = Not Detected
*** MDL = Method Detection Limit

OJAI VALLEY SANITARY DISTRICT
2005 ANNUAL RIVER PRIORITY POLLUTANTS RESULTS

POLYNUCLEAR AROMATIC HYDROCARBONS (PAH)

Lab: Caltest Analytical			R3			R5		
Date Sampled: August 10, 2005								
Constituent	Units	EPA Method	RL*	MDL***	Result**	RL*	MDL***	Result**
Flow (Estimated)	MGD				20.3			22
Acenapthene	ug/L	610	0.30	0.030	ND	0.30	0.030	ND
Acenapthylene	ug/L	610	0.20	0.020	ND	0.20	0.020	ND
Anthracene	ug/L	610	0.30	0.030	ND	0.30	0.030	ND
Benzo(a)anthracene	ug/L	610	0.30	0.020	ND	0.30	0.020	ND
Benzo(a)pyrene	ug/L	610	0.30	0.020	ND	0.30	0.020	ND
Benzo(b)fluoranthene	ug/L	610	0.30	0.030	ND	0.30	0.030	ND
Benzo(ghi)perylene	ug/L	610	0.10	0.030	ND	0.10	0.030	ND
Benzo(k)fluoranthen	ug/L	610	0.30	0.040	ND	0.30	0.040	ND
Chrysene	ug/L	610	0.30	0.040	ND	0.30	0.040	ND
Dibenzo(a,h)anthracene	ug/L	610	0.10	0.030	ND	0.10	0.030	ND
Fluoranthene	ug/L	610	0.05	0.030	ND	0.05	0.030	ND
Fluorene	ug/L	610	0.10	0.030	ND	0.10	0.030	ND
Ideno(1,2,3-cd)pyrene	ug/L	610	0.05	0.030	ND	0.05	0.030	ND
Napthalene	ug/L	610	0.20	0.020	ND	0.20	0.020	ND
Phenanthrene	ug/L	610	0.05	0.030	ND	0.05	0.030	ND
Pyrene	ug/L	610	0.05	0.030	ND	0.05	0.030	ND

* RL = Reporting Limit
** ND = Not Detected
*** MDL = Method Detection Limit

Table O-3C

OJAI VALLEY SANITARY DISTRICT
2006 ANNUAL RIVER PRIORITY POLLUTANTS RESULTS

METALS / INORGANICS

		R3				R5			
Laboratory:		**Caltest Analytical**				**Caltest Analytical**			
Date Sampled: August 9, 2006									
Constituent	**Units**	**Method**	**RL**	**MDL**	**Result**	**Method**	**RL**	**MDL**	**Result**
Flow (Estimated)	MGD				16				18
Aluminum (Al)	ug/L	200.8	10	1.6	ND	200.8	10	1.6	28
Antimony (Sb)	ug/L	200.8	0.5	0.10	ND	200.8	0.5	0.10	ND
Arsenic (As)	ug/L	200.8	0.5	0.30	ND	200.8	0.5	0.30	DNQ
Barium (Ba)	ug/L	200.8	0.1	0.06	51	200.8	0.1	0.03	49
Beryllium (Be)	ug/L	200.8	0.1	0.07	ND	200.8	0.1	0.06	ND
Cadmium (Cd)	ug/L	200.8	0.1	0.02	ND	200.8	0.1	0.02	DNQ
Chromium (Cr)	ug/L	200.8	0.5	0.30	ND	200.8	0.5	0.30	ND
Chromium VI	ug/L	SW8467196A	10	0.50	ND	SM3500CR	10	0.50	ND
Cobalt (Co)	ug/L	200.8	0.5	0.20	DNQ	200.8	0.5	0.20	DNQ
Copper (Cu)	ug/L	200.8	0.5	0.08	1	200.8	0.5	0.08	1.6
Iron (Fe)	mg/L	200.7	0.05	0.012	ND	200.7	0.05	0.012	ND
Lead (Pb)	ug/L	200.8	0.25	0.100	ND	200.8	0.25	0.100	ND
Mercury (Hg)	ug/L	1631E	0.0005	0.00020	DNQ	1631E	0.0005	0.00020	DNQ
Molybdenum (Mo)	ug/L	200.8	0.25	0.0	6.6	200.8	0.25	0.0	6.5
Nickel (Ni)	ug/L	200.8	0.5	0.40	2.6	200.8	0.5	0.40	2.7
Selenium (Se)	ug/L	200.8	1	0.90	1	200.8	1	0.90	2
Silver (Ag)	ug/L	200.8	0.1	0.02	ND	200.8	0.1	0.02	ND
Thallium (Tl)	ug/L	200.8	0.1	0.01	DNQ	200.8	0.1	0.01	ND
Vanadium (V)	ug/L	200.8	2	0.50	DNQ	200.8	2	0.50	DNQ
Zinc (Zn)	ug/L	200.8	1	0.4	1	200.8	1	0.4	7
Cyanide (Cn)	ug/L	335.2	3	0.8	DNQ	335.2	3	0.8	ND

R3 Cobalt	DNQ=0.2 Est Conc	R5 Arsenic	DNQ=0.4 Est Conc
R3 Mercury	DNQ:0.0005 Est. Conc.	R5 Cadmium	DNQ=0.02 Est Conc
R3 Thallium	DNQ:0.01 Est. Conc.	R5 Cobalt	DNQ=0.2 Est Conc
R3 Vanadium	DNQ=0.8 Est Conc	R5 Mercury	DNQ:0.0003 Est. Conc.
R3 Cyanide	DNQ=1.8 Est Conc	R5 Vanadium	DNQ=0.8 Est Conc

RL = Reporting Limit
ND = Not Detected
MDL = Method Detection Limit
DNQ = Detected, but Not Quantified
Est. Conc. = Estimated Concentration

OJAI VALLEY SANITARY DISTRICT
2006 ANNUAL RIVER PRIORITY POLLUTANTS RESULTS

CHLORINATED PESTICIDES / PCBs

			R3			R5		
Laboratory:			**Caltest Analytical**					
Date Sampled: August 9, 2006								
Constituent	**Units**	**EPA Method**	**RL**	**MDL**	**Result**	**RL**	**MDL**	**Result**
Flow (Estimated)	MGD				16			18
Aldrin	ug/L	608	0.005	0.002	ND	0.005	0.003	ND
Alpha-BHC	ug/L	608	0.01	0.003	ND	0.01	0.003	ND
Beta-BHC	ug/L	608	0.005	0.003	ND	0.005	0.003	ND
Delta-BHC	ug/L	608	0.005	0.003	ND	0.005	0.003	ND
Gamma-BHC (Lindane)	ug/L	608	0.010	0.003	ND	0.010	0.003	ND
Alpha-chlordane	ug/L	608	0.010	0.003	ND	0.010	0.003	ND
Chlordane	ug/L	608	0.050	0.02	ND	0.050	0.02	ND
Gamma-chlordane	ug/L	608	0.010	0.003	ND	0.010	0.003	ND
2,4'-DDD	ug/L	608	0.010	0.003	ND	0.010	0.003	ND
2,4'-DDE	ug/L	608	0.010	0.002	ND	0.010	0.002	ND
2,4'-DDT	ug/L	608	0.010	0.003	ND	0.010	0.003	ND
4,4'-DDD	ug/L	608	0.010	0.003	ND	0.010	0.003	ND
4,4'-DDE	ug/L	608	0.010	0.003	ND	0.010	0.003	ND
4,4'-DDT	ug/L	608	0.010	0.003	ND	0.010	0.003	ND
Dieldrin	ug/L	608	0.010	0.002	ND	0.010	0.002	ND
Endosulfan I	ug/L	608	0.010	0.003	ND	0.010	0.002	ND
Endosulfan II	ug/L	608	0.010	0.003	ND	0.010	0.002	ND
Endosulfan Sulfate	ug/L	608	0.010	0.002	ND	0.010	0.003	ND
Endrin	ug/L	608	0.010	0.002	ND	0.010	0.002	ND
Endrin Aldehyde	ug/L	608	0.010	0.003	ND	0.010	0.003	ND
Endrin Ketone	ug/L	608	0.010	0.003	ND	0.010	0.002	ND
Heptachlor	ug/L	608	0.010	0.003	ND	0.010	0.003	ND
Heptachlor Epoxide	ug/L	608	0.010	0.002	ND	0.010	0.002	ND
Methoxychlor	ug/L	608	0.010	0.003	ND	0.010	0.003	ND
PCB 1016	ug/L	608	0.10	0.05	ND	0.10	0.03	ND
PCB 1221	ug/L	608	0.10	0.06	ND	0.10	0.05	ND
PCB 1232	ug/L	608	0.10	0.04	ND	0.10	0.06	ND
PCB 1242	ug/L	608	0.10	0.06	ND	0.10	0.04	ND
PCB 1248	ug/L	608	0.10	0.05	ND	0.10	0.05	ND
PCB 1254	ug/L	608	0.10	0.04	ND	0.10	0.06	ND
PCB 1260	ug/L	608	0.10	0.03	ND	0.10	0.03	ND
Toxaphene	ug/L	608	0.5	0.19	ND	0.5	0.19	ND

RL = Reporting Limit
ND = Not Detected
MDL = Method Detection Limit

Table O-3C

OJAI VALLEY SANITARY DISTRICT
2006 ANNUAL RIVER PRIORITY POLLUTANTS RESULTS
VOLATILE ORGANICS

Lab: Caltest Analytical			R3			R4			R5		
Date Sampled: August 9, 2006											
Constituent	Units	EPA Method	RL	MDL	Result	RL	MDL	Result	RL	MDL	Result
Flow (Estimated)	MGD				16			18			18
Acrolein	ug/L	624	5	0.50	ND	5	0.50	ND	5	0.50	ND
Acrylonitrile	ug/L	624	2.0	0.60	ND	2.0	0.60	ND	2.0	0.60	ND
Benzene	ug/L	624	0.5	0.030	ND	0.5	0.030	ND	0.5	0.030	ND
Bromodichloromethane	ug/L	624	0.5	0.040	ND	0.5	0.040	ND	0.5	0.040	ND
Bromoform	ug/L	624	0.5	0.030	ND	0.5	0.030	DNQ	0.5	0.030	ND
Bromomethane	ug/L	624	0.5	0.080	ND	0.5	0.080	ND	0.5	0.080	ND
Carbon Tetrachloride	ug/L	624	0.5	0.040	ND	0.5	0.040	ND	0.5	0.040	ND
Chlorobenzene	ug/L	624	0.5	0.030	ND	0.5	0.030	ND	0.5	0.030	ND
Chloroethane	ug/L	624	0.5	0.030	ND	0.5	0.030	ND	0.5	0.030	ND
2-Chloroethylvinyl ether	ug/L	624	1	0.100	ND	1	0.100	ND	1	0.100	ND
Chloroform	ug/L	624	0.5	0.040	ND	0.5	0.040	ND	0.5	0.040	ND
Chloromethane	ug/L	624	0.5	0.060	ND	0.5	0.060	ND	0.5	0.060	ND
Dibromochloromethane	ug/L	624	0.5	0.030	ND	0.5	0.030	ND	0.5	0.030	ND
1,2 Dichlorobenzene	ug/L	624	0.5	0.030	ND	0.5	0.030	ND	0.5	0.030	ND
1,3 Dichlorobenzene	ug/L	624	0.5	0.030	ND	0.5	0.030	ND	0.5	0.030	ND
1,4 Dichlorobenzene	ug/L	624	0.5	0.040	ND	0.5	0.040	ND	0.5	0.040	ND
Dichlorodifluromethane	ug/L	624	0.5	0.080	ND	0.5	0.080	ND	0.5	0.080	ND
1,1-Dichloroethane	ug/L	624	0.5	0.040	ND	0.5	0.040	ND	0.5	0.040	ND
1,2-Dichloroethane	ug/L	624	0.5	0.040	ND	0.5	0.040	ND	0.5	0.040	ND
1,1-Dichloroethene	ug/L	624	0.5	0.070	ND	0.5	0.070	ND	0.5	0.070	ND
cis-1,2-Dichloroethene	ug/L	624	0.5	0.070	ND	0.5	0.070	ND	0.5	0.070	ND
trans-1,2-Dichloroethene	ug/L	624	0.5	0.060	ND	0.5	0.060	ND	0.5	0.060	ND
1,2-Dichloropropane	ug/L	624	0.5	0.030	ND	0.5	0.030	ND	0.5	0.030	ND
cis-1,3-Dichloropropene	ug/L	624	0.5	0.030	ND	0.5	0.030	ND	0.5	0.030	ND
trans-1,3-Dichloropropene	ug/L	624	0.5	0.050	ND	0.5	0.050	ND	0.5	0.050	ND
Dichlorotrifluroethane	ug/L	624	0.5	0.050	ND	0.5	0.050	ND	0.5	0.050	ND
Ethylbenzene	ug/L	624	0.5	0.040	ND	0.5	0.040	ND	0.5	0.040	ND
MTBE	ug/L	624	0.5	0.050	ND	0.5	0.050	ND	0.5	0.050	ND
Methylene chloride	ug/L	624	0.5	0.080	ND	0.5	0.080	ND	0.5	0.080	ND
1,1,2,2-Tetrachloroethane	ug/L	624	0.5	0.040	ND	0.5	0.040	ND	0.5	0.040	ND
Tetrachloroethene	ug/L	624	0.5	0.040	ND	0.5	0.060	ND	0.5	0.060	ND
Toluene	ug/L	624	0.5	0.060	ND	0.5	0.060	ND	0.5	0.060	ND
1,1,2-Trichloroethane	ug/L	624	0.5	0.050	ND	0.5	0.050	ND	0.5	0.050	ND
1,1,1-Trichloroethane	ug/L	624	0.5	0.030	ND	0.5	0.030	ND	0.5	0.030	ND
Trichloroethene	ug/L	624	0.5	0.050	ND	0.5	0.050	ND	0.5	0.050	ND
Trichloroflurometh ane	ug/L	624	0.5	0.080	ND	0.5	0.080	ND	0.5	0.080	ND
1,2,3-Trichoropropane	ug/L	624	0.5	0.050	ND	0.5	0.050	ND	0.5	0.050	ND
Trichlorotrifluroethane	ug/L	624	1	0.070	ND	1	0.070	ND	1	0.070	ND
Vinyl Chloride	ug/L	624	0.5	0.060	ND	0.5	0.060	ND	0.5	0.060	ND
Xylenes (Total)	ug/L	624	0.5	0.13	ND	0.5	0.13	ND	0.5	0.13	ND

RL = Reporting Limit
ND = Not Detected
MDL = Method Detection Limit
DNQ = Detected, but Not Quantified

DNQ - R4 Bromoform: 0.2 ug/L Estimated Concentration

OJAI VALLEY SANITARY DISTRICT
2006 ANNUAL RIVER PRIORITY POLLUTANTS RESULTS
GRAB SEMI-VOLATILE ORGANICS

Lab: Caltest Analytical			R3			R4			R5		
Date Sampled: August 9, 2006											
Constituent	Units	EPA Method	RL	MDL	Result	RL	MDL	Result	RL	MDL	Result
Flow (Estimated)	MGD				16			18			18
Benzidine	ug/L	625	5.0	1.0	ND	5.0	1.0	ND	5.0	1.0	ND
Benzylbutylphthalate	ug/L	625	5.0	2.0	ND	5.0	2.0	ND	5.0	2.0	ND
4-Bromophenylphenylether	ug/L	625	5.0	0.80	ND	5.0	2.00	ND	5.0	2.00	ND
Bis(2-chloroethoxy)methane	ug/L	625	5.0	0.70	ND	5.0	0.80	ND	5.0	0.80	ND
Bis(2-chloroethyl)ether	ug/L	625	1.0	0.80	ND	1.0	0.70	ND	1.0	0.70	ND
Bis(2-chloroisopropyl)ether	ug/L	625	2.0	0.80	ND	2.0	0.70	ND	2.0	0.70	ND
4-Chloro-3-methylphenol	ug/L	625	1.0	0.95	ND	1.0	0.93	ND	1.0	0.93	ND
2-Chloronaphthalene	ug/L	625	5.0	0.90	ND	5.0	0.60	ND	5.0	0.60	ND
2-Chlorophenol	ug/L	625	2.0	0.70	ND	2.0	1.20	ND	2.0	1.20	ND
4-Chlorophenylphenylether	ug/L	625	5.0	0.90	ND	5.0	2.00	ND	5.0	2.00	ND
1,2-Dichlorobenzene	ug/L	625	2.0	0.90	ND	2.0	0.40	ND	2.0	0.40	ND
1,3-Dichlorobenzene	ug/L	625	1.0	0.80	ND	1.0	0.99	ND	1.0	0.99	ND
1,4-Dichlorobenzene	ug/L	625	1.0	0.70	ND	1.0	0.96	ND	1.0	0.96	ND
3,3-Dichlorobenzidine	ug/L	625	5.0	0.60	ND	5.0	0.60	ND	5.0	0.60	ND
2,4-Dichlorophenol	ug/L	625	1.0	0.80	ND	1.0	0.90	ND	1.0	0.90	ND
Diethylphthalate	ug/L	625	2.0	1.0	ND	2.0	0.9	ND	2.0	1.0	ND
2,4-Dimethylphenol	ug/L	625	2.0	1.1	ND	2.0	1.1	ND	2.0	1.1	ND
Dimethylphthalate	ug/L	625	2.0	1.0	ND	2.0	0.6	ND	2.0	0.6	ND
Di-n-butylphthalate	ug/L	625	5.0	1.0	ND	5.0	0.6	ND	5.0	0.6	ND
2,4-Dinitrophenol	ug/L	625	5.0	1.2	ND	5.0	2.0	ND	5.0	2.0	ND
2,4-Dinitrotoluene	ug/L	625	5.0	0.90	ND	5.0	0.90	ND	5.0	0.90	ND
2,6-Dinitrotoluene	ug/L	625	5.0	1.0	ND	5.0	0.5	ND	5.0	0.5	ND
Di-n-octylphthalate	ug/L	625	5.0	0.70	ND	5.0	0.70	ND	5.0	0.70	ND
1,4 Dioxane	ug/L	625	10	5	ND	10	5	ND	10	5	ND
1,2-Diphenylhydrazine	ug/L	625	1.0	0.80	ND	1.0	0.90	ND	1.0	0.90	ND
Bis(2-ethylhexyl)phthalate	ug/L	625	3.0	0.60	ND	3.0	0.60	ND	3.0	0.60	ND
Hexachlorobenzene	ug/L	625	1.0	0.70	ND	1.0	0.70	ND	1.0	0.70	ND
Hexachlorobutadiene	ug/L	625	1.0	0.70	ND	1.0	0.70	ND	1.0	0.70	ND
Hexachlorocyclopentadiene	ug/L	625	1.0	0.80	ND	1.0	0.80	ND	1.0	0.80	ND
Hexachloroethane	ug/L	625	1.0	0.60	ND	1.0	0.60	ND	1.0	0.60	ND
Isophorone	ug/L	625	1.0	0.70	ND	1.0	0.70	ND	1.0	0.70	ND
2-Methyl-4,6-dinitrophenol	ug/L	625	5.0	1.00	ND	5.0	1.00	ND	5.0	1.00	ND
Nitrobenzene	ug/L	625	1.0	0.90	ND	1.0	0.90	ND	1.0	0.90	ND
2-Nitrophenol	ug/L	625	5.0	0.70	ND	5.0	0.70	ND	5.0	0.70	ND
4-Nitrophenol	ug/L	625	5.0	0.60	ND	5.0	0.60	ND	5.0	0.60	ND
N-Nitrosodimethylamine	ug/L	625	5.0	0.80	ND	5.0	0.80	ND	5.0	0.80	ND
N-Nitrosodi-N-propylamine	ug/L	625	5.0	0.90	ND	5.0	0.90	ND	5.0	0.90	ND
N-Nitrosodiphenylamine	ug/L	625	1.0	0.90	ND	1.0	0.90	ND	1.0	0.90	ND
Pentachlorophenol	ug/L	625	1.0	0.92	ND	1.0	0.92	ND	1.0	0.92	ND
Phenol	ug/L	625	1.0	0.70	ND	1.0	0.70	ND	1.0	0.70	ND
1,2,4-Trichlorobenzene	ug/L	625	5.0	0.80	ND	5.0	0.80	ND	5.0	0.80	ND
2,4,6-Trichlorophenol	ug/L	625	5.0	1.2	ND	5.0	1.2	ND	5.0	1.2	ND

RL = Reporting Limit
ND = Not Detected
MDL = Method Detection Limit

Table O-3C

OJAI VALLEY SANITARY DISTRICT
2006 ANNUAL RIVER PRIORITY POLLUTANTS RESULTS
POLYNUCLEAR AROMATIC HYDROCARBONS (PAH)

Lab: Caltest Analytical			R3			R5		
Date Sampled: August 9, 2006								
Constituent	Units	EPA Method	RL	MDL	Result	RL	MDL	Result
Flow (Estimated)	MGD				16			18
Acenapthene	ug/L	610	0.30	0.030	ND	0.30	0.030	ND
Acenapthylene	ug/L	610	0.20	0.020	ND	0.20	0.020	ND
Anthracene	ug/L	610	0.30	0.030	ND	0.30	0.030	ND
Benzo(a)anthracene	ug/L	610	0.30	0.020	ND	0.30	0.020	ND
Benzo(a)pyrene	ug/L	610	0.30	0.020	ND	0.30	0.020	ND
Benzo(b)fluoranthene	ug/L	610	0.30	0.020	ND	0.30	0.030	ND
Benzo(ghi)perylene	ug/L	610	0.10	0.020	ND	0.10	0.030	ND
Benzo(k)fluoranthen	ug/L	610	0.30	0.020	ND	0.30	0.040	ND
Chrysene	ug/L	610	0.30	0.020	ND	0.30	0.040	ND
Dibenzo(a,h)anthracene	ug/L	610	0.10	0.030	ND	0.10	0.030	ND
Fluoranthene	ug/L	610	0.05	0.030	ND	0.05	0.030	ND
Fluorene	ug/L	610	0.10	0.030	ND	0.10	0.030	ND
Ideno(1,2,3-cd)pyrene	ug/L	610	0.05	0.030	ND	0.05	0.030	ND
Napthalene	ug/L	610	0.20	0.020	DNQ**	0.20	0.020	ND
Phenanthrene	ug/L	610	0.05	0.030	ND	0.05	0.030	ND
Pyrene	ug/L	610	0.05	0.030	ND	0.05	0.030	ND

R3 - Napthalene - Estimated Concentration = 0.04 ug/L
R5 - Napthalene - Estimated Concentration = 0.04 ug/L

RL = Reporting Limit
ND = Not Detected
MDL = Method Detection Limit

OJAI VALLEY SANITARY DISTRICT
2007 ANNUAL RIVER PRIORITY POLLUTANTS RESULTS
METALS / INORGANICS

		R3				R5			
Laboratory:		**Caltest Analytical**				**Caltest Analytical**			
Date Sampled: August 8, 2007									
Constituent	**Units**	**Method**	**RL**	**MDL**	**Result**	**Method**	**RL**	**MDL**	**Result**
Flow (Estimated)	MGD				3.9				5.8
Aluminum (Al)	ug/L	200.8	10	0.6	DNQ	200.8	10	0.6	48
Antimony (Sb)	ug/L	200.8	0.5	0.10	ND	200.8	0.5	0.10	DNQ
Arsenic (As)	ug/L	200.8	0.5	0.10	DNQ	200.8	0.5	0.10	0.9
Barium (Ba)	ug/L	200.8	0.1	0.02	60	200.8	0.1	0.02	44
Beryllium (Be)	ug/L	200.8	0.1	0.07	ND	200.8	0.1	0.07	ND
Cadmium (Cd)	ug/L	200.8	0.1	0.04	ND	200.8	0.1	0.04	ND
Chromium (Cr)	ug/L	200.8	0.5	0.20	0.5	200.8	0.5	0.20	0.52
Chromium VI	ug/L	SW8467196A	10	0.60	ND	SM3500CR	10	0.60	ND
Cobalt (Co)	ug/L	200.8	0.5	0.04	DNQ	200.8	0.5	0.04	DNQ
Copper (Cu)	ug/L	200.8	0.5	0.05	0.9	200.8	0.5	0.05	2.7
Iron (Fe)	mg/L	200.7	0.05	0.005	ND	200.7	0.05	0.005	ND
Lead (Pb)	ug/L	200.8	0.25	0.050	ND	200.8	0.25	0.050	0.26
Mercury (Hg)	ug/L	1631E	0.0005	0.00020	0.0007	1631E	0.0005	0.00020	0.0008
Molybdenum (Mo)	ug/L	200.8	0.25	0.06	6.8	200.8	0.25	0.06	6.7
Nickel (Ni)	ug/L	200.8	0.5	0.09	1.9	200.8	0.5	0.09	2.9
Selenium (Se)	ug/L	200.8	1	0.98	2	200.8	1	0.98	2
Silver (Ag)	ug/L	200.8	0.1	0.03	ND	200.8	0.1	0.03	ND
Thallium (Tl)	ug/L	200.8	0.1	0.04	0.1	200.8	0.1	0.04	DNQ
Vanadium (V)	ug/L	200.8	2	0.30	DNQ	200.8	2	0.30	DNQ
Zinc (Zn)	ug/L	200.8	1	0.7	1	200.8	1	0.7	16
Cyanide (Cn)	ug/L	335.2	3	0.8	DNQ	335.2	3	0.8	ND

R3 Aluminum	DNQ=2 Est Conc	R5 Antimony	DNQ=0.2 Est Conc
R3 Arsenic	DNQ=0.5 Est Conc	R5 Cobalt	DNQ=0.3 Est Conc
R3 Cobalt	DNQ=0.2 Est Conc	R5 Thallium	DNQ=0.06 Est Conc
R3 Vanadium	DNQ=0.7 Est Conc	R5 Vanadium	DNQ=0.8 Est Conc
R3 Cyanide	DNQ=1.0 Est Conc		

RL = Reporting Limit
ND = Not Detected
MDL = Method Detection Limit
DNQ = Detected, but Not Quantified
Est. Conc. = Estimated Concentration

OJAI VALLEY SANITARY DISTRICT
2007 ANNUAL RIVER PRIORITY POLLUTANTS RESULTS
CHLORINATED PESTICIDES / PCBs

			R3			R5		
Laboratory:			**Caltest Analytical**					
Date Sampled: August 8, 2007								
Constituent	**Units**	**EPA Method**	**RL**	**MDL**	**Result**	**RL**	**MDL**	**Result**
Flow (Estimated)	MGD				3.9			5.8
Aldrin	ug/L	608	0.005	0.003	ND	0.005	0.003	ND
Alpha-BHC	ug/L	608	0.01	0.003	ND	0.01	0.003	ND
Beta-BHC	ug/L	608	0.005	0.003	ND	0.005	0.003	ND
Delta-BHC	ug/L	608	0.005	0.003	ND	0.005	0.003	ND
Gamma-BHC (Lindane)	ug/L	608	0.010	0.002	ND	0.010	0.002	ND
Alpha-chlordane	ug/L	608	0.010	0.002	ND	0.010	0.002	ND
Chlordane	ug/L	608	0.050	0.02	ND	0.050	0.02	ND
Gamma-chlordane	ug/L	608	0.010	0.003	ND	0.010	0.003	ND
2,4'-DDD	ug/L	608	0.010	0.003	ND	0.010	0.003	ND
2,4'-DDE	ug/L	608	0.010	0.002	ND	0.010	0.002	ND
2,4'-DDT	ug/L	608	0.010	0.003	ND	0.010	0.003	ND
4,4'-DDD	ug/L	608	0.010	0.003	ND	0.010	0.003	ND
4,4'-DDE	ug/L	608	0.010	0.003	ND	0.010	0.003	ND
4,4'-DDT	ug/L	608	0.010	0.003	ND	0.010	0.003	ND
Dieldrin	ug/L	608	0.010	0.002	ND	0.010	0.002	ND
Endosulfan I	ug/L	608	0.010	0.003	ND	0.010	0.003	ND
Endosulfan II	ug/L	608	0.010	0.003	ND	0.010	0.003	ND
Endosulfan Sulfate	ug/L	608	0.010	0.002	ND	0.010	0.002	ND
Endrin	ug/L	608	0.010	0.002	ND	0.010	0.002	ND
Endrin Aldehyde	ug/L	608	0.010	0.003	ND	0.010	0.003	ND
Endrin Ketone	ug/L	608	0.010	0.003	ND	0.010	0.003	ND
Heptachlor	ug/L	608	0.010	0.003	ND	0.010	0.003	ND
Heptachlor Epoxide	ug/L	608	0.010	0.002	ND	0.010	0.002	ND
Methoxychlor	ug/L	608	0.010	0.003	ND	0.010	0.003	ND
PCB 1016	ug/L	608	0.10	0.06	ND	0.10	0.06	ND
PCB 1221	ug/L	608	0.10	0.06	ND	0.10	0.06	ND
PCB 1232	ug/L	608	0.10	0.06	ND	0.10	0.06	ND
PCB 1242	ug/L	608	0.10	0.06	ND	0.10	0.06	ND
PCB 1248	ug/L	608	0.10	0.04	ND	0.10	0.04	ND
PCB 1254	ug/L	608	0.10	0.02	ND	0.10	0.02	ND
PCB 1260	ug/L	608	0.10	0.05	ND	0.10	0.05	ND
Toxaphene	ug/L	608	0.5	0.19	ND	0.5	0.19	ND

RL = Reporting Limit
ND = Not Detected
MDL = Method Detection Limit

Table O-3C

OJAI VALLEY SANITARY DISTRICT
2007 ANNUAL RIVER PRIORITY POLLUTANTS RESULTS
VOLATILE ORGANICS

Lab: Caltest Analytical			R3			R4			R5		
Date Sampled: August 8, 2007											
Constituent	Units	EPA Method	RL	MDL	Result	RL	MDL	Result	RL	MDL	Result
Flow (Estimated)	MGD				3.9			5.8			5.8
Acrolein	ug/L	624	5	1.00	ND	5	1.00	ND	5	1.00	ND
Acrylonitrile	ug/L	624	2.0	0.60	ND	2.0	0.60	ND	2.0	0.60	ND
Benzene	ug/L	624	0.5	0.100	ND	0.5	0.100	ND	0.5	0.100	ND
Bromodichloromethane	ug/L	624	0.5	0.080	ND	0.5	0.080	ND	0.5	0.080	ND
Bromoform	ug/L	624	0.5	0.090	ND	0.5	0.090	DNQ	0.5	0.090	ND
Bromomethane	ug/L	624	0.5	0.060	ND	0.5	0.060	ND	0.5	0.060	ND
Carbon Tetrachloride	ug/L	624	0.5	0.060	ND	0.5	0.060	ND	0.5	0.060	ND
Chlorobenzene	ug/L	624	0.5	0.100	ND	0.5	0.100	ND	0.5	0.100	ND
Chloroethane	ug/L	624	0.5	0.100	ND	0.5	0.100	ND	0.5	0.100	ND
2-Chloroethylvinyl ether	ug/L	624	1	0.300	ND	1	0.300	ND	1	0.300	ND
Chloroform	ug/L	624	0.5	0.090	ND	0.5	0.090	ND	0.5	0.090	ND
Chloromethane	ug/L	624	0.5	0.090	ND	0.5	0.090	ND	0.5	0.090	ND
Dibromochloromethane	ug/L	624	0.5	0.080	ND	0.5	0.080	ND	0.5	0.080	ND
1,2 Dichlorobenzene	ug/L	624	0.5	0.100	ND	0.5	0.100	ND	0.5	0.100	ND
1,3 Dichlorobenzene	ug/L	624	0.5	0.100	ND	0.5	0.100	ND	0.5	0.100	ND
1,4 Dichlorobenzene	ug/L	624	0.5	0.100	ND	0.5	0.100	ND	0.5	0.100	ND
Dichlorodifluromethane	ug/L	624	0.5	0.300	ND	0.5	0.300	ND	0.5	0.300	ND
1,1-Dichloroethane	ug/L	624	0.5	0.060	ND	0.5	0.060	ND	0.5	0.060	ND
1,2-Dichloroethane	ug/L	624	0.5	0.090	ND	0.5	0.090	ND	0.5	0.090	ND
1,1-Dichloroethene	ug/L	624	0.5	0.070	ND	0.5	0.070	ND	0.5	0.070	ND
cis-1,2-Dichloroethene	ug/L	624	0.5	0.060	ND	0.5	0.060	ND	0.5	0.060	ND
trans-1,2-Dichloroethene	ug/L	624	0.5	0.090	ND	0.5	0.090	ND	0.5	0.090	ND
1,2-Dichloropropane	ug/L	624	0.5	0.070	ND	0.5	0.070	ND	0.5	0.070	ND
cis-1,3-Dichloropropene	ug/L	624	0.5	0.070	ND	0.5	0.070	ND	0.5	0.070	ND
trans-1,3-Dichloropropene	ug/L	624	0.5	0.090	ND	0.5	0.090	ND	0.5	0.090	ND
Dichlorotrifluroethane	ug/L	624	0.5	0.100	ND	0.5	0.100	ND	0.5	0.100	ND
Ethylbenzene	ug/L	624	0.5	0.090	ND	0.5	0.090	ND	0.5	0.090	ND
MTBE	ug/L	624	0.5	0.090	ND	0.5	0.090	ND	0.5	0.090	ND
Methylene chloride	ug/L	624	0.5	0.080	ND	0.5	0.080	ND	0.5	0.080	ND
1,1,2,2-Tetrachloroethane	ug/L	624	0.5	0.070	ND	0.5	0.070	ND	0.5	0.070	ND
Tetrachloroethene	ug/L	624	0.5	0.100	ND	0.5	0.100	ND	0.5	0.100	ND
Toluene	ug/L	624	0.5	0.060	DNQ[1]	0.5	0.060	DNQ[3]	0.5	0.060	DNQ[4]
1,2,4-Trichlorobenzene*	ug/L	624	0.5	0.060	DNQ[2]						
1,1,2-Trichloroethane	ug/L	624	0.5	0.060	ND	0.5	0.060	ND	0.5	0.060	ND
1,1,1-Trichloroethane	ug/L	624	0.5	0.100	ND	0.5	0.100	ND	0.5	0.100	ND
Trichloroethene	ug/L	624	0.5	0.070	ND	0.5	0.070	ND	0.5	0.070	ND
Trichlorofluromethane	ug/L	624	0.5	0.100	ND	0.5	0.100	ND	0.5	0.100	ND
1,2,3-Trichoropropane	ug/L	624	0.5	0.100	ND	0.5	0.100	ND	0.5	0.100	ND
Trichlorotrifluroethane	ug/L	624	1	0.080	ND	1	0.080	ND	1	0.080	ND
Vinyl Chloride	ug/L	624	0.5	0.100	ND	0.5	0.100	ND	0.5	0.100	ND
Xylenes (Total)	ug/L	624	0.5	0.06	ND	0.5	0.06	ND	0.5	0.06	ND

RL = Reporting Limit
ND = Not Detected
MDL = Method Detection Limit
DNQ = Detected, but Not Quantified
*1,2,4-Trichlorobenzene Detected in blank

DNQ[1] = 0.21 ug/L Estimated concentration
DNQ[2] = 0.06 ug/L Estimated concentration
DNQ[3] = 0.041 ug/L Estimated concentration
DNQ[4] = 0.17 ug/L Estimated concentration

OJAI VALLEY SANITARY DISTRICT
2007 ANNUAL RIVER PRIORITY POLLUTANTS RESULTS
GRAB SEMI-VOLATILE ORGANICS

Lab: Caltest Analytical			R3			R4			R5		
Date Sampled: August 8, 2007											
Constituent	Units	EPA Method	RL	MDL	Result	RL	MDL	Result	RL	MDL	Result
Flow (Estimated)	MGD				3.9			5.8			5.8
Acenaphthene	ug/L	625	0.30	0.030	ND	0.30	0.030	ND	0.30	0.030	ND
Acenaphthylene	ug/L	625	0.20	0.020	ND	0.20	0.020	ND	0.20	0.020	ND
Anthracene	ug/L	625	0.30	0.020	ND	0.30	0.020	ND	0.30	0.020	ND
Benzidine	ug/L	625	5	5.00	ND	5	5.00	ND	5	5.00	ND
Benzo(a)anthracene	ug/L	625	0.30	0.020	ND	0.30	0.020	ND	0.30	0.020	ND
Benzo(a)pyrene	ug/L	625	0.30	0.020	ND	0.30	0.020	ND	0.30	0.020	ND
Benzo(b)fluoranthene	ug/L	625	0.30	0.020	ND	0.30	0.020	ND	0.30	0.020	ND
Benzo(ghi)perylene	ug/L	625	0.10	0.020	ND	0.10	0.020	ND	0.10	0.020	ND
Benzo(k)fluoranthen	ug/L	625	0.30	0.030	ND	0.30	0.030	ND	0.30	0.030	ND
Benzylbutylphthalate	ug/L	625	5	0.70	ND	5	0.70	ND	5	0.70	ND
4-Bromophenylphenylether	ug/L	625	5	1.00	ND	5	1.00	ND	5	1.00	ND
Bis(2-chloroethoxy)methane	ug/L	625	5	0.70	ND	5	0.70	ND	5	0.70	ND
Bis(2-chloroethyl)ether	ug/L	625	1	0.90	ND	1	0.90	ND	1	0.90	ND
Bis(2-chloroisopropyl)ether	ug/L	625	2	0.60	ND	2	0.60	ND	2	0.60	ND
4-Chloro-3-methylphenol	ug/L	625	1	0.60	ND	1	0.60	ND	1	0.60	ND
2-Chloronaphthalene	ug/L	625	5	1.00	ND	5	1.00	ND	5	1.00	ND
2-Chlorophenol	ug/L	625	2	0.80	ND	2	0.80	ND	2	0.80	ND
4-Chlorophenylphenylether	ug/L	625	5	1.00	ND	5	1.00	ND	5	1.00	ND
Chrysene	ug/L	625	0.30	0.020	ND	0.30	0.020	ND	0.30	0.020	ND
Dibenzo(a,h)anthracene	ug/L	625	0.10	0.020	ND	0.10	0.020	ND	0.10	0.020	ND
1,2-Dichlorobenzene	ug/L	625	2	0.90	ND	2	0.90	ND	2	0.90	ND
1,3-Dichlorobenzene	ug/L	625	1	0.80	ND	1	0.80	ND	1	0.80	ND
1,4-Dichlorobenzene	ug/L	625	1	0.90	ND	1	0.90	ND	1	0.90	ND
3,3-Dichlorobenzidine	ug/L	625	5	1.00	ND	5	1.00	ND	5	1.00	ND
2,4-Dichlorophenol	ug/L	625	1	0.70	ND	1	0.70	ND	1	0.70	ND
Diethylphthalate	ug/L	625	2	0.60	ND	2	0.60	ND	2	0.60	ND
2,4-Dimethylphenol	ug/L	625	2	0.80	ND	2	0.80	ND	2	0.80	ND
Dimethylphthalate	ug/L	625	2	0.70	ND	2	0.70	ND	2	0.70	ND
Di-n-butylphthalate	ug/L	625	5	0.60	ND	5	0.60	ND	5	0.60	ND
2,4-Dinitrophenol	ug/L	625	5	0.60	ND	5	0.60	ND	5	0.60	ND
2,4-Dinitrotoluene	ug/L	625	5	0.60	ND	5	0.60	ND	5	0.60	ND
2,6-Dinitrotoluene	ug/L	625	5	0.60	ND	5	0.60	ND	5	0.60	ND
Di-n-octylphthalate	ug/L	625	5	0.70	ND	5	0.70	ND	5	0.70	ND
1,2-Diphenylhydrazine	ug/L	625	1	0.60	ND	1	0.60	ND	1	0.60	ND
Bis(2-ethylhexyl)phthalate	ug/L	625	3	0.60	ND	3	0.60	ND	3	0.60	ND
Fluoranthene	ug/L	625	0.05	0.020	ND	0.05	0.020	ND	0.05	0.020	ND
Fluorene	ug/L	625	0.10	0.020	ND	0.10	0.020	ND	0.10	0.020	ND
Hexachlorobenzene	ug/L	625	1	1.00	ND	1	1.00	ND	1	1.00	ND
Hexachlorobutadiene	ug/L	625	1	1.00	ND	1	1.00	ND	1	1.00	ND
Hexachlorocyclopentadiene	ug/L	625	1	0.80	ND	1	0.80	ND	1	0.80	ND
Hexachloroethane	ug/L	625	1	1.00	ND	1	1.00	ND	1	1.00	ND
Ideno(1,2,3-cd)pyrene	ug/L	625	0.05	0.020	ND	0.05	0.020	ND	0.05	0.020	ND
Isophorone	ug/L	625	1	0.80	ND	1	0.80	ND	1	0.80	ND
2-Methyl-4,6-dinitrophenol	ug/L	625	5	0.60	ND	5	0.60	ND	5	0.60	ND
Napthalene	ug/L	625	0.20	0.020	ND	0.20	0.020	ND	0.20	0.020	ND
Nitrobenzene	ug/L	625	1	0.70	ND	1	0.70	ND	1	0.70	ND
2-Nitrophenol	ug/L	625	5	0.60	ND	5	0.60	ND	5	0.60	ND
4-Nitrophenol	ug/L	625	5	0.70	ND	5	0.70	ND	5	0.70	ND
N-Nitrosodimethylamine	ug/L	625	5	0.80	ND	5	0.80	ND	5	0.80	ND
N-Nitrosodi-N-propylamine	ug/L	625	5	0.60	ND	5	0.60	ND	5	0.60	ND
N-Nitrosodiphenylamine	ug/L	625	1	0.60	ND	1	0.60	ND	1	0.60	ND
Pentachlorophenol	ug/L	625	1	0.60	ND	1	0.60	ND	1	0.60	ND
Phenanthrene	ug/L	625	0.05	0.020	ND	0.05	0.020	ND	0.05	0.020	ND
Phenol	ug/L	625	1	0.60	ND	1	0.60	ND	1	0.60	ND
Pyrene	ug/L	625	0.05	0.020	ND	0.05	0.020	ND	0.05	0.020	ND
1,2,4-Trichlorobenzene	ug/L	625	5	2.00	ND	5	2.00	ND	5	2.00	ND
2,4,6-Trichlorophenol	ug/L	625	5	0.60	ND	5	0.60	ND	5	0.60	ND
1,4 Dioxane	ug/L	625	10	5.00	ND	10	5.00	ND	10	5.00	ND

RL = Reporting Limit
ND = Not Detected
MDL = Method Detection Limit

OJAI VALLEY SANITARY DISTRICT
2008 ANNUAL RIVER PRIORITY POLLUTANTS RESULTS
METALS / INORGANICS

		R3				R5			
Laboratory:		**Caltest Analytical**				**Caltest Analytical**			
Date Sampled: August 6, 2008									
Constituent	**Units**	**Method**	**RL**	**MDL**	**Result**	**Method**	**RL**	**MDL**	**Result**
Flow (Estimated)	MGD				9.2				11.1
Aluminum (Al)	ug/L	200.8	10	0.1	DNQ	200.8	10	0.1	64
Antimony (Sb)	ug/L	200.8	0.5	0.01	DNQ	200.8	0.5	0.01	DNQ
Arsenic (As)	ug/L	200.8	0.5	0.07	DNQ	200.8	0.5	0.07	0.6
Barium (Ba)	ug/L	200.8	0.1	0.02	51	200.8	0.1	0.02	42
Beryllium (Be)	ug/L	200.8	0.1	0.01	ND	200.8	0.1	0.01	ND
Cadmium (Cd)	ug/L	200.8	0.1	0.06	ND	200.8	0.1	0.06	ND
Chromium (Cr)	ug/L	200.8	0.5	0.03	DNQ	200.8	0.5	0.03	DNQ
Chromium VI	ug/L	SW8467196A	10	0.60	ND	SM3500CR	10	0.60	ND
Cobalt (Co)	ug/L	200.8	0.5	0.01	DNQ	200.8	0.5	0.01	DNQ
Copper (Cu)	ug/L	200.8	0.5	0.07	1.4	200.8	0.5	0.07	2.3
Iron (Fe)	mg/L	200.7	0.05	0.0009	0.6	200.7	0.05	0.0009	0.6
Lead (Pb)	ug/L	200.8	0.25	0.010	ND	200.8	0.25	0.010	DNQ
Mercury (Hg)	ug/L	1631E	0.0005	0.00030	0.0007	1631E	0.0005	0.00030	0.0009
Molybdenum (Mo)	ug/L	200.8	0.25	0.01	6	200.8	0.25	0.01	5.5
Nickel (Ni)	ug/L	200.8	0.5	0.02	4.7	200.8	0.5	0.02	4.3
Selenium (Se)	ug/L	200.8	1	0.11	1.7	200.8	1	0.11	1.5
Silver (Ag)	ug/L	200.8	0.1	0.009	ND	200.8	0.1	0.009	ND
Thallium (Tl)	ug/L	200.8	0.1	0.02	ND	200.8	0.1	0.02	ND
Vanadium (V)	ug/L	200.8	2	0.10	DNQ	200.8	2	0.10	DNQ
Zinc (Zn)	ug/L	200.8	1	0.2	3	200.8	1	0.2	11
Cyanide (Cn)	ug/L	335.2	3	0.6	ND	335.2	3	0.6	DNQ

RL = Reporting Limit
ND = Not Detected
MDL = Method Detection Limit
DNQ = Detected, but Not Quantified
Est. Conc. = Estimated Concentration

R3 Aluminum	DNQ=3 Est Conc	R5 Antimony	DNQ=0.1 Est Conc
R3 Antimony	DNQ=0.09 Est Conc	R5 Cobalt	DNQ=0.2 Est Conc
R3 Arsenic	DNQ=0.4 Est Conc	R5 Thallium	DNQ=0.06 Est Conc
R3 Cobalt	DNQ=0.2 Est Conc	R5 Vanadium	DNQ=0.8 Est Conc
R3 Vanadium	DNQ=0.8 Est Conc	R5 Cyanide	DNQ=1.1 Est Conc
R3 Antimony	DNQ=0.09 Est Conc	R5 Chromium	DNQ=0.2 Est Conc
R3 Chromium	DNQ=0.2 Est Conc	R5 Lead	DNQ=0.24 Est Conc

OJAI VALLEY SANITARY DISTRICT
2008 ANNUAL RIVER PRIORITY POLLUTANTS RESULTS
CHLORINATED PESTICIDES / PCBs

			R3			R5		
Laboratory:			**Caltest Analytical**					
Date Sampled: August 6, 2008								
Constituent	**Units**	**EPA Method**	**RL**	**MDL**	**Result**	**RL**	**MDL**	**Result**
Flow (Estimated)	MGD				9.2			11.1
Aldrin	ug/L	608	0.005	0.003	ND	0.005	0.003	ND
Alpha-BHC	ug/L	608	0.01	0.002	ND	0.01	0.002	ND
Beta-BHC	ug/L	608	0.005	0.002	ND	0.005	0.002	ND
Delta-BHC	ug/L	608	0.005	0.002	ND	0.005	0.002	ND
Gamma-BHC (Lindane)	ug/L	608	0.010	0.002	ND	0.010	0.002	ND
Alpha-chlordane	ug/L	608	0.010	0.003	ND	0.010	0.003	ND
Chlordane	ug/L	608	0.050	0.04	ND	0.050	0.04	ND
Gamma-chlordane	ug/L	608	0.010	0.003	ND	0.010	0.003	ND
2,4'-DDD	ug/L	608	0.010	0.003	ND	0.010	0.003	ND
2,4'-DDE	ug/L	608	0.010	0.002	ND	0.010	0.002	ND
2,4'-DDT	ug/L	608	0.010	0.003	ND	0.010	0.003	ND
4,4'-DDD	ug/L	608	0.010	0.003	ND	0.010	0.003	ND
4,4'-DDE	ug/L	608	0.010	0.003	ND	0.010	0.003	ND
4,4'-DDT	ug/L	608	0.010	0.003	ND	0.010	0.003	ND
Dieldrin	ug/L	608	0.010	0.003	ND	0.010	0.003	ND
Endosulfan I	ug/L	608	0.010	0.003	ND	0.010	0.003	ND
Endosulfan II	ug/L	608	0.010	0.003	ND	0.010	0.003	ND
Endosulfan Sulfate	ug/L	608	0.010	0.003	ND	0.010	0.003	ND
Endrin	ug/L	608	0.010	0.003	ND	0.010	0.003	ND
Endrin Aldehyde	ug/L	608	0.010	0.002	ND	0.010	0.002	ND
Endrin Ketone	ug/L	608	0.010	0.003	ND	0.010	0.003	ND
Heptachlor	ug/L	608	0.010	0.003	ND	0.010	0.003	ND
Heptachlor Epoxide	ug/L	608	0.010	0.003	ND	0.010	0.003	ND
Methoxychlor	ug/L	608	0.010	0.004	ND	0.010	0.004	ND
PCB 1016	ug/L	608	0.10	0.05	ND	0.10	0.05	ND
PCB 1221	ug/L	608	0.10	0.06	ND	0.10	0.06	ND
PCB 1232	ug/L	608	0.10	0.04	ND	0.10	0.04	ND
PCB 1242	ug/L	608	0.10	0.04	ND	0.10	0.04	ND
PCB 1248	ug/L	608	0.10	0.04	ND	0.10	0.04	ND
PCB 1254	ug/L	608	0.10	0.06	ND	0.10	0.06	ND
PCB 1260	ug/L	608	0.10	0.05	ND	0.10	0.05	ND
Toxaphene	ug/L	608	0.5	0.5	ND	0.5	0.5	ND

RL = Reporting Limit
ND = Not Detected
MDL = Method Detection Limit

Table O-3C

OJAI VALLEY SANITARY DISTRICT
2008 ANNUAL RIVER PRIORITY POLLUTANTS RESULTS
VOLATILE ORGANICS

Lab: Caltest Analytical			R3			R4			R5		
Date Sampled: August 6, 2008											
Constituent	Units	EPA Method	RL	MDL	Result	RL	MDL	Result	RL	MDL	Result
Flow (Estimated)	MGD				9.2			11.1			11.1
Acrolein	ug/L	624	5	1.30	ND	5	1.30	ND	5	1.30	ND
Acrylonitrile	ug/L	624	2.0	0.66	ND	2.0	0.66	ND	2.0	0.66	ND
Benzene	ug/L	624	0.5	0.25	ND	0.5	0.25	ND	0.5	0.25	ND
Bromodichloromethane	ug/L	624	0.5	0.25	ND	0.5	0.25	ND	0.5	0.25	ND
Bromoform	ug/L	624	0.5	0.32	ND	0.5	0.32	ND	0.5	0.32	ND
Bromomethane	ug/L	624	0.5	0.27	ND	0.5	0.27	ND	0.5	0.27	ND
Carbon Tetrachloride	ug/L	624	0.5	0.22	ND	0.5	0.22	ND	0.5	0.22	ND
Chlorobenzene	ug/L	624	0.5	0.29	ND	0.5	0.29	ND	0.5	0.29	ND
Chloroethane	ug/L	624	0.5	0.37	ND	0.5	0.37	ND	0.5	0.37	ND
2-Chloroethylvinyl ether	ug/L	624	1	0.56	ND	1	0.56	ND	1	0.56	ND
Chloroform	ug/L	624	0.5	0.26	ND	0.5	0.26	ND	0.5	0.26	ND
Chloromethane	ug/L	624	0.5	0.27	ND	0.5	0.27	ND	0.5	0.27	ND
Dibromochloromethane	ug/L	624	0.5	0.31	ND	0.5	0.31	ND	0.5	0.31	ND
1,2 Dichlorobenzene	ug/L	624	0.5	0.27	ND	0.5	0.27	ND	0.5	0.27	ND
1,3 Dichlorobenzene	ug/L	624	0.5	0.27	ND	0.5	0.27	ND	0.5	0.27	ND
1,4 Dichlorobenzene	ug/L	624	0.5	0.32	ND	0.5	0.32	ND	0.5	0.32	ND
Dichlorodifluromethane	ug/L	624	0.5	0.23	ND	0.5	0.23	ND	0.5	0.23	ND
1,1-Dichloroethane	ug/L	624	0.5	0.26	ND	0.5	0.26	ND	0.5	0.26	ND
1,2-Dichloroethane	ug/L	624	0.5	0.27	ND	0.5	0.27	ND	0.5	0.27	ND
1,1-Dichloroethene	ug/L	624	0.5	0.23	ND	0.5	0.23	ND	0.5	0.23	ND
cis-1,2-Dichloroethene	ug/L	624	0.5	0.25	ND	0.5	0.25	ND	0.5	0.25	ND
trans-1,2-Dichloroethene	ug/L	624	0.5	0.23	ND	0.5	0.23	ND	0.5	0.23	ND
1,2-Dichloropropane	ug/L	624	0.5	0.28	ND	0.5	0.28	ND	0.5	0.28	ND
cis-1,3-Dichloropropene	ug/L	624	0.5	0.29	ND	0.5	0.29	ND	0.5	0.29	ND
trans-1,3-Dichloropropene	ug/L	624	0.5	0.34	ND	0.5	0.34	ND	0.5	0.34	ND
Dichlorotrifluroethane	ug/L	624	0.5	0.29	ND	0.5	0.29	ND	0.5	0.29	ND
Ethylbenzene	ug/L	624	0.5	0.26	ND	0.5	0.26	ND	0.5	0.26	ND
MTBE	ug/L	624	0.5	0.28	ND	0.5	0.28	ND	0.5	0.28	ND
Methylene chloride	ug/L	624	0.5	0.28	ND	0.5	0.28	ND	0.5	0.28	ND
1,1,2,2-Tetrachloroethane	ug/L	624	0.5	0.30	ND	0.5	0.30	ND	0.5	0.30	ND
Tetrachloroethene	ug/L	624	0.5	0.21	ND	0.5	0.21	ND	0.5	0.21	ND
Toluene	ug/L	624	0.5	0.24	ND	0.5	0.24	ND	0.5	0.24	ND
1,1,2-Trichloroethane	ug/L	624	0.5	0.30	ND	0.5	0.30	ND	0.5	0.30	ND
1,1,1-Trichloroethane	ug/L	624	0.5	0.23	ND	0.5	0.23	ND	0.5	0.23	ND
Trichloroethene	ug/L	624	0.5	0.26	ND	0.5	0.26	ND	0.5	0.26	ND
Trichloroflurometh ane	ug/L	624	0.5	0.32	ND	0.5	0.32	ND	0.5	0.32	ND
1,2,3-Trichoropropane	ug/L	624	0.5	0.30	ND	0.5	0.30	ND	0.5	0.30	ND
Trichlorotrifluroethane	ug/L	624	1	0.28	ND	1	0.28	ND	1	0.28	ND
Vinyl Chloride	ug/L	624	0.5	0.36	ND	0.5	0.36	ND	0.5	0.36	ND
Xylenes (Total)	ug/L	624	0.5	0.26	ND	0.5	0.26	ND	0.5	0.26	ND

RL = Reporting Limit
ND = Not Detected
MDL = Method Detection Limit
DNQ = Detected, but Not Quantified

Table O-3C

OJAI VALLEY SANITARY DISTRICT
2008 ANNUAL RIVER PRIORITY POLLUTANTS RESULTS
GRAB SEMI-VOLATILE ORGANICS

Lab: Caltest Analytical			R3			R4			R5		
Date Sampled: August 6, 2008											
Constituent	Units	EPA Method	RL	MDL	Result	RL	MDL	Result	RL	MDL	Result
Flow (Estimated)	MGD				9.2			11.1			11.1
Acenaphthene	ug/L	625	0.30	0.030	ND	0.30	0.030	ND	0.30	0.030	ND
Acenaphthylene	ug/L	625	0.20	0.020	ND	0.20	0.020	ND	0.20	0.020	ND
Anthracene	ug/L	625	0.30	0.020	ND	0.30	0.020	ND	0.30	0.020	ND
Benzidine	ug/L	625	5	5.00	ND	5	5.00	ND	5	5.00	ND
Benzo(a)anthracene	ug/L	625	0.30	0.020	ND	0.30	0.020	ND	0.30	0.020	ND
Benzo(a)pyrene	ug/L	625	0.30	0.020	ND	0.30	0.020	ND	0.30	0.020	ND
Benzo(b)fluoranthene	ug/L	625	0.30	0.020	ND	0.30	0.020	ND	0.30	0.020	ND
Benzo(ghi)perylene	ug/L	625	0.10	0.020	ND	0.10	0.020	ND	0.10	0.020	ND
Benzo(k)fluoranthen	ug/L	625	0.30	0.030	ND	0.30	0.030	ND	0.30	0.030	ND
Benzylbutylphthalate	ug/L	625	5	0.70	ND	5	0.70	ND	5	0.70	ND
4-Bromophenylphenylether	ug/L	625	5	1.00	ND	5	1.00	ND	5	1.00	ND
Bis(2-chloroethoxy)methane	ug/L	625	5	0.70	ND	5	0.70	ND	5	0.70	ND
Bis(2-chloroethyl)ether	ug/L	625	1	0.90	ND	1	0.90	ND	1	0.90	ND
Bis(2-chloroisopropyl)ether	ug/L	625	2	0.60	ND	2	0.60	ND	2	0.60	ND
4-Chloro-3-methylphenol	ug/L	625	1	0.60	ND	1	0.60	ND	1	0.60	ND
2-Chloronaphthalene	ug/L	625	5	1.00	ND	5	1.00	ND	5	1.00	ND
2-Chlorophenol	ug/L	625	2	0.80	ND	2	0.80	ND	2	0.80	ND
4-Chlorophenylphenylether	ug/L	625	5	1.00	ND	5	1.00	ND	5	1.00	ND
Chrysene	ug/L	625	0.30	0.020	ND	0.30	0.020	ND	0.30	0.020	ND
Dibenzo(a,h)anthracene	ug/L	625	0.10	0.020	ND	0.10	0.020	ND	0.10	0.020	ND
1,2-Dichlorobenzene	ug/L	625	2	0.90	ND	2	0.90	ND	2	0.90	ND
1,3-Dichlorobenzene	ug/L	625	1	0.80	ND	1	0.80	ND	1	0.80	ND
1,4-Dichlorobenzene	ug/L	625	1	0.90	ND	1	0.90	ND	1	0.90	ND
3,3-Dichlorobenzidine	ug/L	625	5	1.00	ND	5	1.00	ND	5	1.00	ND
2,4-Dichlorophenol	ug/L	625	1	0.70	ND	1	0.70	ND	1	0.70	ND
Diethylphthalate	ug/L	625	2	0.60	ND	2	0.60	ND	2	0.60	ND
2,4-Dimethylphenol	ug/L	625	2	0.80	ND	2	0.80	ND	2	0.80	ND
Dimethylphthalate	ug/L	625	2	0.70	ND	2	0.70	ND	2	0.70	ND
Di-n-butylphthalate	ug/L	625	5	0.60	ND	5	0.60	ND	5	0.60	ND
2,4-Dinitrophenol	ug/L	625	5	0.60	ND	5	0.60	ND	5	0.60	ND
2,4-Dinitrotoluene	ug/L	625	5	0.60	ND	5	0.60	ND	5	0.60	ND
2,6-Dinitrotoluene	ug/L	625	5	0.60	ND	5	0.60	ND	5	0.60	ND
Di-n-octylphthalate	ug/L	625	5	0.70	ND	5	0.70	ND	5	0.70	ND
1,4 Dioxane	ug/L	625	10	5.00	ND	10	5.00	ND	10	5.00	ND
1,2-Diphenylhydrazine	ug/L	625	1	0.60	ND	1	0.60	ND	1	0.60	ND
Bis(2-ethylhexyl)phthalate	ug/L	625	3	0.60	ND	3	0.60	ND	3	0.60	ND
Fluoranthene	ug/L	625	0.05	0.020	ND	0.05	0.020	ND	0.05	0.020	ND
Fluorene	ug/L	625	0.10	0.020	ND	0.10	0.020	ND	0.10	0.020	ND
Hexachlorobenzene	ug/L	625	1	1.00	ND	1	1.00	ND	1	1.00	ND
Hexachlorobutadiene	ug/L	625	1	1.00	ND	1	1.00	ND	1	1.00	ND
Hexachlorocyclopentadiene	ug/L	625	1	0.80	ND	1	0.80	ND	1	0.80	ND
Hexachloroethane	ug/L	625	1	1.00	ND	1	1.00	ND	1	1.00	ND
Ideno(1,2,3-cd)pyrene	ug/L	625	0.05	0.020	ND	0.05	0.020	ND	0.05	0.020	ND
Isophorone	ug/L	625	1	0.80	ND	1	0.80	ND	1	0.80	ND
2-Methyl-4,6-dinitrophenol	ug/L	625	5	0.60	ND	5	0.60	ND	5	0.60	ND
Napthalene	ug/L	625	0.20	0.020	ND	0.20	0.020	ND	0.20	0.020	ND
Nitrobenzene	ug/L	625	1	0.70	ND	1	0.70	ND	1	0.70	ND
2-Nitrophenol	ug/L	625	5	0.60	ND	5	0.60	ND	5	0.60	ND
4-Nitrophenol	ug/L	625	5	0.70	ND	5	0.70	ND	5	0.70	ND
N-Nitrosodimethylamine	ug/L	625	5	0.80	ND	5	0.80	ND	5	0.80	ND
N-Nitrosodi-N-propylamine	ug/L	625	5	0.60	ND	5	0.60	ND	5	0.60	ND
N-Nitrosodiphenylamine	ug/L	625	1	0.60	ND	1	0.60	ND	1	0.60	ND
Pentachlorophenol	ug/L	625	1	0.60	ND	1	0.60	ND	1	0.60	ND
Phenanthrene	ug/L	625	0.05	0.020	ND	0.05	0.020	ND	0.05	0.020	ND
Phenol	ug/L	625	1	0.60	ND	1	0.60	ND	1	0.60	ND
Pyrene	ug/L	625	0.05	0.020	ND	0.05	0.020	ND	0.05	0.020	ND
1,2,4-Trichlorobenzene	ug/L	625	5	2.00	ND	5	2.00	ND	5	2.00	ND
2,4,6-Trichlorophenol	ug/L	625	5	0.60	ND	5	0.60	ND	5	0.60	ND

RL = Reporting Limit
ND = Not Detected
MDL = Method Detection Limit

OJAI VALLEY SANITARY DISTRICT
2009 SEMI-ANNUAL RIVER PRIORITY POLLUTANTS RESULTS
METALS / INORGANICS

Laboratory:		Caltest Analytical					
Date Sampled: February 4, 2009					Results		
Constituent	Units	Method	RL	MDL	R3	R4	R5
Flow (Estimated)	MGD				3.6	5.4	5.4
Antimony (Sb)	ug/L	200.8	0.5	0.01	DNQ	DNQ	DNQ
Arsenic (As)	ug/L	200.8	0.5	0.07	0.6	0.6	0.6
Beryllium (Be)	ug/L	200.8	0.1	0.01	ND	ND	ND
Boron (B)	ug/L	200.8	10	2.8	370	400	540
Cadmium (Cd)	ug/L	200.8	0.1	0.06	ND	ND	ND
Chromium (Cr)	ug/L	200.8	0.5	0.03	0.5	0.6	0.6
Copper (Cu)	ug/L	200.8	0.5	1.20	1.2	2.3	2.9
Lead (Pb)	ug/L	200.8	0.25	0.010	ND	DNQ	DNQ
Mercury (Hg)	ug/L	1631E	0.0005	0.00020	0.0005	0.0006	DNQ
Nickel (Ni)	ug/L	200.8	0.5	0.02	3.8	3.7	3.7
Selenium (Se)	ug/L	200.8	1	0.11	1.7	1.5	1.3
Silver (Ag)	ug/L	200.8	0.1	0.009	ND	ND	ND
Thallium (Tl)	ug/L	200.8	0.1	0.02	ND	DNQ	ND
Zinc (Zn)	ug/L	200.8	1	0.2	5	13	21
Cyanide (Cn)	ug/L	335.2	3	0.6	ND	ND	DNQ

RL = Reporting Limit
ND = Not Detected
MDL = Method Detection Limit
DNQ = Detected, but Not Quantified
Est. Conc. = Estimated Concentration

R3 Antimony	DNQ= 0.08 Est Conc
R4 Antimony	DNQ= 0.1 Est Conc
R4 Lead	DNQ=0.13 Est Conc
R4 Thallium	DNQ= 0.04 Est Conc
R5 Antimony	DNQ= 0.1 Est Conc
R5 Lead	DNQ=0.2 Est Conc
R5 Mercury	DNQ= 0.00049 Est Conc
R5 Cyanide	DNQ= 0.81 Est Conc

OJAI VALLEY SANITARY DISTRICT
2009 SEMI-ANNUAL RIVER PRIORITY POLLUTANTS RESULTS
CHLORINATED PESTICIDES / PCBs

Laboratory:			Caltest Analytical				
Date Sampled: February 4, 2009							
Constituent	Units	Method	RL	MDL	R3	R4	R5
Flow (Estimated)	MGD				3.6	5.4	5.4
Aldrin	ug/L	608	0.005	0.003	ND	ND	ND
Alpha-BHC	ug/L	608	0.01	0.002	ND	ND	ND
Beta-BHC	ug/L	608	0.005	0.002	ND	ND	ND
Delta-BHC	ug/L	608	0.005	0.002	ND	ND	ND
Gamma-BHC (Lindane)	ug/L	608	0.010	0.002	ND	ND	ND
Alpha-chlordane	ug/L	608	0.010	0.003	ND	ND	ND
Chlordane	ug/L	608	0.050	0.04	ND	ND	ND
Gamma-chlordane	ug/L	608	0.010	0.003	ND	ND	ND
2,4'-DDD	ug/L	608	0.010	0.003	ND	ND	ND
2,4'-DDE	ug/L	608	0.010	0.002	ND	ND	ND
2,4'-DDT	ug/L	608	0.010	0.003	ND	ND	ND
4,4'-DDD	ug/L	608	0.010	0.003	ND	ND	ND
4,4'-DDE	ug/L	608	0.010	0.003	ND	ND	ND
4,4'-DDT	ug/L	608	0.010	0.003	ND	ND	ND
Dieldrin	ug/L	608	0.010	0.003	ND	ND	ND
Endosulfan I	ug/L	608	0.010	0.003	ND	ND	ND
Endosulfan II	ug/L	608	0.010	0.003	ND	ND	ND
Endosulfan Sulfate	ug/L	608	0.010	0.003	ND	ND	ND
Endrin	ug/L	608	0.010	0.003	ND	ND	ND
Endrin Aldehyde	ug/L	608	0.010	0.002	ND	ND	ND
Endrin Ketone	ug/L	608	0.010	0.003	ND	ND	ND
Heptachlor	ug/L	608	0.010	0.003	ND	ND	ND
Heptachlor Epoxide	ug/L	608	0.010	0.003	ND	ND	ND
Methoxychlor	ug/L	608	0.010	0.004	ND	ND	ND
PCB 1016	ug/L	608	0.10	0.05	ND	ND	ND
PCB 1221	ug/L	608	0.10	0.06	ND	ND	ND
PCB 1232	ug/L	608	0.10	0.04	ND	ND	ND
PCB 1242	ug/L	608	0.10	0.04	ND	ND	ND
PCB 1248	ug/L	608	0.10	0.04	ND	ND	ND
PCB 1254	ug/L	608	0.10	0.06	ND	ND	ND
PCB 1260	ug/L	608	0.10	0.05	ND	ND	ND
Toxaphene	ug/L	608	0.5	0.43	ND	ND	ND

RL = Reporting Limit
ND = Not Detected
MDL = Method Detection Limit

OJAI VALLEY SANITARY DISTRICT
2009 SEMI-ANNUAL RIVER PRIORITY POLLUTANTS RESULTS
VOLATILE ORGANICS

Laboratory:			Caltest Analytical				
Date Sampled: February 4, 2009							
Constituent	Units	Method	RL	MDL	R3	R4	R5
Flow (Estimated)	MGD				3.6	5.4	5.4
Acrolein	ug/L	624	5	1.30	ND	ND	ND
Acrylonitrile	ug/L	624	2.0	0.66	ND	ND	ND
Benzene	ug/L	624	0.5	0.25	ND	ND	ND
Bromodichloromethane	ug/L	624	0.5	0.25	ND	ND	ND
Bromoform	ug/L	624	0.5	0.32	ND	ND	ND
Bromomethane	ug/L	624	0.5	0.27	ND	ND	ND
Carbon Tetrachloride	ug/L	624	0.5	0.22	ND	ND	ND
Chlorobenzene	ug/L	624	0.5	0.29	ND	ND	ND
Chloroethane	ug/L	624	0.5	0.37	ND	ND	ND
2-Chloroethylvinyl ether	ug/L	624	1	0.56	ND	ND	ND
Chloroform	ug/L	624	0.5	0.26	ND	ND	ND
Chloromethane	ug/L	624	0.5	0.27	ND	ND	ND
Dibromochloromethane	ug/L	624	0.5	0.31	ND	ND	ND
1,2 Dichlorobenzene	ug/L	624	0.5	0.27	ND	ND	ND
1,3 Dichlorobenzene	ug/L	624	0.5	0.27	ND	ND	ND
1,4 Dichlorobenzene	ug/L	624	0.5	0.31	ND	ND	ND
Dichlorodifluromethane	ug/L	624	0.5	0.23	ND	ND	ND
1,1-Dichloroethane	ug/L	624	0.5	0.26	ND	ND	ND
1,2-Dichloroethane	ug/L	624	0.5	0.27	ND	ND	ND
1,1-Dichloroethene	ug/L	624	0.5	0.23	ND	ND	ND
cis-1,2-Dichloroethene	ug/L	624	0.5	0.25	ND	ND	ND
trans-1,2-Dichloroethene	ug/L	624	0.5	0.23	ND	ND	ND
1,2-Dichloropropane	ug/L	624	0.5	0.28	ND	ND	ND
cis-1,3-Dichloropropene	ug/L	624	0.5	0.29	ND	ND	ND
trans-1,3-Dichloropropene	ug/L	624	0.5	0.34	ND	ND	ND
Dichlorotrifluroethane	ug/L	624	0.5	0.29	ND	ND	ND
Ethylbenzene	ug/L	624	0.5	0.26	ND	ND	ND
MTBE	ug/L	624	0.5	0.28	ND	ND	ND
Methylene chloride	ug/L	624	0.5	0.18	ND	ND	ND
1,1,2,2-Tetrachloroethane	ug/L	624	0.5	0.30	ND	ND	ND
Tetrachloroethene	ug/L	624	0.5	0.21	ND	ND	ND
Toluene	ug/L	624	0.5	0.24	ND	ND	ND
1,1,2-Trichloroethane	ug/L	624	0.5	0.30	ND	ND	ND
1,1,1-Trichloroethane	ug/L	624	0.5	0.23	ND	ND	ND
Trichloroethene	ug/L	624	0.5	0.26	ND	ND	ND
Trichlorofluromethane	ug/L	624	0.5	0.32	ND	ND	ND
1,2,3-Trichoropropane	ug/L	624	0.5	0.30	ND	ND	ND
Trichlorotrifluroethane	ug/L	624	1	0.28	ND	ND	ND
Vinyl Chloride	ug/L	624	0.5	0.36	ND	ND	ND
Xylenes (Total)	ug/L	624	0.5	0.26	ND	ND	ND

RL = Reporting Limit
ND = Not Detected
MDL = Method Detection Limit
DNQ = Detected, but Not Quantified

OJAI VALLEY SANITARY DISTRICT
2009 SEMI-ANNUAL RIVER PRIORITY POLLUTANTS RESULTS
GRAB SEMI-VOLATILE ORGANICS

Laboratory:			Caltest Analytical				
Endrin							
Constituent	Units	Method	RL	MDL	R3	R4	R5
Flow (Estimated)	MGD				3.6	5.4	5.4
Acenaphthene	ug/L	625	0.30	0.030	ND	ND	ND
Acenaphthylene	ug/L	625	0.20	0.030	ND	ND	ND
Anthracene	ug/L	625	0.30	0.030	ND	ND	ND
Benzidine	ug/L	625	5	5.00	ND	ND	ND
Benzo(a)anthracene	ug/L	625	0.30	0.030	ND	ND	ND
Benzo(a)pyrene	ug/L	625	0.30	0.030	ND	ND	ND
Benzo(b)fluoranthene	ug/L	625	0.30	0.030	ND	ND	ND
Benzo(ghi)perylene	ug/L	625	0.10	0.030	ND	ND	ND
Benzo(k)fluoranthen	ug/L	625	0.30	0.030	ND	ND	ND
Benzylbutylphthalate	ug/L	625	5	0.98	ND	ND	ND
4-Bromophenylphenylether	ug/L	625	5	0.97	ND	ND	ND
Bis(2-chloroethoxy)methane	ug/L	625	5	0.93	ND	ND	ND
Bis(2-chloroethyl)ether	ug/L	625	1	0.95	ND	ND	ND
Bis(2-chloroisopropyl)ether	ug/L	625	2	0.81	ND	ND	ND
4-Chloro-3-methylphenol	ug/L	625	1	0.91	ND	ND	ND
2-Chloronaphthalene	ug/L	625	5	0.98	ND	ND	ND
2-Chlorophenol	ug/L	625	2	0.98	ND	ND	ND
4-Chlorophenylphenylether	ug/L	625	5	0.99	ND	ND	ND
Chrysene	ug/L	625	0.30	0.030	ND	ND	ND
Dibenzo(a,h)anthracene	ug/L	625	0.10	0.030	ND	ND	ND
1,2-Dichlorobenzene	ug/L	625	2	0.95	ND	ND	ND
1,3-Dichlorobenzene	ug/L	625	1	0.87	ND	ND	ND
1,4-Dichlorobenzene	ug/L	625	1	0.93	ND	ND	ND
3,3-Dichlorobenzidine	ug/L	625	5	5.00	ND	ND	ND
2,4-Dichlorophenol	ug/L	625	1	0.99	ND	ND	ND
Diethylphthalate	ug/L	625	2	0.86	ND	ND	ND
2,4-Dimethylphenol	ug/L	625	2	0.87	ND	ND	ND
Dimethylphthalate	ug/L	625	2	0.97	ND	ND	ND
Di-n-butylphthalate	ug/L	625	5	0.91	ND	ND	ND
2,4-Dinitrophenol	ug/L	625	5	0.83	ND	ND	ND
2,4-Dinitrotoluene	ug/L	625	5	0.60	ND	ND	ND
2,6-Dinitrotoluene	ug/L	625	5	0.98	ND	ND	ND
Di-n-octylphthalate	ug/L	625	5	0.92	ND	ND	ND
1,4 Dioxane	ug/L	625	10	0.90	ND	ND	ND
1,2-Diphenylhydrazine	ug/L	625	1	0.90	ND	ND	ND
Bis(2-ethylhexyl)phthalate	ug/L	625	3	0.95	ND	ND	ND
Fluoranthene	ug/L	625	0.05	0.030	ND	ND	ND
Fluorene	ug/L	625	0.10	0.030	ND	ND	ND
Hexachlorobenzene	ug/L	625	1	0.91	ND	ND	ND
Hexachlorobutadiene	ug/L	625	1	0.92	ND	ND	ND
Hexachlorocyclopentadiene	ug/L	625	1	0.90	ND	ND	ND
Hexachloroethane	ug/L	625	1	0.94	ND	ND	ND
Ideno(1,2,3-cd)pyrene	ug/L	625	0.05	0.030	ND	ND	ND
Isophorone	ug/L	625	1	0.93	ND	ND	ND
2-Methyl-4,6-dinitrophenol	ug/L	625	5	0.91	ND	ND	ND
Napthalene	ug/L	625	0.20	0.030	ND	ND	ND
Nitrobenzene	ug/L	625	1	0.95	ND	ND	ND
2-Nitrophenol	ug/L	625	5	0.89	ND	ND	ND
4-Nitrophenol	ug/L	625	5	0.83	ND	ND	ND
N-Nitrosodimethylamine	ug/L	625	5	0.88	ND	ND	ND
N-Nitrosodi-N-propylamine	ug/L	625	5	0.97	ND	ND	ND
N-Nitrosodiphenylamine	ug/L	625	1	0.83	ND	ND	ND
Pentachlorophenol	ug/L	625	1	0.81	ND	ND	ND
Phenanthrene	ug/L	625	0.05	0.030	ND	ND	ND
Phenol	ug/L	625	1	0.69	ND	ND	ND
Pyrene	ug/L	625	0.05	0.030	ND	ND	ND
1,2,4-Trichlorobenzene	ug/L	625	5	0.98	ND	ND	ND
2,4,6-Trichlorophenol	ug/L	625	5	0.97	ND	ND	ND

RL = Reporting Limit
ND = Not Detected
MDL = Method Detection Limit

Table O-3C

OJAI VALLEY SANITARY DISTRICT
WASTEWATER TREATMENT PLANT
2009 SEMI-ANNUAL RIVER PRIORITY POLLUTANTS RESULTS
Dioxin Congeners

Laboratory:			Caltest Analytical				
Date Sampled: February 4, 2009							
Constituent	Units	Method	RL	MDL	R3	R4	R5
Flow (Estimated)	MGD				3.6	5.4	5.4
2,3,7,8-TCDD	pg/L	1613	0.84	0.234	ND	ND	ND
1,2,3,7,8-PeCDD	pg/L	1613	1.59	0.714	ND	ND	ND
1,2,3,4,7,8-HxCDD	pg/L	1613	1.18	1.78	ND	ND	ND
1,2,3,6,7,8-HxCDD	pg/L	1613	1.69	1.72	ND	ND	ND
1,2,3,7,8,9-HxCDD	pg/L	1613	1.18	1.68	ND	ND	ND
1,2,3,4,6,7,8-HpCDD	pg/L	1613	2.01	3.92	ND	ND	ND
OCDD	pg/L	1613	2.45	1.6	ND	ND	ND
2,3,7,8-TCDF	pg/L	1613	0.97	0.257	ND	ND	ND
1,2,3,7,8-PeCDF	pg/L	1613	1.09	0.395	ND	ND	ND
2,3,4,7,8-PeCDF	pg/L	1613	1.48	0.435	ND	ND	ND
1,2,3,4,7,8-HxCDF	pg/L	1613	1.06	0.754	ND	ND	ND
1,2,3,6,7,8-HxCDF	pg/L	1613	0.73	0.793	ND	ND	ND
2,3,4,6,7,8-HxCDF	pg/L	1613	1.26	0.874	ND	ND	ND
1,2,3,7,8,9-HxCDF	pg/L	1613	0.94	1.28	ND	ND	ND
1,2,3,4,6,7,8-HpCDF	pg/L	1613	1.7	1.94	ND	ND	ND
1,2,3,4,7,8,9-HpCDF	pg/L	1613	0.96	2.26	ND	ND	ND
OCDF	pg/L	1613	3.66	1.28	ND	ND	ND
Toxic Equivilent Quotient		1613			0	0	0

DL = Sample Specific Detection Limit
ND = Not Detected
MDL = Method Detection Limit

OJAI VALLEY SANITARY DISTRICT
2010 SEMI-ANNUAL RIVER PRIORITY POLLUTANTS RESULTS
METALS / INORGANICS

Laboratory:		Caltest Analytical					
Date Sampled: February 3, 2010					Results		
Constituent	Units	Method	RL	MDL	R3	R4	R5
Flow (Estimated)	MGD				29.0	**	31.0
Antimony (Sb)	ug/L	200.8	0.5	0.063	DNQ		DNQ
Arsenic (As)	ug/L	200.8	0.5	0.008	DNQ		DNQ
Beryllium (Be)	ug/L	200.8	0.1	0.041	ND		ND
Boron (B)	ug/L	200.8	10	1.900	390		410
Cadmium (Cd)	ug/L	200.8	0.1	0.011	DNQ		DNQ
Chromium (Cr)	ug/L	200.8	0.5	0.020	DNQ		DNQ
Copper (Cu)	ug/L	200.8	0.5	0.060	0.69		1.1
Lead (Pb)	ug/L	200.8	0.25	0.071	ND		DNQ
Mercury (Hg)	ug/L	1631E	0.0005	0.0002	0.0006		0.0008
Nickel (Ni)	ug/L	200.8	0.5	0.010	0.96		1.2
Selenium (Se)	ug/L	200.8	1	0.130	2.1		2
Silver (Ag)	ug/L	200.8	0.1	0.063	ND		ND
Thallium (Tl)	ug/L	200.8	0.1	0.070	ND		ND
Zinc (Zn)	ug/L	200.8	1	0.800	1.2		5.5
Cyanide (Cn)	ug/L	SM4500-CN E	3	0.600	ND		DNQ

**R4 location no longer exists due to recent heavy rains. River splits above outfall and now does not

RL = Reporting Limit
ND = Not Detected
MDL = Method Detection Limit
DNQ = Detected, but Not Quantified
Est. Conc. = Estimated Concentration

R3 Antimony	DNQ= 0.11 Est Conc
R5 Antimony	DNQ= 0.12 Est Conc
R3 Arsenic	DNQ=0.34 Est Conc
R5 Arsenic	DNQ= 0.38 Est Conc
R3 Cadmium	DNQ= 0.04 Est Conc
R5 Cadmium	DNQ=0.05 Est Conc
R3 Chromium	DNQ= 0.20 Est Conc
R5 Chromium	DNQ= 0.36 Est Conc
R5 Lead	DNQ= 0.11 Est Conc
R5 Cyanide	DNQ= 1.0 Est Conc

OJAI VALLEY SANITARY DISTRICT
2010 SEMI-ANNUAL RIVER PRIORITY POLLUTANTS RESULTS
CHLORINATED PESTICIDES / PCBs

Laboratory:			Caltest Analytical				
Date Sampled: February 3, 2010							
Constituent	Units	Method	RL	MDL	R3	R4	R5
Flow (Estimated)	MGD				29.0	**	31.0
Aldrin	ug/L	608	0.005	0.004	ND		ND
Alpha-BHC	ug/L	608	0.01	0.005	ND		ND
Beta-BHC	ug/L	608	0.005	0.003	ND		ND
Delta-BHC	ug/L	608	0.005	0.004	ND		ND
Gamma-BHC (Lindane)	ug/L	608	0.010	0.004	ND		ND
Alpha-chlordane	ug/L	608	0.010	0.004	ND		ND
Chlordane	ug/L	608	0.050	0.04	ND		ND
Gamma-chlordane	ug/L	608	0.010	0.004	ND		ND
2,4'-DDD	ug/L	608	0.010	0.004	ND		ND
2,4'-DDE	ug/L	608	0.010	0.004	ND		ND
2,4'-DDT	ug/L	608	0.010	0.004	ND		ND
4,4'-DDD	ug/L	608	0.010	0.004	ND		ND
4,4'-DDE	ug/L	608	0.010	0.004	ND		ND
4,4'-DDT	ug/L	608	0.010	0.004	ND		ND
Dieldrin	ug/L	608	0.010	0.004	ND		ND
Endosulfan I	ug/L	608	0.010	0.005	ND		ND
Endosulfan II	ug/L	608	0.010	0.005	ND		ND
Endosulfan Sulfate	ug/L	608	0.010	0.005	ND		ND
Endrin	ug/L	608	0.010	0.003	ND		ND
Endrin Aldehyde	ug/L	608	0.010	0.005	ND		ND
Endrin Ketone	ug/L	608	0.010	0.004	ND		ND
Heptachlor	ug/L	608	0.010	0.004	ND		ND
Heptachlor Epoxide	ug/L	608	0.010	0.004	ND		ND
Methoxychlor	ug/L	608	0.010	0.005	ND		ND
PCB 1016	ug/L	608	0.10	0.05	ND		ND
PCB 1221	ug/L	608	0.10	0.05	ND		ND
PCB 1232	ug/L	608	0.10	0.05	ND		ND
PCB 1242	ug/L	608	0.10	0.04	ND		ND
PCB 1248	ug/L	608	0.10	0.05	ND		ND
PCB 1254	ug/L	608	0.10	0.05	ND		ND
PCB 1260	ug/L	608	0.10	0.05	ND		ND
Toxaphene	ug/L	608	0.5	0.2	ND		ND

RL = Reporting Limit
ND = Not Detected
MDL = Method Detection Limit
**R4 location no longer exists due to recent heavy rains. River splits above outfall and now does not

OJAI VALLEY SANITARY DISTRICT
2010 SEMI-ANNUAL RIVER PRIORITY POLLUTANTS RESULTS
VOLATILE ORGANICS

Laboratory:			Caltest Analytical				
Date Sampled: February 3, 2010							
Constituent	Units	Method	RL	MDL	R3	R4	R5
Flow (Estimated)	MGD				29.0	**	31.0
Acrolein	ug/L	624	5	1.70	ND		ND
Acrylonitrile	ug/L	624	2.0	0.69	ND		ND
Benzene	ug/L	624	0.5	0.18	ND		ND
Bromodichloromethane	ug/L	624	0.5	0.16	ND		ND
Bromoform	ug/L	624	0.5	0.15	ND		ND
Bromomethane	ug/L	624	0.5	0.17	ND		ND
Carbon Tetrachloride	ug/L	624	0.5	0.16	ND		ND
Chlorobenzene	ug/L	624	0.5	0.18	ND		ND
Chloroethane	ug/L	624	0.5	0.38	ND		ND
2-Chloroethylvinyl ether	ug/L	624	1	0.28	ND		ND
Chloroform	ug/L	624	0.5	0.19	ND		ND
Chloromethane	ug/L	624	0.5	0.23	ND		ND
Dibromochloromethane	ug/L	624	0.5	0.17	ND		ND
1,2 Dichlorobenzene	ug/L	624	0.5	0.27	ND		ND
1,3 Dichlorobenzene	ug/L	624	0.5	0.18	ND		ND
1,4 Dichlorobenzene	ug/L	624	0.5	0.18	ND		ND
Dichlorodifluromethane	ug/L	624	0.5	0.20	ND		ND
1,1-Dichloroethane	ug/L	624	0.5	0.19	ND		ND
1,2-Dichloroethane	ug/L	624	0.5	0.18	ND		ND
1,1-Dichloroethene	ug/L	624	0.5	0.21	ND		ND
cis-1,2-Dichloroethene	ug/L	624	0.5	0.20	ND		ND
trans-1,2-Dichloroethene	ug/L	624	0.5	0.22	ND		ND
1,2-Dichloropropane	ug/L	624	0.5	0.18	ND		ND
cis-1,3-Dichloropropene	ug/L	624	0.5	0.16	ND		ND
trans-1,3-Dichloropropene	ug/L	624	0.5	0.16	ND		ND
Dichlorotrifluroethane	ug/L	624	0.5	0.14	ND		ND
Ethylbenzene	ug/L	624	0.5	0.26	ND		ND
MTBE	ug/L	624	0.5	0.15	ND		ND
Methylene chloride	ug/L	624	0.5	0.20	ND		ND
1,1,2,2-Tetrachloroethane	ug/L	624	0.5	0.10	ND		ND
Tetrachloroethene	ug/L	624	0.5	0.19	ND		ND
Toluene	ug/L	624	0.5	0.19	ND		ND
1,1,2-Trichloroethane	ug/L	624	0.5	0.60	ND		ND
1,1,1-Trichloroethane	ug/L	624	0.5	0.19	ND		ND
Trichloroethene	ug/L	624	0.5	0.20	ND		ND
Trichlorofluromethane	ug/L	624	0.5	0.29	ND		ND
1,2,3-Trichoropropane	ug/L	624	0.5	0.19	ND		ND
Trichlorotrifluroethane	ug/L	624	1	0.11	ND		ND
Vinyl Chloride	ug/L	624	0.5	0.25	ND		ND
Xylenes (Total)	ug/L	624	0.5	0.26	ND		ND

RL = Reporting Limit
ND = Not Detected
MDL = Method Detection Limit
DNQ = Detected, but Not Quantified
**R4 location no longer exists due to recent heavy rains. River splits above outfall and now does not combine until just above station R-5

OJAI VALLEY SANITARY DISTRICT
2010 SEMI-ANNUAL RIVER PRIORITY POLLUTANTS RESULTS
GRAB SEMI-VOLATILE ORGANICS

Laboratory:			Caltest Analytical				
Endrin							
Constituent	Units	Method	RL	MDL	R3	R4	R5
Flow (Estimated)	MGD				29.0	**	31.0
Acenaphthene	ug/L	625	0.30	0.030	ND		ND
Acenaphthylene	ug/L	625	0.20	0.030	ND		ND
Anthracene	ug/L	625	0.30	0.030	ND		ND
Benzidine	ug/L	625	5	5.00	ND		ND
Benzo(a)anthracene	ug/L	625	0.30	0.030	ND		ND
Benzo(a)pyrene	ug/L	625	0.30	0.030	ND		ND
Benzo(b)fluoranthene	ug/L	625	0.30	0.030	ND		ND
Benzo(ghi)perylene	ug/L	625	0.10	0.030	ND		ND
Benzo(k)fluoranthen	ug/L	625	0.30	0.030	ND		ND
Benzylbutylphthalate	ug/L	625	5	0.98	ND		ND
4-Bromophenylphenylether	ug/L	625	5	0.97	ND		ND
Bis(2-chloroethoxy)methane	ug/L	625	5	0.93	ND		ND
Bis(2-chloroethyl)ether	ug/L	625	1	0.95	ND		ND
Bis(2-chloroisopropyl)ether	ug/L	625	2	0.81	ND		ND
4-Chloro-3-methylphenol	ug/L	625	1	0.91	ND		ND
2-Chloronaphthalene	ug/L	625	5	0.98	ND		ND
2-Chlorophenol	ug/L	625	2	0.98	ND		ND
4-Chlorophenylphenylether	ug/L	625	5	0.99	ND		ND
Chrysene	ug/L	625	0.30	0.030	ND		ND
Dibenzo(a,h)anthracene	ug/L	625	0.10	0.030	ND		ND
1,2-Dichlorobenzene	ug/L	625	2	0.95	ND		ND
1,3-Dichlorobenzene	ug/L	625	1	0.87	ND		ND
1,4-Dichlorobenzene	ug/L	625	1	0.93	ND		ND
3,3-Dichlorobenzidine	ug/L	625	5	5.00	ND		ND
2,4-Dichlorophenol	ug/L	625	1	0.99	ND		ND
Diethylphthalate	ug/L	625	2	0.86	ND		ND
2,4-Dimethylphenol	ug/L	625	2	0.87	ND		ND
Dimethylphthalate	ug/L	625	2	0.97	ND		ND
Di-n-butylphthalate	ug/L	625	5	0.91	ND		ND
2,4-Dinitrophenol	ug/L	625	5	0.83	ND		ND
2,4-Dinitrotoluene	ug/L	625	5	0.96	ND		ND
2,6-Dinitrotoluene	ug/L	625	5	0.98	ND		ND
Di-n-octylphthalate	ug/L	625	5	0.92	ND		ND
1,4 Dioxane	ug/L	625	10	0.86	ND		ND
1,2-Diphenylhydrazine	ug/L	625	1	0.90	ND		ND
Bis(2-ethylhexyl)phthalate	ug/L	625	3	0.95	ND		ND
Fluoranthene	ug/L	625	0.05	0.030	ND		ND
Fluorene	ug/L	625	0.10	0.030	ND		ND
Hexachlorobenzene	ug/L	625	1	0.91	ND		ND
Hexachlorobutadiene	ug/L	625	1	0.92	ND		ND
Hexachlorocyclopentadiene	ug/L	625	1	0.90	ND		ND
Hexachloroethane	ug/L	625	1	0.94	ND		ND
Ideno(1,2,3-cd)pyrene	ug/L	625	0.05	0.030	ND		ND
Isophorone	ug/L	625	1	0.93	ND		ND
2-Methyl-4,6-dinitrophenol	ug/L	625	5	0.91	ND		ND
Napthalene	ug/L	625	0.20	0.030	ND		ND
Nitrobenzene	ug/L	625	1	0.95	ND		ND
2-Nitrophenol	ug/L	625	5	0.89	ND		ND
4-Nitrophenol	ug/L	625	5	0.83	ND		ND
N-Nitrosodimethylamine	ug/L	625	5	0.88	ND		ND
N-Nitrosodi-N-propylamine	ug/L	625	5	0.97	ND		ND
N-Nitrosodiphenylamine	ug/L	625	1	0.83	ND		ND
Pentachlorophenol	ug/L	625	1	0.81	ND		ND
Phenanthrene	ug/L	625	0.05	0.030	ND		ND
Phenol	ug/L	625	1	0.69	ND		ND
Pyrene	ug/L	625	0.05	0.030	ND		ND
1,2,4-Trichlorobenzene	ug/L	625	5	0.98	ND		ND
2,4,6-Trichlorophenol	ug/L	625	5	0.97	ND		ND

RL = Reporting Limit
ND = Not Detected
MDL = Method Detection Limit
**R4 location no longer exists due to recent heavy rains. River splits above outfall and now does not combine until just above station R-5

OJAI VALLEY SANITARY DISTRICT
WASTEWATER TREATMENT PLANT
2010 SEMI-ANNUAL RIVER PRIORITY POLLUTANTS RESULTS
Dioxin Congeners

Laboratory:			Caltest Analytical				
Date Sampled: February 3, 2010							
Constituent	Units	Method	RL	MDL	R3	R4	R5
Flow (Estimated)	MGD				29.0	**	31.0
2,3,7,8-TCDD	pg/L	1613	1.02	0.355	ND		ND
1,2,3,7,8-PeCDD	pg/L	1613	1.6	0.986	ND		ND
1,2,3,4,7,8-HxCDD	pg/L	1613	2.95	1.14	ND		ND
1,2,3,6,7,8-HxCDD	pg/L	1613	2.98	0.946	ND		ND
1,2,3,7,8,9-HxCDD	pg/L	1613	3.03	1.1	ND		ND
1,2,3,4,6,7,8-HpCDD	pg/L	1613	1.99	1.24	ND		ND
OCDD	pg/L	1613	3.61	3.2	4.32		ND
2,3,7,8-TCDF	pg/L	1613	1.02	0.401	ND		ND
1,2,3,7,8-PeCDF	pg/L	1613	1.87	0.671	ND		ND
2,3,4,7,8-PeCDF	pg/L	1613	1.99	0.656	ND		ND
1,2,3,4,7,8-HxCDF	pg/L	1613	0.959	0.618	ND		ND
1,2,3,6,7,8-HxCDF	pg/L	1613	1.05	0.597	ND		ND
2,3,4,6,7,8-HxCDF	pg/L	1613	1.18	0.644	ND		ND
1,2,3,7,8,9-HxCDF	pg/L	1613	1.5	1.47	ND		ND
1,2,3,4,6,7,8-HpCDF	pg/L	1613	1.14	1.34	ND		ND
1,2,3,4,7,8,9-HpCDF	pg/L	1613	1.07	1.5	ND		ND
OCDF	pg/L	1613	1.78	2.48	ND		ND
Toxic Equivilent Quotient		1613			0.000432		0

DL = Sample Specific Detection Limit
ND = Not Detected
MDL = Method Detection Limit
**R4 location no longer exists due to recent heavy rains. River splits above outfall and now does not combine until just above station R-5

Table O-4
Southern California Costal Water Research Project
2009 Bioassessment

Summary table

Station Code	Station	Target Latitude	Target Longitude	Sample Date	SC-IBI Score (Adjusted)	Impaired	Condition
SMC00271	SMC00271	34.55	-119.17	04/Jun/2009	57.8	No	Fair
SMC00827	SMC00827	34.56	-119.19	15/Jun/2009	57.8	No	Fair
SMC00911	SMC00911	34.51	-119.30	04/Jun/2009	52.1	No	Fair
SMC01151	SMC01151	34.37	-118.97	17/Jun/2009	20.7	Yes	Poor
SMC01684	SMC01684	34.28	-118.92	03/Jun/2009	16.4	Yes	Very poor
SMC01748	SMC01748	34.29	-118.83	03/Jun/2009	22.1	Yes	Poor
SMC01860	SMC01860	34.22	-118.98	28/May/2009	20.7	Yes	Poor
SMC02127	SMC02127	34.42	-119.26	04/Jun/2009	30.7	Yes	Poor
SMC02436	SMC02436	34.26	-118.97	28/May/2009	17.8	Yes	Very poor
SMC03268	SMC03268	34.16	-119.06	28/May/2009	27.8	Yes	Poor
SMC04047	SMC04047	34.46	-119.29	14/May/2009	17.8	Yes	Very poor
SMC04175	SMC04175	34.41	-119.28	11/Jun/2009	43.6	No	Fair
SMC04239	SMC04239	34.36	-119.31	11/Jun/2009	35	Yes	Poor
SMC04308	SMC04308	34.19	-118.91	17/Jun/2009	20.7	Yes	Poor
SMC04399	SMC04399	34.31	-119.30	11/Jun/2009	33.5	Yes	Poor

Very good	0
Good	0
Fair	4
Poor	8
Very poor	3

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Table O-5
Los Angeles Regional Water Quality Control Board
Surface Water Ambient Monitoring Program

Program	ParentProject	StationName	StationCode	SampleDate	LocationCode	MatrixName	MethodName	Analyte	Unit	Result	MDL
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8081BM	Aldrin, Total	ng/g dw		0.387
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment, <63 um	EPA 200.8	Aluminum, Total	mg/Kg dw	99141	220
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 200.8	Aluminum, Total	mg/Kg dw	102337	220
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 200.8	Arsenic, Total	mg/Kg dw	5.8	0.1
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment, <63 um	EPA 200.8	Arsenic, Total	mg/Kg dw	5.89	0.1
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8081BM	Bifenthrin, Total	ng/g dw	2.55	0.5
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 200.8	Cadmium, Total	mg/Kg dw	0.63	0.03
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment, <63 um	EPA 200.8	Cadmium, Total	mg/Kg dw	0.52	0.03
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8081BM	Chlordane, cis-, Total	ng/g dw		0.374
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8081BM	Chlordane, trans-, Total	ng/g dw		0.421
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8141AM	Chlorpyrifos methyl, Total	ng/g dw		25
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8141AM	Chlorpyrifos, Total	ng/g dw		5
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment, <63 um	EPA 200.8	Chromium, Total	mg/Kg dw	57.6	0.29
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 200.8	Chromium, Total	mg/Kg dw	45.6	0.29
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	Plumb, 1981, GS	Clay <0.0039 mm, Coarse 0.00195 to <0.0039 mm	%	1.95	0.01
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	Plumb, 1981, GS	Clay <0.0039 mm, Fine <0.00098 mm	%	4.21	0.01
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	Plumb, 1981, GS	Clay <0.0039 mm, Medium 0.00098 to <0.00195 mm	%	1.25	0.01
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment, <63 um	EPA 200.8	Copper, Total	mg/Kg dw	14.2	0.54
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 200.8	Copper, Total	mg/Kg dw	13.8	0.54
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8081BM	Cyfluthrin, total, Total	ng/g dw		2
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8081BM	Cyhalothrin, lambda, total, Total	ng/g dw		1
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8081BM	Cypermethrin, total, Total	ng/g dw		2
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8081BM	Dacthal, Total	ng/g dw		0.09
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8081BM	DDD(o,p'), Total	ng/g dw		0.09
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8081BM	DDD(p,p'), Total	ng/g dw	0.208	0.116
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8081BM	DDE(o,p'), Total	ng/g dw		0.166
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8081BM	DDE(p,p'), Total	ng/g dw	1.23	0.449
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8081BM	DDMU(p,p'), Total	ng/g dw		0.101
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8081BM	DDT(o,p'), Total	ng/g dw	0.272	0.202
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8081BM	DDT(p,p'), Total	ng/g dw	0.794	0.146
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8081BM	Deltamethrin, Total	ng/g dw		2
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8141AM	Diazinon, Total	ng/g dw		5
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8141AM	Dichlofenthion, Total	ng/g dw		25
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8081BM	Dieldrin, Total	ng/g dw		0.404
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8141AM	Dioxathion , Total	ng/g dw		25
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8081BM	Endosulfan I, Total	ng/g dw		0.524
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8081BM	Endrin, Total	ng/g dw		0.168
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8081BM	Esfenvalerate/Fenvalerate, total, Total	ng/g dw		1
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8141AM	Ethion, Total	ng/g dw		25
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8141AM	Ethoprop, Total	ng/g dw		25
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8141AM	Fenchlorphos, Total	ng/g dw		25
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8141AM	Fenitrothion, Total	ng/g dw		25
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8081BM	Fenpropathrin, Total	ng/g dw		2
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8141AM	Fonofos, Total	ng/g dw		25
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	Plumb, 1981, GS	Granule 2.0 to <4.0 mm	%	0.03	0.01
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8081BM	HCH, alpha , Total	ng/g dw		0.245
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8081BM	HCH, beta, Total	ng/g dw		0.196
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8081BM	HCH, gamma, Total	ng/g dw		0.135
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8081BM	Heptachlor epoxide, Total	ng/g dw		0.23
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8081BM	Heptachlor, Total	ng/g dw		0.333
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8081BM	Hexachlorobenzene, Total	ng/g dw		0.324
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 200.8	Lead, Total	mg/Kg dw	14.4	0.21
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment, <63 um	EPA 200.8	Lead, Total	mg/Kg dw	13.9	0.21
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8141AM	Malathion, Total	ng/g dw		25
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 200.8	Manganese, Total	mg/Kg dw	482	1.08
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment, <63 um	EPA 200.8	Manganese, Total	mg/Kg dw	520	1.08

Table O-5
Los Angeles Regional Water Quality Control Board
Surface Water Ambient Monitoring Program

Program	ParentProject	StationName	StationCode	SampleDate	LocationCode	MatrixName	MethodName	Analyte	Unit	Result	MDL
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment, <63 um	DFG SOP 103	Mercury, Total	mg/Kg dw	0.021	0.004
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	DFG SOP 103	Mercury, Total	mg/Kg dw	0.016	0.004
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8141AM	Merphos, Total	ng/g dw		25
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8081BM	Methoxychlor, Total	ng/g dw	0.199	0.137
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8081BM	Mirex, Total	ng/g dw		0.281
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	SM 2540 G	Moisture, Total	%	22.2	-88
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8082M	Moisture, Total	%	2.4	-88
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8081BM	Moisture, Total	%	3.11	-88
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	DFG SOP 103	Moisture, Total	%	30.46	-88
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8141AM	Moisture, Total	%	3.11	-88
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment, <63 um	EPA 200.8	Moisture, Total	%	33.9	-88
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment, <63 um	DFG SOP 103	Moisture, Total	%	33.85	-88
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 200.8	Moisture, Total	%	22.8	-88
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 200.8	Nickel, Total	mg/Kg dw	27.1	0.12
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment, <63 um	EPA 200.8	Nickel, Total	mg/Kg dw	28.5	0.12
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8081BM	Nonachlor, cis-, Total	ng/g dw		0.288
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8081BM	Nonachlor, trans-, Total	ng/g dw	0.244	0.181
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8081BM	Oxadiazon, Total	ng/g dw	1.36	0.509
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8081BM	Oxychlordane, Total	ng/g dw		0.443
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8141AM	Parathion, Ethyl, Total	ng/g dw		10
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8141AM	Parathion, Methyl, Total	ng/g dw		10
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8082M	PCB 008, Total	ng/g dw		0.106
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8082M	PCB 018, Total	ng/g dw		0.087
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8082M	PCB 027, Total	ng/g dw		0.059
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8082M	PCB 028, Total	ng/g dw		0.138
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8082M	PCB 029, Total	ng/g dw		0.059
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8082M	PCB 031, Total	ng/g dw		0.111
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8082M	PCB 033, Total	ng/g dw		0.111
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8082M	PCB 044, Total	ng/g dw		0.115
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8082M	PCB 049, Total	ng/g dw		0.065
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8082M	PCB 052, Total	ng/g dw		0.153
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8082M	PCB 056, Total	ng/g dw	0.054	0.05
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8082M	PCB 060, Total	ng/g dw		0.054
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8082M	PCB 064, Total	ng/g dw		0.044
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8082M	PCB 066, Total	ng/g dw		0.091
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8082M	PCB 070, Total	ng/g dw	0.17	0.121
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8082M	PCB 074, Total	ng/g dw		0.066
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8082M	PCB 077, Total	ng/g dw		0.053
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8082M	PCB 087, Total	ng/g dw	0.129	0.071
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8082M	PCB 095, Total	ng/g dw	0.273	0.103
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8082M	PCB 097, Total	ng/g dw	0.098	0.058
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8082M	PCB 099, Total	ng/g dw	0.108	0.079
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8082M	PCB 101, Total	ng/g dw	0.288	0.116
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8082M	PCB 105, Total	ng/g dw	0.147	0.125
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8082M	PCB 110, Total	ng/g dw	0.465	0.159
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8082M	PCB 114, Total	ng/g dw		0.049
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8082M	PCB 118, Total	ng/g dw	0.327	0.198
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8082M	PCB 126, Total	ng/g dw		0.056
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8082M	PCB 128, Total	ng/g dw	0.095	0.062
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8082M	PCB 137, Total	ng/g dw		0.039
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8082M	PCB 138, Total	ng/g dw	0.301	0.172
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8082M	PCB 141, Total	ng/g dw	0.068	0.053
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8082M	PCB 146, Total	ng/g dw		0.042

Table O-5
Los Angeles Regional Water Quality Control Board
Surface Water Ambient Monitoring Program

Program	ParentProject	StationName	StationCode	SampleDate	LocationCode	MatrixName	MethodName	Analyte	Unit	Result	MDL
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8082M	PCB 149, Total	ng/g dw	0.222	0.075
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8082M	PCB 151, Total	ng/g dw	0.055	0.031
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8082M	PCB 153, Total	ng/g dw	0.222	0.165
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8082M	PCB 156, Total	ng/g dw		0.054
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8082M	PCB 157, Total	ng/g dw		0.042
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8082M	PCB 158, Total	ng/g dw	0.052	0.038
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8082M	PCB 169, Total	ng/g dw		0.04
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8082M	PCB 170, Total	ng/g dw		0.08
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8082M	PCB 174, Total	ng/g dw		0.055
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8082M	PCB 177, Total	ng/g dw		0.035
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8082M	PCB 180, Total	ng/g dw	0.066	0.05
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8082M	PCB 183, Total	ng/g dw		0.04
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8082M	PCB 187, Total	ng/g dw		0.065
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8082M	PCB 189, Total	ng/g dw		0.04
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8082M	PCB 194, Total	ng/g dw		0.05
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8082M	PCB 195, Total	ng/g dw		0.054
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8082M	PCB 198/199, Total	ng/g dw		0.032
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8082M	PCB 200, Total	ng/g dw		0.039
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8082M	PCB 201, Total	ng/g dw		0.06
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8082M	PCB 203, Total	ng/g dw		0.032
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8082M	PCB 206, Total	ng/g dw		0.056
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8082M	PCB 209, Total	ng/g dw		0.025
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	Newman, et al., 1988	PCB AROCLOR 1248, Total	ng/g dw		4.68
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	Newman, et al., 1988	PCB AROCLOR 1254, Total	ng/g dw	5	1.87
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	Newman, et al., 1988	PCB AROCLOR 1260, Total	ng/g dw		1.87
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	Plumb, 1981, GS	Pebble 4 to <64 mm, Small 4 to <8 mm	%	0	0.01
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8081BM	Permethrin, cis-, Total	ng/g dw		4
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8081BM	Permethrin, trans-, Total	ng/g dw		4
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8141AM	Phosphamidon, Total	ng/g dw		25
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	SM 4500-P E	Phosphorus as P, Total	mg/Kg dw	710	3.2
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	Plumb, 1981, GS	Sand 0.0625 to <2.0 mm, Coarse 0.5 to <1.0 mm	%	0.23	0.01
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	Plumb, 1981, GS	Sand 0.0625 to <2.0 mm, Fine 0.125 to <0.25 mm	%	16.87	0.01
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	Plumb, 1981, GS	Sand 0.0625 to <2.0 mm, Medium 0.25 to <0.5 mm	%	2.33	0.01
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	Plumb, 1981, GS	Sand 0.0625 to <2.0 mm, V. Coarse 1.0 to <2.0 mm	%	0.07	0.01
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	Plumb, 1981, GS	Sand 0.0625 to <2.0 mm, V. Fine 0.0625 to <0.125 mm	%	33.57	0.01
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment, <63 um	EPA 200.8	Selenium, Total	mg/Kg dw	1.16	0.27
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 200.8	Selenium, Total	mg/Kg dw	0.96	0.27
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	Plumb, 1981, GS	Silt 0.0039 to <0.0625 mm, Coarse 0.031 to <0.0625 mm	%	24.51	0.01
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	Plumb, 1981, GS	Silt 0.0039 to <0.0625 mm, Fine 0.0078 to <0.0156 mm	%	3.54	0.01
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	Plumb, 1981, GS	Silt 0.0039 to <0.0625 mm, Medium 0.0156 to <0.031 mm	%	9.24	0.01
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	Plumb, 1981, GS	Silt 0.0039 to <0.0625 mm, V. Fine 0.0039 to <0.0078 mm	%	2.2	0.01
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 200.8	Silver, Total	mg/Kg dw	0.25	0.08
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment, <63 um	EPA 200.8	Silver, Total	mg/Kg dw	0.32	0.08
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8141AM	Sulfotep, Total	ng/g dw		25
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8081BM	Tedion, Total	ng/g dw		0.997
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8141AM	Thionazin, Total	ng/g dw		25
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8141AM	Tokuthion, Total	ng/g dw		25
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 9060A	Total Organic Carbon	% dw	0.4	0.01
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 8141AM	Trichloronate, Total	ng/g dw		10
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment, <63 um	EPA 200.8	Zinc, Total	mg/Kg dw	44.6	3.2
Surface Water Ambient Monitoring Program	SWAMP Stream Pollution Trends	Ventura River Bio 0	402VRB0xx	5/19/2008	Reach	sediment	EPA 200.8	Zinc, Total	mg/Kg dw	42	3.2

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Table O-6

United States Environmental Protection Agency

Long Term 2 Enhanced Surface Water Treatment Rule (LT2)

June 23, 2006

State Department of Health Services
Drinking Water Field Operations Branch
1180 Eugenia Place, Suite 200
Carpinteria, CA 93013

Re: City of San Buenaventura (System No. 56100170)
Long-Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR)
Source Water Monitoring Plan

Compliance Schedule

The City of Ventura is a public water system; classified as a large combined water system with a population of about 110,000. It is required to meet LT2ESWTR Schedule 1 compliance dates as follows:

- The Source Water Monitoring Plan is due by July 1, 2006
- Source water monitoring begins October 1, 2006 and ends September 30, 2008
- The Bin Classification report is due April 1, 2009

Combined Distribution Systems

A letter was sent to CMWD on March 6, 2006, to inform them of the City's population and its compliance schedule since the City is the largest system connected to the combined distribution systems of CMWD and its retailers.

Casitas Municipal Water District (CMWD) treats surface water from Lake Casitas and provides water to retailers. The City is not connected to any of the retailers that receive water from CMWD. The City has two connections with the CMWD including:

- Avenue Plant (CM1): Kingston Reservoir and the 210 Zone
- Hall Canyon Reservoir (CM2)

Source Water Production Facilities

The City has Ventura River has four (4) raw water production facilities near Foster Park located along Highway 33 north of the City. The facilities are operated throughout the year and are considered the primary source of drinking water for the City. The facilities are only offline when maintenance is needed. The City treats the raw water at the Avenue Water Treatment Plant a conventional surface water treatment plant. Water

(Subpart H GWUDI) is extracted from three shallow wells (about 40 to 60 feet deep) and from one subsurface collector (about 15 feet deep). The facilities are perforated in shallow river alluvium of sand and cobblestone. The City's surface water diversion structure has been out of service for about 10 years and not expected to be restored to service.

The four points of extraction of raw water combine in the plant influent box just prior to the Flume. The 24-inch pipe in Foster Park conveys combined well raw water by gravity to influent box. A 36-inch raw waterline from the subsurface collector also flows by gravity to the plant influent box.

Source Water Sample Location

The sample location will be at Flume (City Sample Location No. 27) at the northeast corner of the Avenue Treatment Plant. The Flume is upstream of free chlorine pretreatment, and the uncovered Kingston raw water reservoir. Plant recycle filter backwash water is mixed with the Kingston influent. The City does not plan to make any significant changes to its disinfection practice or pretreatment.

Sample Schedule, Frequency, & Monitoring

Monthly sampling will be conducted for 24 months on Wednesday of the first, full 5-day workweek of each month. If a sample cannot be taken due to circumstances out of the control of the sampler or the plant is out of service for maintenance the City will collect a sample within 21 days of notice of the problem. The City will notify the State with a written explanation if the sample date is changed. If the plant is not operating during the designated sample week, a sample will be taken the week before the plant shutdown. The City expects to begin sampling July 2006 and end June 2008.

Specific sample dates for 24 months include:
<u>2006</u>
Jul 5, Aug 9, Sep 6, Oct 4, Nov 8, Dec 6

<u>2007</u>
Jan 10, Feb 7, Mar 7, Apr. 4, May 9, June 6, Jul 11, Aug 8, Sep 5, Oct 3, Nov 7, Dec 5.

<u>2008</u>
Jan 9, Feb 6, Mar 5, Apr. 9, May 7, June 4

Sample monitoring will include:
- Cryptosporidium
- Giardia
- E. coli

- Turbidity

Approved Laboratory & Analytical Methods

The City will use the EPA approved Biovir Laboratory to analyze the Cryptosporidium samples with EPA Method 1623 by Filtration/IMS/FA. A 10 liter, filtered sample will be shipped to Biovir in accordance with proper temperature and holding times. Biovir will also analyze for E. Coli (100 ml enumeration method meeting section 141.74), and Giardia.

The City's State approved laboratory (ELC No. 1193) will analyze for turbidity, since Biovir is not certified by the State.

The City does not believe arrangements for an approved backup lab will be needed. Biovir Laboratories, Inc. is located at 685 Stone Road, Unit 6 in Benicia, CA 94510 707.747.5906; Dr. Richard Danielson; red@biovir.com. However, the City of San Diego Water Operations Division, and the Modesto Irrigation District are also approved labs and accept outside samples under the LT2 rule.

Reporting Source Water Monitoring Results

LT2 results will be reported electronically (http://cdx.epa.gov) no later than 10 days after the end of the first month following the month when the sample is collected (by the 10th of the second month after sampling). https://intranet.epa.gov/lt2 appears in the Federal Register as the location for electronic reporting.

Mike Oakley, Treatment Supervisor is designated the Administrative User and primary contact for the City, and Biovir will be designated the Contract Lab. The City is responsible for ensuring the lab information reported to the IPMC (Information Processing and Management Center) is correct. The City will review and verify the labs on-line entries.

The following data elements will be reported electronically for each cryptosporidium analysis:

- PWS ID
- Facility ID
- Sample collection date
- Sample type (field)
- Sample volume filtered (L), to nearest ¼ L
- Was 100% of the filtered volume examined?
- Number of oocysts counted.

The following data elements will be reported electronically (IPMC) for each E. Coli analysis:

- PWS ID
- Facility ID
- Sample collection date
- Analytical method number
- Method type
- Source type (flowing stream, lake/reservoir, GWUDI)
- E. coli /100ml
- Turbidity

Recordkeeping of Source Water Monitoring Results

The City will keep the results of the first and second round of source water monitoring for three (3) years after bin classification.

Grandfathering Previously Collected Data

The City does not intend to submit any data previously collected. The City does have some quarterly source water monitoring data for the Ventura River watershed.

Sanitary Survey

The City is required by the rule to respond to significant source water deficiencies identified in the Sanitary Survey. The Sanitary Survey was updated March 2006. Some cattle are in the watershed and were identified as a potential source of contamination. Results of past sampling for Cryptosporidium and Giardia do not indicate any significant presence in the watershed. Some E. coli and streptococcus bacteria were detected.

The City intends to continue sampling after the required 24 month source water monitoring for Cryptosporidium, Giardia, E. coli, and turbidity as part of an ongoing watershed sampling program recommended and implemented as part of the 2001 and 2006 Sanitary Surveys. The next Sanitary survey update will be in 2011 and will include about five years of data. The recycle backwash water return will be evaluated if elevated levels of these contaminants are detected in the source water samples. The City will report any significant deficiencies to the State as soon as possible when detected.

Bin Classification

Following the initial round of 24 months of monthly sampling of source water monitoring the City will calculate the initial Crytosporidium bin concentration for the Avenue Plant. The City will have at least 24 samples and not more than 47 samples. The bin

concentration is equal to the highest arithmetic mean of all the sample concentrations in any 12 consecutive months during which Crytosporidium samples were collected.

The City will report the initial bin classification to the State for approval no later than 6 months after the City is required to complete initial source water monitoring. The City will then apply the bin classification to the Microbial Tool Box and determine the level of treatment required.

Appendix

Consumer Confidence Reports

2006 – 2010

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Ventura's Water Quality Summary 2006

Utilizing data collected in 2005.

Only water quality constituents detected by laboratory testing appear in the chart.

PRIMARY STANDARDS (PDWS)	Units	Maximum Level MCL	State Goal PHG	Ventura River Average	Ventura River Range	Ground Water Average	Ground Water Range	CMWD Average	CMWD Range	Major Sources of Contamination in Drinking Water
Water Clarity										
Treated Turbidity	NTU	TT	NA	0.11 (a)	0.09 - 0.17(a)	NA	NA	0.09 (b)	0.01-0.09 (b)	1
Radioactive Contaminants (e)										
Gross Alpha particle activity	pCi/l	15	NA	4.65	1.7 - 10.0	7.5	1.9 - 17.5	1.1	0.3 - 2.1	2
Radium 226	pCi/l	5	NA	0.10	ND - 0.23	0.50	0.12 - 0.89	NA	NA	2
Uranium (c)	pCi/l	20	0.5	3.13	2.1 - 4.0	4.8	3.8 - 6.8	NA	NA	2
Inorganic Contaminants										
Arsenic	ppb	50	0	ND	ND	ND	ND	ND	ND	3
Fluoride	ppm	2	1	0.39	0.32 - 0.45	0.51	0.40 - 0.61	0.4	0.4	4
Selenium	ppb	50	NA	ND	ND	12	ND - 40	ND	ND	5
Nitrate (as Nitrogen)	ppm	10	10	0.2	ND - .07	0.7	ND - 2.0	0.1	0.1	6

Lead and Copper Samples	Units	RAL	PHG	Samples Collected	Above RAL	90th Percentile	Major Sources of Contamination in Drinking Water
Lead	ppb	15	2	55 (d)	1	9	7
Copper	ppm	1.3	0.17	55 (d)	1	1.09	7

[1]Process and source variations [2]Erosion of natural deposits [3]Erosion of natural deposits; runoff from orchards; glass and electronics production waste [4]Erosion of natural deposits; water additive that promotes strong teeth; discharge from fertilizer and aluminum factories [5] Discharge from refineries or manufacturers; erosion of natural deposits. [6] Runoff and leaching from fertilizer use; leaching from septic tanks and sewage; erosion of natural deposits. [7] Internal corrosion of household plumbing systems.

PRIMARY STANDARDS for Distribution System	Units	MCL MRDL	PHG (MCLG) MRDLG	Distribution System Average	Distribution System Range	Major Sources of Contamination in Drinking Water
Disinfection						
Chloramine Residual	ppm	4	4	2.8	0.5 - 4.8	Drinking water disinfectant added for treatment.
Disinfection By Products						
Total Trihalomethanes	ppb	80	NA	42 (c)	1-99	By-product of drinking water chlorination.
Total Haloacetic Acids	ppb	60	NA	48 (c)	ND - 136	By-product of drinking water chlorination.
Microbiological Contaminant Samples						
Total Coliform Bacteria	NA	5%	0	0	0-1	Naturally present in the environment.
Fecal Coliform Bacteria	NA	0	0	0	0	Human and animal fecal waste.

SECONDARY STANDARDS		Units	Maximum Level MCL	Ventura River Average	Ventura River Range	Ground Water Average	Ground Water Range	CMWD Average	CMWD Range
Aesthetic Standards	Color	Color	15	ND	ND	2.2	ND - 21	ND	ND
	Odor	Threshold	3	ND	ND	ND	ND-2	1	1 - 2
	Chloride	ppm	500	26	20 - 41	67	48 - 105	14	14
	Corrosivity	ppb	Non corrosive	-0.13	-0.42 - 0.26	0.56	0.2 - 1.22	0.1	0.1
	Iron (TT)	ppb	300	ND	ND - 0.11	ND	ND - 200	NS	NS
	Total dissolved solids	ppm	1000	440	322 - 600	1268	852 - 1644	340	340
	Specific conductance	umhos	1600	621	518 - 769	1704	1417 - 2210	502	502
	Sulfate	ppm	500	140	117 - 168	559	379 - 896	116	116
Additional Constituents	pH	pH units	6.5 - 8.5	7.5	7.3 - 7.7	7.5	7.2 - 8.2	7.9	7.9
	Hardness	ppm	NS	263	218 - 337	621	489 - 867	205	205
	Calcium	ppm	NS	69	55 - 90	168	131 - 223	49	49
	Magnesium	ppm	NS	22	20 - 27	49	38 - 76	19	19
	Manganese (TT)	ppb	50	ND	ND	ND	ND - 30	NS	NS
	Sodium	ppm	NS	28	22 - 36	130	90 - 204	23	23
	Phosphate	ppm	NS	0.41	0.19 - 1.28	0.11	ND - 0.26	NS	NS
	Potassium	ppm	NS	2.4	2.0 - 2.7	4.8	3.6 - 7.0	2	2
	Total Alkalinity	ppm	NS	128	111 - 179	249	205 -278	120	120

Footnotes (a) Average is maximum reading, Avenue Plant Surface Filtration (TT) = 0.3 NTU in 95% of samples not to exceed 1.0 NTU for more than one hour. (b) Average is maximum reading, CMWD Direct Filtration (TT) = 95% of samples equal or below 0.2 NTU (c) Highest running average cannot exceed the MCL (d) Samples were taken at selected households on a first draw in August 2005. (e) Monitoring completed in 2003 and 2004.

Legend

ppm: Parts per million or milligrams per liter.
pCi/l: Picocuries per liter; a measure of radioactivity in water.
CMWD: Casitas Municipal Water District
TT: A required process intended to reduce the level of contaminant in drinking water
ppb: Parts per billion or micrograms per liter.
NA: Not applicable
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NS: No standard
NTU: Turbidity, a measure of the clarity or cloudiness of the water.

Water Quality Terminology

The Water Quality Summary shows constituents measured in Ventura's water and reported to the State Department of Health Services, and in some cases the USEPA. Some of the terminology used is described below:

Maximum Contaminant Level (MCL): The highest level of a contaminant that is allowed in drinking water. Primary (health related) MCLs are set as close to the Public Health Goals (PHGs) or Maximum Contaminant Level Goals (MCLGs) as is economically and technologically feasible. Secondary (aesthetically related) MCLs are set to protect the odor, taste and appearance of drinking water.

Maximum Contaminant Level Goal (MCLG): The level of contaminant in drinking water below which there is no known or expected risk to one's health. MCLGs are set by the USEPA.

Public Health Goal (PHG): The level of a contaminant in drinking water below which there is no known or expected risk to one's health. The California Environmental Protection Agency sets PHGs.

Maximum Residual Disinfectant Level (MRDL): The level of a disinfectant added for water treatment that may not be exceeded at the consumer's tap.

Maximum Residual Disinfectant Level Goal (MRDLG): The level of a disinfectant added for water treatment below, which there is no known or expected risk to health. MRDLs are set by the USEPA.

Primary Drinking Water Standard (PDWS): MCLs and MRDLs for contaminants that affect health along with their monitoring and reporting requirements, and water treatment requirements.

Regulatory Action Level (RAL): The concentration of a contaminant, which, if exceeded, triggers treatment or other requirements that a water system must follow.

WATER CONSUMER CONFIDENCE REPORT 2006

The City of Ventura welcomes this opportunity to provide you with water quality information. Ventura's Water Division works to ensure that Ventura's water meets or exceeds state and federal standards. This Water Consumer Confidence Report was prepared in compliance with regulatory requirements. The data presented was gathered predominantly in 2005; however, many constituents are monitored less than once per year because the concentrations of these contaminants do not change frequently. Therefore, some data, though representative, can be more than one year old.

In order to produce, treat and distribute safe water to our customers, the City owns and operates 11 wells, three water treatment plants, 23 booster pump stations, 31 water storage reservoirs and more than 500 miles of distribution pipelines.

Este informe contiene información muy importante sobre su agua potable. Tradúzcalo ó hable con alguien que lo entienda bien. Para más información, por favor llame 652-4500. Copias del informe de agua en espanol pueden ser obtenidas llamando al 652-4500.

Ventura's water meets or exceeds state and federal primary standards.

WATER CONSERVATION BEGINS WITH **YOU**!

Nicholas Santoyo
5th grade Poinsettia Elementary School
2006 Conserve Our Water
Coloring Contest Winner

The City's Water Conservation Program continues to be effective in controlling water demand. As a result, residents today use the same amount of water as they did in 1973, even though the population has increased by 70%. Below are some helpful water conservation tips:.

- Instead of running the tap to get water cold, keep water in the refrigerator.
- When letting the sink or shower water run to heat up, capture this water for watering plants at your home.
- Twice yearly, check faucets indoors and out. Replace worn-out fixtures, washers and hose connections. Turn faucets off firmly.
- Cover pools and spas to reduce evaporation.
- Match washer's load selector to your load size. Wash full loads.
- Plant water-saving plants, trees and shrubs — particularly native species. Mulch to retain water.

For more information about water conservation or to receive this document in an alternate format please contact Will Santoyo at 805/652-4567.

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Ventura's Water Sources

The City has three local water sources; each accounts for approximately one third of the entire water supply. A portion of Ventura's water is from the Ventura River and is pumped from four shallow wells and a subsurface collector. Water is also purchased from Lake Casitas, which is operated and treated by the Casitas Municipal Water District (CMWD), for distribution through the City system to customers. Additional water is pumped from groundwater wells located in the City's east side.

Water Treatment

All of the City's water receives treatment. Water from the Ventura River is treated by a method referred to as Conventional Surface Water Treatment. This process involves coagulation (chemical addition), flocculation (gentle agitation), sedimentation (settling particles), filtration, and disinfection with chloramines. The groundwater sources are also treated with direct media filtration to remove iron, manganese and turbidity. Additional treatment is provided at each plant to help prevent the corrosion of plumbing in your home. CMWD treats the water from Lake Casitas with direct media filtration and with chloramines for disinfection prior to delivery into the City's system.

The City uses chloramines for disinfection. Chloramines are chemicals that contain chlorine and ammonia. Chloramines were selected as the preferred disinfectant because of their ability to provide disinfection over an extended period of time, and for better taste and fewer odors compared to using chlorine alone. Chloramines have been proven to effectively kill microorganisms while producing lower levels of byproducts such as trihalomethanes (TTHMs) and haloacetic acids (HAAs), which are potentially harmful. Drinking water containing these byproducts in excess of the MCL may lead to adverse health effects, liver or kidney problems, or nervous system effects, and may lead to an increased risk of cancer.

Although Chloramines are desirable in protecting the water distribution system, their use requires additional precautions for some water uses. If a member of your household requires dialysis, you should contact your physician or dialysis service provider to assure proper protective equipment is used. If you use tap water for fish or other aquatic animals that use gills for breathing, you need to test and be sure the chloramines are completely removed before use. Setting water in an open container for 24 hours prior to use will not remove all chloramines in the water. Your local pet store can provide information and products for the proper removal of chloramines. Some people who use water containing chloramines and chlorine well in excess of the Maximum Residual Disinfectant Level (MRDL), the maximum level allowed in our water systems, could experience irritating effects to their eyes and nose. Some people who drink water containing these chemicals well in excess of the MRDL could experience stomach discomfort and in the case of chloramines, anemia.

Turbidity is a measure of the cloudiness of the water. The City monitors for turbidity because it is a good indicator of water quality and the effectiveness of the filtration processes. High turbidity can hinder the effectiveness of the disinfectants.

Water Quality Monitoring and Reporting

Ventura owns and operates a full-scale, state-certified laboratory to monitor water quality. Outside labs are also used as necessary. State-certified operators run Ventura's treatment plants. The plants have instrumentation that continuously monitors specific water constituents to ensure that the water is of high quality. Water quality constituents that were detected during 2005 are listed on the Water Quality Summary Table (see back page).

The United States Environmental Protection Agency (USEPA) through the Safe Drinking Water Act establishes drinking water standards, monitoring and reporting protocols. The California Department of Health Services (state) enforces the drinking water standards for the USEPA and has the authority to make standards more stringent if applicable to California. The City conducts monitoring beyond the minimum requirements of the federal and state regulations.

The City submits monthly and annual reports to the state for review that summarize treatment performance and drinking water quality. The state inspects the City's water system each year and submits their findings to the City. The state prepared an Engineering Report dated February 2006, and found that the sources, works, and operation are capable of producing a safe, wholesome and reliable quality of water supply. The quality of the water served and the City water system facilities and operation meet the state's standards for drinking water.

Since 2002, the City has monitored water quality along the Ventura River and San Antonio Creek for Cryptosporidium, Giardia, Bacteria, Nutrients, Bromide, Total Organic Carbon, Chloride and Conductivity. This additional testing is part of an expanded sampling program to detect potential contaminants in the watershed allowing the City to better plan future production and treatment improvements.

Water System Studies & Improvements

A Water System Master Plan is prepared every 10 years and is underway. The current plan will be completed by the end of 2006. The plan will include recommendations for capital improvements based on an analysis of water supply, distribution and quality. Current improvement projects underway include replacement of the Avenue Water Treatment Plant filtration process, evaluating Foster Park well field strategies, additional water storage on the eastside of the City, improvement of various water mains throughout the City, addition of new well capacity in the Saticoy area, emergency generators for operation of critical facilities, energy efficient electrical systems for booster stations, and expansion of the Saticoy Water Treatment Plant.

The City, like other water purveyors in the country, completed a federally mandated review of its water system security. This review evaluated the water facilities and prioritized security measures that can help minimize the risk of damage or contamination. The City already has and will continue to take steps to improve the protection of City water facilities.

In April 2006 the City completed the five-year update to the Sanitary Survey of the Lower Ventura River Watershed. The purpose of the study is to identify potential sources of contamination within the watershed, to make recommendations on how to reduce risks to the water supply, and to make adjustments to the ongoing watershed monitoring program.

A separate Drinking Water Source Assessment for the City's water supplies was completed in January 2002. The purpose of the assessment is to identify existing or potential threats to every source of supply including groundwater. No contaminants have been detected in the water supply from such surrounding sources as gas stations, agricultural drainage, dry cleaners, urban run off, sewer systems, metal plating/finishing and repair shops.

As a water supplier, the City must complete an evaluation of its drinking water supply with respect to Public Health Goals (PHG) every three years. The goals are advisory only, requiring public notification, and are not mandatory limits. The City completed the last evaluation in 2004, which determined that six chemicals, although well below the maximum contaminant level limit, exceeded a PHG. These were lead, copper, uranium, gross alpha & beta particles, and radium 226. Copper and lead can be found in water as a result of the corrosion of plumbing fixtures used in most homes. The City has conducted tests to optimize its treatment with corrosion inhibitors in an effort to further reduce lead and copper levels. High levels of lead can result in kidney problems or high blood pressure, and delays in physical and mental development in children. High levels of copper are known to cause gastrointestinal disturbance and kidney damage. The remaining four chemicals are naturally occurring radioactive isotopes that typically occur in drinking water by the erosion of natural deposits and are considered carcinogenic. Noncarcinogenic effects of uranium on the kidneys and the liver have been documented. Radium is known to cause tumors.

Potential Concerns

In order to ensure tap water is safe, the United States Environmental Protection Agency (USEPA) and the California Department of Health Services prescribe regulations that limit the amount of certain contaminants in water provided by public water systems. The City of Ventura treats its water to meet these regulations. The regulations of the Food and Drug Administration establish limits for contaminants in bottled water, which must provide the same protection for the public health.

Drinking water, including bottled water, may contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the USEPA's Safe Drinking Water Hotline at 1-800-426-4791.

Sources of drinking water (both tap and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs and wells. As water travels over the surface of the land or through the ground, it dissolves naturally occurring minerals and can pick up contaminants resulting from the presence of animals or from human activity.

Contaminants that *may* be present in source water include:

- Microbial contaminants, such as viruses and bacteria from sewage treatment plants, septic systems, agriculture and livestock operations and wildlife.
- Inorganic contaminants, such as salts and metals which can be naturally occurring or result from urban stormwater runoff, industrial or domestic wastewater discharges, oil and gas production, mining or farming.
- Pesticides and herbicides from a variety of sources, such as agriculture, urban stormwater runoff and residential uses.
- Organic chemical contaminants, including synthetic and volatile organic chemicals that are byproducts of industrial processes and petroleum production, and can also come from gas stations, urban stormwater runoff, agricultural applications, and septic systems.
- Radioactive contaminants can be naturally occurring or be the result of oil and gas production and mining activities.

Some people are more vulnerable to contaminants in drinking water than the general population. Immuno-compromised individuals, such as people with cancer, those undergoing chemotherapy, people who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly people and infants can be particularly at risk from infections and are at greater risk of developing life-threatening illnesses. The City encourages immuno-compromised individuals to consult their doctors regarding appropriate precautions to avoid infection.

The City takes precautions to eliminate the risk of infection from microbial contaminants, including Giardia and Cryptosporidium, from its water system. The new membrane filtration improvements being installed at the Avenue Treatment Plant are effective at removing these contaminants.

These organisms are found in surface water throughout the United States and ingesting them may cause an abdominal infection. Symptoms of infection include nausea, diarrhea and abdominal cramps. The City has been sampling for possible risks present in the Ventura River Watershed since 2000. The City's current treatment processes for surface water include coagulation, filtration and Chloramine disinfection to remove these organisms. The USEPA and the Centers for Disease Control guidelines on appropriate means to lessen the risk of infection by Cryptosporidium, Giardia and other microbial contaminants are available from the Safe Drinking Hotline at 1-800-426-4791.

For More Information

If you would like more information regarding the City's water quality or studies, please contact Ventura's Water Superintendent at 652-4500. This Water Consumer Confidence Report is also available on the City's website at www.cityofventura.net

You are invited to express your opinions at City Council meetings held each Monday at 7 p.m. in the Council Chambers at Ventura City Hall, 501 Poli Street.

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WATER CONSUMER CONFIDENCE REPORT 2006

Ventura's Water Quality Summary 2007

Utilizing data collected in 2006.

Only water quality constituents detected by laboratory testing appear in the chart.

PRIMARY STANDARDS (PDWS)	Units	Maximum Level MCL	State Goal PHG	Ventura River Average	Ventura River Range	Ground Water Average	Ground Water Range	CMWD Average	CMWD Range	Major Sources of Contamination in Drinking Water (Footnotes)
Water Clarity										
Treated Turbidity	NTU	TT	NA	0.17 (a)	0.12 - 0.24(a)	0.17	0.1 - 0.44	0.06 (b)	0.01-0.06 (b)	1
Radioactive Contaminants (e)										
Gross Alpha particle activity	pCi/l	15	NA	4.65	1.7 - 10.0	7.5	1.9 - 17.5	1.1	0.3 - 2.1	2
Radium 226	pCi/l	5	NA	0.10	ND - 0.23	0.50	0.12 - 0.89	NA	NA	2
Uranium (c)	pCi/l	20	0.5	3.13	2.1 - 4.0	4.8	3.8 - 6.8	NA	NA	2
Inorganic Contaminants										
Arsenic	ppb	50	0	ND	ND	ND	ND	ND	ND	3
Fluoride	ppm	2	1	0.39	0.32 - 0.48	0.49	0.37 - 0.58	0.4	0.4	4
Selenium	ppb	50	NA	ND	ND	15	ND - 20	ND	ND	5
Nitrate (as Nitrogen)	ppm	10	10	ND	ND - 0.20	1.9	ND - 2.2	2.6	1.8 - 4.1	6

Lead and Copper Samples	Units	RAL	PHG	Samples Collected	Above RAL	90th Percentile	Major Sources of Contamination in Drinking Water
Lead	ppb	15	2	55 (d)	1	9	7
Copper	ppm	1.3	0.17	55 (d)	1	1.09	7

Footnotes: [1] Process and source variations [2] Erosion of natural deposits [3] Erosion of natural deposits; runoff from orchards; glass and electronics production waste [4] Erosion of natural deposits; water additive that promotes strong teeth; discharge from fertilizer and aluminum factories [5] Discharge from refineries or manufacturers; erosion of natural deposits [6] Runoff and leaching from fertilizer use; leaching from septic tanks and sewage; erosion of natural deposits [7] Internal corrosion of household plumbing systems

PRIMARY STANDARDS for Distribution System	Units	MCL MRDL	PHG (MCLG) MRDLG	Distribution System Average	Distribution System Range	Major Sources of Contamination in Drinking Water
Disinfection						
Chloramine Residual	ppm	4	4	2.3	1.1 - 3.9	Drinking water disinfectant added for treatment.
Disinfection By Products						
Total Trihalomethanes	ppb	80	NA	35 (c)	5 - 84	By-product of drinking water chlorination.
Total Haloacetic Acids	ppb	60	NA	35 (c)	2 - 103	By-product of drinking water chlorination.
Microbiological Contaminant Samples						
Total Coliform Bacteria	NA	5%	0	0	0	Naturally present in the environment.
Fecal Coliform Bacteria	NA	0	0	0	0	Human and animal fecal waste.

SECONDARY STANDARDS		Units	Maximum Level MCL	Ventura River Average	Ventura River Range	Ground Water Average	Ground Water Range	CMWD Average	CMWD Range
Aesthetic Standards	Color	Color	15	1.6	ND - 4	5.3	ND - 16	ND	ND
	Odor	Threshold	3	ND	ND	ND	ND	ND	ND
	Chloride	ppm	500	27	17 - 43	67	55 - 79	14	14
	Corrosivity	ppb	Non corrosive (+)	0.07	-0.16 - 0.47	0.48	0.3 - 0.85	-0.3	-0.3
	Iron (TT)	ppb	300	ND	ND	ND	ND - 110	NS	NS
	Total dissolved solids	ppm	1000	526	418 - 760	1292	1042 - 1546	340	340
	Specific conductance	umhos	1600	692	521 - 931	1662	1421 - 2160	541	541
	Sulfate	ppm	500	166	117 - 247	537	388 - 776	120	120
Additional Constituents	pH	pH units	6.5 - 8.5	7.6	7.3 - 7.9	7.5	7.3 - 7.8	7.3	7.3
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	Calcium	ppm	NS	82	58 - 113	161	144 - 180	54	54
	Magnesium	ppm	NS	23	20 - 29	49	36 - 58	20	20
	Manganese (TT)	ppb	50	ND	ND	ND	ND - 40	ND	ND
	Sodium	ppm	NS	31	21 - 54	131	94 - 174	23	23
	Phosphate	ppm	NS	0.22	0.15 - 0.40	0.21	ND - 0.51	NS	NS
	Potassium	ppm	NS	2.3	2.0 - 2.5	4.7	3.7 - 6.3	3	3
	Total Alkalinity	ppm	NS	155	131 - 194	260	219 -283	130	130

Footnotes (a) Average is maximum reading. Avenue Plant Surface Filtration (TT) = 95% of samples equal or below 0.3 NTU (b) Average is maximum reading. CMWD Direct Filtration (TT) = 95% of samples equal or below 0.5 NTU
(c) Highest running average cannot exceed the MCL. (d) Samples were taken at selected households on a first draw in August 2005. (e) Monitoring completed in 2003 and 2004.

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WATER QUALITY CONFIDENCE REPORT 2007

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Ventura River at Foster Park

YOUR WATER CONSERVATION EFFORTS ARE IMPORTANT!

Water is a precious commodity in Southern California, especially during drought years. The needless waste of water raises everyone's bill. Unused water can be stored and made available for future needs. Here are some important ways for water users to conserve our water supply:

Nestor Rodriguez
Will Rogers Elementary
2007 Conserve Our Water
Coloring Contest Winner

- Request a free Customer Service Guide for conservation tips at 805.667.6500.
- Irrigate your landscape in the later evening or early morning to prevent evaporation.
- Use only the amount of water your lawn can absorb – never let water run to the gutter.
- **NEVER** hose down sidewalks, driveways, etc. – use a broom instead.
- Always use hose nozzles that shut-off flow when washing vehicles and other equipment.

Water customers may call 805.652.4568 for helpful ways to conserve water or to schedule an appointment with City staff for a free onsite evaluation to obtain timed watering plans for winter and summer irrigation. Free water conserving showerheads are also available to our customers at the information counter in City Hall.

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Ventura's water meets or exceeds state and federal primary standards.

Ventura's Water Sources

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CMWD treats the water from Lake Casitas with direct media filtration and with chloramines for disinfection prior to delivery into the City s system. Turbidity is a measure of the cloudiness of the water. The City and CMWD are required to monitor for turbidity because it is a good indicator of water quality and the effectiveness of the filtration processes. High turbidity can hinder the effectiveness of the disinfectants.

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Ventura owns and operates a full-scale, state-certified laboratory to monitor water quality. Outside state-certified labs are also used as necessary. State-certified operators run Ventura's treatment plants. The plants have instrumentation that continuously monitors specific water constituents to ensure that the water is of high quality. Water quality constituents that were detected during 2006 are listed on the Water Quality Summary Table (see back page).

The United States Environmental Protection Agency (USEPA) through the Safe Drinking Water Act establishes drinking water standards, monitoring and reporting protocols. The California Department of Health Services enforces the drinking water standards for the USEPA and has the authority to make standards more stringent if applicable to California. The City conducts monitoring beyond the minimum requirements for some federal and state regulations.

The City submits monthly and annual reports to the state for review that summarize treatment performance and drinking water quality. The state inspects the City's water system each year and submits their findings to the City. The state prepared an Engineering Report dated February 2006, finding that the city's sources, facilities, and operation are capable of producing a safe, wholesome and reliable quality of water supply; and meet the state and federal standards and regulations for drinking water.

Since 2002, the City has monitored water quality along the Ventura River and San Antonio Creek for Cryptosporidium, Giardia, Bacteria, Nutrients, Bromide, Total Organic Carbon, Chloride and Conductivity. This additional testing is part of an expanded sampling program to detect potential contaminants in the watershed allowing the City to better plan future production and treatment improvements.

Water System Studies & Improvements

A Water System Master Plan is prepared every 10 years and is underway. The current plan will be completed by the end of 2007. The plan will include recommendations for capital improvements based on an analysis of water supply, distribution, and quality. Current improvement projects underway include replacement of the Avenue Water Treatment Plant filtration process, evaluating Foster Park well field strategies, additional water storage on the eastside of the City, improvement of various water mains throughout the City, addition of new well capacity in the Saticoy area, emergency generators for operation of critical facilities, and energy efficient electrical systems for booster stations.

The City, like other water purveyors in the country, completed a federally mandated review of its water system security. This review evaluated the water facilities and prioritized security measures that can help minimize the risk of damage or contamination. The City already has and will continue to take steps to improve the protection of City water facilities.

In April 2006 the City completed the five-year update to the Sanitary Survey of the Lower Ventura River Watershed. The purpose of the study is to identify potential sources of contamination within the watershed, to make recommendations on how to reduce risks to the water supply, and to make adjustments to the ongoing watershed monitoring program.

A separate Drinking Water Source Assessment for the City's water supplies was completed in January 2002. The purpose of the assessment is to identify existing or potential threats to every source of supply including groundwater. No contaminants have been detected in the water supply from such surrounding sources as gas stations, agricultural drainage, dry cleaners, urban run off, sewer systems, metal plating/finishing and repair shops.

As a water supplier, the City must complete an evaluation of its drinking water supply with respect to Public Health Goals (PHG) every three years. The goals are advisory only, requiring public notification, and are not mandatory limits. The City completed the last evaluation in 2004, which determined that six chemicals, although well below the maximum contaminant level limit, exceeded a PHG. These were lead, copper, uranium, gross alpha & beta particles, and radium 226. Copper and lead can be found in water as a result of the corrosion of plumbing fixtures used in most homes. The City has conducted tests to optimize its treatment with corrosion inhibitors in an effort to further reduce lead and copper levels. High levels of lead can result in kidney problems or high blood pressure, and delays in physical and mental development in children. High levels of copper are known to cause gastrointestinal disturbance and kidney damage. The remaining four chemicals are naturally occurring radioactive isotopes that typically occur in drinking water by the erosion of natural deposits and are considered carcinogenic. Other effects of uranium in the kidneys and the liver have been documented. Radium is known to cause tumors.

Potential Concerns

In order to ensure tap water is safe, the United States Environmental Protection Agency (USEPA) and the California Department of Health Services prescribe regulations that limit the amount of certain contaminants in water provided by public water systems. The City of Ventura treats its water to meet these regulations. The regulations of the Food and Drug Administration establish limits for contaminants in bottled water, which must provide the same protection for the public health.

Drinking water, including bottled water, may contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the USEPA's Safe Drinking Water Hotline at 1.800.426.4791.

Sources of drinking water (both tap and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs and wells. As water travels over the surface of the land or through the ground, it dissolves naturally occurring minerals and can pick up contaminants resulting from the presence of animals or from human activity.

Contaminants that may be present in source water include:

- Microbial contaminants, such as viruses and bacteria that may come from sewage treatment plants, septic systems, agriculture and livestock operations and wildlife.
- Inorganic contaminants, such as salts and metals that may be naturally occurring or result from urban stormwater runoff, industrial or domestic wastewater discharges, oil and gas production, mining or farming.
- Pesticides and herbicides from a variety of sources, such as agriculture, urban stormwater runoff and residential uses.
- Organic chemical contaminants, including synthetic and volatile organic chemicals that are byproducts of industrial processes and petroleum production, and can also come from gas stations, urban stormwater runoff, agricultural applications, and septic systems.
- Radioactive contaminants that can be naturally occurring or be the result of oil and gas production and mining activities.

Some people are more vulnerable to contaminants in drinking water than the general population. Immuno-compromised individuals, such as people with cancer, those undergoing chemotherapy, people who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly people and infants can be particularly at risk from infections and are at greater risk of developing life-threatening illnesses. The City encourages immuno-compromised individuals to consult their doctors regarding appropriate precautions to avoid infection.

The City takes precautions to eliminate the risk of infection from microbial contaminants, including Giardia and Cryptosporidium, from its water system. The new membrane filtration improvements being installed at the Avenue Treatment Plant are very effective at removing these contaminants. These organisms are found in surface water throughout the United States and ingesting them may cause an abdominal infection. Symptoms of infection include nausea, diarrhea and abdominal cramps. Most healthy individuals can overcome the infection within a few weeks. However, immuno-compromised people are at greater risk of developing life-threatening illness, and are encouraged to consult their doctor regarding appropriate precautions to take to avoid infection. Cryptosporidium must be ingested to cause disease, and it may be spread through means other than drinking water. The City has been sampling for possible risks present in the Ventura River Watershed since 2000, with only one sample detected for Cryptosporidium. Casitas monitored for Cryptosporidium during 2006 on a monthly basis with a result of non-detect for 11 samples of 12 total. The City's and Casitas' current treatment processes for surface water including coagulation, filtration and Chloramines disinfection to remove these organisms are not 100% effective. The USEPA and the Centers for Disease Control guidelines on appropriate means to lessen the risk of infection by Cryptosporidium, Giardia and other microbial contaminants are available from the Safe Drinking Hotline at 1-800-426-4791.

For More Information

If you would like more information regarding the City's water quality, facility improvements, or studies, please contact Ventura's Water Superintendent at 805.652.4500. This Water Quality Confidence Report is also available on the City's website at www.cityofventura.net

You are invited to express your opinions at City Council meetings held each Monday at 7 p.m. in the Council Chambers at Ventura City Hall, 501 Poli Street.

WATER QUALITY CONFIDENCE REPORT 2007

Ventura's Water Quality Summary 2007

Utilizing data collected in 2006.

Only water quality constituents detected by laboratory testing appear in the chart.

PRIMARY STANDARDS (PDWS)	Units	Maximum Level MCL	State Goal PHG	Ventura River Average	Ventura River Range	Ground Water Average	Ground Water Range	CMWD Average	CMWD Range	Major Sources of Contamination in Drinking Water (Footnotes)
Water Clarity										
Treated Turbidity	NTU	TT	NA	0.17 (a)	0.12 - 0.24(a)	0.17	0.1 - 0.44	0.06 (b)	0.01-0.06 (b)	1
Radioactive Contaminants (e)										
Gross Alpha particle activity	pCi/l	15	NA	4.65	1.7 - 10.0	7.5	1.9 - 17.5	1.1	0.3 - 2.1	2
Radium 226	pCi/l	5	NA	0.10	ND - 0.23	0.50	0.12 - 0.89	NA	NA	2
Uranium (c)	pCi/l	20	0.5	3.13	2.1 - 4.0	4.8	3.8 - 6.8	NA	NA	2
Inorganic Contaminants										
Arsenic	ppb	50	0	ND	ND	ND	ND	ND	ND	3
Fluoride	ppm	2	1	0.39	0.32 - 0.48	0.49	0.37 - 0.58	0.4	0.4	4
Selenium	ppb	50	NA	ND	ND	15	ND - 20	ND	ND	5
Nitrate (as Nitrogen)	ppm	10	10	ND	ND - 0.20	1.9	ND - 2.2	2.6	1.8 - 4.1	6

Lead and Copper Samples	Units	RAL	PHG	Samples Collected	Above RAL	90th Percentile	Major Sources of Contamination in Drinking Water
Lead	ppb	15	2	55 (d)	1	9	7
Copper	ppm	1.3	0.17	55 (d)	1	1.09	7

Footnotes: [1] Process and source variations [2] Erosion of natural deposits [3] Erosion of natural deposits; runoff from orchards; glass and electronics production waste [4] Erosion of natural deposits; water additive that promotes strong teeth; discharge from fertilizer and aluminum factories. [5] Discharge from refineries or manufacturers; erosion of natural deposits. [6] Runoff and leaching from fertilizer use; leaching from septic tanks and sewage; erosion of natural deposits. [7] Internal corrosion of household plumbing systems

PRIMARY STANDARDS for Distribution System	Units	MCL MRDL	PHG (MCLG) MRDLG	Distribution System Average	Distribution System Range	Major Sources of Contamination in Drinking Water
Disinfection						
Chloramine Residual	ppm	4	4	2.3	1.1 - 3.9	Drinking water disinfectant added for treatment.
Disinfection By Products						
Total Trihalomethanes	ppb	80	NA	35 (c)	5 - 84	By-product of drinking water chlorination.
Total Haloacetic Acids	ppb	60	NA	35 (c)	2 - 103	By-product of drinking water chlorination.
Microbiological Contaminant Samples						
Total Coliform Bacteria	NA	5%	0	0	0	Naturally present in the environment.
Fecal Coliform Bacteria	NA	0	0	0	0	Human and animal fecal waste.

SECONDARY STANDARDS		Units	Maximum Level MCL	Ventura River Average	Ventura River Range	Ground Water Average	Ground Water Range	CMWD Average	CMWD Range
Aesthetic Standards	Color	Color	15	1.6	ND - 4	5.3	ND - 16	ND	ND
	Odor	Threshold	3	ND	ND	ND	ND	ND	ND
	Chloride	ppm	500	27	17 - 43	67	55 - 79	14	14
	Corrosivity	ppb	Non corrosive (+)	0.07	-0.16 - 0.47	0.48	0.3 - 0.85	-0.3	-0.3
	Iron (TT)	ppb	300	ND	ND	ND	ND - 110	NS	NS
	Total dissolved solids	ppm	1000	526	418 - 760	1292	1042 - 1546	340	340
	Specific conductance	umhos	1600	692	521 - 931	1662	1421 - 2160	541	541
	Sulfate	ppm	500	166	117 - 247	537	388 - 776	120	120
Additional Constituents	pH	pH units	6.5 - 8.5	7.6	7.3 - 7.9	7.5	7.3 - 7.8	7.3	7.3
	Hardness	ppm	NS	300	229 - 402	602	528 - 689	217	217
	Calcium	ppm	NS	82	58 - 113	161	144 - 180	54	54
	Magnesium	ppm	NS	23	20 - 29	49	36 - 58	20	20
	Manganese (TT)	ppb	50	ND	ND	ND	ND - 40	ND	ND
	Sodium	ppm	NS	31	21 - 54	131	94 - 174	23	23
	Phosphate	ppm	NS	0.22	0.15 - 0.40	0.21	ND - 0.51	NS	NS
	Potassium	ppm	NS	2.3	2.0 - 2.5	4.7	3.7 - 6.3	3	3
	Total Alkalinity	ppm	NS	155	131 - 194	260	219 -283	130	130

Footnotes: (a) Average is maximum reading Avenue Plant Surface Filtration (TT) = 95% of samples equal or below 0.3 NTU. (b) Average is maximum reading CMWD Direct Filtration (TT) = 95% of samples equal or below 0.5 NTU
(c) Highest running average cannot exceed the MCL (d) Samples were taken at selected households on a first draw in August 2005. (e) Monitoring completed in 2003 and 2004.

Legend

ppm: Parts per million or milligrams per liter.
pCi/l: Picocuries per liter; a measure of radioactivity in water.
CMWD: Casitas Municipal Water District
TT: A required process intended to reduce the level of contaminant in drinking water
ppb: Parts per billion or micrograms per liter.
NA: Not applicable
ND: Not detectable
NS: No standard
NTU: Turbidity, a measure of the clarity or cloudiness of the water.

Water Quality Terminology

The Water Quality Summary shows constituents measured in Ventura's water and reported to the State Department of Health Services, and in some cases the USEPA. Some of the terminology used is described below:

Maximum Contaminant Level (MCL): The highest level of a contaminant that is allowed in drinking water. Primary (health related) MCLs are set as close to the Public Health Goals (PHGs) or Maximum Contaminant Level Goals (MCLGs) as is economically and technologically feasible. Secondary (aesthetically related) MCLs are set to protect the odor, taste and appearance of drinking water.

Maximum Contaminant Level Goal (MCLG): The level of contaminant in drinking water below which there is no known or expected risk to one's health. MCLGs are set by the USEPA.

Public Health Goal (PHG): The level of a contaminant in drinking water below which there is no known or expected risk to one's health. The California Environmental Protection Agency sets PHGs.

Maximum Residual Disinfectant Level (MRDL): The level of a disinfectant added for water treatment that may not be exceeded at the consumer's tap.

Maximum Residual Disinfectant Level Goal (MRDLG): The level of a disinfectant added for water treatment below, which there is no known or expected risk to health. MRDLs are set by the USEPA.

Primary Drinking Water Standard (PDWS): MCLs and MRDLs for contaminants that affect health along with their monitoring and reporting requirements, and water treatment requirements.

Regulatory Action Level (RAL): The concentration of a contaminant, which, if exceeded, triggers treatment or other requirements that a water system must follow.

WATER QUALITY CONFIDENCE REPORT 2008

The City of Ventura welcomes this opportunity to provide you with annual water quality and supply information. Its Water Division personnel work diligently to ensure that our city's water meets or exceeds state and federal drinking water standards and regulations with no violations.

The United States Environmental Protection Agency (USEPA) through the Safe Drinking Water Act establishes federal drinking water standards, monitoring and reporting protocols enforced by the California Department of Public Health, which has the authority to make state standards more stringent than federal standards. The City of Ventura conducts monitoring beyond the minimum requirements for some federal and state regulations.

The City of Ventura has prepared this 2008 Water Quality Consumer Confidence Report in compliance with the State Health and Safety Code requirements gathering most data in 2007; however, many constituents are monitored less than once per year because the concentrations of these contaminants do not change frequently. Therefore, some data, though representative, can be more than one year old.

In order to produce, treat and distribute safe drinking water to our customers, the City owns and operates 11 wells, three water treatment plants, two treated water connections from Lake Casitas, 23 booster pump stations, 31 water storage reservoirs, and more than 500 miles of distribution pipelines.

For More Information

If you would like more information regarding the City's water quality, facility improvements, or studies, please contact Ventura's Water Superintendent at 805.652.4500. This Water Quality Confidence Report is also available on the City's website at www.cityofventura.net.

You are invited to express your opinions at City Council meetings held each Monday at 7 pm in the Council Chambers at Ventura City Hall, 501 Poli Street.

Este informe contiene información muy importante sobre su agua potable. Para más información o obtener copias del informe de agua en espanol llame 652-4500.

CITY OF VENTURA
cityofventura.net

Source of supply from the Ventura River at Foster Park

Ventura's Water Sources

The City has three local water sources; each accounts for approximately one third of the entire water supply. A portion of Ventura's water is from the Ventura River and is pumped from four shallow wells and a subsurface collector. This water drains from a 51,000-acre lower watershed in the Ojai and Ventura River Valleys that include the tributaries of the San Antonio and the Coyote Creeks. Water is also purchased from Lake Casitas, which is operated and treated by the Casitas Municipal Water District (CMWD) for distribution through the City system to customers. Most of this water drains from the upper watershed that is federally protected to limit contamination of the lake. Water quality in the river and the lake are similar. Additional water is pumped from deep groundwater wells located in the City's east side near Victoria Avenue and in Saticoy. Water quality from the aquifers in the Fox Canyon, Mound, and Santa Paula groundwater basins are similar, but include about twice as much total dissolved solids (TDS) or minerals (hardness) than from the upper and lower watersheds that drain to the river. The TDS for the City's blended groundwater averages around 1,300 ppm, resulting in taste and odor concerns for some people.

Ventura's water meets or exceeds state and federal primary standards.

Water Treatment

All of the City's water receives treatment. Major changes in the method to treat water from the Ventura River at the Avenue Water Treatment Plant occurred during the last half of 2007. Since 1939 water from the Ventura River was treated by a method referred to as Conventional Surface Water Treatment. This process involves prechlorination (control bacteria and algae), coagulation (chemical addition), flocculation (gentle agitation), sedimentation (settling particles), filtration with sand and anthracite (removing bacteria and turbidity), and disinfection (killing bacteria and viruses) with chlorine.

JACOB FOKO

Since August, water from the Ventura River is treated with a more reliable method referred to membrane ultrafiltration (UF). This is a more effective treatment process than media filtration. It involves prechlorination (control bacteria and algae), coagulation (chemical addition), membrane filtration (removing bacteria and turbidity), and disinfection with chlorine to ensure effective removal of viruses and bacteria. After the membrane process, caustic soda and polyphosphate are added to help minimize the corrosion of plumbing in your home. Ammonia is also added that combines with chlorine to form the final disinfectant for the drinking water. Thousands of UF hollow fiber filtration membranes provide a physical barrier to pathogens and particles in the water larger than the 0.02 micron pore size. This pore size excludes anything larger including bacteria, giardia, and cryptosporidium, and to large extent viruses that are all larger than 0.02 microns.

The groundwater sources are treated at either the Bailey or Saticoy Plants with prechlorination and direct media filtration to remove iron, manganese, and turbidity particles, and disinfected with chloramines. Additional treatment with polyphosphate is provided at each plant to help minimize the corrosion of plumbing in your home. CMWD also treats the water from Lake Casitas with direct media filtration and with chloramines for disinfection prior to delivery into the City's system.

The City uses chloramines for disinfection in the distribution system. Chloramines are chemicals that contain chlorine and ammonia. Chloramines were selected as the preferred disinfectant because of their ability to provide disinfection over an extended period of time, and for better taste and fewer odors compared to using chlorine alone. Chloramines have been proven to effectively kill microorganisms while producing lower levels of byproducts such as trihalomethanes (TTHMs) and haloacetic acids (HAAs), which are potentially harmful. Drinking water containing these byproducts in excess of the MCL may lead to adverse health effects, liver or kidney problems, or nervous system effects, and may lead to an increased risk of cancer.

Although Chloramines are desirable in protecting the water distribution system, their use requires additional precautions for some water uses. If a member of your household requires dialysis, you should contact your physician or dialysis service provider to assure proper protective equipment is used. If you use tap water for fish or other aquatic animals that use gills for breathing, you need to test and be sure the chloramines are completely removed before use. Setting water in an open container for 24 hours prior to use will not remove all chloramines in the water. Your local pet store can provide information and products for the proper removal of chloramines.

Water Quality Monitoring and Reporting

Ventura owns and operates a full-scale, state-certified laboratory to monitor water quality. Outside state-certified labs are also used as necessary. State-certified personnel are required to operate Ventura's treatment plants and the distribution system. Additionally, the plants have instrumentation that continuously monitors specific water constituents to ensure that the treatment method is producing water of high quality. Water quality constituents that were detected by the laboratories during 2007 are listed on the Water Quality Summary Table (see back page).

The City submits monthly and annual reports to the state for review that summarize treatment performance and drinking water quality. The state inspects the City's water system each year and submits their findings to the City. The state prepared an Engineering Report dated August 3, 2007, finding that the city's sources, facilities, and operation are capable of producing a safe, wholesome and reliable quality of water supply; and meet the state and federal standards and regulations for drinking water.

Since 2002, the City has monitored water quality along the Ventura River, Coyote Creek and San Antonio Creek for Cryptosporidium, Giardia, Bacteria, Nutrients, Bromide, Total Organic Carbon, Chloride and Conductivity. This additional testing is part of an expanded sampling program to detect potential contaminants in the watershed allowing the City to better plan future production and treatment improvements.

Turbidity is a measure of the cloudiness of the water. The City and CMWD are required to monitor for turbidity every 15 minutes because it is a good indicator of water quality and the effectiveness of the filtration processes, especially for surface waters. High turbidity can hinder the effectiveness of the microbial disinfectants.

Water System Studies & Improvements

A Water System Master Plan is prepared about every 10 years and will be completed by the end of 2008. The plan will include an evaluation of the water systems capacity and delivery capabilities and provide recommendations for capital improvements based on an analysis of water supply, distribution, and water quality. Current improvement projects underway include addition of two wells on the Eastside, evaluating Foster Park well field strategies, improvement of various water mains throughout the City, and an emergency generator for uninterrupted operation of one of the critical booster pump stations.

The City, like other water purveyors in the country, completed a federally mandated review of its water system security. This review evaluated the water facilities and prioritized security measures that can help minimize the risk of damage or contamination due to a malevolent act. The City already has and will continue to take steps to improve the protection of City water facilities.

In April 2006 the City completed the five-year update to the Sanitary Survey of the Lower Ventura River Watershed. The purpose of the study is to identify potential sources of contamination within the watershed, to make recommendations on how to reduce risks to the water supply, and to make adjustments to the ongoing watershed water quality monitoring program.

A separate Drinking Water Source Assessment for the City's water supplies was completed in January 2002. The purpose of the assessment is to identify existing or potential threats to every source of supply including groundwater. No contaminants have been detected in the water supply from surrounding sources such as gas stations, agricultural drainage, dry cleaners, urban run off, sewer systems, metal plating/finishing and repair shops.

As a water supplier, the City must complete an evaluation of its drinking water supply with respect to Public Health Goals (PHG) every three years. The goals are advisory only, requiring public notification, and are not mandatory limits. The City completed the last evaluation in 2007, which determined that ten chemicals, although well below the maximum contaminant level limit, exceeded a state PHG or the federal MCLG. These were lead, copper, arsenic, uranium, gross alpha & beta particles, radium 226, bromodichloromethane, bromoform, and dichloroacetic acid.

Copper and lead can be found in water as a result of the corrosion of plumbing fixtures used in most homes. The City has conducted tests to optimize its treatment with corrosion inhibitors in an effort to further reduce lead and copper levels. High levels of lead can result in kidney problems or high blood pressure, and delays in physical and mental development in children. High levels of copper are known to cause gastrointestinal disturbance and kidney damage. Arsenic, and the four naturally occurring radioactive isotopes that typically occur in drinking water by the erosion of natural deposits are considered carcinogenic. Noncarcinogenic effects of uranium on the kidneys and the liver have been documented. Radium is known to cause tumors. Bromodichloromethane, bromoform, and dichloroacetic acid are formed during the disinfection process with chlorine and can increase the risk of cancer and effects on the liver, kidney and central nervous system.

Potential Concerns

In order to ensure tap water is safe, the United States Environmental Protection Agency (USEPA) and the California Department of Public Health prescribe regulations that limit the amount of certain contaminants in water provided by public water systems. The City of Ventura treats its water to meet these regulations. The regulations of the Food and Drug Administration establish limits for contaminants in bottled water, which must provide the same protection for the public health.

Drinking water, including bottled water, may contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the USEPA's Safe Drinking Water Hotline at 1-800-426-4791.

Sources of drinking water (both tap and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs and wells. As water travels over the surface of the land or through the ground, it dissolves naturally occurring minerals and can pick up contaminants resulting from the presence of animals or from human activity.

Contaminants that may be present in source water include:

- Microbial contaminants, such as viruses and bacteria that may come from sewage treatment plants, septic systems, agriculture and livestock operations and wildlife.
- Inorganic contaminants, such as salts and metals that may be naturally occurring or result from urban stormwater runoff, industrial or domestic wastewater discharges, oil and gas production, mining or farming.
- Pesticides and herbicides from a variety of sources, such as agriculture, urban stormwater runoff and residential uses.
- Organic chemical contaminants, including synthetic and volatile organic chemicals that are byproducts of industrial processes and petroleum production, and can also come from gas stations, urban stormwater runoff, agricultural applications, and septic systems.
- Radioactive contaminants that can be naturally occurring or be the result of oil and gas production and mining activities.

JACOB FOKO

The uranium content in the City's water supplies is generally well below the maximum contaminant level of 20 pCi/L. However, during 2007, the average of quarterly samples for the Mound Well was 17 pCi/L. This well also contains higher than average total dissolved solids and sulfate levels. The well is operated less often than the other wells and its water is blended with the other groundwater sources to lower the TDS, sulfate and uranium content in the water. Some people who drink water containing uranium in excess of the MCL over many years may have kidney problems or an increased risk of getting cancer.

Some people are more vulnerable to contaminants in drinking water than the general population. Immuno-compromised individuals, such as people with cancer, those undergoing chemotherapy, people who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly people and infants can be particularly at risk from infections and are at greater risk of developing life-threatening illnesses. The City encourages immuno-compromised individuals to consult their doctors regarding appropriate precautions to avoid infection.

The City takes precautions to eliminate the risk of infection from microbial contaminants, including viruses, bacteria, Giardia and Cryptosporidium, from its water system. These organisms are found in surface water throughout the United States and ingesting them may cause an abdominal infection. The City has been sampling for possible risks in the watershed since 2000. The new membrane filtration and disinfection improvements installed at the Avenue Treatment Plant are very effective at removing these contaminants. The media filtration used by Casitas, although good and removal of Giardia and/or Cryptosporidium are not considered 100% effective. Symptoms of infection include nausea, diarrhea and abdominal cramps. Most healthy individuals can overcome the infection within a few weeks. However, immuno-compromised people are at greater risk of developing life-threatening illness, and are encouraged to consult their doctor regarding appropriate precautions to take to avoid microbial infection. Cryptosporidium must be ingested to cause disease, and it may be spread through means other than drinking water. The USEPA and the Centers for Disease Control guidelines on appropriate means to lessen the risk of infection by Cryptosporidium, Giardia and other microbial contaminants are available from the Safe Drinking Hotline at 1-800-426-4791.

Ventura's Water Quality Summary 2009

Utilizing data collected in 2008, unless noted.

Only water quality constituents detected by laboratory testing appear in the chart.

PRIMARY STANDARDS (PDWS)	Units	Maximum Level MCL	State Goal PHG	Ventura River Average	Ventura River Range	Ground Water Average	Ground Water Range	CMWD Average	CMWD Range	Major Sources of Contamination in Drinking Water (Footnotes)
Water Clarity										
Treated Turbidity	NTU	TT	NA	0.10 (a)	0.02 - 0.10(a)	0.23	0.1 - 0.5	0.08 (b)	0.01-0.08 (b)	1
Radioactive Contaminants (e)										
Gross Alpha particle activity	pCi/l	15	NA	4.26	1 - 10	9.2	2.9 - 20.4	1.1	0.3 - 2.1	2
Radium 226	pCi/l	5	NA	0.08	ND - 0.3	0.7	0.1 - 0.4	NA	NA	2
Uranium (c)	pCi/l	20	0.5	3.0	1.8 - 4.9	8.2	3.4 - 19.3	NA	NA	2
Inorganic Contaminants										
Fluoride	ppm	2	1	0.51	0.44 - 0.55	0.52	0.43 - 0.64	0.2	0.2	4
Selenium	ppb	50	NA	ND	ND	7.2	ND - 18	ND	ND	5
Nitrate (as Nitrogen)	ppm	10	10	1.1	ND - 1.9	1.2	ND - 3.3	ND	ND	6

Lead and Copper Samples	Units	RAL	PHG	Samples Collected	Above RAL	90th Percentile	Major Sources of Contamination in Drinking Water
Lead	ppb	15	2	50 (d)	0	1	7
Copper	ppb	1300	0.17	50 (d)	2	970	7

Footnotes: [1] Process and source variations [2] Erosion of natural deposits [3] Erosion of natural deposits; runoff from orchards; glass and electronics production waste [4] Erosion of natural deposits; water additive that promotes strong teeth; discharge from fertilizer and aluminum factories [5] Discharge from refineries or manufacturers; erosion of natural deposits. [6] Runoff and leaching from fertilizer use leaching from septic tanks and sewage; erosion of natural deposits. [7] Internal corrosion of household plumbing systems

PRIMARY STANDARDS for Distribution System	Units	MCL MRDL	PHG (MCLG) MRDLG	Distribution System Average	Distribution System Range	Major Sources of Contamination in Drinking Water
Disinfection						
Chloramine Residual	ppm	4	4	2.3	0.4 - 4.0	Drinking water disinfectant added for treatment.
Disinfection By Products						
Total Trihalomethanes	ppb	80	NA	33 (c)	3 - 86	By-product of drinking water chlorination.
Total Haloacetic Acids	ppb	60	NA	27 (c)	2 - 75	By-product of drinking water chlorination.
Microbiological Contaminant Samples						
Total Coliform Bacteria	NA	5%	0	0	0-1	Naturally present in the environment.
Fecal Coliform Bacteria	NA	0	0	0	0	Human and animal fecal waste.

SECONDARY STANDARDS		Units	Maximum Level MCL	Ventura River Average	Ventura River Range	Ground Water Average	Ground Water Range	CMWD Average	CMWD Range
Aesthetic Standards	Color	Color	15	5	ND - 5	5	ND - 10	ND	ND
	Odor	Threshold	3	ND	ND	ND	ND	ND	ND
	Chloride	ppm	500	42	40-49	65	54 - 91	14	14
	Corrosivity	ppb	Non corrosive (+)	0.26	-0.02 - 0.54	0.36	0.12 - 0.65	0.3	0.3
	Iron (TT)	ppb	300	ND	ND	ND	ND	NS	NS
	Total dissolved solids	ppm	1000	713	633- 772	1296	1056 - 1642	310	310
	Specific conductance	umhos	1600	966	893 -1027	1631	1354 - 2150	547	547
	Sulfate	ppm	500	244	219 - 270	539	404 - 783	127	127
Additional Constituents	pH	pH units	6.5 - 8.5	7.6	7.3- 7.8	7.4	7.2 - 7.6	7.6	7.6
	Hardness	ppm	NS	378	346 - 414	564	441 - 752	217	217
	Calcium	ppm	NS	104	91 - 118	143	96 - 194	54	54
	Magnesium	ppm	NS	29	28 - 33	50	40 - 65	20	20
	Manganese (TT)	ppb	50	ND	ND - 0.02	ND	ND - 60	ND	ND
	Sodium	ppm	NS	44	40 - 49	126	96 - 187	23	23
	Phosphate	ppm	NS	ND	ND - 0.05	0.19	0.15 - 0.34	NS	NS
	Potassium	ppm	NS	2.1	2.0 - 2.3	4.7	4.0 - 6.6	2	2
	Total Alkalinity	ppm	NS	208	163 - 236	262	230 -290	140	140

Footnotes: (a) Average is maximum reading. Avenue Plant Surface Filtration (TT) = 95% of samples equal or below 0.1 NTU. (b) Average is maximum reading. CMWD Direct Filtration (TT) = 100% of samples equal or below 0.2 NTU (c) Highest running average cannot exceed the MCL. (d) Samples were taken at selected households on a first draw in August 2005. (e) Monitoring completed in 2007 and 2008.

Legend

- **ppm:** Parts per million or milligrams per liter.
- **pCi/l:** Picocuries per liter, a measure of radioactivity in water.
- **CMWD:** Casitas Municipal Water District.
- **TT:** A required process intended to reduce the level of contaminant in drinking water
- **ppb:** Parts per billion or micrograms per liter.
- **NA:** Not applicable
- **ND:** Not detectable
- **NS:** No standard
- **NTU:** Turbidity, a measure of the clarity or cloudiness of the water.

Water Quality Terminology

The Water Quality Summary shows constituents measured in Ventura's water and reported to the State Department of Health Services, and in some cases the USEPA. Some of the terminology used is described below:

Maximum Contaminant Level (MCL): The highest level of a contaminant that is allowed in drinking water. Primary (health related) MCLs are set as close to the Public Health Goals (PHGs) or Maximum Contaminant Level Goals (MCLGs) as is economically and technologically feasible. Secondary (aesthetically related) MCLs are set to protect the odor, taste and appearance of drinking water.

Maximum Contaminant Level Goal (MCLG): The level of contaminant in drinking water below which there is no known or expected risk to one's health. MCLGs are set by the USEPA.

Public Health Goal (PHG): The level of a contaminant in drinking water below which there is no known or expected risk to one's health. The California Environmental Protection Agency sets PHGs.

Maximum Residual Disinfectant Level (MRDL): The level of a disinfectant added for water treatment that may not be exceeded at the consumer's tap.

Maximum Residual Disinfectant Level Goal (MRDLG): The level of a disinfectant added for water treatment below, which there is no known or expected risk to health. MRDLs are set by the USEPA.

Primary Drinking Water Standard (PDWS): MCLs and MRDLs for contaminants that affect health along with their monitoring and reporting requirements, and water treatment requirements.

Regulatory Action Level (RAL): The concentration of a contaminant, which, if exceeded, triggers treatment or other requirements that a water system must follow.

WATER QUALITY CONFIDENCE REPORT 2009

Since 1923, the City of Ventura has reliably provided safe and clean water for drinking as well as fire protection to our community, which is essential for health of our families, businesses and the environment. The Public Works Environmental and Water Resources Division welcomes this opportunity to provide our residents with important water quality information about the City's drinking water supply, special health requirements, and our efforts to identify potential contaminants. The 2009 Water Quality Consumer Confidence Report has been prepared in compliance with the Federal and State Health and Safety Code requirements based on the most current 2008 data.

To ensure tap water is safe, the United States Environmental Protection Agency (USEPA) and the California Department of Public Health (CDPH) prescribe regulations that limit the amount of certain contaminants in water provided by public water systems. The City of Ventura successfully treats its water to consistently meet these regulations. The regulations of the Food and Drug Administration (FDA) establish limits for contaminants in bottled water, which must provide the same level of protection for the public health.

For More Information

If you would like more information regarding the City's water quality, facility improvements, or studies, please contact Ventura's Water Utility Manager's office at 652-4500. This Water Quality Confidence Report is available in Spanish and on the City's website at www.cityofventura.net

You are also invited to express your opinions at City Council meetings held most Monday evenings in the Council Chambers at Ventura City Hall, 501 Poli Street. Please visit the City Council link at www.cityofventura.net for a complete schedule.

Este informe contiene información muy importante sobre su agua potable. Traduzcalo o hable con alguien que lo entienda bien. Para más información o obtener copias del informe de agua en espanol llame 652-4500.

CITY OF VENTURA

www.cityofventura.net

Ventura Avenue Water Treatment Facility

Ventura's Water System & Sources

In order to produce, treat and deliver safe and clean drinking water to our residents, the City of Ventura owns and operates 11 groundwater wells, three water treatment plants, two treated water connections from Lake Casitas, 23 booster pump stations, 31 water storage reservoirs, 14 pressure zones and more than 380 miles of distribution pipelines. Based on the number of facilities and assets, the CDPH has categorized the City's water system operations as a "5" – indicating the highest degree of treatment and distribution complexity.

The City is fortunate to have **three local water sources**, each producing approximately one third of the entire water supply. One portion is from the **Ventura River at Foster Park**, pumped from four shallow wells and a subsurface collector. This water drains from a 51,000-acre lower watershed in the Ojai and Ventura River Valleys that includes the tributaries of the San Antonio and the Coyote Creeks. Water is also purchased from Lake Casitas, which is operated and treated by the **Casitas Municipal Water District (CMWD)** for distribution through the City's system to customers. Most of this water drains from the upper watershed that is federally protected to limit contamination of the lake. Water quality in the river and the lake are similar. Water is also pumped from deep **groundwater wells** located in the City's east side near Victoria Avenue and in Saticoy. Water quality from the aquifers in the Fox Canyon, Mound, and Santa Paula groundwater basins are similar, but include about two times the total dissolved solids (TDS) or minerals (hardness) than the water from the other watersheds.

Ventura's water meets or exceeds state and federal primary standards.

Water Treatment

All of the City's water is treated to meet strict State and Federal regulations. In 2007, the Avenue Water Treatment Facility was modernized to treat water from the Ventura River with a reliable and effective process known as membrane ultrafiltration (UF). Thousands of UF hollow fiber filtration membranes provide a physical barrier to pathogens and particles larger than the 0.02 micron pore size, including bacteria, viruses, giardia, and cryptosporidium.

The groundwater sources are treated at either the Bailey or Saticoy Plants with prechlorination and direct media filtration to remove iron, manganese, and turbidity particles, and disinfected with chloramines. Additional treatment with polyphosphate is provided at each plant to help minimize the corrosion of plumbing in your home. CMWD treats the water from Lake Casitas with direct media filtration and with chloramines for disinfection prior to delivery into the City's system.

The City uses chloramines, (chemicals that contain chlorine and ammonia), for continuous disinfection of the drinking water in the distribution system. Chloramines were selected as the preferred disinfectant because of their ability to provide disinfection over a longer period of time, and improve taste and odor as compared to using chlorine alone. Chloramines have been proven to effectively kill microorganisms while producing lower levels of disinfection byproducts such as trihalomethanes (TTHMs) and haloacetic acids (HAAs), which are potentially harmful contaminants. Drinking water containing these byproducts in excess of the regulated maximum contaminant level (MCL) may lead to adverse health effects, liver or kidney problems, or nervous system effects, and may lead to an increased risk of cancer.

Although chloramines are desirable in protecting the water distribution system, their use requires additional precautions for some water uses. If a member of your household requires dialysis, you should contact your physician or dialysis service provider to assure proper protective equipment is used during the treatment. If you use tap water for fish or other aquatic animals that use gills for breathing, you need to test and be sure the chloramines are completely removed before use. Setting water in an open container for 24 hours prior to use will not remove all chloramines in the water. Your local pet store can provide information and products for the proper removal of chloramines.

Water Quality Monitoring & Results

Ventura owns and operates a full-scale, State-certified laboratory and may also use outside State-certified labs to monitor water quality. Water quality constituents that were detected by the laboratories during 2008 are listed on the Water Quality Summary Table (see back page). All drinking water, including bottled drinking water, may reasonably be expected to contain at least small amounts of some contaminants. It is important to remember that the presence of these contaminants does not necessarily pose a health risk. As reflected in the summary, Ventura's water system did not have any violations during the reporting period and we are proud that our drinking water meets or exceeds all State and Federal requirements.

Our operations are also designed to protect and monitor public health. All treatment and distribution water system operating personnel must earn increasingly rigorous State certifications from the CDPH and maintain this certification through continuing education.

Treatment plants are continuously monitored for specific water constituents by special automated instrumentation to ensure that the process is always producing water of high quality. Turbidity (cloudiness of the water) is monitored to indicate the effectiveness of the filtration processes, especially for surface waters. The City and CMWD are required to measure turbidity levels every 15 minutes because high turbidity can hinder the effectiveness of the chloramines disinfectant that kills bacteria and viruses.

Water Quality Reporting

The City submits monthly and annual reports to the State for review that summarize treatment and distribution operations and drinking water quality. The State annually inspects the City's water system, and prepared an Engineering Report in August 2007, finding that the City's sources, facilities, and operations are capable of producing safe and reliable water quality, which meet State and Federal drinking water standards and regulations.

In 2008, the City met the triennial lead and copper corrosion monitoring requirements by sampling 50 locations to test consumer's tap water. The tests results indicated that no additional corrosion control treatment is required and a summary is provided in the Water Quality Summary Table (see back page).

Water System Studies & Improvements

Prepared every 10 years, a new Water System Master Plan is currently nearing completion and will include an evaluation of capacity and delivery and recommendations for capital improvements based on an analysis of water supply, distribution, and water quality. While the City has adequate supplies for the near future, planning is underway for additional reliability and redundancy improvements to ensure future supply, even during drought conditions. Supplemental water supply sources are also being evaluated to determine their cost effectiveness and water quality benefits.

Current improvement projects include two new wells on the Eastside, renovation of the Saticoy Plant, evaluation of the Ventura River Foster Park well field strategies, replacement of aging water mains throughout the City (including the Foster Hillsides neighborhoods), and installation of emergency generators for uninterrupted operation of two critical booster pump stations. Due to our aging infrastructure and environmental regulations, we expect to continue our aggressive capital project program over the next few decades. Significant financial investment by the community will be required to replace our systems and protect our water supply for future generations.

The City, like other water purveyors in the country, completed a federally mandated review of the security of its water system. This review evaluated all water facilities and prioritized security measures to minimize the risk of damage or contamination due to a malevolent act. As a result, the City has upgraded its security and will continue to take steps to improve the protection of our water system.

Water Health Evaluation

Identifying threats to our water quality as well as potential contaminants is important to sustaining a healthy water supply. In 2006, the City completed a five-year update to the Sanitary Survey of the Lower Ventura River Watershed. The purpose of the study was to identify potential sources of contamination within the watershed and offer recommendations to reduce possible risks to the water supply and accordingly adjust the ongoing watershed water quality monitoring program. Since 2002, the City has also conducted an expanded testing program for specific water quality contaminants along the Ventura River, Coyote Creek, which may aid in early detection and direct planning for future improvements.

In addition, a separate Drinking Water Source Assessment for all the City's water supplies was completed in January 2002 to identify existing or potential threats to sources of supply, including groundwater. No contaminants were detected then or occur now in the water supply from surrounding activities such as gas stations, agricultural drainage, dry cleaners, urban runoff, sewer systems, metal plating/finishing and repair shops.

As a water supplier, the City must complete an evaluation of its drinking water supply with respect to Public Health Goals (PHG) every three years. The goals are advisory only, requiring public notification, and are not mandatory limits. The City completed the last evaluation in 2007, which determined that ten chemicals, although well below the maximum contaminant level limit, exceeded a State PHG or the Federal Maximum Contaminant Level Goal (MCLG). The identified contaminants were lead, copper, arsenic, uranium, gross alpha and beta particles, radium 226, bromodichloromethane, bromoform, and dichloroacetic acid.

Copper and lead can be found in water as a result of the corrosion of plumbing fixtures used in most homes. The City has conducted tests to optimize its treatment with corrosion inhibitors in an effort to further reduce lead and copper levels. High levels of lead can result in kidney problems or high blood pressure, and delays in physical and mental development in children. High levels of copper are known to cause gastrointestinal disturbance and kidney damage. Arsenic, and the four naturally occurring radioactive isotopes that typically occur in drinking water by the erosion of natural deposits, are considered carcinogenic. Noncarcinogenic effects of uranium on the kidneys and the liver have been documented. Radium is known to cause tumors. Bromodichloromethane, bromoform, and dichloroacetic acid are formed during the disinfection process with chlorine and can increase the risk of cancer and effects on the liver, kidney and central nervous system.

Potential Concerns

Drinking water, including bottled water, may contain small amounts of some contaminants, which does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the USEPA's Safe Drinking Water Hotline at 1-800-426-4791.

Sources of drinking water (both tap and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs and wells. As water travels over the surface of the land or through the ground, it dissolves naturally occurring minerals and can pick up contaminants resulting from the presence of animals or from human activity.

Contaminants that may be present in source water include:

- Microbial contaminants, such as viruses and bacteria that may come from sewage treatment plants, septic systems, agriculture and livestock operations and wildlife.
- Inorganic contaminants, such as salts and metals that may be naturally occurring or result from urban stormwater runoff, industrial or domestic wastewater discharges, oil and gas production, mining or farming.
- Pesticides and herbicides from a variety of sources, such as agriculture, urban stormwater runoff and residential uses.
- Organic chemical contaminants, including synthetic and volatile organic chemicals that are byproducts of industrial processes and petroleum production, and can also come from gas stations, urban stormwater runoff, agricultural applications, and septic systems.
- Radioactive contaminants that can be naturally occurring or be the result of oil and gas production and mining activities.

The uranium content in the City's water supplies is generally well below the maximum contaminant level of 20 pCi/L. However, during 2008, the average of quarterly samples for the Mound Well was 19 pCi/L. This well also contains higher than average total dissolved solids and sulfate levels. The well is operated less often than the other wells with better water quality and its water is blended with the other groundwater sources to lower the TDS, sulfate and uranium content in the water. Some people who drink water containing uranium in excess of the MCL over many years may have kidney problems or an increased risk of developing cancer.

Some people are more vulnerable to contaminants in drinking water than the general population. Immuno-compromised individuals, such as people with cancer, those undergoing chemotherapy, people who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, and some elderly people and infants can be particularly at risk from infections and are at greater risk of developing life-threatening illnesses. The City encourages immuno-compromised individuals to consult their doctors regarding appropriate precautions to avoid infection.

The City takes precautions to eliminate the risk of infection from microbial contaminants, including viruses, bacteria, Giardia and Cryptosporidium, from its water system. These organisms are found in surface water throughout the United States and ingesting them may cause an abdominal infection. The City has been conducting monthly sampling for possible risks in the watershed for the last two years. There was no detection of the Giardia or Cryptosporidium in any of the 24 samples. The new membrane filtration improvements installed at the Avenue Treatment Plant are very effective at removing these contaminants. The media filtration used by Casitas, although good at the removal of Giardia and/or Cryptosporidium, is not considered 100% effective. Symptoms of infection include nausea, diarrhea and abdominal cramps. Most healthy individuals can overcome the infection within a few weeks. However, immuno-compromised people are at greater risk of developing life-threatening illness, and are encouraged to consult their doctor regarding appropriate precautions to take to avoid microbial infection. Cryptosporidium must be ingested to cause disease, and it may be spread through means other than drinking water. The USEPA and the Centers for Disease Control guidelines on appropriate means to lessen the risk of infection by Cryptosporidium, Giardia and other microbial contaminants are available from the Safe Drinking Hotline at 1-800-426-4791.

WATER QUALITY CONFIDENCE REPORT 2010

Since 1923, the City of Ventura has reliably provided clean water to our community for drinking and fire protection, and is essential to the health of our families, businesses and the environment. Our 2010 Water Quality Consumer Confidence Report includes details about where your water comes from, what it contains, and how it compares to State standards. The report also contains special health information and our efforts to identify potential contaminants and other risks to our water supply. The City of Ventura's Public Works Environmental and Water Resources Division is the responsible agency that supervises and maintains the delivery of tap water within City limits and some County areas. We welcome this opportunity to publish this important report because informed customers are our best allies to protect Ventura's precious water resources, now and in the future.

For More Information

If you would like more information regarding the City's water quality, facility improvements, or studies, please contact the Ventura Water Utility Manager's office at 652-4500. This Water Quality Confidence Report is available in Spanish and on the City's website at ***www.cityofventura.net****.*

You are also invited to express your opinions at City Council meetings held most Monday evenings in the Council Chambers at Ventura City Hall, 501 Poli Street. Please visit the City Council link at www.cityofventura.net for a complete schedule.

Este informe contiene información muy importante sobre su agua potable. Traduzcalo o hable con alguien que lo entienda bien. Para más información o obtener copias del informe de agua en espanol llame 652-4500.

Our Water. Our Future.
Ours to Protect.

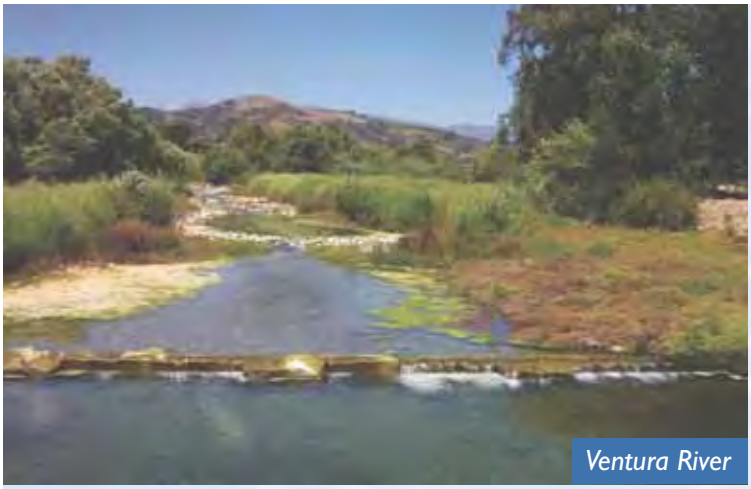
CITY OF
VENTURA
Environmental & Water Resources

Lake Casitas

Ventura's Water System & Sources

In order to produce, treat and deliver safe and clean drinking water to our residents, the City of Ventura owns and operates 11 groundwater wells, three water treatment plants, two treated water connections from Lake Casitas, 23 booster pump stations, 31 water storage reservoirs, 14 pressure zones, more than 3,000 fire hydrants and 380 miles of distribution pipelines. Based on the number of facilities and assets, the California Department of Public Health (CDPH) has categorized the City's water system operations as a "5," indicating the highest degree of treatment and distribution complexity.

The City is fortunate to have **three local water sources**, each producing approximately one third of the entire water supply. One portion is from the **Ventura River at Foster Park**, pumped from four shallow wells and a subsurface collector. This water drains from a 51,000-acre lower Ventura River Watershed in the Ojai and Ventura River Valleys that includes the tributaries of the San Antonio and the Coyote Creeks. Water is also purchased from **Lake Casitas**, which is operated and treated by the Casitas Municipal Water District (CMWD). Most of this water drains from the upper watershed that is federally protected to limit contamination of the lake. Water quality in the river and the lake are similar. Water is also pumped from **deep groundwater wells** located in the City's east side near Victoria Avenue and in Saticoy. Water quality from the Santa Clara River Watershed aquifers in the Fox Canyon, Mound and Santa Paula groundwater basins is similar to the water from the Ventura River and Lake Casitas but includes about two times the total dissolved solids (TDS) or minerals (hardness).



Ventura River

Water Treatment

All of the City's water is treated to meet strict State and Federal regulations. In 2007, the Avenue Water Treatment Facility was modernized to treat water from the Ventura River with a reliable and effective process known as membrane ultrafiltration (UF). Thousands of UF hollow fiber filtration membranes provide a physical barrier to remove pathogens and particles larger than the 0.02 micron pore size, including bacteria, viruses, Giardia, and Cryptosporidium.

The groundwater sources are treated at either the Bailey or Saticoy Plants with prechlorination and direct media filtration to remove iron, manganese, and turbidity particles, and disinfected with chloramines. Additional treatment with polyphosphate is provided at each plant to help minimize the corrosion of plumbing in your home. CMWD treats the water from Lake Casitas with direct media filtration and with chloramines for disinfection prior to delivery into the City's system.

The City uses chloramines, (chemicals that contain chlorine and ammonia), for continuous disinfection of the drinking water in the distribution system. Chloramines were selected as the preferred disinfectant because of their ability to provide disinfection over a longer period of time, and improve taste and odor as compared to using chlorine alone. Chloramines have been proven to effectively kill microorganisms while producing lower levels of disinfection byproducts such as trihalomethanes (TTHMs) and haloacetic acids (HAAs), which are potentially harmful contaminants. Drinking water containing these byproducts in excess of the regulated maximum contaminant level (MCL) may lead to adverse health effects, liver or kidney problems, or nervous system effects, and may lead to an increased risk of cancer.

Although chloramines are desirable in protecting the water distribution system, their use requires additional precautions for some water uses. If a member of your household requires dialysis, you should contact your physician or dialysis service provider to assure proper protective equipment is used during the treatment. If you use tap water for fish or other aquatic animals that use gills for breathing, you need to test and be sure the chloramines are completely removed before use. Setting water in an open container for 24 hours prior to use will not remove all chloramines in the water. Your local pet store can provide information and products for the proper removal of chloramines.

Water Quality Monitoring & Results

Ventura owns and operates a full-scale, State-certified laboratory and may also use outside State-certified labs to monitor water quality. Water quality constituents that were detected by the laboratories during 2009 are listed on the Water Quality Summary Table (see back page). As reflected, Ventura's water system did not have any violations during the reporting period and we are proud that our drinking water successfully met the State and Federal requirements.

PHOTO BY JACOB FOKO

Our operations are also designed to protect and monitor public health. All treatment and distribution water system operating staff must provide evidence of competency by passing rigorous State certification exams from the CDPH and maintain this certification through continuing education.

Treatment plants are continuously monitored for specific water constituents by special automated instrumentation to ensure that the process is always producing water of high quality. Turbidity (cloudiness of the water) is monitored to indicate the effectiveness of the filtration processes, especially for surface waters. The City and CMWD are required to measure turbidity levels every 15 minutes because high turbidity can hinder the effectiveness of the chloramines disinfectant that kills bacteria and viruses.

Water Quality Reporting

The City submits monthly and annual reports to the State for review that summarize treatment and distribution operations and drinking water quality. The State annually inspects the City's water system. An Engineering Report, prepared by the State in August 2007, found that the City's water sources, facilities, and operations are capable of producing safe and reliable water quality, which meet State and Federal drinking water standards and regulations.

The City of Ventura's water meets or exceeds state and federal primary standards.

Ventura Avenue Water Treatment Facility

In 2008, the City met the triennial lead and copper corrosion monitoring requirements by sampling 50 locations to test consumer's tap water. The tests results indicated that no additional corrosion control treatment is required and a summary is provided in the Water Quality Summary Table (see last pages).

Water System Planning & Improvements

Prepared every 10 years, a new Water System Master Plan is currently nearing completion and will include an evaluation of capacity and delivery and recommendations for capital improvements based on an analysis of water supply, distribution, and water quality. While the City has adequate supplies for the near future, additional reliability and redundancy improvements are being planned to ensure future supply, even during drought conditions. Supplemental water supply sources are also being evaluated to determine their cost effectiveness and water quality benefits.

Water pumped from groundwater wells contains higher levels of dissolved solids, minerals and sulfur than Ventura's other two sources of water. Its mineralized content results in deposits on plumbing fixtures and less aesthetically pleasing water. While treated groundwater meets all health requirements, the Draft Water Master Plan, as well as the CDPH, recommends that the City develop a Water Quality Improvement Program to lower the mineral levels in the future. As a first step, an engineering study will be completed later this year to determine the most feasible options to meet higher water quality goals and will include cost estimates for each alternative.

Current improvement projects underway include two new wells on the Eastside, Saticoy Plant renovation design, evaluation of the Ventura River Foster Park well field strategies, replacement of aging water mains throughout the City (including the Foster Hillsides neighborhood and Tower Square), and installation of a emergency generator for uninterrupted operation of two critical booster pump stations. Due to our aging infrastructure and environmental regulations, we expect to continue our aggressive capital project program over the next few decades.

Significant financial investment by the community will be required to replace our systems and protect our water supply for future generations.

The City, like other water purveyors in the country, completed a federally mandated review of the security of its water system. This review evaluated all water facilities and prioritized security measures to minimize the risk of damage or contamination due to a malevolent act. As a result, the City has upgraded its security and will continue to improve the protection of our water system.

Water Health Evaluation

Identifying threats to our water quality as well as potential contaminants is important to sustaining a healthy water supply. This year, the City will conduct a five-year update to the Sanitary Survey of the Lower Ventura River Watershed to identify potential sources of water contamination. The study will also offer recommendations to reduce possible risks to the water supply and adjust the ongoing watershed water quality-monitoring program accordingly. Also, since 2002, the City has conducted an expanded testing program for specific water quality contaminants along the Ventura River and Coyote Creek, which may aid in early detection and direct planning for future improvements.

Separate Drinking Water Source Assessments are completed for all new water supplies, such as groundwater wells, to identify existing or potential threats. No contaminants have been detected in the water supply from surrounding activities such as gas stations, agricultural drainage, dry cleaners, urban runoff, sewer systems, metal plating/finishing and repair shops.

As a water supplier, the City must evaluate its drinking water supply every three years with respect to Public Health Goals (PHG). The goals are advisory only and are not mandatory limits, but do require public notification. The last evaluation in 2007 determined that ten chemicals, although well below the maximum contaminant level limit, exceeded a State PHG or the Federal Maximum Contaminant Level Goal (MCLG). The identified contaminants were lead, copper, arsenic, uranium, gross alpha and beta particles, radium 226, bromodichloromethane, bromoform, and dichloroacetic acid. Arsenic, and the four naturally occurring radioactive isotopes that typically occur in drinking water by the erosion of natural deposits, are considered carcinogenic. Noncarcinogenic effects of uranium on the kidneys and the liver have been documented. Radium is known to cause tumors. Bromodichloromethane, bromoform, and dichloroacetic acid are formed during the disinfection process with chlorine and can increase the risk of cancer and effects on the liver, kidney and central nervous system.

Water Recovery Basins

Copper and lead can be found in water as a result of the corrosion of plumbing fixtures used in most homes. The City has conducted tests to optimize its treatment with corrosion inhibitors in an effort to further reduce copper and lead levels. High levels of copper are known to cause gastrointestinal disturbance and kidney damage. If present, elevated levels of lead can cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. The City is responsible for providing high quality drinking water, but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to 2 minutes before using water for drinking or cooking. If you are concerned about lead in your water, you may wish to have your water tested. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline at 1-800-426-4791 or www.epa.gov/safewater/lead.

Potential Concerns

In order to ensure that tap water is safe to drink, the U.S. Environmental Protection Agency (USEPA) and the State Department of Public Health (Department) prescribe regulations that limit the amount of certain contaminants in water provided by public water systems. Department regulations also establish limits for contaminants in bottled water that provide the same protection for public health.

Drinking water, including bottled water, may contain small amounts of some contaminants, which does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the Safe Drinking Water Hotline at 1-800-426-4791.

Sources of drinking water (both tap and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs and wells. As water travels over the surface of the land or through the ground, it dissolves naturally occurring minerals and can pick up contaminants resulting from the presence of animals or from human activity.

Contaminants that may be present in source water include:

- Microbial contaminants, such as viruses and bacteria that may come from sewage treatment plants, septic systems, agriculture and livestock operations and wildlife.
- Inorganic contaminants, such as salts and metals that may be naturally occurring or result from urban stormwater runoff, industrial or domestic wastewater discharges, oil and gas production, mining or farming.
- Pesticides and herbicides from a variety of sources, such as agriculture, urban stormwater runoff and residential uses.
- Organic chemical contaminants, including synthetic and volatile organic chemicals that are byproducts of industrial processes and petroleum production, and can also come from gas stations, urban stormwater runoff, agricultural applications, and septic systems.
- Radioactive contaminants that can be naturally occurring or be the result of oil and gas production and mining activities.

The City takes precautions to eliminate the risk of infection from microbial contaminants, including viruses, bacteria, Giardia and Cryptosporidium, from its water system. These organisms are found in surface water throughout the United States and ingesting them may cause an abdominal infection. The City has been conducting monthly sampling for possible risks in the watershed for the last two years. There was no detection of Giardia or Cryptosporidium in any of the 24 samples. The new membrane filtration improvements installed at the Avenue Treatment Plant are very effective at removing these contaminants. The media filtration used by Casitas, although good at the removal of Giardia and/or Cryptosporidium, is not considered 100% effective. Symptoms of infection include nausea, diarrhea and abdominal cramps. Most healthy individuals can overcome the infection within a few weeks.

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. USEPA/Centers for Disease Control (CDC) guidelines on appropriate means to lessen the risk of infection by Cryptosporidium and other microbial contaminants are available from the Safe Drinking Water Hotline at 1-800-426-4791.

Ventura's Water Quality Summary 2010

Utilizing data collected in 2009, unless noted.
Only water quality constituents detected by laboratory testing appear in the chart.

PRIMARY STANDARDS (PDWS)	Units	Maximum Level MCL	State Goal PHG	Ventura River Average	Ventura River Range	Ground Water Average	Ground Water Range	CMWD Average	CMWD Range	Major Sources of Contamination in Drinking Water (Footnotes)
Water Clarity										
Treated Turbidity	NTU	TT	NA	0.04 (a)	0.02 - 0.04(a)	0.33	0.1 - 1.4	0.13 (b)	0.01-0.13 (b)	1
Radioactive Contaminants (e)										
Gross Alpha particle activity	pCi/l	15	NA	3.2	1 - 5.5	8.5	4.6 - 19.2	1.1	0.3 - 2.1	2
Radium 226	pCi/l	5	NA	0.2	ND - 0.3	0.3	0.1 - 0.4	NA	NA	2
Uranium (c)	pCi/l	20	0.5	3.3	1.6 - 4.9	4.6	3.4 - 16.8	NA	NA	2
Inorganic Contaminants										
Fluoride	ppm	2	1	0.5	0.4 - 0.6	0.51	0.41 - 0.64	0.3	0.3	4
Selenium	ppb	50	NA	ND	ND	13.5	ND - 19.7	ND	ND	5
Nitrate (as Nitrogen)	ppm	10	10	1.1	ND - 1.0	1.2	ND - 3.5	ND	ND	6
Thalium	ppb	2	0.1	1.0	1.0	1.4	1.4	ND	ND	7

Lead and Copper Samples	Units	RAL	PHG	Samples Collected	Above RAL	90th Percentile	Major Sources of Contamination in Drinking Water
Lead	ppb	15	2	52 (d)	0	1	8
Copper	ppb	1300	300	52 (d)	2	970	8

PRIMARY STANDARDS for Distribution System	Units	MCL MRDL	PHG (MCLG) MRDLG	Distribution System Average	Distribution System Range	Major Sources of Contamination in Drinking Water
Disinfection						
Chloramine Residual	ppm	4	4	2.2	1.0 - 3.7	Drinking water disinfectant added for treatment.
Disinfection By Products						
Total Trihalomethanes	ppb	80	NA	31 (c)	3 - 97	By-product of drinking water chlorination.
Total Haloacetic Acids	ppb	60	NA	25 (c)	2 - 74	By-product of drinking water chlorination.
Microbiological Contaminant Samples						
Total Coliform Bacteria	NA	5%	0	0	0-1	Naturally present in the environment.
Fecal Coliform Bacteria	NA	0	0	0	0	Human and animal fecal waste.

SECONDARY STANDARDS		Units	Maximum Level MCL	Ventura River Average	Ventura River Range	Ground Water Average	Ground Water Range	CMWD Average	CMWD Range
Aesthetic Standards	Color	Color	15	5	ND - 5	5	ND - 5	5	5
	Odor	Threshold	3	ND	ND	ND	ND	ND	ND
	Chloride	ppm	500	50	45-61	66	58 - 77	17	17
	Corrosivity	ppb	Non corrosive (+)	0.4	0.1 - 0.7	0.3	0.1 - 0.6	- 0.1	- 0.1
	Iron (TT)	ppb	300	ND	ND	ND	ND	NS	NS
	Total dissolved solids	ppm	1000	722	665- 820	1241	1037 - 1528	330	330
	Specific conductance	umhos	1600	985	931 -1028	1616	1387 - 1924	548	548
	Sulfate	ppm	500	252	238 - 274	548	440 - 715	129	129
Additional Constituents	pH	pH units	6.5 - 8.5	7.7	7.4- 7.8	7.4	7.1 - 7.6	7.6	7.6
	Hardness	ppm	NS	391	366 - 426	554	461 - 713	212	212
	Calcium	ppm	NS	110	101 - 125	142	118 - 194	52	52
	Magnesium	ppm	NS	29	27 - 34	49	39 - 60	20	20
	Manganese (TT)	ppb	50	ND	ND - 0.1	ND	ND - 50	ND	ND
	Sodium	ppm	NS	45	42 - 47	126	97 - 177	23	23
	Phosphate	ppm	NS	ND	ND - 0.1	0.2	0.1 - 0.8	ND	ND
	Potassium	ppm	NS	2.1	2.0 - 2.3	4.7	3.9 - 5.7	3	3
	Total Alkalinity	ppm	NS	209	184 - 223	253	213 - 270	120	120

Water Quality Terminology

The Water Quality Summary shows constituents measured in Ventura's water and reported to the State Department of Health Services, and in some cases the USEPA. Some of the terminology used is described below:

Maximum Contaminant Level (MCL): The highest level of a contaminant that is allowed in drinking water. Primary (health related) MCLs are set as close to the Public Health Goals (PHGs) or Maximum Contaminant Level Goals (MCLGs) as is economically and technologically feasible. Secondary (aesthetically related) MCLs are set to protect the odor, taste and appearance of drinking water.

Maximum Contaminant Level Goal (MCLG): The level of contaminant in drinking water below which there is no known or expected risk to one's health. MCLGs are set by the USEPA.

Public Health Goal (PHG): The level of a contaminant in drinking water below which there is no known or expected risk to one's health. The California Environmental Protection Agency sets PHGs.

Maximum Residual Disinfectant Level (MRDL): The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.

Maximum Residual Disinfectant Level Goal (MRDLG): The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.

Primary Drinking Water Standard (PDWS): MCLs and MRDLs for contaminants that affect health along with their monitoring and reporting requirements, and water treatment requirements.

Regulatory Action Level (RAL): The concentration of a contaminant, which, if exceeded, triggers treatment or other requirements that a water system must follow.

Footnotes

[1] Process and source variations.

[2] Erosion of natural deposits.

[3] Erosion of natural deposits; runoff from orchards; glass and electronics production waste.

[4] Erosion of natural deposits; water additive that promotes strong teeth; discharge from fertilizer and aluminum factories.

[5] Discharge from refineries or manufacturers; erosion of natural deposits.

[6] Runoff and leaching from fertilizer use; leaching from septic tanks and sewage; erosion of natural deposits.

[7] Leaching from ore-processing sites, discharge from electronics and glass factories.

[8] Internal corrosion of household plumbing systems.

(a) Average is maximum reading. Avenue Plant Surface Filtration (TT) = 95% of samples equal or below 0.1 NTU.

(b) Average is maximum reading. CMWD Direct Filtration (TT) = 100% of samples equal or below 0.2 NTU

(c) Highest running average cannot exceed the MCL.

(d) Samples were taken at selected households on a first draw in August 2008.

(e) Monitoring completed in 2007 and 2008.

Legend

ppm: Parts per million or milligrams per liter.

ppb: Parts per billion or micrograms per liter.

pCi/l: Picocuries per liter, a measure of radioactivity in water.

CMWD: Casitas Municipal Water District

TT: A required process intended to reduce the level of contaminant in drinking water

NA: Not applicable

ND: Not detectable

NS: No standard

NTU: Turbidity, a measure of the clarity or cloudiness of the water.

Victoria Well No. 2

Continued from Page 3

What's New With Chloramine Disinfection?

All public drinking water must be disinfected to prevent water-borne diseases. Casitas disinfects the water by adding chlorine and a small amount of ammonia to the water to form chloramines. Chloramine disinfection is approved by the California Department of Public Health and the Environmental Protection Agency. Many United States and Canadian cities have used chloramines for decades to disinfect water. The Metropolitan Water District of Southern California supplies water to nearly 18 million people and has been successfully using chloramines for disinfection since 1984. Chloramines reduce the level of unwanted disinfection byproducts in our water. Disinfection byproducts are formed when chlorine mixes with naturally occurring organic material in water. Currently, regulated disinfection byproducts include trihalomethanes and haloacetic acids. Chloramines stop the formation of these byproducts and the chloraminated water has less of a chlorine taste and odor than chlorinated water. Chloramines do not pose a health hazard to the general population. Chloraminated water is safe for drinking, bathing, cooking and other normal uses. Two specific groups of people, however, do need to take special care with chloraminated water - kidney dialysis patients and tropical fish hobbyists.

Dialysis Patients Have Special Needs

Kidney patients are not harmed from drinking, cooking or bathing in chloraminated water. However, there is a problem that needs to be addressed for individuals who are undergoing dialysis treatment on artificial kidney machines. Chloramines must not be present in the water used in dialysis machines. They can be removed through a filtration system. We have worked with the California Department of Public Health to ensure that everyone involved with treatment of dialysis patients is alerted to the facts about chloraminated water.

Chloramines and Your Aquarium or Fishpond

Chloramines are toxic to fish or animals that use gills to breath. While chlorine will evaporate rather quickly from standing water, it may take weeks for chloramines to disappear. Thus it is necessary to dechlorinate water used for aquariums and fishponds. We suggest using a filter system or a dechlorinating agent sold at most pet stores for fresh and saltwater aquariums and fishponds. Another option is to install a high-quality granular activated carbon (GAC) filter in your home. The chloramine residual in water used for fish should be kept below 0.1 parts per million. Contact your local pet store or fish shop for additional assistance.

Chloramines Are Safe for Plants and Swimming Pools

Chloramines will not affect the chlorine balance in your backyard swimming pool. You still need to add chlorine to retard algae and bacterial growth. Chloramines have no affect on plants, vegetables or fruit trees. For more information on chloramines call 805-649-2251, ext. 120.

What About Radon?

Radon is a radioactive gas that you can't see, taste or smell. Radon can get into the air when released from tap water from showering, washing dishes and other activities. Radon is a known human carcinogen. The water we send to our distribution system is well below the EPA proposed regulation of 300 pCi/L (picocuries/liter) of radon. Lake Casitas water measures at 0.0 pCi/L of radon, and the Mira Monte Well water measures at 500 pCi/L of radon. Mira Monte Well water is blended with Lake Casitas water, making the level of radon in the blended water approximately 16 pCi/L. For additional information, call your State radon program (1-800-745-7236) or call the EPA Safe Drinking Water Act Hotline (1-800-426-4791) or the National Safe Council Radon Hotline (1-800-SOS-RADON).

What about Cryptosporidium?

Cryptosporidium is a microbial pathogen found in surface water throughout the world. Although filtration removes it, the most commonly used filtration methods cannot guarantee 100 percent removal. Casitas monitored for Cryptosporidium during 2009 on a monthly basis with a result of non-detect for all of the samples. Low levels of Cryptosporidium were detected in the source water during 2006; since then results from monthly sampling have been negative. We encourage immuno-compromised individuals to consult their doctor regarding appropriate precautions to take to avoid infection, because they are at a greater risk of developing life threatening illness. Cryptosporidium must be ingested to cause disease, and it may be spread through means other than drinking water.

Fluoride

Casitas does not add fluoride, but there is some fluoride in the water that is naturally occurring. This level was tested at 0.3 mg/L in 2009. For more information on fluoride check the Department of Public Health's Fluoridation website for more information on fluoridation, oral health and current issues: www.cdph.ca.gov/certlic/drinkingwater/Pages/Fluoridation.aspx.

Lead and Copper

The latest results from Casitas' lead testing were below the action level. If present, elevated levels of lead can cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. Casitas is responsible for providing high quality drinking water, but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to 2 minutes before using water for drinking or cooking. If you are concerned about lead in your water, you may wish to have your water tested. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline or at:
http: //www. epa.gov /safewater/ lead.
Elevated levels of copper can occur when corrosive water causes leaching of copper plumbing. To prevent this Casitas has implemented a corrosion-control plan by adding a small amount of phosphate to the water to lower the corrosivity and reduce copper levels

Important Health Information

Some people may be more vulnerable to contaminants in drinking water than others. Immuno-compromised people such as cancer patients who are undergoing chemotherapy; those who have undergone organ transplants; people with HIV/AIDS or other immune system disorders; some elderly people; and infants can be particularly at risk for infections. These people should seek advice from their health care providers. The USEPA/Centers for Disease Control guidelines on appropriate means to lessen the risk of infection by Cryptosporidium and other microbial contaminants are available from the Safe Drinking Water Hotline at 1-800-426-4791.

Ken Grinnell, Water Quality Laboratory Technician performs testing in Casitas lab

Casitas Keeps Your Water Safe

Casitas strives to provide you with water that meets or exceeds all federal and state standards for safe water. To ensure that you receive the highest quality drinking water, we test beyond what state and federal regulations mandate. This report shows the results of our monitoring for the period of January 1 through December 31, 2009, or the most recent testing period required.

Este informe contiene informacion muy importante sobre su agua beber. Traduzcalo hable con alguien que lo entienda bien. Para la informacion llame por favor 805-649-2251.

Board meetings are open to the public and are held on the second and fourth Wednesdays of each month at 4:30 p.m. at the district main office, 1055 Ventura Ave., Oak View, CA, 93022. For additional details on the subjects outlined here and for more information about Casitas Municipal Water District, visit us at our Web site:
www.casitaswater.org, or call Susan McMahon, Water Quality Supervisor, at 805-649-2251, ext. 120.

Your Tap Water Is Safe to Drink

To ensure that tap water is safe to drink, the U.S. Environmental Protection Agency (USEPA) and the California Department of Public Health set regulations that limit the amount of certain contaminants in water provided by public water systems. Health department regulations also establish limits for contaminants in bottled water.

It is reasonable to expect drinking water, including bottled water, to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. For more information about contaminants and potential health effects, call the USEPA's Safe Drinking Water Hotline at 1-800-426-4791.

Painters at Lake Casitas

Do You Know the Source of Your Water?

The Casitas Municipal Water District is normally supplied by a blend of ground water and surface water that is treated before it is distributed to the public. Last year was a little different because the ground water source was turned off for maintenance. When in use, the ground water is drawn from the Mira Monte Well. The surface water comes from Lake Casitas, located near the junction of Highway 150 and Santa Ana Road. Most of the watershed is federally protected to limit contamination of the lake, and we inspect the watershed on a regular basis.

For more information, you may review the 1995 Watershed Sanitary Survey and the Survey's 2000 and 2006 updates, which are available at out main office in Oak View.

Lake Casitas is considered to be most vulnerable to the following activities not associated with any detected contaminants: boat services (repair and refinishing), petroleum pipelines and recreation. There have been no contaminants detected in the water supply, although the lake is still vulnerable to activities located near this major source of our drinking water. The potential sources of contaminants include private sewage disposal systems; livestock and wildlife grazing; limited pesticide and herbicide use; activities in the surrounding recreation area; unauthorized dumping; limited growth of new homes or urban areas; traffic accidents; and spills.
The 2002 drinking water source assessment for the Mira Monte Well is also available to the public at our office. This well is considered to be most vulnerable to the use of fertilizers and animal grazing, which raise nitrate levels in the water. In addition, the Mira Monte Well may be vulnerable to activities associated with an urban environment. However, these activities have not resulted in contamination of the well.

Nature and Man InfluenceYour Water Quality

The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs and wells. As water travels over the surface of the land or through the ground, it dissolves naturally occurring minerals, and, in some cases, radioactive material. It also can pick up substances resulting from the presence of animals or human activity.
Contaminants that may be present in source water include:

1). Microbial contaminants like viruses and bacteria, which may come from sewage treatment plants, septic systems, agricultural livestock operations and wildlife.
2). Inorganic contaminants like salts and metals, which can be naturally occurring or result from urban storm water runoff; industrial or domestic wastewater discharges; oil and gas production; mining or farming.
3). Pesticides and herbicides that may come from a variety of sources including agriculture, urban storm water runoff and residential uses.
4). Organic chemical contaminants, including synthetic and volatile organic chemicals that are byproducts of industrial processes and petroleum production. They can come from gas stations, urban storm water runoff, agricultural application and septic systems.
5). Radioactive contaminants that can be naturally occurring or the result of oil and gas production and mining activities.
6). Lake Casitas has no urban or industrial water runoff and very few residents still live in the watershed. There is no oil, gas or mining production in our watershed.

Continued on Page 6

Casitas Water Quality Table 2010
(2009 Data)

Primary Standards

CONSTITUENTS		(MCLG)	LAKE CASITAS TREATED WATER		MIRA MONTE WELL		DISTRIBUTION SYSTEM		Date Sampled	Source of Contamination
	MCL	*PHG*	*LEVEL*	*RANGE*	*LEVEL*	*RANGE*	*LEVEL*	*RANGE*		
Turbidity	Treatment technique (TT)[a]								**Dist. Sys./MMW**	
Filter Effluent Turbidity (NTU) [a]	1 NTU	NA	Highest value 0.13	0.01-0.13	NA	0.06	0.4	0.1-2.3	2009/2007	1
	95 0.2 NTU	100	of turbidity measurements 0.2						2009	
MICROBIOLOGICAL [b]										
Total Coliform Bacteria (Total Coliform Rule)	1 positive sample/month	(0)	NA	NA	NA	NA	0	0	2009	2
Fecal Coliform Bacteria (Total Coliform Rule)	1 positive sample/month	(0)	NA	NA	NA	NA	0	0	2009	3
INORGANIC CHEMICALS										
Fluoride (ppm)	2	1	0.3	0.3	0.5	0.5	NA	NA	2009/2007	4
Trihalomethanes (ppb)	80	NA	NA	NA	NA	NA	33.9	24.3-38.7	2009	5
Haloacetic acids (ppb)	60	NA	NA	NA	NA	NA	14	6-23	2009	6
DISINFECTION RESIDUALS										
Chloramines (ppm)	4 (MRDL)	4(MRDLG)	NA	NA	NA	NA	2.66	1.40-3.84	2009	7
RADIOACTIVITY										
Gross Alpha (pCi/L)	15	(0)	1.1	0.3-2.1	1.4	0.9-2.5	NA	NA	2004/2001	8
									(Most recent)	
INDIVIDUAL TAP MONITORING FOR: LEAD AND COPPER	**Regulatory Action Level**	**MCLG PHG**	**# of samples collected**	**Homes above AL**	**Level detected at 90th percentile**				**Date Sampled**	
Lead (ppb)	15	0.2	20	0		0.9			2008	9
Copper (ppm)c	1.3	0.3	20	0		0.950			2008	10

[1] Soil run-off [2] Naturally present in the environment [3] Human and animal fecal waste [4] Erosion of natural deposits; water additive which promotes strong teeth; discharge from fertilizer and aluminum factories [5] By-product of drinking water disinfection [6] By-product of drinking water disinfection [7] Drinking water disinfectant added for treatment [8] Erosion of natural deposits [9] Internal corrosion of household plumbing systems; discharges from industrial manufacturers; erosion of natural products [10] Internal corrosion of household plumbing systems; erosion of natural deposits; leaching from wood preservatives

Secondary Standards Constituents	*MCL*		LAKE CASITAS			Mira Monte Well			Date Sampled Lake/Well	Sources of Contamination
			LEVEL	*RANGE*		*LEVEL*	*RANGE*			
Color (units)	15		5	5		5	5		2009/2007	11
Corrosivity (Langlier Index) (ppm)	Non-corrosive		-0.09	-0.09		-0.5	-0.5		2009/2007	12
0dor (units)	3		ND	ND		ND	ND		2009/2007	11
Turbidity(NTU)	5		ND	ND		0.6	0.6		2009/2007	13
Total Dissolved Solids (ppm)	1000		330	330		420	420		2009/2007	14
Specific Conductance (umhos)	1600		548	548		668	668		2009/2007	15
Chloride (ppm)	500		17	17		64	64		2009/2007	16
Sulfate (ppm)	500		129	129		32	32		2009/2007	17
ADDITIONAL CONSTITUENTS										
Total Hardness (ppm)	NS		212	212		207	207		2009/2007	18
Sodium (ppm)	NS		23	23		58	58		2009/2007	18
UNREGULATED CONTAMINANTS										
Boron (ppb)	N.L. 1000		200	200		ND	ND		2009/2007	
Vanadium (ppb)	N.L. 50		ND	ND		ND	ND		2008/2007	

[11] Naturally occurring organic materials [12] Natural or industrially influenced balance of hydrogen, carbon or oxygen in the water; affected by temperature or other factors [13] Soil run-off [14] Run-off/leaching from natural deposits [15] Substances that form ions in water; seawater influence [16] Run-off/leaching from natural deposits; seawater influence [17] Run-off /leaching from natural deposits; industrial wastes [18] Generally found in ground and surface water

TERMS USED IN THIS REPORT

Maximum Residual Disinfectant Level (MRDL): The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.

Maximum Residual Disinfectant Level Goal (MRDLG): The level of a drinking water disinfectant below which there is no expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.

Maximum Contaminant Level (MCL): The highest level of a contaminant that is allowed in drinking water. Primary MCLs are set as close to the PHGs (or MCLGs) as is economically and technologically feasible. Secondary MCLs are set to protect the odor, taste, and appearance of drinking water.

Maximum Contaminant Level Goal (MCLG): The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs are set by USEPA.

ND: Not detectable at testing limit.

Notification Level: Health based advisory levels established by California Dept. of Public Health for chemicals in drinking water that lack MCLs.

ppb: parts per billion or micrograms per liter (ug/L)

ppm: Parts per million or milligrams per liter (mg/L)

ppt: parts per trillion or nanograms per liter (ng/L)

pCi/L: picocuries per liter (a measure of radiation)

Public Health Goal (PHG): The level of a contaminant in drinking water below which there is no known or expected risk to health. PHGs are set by the California Environmental Protection Agency.

Primary Drinking Water Standards (PDWS): MCLs and MRDLs for contaminants that affect health along with their monitoring and reporting requirements, and water treatment requirements.

Regulatory Action Level (RAL): The concentration of a contaminant which, if exceeded, triggers treatment or other requirements which a water system must follow.

Secondary Drinking Water Standards (SDWS): MCLs for contaminants that affect taste, odor, or appearance of the drinking water. Contaminants with SDWSs do not affect the health at these MCL levels.

Treatment Technique (TT): A required process intended to reduce the level of a contaminant in drinking water.

Key To Table (ACRONYMS)

AL	Regulatory Action Level
umhos	Micromhos per centimeter (a measure of specific conductance)
NA	Not applicable
ND	None detected
NL	Notification Level
NS	No Sample
NTU	Nephelometric Turbidity Units (a measure of turbidity)
ppm	Parts per million, or milligrams per liter (mg/L)
ppb	Parts per billion, or micrograms per liter (ug/L)
pCi/L	Picocuries per liter (a measure of radioactivity)
SMCL	Secondary Maximum Contaminant Level
TT	Treatment Technique

Water Quality Table Footnotes:

a) 100 of the samples tested for turbidity were below the required TT level of 0.2 NTU. Turbidity is a measure of the cloudiness of water and is a good measure of water quality and filtration performance.

b) In 2009 we collected 160 samples for total coliform bacteria testing. Total coliform bacteria were not detected in any of these samples.

c) Casitas has implemented a corrosion control plan by adding a small amount of phosphate to the water to lower corrosivity and reduce copper levels.

Water is Precious

MEINERS OAKS WATER DISTRICT
CONSUMERS CONFIDENCE REPORT FOR 2009

Last year, as in years past, your tap water meets or exceeds all EPA and State drinking water health standards. Meiners Oaks Water District delivered safe drinking water that did not violate a maximum contaminant level; although we did violate our turbidity standard in August 2009. This was due to a maladjusted piece of equipment that never compromised the health or safety of our customers. This report details about where your water comes from, what it contains, and how it compares to State standards.

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the EPA's Safe Drinking Water Hotline (1-800-426-4791).

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers USEPA/Centers for Disease Control (CDC) guidelines on appropriate means to lessen the risk of infection by Cryptosporidium and other microbial contaminants are available from the Safe Drinking Water Hotline (1-800-426-4791).

The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activity. Contaminants that may be present in source water include:

- Microbial contaminants, such as viruses and bacteria, that may come from sewage treatment plants, septic systems, agricultural livestock operations, and wildlife.
- Inorganic contaminants, such as salts and metals, that can be naturally occurring or result from urban storm water runoff, industrial or domestic wastewater discharges, oil and gas production, mining or farming.
- Pesticides and herbicides, which may come from a variety of sources such as agriculture, urban storm water runoff, and residential uses.
- Organic chemical contaminants, including synthetic and volatile organic chemicals, which are byproducts of industrial processes and petroleum production, and can also come from gas stations, urban storm water runoff and septic systems.

- Radioactive contaminants, which can be naturally occurring or be the result of oil and gas production and mining activities.

In order to ensure that tap water is safe to drink, USEPA and the California Department of Health Services prescribe regulations that limit the amount of certain contaminants in water provided by public water systems. Department regulations also establish a limit for contaminants in bottled water that must provide the same protection for public health. To add to the delivery and protection of your drinking water, we have added a new EPA approved 2 stage filtration system. The first stage has a run of 10 filters and the second has a run of 8 filters. This filtration system has a minimum removal rate of 99.9% for Cryptosporidium and Giardia which equals a 3-log removal required by the State of California. With the addition of chlorine gas at .5 to .8 ppm (parts per million), we can help to ensure that the best water possible is being delivered to our customers.

Sources of your Water

Your water comes from four district wells drilled 100 to 400 feet into underground aquifers. Two groundwater wells are located at Lomita and Rice, and two wells three miles north of Meiners Oaks. We have one water system connection to receive surface water from Lake Casitas. Customers may receive Lake Casitas surface water if our wells need repair or cannot keep up with system demand. A blend of surface and ground water is delivered on those occasions.

Water Conservation

Meiners Oaks Water District would like to ask its customers to please conserve water every chance they get. It is a precious natural resource that we cannot afford to abuse. We would also like to remind everyone that this has been a normal year for rainfall at 29.05"; but that doesn't mean we can afford to slack off on our conservation. So please keep in mind to use positive shut off valves when washing your car or watering your plants or garden. Use low flow shower heads and faucets. Low flow toilets are also a big water saver. If you cannot afford a low flow toilet they offer bladders that can be installed in the tank of your toilet. At this point in the year our well levels are looking good, but if the weather doesn't become more cooperative in the upcoming years water levels could drop and conditions could become more severe. So please remember to conserve your precious resource.
Another way to save water is to use smart controllers for your irrigation valves. They are available through Casitas Municipal Water rebate program, let them know that you are one of our customers and present them a water bill from our district and they will take it from there. Please contact Ron Merckling at 649-2251 EXT. 118

Fun Facts

Studies have shown that house holds in America will use approximately 146,000 gallons annually. 42 percent of that or approximately 61,300 gallons is used indoors.
The 58 percent that is left approximately 84,700 gallons is being used outdoors.
A person needs 4 to 5 gallons of water per day to survive
1.1 billion People lack access to an improved water supply - approximately one in six people on earth.
Did you know that if you fixed all the leaks in your sprinkler system you could save up to 500 gallons a month?
Currently, the average household in southern California will use approximately 110 gallons of water per day. If efficient water use is practiced and efficient water fixtures are used that number could drop to 42 gallons per household per day.

For more information about saving water and doing your part go to www.bewaterwise.com or http://meinersoakswater.com/

Conclusion

Meiners Oaks Water District would like remind its customers that by using water efficient fixtures in their homes, they can cut back on their water usage considerably. We would also like to remind our customers that there is not an infinite supply of water in our state, and a few small changes in our life styles could help make a difference for everyone.

The Meiners Oaks Water District Board meets on the third Tuesday of each month at the water district office: 202 W. El Roblar. The meetings begin at 6:30 PM and anyone may attend any of these regular meetings. If you have any questions, please call (805) 646-2114.

WATER QUALITY DATA

The table below lists all the drinking water contaminants that we detected during the 2009 calendar year. The presence of these contaminants in water does not necessarily indicate that the water poses a health risk. The State allows us to monitor for some contaminants less than once per year because the concentrations of these contaminants do not change frequently. Some of our data, though representative, are more than one year old. All of the data is from the most recent monitoring done in compliance with regulations.

TERMS USED IN THIS REPORT:

Maximum Contaminant Level (MCL): The highest level of a contaminant that is allowed in drinking water. Primary MCLs are set as close to the PHGs (or MCLGs) as is economically and technologically feasible. Secondary MCLs are set to protect the odor, taste, and appearance of drinking water.

Maximum Contaminant Level Goal (MCLG): The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs are set by the U.S. Environmental Protection Agency (USEPA).

Public Health Goal (PHG): The level of a contaminant in drinking water below which there is no known or expected risk to health. PHGs are set by the California Environmental Protection Agency.

Maximum Residual Disinfectant Level (MRDL): The level of a disinfectant added for water treatment that may not be exceeded at the consumer's tap.

Maximum Residual Disinfectant Level Goal (MRDLG): The level of a disinfectant added for water treatment below which there is no known or expected risk to health. MRDLGs are set by the U.S. Environmental Protection Agency.

Primary Drinking Water Standards (PDWS): MCLs and MRDLs for contaminants that affect health along with their monitoring and reporting requirements, and water treatment requirements.

Secondary Drinking Water Standards (SDWS): MCLs for contaminants that affect taste, odor, or appearance of the drinking water. Contaminants with SDWSs do not affect the health at the MCL levels.

Treatment Technique (TT): A required process intended to reduce the level of a contaminant in drinking water.

Regulatory Action Level (AL): The concentration of a contaminant which, if exceeded, triggers treatment or other requirements that a water system must follow.

Variances and Exemptions: Department permission to exceed an MCL or not comply with a treatment technique under certain conditions.

ND: not detectable at testing limit

ppm: parts per million or milligrams per liter (mg/L)

ppb: parts per billion or micrograms per liter (ug/L)

ppt: parts per trillion or nanograms per liter (ng/L)

pCi/L: picocuries per liter (a measure of radiation)

MFL : Million Fibers Per Liter

The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally-occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activity.

Contaminants that may be present in source water include:

- *Microbial contaminants*, such as viruses and bacteria that may come from sewage treatment plants, septic systems, agricultural livestock operations, and wildlife.
- *Inorganic contaminants*, such as salts and metals, that can be naturally-occurring or result from urban storm water runoff, industrial or domestic wastewater discharges, oil and gas production, mining, or farming.
- *Pesticides and herbicides* that may come from a variety of sources such as agriculture, urban storm water runoff, and residential uses.
- *Organic chemical contaminants*, including synthetic and volatile organic chemicals, that are byproducts of industrial processes and petroleum production, and can also come from gas stations, urban storm water runoff, agricultural application, and septic systems.
- *Radioactive contaminants*, which can be naturally-occurring or be the result of oil and gas production and mining activities.
- Disposing of unused, unwanted, and expired medications once it was common practice to flush these medications (also known as pharmaceuticals) down the toilet. Your doctor or pharmacist may have directed you to do this. We now know that these substances are bad for our environment - the ground, water, and air around us.
  For more information please look to (nodrugsdownthedrain.org)
  In order to ensure that tap water is safe to drink, the USEPA and the state Department of Public Health (Department) prescribe regulations that limit the amount of certain contaminants in water provided by public water systems. Department regulations also establish limits for contaminants in bottled water that must provide the same protection for public health.

Tables 1, 2, 3, 4, and 5 list all of the drinking water contaminants that were detected during the most recent sampling for the constituent. The presence of these contaminants in the water does not necessarily indicate that the water poses a health risk. The Department allows us to monitor for certain contaminants less than once per year because the concentrations of these contaminants do not change frequently. Some of the data, though representative of the water quality, are more than one year old.

Table 1 - sampling results showing the detection of coliform bacteria					
Microbiological Contaminants (to be completed only if there was a detection of bacteria)	Highest No. of detections	No. of months in violation	MCL	MCLG	Typical Source of Bacteria
Total Coliform Bacteria	(0)	0	More than 1 sample in a month with a detection	0	Naturally present in the environment
Fecal Coliform or *E. coli*	(0)	0	A routine sample and a repeat sample detect total coliform and either sample also detects fecal coliform or *E. coli*	0	Human and animal fecal waste

Table 1.2	Sample Date	Level Detected	MCL	PHG	BY-Products of Disinfection
Total Trihalomethanes (TTHM	2009	ND	80 ug/L		
Chloroform	2009	ND			
Dibromochloromethane	2009	ND			
Bromoform	2009	ND			
Haloacetic acids (five) (HAA5)	2009	ND	60		
Dichloroacetic acid	2009	1			
Trichloroacetic acid	2009	ND			
Chlorite	2007	ND	1.0		
Bromate	2007	ND	10		
Perchlorate	2009	ND	6		

Table 2 - sampling results showing the detection of Lead and copper Last sample date 7-08-2008 Due 6-2011						
Lead and Copper (to be completed only if there was a detection of lead or copper in the last sample set)	No. of samples collected	90th percentile level detected	No. sites exceeding AL	AL	MCL	Typical Source of Contaminant
Lead (ppb)	19	1.0	0	15	15	Internal corrosion of household water plumbing systems; discharges from industrial manufacturers; erosion of natural deposits
Copper (ppm)	19	140	0	1.3	1300	Internal corrosion of household plumbing systems; erosion of natural deposits; leaching from wood preservatives

TAble 3 - sampling results for sodium and hardness						
Chemical or Constituent (and reporting units)	Sample Date	Level Detected	Range of Detections	MCL	PHG (MCLG)	Typical Source of Contaminant
Sodium (ppm)	2009	62	54-68	none	none	Generally found in ground & surface water
Hardness (ppm)	2009	549	452-604	none	none	Generally found in ground & surface water

TAble 4 - detection of contaminants with a Primary Drinking Water Standard						
Chemical or Constituent (and reporting units)	Sample Date	Level Detected	Range of Detections	MCL [MRDL]	PHG (MCLG) [MRDLG]	Typical Source of Contaminant
Turbidity – NTU	2009	<.1	<.1-5	5 95%<0.2	NS	Any particulate matter that scatters light
Inorganic Chemicals Nitrate as NO3	2009	12.1	10-15.5mg/L	45 mg/L	1	Erosion of natural deposits
Fluoride - ppm	2009	.5	.5-.7	1.7	1	Natural deposits or injection
Gross Alpha pCi/L	2008	.975	.975 – 2.86	15	0	
Bacteriological						
Total Coliform	2009	<1.1	<1.1		0	Naturally Present in the Environment
Fecal Coliform or E.Coli	2009	<1.1	<1.1		0	Human and Animal fecal Waste

TAble 5 - detection of contaminants with a Secondary Drinking Water Standard						
Chemical or Constituent (and reporting units)	Sample Date	Level Detected	Range of Detections	MCL	PHG (MCLG)	Typical Source of Contaminant
Chloride - ppm	2009	36.7	26-49	500	NS	Run off/from natural deposits
Corrosivity (a)	2009	12.0	12.0-12.6	Non-corrosive	NS	Natural or industrial influenced balance of hydrogen, carbon or oxygen in the water – affected by temperature
Manganese – ppm	2009	ND	ND	50	NS	Normally found in ground water
Odor Threshold – Units	2009	ND	ND	3	NS	Natural occurring organic materials
Sulfate - ppm	2009	294	235-390	500	NS	Run-off from natural deposits, industrial wastes
Specifis Conductance – umhos	2009	1040	961-1180	1600	NS	Substances that form ions in water- sea water influence
Turbidity – NTU	2009	<.25	<.1-.5	5	NS	Soil runoff
TDS – ppm	2009	690	620-800	1000	NS	Run off – natural deposits
Additional Parameters						
Calcium - ppm	2009	161	125-186	Secondary	NS	Generally found in ground and surface water
Hardness – ppm	2009	549	452-604	Secondary	NS	Generally found in ground and surface water
Magnesium – ppm	2009	35	33-41	Secondary	NS	Generally found in ground and surface water
pH Units	2009	7.2	7.1-7.5	NS	NS	Measure of hydrogen ions
Sodium - ppm	2009	62	54-68	Secondary	NS	Naturally occurring
Asbestos	2009	ND	0	7 (MFL)	NS	Erosion of natural deposits

**Any violation of an MCL, MRDL, or TT is asterisked. Additional information regarding the violation is provided later in this report.*

Additional General Information on Drinking WaterDrinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that the water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the USEPA's Safe Drinking Water Hotline (1-800-426-4791).

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. USEPA/Centers for Disease Control (CDC) guidelines on appropriate means to lessen the risk of infection by *Cryptosporidium* and other microbial contaminants are available from the Safe Drinking Water Hotline (1-800-426-4791).

Summary Information for Contaminants Exceeding an MCL, MRDL, or AL, or a Violation of Any Treatment Technique or Monitoring and Reporting Requirement

For Systems Providing Surface Water as a Source Of Drinking Water:

(Refer to page 1, "Type of water source in use" to see if your source of water is surface water or groundwater)

Table 7 - sampling results showing TREATMENT OF SURFACE WATER SOURCES	
Treatment Technique [(a)] (Type of approved filtration technology used)	Slow Sand filtration (18 pressure tanks) with a 99.9% log removal
Turbidity Performance Standards [(b)] (that must be met through the water treatment process)	Turbidity of the filtered water must: 1 – Be less than or equal to 1.0 NTU in 95% of measurements in a month. 2 – Not exceed .5 NTU for more than eight consecutive hours. 3 – Not exceed 5 NTU at any time.
Lowest monthly percentage of samples that met Turbidity Performance Standard No. 1.	100% October 2008
Highest single turbidity measurement during the year	.485
Number of violations of any surface water treatment requirements	1

(a) A required process intended to reduce the level of a contaminant in drinking water.

(b) Turbidity (measured in NTU) is a measurement of the cloudiness of water and is a good indicator of water quality and filtration performance. Turbidity results which meet performance standards are considered to be in compliance with filtration requirements.

** Any violation of a TT is marked with an asterisk. Additional information regarding the violation is provided earlier in this report.*

Summary Information for Surface Water Treatment

Appendix

Ventura Countywide Stormwater Quality Management Program

2008-2009 Annual Report

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Annual Report for
Permit Year 9,
Reporting Year 15

October 2009

2008-09 Annual Report

Ventura Countywide Stormwater Quality Management Program

A cooperative project of the County of Ventura, the cities of Ventura County and the Ventura County Watershed Protection District

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E ECUTIVE SUMMARY

The purpose of this document is to comply with NPDES Permit No. CAS004002/Order No. 00-108, which requires submittal by October 1 of each year of an Annual Storm Water Report (Report). This Report discusses the Co-permittees' Second Term Permit compliance activities for the period of July 1, 2008 to June 30, 2009, includes a description of all activities conducted during the reporting period, and an assessment of the Ventura Countywide Stormwater Program's effectiveness. This Annual Report was prepared with the cooperation and assistance of the Ventura Countywide Co-permittees who contributed the detailed permit compliance information and data regarding their various stormwater programs. The Co-permittees through implementation of various comprehensive program elements, have achieved compliance with all requirements of the Permit.

Although the Regional Board adopted a new permit, (Order No. 09-0057), on May 7, 2009, the new Order did not become effective until August 5, 2009, after the reporting period ended on June 30, 2009. The new permit was not in effect for any part of the reporting year covered by this Report, and this Report only addresses compliance with Order No. 00-108.

The organization of the Report reflects the organization of the 2001 Stormwater Management Plan (SMP). The implementation portion of the SMP consists of the following elements, with this Report containing a section on each element: 2. Management, 3. Program for Residents, 4. Programs for Industrial and Commercial Businesses, 5. Programs for Planning and Land Development, 6. Programs for Construction Sites, 7. Programs for Public Agency Activities, 8. Programs for Illicit Discharges/Illegal Connections, 9. Stormwater Quality Monitoring.

For this year's annual Program Effectiveness Assessment (PEA), the Co-permittees utilized a series of measures (both *direct* and *indirect*) to verify program implementation and ultimately validate achievement of Program goals. The identified measures are designed to assess the effectiveness of the Program to improve stormwater water quality.

This year's PEA shows strong evidence of increasing program effectiveness:

A. For the past five years illicit discharges have decreased signaling a change in the public's behavior for the better;

B. Increased enforcement of stormwater requirements at construction sites even though there was a reduction in grading permits granted;

C. Increased program activities removing trash and debris from catch basins, channels, ditches and detentions basins resulting in more debris removed;

D. Land development projects are increasingly identified and conditioned for stormwater BMPs based on site activity and pollutants of concern, and not solely on permit requirements.

In addition, key baseline data has been compiled on a watershed and countywide basis for future comparative assessment and trends analysis in the areas of municipal activities, new and existing development, and construction.

<u>Notable accomplishments that occurred during this reporting period include:</u>

A. The achievement of over 4.6 million impressions in the countywide public outreach effort. 20 of media placed was in Spanish.

B. Over 1 million pet waste pickup bags were given out at local parks, beaches and trail heads countywide at a cost of over 100,000.

C. A cooperative effort with Police and Sheriffs to catch illicit discharges by installing hidden security cameras in areas of frequent illegal dumping.

D. 1197 food service facilities were inspected for stormwater compliance.

E. 644 automotive service facilities inspected for stormwater compliance.

F. 412 industrial facilities were visited for stormwater quality education.

G. 82 development projects identified within one or more of the SQUIMP categories were conditioned for stormwater quality controls.

H. 51 development projects that were not one of the SQUIMP categories were also conditioned for stormwater quality controls.

I. 268 stormwater quality inspections were made at active construction sites but only 159 grading permits issued.

J. Over 43,000 tons of debris was removed by public works crews by cleaning 15,453 catch basins, 220 miles of channels and ditches, and sweeping over 115,000 miles of curbs and gutters.

K. Inspectors responded to 541 reports of illicit discharges resulting in 357 enforcement actions taken, a decrease for the fifth consecutive year.

L. Permittees decided to voluntarily implement progressive stormwater programs in advance of permit renewal, even though these programs are not required by the current permit such as storm drain mapping, catch basin prioritization and a Youth Awareness Survey.

With respect to water quality monitoring, the Co-permittees continued to implement a very comprehensive monitoring program. Key points are highlighted below:

A. The Ventura Countywide Stormwater Monitoring Program met all the monitoring requirements of its Permit.

B. Water quality monitoring data were collected by the Stormwater Monitoring Program during four wet weather and two dry weather events.

C. All environmental and QA/AC water chemistry data thoroughly evaluated and accepted by VCWPD staff using *ata ua ity va uation an* and *ata ua ity va uation Standard peratin rocedures* guidance documents.

D. Acute toxicity of *Ceriodaphnia du ia* was observed at the agriculture dominated Receiving Water sites W-3 (La Vista) and W-4 (Revolon Slough) for the samples collected during Event 1.

E. No Chronic toxicity of *Stron y ocentrotus purpuratus* (purple sea urchin) was observed at the Mass Emission station.

F. Toxaphene concentrations exceeded applicable water quality objectives at multiple locations during one or more wet weather monitoring events.

G. Elevated pollutant concentrations were observed at all monitoring sites during one or more monitored wet weather storm events, as well as ME-CC and ME-SCR during one or more dry weather events. See Section 9 for details and an explanation of monitoring results.

Future Program Activities

The Permittees are aggressively moving forward with implementation of the new permit. Subcommittees are working on developing new forms, protocols and procedures to ensure compliance with each program. Already a Youth Outreach Plan has been submitted to the Regional Board and a new Pesticide Application Protocol has been drafted. Monitoring stations have been installed at the four new monitoring sites and are standing by for the first rain of the season. There are many challenges for the Program this next year including revising the Technical Guidance Manual for Land Development, writing and adopting new ordinances, implementing the Youth Outreach Plan and developing a new annual report format.

SECTION 1.0 INTRODUCTION

The Watershed Protection District (Principal Co-permittee), the County of Ventura and the incorporated cities of Camarillo, Fillmore, Moorpark, Ojai, Oxnard, Port Hueneme, Ventura, Santa Paula, Simi Valley, Thousand Oaks, (each a Co-permittee and collectively known as Co-permittees) operate municipal storm drain systems and discharge stormwater and urban runoff pursuant to the countywide NPDES permit (Board Order No. 00-108). This permit, administrated by the Los Angeles Regional Water Quality Control Board (RWQCB), requires an Annual Storm Water Report and Assessment (Annual Report) submitted by October 1 of each year.

The first permit was adopted in 1994, and on July 27, 2000 a second permit was adopted. That permit was on administrative extension until October 7, 2009 when the current permit (Board Order 09-0057, adopted May 7, 2009) became effective. This new permit was not in effect for any part of the permit year covered by this report, and this report only address compliance with Board Order 00-108.

1.1 Purpose and Organization of Report

In accordance with the requirements of the permit, the primary purpose of the report is to document:

- The status of the general program and individual tasks contained in the Stormwater Management Plan (SMP);
- Results of the monitoring and reporting program CI 7388; and
- Compliance status and effectiveness of the implementation of permit requirements.

The organization of the report reflects the organization of the Program's 2001 SMP. Each section contains a review of co-permittee program activities and detailed descriptions of the 2007-2008 permit year:

- Program management framework (committee and subcommittee structure) and a fiscal analysis report (**Section 2.0**)
- Status and effectiveness of the public information dissemination and pollution prevention outreach program (**Section 3.0**)
- Inspection and enforcement activities directed at effectively prohibiting non-stormwater discharges from businesses and industrial sites in order to reduce stormwater pollution to the maximum extent practicable. **(Section 4.0)**
- Efforts to minimize the impact of new development and significant redevelopment on stormwater quality.(**Section 5.0**)
- Construction site practices to ensure the protection of stormwater quality to the maximum extent practicable **(Section 6.0)**
- Efforts to reduce the adverse effects that municipal activities may have on water quality **(Section 7.0)**
- Status of the control measures established under the Illicit Discharge/Illegal Connections elimination program (**Section 8.0**)
- A summary and analysis of the monitoring results from the water quality monitoring program (**Section 9.0**) and **(Appendi 3)**

1.2 Major Program Accomplishments

Notable accomplishments that occurred during the reporting period include:

- Regional Board adoption of new NPDES MS4 Permit (Order No. 08-0057);
- Development and distribution of new BMPS posters for restaurants and auto shops;
- Implementation of a new public education campaign on horse manure management;
- Initiated development of new Youth Outreach Campaign by performing an awareness survey:
- Stormwater Quality Monitoring (6 events, 4 wet and 2 dry);
- Regional TMDL participation;
- Southern California Coastal Water Research Project (SCCWRP) Participation:

- Cooperation and commitment to SCCWRP to aid in a hydromodification effects study;
- Cooperation and commitment to the Stormwater Monitoring Coalition of Southern California to a Low Impact Development Guidance and Training Project for Southern California;
- CASQA Participation;
- Calleguas Creek Watershed Management Plan Participation;
- Ventura River Watershed Council Participation;
- Integrated Regional Water Management Plan (IRWMP) Participation.

The Co-permittees have been working with Regional Board staff on the adoption of the new NPDES permit since 2005. Because it was reasonable to expect the new permit would substantially change program elements and strategies the Permittees have been conservative in starting and amending programs over the past years. This does not mean Co-permittees forestalled programs improvements or new programs, in fact the permittees have been proactively implementing some program elements found in the new permit.

1.3 Effectiveness Assessment Strategy

The SMP recognizes a number of separate, but nonetheless related, water quality planning processes. These processes are countywide, jurisdictional and watershed based water quality management tools. Each process is iterative and incorporates phases of assessment to determine whether programmatic goals are being achieved.

1 1 easura e oa s

Measurable goals are a primary implementation tool of the SMP. They are described by USEPA as BMP design objectives or goals that quantify the progress of program implementation and the performance of BMPs. They are objective markers or milestones that track the progress of the co-permittees in implementing the provisions of the permit and the SMP to the Maximum Extent Practicable (MEP).

Measurable goals may be categorized in a variety of ways. In this report, two categories are acknowledged: (1) the shorter-term confirmation of BMP implementation (Implementation or Process Measures, also termed Programmatic Indicators) and (2) the longer-term verification of environmental improvement (Validation or Results Measures, typically actual indicators of environmental change). These two categories of measurable goals reflect two basic assessment questions:

- Are program elements being implemented correctly
- Are desired outcomes (i.e. environmental improvements) being achieved

Programmatic and environmental indicators may be constructed into a hierarchical relationship (See **Table 1.1 Hierarchy of Indicators**). This relationship helps to illustrate the fact that environmental outcomes rest on, or follow from, jurisdictional program implementation. Moreover, it points to the reality that scientific evidence of changing ecosystem quality will follow program implementation over time, and should not be expected to be evident concurrently.

Table 1.1 Hierarchy of Indicators (USEPA, 1998)

Environmental Indicators (Direct Measures)	6	Ultimate Impacts: Ecological Health Welfare
	5	Body Burden/Uptake
	4	Ambient Conditions
	3	Discharge/Emission
Programmatic Indicators (Indirect Measures)	2	Actions by Regulated Community
	1	Actions by Regulators

In the context of evaluating stormwater management program implementation, the distinction is also often made between *direct* and *indirect* measures. Direct measures are typically environmental indicators such as determinations of water quality. Indirect measures are essentially non-water quality indicators, such as reductions in pesticide use, from which improvements in water quality can be inferred.

A number of Performance Measures have been identified based upon the following selection criteria:

- Relevance: It has demonstrable relation to the strategy and objectives;
- Reliability: The measure will help identify the strengths and weakness of the program area/process;
- Clarity of Naming System: It is readily understandable by its name; and
- Availability of Data: The data are available at reasonable cost.

These Performance Measures comprise process and result (direct and indirect) measures that are used to highlight the progress of the Co-permittees in implementing water quality management, protection and enhancement requirements of the Permit. The Performance Measures are defined in the SMP and presented in **Table 1.2**

Table 1.2 Performance Measures

Program Element	Performance Measure	Type of Performance Measure	
		Process Measure	Result Measure
Program Management	Participation in Management Committee		
	Participation in subcommittee meetings		
	Submittal of Co-permittee Self-Audit		
	Submittal of the Annual Report		
	Annually submittal of Co-permittee program evaluation results		
	Stormwater program budget updates		
	Review and adopt or amend legal authority to implement stormwater management plan		
Public Outreach	Identify program contact person(s)		
	Catch basin stenciling		
	Signs prohibiting illegal dumping at designated public access points to creeks and channels		
	Educational activities and participation in countywide events		
	Household Hazardous Waste Collected		
	Used Oil Collected		
	Educational material distribution		
	No. of outreach contacts		
Industrial/ Commercial Businesses	No. of site education/inspections to automotive, food service and other targeted businesses		

Table 1.2 Performance Measures

Program Element	Performance Measure	Type of Performance Measure	
		Process Measure	Result Measure
	No. of follow up inspections		
	No. of additional businesses targeted based on Pollutants of Concern (POCs) as appropriate		
	No. of facilities identified as potentially subject to the General Industrial Permit given educational materials		
	No. of targeted employees trained		
Planning & Land Development	No. of Projects reviewed and conditioned for stormwater		
	Area to which BMPs have been applied		
	No. of BMPs implemented		
	Stormwater quality conditions included in environmental checklists, initial studies or EIRs required by CEQA and/or NEPA		
	Watershed and stormwater management considerations in Co-permittees' General Plan		
	Technical Guidance Manual		
	Environmentally Sensitive Areas		
	Development Community Outreach		
	No. of targeted employees trained		
Construction Sites	No. of SWPCPs/SWPPPs developed and implemented		
	No. of NOIs filed with the State		
	No. of sites inspected		
	No. of follow up inspections		
	No. of enforcement actions		
	Construction Community Outreach		
	No. of targeted employees trained		
Municipal Activities	Co-permittee corporate yard SWPCP		
	Drainage System Operation and Maintenance		
	Roadway Operation and Maintenance		
	No. of Facilities Inspected		
	Solid Waste Collected		
	Pesticide, Herbicide and Fertilizer Protocols		
	Reduction in Total Pesticide Application		
	Reduction in Total Fertilizer (Nitrogen) Application		
	Reduction in Total Fertilizer (Phosphorus) Application		

Table 1.2 Performance Measures

Program Element	Performance Measure	Type of Performance Measure	
		Process Measure	Result Measure
	No. of targeted employees trained		
Illicit Discharge/Illegal Connections	No. of complaints		
	No. of enforcement actions		
	Educational material distribution		
	No. of targeted employees trained		

1 2 ectiveness Assess ent

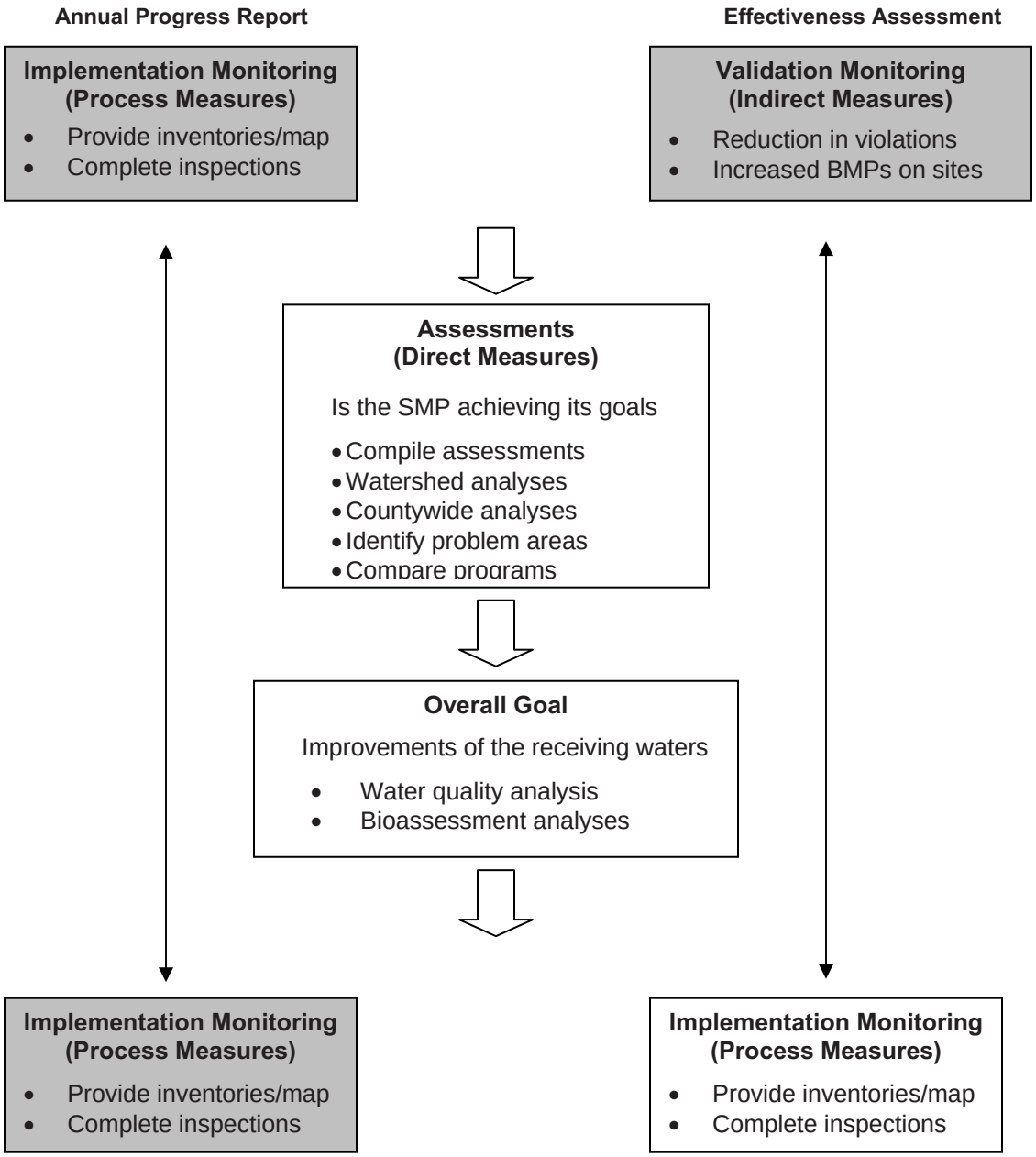
Effectiveness assessment requires the establishment of a set of baseline conditions. Thereafter, effectiveness can be evaluated by comparisons of indicator information against the baseline data over the years. Where the period of evaluation is characterized by the implementation of new program requirements, determinations of program effectiveness will initially be limited to confirmation of program implementation. Indeed, it must be recognized that direct measures of program effectiveness may not be available within the history of the Stormwater Quality Program. This challenge arises because:

- Baseline water quality conditions are not readily established;
- Water quality changes in response to program implementation are likely to be slow and may be marked by changes due to extreme weather events;
- Establishing a link between receiving water condition and program activities is difficult at the watershed scale when program elements are being implemented incrementally with the development/redevelopment cycle;
- The watersheds of Ventura County are not predominantly urbanized, so in-stream measurements cannot isolate changes due to urban or other sources.

The evaluation of stormwater program effectiveness assessment is also conducted at two levels. At the jurisdictional or Co-permittee level, the assessment is conducted annually and focuses on program implementation. Inferences about the connection of management program elements to water quality improvements made in these assessments will be drawn from the assessment of programmatic indicators and indirect measures of progress. The Co-permittees' program assessments are presented in **Sections 3.0 8.0**.

At the countywide program level, the major assessment is done principally on a permit cycle basis with an emphasis on using indirect measures of progress. The Annual Progress Report strategy is illustrated in **igure 1-1**.

igure 1-1 Annual Progress Report



SECTION 2.0 PROGRAM MANAGEMENT

2.1 Responsibilities

The responsibilities of the Principal Co-permittee and Co-permittees are defined within the Permit and the Implementation Agreement. These roles and responsibilities are outlined below.

2 1 1 Principal Co-permittee

The role of the Principal Co-permittee is similar to the other Co-permittees with the addition of certain overall programmatic and facilitation responsibilities. These responsibilities are not to ensure the compliance of the Co-permittees as the Principal Co-permittee has no regulatory authority over the Co-permittees. These responsibilities include the following:

- Coordinate Permit activities;
- Establish uniform data submittal format;
- Set time schedules;
- Prepare regulatory reports;
- Forward information to the Co-permittees;
- Arrange for public review;
- Secure services of consultants as necessary;
- Implement activities of common interest;
- Develop/prepare/generate all materials and data common to all Co-permittees;
- Update Co-permittees on RWQCB and US Environmental Protection Agency (USEPA) regulations;
- Convene all Management Committee and Subcommittee meetings;
- Manage the countywide educational outreach program; and
- Manage the countywide stormwater quality monitoring program.

2 1 2 Co-permittees

Each Co-permittee is responsible for implementing the NPDES Stormwater Program within their jurisdiction. The main responsibility of each Co-permittee includes:

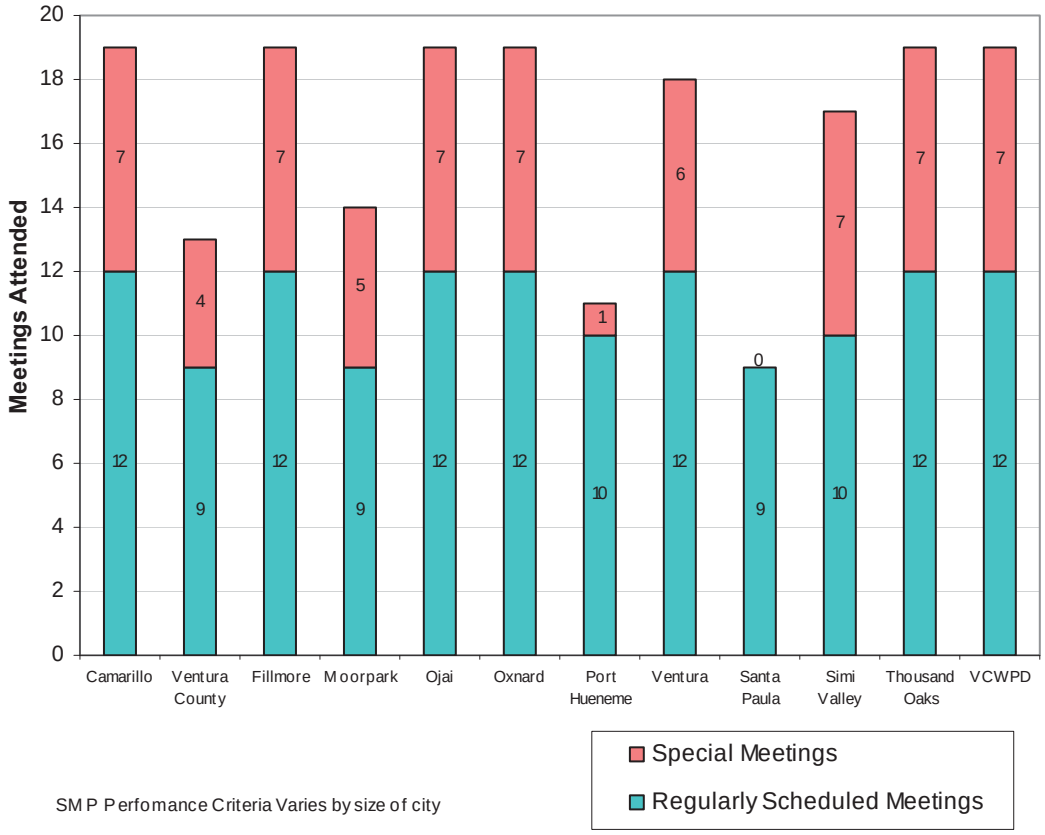
- Review, approve and comment on budgets, plans, strategies, management programs and monitoring programs developed by the Principal Co-permittee or any subcommittee;
- Implement the various stormwater management programs outlined in the Permit and the Stormwater Management Plan (SMP) within its jurisdiction;
- Establish and maintain adequate legal authority;
- Take appropriate enforcement actions as necessary within its jurisdictions to ensure compliance with applicable ordinances;
- Coordinate among internal departments and agencies, as appropriate, to facilitate the implementation of the Permit and the SMP;
- Respond to/or arrange for response to emergency situations, such as accidental spills, leaks, illicit discharges/illegal connections, etc., to prevent or reduce the discharge of pollutants to the storm drain systems and waters of the U.S. within its jurisdiction;
- Conduct inspections of and perform maintenance on municipal infrastructure within its jurisdiction;
- Conduct and coordinate any surveys and source identification studies necessary to identify pollutant sources and drainage areas;
- Participate in the Management Committee meetings and subcommittee meetings as outlined in the SMP; and
- Prepare and submit all reports or requests of information to the Principal Co-permittee in a timely fashion.

2.2 Management Activities

2 2 1 Management Committee

The NPDES Management Committee is the Principal forum for directing the Program's development and implementation. This Committee is attended by senior staff from all Co-permittee agencies and meets monthly to assure Program continuity. In addition, this committee periodically evaluates the need to create ad hoc committees or workgroups as required in order to accomplish the objectives of the NPDES Stormwater Program. Participation in the NPDES Management Committee is a specific requirement of the Permit. Co-permittee participation in the NPDES Management Committee is noted in **igure 2-1**.

12 Regular and 7 Special Management meetings were held.



igure 2-1 Co-Permittee Management Committee Meeting Attendance

2 2 2 Subcommittees

The Subcommittees provide a forum for discussion of particular program elements and are attended by the staff with the appropriate expertise from each Co-permittee. These meetings create a more uniform approach to program management countywide and allow the Co-permittees to learn from each other. The subcommittees are tasked principally with the following program material responsibilities

- **Residential Public Outreach Subcommittee**
  To help provide regional consistency and oversight for the stormwater public education program efforts. Select specific Pollutants of Concern in which public education can potentially make a difference.

- **usiness and Illicit Discharge Control Subcommittee**
  Oversee the development of the model industrial/commercial and illicit discharge/illegal connections programs. Create regional consistency to business inspections and reporting of discharges.

- **Planning and Land Development Subcommittee**
  To help provide regional tools for design, review and conditioning of new development and redevelopment projects, and promote regional consistency in their application.

- **Construction Subcommittee**
  To provide regional consistency to inspections, share solutions to common problems and the development of model new development and construction programs.

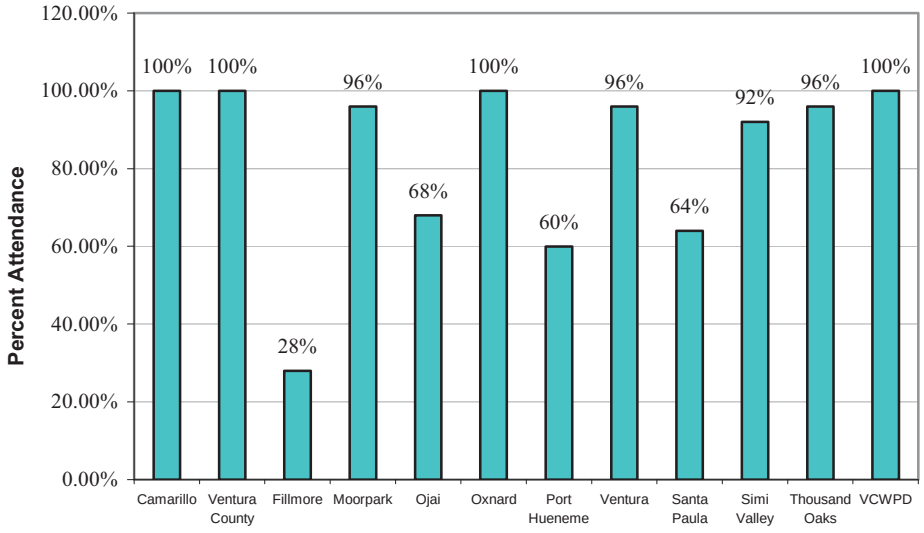
- **Public Infrastructure**
  The development of the model municipal activities program, corporate yard inspections, and integrated pesticide management, pesticide and fertilizer programs.

Co-permittee participation in Subcommittees is noted in **igure 2-2**.

2 2 Other Regional Committees/Work Groups

Many of the Co-permittees additionally participate in various watershed management advisory groups. These groups include: the Ventura County Integrated Resources Water Management Plan (IRWMP), Ventura River Watershed Planning Committee, Santa Clara River Enhancement and Management Committee, Wetlands Recovery Project, Calleguas Creek Watershed Management Committee, Matilija Dam Ecosystem Restoration Study, Channel Islands Beach Park Action Plan for Improving Water Quality, Malibu Creek Watershed Management Committee, Steelhead Restoration and Recovery Plan, Beach Erosion Authority for Clean Oceans and Nourishment (BEACON), Southern California Coastal Water Research Project (SCCWRP) and the Ormond Beach Task Force. These watershed and regional groups focus their activities and discussions on specific concerns such as water quality, habitat restoration and flood control, as well as short, medium and long-term solutions.

25 Subcommittee meetings were convened.



igure 2-2 Co-Permittee Subcommittee Meeting Attendance

SMP Perfomance Criteria Varies by size of city

2 2 Management Framework Program Implementation

In addition to the countywide and watershed management frameworks for program development, the Co-permittees at a jurisdiction level have formally identified which departments and staff have responsibility for implementation of each program elements within their jurisdictions.

2.3 Legal Authority

Although adequate legal authority existed for most potential pollutant discharges at the inception of the stormwater program in 1994, the Co-permittees determined that a Model Stormwater Quality Ordinance should be developed to provide a more uniform countywide approach and to provide a legal underpinning to the entire Ventura Countywide NPDES Stormwater Program.

Subsequently, all of the Co-permittees adopted largely similar versions of the model Stormwater Quality Ordinance. In addition, each Co-permittee has designated Authorized Inspector(s) responsible for enforcing the Ordinance. The Authorized Inspector(s) is the person designated to investigate compliance with, detect violations of and/or take actions pursuant to the Ordinance.
The detection, elimination and enforcement activities undertaken by the Co-permittees during 2008/09 are described further in **Section 8**. In addition to prohibiting un-permitted discharges, the Stormwater Quality Ordinance in conjunction with the SQUIMP also provides for requiring BMPs in new development and significant redevelopment. A Stormwater Quality Ordinance has been adopted in each Co-permittees' jurisdictions as indicated in **Table 2.1**

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Table 2-1

Ordinance Adoption Dates

Co-permittee	Adopted Date	Amendment Date
Camarillo	3/25/1998	
County of Ventura	7/22/1997	
Fillmore	12/8/1998	
Moorpark	12/3/1997	
Ojai	2/9/1999	
Oxnard	3/24/1998	
Port Hueneme	4/1/1998	2/1/2001
San Buenaventura	1/11/1999	
Santa Paula	11/16/1998	
Simi Valley	7/23/2001	4/22/2002
Thousand Oaks	9/14/1999	

2.4 Watershed Protection Stormwater Program Representation

The Principal Co-permittee represents the Co-permittees participating in the following organizations and associations:

2 1 California Association for Stormwater Agencies (CAS A)

The California Association of Stormwater Quality Agencies (previously California Storm Water Quality Task Force) serves as advisory body to the State Water Resources Control Board (SWRCB) on stormwater quality program issues. CASQA is primarily comprised of agencies, organizations, businesses and individuals responsible for and/or interested in the implementation of municipal stormwater management programs in California. Since its inception in 1989, CASQA has evolved into the leading organization in California dealing with stormwater quality issues.

2 2 Southern California Coastal Water Research Project (SCCWRP)

The Southern California Coastal Water Research Project (SCCWRP) is a joint powers agency focusing on marine environmental research. SCCWRP's mission is to gather the necessary scientific information so that member agencies can effectively and cost-efficiently protect the Southern California marine environment. In addition, SCCWRP's mission is to ensure that the data it collects and synthesizes effectively reaches decision-makers, scientists and the public.

2 California Coalition for Clean Water (CCCW)

The California Coalition for Clean Water (CCCW) is an alliance of local governments and public agencies, labor, agriculture, business, housing and development interests working together towards the development and implementation of water quality standards that protect water quality while balancing economic and social needs of local communities and the State. CCCW's mission is to assist the California Regional Water Quality Control Boards and SWRCB to adopt and implement sound water quality standards that reflect the intent and spirit of state and federal clean water laws.

2 National and Global Organizations

As Principal co-permittee, the Watershed Protection District (District) participated jointly with SCCWRP and various other federal and international organizations such as the Society of Environmental Toxicology and Chemistry (SETAC). SETAC is a nonprofit, worldwide professional society comprised of individuals and institutions engaged in the study, analysis, and solution of environmental problems. SETAC s mission is to support the development of principles and practices for protection, enhancement and management of sustainable environmental quality and ecosystem integrity.

SETAC promotes the advancement and application of scientific research related to contaminants and other stressors in the environment, education in the environmental sciences, and the use of science in environmental policy and decision-making.

2 Southern California Agencies

Beginning in 2003, and continuing through 2008 the District began participating in the Storm Water Advisory Team (SWAT) meetings. SWAT was created by stormwater-regulated agencies who believed that coordination amongst the regulated community would be beneficial to not only providing a unified voice to the Regional Board but would also encourage regional consistency in pollution prevention efforts. Meetings are held to discussions various issues such as TMDL development and progress permit negotiations, and regional monitoring opportunities.

2 Local Involvement

Watershed Protection District staff participates in various watershed-specific local subcommittees and groups that are focused on water quality and TMDLs. For example, staff regularly attends Calleguas Creek water quality subcommittee meetings and is involved in developing appropriate methods for monitoring water quality. Similarly, in the Malibu Creek watershed, staff provides technical expertise for the water quality monitoring technical advisory committee, reference water quality study workgroup, and bacteria compliance monitoring workgroup.

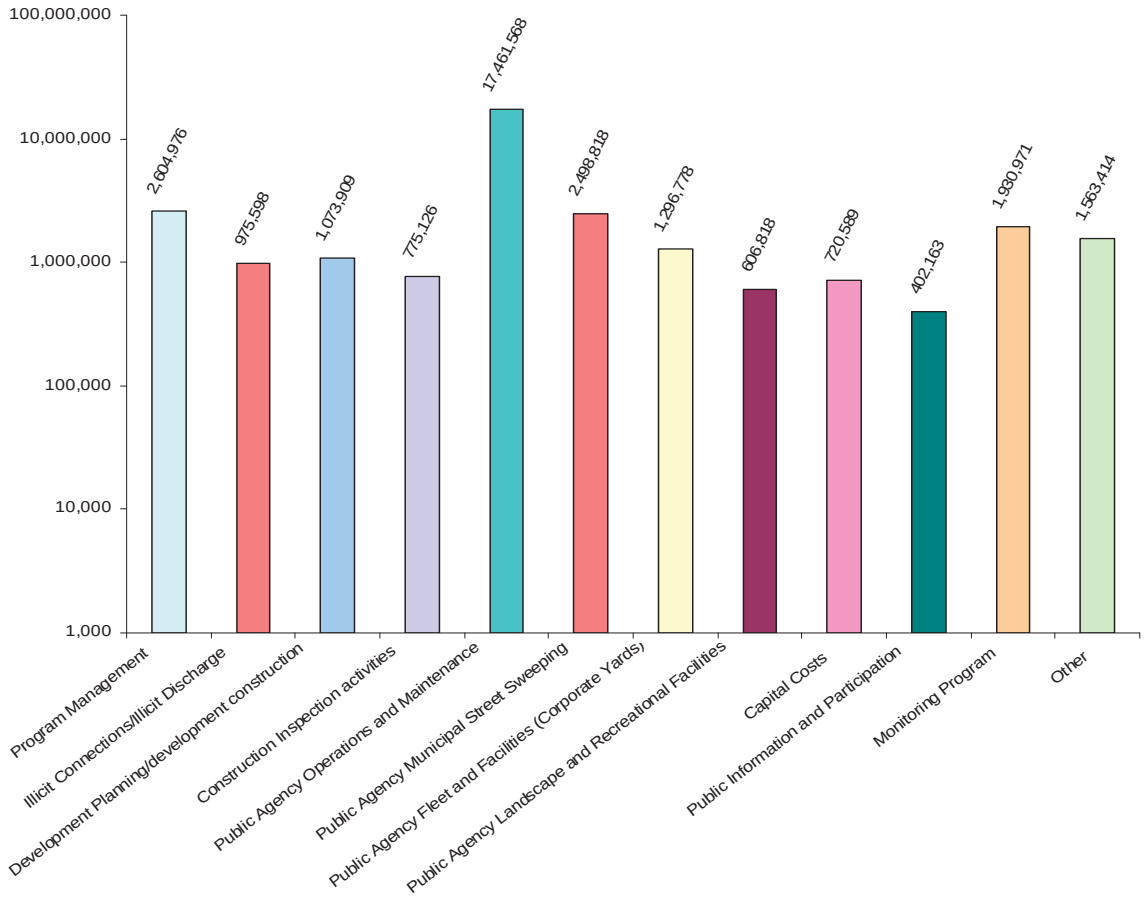
2.5 iscal Analysis

This Section presents a summary of the costs incurred by the Co-permittees in developing, implementing and maintaining programs in order to comply with permit requirements and includes information on the funding sources used by the Co-permittees. The total cost to each Co-permittee is the sum of *shared* costs and *individua* costs.

2.5.1 Program Costs for Permit year 2 / 9

In 2008/09 the projected cost of the activities undertaken by the Co-permittees implementing the stormwater program within their jurisdictions are estimated to be 31,910,727. This is a large increase over previous years' budgets of 15,365,736 in 2008/09, 16,739,303 in 2007/08, 19,158,359 in 2006/07, 15,429,018 in 2005/06, and 14,205,276 in 2004/05.

The Countywide budget for stormwater quality is 31,910,727



igure 2-3 Countywide Y 2008-2009 Stormwater Program udget

Table 2-2

Agency Annual Budget Update for Stormwater Management Program - Fiscal Year 2009-2010

	Item	*Co-Permittee*												
		Camarillo	County of Ventura	Fillmore	Moorpark	Ojai	Oxnard	Port Hueneme	Ventura	Santa Paula	Simi Valley	Thousand Oaks	VCWPD	Principal Co-Permittee
I.	Program Management	323,566	$485,126	$35,205	$119,461	$105,000	$280,907	$45,000	$177,000	$37,020	$193,711	$165,944	$117,125	$519,911
II.	Illicit Connections/ Illicit Discharge	50,201	$182,655	$29,495	$3,000	$0	$85,058	$5,000	$222,000	$84,713	$232,051	$68,528	$5,631	$7,266
III.	Development Planning	75,126	$116,545	$53,893	$75,000	$7,000	$91,404	$5,000	$253,000	$11,187	$37,136	185,610	$6,889	$156,119
IV.	Construction Inspection Activities	68,167	$79,945		$75,000	$5,000	$180,894	$5,000	$40,000	$8,762	$95,843	196,030	$17,345	$3,140
V.	Public Agency Activities													
V.a.	Operations and Maintenance	258,317	$800,000	$92,865	$39,000	$4,000	$467,809	$15,000	$225,000	$159,187	$165,472	232,848	$15,000,000	$2,070
V.b.	Municipal Street Sweeping	255,000	$150,000		$111,850	$45,000	$525,000	$78,500	$200,000	$130,125	$313,060	690,283	NA1	NA2
V.c.	Fleet and Public Agency Facilities (Corporate Yards)	5,194	$3,000	$101,791	$1,000	$4,000	$33,581	$5,000	$0	$4,116	$1,067,759	2,231	$69,106	$0
V.d.	Landscape and Recreational Facilities	11,378	$1,500		$1,500	$200,000	$8,179	$354,700	$22,000	$2,165	$3,821	1,575	NA1	$0
VI.	Capital Costs	144,000	$0		$10,000	$6,000	$390,000	$10,000	$95,000	$0	$65,589	0	0	$0
VII.	Public Information and Participation	14,977	$6,000	$24,967	$10,680	$0	$17,294	$15,000	$40,000	$4,391	$21,691	58,427	0	$188,736
VIII.	Monitoring Program	149,625	$10,000	$15,000	$0	$0	$29,144		$331,000	$0	$6,502	0	0	$1,389,700
IX.	Other (Business)	42,132	$1,026,355		$67,757	$0	$185,998	$20,000	$0	$0	$96,101	62,990	0	$62,081
	Totals	$1,397,683	$2,861,126	$353,216	$514,248	$376,000	$2,295,268	$558,200	$1,605,000	$441,666	$2,298,736	$1,664,466	$15,216,095	$2,329,023

Table 2.2 Agency Annual udget Update for Stormwater Management Program - iscal Year 2008-2009

2 2 Fiscal Resources

Each Co-permittee prepares a stormwater budget annually and allocates resources to be applied to the stormwater program. **Table 2.2** presents the projected stormwater budget for each Co-permittee for Fiscal Year 2008/09 and **igure 2-3** shows how the countywide budget is divided among the various programs. As expected, there is some variability between the stormwater program budgets reported by the Co-permittees. This variability is due in part to the accounting practices utilized by each Co-permittee and the allocation of activity costs amongst programs implemented by each Co-permittee.

In addition, the Co-permittees vary significantly in their jurisdictional area and population (**Table 2.3**), which may explain some differences in resources dedicated to various program areas. Yet, a review of the annual budgets produces some nominal findings. In general, Co-permittees with the largest populations tend to have budgets greater than the budgets reported by Co-permittees with the smallest populations. However, within the group of cities with the largest populations and within the group with the smallest populations, there is still variation in program budgets.

Table 2.3
Ventura County Statistics

Co-permittee	Population	Area (Sq. Mi.)
Camarillo	62,498	19.6
County of Ventura	46,328	10.7
Fillmore	15,128	2.7
Moorpark	36,200	19.2
Ojai	8,687	4.4
Oxnard	197,067	25.3
Port Hueneme	22,137	4.3
Ventura	106,744	21.7
Santa Paula	29,121	4.6
Simi Valley	121,288	39.4
Thousand Oaks	128,650	57.2

2 Funding Sources

Funding sources to implement the stormwater program, including pre-existing programs that meet permit objectives, include both general and specific funds, taxes, maintenance and user fees and grants. Volunteer groups like Surfrider Foundation help implement some stormwater program elements and thus no fiscal value was attributed to these contributions.

The funding sources used by the Co-permittees include: Watershed Protection District Benefit Assessment Program, General Fund, Utility Tax, Separate Tax, Gas Tax, Special District Fund, Others (Developer Fees, Business Inspection Fees, Sanitation Fee, Fleet Maintenance, Community Services District, Water Fund, Grants and Used Oil Recycling Grants.

3.0 Program Development

Public Education is an essential part of a municipal stormwater program because changing public behavior can create a real reduction in pollutants. When a community has a clear understanding of where the pollution comes from, how it can affect them and what they can do to stop it, they will be more likely to support the program, change their own practices and help educate others.

The Co-permittees are building upon the many successes of the current program. Early in the program, the Co-permittees identified key elements crucial to establishing a successful outreach campaign. These elements include:

- Watershed Awareness
- Public Awareness Surveys
- Identification of general and specific goals of the program
- Identification of target audiences and key messages for those audiences
- Development of program strategies and plan overview
- Pollution prevention program using a unified “brand name”
- Development of a watershed based outreach program
- Identification of opportunities to reach out to regulatory agencies
- Development of a model public education/public participation strategy for localization at the Co-permittee level
- Development and implementation of a school-aged children education outreach program
- Development and implementation of food facilities outreach program materials
- Development and implementation of automotive facilities outreach program materials
- Development and implementation of industrial facilities outreach program materials

3.1 Countywide Outreach Efforts

The **Community for a Clean Watershed** program was established in 2005 by the Ventura Countywide Stormwater Quality Management Program. Through the development of educational public outreach media campaigns, brochures and the Clean Watershed website, the Community for a Clean Watershed program has successfully raised awareness among Ventura County residents on the issues impacting the health of Ventura County’s watersheds.

2 1 ack round

The **Community for a Clean Watershed** program was established in 2005 by the Program as a way to consistently brand our stormwater pollution message. Designed with the help of focus groups, the name was chosen to instill a sense of community and ownership.

Through the development of educational public outreach campaigns, brochures and the Clean Watershed website, the **Community for a Clean Watershed** program has successfully raised awareness among Ventura County residents on the issues impacting the health of Ventura County’s watersheds.

The co-permittees’ first step towards creating an effective public outreach campaign was to gain a better understanding of public perception of stormwater pollution, storm drains and watershed protection. The research data, collected through a series of English and Spanish focus groups,

revealed a clear direction to take in order to obtain the behavioral changes desired from the community including:

- Clearly define the *atershed* and begin to bring it into the mainstream
- Differentiate the message from don't litter' and water pollution' ads
- Make an emotional, visual connection
- Appeal to the local pride' of Ventura County residents
- Provide enough information to empower residents to make a difference'
- Provide a place for residents to get informed and to act, i.e. a dedicated website

While it's been five years since this project started, the objectives of the Community for a Clean Watershed program continue to be to:

- Create and build awareness
- Educate residents
- Change negative behavior
- Develop a consistent message throughout all cities and areas in Ventura County
- Attempt a year-round effort to increase top-of-mind awareness of the watershed

Public Outreach Permit Year 08 09

New outreach objectives included in Permit Year 08/09 included:

- Extend outreach to more targeted audiences, including horse owners
- Prepare for new permit which will require outreach to school aged children.

Progress has been made toward the goals of educating the public and creating awareness of the watershed. Through a coordinated effort, the co-permittees are attempting to continue their long-term, multi-media countywide municipal NPDES public education outreach activities to increase the overall effectiveness of the program. In 2008-09, efforts were extended to additional target audiences in a variety of media.

Since 2005, the Countywide Program has utilized the marketing services of theAgency. A full service advertising and public relations agency located in Ventura County, theAgency continues to develop materials and implement Community for a Clean Watershed campaigns and related research. The 2008-09 year's efforts included the following key initiatives:

Target: Residents

- Coastal Cleanup Day, September 2008
  Pollutant of Concern: Trash
  - Print
  - Public Access Cable

- December 2008 Public Outreach
  Pollutants of Concern: Trash/Bacteria
  - Radio
  - Newspaper
  - Online banners
  - Outdoor bulletin
  - Transit Shelters

- May 2009 Public Outreach
  Pollutant of Concern: Pesticides

- Cable Television
- Radio
- Online Banners
- Transit Shelters

Target: Auto and ood Service usinesses

- Auto Services
  Pollutants of concern: trash, automotive fluids, including grease, chemicals, solvents, detergents
  - BMP Posters
- Food Service
  Pollutants of concern: illicit disposal of trash, cleaning products, FOG (fats, oils, grease), other solvents
  - BMP Posters

Target: Horse Owners

Pollutant of Concern: Bacteria

- Educational Brochures
- Direct Mail, May 2009

Spanish Newspaper Ad

December 2008:
In December, an existing radio spot with a broad watershed message and mention of several pollutants of concern provided an umbrella platform from which to launch new elements tackling two specific pollutants of concern. Newspaper ads utilized a familiar Watershed image of a dog, with the call to action “Please Pick up my Poop,” while new outdoor signage suggested, “The Watershed Should Only Shed Water ..not Trash” showing a Styrofoam cup that ended up on a beach.

English Transit Shelter

Spanish Transit Shelter

Outdoor Billboard

Images from flash Web Banner

Radio Interviews/Publicity: December 2008
As part of the negotiated value-add, radio Interviews were conducted on both radio stations on the December media buy. Each radio interview was at least five minutes, reviewing the concept of a Watershed as well as offering suggestions for how to keep it clean.

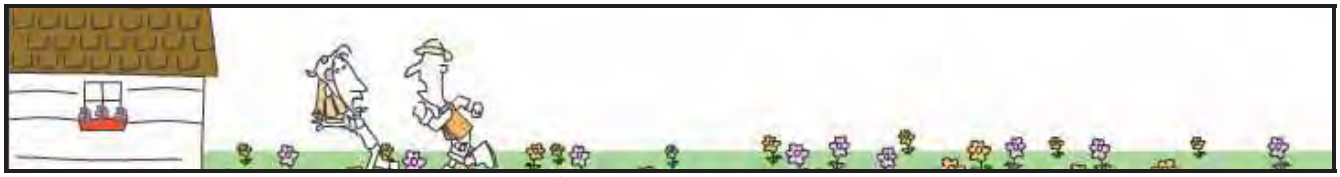
In addition, on December 7, 2008, a press release ran in the local newspaper's "Eye on the Environment column, proclaiming "Follow these steps to cut pollutants flowing to the ocean." The article enumerated several pollutants, giving advice on how to keep each type of contaminant out of local watersheds.

May 2009:
Coinciding with the spring planting season, the Community for a Clean Watershed ran a four-week pesticide campaign utilizing television and radio campaign elements from the previous year's creative arsenal. The animated "More, Better" television commercial graphically demonstrated how using too much pesticide runs into the storm drains, eventually making it into the Watershed, adversely affecting plants and animals. The radio spot was a humorous adaptation of the television ad, featuring the two animated characters as they defend their house against garden pests and inadvertently poison the watershed. An animated web banner corresponded with both broadcast media while the transit shelters took a more direct approach showing a snail and telling residents "Don't kill an ocean just to keep pests out of your garden."

Frames from pesticide TV commercial

English Transit Shelter

Spanish Transit Shelter



Frame from web banner

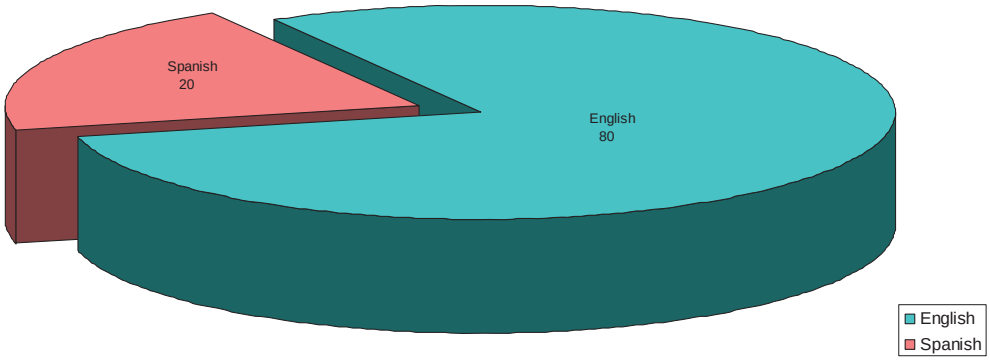
Media Outreach Strategy
As in the past, each media plan was negotiated with the goal to maximize target reach and frequency on a limited budget. In addition, attention was paid to geographical distribution throughout Ventura County as well as adequate coverage in the Latino market. theAgency was able to consistently obtain low rates and significant bonus elements, including bonus radio commercials, newspaper ads and outdoor billboards. Bonus impressions nearly doubled paid impressions.

For the three campaigns in the 2008 – 2009 year, the Community for a Clean Watershed media plan achieved a total of 5,342,005 gross impressions broken out as follows:

Campaign	Gross Impressions
Coastal Cleanup Day	1,459,048
December Trash/Bacteria	2,761,613
May Pesticide	1,121,344
Website: cleanwatershed.org	3,724

Bilingual Public Outreach
To reach the significant Hispanic community in Ventura County, all elements of the campaign were created in Spanish. This included the newspaper, transit shelter and radio ads, each of which ran in Spanish media

20 of the Countywide Outreach Effords were in Spanish



Spanish Media Outreach Using a media mix of Spanish newspaper, radio and transit shelters, Spanish language advertising accounted for 20 of total media impressions: 832,126.

Community for a Clean Watershed

In its third year, the cleanwatershed.org website continues to reinforce the various public outreach messages as well as make available a network of resources to help the web viewer make informed decisions. The website is updated on a regular basis to add relevant campaign materials as well as educational materials. 2,101 unique visitors made 3,724 visits and read an average of 2.24 pages. Web visits peaked in May, coinciding with the public outreach campaign.

Horse Owners est Management Practices (MP) Direct Mailer

In May, the Watershed continued its best practices campaign with outreach to Ventura County horse owners, equestrians and horse property owners. This mailer, which was delivered twice to more than 6,000 relevant households and businesses, reminded this population of the key actions they can and should take to promote healthier, happier horses as well as to protect the watershed.

Outside of tri-fold mailer

Inside of tri-fold mailer

Eye on the Environment

The Ventura County Star, a local daily newspaper serving all of Ventura County with a Sunday readership of over 240,000 people has generously offered space for a weekly 750-word column to the Ventura County Integrated Waste Management Division. The column is titled Eye on the Environment and runs every Sunday. Focused on all aspects of protecting the environment the column helps promote awareness of stormwater pollution directly and indirectly. Some topics don't discuss stormwater directly but the message is just as helpful to reducing stormwater pollution. For example several columns last year provided information on the hazards balloons and plastics bags can cause to the environment, the benefits of conserving water, or how to properly dispose of household hazardous materials. All clearly issues with a stormwater component. Four columns over the Permit year were written by District staff and directly addressed stormwater pollution pollutants of concern and what residents can do to prevent them from entering the environment.

VenturaCountyStar

Eye on the Environment: Police your own actions, halt negligent 'envirocide'

By Anne Aussem
Guest writer
Sunday, February 22, 2009

The story you are about to read is true. The names have been changed to protect the innocent.

It's 10 a.m. Sunday, Feb. 22, 2009. The crime: Our waterbeds are swimming from too much pollution. The evidence: unusable levels of pesticides, fertilizers, bacteria and litter. Possible suspects include any flow to a creek or storm drain that is not clean stormwater, aka Illicit Discharges, and the illegal dumping of trash, aka Midnight Dumpers. The punishment: can be required to pay all cleanup costs and in some areas, expensive fines as well.

Your help is needed in apprehending these suspects. Ventura County and all its cities have ordinances making such activities illegal, and you if witness someone abusing the gutter, you should report it. Inspectors will investigate and enforce if necessary. The gutter is not for the disposal of sudsy water or any other waste.

These scofflaws, however, aren't the only sources of pollutants to our waterbeds. Just as the Midnight Dumper with a pickup full of trash harms the environment, so can the daily activities of people everywhere. All these pollutants add up to a big problem. We might all be guilty of negligent "envirocide."

Here are five of the "least wanted" pollutants and what you can do to prevent their escape into the environment:

Harboring a fugitive: In a can, it's called trash; not on the ground, it's litter. Putting wrappers from a fast-food meal in a pickup truck bed seems like the right thing to do. But at 50 mph, it becomes litter as it escapes into the road (aka Fugitive Trash). Also, wind or hungry tiny gulls can make a mess of a trash can or Dumpster that doesn't have a tight lid on it.

Maximum security: You could say pesticides and weedkillers were born to kill, and they, along with other landscape chemicals, are serious waterbed pollutants. These should always be secured out of the elements, away from wind and rain. Use only the amounts recommended on the label, and try using a smaller amount or less-toxic alternatives (a 2-inch layer of mulch could keep weeds from breaking into your garden). Do not overwater after applying chemicals, or apply pesticides, weedkillers or fertilizers before a rain, or they might make their break for the waterbeds.

Getaway car: Leaking automotive fluids will gang up on driveways and roads. This toxic grime will be washed off in one big slug during the first rains of the season, straight to the environment. Inspect your car for leaks regularly and get them fixed. Spent oil and other automotive fluids must be disposed of properly. Certified used-oil collection centers are available at some auto parts stores or repair shops, or see your city's household hazardous waste collection events.

Take that, you dirty copper: Dust from metallic brake pads, outside decorative copper and other metal displays is not usually thought of as water pollutants, but to aquatic life, it can be a killer. Some smaller cars can use nonmetallic brake pads. Ask your mechanic if your car qualifies. If decorative copper or other unpainted metals are outside your home, make sure any water runoff is contained in the landscaping instead of making a break for the gutter or street.

K-9 waste: Pet waste is a source of bacteria that can make people sick. Dirty diapers and discarded food are also known accomplices in this offense. Pick up after your dog and dispose of the waste properly in trash cans. The same is true for baby diapers and food waste.

There is no defense for harming the environment, but it is beyond a reasonable doubt that someone could contribute no pollution at all. With just the facts, a little self-policing and judicial action, we can make a big difference and avoid negligent envirocide.

— Anne Aussem is a water quality manager with the Ventura County Watershed Protection District. Representatives of government or nonprofit agencies who want to submit articles on environmental topics for this column should contact David Goldstein at 658-4312 or david.goldstein@ventura.org.

On the Net:

http://www.vcwatershed.org

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Youth Survey

In anticipation for the upcoming permit which includes a component for K-12 outreach, the Community for a Clean Watershed wanted to establish a baseline of understanding before targeted outreach began. A web survey, implemented by Applied Research West, was used as the method for data collection, surveying a total of 330 participants between the ages of 5 and 18 with 30 participants from each city in Ventura County and attention paid to matching the ethnic composition of the area.

Key findings, which will help direct the messaging platform as well as media selection, include:

Awareness of Watershed and Storm-water

- Kids 13–18 have a greater awareness of the terms watershed' and storm water' with Kids 5–9 significantly lower.
- All age groups (79) agree that the watershed includes land, rivers, lakes, creeks and beaches. However, 33-35 of Kids 5-9 are less certain it includes their house and yard.
- There is a high awareness that pollutants in their yards could end up miles away, although Kids 16–18 are less like to agree that it could happen.

Conservation Behavior

- Recycling of paper, plastic and cans are commonly practiced although Kids 5–9 are somewhat less likely.
- All age groups show a strong response to turning off water while brushing their teeth. A 10-minute shower is more challenging with an average of 67 complying.
- Most kids, 57 , will ask others to pick up litter or pick it up themselves.

- Litter on the ground is largely ignored by Kids 16-18 whereas half of 5–15 year-olds will always pick it up.

Attitudes and Water Issue Understanding

- Young kids 5-9 and older kids 16-18 are less sure that sewer water is always cleaned and treated.
- 89 of all age groups agree that anything dropped in the gutter or storm drain might end up in the ocean.
- Kids 8-12 are more likely to believe it is okay to use the gutter to throw away trash.
- While almost 40 agreed that it was someone else's job to keep the environment clean, 88 agreed it is their family's job to do so.
- 87 understand that people cannot survive without water. Only half believe the world can run out of water.

Polluting Impact of Various Items

- Motor oil was perceived as the most polluting with garden pesticides and trash/litter next.
- Fertilizer and household cleaners are considered moderate polluters.
- Pet and Yard Waste were rated the lowest high level' of concern.

Summary of Effectiveness

This was the fourth year of the Community for a Clean Watershed public outreach efforts; and was a year of transition as the co-permittees anticipated the new permit requirements. Working within a reduced budget for outreach, the group was able to maintain awareness with Ventura County residents, extending the original message of "The Watershed Should Only Shed Water" to The Watershed Should Only Shed Water .not (trash/pesticides/bacteria)." Specifically, the following was achieved:

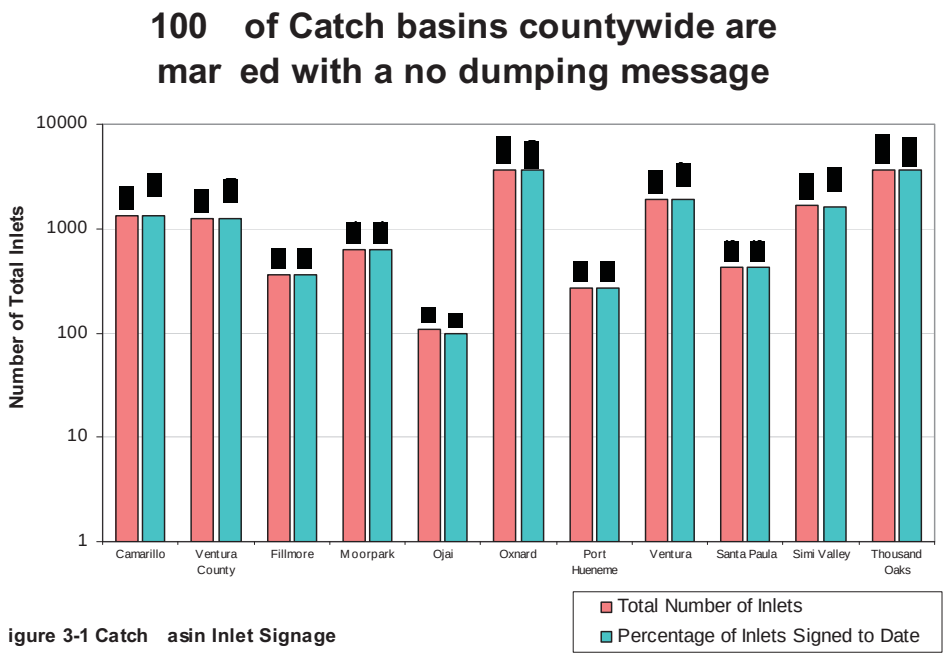
- Add to the arsenal of creative elements that cover the various pollutants of concern. These materials are available for collective or individual city use throughout Ventura County.
- Provide consistent messaging throughout the year to residents.
- Persuade the local media to extend the reach of the campaign through bonus placements, thus extending the repetition of the watershed message.
- Provide BMP materials to auto service dealers, food service and horse owners.
- Determine current understanding of watershed terms, conservation, water issues, and key pollutant concerns of children in grades K-12, to be used as a baseline for future outreach efforts to this population.

2 u ic Reportin

Each Co-permittee has identified staff serving as the contact person(s) for public reporting of clogged catch basin inlets and illicit discharges/dumping. Designated staff is provided with relevant stormwater quality information, including program activities and preventative stormwater pollution control information. Contact information is updated as necessary and published in the government pages of the local phone book and other appropriate locations. In addition, this information is available on the Program's website at www.vcstormwater.org.

3.2. Curb Inlet Stenciling

As required by the Permit, Co-permittees have completed labeling or marking the curb inlets to their entire storm drain system. During the reporting period, some Co-permittees maintained their inlet signs by reapplying stencils/markers as they wore out and applying stencils/markers to new inlets as they were installed. **igure 3-1** depicts the progress the Co-permittees have made in their efforts to install and maintain their curb markers.



igure 3-1 Catch asin Inlet Signage

Table 3-2
Public Reporting Phone Numbers

	General Information	Reporting Illicit Discharges
Ventura County Watershed Protection District	805/650-4064	805/650-4064
City of Camarillo	805/388-5338	805/388-5338
County of Ventura	805/650-4064	805/650-4064
City of Fillmore	805/524-1500x109	805/524-3701
City of Moorpark	805/517-6257	805/517-6257
City of Ojai	805/658-6611	805/640-2560
City of Oxnard	805/488-3517	805/271-2220
City of Port Hueneme	805/986-6556	805/986-6507
City of Ventura	805/652-4582	805/667-6510
City of Santa Paula	805/933-4212	805/933-4212
City of Simi Valley	805/583-6462	805/583-6400

City of Thousand Oaks	805/449-2386	805/449-2400

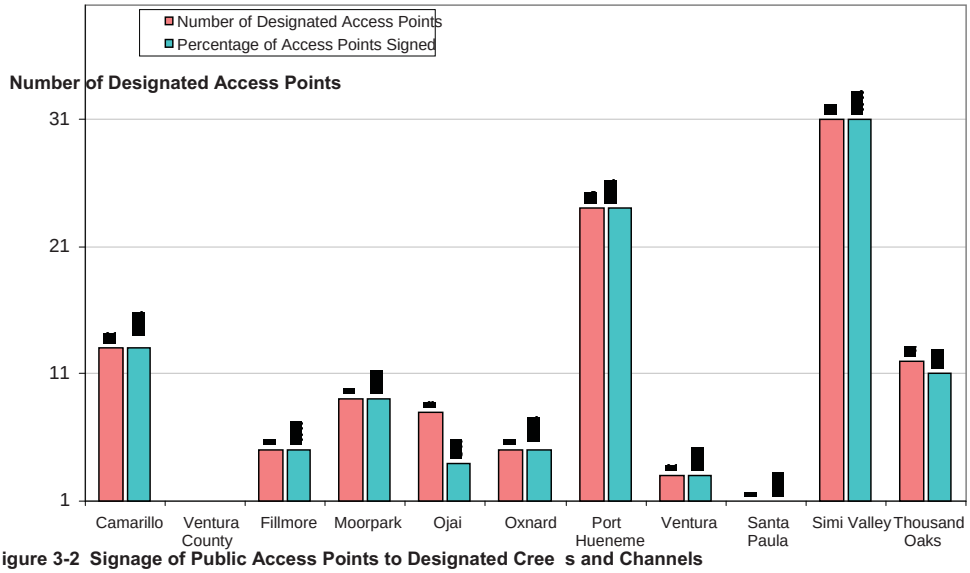
The percentage of inlets signed to date meets the performance criteria established in the SMP for all Co-permittees. Signs at curb inlets have varying useful lives due to the materials from which they are constructed (e.g., paint, thermoplastic), their position (e.g., on top of curb, on face of curb), and wear factors (e.g., traffic, street sweeping, sunlight). As a result, the Co-permittees have different programs to maintain curb inlet signage within their respective jurisdictions. Some Co-permittees replace a portion of their signs each year whereas others re-sign all inlets every few years. Regardless of the specific inlet signage practice, all Co-permittees understand the importance of signage to the education component of their program and are committed to installation and maintenance of signage that meets both the educational goal of the program as well as the 90 performance criteria set forth in the SMP.

3.2.7 Access Points to Designated Creeks Other Water Bodies

In addition to the Storm Drain Inlet Stenciling Program, the Co-permittees are required to designate appropriate access points to the creeks and channels within their jurisdiction for the placement of signs with prohibitive language to discourage illegal dumping. Each Co-permittee is responsible for designating the appropriate access points to creeks and channels within their jurisdiction, which requires some field verification and mapping. This program element also required in some cases, the cooperation between the City and special districts outside the City's jurisdiction.

igure 3-2 depicts the progress the Co-permittees have made in their efforts to post their signs at appropriate access points to creeks and channels. A review of **igure 3-2** shows that all the Co-permittees met the performance criteria that 90 of the designated public access points be posted with signs regarding the prohibition of illegal dumping.

95 of all public access points to cree s and other waters have been posted with a no dumping message



igure 3-2 Signage of Public Access Points to Designated Cree s and Channels

No updated information on this task for this year
The designated public access areas to creeks within the City are under the jurisdiction of the Conejo Recreation and Parks District.

2 Local Community Outreach Efforts

Each of the Co-permittees organized community-oriented outreach events, training and other activities on stormwater quality within their jurisdiction. The Co-permittees emphasized the importance of using environmentally safe practices at home and work to prevent stormwater pollution. Outreach efforts included community newsletters, small group learning activities and other media to deliver a stormwater message that educates and informs the general public.

One such effort is demonstrated by the City of Camarillo. The city regularly publishes *City Scene*, a newsletter for City of Camarillo residents, providing local community and neighborhood focused information. In a recent edition, readers were provided city specific information how to prepare for the rainy season through good housekeeping and proper slope maintenance. It communicated the message that not only can drainage failures damage property, but the sediment and various pollutants that erode from the slopes or that come out of private drains end up in the storm drain system and ultimately into our creeks and ocean without being treated. Reminding people that pollutants impair water bodies and can be harmful to aquatic life. The City of Thousand Oaks jointly sponsored a semi-annual publication and distribution of a solid waste newsletter. This newsletter was designed to educate readers in recycling and proper waste disposal methods. Distribution was estimated to be more than 33,000.

The City of Thousand Oaks worked with other local agencies, business and groups to promote awareness and education about stormwater pollution. Including:

- Conejo Open Space Conservation Agency, COSCA, Trail Education Days—On April 30, 2009 about 25 fifth-grade students were given an informational tour through the Wildwood park natural area. During the hike, the children were taught about topics in ecology including urban stormwater impacts and the benefits of recycling.

- Amgen Earth Day and Energy Conservation Fair—On April 22, 2009, Amgen Corporation hosted this event to raise awareness about excessive energy use and surface water quality issues. About 2,500 Amgen employees attended the event. The City of Thousand Oaks gave participants recycled products and answered questions about informational poster displays. Participants were also given brochures on recycling and stormwater topics.

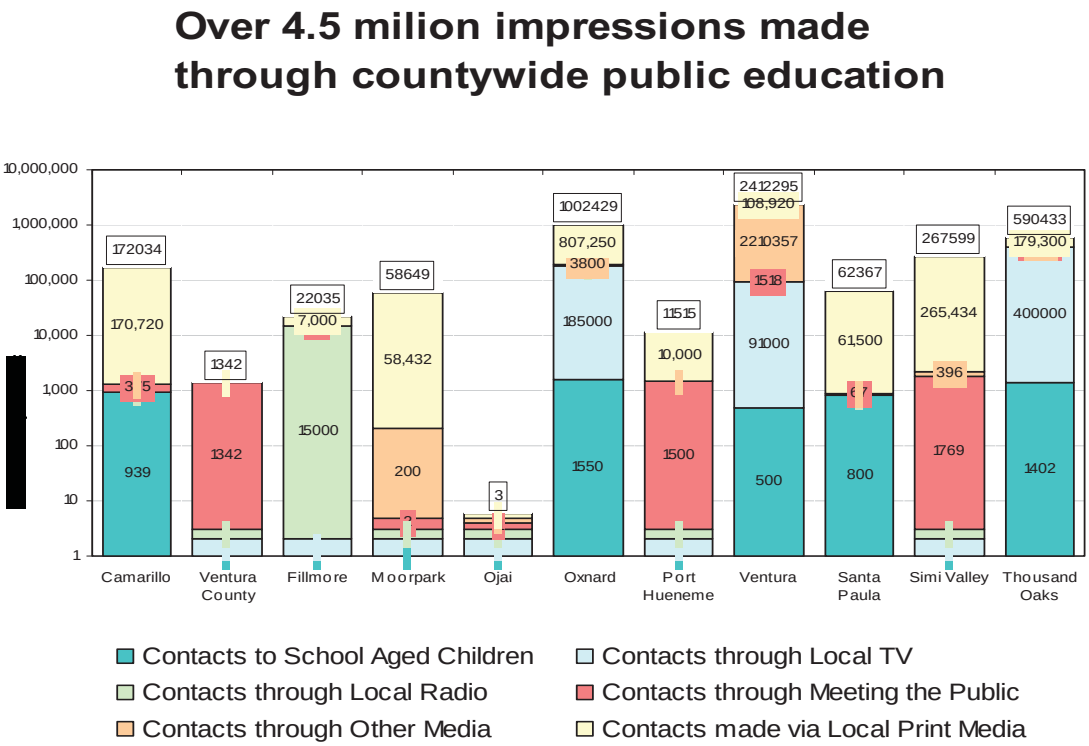
- Baxter Bioscience Earth Day—On June 1, 2009, the City of Thousand Oaks's staff presented a Power Point presentation focusing on residential activities that cause surface water pollution and how to reduce this contamination. Despite advertisement through internal memo from the company's Health & Safety Division, only ten people attended.

- Whole Foods Market—City of Thousand Oaks representatives operated an educational outreach booth on September 20, 2008. The theme was "Going Green." The estimated 300 participants learned about topics such as water conservation, recycling, and storm water quality by spinning a wheel and answering questions.

- Public Works Week—May 21,22, and 23, 2009—About 35 Conejo Valley schools brought more than 1,200 children and 150 adults to see examples of the activities and equipment that are used to by the City of Thousand Oaks to maintain its infrastructure. For stormwater quality management, a table-sized model depicting a watershed was sprinkled with simulated pollutants such as cinnamon (sediment) and food colorings (fertilizer and pesticide) in its residential section. Children participated by simulating rain with spray bottles and saw these suggestive pollutants contaminate the creeks and lake. A simulated curb drain receiving re-circulated water and a section of storm drain pipe were there for reference.

- Sports Pro Camp and Boy Scouts- staff gave presentations on recycling and proper disposal of waste materials to prevent surface water quality impacts. These events were held on July 1, 2008 and November 6, 2008, respectively. Combined attendance was 50 children.

igure 3-3 indicates the number of educational contacts made by the Co-permittees at local community outreach events/activities during this reporting period.



igure 3-3 Local Community Outreach Efforts

The City of Oxnard provides residents with a quarterly newsletter called *City Works*, which includes articles on Storm Water Pollution Prevention and provides guidance to both the public and private sectors as to how best to reduce storm water pollution. Articles have featured Coastal Clean up Day, Water Conservation, Recycling Household Hazardous Waste, Trapping Trash Before It Reaches the Beach, and Only Rain Should Go Down the Storm Drain. The City of Oxnard will continue to use the quarterly newsletter (*City Works*) to provide the public with the latest stormwater pollution prevention methods.

3.3 Ongoing Program Accomplishments

3.3.3 Community Cleanups

California Coastal Cleanup Day is a premier volunteer event focused on the cleanup of beaches and creeks throughout the country. On this day, more than 50,000 volunteers turn out to over 700 cleanup sites statewide to conduct what has been hailed by the Guinness Book of World Records as "the largest garbage collection." Since the program started in 1985, over 552,000 Californians have removed more than 8.5 million pounds of debris from our state's shorelines and coast. When combined with the International Coastal Cleanup organized by the Ocean Conservancy and taking place on the same day, California Coastal Cleanup Day is one of the largest volunteer events of the year.

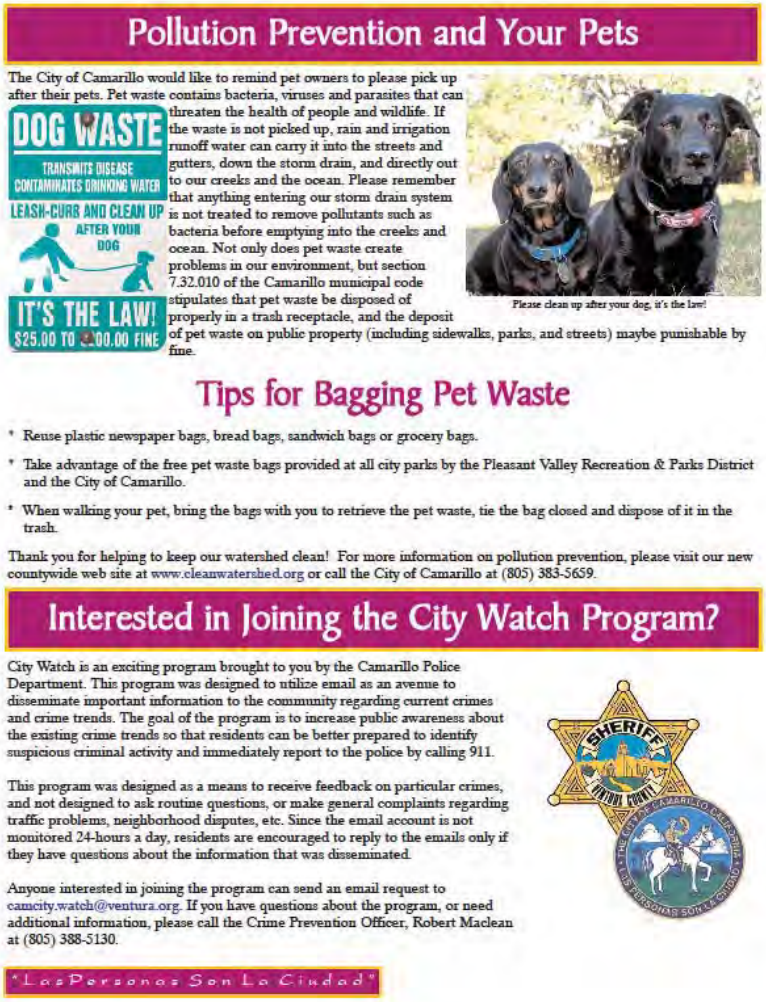
Coastal Cleanup Day is also the highlight of the California Coastal Commission's year round "Adopt-a-Beach" program and takes place every year on the third Saturday of September, the end of the summer beach season and right near the start of the school year. Coastal Cleanup Day is a great way for families, students, service groups and neighbors to join together and take care of our fragile water environments Together they show community support for our shared natural resources, learn about the impacts of marine debris and how we can prevent them.

Beginning in 1996, the Co-permittees have participated in this extremely successful statewide event. This annual event has been an excellent opportunity for volunteers to help clean and beautify local beaches and inland waterways. Over the past ten years, the Co-permittees have worked hard to encourage more volunteer participation in addition to targeting additional beach and inland areas for cleanup. This volunteer program continues to be a huge success, not only in cleaning local sensitive environments but also in creating a heightened awareness on proper trash disposal and its benefit to stormwater quality. This permit year, a record high of 2,772 volunteers removed over 13,900 pounds of trash and recyclables from close to 50 miles of inland and coastal shorelines in Ventura County. While the number of volunteers was high the amount of trash wasn't, indicating that there is less trash getting out into the environment.

Community Cleanup Day—The City of Thousand Oaks sponsored a collection event of waste materials on May 16, 2009. At the event, about 1794 residents brought 236 tons of trash and green waste; 25,579 pounds of miscellaneous electronic components; 25,882 pounds of video monitors; 9.2 tons of paper from document shredding; and four semi-trailer loads of assorted computer components that were donated to the Goodwill for re-use.

Freeway Ramp and Interchange Collection Program (Adopt-A-Highway)—From July 1, 2007 to June 30, 2008, about 14,625 pounds of trash and debris were removed from 13 freeway on-ramps and exits and one freeway interchange in the City of Thousand Oaks

2 Pet Waste Program



Pollution Prevention and Your Pets

The City of Camarillo would like to remind pet owners to please pick up after their pets. Pet waste contains bacteria, viruses and parasites that can threaten the health of people and wildlife. If the waste is not picked up, rain and irrigation runoff water can carry it into the streets and gutters, down the storm drain, and directly out to our creeks and the ocean. Please remember that anything entering our storm drain system is not treated to remove pollutants such as bacteria before emptying into the creeks and ocean. Not only does pet waste create problems in our environment, but section 7.32.010 of the Camarillo municipal code stipulates that pet waste be disposed of properly in a trash receptacle, and the deposit of pet waste on public property (including sidewalks, parks, and streets) maybe punishable by fine.

DOG WASTE
TRANSMITS DISEASE
CONTAMINATES DRINKING WATER
LEASH-CURB AND CLEAN UP
AFTER YOUR DOG
IT'S THE LAW!
$25.00 TO $00.00 FINE

Please clean up after your dog, it's the law!

Tips for Bagging Pet Waste

* Reuse plastic newspaper bags, bread bags, sandwich bags or grocery bags.
* Take advantage of the free pet waste bags provided at all city parks by the Pleasant Valley Recreation & Parks District and the City of Camarillo.
* When walking your pet, bring the bags with you to retrieve the pet waste, tie the bag closed and dispose of it in the trash.

Thank you for helping to keep our watershed clean! For more information on pollution prevention, please visit our new countywide web site at www.cleanwatershed.org or call the City of Camarillo at (805) 383-5659.

Interested in Joining the City Watch Program?

City Watch is an exciting program brought to you by the Camarillo Police Department. This program was designed to utilize email as an avenue to disseminate important information to the community regarding current crimes and crime trends. The goal of the program is to increase public awareness about the existing crime trends so that residents can be better prepared to identify suspicious criminal activity and immediately report to the police by calling 911.

This program was designed as a means to receive feedback on particular crimes, and not designed to ask routine questions, or make general complaints regarding traffic problems, neighborhood disputes, etc. Since the email account is not monitored 24-hours a day, residents are encouraged to reply to the emails only if they have questions about the information that was disseminated.

Anyone interested in joining the program can send an email request to camcity.watch@ventura.org. If you have questions about the program, or need additional information, please call the Crime Prevention Officer, Robert Maclean at (805) 388-5130.

SHERIFF
VENTURA COUNTY

"Las Personas Son La Ciudad"

The Pet Waste Program began in 1999 by the Co-permittees to educate pet owners on bacterial contamination to our ocean and streams from pet waste. The program began by installing dispensers for pet waste pickup bags at beaches, parks and trail heads. This program has grown to giving out over 2 million pet waste bags a year at a cost of about 150,000. There are now close to 400 pet waste bag dispensers throughout the county encouraging pet owners to pick up after their pets. This program has been a huge success with the demand for more dispensers and pet waste bags growing annually.

The City of Ventura also replaced the plastic pet waste bags with biodegradable bags. The City made this change to reduce plastic litter. Once plastic enters the rivers and ocean, it poses a significant threat to marine animals. Additionally, plastic does not biodegrade and any plastic that becomes litter will remain in our environment indefinitely. The new biodegradable pet waste bags, made by BioBag, will

completely degrade over time.

ide oo Cruiser

The City of Camarillo sponsors the Tide Pool Cruiser to perform educational visits to eight local schools and at their local Coastal Cleanup Day event. This mobile unit shows an up-close view of the inside of a storm drain and dramatically demonstrates how anything that enters it will drain straight to the environment. The environment is represented by an interactive marine touch tank with live organisms; and our dependence on the ocean is shown through a "general store" that makes the connection between what is placed in the storm drain and its impact on marine life.

This program is designed to teach children (and by extension their parents) about the hazards of non-point source stormwater pollution. In an innovative, hands-on and exciting manner participants learn of the connection between the introduction of pollutants through the storm drain system and their impact on the marine environment.

Presentations to Young People

The Watershed Protection District, Camarillo and Thousand Oaks also provided the hands on watershed educational tool the EnviroScape to local schools. The EviroScape is a portable table-top model that provides unique, interactive learning experiences, the EnviroScape makes the connection between what we do on earth and environmental quality. Stormwater pollution and runoff are visually apparent when rain falling over the landscape top carries soil (cocoa), chemicals (colored drink mixes) and oil (cocoa and water mixture) through a watershed to a body of water. Stormwater runoff and storm drain function are also addressed.

Best management practices demonstrated include felt buffer strips as vegetation, clay to create berms and other methods to show conservation and water pollution prevention measures at work.

SECTION 3.0 PROGRAMS OR RESIDENTS

The model shows nonpoint source pollution and the steps everyone can take to help prevent environmental contamination.

3.3.4 Solid Waste Collection/Recycling

The Co-permittees have solid waste collection programs for public, residential, commercial and industrial areas. The Co-permittees recognize the public needs education and encouragement to properly dispose of their trash in order to reduce the chance storm drains will be used as waste receptacles. The Co-permittees promote these events through a variety of methods including community newsletters, radio and television public service announcements, brochures and utility bill inserts. Many Co-permittees have combined recycling, litter control and hazardous materials disposal messages.

The City of Thousand Oaks' sponsored eleven household hazardous waste collection days over the 2008-2009 fiscal year. On average, each month 359 residents brought in an about 917 pounds of waste materials including household chemicals such as fertilizers, cleaning chemicals, paints, insecticides, electronics, used motor oil, and unused pharmaceuticals to each collection event. Proper disposal lof these materials ensures that they won't end up in the environment.

arth ay and Ar or ay

Most Co-Permittees celebrated Earth Day by hosting festivals with educational presentations and environmentally conscience vendors. The City of Thousand Oaks sponsored an Arbor Earth Day on April 25, 2009. Representatives from the City's Resource Division offered attendees a chance to spin a wheel and answer questions about water conservation, solid waste control and storm water impacts. Correct answers were rewarded with a gift. Freebies and informational brochures on these topics were available to all. More than 5,000 people attended this event.

3.3. Mobile Satellite City Hall Event

In 2009, the City of Oxnard hosted their Helen Putnam award-winning Mobile Satellite City Hall events in centralized city locations in an ongoing effort to educate a greater number of local residents in stormwater pollution prevention methods, and in the importance of taking ownership of their local environment. These events provide Oxnard residents with the opportunity to voice their water quality concerns to the city's department/division appointed representatives. This innovative approach of providing educational outreach to the general public has been extremely successful in promoting a positive environmental awareness, sound stormwater pollution prevention practices, and illicit discharge identification/ abatement throughout the city's targeted demographic areas.

SECTION 4.0 PROGRAMS OR USINESSES

The daily activities of many businesses create a potential for pollutants to enter a storm drain system. The Co-permittees have developed programs to address this source of pollutants through inspections of targeted businesses providing educational outreach and enforcement if needed. These efforts include providing information on the potential for illicit discharges and illegal connections from businesses, the selection and use of proper BMPs, and the potential for enforcement action and fines if environmental rules are ignored.

The Co-permittees use the Business and Illicit Discharge/Illegal Connection Subcommittee meeting to coordinate and implement a comprehensive program to control pollutants in stormwater discharges to municipal systems from targeted commercial facilities. The Subcommittee is comprised of representatives of the Co-permittee cities and other municipal staff from various departments (Environmental Health, Environmental Services and Wastewater Services). Each Co-permittee has implemented an Industrial/Commercial Business Program, which includes the following components to meet the goals and objectives of the program:

- Tracking Critical Sources
- Inspecting Critical Sources
- Ensuring Compliance of Critical Sources

4.1 Program Implementation

The Business Program provides a framework and a process for each Co-permittee to develop its own commercial/industrial program consistent with Permit and SMP requirements. Key program components include:

- Pollution Prevention
- Source Identification and Facility Inventory
- Prioritization for Inspection
- Implementation of Best Management Practices
- Site Education/Inspections
- Enforcement
- Non-compliant Industrial Site Identification and Regional Board Notification Procedures
- Program Reporting

1 1 usiness Co unity Site ducation/ nspection ro ra

The goal of the site education/inspection program is to confirm that stormwater Best Management Practices (BMPs) are effectively implemented in compliance with state law, county and municipal ordinances. During site visits, the Co-permittees:

- Consulted with a representative of the facility to explain applicable stormwater regulations;
- Distributed and discussed applicable BMP fact sheets and educational materials; and
- Conducted a site walk-through to inspect for evidence of illicit discharges and illegal connections, appropriate stormwater BMPs, and stormwater quality management education programs for employees.

In addition, the Co-permittees maintain a database of inspected automotive and food service facilities that includes the following information for each facility:

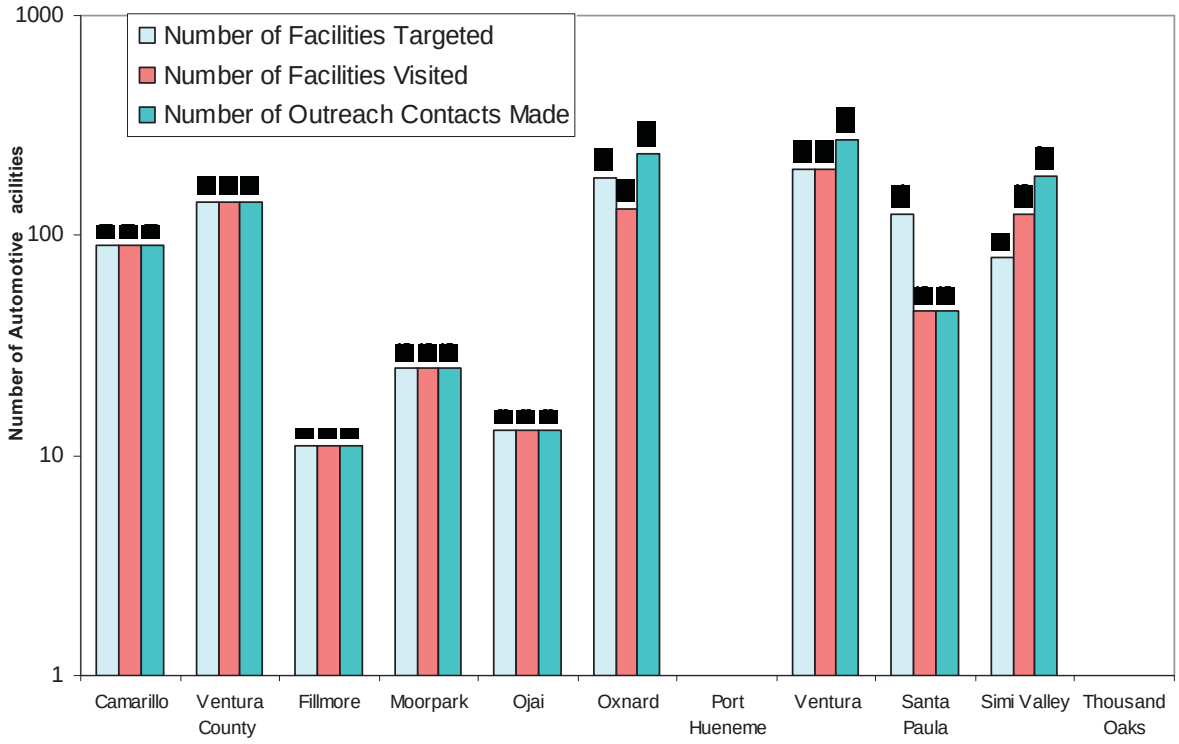
- Name of Facility
- Site Address

- Applicable SIC Code(s)
- NPDES Permit Coverage
- SWPPP Availability
- Facility Contact

A print out of the Co-permittees' database is attached in Appendix 1. The Co-permittees annually update the database with their activities for the current reporting period and provide a copy as part of this Annual Report.

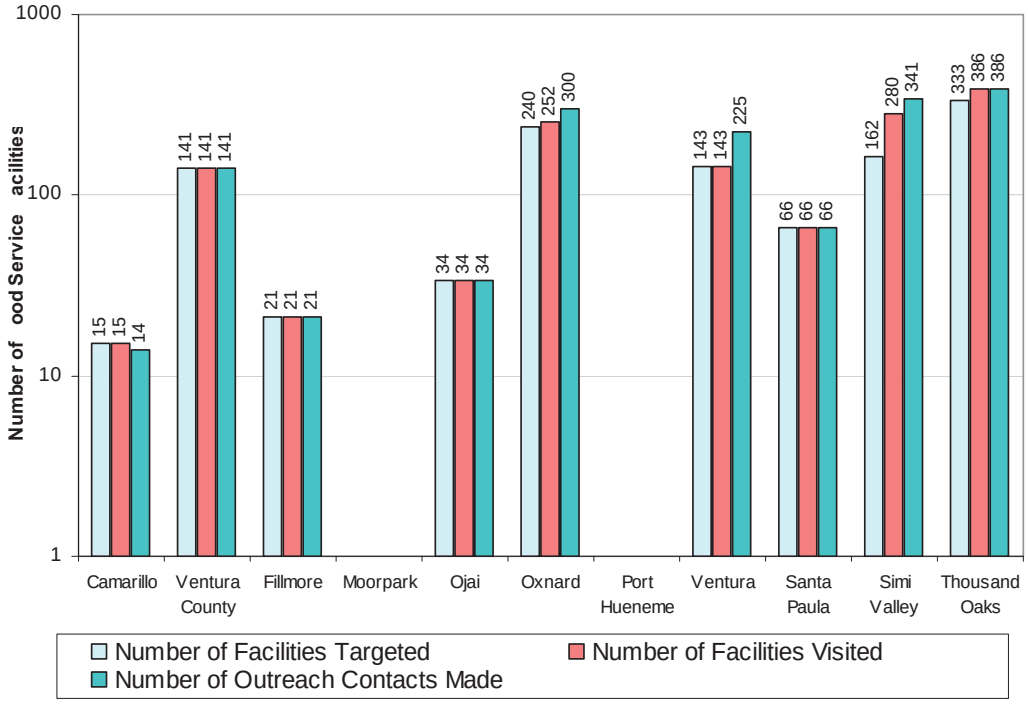
igure 4-1 shows the total number of targeted automotive service facilities and the total number visited within each Co-permittee's jurisdiction. **igure 4-2** shows the total number of food service facilities targeted and the total number visited within each Co-permittee's jurisdiction. In some cases the number of facilities visited exceeded the number of targeted for inspection. This situation may result from changes in facility ownership, businesses that move requiring site visits to a facilities new location as well as the one vacated. In many cases the Co-permittees were exceeding their targets in order to assure compliance with the permit requirement to inspect all these facilities once every two years.

Over 600 automotive service facilities were inspected countywide.

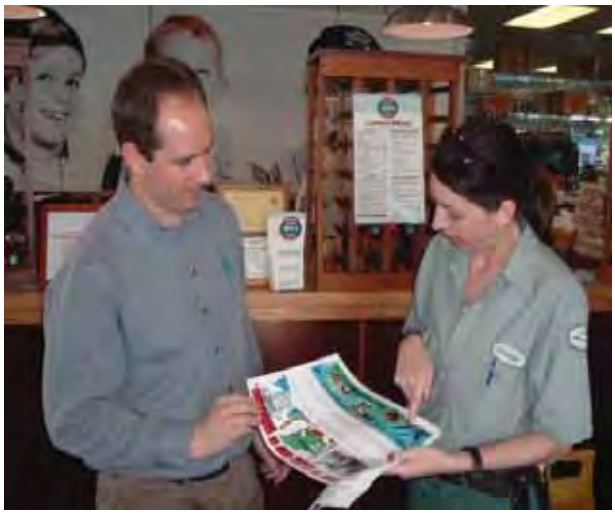


* Data reflects the number of facilities visited in this reporting period only; which is the first year of a two-year reporting period.

Over 100 of targeted restaurants were inspected, 1100 total countywide.



The vast majority of site visits were unannounced providing the inspectors with an honest look at daily activities of the facility. During these site visits, Co-permittee inspection staff would meet with the business owner/manager to review the objectives of the inspection. After performing a walk-through of the facility, inspection results were discussed with the business owner/manager. In the event a Co-permittee determined a facility's stormwater BMPs were insufficient, the Co-permittee provided their recommendations to the facility owner/manager. Source control BMPs were recommended as a first step in BMP implementation before requiring the facility to implement costly structural BMPs. In addition, inspection staff informed facilities' owners/managers that BMP implementation does not guarantee compliance nor relieve them from additional regulations.



Site Inspection of a Commercial Facility

Whenever evidence of an illicit discharge was found, facilities were scheduled for follow-up visits within six months of the inspection. If continued stormwater violations were found, another visit was scheduled and/or enforcement actions initiated. Enforcement actions may include any of the following: Warning Notice, Notice of Violation(s), Administrative Civil Liability actions and monetary fines. These actions are reported in Section 8 - Programs for Illicit Discharges.

1 2 e ducationa ateria s

To facilitate educating business owners and their employees on proper stormwater BMPs the program developed and distributed bmp posters. The posters targeted automotive shops and restaurants and highlighted the most common sources of pollution from each industry. With narrative text describing the problem and solutions to stormwater pollution, the message of what not to do was graphically demonstrated through a serious of drawings of a cartoonish oaf doing everything wrong. Printed on both sides with English on one and Spanish on the other the posters became useful tools during inspections. The business community was receptive to the posters as well because it made their job of training staff and communicating proper best management practices easier.

1 2 ar eted usiness utreach ro ra ased on o utants o Concern

Individually, the Co-permittees have concentrated their efforts on businesses with the greatest potential to contribute known Pollutants of Concern (ammonia, bacteria, etc.). Businesses that have been targeted for education and outreach include agriculture-related facilities, commercial equestrian stable facilities, car washes, and mobile businesses such as vehicle detailers and concrete pumpers.

- In every jurisdiction a business licence must be obtained before a business begins to operate. This provides an oportunity for Permittees to educate the business on proper BMPs and allows them to easily track new businesses for future inspections.

- The Cities of Camarillo and Thousand Oaks both educate and inspect mobile businesses identified in the field as time permits during their normal inspection duties.

- The City of Simi Valley concentrated their efforts this year on requiring Stormwater Pollution Prevention Plans (SWPCPs) from their major industrial, food, and auto services facilities (160 SWPCPs were received and approved this year). They also perform geographically concentrated pretreatment inspections and issue permits to restaurants to reduce the POCs associated with sanitary sewer overflows (SSOs.)

- The City of Ventura educates and inspects mobile businesses as part of their program, concentrating efforts to make sure that mobile businesses do not discharge to storm drains. They also have established a hotline for illicit discharge reporting that has enabled easy reporting and improved response. Through this they have experienced a drop in reported illicit discharges from mobile businesses this year. Also, as part of their pretreatment inspections they require pumping records for grease traps and interceptors from each restaurant inspected, and hand out educational materials on problems with improperly maintained grease trap/interceptor and sanitary sewer overflows. In addition, Ventura is using educational materials to target the residential community in regards to discharging fats, oils, or grease from their kitchens to the sanitary sewer.

- The cities of Moorpark and Ventura have begun invoicing business for the required inspections. The inspection fees run from 40 to 137 an inspection and vary by city and the type of business. The City of Ventura has been able to recoup approximately 100,000 that would have otherwise come from the general fund.

1 enera ndustria er it aci ity Site Visit ro ra

The Permit requires each Co-permittee to identify industrial/commercial facilities potentially subject to the General Industrial Permit and target these facilities for education and outreach. Targeted facilities include wastewater treatment plants, landfills, large transportation yards and airports that may be publicly-owned by Co-permittees. However, this does not include public facilities such as municipal maintenance yards that may contain industrial types of activity. Co-permittee-owned facilities are not subject to the Industrial/Commercial Business Program (with the exception of the City of Thousand Oaks' Municipal Service Center). Requirements for these public facilities are discussed in the Section 7 - Program for Public Agency Activities. Inspection and enforcement of the General Industrial Permit is accomplished by the permitting agency, either the SWRCB or the RWQCB.

Co-permittees use a variety of methods to create their lists of facilities subject to this program element. Some of the resources used to facilitate identifying facilities included:

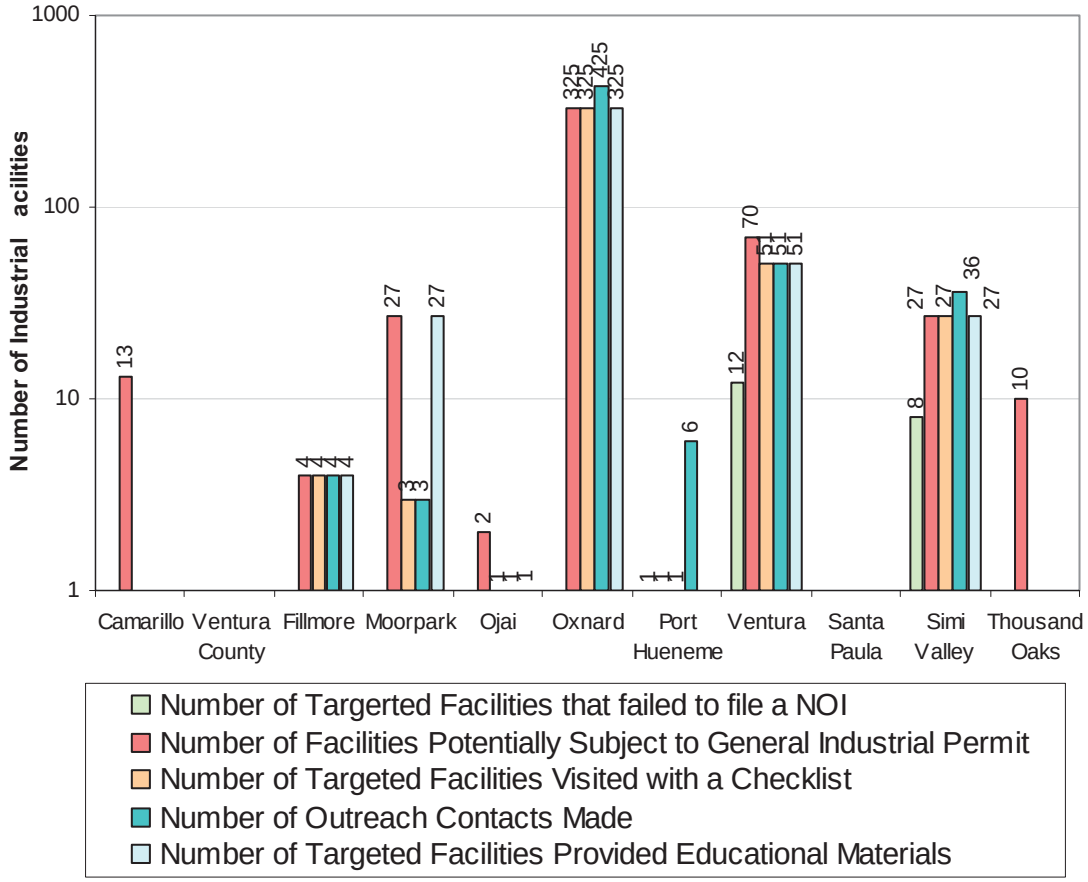
- State Water Resources Control Board (SWRCB) database of facilities covered by the General Industrial Permit;
- Hazardous materials inventories maintained by fire or environmental health departments;
- List of facilities subject to local wastewater utility's industrial pretreatment programs;
- City business license records;
- Commercially available business listings (e.g., the Dun & Bradstreet database);
- Telephone book business listings;
- Non-filers database; and
- Letters/Use surveys/Mailer with response requested/checklist, etc.

Once the list of facilities was compiled, the Co-permittees implemented an education outreach effort that provided an introduction of stormwater pollution prevention to those business owners/operators.

The Co-permittees strongly believe most business representatives are conscientious and want to do the “right thing” after they are made aware of what they need to do and how easy compliance can be achieved with simple changes. An informational site visit, in which an agency representative walks the site with the facility owner/operator, provides useful information about stormwater requirements and BMPs. These efforts have proven to be an effective approach for education and outreach.

In addition to the Co-permittees’ efforts, the RWQCB has performed a number of industrial site inspections in Ventura County. This has greatly increased the number of facilities educated about stormwater regulations and requirements. The RWQCB has also indicated an interest in coordinating with VCWPD to host an training workshop on the General Industrial Permit and its requirements. The Co-permittees look forward to this opportunity to work with RWQCB staff.

Over 400 industrial industrial facilities were visited countywide.



igure 4-3 Targeted usiness facilities sub ect to General Industrial Permitting

Due to the efforts of the Co-permittees during the last reporting period, many of the facilities targeted through this program have applied for permit coverage and have developed and implemented Storm Water Pollution Prevention Plans (SWPPPs).

igure 4-3 shows the total number of facilities targeted for an outreach contact and how many were provided educational materials within each Co-permittee’s jurisdiction. Note that the data reflect the

number of facilities contacted in this reporting period only, the first year of a two-year performance criterion.

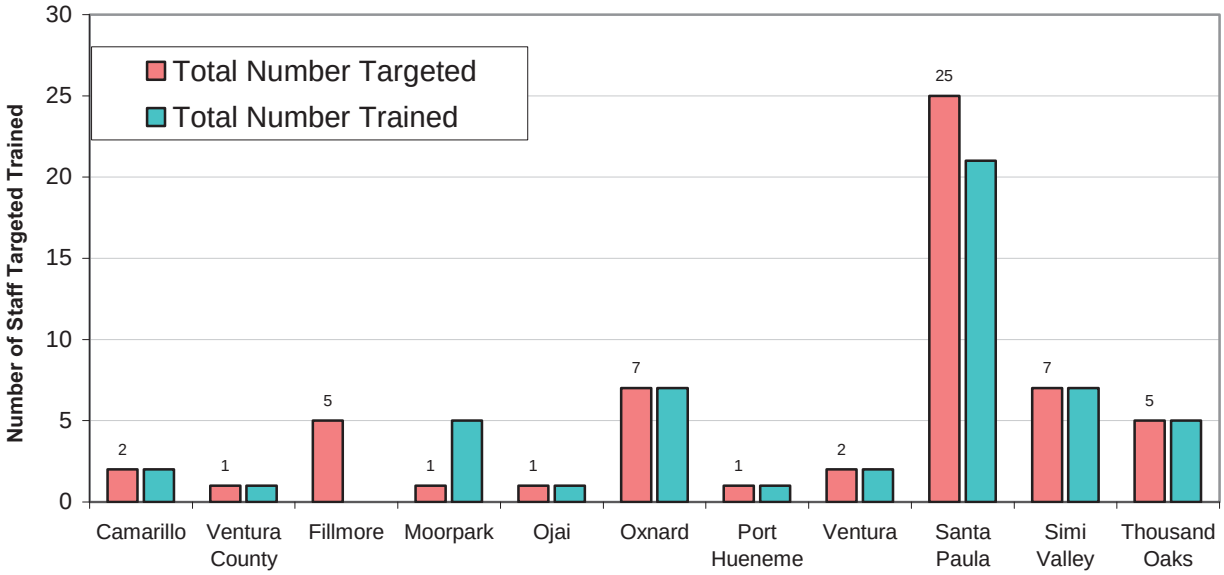
1 Stor ater ua ity Sta rainin

Each Co-permittee identified inspection staff and other personnel for training based on the type of stormwater quality management and pollution issues that they might encounter during the performance of their regular inspections or daily activities. Targeted staff may include those who perform inspection activities as part of the HA MAT, and wastewater pretreatment programs as well as staff who may respond to questions from the public or industrial/commercial businesses.

Staff was trained in a manner that provided adequate knowledge for effective business inspections, enforcement, and answering questions from the public or industrial/commercial operators. Training included a variety of forums, ranging from informal "tailgate" meetings, to formal classroom training, and self-guided training methods. When appropriate, staff training included information about the prevention, detection and investigation of illicit discharges and illegal connections (ID/IC). See **Section 8** for more information regarding ID/IC training.

During this reporting period, the Co-permittees trained 58 inspection staff in stormwater pollution prevention. **igure 4-4** depicts the number of staff trained in the program area for each Co-permittee. All eleven Co-permittees exceeded the performance criterion established in the SMP and by training more than the required 90 of targeted employees. Some cities such as Santa Paula uses the County Environmental Health Department for their inspections and therefore did not target any of their employees.

52 staff members were trained on business inspections.



igure 4-4 usiness Inspection Staff Trained

The Co-permittees continued to emphasize consistency among inspection programs, both in terms of stormwater requirements and inspection procedures countywide. The Co-permittees realize the importance of providing a "level playing field" for the business community and of requiring compliance

in a similar and clear manner. In order to facilitate countywide consistency, the Co-permittees met regularly to coordinate efforts and devise strategies for the inspection program at the Business & Illicit Discharge/Illegal Connection Subcommittee. As a part of this effort the Co-permittees encouraged the participation of the County of Ventura Environmental Health Department (EHD) in these discussions and to provide comments and guidance in the development of educational materials.

EHD continues to play an important role in the Co-permittees' efforts to inspect and assure compliance with stormwater regulations in the business community. EHD conducts stormwater inspections of automotive service facilities on the behalf of several Co-permittees, and also performs inspections for the County unincorporated program for food service facilities. Implementation of these program elements required the Co-permittees to spend significant time and resources on communication, coordination and comprehensive training, both for Co-permittee staff as well as EHD inspection staff.

Although the Co-permittees need the flexibility to develop inspection programs that are appropriate for local conditions, the Co-permittees have worked hard to incorporate similar baseline elements in their individual programs.

The Co-permittees will continue to work on coordination and providing the business community of Ventura County a fair, but effective, inspection program.

1 ducationa rochure or ndustria aci ities

Early on, during the 2001-02 reporting period, the Business & Illicit Discharge/Illegal Connection Subcommittee formed a small work group to develop an educational brochure for the General Industrial Permit Facility Site Visit Program. The work group spent considerable time and effort collecting information on the state's permit and closely examined what other municipalities have done to educate industrial facilities.

The work group consolidated this information and developed a tri-fold brochure that still has valuable use today. It includes the following specific requirements of the General Industrial Permit:

- Facilities subject to the General Industrial Permit must file a Notice of Intent (NOI) with the SWRCB; and
- A Storm Water Pollution Prevention Plan (SWPPP) must be developed and available on site.

1 Watershed rotection ips or usiness

The Co-permittees revamped a brochure in early 2008 aimed at businesses to provided information on prohibited illicit discharges. Printed in both English and Spanish they detailed preventative methods for controlling illicit discharges, what to do in the event of an illicit discharge and penalties that can be assessed for non-compliance. These brochures were created as part of the *Co unity or a C ean Watershed* campaign and are distributed during site visits.

Table 4.1 Permit Required Activities Industrial Commercial usiness Program	
Required Activity	**Performance Criteria**
Site Education/Inspection	Each Co-permittee will conduct site education/inspections of 90 of automotive, food service and other targeted businesses in their jurisdiction every two years.
	Businesses will be scheduled for a follow-up visit whenever evidence of an illicit discharge is found, within six months of the education site inspection.
Targeted Businesses/POCs	Co-permittees will target additional businesses based on Pollutants of Concern (POCs) as appropriate.
General Industrial Permit Facility Visits	Co-permittees will distribute educational materials to 90 of facilities identified as potentially subject to the General Industrial Permit and perform site visits as locally determined necessary to complete a checklist every two years.
	The checklist will include the SIC Code of the industrial user; indicate whether an identified site has obtained coverage under the State General Industrial Permit, and if a SWPPP is available on site.
Stormwater Quality Staff Training	Co-permittees will train 90 of targeted employees by January 27, 2001 and annually thereafter.

SECTION 5.0 PROGRAM OR PLANNING & LAND DEVELOPMENT

5.1 Program Description

The Co-permittees have developed and implemented a Program for Planning and Land Development to address stormwater quality in the planning and design of development and redevelopment projects. This program, outlined in the Stormwater Quality Management Plan (SMP), describes the minimum standards the Co-permittees are to follow to implement their own development planning programs in compliance with the Permit. The term "development project" as used in this Program encompasses those projects subject to a planning and permitting review/process by a Co-permittee. A development project includes any construction, rehabilitation, redevelopment or reconstruction of any public and private residential project, industrial, commercial, retail and other non-residential projects, including qualifying public agency projects.

To meet the goals and objectives of the Program, the Co-permittees attend Planning and Land Development Subcommittee meetings to coordinate and implement a comprehensive and consistent program to mitigate impacts on water quality from development projects to the maximum extent practicable (MEP). However, the Co-permittees may modify their programs to address particular issues, concerns or constraints unique to a particular watershed such as local geology or known water quality impairments.

Predevelopment Meeting

5.2 Program Implementation

2 1 Project Review and Conditioning

Development and redevelopment projects have the potential to discharge pollutants through stormwater runoff. Recognizing this potential and addressing it throughout the development process can reduce these impacts. The Co-permittees approach stormwater concerns early in the project development process when the options for pollution control are greatest and the cost to incorporate these controls into new development and redevelopment projects is least.

In planning and reviewing a development project, the Co-permittees consider three key questions with respect to stormwater quality control: 1. what kind of water quality controls are needed ; 2. where should controls be implemented ; 3. what level of control is appropriate During the planning and review process, the Co-permittees identify potential stormwater quality problems, communicate design objectives, and evaluate the plan for the most appropriate alternatives and design.

2 2 Stormwater uality Urban Impact Mitigation Plan (S UIMP)

The Permit requires the implementation of the Stormwater Quality Urban Impact Mitigation Plan (SQUIMP) for new development projects that fall into one or more of the following categories:

- Single-family hillside residences;
- 100,000 square foot commercial development;
- Automotive repair shops;
- Retail gasoline outlets;

- Restaurants;
- Home subdivisions with 10 or more housing units;
- Locations within, or directly adjacent to or discharging to an identified Environmentally Sensitive Area (ESA); and
- Parking lots of 5,000 square feet or more with 25 or more parking spaces and potentially exposed to stormwater runoff.

In addition, redevelopment projects of one of the SQUIMP categories that result in the creation, addition or replacement of 5,000 square feet or more of impervious surfaces, not a part of routine maintenance, are subject to SQUIMP requirements. If a redevelopment project creates or adds 50 or more impervious surface area to the existing impervious surfaces, then stormwater runoff from the entire area (existing and redeveloped) must be conditioned for stormwater quality mitigation. Otherwise, only the affected area of the redevelopment project requires mitigation.

The SQUIMP lists the minimum required BMPs that must be implemented for new development and redevelopment projects subject to the SQUIMP. The minimum requirements include the following BMPs:

- Control peak stormwater runoff discharge rates
- Conserve natural areas
- Minimize stormwater pollutants of concern
- Protect slopes and channels
- Provide storm drain stenciling and signage
- Properly design outdoor material storage areas
- Properly design trash storage areas
- Provide proof of ongoing BMP maintenance
- Meet design standards for structural or treatment control BMPs
- Comply with specific provisions applicable to individual priority project categories, which include the following: 100,000 square foot commercial development; restaurants; retail gasoline outlets; automotive repair shops; and parking lots.

2 BMP Selection and Design Criteria

The Co-permittees require project proponents to follow the countywide Technical Guidance Manual for Stormwater Quality Control Measures. This manual addresses the SQUIMP requirements of the NPDES permit, specifying design storm volumes and flows to be treated. Also, it identifies Pollutants of Concern from certain types of projects and provides various site, source and treatment control BMPs applicable to Ventura County and the SQUIMP project.

The Co-permittees consider site-specific conditions of development projects when determining which BMPs are most appropriate for a site. Prior to approving BMPs, the staff conditioning the project evaluates post-construction activities and potential sources of stormwater pollutants. The project proponent is required to consider BMPs that would address the potential pollutants reasonably expected to be present at the site once occupied. BMPs to protect stormwater during the construction phase are not a part of this conditioning process and are addressed through the grading permit process through the Construction Program.

SECTION 5.0 PROGRAM OR PLANNING & LAND DEVELOPMENT

In order to achieve appropriate stormwater quality controls, the Co-permittees use the following common criteria in screening and selecting, or rejecting BMPs during the planning stage with a priority given to non-proprietary designed BMPs:

- Project characteristics;
- Site factors (e.g., slope, high water table, soils, etc.);
- Pollutant removal capability;
- Short term and long term costs;
- Responsibility for maintenance;
- Contributing watershed area; and
- Environmental impact and enhancement.

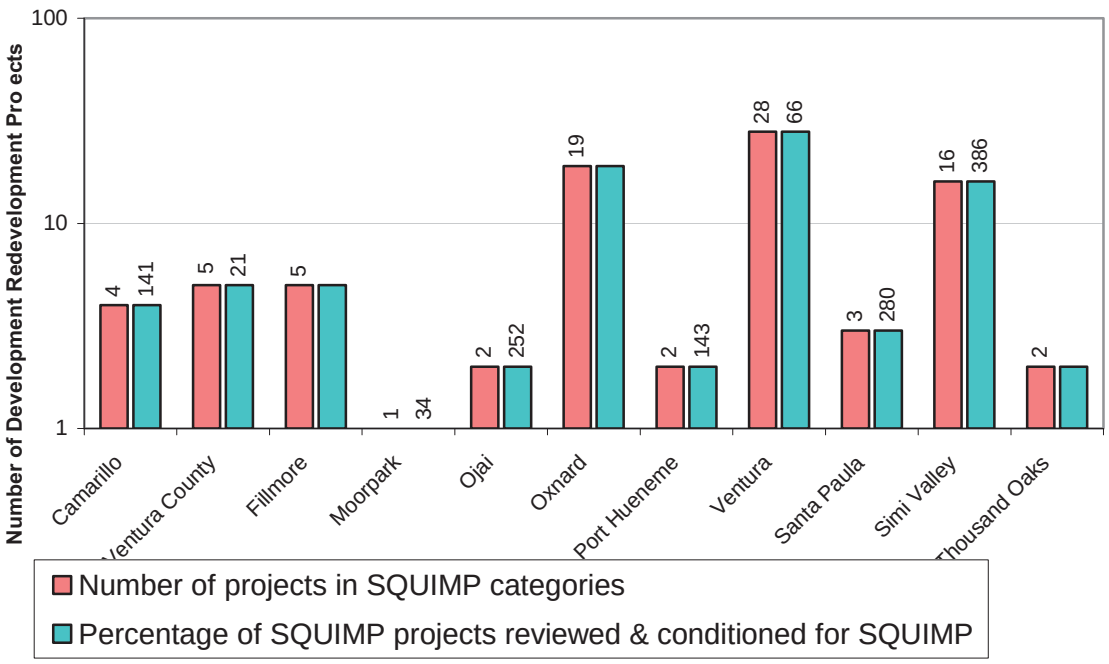
The BMP selection criteria listed above is applied by the Co-permittees in accordance with the overall objective of the Planning and Land Development Program, i.e., to reduce pollutants in discharges to the MEP. Some BMPs will clearly be more appropriate and effective in some site-specific situations than others, and BMP selections reflect this variability.

Low Impact Development Grass Swale at an Industrial Site in Oxnard

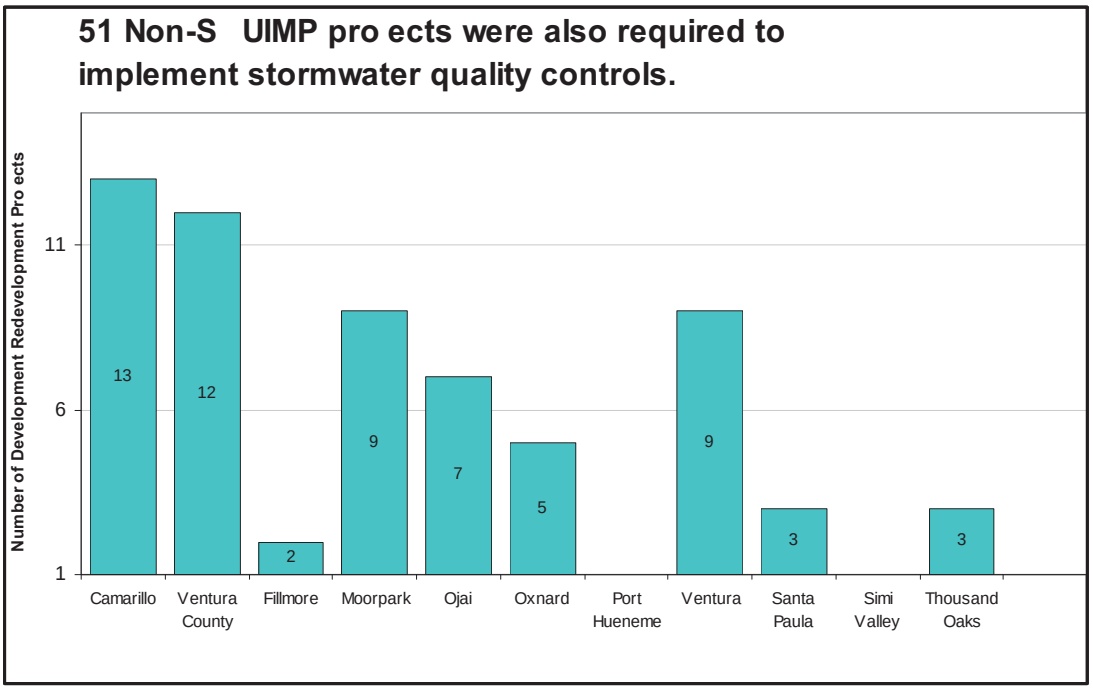
2 S UIMP Implementation

igure 5-1 indicates the number of SQUIMP category projects that were reviewed and conditioned to meet stormwater and SQUIMP requirements by each Co-permittee. 100 of all development and redevelopment subject to SQUIMP requirements were appropriately conditioned. These results exceed the performance criterion of 90 established in the SMP.

Besides the projects subject to SQUIMP requirements, the Co-permittees reviewed and conditioned 77 additional development projects for stormwater quality. These projects included structural improvement projects that did not qualify as one of the SQUIMP categories, but the Co-Permittees saw a need to protect stormwater quality through the design of the projects. **igure 5-2** illustrates the total number of projects reviewed by each Co-permittee and how many were conditioned for stormwater quality as SQUIMP or non-SQUIMP.



igure 5-1 Percentage of S UIMP pro ects conditioned for stormwater quality



Although not a permit requirement under the order 00-108, some permittees have begun programs to ensure that permanent BMPs are adequately maintained. This requires cataloging and tracking the BMPs that have been required and an understanding of the proper maintenance necessary. Methods used range from letters and educational visits to property owners and/or management explaining the purpose of the BMPs and the specific maintenance requirements to visual inspections to ensure that proper maintenance is being performed. In many instances, Permittees have found improperly maintained BMPs and followed through with enforcement action to correct the deficiencies.

2 *Environmental Review*

The California Environmental Quality Act (CEQA) sets forth requirements for the processing and environmental review of many projects. The Co-permittees use the CEQA processing and review as an excellent opportunity to address stormwater quality issues related to proposed projects early in the planning stages. The National Environmental Quality Act (NEPA) comes into play less often than CEQA, but may be included on projects involving Federal funding. Like CEQA, NEPA processing and review provides opportunities to address stormwater quality issues related to proposed projects early in the planning stages.

Each Co-permittee has reviewed their internal planning procedures for preparing and reviewing CEQA (and NEPA when applicable) documents and has linked stormwater quality mitigation conditions to legal discretionary project approvals. In addition, when appropriate, the Co-permittees consider stormwater quality issues when processing environmental checklists, initial studies and environmental impact reports.

2 *General Plan Revisions*

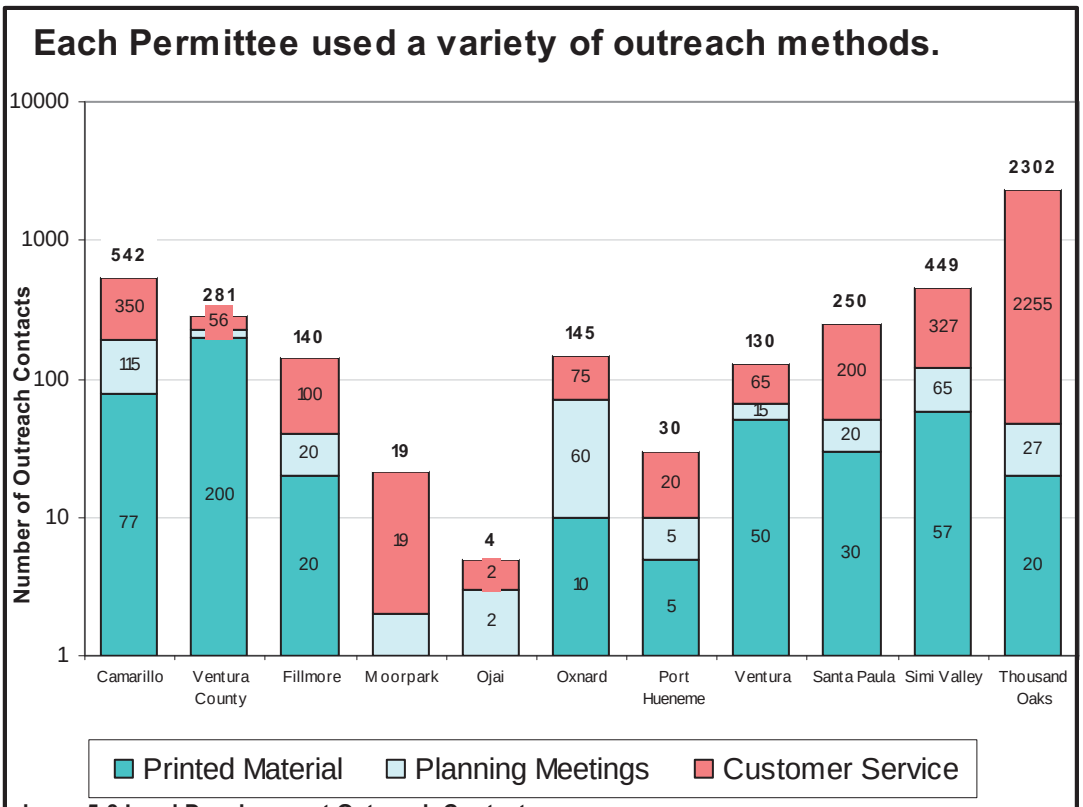
The Co-permittees' General Plans provide the foundation and the framework for land use planning and development. Therefore, the General Plan is a useful tool to promote the policies for protection of stormwater quality. The Co-permittees have included watershed and stormwater management considerations in the appropriate elements of their General Plans whenever these elements are significantly rewritten. **Table 5.1** indicates the scheduled date of a significant rewrite to the Co-permittees' General Plan. Note that some Co-permittees have already modified their General Plan to include stormwater requirements and thus no date is provided.

Co-permittee	Date of General Plan	Scheduled date for significant rewrite of General Plan
Camarillo	10/2003	Plan already updated to include stormwater
County of Ventura	10/1997	
Fillmore	4/2003	Plan already updated to include stormwater
Moorpark	1/1984	N/A
Ojai	5/1997	Plan already updated to include stormwater
Oxnard	1/1990	2009
Port Hueneme	8/1997	2015
Ventura	8/2005	Plan already updated to include stormwater
Santa Paula	1/1998	2009
Simi Valley	10/1988	12/1/2009
Thousand Oaks	7/1996	2019 - Plan already updated to include stormwater

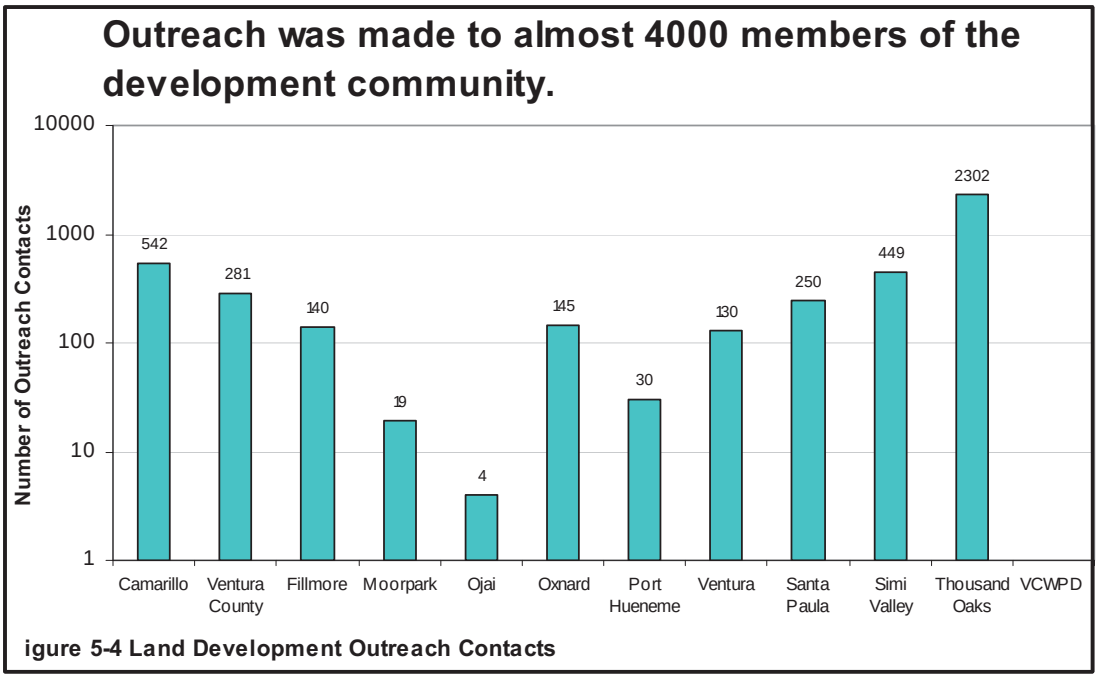
Table 5.1 Co-permittees' General Plan

2 Community Outreach Development

During the reporting period, the Co-permittees made 3292 contacts to development community representatives through customer service (counter assistance, phone conservations, discussions, etc.), professional society presentations, community group presentations, workshops/seminars, and educational outreach materials. These numbers are reflected in **igure 5-3** which indicates the percentage of outreach methods used, and **igure 5-4** show the number of contacts made by each Co-permittee.

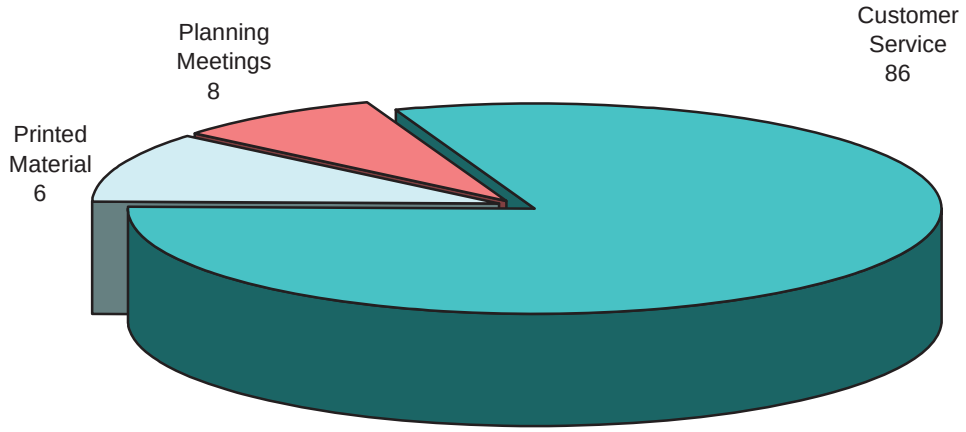


igure 5-3 Land Development Outreach Contacts



igure 5-4 Land Development Outreach Contacts

Countywide Development Outreach Contacts 4292

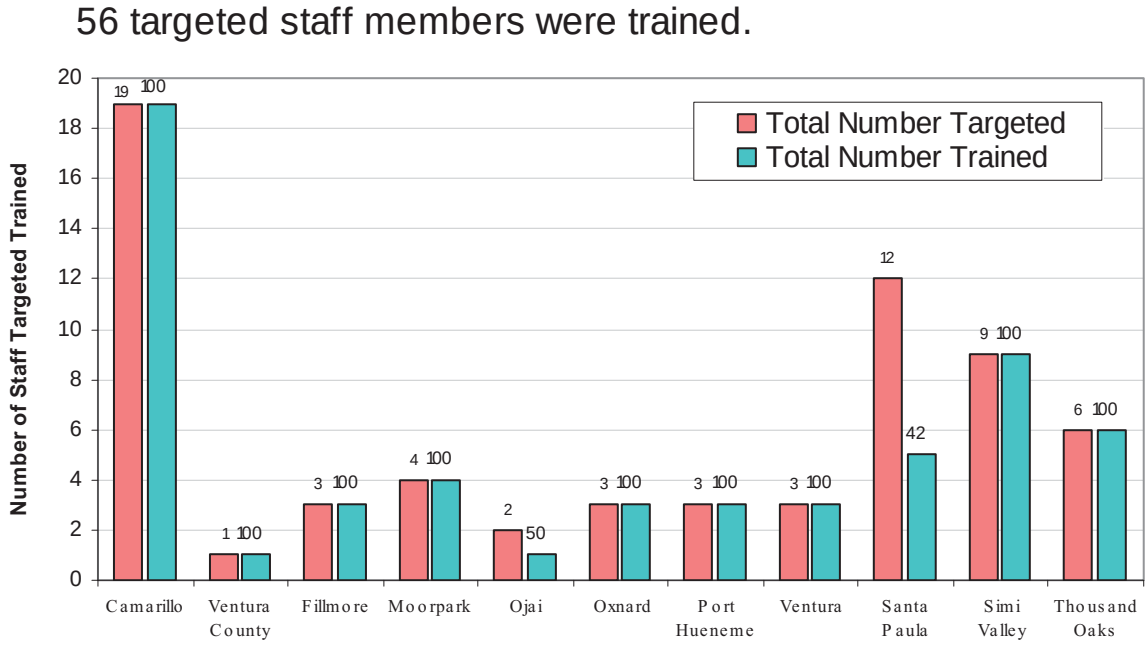


igure 5-5 Land Development Outreach Activities Used Countywide

2 Stormwater uality Staff Training

The Co-permittees identified employees for training regarding the requirements of the Planning and Land Development Program and SQUIMP requirements. Targeted employees include staff involved with planning, review, conditioning, permitting of development projects and administration of departments that conduct these activities.

Training methods varied amongst the Co-permittees and ranged from informal meetings to formal classroom training or self-guided training. During the reporting period, the Co-permittees trained over 75 development staff in stormwater management, plan review and SQUIMP requirements. **igure 5-6** depicts the number of staff trained in the program area for each Co-permittee. The majority of the Co-permittees exceeded the performance criterion established in the SMP and trained more than the required 90 of targeted employees.



igure 5-6 Land Development Staff Trained

6.1 Program Implementation

Reducing pollutants from construction activities has been a focus of the Co-permittees' compliance program since the permit's inception. The Co-permittees regulate construction activities and also have responsibility for the construction and renovation of municipal facilities and infrastructure. Major components of the Co-permittee's Construction Program include:

- Inspect sites required to submit SWPPPs for stormwater quality requirements a minimum of once during the wet season;
- Develop and implement a checklist for inspecting stormwater quality control measures at construction sites;
- Require proof of filing a Notice of Intent (NOI) for coverage under the State General Construction Permit prior to issuing a grading permit for all projects requiring coverage.

Additionally, the Construction Program provides construction site owners, developers, contractors and other responsible parties information on the requirements and guidelines for pollution prevention/BMP methods. To ensure construction sites are implementing the SWPPPs properly, each jurisdiction conducts inspections during the rainy season to verify the appropriateness and implementation of BMPs, taking enforcement action as necessary. Furthermore, training and outreach is done regularly to make certain implementation occurs consistently throughout Ventura County.

The Co-permittees attend Construction Subcommittee meetings to coordinate and implement a comprehensive program to mitigate impacts on water quality from construction sites to the maximum extent practicable (MEP). In order to facilitate effective inspections and to document compliance with this requirement the Construction Subcommittee developed a Stormwater Quality Checklist for Co-permittee use. The checklist and the meetings create countywide consistency in the programs, however, the Co-permittees may modify their programs to address particular issues, concerns or constraints that are unique to a particular watershed or to an individual municipality. The Subcommittee is comprised of representatives of the Co-permittees cities and other municipal staff from various departments (Engineering Services, Planning and Land Development and Inspection Services).

1 1 SW C /SW reparation Certi ication and p e entation

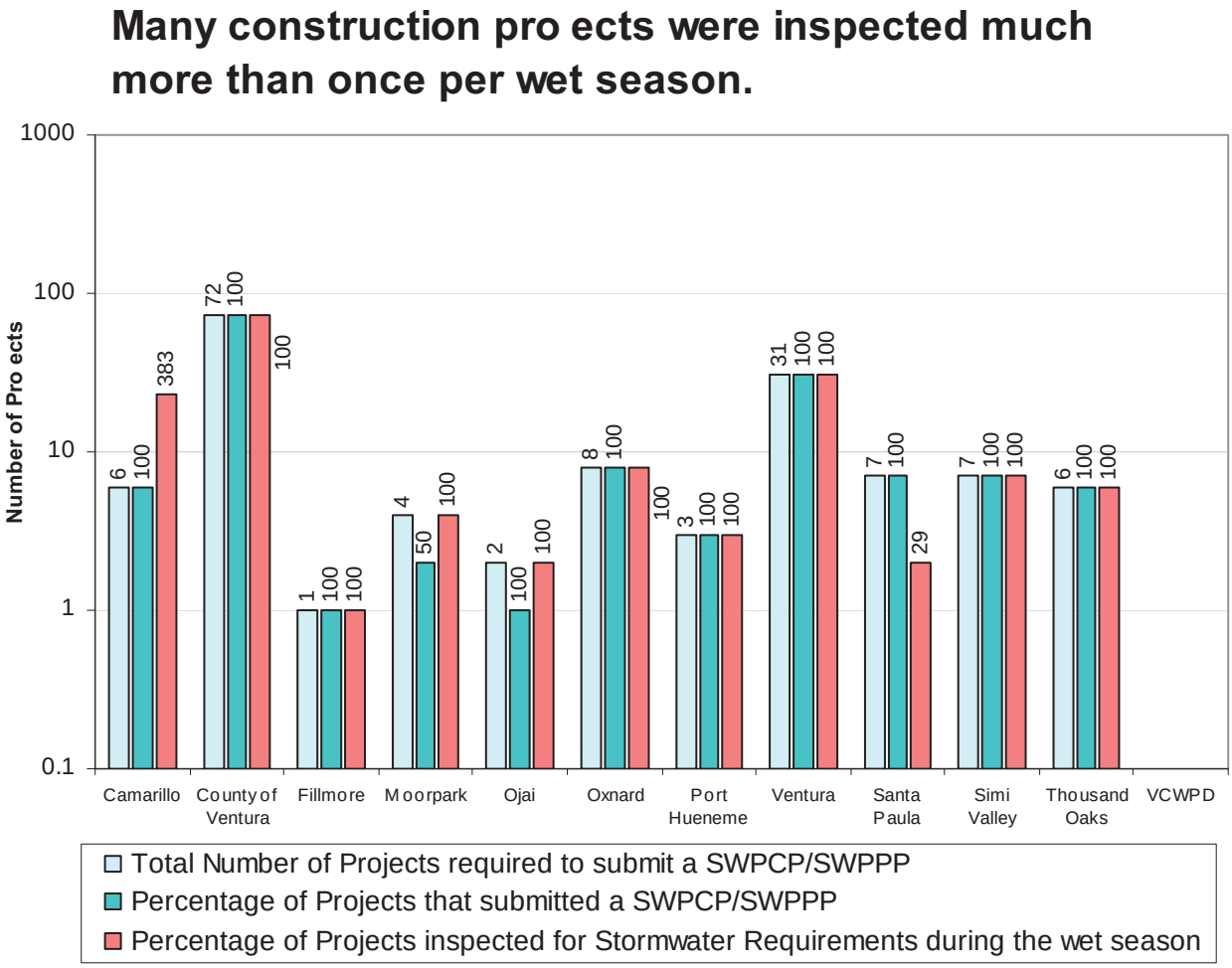
Prior to receiving a grading permit, the Co-permittees require a Storm Water Pollution Prevention Plan (SWPPP) be submitted for projects greater than one acre. Additionally, as is mandatory for all construction related activity disturbing one or more acres, Co-permittees require proof of filing an NOI for projects subject to the General Construction Permit. The SWPPP remains in effect until the construction site is stabilized and all construction activity is completed. The SWPPP includes identification of potential pollutant sources and the design, placement and maintenance of BMPs to effectively prevent the entry of pollutants from the construction site to the storm drain system. In addition, the Co-permittees require construction projects to include the following requirements:

- Erosion from slopes and channels will be eliminated by implementing BMPs, including but not limited to, limiting grading during the wet season, inspecting graded areas during rain events, planting and maintaining vegetation on slopes and covering erosion susceptible slopes.
- Sediments generated on the project site shall be retained using structural drainage controls
- No construction-related materials, wastes, spills or residues shall be discharged from the project site to streets, drainage facilities or adjacent properties by wind or runoff;
- Non-stormwater runoff from equipment and vehicle washing and any other activity shall be contained at the project site;

The Co-permittees have also incorporated SWPCP provisions in their own construction projects resulting in soil disturbance of one acre or more, located in hillside areas, or directly discharging to an

ESA. The Co-permittees include provisions delineating contractor responsibilities for SWPCP preparation, implementation and for performance of the work and ancillary activities in accordance with the SWPCP approved by the Co-permittee for the project. In some jurisdictions, SWPCPs were required and submitted for nearly all projects including those not exceeding Permit thresholds. This conservative approach underlines the importance the Co-permittees place on ensuring implementation of stormwater controls at construction sites.

igure 6-1 indicates the number of construction projects required to submit a SWPCP/SWPPP and the number of projects that submitted a SWPCP/SWPPP. This figure reflects the number of grading permits issued during this reporting period and does not necessarily reflect the number of active construction projects. The Co-permittees have consistently required projects to submit SWPCPs (and SWPPPs when required) with most Co-permittees exceeding the 90 performance criteria established in the SMP. This figure also details the number of inspections conducted at construction sites with a SWPCP during the wet season. The number of active projects requiring inspection does not always match the number of grading permits granted. A project may be operating under a grading permit granted the previous year, or the grading permits may have been granted after the wet season so there was no opportunity for a wet season inspection. Most of the Co-permittees met or exceeded the 90 performance criterion established in the SMP. Most Co-permittees inspect more construction sites than were required to submit a SWPCP, and inspect them more frequently for stormwater compliance than the permit requires.



igure 6-1 Construction Pro ects Required to Submit a SWPCP

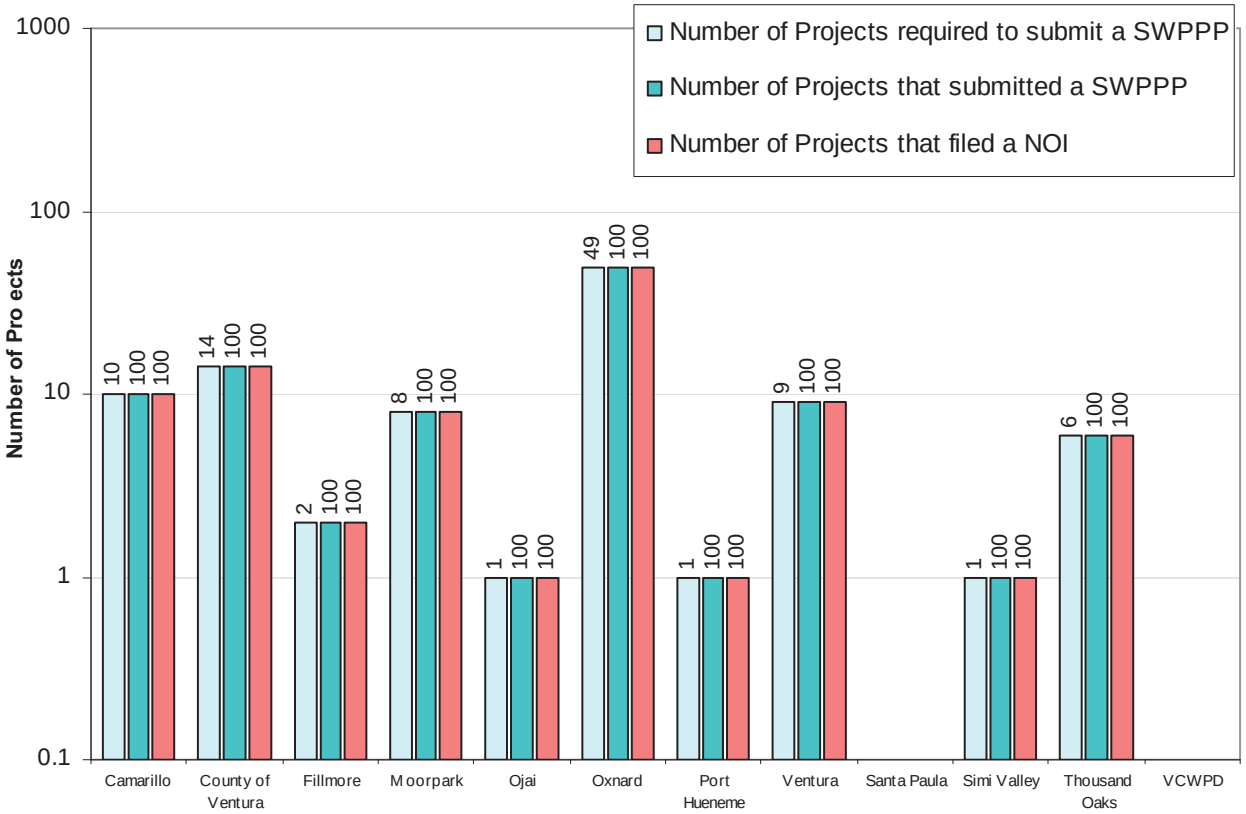
1 2 enera Construction er it

As mentioned above, the Co-permittees require all construction projects subject to the General Stormwater Permit for Construction Activities to submit proof of filing a Notice of Intent (NOI) prior to issuing a grading permit. Proof of filing a NOI may include a copy of the completed NOI form and a copy of the check sent to the State Water Resources Control Board (SWRCB) or a copy of the letter from the SWRCB with the Waste Discharge Identification Number (WDID) for the project.

In addition, the Co-permittees files NOIs with the SWRCB and pay the appropriate fees whenever Co-permittee construction projects qualify for coverage under the General Construction Permit. The NOIs and appropriate fees are filed prior to the commencement of any construction activity covered by the General Construction Permit. A copy of the NOI is kept with the project files and in the SWPPP for the project.

Projects subject to the requirements of the General Construction Permit currently include those involving clearing, grading, or excavation resulting in soil disturbances of at least one acre. Co-permittee emergency work and routine Co-permittee maintenance projects do not require preparation of a SWPCP/SWPPP, but are instead performed in accordance with the Program for Public Agency Activities.

100 compliance for pro ects required to file an NOI and submit an SWPPP.



igure 6-2 Construction Pro ects Required to Submit a SWPPP

No projects that required an NOI this permit year.

igure 6-2 presents the number of construction projects that required coverage under the General Stormwater Permit for Construction Activities and prepared a SWPPP. All co-permittees exceeded the 90 performance criterion for verifying the filing of a NOI established in the SMP.

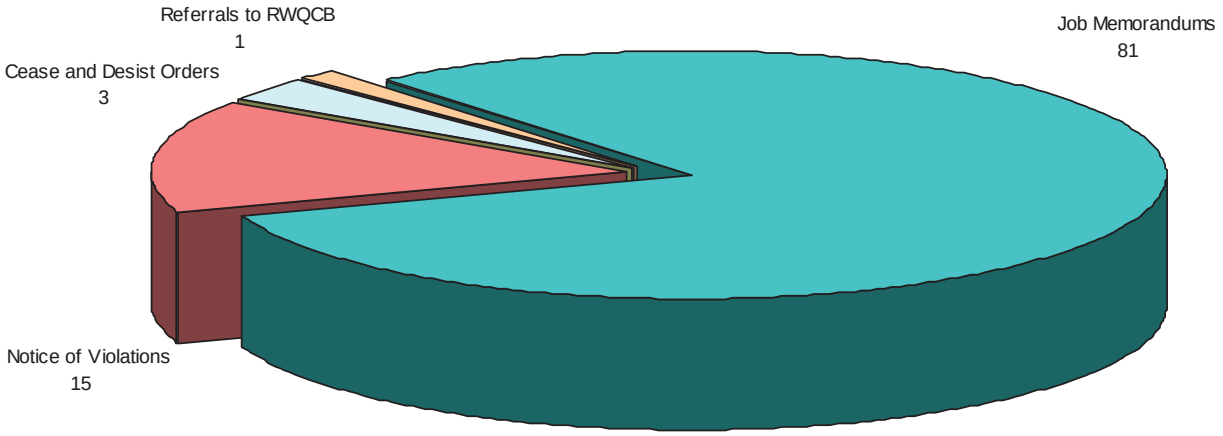
1 Construction Site nspection ro ra

The Co-permittees inspect all construction sites with SWPPPs a minimum of once during the wet season to determine if the SWPPP is adequately implemented. During this site inspection, a checklist is completed to document inspection results. If it is determined the SWPPP is not adequately implemented, or when there is evidence of a reasonable potential for sediment, construction materials, wastes, or non-stormwater runoff to be discharged from the project site, the Co-permittees will conduct a follow-up inspection within two weeks. But most often it is much sooner.

When a construction site fails to comply with the SWPCP/SWPPP, a Co-permittee implements the appropriate notification and enforcement procedures. There are five general levels of notification and enforcement for most stormwater related problems for construction projects. These are: Verbal Notification, Job Memorandum, Notice of Violation, Administrative Compliance Order, Stop Work Order. Sites that are permitted under the construction activities general permit are also referred to the RWQCB if they fail to achieve compliance in two weeks. The decision to use any level of compliance control is based upon the severity of the violation(s). Severe violation may result in all construction activities being stopped at the job site and not allowed to proceed until compliance is achieved.

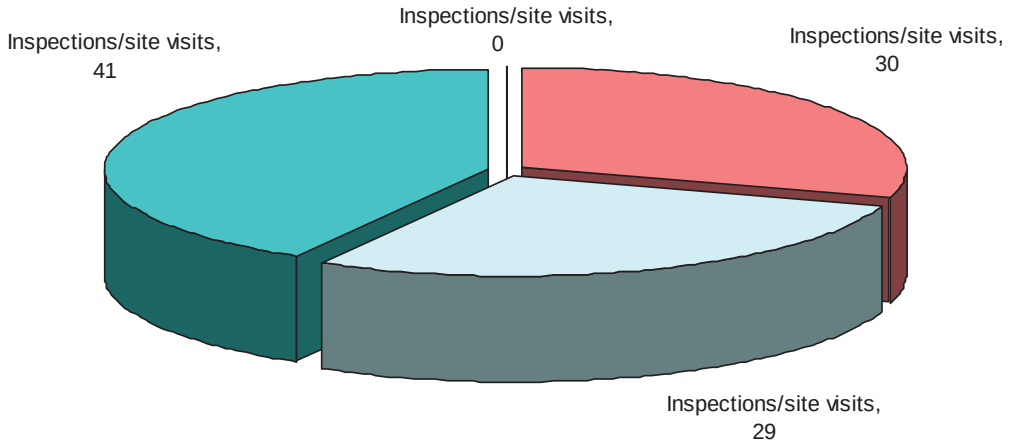
igure 6-3 indicates the number and types of enforcement actions taken by the Co-permittees countywide. A single construction project can be issued multiple violations, ranging from written notices to RWQCB referrals. There were 294 total enforcement actions countywide this year, overall that is significantly less than in previous years, but the use of notices of violation has increased as percentage of enforcement actions from 7 to 40 .

268 Enforcement Actions at Construction Site Were Ta en This Year.



igure 6.3 Enforcement Actions

Total Number of Outreach Contacts 3978



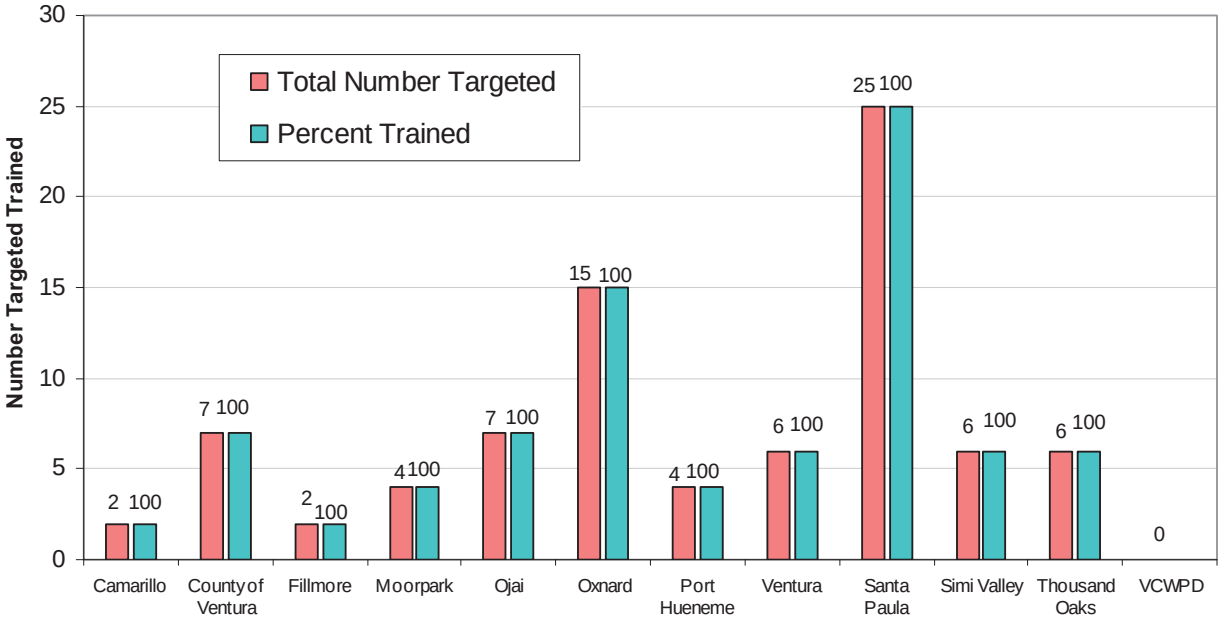
igure 6-4 Construction Outreach Methods Used Countywide

1 Stor ater ua ity Sta rainin

The Co-permittees targeted employees involved with construction engineering and inspection for training regarding the requirements of the Program for Construction Sites. Training methods varied amongst the Co-permittees and ranged from informal meetings, to formal classroom training or self-guided training. The Co-permittees also trained staff on the prevention, detection and investigation of illicit discharges and illegal connections (ID/IC) associated with construction activities. See **Chapter 8** for more information regarding ID/IC training.

During this reporting period, the Co-permittees trained 66 construction inspection staff in stormwater management, construction inspections, SWPCPs, SWPPPs, illicit discharge response, and non-stormwater discharges. **igure 6-5** depicts the number of staff trained in the program areas for each Co-permittee. All of the Co-permittees exceeded the performance criterion established in the SMP and trained more than the required 90 of the targeted employees.

100 of targeted employees received training on construction MPs.



igure 6-5 Construction Inspection Staff Trained

Table 6.1 Permit Required Activities Construction Site Program	
Required Activity	**Performance Criteria**
SWPCP Preparation, Certification & Implementation	Co-permittees will require 90 of construction projects meet the permit requirements, and submit a SWPCP prior to issuing a grading permit. For construction projects that prepare a SWPCP under this program, require implementation of the SWPCP during the entire course of construction.
Incorporating Best Management Practices (BMPs)	For construction sites requiring a SWPCP, Co-permittees will require the inclusion of the statement specified in the Permit from the project architect, or engineer of record, or authorized qualified designee and the certification specified in the Permit from the landowner. For Co-permittee construction projects requiring a SWPCP, Co-permittees will include the statement specified in the Permit from the project architect, or engineer of record, or authorized qualified designee and the Co-permittees certification specified in the Permit from an elected official, ranking management official or the manager of the construction activity.
Notice of Intent Requirement	For construction projects subject to the General Construction Permit, Co-permittees will require proof a NOI has been filed prior to issuance of a grading permit for 90 of all such projects.
Construction Site Inspection Program	Develop and implement a checklist for inspecting stormwater quality control measures at construction sites by January 27, 2001. For construction projects that required a SWPCP, inspect sites a minimum of once during the wet season for stormwater quality requirements and complete a stormwater quality control site inspection checklist. For sites having not adequately implemented the SWPCP or where there is evidence of or a reasonable potential for sediment, construction materials or wastes, or non-stormwater runoff to be discharged from the project site, a written notice (Job Memorandum, Notice of Violation, Administrative Compliance Order, Cease and Desist Order) shall be prepared and delivered to the owner or person responsible for implementing the SWPCP. For sites having not adequately implemented the SWPCP, conduct a follow-up inspection within two weeks to ensure compliance and complete a stormwater quality control site inspection checklist. For sites having not achieved compliance after the follow-up inspection and are covered by the General Construction Permit, Co-permittees will notify the RWQCB.
Construction Community Outreach	During meetings and inspections with developers, contractors, construction workers and others involved in construction projects and activities, discuss stormwater quality controls as appropriate. Notify developers of their responsibility for all discharges from the project site, including discharges from streets and storm drains, until final acceptance of the project by the Co-permittee. Notify developers of their responsibility includes discharges resulting from activities at owner occupied facilities. Co-permittees will develop a “New Owner” brochure and upon request provide these to developers, Home Owner Associations (HOAs), and residents to assist them with their efforts to prevent discharges from owner occupied portions of the project site.
Stormwater Quality Staff Training	Co-permittees will train 90 of targeted employees by January 27, 2001 and annually thereafter.

SECTION 7.0 PROGRAM OR PU LIC AGENCY ACTIVITIES

7.1 Introduction

The Co-permittees own and operate public facilities, and build and maintain much of the infrastructure of the urban and suburban environment throughout their jurisdictions. Public agencies have a dual role in preventing pollution in the operation and maintenance of these facilities. Some programs help remove pollutants before they reach receiving waters, e.g. street sweeping, and others are source control ensuring all the activities performed do not contribute to stormwater pollution to the maximum extent practicable.

Programs the Co-permittees have that remove pollutants are:

- Drainage facilities inspection and maintenance
  - Catch basin inlets
  - Open channels
  - Detention basins
- Roadway Operation and Maintenance
- Emergency Spill Response
- Solid waste and hazardous waste collection

All the other field activities have a potential to contribute to stormwater pollution if they are not performed appropriately. With the adoption of the second term permit, the Co-permittees were required to formally evaluate and revise the municipal activities program to prevent stormwater pollution to the MEP. This evaluation was accomplished through the development and implementation of the Model Municipal Activities Program outlined in the SMP. This program covered all aspects of public agency activities from Corporate Yard SWPCP, infrastructure maintenance and staff training. The objective of this model program is to provide the Co-permittees with:

- A program framework for reducing to the maximum extent practicable the adverse impacts that municipal activities may have on water quality;
- An iterative process by which they can effectively monitor and respond to problems as they are discovered; and
- Methodologies to meet permit requirements.

7.2 Pollutant Removal Programs

All Co-permittees routinely conduct preventive maintenance activities widely recognized as effective BMPs for pollutant control. These activities include solid waste collection/recycling, drainage facility maintenance, catch basin stenciling and emergency spill response. These efforts work at both removing pollutants from the storm drain system and prevent them from entering it in the first place.

2 1 raina e aci ity aintenance

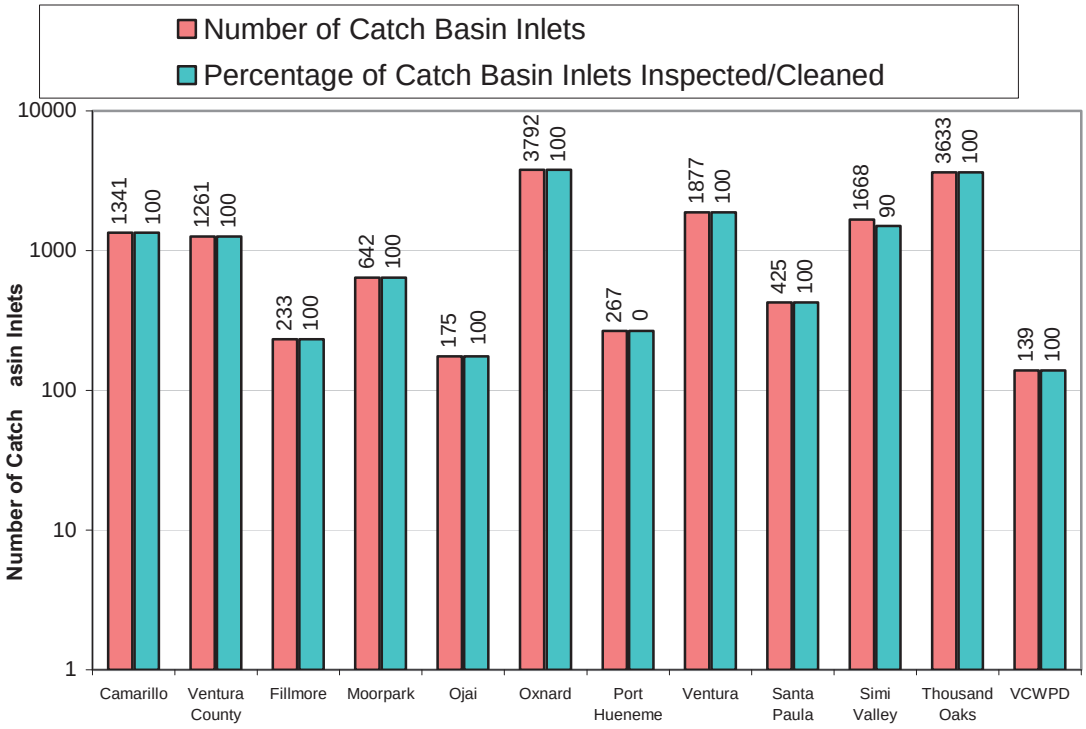
As required by the Permit, Co-permittees inspect catch basins and other drainage facilities that are a part of their system. These inspections are scheduled and completed at least once each year before the wet season (Permit-defined wet season begins October 1). Inspections include the visual observation of each catch basin, and open channels to determine if the facility has accumulated trash, sediment or debris requiring removal. All debris removed from the system is disposed of properly and therefore represents pollutants that would have likely been washed downstream to a receiving water.

Co-permittees also routinely inspect and clean their drainage facilities during the year on an as-needed basis. “Routine cleaning” for these facilities, means the removal of accumulations of trash, sediment and debris likely be washed downstream with the next runoff event or cause a loss of

hydraulic capacity and result in potential flooding. For catch basins, “as-needed cleaning” occurs whenever trash, sediment or debris accumulation is found to be at least 40 of capacity.

igure 7-1 depicts the number of catch basins/inlets inspected and/or cleaned by Co-permittees this reporting period in relation to the total number of facilities. Most of the Co-permittees achieved the 90 performance criteria established in the SMP. The major type of material removed by the Co-permittees is depicted in **igure 7-2** and the source of this material is depicted in **igure 7-3**.

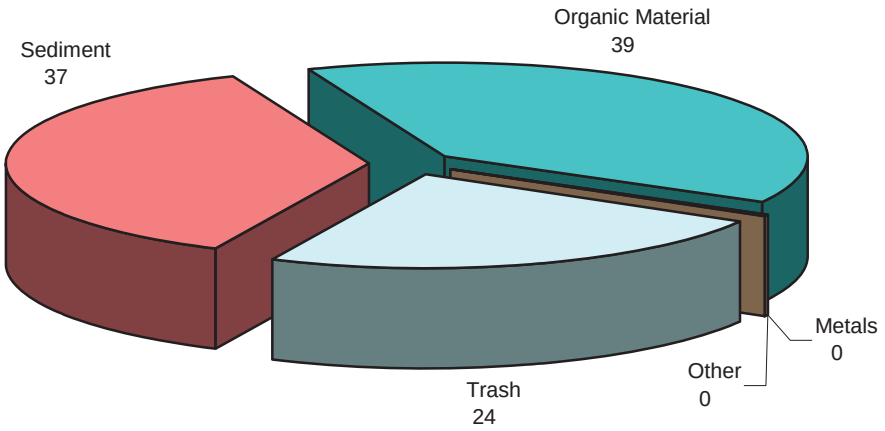
99 of catch basins were inspected and cleaned, if necessa before the wet season.



igure 7-1 Drainage acilities Cleaned - Catch asins Inlets

When performing cleaning activities, Co-permittees implement appropriate BMPs to prevent sediments and debris from being washed downstream. By removing this amount of material from the catch basin inlets, open channels and detention basins the Co-permittees make a significant contribution in preventing the passage of these materials in downstream receiving waters. During the reporting period, the Co-permittees tallied the collection of over 780 tons of solid debris from drainage facility maintenance activities.

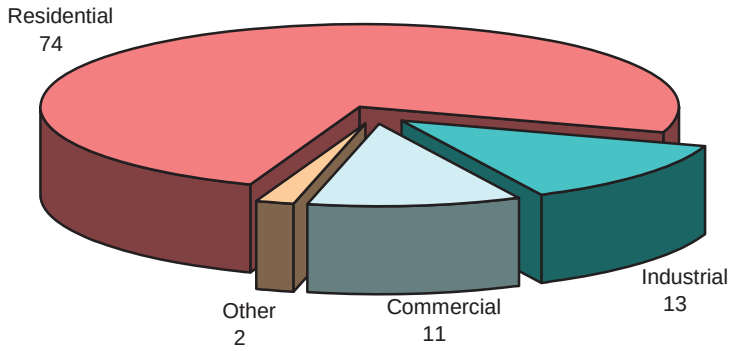
76 of the debris removed from catch basins was sediment and organic material.



igure 7-2 Countywide Catch asin Debris by Material

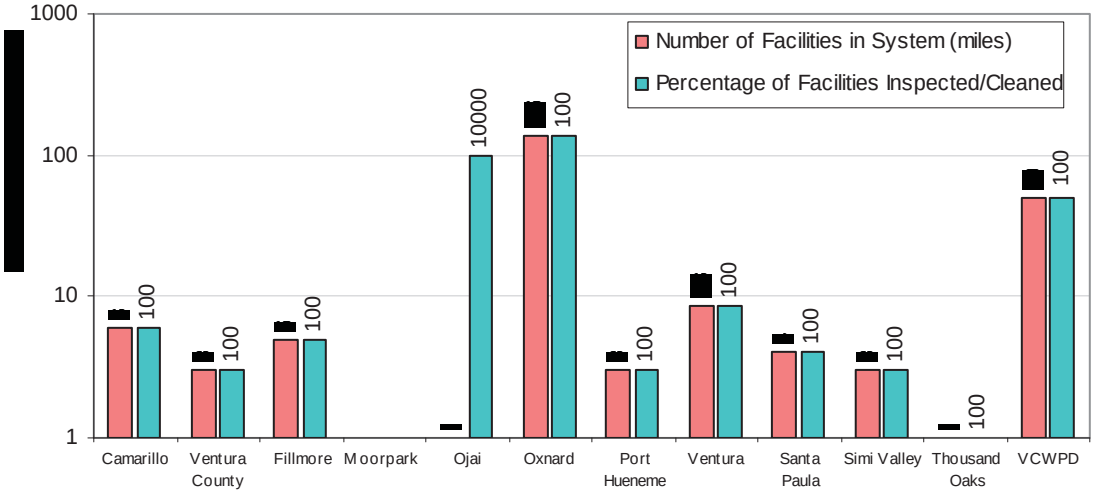
Because the design of detention and retention basins includes the accommodation of multi-year accumulations of debris and sediment, “routine cleaning” of these facilities, means the removal of barriers from the inlet/outlet of the facility to restore the operational design and efficiency of the facility. The debris/sediment is cleaned whenever the basin has filled to target levels established in the facility design or subsequently adopted operation and maintenance protocols for the facility. In addition, debris basins designed to capture debris in flows upstream of urban areas are not considered to be detention or retention basins for this report as there are no MS4s draining to them. Debris basins are inspected and maintained in accordance with applicable local policies and procedures appropriate for these facilities. Removal of accumulated debris and sediment is carried out either manually or by mechanical methods and in some cases such as large detention basins require special permits from the Department of Fish and Game and the Regional Water Quality Control Board.

Residential sources ma e up the ma ority of the debris collected.



igure 7-3 Countywide Catch asin Debris by Source

Over 16,000 Tons of Debris Were Removed from Channels and Ditche Countywide



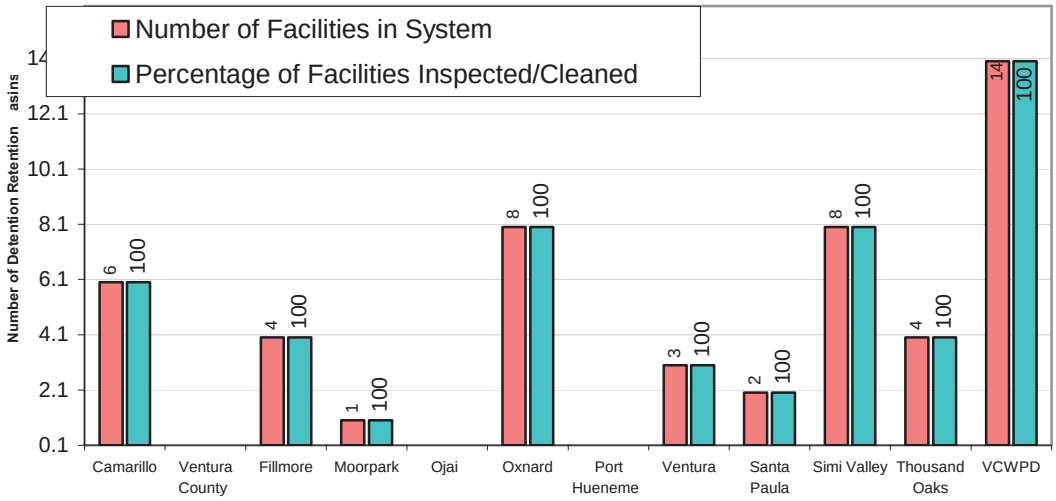
igure 7-4 Drainage acilities Cleaned - Channels Ditches

Note that all channels and/or ditches within the City of Moorpark's jurisdiction are maintained by VCWPD.

This reporting period the Co-permittees removed 3500 tons of debris from their detention/retention basins. Year to year variation in debris removal is due to the differing multi-year cleaning and maintenance schedules for each Co-permittee.

In addition to the debris removed from catch basin inlets, Co-permittees removed approximately 16,000 tons of debris from their channels/ditches. Variations in the amount of debris removed are to be expected from year to year as storm patterns, population and plant coverage differs from year to year. **igure 7-4** depicts the number of channels/ditches inspected and/or cleaned by Co-permittees this reporting period in relation to the total number of facilities. All of the Co-permittees achieved the 90 performance criteria established in the SMP. **igure 7-5** depicts the number of facilities inspected and/or cleaned by Co-permittees this reporting year in relation to the total number of facilities. All of the Co-permittees achieved the 90 performance criteria established in the SMP.

Over 26000 Tons of Debris was Removed from Detention asins

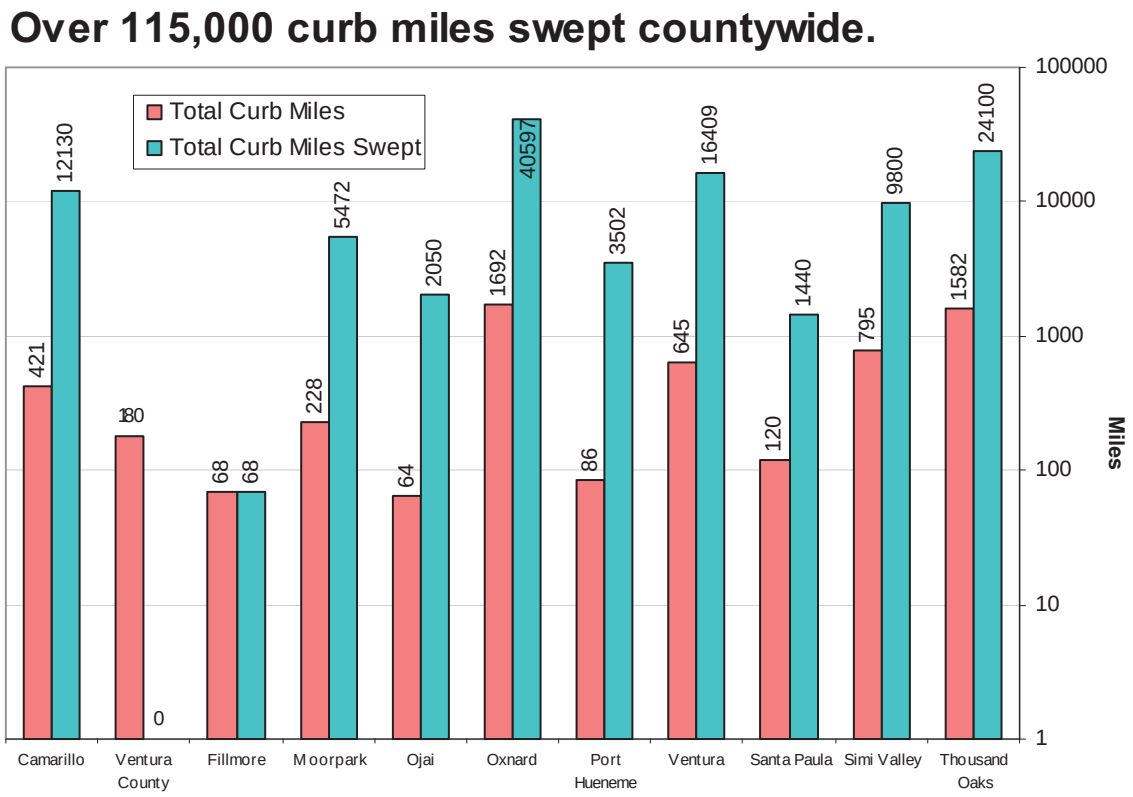


igure 7-5 Drainage acilities Cleaned - Detention Retention asins

2 2 Road ay peration and aintenance

Co-permittees have identified curbed streets within their jurisdiction and have implemented a sweeping program for these streets. At a minimum the streets are swept by the Co-permittees in accordance with the following classifications:

- High traffic downtown areas: sweep at least four times per month
- Moderate traffic collector streets and residential areas: sweep at least six times per year
- Other continuously bermed public streets: sweep at least one time per year prior to wet season



igure 7-6 Street Cleaning Effort
Note: Total miles swept included sections swept more than once

igure 7-6 indicates the street cleaning effort in total miles cleaned. Co-permittees have made excellent progress in their street cleaning efforts, with most Co-permittees exceeding the performance criteria established in the SMP.

For the purpose of streets "prior to the wet season" means sweeping the street at least once during the three-month period immediately prior to the wet season (July, August, September). "Continuously bermed" means a street in the permitted area where a berm exists on both sides of the street without breaks.

To increase the efficiency of the street sweeping, Co-permittees have made an effort to encourage voluntary relocation of street-parked vehicles on scheduled sweeping days. This has been achieved by placing temporary "no stopping" and "no parking" signs, posting permanent street sweeping signs and/or distributing street sweeping schedules to residents and businesses. Many of the Permittees have coordinated street sweeping to follow the routine trash collection days in order to remove any litter left in the streets by the trash removal service.

2 er ency Spi Response

All Co-permittees have the authority to control releases to the storm drain system through their individual Water Quality Ordinances and each Co-permittee has designated appropriate staff for enforcing their ordinance. Unfortunately, even with the ordinances in place there are occasions where a spill or release will need to be cleaned up. Cleanup can be as simple as dispatching a crew to pick up dumped trash, or a street sweeper or vacuum truck to clean an area or catch basin and storm drain after a known spill. It could also become a major multi-agency operation if hazardous or unknown materials are involved.

Emergency responses to water pollution incidents are routinely undertaken by Co-permittee designated staff, and other municipal departments and emergency responders may become involved if the material is a suspected hazard. Although each Co-permittee is responsible for responding to complaints and incidents within their jurisdiction, very often neighboring Co-permittees will coordinate their efforts with either very large events and/or spills that cross jurisdictional boundaries. The Co-permittees focus on responding quickly and efficiently to emergency spills with priority on mitigating the spills that have a potential to adversely impact the environment.

2 So id Waste Co ection/Recyc in

The Co-permittees each have solid waste collection programs for public, residential, commercial and industrial areas. Special programs for bulky items and hazardous waste provide the public with legal and economical disposal options and therefore help prevent the illicit disposals that can lead to pollution. The Co-permittees conduct public education outreach on these programs through a variety of methods including community newsletters, radio and television public service announcements, brochures and utility bill inserts. (For more information on solid waste collection/recycling programs see **Section 3**).

he City o Ventura s i ueroa stor drain diversion ith educationa si na e

2 ry Weather iversions

The City of Ventura, with the support of environmental and regulatory partners, obtained Clean Beaches Initiative funding from the State Water Resources Control Board to improve beach water quality at Surfers Point through the design and construction of two dry weather runoff diversions. Dry weather runoff from the City of Ventura s Figueroa Street and California Street storm drain systems continue to be successfully diverted into the sanitary sewer system, for treatment at the City s wastewater treatment plant, rather than flow directly into the ocean untreated. These diversions have operated year round since 2006, being turned on and off by rain gauges and computers.

7.3 Municipal Activities Program Implementation

A significant portion of the Co-permittees' activities includes the operation and maintenance of municipal infrastructure. These activities have the potential to impact stormwater quality and as such the Co-permittees have implemented a Program for Public Agency Activities. This program addresses the implementation of BMPs to control pollutant discharges to the maximum extent practicable (MEP).

In order to address the Co-permittees' potential impacts on stormwater, the following activities have been targeted:

- Activities at Co-permittee Corporation Yards
- Drainage System Operation and Maintenance Activities
- Roadway Operation and Maintenance Activities
- Pesticide, Herbicide and Fertilizer Application and Use
- Municipal Staff Training

1 Corporation ards

The Co-permittees utilize corporation yards to support operation and maintenance activities within their jurisdiction. Corporation yards are operated and maintained by the Co-permittees for the following activities or facilities:

- Vehicle and equipment
  - Storage and parking
  - Maintenance
  - Fueling
  - Washing and cleaning
- Sign painting activities
- Bulk material storage areas
- Employee support facilities, such as offices, locker rooms and meeting rooms

Table 7.1 Co-permittee Corporation Yards

Co-permittee	Corporation Yard Name	Location	SWPCP Developed & Implemented	SWPCP available on site
Camarillo	Camarillo Corporate Yard	283 South Glenn Drive	Yes	Yes
County of Ventura	El Rio Corporate Yard	682 El Rio Drive	Yes	Yes
	Moorpark Yard	7150 Walnut Cyn. Road	Yes	Yes
	Saticoy Public Works Corporate Yard	11251-A Riverbank Drive Saticoy, CA	Yes	Yes
Fillmore	Fillmore Public Works Yard	711 Sespe Avenue	Yes	Yes
Moorpark	Public Works/Parks Yard	675 Moorpark Avenue	Yes	Yes
Ojai	Ojai Corporate Yard	Signal Street	Yes	Yes
Oxnard	Oxnard Corporate Yard	1060 Pacific Avenue	Yes	Yes
	Regional Recycling Center	111 S. Del Norte Blvd.	Yes	Yes
	Oxnard Water Treatment Yard	251 S. Hayes Avenue	Yes	Yes
Port Hueneme	Municipal Service Center	700B E. Port Hueneme Road	Yes	Yes
	Service Yard Annex	746 Industrial Avenue	Yes	Yes
Ventura	SanJon Corporate Yard	336 SanJon Road	Yes	Yes
Santa Paula	Corporation Street Yard	903 Corporation Street	Yes	Yes
	Palm Avenue Yard	180 South Palm Avenue	Yes	Yes
Simi Valley	Simi Public Service Center	500 W. Los Angeles Avenue	Yes	Yes
Thousand Oaks	Municipal Service Center	1993 Rancho Conejo Blvd.	Yes	Yes
VCWPD	El Rio Corporate Yard	682 El Rio Drive	Yes	Yes
	Moorpark Yard	7150 Walnut Cyn. Road	Yes	Yes
	Saticoy Public Works Corporate Yard	11251-B Riverbank Drive Saticoy, CA	Yes	Yes

2 Stor Water o ution Contro an eve op ent

The Permit required the Co-permittees to develop and implement a SWPCP at designated corporation yards by July 27, 2002. As the Principal Co-permittee, VCWPD developed a SWPCP template to be used as a guide by the Co-permittees in the development of their plans for each of the designated corporate yard facilities.

Construction of Wash Rack Area

As shown in **Table 7.1 Co-permittee Corporation Yards**, all of the Co-permittees have modified and implemented the model SWPCP to suit their specific site's activities at their corporate yards.

The Co-permittees keep a copy of the SWPCP at the facility site and review it annually to see that information is current and accurate. BMPs that have been implemented are assessed to determine if they are working as planned, and any required changes are noted in the SWPCP.

As specified in the permit and reflected in the SWPCPs all hazardous and toxic waste storage areas are prohibited from discharging untreated stormwater runoff to the storm drain system. Fueling areas, vehicle maintenance and repair areas and temporary street maintenance material and waste areas are also prohibited from discharging untreated stormwater. All vehicle and equipment wash areas are to be self-contained and covered, or equipped with a clarifier and properly connected to the sanitary sewer. These specific site BMP requirements and associated deadlines were discussed and reviewed frequently by the Co-permittees during Public Infrastructure Subcommittee meetings. All of the Co-permittees have met the performance criteria established in the SMP, and have implemented appropriate BMPs to their hazardous and toxic waste storage areas, fueling areas, vehicle maintenance and repair areas, street maintenance material and waste areas.

Once implemented, the SWPCP requires annual inspections of the corporate yards to evaluate the implementation and effectiveness of the SWPCP. In order to facilitate this process, the Public Infrastructure Subcommittee began discussions on what components of the SWPCP should be evaluated and how best to conduct inspections. As a product of these discussions, the Subcommittee developed a model inspection form Co-permittees could implement at their yards. The Co-permittees plan to continue to address SWPCP implementation and annual inspections at the Public Infrastructure Subcommittee and utilize the lessons learned for improvement and inclusion in future inspection activities.

ie d aintenance Activities

Street maintenance activities and underground utility work have the potential to discharge pollutants to the storm drain system if appropriate protective measures are not implemented. Therefore, Co-permittees require roadway maintenance staff, roadway maintenance contractors and others to implement BMPs to control discharge of pollutants to the storm drain system as a result of roadway and utility maintenance activities. At a minimum, Co-permittees have included the following BMPs:

- Prohibit saw-cutting during a storm event of 0.25 inches or greater;
- Prohibit the discharge of untreated runoff from temporary or permanent street maintenance material and waste storage areas from entering the storm drain system.

Some Co-permittees contract for their street maintenance work and most issue street cut or similar permits for private work done in their streets. Co-permittees have addressed work under these contracts or permits by including contract provisions and/or permit conditions requiring street maintenance or repair work comply with the minimum requirements shown above and other BMPs required for protection of water quality. In the event of an emergency and roadway maintenance work must be conducted immediately in order to protect lives or property, Co-permittees make every effort to work in a manner protective of water quality, but public safety is a priority.

esticide er icide and erti i er App ication and se

The Permit required the Co-permittees to develop and adopt a standardized protocol for the routine and non-routine application of pesticides, herbicides (including pre-emergents) and fertilizers by July 27, 2001. The standardized protocol includes the following minimum requirements to control the discharge of pollutants to stormwater due to pesticide, herbicide and fertilizer application:

- Prohibit the application of pesticides, herbicides and fertilizers during rain events;
- Prohibit the application of pesticide, herbicides and fertilizers within one day of a rain event forecasted to be greater than 0.25 inches except for application of pre-emergents;

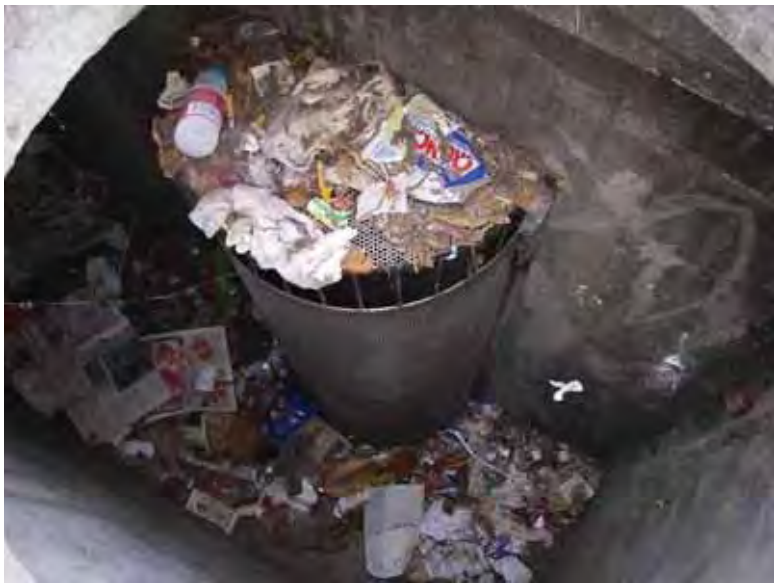
- Prohibit the application of pesticides, herbicides and fertilizers after a rain event where water is leaching or running from the application area; and
- Prohibit the application of pesticides, herbicides and fertilizers when water is running off-site from the application site.

In addition, Co-permittees require all staff applying pesticides to be either certified by the California Department of Food and Agriculture, or under the direct on-site supervision of a certified pesticide applicator, as defined in the standardized protocol. Co-permittees have also restricted the purchase and use of pesticides and herbicides to certified staff.

Co-permittees that contract out for pesticide applications have included contract provisions requiring the contract applicator meet all requirements of this program, including compliance with the standardized protocol, the prohibitions and requirements for certification and supervision of pesticide applicators.

i ot rash xc uder ro ra s

The City of Ventura started installing trash excluders in known problem areas near the end of the permit term last year. This permit term it has completed its first yearly cycle, with positive results. The five vertical excluders, all located inside of the catch basins and within high trash areas, retained large amounts of trash and added no additional costs to the annual catch basin cleaning. One excluder became fully clogged by grass clippings and caused flooding during a rain event. The source of the one-time, sudden accumulation of grass clippings was investigated, but is not known.

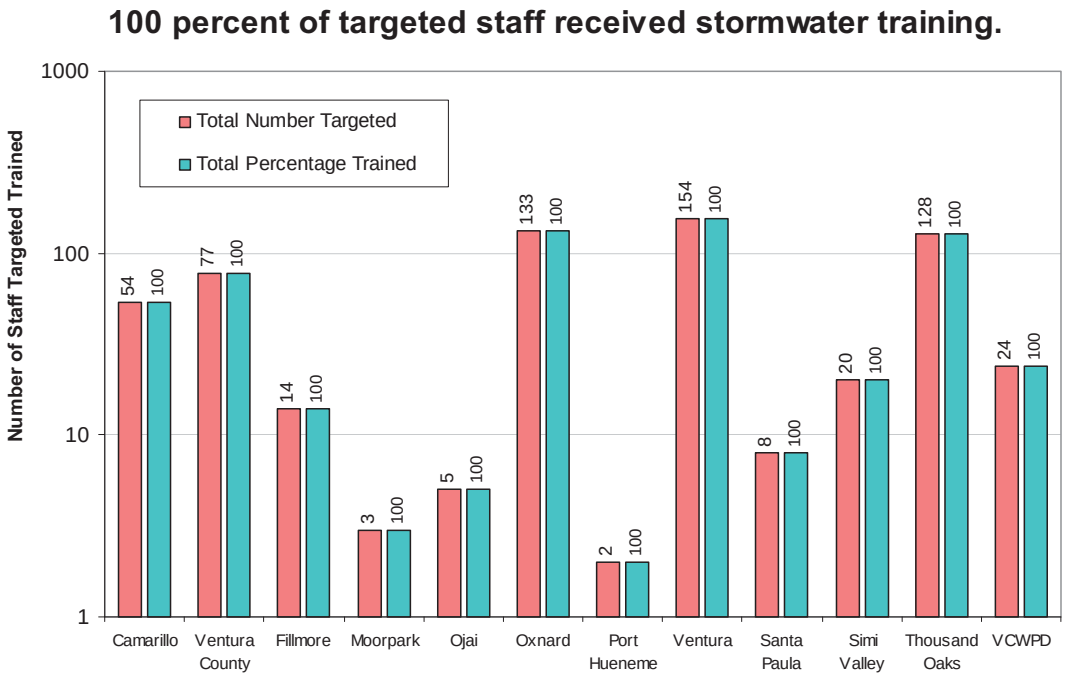


A trash exc uder in the City o Ventura

Stor ater ua ity Sta rainin

Each Co-permittee targets staff based on the type of stormwater quality and pollution issues they typically encounter during the performance of their regular maintenance activities. Targeted staff included those who perform activities in the following areas: stormwater maintenance, drainage and flood control systems, streets and roads, parks and public landscaping and corporation yards.

Training methods vary amongst Co-permittees and range from informal meetings, to formal classroom training or self-guided training. The Co-permittees also train staff on the prevention, detection and investigation of illicit discharges and illegal connections (ID/IC). (See **Section 8** for more information regarding ID/IC training).



igure 7-7 Public Agency Staff Trained

During the reporting period, the Co-permittees trained 619 municipal staff in stormwater management, SWPCPs, illicit discharge, response and non-stormwater discharges, this is almost a hundred more employees than last reporting year. **igure 7-7** depicts the number of staff trained in the program area for each Co-permittee.

8.1 Program Description

Example of an Illegal Connection

Illicit discharges and illegal connections can be concentrated sources of contamination to municipal storm drain systems. An illicit discharge is any intentional or unintentional discharge to a municipal storm drain that is either not composed entirely of stormwater, prohibited in our NPDES permit (Part 1,A,2,b), or not covered by a NPDES Permit. To reduce this source of pollution the Permittees have developed and implemented programs for the identification and elimination of illicit discharges and illegal connections to the municipal separate stormwater sewer system (MS4). Key components of these programs are public reporting, incidence response and enforcement actions. Some areas even have a cooperative effort with Police and Sheriffs to catch perpetrators by installing hidden security cameras in areas of frequent illegal dumping.

An illegal connection to the storm drain system is an undocumented and/or un-permitted physical connection from a facility to the storm drain system. An illicit discharge refers to the disposal of non-stormwater materials such as paint or waste oil into the storm drain or the discharge of waste streams containing pollutants to the storm drain system. Categories of non-stormwater discharges not prohibited (exempted or conditionally exempted) under the Permit (and detailed in the SMP) are listed in **Table 8.1**.

Table 8.1 Conditionally E empt Non-Storm Water Discharges

Non-stormwater Discharges
Water line Flushing
Discharges from potable water sources
Foundation drains
Air conditioning condensate
Water from crawl space pumps
Reclaimed and potable irrigation water
De-chlorinated swimming pool discharges
Individual residential car washing
Sidewalk washing
Discharges or flows from emergency fire fighting activities

The term “illicit discharges” used in this program includes several categories as follows:

- Incidental spills or disposal of wastes or non-stormwater. These may be intentional, unintentional or accidental and would typically enter the storm drain system directly through drain inlets, catch basins;
- Discharges of sanitary sewage due to overflows or leaks; usually incidental but may be continuous;
- Discharges of prohibited non-stormwater other than through an illegal connection. These typically occur as surface runoff from outside the public right-of-way (e.g., area washdown from an industrial site).

SECTION 8.0 PROGRAM OR ILLICIT DISCHARGES CONNECTIONS

To meet the goals and objectives of this program, the Co-permittees have developed a comprehensive illicit discharge/illegal connection program, which includes the following components:

- Public Reporting
- Incidence Response
- Inspections
- Enforcement
- Illicit Discharges/Illegal Connections Staff Training

1 1 u ic Reportin

Many illicit discharges are identified through public reporting of the situation. The goal of this component, in tandem with the Public Outreach component, is to educate the public and facilitate public reporting of illicit discharges and illegal connections. The baseline objectives are:

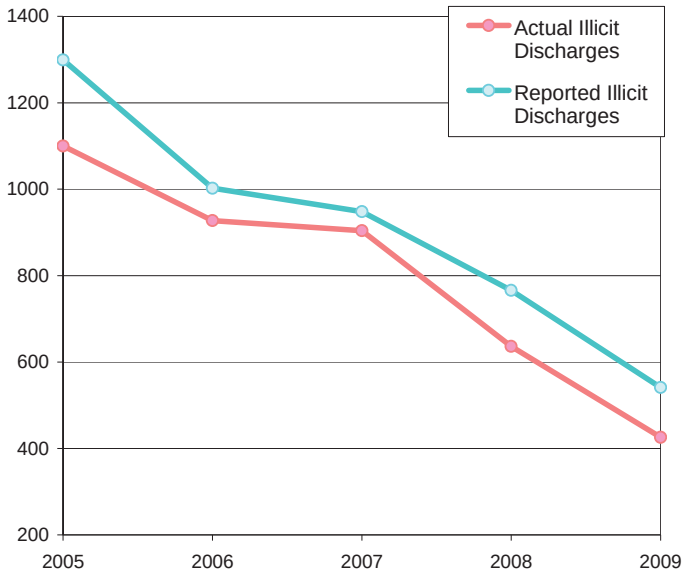
- Implement a program to receive calls from the public regarding potential illicit discharges and illegal connections, communicate and coordinate a timely response, perform all necessary follow up to the complaint, and maintain documentation.

- Provide educational material on non-stormwater discharges and why they are harmful to streams, and oceans and how to report them;

- Target the land development/construction community with educational material and provide workshops on stormwater quality regulations and illicit discharge prevention response; and

- Target the industrial/commercial community with educational material and provide workshops on stormwater quality regulations and illicit discharge prevention and response.
-

Illicit discharges have continually decreased for the last five years.



igure 8-1 Illicit Discharge Dumping Response

1 2 ncidence Response

Timely responses to reports of illicit discharges are necessary to have the opportunity to determine the source, identify the responsible party and initiate any cleanup to reduce pollutants from such discharge to the MEP. The baseline objectives include:

- Initiate response within 24 hours of receiving a report of discharge from the public, other agencies or observed by a Co-permittee field staff during the course of their normal daily activities;
- Investigate to determine the nature and source of discharge and eliminate through voluntary termination or enforcement action (when possible); and
- Educate identified responsible parties and initiate enforcement actions as necessary.

While the goal is to respond within 24 hours, most reports of illicit discharge are responded to within a few hours. Some Co-permittees have prioritized problem areas (where geographical and/or activity-related) for inspection, cleanup and enforcement using the methods defined in the program.

1 nspections

The discovery of potential or likely illicit discharges through business inspections will reduce the number of overall illicit discharges. Inspections of infrastructure can also detect and eliminate illegal connections to the MS4 and reduce pollutants discharged through such connections to the MEP. The baseline objectives include:

- Inspect the storm drain system to identify illegal connections during scheduled infrastructure maintenance by personnel;

- Connections to the storm drain system that are suspected or observed to be a source of an illicit discharge will be investigated to determine the origin and nature of the discharge;

- Use business inspections to identify and resolve potential illicit discharges and illegal connections; and

- Educate the business community on the environmental and legal consequences of illicit discharges.

1 n orce ent and ducation

Every time a responsible party is identified for an illicit discharge there is an opportunity for education and enforcement. Enforcement activity begins at the appropriate level as determined by the Co-permittees' authorized representative. For incidents more severe or threatening at the outset, enforcement starts at an increased level. Often times a verbal warning and requiring cleanup of the discharge is effective, if necessary the Co-permittee will charge the responsible party for cleanup services provided . Education of targeted audiences occurs through inspections of illicit discharges, businesses and construction activities. The importance of eliminating or mitigating non-stormwater discharges to local streams and channels is emphasized.

The capacity to issue civil citations has been added to the City of Oxnard's enforcement plan to ensure that repeat violators of local, state, and federal stormwater quality regulations are assessed a fine for their illicit (illegal) activities. The integration of this enforcement action allows the municipality to assess a 100.00 fee for those individuals or entities that receive a notice of violation (NOV) and thereafter again engage in the same illicit discharge activity. An additional 100.00 fine is assessed, per day, per violation, if a repeat violation is committed within a thirty (30) day period. If, after thirty (30) days, the same party is once again engaging in similar illicit activities then a 200.00 citation is given. A 500.00 fine is issued to third time participants of an illicit discharge committed sixty (60) days after the initial citation. Since current City policy allows the Mayor to delegate the authority to issue civil citations to designated employees, no changes to the City's stormwater ordinance were necessary. The only prerequisite imposed on these employees was that they receive training on civil citation writing from the City of Oxnard Code Enforcement Unit. Simply having the ability to issue a civil citation has proven to be enough of a deterrent to discourage/eliminate future occurrences of the same type of illicit activities from the local residents and the construction/building communities.

8.2 Program Implementation

2 1 Source Contro

The Co-permittees have a number of programs facilitating the detection of sources of illicit discharges. These programs include business and industrial facility site visits, drainage facility inspection, water quality monitoring and the wide distribution of public education materials that provide phone numbers and web addresses to encourage the reporting of spills.

Staff performing routine maintenance activities within the municipal storm drain system and other Co-permittee field personnel are trained to report suspected problems and/or discharges to the system. In addition to inspections, the Co-permittees receive notifications from a variety of sources such as the public and regional and/or local agencies.

Example of Illegal Dumping

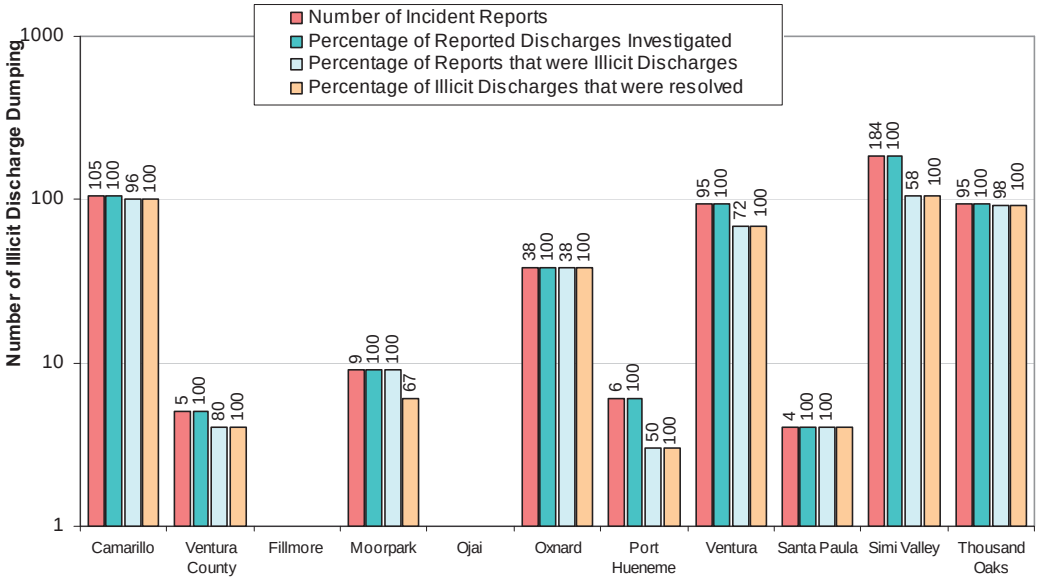
For the first few years as the program evolved and the public became aware of what was not allowed down storm drains reports of illicit discharges increased, however for the last five years reports illicit discharges have decreased. Since the public is more aware of illicit discharges this decrease likely represents a change in behavior and fewer pollutants reaching the storm drains through illicit discharges.

This reporting year, the Co-permittees continued to:

- Investigate the cause, determine the nature and estimate the amount of discharge for each reported illicit discharge/dumping incidents;
- Determine when possible the type of materials and source type for each reported illicit discharge/dumping incidents;
- Determine when possible the probable cause for the illicit discharge/dumping
- Conduct enforcement or educational activities to prevent similar discharges from reoccurring;
- Verify that reported illicit discharge/dumping incidents were terminated and/or cleaned;
- Refer illicit discharge/dumping or illegal connections to other agencies when appropriate;
- Identify and eliminate illegal connections; and
- Provide educational materials and contact numbers for reporting illicit discharge/dumping when conducting stormwater inspections.

igure 8-2 and **igure 8-3** show the results of the Co-permittees' efforts. All of the illicit discharges reported were resolved countywide (meaning they were cleaned up; referred to another agency; and/or educational material was distributed). The number of incidents investigated and addressed by the Co-permittees reporting discharges exceeds the 90 performance criteria established in the SMP. Note: These figures represent incidents Co-permittees responded to as part of the Stormwater Management Program. Incidents addressed by EHD Hazardous Waste Program or local CUPA may not be included in these figures.

100 of reports of illicit discharges were investigated and
100 of actual illicit discharges were resolved.



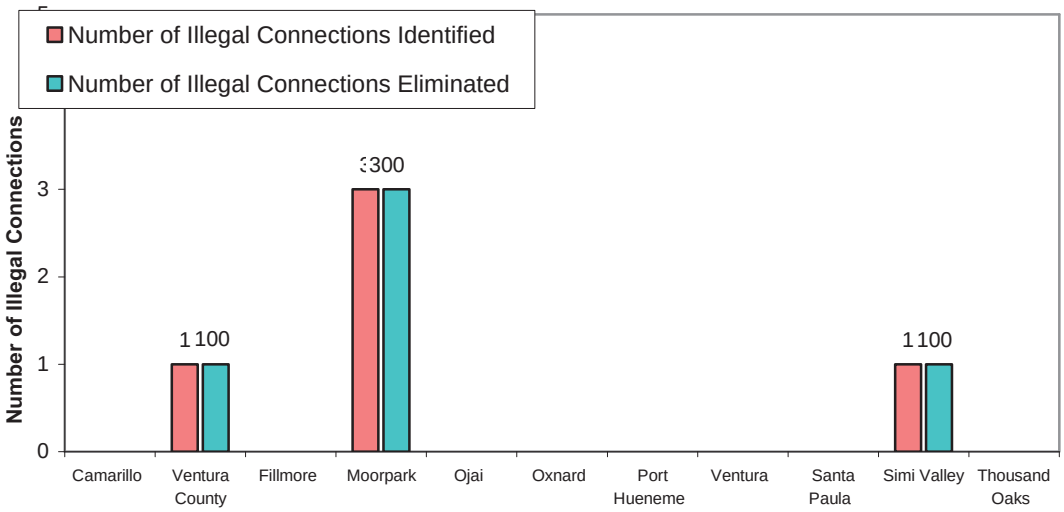
igure 8-2 Illicit Discharge Dumping Response

No illicit Discharges reported this year.

igure 8-3 indicates the number of illegal connections identified and eliminated. Each Co-permittee detects and eliminates illegal connections within its municipal storm drain system. Any illegal connection identified by the Co-permittees during routine inspections or reported by a third party is investigated. Appropriate actions are then taken to approve undocumented connections by permit procedure and/or pursue removal of those connections determined to be illicit connections and therefore not permissible.

If the discharge from an identified connection is determined to consist only of stormwater or exempted non-stormwater, the connection will be allowed to remain and will no longer be considered an illegal connection. Co-permittees may elect to issue a permit for the connection or allow the connection to remain if information on the connection is documented; or the discharge will be permitted through a separate NPDES permit; or the connection will be terminated through voluntary action or enforcement proceedings.

100 of illegal connections were eliminated.



igure 8-3 Illegal Connection Response

No illegal connections reported this permit year.

If evidence of an illegal discharge is detected in an MS4 and the source is not apparent, a source investigation may be conducted to determine if the discharge is being conveyed through an illegal connection. Depending on the type of illicit connection detected, the Co-permittees may eliminate the connection by means of appropriate legal procedures. Follow-up compliance is conducted to ensure any required abatement activities have been successfully and adequately implemented.

Owners of existing drains without appropriate permits (including encroachment permits) are notified to comply. For those drains where the owner is unresponsive or cannot be identified, each Co-permittee is responsible for deciding whether to formally accept the connection as part of their public drainage system or cap it off.

2 2 Source eter ination

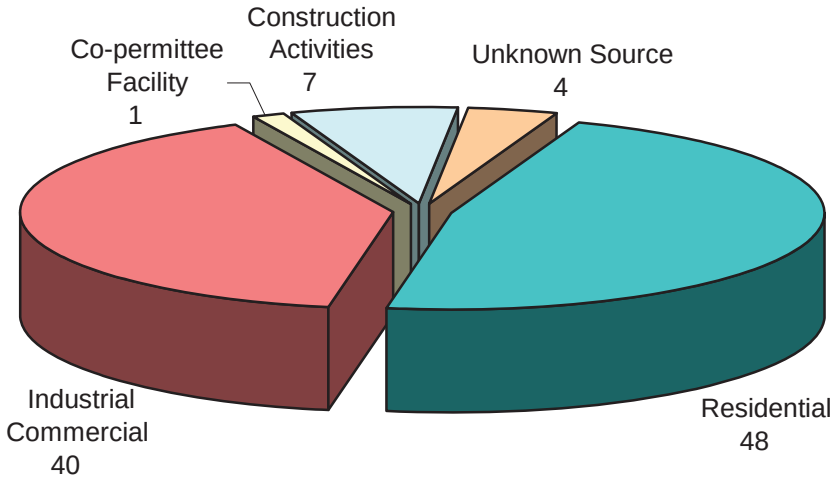
As part of their field investigation of reported illicit discharges/dumping incidents, the Co-permittees attempt to determine the material's source. This investigation begins at the surface drainage system in the vicinity of suspected illicit discharges. This may include accessible areas in the public right-of-way adjacent to residences and businesses, catch basins, open channels near known points of discharge, and upstream manholes. If the source and responsible party can be determined, Co-permittees take one or all of the following actions when appropriate:

- Voluntary cleanup/termination;
- Initiate enforcement procedures;
- Take steps to prevent similar discharges from reoccurring.

When the source cannot be determined, the appropriate department or contractor will be notified to contain and clean up the material. Because these situations and materials can vary, procedures vary as well. In general, the following are steps that are taken by Co-permittees to determine sources:

- Verify location of the spill/discharge;
- Containment and cleanup;
- Investigate the cause (look for origin);
- Determine the nature and estimate the amount of illicit discharge/dumped material;
- When appropriate, refer documented non-stormwater discharges/dumping or illegal connections to the proper agency for investigation; and
- If appropriate, notify the RWQCB and/other proper agencies.

The ma ority of illicit discharges are from residential and commercial industrial sources.



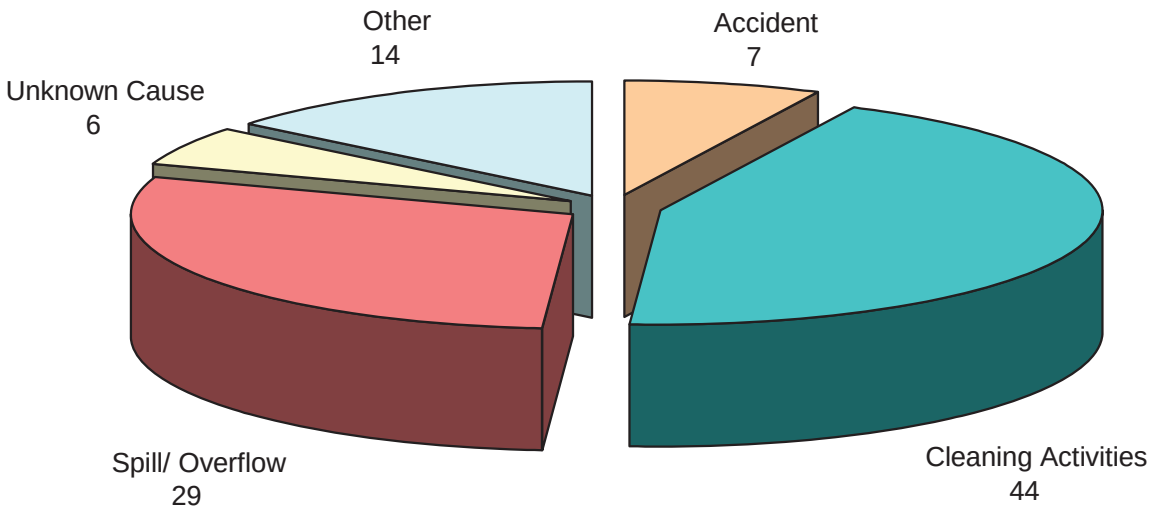
igure 8-4 Source of Material Discharged during Illicit Discharge Events Countywide

During an illicit discharge investigation the source of the discharge is determined. Residential and industrial sources continue to be the dominate sources of illicit discharges. Since these two sources account for 88 of all illicit discharges, the Co-permittees plan to continue targeting business facilities and residents for comprehensive educational outreach. In addition, Co-permittees continue to cross-train targeted staff on how to identify and report illicit discharges. **igure 8-4** presents a breakdown of illicit discharges by source.

igure 8-5 indicates the likely cause for illicit discharges countywide. The vast majority of incidents resulted from cleaning activities, which the Co-permittees define as *any activity intended to ash tidy up or ake c ean*. In order to reduce the number of illicit discharges and to prevent similar incidents from reoccurring, the Co-permittees have taken a variety of actions. Some Co-permittees provide additional training to field staff (such as Building Inspectors, Engineering Inspectors, maintenance personnel) to look for "potential" discharges. When "potential" discharges are found, Co-permittees provide educational material to the appropriate resident, business owner, etc. In addition, other Co-permittees distribute educational material with all encroachment and building permits. Other Co-permittees publish articles in local magazines regarding pool maintenance, vehicle maintenance and

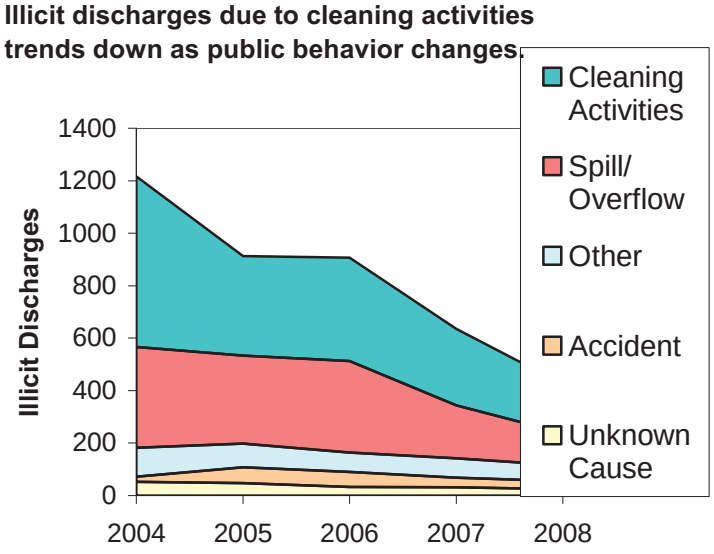
homeowner projects. Some Co-permittees also distribute letters, brochures and informational door hangers directly to homeowners during residential street sweeps in known problem areas.

Cleaning activities are still a ma or source of illicit discharges.



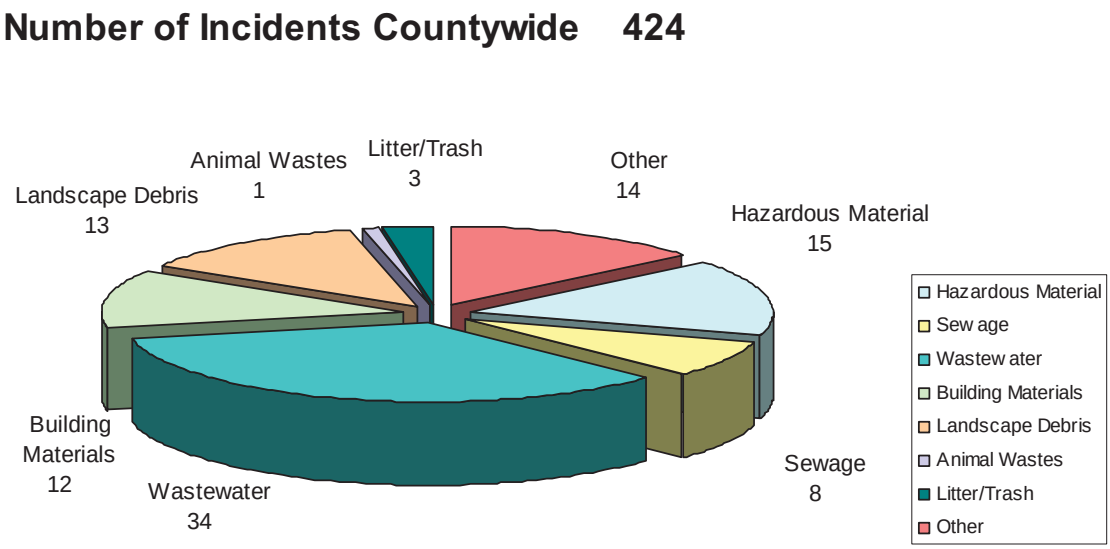
igure 8-5 Probable Cause of Illicit Discharges Countywide

It is projected that over time there will be a shift in the cause of illicit discharges as the public becomes more educated and encouraged to change their behavior. The number of Illicit discharges due to cleaning activities should drop, and that has been observed. Also, the number due to spills and overflows should lower as better practices are employed to prevent them. Ideally, the majority of discharges will be due to accidents because they are least likely to be changed by the program's efforts. **igure 8-6** shows how the cause of illicit discharges has changed over the last five years.



igure 8-6 Cause of illicit discharges over past five

igure 8-7 shows the type of material discharged. Wastewater continues to be the most often type of material discharged. For definitions of categories for material type see **Table 8.2**.



igure 8-7 Type of Material Discharged during Illicit Dishcarge Events Countywide

Table 8.2 details the categories used by the Co-permittees to describe the material type of an illicit discharge. The definitions of these various categories are solely for facilitating the Co-permittees with their characterization of material type for annual report consistency. The Co-permittees are aware these definitions are by no means all-inclusive nor necessarily how another agency or person would define these categories. The Co-permittees used a variety of resources for assistance in defining these categories including the Ventura County Environmental Health and the RWQCB websites, and the Environmental Protection Agency's glossary of terms and educational outreach materials.

Material Type & Definitions	
TYPE	DEFINITION
Hazardous Material	By-products of society that can pose a substantial or potential hazard to human health or environment when improperly managed. Posses at least one of the four following characteristics (ignitability, corrosivity, reactivity, or toxicity), or is identified as a listed waste (e.g., oil, used anti-freeze, hydraulic fluid)
Sewage	The waste and wastewater produced by residential and commercial sources and discharged into sewers, includes the sludge produced by Publicly Owned Treatment Works.
Wastewater	The spent or used water from a home, community, farm or industry that contains dissolved or suspended matter.
uilding Materials	Any debris associated with construction activities used to construct a building and/or stand/alone facility, such as plaster, dry-wall, nails, wood, etc.
Landscape Debris	Excessive eroded soils, sediment and/or organic materials.
Animal Wastes	Discharge from confinement facilities, kennels, pens, recreational facilities, stables, show facilities and residential yards.
Litter Trash	Synthetic consumer by-product
Other	Any remaining materials that do not fit into the above mentioned categories.

Table 8.2 Illicit Discharge Material Type

2 n orce ent

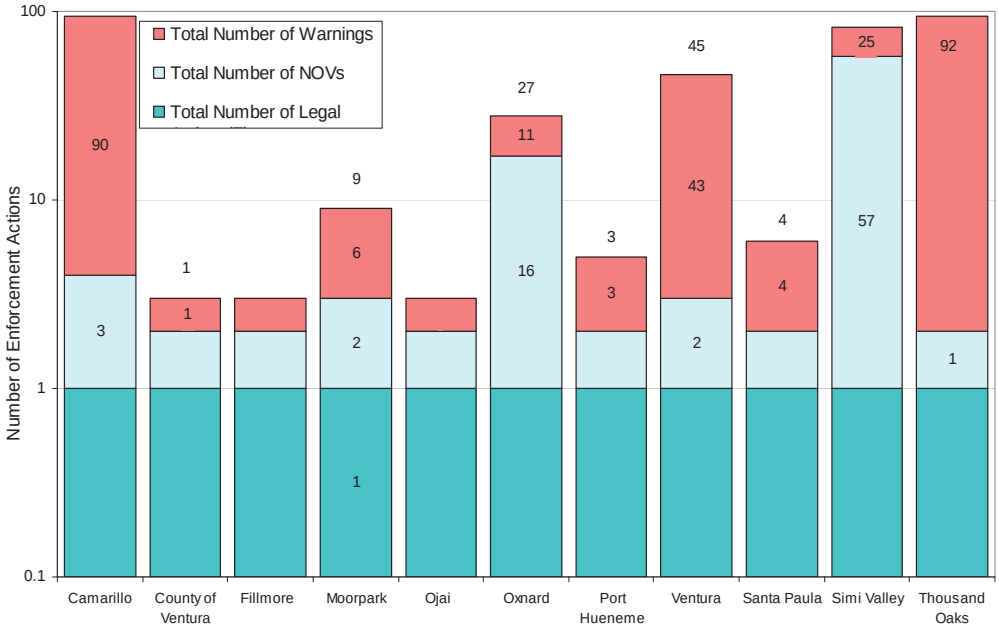
Co-permittees continue to implement enforcement procedures to eliminate illicit discharges and illegal connections available through their legal authority of their respective ordinances. Most enforcement processes follow a common sequence. These typically include:

- Verbal or written warnings for minor violations;
- Formal notice of violation or non-compliance with compliance actions and time frames;
- Cease and desist or similar order to comply; and
- Specific remedies such as civil penalties (e.g., infraction), non-voluntary termination with cost recovery, or referral for criminal penalties or further legal action;
- Authority to issue civil citations of 100 on site.

Enforcement activity begins at the appropriate level as determined by the Co-permittees' authorized representative. For incidents more severe or threatening at the outset, enforcement starts at an increased level. Enforcement steps are accelerated if there is evidence of a clear failure to act or an increase in the severity of the discharge. Enforcement actions for violating any of the provisions of the Co-permittees' ordinances may include any of the following or a combination thereof:

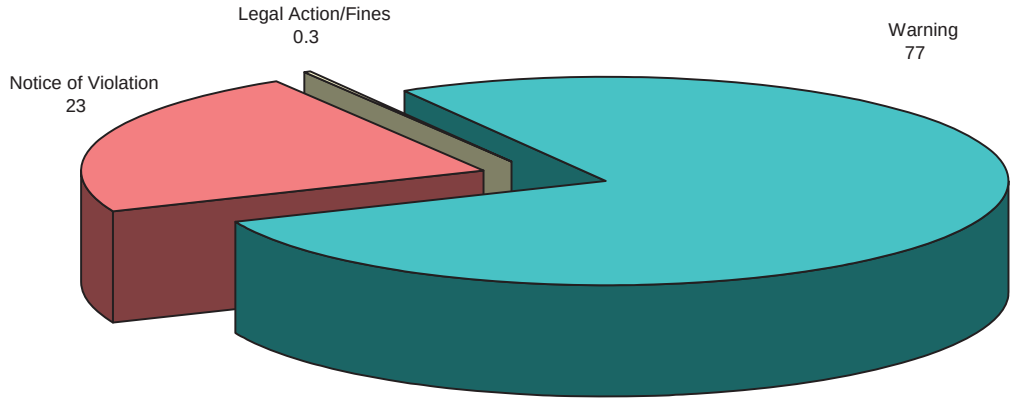
- Criminal Penalties
- Monetary punishment
- Imprisonment
- Civil Penalties

igure 8-8 and **8-9** indicate the number and type of enforcement actions taken by the Co-permittees in response to reported illicit discharge/dumping events during this reporting period. The data presented in **igure 8-8** indicates most Co-permittees issued some form of enforcement action when resolving an illicit discharge and/or dumping event. A total of 424 verified illicit discharges were reported countywide and Co-permittees issued enforcement actions on 84 of these incidents. Generally, enforcement doesn't occur only when a responsible party cannot be identified.



igure 8-8 Number of Enforcement Actions

Number of Enforcement Actions Countywide 357



igure 8-9 Types of Enforcement Actions ta en Countywide

Note: Due to the wide range of number of discharges across the different Co-permittees it was necessary to present this on a logarithmic scale. This does not allow accurate representation of values of one or zero.
No enforcement action taken.

As indicated in **igure 8-9**, the vast majority of enforcement actions consisted of both verbal and written warnings of violation. Last reporting period had more enforcement actions, but this was due to there being more illicit discharges to enforce against. This year, the Co-permittees issued a total of 123 Notice of Violations (21), 356 warnings (79) and 1 legal action. No monetary fines were collected by the Co-permittees this year. This continued enforcement effort underscores the Co-permittees high level of expectations from its residential and business communities. After twelve years of stormwater educational outreach, the Co-permittees believe that additional tools, such as Notice of Violations (NOVs) and fines are appropriate in certain instances to achieve compliance.

In addition, the Co-permittees continue to utilize a database of reported illicit discharge incidents that includes the following information for each event:

- Date of initial inspection
- Type of material discharged
- Source type of discharge
- Probable cause of discharge
- Date of follow-up inspection
- Date of conclusion/clean up/removal/follow up/education
- Enforcement taken action

A printed copy of the Co-permittees' database is attached in Appendix 2. The Co-permittees annually update the database with their activities for the current reporting year and provide a copy as part of the Annual Report.

2 Education and Outreach

Stormwater pollution prevention is most easily and cost effectively achieved through education and awareness. Over the last five years the number of reported illicit discharges and actual illicit discharges has been trending downward as shown in **figure 8-1**. This is remarkable because over that same time there has been countywide outreach materials with reporting phone numbers distributed to educate the public on how to report discharges. This reporting year, Co-permittees continue to distribute educational material describing illicit discharges, and providing contact numbers for reporting illicit discharges during inspections to automotive, food service and construction sites.

Ongoing Co-permittees illicit discharge educational and outreach efforts:

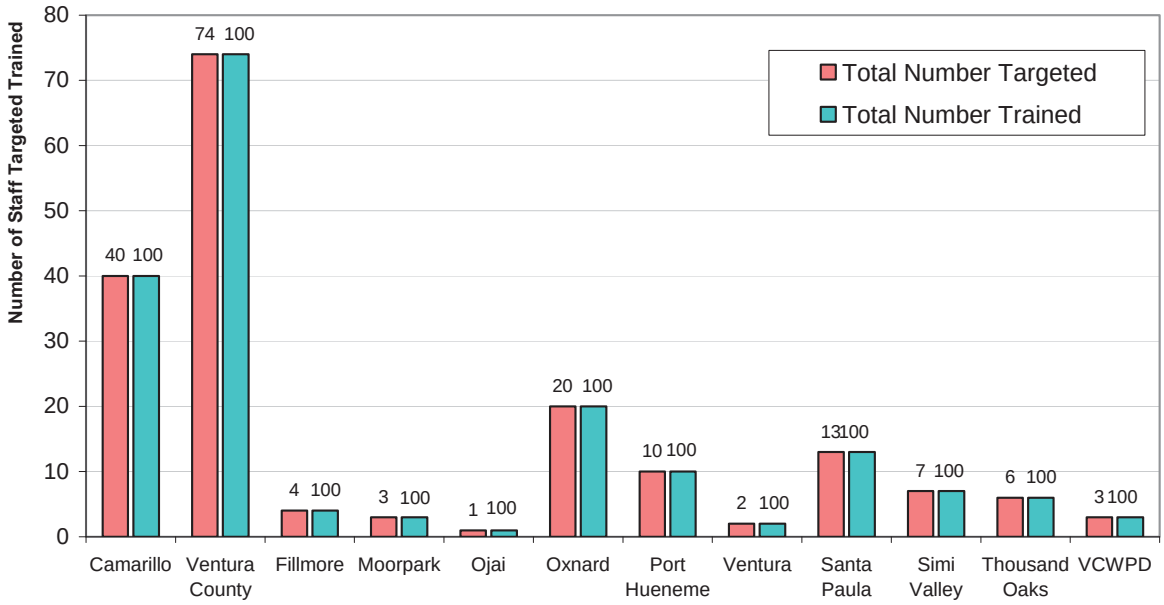
- The City of Ventura implemented an innovative means to provide city employees and residents with a tool to report illicit discharges. The city developed and distributed to all city vehicles a static-cling windshield sticker that displays the city's Illicit Discharge Hotline phone number and a flyer describing illicit discharges and encouraging employee participation in this program.

- The City of Camarillo identified the phone number to report illicit discharges on the catch basin markers designed to discourage dumping. This combination of two permit-required activities (provide an illicit discharge reporting number to the public and stencil storm drains with a "no dump" message) has proven to be an effective approach, and has proven a great success for the city in their efforts to improve illicit discharge reporting. The city plans to implement the markers citywide.

- The City of Simi Valley on several occasions canvases streets or neighborhoods where illicit discharges were common. They distributed brochures, BMP fact sheets and informational door hangers during these sweeps in an effort to address localized stormwater issues. They have also incorporated stormwater criteria into the pretreatment inspections to aid in identifying illegal connections and stopping illicit discharges before they happen.

- Many Co-permittees host and fund household hazardous waste and electronic waste collection events for their residents. Quarterly or even monthly operations these programs for collecting household hazardous waste serve thousands of participants each year. Thousands of pounds of toxic waste collected may have otherwise have leaked into strom drains after being placed in the trash, or worse illegally dumped straight into the storm drain.

100 of targeted staff were trained.



igure 8-10 Illicit Discharge Illegal Connection Staff Training

Details on the number of educational contacts made during this reporting period are included in **Section 4** (Program for Industrial/Commercial Business) and **Section 6** (Program for Construction Sites).

2 Stor ater ua ity Sta rainin

Each Co-permittee targets staff based on the type of stormwater quality and pollution issues they may encounter. Targeted staff included illicit discharge inspectors, drainage, roadway, landscape and facilities staff, industrial pretreatment inspectors and code enforcement officers. Training is incorporated with existing business inspection, construction site, and public agency activity programs.

Staff is trained in a manner that provides adequate knowledge for effective illicit discharge identification, investigation, reporting and/or clean up. Training was achieved in a variety of ways, including informal “tailgate” meetings, formal classroom training and/or self-guided training methods. During this reporting period, Co-permittees trained 162 municipal staff on illicit discharge response and non-stormwater discharges. **igure 8-10** depicts the number of staff trained. All of the eleven Co-permittees exceeded the performance criterion established in the SMP, and trained more than the 90 of targeted employees.

9.1 Program Summary

Pursuant to NPDES Permit No. CAS004002, the Ventura Countywide Stormwater Quality Management Program (Management Program) must submit a Stormwater Monitoring Report annually by October 1st summarizing and providing a general interpretation of the results from water quality monitoring conducted during the monitoring year. Consistent with this requirement the Management Program has prepared this Report to satisfy the permit requirements and assess the effectiveness of the overall Ventura Countywide Stormwater Monitoring Program (Stormwater Monitoring Program).

This report provides an investigation of stormwater program effectiveness, characterizes the surface water quality of Ventura County, and summarizes available water quality data for monitoring conducted during the 2008/09 season. Analysis of samples collected at various monitoring sites throughout the watershed provides information to assess the impact of stormwater runoff and helps characterize the status of surface water quality for watersheds in Ventura County. The monitoring aids in the identification of pollutant sources as well as the evaluation of the Stormwater Monitoring Program's effectiveness. Evaluating the Stormwater Monitoring Program's effectiveness allows for changes to be made and continual improvement of the overall Program. This adaptive management strategy improves the quality and effectiveness of the Stormwater Monitoring Program and minimizes the impact of stormwater pollutant discharges throughout the watersheds.

For the 2008/09 monitoring season, several key points have been identified and are highlighted below.

- **This report presents and discusses the ater uality monitoring data collected during four et eather events and t o dry eather events monitored by the Storm ater Monitoring Program.** The four wet weather events included monitoring at the Stormwater Monitoring Program's Land Use (Event 1), Receiving Water (Event 1), and Mass Emission (all events) sites. The two dry weather events included monitoring only at the Mass Emission stations. The Stormwater Monitoring Program conducted a thorough QA/QC evaluation of the environmental and QA/QC results generated from its analysis of water quality samples and found the resultant data set to have achieved a 98.1% success rate in meeting program data quality objectives. Overall, the 2009/09 monitoring season produced a high quality data set in terms of the low percentage of qualified data, as well as the low reporting levels achieved by all laboratories analyzing the Stormwater Monitoring Program's water quality samples.

- **VCWPD employed the services of CRG Marine Laboratories, Inc., in order to achieve lo detection limits for the ma ority of the ater uality parameters evaluated by the Storm ater Monitoring Program.** As a means of improving the detection capability of various constituents found in the water quality samples collected by the VCWPD, the Stormwater Monitoring Program has again employed the services of CRG Marine Laboratories, Inc (CRG). CRG began analyzing the majority of the water quality parameters evaluated by the Stormwater Monitoring Program at the beginning of the 2003/04 monitoring season. CRG is known for their ability to measure analytes at concentrations much lower than most water quality laboratories. During the current monitoring year, CRG was able to achieve detection limits for trace organic compounds (i.e., organics, PCBs, and pesticides) that are 100 – 1000 times lower than laboratories used in the past. Additionally,

CRG typically achieved detection limits for metals that are 10 times lower than historic levels for this class of constituent. Additional laboratories used by VCWPD also possess the ability to measure target analytes at very low levels.

- **VCWPD staff evaluated environmental and QA QC ater chemistry data using the *ata ua it a uatio P a* and *ata ua it a uatio ta ar erati Proce ures* guidance documents.** The *Data Quality valuation Plan* (DQEP) describes the multiple step process used by VCWPD staff to identify errors, inconsistencies, or other problems potentially associated with Stormwater Monitoring Program data. Furthermore, the DQEP describes the various data quality objectives (DQOs) to which environmental and QA/QC data are compared as part of the Stormwater Monitoring Program's quality assurance/quality control program. The *Data Quality valuation Standard erating Procedures* document is a set of written instructions that describes both technical and administrative operational elements undertaken by the Stormwater Monitoring Program in carrying out its DQEP.

- **VCWPD used its ater uality database to store and analy e storm ater uality data.** The Stormwater Monitoring Program has invested approximately $200,000 in the past six years to develop a water quality database to further expedite, standardize, and enhance the Stormwater Monitoring Program's data management and data analysis activities. Key database attributes include automatic importation and cursory evaluation of electronically formatted data, semi-automated QA/QC evaluation, automated comparison of the Stormwater Monitoring Program's data to water quality objectives, and a wide array of hard copy and electronic data reporting features. The database has allowed the Stormwater Monitoring Program to improve its overall data management effort by providing staff with a robust data management tool for the storage, analysis, and reporting of stormwater monitoring data.

- **Acute toxicity of *erio a ia u ia* as observed at Receiving Water sites W-3 (La Vista) and W-4 (Revolon Slough) for the samples collected during Event 1.** The permit requires that a TIE Baseline test be initiated for each sample with a TUa >1.0. This test was performed, but by the time the testing was initiated much of the toxicity had dissipated; therefore, no further TIE testing was undertaken.

- **No chronic toxicity of *tro oce trotus ur uratus* (Purple Sea Urchin) as observed at any of the Mass Emission stations.**

- **Toxaphene concentrations exceeded applicable ater uality ob ectives at multiple locations during one or more et eather monitoring events.** These exceedances mark the first time that this insecticide has ever been detected in Ventura County.

- **No samples (ater chemistry or a uatic toxicity) ere collected for the Ortega Street (I-2) and S an Street (R-1) Land Use sites.** In previous years, the Stormwater Monitoring Program satisfied its NPDES permit condition stating that these two Land Use sites must be monitored a minimum of three times per permit term with respect to the collection of water chemistry samples. Beginning last year (2007/08), the Stormwater Monitoring Program felt that it had obtained enough data to fulfill its regulatory obligation to collect aquatic toxicity grab samples at these sites in order to amass baseline toxicity information related to land use discharges.

- **Elevated pollutant concentrations ere observed at all monitoring sites during one or more monitored et eather storm events, and at Mass Emission stations ME-CC and ME-SCR during one or more dry eather events.** Constituent concentrations above Los Angeles Region Basin Plan, California Toxics Rule, and/or California Ocean Plan[1] water quality objectives were measured at the following monitoring sites:

[1] The Stormwater Management Program believes the comparison of stormwater runoff data to the California Ocean Plan is inappropriate based on the following applicability language contained in the plan: "This plan is not applicable to discharges to enclosed bays and estuaries or inland waters, nor is it applicable to vessel wastes, or the control of dredged material." (California Ocean Plan. State Water Resources Control Board. 2005.)

Mass Emission Sites

ME-CC **Anion** Chloride
Bacteriological . *coli*, Enterococcus, Fecal Coliform, Total Coliform
Conventional Total Dissolved Solids
Metal Aluminum, Chromium, Copper, Lead, Nickel, Zinc
Nutrient Nitrate as N
Organic Bis(2-ethylhexyl)phthalate, Total PAH Compounds
Pesticide 4,4'-DDD, 4,4'-DDE, Total Chlordane Compounds, Total DDT Compounds
Toxaphene

ME-VR2 **Bacteriological** . *coli*, Enterococcus, Fecal Coliform, Total Coliform

ME-SCR **Bacteriological** . *coli*, Enterococcus, Fecal Coliform, Total Coliform
Metal Aluminum, Chromium, Copper, Lead, Mercury, Nickel, Selenium
Nutrient Ammonia as N
Organic Bis(2-ethylhexyl)phthalate, Total PAH Compounds
Pesticide Toxaphene

Receiving Water Sites

W-3 **Bacteriological** . *coli*, Enterococcus, Total Coliform
Metal Aluminum, Copper, Lead, Zinc
Organic Total PAH Compounds
Pesticide 4,4'-DDD, 4,4'-DDE, Total DDT Compounds, Toxaphene

W-4 **Bacteriological** . *coli*, Enterococcus, Fecal Coliform, Total Coliform
Conventional Total Dissolved Solids
Metal Aluminum, Copper
Nutrient Nitrate as N
Organic Total PAH Compounds
Pesticide 4,4'-DDD, 4,4'-DDE, Total Chlordane compounds, Total DDT Compounds, Toxaphene

Even though receiving water objectives are not directly applicable to constituent concentrations measured at Land Use monitoring stations, the Stormwater Monitoring Program performed comparisons between Land Use water quality data and Los Angeles Region Basin Plan, California Toxics Rule, and California Ocean Plan objectives as a means of identifying potential pollutants of concern.

Land Use Sites

A-1

Bacteriological . *coli*, Enterococcus, Fecal Coliform, Total Coliform
Conventional Total Dissolved Solids
Metal Aluminum, Copper
Nutrient Nitrate as N
Organic Total PAH Compounds
Pesticide 4,4'-DDD, 4,4'-DDE, Total Chlordane Compounds, Total DDT compounds, Toxaphene

igure 9-1: Mass Emission Site Photos: ME-CC (Calleguas Cree), ME-SCR (Santa Clara River), and ME-VR2 (Ventura River) during storm flows in January 2008 (Event 3)

igure 1: ISCO 6712 refrigerated sampler, ISCO 4230 flowmeter, and steel enclosure at Mass Emission site ME-VR2

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Appendix

Ventura Stream Team 2006 Annual Report

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The State of the Ventura River

A review of data collected from ctober 2005 through Se tember 200 by Santa arbara Channel ee er s Ventura Stream eam

Al Leydecker

Introduction

The Ventura River and tributary streams transport pollutants such as bacteria and excess nutrients downstream to the estuary and ocean, and the purpose of Santa Barbara Channelkeeper's Stream Team program is to provide comprehensive and long-term monitoring of conditions in this ecologically important watershed. Ventura Stream Team began early in 2001 as a partnership program of Santa Barbara Channelkeeper and the Ventura Chapter of the Surfrider Foundation. The program has three goals: (1) establish a baseline of information about stream conditions in the watershed; (2) establish a trained volunteer monitoring base; and (3) locate previously unidentified point sources of pollution.

Stream Team conducts monthly on-site testing of the Ventura and major tributaries at designated locations. Near the beginning of each month, teams of volunteers measure physical and chemical parameters in the field using portable, hand-held instruments. Data collected includes on-site measurements of dissolved oxygen, turbidity, conductivity, H, temperature and flow. Water samples, collected at each site, are processed in Channelkeeper's laboratory for three Public Health bacterial indicators using approved standard methodology (Colilert-18 and Enterolert-24, manufactured by Idexx Laboratories; US-EPA, 2003). Additional samples are analyzed for nutrients through the cooperation of the Santa Barbara Channel – Long Term Ecological Research Project (SBC-LTER) at the University of California, Santa Barbara. The parameters measured are ammonium, nitrite plus nitrate, orthophosphate, total dissolved nitrogen and total dissolved phosphorus. Characteristics such as vegetation and observed aquatic life are also recorded. Occasionally, tests for other ions and contaminants are conducted. As part of every sampling event, instruments and meters are checked and calibrated against factory standards before taking them out into the field. Additional quality control checks are periodically performed in the field and as part of every bacteriological and chemical analysis.

In February 2006, a comprehensive report and analysis of the data collected during the first five years of the program was prepared and circulated to interested individuals, environmental organizations and government agencies. This report is available in PDF format on the Stream Team website (http://www.stream-team.org/Ventura/main.html), as are numerous other special reports on Ventura River conditions. The data collected as a result of Stream Team activities are also available here. The purpose of this report is to supplement the original document, *Ventura Stream eam 2001 2005*, and bring it up to date with a summary and analysis of an additional year of data. Since this document is meant to supplement and not replace the original report, it does not contain the introductory sections describing the environmental setting, hydrology and detailed sampling site descriptions. The reader is referred to the original document for that information.

Sampling Locations

The Ventura sampling sites represent four distinct reaches or sub-watersheds: four on the lower Ventura River, two on Canada Larga, four on San Antonio Creek and its tributaries, and five upper Ventura/Matilija locations. Sampling is typically accomplished by three teams: one on the lower Ventura and Canada Larga, another on San Antonio Creek, and the third monitoring the upper Ventura/Matilija. A map of the sampling locations is shown in Figure 1.

VR01, the Ventura River at the Main Street Bridge, is sampled immediately upstream of the bridge. This site is just above marine influence from the nearby estuary and marks the freshwater boundary.

VR02, the Ventura River near Stanley Drain, is located just above the confluence with this large storm drain serving semi-industrial and brownfields areas in northern Ventura.

VR03, the Ventura River at Shell Road, is slightly downstream of the Shell Road bridge. The Ojai Sewage Treatment Plant is approximately a mile upstream of this location. VR03 allows us to monitor conditions below the treatment plant and, with two further downstream sampling locations (VR02 and VR01), track the sequential changes that occur as this mixture of normal river water and treated effluent flows to the estuary.

VR04, Lower Canada Larga, is located off Ventura Avenue, just downstream of the Canada Larga bridge. Canada Larga flows through extensive ranch lands before passing through industrial development on its way to the river.

VR05, Upper Canada Larga, is located 3.5 miles up Canada Larga Road, at a small bridge over the creek. The hills and valley bottom around this location provide grazing land for local ranches. The two Canada Larga sites monitor a major Ventura River tributary as land use changes from ranching to industrial.

VR06, the Ventura River at Foster Park, is located below the County's Foster Park, slighty downstream of the Casitas Vista Drive bridge. Highly influenced by relatively clean groundwater forced to the surface by a bedrock reef located ¼ mile upstream, VR06 exemplifies natural conditions on the lower river (or, these days, as close to them as we are likely to find) and provides a contrast from which to judge the impacts from the introduction of treated effluent below this point.

VR07, San Antonio Creek at Old Creek Road, monitors a major tributary of the Ventura River and represents the combined drainage from various Ojai Valley land uses.

VR08, Lion Canyon, is sampled just before it enters San Antonio Creek. A sub-watershed of approximately eight square miles, the entire catchment is mostly under single ownership and is used for cattle grazing and dude-ranch activities associated with the Ojai Valley Country Club.

VR09, Stewart/Fox, samples the combined flow out of Stewart and Fox canyons, both of which flow through western Ojai and are partially channelized through the town (this stream is shown on some maps as Pirie Creek).

VR10, Upper San Antonio Creek, adjacent to VR09, combines flow from the upper San Antonio and Thacher drainages in eastern Ojai.

VR11, the Ventura River at Santa Ana, is sampled below the Santa Ana Road bridge.

VR12, the Ventura River at Highway 150 sampling location, is located upstream of the bridge. VR11 and VR12 monitor conditions on the upper Ventura River. The Robles Diversion Dam diverts water to Casitas Lake above these sites; diversions, and the porous sediments that form the river bottom in this reach, typically leave little flow in the channel after the rainy season.

VR13, the Matilija Creek sampling location, is approximately one kilometer downstream of Matilija Dam, at an obsolete USGS stream gauging station.

VR14, the North Fork Matilija Creek sampling location, is located below a bridge on Highway 33 used as a Ventura County flood gauging station. VR14 represents the most pristine sampling location in the program, the site least affected by anthropomorphic impacts.

VR15, Upper Matilija Creek, is the uppermost sampling location in the watershed. It is approximately 1.5 miles above Matilija Dam, in Matilija Canyon. Sampling above and below Matilija Dam, a candidate for removal and restoration, allows Channelkeeper to monitor the impact of its sediment-filled reservoir.

Figure 1. Map with Santa Barbara Channelkeeper's Ventura Stream Team sampling locations.

Since these groupings divide the watershed into reasonable geographic and ecological units, whenever possible we display and discuss the data that follows using a similar format. When the variation of a measured parameter with time is shown or discussed, four sites, VR04, VR05, VR11 and VR12, are omitted. Flow in these locations has become increasingly rare with the passage of time (more on this later); for example, the last three years saw only eleven months of flow at VR04 and VR05, four at VR11 and five at VR12. We do, however, include these sites in the presentation of the overall results for each parameter.

Hydrology

In the discussions and presentation of data that follow, the use of the terms "year" and "annual" usually refer to the "water-year." Unlike the calendar year, the water-year begins on October 1 and ends the following September 30, i.e., water-year 2006, with which this report is concerned, began on October 1, 2005 and ended on September 30, 2006. Hydrologists and agencies concerned with water in California use a water-year concept because it better fits the seasonal progression of annual precipitation: rainy to dry, snowfall to snowmelt.

Rainfall Variability

The dominant hydrologic characteristic of the Ventura River, and indeed, of all streams in coastal Southern California, is extreme inter-annual variation in rainfall and river runoff. On the Ventura River average annual flows have varied from near zero (1951) to 380 (1995) cubic feet per second (cfs).[1] Since 1878, the average winter rainfall in Los Angeles has been 15 inches (NWS-LA).[2] However, "average" conveys no sense of the extreme variability. Very few years actually have "average" rainfall; most years are drier than average and a relatively few really wet years heavily influence the record (these are usually, but not always, associated with strong El Niño events; Null, 2004; Monteverdi and Null, 1997). If a "wet" year is defined as having rainfall at least 150% above the average (greater than 22 inches in downtown Los Angeles), there have been seventeen "wet" years since 1878, approximately one every seven and a half years. The 1990s were unusual in that three wet years (1993, 1995 and 1998) occurred relatively close together within a single decade.

However, El Niños are just one of the climate cycles influencing local weather. The region is also impacted by the Pacific Decadal Oscillation (PDO), a roughly 50-year pattern of alternately cold and warm waters that abruptly shift location in the Pacific Ocean (Mantua et al., 1997; Minobe, 1997; Mantua, 2000). The "cold" PDO phase moves the jet stream (and a majority of winter rain) northwards, while the "warm" phase shoves it, and rainfall, southwards – giving the south coast and southern California wetter winters.

Annual flows in the Ventura River, dependent on rainfall, vary in a similar fashion, and one way of showing the long-term pattern is a plot of *cumulative de artures from the mean*. The average annual flow in the river is equivalent to five inches of rainfall (measured at Foster Park).[3] The upper panel of Figure 2 plots the cumulative flow excess or deficiency. In other words, a

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[1] Flows recorded at the USGS gauging station at Foster Park, USGS-NWIS.

[2] The Los Angeles record is the longest in the region. Climate data for the region are available from a number of internet sources: DRI-WRCC, CDEC, CCDA and JISAO.

[3] If we assume that the average rainfall in the watershed is roughly that of Ojai, 21.5 inches, then approximately 20% ends up flowing down the Ventura River. As for the rest, most is evaporated or transpired by plants and trees, and a smaller part recharges the groundwater table or is stored as soil moisture.

continuous accounting of how much each year's flow affected the long-term departure away from maintaining the five inch per year average. The plot shows a pattern of alternately rising and falling trends, where flow was either generally above or generally below average, lasting decades. Increasing trends are generally caused by an increased frequency of big years. The general pattern between 1944 and 1968 was below average flows (a decreasing trend), but from 1968 to 1998 the trend reversed – except during the great California drought of 1987-1992.

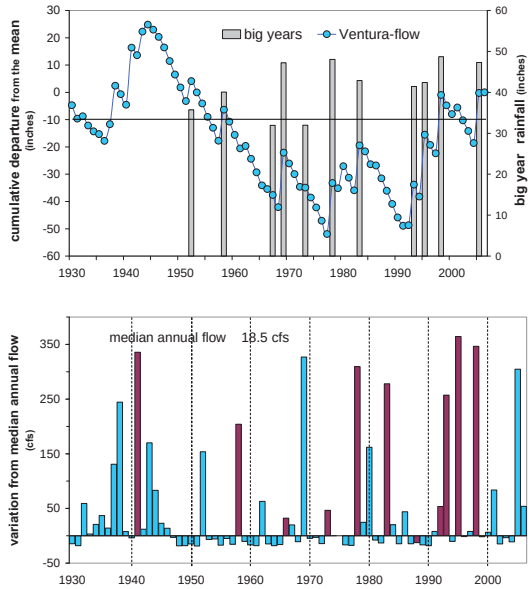


Figure 2. *er anel* The cumulative *flow* excess or deficiency – how much each water-year's flow (measured in inches of runoff at Foster Park) varied from the 4.98 inch overall average. The plot shows the same pattern of rising and falling trends, heavily influenced by wet years, as rainfall. Wet years, in this chart, represent Ojai rainfall above 31.5 inches.
Lower anel Median annual flow on the Ventura (at Foster Park) is 18.5 cfs, i.e., half the years on the chart had average flows less than this, the other half were greater. The distribution is skewed – "above the median" years tend to be extremely wet. While not a wet year, slightly above-average rainfall in 2006 reinforced increased groundwater inflows from 2005, giving appreciably enhanced flows (annual average = 72 cfs) in summer 2006.

Cycles of Change

The extreme rainfall variability experienced in the Ventura watershed engenders cycles of sediment deposition and removal, algal growth, and the advance and retreat of riparian and aquatic vegetation along the river. In turn, these changes dramatically alter the appearance and biological functioning of the river and riparian zone, and regulate the uptake of nutrients.

Major winter storms, such as occur during severe El Niño years, begin a transformational cycle by completely scouring the channel of vegetation and fine sediment; this occurs, on average, once every seven years (the interval has varied from three to 30 years) (Leydecker et al., 2003). The scoured river channel, with broadened flows, warmer water temperatures, an absence of shade and a nutrient-rich environment (caused by higher nutrient concentrations from enhanced groundwater inputs following a wet winter along with abundant nitrogen and phosphorus from urban and agricultural runoff), becomes dominated by filamentous algae (principally *Clado hora, Rhi oclonium*, *nteromor ha* and *S irogyra* spp.). Under these conditions, even

Figure 3. View of the Ventura River looking downstream from Shell Bridge (VR03) on October 2, 2004 (upper photo) and on Feburary 2, 2005 (lower).

the undeveloped upper sections of the Ventura River, or the area's pristine streams, provide a hospitable environment for explosive algal growth. Even where nitrate concentrations are low, high phosphorus content from eroding mountain bedrock allow expanded growth of algal species that are able to utilize symbiotic relationships with bacteria to fix atmospheric nitrogen. As long as the storms of succeeding winters continue to be severe enough to keep the channel clean and sediment moving to the ocean, algae both dominate and thrive.

However, sooner or later a low runoff year occurs – mostly sooner, since two out of three years have less than half the average runoff (Figure 2). In the absence of severe winter floods, sediment accumulates in the channel and seedlings, having gained a toe-hold during the previous summer, become more deeply rooted. Exuberant plant growth begins the competitive replacement of algae by aquatic vegetation (Leydecker and Alstatt, 2002). Perennial aquatic plants become established (ludwiga, speedwell, water cress), over-shadowing the water surface and narrowing the channel by further trapping fine sediment. The rapid growth of riparian vegetation provides increased shade to a narrowed waterway and algal growth becomes increasingly confined to open, deeper waters. Where the growth of taller riparian vegetation, like willows and giant reed (*Sali* spp. and *Arundo dona*), appreciably block sunlight, algae may disappear entirely. Over the years these processes increasingly stabilize the channel and elevate the threshold flow of a future scouring storm.

In the five years since 2001, Ventura Stream Team has sampled a wide variety of conditions dictated by the annual variation in rainfall. The last big rainfall event, the previous flood that reset the transformational cycle described above, occurred during the severe El Niño winter of 1998. From 2001 through 2004, Channelkeeper has observed and documented these changes (cf. SBCK(b)). Figure 3 shows the variations in both monthly and annual rainfall that have occurred during the years of the Ventura survey. Prior to 2005, two of the years were slightly above normal (2001 and 2003) and two below normal (2002 and 2004), one of which (2002) could be characterized as a severe drought year.

An traordinary ear

The 2005 water-year, characterized by weak El Niño conditions in the Pacific, began with expectations of another below-normal rainfall winter. However, in the three weeks following

Christmas, the South Coast was hit with a series of major winter storms delivering impressive amounts of rainfall in two distinct pulses: the first from December 26, 2004 through January 4, 2005 and, after a few days of sunshine, the second from January 7-11, 2005. In Ojai, 10.4 inches were recorded during the first phase and slightly more, 12.6 inches, in the second. By the end of January, a total of 28.8 inches had fallen since the beginning of the rainy season, compared with the annual average of 20.9 inches. As storms coming out of the Pacific are uplifted over the coastal mountains, even larger amounts of rain are wrung out of them: San Marcos Pass received 18.2 and 24.6 inches, respectively, and amounts even greater than this were recorded in the Ventura River watershed at Old Man Mountain.

As shown in the lower panel of Figure 2, not all high rainfall years are severe El Niño years. At times, some really wet winters are caused by a much shorter weather cycle of 30 to 60 days called the "Madden-Julian Oscillation." Simplifying the process greatly, atmospheric high pressure off of the Pacific Northwest moves *west*, allowing a low pressure system to develop off-shore, which in turn sweeps heavy moisture from Indonesia into southern California. This type of weather system is often called a “pineapple express” as the moisture plume passes over the Hawaiian Islands en route. However called, it delivered extraordinary amounts of rainfall in the winter of 2005.

The Ventura River reacts rapidly to changes in rainfall. The peak flow on January 11, 2005 is estimated to have been 41,000 cubic feet per second (cfs) – a seventeen foot wall of water at Foster Park. This flood, and the copious rainfall that occasioned it, made 2005 the new transformational year; the year that began the cycle anew (Figure 3).

Another good year

2006 was, again contrary to expectations, another good water-year. Annual rainfall in downtown Ventura was 17.8 inches. This was below the amount of rainfall in 2001 and 2003 (Figure 4), but still 3.9 inches above average. Ojai rainfall (25.3 inches) was also above its annual average of 21.5 (and its median, since 1948, of 18.6 inches). But what made the year exceptional was the extravagantly excessive rainfall in April. In downtown Santa Barbara, 6.31 inches were recorded, 4.6 inches at the Ventura Government Center, 5.4 inches in Ojai. The historical medians (one half the recorded years had April rains below, the other half above, this amount) are 0.72 inches in Santa Barbara, 0.55 inches in Ventura. This was more than eight times the normally expected amount of rain. April 2006 proved to the second wettest April in both Santa Barbara (since 1868) and Ventura (since 1874). The rains continued into May, with 1.2 inches in both Ventura and Ojai compared with long-term averages (since 1948) of 0.23 and 0.45 inches. The bar graph in the upper panel of Figure 3 shows the wet nature of Spring 2006 when compared with previous survey years, and demonstrates that most of the rainfall occurred rather late in the season (more than half the total rainfall fell after February).

The effect on the river of two good water-years in a row, one with exceptionally heavy rainfall and the other with an unusually wet spring, was enhanced groundwater inflows. Wet years, while noted for large amounts of runoff, also replenish groundwater reservoirs, elevating water tables and increasing seepage into rivers and creeks. This can be most directly seen in the unusually high dry-season flows that follow a wet winter, but there is also a carry-over of higher

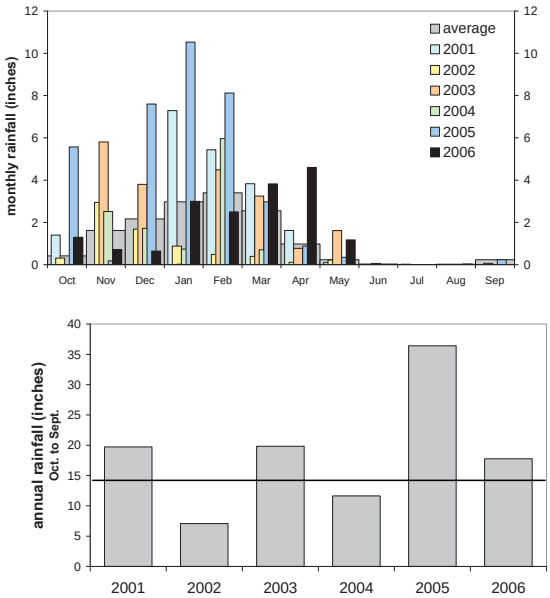


Figure 4. Monthly (upper panel) and yearly (lower panel, for October to September water-years) rainfall for 2006 and previous years of Channelkeeper's Ventura Stream Team surveys (Ventura COOP station, 049285-6, http://www.calclim.dri.edu/ccda/scacoop.html). The heavy line in the lower panel represents the average annual Ventura rainfall of 14 inches. While rainfall in 2006 was not as remarkable as that of 2005, it was an above average year (17.8 inches) with an extremely wet spring (April rainfall was 4.6 inches, the second wettest in since 1874) and far above the median of 0.55 inches (half of Ventura's Aprils have been wetter than this, half drier).

flows into subsequent years. The upper panel of Figure 5 compares June through September flows at Foster Park for each year from 1998 through 2006 and also shows annual rainfall (as well as median dry-season flows and rainfall for comparison). Note that flows were very high during the wet years of 1998 and 2005, but that flows in the years that directly followed were also much higher than might be expected from the amounts of rain that fell. 1999, 2002 and 2004 all had below median amounts of rainfall, yet dry-season flows in 1999 were over twice the median, while those of the other two years were less than half, and while 2004 had appreciably more rain than 2002, flows were quite similar.

What accounts for this is the relatively proximity of a wet year. Wet years recharge the groundwater table, almost all other years deplete it. The recharge that occurs during a wet winter can carry over for quite a number of years. We've attempted to quantify this effect in the lower panel of Figure 5, which shows the ratio between average dry-season flow and rainfall for each year (average dry-season flow divided by the rainfall of the preceding winter). If everything were equal, more rainfall should produce more summer flow and the ratio should be similar from year to year. However, this turned out not to be the case. The bold lines show the trend towards less flow per inch of rain as we move further from a wet year. In contrast with declines shown following the big El Nino year of 1998, and above average rainfall in both 2000 and 2001, 2006 shows a substantial increase in the ratio. In other words, summer flows were far higher than expected, the combined product of 2005 and the wet 2006 spring.

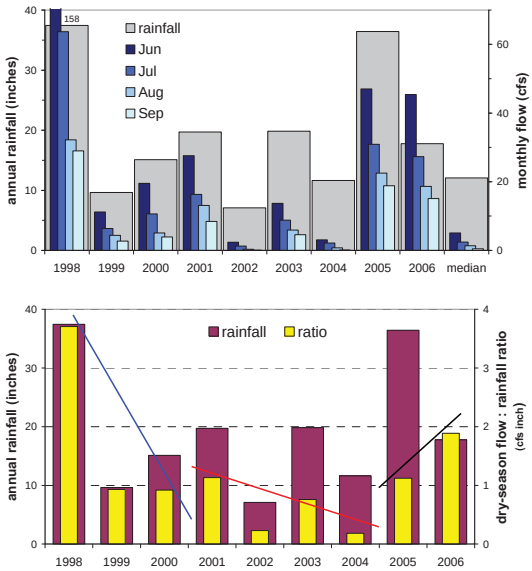


Figure 5. In the upper panel, annual rainfall (in Ventura) is plotted for the severe El Niño year of 1998 and every year since, along with average June, July, August and September flows at Foster Park in cfs for each year (shown on the right-hand axis). The median rainfall and monthly flows are included for comparison. Rainfall is again plotted in the lower panel, but the right-hand scale shows the ratio between average May through September flow and rainfall, i.e., the ratio between average dry-season flow and rainfall. The bold lines show the trend towards less flow per inch of rain as we get further from a large El Niño; it required two years of above-average rainfall (2000 and 2001) to partially recover from low rainfall in 1999. River flow in 2004 was as low as it was in 2000, despite having approximately five times the rainfall. In contrast, 2006 shows an increase in the ratio, more runoff than expected, as the result of a wet spring and two good years in a row enhancing groundwater supplies.

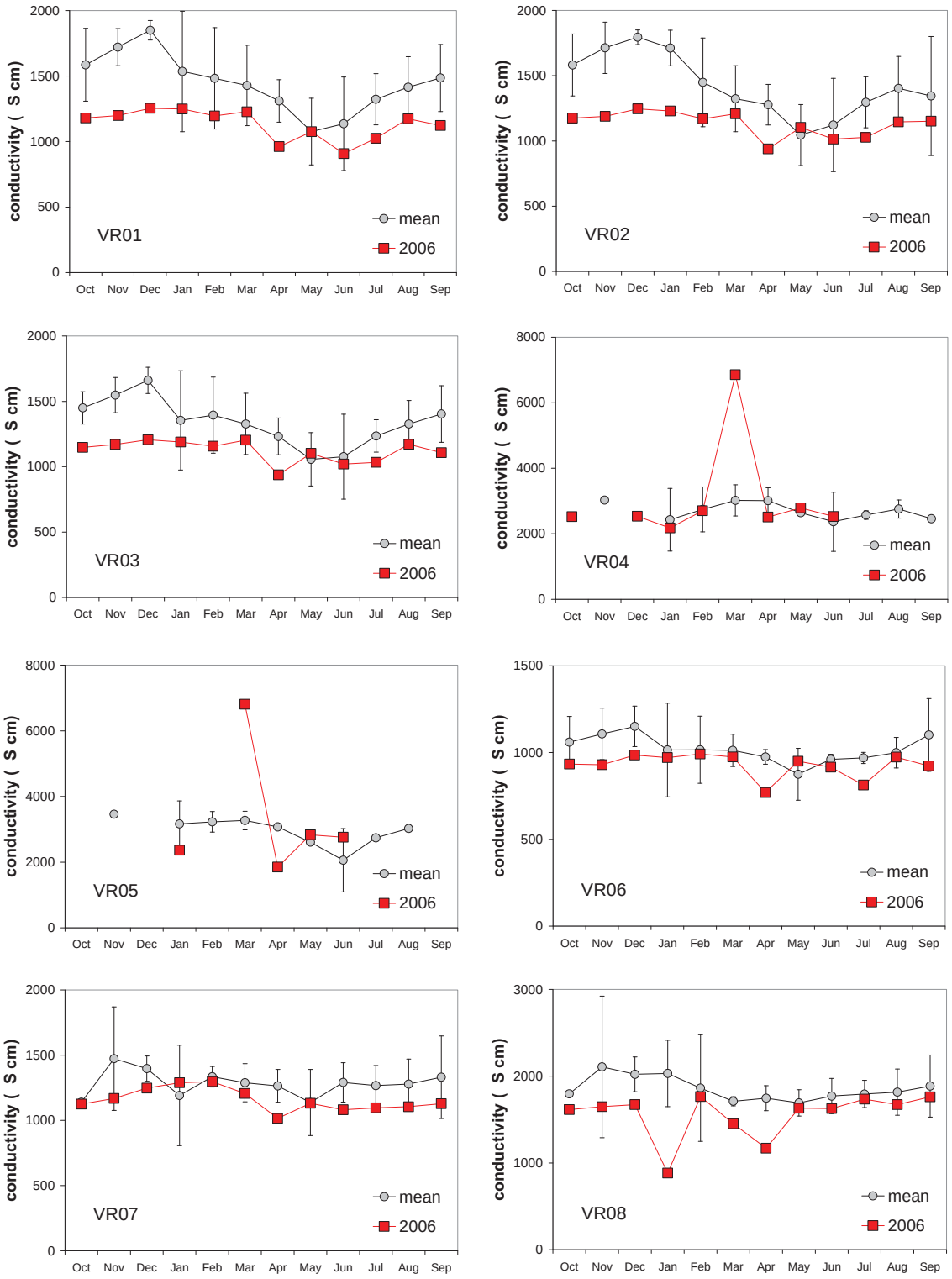
Conductivity[4]

Water, one of the most efficient solvents in the natural world, is able to dissolve a great many solids. Many of these solids when put into solution carry an electrical charge. For example, chloride, nitrate and sulfate carry negative charges, while sodium, magnesium and calcium have a positive charge. These dissolved substances increase water's *conductivity* – its ability to conduct electricity. Therefore, measuring the conductivity of water indirectly indicates the amount total dissolved solids (TDS). It's not a perfect measure because some dissolved substances, particularly organic compounds like alcohol or sugar, are very poor conductors. Each stream tends to have a relatively consistent range of conductivity that, once established, can be used as a baseline for future comparisons. Conductivity tends to decrease in winter when heavy rainfall and runoff increase the amount of fresh, lower-conductivity water entering a stream or river. With greater flow, mineral concentrations are typically more dilute. On the other hand, in late summer and fall, especially during periods of drought, dissolved solids become more concentrated (mostly because of increased evaporation), raising conductivity.

Conductivity is affected by temperature: the warmer the water, the higher its conductivity. For this reason, conductivity is usually reported at a standard temperature: 25 degrees Celsius

[4] US-EPA (1997), Deas and Orlob (1999) and Heal the Bay (2003) were used as references in the preparation of the following sections on water quality parameters.

(25°C). Conductivity is measured in micro-siemens per centimeter (µS/cm) or milli-siemens per centimeter (mS/cm). Distilled water has a conductivity in the vicinity of 0.5 to 3 µS/cm and the conductivity of rivers in the United States generally ranges from 50 to 1,500 µS/cm. Drinking water typically has to meet a standard of 1,000 mg/L total dissolved solids and a maximum conductivity of 1,600 µS/cm.



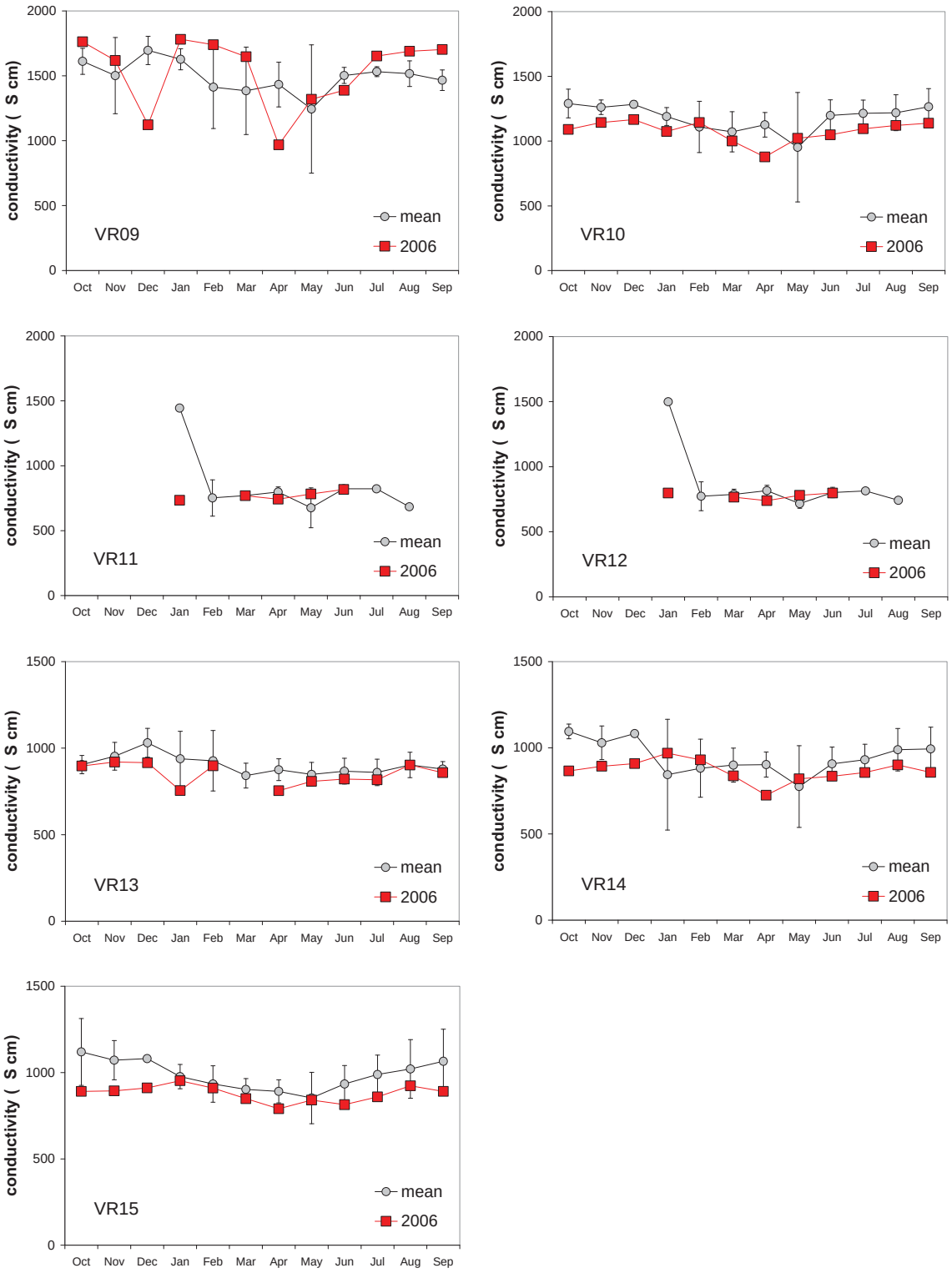


Figure 6. Monthly conductivies for the Ventura Stream Team sampling locations during the 2006 water-year are shown with along with the average monthly conductivity from 2001-2005. Error bars indicate the monthly standard deviation in µS/cm.

In the Ventura watershed, there has been a trend towards increasing conductivity from 2001 until the winter of 2005 (Figure 7). A trend (cf. SBCK, 2004) caused by (1) increasingly depleted and generally older groundwater inflows, (2) enhanced uptake by growing riparian vegetation, and (3) a relative increase in evaporation as dry-season river flows decreased. (All related, as described in the previous section, to increasing amounts of time since the last wet winter of 1997-98.) Conductivity, everything else being equal, generally increases with the age of water – the longer water is in contact with soil or geologic strata, the higher its conductivity; groundwater has higher conductivity than water in the soil, and older groundwater higher conductivity than younger.

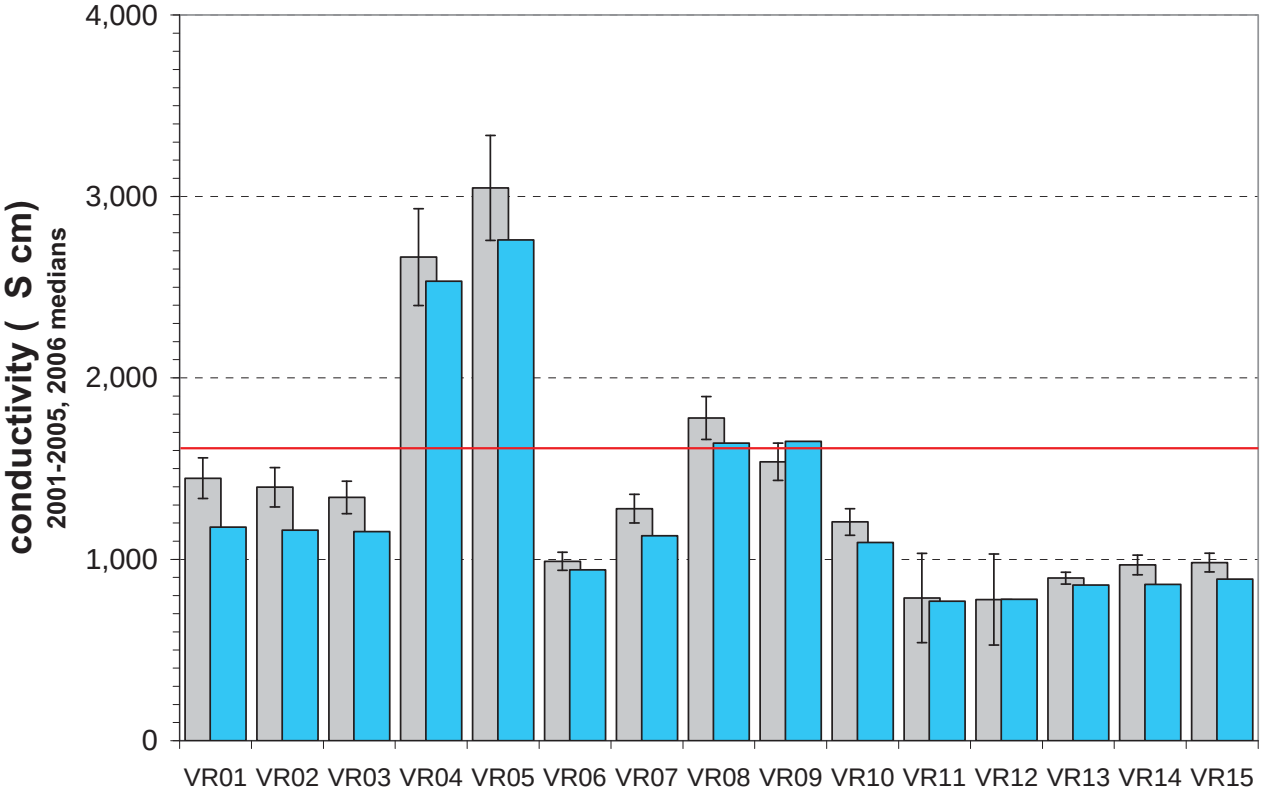


Figure 7. Median conductivities during the 2006 water-year are contrasted with median conductivity for the previous five years (2001-2005). The error bars indicate twice the standard error of the median, i.e., the 2006 median would be expected to lie within these error bars and anything beyond the limits could indicate a significant change (only one out of every 20 years would be expected to naturally fall outside of ± two standard errors). Note that 2006 conductivity at locations with year-round water generally falls below these limits. The horizontal line represents a generally accepted upper conductivity limit of 1,600 µS/cm for drinking water.

In 2005 the situation abruptly changed. The advent of a wet water-year (rainfall of 36.2 inches in Ojai) caused a dramatic increase in dry-season flows. With this increase there was an abrupt decrease in conductivity (Figure 8). Higher water levels, caused by increased flows from higher elevations (which generally have lower conductivity) and increased inputs from replenished water tables (with recent, lower conductivity, runoff) greatly lowered conductivity throughout the system.

When presenting 2006 data, for conductivity and all other parameters, we use two formats. One shows the 2006 monthly variation against a background of average monthly values (determined by averaging monthly results from 2001 through 2005), and the other shows the average 2006 value along with the long-term average from 2001 through 2005. In other words, monthly and average 2006 values are contrasted with previous results. This should enable us to tell at a glance where significant departures from the norm have occurred. Monthly variations in conductivity for each sampling location are shown in Figure 6 and the annual averages in Figure 7.

Figure 6 indicates that 2006 conductivities were almost always below average. This was somewhat to be expected since the monthly average incorporates four years of rising conductivity (2001-2004) and one year (2005) of low conductivity. Error bars in the figure indicate the monthly standard deviation. The inference is that we could expect conductivity to

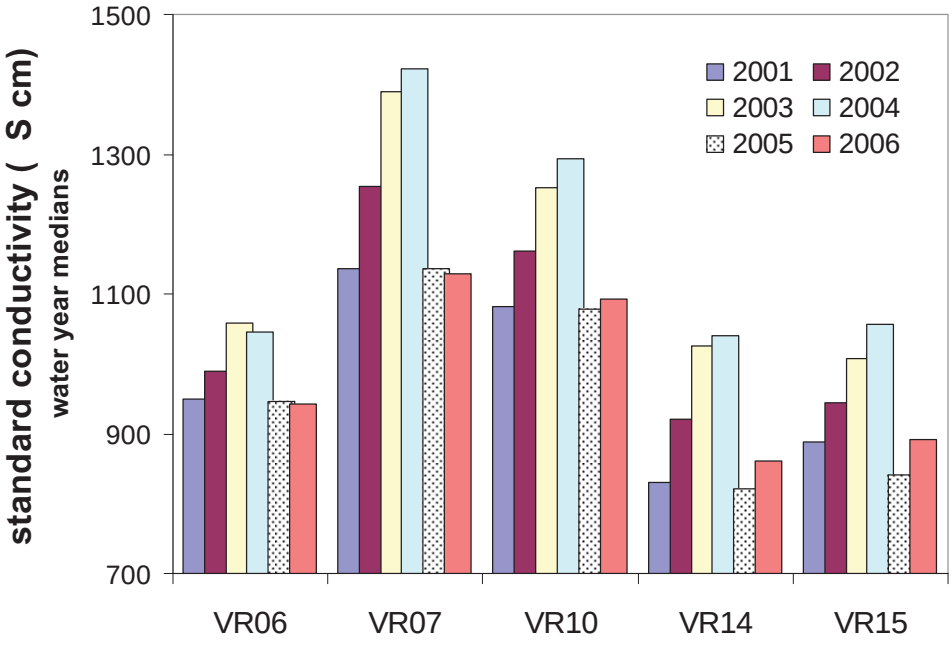


Figure 8.
Changes in annual median conductivity for Ventura Stream Team sampling sites with relatively natural, year-round flows, 2001-2006. There had been a consistent increase in conductivity over the initial four years of sampling; the percent increase from 2001-2004 at VR06 through VR15 was 12, 23, 19, 25 and 19%, respectively. However, in 2005 conductivity abruptly decreased by 20% throughout the Ventura system. In 2006 conductivity generally increased at upper elevation sites (VR14 & 15) and decreased at the lower ones (VR06 & VR07).

fall within the error bars every two out of three years. In other words, a 2006 value within the error bars can be considered relatively normal. For statisticians, reasonable values are those which fit between *two* standard deviations – twice the limits shown by the error bars – and Figure 6 shows very few results that fit this description. Those that do mostly occurred during October, November and December, and are part of the very low values seen in 2005, i.e., they occurred before the winter rains of 2006.[5]
Measurements taken during or soon after storms show very low conductivities due to large amounts of fresh runoff. Rain in this region generally has a conductivity between 10 and 40 µS/cm. Months in Figure 6 that have a large difference between error bars, i.e., indicating a wide variation in monthly values, include storm values in the data record. Similarly, low conductivity in April 2006 identifies rain-influenced measurements. Monthly averages derived from limited data show no error bars and some months are totally absent; these data identify sites that are usually dry during those months (e.g., VR04, VR05, VR11 and VR12). Occasional low 2006 values in December (VR09) or January (VR08) defy explanation and are probably the result of measurement error.

The most unusual site in 2006 was VR09, which showed higher than average conductivity whereas almost all other locations were below average. This is best seen in Figure 7, where median 2006 conductivity is contrasted with the median of all previous data. The median is a better measure of "average" conductivity than the actual average since it reduces the effect of occasional low, storm-influenced values. The error bars in Figure 7 indicate twice the standard error of the median. Note that the majority of sites in 2006 fell below this limit, indicating a significant difference. However, a significant difference may or may not be meaningful, and in this case, since we know too many dry-year data points with increasing conductivities were included in the median, the below-average results are not meaningful.

Figure 8 illustrates the overall trend, showing median annual conductivity for all years since 2001 at locations with relatively natural year-round flows (sites that don't go dry and that are uninfluenced by urban nuisance waters or Ojai sewage treatment plant effluent). Much of what was discussed earlier can be seen here: the abrupt 2005 decrease following the gradual increase from 2001 through 2004. However, sites in 2006 exhibited disparate trends. Locations on the upper Matilija showed the increasing conductivity we might have expected in the second season after a wet winter (VR14 and VR15), but lower-elevation locations had similar or even lower conductivity than during 2005 (VR06 and VR07). One possible explanation could be a greater percentage of 2006 recharge showing up at the lower sites, either due to shorter groundwater travel times or proportionally greater lower-elevation rainfall.

Temperature

The expected annual pattern for water temperature is straight-forward: rising from winter lows to summer highs and then decreasing in early fall. In other words, water temperature follows changes in air temperature. On the Ventura, that pattern is observed at all sites (Figure 9). The error bars in Figure 9 again indicate the monthly standard deviation. And while few of the 2006

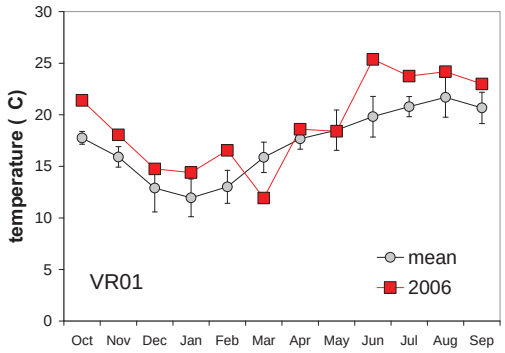
[5] Measurements that fall outside of two standard deviations are considered relatively rare, normally occurring only 5% of the time. Applying this to monthly conductivity, this would occur only once every twenty years, and a value this far outside the norm would be considered significantly different. In essence, this is the statistician's definition of significant.

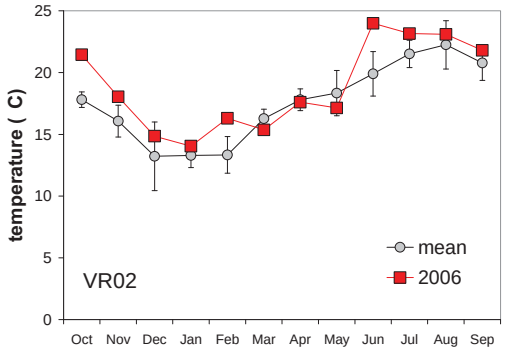
measurements were significantly different from monthly averages (i.e., fall below or above two standard deviations), there were some departures from the established pattern.

Most obvious were lower water temperatures in March, April and May, particularly at higher elevation locations (VR08-15). At lower elevations, temperatures seem to have been higher during both the earlier and later parts of the water-year. Abundant rain and increased flows probably account for lower temperatures during spring; flows in April were among the highest ever seen, higher than in 2005 or 1998. The lower sites exhibited some of the "apples and oranges" problem seen in the conductivity discussion. The monthly average combines years with different characteristics: years like 2002-2004 when almost complete aquatic plant cover shielded the river from sunlight vs. other years with more open flow. Data from October, November and December were particularly susceptible to this problem since these months in 2005 represent characteristics developed during 2004 instead of the changed circumstances that followed the big storms around the end of the calendar year.

Plant cover, increased flows and cooler weather produce lower water temperatures while the opposite circumstances produce higher. These effects are particularly pronounced on the lower Ventura's broad and shallow flows. On the other hand, sites that often go dry, like VR04 and 05, often show aberrant results for the low trickling or puddle type flows seen at the beginning and end of wet episodes.

Annual averages (with error bars denoting maximum and minimum water temperatures for both 2006 and the overall average) are shown in the bottom panel of Figure 11. The graph includes three horizontal lines to help put these results in perspective. These mark important threshold temperatures for trout and steelhead: above 24°C leads to death; below 16°C indicates good dry season conditions; and below 11°C in winter is excellent for spawning and incubation (Brungs and Jones, 1977; Armor, 1991; McEwan and Jackson, 1996; Sauter et al., 2001). As temperatures rise, fish have increasing trouble extracting oxygen from water, while at the same time the maximum amount of oxygen able to be held in solution decreases.


temperature (C)
VR01
mean
2006
Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep


temperature (C)
VR02
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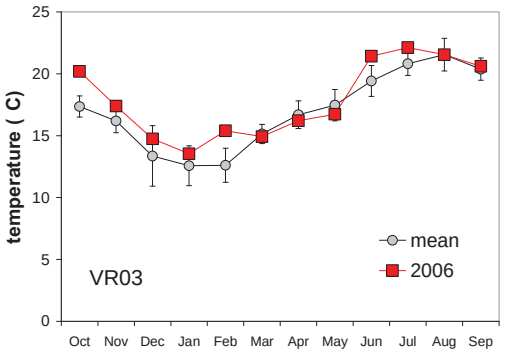
temperature (C)
VR03
mean
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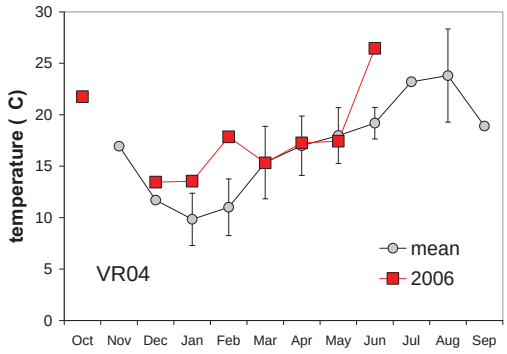
temperature (C)
VR04
mean
2006
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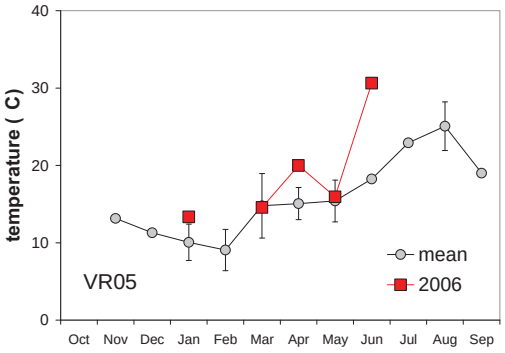
temperature (C)
VR05
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2006
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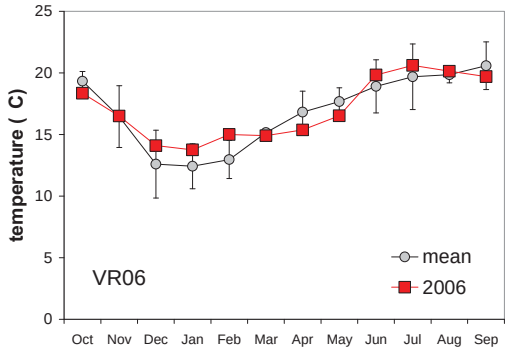
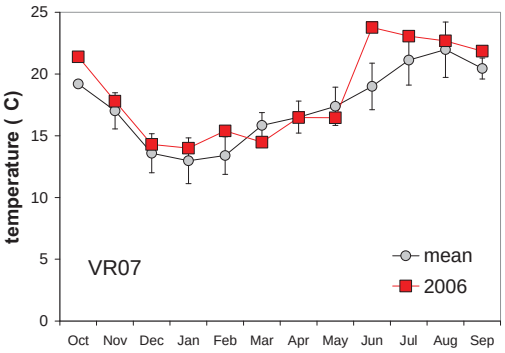
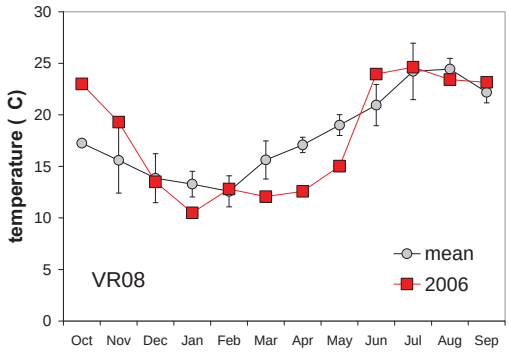

temperature (C)
VR06
mean
2006
Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep


temperature (C)
VR07
mean
2006
Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep


temperature (C)
VR08
mean
2006
Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep

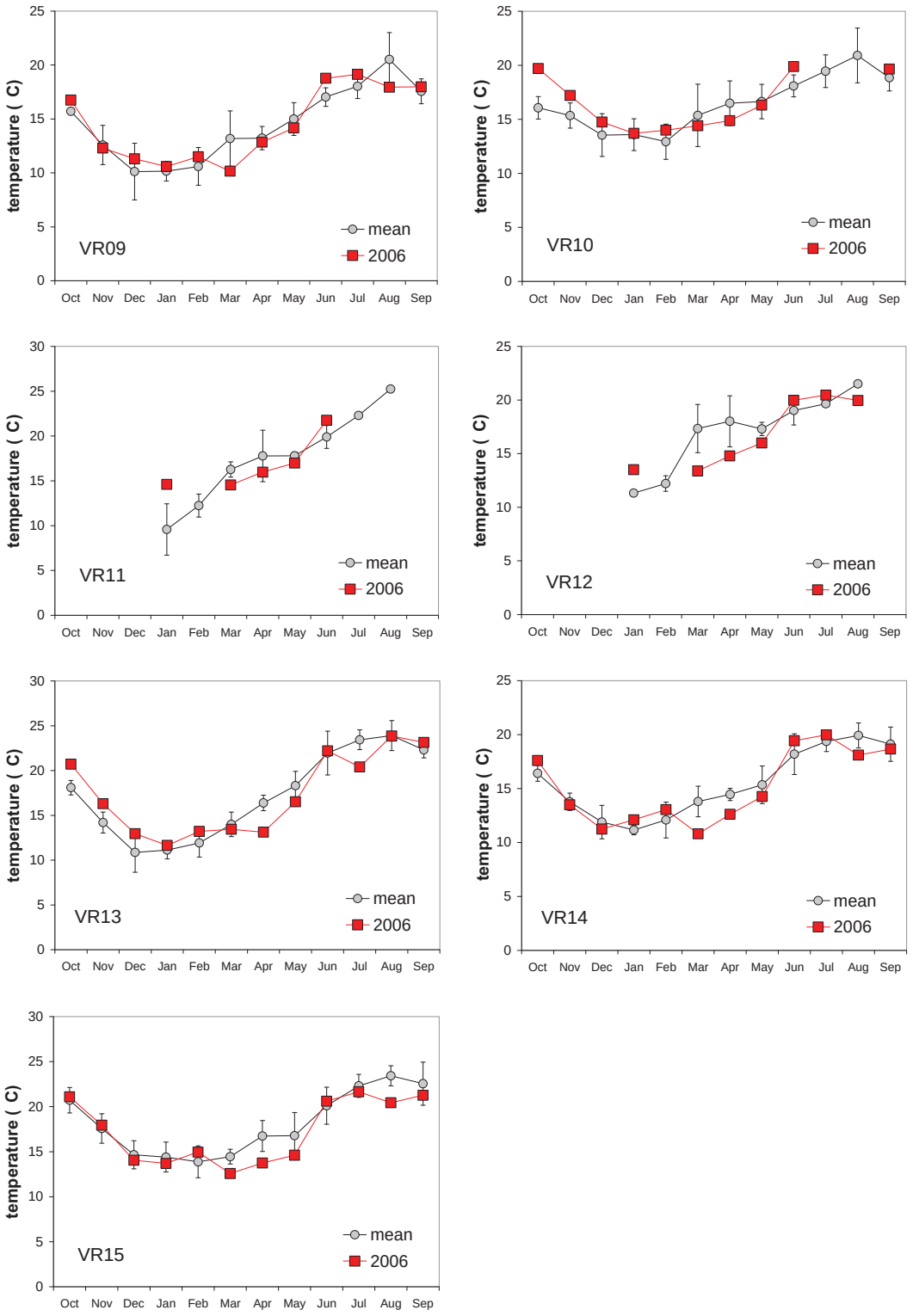


Figure 9. Monthly water temperatures for Ventura Stream Team sampling locations during the 2006 water-year are shown, along with the average monthly temperature from 2001-2005. Error bars indicate the monthly standard deviation in °C.

While the temperature requirements for steelhead are rather stringent, warm-water fish have greater tolerance for higher temperatures. Channelkeeper data show that temperatures often increase above 24°C in late summer and rarely drop below 11°C in winter. Reasonable departures from these criteria are probably not a vital concern. Southern steelhead evolved in what are essentially warm-water rivers and streams and undoubtedly have greater tolerance for higher temperatures than their more northern cousins; then too, fish are not passive participants but are free to seek out more favorable conditions (Matthews and Berg, 1997; Stoecker, 2002).

Dissolved Oxygen

Aquatic organisms are dependent on the presence of oxygen; not enough dissolved oxygen and they weaken or die. Water temperature, altitude, turbulence, season and time of day all affect the amount of oxygen in water. Water holds less oxygen at warmer temperatures and higher altitudes, and plants and algae can cause significant variations.

Dissolved oxygen (DO) is usually measured in milligrams per liter (mg/L) or percent saturation. Milligrams per liter is the weight of oxygen in a liter of water. It's often simpler to think of mg/L as "parts per million," since a liter of water weighs a million milligrams, 1 mg/L is the same as one part of dissolved oxygen in a million parts of water.

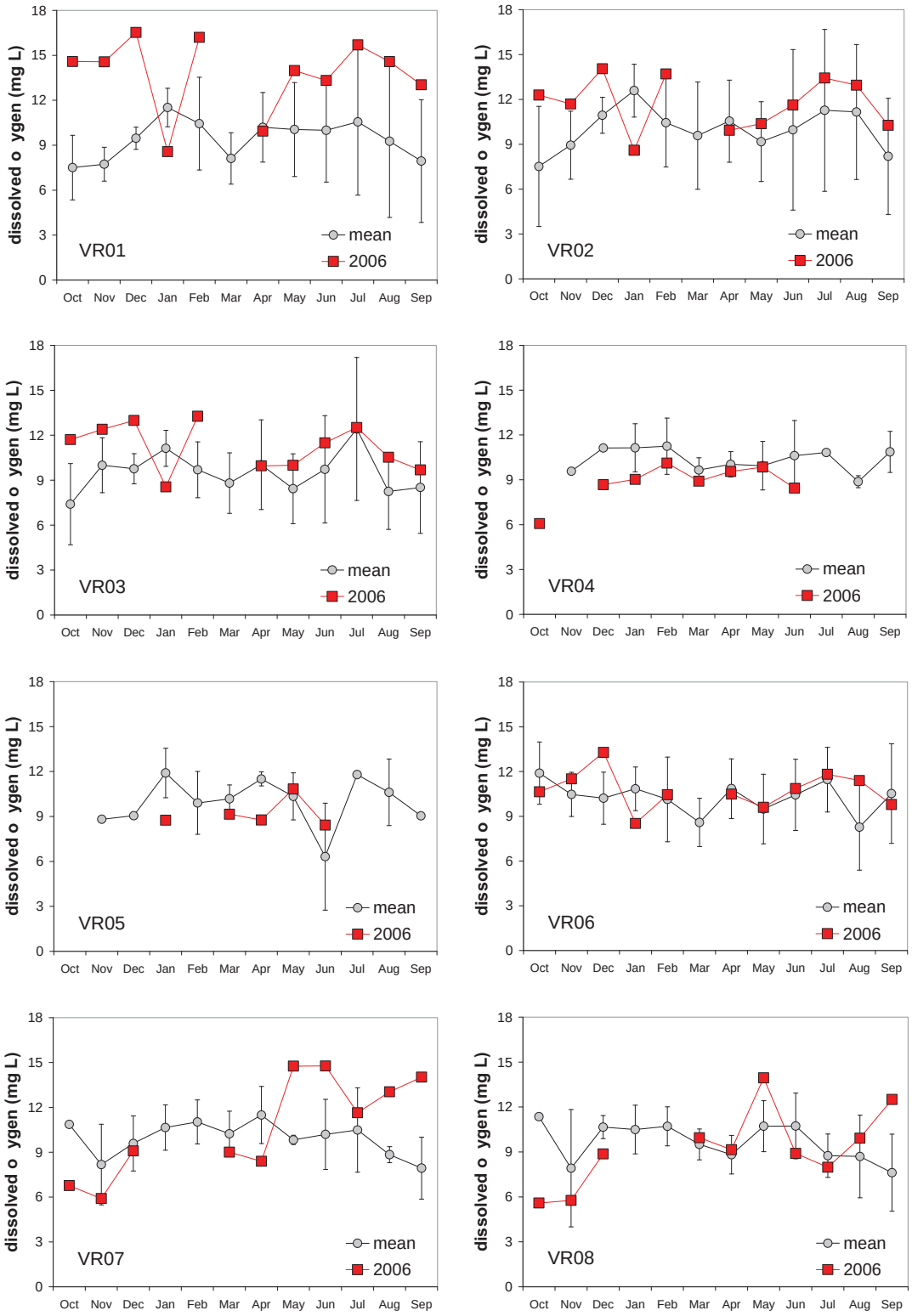
Cold water fish (trout and steelhead) require oxygen levels above 6 mg/L, and DO above 8 mg/L may be required for spawning (Davis, 1975; EPA, 1986; Bjorn and Reiser, 1991; Deas and Orlob, 1999). Warm-water fish can tolerate concentrations as low as 4 mg/L. Below 4 mg/L, fish are put in danger, and below 2 mg/L, usually defined as the beginning of hypoxia, all other aquatic organisms become stressed. Anoxic conditions, i.e., the total disappearance of oxygen, is not only fatal to oxygen-dependent biota but leads to fundamental microbial and geochemical changes in stream and sediments.

Dissolved oxygen concentrations during 2006 at the Ventura sampling sites are shown in Figure 10. Error bars represent the standard deviation of past monthly concentrations. DO in 2006 was generally higher than the average of past measurements, and in almost all cases monthly concentrations were above 6 mg/L. Unfortunately, this is not good news. DO concentrations were often too high and, as such, indicate trouble.

Stream sampling typically takes place in daylight. During much of the year, algae and underwater aquatic vegetation use sunlight for photosynthesis, removing carbon dioxide from the water column and replacing it with oxygen. This process is reversed at night when oxygen is removed and carbon dioxide added (Carlsen, 1994; NM-SWQB, 2000). Thus very high daytime oxygen concentrations can indicate an overabundance of algae. Under these conditions oxygen reaches a minimum just before sunrise – and it is concentrations during this critical period that determine the actual threat to fish and other aquatic species, a threat that is ordinarily not evaluated (Windel et al., 1987; Deas and Orlob, 1999; PIRSA, 1999).

Summer-time water temperatures in the Ventura River system usually peak around 20°C (Figure 9). Water at this temperature, in equilibrium with a sea-level atmosphere, can contain a maximum concentration of 9 mg/L of dissolved oxygen (i.e., completely saturated). Minimum stream temperatures generally fall to 10-12°C, with a DO concentration of ±11 mg/L at complete saturation. So summer concentrations above 10 mg/L or winter concentrations greater than 12 mg/L are an indicator of too much oxygen during daylight testing (and therefore the possibility of too little during the early morning hours), and most of Ventura Stream Team sampling

locations exhibit this problem during at least part of the year. (Note the early spring oxygen peaks on the Matilija; the May and early fall peaks at Foster Park and below Ojai (VR06, VR08, VR09 and VR10); and the almost year-round presence of abnormally high oxygen levels on lower San Antonio Creek and the lower Ventura (VR01-03, and VR07)).



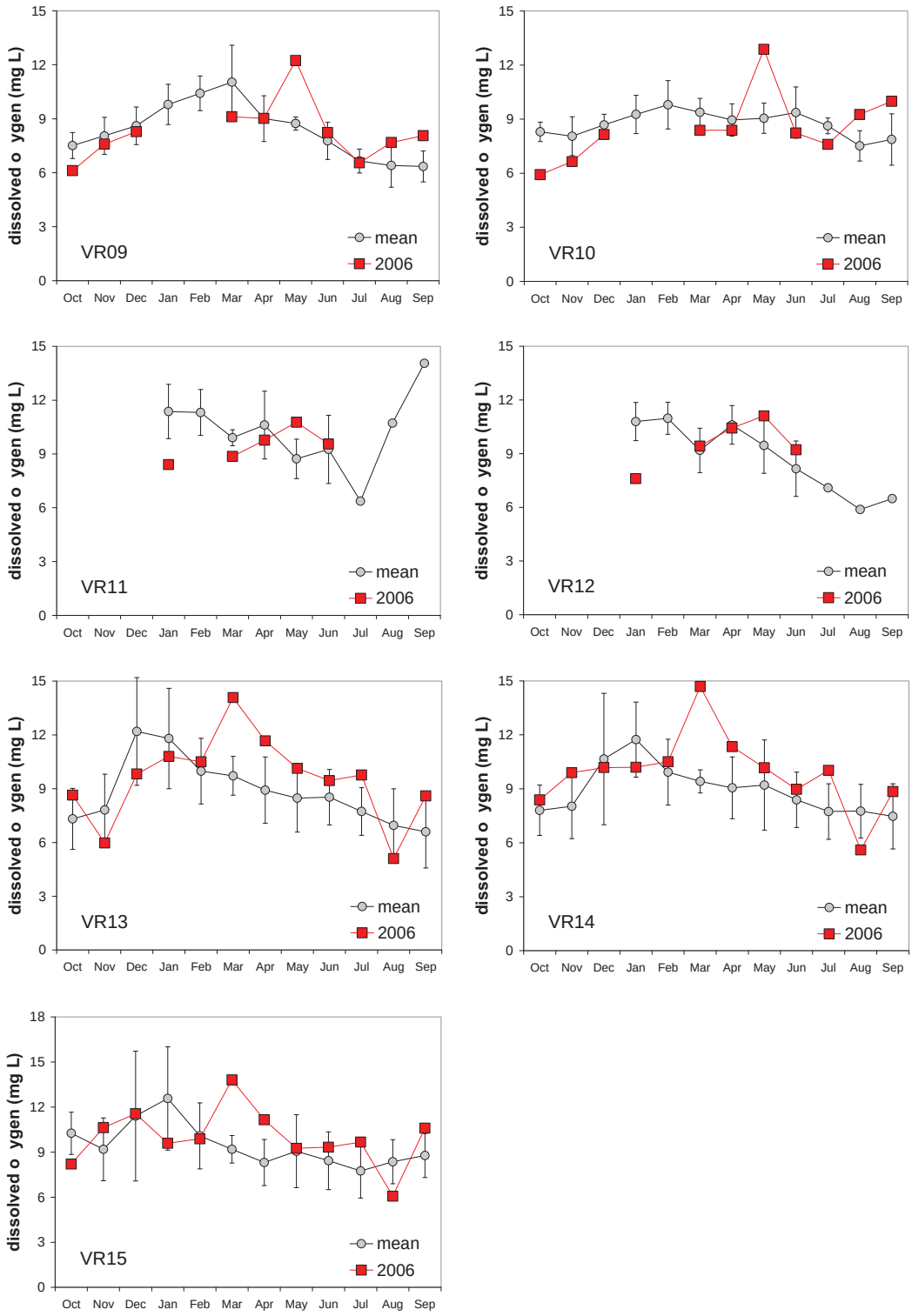


Figure 10. Monthly dissolved oxygen concentrations for Ventura Stream Team sampling locations during the 2006 water-year are shown, along with the average monthly dissolved oxygen from 2001-2005. Error bars indicate the monthly standard deviation in mg/L.

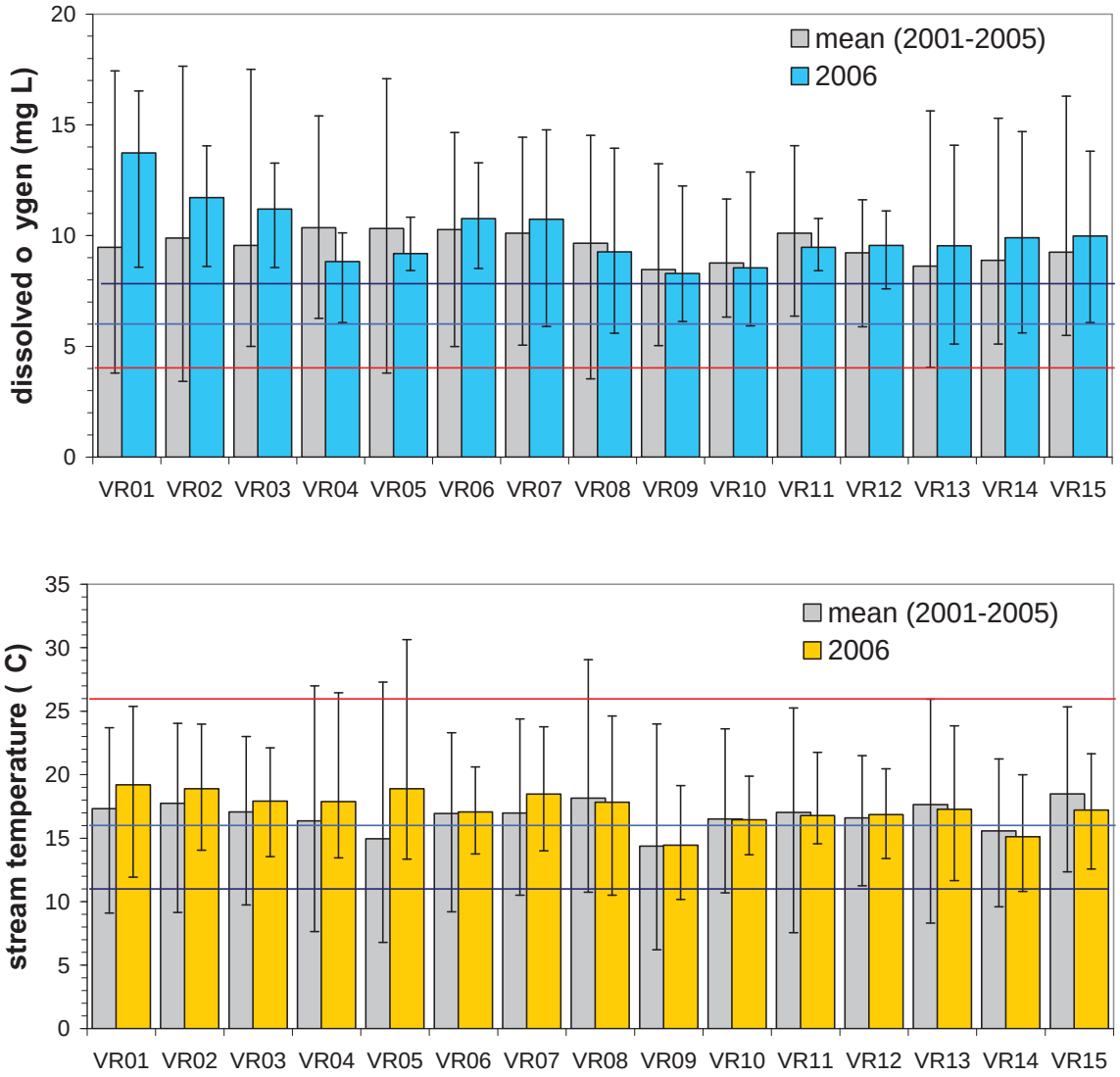
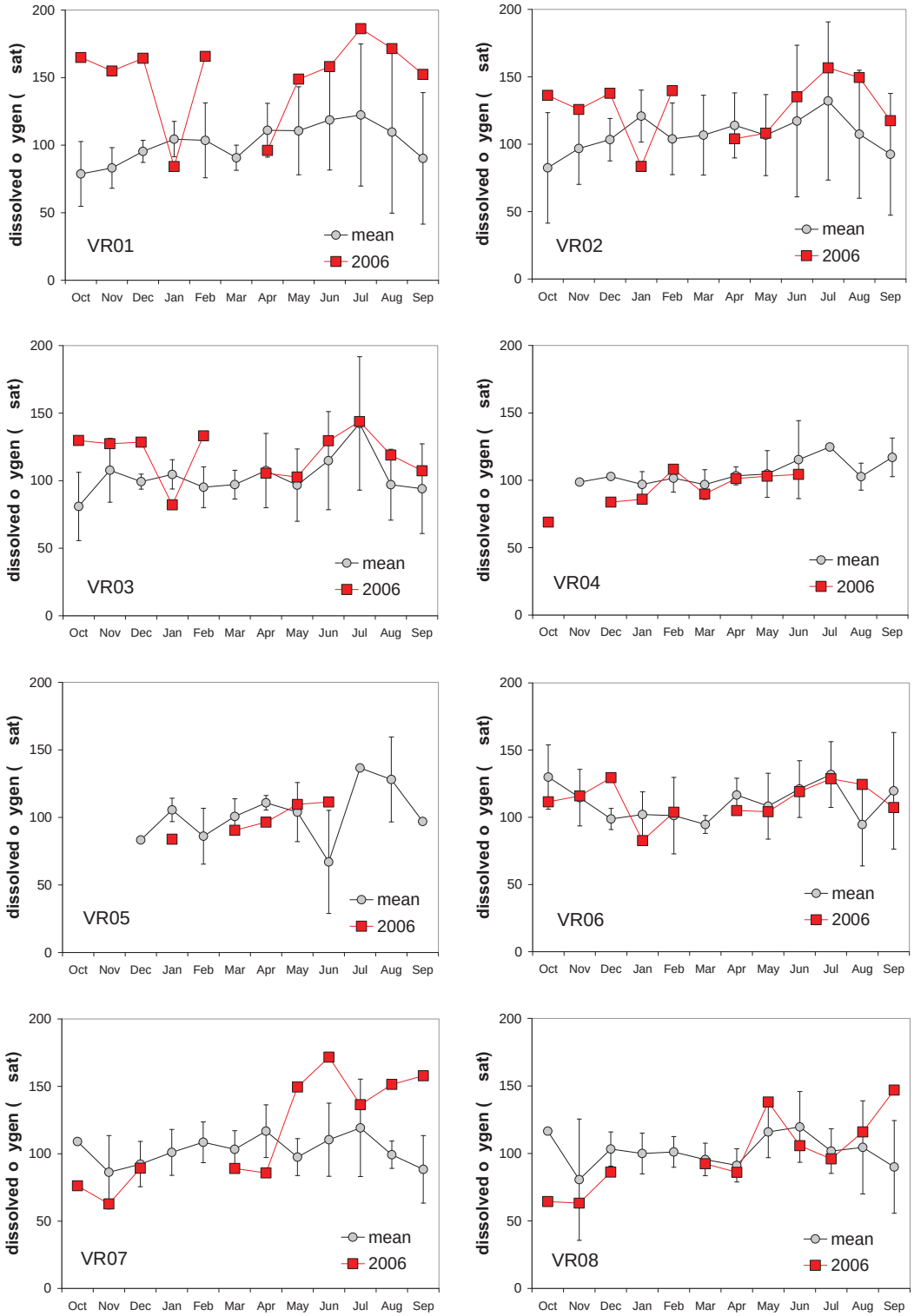


Figure 11. *er anel*: Average dissolved oxygen concentrations for Ventura Stream Team sampling locations during the 2006 water-year are contrasted with mean dissolved oxygen from 2001-2005. Error bars indicate the maximum and minimum concentrations for each average. The 3 horizontal lines mark important DO milestones; above 8 mg/L represents near ideal conditions; below 6 trout and steelhead start to feel stress (but no lasting harm is done in the short term); and below 4 lies severe damage and death. (lower panel) Average 2006 stream temperature contrasted with mean temperature from 2001 through 2005; error bars again indicate maximum and minimum temperatures. The lines represent temperature milestones: above 24°C leads to death; below 16°C indicates good dry season conditions; and below 11°C is excellent for spawning and incubation. Extreme values become critical at locations with measurements below (for DO) or above (for temperature) the bold line.

Channelkeeper's Ventura Stream Team sampling program also measures *ercent saturation*, the amount of DO compared with what water, at the measured temperature and altitude, can hold at equilibrium; in other words, the oxygen excess or deficiency compared with this theoretical maximum. Theoretical, because a stream or river can become super-saturated with oxygen. The key word is *equilibrium*, meaning the attainment of some steady state, a balance between the amount of oxygen entering and the amount leaving. A stream slowly warming as morning air temperatures rise can become super-saturated, as can a turbulent reach actively entraining oxygen. But the only process capable of achieving high amounts of super-saturation is active photosynthesis. A dissolved oxygen content in excess of 120% of saturation is a good indicator of algal problems (it can go as high as 400%). Figure 12 shows 2006 percent DO saturation results for the sampling sites and demonstrates the large extent of algal problems during the past year.

Winter storms in 2005 created ideal conditions for excessive dry-season algal growth in the Ventura River system by: opening the river and tributaries to sunlight; removing competing vegetation; sweeping insect predators out to sea; flushing sediment; restoring a rocky bottom (the ideal substrate for most problem causing algal species in this area); and, through increased groundwater infiltration, insuring expanded habitat and plentiful nutrients. During 2006 these conditions continued. If anything, algal growth during the spring of 2006 may have exceeded that of 2005. Only during the latter part of the year did the heavy growth of aquatic plants inhibit the impact of algae on the lower river (Figure 13). This can be seen in the decrease in % saturation at VR01-03 and VR06 in August and September after peaking in July (Figure 12).


VR01
VR02
VR03
VR04
VR05
VR06
VR07
VR08
mean
2006
dissolved o ygen (sat)
0
50
100
150
200
Oct
Nov
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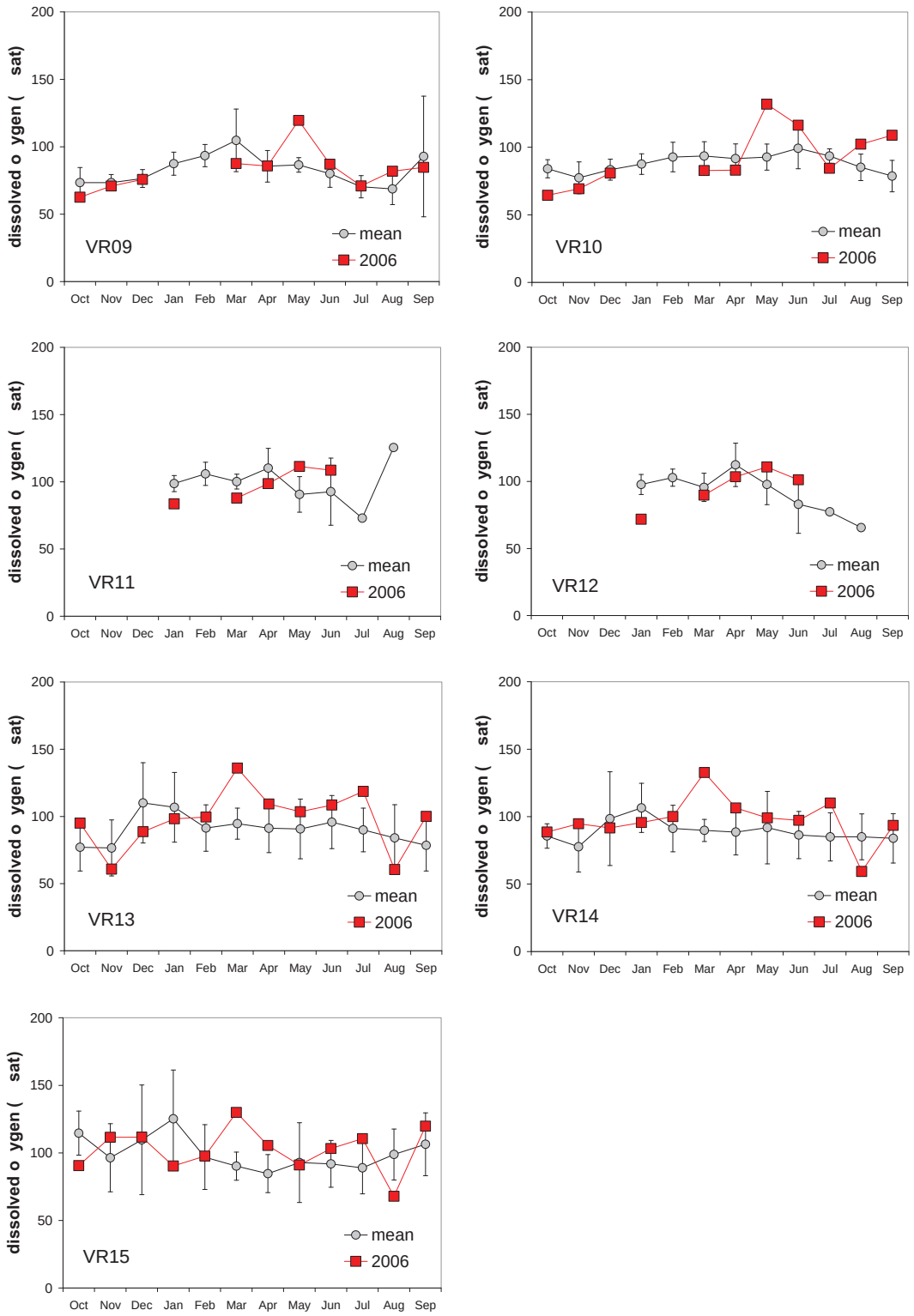


Figure 12. Monthly dissolved oxygen concentrations in percent saturation for Ventura Stream Team sampling locations during the 2006 water-year are shown, along with the average saturation from 2001-2005. Error bars indicate the monthly standard deviation.

Elsewhere the data appear to show two distinct algal blooms, one in early spring (March or May) and another in September (with the possibility of an additional July bloom on the Matilija).

Figure 13. Upstream from the Main Street Bridge (VR01), December 2005 (top) and November 2006 (bottom). By the end of 2006, the lower Ventura was covered with two types of plant cover. Most of what can be seen is watercress, however the arrow marks a line of slightly darker and taller vegetation near the stream edge: *Ludwiga he a etala* or water primrose. If the past is prologue, this plant will come to dominate the lower river.

Mean annual DO concentrations for Ventura Stream Team sampling sites in 2006, along with mean concentrations from previous years, are shown in the upper panel of Figure 11. The error bars indicate maximum and minimum concentrations for each set of data. As with temperature, three important benchmarks are indicated by horizontal lines: above 8 mg/L represents near ideal conditions; below 6 mg/L trout and steelhead begin to feel stress (but no lasting harm is done in the short term); and below 4 mg/L lies severe damage and death. As before, these markers pertain particularly to steelhead and trout; for warm-water fish each limit could be lowered by 1 mg/L, decreasing them to 7, 5 and 3 mg/L, respectively.

Based on the discussion above, locations with an annual mean oxygen concentration greater than 10 mg/L exhibited a severe algal problem: VR01-03, 06 and 07. Figure 14, the average annual percent saturation for both 2006 and past years, reinforces this impression.

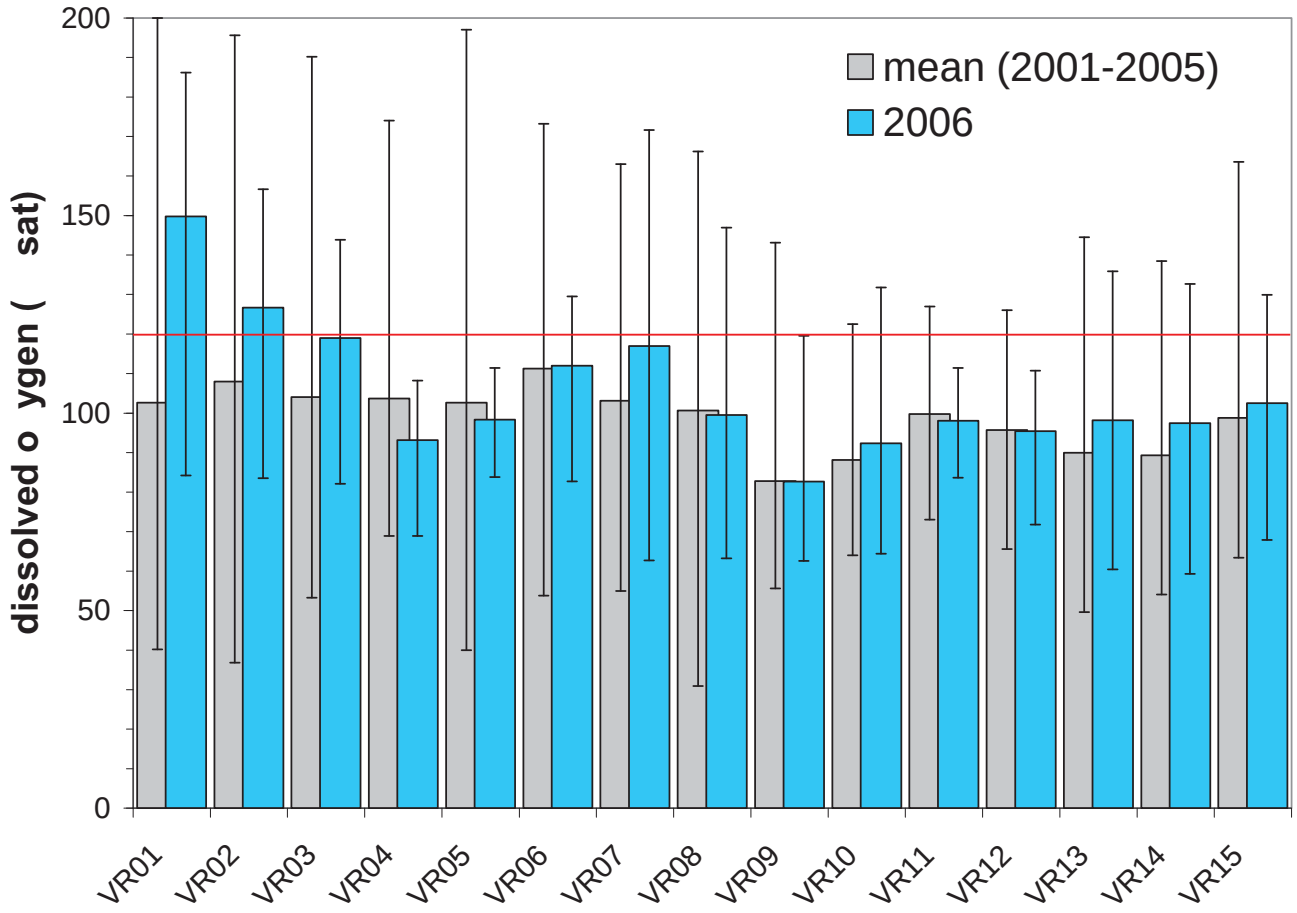


Figure 14. Average dissolved oxygen (in percent saturation) during the 2006 water-year is contrasted with average values from 2001-2005. Concentrations above 120% saturation (horizontal line) usually indicate problems with algal growth: over-saturation during daylight followed by depleted concentrations at night. The error bars indicate the maximum and minimum percent saturation at each site.

Turbidity

Turbidity is a measure of water clarity and the amount of sediment suspended in the water column. There are numerous methods for measuring turbidity and it can be reported in a number of different units. Channelkeeper measures clarity with a turbidity meter (or nephelometer) which reports results in Nephelometric Turbidity Units (NTU). A nephelometer passes a beam of light through a water sample and records how much of the beam is scattered at right angles; the more sediment in the sample, the more light is scattered and the higher the turbidity reading.

Particles suspended in the water column have both long- and short-term effects on steelhead and other fish (Sigler et al., 1984; Newcombe and MacDonald, 1991; ODEQ, 2001a, 2001b). Over the long term, sediment settles on the bottom and fills the interstices between streambed gravels

and rocks, decreasing the amount of desirable habitat for spawning and for the insects fish feed upon. Over the short term, turbidity reduces the ability of fish and invertebrates to find food. Water quality begins to be degraded by suspended sediment somewhere between turbidities of 3 and 5 NTU; turbidities above the range of 7-10 NTU appear to diminish the numbers and variety of benthic invertebrates (Quinn et al., 1992; Munn et al., 1989), and above 25 NTU, impacts on steelhead and trout begin to be noticeable. These limits apply to the dry season and periods between storms. During storms they become meaningless in the Ventura River watershed as local suspended sediment concentrations reach tens of thousands of milligrams per liter – turbidity readings in the hundreds of thousands. Fortunately, on the Ventura, turbidities rapidly drop soon after the end of rainfall, and return to near-background levels within 3-7 days after a storm.

Figure 15 shows 2006 geomean turbidity for each of the sampling locations along with geomean turbidity for the earlier record (2001-2006).[6]

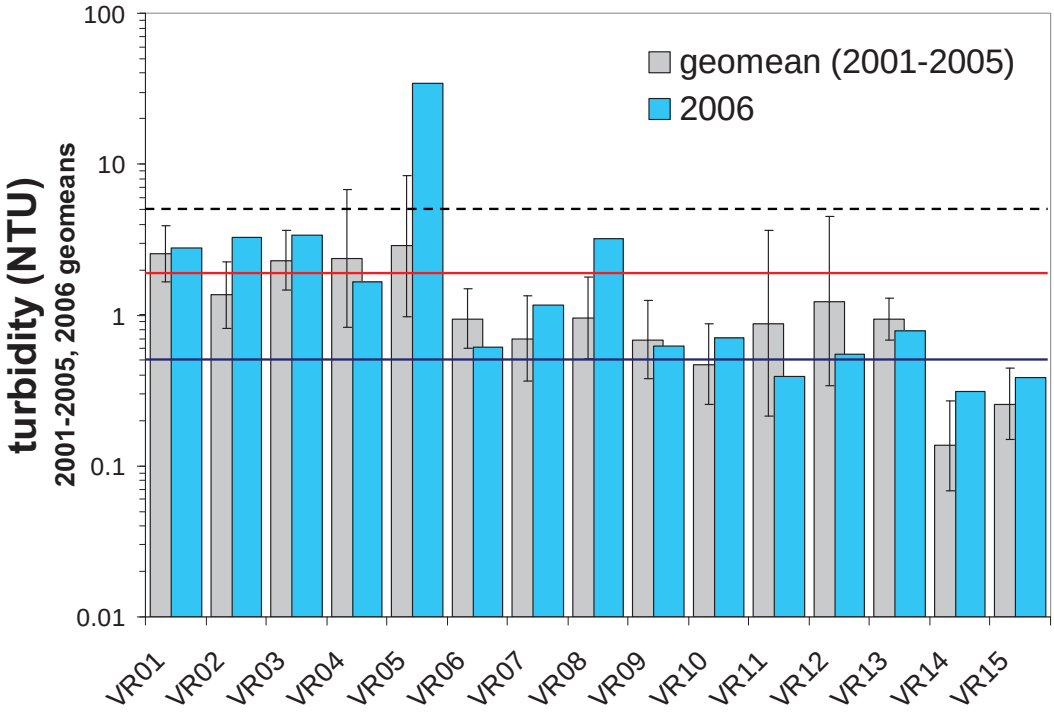


Figure 15. Geomean turbidity during the 2006 water-year is contrasted with the geomean of all measurements from 2001-2006. Error bars indicate the 95% confidence interval for the geomean. Two of the horizontal lines mark typical Public Health drinking water quality benchmarks: a maximum turbidity of 5 NTU and no more than 5% of monthly samples with greater than 0.5 NTU. The bold line indicates the EPA's proposed ecological limit for maximum (non-storm) turbidity in streams of this region, 1.9 NTU.

[6] The geomean is calculated by converting measurements to logarithms, averaging, and then converting the logarithm of the average back to a number. Like the median, it can be a better indicator of "average" conditions than a simple average, particularly when a dataset has numbers that span many orders-of-magnitude – as does turbidity, ranging from near zero into the thousands during storms. The median, the number that falls in the center of a group of measurements, ignores very high or very low numbers as long as they are few. In contrast, the geomean incorporates them but reduces their importance in calculating the average.

Two of the horizontal lines in Figure 15 represent typical Public Health drinking water limits: a maximum turbidity of less than 5 NTU and no more that 5% of monthly samples greater than 0.5 NTU. The third represents an ecological standard. Since increased turbidity may be related to over-productivity or excess nutrient enrichment – more biologically productive water often contains increased amounts of suspended organic matter – the EPA has suggested turbidity standards for various eco-regions in the United States. The goal for Ecoregion III, the xeric (dry) west, in which the most of sampled Ventura watershed is located, is less than 1.84 NTU (US-EPA, 2000a, 2000b). Ecoregion III has been further divided into sub-regions, and the sub-region in which the Ventura lies (sub-region six) has a slightly higher 1.90 NTU limit.

Turbidity measurements in 2006 were roughly compatible with those of earlier years (Figure 15). Some locations had higher turbidity, some lower. Generally, when flows are relatively high, turbidity increases (higher stream velocities tend to keep more particles in suspension), and greater amounts of algae tend to increase the amount of suspended organic matter. Sites with higher turbidity in 2006 (VR01-03, VR07, VR08, and VR10) tended to combine both of these factors. Results for 2005 were also higher for the same reasons. The only exceptionally high result, VR05, is an artifact of three very high, storm-influenced readings during the five months that flow was observed at this site. Using the EPA criterion, only the lower Ventura River and Canada Larga would appear to have persistent problems with excessive turbidity, but even at these sites it is usually below biologically significant limits (7-10 NTU).

H

H is a relative measure of alkalinity and acidity, an expression of the number of free hydrogen atoms present. It is measured on a scale of 1 to 14, with 7 indicating neutral – neither acid nor base; lower numbers show increasing acidity, whereas higher numbers indicate more alkaline waters. H numbers represent a logarithmic scale, so small differences in numbers can be significant: a H of 4 is a hundred times more acidic than a H of 6. All plants and aquatic species live within specific ranges of H, and altering H beyond these ranges causes injury or death. Pollutants can push H toward the extremes, and low H in particular is highly dangerous because it allows toxic elements and compounds to *mobili e* (go into solution) and be taken in by aquatic plants and animals. A change of more than two points on the H scale can kill many species of fish; the EPA and Regional Water Quality Control Board (SWQCB-LA) regard a H change of more than 0.5 as harmful (SWQCB-LA, 1994).

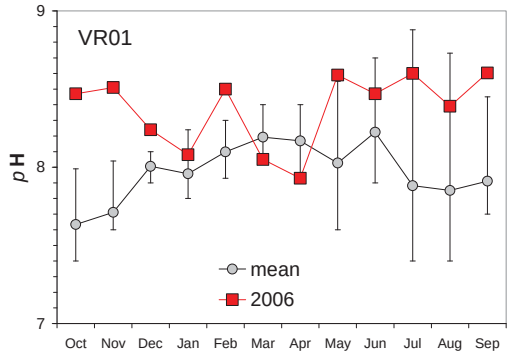
There are numerous available standards for H. Fish live within a range of 5-9, but the best fishing waters lie between 6.5-8.2. The Central Coast Regional Water Quality Board uses a standard of 7.0-8.5 for surface water, 6.5-8.3 for potable water and swimming (SWQCB-CC, 1994); the Los Angeles Regional Water Quality Control Board uses 6.5-8.5 (SWQCB-LA, 1994); and the EPA recommends 6.5-8.0 as being the best for aquatic animals. We use 8.5 as an upper reference limit since the Los Angeles Regional Board establishes the legal standard for the Ventura River.

Photosynthesis, discussed earlier in the section on dissolved oxygen, removes carbon dioxide from the water at the same time as it releases oxygen. Removing carbon dioxide is the same as removing acidity, thus photosynthesis increases H at the same time as it increases the amount of dissolved oxygen (PIRSA, 1999; NM-SWQB, 2000).

Normally, absent this process, we should see little change in H. The dissolved minerals that give Ventura waters high conductivity contain large amounts of carbonates which "buffer" the river against large variations (waters in the region typically contain around 120 mg/L of acid neutralizing capacity expressed as carbonate), but changes in the concentration of dissolved carbon dioxide are a major exception.

Figure 16 shows monthly 2006 H measurements along with the average monthly results from previous sampling; the error bars represent maximum and minimum values for 2001-2005. Algal productivity on the lower Ventura River did manage to keep H slightly above the 8.5 limit for much of the dry season. Elsewhere, values were in the allowable 6.5-8.5 range. Figure 18 summarizes the 2006 results, comparing the annual mean with the overall mean from previous years. The general trend is a slight increase at all locations with year-round flow (i.e. with appreciable dry-season algal production).

The data, however, show some discrepancy. When significant amounts of algae are present, dissolved oxygen concentrations and H should rise and fall together. In Figure 17, percent DO saturation is plotted, along with H data from Figure 16, for a subset of Ventura locations. The lower river sites (e.g., VR01 and VR02) do show the expected correspondence, but at other locations H decreases as percent saturation rises above 120% (e.g., VR08, VR10 and VR15). H is difficult to measure accurately and this may simply be an example of that.


VR01
pH
9
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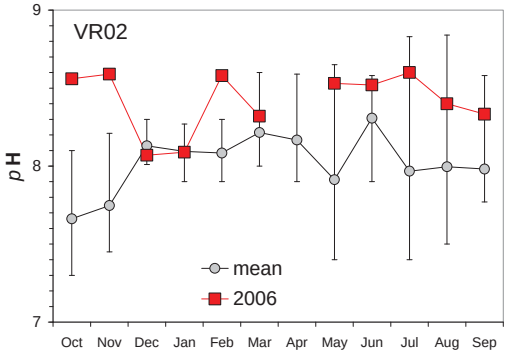
7
mean
2006
Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep


VR02
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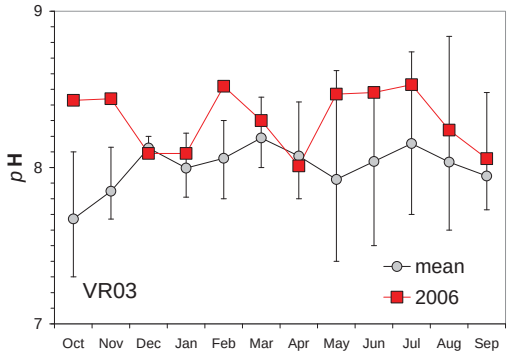
VR03
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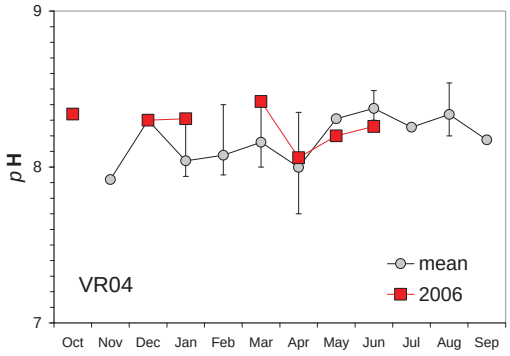
Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep


VR04
pH
9
8
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2006
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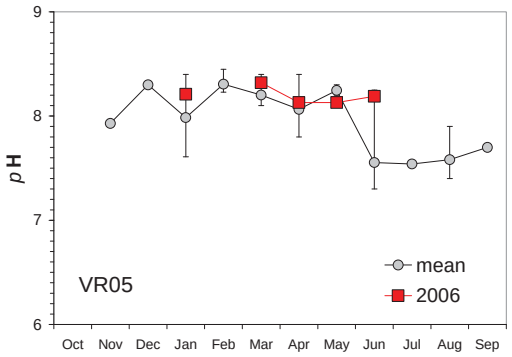
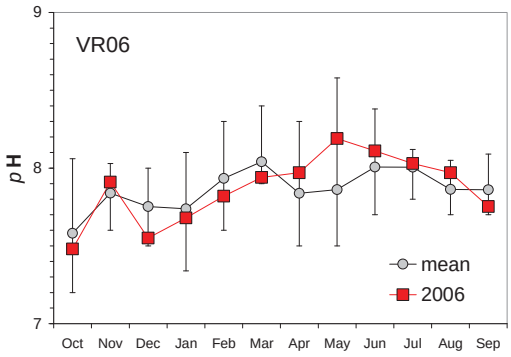

VR05
pH
9
8
7
6
mean
2006
Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep


VR06
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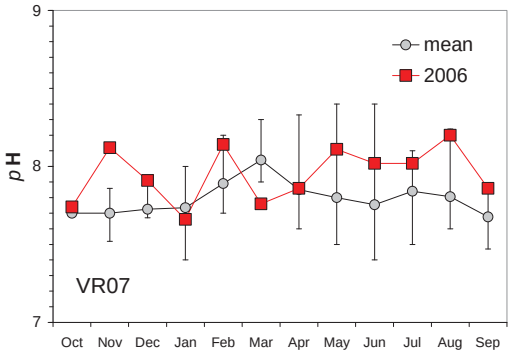
2006
Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep


VR07
pH
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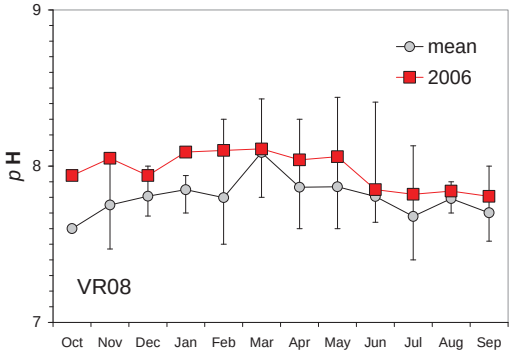
mean
2006
Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep


VR08
pH
9
8
7
mean
2006
Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep

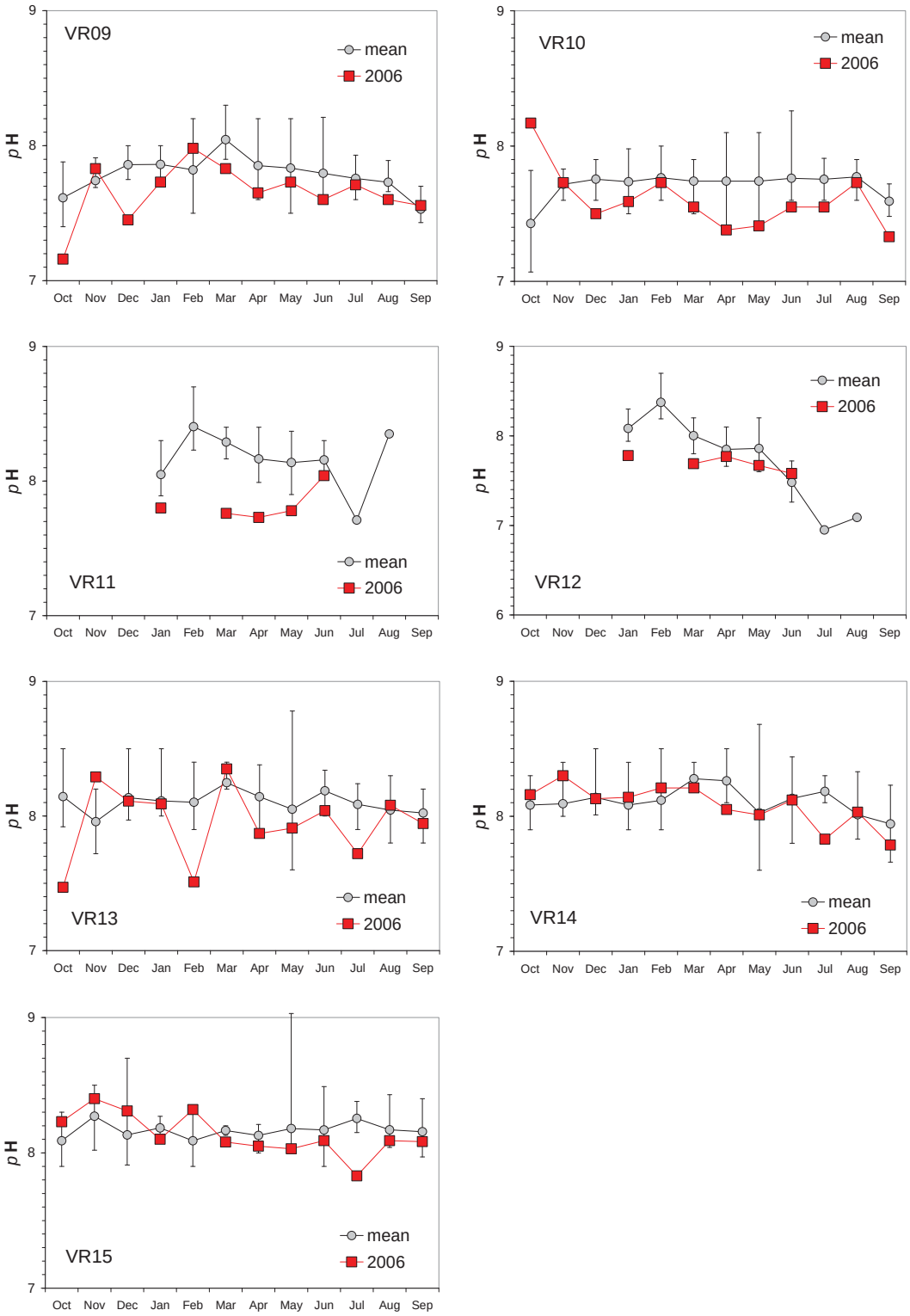


Figure 16. Monthly H values for the Ventura Stream Team sampling locations during the 2006 water-year are shown, along with the average H from 2001-2005 (H of the average H ion concentration). Error bars indicate the maximum and minimum values from 2001-2005.

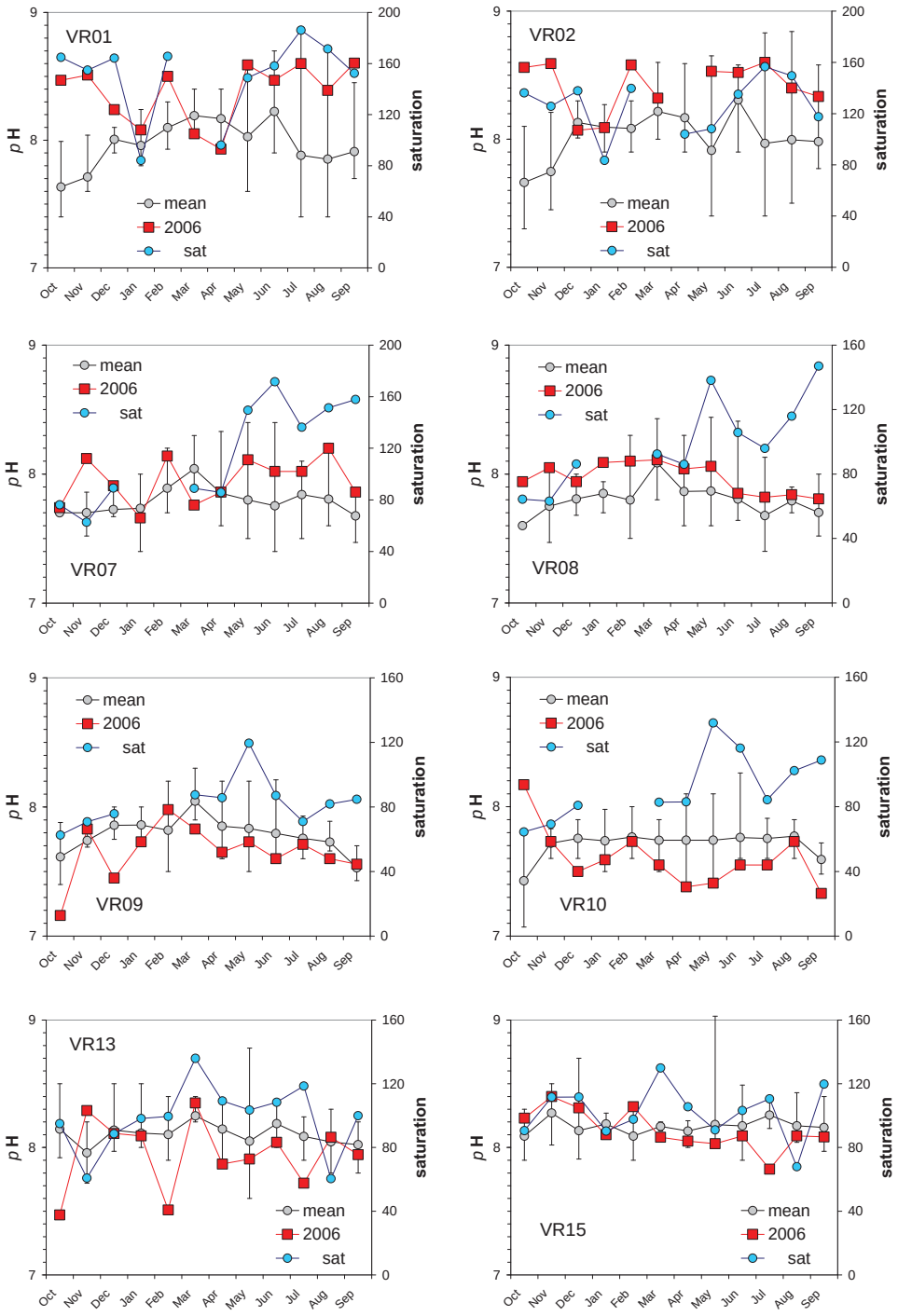


Figure 17. Monthly 2006 percent DO saturation values for selected Ventura Stream Team sampling locations are plotted along with pH data from Figure 16. Since Ventura waters are highly buffered, there should be a reasonable correspondence between pH and % saturation, since both increase with daylight photosynthesis. This is generally the case at the lower river sites and elsewhere during the first part of the year. However at many locations, particularly towards the end of the year, this relationship breaks down.

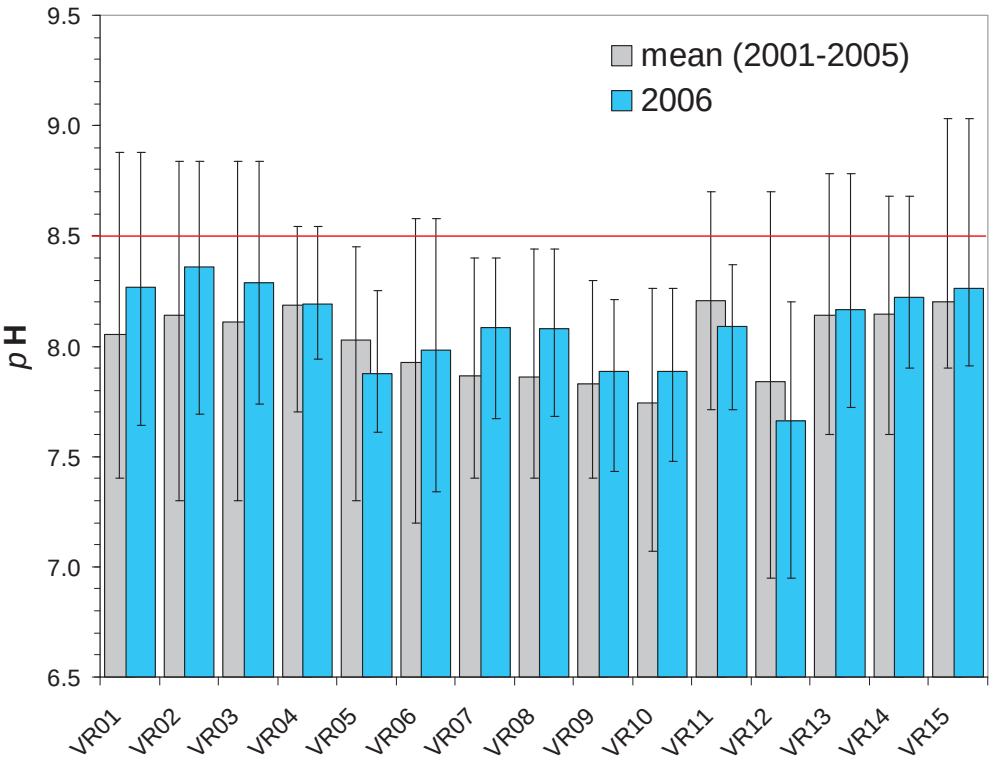


Figure 18. Average H during the 2006 water-year is contrasted with average values from 2001-2005. The error bars indicate the highest and lowest values measured for each time period at the sampling locations. The horizontal line represents the Los Angeles Regional Water Quality Control Board's upper H limit of 8.5 (from the Ventura Basin Plan). Average pH was computed from the mean hydrogen ion concentration. Concentrations above 120% saturation (horizontal line) usually indicate problems with algal growth: over-saturation during daylight followed by depleted concentrations at night. The error bars indicate the maximum and minimum percent saturation at each site. A H above 8.5 is usually associated with excessive algal growth.

Nutrients

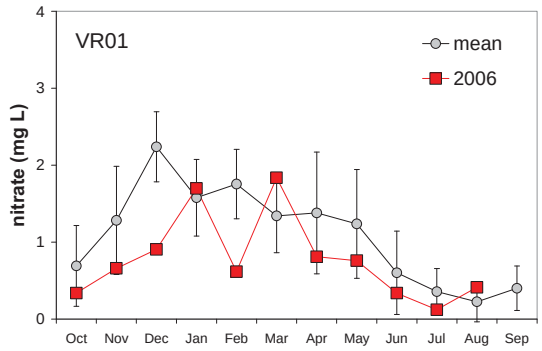
Phosphorus and nitrogen are essential nutrients for all living organisms (nitrogen for protein synthesis and phosphorus for energy transformation in cells), but in excess amounts they cause severe problems (Sterner, 2002, Smith et al, 1999, Carpenter et al., 1989).

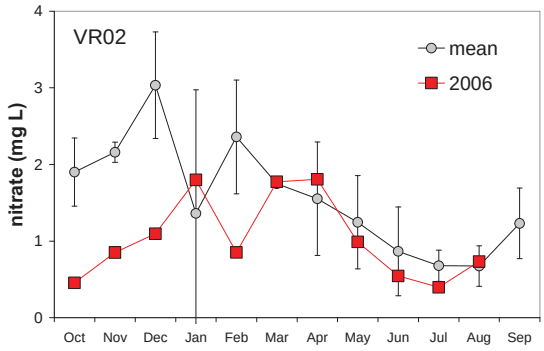
Phosphorus in streams and rivers can come naturally from soil and rocks and decaying plants, or unnaturally in runoff from pastures, fertilized lawns and cropland. Failing septic systems and wastewater treatment plants are also sources, as are disturbed land areas and drained wetlands. Phosphorus, both as phosphate and in organic molecules, moves in solution or attached to particles suspended in the flow.

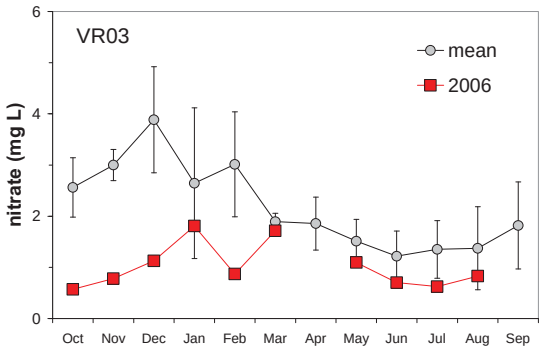
Nitrogen is available as dissolved inorganic molecules (nitrate, nitrite and ammonium) and as dissolved or suspended organic matter (complex compounds associated with living, or once living, tissue). Nitrate, the most common form of nitrogen found in the Ventura watershed, can be toxic to warm-blooded animals, particularly babies, at high concentrations (greater than 10 mg/L), and there may also be a link between high nitrate levels and cancer (cf. non-Hodgkin's

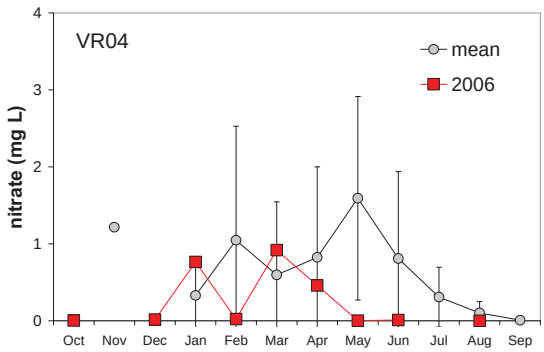
lymphoma, Ward et al., 1996). Sources of nitrate include effluent from wastewater treatment plants, runoff from fertilized lawns and cropland, failing septic systems, animal manure and industrial discharges. Nitrates move quickly into streams and rivers since they readily dissolve and are not adsorbed on soil particles.

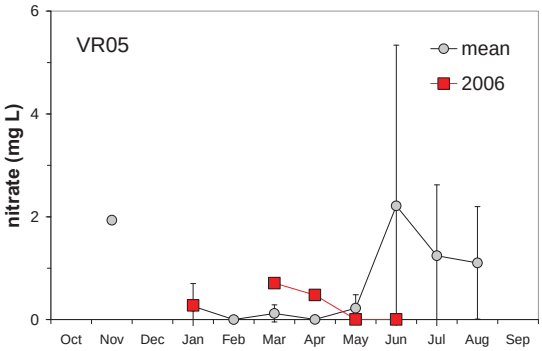
Nutrients in excessive amounts can cause *eutro hication*, defined as over-enrichment or over-fertilization of a lake or stream, which sets off a chain of undesirable events including accelerated plant growth, algal blooms, low dissolved oxygen and, if carried to extremes, the death of all oxygen-dependent aquatic life.

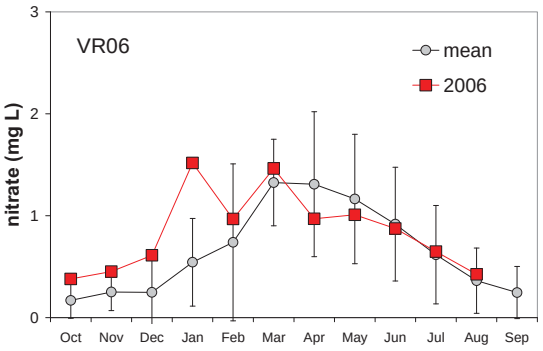

VR01
mean
2006
nitrate (mg L)
0
1
2
3
4
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep

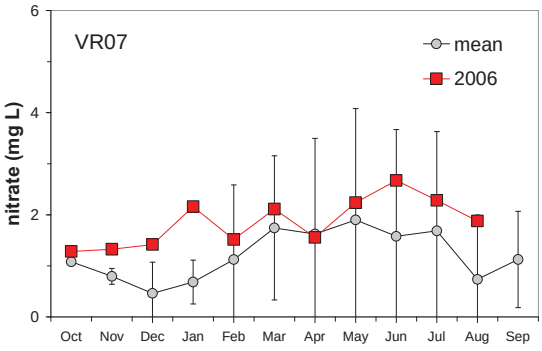

VR02
mean
2006
nitrate (mg L)
0
1
2
3
4
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep

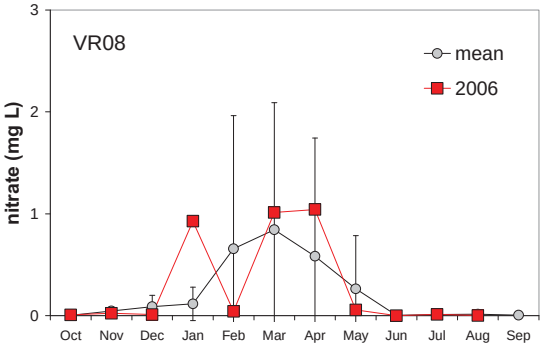

VR03
mean
2006
nitrate (mg L)
0
2
4
6
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep


VR04
mean
2006
nitrate (mg L)
0
1
2
3
4
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep


VR05
mean
2006
nitrate (mg L)
0
2
4
6
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep


VR06
mean
2006
nitrate (mg L)
0
1
2
3
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep


VR07
mean
2006
nitrate (mg L)
0
2
4
6
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep


VR08
mean
2006
nitrate (mg L)
0
1
2
3
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep

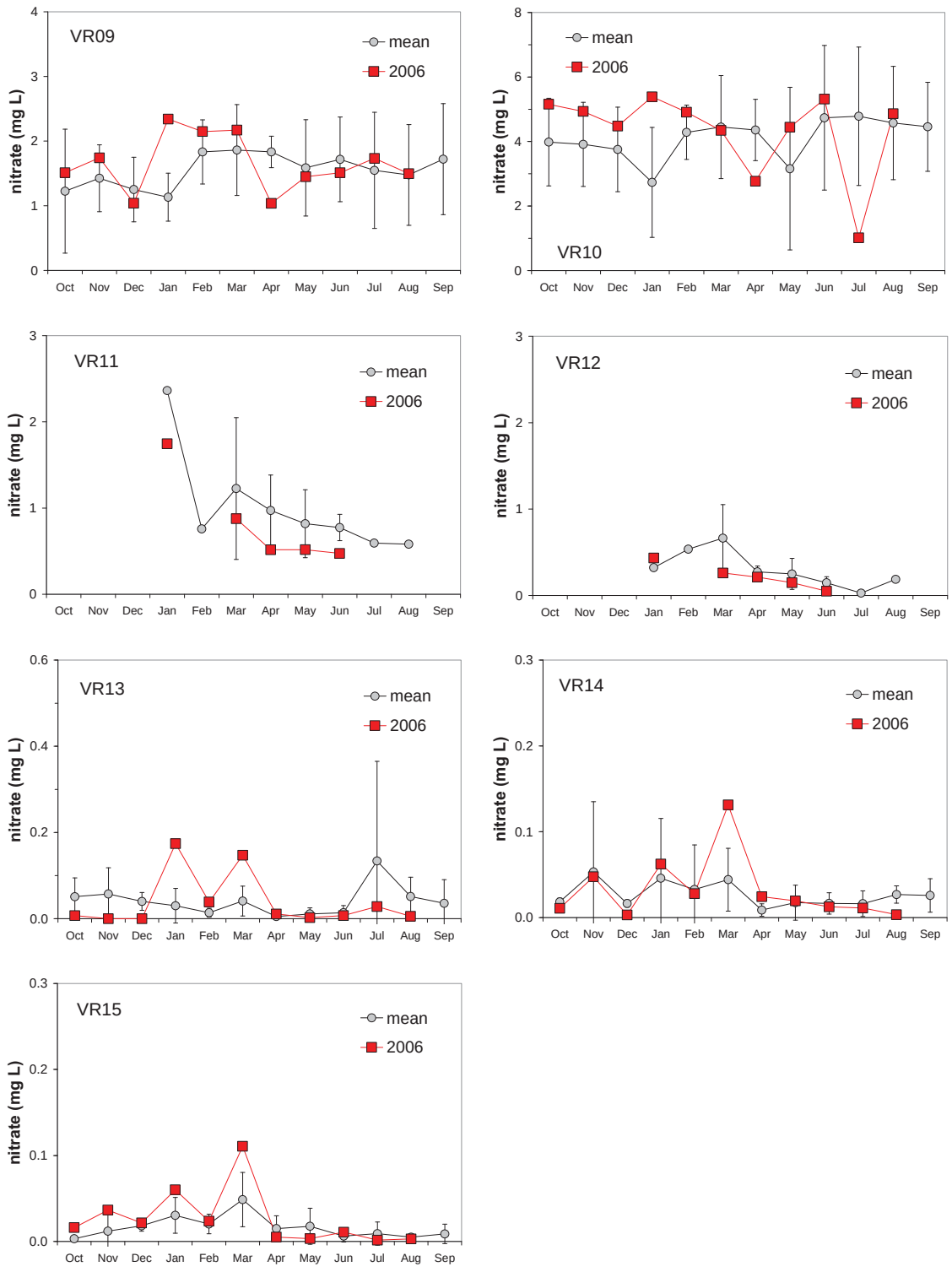


Figure 19. Monthly nitrate concentrations for Ventura Stream Team sampling locations during the 2006 water-year are shown, along with average monthly nitrate from 2001-2005. Error bars indicate the monthly standard deviation in mg/L.

Nitrate

Nitrate is the most important form of dissolved nitrogen in the Ventura River catchment: roughly 70% of the total dissolved nitrogen in river and stream samples is nitrate (ammonium contributes about 1% and organic forms make up the rest). 2006 monthly nitrate concentrations for Ventura Stream Team sampling locations are shown in Figure 19. Concentrations were generally similar to those of past years, i.e., within one standard deviation of the 2001-2005 average. Exceptions were VR01, VR02 and VR03, where lower than normal concentrations were seen during the fall of 2005 due to above average wet-year flows diluting the high-nitrate Ojai sewage treatment plant effluent that usually dominates these sites.

Elsewhere, higher wet-year flows usually produce increased nitrate while lower flows typically have lower, often near-zero, concentrations. Biological uptake (removal by plants, algae and critters) reduces the amount of available nitrate as water flows downstream, and since *amount* is the product of concentration multiplied by flow, the decrease in concentration is much greater when flows are low. This acounts for generally higher than average concentrations at locations with year-round flow (e.g., VR06-10 and on the Matilija) and lower at those that rapidly go dry (VR04-05 and VR11-12) (see Figure 20). Since biological uptake and lower flows are both more common in the summer, concentrations exhibit seasonal patterns at some locations, increasing during the winter from enhanced runoff and groundwater inflows and decreasing thereafter (i.e., VR06). Annual results, expressed as average water-year concentrations, are sumarized in Figure 20.

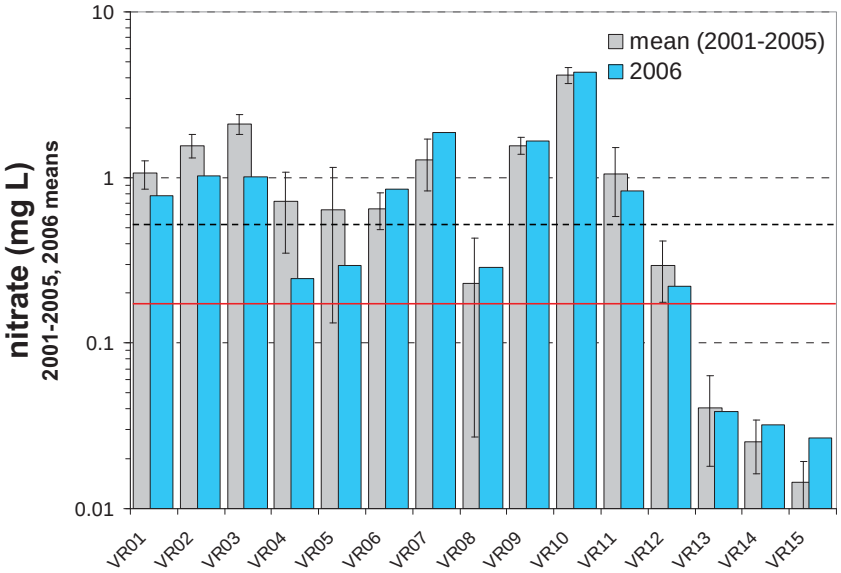


Figure 20. Average nitrate concentrations for the Ventura Stream Team sampling sites during the 2006 water-year are contrasted with average concentrations over the previous five years (2001-2005). The error bars indicate twice the standard error of the mean, i.e., the 2006 average would be expected to lie within these error bars, while anything beyond these limits could indicate a significant change. Note that most 2006 locations are generally within or below the error bars. The bold horizontal line marks the EPA's proposed limit for maximum nitrate in this region (0.16 mg/L); the dashed line is the recommended limit for nitrogen (0.52 mg/L). In 2006, nitrate typically made up about 80% of the total nitrogen in the Ventura system, so most sites considerably exceeded both the recommended nitrate and total nitrogen amounts. Only the higher elevation, relatively pristine, Matilija sampling sites consistently exhibit low nitrogen.

Note that nitrate concentration in the Ventura watershed vary considerably from location to location (Figures 19 and 20). The almost universal Public Health limit is 10 mg-N/L (10 milligrams of nitrogen per liter. However, 10 mg/L is far too much nitrate in terms of eutrophication and river health. The EPA has suggested standards for various eco-regions in the United States, and the goal for Ecoregion III, the xeric (dry) west, in which the Ventura River is located, is less than 0.38 mg/L of total nitrogen (US-EPA, 2000b). Notice that this is less than 4% of the Public Health nitrate limit (e.g., SWQCB-LA, 2001). Ecoregion III has been further divided by the EPA into sub-regions, and for the sub-region in which the Ventura lies (sub-region six) a slightly higher 0.52 mg/L limit has been proposed. Sub-region 6 also has a suggested nitrate limit of 0.16 mg/L. Both these limits are shown on Figure 20.

Considering this, the Matilija sites are in very good shape: nitrate concentrations are usually below the 0.16 mg/L benchmark and average annual concentrations are well below. All other sites have nitrate concentrations above the 0.16 limit: more than an order-of-magnitude greater in many cases. VR10 (Upper San Antonio Creek) continues to have the most severe excess nitrate problem on the river.

Phosphate

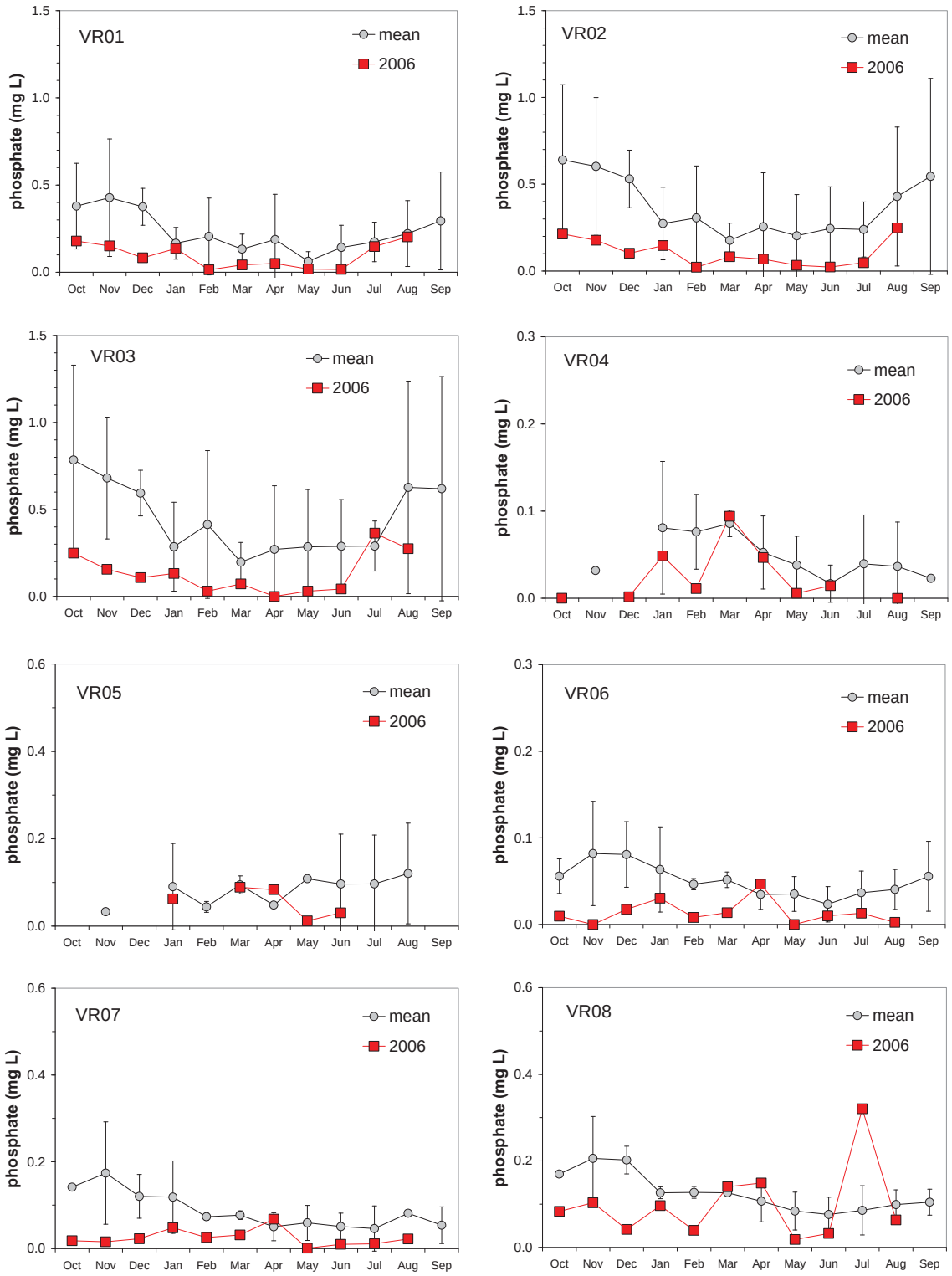
As with nitrate, a question arises of how much phosphorus is too much phosphorus? The EPA has recommended levels of maximum phosphorus concentration for streams in Ecoregion III: an overall recommendation of 0.022 mg/L, increased to 0.030 mg/L for the sub-region 6 that includes the Ventura (US-EPA, 2000b). We use 0.030 mg/L as a benchmark. All streams in Ventura and other watersheds in the area have high phosphate concentrations because phosphorus content is high in the marine deposits that make up a large part of the underlying geologic strata (Dillon, 1975; Grobler and Silberbauer, 1985; Schlesinger,1997); this is somewhat reflected in the increased sub-region 6 EPA limit.

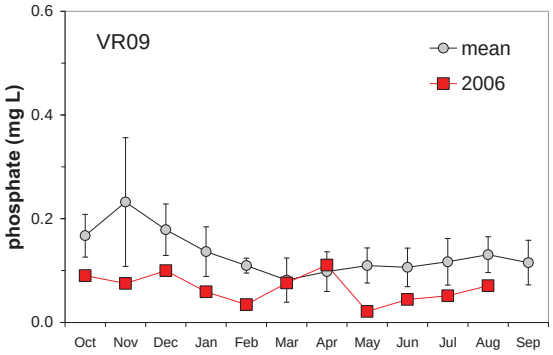
Figure 22 summarizes the 2006 phosphate results, showing annual mean phosphate concentrations at each location and contrasting them with the 2001-2005 average. The results are quite startling: *all* locations had significantly lower average phosphate concentrations than in previous years (2006 results are two or more standard errors below the 2001-2005 mean). The monthly data in Figure 21 verify this conclusion at almost every location. There are two possible explanations: less phosphate is getting into the Ventura River and its tributaries, and/or larger amounts are being removed by biological uptake and productivity.

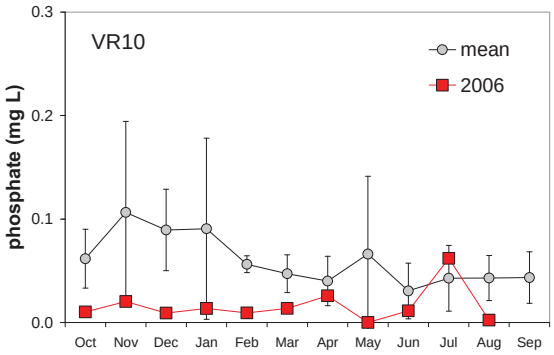
It is most likely a combination of these two reasons. The dry seasons of 2005 and 2006 were characterized by extraordinary algal blooms, and the increased uptake of phosphorus undoubtedly played an important role in reducing concentrations. It is biological uptake that gives form to the pattern seen with most of the average monthly data in Figure 21: lower concentrations during the dry season, with a low seen between April and June.

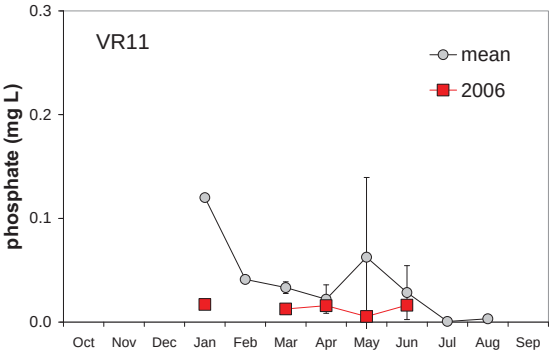
Exceptions to the pattern are usually samples taken during or soon after storms, because high phosphate concentrations are typically caused by high sediment loads. Phosphate molecules are easily attached to soil particles, and the width and condition of streamside buffer areas, the extent of stream bank armoring, and the proximity of un-vegetated, easily erodable soil to channel or storm drain inlet, as well as rainfall intensity, determine how much sediment ends up in the creek. This, in turn, drives the phosphate increase. This is particularly true of the first storm of the season, which usually moves a lot of sediment and accumulated debris in what were initially

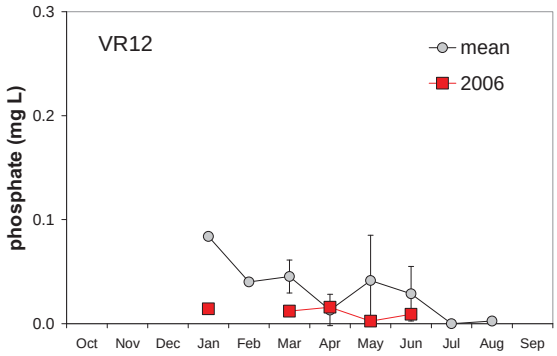
Figure 21. Monthly phosphate concentrations for Ventura Stream Team sampling locations during the 2006 water-year are shown, along with average monthly phosphate from 2001-2005. Error bars indicate the monthly standard deviation in mg/L.

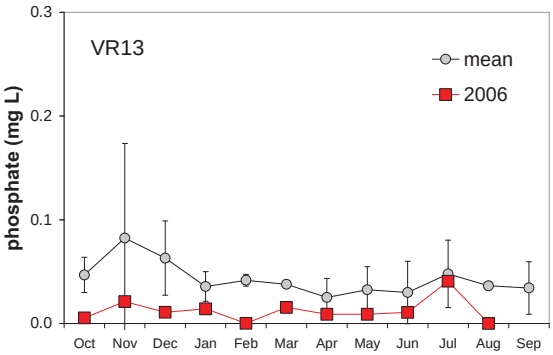


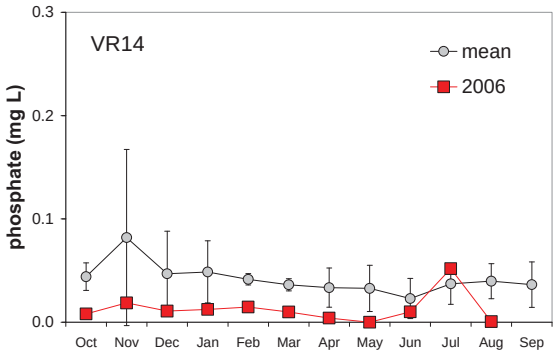

VR09
mean
2006
phosphate (mg L)
0.0
0.2
0.4
0.6
Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep

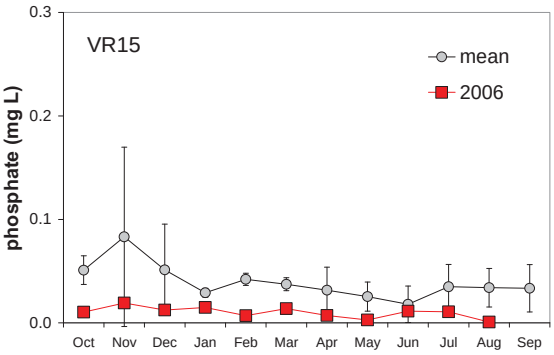

VR10
mean
2006
phosphate (mg L)
0.0
0.1
0.2
0.3
Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep


VR11
mean
2006
phosphate (mg L)
0.0
0.1
0.2
0.3
Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep


VR12
mean
2006
phosphate (mg L)
0.0
0.1
0.2
0.3
Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep


VR13
mean
2006
phosphate (mg L)
0.0
0.1
0.2
0.3
Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep


VR14
mean
2006
phosphate (mg L)
0.0
0.1
0.2
0.3
Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep


VR15
mean
2006
phosphate (mg L)
0.0
0.1
0.2
0.3
Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep

dry or near stagnant streams, explaining why the highest monthly concentrations are usually seen in October or November. In 2006, we saw the effect of storm-influenced concentrations in higher March and April values.

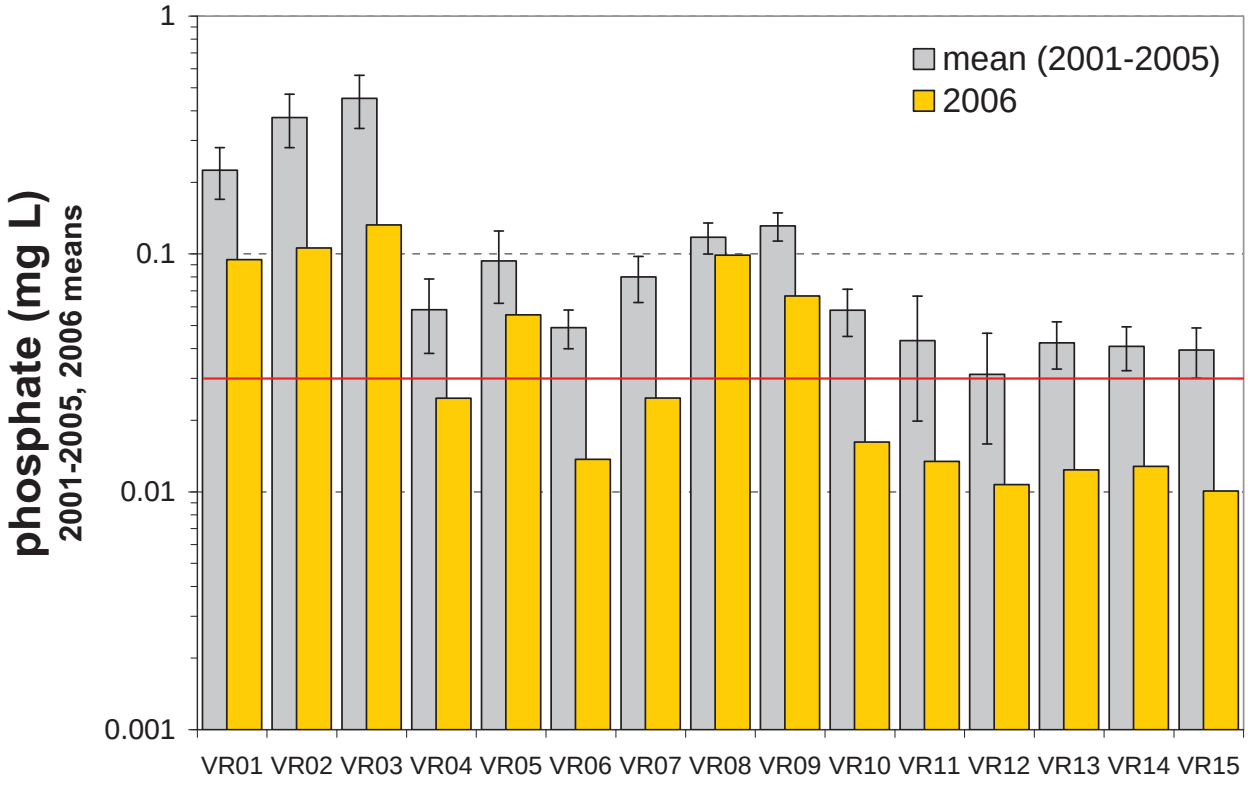


Figure 22. Average phosphate concentrations for the Ventura Stream Team sampling sites during the 2006 water-year are contrasted with average concentrations over the previous five years. The error bars indicate twice the standard error of the mean, i.e., the 2006 average would be expected to lie within these error bars, while anything beyond these limits could indicate a significant change. Note that almost all 2006 results are below the error bars, indicating unusually low phosphate. The heavy horizontal line mark marks the EPA's proposed limit for maximum phosphorus in this region (0.030 mg/L).

However, something else appears to be happening. Monthly phosphate concentrations since January 2001 (for locations with year-round flow) are plotted in Figure 23. The figure clearly shows a major shift taking place around April 2005, i.e., at the end of the 2005 rainy season. Along with increased uptake, it is probable that increased groundwater inflows, from a water-table recharged with low-phosphate runoff from 2005 storms, played a role since the effects extend beyond the growing season. This could be similar to the process used to explain the 2005 decrease in conductivity, and the slow rise since: shorter groundwater residence times within the underlying geologic strata leading to lower phosphate concentrations. Like conductivity,

phosphate concentrations in 2006 have shown an increase over those of the 2005 dry season. In addition to these other processes, dilution by above-average flows of the high-phosphate effluent from the Ojai sewage treatment plant contributed to lower concentrations at VR01, VR02 and VR03.

The results from 2001-2005 indicate that all sites typically had mean phosphate concentrations above the 0.03 mg/L phosphorus limit. However, lower phosphate in 2006 does not necessarily represent a dramatic improvement since phosphate alone is only part of the total phosphorus concentration in the stream or river, and organic phosphorus makes up the remainder; typically phosphate represents approximately 90% of the total phosphorus in Ventura nutrient samples.[7]

[7] Unfortunately, while total dissolved phosphorus (TDP; dissolved organic phosphorus is TDP minus phosphate) is measured in the UCSB nutrient analysis, the results are unreliable. TDP and phosphate are determined by different tests and sometimes the results show phosphate to be higher than the TDP concentration. Obviously, this cannot be true; something either went wrong or the precision of the analysis was not high enough to produce a satisfactory result. Error and imprecision are part of all laboratory analysis; a result is never simply a number, it is a number plus or minus some associated error. This is ordinarily expected to occur some of the time, particularly when overall concentrations are high, i.e., it happens about 4% of the time with nitrate and total dissolved nitrogen samples. Unfortunately, it happens almost half the time with phosphorus and indicates a real problem, one that the UCSB laboratory has not been able to solve; in 2006, 40 % of the TDP samples produced unacceptable results.

However, a high percentage of unacceptable results does not mean that an analysis is entirely meaningless. While any single result has to remain suspect, overall trends in the data are likely to reflect reality (based on the assumption that, in aggregate, "acceptable" results are likely to be either valid or, at worse, contain an error that always underestimates TDP – underestimates because that is the implication of many samples with TDP higher than phosphate). In 2006, samples with realistic values were concentrated in the months of October, January, April and May (samples later than May are, as yet, unavailable) – almost all samples from these months appear valid. Looking only at those results, the percentage of TDP contributed by phosphate was 65, 86, 49 and 26% for the respective months. Overall, acceptable 2006 samples contained an average of 60% phosphate, considerably lower than the 90% of previous years.

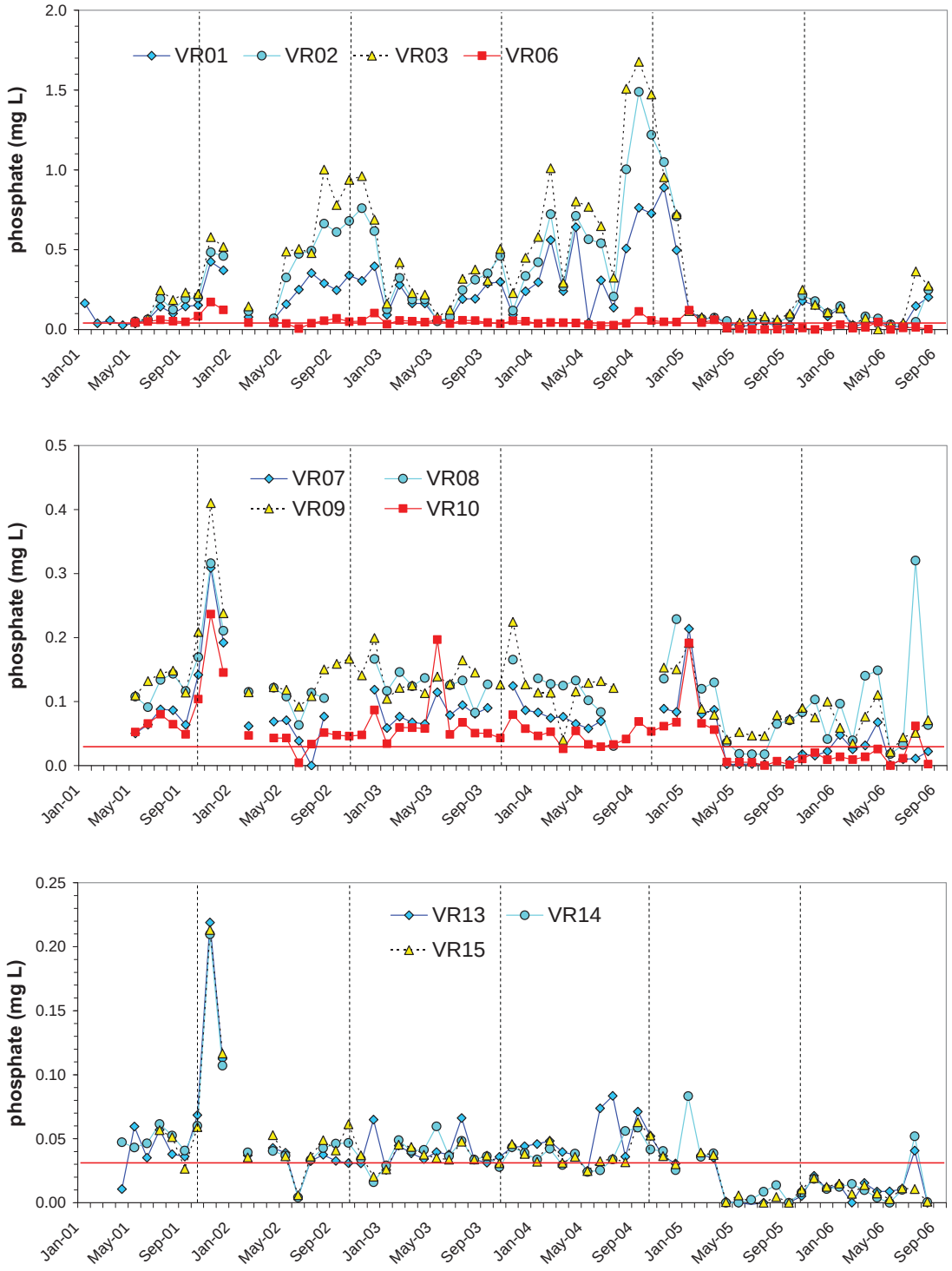


Figure 23. Phosphate concentrations, January 2001-August 2006. Dashed vertical lines mark the start of each water-year. The horizontal line marks the EPA proposed target for maximum phosphorus in this region, 0.030 mg/L (Ecoregion III, sub-region 6). The graphs show phosphate, which typically makes up approximately 90% of total phosphorus in the stream. Note that the graphs use different vertical scales.

The 2006 data reflect exactly what we might expect during a year with extensive algal uptake: more organic phosphorus than phosphate during the most productive months. During their life-cycle, algae and other aquatic organisms preferentially take up phosphate while living and then release organic phosphorus when they shed, die or decay, thus during highly productive periods, phosphate declines while organic phosphorus concentrations increase.

This complicated and convoluted explanation is simply preparation for a basic point: although phosphate concentrations declined in 2006, the overall phosphorus situation may not have substantially improved because an increase in organic phosphorus accompanied the phosphate decline. We are unable to accurately measure actual organic phosphorus concentrations because of the problematical TDP analysis, but know the increase was appreciable. Even considering phosphate alone, six sites, VR01-03, VR05, VR08 and VR09 had concentrations higher than would be deemed acceptable for total phosphorus. The river reach below the Ojai sewage treatment plant continues to have the highest phosphate concentrations in the watershed.

Combining Nitrate and Phosphate

Living organisms need both nitrogen (N) and phosphorus (P), and it is necessary to consider both nutrients in combination. Absent *either* nitrogen or phosphorus, a plant or alga needing both can not grow. Oceanic plankton need N and P in a ratio of 16 atoms of nitrogen to one atom of phosphorus, this ratio, 16:1, is named after its discoverer, the "Redfield ratio" (Sterner and Elser, 2002). For freshwater organisms, the average ratio is closer to 30:1 (Nordin, 1985; Sterner and Elser, 2002). Less than 30:1 means some of the phosphorus goes unused, greater than 30:1 and nitrogen is under-utilized. The first case is called N-limited, the second, P-limited, referring to which nutrient is found in limited amounts and thus controls growth. This is an important concept in stream ecology since unused nutrients cannot contribute to eutrophication and its associated problems (Borchardt, 1996).

However, there are exceptions. Some aquatic plants and algae don't get nitrogen from the water, but have the ability "fix" nitrogen from the air, in other words, convert nitrogen gas into ammonia, and then use ammonia for cell metabolism. Ammonia is an important source of N, normally found only in low concentrations in the Ventura watershed (typically around 1-2% of the nitrate concentration). These organisms are literally accompanied by their own nitrogen supply since attached symbiotic bacteria do the actual work. Plants and algae with this relatively rare ability are normally not very competitive in aquatic environments where dissolved nitrogen is abundant, but when nitrogen becomes limiting they come into their own. Because plants, algae and micro-organisms are the foundation of the aquatic food chain, it is important to know which assemblage of species provides this function, and the type of nutrient limitation and its severity, help to determine this.

Channelkeeper's Ventura Stream Team sampling locations provide examples of both N-limitation and P-limitation, and at some sites the situation flips back and forth. Figure 24 shows median nitrate to phosphate ratios for 2006 and prior years. Error bars mark the quartile points, i.e., the middle 50% of all monthly results fit between these limits. In the figure, the Matilija sites and VR08 have very low ratios; these locations are always N-limited. Conversely, VR10 is always P-limited. At the other locations nitrogen and phosphorus are either roughly in balance or the stream in these areas bounces back and forth depending on circumstances.

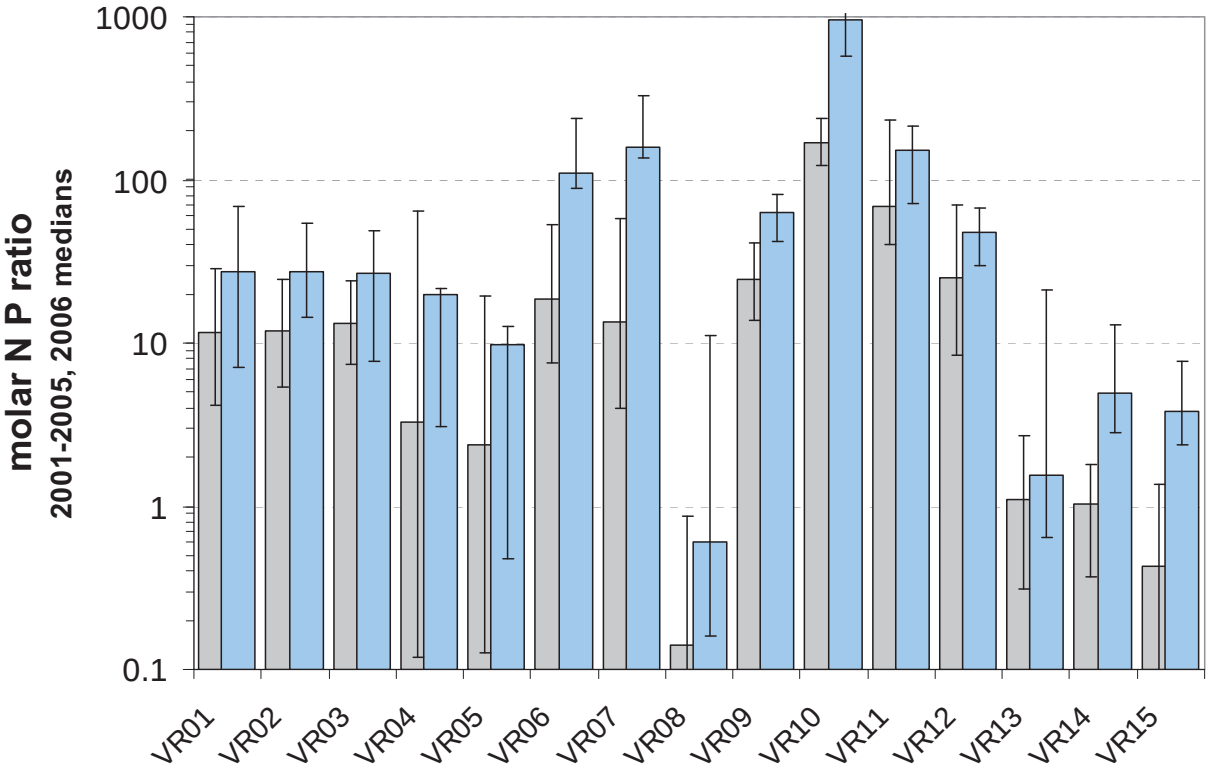


Figure 24. Median nitrate to phosphate ratios for the Ventura Stream Team sampling sites, 2001-2005 and 2006. Life requires both nitrogen and phosphorus, but in different amounts. Plankton, on which the oceanic food chain is based, use nitrogen and phosphorus in a ratio of 16 molecules of nitrogen to one of phosphorus; this is known as the "Redfield Ratio." In creeks and rivers, the ratio is closer to 30:1 and is indicated by the horizontal bar in the figure. The nitrate to phosphate ratio is being used as an approximation of the nitrogen to phosphorus ratio; on average, nitrate is approximately 85% of the total nitrogen and phosphate 90% of the total phosphate in Ventura Stream Team samples). The Matilija tributaries and Lion Canyon are severely "nitrogen limited," meaning that while phosphorus is plentiful, nitrogen is often exhausted. VR10, below Ojai, is "phosphorus limited". All other locations move across the boundary depending on time of year, typically being phosphorus limited during winter and spring, nitrogen limited in summer and fall. The error bars indicate the quartile points, i.e., 50% of the monthly N/P ratios for that location lie within the band represented by the error bar. In 2006, N/P ratios noticeably increased above long-term mean values, mainly as a result of lower than usual phosphate concentrations (see Figure 18).

Relatively dry winters typically produce N-limited conditions, mainly due to reduced inflows of nitrate in storm runoff (recall that approximately 30-times more nitrogen than phosphorus is needed for balance). Wet winters usually produce plenty of high-nitrate groundwater inflows and runoff, resulting in P-limitation. 2006, with reduced phosphate concentrations probably shifted the entire system towards P-limitation. Comparing dry-season (June-September) nutrient ratios, Figure 25 illustrates the changes that occurred from 2004 (a low rainfall year) through 2006. It is important to stress the word "probably" since we have only limited knowledge of

organic phosphorus concentrations: the TDN to TDP ratio is usually a better predictor of nutrient status than the nitrate: phosphate relationship used here.[8]

While nutrient concentrations can determine the nature of the aquatic community and whether or not algae thrive, other factors are equally important. Flow controls the extent of habitat availability and the amount of sunlight sets an upper limit on primary productivity. In many parts of the watershed, overhanging vegetation and trees restrict available sunlight, retarding algal growth which, given the over-abundance on nutrients in the Ventura River watershed, is no small thing.

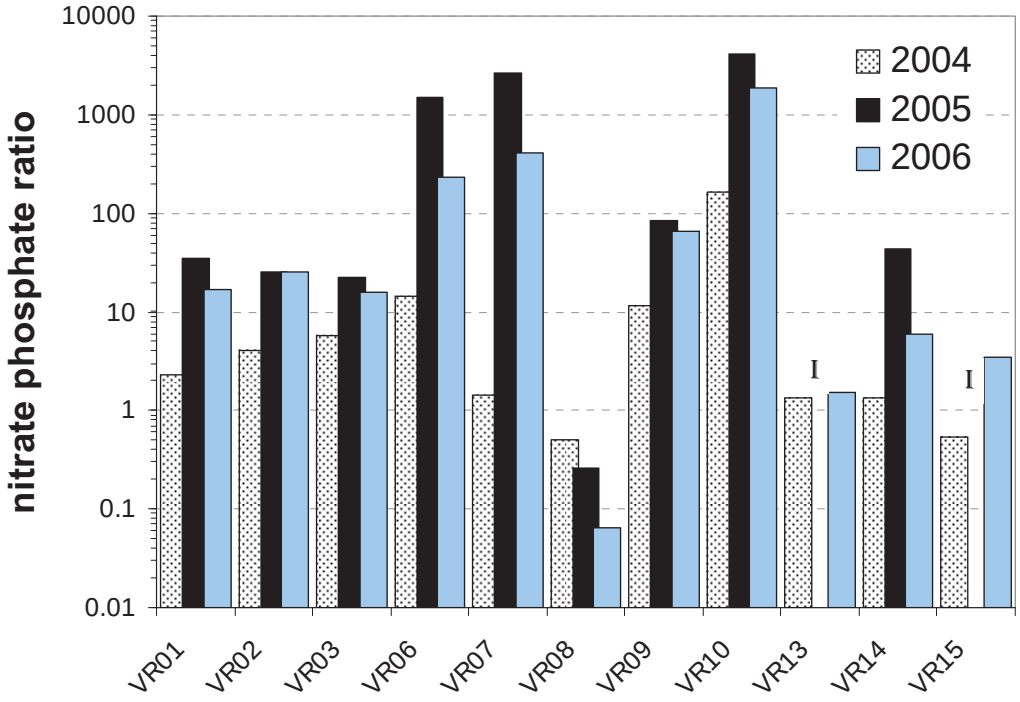


Figure 25. Average dry-season (June through September) nitrate to phosphate ratios for 2004, 2005 and 2006. The horizontal bar marks the approximate 20:1 to 30:1 zone where both nutrients are in balance. The letter "I" indicates sites where phosphate concentrations fell below detection limits (< 0.3 µM) and the N:P ratio was indeterminate. In 2005, increased nitrate concentrations and heavy algal growth following a wet winter produced a substantial increase in N:P ratio at all locations except VR08 (Lion Canyon). Wet years flush out the nitrogen accumulated in higher elevation chaparrel during dry spells, increasing nitrate concentrations in both storm runoff and groundwater seepage. Increased algal growth - which follows a wet winter due to greater availability of nitrogen, sunlight and favorable habitat - disproportionately reduces stream phosphate concentrations. 2006 is an example of the gradual return to conditions seen in 2001-2004: growing season N:P ratios remain high because of heavy algal growth, but they have decreased from the level seen in 2005 as nitrate becomes less plentiful and growing aquatic vegetation reduces available algal habitat.

[8] Figures 24 and 25 use molar ratios, where the concentrations of nitrate and phosphate were expressed in µM – micromoles per liter – before dividing one by the other. The µmole, a measure of the number of atoms, is more useful when comparing the proportions of nutrients; 1 mg/L of nitrate as nitrogen is equal to 72 µM, 1 mg/L of phosphate as phosphorus equals 32 µM.

Bacteria[9]

Members of two bacteria groups, the coliforms and fecal streptococci, are used as indicators of possible sewage contamination because they are commonly found in human and animal feces. Although they are generally not harmful themselves, they indicate the potential presence of pathogenic (disease-causing) bacteria, viruses, and protozoans that also live in human and animal digestive systems. Their presence in water suggests that pathogenic microorganisms might also be present and that contact with these waters could be a health risk. Since it is difficult, time-consuming and expensive to test directly for a large variety of pathogens, water is usually tested for coliforms and fecal streptococci instead. Channelkeeper analyzes monthly samples for three types of bacteria:

otal Coliform: Total coliforms are a large and widespread group of bacteria that occur in human feces, but are also found in animal manure, soil, vegetation, submerged wood, and in other places outside the human body. They are no longer recommended by the EPA as an indicator for freshwater but remain the standard test for drinking water because their presence indicates contamination of a water supply by some outside source. California still requires the total coliform test for recreational waters because the *ratio* of fecal to total coliforms remains a good indicator of swimming related illness.

. coli: A species of coliform bacteria specific to fecal material from humans and other warm-blooded animals, *. coli* is recommended by the EPA as the best indicator of health risk from water contact in freshwater: California still allows the broader, and older, fecal coliform test.

nterococcus: A relatively human-specific subgroup of fecal streptococci with an ability to survive in salt water, enterococci mimic many pathogens more closely than the other indicators. The EPA considers enterococci the best indicator of health risk in saltwater and as a useful indicator for freshwater as well.

Bacteria are reported as the "*most robable number*" (MPN) of bacteria in 100 milliliters (ml) of water (100 ml is about 4 ounces). Channelkeeper uses a statistical test instead of directly counting bacteria so the reported number is actually a statistical estimate. California Public Health requirements for bacteria counts are complicated and vary somewhat by jurisdiction; what follows is an amalgam of EPA recommendations and various California standards. Generally, there are two limits for each test, a single sample limit and a limit for a geometric average of five or more samples collected over a period of either five weeks or a month.[10]

For freshwater recreational use, the total coliform limits are "not to exceed 10,000 per 100 ml in a single sample, and a geomean of less than 1,000." For *. coli* the geomean requirement is less than 126 bacteria/100 ml of water and the single sample limit varies from 235 to 500 depending on intensity of use (not to exceed 235 for beach areas, 576 for occasional recreational use). For enterococcus the "geomean average of five or more samples" limit is less than 33/100 ml and the single sample limit can vary from 61 to 151/100 ml, again depending on frequency of use.

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[9] US-EPA (2002 and 2004), SWQCB (2003 and 2004), and SWQCB-LA (2001) were used as references for this section. There are significant differences between EPA indicator bacteria guidelines and current California State regulations. The regulatory situation is in a state of flux and the following narrative should be considered a reasonable overview and not taken as definitive.

[10] The "geometric average" or "geomean" is calculated by converting bacteria counts into logarithms, averaging the logarithms, and then converting that average back to a regular number. The geomean reduces the influence of very high or low numbers – which might unfairly represent aberrant samples.

The total coliform limits are a geomean of less than 1,000 with single samples not to exceed 10,000, *as long as the fecal total coliform ratio is less than 0.1* (in other words, as long as less than 10% of the coliforms are of fecal origin). If the ratio rises above 0.1, then the single sample limit decreases to 1,000.[11]

Since Channelkeeper only samples once a month, using "average geomean" standards would be inappropriate. However, the geomean concept, of reducing the importance of occasional very high or very low samples, is a useful tool. Accordingly, geomean values for all samples collected at each Ventura location during the 2006 water-year are shown, for each of the three types of bacteria, in Figures 26 and 27. For comparison, geomeans calculated from data collected from January 2001 through September 2005 are also exhibited. Fecal to total coliform ratios for both 2001-2005 and 2006 are included in the lower panel of Figure 27. The single sample standards discussed above are shown as horizontal lines on the charts.

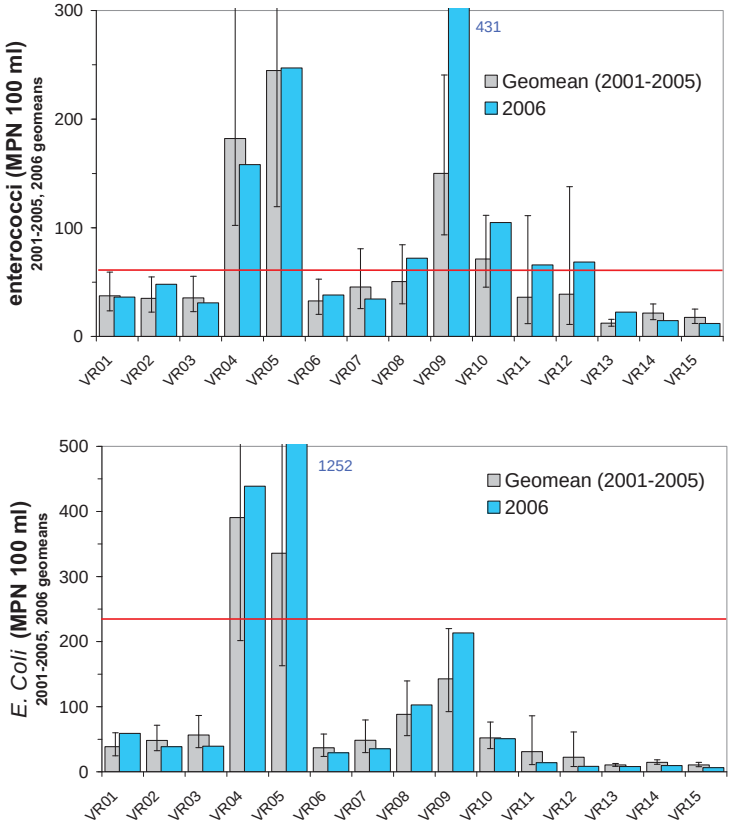

Figure 26. 2006 geomean enterococci (upper panel) and . *coli* (lower panel) concentrations compared with geomeans from 2001-2005. Error bars represent the 95% confidence interval for the long-term geomeans. Solid horizontal lines mark the EPA's recommended freshwater beach Public Health limits for maximum enterococcus (61 MPN/100 ml) and . *coli* (235 MPN/100 ml).

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[11] The most recent Basin Plan update for the Los Angeles Regional Water Quality Control Board, which sets standards for Ventura, requires, for water-contact recreation in freshwater, a single sample . *coli* limit of 235 and a 30-day geomean below 126. In marine waters, the single sample enterococcus number is not to exceed 104 with a 30-day geomean limit of 35; single total coliform samples have a limit of 10,000 and a 30-day geomean requirement of 1,000, unless the ratio of fecal to total coliform exceeds 0.1, in which case the single sample total coliform limit is reduced to 1,000. Currently, the Los Angeles Regional Water Board does not have a freshwater standard for either enterococcus or total coliform. It does, however, retain a fecal coliform requirement of 400 for a single sample, 200 for the geomean. Agencies are allowed to use either the fecal coliform or . *coli* test.

The error bars in Figures 26 and 27 indicate the 95% confidence interval of the long-term geomeans. Think of this as similar to the "twice the standard error of the mean" criteria shown in previous figures. Both indicate the bounds within which an annual geomean might be expected to vary. Note that in 2006, enterococcus and total coliform counts at VR09, and . *coli* counts at VR05, were significantly higher than past results. Geomeans for 2006 at all other locations were consistent with past results (enterococcus did show a significant increase at VR13).

When it comes to determining which locations generally have the highest levels of bacteria, there is relatively good agreement between all three tests, but in terms of which sites meet the standards for freshwater recreation (using single sample standards of 61 enterococci, 235 . *coli* and 10,000/1,000 total coliforms as criteria) the results present a mixed picture. All three tests agree that VR04 and VR05 (Canada Larga) are highly polluted and do not meet any standard. However, while VR09 and VR10 (Pirie and Upper San Antonio creeks) usually fail to meet the enterococci standard, they have acceptable levels of . *coli* and total coliform (2001-2005 geomeans). In 2006, VR08 through VR12 generally exceeded the enterococcus limit, but not that for . *coli* or total coliform.

This is not an unusual result. Studies show that while there is usually agreement between the three tests at either highly polluted or pristine locations, they can appreciably disagree at sites that lie in the middle (Kinzelman, 2003; Nobel et al., 2003). As to why the enterococcus standard is often exceeded in Channelkeeper results while the . *coli* limit almost never is, it is possible that enterococci are able to live and reproduce in some local waters during the summer. Predation is the primary driver that removes indicator organisms from open water and not adverse environmental conditions (Rassoulzadegan and Sheldon, 1986), and research has shown that coliforms and enterococci can often survive, grow (Francy et al., 2000; Nasser and Oman, 1999) and reproduce in plants and soil (Solomon et al., 2002; Hardina and Fujioka, 1991; Marino and Gannon, 1991).

In any event, aside from VR04, VR05 and possibly VR09, all other Ventura locations are generally safe for water-contact recreation; test results at these sites usually have no problems meeting the applicable . *coli* standard. Figure 28 repeats the 2006 results: annual geomeans for . *coli* and enterococcus, as well as the fecal to total coliform ratio, are shown in the upper panel, while all three indicator bacteria are shown in the lower.[12]

[12] Channelkeeper does not actually test for fecal coliform, instead the . *coli* values have been multiplied by 1.7 to estimate fecal coliform concentrations (this assumes that a fecal coliform sample would consist of approximately 60% . *coli*; this equivalency is the value assumed by most regulatory standards and is a conservative estimate; see also Cude, 2005.

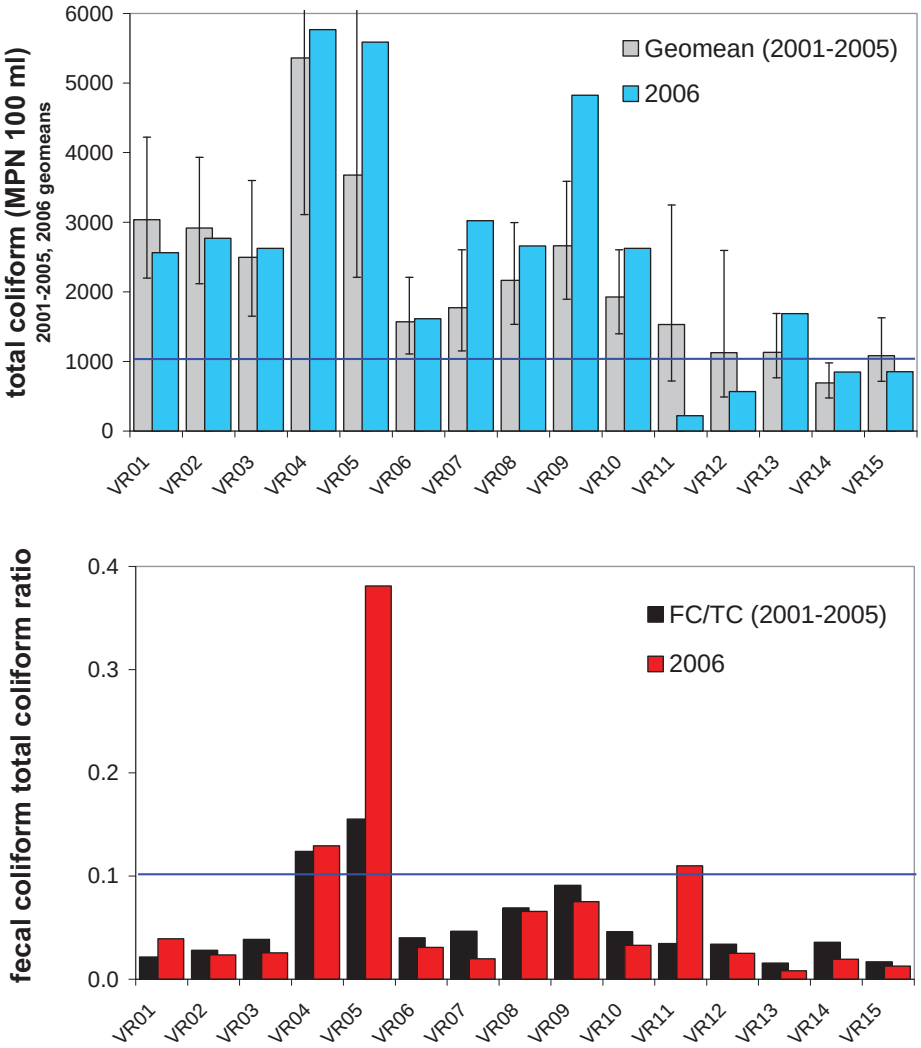

Figure 27. *er anel*: 2006 geomean concentrations for total coliform compared with 2001-2005 geomeans. Error bars represent the 95% confidence interval for the long-term geomeans. The California limit for total coliform is 10,000 MPN/100 ml.
Lower anel: 2006 and 2001-2005 fecal to total coliform ratios (the California limit for total coliform decreases to 1,000 MPN/100 ml if the fecal coliform/total coliform ratio exceeds 0.1 (horizontal line)).

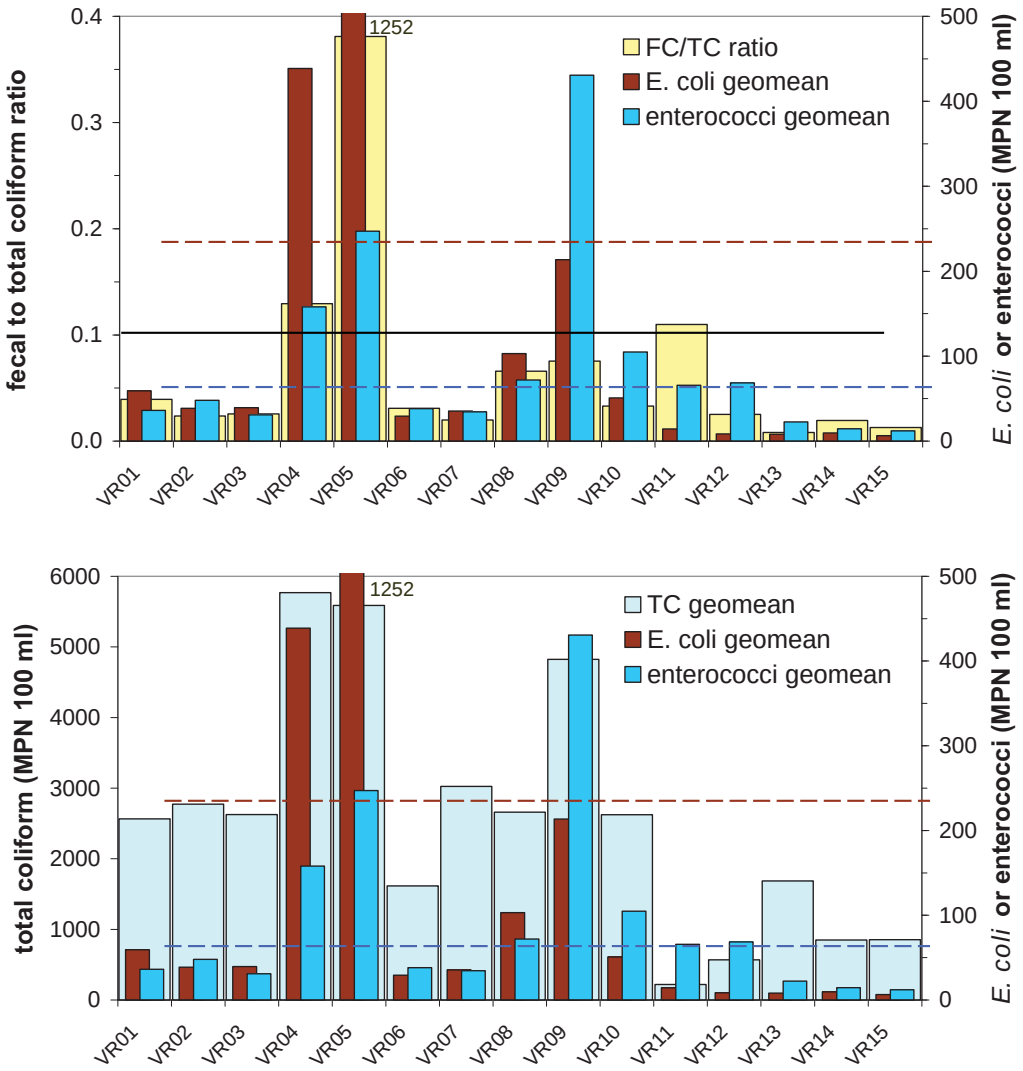

Figure 28. *er anel*: The average 2006 fecal to total coliform ratio with . *coli* and enterococci concentrations (as geomeans). Dashed horizontal lines mark the EPA's recommended freshwater beach Public Health limits for maximum enterococcus (61 MPN/100 ml) and . *Coli* (235 MPN/100 ml). The California limit for total coliform (10,000 MPN/100 ml) decreases to 1,000 (indicating a pollution problem) if the fecal coliform/total coliform ratio exceeds 0.1 (solid line).
Lower anel Total coliform, . *coli* and enterococci geomean concentrations, 2006.

Summary of Results: Problem Areas

In this section, Channelkeeper's 2006 sampling results are reviewed to identify problems and potential causes. Problem locations indicated by abnormal physical parameter values (conductivity, water temperature, H and turbidity) are summarized in Table 1.

Excessively high conductivities can signify any combination of waste flows and dry-season runoff containing high concentrations of dissolved salts, high evaporation rates occurring under stagnant conditions, and possibly, dissolution of cement by trickling flows in concrete channels.

Table 1. Physical parameters. Numbers in the table are calculated criteria values that identify specific problems during 2006 at the Ventura sampling sites. Column headings show the parameters, measurement units and the criteria used flag problem areas. Values in parentheses are those from the 2001-2005 report. The specific criteria were: (1) median conductivity > 2,000 µS/cm; (2) 10% of monthly water temperatures ≥ 26.4°C; (3) 10% of monthly H values > 8.5; and (4) median non-storm turbidity > 1.9 NTU.

	S/cm	percent	percent	NTU
	median	10 % ≥ 26.4 °C	10 % ≥ 8.5	median
site	**conductivity**	**temperature**	***p*H**	**turbidity**
VR01			33 (*12*)	2.0
VR02			45 (*2 0*)	
VR03			33 (*1*)	2.3
VR04	2,534 (*2*)	13	11	
VR05	2,760 (*0*)	20		3.5
VR06				
VR07				
VR08				
VR09				
VR10				
VR11				
VR12				
VR13				
VR14				
VR15				

Canada Larga is the only Ventura tributary with excessive conductivity. The probable causes are grazed pasture runoff at the upper site and industrial nuisance flows at the lower. Both locations are prone to low flows with high evaporation, and the concrete canal above VR05 may also contribute to the problem. The criterion used to identify excessive conductivity was a median value greater than 2,000 µS/cm (25% above the maximum limit for domestic water supplies). Although conductivity during 2006 at VR08 and VR09 did not exceed the 2,000 µS/cm standard, high median conductivities (1604 at VR08, from pasture runoff and high evaporation, and 1,650 at VR09) are of some concern.

The criterion for water temperature was a statistical test; if 10% of the monthly values were equal to or exceeded 26.4°C, it was judged excessive (26.4 is 10% higher than the maximum temperature benchmark of 24°C used earlier). Excessive temperatures are caused by un-shaded, shallow trickling flows, i.e., the absence of riparian vegetation. Both VR04 and VR05 had excessive temperatures in June 2006; at no other sites did recorded temperature exceed 26.4°C.

The similar criterion was used for H: excessive pH was identified as greater than 10 percent of the monthly values exceeding 8.5 (8.5 is the SWQCB-LA upper limit for surface waters). Excess H in the Ventura River and its tributaries is almost always caused by algal blooms.

High H on the lower river in 2006 (VR01-03) and at VR04 was due to excessive algae throughout the summer.

Excessive turbidity was identified as non-storm median values exceeding the suggested EPA limit of 1.9 NTU. Failed sites are usually characterized by either periodic disturbance or relatively stagnant waters and excessive biological productivity (the presence of microscopic algae and bacterial films at the site or immediately upstream). VR01, VR03 and VR05 exceeded the 1.9 NTU criterion in 2006. Cattle were probably responsible at VR05 and there is some as yet unknown source of disturbance upstream of VR01. It is possible that Ojai sewage treatment plant outflows may bear some responsibility for higher turbidity at VR03.

Biological problems, identified by aberrant parameter values and concentrations (nitrate, phosphate, minimum dissolved oxygen and excessive DO saturation), are summarized in Table 2. Excessive biological productivity or eutrophication is the major biological problem identified by Channelkeeper's sampling. Excessive nutrient concentrations are major causal factors and both minimum DO values and excessive DO saturation pinpoint the deleterious effects. The criteria used to identify excessive nutrients were median nitrate concentrations above 0.52 mg/L and median phosphate concentrations above 0.030 mg/L. These limits are, respectively, the suggested EPA values for nitrogen and phosphorus in the Ventura region. As applied here, they are slightly less conservative since they evaluate only the nitrate and phosphate fractions of these elements.

Almost all sampling locations have excessive nutrients. To distinguish locations and reaches with severe concentrations *far above the norm* are shown in red: we have defined far above the norm as five times the EPA limit. Urban and agricultural runoff are the major causes of high nitrate at VR09 and VR10 (below Ojai) if the definition of agriculture is extended to include "urban agriculture," i.e., runoff from the fertilization and over-watering of lawns, landscaping, parks and golf courses. However, on the lower river (VR01-03), treated sewage effluent is the primary source of high nitrate. VR07 and VR06 also had excessive nitrate in 2006, probably caused by greater contributions from upstream sites on San Antonio Creek and increased groundwater inflows. Other sources contribute to the overall nitrate problem in the Ventura watershed: deposition of airborne pollutants, auto emissions, high groundwater concentrations from past land use, etc. However, the effects of these inputs are mainly noticed during storms and the rainy season, whereas the majority of Channelkeeper sampling takes place during the dry weather – when nuisance urban flows and the discharge of treated sewage effluent dominate.

Channelkeeper's 2006 results demonstrate a substantial improvement in phosphate concentrations on the Ventura River. Previously, every sampling location had problems with high phosphate – all sites having median phosphate concentrations that exceeded the EPA recommended limit for total phosphorus. This is primarily a consequence of natural geological conditions in the watershed. However, the release of treated sewage effluent above VR03 adds considerably to the problem on the lower river (VR01-03). In 2006, only six of the fifteen sampled locations had excessive phosphate. Other than VR01-03, these were VR05, VR08 and VR09. The probable cause at VR08 and VR05 is animal waste from cattle and horses. The precise cause of high phosphate concentrations at VR09 remains unknown, but urban agriculture (fertilizer, pesticides, etc.) and domestic pets and horses undoubtly contribute. It is important to stress the caveat stated in the section on phosphate: that the overall phosphorus situation may not have improved as much as decreases in phosphate concentrations indicate because an increase in

organic phosphorus, which we were unable to accurately measure, accompanied the phosphate decline.

Table 2. Biological parameters. Numbers in the table are calculated criteria values that identify specific problems at Ventura Stream Team sampling sites in 2006. Values in parentheses are those from the 2001-2005 report. Column headings show the parameters, measurement units and the criteria used flag problem areas. The specific criteria were: (1) median nitrate > 0.52 mg-N/L; (2) median phosphate > 0.03 mg-P/L; (3) greater than 5% of monthly DO < 5 mg/L and a minimum DO ≥ 4.0; and (4) 10% of the monthly values exceeding 120 % DO saturation. Particularly egregious results are shown in bold.

	mg-N/L	mg-P/L	(mg/L)	percent
	median	median	5% < 5 (min)	10% < 120%.
site	**nitrate**	**phosphate**	**minimum DO**	**DO sat.**
VR01	0.66 (*1 0)*	0.083 (*.1 4*)		**80** (*2 .3)*
VR02	0.85 (*1)*	0.083 (*.27*)	*1 0*	**64** (*37.5)*
VR03	0.85 (*2 00*)	0.108 (*.312*)		**55** (*22.)*
VR04		(*0 0)*	*10*	(*12)*
VR05		0.062 (*0 0 0*)		
VR06	0.87	(*0 0)*		**27** (*31.)*
VR07	1.88 (*0)*	(*0 0)*	*11 1*	**50** (*1)*
VR08		0.083 (*0 121*)	*11 1*	**20** (*11 1)*
VR09	1.51 (1.44)	0.071 (*0 12)*		
VR10	**4.68** (*3.75*)	(*0 0 1*)		
VR11	(*0)*	(*0 0)*		(*11)*
VR12		(*0 0)*		(*11)*
VR13		(*0 0)*		
VR14		(*0 0)*		
VR15		(*0 0)*		17 (*23.4)*

Actual rather than potential algal problems can be identified by dangerously low levels of dissolved oxygen and excessive oxygen saturation. Two criteria were used to identify low DO: (1) minimum concentrations equal to or below 4 mg/L, and (2) greater than 5% of the monthly values lower than 5 mg/L. The criterion for percent saturation was greater than 10% of the monthly values exceeding 120% saturation. Locations where more than 20% of monthly DO saturation exceeded 120% are identified in bold.

The DO criteria are somewhat contradictory, as excessive percent saturation values are likely to be found only during daylight, while minimum DO concentrations generally occur at night. Since almost all Channelkeeper sampling currently takes place in daylight, excessive % saturation is the better metric. With continued pre-dawn sampling and the further accumulation of this type of data, a better minimum DO criterion can be established. At present, only problem locations with relatively deep stagnant waters and with high concentrations of bacteria can be identified by minimum DO levels. It is for this reason that different problem areas have been identified by each of the two parameters. This is particularly true for locations with the most egregious percent saturation values - where low DO concentrations are unlikely to be found during daylight hours.

In 2006, no locations had DO concentrations below 5 mg/L. The lowest recorded concentration was 5.59 mg/L in October 2005 at VR08. However, as indicated by the percent oxygen saturation, excessive algal growth in 2006 was a problem throughout the watershed. The lower Ventura River (VR01-03 and VR06), lower San Antonio Creek (VR07), Lion Canyon (VR08) and Matilija Creek above the reservoir have the greatest problems with over-saturation. These problem locations all feature open reaches with high levels of sunlight. High nutrient levels at VR01-03 undoubtedly contribute, and the algal problem at these three locations is the primary cause of excessive H (Table 1). Although critically low values of "just before sunlight" dissolved oxygen were not investigated in 2006 at these sites, we suspect they may have3 occasionally occurred.

Finally, indicator bacteria concentrations and the fecal to total coliform ratio (FC/TC) were used to identify public health threats. Results are summarized in Table 3. Geomean concentrations above acceptable EPA, County or State of California limits were used as selection criteria to identify locations unsuitable for water contact recreation. This may be too high a standard since these concentrations (. *coli* < 235 MPN/100 ml; enterococci < 61; total coliform < 10,000, 1,000 if FC/TC > 0.1) are applicable to freshwater public beaches. Accordingly, egregious sites (in bold) are identified as those which exceed a lower standard, identified by the EPA as "infrequent full body contact recreation" - . *coli* < 576 and enterococci < 151 MPN/100 ml.

Very few sites fail to meet Public Health standards for swimming, and only VR04 and VR05 (Canada Larga) may present a true hazard for occasional recreational users – the most likely form of public contact with these waters. . *coli* is judged by the EPA as the best freshwater indicator of problems, and only these two locations had concentrations consistently exceeding the "infrequent use" standard. Some of the possible reasons for high enterococci counts at VR09 and VR10 were discussed in earlier sections of the report; high enterococci numbers may not be related to actual pathogenic pollution problems. The very high FC/TC ratios at Canada Larga probably result from cattle grazing and are an additional reason for occasional visitors to be wary around this stream.

Table 3. Public Health parameters. Numbers in the table are calculated criteria values for the 2006 water-year that identify specific potential contamination problems at the Ventura Stream Team sampling sites. Values in parentheses are those from the 2001-2005 report. Column headings show the parameters, measurement units and the criteria used flag problem areas. The specific criteria were: (1) geomean > 235 MPN/100 ml for E. coli; (2) geomean > 61 MPN/100 ml for enterococci; (3) FC/TC geomean ratio > 0.1 ; and (4) total coliform geomean > 10,000 MPN/100 ml, unless FC/TC exceeds 0.1, then 1,000. Geomeans exceeding the EPA standards for "infrequent full body contact recreation" are shown in bold.

	MPN/100 ml	MPN/100 ml	ratio	MPN/100 ml
	geomean	geomean	geomean	geomean
site	*E. Coli*	**enterococci**	**C TC**	**total coliform**
VR01				
VR02				
VR03				
VR04	439 (*595*)	**158** (*17*)	0.13 (*0 21*)	5,768 (*0*)
VR05	**1,250** (*0*)	**247** (*245*)	0.38 (*0 20*)	5,586 (*0*)
VR06				
VR07				
VR08		72		
VR09		**431** (*15*)		
VR10		135 (*1*)		
VR11		66	0.11	
VR12		69		
VR13				
VR14				
VR15				

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Appendix: Methodology

Water sam ling and chemical analyses

Stream water samples are collected manually at mid-depth near the center of flow. Sample bottles (and caps) of high-density polyethylene (HDPE) are rinsed three times with deionized water before being used, and twice with sample water immediately prior to being filled; samples are placed in coolers as soon as possible and are transported on ice. Once in the laboratory, they are stored at 4°C.

Samples for dissolved constituents are generally filtered in the field through Gelman A/E glass fiber filters, pre-flushed with deionized and sample water. A syringe is used to force the sample through the filter unit. Stormflow samples with high sediment concentrations cannot be field-filtered and are usually allowed to settle before filtration in the laboratory. Samples are analyzed at UCSB for nitrogen (dissolved organic nitrogen, nitrate (NO_3 + NO_2) and ammonium) and phosphorus (soluble reactive phosphate, i.e., SRP). Nitrate, ammonium and phosphate are determined colorimetrically on a Lachat® auto-analyzer. Ammonium is measured by adding base to the sample stream, converting ammonium to ammonia, which diffuses across a Teflon® membrane (Willason and Johnson, 1986) and into phenol red pH indicator. Nitrate is analyzed using a standard Griess-Ilosvay reaction after Cd reduction (EPA, 1983), and phosphate after reaction with ammonium molybdate and antimony potassium tartrate and reduction by ascorbic acid with heating at 45°C.

Detection limits are 0.3 μmol L^{-1} for NH_4^+ and PO_4^{3-} and 0.5 μmol L^{-1} for NO_3^-; accuracy is ±5%. Total dissolved nitrogen (TDN) is determined after persulfate digestion (Valderrama, 1980) followed by measurement of nitrate. The basic persulfate reagent is added to a separate sample aliquot at the time of initial processing or labortory filtration and the digestion completed within one week The detection limit is 0.5 μmol L^{-1} and accuracy $\pm$ 10%. Dissolved organic nitrogen (DON) is calculated as the difference between TDN and dissolved inorganic nitrogen (DIN: nitrate and ammonium).

acteriological analysis

Water samples for bacteria analysis are collected manually, at mid-depth near the center of flow, in sterile plastic bottles pre-charged with small amounts of sodium thiosulfate to remove residual chlorine (a possible problem below sewage treatment plants and in urban nuisance waters). Samples are placed in coolers, transported on ice, and analyzed within six hours of collection.

Each sample is analyzed for three indicator bacteria: total coliform, . *coli*, and enterococci using IDEXX Colilert® and Enterolert® methodologies (ASTM #D6503-99). Both methods are approved by the Environmental Protection Agency (EPA, 2003). The sample, diluted with distilled, bacteria-free water (typically using a dilution of 10:1), is used to fill multiple wells in an analysis tray. Colilert uses two indicators, one that changes color when metabolized by total coliform and another that fluoresces when metabolized by . *coli*; the Enterolert indicator fluoresces when metabolized by enterococci. The number of positive wells after incubation for 18 hours at 35°C (Colilert) or 24 hours at 41°C (Enterolert) provides a statistical determination of concentration. The unit of measure is the "most probable number" of "colony forming units," abbreviated as either "MPN" or "cfu," in 100 ml of sample.

Quality control is evaluated by analyzing laboratory "blanks" (zero bacteria samples), duplicate field samples, and by performing multiple tests on single samples. The reproducibility of the bacteria results is evaluated by examining the differences between duplicate field samples; three to four duplicates (consecutive samples taken at the same location), one for each sampling team, are collected during each sampling event.

In field measurements

Portable, hand-held meters are used to take field measurements for dissolved oxygen, H, conductivity, water temperature and turbidity. Measurements are typically taken near the center of flow, below the surface in the upper half of the water column. The objective is to obtain measurements characteristic of the bulk of streamflow and not a spectrum of variation at the testing location. All instruments are calibrated according to manual instructions using certified laboratory standards on the day prior to sampling. The following list shows the type and accuracy of each meter used:

Meter	*Accuracy*
YSI Model 55 Dissolved Oxygen/Temperature Meter	± 0.3 mg/L or 2 %; ± 0.2°C
Oakton CON 410 Conductivity/TDS/Temperature Meter	± 1 %; ± 0.5°C
LaMotte 2020 Turbidimeter	± 2 % or 0.05 NTU
Oakton Waterproof H Testr2 (prior to April 2005)	± 0.1 H
Oakton H/mV/Temperature Meter (April 2005)	± 0.01 H

At each site, three readings are taken in three different locations with each meter (six for stream temperature using temperature scales on both the conductivity and dissolved oxygen meters). For the turbidimeter, two separate sample vials are tested three times each. All readings are later averaged to produce the final result entered into the database.

After sampling, all results are checked for quality control purposes. Questionable values are re-tested within six hours using a 500 ml sample collected at each location and transported on ice. Questionable results are those that (1) are unusual in light of past measurements at the location, (2) have widely varying multiple measurements, or (3) are expressed in doubtful units (e.g., milli vs. micro, or ppt vs. ppm). The "backup" samples are also used in cases of on-site equipment failure or suspected meter malfunction.

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Appendix

2005 DPH Drinking Water Source Assessment

For Nye Well No.11

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Drinking Water Source Assessment

Water System

VENTURA WATER DEPARTMENT

Ventura County

Water Source

NYE WELL NO. 11

Assessment Date

September, 2005

Assessment Completed By

Hopkins Ground ater Consultants, Inc.

California Department of Health Services
Drinking Water Field Operations Branch
DHS Santa Barbara District

District No.	**06**
System No.	**5610017**
Source No.	**034**
PS Code	**5610017-034**

Vulnerability Summary

District Name DHS Santa Barbara District **District No.** 06 **County** Ventura

System Name VENTURA WATER DEPARTMENT **System No.** 5610017

Source Name NYE WELL 11 **Source No.** 034 **PS Code** 5610017-034

Completed by Hopkins Groundwater Consultants, Inc. **Date** September, 2005

According to DHS records, this Source is Groundwater. This Assessment was done using the Default Groundwater System Method.

A source water assessment was conducted for the **NYE WELL 11**

of the **VENTURA WATER DEPARTMENT** water system in **September, 2005** .

The source is considered most vulnerable to the following activities not associated with any detected contaminants:

Agricultural Drainage
Automobile - Repair shops
Farm machinery repair
Junk/scrap/salvage yards
Machine shops
NPDES/WDR permitted discharges
Recreational area - surface water source
Septic systems - low density 1/acre
Sewer collection systems
Utility stations - maintenance areas
Wells - Agricultural/ Irrigation
Historic gas stations

Discussion of Vulnerability

1) The Foster Park Well Field consists of four conventional shallow groundwater wells. Groundwater is conveyed to the Avenue Surface Water Treatment Plant and treated as groundwater under the influence of surface water.
2) Conventional filtration currently used will be replaced with enon 1000 UF membranes in 2007.
3) The plant treatment is effective at removing particles such as turbidity, bacteria, viruses, and protozoans.
4) Treatement is not effective at removing inorganic and organic contaminates.
5) A 2005 update to the Ventura River lower watershed sanitary survey is underway.

Vulnerability Summary

District Name	DHS Santa Barbara District	**District No.**	06	**County**	Ventura
System Name	VENTURA WATER DEPARTMENT			**System No.**	5610017
Source Name	NYE WELL 11	**Source No.**	034	**PS Code**	5610017-034
Completed by	Hopkins Groundwater Consultants, Inc.			**Date**	September, 2005

A copy of the complete assessment may be viewed at:

City of San Buenaventura
502 Poli Street
Ventura, CA 93002

You may request a summary of the assessment be sent to you by contacting:

Jim Passanisi
Water Superintendent
805-652-4504

Vulnerability Ran ing

District Name DHS Santa Barbara District **District No.** 06 **County** Ventura

System Name VENTURA WATER DEPARTMENT **System No.** 5610017

Source Name NYE WELL 11 **Source No.** 034 **PS Code** 5610017-034

Completed by Hopkins Groundwater Consultants, Inc. **Date** September, 2005

The following PCAs were identified in the assessment and are listed in priority order based on risk to the water supply. Refer to the last page for more information.

one	PCA (Ris Ran ing)		PCA Ris Points	one Points	P E Points	Vulnerability Score
A	Agricultural Drainage (H in one A, otherwise M)		5	5	5	15
A	Automobile - Repair shops (H)		5	5	5	15
A	Farm machinery repair (H)		5	5	5	15
A	Junk/scrap/salvage yards (H)		5	5	5	15
A	Machine shops (H)		5	5	5	15
A	NPDES/WDR permitted discharges (H)		5	5	5	15
A	Recreational area - surface water source (H)		5	5	5	15
A	Septic systems - low density 1/acre (H in one A, otherwise L)		5	5	5	15
A	Sewer collection systems (H in one A, otherwise L)		5	5	5	15
A	Utility stations - maintenance areas (H)		5	5	5	15
A	Wells - Agricultural/ Irrigation (H)		5	5	5	15
B5	Historic gas stations (VH)		7	3	5	15
A	Construction/demolition staging areas (M)		3	5	5	13
A	Fertilizer/Pesticide/Herbicide Application (M)		3	5	5	13
A	Hardware/lumber/parts stores (M)		3	5	5	13
A	Housing - high density 1 house/0.5 acres (M)		3	5	5	13
A	Parking lots/malls 50 spaces (M)		3	5	5	13
A	Parks (M)		3	5	5	13
A	Storm Drain Discharge Points (M)		3	5	5	13
A	Transportation corridors - Freeways/state highways (M)		3	5	5	13
A	Transportation corridors - Historic railroad right-of-ways (M)		3	5	5	13
A	Transportation corridors - Road Right-of-ways herbicide use areas (M)		3	5	5	13
A	Wells - Water supply (M)		3	5	5	13
B5	Automobile - Repair shops (H)		5	3	5	13
B5	Farm machinery repair (H)		5	3	5	13
B5	Junk/scrap/salvage yards (H)		5	3	5	13
B5	Machine shops (H)		5	3	5	13

A contaminant potentially associated with this activity has been detected in the water supply.

Vulnerability Ran ing

District Name DHS Santa Barbara District **District No.** 06 **County** Ventura

System Name VENTURA WATER DEPARTMENT **System No.** 5610017

Source Name NYE WELL 11 **Source No.** 034 **PS Code** 5610017-034

Completed by Hopkins Groundwater Consultants, Inc. **Date** September, 2005

The following PCAs were identified in the assessment and are listed in priority order based on risk to the water supply. Refer to the last page for more information.

one	PCA (Ris Ran ing)		PCA Ris Points	one Points	P E Points	Vulnerability Score
B5	NPDES/WDR permitted discharges (H)		5	3	5	13
B5	Recreational area - surface water source (H)		5	3	5	13
B5	Utility stations - maintenance areas (H)		5	3	5	13
B5	Wells - Agricultural/ Irrigation (H)		5	3	5	13
B10	Historic gas stations (VH)		7	1	5	13
A	Historic waste dumps/landfills (VH)		7	0	5	12
B5	Historic waste dumps/landfills (VH)		7	0	5	12
B5	Injection wells/dry wells/ sumps (VH)		7	0	5	12
B10	Historic waste dumps/landfills (VH)		7	0	5	12
B10	Injection wells/dry wells/ sumps (VH)		7	0	5	12
A	Campgrounds/Recreational areas (L)		1	5	5	11
A	Crops, nonirrigated e.g., Christmas trees, grains, grass seeds, hay, pasture includes drip-irrigated crops (L)		1	5	5	11
A	Rental Yards (L)		1	5	5	11
A	Surface water - streams/lakes/rivers (L)		1	5	5	11
A	Transportation corridors - Roads/Streets (L)		1	5	5	11
A	Wells - monitoring, test holes (L)		1	5	5	11
B5	Agricultural Drainage (H in one A, otherwise M)		3	3	5	11
B5	Construction/demolition staging areas (M)		3	3	5	11
B5	Fertilizer/Pesticide/Herbicide Application (M)		3	3	5	11
B5	Housing - high density 1 house/0.5 acres (M)		3	3	5	11
B5	Other Animal operations (H in one A, otherwise M)		3	3	5	11
B5	Parks (M)		3	3	5	11
B5	Storm Drain Discharge Points (M)		3	3	5	11
B5	Transportation corridors - Freeways/state highways (M)		3	3	5	11
B5	Transportation corridors - Historic railroad right-of-ways (M)		3	3	5	11
B5	Transportation corridors - Road Right-of-ways herbicide use areas (M)		3	3	5	11
B5	Wells - Water supply (M)		3	3	5	11

A contaminant potentially associated with this activity has been detected in the water supply.

Vulnerability Ran ing

District Name DHS Santa Barbara District **District No.** 06 **County** Ventura

System Name VENTURA WATER DEPARTMENT **System No.** 5610017

Source Name NYE WELL 11 **Source No.** 034 **PS Code** 5610017-034

Completed by Hopkins Groundwater Consultants, Inc. **Date** September, 2005

The following PCAs were identified in the assessment and are listed in priority order based on risk to the water supply. Refer to the last page for more information.

one	PCA (Ris Ran ing)		PCA Ris Points	one Points	P E Points	Vulnerability Score
B10	Farm machinery repair (H)		5	1	5	11
B10	Machine shops (H)		5	1	5	11
B10	NPDES/WDR permitted discharges (H)		5	1	5	11
B10	Recreational area - surface water source (H)		5	1	5	11
B10	Utility stations - maintenance areas (H)		5	1	5	11
B10	Wells - Agricultural/ Irrigation (H)		5	1	5	11
A	Chemical/petroleum pipelines (H)		5	0	5	10
A	Illegal activities/unauthorized dumping (H)		5	0	5	10
B5	Chemical/petroleum pipelines (H)		5	0	5	10
B5	Illegal activities/unauthorized dumping (H)		5	0	5	10
B5	Underground storage tanks - Non-regulated tanks tanks smaller than regulatory limit (H)		5	0	5	10
B5	Underground storage tanks - Not yet upgraded or registered tanks (H)		5	0	5	10
B10	Chemical/petroleum pipelines (H)		5	0	5	10
B10	Illegal activities/unauthorized dumping (H)		5	0	5	10
B10	Underground storage tanks - Non-regulated tanks tanks smaller than regulatory limit (H)		5	0	5	10
B10	Underground storage tanks - Not yet upgraded or registered tanks (H)		5	0	5	10
B5	Campgrounds/Recreational areas (L)		1	3	5	9
B5	Crops, nonirrigated e.g., Christmas trees, grains, grass seeds, hay, pasture includes drip-irrigated crops (L)		1	3	5	9
B5	Septic systems - low density 1/acre (H in one A, otherwise L)		1	3	5	9
B5	Sewer collection systems (H in one A, otherwise L)		1	3	5	9
B5	Surface water - streams/lakes/rivers (L)		1	3	5	9
B5	Transportation corridors - Roads/Streets (L)		1	3	5	9
B10	Agricultural Drainage (H in one A, otherwise M)		3	1	5	9
B10	Construction/demolition staging areas (M)		3	1	5	9
B10	Contractor or government agency equipment storage yards (M)		3	1	5	9
B10	Fertilizer/Pesticide/Herbicide Application (M)		3	1	5	9

A contaminant potentially associated with this activity has been detected in the water supply.

Vulnerability Ran ing

District Name DHS Santa Barbara District **District No.** 06 **County** Ventura

System Name VENTURA WATER DEPARTMENT **System No.** 5610017

Source Name NYE WELL 11 **Source No.** 034 **PS Code** 5610017-034

Completed by Hopkins Groundwater Consultants, Inc. **Date** September, 2005

The following PCAs were identified in the assessment and are listed in priority order based on risk to the water supply. Refer to the last page for more information.

one	PCA (Ris Ran ing)		PCA Ris Points	one Points	P E Points	Vulnerability Score
B10	Housing - high density 1 house/0.5 acres (M)		3	1	5	9
B10	Other Animal operations (H in one A, otherwise M)		3	1	5	9
B10	Parks (M)		3	1	5	9
B10	Storm Drain Discharge Points (M)		3	1	5	9
B10	Transportation corridors - Freeways/state highways (M)		3	1	5	9
B10	Transportation corridors - Historic railroad right-of-ways (M)		3	1	5	9
B10	Transportation corridors - Road Right-of-ways herbicide use areas (M)		3	1	5	9
B10	Wells - Water supply (M)		3	1	5	9
A	Crops, irrigated Berries, hops, mint, orchards, sod, greenhouses, vineyards, nurseries, vegetable (M)		3	0	5	8
B5	Above ground storage tanks (M)		3	0	5	8
B5	Crops, irrigated Berries, hops, mint, orchards, sod, greenhouses, vineyards, nurseries, vegetable (M)		3	0	5	8
B10	Above ground storage tanks (M)		3	0	5	8
B10	Crops, irrigated Berries, hops, mint, orchards, sod, greenhouses, vineyards, nurseries, vegetable (M)		3	0	5	8

A contaminant potentially associated with this activity has been detected in the water supply.

E planation of Source Water Assessments and Definition of Terms

A source water assessment was recently completed for this drinking water source. The assessment identifies the vulnerability of the drinking water supply to contamination from typical human activities. The assessments are intended to facilitate and provide the basic information necessary for a local community to develop a program to protect the drinking water supply.

A summary of the complete assessment is provided here. For more information, contact the agency or individual that prepared the assessment (shown in summary). You may also contact the local Department of Health Services Drinking Water Field Operations Branch district office (http://www.dhs.ca.gov/ps/ddwem/technical/dwp/districtofficesmap.pdf). Additional information about assessments can be found at: http://www.dhs.ca.gov/ps/ddwem/dwsap/FAQ.htm

Terms used in this summary:

Source Water Assessment: An assessment is an evaluation of a drinking water source to determine the "possible contaminating activities" (PCAs) to which the source is most vulnerable. The assessment includes: a delineation of protection zones around the source; an inventory of the types of PCAs within the source protection zones; and an analysis to determine the PCAs to which the source is most vulnerable. The information is compiled into a report that includes a map, calculations, checklists, and a summary of the findings.

Possible Contaminating Activity (PCA): A PCA is a current or historic human activity that is an actual or potential origin of contamination for a drinking water source. PCAs include activities that use, store, produce or dispose of chemicals that have the potential to contaminate drinking water supplies. There are 110 types of PCAs in the California DWSAP program.

PCA Risk Ranking: Each type of PCA is assigned a risk ranking (Very High, High, Moderate, or Low). The risk ranking is based on the contaminant(s) typically associated with that PCA, the likelihood of release from that type of facility based on historical experience, and the mobility of the contaminant(s).

PCA Inventory: The PCA inventory is a review using local knowledge, databases, and on-site evaluations to identify the occurrence and approximate location of PCAs in the source water zones. The inventory for the basic DWSAP assessments is a presence-absence review. If a type of PCA occurs in a zone, a "Yes" is noted in the inventory for that zone, regardless of whether there is one or many of that type of facility within the zone. If a PCA has been associated with a contaminant detected in the water supply, a notation is made in the PCA inventory.

Source Water Zones or Areas: These are areas located around and typically adjacent to a drinking water source that have been identified as initial protection areas.

For **groundwater sources,** there are typically three concentric circular zones around a source (Zones A, B5 and B10). The sizes of the are determined based on characteristics of the source. PCAs located in the inner Zone A are considered more of a risk to the water supply than PCAs located in the middle Zone B5. Similarly, PCAs located in Zone B5 are considered more of a risk than PCAs located in the outer Zone B10.

For **surface water sources,** the watershed is defined as the overall protection area, and as an option, zones are defined closer to the source. Two types of zones are typically established. Zone A is the area within and near the surface water body and its tributaries. Zone B is an area within 2,500 feet of the intake, not including areas in Zone A. For surface water sources, PCAs located in Zone A are considered a greater threat than PCAs located in Zone B. PCAs located on the watershed outside of the zones are considered to be of less risk to the water supply. If zones have not been defined, PCAs are considered to be of equal risk regardless of location on the watershed.

Physical Barrier Effectiveness (PBE): The PBE for a source is an evaluation of the ability of the source and the surrounding area to prevent the movement of contaminants into the source. The PBE is based on the construction and operation features of the source, and the characteristics of the surrounding area. A source is assigned a PBE of Low, Moderate or High, where High indicates that the physical barriers of the source and site are very effective in preventing the movement of contaminants. By design, typical groundwater sources will have Moderate PBE, while typical surface water sources will have Low PBE. This is due to the greater exposure of surface water sources to contamination.

Vulnerability Ranking: The vulnerability ranking is a summary of the PCAs identified in the assessment prioritized by the risk that they pose to the water supply. The prioritization is based on the risk associated with a PCA, the zone in which it occurs, and the PBE of the source.
In the vulnerability ranking, points are assigned as follows:

PCA risk ranking	Very High = 7	High = 5	Moderate = 3	Low = 1	Unknown in any zone = 0
Zone (Groundwater)	A = 5	B5 = 3	B10 = 1		
Zone (Surface water with zones)	A = 5	B = 3	Watershed = 1		
Zone (Surface water without zones)	Watershed = 5				
Physical Barrier Effectiveness	Low = 5	Moderate = 3	High = 1		

The points for each type of PCA in each zone are totaled to give a vulnerability score, and the PCAs are ranked in order from the highest score to the lowest score. PCAs associated with detected contaminants are ranked at the top, regardless of vulnerability score. By definition, groundwater sources are not considered vulnerable to PCAs with scores less than 8, and surface water sources are not considered vulnerable to PCAs with scores less than 11. It should be noted that the vulnerability ranking scores do not have a direct quantitative value. Rather, the points are used only to relatively rank the types of PCAs for an individual source.

Note: Some of the summaries do not include a vulnerability ranking. If the assessment was done on paper and the details were not entered into the database, the vulnerability ranking is not available here. In addition, alternate methods of determining vulnerability were allowed in some cases, and the vulnerability ranking is not in the database.

Vulnerability Summary: The source is considered most vulnerable to the PCAs with the highest score, and to PCAs associated with detected contaminants. These PCAs are noted in the vulnerability summary. Further details or discussion may be provided in the vulnerability discussion.

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Appendix T

2005 DPH Drinking Water Source Assessment

For Saticoy County Yard Well

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Drinking Water Source Assessment

Water System

VENTURA WATER DEPARTMENT

Ventura County

Water Source

SATICOY COUNTY YARD WELL

Assessment Date

April, 2005

Assessment Completed By

Hopkins Groundwater Consultants, Inc.

California Department of Health Services
Drinking Water Field Operations Branch
DHS Santa Barbara District

District No.	**06**
System No.	**5610017**
Source No.	**033**
PS Code	**5610017-033**

Vulnerability Summary

District Name DHS Santa Barbara District **District No.** 06 **County** Ventura

System Name VENTURA WATER DEPARTMENT **System No.** 5610017

Source Name SATICOY COUNTY YARD WELL **Source No.** 033 **PS Code** 5610017-033

Completed by Hopkins Groundwater Consultants, Inc. **Date** April, 2005

According to DHS records, this Source is Groundwater. This Assessment was done using the Default Groundwater System Method.

A source water assessment was conducted for the **SATICOY COUNTY YARD WELL**

of the **VENTURA WATER DEPARTMENT** water system in **April, 2005**.

The source is considered most vulnerable to the following activities not associated with any detected contaminants:

Automobile - Gas stations

Discussion of Vulnerability

The Saticoy County Yard Well (source well) is part of a new Ventura County Public Works Facility, which is being constructed approximately 700 feet northwest of the new source well. Project architects reported the Ventua County Watershed Protection District (VCWPD) required 40-millimeter high density polyurethane sheeting be installed under all maintenance buildings and fuel facilities. The fuel facilities will also be equipped with auto shut-offs and monitoring equipment. The VCWPD reported only one existing water well in the vicinity that is currently not active and is considered abandoned. There is no construction documentation of the abandoned well, however wells in the vicinity of this well have historically been shallow completions.

The source well is located within the Oxnard Forebay basin, its principle source of recharge is the Santa Clara River to the northeast. The source well is constructed with a 280 foot sanitary seal, and produces from a lower aquifer system which should isolate the source well from possible contamination from any existing or future LUFT sites, urban and agricultural uses.

A copy of the complete assessment may be viewed at:

City of San Buenaventura
501 Poli Street
Ventura, CA 93002

You may request a summary of the assessment be sent to you by contacting:

Jim Passanisi
Water Superintendent
805-652-4504

Vulnerability Ranking

District Name DHS Santa Barbara District **District No.** 06 **County** Ventura

System Name VENTURA WATER DEPARTMENT **System No.** 5610017

Source Name SATICOY COUNTY YARD WELL **Source No.** 033 **PS Code** 5610017-033

Completed by Hopkins Groundwater Consultants, Inc. **Date** April, 2005

The following PCAs were identified in the assessment and are listed in priority order based on risk to the water supply. Refer to the last page for more information.

Zone	PCA (Risk Ranking)	*	PCA Risk Points	Zone Points	PBE Points	Vulnerability Score
A	Automobile - Gas stations (VH)		7	5	1	13
A	Agricultural Drainage (H in Zone A, otherwise M)		5	5	1	11
A	Automobile - Body shops (H)		5	5	1	11
A	Automobile - Repair shops (H)		5	5	1	11
A	Fleet/truck/bus terminals (H)		5	5	1	11
A	Sewer collection systems (H in Zone A, otherwise L)		5	5	1	11
A	Wells - Agricultural/ Irrigation (H)		5	5	1	11
B5	Historic gas stations (VH)		7	3	1	11
B5	Known Contaminant Plumes (VH)		7	3	1	11
B5	Underground storage tanks - Confirmed leaking tanks (VH)		7	3	1	11
A	Automobile - Car washes (M)		3	5	1	9
A	Contractor or government agency equipment storage yards (M)		3	5	1	9
A	Crops, irrigated [Berries, hops, mint, orchards, sod, greenhouses, vineyards, nurseries, vegetable] (M)		3	5	1	9
A	Fertilizer/Pesticide/Herbicide Application (M)		3	5	1	9
A	Parking lots/malls [>50 spaces] (M)		3	5	1	9
A	Storm Drain Discharge Points (M)		3	5	1	9
A	Transportation corridors - Freeways/state highways (M)		3	5	1	9
A	Transportation corridors - Road Right-of-ways [herbicide use areas] (M)		3	5	1	9
A	Wells - Water supply (M)		3	5	1	9
B5	Automobile - Body shops (H)		5	3	1	9
B5	Automobile - Repair shops (H)		5	3	1	9
B5	Junk/scrap/salvage yards (H)		5	3	1	9
B5	Utility stations - maintenance areas (H)		5	3	1	9
B5	Wells - Agricultural/ Irrigation (H)		5	3	1	9
B10	Underground storage tanks - Confirmed leaking tanks (VH)		7	1	1	9

*** = A contaminant potentially associated with this activity has been detected in the water supply.**

Explanation of Source Water Assessments and Definition of Terms

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VENTURA WATER

Cost of Service and Rate Design Study Report

Raftelis Financial Consultants, Inc.

March 2012

RAFTELIS FINANCIAL CONSULTANTS, INC.

201 S. Lake Blvd, Suite 301
Pasadena • CA • 91101

Phone 626•583•1894
Fax 626•583•1411

www.raftelis.com

March 14, 2012

Ms. Shana Epstein
General Manager
Ventura Water
P.O. Box 99, 336 Sanjon Road
Ventura, CA 93002

Subject: Cost of Service and Rate Design Study Report for Water and Wastewater Utilities

Dear Ms. Epstein:

Raftelis Financial Consultants Inc. (RFC) is pleased to present this report on the cost of service and rate study for the water and wastewater utilities to the City of San Buenaventura – Ventura Water (City). We are confident that the recommendations based on the cost of service analysis will result in fair and equitable water and wastewater rates to the City's users.

The study involved a comprehensive review of the City's financial plan and rate structures for the water and wastewater utilities. Based on our findings, RFC recommends that the City implement the following revenue adjustments for fiscal years (FY) 2013 and 2014 in order to fund operating and capital expenses and meet Council approved reserves and debt coverage requirements.

Effective Date	Water	Wastewater
July 2012	$1.7 million	$1.4 million
July 2013	$1.8 million	$1.0 million

All assumptions, including all increases in operating and capital costs, were factored into the rates. The rates were restructured to promote conservation, enhance rate and revenue stability and increase equity among customer classes. The recommendations and findings of the study and various tables describing the calculation of the rates are included.

It was a pleasure working with you and we appreciate the assistance that you, Ms. Nancy Broschart, and other staff members provided during the course of the study. If you have any questions, please call me at (626) 583-1894.

Sincerely,

Sudhir Pardiwala
Vice President

Hannah Phan
Senior Consultant

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SECTION 1 – EXECUTIVE SUMMARY

The City of San Buenaventura – Ventura Water (City) engaged Raftelis Financial Consultants, Inc. (RFC) to conduct a comprehensive financial plan over the planning period from fiscal years (FY) 2013 to 2022 and develop cost of service rates for the water and wastewater utilities. The rate study process was conducted in conjunction with input from City staff and a citizens Advisory Committee, a resident stakeholders group. This report documents the resultant findings, analyses, and proposed changes that were developed with input from and approved by the stakeholders.

The major objectives of the study include the following:

1. Ensure *Revenue Sufficiency* to meet the operation and maintenance (O&M) and capital needs of the City's water and wastewater utilities.
2. Ensure that rates are *Fair and Equitable* and are based on *Cost of Service* guidelines used in the industry.
3. Plan for *Rate and Revenue Stability* to prevent rate spikes and provide for adequate operating and capital reserves and the overall financial health of the water and wastewater utilities under varying conditions.

This executive summary provides an overview of the study and includes findings and recommendations for both water and wastewater rates.

The remainder of the report defines a unit of water as a hundred cubic feet (HCF or hcf). A hundred cubic feet of water equals 748 gallons or enough water to fill 15 bathtubs. Also, a fiscal year (FY) for the City of Ventura is from July 1 to June 30 the following year. Therefore, fiscal year July 1, 2011 through June 30, 2012 is identified as FY 2012, fiscal year July 1, 2012 through June 30, 2013 is identified as FY 2013 and so forth.

WATER UTILITY

System Background

The water utility provides service to over 28,500 customer accounts in a service area of over 32 square miles, which includes all portions within the City limits as well as portions of the unincorporated Ventura County. Water is supplied through three main sources: local groundwater from the Mound, Santa Paula, and Oxnard Plain basins, treated water purchased from Casitas Municipal Water District (Casitas) and Ventura River water (via surface diversion, subsurface collector and shallow wells). The water supply costs range from $125 per acre foot for groundwater to approximately $340 per acre foot for treated water in FY 2012. The cost of local groundwater supply sources has increased in the last several years due to continued years of drought, tightening water restrictions and environmental and regulatory requirements.

The current water rate structure consists of a fixed bi-monthly service charge that varies by meter size, a tiered commodity rate for residential customers, and uniform commodity rates for non-residential customers, as shown in **Table 1-1.**

Table 1-1
Existing Bi-Monthly Rate Structure

Bi-Monthly Service Charge				
Meter Size	Inside City	Outside City	Fire Line	Reclaimed
3/4"	$15.03	$25.55		$15.03
1"	$28.74	$48.86	$6.93	$28.74
1 1/2"	$47.76	$81.19	$6.93	$47.76
2"	$66.76	$113.49	$6.93	$66.76
3"	$150.42	$255.71	$20.80	$150.42
4"	$245.49	$417.33	$41.60	$245.49
6"	$483.06	$821.20	$115.58	$483.06
8"	$720.60	$1,225.02	$242.71	$720.60
10"	$958.15	$1,628.86	$416.08	$958.15
12"	$1,100.68	$1,871.16	$429.94	$1,100.68

Rates ($/hcf)		Inside City	Outside City
SFR			
Tier 1	1 to 16	$2.02	$3.43
Tier 2	17 to 42	$2.66	$4.52
Tier 3	43+	$4.27	$7.26
MFR			
Tier 1	1 to 10	$2.02	$3.43
Tier 2	11 to 24	$2.66	$4.52
Tier 3	25+	$4.27	$7.26
Non-Residential		$2.66	$4.52
City Parks		$1.40	$1.40
Reclaimed Water		$0.50	$0.50

SFR – single family residential
MFR – multi-family residential

Financing Plan

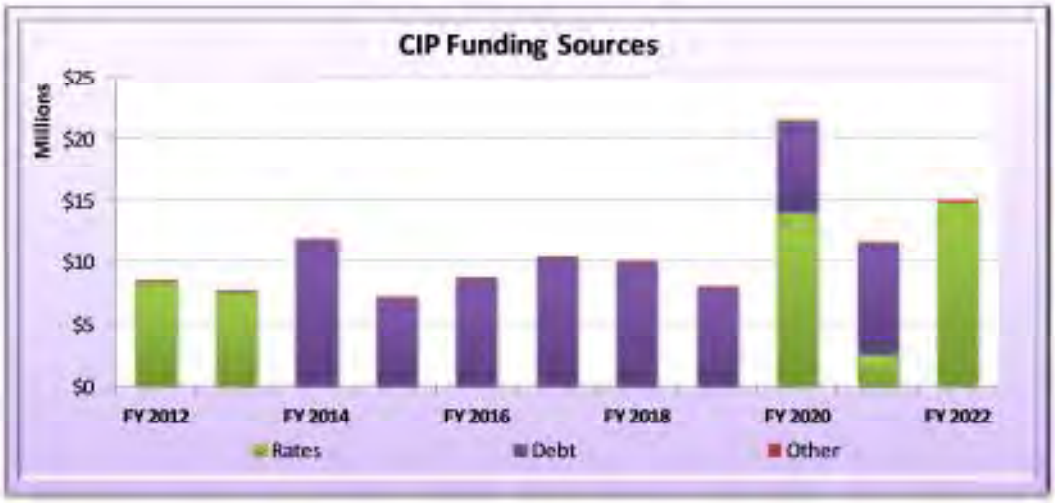
In order to determine water rates, RFC projected the revenue requirements, including operations and maintenance (O&M) expenses, capital improvement expenses, debt service costs, reserve requirements, etc., for the study period from FY 2013 to 2022. O&M expenses include the cost of operating and maintaining water supply, treatment, storage, and distribution facilities, as well as the costs of providing technical services such as laboratory services and other administrative costs of the water system such as

meter reading and billing. O&M projections are based on the City's FY 2012 adopted and 2013 estimated budgets using an inflationary factor of three percent per year starting in FY 2014 to project all O&M expenditures, except personnel, chemicals, and utilities. Salaries are projected to remain unchanged through FY 2015 due to current union contracts, increasing at 0.5 percent per year in all other years. Benefits expenses are projected to remain unchanged through FY 2014, increasing at 0.3 percent per year in all other years. Chemical and utilities expenses are projected to increase at 5 percent per year during the study period. Water supply costs are budgeted to increase approximately 6 percent in FY 2013, 3 percent in FY 2014 and approximately 4.5 percent from FY 2015 to 2021.

In addition to the operating expenses, the City is planning significant capital expenditures over the next eleven years. Due to the size of the total Capital Improvement Program (CIP), $120 million over the next eleven years (FY 2012 to 2022), the capital financing plan projects that approximately $80 million will be funded through debt. Existing and anticipated debt service results in annual payments in the range of $3 to $8.2 million. **Figure 1-1** shows the CIP funding plan over planning period.

Water accounts are projected to grow at an average of 0.4 percent per year. However, water usage, due to conservation efforts, is projected to decrease 2 percent per year in FY 2013 and 2014 and 1 percent per year through FY 2020.

Figure 1-1
Capital Financing Plan



To ensure that the City will have adequate revenues to fund water operating and capital expenses and to maintain sufficient reserves, RFC recommends the following revenue adjustments.

Annual Revenue Increases

Effective Date	Increases
July 1, 2012	$1.7 million
July 1, 2013	$1.8 million

Figure 1-2 shows the resulting reserve balance, excluding the debt reserves. The red line represents the total target, which is composed of both operating and capital reserves targets consistent with industry

standards. The operating reserve target is set at 25 percent of the operating expenses and the capital reserve target is gradually increased from 50 percent to 100 percent of average annual replacement capital expenditures by FY 2017.

Figure 1-2
Reserves Balance

Cost of Service Analysis and Rate Design

To calculate fair and equitable rates so that users pay in proportion to the cost of providing service, RFC performed a cost allocation of the total revenue requirements consistent with industry standards. The cost of service allocation is based on the Base-Extra Capacity Method described in the American Water Works Association (AWWA) M-1 Manual. Under this method, costs are apportioned amongst various cost parameters to determine the costs to provide service under average conditions, to meet peaking requirements, to provide meter capacity and to provide customer service. Costs to serve different customer classes are determined; rates are then designed to recover the costs equitably consistent with Proposition 218 requirements.

Fixed meter charges were increased from the current levels to provide increased revenue stability. Additionally, based on current usage patterns, RFC adjusted the tiers for residential customers to meet the City's goals of promoting efficient water usage that encourages conservation and recovers costs proportionally from customers. Because they are non-homogenous, commercial and irrigation accounts are not ideally suited for a tiered rate structure; therefore, all non-residential customers will be billed on a uniform rate structure. Municipal irrigation customers will be provided a lower interruptible commodity rate which would require those customers to be the first to reduce usage in times of drought or emergency.

Outside-City customers will be charged an incremental rate on their water usage based on the cost of providing service to those customers. RFC also recommends that reclaimed water rates be increased to cover the cost of providing recycled water service.

Proposed Water Rates

Table 1-2 shows the proposed rates for calendar year 2012 and 2013. These rates are effective in July of each year.

Table 1-2
Proposed Bi-Monthly Service Charge – Based on Meter Size (Per Meter)

	Current Rates*	Effective July 1, 2012	Effective July 1, 2013
Bi-Monthly Service Charge			
Meter Size			
3/4"	$15.03	$23.14	$25.11
1"	$28.74	$35.34	$38.35
1 1/2"	$47.76	$65.86	$71.46
2"	$66.76	$102.48	$111.20
3"	$150.42	$218.43	$237.00
4"	$245.49	$389.31	$422.41
6"	$483.06	$798.20	$866.05
8"	$720.60	$1,469.52	$1,594.43
10"	$958.15	$2,323.92	$2,521.46
12"	$1,100.68	$3,056.26	$3,316.05

Proposed Bi-Monthly Fireline Service Charge – Based on Meter Size (Per Meter)

	Current Rates*	Effective July 1, 2012	Effective July 1, 2013
Bi-Monthly Fireline Charge			
Meter Size			
1" Ubranch	$2.11	$5.96	$6.47
1"	$6.93	$5.96	$6.47
1 1/2"	$6.93	$5.96	$6.47
2"	$6.93	$5.96	$6.47
3"	$20.80	$17.30	$18.78
4"	$41.60	$36.87	$40.00
6"	$115.58	$107.09	$116.20
8"	$242.71	$228.21	$247.61
10"	$416.08	$410.40	$445.29
12"	$429.94	$662.91	$719.26

Proposed Bi-Monthly Water Rates – Commodity Rates

		Current Rates*	Effective July 1, 2012	Effective July 1, 2013
Volume Rates ($/hcf)				
SFR				
Tier 1	0 to 14	$2.02	$1.98	$2.15
Tier 2	15 to 30	$2.66	$2.69	$2.92
Tier 3	> 30	$4.27	$4.41	$4.79
MFR				
Tier 1	0 to 10	$2.02	$1.98	$2.15
Tier 2	11 to 16	$2.66	$2.69	$2.92
Tier 3	> 16	$4.27	$4.41	$4.79
Non-Residential		$2.66	$2.48	$2.70
Institutional/Interruptible Rate		$1.40	$1.98	$2.15
Reclaimed Water		$0.50	$0.64	$0.68
Untreated Water		$1.40	$1.88	$2.04
Outside City Rates		170% of Inside	Add $0.73/hcf	Add $0.76/hcf

*Current rates have different tiers

Customer Impacts

Table 1-3 below shows the impacts of an average single-family residential (SFR) customer with a 3/4-inch meter using an average 21 hcf of water bi-monthly. For comparison purposes, the impacts of very low to very high users are also shown.

Table 1-3
SFR Bi-Monthly Customer Impacts

SFR	Usage (hcf)	Current	July 1, 2012	July 1, 2013	Difference 1	Difference 2
Very Low	5	$25.13	$33.04	$35.86	$7.91	$2.82
Low	12	$39.27	$46.90	$50.91	$7.63	$4.01
Average	21	$60.65	$69.69	$75.65	$9.04	$5.96
High	35	$97.89	$115.95	$125.88	$18.06	$9.93
Very High	50	$150.67	$182.10	$197.73	$31.43	$15.63

Note: Assume 3/4" meter

WASTEWATER UTILITY

System Background

The City's wastewater utility is responsible for the collection, treatment, and disposal of wastewater from its 44,300 (each multi-family dwelling unit is counted as an account) residential and non-residential accounts. Wastewater is treated at the Ventura Water Reclamation Facility, a tertiary treatment facility located in the Ventura Harbor area near the mouth of the Santa Clara River.

Table 1-4 shows the existing wastewater rate structure. Residential customers have a six-tier bi-monthly wastewater rate structure, with usage determined using the lowest water usage on bills received during the previous winter, defined as the time period from November 1 through April 30. Commercial customers pay a fixed charge varying with strength up to 8 hcf and a rate for usage above 8 hcf. They are divided into six strength groups. Churches pay a fixed bi-monthly charge equal to the highest residential charge. Schools pay a fixed charge which varies depending based on whether or not they have showers and per 100 students on average daily attendance (ADA). Industrial customers are billed monthly based on flow, chemical oxygen demand (COD), and total suspended solids (SS).

Financing Plan

In order to determine wastewater rates, RFC projected the revenue requirements, including operations and maintenance (O&M), capital improvement expenses, debt service costs, reserves requirements, etc., for the study period from FY 2013 to 2022. O&M expenses include the cost of operating and maintaining wastewater collection, treatment, and disposal facilities, as well as the costs of providing technical services such as laboratory services and other administrative costs of the wastewater system such as customer service and billing. The O&M projections are based on the City's FY 2012 adopted and estimated 2013 budgets using an inflationary factor of three percent per year starting in FY 2014 to project all O&M expenditures, except personnel, chemicals, and utilities. Salaries are projected to remain unchanged through FY 2015 due to current union contracts, increasing at 0.5 percent per year in all other years. Benefits expenses are projected to remain unchanged through FY 2014, increasing at 0.3 percent per year in all other years. Chemical and utilities expenses are projected to increase at 5 percent per year during the study period.

Capital expenditures are based on the City's Capital Improvement Program (CIP) and are funded by various sources, including connection fees, rate revenues, grants, bonds proceeds, etc. Due to the size of the CIP, $147 million over eleven years (FY 2012 to 2022), the capital financing plan projects that approximately $95 million will be funded through debt. Existing and anticipated debt service results in annual payments in the range of $1.7 to $7.1 million. **Figure 1-4** shows the CIP funding plan over the eleven-year period. It should be noted that most tables and figures are shown for the ten years FY 12 through FY 21 for clarity and to compare with FY 12 data.

Similar to growth used in the water projections, wastewater accounts are projected to grow at an average of approximately 0.4 percent per year.

Table 1-4
Existing Bi-Monthly Wastewater Rates

SFR & MFR	HCF*	Bi-Monthly Rate
Tier 1	0 - 8	$34.27
Tier 2	9 - 10	$42.24
Tier 3	11 - 12	$50.00
Tier 4	13 - 14	$57.76
Tier 5	15 - 16	$65.51
Tier 6	17+	$73.27
Schools (with showers - 100 ADA)		$131.89
Schools (no showers - 100 ADA)		$102.58
Churches		$73.27

*HCF determined based on lowest billing between November through April

Commercial	HCF	Bi-Monthly Rate
Group 1		
Tier 1	0 - 8	$16.07
Tier 2	9+	$2.63
Group 2		
Tier 1	0 - 8	$24.26
Tier 2	9+	$3.15
Group 3		
Tier 1	0 - 8	$36.38
Tier 2	9+	$5.39
Group 4		
Tier 1	0 - 8	$56.79
Tier 2	9+	$7.03
Group 5		
Tier 1	0 - 8	$47.74
Tier 2	9+	$6.57
Group 6		
All		$73.27
Industrial (Monthly)		
Flow	(MG)	$2,470.10
COD	(klbs)	$280.51
SS	(klbs)	$597.62

Figure 1-4
Capital Financing Plan

In order to meet projected revenue requirements and to maintain desired reserves fund balances, the following revenue adjustments are proposed to meet long term revenue stability.

Annual Revenue Increases

Effective Date	Increases
July 1, 2012	$1.4 million
July 1, 2013	$1.0 million

Figure 1-5 shows the resultant reserves balance, excluding the debt reserves. The red line representing the total targets are the same as defined for the water utility.

Figure 1-5
Reserves Balance

Cost of Service Analysis

To calculate fair and equitable rates so that users pay in proportion to the cost of providing service, RFC performed a cost allocation of the total revenue requirements consistent with industry standards. The methodology is consistent with the guidelines of the Water Environment Federation (WEF). Since wastewater is not directly measured for each customer, RFC estimated the wastewater loadings (flow, chemical oxygen demand (COD) and total suspended solids (SS)), generation for each customer class through a mass balance analysis, which is used to determine the loadings of each user class and their cost responsibility. Costs are allocated to flow, COD and SS to apportion the costs amongst various customer classes in proportion to their loadings.

Proposed Wastewater Rates

The current rate structure has an effective cap of 17 hcf per bimonthly period for residential wastewater discharge. Non-residential customers are categorized into six groups based on their strength, each with a fixed bimonthly charge that includes the first 8 units of water plus a variable unit rate for the remaining usage based on actual water usage.

As a result of discussions with City staff and the Advisory Committee, a fixed plus flow charge rate structure was selected to further incentivize conservation and improve equity amongst different customer classes. Residential wastewater charges will be based on the average winter usage based on two full cycles for bills received from February to May. To capture costs of serving customers with higher wastewater generation, the residential cap is increased to 30 hcf for single family and 24 hcf for multi-family users per bi-monthly period. Additionally, to prepare for costs associated with the Santa Clara River Estuary settlement with Heal the Bay and Wishtoyo Foundation's Ventura Coastkeeper Program, a charge equal to two percent of the wastewater bill in FY 2013 and four percent of the

wastewater bill in FY 2014 is recommended. Revenues collected from this charge will be used for Estuary protection related planning studies.

Table 1-5 shows the proposed wastewater rates for the next two years with the winter average fixed plus flow rate structure for residential customers and a fixed plus flow rate structure based on actual water usage for non-residential customers. Schools will be billed on the basis of 100 ADA only.

The current non-residential classes are retained as they adequately reflect the strength of those customers. Proposed charges for churches are based on water used instead of the current bi-monthly fixed charge.

Table 1-5
Proposed Bi-Monthly Wastewater Rates

	Effective	
	July 1, 2012	July 1, 2013
SFR		
Bi-monthly Fixed Charge	$17.65	$18.35
Bi-monthly Flow Charge*	$2.67	$2.78
Maximum Bill (cap at 30 hcf)	$97.75	$101.75
Max Estuary Protection Fund Charge	$1.96	$4.07
MFR		
Bi-monthly Fixed Charge	$13.06	$13.58
Bi-monthly Flow Charge*	$2.67	$2.78
Maximum Bill (cap at 24 hcf)	$77.14	$80.30
Max Estuary Protection Fund Charge	$1.54	$3.21
Commercial		
Bi-monthly Fixed Charge	$17.65	$18.35
Bi-monthly Flow Charge**		
Group 1	$3.13	$3.26
Group 2	$3.58	$3.72
Group 3	$4.61	$4.80
Group 4	$5.61	$5.84
Group 5	$5.12	$5.33
Group 6	$1.08	$1.13
Churches	$2.33	$2.43
Schools (100 ADA)	$128.17	$133.25
Industrial (Monthly)		
Flow (MG)	$3,689.47	$3,835.63
COD (klbs)	$153.01	$159.08
SS (klbs)	$283.68	$294.92
Estuary Protection Fund Charge	2% of bill	4% of bill

*Based on average winter usage for 2 full billing cycles for bills received February through May
** Based on actual water usage

Customer Impacts

Tables 1-6 and 1-7 below show the impacts to SFR and MFR customers at different levels of winter water usage. The three columns within the box outline show the breakdown between the wastewater charge, the Estuary protection charge and the proposed total bi-monthly wastewater bills for the first year. The last three columns show the bills for the second year.

Table 1-6
SFR Bi-Monthly Customer Impacts

Winter Avg HCF	Current Bill	7/1/2012 WW Bill	7/1/2012 Estuary	7/1/2012 Total Bill	7/1/2013 WW Bill	7/1/2013 Estuary	7/1/2013 Total Bill
5	$34.27	$31.00	$0.62	$31.62	$32.25	$1.29	$33.54
10	$42.24	$44.35	$0.89	$45.24	$46.15	$1.85	$48.00
15	$65.51	$57.70	$1.15	$58.85	$60.05	$2.40	$62.45
20	$73.27	$71.05	$1.42	$72.47	$73.95	$2.96	$76.91
25	$73.27	$84.40	$1.69	$86.09	$87.85	$3.51	$91.36
30	$73.27	$97.75	$1.96	$99.71	$101.75	$4.07	$105.82

Table 1-7
MFR Bi-Monthly Customer Impacts

Winter Avg HCF	Current Bill	7/1/2012 WW Bill	7/1/2012 Estuary	7/1/2012 Total Bill	7/1/2013 WW Bill	7/1/2013 Estuary	7/1/2013 Total Bill
2	$34.27	$18.40	$0.37	$18.77	$19.14	$0.77	$19.91
6	$34.27	$29.08	$0.58	$29.66	$30.26	$1.21	$31.47
12	$50.00	$45.10	$0.90	$46.00	$46.94	$1.88	$48.82
17	$73.27	$58.45	$1.17	$59.62	$60.84	$2.43	$63.27
21	$73.27	$69.13	$1.38	$70.51	$71.96	$2.88	$74.84
24	$73.27	$77.14	$1.54	$78.68	$80.30	$3.21	$83.51

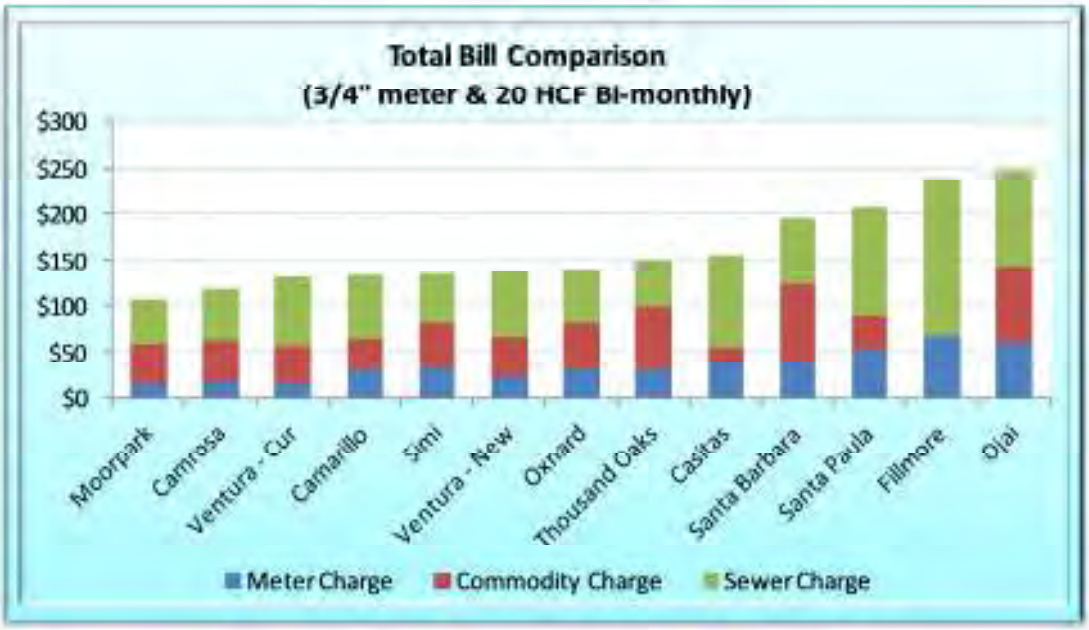
Non-residential customers will experience different rate impacts depending on their group and usage levels. **Table 1-8** shows the rate impact of an average user within each group.

Table 1-8
Non-Residential Bi-Monthly Customer Impacts

Customer Group	Bi-Monthly Usage HCF	Current Bill	7/1/2012 WW Bill	7/1/2012 Estuary	7/1/2012 Total Bill	7/1/2013 WW Bill	7/1/2013 Estuary	7/1/2013 Total Bill
Group 1	70	$179.13	$236.75	$4.74	$241.49	$246.55	$9.86	$256.41
Group 2	331	$1,041.71	$1,202.63	$24.05	$1,226.68	$1,249.67	$49.99	$1,299.66
Group 3	923	$4,968.23	$4,272.68	$85.45	$4,358.13	$4,448.75	$177.95	$4,626.70
Group 4	147	$1,033.96	$842.32	$16.85	$859.17	$876.83	$35.07	$911.90
Group 5	122	$796.72	$642.29	$12.85	$655.14	$668.61	$26.74	$695.35
Group 6	200	$73.27	$233.65	$4.67	$238.32	$244.35	$9.77	$254.12
Chuches	242	$73.27	$581.51	$11.63	$593.14	$606.41	$24.26	$630.67
Schools	704 ADA	$722.15	$902.32	$18.05	$920.37	$938.08	$37.52	$975.60

Figure 1-6 compares the total bi-monthly water and wastewater service charges for an average SFR customer with a 3/4" meter and 20 hcf of water usage bi-monthly with neighboring communities' rates as of December 2011.

Figure 1-6
Total Bill Comparison



SECTION 2 – INTRODUCTION

BACKGROUND

The City of San Buenaventura – Ventura Water (City) engaged Raftelis Financial Consultants, Inc. (RFC) to develop a long-term financial plan and conduct a comprehensive rate study for the water and wastewater utilities that could be utilized to evaluate and enhance the equity of user charges for the City's water and wastewater services to ensure that there is a proportionate recovery of costs from the various user classes. This report documents the resultant findings, analyses, and proposed changes.

The City's water utility provides water services to approximately 28,500 residential, commercial, irrigation, and industrial accounts. The City receives water from three main sources: the Ventura River, Lake Casitas, and local groundwater wells. The water utility is responsible for operating and maintaining three water treatment plants, 380 miles of distribution pipelines, 23 pump stations, 16,000 valves, 3,700 fire hydrants, and 31 reservoirs.

The City's wastewater utility provides sewer services to about 44,300 residential (each multi-family dwelling unit is counted as an account), commercial, and industrial accounts. Approximately 9 million gallons per day (MGD) of wastewater is treated at the Ventura Water Reclamation Facility, a tertiary treatment facility located in the Ventura Harbor area near the mouth of the Santa Clara River. The wastewater utility is also responsible for the operation and maintenance of 290 miles of gravity collection pipelines, 10 miles of force mains, 5,900 manholes and 11 operating lift stations.

The City operates the water and wastewater systems as separate, self-supporting enterprises, with revenues and expenditures accounted for separately from its other enterprises and activities. These functions receive no funding from the City's General Fund.

Objectives

A pricing objectives public workshop (see **Appendix A** for details) was conducted with the citizens Advisory Committee and members of the public. In this exercise, participants were asked to prioritize 11 pricing objectives that would serve as a guideline in the design of rates. Each objective was given a grade and weight in order to calculate the most important pricing objectives. The most important objectives that resulted from the exercise were:

- Ensure that rates are based on *Cost of Service* guidelines used in the industry
- Plan for *Revenue Stability* to provide for adequate operating and capital reserves and the overall financial health of the water and wastewater utilities under varying conditions
- Plan for *Rate Stability* to prevent rate spikes
- Ensure *Affordability* of water and wastewater service for low volume customers
- Provide for *Fairness and Equitability* in the development of a system of user charges

Some of these objectives conflict with others. For example, revenue stability may conflict with affordability. That being the case, judgment plays a role in the final design of rate structures and rates

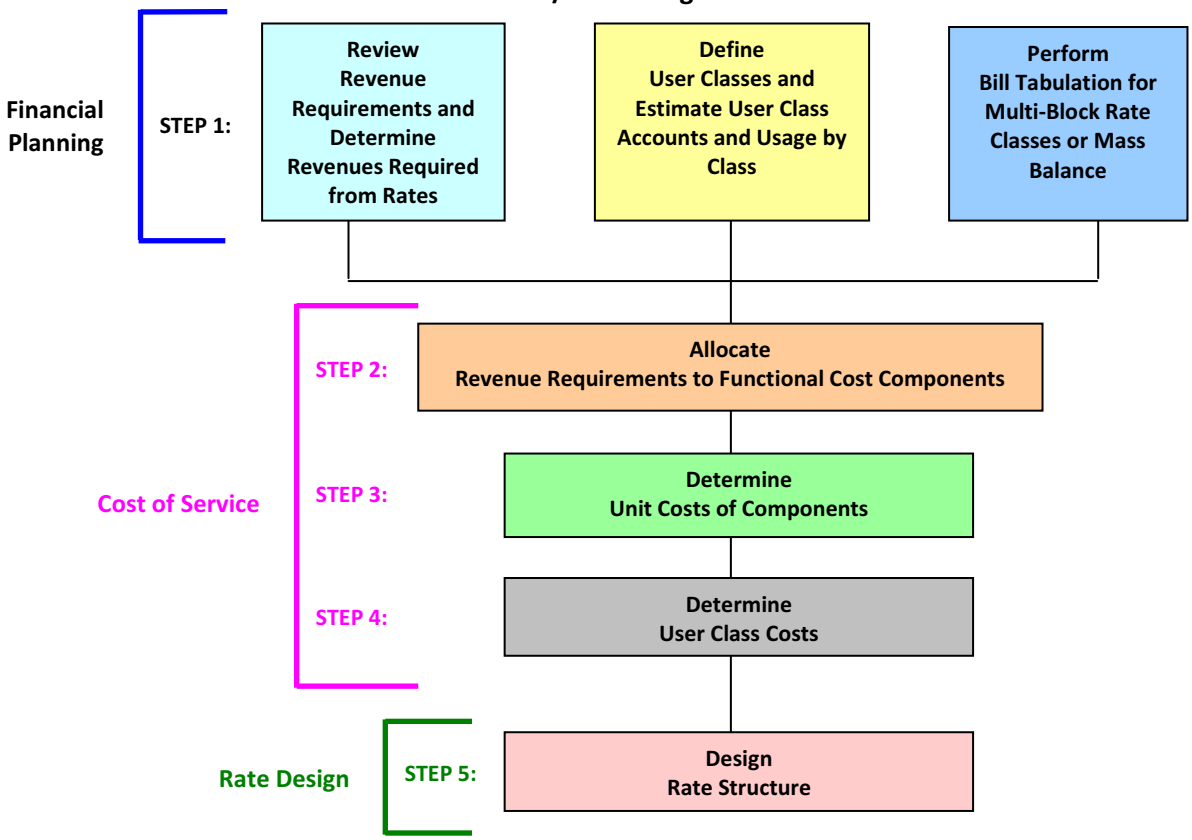
and the Advisory Committee carefully considered customer impacts throughout the process to balance competing objectives.

Scope of the Study

The scope of this study results in the development of cost of service based water and wastewater user rates through a comprehensive cost of service and rate design study process. **Figure 2-1** provides a graphical representation of the various steps involved in the comprehensive cost of service and rate design process. The three major processes are as follows:

- **Financial Planning:** User and usage data from the most recent Fiscal Year (FY) is compiled. The single family residential usage in the different tiers is analyzed to determine revenues that will be collected from this class. Operating and capital costs are compiled and revenue requirements are projected for a ten-year period from FY 2013 through FY 2022. Financial planning involves estimation of annual O&M and capital expenditures, annual debt service and reserve requirements, operating and capital revenue sources and the determination of required annual user revenues from rates and charges.
- **Cost of Service Analysis:** Cost of Service Analysis involves identifying and apportioning annual revenue requirements to the different cost centers and defining unit costs so that costs can be allocated to the different user classes proportionate to their demand on the water system (for water) and proportionate to their wastewater loadings (for wastewater).
- **Rate Design:** Rate Design involves the development of a fixed and variable schedule of rates for each of the different user classes to proportionately recover the costs associated with such user classes. This is also where policy objectives can be achieved, such as encouraging water conservation.

Figure 2-1
Cost of Service/Rate Design Process



Assumptions Used In the Study

The following assumptions are used in the study:

1. Annual O&M and capital expenditures, other revenue sources and reserve requirements, O&M inflation factors and user account growth projections are all based on the City's FY 2012 adopted and 2013 estimated budgets. Water supply costs are projected using the latest estimates available from United Water Conservation District (United), Fox Canyon Groundwater Management Agency (FCGMA), State Water Project and Casitas Municipal Water District (Casitas).

2. Annual water system accounts and volume data used in the study are based on data from the City's billing system.

3. Hydraulic capacity ratios of meters are based on their rated capacity as indicated in AWWA's *Sizing Water Service Lines and Meters, M22* Manual.

This study report includes three sections in addition to the Executive Summary and the Introduction. A brief description of the remaining sections follows.

- ***Section 3*** describes findings and results of the water rate study. It includes a description of the water system, the current water rates for the various types of customers, and the existing and suggested user classifications. This section also discusses the water system revenues and expenditures, the determination of annual revenues required from user rates, a detailed discussion of the Cost of Service, which includes allocation of costs to water parameters and the determination of unit costs, and a detailed discussion of the merits of alternative rate structures and the expected impact on the different user classes, including Outside-City customers.

- ***Section 4*** describes findings and results of the wastewater rate study. It includes a description of the wastewater system, the current wastewater rates for the various types of customers, and the existing and suggested user classifications. This section also discusses the wastewater system revenues and expenditures, the determination of annual revenues required from user rates, a detailed discussion on the Cost of Service, which includes allocation of costs to wastewater parameters and the determination of unit costs, and a detailed discussion of the merits of alternative rate structures and the expected impact on the different user classes. The charges resulting from potential costs for Estuary protection are included.

- ***Section 5*** includes a survey of water and wastewater charges of the City and neighboring and comparable agencies.

- ***Appendix A*** includes the results of the exercise on Pricing Objectives and the rate structures that best meet those objectives.

SECTION 3 – WATER RATE STUDY

The following subsections present the findings and recommendations of the rate study which pertain to the water utility.

WATER SYSTEM

Below is a brief description of the City's current water system and rate structure.

Water System Infrastructure

The water utility provides service to over 28,500 customers in a service area of over 32 square miles. The primary water supply is local groundwater from the Mound, Santa Paula, and Oxnard Plain basins which can represent nearly 50 percent of the total supply, depending on weather and the availability of the other sources. About one third of the water is purchased treated from the Casitas Municipal Water District. The remainder of the water is supplied through Ventura River surface water. Water supply costs range from $125 per acre foot for untreated groundwater to approximately $340 per acre foot for treated Casitas water in FY 2012. The City's treatment cost is approximately $260 per acre foot. The cost of groundwater has increased in the last several years due to continued years of drought, tightening water restrictions and environmental and regulatory requirements.

The City owns and operates three water treatment plants, the Avenue Treatment Plant, Bailey Conditioning Facility, and the Saticoy Conditioning Facility and delivers water to its customers through 380 miles of pipelines, 23 pump stations, and 31 reservoirs. The City also provides reclaimed water from the Ventura Water Reclamation Facility to two local golf courses, the Ventura Marina area, and private commercial customers along the existing reclaimed water distribution system for landscape irrigation.

Water Rates

The current water rate structure consists of a bi-monthly service charge and a per-unit volume rate. The service charge varies by meter size and also differs between Inside City and Outside City customers. Residential customers have a three-tier water volume rate, and non-residential customers pay a uniform rate per hundred cubic feet (hcf) of water used. The volume rate also differs between Inside and Outside City customers. Outside City customers pay 170 percent of the Inside City rates. The bi-monthly service charge is shown in **Table 3-1**.

Table 3-1
Existing Bi-Monthly Service Charge – Based on Meter Size (Per Meter)

Bi-Monthly Service Charge				
Meter Size	Inside City	Outside City	Fire Line	Reclaimed
3/4"	$15.03	$25.55		$15.03
1"	$28.74	$48.86	$6.93	$28.74
1 1/2"	$47.76	$81.19	$6.93	$47.76
2"	$66.76	$113.49	$6.93	$66.76
3"	$150.42	$255.71	$20.80	$150.42
4"	$245.49	$417.33	$41.60	$245.49
6"	$483.06	$821.20	$115.58	$483.06
8"	$720.60	$1,225.02	$242.71	$720.60
10"	$958.15	$1,628.86	$416.08	$958.15
12"	$1,100.68	$1,871.16	$429.94	$1,100.68

Commodity rates are shown in **Table 3-2**.

Table 3-2
Existing Bi-Monthly Commodity Rates (Per 100 Cubic Feet)

Rates ($/hcf)		Inside City	Outside City
SFR			
Tier 1	1 to 16	$2.02	$3.43
Tier 2	17 to 42	$2.66	$4.52
Tier 3	43+	$4.27	$7.26
MFR			
Tier 1	1 to 10	$2.02	$3.43
Tier 2	11 to 24	$2.66	$4.52
Tier 3	25+	$4.27	$7.26
Non-Residential		$2.66	$4.52
City Parks		$1.40	$1.40
Reclaimed Water		$0.50	$0.50

Water Accounts and Usage Characteristics

Customer accounts and usage information for FY 2011 are used as the basis for projecting water revenues during the study period. RFC has made the following assumptions regarding the growth and water usage in the City.

Growth Assumptions

RFC assumed that the City will experience an average account growth rate of 0.4 percent per year during the study period, since the City is almost built out. Water usage growth rates are projected to be

proportional to account growth rates. However, since FY 2011 was a wetter year than average, water usage in FY 2012 is expected to increase 2 percent. In the future years, due to mandatory conservation requirements, water usage is projected to decrease 2 percent per year in FY 2013 and 2014 and 1 percent per year through FY 2020 and then remain unchanged thereafter.

Meters & Equivalent Meters

Most customers in the City are provided water service through a 3/4-inch meter. The total number of meters by size in the City is shown in **Table 3-3** below. The projected average annual growth rate for the entire City is approximately 0.4 percent per year over the ten year planning period.

To allocate meter-related costs appropriately, the concept of equivalent meters needs to be understood. By using equivalent meters instead of a straight meter count, the analysis accounts for the fact that larger meters impose larger demands and are more expensive to install, maintain, and replace than smaller meters and commit a greater capacity in the system.

Equivalent meters are based on meter hydraulic capacity. A ratio of hydraulic capacity is calculated by dividing large meter capacities by the base meter capacity. The base meter is the smallest meter, in our case, a 3/4-inch meter. The actual number of meters by size is multiplied by the corresponding capacity ratio to calculate equivalent meters. The capacity ratio is calculated using the meter capacity in gallons per minute (gpm) provided in the AWWA M22 Manual.

Equivalent meters are used in calculating meter service costs. The equivalent meter ratios used for this study are shown in **Table 3-4** below.

Table 3-3
Customer Accounts/Meters – Current & Projected

Line #	Total Meters Summary	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016
1	Inside City					
2	3/4"	23,431	23,442	23,570	23,688	23,807
3	1"	2,123	2,123	2,134	2,144	2,154
4	1 1/2"	811	811	814	817	821
5	2"	650	650	653	656	659
6	3"	104	104	104	104	104
7	4"	56	56	56	56	56
8	6"	64	64	64	64	64
9	8"	7	7	7	7	7
10	10"	0	0	0	0	0
11	12"	0	0	0	0	0
12	**Subtotal Inside City**	**27,246**	**27,257**	**27,402**	**27,536**	**27,672**
13						
14	Outside City					
15	3/4"	1,141	1,130	1,119	1,119	1,119
16	1"	101	100	99	99	99
17	1 1/2"	13	13	13	13	13
18	2"	18	18	18	18	18
19	3"	5	5	5	5	5
20	4"	5	5	5	5	5
21	6"	0	0	0	0	0
22	8"	0	0	0	0	0
23	10"	1	1	1	1	1
24	12"	0	0	0	0	0
25	**Subtotal Outside City**	**1,284**	**1,272**	**1,260**	**1,260**	**1,260**
26						
27	**TOTAL METERS (EXCLUDING FIRELINE)**	**28,530**	**28,529**	**28,662**	**28,796**	**28,932**
28	**FIRELINE (EXCLUDE HYDRANTS)**	**3,093**	**3,093**	**3,093**	**3,093**	**3,093**

Line #	Total Meters Summary	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021
1	Inside City					
2	3/4"	23,926	24,046	24,166	24,287	24,408
3	1"	2,164	2,174	2,184	2,194	2,204
4	1 1/2"	825	829	833	837	841
5	2"	662	665	668	671	674
6	3"	104	104	104	104	104
7	4"	56	56	56	56	56
8	6"	64	64	64	64	64
9	8"	7	7	7	7	7
10	10"	0	0	0	0	0
11	12"	0	0	0	0	0
12	**Subtotal Inside City**	**27,808**	**27,945**	**28,082**	**28,220**	**28,358**
13						
14	Outside City					
15	3/4"	1,119	1,119	1,119	1,119	1,119
16	1"	99	99	99	99	99
17	1 1/2"	13	13	13	13	13
18	2"	18	18	18	18	18
19	3"	5	5	5	5	5
20	4"	5	5	5	5	5
21	6"	0	0	0	0	0
22	8"	0	0	0	0	0
23	10"	1	1	1	1	1
24	12"	0	0	0	0	0
25	**Subtotal Outside City**	**1,260**	**1,260**	**1,260**	**1,260**	**1,260**
26						
27	**TOTAL METERS (EXCLUDING FIRELINE)**	**29,068**	**29,205**	**29,342**	**29,480**	**29,618**
28	**FIRELINE (EXCLUDE HYDRANTS)**	**3,093**	**3,093**	**3,093**	**3,093**	**3,093**

Table 3-4
Equivalent Meters Ratio and Equivalent Meters

Meter Size	Meter Capacity	AWWA Ratio	Number of Meters	Equivalent Meters
3/4"	30	1.00	24,572	24,572
1"	50	1.67	2,223	3,705
1 1/2"	100	3.33	824	2,747
2"	160	5.33	668	3,563
3"	350	11.67	109	1,272
4"	630	21.00	61	1,281
6"	1,300	43.33	64	2,773
8"	2,400	80.00	7	560
10"	3,800	126.67	1	127
12"	5,000	166.67	0	0

Water Usage

Table 3-5 shows the current and projected water usage for each customer class from FY 2012 through 2021. Due to conservation requirements, the total water usage is projected to decrease approximately 3 percent over the planning period.

Table 3-5
Water Usage by Customer Class (in hcf*)

Line #		FY 2012	FY 2013	FY 2014	FY 2015	FY 2016
1	**Inside City**					
2	SFR	2,873,534	2,817,471	2,776,308	2,762,288	2,748,338
3	MFR	1,542,258	1,512,169	1,490,076	1,482,551	1,475,064
4	Non-Residential	1,480,471	1,450,861	1,428,953	1,421,737	1,414,557
5	City Parks	139,395	136,607	133,875	132,536	131,211
6	Reclaimed Water	207,406	207,406	207,406	228,147	250,962
7						
8	**Outside City**					
9	SFR	130,275	126,393	122,627	121,400	120,186
10	MFR	38,993	37,831	36,703	36,336	35,973
11	Non-Residential	126,335	123,808	121,332	120,119	118,918
12	City Parks	11,309	11,083	10,861	10,752	10,645
13						
14	**TOTAL WATER USAGE**	**6,549,976**	**6,423,629**	**6,328,141**	**6,315,867**	**6,305,854**

Line #		FY 2017	FY 2018	FY 2019	FY 2020	FY 2021
1	**Inside City**					
2	SFR	2,734,459	2,720,650	2,706,911	2,693,241	2,706,707
3	MFR	1,467,615	1,460,204	1,452,830	1,445,493	1,452,720
4	Non-Residential	1,407,414	1,400,306	1,393,235	1,386,199	1,393,130
5	City Parks	129,899	128,600	127,314	126,040	126,040
6	Reclaimed Water	276,058	303,664	334,030	367,433	404,176
7						
8	**Outside City**					
9	SFR	118,985	117,795	116,617	115,451	115,451
10	MFR	35,613	35,257	34,904	34,555	34,555
11	Non-Residential	117,729	116,551	115,386	114,232	114,232
12	City Parks	10,538	10,433	10,329	10,225	10,225
13						
14	**TOTAL WATER USAGE**	**6,298,309**	**6,293,460**	**6,291,554**	**6,292,869**	**6,357,237**

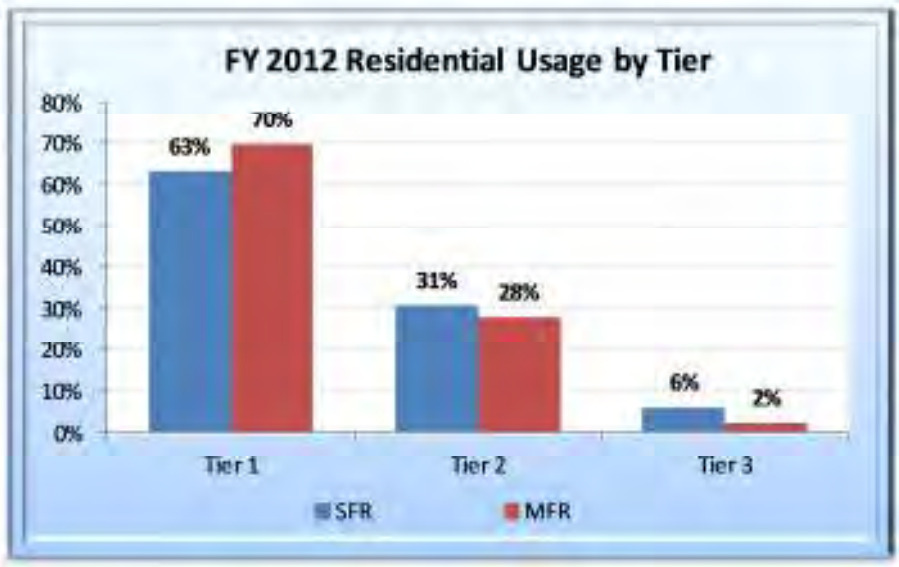
* hcf – hundred cubic feet

Usage Characteristics

Figure 3-1 shows the projected usage by tier for SFR and MFR in FY 2012 under the existing rate structure. The graph indicates that a significant portion of residential customers' usage is in Tier 1 and a

disproportionally small usage in Tier 3. This results because the tier definitions were set over 20 years ago and consumption patterns have changed significantly since that time. The existing tier definitions can be improved to send a stronger signal for conservation. RFC proposes that the City adjust the tier widths for residential customers to achieve greater equity in the rate structure and encourage conservation. The proposed adjustments are presented in Rate Design subsection.

Figure 3-1
FY 2012 Projected Usage by Current Tiers



Usage records in FY 2011 indicate that the average SFR water usage is approximately 21 hcf per bi-monthly period while the average MFR water usage per dwelling unit is approximately 13 hcf per bi-monthly period.

WATER USER CLASSIFICATION

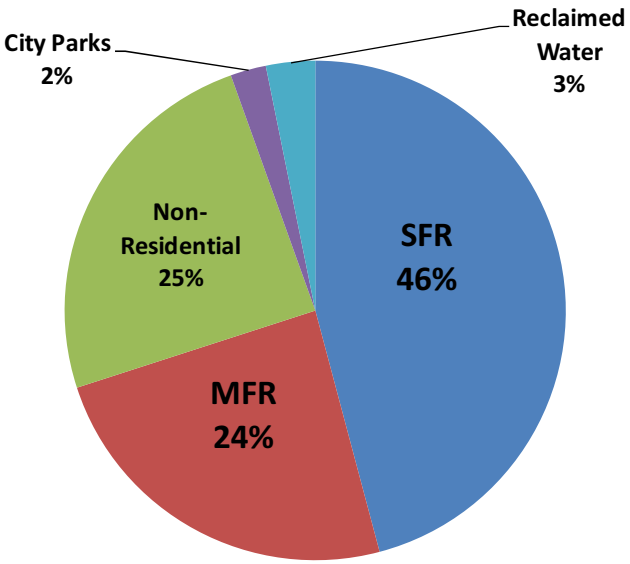
One of the major tasks in the cost of service and rate design process is the classification of users within the water system and the determination of annual demand and costs associated with each class. A review of the City's existing user classifications is presented in the following subsection.

Existing User Classification

The City currently serves a population of nearly 109,000 within the City's service area. In an ideal scenario, a utility with unlimited resources and perfect information could calculate and implement unique rates for every customer based on each customer's individual usage patterns and their unique costs. However, since in the real world it is costly and time prohibitive to separately track each customer's demands and costs, utilities group customers with similar characteristics into categories or user classifications so that rates can be effectively calculated and implemented to recover utility costs in an equitable manner. **Table 3-5** shows the breakdown of the City's water user classes and estimated water usage, in hcf, associated with each class.

The percentage usage breakdown for each customer class is shown in **Figure 3-2.** Residential customers account for 70 percent of the total usage and non-residential customers account for 25 percent, with City parks and reclaimed water making up the remainder. Outside-City customers account for approximately 5 percent of the total water usage in the system.

Figure 3-2
FY 2012 Projected Usage by Customer Class



WATER REVENUE REQUIREMENTS

A review of a utility's revenue requirements is a key first step in the rate design process. The review involves an analysis of annual operating revenues under the current rates, capital revenues, operation and maintenance (O&M) expenses, capital expenditures, transfers between funds, and reserve requirements. This subsection of the report provides a discussion of the projected revenues, O&M and capital expenditures, capital improvement financing plan, debt service requirements, and the revenue adjustments required to ensure the financial stability of the water utility.

Water System Revenues

The City's water utility derives its required annual operating and capital revenues from a number of sources. The principal source of operating revenues from rates are the water service charges from the City's users, which are expected to decrease from $19.9 million in FY 2012 to $19 million by FY 2021 due to projected reduction in water usage. Other revenue sources include miscellaneous operating revenues such as installation fees, rental income, interest earnings, etc. Capital revenue sources include connection fees, bond proceeds, and grants and loans.

RFC reviewed the various sources of operating and capital revenues and the City's financing plan. **Table 3-6** presents the details of the operating and capital related revenues.

Table 3-6
Revenue Summary at Existing Rates

Line #		FY 2012	FY 2013	FY 2014	FY 2015	FY 2016
1	**Inside City**					
2	Bi-Monthly Service Charge	$3,885,515	$3,886,507	$3,902,008	$3,916,435	$3,931,239
3	Usage Revenues	$14,349,164	$14,067,186	$13,858,743	$13,787,829	$13,717,282
4						
5	**Outside City**					
6	Bi-Monthly Service Charge	$276,841	$274,862	$272,882	$272,882	$272,882
7	Usage Revenues	$1,290,962	$1,258,245	$1,226,388	$1,214,124	$1,201,983
8						
9	Interest - Investment Earnings	$350,000	$164,525	$83,343	$174,201	$303,282
10	Water - Connection Fees	$90,000	$90,030	$90,510	$90,963	$91,418
11	Other Miscellaneous Revenue	$1,892,874	$2,377,896	$2,377,896	$2,435,432	$2,494,695
12						
13	**TOTAL WATER REVENUE**	**$22,135,356**	**$22,119,251**	**$21,811,771**	**$21,891,867**	**$22,012,780**

Line #		FY 2017	FY 2018	FY 2019	FY 2020	FY 2021
1	**Inside City**					
2	Bi-Monthly Service Charge	$3,946,043	$3,960,937	$3,975,831	$3,990,815	$4,005,799
3	Usage Revenues	$13,647,100	$13,577,282	$13,507,825	$13,438,729	$13,505,040
4						
5	**Outside City**					
6	Bi-Monthly Service Charge	$272,882	$272,882	$272,882	$272,882	$272,882
7	Usage Revenues	$1,189,963	$1,178,064	$1,166,283	$1,154,620	$1,154,620
8						
9	Interest - Investment Earnings	$464,495	$652,170	$796,391	$1,043,863	$909,784
10	Water - Connection Fees	$91,875	$92,334	$92,796	$93,260	$93,726
11	Other Miscellaneous Revenue	$2,555,736	$2,618,608	$2,683,367	$2,750,068	$2,818,770
12						
13	**TOTAL WATER REVENUE**	**$22,168,094**	**$22,352,277**	**$22,495,375**	**$22,744,236**	**$22,760,621**

The City currently derives 21 percent of its rate revenues from fixed service charges and the remainder from the variable commodity rates. RFC proposes that the City increase the percentage of revenue collected from fixed charges to achieve greater revenue stability. The proposed adjustment is presented in Rate Design subsection.

Water System Expenditures

For sound financial operation of the City's water system, revenues generated must be sufficient to meet the revenue requirements or cash obligations of the system. Revenue requirements include water purchase costs, O&M expenses, capital improvement program (CIP) expenditures, principal and interest payments on existing debt, and other obligations.

Operation and Maintenance Expenses

O&M expenditures include the cost of operating and maintaining water supply, treatment, storage, and distribution facilities. O&M expenses also include the costs of providing technical services such as laboratory services and other administrative costs of the water system such as meter reading and billing. These costs are a normal obligation of the system, and are met from operating revenues as they are incurred. The comprehensive forecasted annual O&M expenditures for the study are based upon the City's budgeted FY 2012 and 2013 expenditures, adjusted for changes since the budget was developed and for anticipated changes in operations and the effect of inflation in future years. The City conservatively uses an inflationary factor of three percent per year starting in FY 2014 to project all O&M expenditures, except personnel, chemicals, and utilities. Salaries are projected to remain unchanged through FY 2015 due to union contracts, increasing at 0.5 percent per year in all other years. Benefits expenses are projected to remain unchanged through FY 2014, increasing at 0.3 percent per year in all other years. Chemical and utilities expenses are projected to increase at 5 percent per year during the study period. Projected O&M expenditures for the study period are summarized by functions in **Table 3-7**. It should be noted that water and wastewater utilities share certain facilities and services when it makes sense to do so in order to reduce overhead costs. The wastewater utility pays for a portion of the administrative expenses, such as customer care, water resource planning, general manager budget, etc. budgeted in water utility. The payment from the wastewater utility is included in "Other Miscellaneous Revenue", line 11 of **Table 3-6**, which is used to offset the total budgeted expenditures of the water utility.

Table 3-7
Water Operations & Maintenance Expenses

Line #		FY 2012 Budgeted	FY 2013 Projected	FY 2014 Projected	FY 2015 Projected	FY 2016 Projected
1	Ventura Water Utility Administration	$500,506	$536,601	$538,040	$543,491	$550,476
2	Water Administration	$2,592,557	$2,650,020	$2,514,043	$2,608,728	$2,709,392
3	Water Distribution	$2,895,180	$3,146,785	$3,159,263	$3,207,799	$3,263,569
4	Water Production	$3,813,760	$4,113,387	$4,224,536	$4,366,333	$4,516,648
5	Water Purification	$4,938,499	$5,048,063	$5,168,933	$5,365,191	$5,573,676
6	Customer Care - Billing	$1,096,712	$1,550,488	$1,310,199	$1,332,699	$1,357,916
7	Water Efficiency	$1,063,698	$815,583	$816,496	$825,161	$836,064
8	Resource Planning	$962,610	$1,460,286	$1,429,630	$1,455,752	$1,484,880
9	Revenue Management	$206,241	$212,016	$218,376	$224,928	$231,675
10	State Water Project Payment	$1,374,829	$1,413,324	$1,455,724	$1,499,396	$1,544,378
11	**TOTAL WATER O&M EXPENSES**	**$19,444,592**	**$20,946,552**	**$20,835,241**	**$21,429,478**	**$22,068,673**

Line #		FY 2017 Projected	FY 2018 Projected	FY 2019 Projected	FY 2020 Projected	FY 2021 Projected
1	Ventura Water Utility Administration	$557,628	$564,954	$572,457	$580,142	$588,016
2	Water Administration	$2,812,660	$2,921,247	$3,028,936	$3,141,664	$3,259,709
3	Water Distribution	$3,320,831	$3,379,632	$3,440,015	$3,502,028	$3,565,718
4	Water Production	$4,673,218	$4,836,320	$5,006,247	$5,183,303	$5,367,806
5	Water Purification	$5,791,718	$6,019,774	$6,258,318	$6,507,853	$6,773,187
6	Customer Care - Billing	$1,383,824	$1,410,446	$1,437,801	$1,465,912	$1,494,801
7	Water Efficiency	$847,232	$858,674	$870,397	$882,409	$894,720
8	Resource Planning	$1,514,817	$1,545,585	$1,577,210	$1,609,716	$1,643,131
9	Revenue Management	$238,626	$245,784	$253,158	$260,753	$268,575
10	State Water Project Payment	$1,590,709	$1,638,430	$1,687,583	$1,738,211	$1,790,357
11	**TOTAL WATER O&M EXPENSES**	**$22,731,265**	**$23,420,846**	**$24,132,122**	**$24,871,990**	**$25,646,020**

Water supply costs vary from $3.7 million to $5.5 million in 2012 through 2021. Total water supply costs are forecasted to increase at an average of approximately 5 percent over the study period.

Water Capital Improvement Program

The City has developed a comprehensive water Capital Improvement Program (CIP) to address current water system needs. As **Table 3-9** indicates, the total estimated water CIP from FY 2012 to FY 2022 is $120million. These projected costs include a 3.5 percent annual inflation factor due to anticipated increases in construction costs over time. This inflation rate is a conservative estimate and ensures that the City has adequate resources reserved to complete the necessary projects. Additionally, the CIP costs used in this study represents only 75 percent of the actual projected CIP. This percentage is based on the City's previous experiences regarding project completion, recognizing project delays and changing priorities in the program schedule. This minimizes customer rate impacts as capital project expenditures are the primary driver for future increases.

Table 3-9
Water Capital Improvement Program at 75% of Budget - inflated

Line #	Proj No.	Description	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016
1	97917	Well - Saticoy #3	$1,332,000	$960,000	$0	$0	$0
2	97927	Pipeline - North Catalina	$1,020,000	$1,102,500	$0	$0	$0
3	97916	Storage Tank - Circulation Improvements	$82,500	$535,342	$0	$0	$0
4	97928	Well - Saticoy Country Club #3	$600,750	$0	$0	$0	$0
5	97930	Pump Station - Gosnell Rehab	$105,000	$997,500	$0	$0	$0
6	97914	Pipeline - Harbor Blvd Replace & Improve	$135,000	$1,905,000	$0	$0	$0
7	97929	Reservoir - Kingston Cover/Roof	$288,750	$112,500	$1,875,000	$0	$0
8	97915	Pipeline - Montalvo Area Replace & Improve	$75,000	$112,500	$2,647,500	$0	$0
9	97924	Well - Golf Course #7	$345,000	$0	$2,362,500	$1,650,000	$0
10	97925	Facility - System Pressure Monitoring Stations	$513,750	$30,000	$0	$0	$0
11	97931	Storage Tank - Hall Canyon & Mariano Retrofit	$82,500	$626,250	$585,000	$0	$0
12	97920	Pipeline - Fairview Drive	$2,045,250	$0	$0	$0	$0
13	97926	Pipeline - Market Street Area	$1,057,500	$0	$0	$0	$0
14	73038	Pump Station - Fixed Emergency Power	$0	$86,250	$738,750	$0	$0
15	97521	Treatment - Saticoy Conditioning Capacity & Facility Renovation	$0	$0	$0	$0	$0
16	97907	Well - Mound #2	$375,000	$375,000	$0	$0	$1,500,000
17	73037	Facility - Hall Canyon Pressure Reducing	$0	$0	$225,000	$0	$0
18	73021	Pipeline - Navigator Drive	$0	$0	$0	$750,000	$0
19	73042	Facility - 360 Zone Pressure Reducing	$0	$0	$0	$300,000	$0
20	97887	Pump Station - Booster Motor Control Upgrades	$0	$0	$0	$0	$1,500,000
21	73013	Treatment - Bailey Control & Equipment Upgrade	$0	$0	$0	$0	$0
22	97895	Pipeline - Telephone Road Extension (210/330) Improvements	$0	$0	$0	$0	$0
23	73004	Pipeline - Grant Park Improvements	$0	$0	$0	$0	$0
24	73009	Treatment - Avenue Plant Phase II	$0	$0	$0	$0	$0
25	73033	Facility - Ventura/Oxnard Emergency Interconnect	$0	$0	$0	$0	$0
26	73032	Recycle - Reuse OVSD Effluent	$0	$0	$0	$0	$0
27	73039	Pipeline - Small Diameter Replacement/Improvement	$0	$0	$0	$0	$0
28	73040	Pipeline - Deficient Replacement/Improvement	$0	$0	$0	$0	$0
29	73041	Pipeline - Looping Program/Improvement	$0	$0	$0	$0	$0
30	73044	Treatment -Avenue Membrane Module Replacement	$0	$0	$0	$0	$0
31	97904	Well - Foster Park Well field	$0	$0	$0	$0	$0
32	97879	Storage Tank - Arroyo Verde (605 Zone)	$0	$0	$0	$0	$0
33	97864	Pipeline - Loma Vista 210/430 Improvement	$0	$0	$0	$0	$750,000
34	97896	Well - Golf Course Pump Station & Well Upgrade	$0	$0	$0	$0	$0
35	97897	Pipeline - Dead-End Main Connections/Improvement	$0	$0	$0	$0	$0
36	**Potential Projects**						
37	97893	Pipeline - Northbank (West) New	$0	$0	$0	$0	$0
38	97894	Pipeline - Northbank (East) New	$0	$0	$0	$0	$0
39	**Additional CIP not in Adopted CIP**						
40		Facility - 330 to 210 Pressure Zone Flow Control/Pressure	$0	$0	$0	$40,050	$165,975
41		Pipeline - Annual Replacement Program	$0	$0	$0	$1,781,550	$2,765,850
42		Facility - Energy Efficiency Projects	$0	$75,000	$75,000	$75,000	$75,000
43		Well - Saticoy Well #4 & Golf Course Parcel	$0	$0	$0	$0	$0
44		Pipeline - Olivas Park Drive Waterline	$0	$0	$860,625	$0	$0
45		Well - 87 Acre Parcel Well & Treatment Facility	$375,000	$759,225	$785,775	$649,800	$0
46		Conditioning - Water Quality Reverse Osmosis	$0	$0	$375,000	$375,000	$375,000
47		Conditioning - Reverse Osmosis Outfall	$0	$0	$0	$0	$0
48		Meters - Automated Reading Installation Citywide	$0	$0	$1,451,250	$1,530,000	$1,586,250
49							
50	**TOTAL CIP**		**$8,433,000**	**$7,677,067**	**$11,981,400**	**$7,151,400**	**$8,718,075**

Line #	Proj No.	Description	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022
1	97917	Well - Saticoy #3	$0	$0	$0	$0	$0	$0
2	97927	Pipeline - North Catalina	$0	$0	$0	$0	$0	$0
3	97916	Storage Tank - Circulation Improvements	$0	$0	$0	$0	$0	$0
4	97928	Well - Saticoy Country Club #3	$0	$0	$0	$0	$0	$0
5	97930	Pump Station - Gosnell Rehab	$0	$0	$0	$0	$0	$0
6	97914	Pipeline - Harbor Blvd Replace & Improve	$0	$0	$0	$0	$0	$0
7	97929	Reservoir - Kingston Cover/Roof	$0	$0	$0	$0	$0	$0
8	97915	Pipeline - Montalvo Area Replace & Improve	$0	$0	$0	$0	$0	$0
9	97924	Well - Golf Course #7	$0	$0	$0	$0	$0	$0
10	97925	Facility - System Pressure Monitoring Stations	$0	$0	$0	$0	$0	$0
11	97931	Storage Tank - Hall Canyon & Mariano Retrofit	$0	$0	$0	$0	$0	$0
12	97920	Pipeline - Fairview Drive	$0	$0	$0	$0	$0	$0
13	97926	Pipeline - Market Street Area	$0	$0	$0	$0	$0	$0
14	73038	Pump Station - Fixed Emergency Power	$0	$0	$0	$0	$0	$0
15	97521	Treatment - Saticoy Conditioning Capacity & Facility Renovation	$0	$0	$0	$7,508,644	$0	$0
16	97907	Well - Mound #2	$2,659,451	$0	$0	$0	$0	$0
17	73037	Facility - Hall Canyon Pressure Reducing	$0	$0	$0	$0	$0	$0
18	73021	Pipeline - Navigator Drive	$0	$0	$0	$0	$0	$0
19	73042	Facility - 360 Zone Pressure Reducing	$0	$0	$0	$0	$0	$0
20	97887	Pump Station - Booster Motor Control Upgrades	$0	$0	$0	$0	$0	$0
21	73013	Treatment - Bailey Control & Equipment Upgrade	$1,425,000	$0	$0	$0	$0	$0
22	97895	Pipeline - Telephone Road Extension (210/330) Improvements	$0	$0	$0	$0	$0	$0
23	73004	Pipeline - Grant Park Improvements	$0	$1,125,000	$0	$0	$0	$0
24	73009	Treatment - Avenue Plant Phase II	$0	$0	$0	$0	$0	$0
25	73033	Facility - Ventura/Oxnard Emergency Interconnect	$0	$0	$0	$0	$0	$0
26	73032	Recycle - Reuse OVSD Effluent	$0	$0	$0	$2,250,000	$0	$0
27	73039	Pipeline - Small Diameter Replacement/Improvement	$0	$0	$0	$0	$0	$0
28	73040	Pipeline - Deficient Replacement/Improvement	$0	$0	$0	$0	$0	$0
29	73041	Pipeline - Looping Program/Improvement	$0	$1,500,000	$1,875,000	$0	$0	$0
30	73044	Treatment -Avenue Membrane Module Replacement	$0	$1,350,000	$0	$0	$0	$0
31	97904	Well - Foster Park Well field	$0	$0	$0	$5,993,069	$0	$0
32	97879	Storage Tank - Arroyo Verde (605 Zone)	$0	$0	$3,000,000	$0	$0	$0
33	97864	Pipeline - Loma Vista 210/430 Improvement	$1,500,000	$0	$0	$0	$0	$0
34	97896	Well - Golf Course Pump Station & Well Upgrade	$0	$0	$0	$0	$1,500,000	$0
35	97897	Pipeline - Dead-End Main Connections/Improvement	$0	$0	$0	$0	$0	$374,894
36	**Potential Projects**							
37	97893	Pipeline - Northbank (West) New	$0	$0	$0	$0	$0	$0
38	97894	Pipeline - Northbank (East) New	$0	$0	$0	$0	$0	$0
39	**Additional CIP not in Adopted CIP**							
40		Facility - 330 to 210 Pressure Zone Flow Control/Pressure	$0	$0	$0	$0	$0	$0
41		Pipeline - Annual Replacement Program	$2,862,600	$2,962,800	$3,066,525	$3,173,850	$3,284,925	$3,399,900
42		Facility - Energy Efficiency Projects	$75,000	$75,000	$75,000	$75,000	$75,000	$75,000
43		Well - Saticoy Well #4 & Golf Course Parcel	$477,075	$2,962,800	$0	$0	$0	$0
44		Pipeline - Olivas Park Drive Waterline	$0	$0	$0	$0	$0	$0
45		Well - 87 Acre Parcel Well & Treatment Facility	$0	$0	$0	$0	$0	$0
46		Conditioning - Water Quality Reverse Osmosis	$0	$0	$0	$2,469,000	$3,833,175	$6,612,150
47		Conditioning - Reverse Osmosis Outfall	$0	$0	$0	$0	$2,964,300	$4,602,075
48		Meters - Automated Reading Installation Citywide	$1,350,000	$0	$0	$0	$0	$0
49								
50	**TOTAL CIP**		**$10,349,126**	**$9,975,600**	**$8,016,525**	**$21,469,562**	**$11,657,400**	**$15,064,019**

Major Capital Improvement Financing Plan

Typical CIP funding sources include the following:

System Revenues	***Capital Financing***
Connection Fees	Bond proceeds
Pay-as-you-go revenues	Grant receipts and Contributions
Interest earnings	

Table 3-10 presents the proposed capital financing plan to finance major CIP projects over the ten-year period from FY 2012 to FY 2021. It is projected that the City will issue debt of $25 million in FY 2014, $20 million in FY 2016, $25 million in FY 2018, and $10 million in FY 2021 to adequately fund the capital improvement program since revenues from rates are insufficient to cover the costs. Other revenue shown below includes estimated connection fees revenues and grants.

Table 3-10
Capital Financing Plan

Line #		FY 2012	FY 2013	FY 2014	FY 2015	FY 2016
1	Debt Financing	$0	$0	$11,890,890	$7,060,437	$8,626,657
2	Rate Revenue	$8,343,000	$7,587,037	$0	$0	$0
3	Other Revenue	$90,000	$90,030	$90,510	$90,963	$91,418
4	**TOTAL CIP**	**$8,433,000**	**$7,677,067**	**$11,981,400**	**$7,151,400**	**$8,718,075**

Line #		FY 2017	FY 2018	FY 2019	FY 2020	FY 2021
1	Debt Financing	$10,257,251	$9,883,266	$7,923,729	$7,296,901	$8,991,304
2	Rate Revenue	$0	$0	$0	$14,079,402	$2,572,370
3	Other Revenue	$91,875	$92,334	$92,796	$93,260	$93,726
4	**TOTAL CIP**	**$10,349,126**	**$9,975,600**	**$8,016,525**	**$21,469,562**	**$11,657,400**

Debt Service Requirements

Debt service requirements consist of principal and interest payments on existing debt. The City currently has debt service obligations associated with its outstanding 2004 Water Certificates of Participation (COP) and its 2009 State Revolving Fund (SRF) loan. Existing and proposed debt service consists of annual payments in the range of $3 to $8.2 million. **Table 3-11** shows the existing and proposed debt service of the water utility.

Table 3-11
Existing and Proposed Debt Service

Line #		FY 2012	FY 2013	FY 2014	FY 2015	FY 2016
1	2009 SRF Loan from DWR	$1,263,820	$1,263,820	$1,263,820	$1,263,820	$1,263,820
2	2004 Water Revenue COP	$1,688,375	$1,685,887	$1,685,975	$1,684,275	$1,681,575
3	**Total Existing Debt Service**	**$2,952,195**	**$2,949,707**	**$2,949,795**	**$2,948,095**	**$2,945,395**
4						
5	**Total Proposed Debt Service**	**$0**	**$0**	**$885,869**	**$1,771,739**	**$2,480,434**

Line #		FY 2017	FY 2018	FY 2019	FY 2020	FY 2021
1	2009 SRF Loan from DWR	$1,263,820	$1,263,820	$1,263,820	$1,263,820	$1,263,820
2	2004 Water Revenue COP	$1,680,937	$1,684,000	$1,682,100	$1,676,925	$1,668,900
3	**Total Existing Debt Service**	**$2,944,757**	**$2,947,820**	**$2,945,920**	**$2,940,745**	**$2,932,720**
4						
5	**Total Proposed Debt Service**	**$3,189,130**	**$4,074,999**	**$4,960,869**	**$4,960,869**	**$5,315,216**

Reserves

The City requires adequate cash reserves to meet operating, capital, and debt service requirements. Operating reserves may be used to meet ongoing cash flow requirements as well as emergency requirements. Typically, a balance in the range of 10 to 50 percent of annual operating expenses is considered appropriate. This represents one to six months of working capital. RFC proposes that the City maintain a minimum 90-day operating reserve. The operating reserve balances and the minimum operating reserves targets are shown in **Table 3-11**. Interest from reserve funds may be used to finance operations. The capital reserve is similar in function to the operating reserve, but it is a reserve used for replacement and refurbishment (R&R) related capital expenses. Standard practices recommend a 100 percent of annual capital replacement expenses. However, to reduce customer impacts, the capital reserve is set at 50 percent of the annual replacement CIP in FY 2012, gradually increasing to 100 percent by FY 2017, to cover unexpected increases in capital expenditures. The estimated FY 2012 total ending reserves balance is approximately $12.8 million, not including debt reserves. However, most of the funds are already earmarked for existing capital projects. The reserve levels are projected to be below the proposed target level in the early years of the study period but will meet the proposed target level in future years.

Table 3-11
Water Reserves/Fund Balance

Line #		FY 2012	FY 2013	FY 2014	FY 2015	FY 2016
1	**Ending Balance**					
2	Operating Fund	$791,063	$1,805,385	$2,496,372	$3,702,692	$5,747,841
3	Capital Improvement Fund	$12,012,979	$3,425,943	$3,425,943	$3,425,943	$3,425,943
4	Bond Fund	$0	$0	$10,587,371	$3,526,934	$12,882,886
5	Debt Reserve Fund	$0	$0	$1,771,739	$1,771,739	$3,189,130
6						
7	**Target Balance**					
8	Operating Fund	$4,517,441	$4,883,307	$4,844,879	$4,982,520	$5,131,074
9	Capital Improvement Fund	$1,801,057	$2,161,268	$2,521,480	$2,881,691	$3,241,902

Line #		FY 2017	FY 2018	FY 2019	FY 2020	FY 2021
1	**Ending Balance**					
2	Operating Fund	$7,670,194	$11,444,839	$13,873,625	$8,057,933	$10,669,913
3	Capital Improvement Fund	$4,425,943	$4,425,943	$6,425,943	$4,346,540	$6,774,171
4	Bond Fund	$2,625,635	$15,220,630	$7,296,901	$0	$0
5	Debt Reserve Fund	$3,189,130	$4,960,869	$4,960,869	$4,960,869	$5,669,564
6						
7	**Target Balance**					
8	Operating Fund	$5,285,139	$5,445,604	$5,611,135	$5,783,445	$5,963,916
9	Capital Improvement Fund	$3,602,114	$3,602,114	$3,602,114	$3,602,114	$3,602,114

Based on the terms of the debt issued, debt reserves provide protection to bond buyers for one year of debt service payments in times of financial difficulty. These are restricted reserves used only for meeting debt service payments. One year of debt service payments is required to be set aside in the reserve; each time the City issues a new bond, additional proceeds are required to be added to the debt reserves.

Proposed Revenue Adjustments

In order to meet projected revenue requirements, to achieve desired operating and capital reserve fund balances, and to minimize customer impacts, the following revenue adjustments are proposed to meet long term rate stability:

Effective Date	Increases
July 1, 2012	$1.7 million
July 1, 2013	$1.8 million

The operating financial plan presented in **Table 3-12** shows the revenues projected from rates based on the proposed revenue adjustment schedule shown above.

Table 3-12
Water Operating Financial Plan

Line #		FY 2012	FY 2013	FY 2014	FY 2015	FY 2016
1	Revenue Under Existing Rates	$19,850,082	$19,507,801	$19,281,022	$19,212,270	$19,144,386
2	Total Additional Revenue	$0	$1,658,163	$3,417,079	$5,327,354	$7,387,028
3	Total Revenue from Rates	$19,850,082	$21,165,964	$22,698,101	$24,539,624	$26,531,414
4						
5	Other Operating Revenue	$1,892,874	$2,377,896	$2,377,896	$2,435,432	$2,494,695
6	Outside City Revenue Offset		$202,196	$202,554	$206,373	$210,262
7	Interest Income	$350,000	$164,525	$83,343	$174,201	$303,282
8	**Total Revenue**	**$22,092,956**	**$23,910,580**	**$25,361,893**	**$27,355,631**	**$29,539,652**
9						
10	O&M Expenses	$18,069,763	$19,533,227	$19,379,517	$19,930,082	$20,524,296
11	State Water Project Payment	$1,374,829	$1,413,324	$1,455,724	$1,499,396	$1,544,378
12	Existing Debt Service	$2,952,195	$2,949,707	$2,949,795	$2,948,095	$2,945,395
13	Proposed Debt Service	$0	$0	$885,869	$1,771,739	$2,480,434
14	**Total Expenses**	**$22,396,787**	**$23,896,259**	**$24,670,905**	**$26,149,311**	**$27,494,503**
15						
16	**Net Cash Flow**	**($303,831)**	**$14,321**	**$690,988**	**$1,206,319**	**$2,045,150**
17						
18	Debt Coverage Ratio	136%	148%	156%	157%	166%
19	Required Coverage	125%	125%	125%	125%	125%

Line #		FY 2017	FY 2018	FY 2019	FY 2020	FY 2021
1	Revenue Under Existing Rates	$19,076,988	$19,010,165	$18,943,821	$18,878,046	$18,959,341
2	Total Additional Revenue	$9,476,063	$11,719,112	$13,821,756	$16,059,392	$18,584,702
3	Total Revenue from Rates	$28,553,051	$30,729,277	$32,765,578	$34,937,438	$37,544,043
4						
5	Other Operating Revenue	$2,555,736	$2,618,608	$2,683,367	$2,750,068	$2,818,770
6	Outside City Revenue Offset	$214,222	$218,255	$222,361	$226,543	$233,339
7	Interest Income	$464,495	$652,170	$796,391	$1,043,863	$909,784
8	**Total Revenue**	**$31,787,504**	**$34,218,310**	**$36,467,697**	**$38,957,912**	**$41,505,936**
9						
10	O&M Expenses	$21,140,555	$21,782,415	$22,444,539	$23,133,780	$23,855,663
11	State Water Project Payment	$1,590,709	$1,638,430	$1,687,583	$1,738,211	$1,790,357
12	Existing Debt Service	$2,944,757	$2,947,820	$2,945,920	$2,940,745	$2,932,720
13	Proposed Debt Service	$3,189,130	$4,074,999	$4,960,869	$4,960,869	$5,315,216
14	**Total Expenses**	**$28,865,151**	**$30,443,665**	**$32,038,911**	**$32,773,604**	**$33,893,956**
15						
16	**Net Cash Flow**	**$2,922,352**	**$3,774,645**	**$4,428,786**	**$6,184,308**	**$7,611,980**
17						
18	Debt Coverage Ratio	174%	177%	177%	200%	214%
19	Required Coverage	125%	125%	125%	125%	125%

Debt Service Coverage

The City must meet debt service coverage requirements on its outstanding bond issues. Coverage requirements typically vary between 100 percent and 160 percent or higher. The City's required debt coverage is 125 percent, which means that the City's adjusted net system revenues shall amount to at least 125 percent of the annual debt service. The system revenues include funds derived from the ownership and operation of the system including water service charges from the City's users, miscellaneous service charges, revenues received from contracts, and interest income. Annual debt service includes annual principal and interest payments on outstanding debt. With the proposed revenue adjustments the City exceeds the coverage requirement during all ten years of the study.

COST OF SERVICE ANALYSIS

The City's user classifications and the revenue requirements reviewed and finalized through the operating and capital cash flow analysis provide the basis for performing the cost of service analysis. This section of the report discusses the allocation of operating and capital costs to the parameters and the determination of unit rates.

The total revenue requirements net of revenue credits from miscellaneous sources, is by definition, the cost of providing service as shown in **Table 3-13**. This cost is then used as the basis to develop unit rates for the water parameters and to allocate costs to the various user classes in proportion to the water services rendered. The concept of proportionate allocation to user classes implies that allocations should take into consideration not only the average quantity of water used but also the peak rate of

consumption. There are costs associated with design and construction of facilities used to meet peak demands, and these need to be allocated so that peaking costs can be calculated and appropriately passed on. In this study, water rates were calculated for FY 2013, and accordingly FY 2013 is defined as the Test Year. Test Year revenue requirements are used in the cost allocation process.

Cost of Service to be Allocated

The annual revenue requirements or costs of service to be recovered from commodity charges include operation and maintenance (O&M) expenses, costs associated with annual renewal and replacements, and other capital related costs. O&M expenses include costs directly related to the supply, treatment, and distribution of water as well as routine maintenance of system facilities. This maintenance is often referred to as routine capital and represents the annual recurring capital outlay for minor system improvements and purchases of materials and supplies.

The total FY 2013 cost of service to be recovered from the City's users, shown in **Table 3-13**, is estimated at approximately $21.2 million, of which approximately $16.8 million is operating costs and the remaining $4.4 million is capital costs, which consists of State Water Project (SWP) payment and existing debt service. The cost of service analysis is based upon the premise of generating annual revenues adequate to meet the estimated annual revenue requirements. As part of the cost of service analysis, revenues from other sources except water rates and charges, such as revenues from miscellaneous services, are deducted from the appropriate cost elements. Additional deductions are made to reflect interest income and other non-operating income during FY 2013. Adjustments are also made to account for cash balances to ensure adequate collection of revenue and to determine annual revenues needed from rates.

To allocate the cost of service among the different user classes, costs first need to be allocated to the appropriate water parameters. The following section describes the allocation of the operating and capital costs of service to the appropriate parameters of the water system.

Table 3-13
Allocation of Revenue Requirements

	FY 2013		
	Operating	**Capital**	**Total**
Revenue Requirements			
O&M Expenses	$19,533,227		**$19,533,227**
State Water Project Payment		$1,413,324	**$1,413,324**
Existing Debt Service		$2,949,707	**$2,949,707**
Proposed Debt Service		$0	**$0**
Subtotal Revenue Requirements	**$19,533,227**	**$4,363,031**	**$23,896,259**
Less: Other Revenues			
Other Operating Revenue	$2,377,896		**$2,377,896**
Outside City Revenue Offset	$202,196		**$202,196**
Interest Income	$164,525		**$164,525**
Subtotal Other Revenues	**$2,744,616**	**$0**	**$2,744,616**
Less: Adjustments			
Adjustments to Annual Cash Balance	($14,321)		**($14,321)**
Adjustments to Annualize Rate Increase	$0		**$0**
Subtotal Adjustments	**($14,321)**	**$0**	**($14,321)**
Revenue to be Recovered from Rates	**$16,802,932**	**$4,363,031**	**$21,165,964**

Functional Cost Components

The total cost of water service is analyzed by system function in order to equitably distribute costs of service to the various classes of customers. For this analysis, water utility costs of service are assigned to three basic functional cost components including base costs, extra capacity costs and customer service related costs.

Base costs are those operating and capital costs of the water system associated with serving customers at a constant average rate of use. Extra capacity costs represent those costs incurred to meet customer peak demands for water in excess of average day usage. Total extra capacity costs are subdivided into costs associated with maximum day (Max Day) and maximum hour (Max Hour) demands and are explained below.

Customer service costs include customer related and meter related costs. Customer costs are uniform for all customers and include such costs as meter reading, billing, collecting, and accounting. Meter service costs include maintenance and capital costs associated with meters and capacity related costs. These costs are assigned based on meter size or equivalent meter capacity.

The allocation of costs of service into these principal components provides the means for determining the costs to the various customer classes on the basis of their respective base, extra capacity and customer requirements for service.

Allocation to Functional Cost Components

The water utility is comprised of various facilities each designed and operated to fulfill a given function. In order to provide adequate service to its customers at all times, the utility must be capable of not only providing the total amount of water used, but also supplying water at peak or maximum rates of demand. Facilities are designed to meet specific design parameters. For example, a treatment plant is designed to meet the maximum demands that the utility would experience in a day (Max Day). Therefore costs related to the treatment plant would be allocated on the basis of Max Day. The distribution of costs to the functional components of Base, Max Day and Max Hour is described below. The separation of costs into these functional components provides a means for distributing such costs to the various classes of customers on the basis of respective responsibilities for each particular type of service.

Determination of Allocation Percentages

Allocation percentages are usually derived from actual historical data as is the case in this Study. RFC performed the following steps to derive the allocation percentages for apportioning the City's O&M and capital costs. Customer service related costs are allocated directly to their cost component so no allocation percentages are necessary. Costs related to meter maintenance are allocated to meter service. The methodology for calculating volume related cost allocation is explained below. **Table 3-14** will help in understanding the allocation calculations.

To ensure that costs related to peaking are captured appropriately, the first step is to define system peaking factors. Peaking factors are defined by comparing against the average daily demand (ADD) or Base (in the Base-Extra Capacity Method). Since the peaking factors are compared to the Base, it is assigned a value of 1.0. The City's maximum day (Max Day) demand is estimated to be 1.52 times the ADD. This means that facilities that are designed for Max Day have to provide 152 percent of the ADD. The Max Day factor is therefore 52 out of the 152, the remaining 100 being assigned to Base. The maximum instantaneous usage is approximated by the Max Hour usage and is estimated to be 3.97 times the ADD. Max Hour is therefore assigned a value of 2.45 calculated as follows:

3.97 – 1.00 for Base - 0.52 for Max Day = 2.45

Allocations are calculated based on these factors. Cost components that are solely Base related, such as source of supply, are allocated 100 percent to Base. Facilities that are designed to meet Max Day peaks, such as treatment plants, are allocated to Base and Max Day factors. Therefore facilities designed for Max Day are allocated as follows:

Base:	65.8%	=	(1.00/1.52)x100
Max Day:	34.2%	=	(1.52-1.00)/1.52x100

Facilities such as distribution systems that are designed for Max Hour are allocated similarly.

Base:	25.2%	=	(1.00/3.97)x100
Max Day:	13.1%	=	(0.52/3.97)x100
Max Hour:	61.7 %	=	(2.45/3.97)x100

Since facilities such as reservoirs and distribution systems are also designed to handle fire flow, a small allocation is also provided for fire flow.

The percentages calculated above are used to spread the operating and capital improvement costs amongst Base, Max Day, and Max Hour parameters for cost of service calculations.

Allocation of Operating Expense

Projected net operating expenses for FY 2013 are allocated to cost components on the basis of the design criteria of the facilities. Water supply costs are allocated to base; storage or reservoir costs are allocated to max day; distribution system costs are allocated to max hour; billing costs are allocated to customer service, etc.

Administration and general expenses are related to total system operations and are allocated the same as the remaining operating expenses. The resulting allocation of operation and maintenance expense serves as the basis for allocating the FY 2013 net operating costs shown in **Table 3-13** to the base, extra capacity and customer costs functions.

Allocation of Plant Investment and Capital Costs

Capital costs include capital improvements financed from annual revenues, debt service and other sources. A reasonable method of assigning capital costs to functional components is to allocate such costs on the basis of net plant investment.

Net plant investment is represented by the total cost of water utility facilities less accumulated depreciation. The estimated fiscal year net plant investment in water facilities consists of net plant in service as of June 30, 2011.

Costs are allocated based on the design criteria of each facility. The investment in general plant is allocated to each cost component on the basis of all other plant investment. The resulting allocation of net plant investment serves as the basis for allocating the capital costs shown in **Table 3-13**.

Unit Cost of Service

In order to allocate costs of service to the different user classes, the unit costs of service need to be developed for each cost component. The unit costs of service are developed by dividing the total annual costs allocated to each parameter by the total annual units for the respective component.

Different units are used for the different cost components. The volume related cost components are based on volumetric units of one hundred cubic feet or HCF (about 748 gallons). Customer related cost components are based on number of accounts or bills. Meter related costs are based on equivalent meters. **Table 3-14** shows the total number of units allocated to each component.

Table 3-14
Determination of Total Annual Units

Customer Class	Annual Use (hcf)	Average Daily Use (hcf/day)	Maximum Day Requirements: Capacity Factor	Maximum Day Requirements: Total Capacity (hcf/day)	Maximum Day Requirements: Extra Capacity (hcf/day)	Maximum Hour Requirements: Capacity Factor	Maximum Hour Requirements: Total Capacity (hcf/hour)	Maximum Hour Requirements: Extra Capacity (hcf/hour)	Monthly Bills	Equiv. Meters
Inside City										
SFR	2,817,471	7,719	1.52	11,733	4,014	3.97	30,644	18,911	131,760	22,829
MFR	1,512,169	4,143	1.52	6,297	2,154	3.97	16,448	10,151	14,946	6,553
Non-residential	1,450,861	3,975	1.52	6,042	2,067	3.97	15,781	9,739	15,546	8,720
City Parks	136,607	374	1.52	568	194	3.97	1,485	917	1,290	771
Outside City										
SFR	126,393	346	1.52	526	180	3.97	1,374	848	6,096	1,055
MFR	37,831	104	1.52	158	54	3.97	413	255	570	144
Non-residential	123,808	339	1.52	515	176	3.97	1,346	831	966	527
Groundwater	11,083	30	1.52	46	16	3.97	119	73	0	0
TOTAL WATER USAGE	**6,216,223**	**17,030**		**25,885**	**8,855**		**67,610**	**41,725**	**171,174**	**40,599**

Once the total number of units is known they can be used to calculate unit costs. **Table 3-15** shows the costs allocated to the different cost components spread against the appropriate units of service and the development of the FY 2013 unit costs for each of the cost components. To ensure that the costs are appropriately shared between fixed and variable components, a portion of the extra capacity related costs are allocated to meters to recognize the demand that meters place on the system. The allocated costs are simply divided by the total number of units for each component to determine the unit costs of each component as shown in **Table 3-15**. The uniform average commodity rate is $2.40 per hcf and includes the peaking costs. The High Use column represents a portion of the costs of the Water Efficiency program which promotes conservation and efficient water use. Since it is a conservation program, the associated costs are spread to only 15 percent of the total water usage representing the high usage residential customers. This cost is allocated to all customer classes based on 15 percent of each class total water usage.

Table 3-15
Development of Unit Costs

	Base	Max Day	Max Hour	Meter	Billing	High Use	General	Total
Operating Expenses	$7,278,192	$2,672,445	$1,645,608	$0	$694,444	$365,289	$3,044,414	$16,802,932
Capital Expenses	$1,801,398	$750,822	$1,278,813	$9,991	$221	$0	$72,377	$4,363,031
Total Cost	**$9,079,590**	**$3,423,267**	**$2,924,421**	**$9,991**	**$694,665**	**$365,289**	**$3,116,791**	**$21,165,964**
Allocation of General Costs	$1,715,391	$646,752	$552,506	$1,888	$131,242	$69,013	($3,116,791)	
Allocation of Public Fire Costs				$1,051,858				
Allocation Peak to Meter		($1,831,508)	($1,564,617)	$3,396,125				
Total Cost of Service	**$10,794,981**	**$2,238,510**	**$1,912,310**	**$4,459,862**	**$825,907**	**$434,303**	**$0**	**$21,165,964**
Total Units of Service	6,216,223	8,855	41,725	243,594	171,174	6,216,223		
Unit of Measure	hcf	hcf/day	hcf/day	Equiv meters	bi-monthly bill	hcf		
Total Unit Cost of Service	$1.74	$252.80	$45.83	$18.31	$4.82	$0.07		
Unit Rate	$1.74	$0.36	$0.31					

The meter and billing costs shown in **Table 3-15** are used to calculate the meter charges and the Base, Max Day, Max Hour and High Use costs for each class are used to develop the unit commodity rates for each class of customers.

User Class Costs

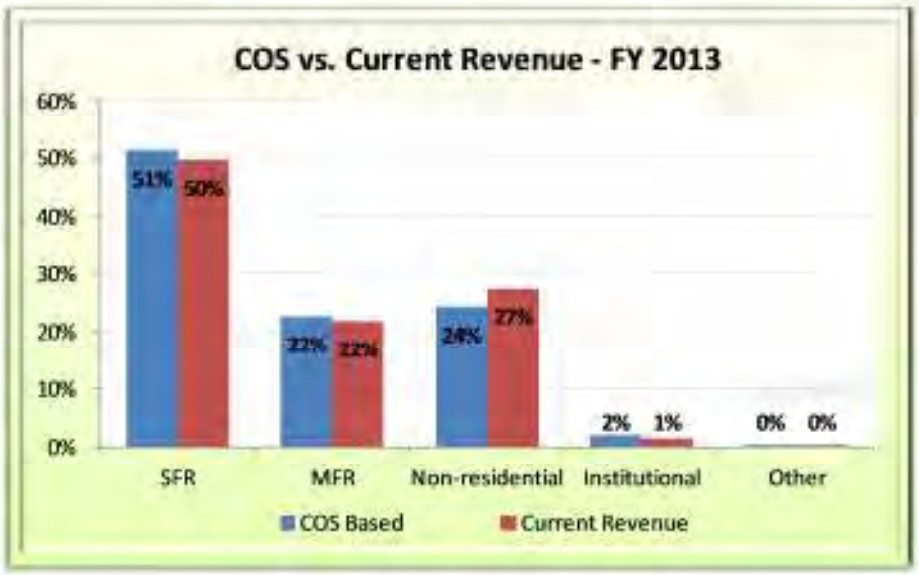
The unit costs shown in **Table 3-15** are then applied to the projected FY 2013 units for each user class to derive user class costs. **Table 3-16** shows the FY 2013 cost responsibility for each user class.

Table 3-16
Allocation of Costs to Customer Classes

Customer Class	Base	Max Day	Max Hour	Meter	Billing	High Use	Total
Inside City							
SFR	$4,892,769	$1,014,724	$866,715	$2,507,837	$635,736	$196,845	**$10,114,626**
MFR	$2,626,005	$544,523	$465,233	$719,894	$72,114	$105,649	**$4,533,418**
Non-residential	$2,519,540	$522,530	$446,351	$957,869	$75,009	$101,366	**$4,622,663**
City Parks	$237,229	$49,042	$42,027	$84,659	$6,224	$9,544	**$428,726**
Outside City							
SFR	$219,492	$45,503	$38,865	$115,857	$29,413	$8,831	**$457,961**
MFR	$65,696	$13,651	$11,687	$15,855	$2,750	$2,643	**$112,282**
Non-residential	$215,004	$44,492	$38,086	$57,892	$4,661	$8,650	**$368,784**
Groundwater	$19,246	$4,045	$3,346	$0	$0	$774	**$27,410**
TOTAL COST OF SERVICE	**$10,794,981**	**$2,238,510**	**$1,912,310**	**$4,459,862**	**$825,907**	**$434,303**	**$20,665,871**

The SFR user class (inside and outside the City) has the highest assignment of costs at $10.6 million and is responsible for 51 percent of the total cost of service. The non-residential user classes are responsible for the next 26 percent of the annual cost of service. MFR customers are responsible for the remaining 22 percent of the total cost of service. **Figure 3-3** compares the existing revenue and the revenues based on the cost of service to be recovered by customer class. Under the cost of service approach non-residential customers will receive a small benefit as compared to the current rate structure.

Figure 3-3
Comparison of Revenue under COS and Existing Rate Structure



RATE DESIGN

The revenue requirements and cost of service analysis described in the preceding sections of this report provide a basis for the design of cost of service based water rates. Rate design is the process of developing rate schedules for each user class such that the annual cost of service determined for each user class is equitably recovered from the users in that class. In this study, the focus of rate design is on the development of rate schedules for each of the City's retail service user classes. This subsection of the report discusses the current water rate structure and develops a schedule of water rates for the City's residential user class and rates for the non-residential class that would improve the equitability of cost recovery by class and customer and meet the City's pricing objectives. Finally, this subsection analyzes the impact of the proposed cost allocations and rate designs on residential customers.

Proposed Rate Structure

Rate structures should be designed to ensure that users pay their proportionate share of costs. In addition, rate structures should be easy to understand, simple to administer, and comply with regulatory requirements. A review of the current rate structure provides insights into the equitability of the current methodology and changes, if any, that should be considered.

The proposed changes to the rate structure are based on the results of the pricing objectives exercise that was conducted with the citizens Advisory Committee (Committee) at the beginning of the study to prioritize the most important objectives that would be used to design the final rate structure. The results show that the three most important objectives of the Committee are cost of service based allocations, rate and revenue stability, and water conservation. The complete process is detailed in Appendix A.

Along with the Committee members and staff, RFC evaluated two alternative rate structures before finalizing the proposed rate structure. Based on the results of the pricing objectives exercise, RFC computed rates under two alternatives: revising the tier cutoffs and adding an additional tier for the residential customers. The current usage characteristics indicate that adding an additional tier would not provide more benefits than just revising the tier cutoffs. The Committee also reviewed customer impacts for both of the options with different increased levels of the meter charge to enhance revenue stability and agreed that recovering more revenue through the service charge was desirable.

The Committee members also selected the revised tiers alternative as the preferred rate structure. The current structure for meter service charges that varies with meter size would remain unchanged. The changes to the service charge and the suggested commodity rates for the various user classes are discussed in detail below.

Outside City Customers Rate Differential

The City currently charges Outside City customers 170 percent of the Inside City rates, based on a calculation determined in the 1970s. As part of the rate study, RFC reviewed the methodology and determined that the existing method is no longer defensible under Proposition 218 requirements. Based on further analysis, RFC proposes that the Outside City customers be assessed an additional $0.73 per hcf per unit the first year and $0.76 per hcf per unit the second year of water consumed in order to recover the benefits that Outside City customers receive from Inside City customers.

The proposed Outside City rate has three components: property tax on water utility's assets, police and fire protection costs of water utility's assets, and the marginal cost of different water supply costs. The cost components are as follows:

- Property tax on water utility's assets: $0.05/HCF. As the utilities' assets are City property and do not pay property taxes, the City's General Fund and its residents absorb this revenue loss through their property taxes, for which there is no contribution from Outside City customers. Thus, Outside City customers need to pay their share of this cost. The calculation is based on the estimated property taxes the City would receive on the water utility's assets, divided by the total annual water consumption to arrive at the unit cost per hcf.
- Police and fire protection costs on water utility's assets: $0.10/HCF. The water utility assets are protected by Ventura's Police and Fire personnel who are funded by the City's General Fund. Inside City customers support these costs through property taxes; Outside City customers who receive this benefit should pay their share of the police and fire costs that relate to water utility's assets. The calculation is based on the water utility assets' share of the police and fire costs, as shown in the General Fund budget, divided by the total annual water consumption to arrive at the unit cost per hcf.
- Differential water supply costs: $0.58/HCF. The water utility's first responsibility is to provide water to Inside City customers. The incremental costs associated with the higher cost water supply and long-term planning is passed on to Outside City customers through this differential.

The calculation of the different cost components is shown in Appendix B.

Bi-Monthly Service Charges

A service charge is a cost recovery mechanism that is generally included in the rate structure to recover some of the fixed costs including meter and customer related costs, and a portion of the capacity related cost and is a stable source of revenue independent of water consumption.

Customer related costs are fixed expenditures that relate to operational support activities including accounting, water billing, customer service, and administrative and technical support. The customer related costs are essentially common-to-all customers that are reasonably uniform across the different user classes. In addition, there are capacity related costs such as meter maintenance and peaking charges that are included based on the hydraulic capacity of the meters. Since facilities are designed to meet peaking requirements, RFC has assigned some of the costs related to peaking to the service charge. Increasing the fixed charge also tends to reduce the variable rates and to provide incentive for conservation. A service charge provides a mechanism for recovering a portion of the fixed costs and ensures a stable source of user revenues for the utility. A guideline used in deciding the amount of revenue that should be recovered from fixed charges is provided by the California Urban Water Conservation Council's Best Management Practice #11 which states that the maximum amount of the fixed revenue should not exceed 30 percent of the total rate revenue. The City's costs to be collected from monthly service charges for FY 2013 are set at 25 percent of the total rate revenue or $5.3 million.

The Meter Unit Cost is multiplied by the meter capacity ratios from the AWWA M22 Manual *Sizing Water Service Lines and Meters* to calculate the Meter Capacity Cost. The Meter Capacity Cost is then added to the Customer Service or Billing Cost, which as stated before, does not vary by meter size, to compute the cost based service charge for the first year shown in the right hand column of **Table 3-17**.

Table 3-17
Bi-Monthly Service Charge Calculation for FY 2013

Meter Size	Meter Ratio	Meter Component	Billing Component	Bi-monthly Charge
3/4"	1.00	$18.31	$4.82	$23.14
1"	1.67	$30.51	$4.82	$35.34
1 1/2"	3.33	$61.03	$4.82	$65.86
2"	5.33	$97.65	$4.82	$102.48
3"	11.67	$213.60	$4.82	$218.43
4"	21.00	$384.48	$4.82	$389.31
6"	43.33	$793.37	$4.82	$798.20
8"	80.00	$1,464.69	$4.82	$1,469.52
10"	126.67	$2,319.09	$4.82	$2,323.92
12"	166.67	$3,051.43	$4.82	$3,056.26

Bi-Monthly Fireline Charges

Fireline charges are assessed to private fire protection meters. Based on the cost of service analysis discussed above, a portion of the total costs are allocated to private fire protection. The proposed bi-monthly charges are shown for the first year in **Table 3-18** below.

Table 3-18
Bi-Monthly Fireline Charge Calculation for FY 2013

Fire Line Charges	Bi-monthly Charge
1" Ubranch	$5.96
1"	$5.96
1 1/2"	$5.96
2"	$5.96
3"	$17.30
4"	$36.87
6"	$107.09
8"	$228.21
10"	$410.40
12"	$662.91

Commodity Rate

The commodity rate is the rate developed for each user class which will recover the City's variable volume related costs. The annual estimated FY 2013 revenues required, less annual cost based service charge revenues, are the revenues that need to be recovered through commodity rates. A uniform water commodity rate for each user class can be computed based on the user class' annual usage revenues required and the estimated annual volume of water usage.

Proposed Changes

A review of the current tiers shows that there are some inequities in the tier widths for residential customers (as shown in **Figure 3-1**). RFC proposed that the City adjust the tier widths to ensure greater equity for SFR and MFR customers. RFC reviewed alternative inclining tier structures for residential customers; the recommended tiers are shown in **Table 3-19**. Because non-residential water users are non-homogenous, RFC recommends a uniform rate structure for all non-residential users. **Table 3-19** shows a comparison of the usage and bills distribution between the current tier widths and the proposed tier widths.

Table 3-19
Comparison of Usage and Bills Distribution

SFR Current Tiers	HCF	% of Usage	% of Total Bills
Tier 1	0 – 16	62%	44%
Tier 2	17 – 42	30%	49%
Tier 3	> 42	8%	7%

SFR Proposed Tiers	HCF	% of Usage	% of Total Bills
Tier 1	0 – 14	56%	37%
Tier 2	15 – 30	29%	45%
Tier 3	> 30	14%	19%

MFR Current Tiers	HCF	% of Usage	% of Total Bills
Tier 1	0 – 10	70%	38%
Tier 2	11 – 24	28%	59%
Tier 3	> 24	2%	3%

MFR Proposed Tiers	HCF	% of Usage	% of Total Bills
Tier 1	0 – 10	70%	38%
Tier 2	11 – 16	21%	42%
Tier 3	> 16	9%	21%

Proposed Water Rates

Table 3-20 shows the proposed water rates for the next two years, from FY 2013 to FY 2014.

Table 3-20
Proposed Bi-Monthly Service Charge – Based on Meter Size (Per Meter)

	Current Rates*	Effective July 1, 2012	Effective July 1, 2013
Bi-Monthly Service Charge			
Meter Size			
3/4"	$15.03	$23.14	$25.11
1"	$28.74	$35.34	$38.35
1 1/2"	$47.76	$65.86	$71.46
2"	$66.76	$102.48	$111.20
3"	$150.42	$218.43	$237.00
4"	$245.49	$389.31	$422.41
6"	$483.06	$798.20	$866.05
8"	$720.60	$1,469.52	$1,594.43
10"	$958.15	$2,323.92	$2,521.46
12"	$1,100.68	$3,056.26	$3,316.05

Proposed Bi-Monthly Fireline Service Charge – Based on Meter Size (Per Meter)

	Current Rates*	Effective July 1, 2012	Effective July 1, 2013
Bi-Monthly Fireline Charge			
Meter Size			
1" Ubranch	$2.11	$5.96	$6.47
1"	$6.93	$5.96	$6.47
1 1/2"	$6.93	$5.96	$6.47
2"	$6.93	$5.96	$6.47
3"	$20.80	$17.30	$18.78
4"	$41.60	$36.87	$40.00
6"	$115.58	$107.09	$116.20
8"	$242.71	$228.21	$247.61
10"	$416.08	$410.40	$445.29
12"	$429.94	$662.91	$719.26

Proposed Bi-Monthly Water Rates – Commodity Rates

		Current Rates*	Effective July 1, 2012	Effective July 1, 2013
Volume Rates ($/hcf)				
SFR				
Tier 1	0 to 14	$2.02	$1.98	$2.15
Tier 2	15 to 30	$2.66	$2.69	$2.92
Tier 3	> 30	$4.27	$4.41	$4.79
MFR				
Tier 1	0 to 10	$2.02	$1.98	$2.15
Tier 2	11 to 16	$2.66	$2.69	$2.92
Tier 3	> 16	$4.27	$4.41	$4.79
Non-Residential		$2.66	$2.48	$2.70
Institutional/Interruptible Rate		$1.40	$1.98	$2.15
Reclaimed Water		$0.50	$0.64	$0.68
Untreated Water		$1.40	$1.88	$2.04
Outside City Rates		170% of Inside	Add $0.73/hcf	Add $0.76/hcf

*Current rates have different tiers

IMPACT ANALYSIS

RFC performed an analysis to evaluate the impact of the proposed rate structure on various users. The impacts of each of these changes among user classes and within user classes are discussed below.

Residential Customer Impacts

For SFR customers, the bill impacts at various usage levels for SFR customers are shown below in **Table 3-21**.

Table 3-21
SFR Bi-Monthly Customer Impacts

SFR	Usage (hcf)	Current	July 1, 2012	July 1, 2013	Difference 1	Difference 2
Very Low	5	$25.13	$33.04	$35.86	$7.91	$2.82
Low	12	$39.27	$46.90	$50.91	$7.63	$4.01
Average	21	$60.65	$69.69	$75.65	$9.04	$5.96
High	35	$97.89	$115.95	$125.88	$18.06	$9.93
Very High	50	$150.67	$182.10	$197.73	$31.43	$15.63

Note: Assume 3/4" meter

For MFR customers, the bi-monthly bill impacts will vary depending on the meter size and the number of units in each account. For comparison purposes, the MFR bill impacts at various usage levels are shown in **Table 3-22**, also assuming a 3/4" meter.

Table 3-22
MFR Bi-Monthly Customer Impacts

MFR	Usage (hcf)	Current	July 1, 2012	July 1, 2013	Difference 1	Difference 2
Very Low	3	$21.09	$29.08	$31.56	$7.99	$2.48
Low	8	$31.19	$38.98	$42.31	$7.79	$3.33
Average	13	$43.21	$51.01	$55.37	$7.80	$4.36
High	22	$67.15	$85.54	$92.87	$18.39	$7.33
Very High	35	$119.44	$142.87	$155.14	$23.43	$12.27

Note: Assume 3/4" meter

Non-Residential Customer Impacts

Under the proposed rate structure, non-residential customers' rate impacts vary depending on the meter size and the level of usage for each customer. For illustration purposes, **Table 3-23** shows the impacts of non-residential customers at various usage levels, assuming a 1" meter.

Table 3-23
Non-Residential Bi-Monthly Customer Impacts

Non-Residential	Usage (hcf)	Current	July 1, 2012	July 1, 2013	Difference 1	Difference 2
Very Low	20	$81.94	$84.94	$92.35	$3.00	$7.41
Low	50	$161.74	$159.34	$173.35	($2.40)	$14.01
Average	100	$294.74	$283.34	$308.35	($11.40)	$25.01
High	200	$560.74	$531.34	$578.35	($29.40)	$47.01
Very High	300	$826.74	$779.34	$848.35	($47.40)	$69.01

Note: Assume 1" meter

SECTION 4 – WASTEWATER RATE STUDY

The following subsections present the findings and recommendations of the rate study pertaining to the wastewater utility.

WASTEWATER SYSTEM

Below is a brief description of the City's current wastewater system and rate structure.

Wastewater System Infrastructure

The City's wastewater system collects, and transports wastewater from approximately 44,300 (each multi-family dwelling unit is counted as an account) residential and commercial customers at the start of FY 2012. Wastewater is transported and treated at Ventura Water Reclamation Facility, a tertiary treatment facility located in the Ventura Harbor area near the mouth of the Santa Clara River. Approximately 9 million gallons per day (MGD) of wastewater is delivered to the treatment plant through more than 300 miles of sewer mains and 11 lift stations.

Wastewater Rates

Currently, residential customers have a six-tier bi-monthly wastewater rate structure, with usage determined using the lowest water usage on bills received during the previous winter, from November 1 through April 30. Commercial customers pay a fixed charge varying with strength up to 8 hcf and a rate for usage above 8 hcf. They are divided into 6 strength groups. Churches pay a fixed bi-monthly charge equal to the highest residential charge. Schools pay a fixed charge based on average daily attendance (ADA) that varies depending on whether or not they have showers or no showers. Industrial customers are billed monthly based on flow, chemical oxygen demand (COD), and total suspended solids (SS).

Wastewater Accounts and Flow Projections

Customer accounts and water usage (or winter water for residential customers) information for FY 2011 are used as the basis for projecting wastewater revenues during the study period. RFC has made certain assumptions regarding the growth and water usage (or winter water for residential customers) in the City.

Growth Assumptions

Table 4-2 shows that the majority of the City's wastewater accounts are residential customers (SFR and MFR). Similar to growth used in the water projections, the wastewater accounts are projected to grow at an average of 0.4 percent per year during the study period. Additionally, the accounts and usage data have been normalized to ensure that the actual revenues collected matched the calculated revenues based on the number of accounts.

Table 4-1
Existing Wastewater Rates

SFR & MFR	HCF*	Bi-Monthly Rate
Tier 1	0 - 8	$34.27
Tier 2	9 - 10	$42.24
Tier 3	11 - 12	$50.00
Tier 4	13 - 14	$57.76
Tier 5	15 - 16	$65.51
Tier 6	17+	$73.27
Schools (with showers - 100 ADA)		$131.89
Schools (no showers - 100 ADA)		$102.58
Churches		$73.27

*HCF determined based on lowest billing between November through April

Commercial	HCF	Bi-Monthly Rate
Group 1		
Tier 1	0 - 8	$16.07
Tier 2	9+	$2.63
Group 2		
Tier 1	0 - 8	$24.26
Tier 2	9+	$3.15
Group 3		
Tier 1	0 - 8	$36.38
Tier 2	9+	$5.39
Group 4		
Tier 1	0 - 8	$56.79
Tier 2	9+	$7.03
Group 5		
Tier 1	0 - 8	$47.74
Tier 2	9+	$6.57
Group 6		
All		$73.27
Industrial (Monthly)		
Flow	(MG)	$2,470.10
COD	(klbs)	$280.51
SS	(klbs)	$597.62

Table 4-2
Wastewater Accounts and Usage by Customer Class

Line #			FY 2012	FY 2013	FY 2014	FY 2015	FY 2016
1	SFR						
2	Tier 1	0 - 8	5,778	5,778	5,778	5,807	5,836
3	Tier 2	9 - 10	4,737	4,737	4,737	4,761	4,785
4	Tier 3	11 - 12	2,263	2,263	2,263	2,274	2,285
5	Tier 4	13 - 14	1,999	1,979	1,959	1,949	1,939
6	Tier 5	15 - 16	1,678	1,661	1,644	1,636	1,628
7	Tier 6	17+	5,836	5,778	5,720	5,691	5,662
8	**Subtotal SFR**		**22,291**	**22,196**	**22,101**	**22,118**	**22,135**
9							
10	MFR						
11	Tier 1	0 - 8	7,278	7,278	7,278	7,314	7,351
12	Tier 2	9 - 10	3,350	3,350	3,350	3,367	3,384
13	Tier 3	11 - 12	4,498	4,498	4,498	4,520	4,543
14	Tier 4	13 - 14	2,106	2,085	2,064	2,054	2,044
15	Tier 5	15 - 16	1,060	1,049	1,039	1,034	1,029
16	Tier 6	17+	885	876	867	863	859
17	**Subtotal MFR**		**19,177**	**19,136**	**19,096**	**19,152**	**19,210**
18							
19	Schools (with showers - 100 ADA)		223	223	223	223	223
20	Schools (no showers - 100 ADA)		126	126	126	126	126
21	Churches		47	47	47	47	47
22							
23	**Commercial**						
24	Group 1						
25	Tier 1	0 - 8	1,489	1,489	1,489	1,489	1,489
26	Tier 2	9+	521,233	516,021	510,861	505,752	500,694
27	Group 2						
28	Tier 1	0 - 8	37	37	37	37	37
29	Tier 2	9+	66,832	66,164	65,502	64,847	64,199
30	Group 3						
31	Tier 1	0 - 8	9	9	9	9	9
32	Tier 2	9+	45,947	45,488	45,033	44,583	44,137
33	Group 4						
34	Tier 1	0 - 8	11	11	11	11	11
35	Tier 2	9+	8,370	8,286	8,203	8,121	8,040
36	Group 5						
37	Tier 1	0 - 8	228	228	228	228	228
38	Tier 2	9+	145,622	144,166	142,724	141,297	139,884
39	Group 6						
40	All		0	0	0	0	0

Line #			FY 2017	FY 2018	FY 2019	FY 2020	FY 2021
1	SFR						
2	Tier 1	0 - 8	5,865	5,894	5,923	5,953	5,983
3	Tier 2	9 - 10	4,809	4,833	4,857	4,881	4,905
4	Tier 3	11 - 12	2,296	2,307	2,319	2,331	2,343
5	Tier 4	13 - 14	1,929	1,919	1,909	1,899	1,908
6	Tier 5	15 - 16	1,620	1,612	1,604	1,596	1,604
7	Tier 6	17+	5,633	5,605	5,577	5,549	5,577
8	**Subtotal SFR**		**22,152**	**22,170**	**22,189**	**22,209**	**22,320**
9							
10	MFR						
11	Tier 1	0 - 8	7,388	7,425	7,462	7,499	7,536
12	Tier 2	9 - 10	3,401	3,418	3,435	3,452	3,469
13	Tier 3	11 - 12	4,566	4,589	4,612	4,635	4,658
14	Tier 4	13 - 14	2,034	2,024	2,014	2,004	2,014
15	Tier 5	15 - 16	1,024	1,019	1,014	1,009	1,014
16	Tier 6	17+	855	851	847	843	847
17	**Subtotal MFR**		**19,268**	**19,326**	**19,384**	**19,442**	**19,538**
18							
19	Schools (with showers - 100 ADA)		223	223	223	223	223
20	Schools (no showers - 100 ADA)		126	126	126	126	126
21	Churches		47	47	47	47	47
22							
23	**Commercial**						
24	Group 1						
25	Tier 1	0 - 8	1,489	1,489	1,489	1,489	1,489
26	Tier 2	9+	495,687	490,730	485,823	480,965	480,965
27	Group 2						
28	Tier 1	0 - 8	37	37	37	37	37
29	Tier 2	9+	63,557	62,921	62,292	61,669	61,669
30	Group 3						
31	Tier 1	0 - 8	9	9	9	9	9
32	Tier 2	9+	43,696	43,259	42,826	42,398	42,398
33	Group 4						
34	Tier 1	0 - 8	11	11	11	11	11
35	Tier 2	9+	7,960	7,880	7,801	7,723	7,723
36	Group 5						
37	Tier 1	0 - 8	228	228	228	228	228
38	Tier 2	9+	138,485	137,100	135,729	134,372	134,372
39	Group 6						
40	All		0	0	0	0	0

WASTEWATER USER CLASSIFICATION

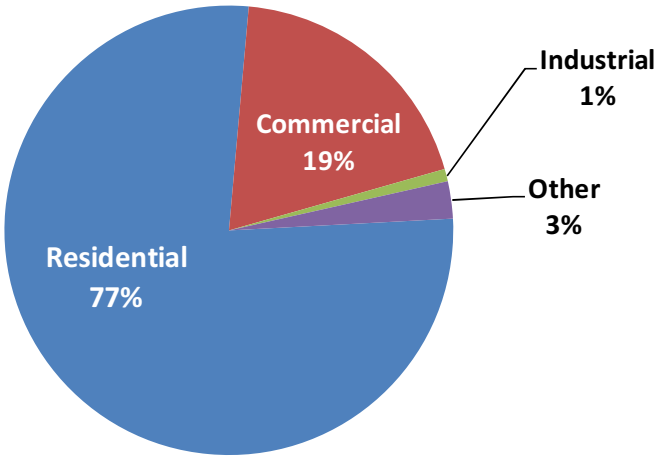
A review of the City's existing user classifications is presented in the following subsections.

Existing User Classification

Currently, the City classifies its non-residential users into six major groups. Churches, schools, and industrial customers are in their own separate groups. Group 1 consists of non-residential customers with low strength wastewater, such as laundromats, car washes, professional offices, retail establishments, gym, theaters, etc. Group 2 consists of customers with low-medium strength such as hotels and motels without dining facilities and commercial laundries. Group 3 consists of customers with medium strength such as hotels with dining facilities. Group 4 consists of medium-high strength customers, including groceries with garbage grinders and mortuaries. Group 5 consists of high strength customers, such as restaurants, bakeries and multi-use shopping centers. Group 6 consists of plant nurseries, which is considered low strength but typically uses a lot of water for irrigation purposes. It is appropriate to consider nurseries, churches, and schools as separate customer classes since their usage differs greatly from other non-residential customers. RFC finds that the existing non-residential customer classification is consistent with industry standards; thus, we are not proposing any changes to the classification.

Figure 4-1 shows the percentage of wastewater revenue collected from each customer class. Approximately 77 percent of the total revenue is from residential customers. The remainder is from non-residential customers.

Figure 4-1
FY 2012 Revenue by Customer Class



WASTEWATER REVENUE REQUIREMENTS

A review of a utility's revenue requirements is a key first step in the rate design process. The review involves an analysis of annual operating revenues under the current rates, capital revenues, operation and maintenance (O&M) expenses, capital expenditures, transfers between funds, and reserve requirements. This section of the report provides a discussion of the projected revenues, O&M and capital expenditures, capital improvement financing plan, debt service requirements, and the revenue adjustments required to ensure the financial stability of the wastewater utility.

Wastewater System Revenues

The City's wastewater utility operates the wastewater system. The City derives its required annual operating and capital revenues from a number of sources. The principal source of operating revenues from rates is the wastewater service charge revenues from the City's users which are expected to decrease from $16 million in FY 2012 to $15.9 million by FY 2021 due to reductions in water usage. Other revenue sources include miscellaneous operating revenues such as interest earnings, miscellaneous sewer services, etc. Capital revenue sources include wastewater connection fees, capital funds, bond proceeds, and grants and loans.

RFC reviewed the various sources of operating and capital revenues and the City's financing plan. **Table 4-3** presents the details of the operating and capital related revenues.

Table 4-3
Revenue Summary

Line #		FY 2012	FY 2013	FY 2014	FY 2015	FY 2016
1	**Service Charge Revenue**					
2	Residential	$12,215,957	$12,161,288	$12,107,012	$12,114,120	$12,121,733
3	Commercial	$3,064,572	$3,036,129	$3,007,963	$2,980,086	$2,952,486
4	Industrial	$140,787	$140,183	$139,585	$138,992	$138,406
5	Church	$20,662	$20,662	$20,662	$20,662	$20,662
6	School	$254,012	$254,012	$254,012	$254,012	$254,012
7						
8	Interest - Investment Earnings	$726,046	$285,402	$348,233	$357,096	$432,396
9	Wastewater - Connection Fees	$150,000	$150,000	$150,000	$150,750	$151,504
10	Other Miscellaneous Revenue	$375,710	$375,710	$375,710	$386,081	$397,488
11						
12	**TOTAL WASTEWATER REVENUE**	**$16,947,747**	**$16,423,387**	**$16,403,178**	**$16,401,799**	**$16,468,687**

Line #		FY 2017	FY 2018	FY 2019	FY 2020	FY 2021
1	**Service Charge Revenue**					
2	Residential	$12,129,347	$12,137,400	$12,145,753	$12,154,312	$12,214,742
3	Commercial	$2,925,164	$2,898,107	$2,871,323	$2,844,813	$2,844,813
4	Industrial	$137,825	$137,250	$136,681	$136,118	$136,118
5	Church	$20,662	$20,662	$20,662	$20,662	$20,662
6	School	$254,012	$254,012	$254,012	$254,012	$254,012
7						
8	Interest - Investment Earnings	$493,638	$404,849	$1,069,590	$1,333,561	$724,597
9	Wastewater - Connection Fees	$152,261	$153,023	$153,788	$154,557	$155,329
10	Other Miscellaneous Revenue	$410,036	$423,839	$439,022	$455,724	$474,095
11						
12	**TOTAL WASTEWATER REVENUE**	**$16,522,947**	**$16,429,142**	**$17,090,832**	**$17,353,759**	**$16,824,369**

Wastewater System Expenditures

For sound financial operation of the City's wastewater system, revenues generated must be sufficient to meet the revenue requirements or cash obligations of the system. Revenue requirements include O&M expenses of allocation, treatment, and disposal, capital improvement program (CIP) expenditures, principal and interest payments on existing debt, and other obligations.

Operation and Maintenance Expenses

O&M expenditures include the cost of operating and maintaining wastewater collection, treatment, and disposal facilities. O&M expenses also include the costs of providing technical services such as laboratory services and other administrative costs of the wastewater system. These costs are a normal obligation of the system, and are met from operating revenues as they are incurred. The comprehensive forecasted annual O&M expenditures for the study are based upon the City's adopted FY 2012 budget and 2013 estimated expenditures, adjusted for changes since the budget was developed for anticipated changes in operations and the effect of inflation in future years. The City conservatively used an inflationary factor of three percent per year starting in FY 2014 to project all O&M expenditures,

except personnel, chemicals, and utilities. Salaries are projected to remain unchanged through FY 2015 due to union contracts, increasing at 0.5 percent per year in all other years. Benefits expenses are projected to remain unchanged through FY 2014, increasing at 0.3 percent per year in all other years. Chemical and utilities expenses are projected to increase at 5 percent per year during the study period. Projected O&M expenditures for the study period are summarized by functions in **Table 4-4**. It should be noted that water and wastewater utilities share certain facilities and services when it makes sense to do so in order to reduce overhead costs. The wastewater utility pays for a portion of the administrative expenses, such as customer care, water resource planning, general manager budget, etc. budgeted in the water utility. The payment to the water utility is included in the "Wastewater Administration" costs, line 1 of **Table 4-4**.

Table 4-4
Wastewater Operations & Maintenance Expenses

Line #		FY 2012 Budgeted	FY 2013 Projected	FY 2014 Projected	FY 2015 Projected	FY 2016 Projected
1	Wastewater Administration	$5,516,079	$6,078,850	$5,741,138	$5,915,904	$6,097,445
2	Wastewater Maintenance	$4,052,786	$4,080,143	$4,097,235	$4,170,543	$4,252,516
3	Wastewater Operations	$4,083,675	$4,029,989	$3,981,614	$4,105,766	$4,240,118
4	Wastewater Laboratory	$1,055,163	$1,045,790	$1,055,944	$1,071,062	$1,088,686
5	Rev Mgmt - Wastewater	$225,000	$231,300	$238,239	$245,386	$252,748
6	**TOTAL WASTEWATER O&M EXPENSES**	**$14,932,703**	**$15,466,071**	**$15,114,171**	**$15,508,661**	**$15,931,512**

Line #		FY 2017 Projected	FY 2018 Projected	FY 2019 Projected	FY 2020 Projected	FY 2021 Projected
1	Wastewater Administration	$6,285,026	$6,478,868	$6,687,445	$6,903,901	$7,128,604
2	Wastewater Maintenance	$4,336,825	$4,423,543	$4,512,746	$4,604,510	$4,698,918
3	Wastewater Operations	$4,380,400	$4,526,889	$4,679,873	$4,839,655	$5,006,554
4	Wastewater Laboratory	$1,106,775	$1,125,342	$1,144,402	$1,163,968	$1,184,056
5	Rev Mgmt - Wastewater	$260,330	$268,140	$276,184	$284,470	$293,004
6	**TOTAL WASTEWATER O&M EXPENSES**	**$16,369,357**	**$16,822,782**	**$17,300,650**	**$17,796,505**	**$18,311,135**

Wastewater Capital Improvement Program

The City has developed a comprehensive wastewater Capital Improvement Program (CIP) to address current (replacement) and future (expansion) wastewater system needs. As **Table 4-5** indicates, the total estimated wastewater CIP from FY 2012 to FY 2022 is $147 million. These projected costs include a 3.5 percent annual inflation factor due to anticipated increases in construction costs over time. This inflation rate is a conservative estimate and ensures that the City has adequate resources reserved to complete the necessary projects. Additionally, the CIP used in this study represents only 75 percent of the actual budgeted CIP. This percentage was based on the City's previous experiences of project completion.

Table 4-5
Wastewater Capital Improvement Program at 75% of Budget – inflated

Line #	Proj No.	Description	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016
1	96907	Lift Station - Seaside & Sewer Forcemain Replacement	$240,000	$243,750	$0	$0	$0
2	96911	Pipeline - Ralston and Victoria/Capacity	$210,000	$0	$0	$0	$0
3	96903	Treatment - VWRF Electrical Switchgear Replacement	$1,357,500	$1,237,500	$0	$0	$0
4	96910	Pipeline - Ash St and Thompson Blvd/Capacity	$525,000	$0	$0	$0	$0
5	96904	Lift Station - State Beach Drywell Replacement	$41,250	$281,250	$0	$0	$0
6	74005	Treatment - VWRF Dewatering Equipment Replacement	$450,000	$1,350,000	$7,200,000	$0	$0
7	96913	Pipeline - Avenue Area/Capacity	$165,000	$0	$1,110,000	$0	$0
8	96909	Treatment - Plant Disinfection Facility (Pasteurization)	$918,750	$0	$513,750	$3,750,000	$3,750,000
9	96900	Treatment - Plant Nutrient Improvement	$832,500	$0	$0	$0	$0
10	96912	Pipeline - Callens Rd &Market St/Capacity	$1,282,500	$0	$0	$0	$0
11	96905	Pipeline - Harbor & Woolsey/Capacity	$0	$0	$39,863	$119,588	$637,800
12	74028	Recycled - Golf Course Drive Reclaimed Water Pipeline	$0	$0	$18,750	$56,250	$300,000
13	74036	Pipeline - HWY 126 Frontage Area/Capacity	$0	$0	$36,476	$109,429	$583,620
14	74037	Pipeline - College Dr. Area/Capacity	$0	$0	$70,125	$210,375	$1,122,000
15	74039	Pipeline - Ann Street Area/Capacity	$0	$0	$0	$0	$325,354
16	74038	Pipeline - Mills Rd and HWY 101 Area/Capacity	$0	$0	$0	$0	$0
17	74040	Pipeline - Aurora Dr. Area/Capacity	$0	$0	$0	$0	$0
18	74042	Pipeline - Ventura Ave & Franklin Lane Area/Capacity	$0	$0	$0	$0	$0
19	74043	Pipeline - Main St and Brent St Area/Capacity	$0	$0	$0	$0	$0
20	74034	Treatment - Plant Aeration Blowers	$0	$0	$0	$0	$0
21	74050	Pipeline - Sperry Avenue Area/Capacity	$0	$0	$0	$0	$0
22	96878	Treatment - VWRF Digester 4	$0	$0	$0	$0	$0
23	74044	Pipeline - Westside Area/Capacity	$0	$0	$0	$0	$0
24	74045	Pipeline - Catalina & Thompson Area/Capacity	$0	$0	$0	$0	$0
25	74046	Pipeline - Main St & Loma Vista Area/Capacity	$0	$0	$0	$0	$0
26	74047	Pipeline - Channel Dr Area/Capacity	$0	$0	$0	$0	$0
27	74051	Pipeline - Northbank Dr Area/Capacity	$0	$0	$0	$0	$0
28	74049	Pipeline - Telegraph Rd Area/Capacity	$0	$0	$0	$0	$0
29	74053	Pipeline - Neath St Area/Capacity	$0	$0	$0	$0	$0
30	**Projects with No Allocation**						
31	74030	Treatment - Wastewater Plant Wetlands Improvements	$0	$0	$0	$0	$0
32	74032	Treatment - Plant Chlorine Contact Chamber	$0	$0	$0	$0	$0
33	96874	Treatment - VWRF Tertiary Filter Replacement	$0	$0	$0	$0	$0
34	96884	Facility - VWRF Landscape Improvements	$0	$0	$0	$0	$0
35	96894	Facility - VWRF Maintenance Storage Area	$0	$0	$0	$0	$0
36	74052	Treatment - Effluent Pumping & Flow Measurement Upg	$0	$0	$0	$0	$900,000
37	**Additional CIP not in Adopted CIP**						
38		Transfer Station - Seaside Transfer Station & Force Main	$0	$0	$0	$0	$0
39		Pipeline - Remaining "E" Projects/Capacity	$0	$0	$0	$0	$0
40		Pipeline - Near Term Projects/Capacity	$0	$0	$0	$0	$0
41		Pipeline - Ultimate Projects/Capacity	$0	$0	$0	$0	$0
42		Pipeline - Olivas Park Dr Sewer Extension & Reclaimed lir	$0	$0	$0	$0	$0
43		Facility - Energy Efficiency Projects	$0	$75,000	$75,000	$75,000	$75,000
44		Facility - Reclaimed Water Structure	$0	$0	$0	$0	$0
45		Treatment - Diversion Structure	$0	$0	$0	$0	$0
46		Meters - Automated Reading Installation Citywide	$0	$0	$967,500	$1,020,000	$1,057,500
47							
48	**TOTAL CIP**		**$6,022,500**	**$3,187,500**	**$10,031,464**	**$5,340,641**	**$8,751,274**

Line #	Proj No.	Description	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022
1	96907	Lift Station - Seaside & Sewer Forcemain Replacement	$0	$0	$0	$0	$0	$0
2	96911	Pipeline - Ralston and Victoria/Capacity	$0	$0	$0	$0	$0	$0
3	96903	Treatment - VWRF Electrical Switchgear Replacement	$0	$0	$0	$0	$0	$0
4	96910	Pipeline - Ash St and Thompson Blvd/Capacity	$0	$0	$0	$0	$0	$0
5	96904	Lift Station - State Beach Drywell Replacement	$0	$0	$0	$0	$0	$0
6	74005	Treatment - VWRF Dewatering Equipment Replacement	$0	$0	$0	$0	$0	$0
7	96913	Pipeline - Avenue Area/Capacity	$0	$0	$0	$0	$0	$0
8	96909	Treatment - Plant Disinfection Facility (Pasteurization)	$0	$0	$0	$0	$0	$0
9	96900	Treatment - Plant Nutrient Improvement	$0	$0	$0	$0	$0	$0
10	96912	Pipeline - Callens Rd &Market St/Capacity	$0	$0	$0	$0	$0	$0
11	96905	Pipeline - Harbor & Woolsey/Capacity	$0	$0	$0	$0	$0	$0
12	74028	Recycle - Golf Course Drive Reclaimed Water Pipeline	$0	$0	$0	$0	$0	$0
13	74036	Pipeline - HWY 126 Frontage Area/Capacity	$0	$0	$0	$0	$0	$0
14	74037	Pipeline - College Dr. Area/Capacity	$0	$0	$0	$0	$0	$0
15	74039	Pipeline - Ann Street Area/Capacity	$1,409,151	$2,015,495	$0	$0	$0	$0
16	74038	Pipeline - Mills Rd and HWY 101 Area/Capacity	$445,948	$1,189,052	$0	$0	$0	$0
17	74040	Pipeline - Aurora Dr. Area/Capacity	$678,517	$1,001,483	$0	$0	$0	$0
18	74042	Pipeline - Ventura Ave & Franklin Lane Area/Capacity	$122,251	$252,749	$0	$0	$0	$0
19	74043	Pipeline - Main St and Brent St Area/Capacity	$522,615	$977,385	$0	$0	$0	$0
20	74034	Treatment - Plant Aeration Blowers	$0	$0	$0	$3,750,000	$0	$0
21	74050	Pipeline - Sperry Avenue Area/Capacity	$0	$0	$1,500,000	$0	$0	$0
22	96878	Treatment - VWRF Digester 4	$0	$0	$0	$0	$5,250,000	$0
23	74044	Pipeline - Westside Area/Capacity	$0	$0	$519,976	$605,024	$0	$0
24	74045	Pipeline - Catalina & Thompson Area/Capacity	$0	$0	$851,858	$1,398,143	$0	$0
25	74046	Pipeline - Main St & Loma Vista Area/Capacity	$0	$0	$0	$0	$764,600	$1,485,400
26	74047	Pipeline - Channel Dr Area/Capacity	$0	$0	$0	$0	$660,404	$464,596
27	74051	Pipeline - Northbank Dr Area/Capacity	$0	$0	$0	$0	$732,867	$767,133
28	74049	Pipeline - Telegraph Rd Area/Capacity	$0	$0	$0	$0	$469,642	$1,030,358
29	74053	Pipeline - Neath St Area/Capacity	$0	$0	$0	$0	$0	$961,772
30	**Projects with No Allocation**							
31	74030	Treatment - Wastewater Plant Wetlands Improvements	$0	$0	$3,750,000	$0	$0	$0
32	74032	Treatment - Plant Chlorine Contact Chamber	$0	$0	$0	$0	$0	$0
33	96874	Treatment - VWRF Tertiary Filter Replacement	$4,500,000	$0	$0	$0	$0	$0
34	96884	Facility - VWRF Landscape Improvements	$0	$0	$450,000	$0	$0	$0
35	96894	Facility - VWRF Maintenance Storage Area	$0	$952,500	$0	$0	$0	$0
36	74052	Treatment - Effluent Pumping & Flow Measurement Upg	$0	$0	$0	$0	$0	$0
37	**Additional CIP not in Adopted CIP**							
38		Transfer Station - Seaside Transfer Station & Force Main	$0	$0	$0	$1,316,025	$3,300,375	$1,138,650
39		Pipeline - Remaining "E" Projects/Capacity	$0	$0	$0	$0	$0	$1,836,300
40		Pipeline - Near Term Projects/Capacity	$0	$0	$0	$0	$0	$0
41		Pipeline - Ultimate Projects/Capacity	$0	$0	$0	$0	$0	$0
42		Pipeline - Olivas Park Dr Sewer Extension & Reclaimed lir	$0	$0	$0	$0	$0	$0
43		Facility - Energy Efficiency Projects	$75,000	$75,000	$75,000	$75,000	$75,000	$75,000
44		Facility - Reclaimed Water Structure	$2,862,600	$7,900,875	$12,266,100	$12,695,400	$0	$0
45		Treatment - Diversion Structure	$0	$0	$2,862,600	$6,913,275	$10,221,750	$9,521,550
46		Meters - Automated Reading Installation Citywide	$900,000	$0	$0	$0	$0	$0
47								
48	**TOTAL CIP**		**$11,516,081**	**$14,364,540**	**$22,275,533**	**$26,752,867**	**$21,474,638**	**$17,280,758**

Major Capital Improvement Financing Plan

The CIP is to be funded through a combination of system revenues and debt financing. The typical CIP funding sources include the following:

System Revenues:	***Capital Financing:***
Connection Fees	Debt proceeds
Pay-as-you-go revenues	Grant receipts and Contributions
Interest earnings	

Table 4-6 presents the proposed capital financing plan to finance major CIP projects over the ten-year period from FY 2012 to FY 2021. It is projected that the City will issue debt of $10 million in FY 2016, $55 million in FY 2018, and $30 million in FY 2021 to adequately fund the capital improvement program

since revenues from rates are insufficient to cover the costs. Other revenue shown below includes estimated connection fees revenues and grants.

Table 4-6
Capital Financing Plan

Line #		FY 2012	FY 2013	FY 2014	FY 2015	FY 2016
1	Debt Financing	$0	$0	$0	$0	$7,806,645
2	Rate Revenue	$5,872,500	$3,037,500	$9,155,839	$4,424,891	$0
3	Other Revenue	$150,000	$150,000	$875,625	$915,750	$944,629
4	**TOTAL CIP**	**$6,022,500**	**$3,187,500**	**$10,031,464**	**$5,340,641**	**$8,751,274**

Line #		FY 2017	FY 2018	FY 2019	FY 2020	FY 2021
1	Debt Financing	$1,184,659	$14,211,517	$22,121,746	$13,118,912	$21,319,309
2	Rate Revenue	$9,504,160	$0	$0	$13,479,398	$0
3	Other Revenue	$827,261	$153,023	$153,788	$154,557	$155,329
4	**TOTAL CIP**	**$11,516,081**	**$14,364,540**	**$22,275,533**	**$26,752,867**	**$21,474,638**

Debt Service Requirements

Debt service requirements consist of principal and interest payments on existing debt. The City currently has debt service obligation associated with its 2004 Wastewater Certificates of Participation (COPs). Existing and projected debt service results in annual payments in the range of $1.7 to $7.1 million. **Table 4-7** shows the existing and proposed debt service of the wastewater utility.

Table 4-7
Existing and Proposed Debt Service

Line #		FY 2012	FY 2013	FY 2014	FY 2015	FY 2016
1	2004 Wastewater Revenue COP	$1,738,550	$1,740,613	$1,736,550	$1,739,550	$1,476,150
2	**Total Existing Debt Service**	**$1,738,550**	**$1,740,613**	**$1,736,550**	**$1,739,550**	**$1,476,150**
3						
4	**Total Proposed Debt Service**	**$0**	**$0**	**$0**	**$0**	**$354,348**

Line #		FY 2017	FY 2018	FY 2019	FY 2020	FY 2021
1	2004 Wastewater Revenue COP	$1,476,950	$1,475,963	$1,473,125	$1,474,225	$1,475,500
2	**Total Existing Debt Service**	**$1,476,950**	**$1,475,963**	**$1,473,125**	**$1,474,225**	**$1,475,500**
3						
4	**Total Proposed Debt Service**	**$708,696**	**$2,657,608**	**$4,606,521**	**$4,606,521**	**$5,669,564**

Reserves

The City requires adequate cash reserves to meet operating, capital, and debt service requirements. Operating reserves may be used to meet ongoing cash flow requirements as well as emergency requirements. Typically, a balance in the range of 10 to 50 percent of annual operating expenses is considered appropriate. This represents one to six months of working capital. RFC proposes that the City maintain a minimum 90-day operating reserve. The operating reserve balances and the minimum

operating reserves targets are shown in **Table 4-8**. Interest from reserve funds may be used to finance operations. The capital reserve is similar in function to the operating reserve, but it is a reserve established for repair and rehabilitation-related capital expenses. Standard practices recommend a 100 percent of annual capital replacement expenses. However, to reduce customer impacts, the capital reserve is set at 50 percent of the annual replacement CIP in FY 2012, gradually increasing to 100 percent by FY 2017, to cover unexpected increases in capital expenditures. The estimated FY 2012 total reserves balance is approximately $30 million, not including the debt reserves. However, most of the funds are already earmarked for existing capital projects. The reserves levels are at or above the proposed target level in all years in the study period.

Table 4-8
Wastewater Reserves/Fund Balance

Line #		FY 2012	FY 2013	FY 2014	FY 2015	FY 2016
1	**Ending Balance**					
2	Operating Fund	$1,726,694	$1,858,155	$2,956,155	$4,304,413	$5,869,556
3	Capital Improvement Fund	$28,239,052	$25,201,552	$16,045,713	$11,620,822	$11,620,822
4	Estuary Protection Fund	$0	$340,348	$1,059,748	$2,209,834	$3,851,093
5	Bond Fund	$0	$0	$0	$0	$1,184,659
6	Debt Reserve Fund	$0	$0	$0	$0	$708,696
7						
8	**Target Balance**					
9	Operating Fund	$3,733,176	$3,866,518	$3,778,543	$3,877,165	$3,982,878
10	Capital Improvement Fund	$2,062,209	$2,474,651	$2,887,093	$3,299,534	$3,711,976

Line #		FY 2017	FY 2018	FY 2019	FY 2020	FY 2021
1	**Ending Balance**					
2	Operating Fund	$5,373,964	$5,525,678	$5,528,784	$4,037,241	$5,363,806
3	Capital Improvement Fund	$4,832,312	$6,807,530	$11,527,205	$5,949,976	$8,505,413
4	Estuary Protection Fund	$5,340,030	$5,757,084	$3,636,483	$1,499,571	$1,866,000
5	Bond Fund	$0	$35,240,657	$13,118,912	$0	$5,654,605
6	Debt Reserve Fund	$708,696	$4,606,521	$4,606,521	$4,606,521	$6,732,607
7						
8	**Target Balance**					
9	Operating Fund	$4,092,339	$4,205,695	$4,325,162	$4,449,126	$4,577,784
10	Capital Improvement Fund	$4,124,418	$4,124,418	$4,124,418	$4,124,418	$4,124,418

Based on the terms of the debt issued, debt reserves provide protection to bond buyers for one year of debt service payments in times of financial difficulty. These are restricted reserves used only for meeting debt service payments. One year of debt service payments is required to be set aside in reserve; each time the City issues new bonds, additional proceeds are required to be added to the debt reserves.

Proposed Revenue Adjustments

In order to meet projected revenue requirements, to achieve desired operating and capital reserve fund balances, and minimize customer impacts, the following revenue adjustments are proposed to meet long term rate stability:

Effective Date	Increases
July 1, 2012	$1.4 million
July 1, 2013	$1.0 million

The operating financial plan presented in **Table 4-9** shows the revenues from rates based on the proposed revenue adjustment schedule shown above.

Table 4-9
Wastewater Operating Financial Plan

Line #		FY 2012	FY 2013	FY 2014	FY 2015	FY 2016
1	Revenue Under Existing Rates	$15,695,991	$15,612,275	$15,529,234	$15,507,873	$15,487,299
2						
3	Total Additional Revenue	$0	$1,405,105	$2,413,243	$3,484,991	$4,618,428
4	Total Revenue from Rates	$15,695,991	$17,017,380	$17,942,477	$18,992,864	$20,105,727
5						
6	Other Operating Revenue	$375,710	$375,710	$375,710	$386,081	$397,488
7	Interest Income	$726,046	$285,402	$348,233	$357,096	$432,396
8	**Total Revenue**	**$16,797,747**	**$17,678,492**	**$18,666,421**	**$19,736,040**	**$20,935,611**
9						
10	O&M Expenses	$14,932,703	$15,466,071	$15,114,171	$15,508,661	$15,931,512
11	Existing Debt Service	$1,738,550	$1,740,613	$1,736,550	$1,739,550	$1,476,150
12	Proposed Debt Service	$0	$0	$0	$0	$354,348
13						
14	**Total Expenses**	**$16,671,253**	**$17,206,684**	**$16,850,721**	**$17,248,211**	**$17,762,010**
15						
16	**Net Cash Flow**	**$126,494**	**$471,808**	**$1,815,699**	**$2,487,829**	**$3,173,601**
17						
18	Debt Coverage Ratio	107%	127%	205%	243%	273%
19	Required Coverage	125%	125%	125%	125%	125%

Line #		FY 2017	FY 2018	FY 2019	FY 2020	FY 2021
1	Revenue Under Existing Rates	$15,467,010	$15,447,431	$15,428,432	$15,409,917	$15,470,347
2						
3	Total Additional Revenue	$5,817,141	$7,085,210	$8,876,889	$10,808,329	$12,956,399
4	Total Revenue from Rates	$21,284,151	$22,532,641	$24,305,321	$26,218,247	$28,426,746
5						
6	Other Operating Revenue	$410,036	$423,839	$439,022	$455,724	$474,095
7	Interest Income	$493,638	$404,849	$1,069,590	$1,333,561	$724,597
8	**Total Revenue**	**$22,187,826**	**$23,361,329**	**$25,813,934**	**$28,007,532**	**$29,625,439**
9						
10	O&M Expenses	$16,369,357	$16,822,782	$17,300,650	$17,796,505	$18,311,135
11	Existing Debt Service	$1,476,950	$1,475,963	$1,473,125	$1,474,225	$1,475,500
12	Proposed Debt Service	$708,696	$2,657,608	$4,606,521	$4,606,521	$5,669,564
13						
14	**Total Expenses**	**$18,555,002**	**$20,956,352**	**$23,380,295**	**$23,877,250**	**$25,456,199**
15						
16	**Net Cash Flow**	**$3,632,824**	**$2,404,977**	**$2,433,638**	**$4,130,281**	**$4,169,240**
17						
18	Debt Coverage Ratio	266%	158%	140%	168%	158%
19	Required Coverage	125%	125%	125%	125%	125%

Debt Service Coverage

The City must meet debt service coverage requirements on its outstanding bond issues. Coverage requirements typically vary between 100 percent and 160 percent or higher. The City's required debt coverage is 125 percent, which means that the City's Adjusted Net System Revenues shall amount to at least 125 percent of the Annual Debt Service. The System Revenues include funds derived from the ownership and operation of the system including wastewater service charges from the City's users, miscellaneous service charges, revenues received from contracts, and interest income. Annual Debt Service includes annual principal and interest payments on outstanding debt. With the proposed revenue adjustments, the City exceeds the coverage requirement in all but the current fiscal year. Failure to meet debt service coverage results in a technical default, which without foreseeable remedial action, such as implementing rate increases, could result in a downgrade of credit rating, more restrictions or higher costs in future debt issuance, or even denial of credit.

COST OF SERVICE ANALYSIS

The determination of the City's user class flows and loadings and the revenue requirements reviewed and finalized through the operating and capital cash flow analysis provide the basis for performing the cost of service analysis. This section of the report discusses the allocation of operating costs and the determination of unit rates, and the calculation of user class cost responsibility.

The total revenue requirement net of miscellaneous revenue credits, by definition, is the net cost of providing service. This cost of service is then used as the basis to develop unit rates for the wastewater parameters and to allocate costs to the various user classes in proportion to the wastewater services

rendered. In this study, wastewater rates were calculated for FY 2013, and accordingly FY 2013 revenue requirements are used in the cost allocation process.

Costs of Service to be Allocated

The annual revenue requirement or cost of service to be recovered from wastewater charges includes operation and maintenance expenses and other non-operating expenses costs. O&M expenses include costs directly related to the collection, treatment, and disposal of wastewater and maintenance of system facilities.

The total FY 2013 net cost of service to be recovered from the City's wastewater users, as shown in **Table 4-10**, is estimated at over $17 million, of which approximately $15.3 million is operating costs and the remaining $1.7 million is capital costs, which consists of existing debt service. The cost of service analysis is based upon the need to generate annual revenues adequate to meet the estimated annual revenue requirement. As part of the cost of service analysis, revenues from other sources except wastewater rates and charges are deducted from the appropriate cost elements. Additional deductions are made to reflect interest income and other non-operating income during FY 2013. Adjustments are also made to account for cash balances to ensure adequate collection of revenue and to determine annual revenues needed from rates.

Table 4-10
Allocation of Revenue Requirements

	FY 2013		
	Operating	**Capital**	**Total**
Revenue Requirements			
O&M Expenses	$15,466,071		**$15,466,071**
Existing Debt Service		$1,740,613	**$1,740,613**
Proposed Debt Service		$0	**$0**
Subtotal Revenue Requirements	**$15,466,071**	**$1,740,613**	**$17,206,684**
Less: Other Revenues			
Other Operating Revenue	$375,710		**$375,710**
Interest Income	$285,402		**$285,402**
Subtotal Other Revenues	**$661,112**	**$0**	**$661,112**
Less: Adjustments			
Adjustments to Annual Cash Balance	($471,808)		**($471,808)**
Adjustments to Annualize Rate Increase	$0		**$0**
Subtotal Adjustments	**($471,808)**	**$0**	**($471,808)**
Revenue to be Recovered from Rates	**$15,276,767**	**$1,740,613**	**$17,017,380**

Mass Balance

The mass balance analysis is used to estimate the wastewater loadings (flow and strength) generated by each customer group. While wastewater discharged into sewers for most users is not metered when it enters the wastewater system, the total amount of flow and strength entering the treatment plant and treated every day is a known quantity. This total flow entering the treatment plant has to be corrected for infiltration and inflow (I&I), which is water that enters the collection system during rain-related events, run-off, or other ways. Additionally, non-residential and industrial customer loadings can be estimated based on their water usage. Non-residential and industrial customer strengths are estimated according to industry accepted standards. The remaining loadings, net of the total less infiltration and non-residential and industrial, are assigned to residential users. Based on this analysis, it is estimated that each person in a residential household generates approximately 53 gallons of wastewater per day. This number is reasonable given the average water usage in the City.

Table 4-11 shows the total annual units of flow, strength, and accounts for each customer class as a result of the mass balance analysis. Based on the City's average density of 2.6 people per household[1], the number of SFR and MFR dwelling units within the City, and using a ratio of MFR residential density (people per household) of 75% of SFR density, RFC calculated that an SFR unit has an average of 3 people per household and an MFR unit has an average of 2.25 people per household. These estimates are used to approximate the wastewater generation of the residential class, consistent with the mass balance analysis results.

Table 4-11
Determination of Total Annual units

Customer Class	Flow (hcf)	COD (lbs)	SS (lbs)	No. of Accounts
SFR	1,789,395	6,981,263	4,073,056	22,196
MFR	1,136,475	4,433,918	2,586,867	14,352
Commercial				
Group 1	616,924	1,324,766	531,447	1,489
Group 2	73,631	284,971	68,945	37
Group 3	49,837	373,321	124,440	9
Group 4	9,508	94,964	47,482	11
Group 5	166,124	1,703,801	529,910	228
Group 6	1	3	1	0
Industrial	54,118	254,002	87,607	3
Schools with showers	53,663	87,096	33,498	8
Schools without showers	30,321	49,211	18,927	34
Churches	19,206	35,967	17,984	47
TOTAL	**3,999,202**	**15,623,284**	**8,120,163**	**38,414**

[1] Source: State Department of Finance Report E-5 City/County Population and Housing Estimates, 1/1/2010

Unit Cost of Service

In order to allocate costs of service to the different user classes, unit costs of service are developed consistent with the guidelines for allocating costs detailed in the Manual of Practice titled Financing and Charges for Wastewater Systems published by the Water Environment Federation (WEF). Operating and capital costs are functionalized as collection, treatment, billing, administrative, etc. These costs are then allocated to the flow, COD and SS parameters based on the design of each facility. Collection costs are allocated entirely to flow. Since treatment plants are designed to treat flow, COD and SS, treatment costs are allocated to those three parameters: based on the design of each component of the treatment system. For example, the equipment in the primary clarifiers is designed to remove suspended solids. Along with suspended solids there is also some removal of COD, therefore the equipment is allocated to SS and COD based on the removal of those two parameters. Additionally the primary tank structure is designed for flow; therefore the structure is allocated to flow. Similarly other components of the treatment plant are analyzed to determine the appropriate allocation to flow, COD and SS. Administrative costs are assigned to general and then spread amongst the other costs centers proportionately. Costs related to recycled water are allocated to recycled water. The unit costs of service are developed by dividing the total annual costs by the appropriate service units, such as flow, COD and SS generated in the system and accounts for billing costs. **Table 4-12** shows the units of service and the development of the FY 2013 unit costs for each of the wastewater expense categories.

Table 4-12
Development of Unit Cost

	Flow	COD	SS	Billing	Recycled Water	General	Total
Operating Expenses	$7,476,313	$1,708,920	$1,649,299	$600,444	$127,381	$3,714,409	$15,276,767
Capital Expenses	$1,295,804	$191,084	$181,530	$33,969	$30,573	$7,651	$1,740,613
Total Cost	**$8,772,117**	**$1,900,004**	**$1,830,829**	**$634,414**	**$157,955**	**$3,722,061**	**$17,017,380**
Allocation of General Cost	$2,485,304	$538,307	$518,708	$179,741		($3,722,061)	
Cost of Service	**$11,257,422**	**$2,438,311**	**$2,349,537**	**$814,155**	**$157,955**	**$0**	**$17,017,380**
Total Units of Service	3,999,202	15,623,284	8,120,163	230,484	207,406		
Unit of Measure	hcf/yr	lb/yr	lb/yr	bills/yr	hcf/yr		
Total Unit Cost of Service	$2.81	$0.16	$0.29	$3.53	$0.76		

User Class Costs

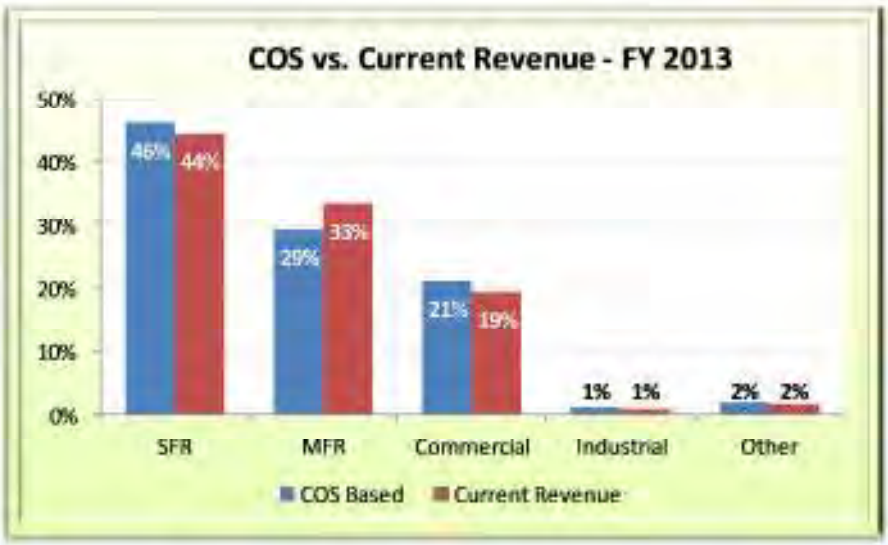
The unit costs shown in **Table 4-12** are then applied to the projected FY 2013 units and flow for each user class, shown in **Table 4-11**, to derive user class costs. **Table 4-13** shows the FY 2013 cost responsibility for each user class.

Table 4-13
Allocation of Costs to Customer Classes

Customer Class	Flow	COD	SS	Billing	Recycled Water	Total
SFR	$5,036,997	$1,089,559	$1,178,522	$470,427		$7,775,506
MFR	$3,199,082	$691,997	$748,500	$304,180		$4,943,759
Commercial						
Class 1	$1,736,590	$206,755	$153,772	$31,558		$2,128,675
Class 2	$207,265	$44,475	$19,949	$784		$272,473
Class 3	$140,287	$58,264	$36,006	$191		$234,748
Class 4	$26,764	$14,821	$13,739	$233		$55,557
Class 5	$467,625	$265,911	$153,327	$4,832		$891,696
Class 6	$3	$1	$0	$0		$4
Industrial	$152,336	$39,642	$25,349	$64		$217,391
Schools with showers	$151,057	$13,593	$9,693	$170		$174,512
Schools without showers	$85,351	$7,680	$5,477	$721		$99,228
Churches	$54,063	$5,613	$5,203	$996		$65,876
Reclaimed Water					$157,955	$157,955
TOTAL	**$11,257,422**	**$2,438,311**	**$2,349,537**	**$814,155**	**$157,955**	**$17,017,380**

The residential user class has the highest assignment of costs at $12.7 million and is responsible for 75 percent of the total cost of service. The non-residential user classes are responsible for the remaining 25 percent of the annual cost of service. **Figure 4-2** compares the existing revenue and the cost of service to be recovered by customer class. The COS analysis shows that single family residential and commercial customers, as a class, need to pay slightly more than they are currently paying and that multi-family customers will benefit from the proposed rates. Individual SFR and MFR customers will see different impacts depending on their actual average winter water usage. A majority of residential customers will see a benefit from the revised rate structure. Customers with high winter water use, up to 30 hcf bi-monthly, will see significant increases in their bill.

Figure 4-2
Comparison of Revenue under COS and Existing Rate Structure



RATE DESIGN

The revenue requirements and cost of service analyses described in the preceding sections of this report provide a basis for the design of wastewater rates. Rate design involves the development of rate schedule for each user class so as to recover the annual cost of service determined for each user class. This subsection of the report discusses alternative wastewater rate structures, presents a schedule of rates for the City's user classes, and analyzes the impact of the proposed changes in user classifications, cost allocation and rate design on the user classes.

Rate Structure Alternatives

The primary emphasis in the design of rate structures is ordinarily placed on achieving fairness and equity, with the objective of being able to ensure that each customer class pays its fair share of costs. In addition, rate structures should be easy to understand, simple to administer, and comply with regulatory requirements. A review of the existing City wastewater rate structures provides insights into the equitability of the current methodology and the changes, if any, that should be considered.

The proposed changes to the rate structure are based on the results of the pricing objectives exercise that was conducted with the citizens Advisory Committee (Committee) at the beginning of the study to prioritize the most important objectives that would be used to design the final rate structure. The results show that the three most important objectives of the Committee are cost of service based allocations, rate stability, and revenue stability. The complete process is detailed in Appendix A.

Similar to the water rates design process, RFC also evaluated two alternative wastewater rate structures: a fixed wastewater charge for residential customers and a fixed plus flow based charge for all customers. Non-residential rates are the same under both alternatives. During discussions, Committee

members agreed that a fixed wastewater charge would not be equitable and would overburden low volume users. The preferred rate structure is discussed in detail below.

Residential Customers

While the methodology for cost allocation to user classes for equitable cost recovery is covered in some detail by the previously referenced WEF guidelines, the City has some flexibility to design a rate structure that best meets its needs. For example, many California agencies levy flat charges on their residential customers; the City could take the total revenue recovery from residential customers and spread it equally amongst all residential customers. The Advisory Committee reviewed this alternative structure and decided against it. The second alternative was to retain the current system; however, the current system of rates overburdens low volume water users by having a high Tier 1 charge. RFC proposes that the City implement a fixed plus flow rate structure to stabilize revenues, and to recognize the fact that wastewater system costs are mostly fixed.

Table 4-14 shows the residential wastewater rates under the existing rate structure and the fixed plus flow rate structure for FY 2013 and 2014. The flow based rate is based on the average winter water usage for two bills received between February and May and capped at 30 hcf and 24 hcf bi-monthly for SFR and MFR customers, respectively. Committee members also evaluated the wastewater rates at different caps and agreed that a cap of 30 hcf and 24 hcf bi-monthly would provide sufficient incentives for conservation and be equitable for all residential customers as high winter usage for these groups would likely be for outdoor watering, water not returned to the collection system for treatment. Based on the estimated wastewater generation of 53 gallons per day per person, a cap of 30 hcf bi-monthly provides for a household of up to 7 people for SFR customers. A cap of 24 hcf bi-monthly provides for a household of up to 5.5 people for MFR customers.

Table 4-14
Current and Proposed Residential Wastewater Rates

Customer Class		Current	July 1, 2012	July 1, 2013
SFR				
Tier 1	0 - 8	$34.27		
Tier 2	9 - 10	$42.24		
Tier 3	11 - 12	$50.00		
Tier 4	13 - 14	$57.76		
Tier 5	15 - 16	$65.51		
Tier 6	17+	$73.27		
Bi-monthly Fixed Charge			$17.65	$18.35
Bi-monthly Flow Charge*			$2.67	$2.78
Maximum Bill (cap at 30 hcf)			$97.75	$101.75
MFR				
Tier 1	0 - 8	$34.27		
Tier 2	9 - 10	$42.24		
Tier 3	11 - 12	$50.00		
Tier 4	13 - 14	$57.76		
Tier 5	15 - 16	$65.51		
Tier 6	17+	$73.27		
Bi-monthly Fixed Charge			$13.06	$13.58
Bi-monthly Flow Charge*			$2.67	$2.78
Maximum Bill (cap at 24 hcf)			$77.14	$80.30

*Based on average winter usage for 2 full billing cycles for bills received February through May

Non-Residential Customers

A review of the non-residential customer wastewater rates indicates that there are inequities among non-residential customers in the different groups. RFC proposes that the City correct the inequities among non-residential customers in the different groups. Based on the unit rates indicated in the current rate schedule, RFC calculated the wastewater rates for each group.

Under the existing rate structure, churches and nurseries pay a fixed bi-monthly charge based on the highest residential charge. Since the amount of wastewater generated by churches can vary significantly based on their size and activity, to ensure proportionate cost recovery to meet Proposition 218 cost of service requirements, RFC proposes that churches and nurseries should be charged based on their actual water usage. Churches are assigned a return factor of 75 percent and nurseries are assigned a return factor of 30 percent based on their estimated wastewater generation. Additionally, they will pay the same fixed charges as all other customers.

Similarly, under the existing rate structure, schools pay a fixed bi-monthly charge based on a factor of 1.4 or 1.8 times the highest residential charge per student based on average daily attendance. To

ensure proportionate cost recovery, RFC proposes that the schools' rate be revised to recover their cost of service based on accepted industry standards. Schools are not typically charged on the basis of their water usage since a significant portion of their water usage is for irrigation purposes. Instead, schools are charged per student based on average daily attendance. The revised rate for schools assumes that each student generates 10 gallons of wastewater per day for the duration of the school year. The resultant rate is shown in **Table 4-15**.

Table 4-15 shows the non-residential wastewater rates under the existing rate structure and the proposed rate structure for FY 2013 and 2014 in each group. RFC recommends the City retain the current classification of customer groups based on their strength. Non-residential customers will pay the same fixed charges as residential customers and will be charged based on their actual water usage.

Table 4-15
Current and Proposed Non-Residential Wastewater Rates

Customer Class		Current	July 1, 2012	July 1, 2013
Commercial				
Group 1				
Tier 1	0 - 8	$16.07		
Tier 2	9+	$2.63		
Group 2				
Tier 1	0 - 8	$24.26		
Tier 2	9+	$3.15		
Group 3				
Tier 1	0 - 8	$36.38		
Tier 2	9+	$5.39		
Group 4				
Tier 1	0 - 8	$56.79		
Tier 2	9+	$7.03		
Group 5				
Tier 1	0 - 8	$47.74		
Tier 2	9+	$6.57		
Group 6				
All		$73.27		
Bi-monthly Fixed Charge			$17.65	$18.35
Bi-monthly Flow Charge**				
Group 1			$3.13	$3.26
Group 2			$3.58	$3.72
Group 3			$4.61	$4.80
Group 4			$5.61	$5.84
Group 5			$5.12	$5.33
Group 6			$1.08	$1.13
Churches			$2.33	$2.43
Schools (100 ADA)			$128.17	$133.25

** Based on actual water usage

Proposed Wastewater Rates

To prepare for costs associated with the Santa Clara River Estuary settlement with Heal the Bay and Wishtoyo Foundation's Ventura Coastkeeper Program, a charge equal to two percent of the wastewater bill in FY 2013 and four percent of the wastewater bill in FY 2014 is recommended. Revenues collected from this charge will be kept in a separate reserve and used for Estuary protection related planning studies only. **Table 4-16** shows the proposed wastewater rates for the next two years.

Table 4-16
Proposed Wastewater Rates

	Effective	
	July 1, 2012	July 1, 2013
SFR		
Bi-monthly Fixed Charge	$17.65	$18.35
Bi-monthly Flow Charge*	$2.67	$2.78
Maximum Bill (cap at 30 hcf)	$97.75	$101.75
Max Estuary Protection Fund Charge	$1.96	$4.07
MFR		
Bi-monthly Fixed Charge	$13.06	$13.58
Bi-monthly Flow Charge*	$2.67	$2.78
Maximum Bill (cap at 24 hcf)	$77.14	$80.30
Max Estuary Protection Fund Charge	$1.54	$3.21
Commercial		
Bi-monthly Fixed Charge	$17.65	$18.35
Bi-monthly Flow Charge**		
Group 1	$3.13	$3.26
Group 2	$3.58	$3.72
Group 3	$4.61	$4.80
Group 4	$5.61	$5.84
Group 5	$5.12	$5.33
Group 6	$1.08	$1.13
Churches	$2.33	$2.43
Schools (100 ADA)	$128.17	$133.25
Industrial		
Flow (MG)	$3,689.47	$3,835.63
COD (klbs)	$153.01	$159.08
SS (klbs)	$283.68	$294.92
Estuary Protection Fund Charge	2% of bill	4% of bill

*Based on average winter usage for 2 full billing cycles for bills received February through May
** Based on actual water usage

IMPACT ANALYSIS

RFC performed an impact analysis to evaluate the impact of the recommended changes to the rate structure. The impacts of each of these changes among user classes and within user classes are discussed below.

Residential Customer Impacts

Under the proposed rate structure, residential customers will experience a range of impacts depending on their previous usage level. However, an average SFR customer, generating 15 hcf of wastewater per bi-monthly period, will see a decrease of approximately $6.66 in their bi-monthly bill compared to the existing rates.

Tables 4-17 and **4-18** show the bi-monthly bill impacts for SFR and MFR customers at each level of winter water consumption, respectively. The three columns within the box outline show the breakdown between the wastewater charge, the Estuary protection charge, and the total bi-monthly wastewater bills for each level of usage for the first year. The last three columns show the bills for the second year.

Table 4-17
SFR Bi-Monthly Rate Impacts

Winter Avg HCF	Current Bill	7/1/2012 WW Bill	7/1/2012 Estuary	7/1/2012 Total Bill	7/1/2013 WW Bill	7/1/2013 Estuary	7/1/2013 Total Bill
0	$34.27	$17.65	$0.35	$18.00	$18.35	$0.73	$19.08
1	$34.27	$20.32	$0.41	$20.73	$21.13	$0.85	$21.98
2	$34.27	$22.99	$0.46	$23.45	$23.91	$0.96	$24.87
3	$34.27	$25.66	$0.51	$26.17	$26.69	$1.07	$27.76
4	$34.27	$28.33	$0.57	$28.90	$29.47	$1.18	$30.65
5	$34.27	$31.00	$0.62	$31.62	$32.25	$1.29	$33.54
6	$34.27	$33.67	$0.67	$34.34	$35.03	$1.40	$36.43
7	$34.27	$36.34	$0.73	$37.07	$37.81	$1.51	$39.32
8	$34.27	$39.01	$0.78	$39.79	$40.59	$1.62	$42.21
9	$42.24	$41.68	$0.83	$42.51	$43.37	$1.73	$45.10
10	$42.24	$44.35	$0.89	$45.24	$46.15	$1.85	$48.00
11	$50.00	$47.02	$0.94	$47.96	$48.93	$1.96	$50.89
12	$50.00	$49.69	$0.99	$50.68	$51.71	$2.07	$53.78
13	$57.76	$52.36	$1.05	$53.41	$54.49	$2.18	$56.67
14	$57.76	$55.03	$1.10	$56.13	$57.27	$2.29	$59.56
15	$65.51	$57.70	$1.15	$58.85	$60.05	$2.40	$62.45
16	$65.51	$60.37	$1.21	$61.58	$62.83	$2.51	$65.34
17	$73.27	$63.04	$1.26	$64.30	$65.61	$2.62	$68.23
18	$73.27	$65.71	$1.31	$67.02	$68.39	$2.74	$71.13
19	$73.27	$68.38	$1.37	$69.75	$71.17	$2.85	$74.02
20	$73.27	$71.05	$1.42	$72.47	$73.95	$2.96	$76.91
21	$73.27	$73.72	$1.47	$75.19	$76.73	$3.07	$79.80
22	$73.27	$76.39	$1.53	$77.92	$79.51	$3.18	$82.69
23	$73.27	$79.06	$1.58	$80.64	$82.29	$3.29	$85.58
24	$73.27	$81.73	$1.63	$83.36	$85.07	$3.40	$88.47
25	$73.27	$84.40	$1.69	$86.09	$87.85	$3.51	$91.36
26	$73.27	$87.07	$1.74	$88.81	$90.63	$3.63	$94.26
27	$73.27	$89.74	$1.79	$91.53	$93.41	$3.74	$97.15
28	$73.27	$92.41	$1.85	$94.26	$96.19	$3.85	$100.04
29	$73.27	$95.08	$1.90	$96.98	$98.97	$3.96	$102.93
30	$73.27	$97.75	$1.96	$99.71	$101.75	$4.07	$105.82

Table 4-18
MFR Bi-Monthly Rate Impacts - Per Dwelling Unit

Winter Avg HCF	Current Bill	7/1/2012 WW Bill	7/1/2012 Estuary	7/1/2012 Total Bill	7/1/2013 WW Bill	7/1/2013 Estuary	7/1/2013 Total Bill
0	$34.27	$13.06	$0.26	$13.32	$13.58	$0.54	$14.12
1	$34.27	$15.73	$0.31	$16.04	$16.36	$0.65	$17.01
2	$34.27	$18.40	$0.37	$18.77	$19.14	$0.77	$19.91
3	$34.27	$21.07	$0.42	$21.49	$21.92	$0.88	$22.80
4	$34.27	$23.74	$0.47	$24.21	$24.70	$0.99	$25.69
5	$34.27	$26.41	$0.53	$26.94	$27.48	$1.10	$28.58
6	$34.27	$29.08	$0.58	$29.66	$30.26	$1.21	$31.47
7	$34.27	$31.75	$0.64	$32.39	$33.04	$1.32	$34.36
8	$34.27	$34.42	$0.69	$35.11	$35.82	$1.43	$37.25
9	$42.24	$37.09	$0.74	$37.83	$38.60	$1.54	$40.14
10	$42.24	$39.76	$0.80	$40.56	$41.38	$1.66	$43.04
11	$50.00	$42.43	$0.85	$43.28	$44.16	$1.77	$45.93
12	$50.00	$45.10	$0.90	$46.00	$46.94	$1.88	$48.82
13	$57.76	$47.77	$0.96	$48.73	$49.72	$1.99	$51.71
14	$57.76	$50.44	$1.01	$51.45	$52.50	$2.10	$54.60
15	$65.51	$53.11	$1.06	$54.17	$55.28	$2.21	$57.49
16	$65.51	$55.78	$1.12	$56.90	$58.06	$2.32	$60.38
17	$73.27	$58.45	$1.17	$59.62	$60.84	$2.43	$63.27
18	$73.27	$61.12	$1.22	$62.34	$63.62	$2.54	$66.16
19	$73.27	$63.79	$1.28	$65.07	$66.40	$2.66	$69.06
20	$73.27	$66.46	$1.33	$67.79	$69.18	$2.77	$71.95
21	$73.27	$69.13	$1.38	$70.51	$71.96	$2.88	$74.84
22	$73.27	$71.80	$1.44	$73.24	$74.74	$2.99	$77.73
23	$73.27	$74.47	$1.49	$75.96	$77.52	$3.10	$80.62
24	$73.27	$77.14	$1.54	$78.68	$80.30	$3.21	$83.51

Non-Residential Customer Impacts

Under the proposed rate structure, non-residential customers will experience different rate impacts depending on their group and usage level. **Table 4-19** shows the rate impact of an average user within each group.

Table 4-19
Non-Residential Bi-Monthly Rate Impacts

Customer Group	Bi-Monthly Usage HCF	Current Bill	7/1/2012 WW Bill	7/1/2012 Estuary	7/1/2012 Total Bill	7/1/2013 WW Bill	7/1/2013 Estuary	7/1/2013 Total Bill
Group 1	70	$179.13	$236.75	$4.74	$241.49	$246.55	$9.86	$256.41
Group 2	331	$1,041.71	$1,202.63	$24.05	$1,226.68	$1,249.67	$49.99	$1,299.66
Group 3	923	$4,968.23	$4,272.68	$85.45	$4,358.13	$4,448.75	$177.95	$4,626.70
Group 4	147	$1,033.96	$842.32	$16.85	$859.17	$876.83	$35.07	$911.90
Group 5	122	$796.72	$642.29	$12.85	$655.14	$668.61	$26.74	$695.35
Group 6	200	$73.27	$233.65	$4.67	$238.32	$244.35	$9.77	$254.12
Chuches	242	$73.27	$581.51	$11.63	$593.14	$606.41	$24.26	$630.67
Schools	704 ADA	$722.15	$902.32	$18.05	$920.37	$938.08	$37.52	$975.60

SECTION 5 – RATE SURVEY

The City conducted a water and wastewater rate survey of the City's rates and those of neighboring and comparable agencies in Ventura County. Rate surveys can provide insights into a utility's pricing policies related to service. Care should be taken, however, in drawing conclusions from such a comparison as some factors including geographic location, demand, customer constituency, level of treatment, level of grant funding, age of system, sources of water costs, and rate-setting methodology can affect the cost of providing services. Rates for various agencies as of December 2011 (the time period at which the survey was conducted) are shown in **Figures 5-1 and 5-2** below. Some of these agencies are in the process of increasing their rates.

Figure 5-1 compares the total bi-monthly water and wastewater service charges for a low volume SFR customer with a 3/4" meter and 8 hcf of water usage bi-monthly.

Figure 5-1

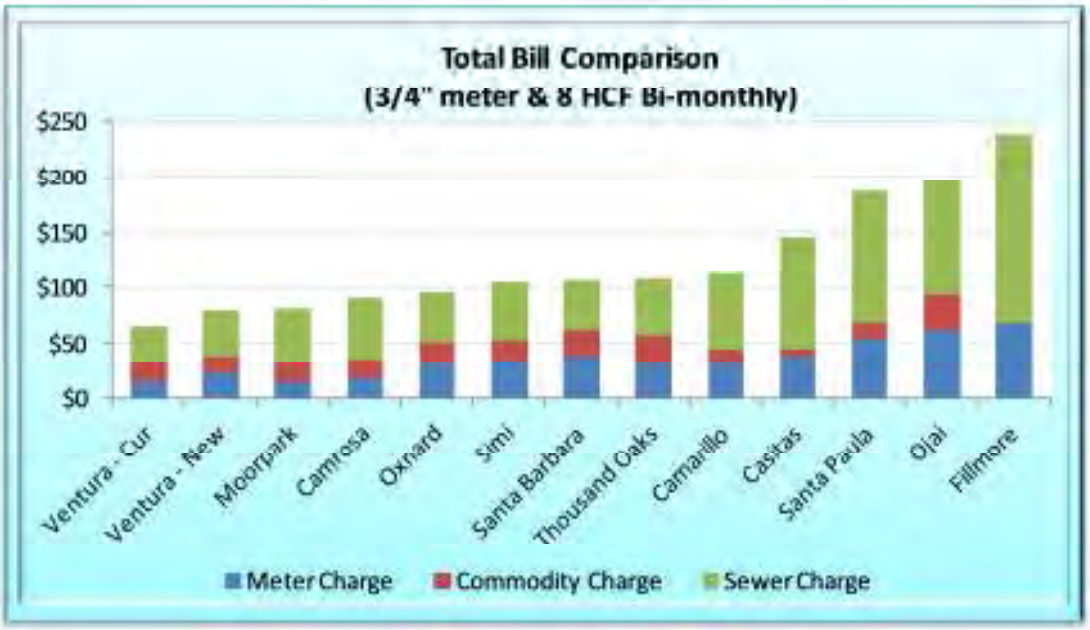
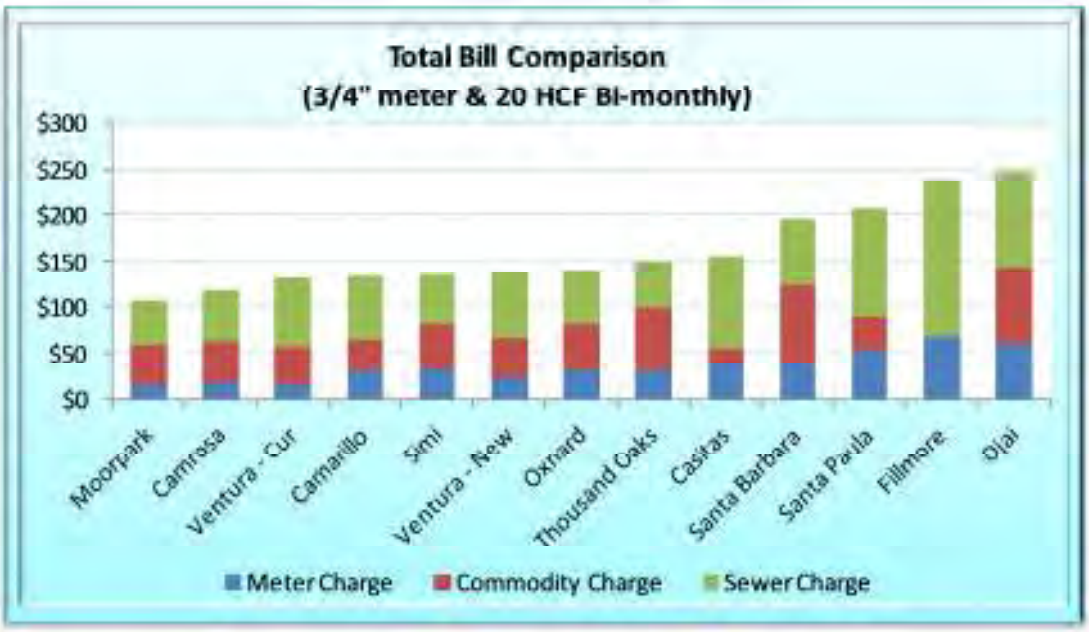


Figure 5-2 compares the total bi-monthly water and wastewater service charges for an average SFR customer with a 3/4" meter and 20 hcf of water usage bi-monthly.

Figure 5-2


Total Bill Comparison
(3/4" meter & 20 HCF Bi-monthly)
$300
$250
$200
$150
$100
$50
$0
Moorpark
Camrosa
Ventura - Cur
Camarillo
Simi
Ventura - New
Oxnard
Thousand Oaks
Casitas
Santa Barbara
Santa Paula
Fillmore
Ojai
Meter Charge
Commodity Charge
Sewer Charge

APPENDIX A

PRICING OBJECTIVES WORKSHOP

RFC conducted a pricing objectives public workshop with the stakeholders group and public to determine the objectives stakeholders considered to be most important in the design of water and wastewater rates. **Table A-1** shows a brief description of the 11 pricing objectives presented to the stakeholders.

Stakeholders were asked to rank a maximum of two objectives as "Most Important" and three objectives as "Very Important". The remaining objectives can be ranked as "Important" and "Least Important" depending on the views of each stakeholder. Additionally, stakeholders were asked to rank the sub-objectives under the Conservation objective from 1 to 6, 1 being the most important.

Table A-1
Pricing Objectives Description

Pricing Objective	Description
Cost of Service Based Allocations	The rate structure should ensure that each customer class is contributing equitably towards revenue requirements based upon the costs of providing service to each customer class.
Minimization of Customer Impacts	The rate structure should be developed such that adverse rate impacts on each customer class are minimized.
Equitable Contributions from New Customers	New customers should be responsible for the capital costs of providing them service.
Economic Development	The rate structure should incorporate a preferential rate that may be used to attract economic development to the City.
Rate Stability	The rate structure should minimize dramatic rate increases or decreases over the planning period.
Affordability	The rate structure should incorporate practices or procedures that help ensure that customers can afford water and wastewater service.
Simple to Understand and Update	The rate structure should be easy for City customers to understand, utilizing a moderate level of educational tools. In addition, the rate structure should be able to be effectively maintained by City staff in future years.
Ease of Implementation	The rate structure should be compatible with City's billing system. In addition, the rate structure should allow for the continuation of existing management and system reports.
Defensibility	The rate structure should be consistent with the rate setting methodologies provided by AWWA and applicable laws, in order to ensure that rates are defensible if challenged in court.
Revenue Stability	The rate structure should provide for a steady and predictable stream of revenues to the utility such that the utility is capable of meeting its current financial requirements.
Conservation/Demand Management ***Sub-Objectives***	The rate structure should encourage water conservation as well as assist in managing system demand. • Reduce Peak Consumption • Reduce Seasonal Consumption • Reduce Total Consumption • Reward Economically Efficient Water Users • Surcharge Nonessential and Non-efficient Water Use • Communicate Conservation Consciousness

The "Most Important" objectives were given a weight of 1; "Very Important" objectives were given a weight of 2; etc. **Table A-2** below shows the combined weighted scores of each objective from all stakeholders.

Table A-2
Pricing Objectives Results

Classification	Rank	Pricing Objectives	Total Score
Most Important	1	Cost of Service Based Allocations	11
Very Important	2	Rate Stability	18
	3	Revenue Stability	19
	4	Conservation	19
	5	Defensibility	19
Important	6	Minimization of Customer Impacts	21
	7	Simple to Understand and Update	22
	8	Equitable Contributions from New Customers	22
Least Important	9	Economic Development	25
	10	Ease of Implementation	26
	11	Affordability	26

The rankings were then used to compare four water and three wastewater alternative rate structures to determine which rate structures best meet the City's objectives. The selected alternatives for water rates are modifying the tier cut-offs and adding a fourth tier. The selected alternative for wastewater rates is a fixed plus flow structure. Water and wastewater rates were developed for the selected alternatives, as described in previous sections of the report.

Tables A-3 and A-4 show the comparison of the alternative water and wastewater rate structures.

Table A-3
Comparison of Alternative Water Rate Structures

Ranking	Classifications	Pricing Objectives	Current Rate Structure	Option 1: Revise Current Tiers	Option 2: Add New Tier	Option 3: Hybrid	Option 4: Water Budget Based
1	Most Important	Cost of Service Based Allocations	B-	A	A	A	A
2	Very Important	Rate Stability	A	A	A	A	A
3		Revenue Stability	B-	A-	A-	A-	A-
4		Conservation	B-	A	A+	A+	A
5		Defensibility	B-	A	A	A	A
6	Important	Minimization of Customer Impacts	A	A-	B+	B	C+
7		Simple to Understand and Update	A+	A	A-	A-	C-
8		Equitable Contributions from New Customers	B+	B+	B+	B+	B+
9	Least Important	Economic Development	B	B	B	B	B
10		Ease of Implementation	A+	A	A	A	C
11		Affordability	B	B+	A-	A	B+
		Overall Scores	**80.6**	**95.4**	**95.3**	**95.0**	**86.0**

Ranking	Classifications	Pricing Objectives	Current Rate Structure	Option 1: Revise Current Tiers	Option 2: Add New Tier	Option 3: Hybrid	Option 4: Water Budget Based
1	Most Important	Reward Efficient Water Users	B	B+	B+	B+	A+
2		Surcharge Nonessential and Non-efficient Usage	B	B+	B+	B+	A+
3	Very Important	Communicate Conservation Consciousness	C+	B+	A-	A	A
4		Reduce Total Consumption	B	B+	A-	A	B+
5	Important	Reduce Peak Consumption	B+	A-	A	A+	B
6	Least Important	Reduce Seasonal Consumption	B+	A-	A	A+	B
		Overall Scores	**49.8**	**57.3**	**60.6**	**63.3**	**65.3**

Table A-4
Comparison of Alternative Wastewater Rate Structures

Ranking	Classifications	Pricing Objectives	Current Rate Structure	Option 1: Fixed Charge Only	Option 2: Flow Based Only	Option 3: Fixed + Flow Based
1	Most Important	Cost of Service Based Allocations	B-	B	A	A
2	Very Important	Rate Stability	A	A	A	A
3		Revenue Stability	B+	A+	C+	A-
4		Conservation	B+	C	A+	A-
5		Defensibility	A	A	A	A
6	Important	Minimization of Customer Impacts	A	A-	A-	A
7		Simple to Understand and Update	A+	A+	B+	A
8		Equitable Contributions from New Customers	B+	B+	B+	B+
9	Least Important	Economic Development	B	B	B	B
10		Ease of Implementation	A+	A	B+	A
11		Affordability	B-	C+	A-	B+
		Overall Scores	**87.8**	**86.8**	**90.4**	**95.1**

APPENDIX B

OUTSIDE CITY CHARGES CALCULATION

Outside City customers are currently charged 170 percent of the Inside City rates, based on a calculation developed in the 1970s. Upon further review, RFC found that the methodology is no longer defensible under Proposition 218. Outside City customers do receive additional benefits from Inside City customers and this section develops a rationale for the Outside City surcharge.

In order to determine the Outside City rate differential, we need to determine the benefits Outside City customers receive but have not paid for because they reside outside the City limits. RFC identified three factors that can be used to calculate the rate differential. These are:

1. Property tax on water utility assets
2. Police and fire protection on water utility assets
3. Incremental cost of water supply

These cost components are further explained below:

- Property tax on water utility's assets – As the utilities' assets are City property and do not pay property taxes, the City's General Fund and its residents absorb this revenue loss through their property taxes, for which there is no contribution from Outside City customers. Thus, Outside City customers need to pay their share of this cost, which they would incur if they are served by a private utility. The calculation is based on the estimated property taxes the City would receive on the water utility's assets, divided by the total annual water consumption to arrive at the unit cost per hcf.

- Police and fire protection costs on water utility's assets – The water utility assets are protected by Ventura's Police and Fire personnel who are funded by the City's General Fund. Inside City customers support these costs through property taxes; Outside City customers who receive this benefit should pay their share of the police and fire costs that relate to water utility's assets. The calculation is based on the water utility assets' share of the police and fire costs, as shown in the General Fund budget, divided by the total annual water consumption to arrive at the unit cost per hcf.

- Differential water supply costs – The water utility's first responsibility is to provide water to Inside City customers. The incremental costs associated with the higher cost water supply and long-term planning is passed on to Outside City customers through this differential. The highest cost untreated water is United Water. The total cost of Water from United Water, including treatment is calculated in the rate model and shown below.

Table B-1 shows the detailed calculation of each component of the proposed Outside City rate.

Table B-1
Outside City Rate Calculation

Outside City Rate Differential Calculation		
Property Tax Component		
	Total Utility Assets	$156,163,699
(a)	Estimated property tax loss	$276,410
	Total Water Sales (hcf)	6,216,223
	Unit Cost ($/hcf)	$0.05
Police and Fire Component		
(b)	Total City Assets (est. in $M)	$10,734
	Percentage of Utility Assets	1.5%
(c)	Police and Fire Budget	$44,000,000
	Police & Fire Costs Allocated to Wate	$640,107
	Total Water Sales (hcf)	6,216,223
	Unit Cost ($/hcf)	$0.10
Water Supply Component		
	United water total cost	$2.05
	Average treatment cost	$1.47
	Difference	$0.58
TOTAL RATE DIFFERENTIAL ($/HCF)		**$0.73**

Note:
(a) The City collects 17.7% of the 1% property tax
(b) Estimated from the unsecured property tax revenue the General Fund receives
(c) From the General Fund FY 2012 budget

Keeley, J.E., M. Baer-Keeley, and C.J. Fotheringham (eds). 2000.
2nd Interface Between Ecology and Land Development in California.
U.S. Geological Survey Open-File Report 00-62.

Alien Species in the Flora and Vegetation of the Santa Monica Mountains, California: Patterns, Processes, and Management Implications

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Abstract. Naturalized alien species make up 26.8% of the flora of the Santa Monica Mountains, a level higher than that for California as a whole. Monocotyledonae, particular grasses, are a significant component of this high occurrence of alien species. The largest numbers of aliens occurs in the Poaceae (56 alien species), Asteraceae (35), and Brassicaceae (23). Compared to the flora of natives, alien species in the Santa Monica Mountains show a high frequency (56%) of annuals, and low frequencies of woody species. Approximately half of the alien flora of the Santa Monica Mountains is restricted at the present time to strongly disturbed habitats such as roadsides, cleared land and wasteplaces. In the absence of major disturbance, mature chaparral communities are relatively free of invasive alien species, while invasive alien annual grasses may form an important element in more open coastal sage scrub. Oak woodlands and grasslands have been altered dramatically from their original structure and are dominated by annual grasses and forbs from the Mediterraean Basin. Riparian communities include more invasive alien species than any other native ecosystem, and explosive expansion of *Arundo donax* in this habitat in recent years has the potential to dramatically alter their structure and biodiversity. Coastal and salt marsh habitats also harbor many aggressive invaders. The management and control of invasive alien species in the Santa Monica Mountains and elsewhere in California presents a critical issue of resource management for the future.

Keywords: California grasslands; chaparral; invasibility; invasive species; Mediterranean-climate.

Invasive Alien Plants in Mediterranean-Climate Ecosystems

Invasions of alien species into mediterranean-climate regions throughout the world have become a problem of increasing environmental focus and concern (Mooney and Drake 1986; Kruger et al. 1989; di Castri et al. 1990; Groves 1991; Rundel 1998; Rundel et al. 1998). While thousands of alien plant species have been planted horticulturally in each region, only about 10% of these have become naturalized. About 1% of these introductions have become invasive with respect to becoming established in native plant communities.

Comparative studies of alien plant species that have become naturalized within the five mediterranean-climate regions have provided important lessons for resource management because of the similarities of the physical environment of these ecosystems and the common phylogenetic origin of many of the problem weeds. While the compositions of invasive alien plant species within each of these regions show patterns related to the history of human colonization, the nature of settlement patterns, and the nature of trade routes for agricultural and livestock products, there is a strong predominance of European species in these invasive floras. This pattern applies even within the Mediterranean Basin itself, where more than half of the introduced flora of the western Mediterranean comes either from northern Europe or from other areas of the Mediterranean Basin (Guillerm et al. 1990). Moreover, there is a surprising dominance of species of four families in invasive alien floras of mediterranean-climate regions — Poaceae, Asteraceae, Brassicaceae, and Fabaceae.

Patterns of Life History in Invasive Species

There are two features of mediterranean-climate ecosystems that have been hypothesized to be significant in promoting the invasion of alien plant species (Groves 1991). The first of these is the nature of open habitats available for colonization with the first autumn rains falling after a long summer drought. The majority of herbaceous invaders in Mediterranean-type ecosystems effectively invade such habitats by responding rapidly with germination from soil seed pools once adequate moisture conditions occur and temperatures are suitable. While dormancy mechanisms are often present, these are only suf-

ficient to maintain dormancy from the time of seed maturation in late spring to the onset of rains in autumn.

The second important component of the invasion of alien annuals species in mediterranean-type ecosystems is the evolutionary origin of many of these species under a long history of human disturbance in the Mediterranean Basin (Le Houérou 1981). As human populations in this region slowly developed large population centers and agricultural economies over a period of thousands of years, there was a natural selection process for biological attributes in weedy species that could adapt to such conditions. Annual cultivation for cropping, grazing, deforestation, and changing frequencies and intensities of fire all introduced selective forces on the life history attributes of native grasses and forbs.

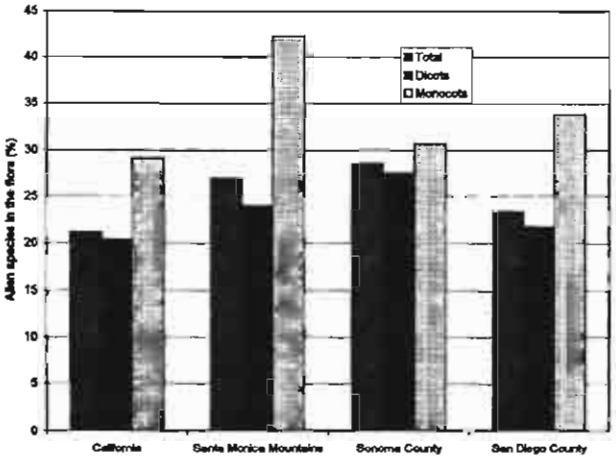

Figure 1. Relative frequencies of naturalized alien species in the total flora of California and within regional areas of the Santa Monica Mountains, Sonoma County and San Diego County. Data from Hickman (1993), Raven et al. (1986), Best et al. (1996), and Beauchamp (1986).

Naturalized Alien Species in the Flora of the Santa Monica Mountains

The flora of the Santa Monica Mountains in southern California includes 640 native species of vascular plants plus an additional 234 alien species that have become naturalized (Raven et al. 1986). Aliens, therefore, form 26.8% of the total flora. These aliens are largely species native to other mediterranean-climate regions, although this total includes a few naturalized species that are native to other parts of California (e.g., *Romneya coulteri*). This proportion of aliens can be compared (Fig. 1) with the flora of Sonoma County with 28.5% aliens (Best et al. 1996), San Diego County with 23.4% aliens (Beauchamp 1986), and all of California with 21.1% aliens (Hickman 1993). Considering alien species of Dicotyledonae and Monocotyledonae separately, the Santa Monica Mountains are notable in comparison to these other areas in the large proportion of aliens (42%) among monocots (Fig.1). In evaluating these numbers, it is important to remember that there has been a sharp increase in the number of alien species naturalized in California over the past two centuries (Frenkel 1970). Future surveys will undoubtedly add to this list of aliens for the Santa Monica Mountains and other areas. Rejmanek and Randall (1994) have recently published a thorough summary of invasive alien plants in California.

Nearly 60% of the alien species in the Santa Monica Mountains are members of just five families (Table 1). The greatest number of alien species is found in the Poaceae with 56 species (57% of all Poaceae), followed by the Asteraceae with 35 species (27 % of all Asteraceae), the Brassicaceae with 23 species (53% of all Brassicaceae), the Chenopodiaceae with 13 species (46% of all Chenopodiaceae), and the Fabaceae with 12 species (21.0% of all Fabaceae). Alien species are notably few or absent in a number of the largest families in the flora of the Santa Monica Mountains — the Onagraceae (no

Table 1. Distribution of naturalized alien species within important families in the flora of the Santa Monica Mountains. Families are arranged in order of the number of native species. Data from Raven et al. (1986).

Family	Total species	Native species	Alien species	Percent aliens
Largest Families				
Asteraceae	131	97	35	26.7
Poaceae	98	42	56	57.1
Fabaceae	57	45	12	21.0
Scrophulariaceae	36	33	3	8.3
Onagraceae	22	22	0	0.0
Brassicaceae	43	20	23	53.4
Hydrophyllaceae	21	21	0	0.0
Cyperaceae	21	19	2	9.5
Polygonaceae	25	18	7	28.0
Apiaceae	24	16	8	33.3
Other families				
Chenopodiaceae	28	15	13	46.4
Solanaceae	14	5	9	64.2
Total flora	874	640	234	26.8

aliens), Hydrophyllaceae (no aliens), Scrophulariaceae (3 alien species), and Cyperaceae (2 alien species; Table 1).

The relative distribution of naturalized alien species among plant life-forms compared to the distribution within native species shows distinct patterns of difference (Fig. 2). Annuals make up 56% of alien species, compared to only 36% of natives. While the relative frequencies of herbaceous perennials are similar in the two groups, with 38% and 35% respectively, there are very few subshrubs and shrubs among aliens in the Santa Monica Mountains.

Alien Species in Ecosystems of the Santa Monica Mountains

Natural ecosystems in the Santa Monica Mountains, as in other areas of southern California, have experienced changing forms and levels of disturbance associated with human settlement. Such impacts begin with indigenous populations several thousand years ago (Anderson 1993). The nature and extent of human disturbance, however, has accelerated over the past 150 years. Some ecosystems have remained relatively pristine in their floristic composition and vegetation composition, while the structure and diversity of others have been strongly affected by human activities. Almost invariably, strong anthropogenic disturbance since European settlement has been associated with an increasing number and dominance of invasive alien species in native communities.

Highly disturbed habitats

Distinctive assemblages of alien species and a few weedy natives characterize highly disturbed habitats in California along roads and trails in vacant parcels of land that have been cleared. Frenkel (1970) has broadly discussed the floristic composition of roadside vegetation in

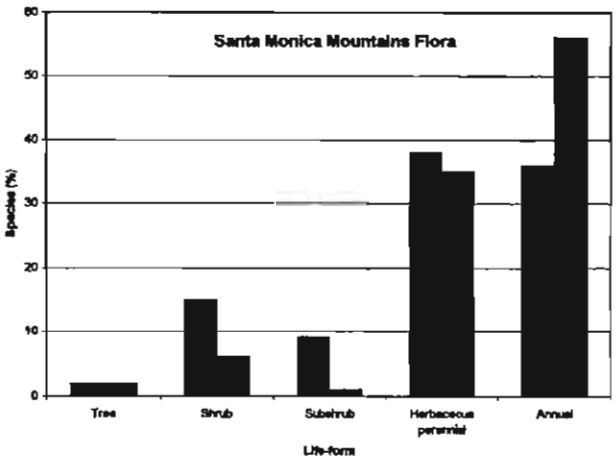

Figure 2. Relative distribution of naturalized alien species among five life-forms in the flora of the Santa Monica Mountains. Data adapted from Raven et al. (1986).

California, and Vessel and Wong (1987) have described the natural history and ecology of vacant lots in the state.

As in other parts of Califonia and mediterranean-climate regions throughout the world (Rundel et al. 1998), there is a strong correlation between the occurrence of alien species in the Santa Monica Mountains and landscape disturbance. More than half of the alien species in the Santa Monica Mountains are weedy taxa strongly associated with disturbed habitats such as roadsides, trails, cleared areas, and wasteplaces. These species have not invaded semi-natural plant communities to any significant extent nor become aggressive outside of highly disturbed habitats of this type. Requirements for disturbed soil microenvironments, low competition, or high microhabitat availability for water or nutrient resources are the likely primary causes of this pattern of limited distribution. Nevertheless, there is potential for some of these species to become more invasive in the future, particularly if seed dispersal more than microhabitat is a factor in distribution.

Chaparral and coastal sage scrub

Mature chaparral ecosystems in the Santa Monica Mountains are remarkably free of alien species in the absence of major anthropogenic disturbance. Only 19 alien species are commonly associated with chaparral (Fig. 3). And the majority of these are generalist annuals that become briefly established on open sites in the first few years after fire. Examples of such species include *Hypochaeris glabra* (Asteraceae), *Brassica nigra*, *Lepidium virginicum*, *Sisymbrium altis* and *S. officinale* (Brassicaceae), *Stellaria media* (Caryophyllaceae), *Erodium cicutarium* (Geraniaceae), and *Bromus diandrus*, *B. hordaceus* and *B. madritensis* (Poaceae). Unlike the situation with native post-fire annuals, soil seed pools of alien annuals typically do not survive fires and thus these species become established through seed dispersal from populations outside burned areas. As a result, open areas created by chaparral fires are invaded less strongly by aliens than are chaparral areas cleared or disturbed in other manners. Recent studies of post-fire aerial spraying of seeds of both native and alien species in the Santa Monica Mountains have shown relatively insignificant establishment compared to native regeneration (Keeley 1996).

Woody aliens in chaparral are rare in southern California, although these may be aggressive invaders in more mesic conditions in northern and central parts of the state. There are local areas in the Santa Monica Mountains, as in Cold Creek Canyon, where Spanish broom (*Spartium junceum*; Fabaceae), has become established on disturbed chaparral sites. This species should be monitored for possible expansion of its range outside of these local areas, as it is known to be an aggressive invader with the potential to reduce community diversity in grasslands and shrublands (Chiarucci et al. 1995). As a legume with ni-

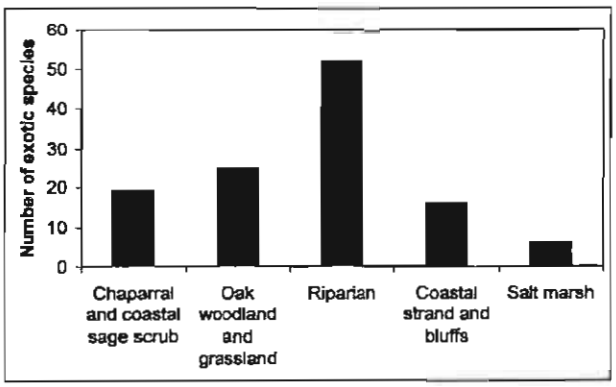

Figure 3. Numbers of naturalized alien species commonly associated with native plant communities in the Santa Monica Mountains. Data from Raven et al. (1986) and personal observations.

trogen-fixing root nodules, *S. junceum* has the potential to significantly alter soil nutrient characteristics beneath its canopy and thereby provide favorable habitat for alien herb species (Maron and Connors 1996). A related species of legume, *Cytisus scoparius*, has become an invasive problem in shrublands of northern California (Bossard and Rejmanek 1994)

The South American wild tree tobacco, *Nicotiana glauca* (Solanaceae), has become widely established on landslide slopes and roadsides in many chaparral areas of the Santa Monica Mountains, but has not to date become a problem in mature chaparral. It has become invasive in riparian habitats, however, as described below. Tree-of-heaven, *Ailanthus altissima* (Simaroubaceae), was brought to California from Asia more than a century ago by Chinese laborers, and has become locally established at a number of sites along north slopes of the Santa Monica Mountains. This tree has the potential to become an increasingly aggressive invader on moist chaparral slopes and riparian corridors.

The open stand structure and light penetration to the ground surface in coastal sage scrub communities makes these more invasible to alien species than chaparral. Most of the same annual invaders described above for chaparral may also be found in open areas of coastal sage scrub, particularly in areas subject to habitat disturbance of any kind. Moreover, alien annuals in these stands may serve as sources for seed distribution to adjacent chaparral stands following fires in the former. Alien annual grasses in coastal sage scrub also inhibit regeneration of native shrub species by competing for soil moisture, thereby promoting a slow conversion from shrubland to grassland (Zink et al. 1995; Eliason and Allen 1997).

Oak woodland and grasslands

The most dramatic example of altered ecosystem structure in California following disturbance has occurred with the oak woodlands and grasslands of the state. These communities have become totally modified from a system largely dominated by native perennial grasses to one in which introduced European annual grasses and forbs provide almost all of the herbaceous plant cover (Heady 1977; Huennecke and Mooney 1989). The sources of these invaders are reasonably well documented, with both deliberate and accidental introductions involved (Mooney et al. 1986; Rejmanek et al. 1991). Flexible life-history characteristics with high reproductive effort, low root to shoot ratios, and large seed banks have pre-adapted these species to habitats with strong grazing pressure and frequent human disturbance (Jackson 1985; Maranon and Bartolome 1993). It is interesting to note that grasslands on edaphically-challenging soil substrates in California, such as serpentine-derived or heavy clay soils, retain a dominance of native annuals and herbaceous perennials, indicating that the widespread introduced annuals are not as competitive in these habitats. Species diversities of native grasslands are commonly higher than those of grasslands dominated by introduced species.

There have been a number of studies establishing the manner in which changes from dominance by perennial bunchgrasses to alien annual grasses have affected woodland and grassland ecosystems in California. One major impact has been changing soil moisture regimes that alter the patterns of seasonal soil water availability (Holmes and Rice 1996). Alien annual species compete strongly with oak seedlings for soil moisture in surface horizons, thereby affecting population dynamics of tree establishment (Bicak and Sternberg 1993; Gordon and Rice 1993).

There seems no question that past and ongoing anthropogenic disturbance has been a factor in allowing invasions of Mediterranean grasses and forbs into Californian woodlands and grasslands (Heady 1977; Huennecke and Mooney 1989; Stromberg and Griffin 1996). Although some disturbance regimes are less damaging to native species than others, almost all forms of disturbance ultimately favor aliens over native species (Kotanen 1997). Management strategies to increase populations of native bunchgrasses and forbs in these habitats have typically involved reducing or eliminating such disturbances, especially from grazing and agricultural activities. Nevertheless, disturbance regimes are important for the persistence of many native grassland species (Schiffman 1994; Kotanen 1997). While it has long been assumed that species-rich communities of native grasslands are less invasible than low diversity communities (Rejmanek 1993), this generalization may not always be true (Robinson et al. 1995). While many of the dominant alien grasses in grassland communities today will likely always be parts of these ecosystems, newer invaders are cause for concern. Star thistle (*Centaurea solstitalis;* Asteraceae) has become increasingly invasive in recent years, presenting serious problems for control (Roche et al. 1994).

Riparian habitats

Riparian communities and associated wetland habitats make up less than 1% of the land area of the Santa Monica Mountains of Southern California, but surprisingly are the primary habitat for 20% of the native flora (Rundel and Sturmer 1998). This remarkable biodiversity is consistent with that found in other riparian communities. Riparian habitats form unusually dynamic ecosystems in southern California. These areas are subject to impacts of fluvial disturbances from flooding and associated sediment deposition and/or erosion, as well as nonfluvial impacts from adjacent upland areas in the form of fire, landslides, and other alterations to their physical structure.

More than fifty species of aliens may be found in riparian corridors of the Santa Monica Mountains, nearly half of all alien species in the region. These species include some strongly aggressive invaders that have the potential to dramatically impact the structure and biodiversity of riparian ecosystems. The species of greatest concern among these is *Arundo donax* (Poaceae), the giant reed. This bamboo-like grass of European origin has rapidly expanded its distribution and abundance in the Santa Monica Mountains in recent years. *Arundo* is thought to lack functional sexual reproduction in our area, but instead spreads readily by vegetative propagation from stem or root fragments. Once established in a watershev$ it expands its range rapidly following disturbance associated with strong hydrological flow in streams and creeks.

There are two primary ways in which the spread of *Arundo donax* can affect the structure and diversity of riparian communities. Thick stands of *Arundo* crowd out and shade native riparian species, particularly keystone woody species such as sycamores, willows, and alders. Such *Arundo* stands also provide a large biomass of highly flammable plant material. Under these conditions, chaparral fires, which commonly jump over or stop along riparian corridors, will burn intensely through these areas, seriously weakening or killing native species. *Arundo*, however, readily resprouts after fire to regain and expand its previous dominance.

Several other woody plant species may become locally abundant invaders in riparian habitats in the Santa Monica Mountains. *Ricinus communis* (Euphorbiaceae), the castor bean, forms dense thickets along both small runoff channels and larger streams such as Malibu Creek. These thickets often crowd out competing native species, but seem to be associated primarily with areas of heavy site disturbance. *Ageratina adenophora* (Asteraceae), an escapee from gardens, has become widely established in riparian corridors in the eastern third of the Santa Monica Mountains from Pacific Palisades to Griffith Park. It frequently forms the dominant understory shrub in shaded sites under the canopies of native tree species. *Nicotiana glauca* is often locally abundant in riparian habitats where disturbance has occurred. This species forms dense monospecific stands in disturbed flood plains in other areas of riparian habitat in southern California and northwestern Baja California, suggesting that it may become increasingly invasive along some of the larger streams such as Topanga and Malibu Creeks in the Santa Monica Mountains. *Ailanthus altissima* is locally established in riparian habitats of the mountains, and also has the potential to become much more aggressive.

One herbaceous species, the milk thistle *Silybum marianum* (Asteraceae), has become established in a number of riparian habitats and may become an aggressive weedy invader with strongly negative impacts on native species. The biology and life history of this and other invasive thistle species has been described in some detail (Gabay et al. 1994; Bruzzese 1996; Sheppard 1996). The bull thistle, *Cirsium vulgare* (Asteraceae), has been shown to competitively suppress the growth of adjacent tree seedlings (Randall and Rejmanek 1993).

Coastal dunes and bluffs

The structure and function of coastal dune and bluff communities in many parts of central and northern of California have been dramatically changed by the introduction of invasive alien species. The most significant change has resulted from the widespread introduction of *Ammophila arenaria* (Poaceae) from Europe for dune control. This aggressive species changes the nature and structure of the dunes through geomorphic impacts on dune stability and by the shading out of native species (Buell et al. 1995). Once established, it is very difficult to remove. *Carpobrotus edulis* (Aizoaceae) from South Africa, originally planted for dune cover and erosion control along the coast, also has become a widespread invader, crowding out native species (D'Antonio 1993; D'Antonio et al. 1993).

Ammophila and *Carpobrotus* have not had a significant impact in the Santa Monica Mountains where the relative paucity of dune areas and sandy soils limits their spread. *Carpobrotus chilensis*, *C. edulis*, *Mesembryanthemum crystallinum* (Aizoaceae), and *Cakile maritima* (Brassicaceae) are all well-established invaders on coastal dunes and beaches. Patterns of extensive disturbance of coastal bluffs have led to herbaceous communities in which aliens commonly outnumber native species.

Pampas grass, *Cortaderia atacamensis* (Poaceae), has become locally established along the Malibu Coast in areas with seepage, and has the potential to become a serious invader as it is along large areas of the central California coast. Similarly, fountain grass (*Pennisetum setaceum;* Poaceae) may be a serious problem as well in these habitats.

Salt marsh

Although salt marsh habitats at Point Mugu and Malibu Lagoon in the Santa Monica Mountains have retained a dominance of native perennial species, the largest portions of the total floras of these areas are composed of alien species. Approximately 60% of the vascular plant species sampled in transect studies carried out at Malibu Lagoon were aliens (Manion and Dillingham 1989). Many of these aliens, however, are associated with disturbed upland sites with relatively low soil salinity. Kuhn and Zedler (1997) have investigated the differential effects of salinity and soil saturation on native and alien plants in a coastal salt marsh further south in southern California. They found that although *Polypogon monspeliensis* (Poaceae) was an aggressive invader of salt marshes where salinity was reduced by urban runoff or unwanted freshwater inflows, this species grew poorly at higher salinities that were readily tolerated by native species. Invasions of *Spartina alterniflora* (Poaceae), a major problem in northern California, have not occurred along the Malibu Coast, perhaps because of a paucity of suitable habitats.

Aliens that have not naturalized

In considering the large number of alien species in the Santa Monica Mountains, and in particular those that are highly invasive, it is worth noting a number of species that have not become established. *Acacia cyclops*, *Pinus halapensis*, and P. *radiata*, for example, are all widely planted in the area but do not seem to have become naturalized. These species are highly invasive in other mediterranean-climate regions (Kruger et al. 1989).

Resource Management for the Future

There can be no simple recommendation for resource management responses to problems of alien species invasions in the Santa Monica Mountains. With limited resources available, it is difficult to know how such resources should be best utilized with our limited present knowledge. Oak woodlands and grasslands appear to be permanently altered to a dominance of alien annual species, with little practical hope of restoring these communities to their natural state. Nevertheless, there is a need for management policies to protect rare and endangered native species within these habitats, and native bunchgrass communities can be maintained on low nutrient or eroded sites. Some species such as *Arundo donax* are expanding explosively and present a difficult but important problem for control. Other potentially invasive species need careful monitoring or control before they become a serious management problem.

Three critical questions that are now being addressed broadly by researchers with respect to invasive species deserve careful study.

1. Which species make good invaders? While we know something about the life history characteristics of many invasive species, we are only now beginning to be able to predict potential future problems of this nature (Tucker and Richardson 1995; Reichard and Hamilton 1997; Rejmanek and Richardson 1996).
2. Which communities are most easily invaded? It is clear in California and throughout the world that some ecological communities are far more easily invaded by others, but we still do not understand the nature of competitive interactions and life-history characteristics that allows this to occur (Perrins et al. 1992; Rejmanek 1993; Planty-Tabacchi et al. 1996).
3. What will be the rate of spread of invading species? New advances in demographic modeling are allowing a greatly improved basis for making predictions for the rate of spread of newly invasive species (Andow et al. 1993; Shigesada and Kawasaki 1997). Such a capability will be critical to effective resource mangement policies in the future.

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GROUNDWATER AND SURFACE WATER CONDITIONS REPORT - 2011

United Water Conservation District
Open-File Report 2012-02

PREPARED BY

GROUNDWATER RESOURCES DEPARTMENT
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GROUNDWATER AND SURFACE WATER CONDITIONS REPORT - 2011

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Open-File Report 2012-02

Groundwater Resources Department
May 2012

THIS REPORT IS PRELIMINARY AND IS SUBJECT TO MODIFICATION

BASED UPON FUTURE ANALYSIS AND EVALUATION

Cover Photo: Recharge basin at El Rio Spreading Grounds, February 2011. By John Carman

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GROUNDWATER AND SURFACE WATER CONDITIONS REPORT - 2011

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EXECUTIVE SUMMARY / ABSTRACT

United Water Conservation District is a public agency that encompasses nearly 213,000 acres of central and southern Ventura County. The District covers the downstream (Ventura County) portion of the valley of the Santa Clara River, as well as the Oxnard Plain. The District serves as the steward for managing the surface water and groundwater resources within all or portions of eight groundwater basins. This report includes data and records from the 2011 calendar year, including basic information and discussion on the operation of the District's facilities, weather and hydrologic information, groundwater levels and available storage within the basins, and the quality of surface water and groundwater.

Major water resource issues and concerns are the driving impetus for the District's projects and programs. Projects and programs are implemented to manage, mitigate, or eliminate those issues or concerns that threaten the water resources. Those issues and concerns include, but are certainly not limited to, groundwater overdraft and the intrusion of saline water in the Oxnard Plain and Pleasant Valley basins, the gradual, long-term declining water levels in the Santa Paula Basin, water quality of the Oxnard Forebay basin and the Piru basin, and concerns related to the management of the Piru and Fillmore basin water resources.

To address those issues and concerns, United implements a wide variety of activities. Some of the activities are District-wide, for example: water levels are monitored in an extensive network of water wells thorough the District and a significant number of these wells are sampled as a part of a water quality monitoring program. In addition, stream gauging is performed periodically to quantify surface water volumes and flow rates under various hydrologic conditions. These data are important to United's habitat conservation efforts and the facilitation of fish passage at the Vern Freeman Diversion, as well as optimizing various District operations (e.g., annual conservation release, diversion of water to recharge basins or for use in-lieu of groundwater pumping by agricultural operations on the Oxnard Plain and in Pleasant Valley basin). Currently, the largest District-wide project underway by the groundwater department is the update of the Ventura County Regional Groundwater Flow Model. This is a multi-year, multi-faceted project that requires the expertise of several groundwater science specialties and relies on the District's long record of water-level, water quality, and stream gauging data. When completed, the groundwater flow model will be a primary evaluative tool for various proposed water management scenarios and will assist stakeholders with enhancing the sustainability and reliability of local water resources.

Issue-specific projects are also implemented by United to assist local stakeholders in the management of local water resources (e.g., AB3030 Piru/Fillmore Groundwater Management Plan, analyses of groundwater conditions in the Santa Paula basin as a part of the Technical Advisory Committee) or the pursuit of grant funds (e.g., Local Groundwater Assistance Program grants from CA Department of Water Resources, Fox Canyon Groundwater Management Agency Groundwater

Supply Enhancement Assistance Program) to help defray the costs of some of the groundwater projects.

The benefits of the surface water and groundwater projects and programs operated by United are shared by the many groundwater pumping entities in the District and those who receive those waters. Many of the benefits are in the background and not readily recognized or apparent to individual water users, however, the positive impacts of the District's activities are significant to the agricultural, municipal, and industrial economies of Ventura County.

1 INTRODUCTION AND BACKGROUND

United Water Conservation District (also "United" or "District") is a public agency that encompasses nearly 213,000 acres of central and southern Ventura County. The District covers the downstream (Ventura County) portion of the valley of the Santa Clara River, as well as the Oxnard Plain. The District serves as a steward for managing the surface water and groundwater resources for all or portions of eight groundwater basins (Figure 1-1). It is governed by a seven-person board of directors elected by division, and receives revenue from property taxes, groundwater extraction (pump) charges, recreation fees, and water delivery charges. The developed areas of the District are a mix of agriculture and urban areas, with prime agricultural land supporting high-dollar crops such as avocados, berries, row crops, tomatoes, lemons, oranges, flowers and ornamental nursery stock. Approximately 370,000 people live within the District boundaries, including those living in the cities of Oxnard, Port Hueneme, Santa Paula, Fillmore and eastern Ventura.

The District is authorized under its principal act (California Water Code Section 74000 et seq) to exercise multiple powers. These powers include the authority to conduct water resource investigations, acquire water rights, build facilities to store and recharge water, construct wells and pipelines for water deliveries, commence actions involving water rights and water use, prevent interference with or diminution of stream/river flows and their associated natural subterranean supply of water, and to acquire and operate recreational facilities in connection with dams, reservoirs or other District works.

This report includes general information about the District's mission and detailed data on the operation of the District's facilities, weather and hydrologic information for the past year, groundwater levels and storage within the basins, and the quality of the surface water and groundwater. Recent and current studies and investigations conducted by the District's Groundwater Department are also detailed.

1.1 UWCD MISSION STATEMENT AND GOALS

The District's mission statement is:

United Water Conservation District shall manage, protect, conserve, and enhance the water resources of the Santa Clara River, its tributaries and associated aquifers, in the most cost-effective and environmentally balanced manner.

In order to accomplish this mission, United Water Conservation District follows these guiding principles:

- Construct, operate, and maintain facilities needed now and in the future to put local and imported water resources to optimum beneficial use;

- Deliver safe and reliable drinking water that meets current and future health standards to cities and urban areas;
- Provide an adequate and economical water supply to support a viable and productive agricultural sector;
- Fight overdraft and seawater intrusion and enhance the water quality of the aquifers through the use of District programs;
- Monitor water conditions to detect and guard against problems and to report those conditions to the public;
- Seek opportunities to develop cooperative programs with other agencies in order to maximize use of District resources and promote mutually beneficial projects;
- Acquire and operate high-quality public recreational facilities that are financially self-supporting;
- Balance District operations with environmental needs to maximize use of the region's water resources; and
- Conduct District affairs in a business-like manner that promotes safe investment policy, sound financial audits and the utmost in professional and financial integrity.

The District recognizes that many of the projects and activities required to implement these guiding principles have long timelines for development and initiation, and the positive impacts of these projects and activities may be realized over many years. This is consistent with the District's mission to provide for the long-term health of the water resources within the District. To fulfill its mission, the District retains technical experts in the fields of engineering, hydrogeology, surface water hydrology, environmental science, biology, and regulatory compliance, as well as administrative personnel with specialties in accounting and finance.

1.2 UWCD HISTORY

The original founding organization for United Water Conservation District was called the Santa Clara River Protective Association. It was formed in 1925 to protect the runoff of the Santa Clara River from being appropriated and exported outside the watershed. The Santa Clara Water Conservation District was formed in 1927 to further the goals of the Association by protecting water rights and conserving the waters of the Santa Clara River and its tributaries. The District began a systematic program of groundwater recharge in 1928, primarily through constructing spreading grounds along the Santa Clara River. Sand dikes were constructed on the Santa Clara River near Saticoy to divert river water into spreading grounds in nearby upland areas.

As seawater intrusion on the Oxnard Plain was recognized in the 1940s, it was clear that the District did not have the financial ability to raise money to construct the facilities necessary to combat the problem. With the help of the City of Oxnard, a new district was organized in 1950 under the Water

Conservation District Law of 1931. The new district was called United Water Conservation District for its unification of urban and agricultural concerns. United Water then constructed a number of water conservation projects, including:

- Santa Felicia Dam (1955) to capture and store winter runoff on Piru Creek to release in controlled amounts during the dry season. The 200-foot high dam can currently store about 82,300 acre-feet (AF) in Lake Piru. The reservoir is located downstream of a State Water Project reservoir, enabling the District to receive Northern California water via flows down middle Piru Creek without the construction of expensive delivery pipelines;
- A pipeline to new spreading grounds at El Rio; and
- Wells at the El Rio spreading grounds to produce water for the Oxnard-Hueneme (O-H) pipeline (1954) that supplies drinking water to the cities of Oxnard and Port Hueneme, a number of mutual water companies, and the two Navy bases at the coast. The O-H system supplies water from the Oxnard Forebay basin (the recharge area for the Oxnard Plain basin), rather than pumping individual wells in coastal areas of the Oxnard Plain that could accelerate seawater intrusion.

Following increasing intrusion of seawater from the 1950s to the 1980s, United Water built several new facilities to increase recharge to the aquifers and to decrease groundwater pumping in areas affected by the intrusion. These facilities provide both direct present benefit, and long-term benefits, to the groundwater aquifers and to the groundwater extractors in the District. In 1958 a pipeline was completed to deliver diverted surface water to Pleasant Valley County Water District, which serves agricultural water to the Pleasant Valley basin. The Pumping Trough Pipeline (PTP) was constructed in 1986 to convey diverted river water to agricultural pumpers on the Oxnard Plain, thus reducing the amount of groundwater pumping in critical areas. The Freeman Diversion (1991) replaced the temporary diversion dikes in the Santa Clara River with a permanent concrete structure, allowing diversion of storm flows throughout the winter. A major additional benefit of the Freeman Diversion was the stabilization of riverbed elevations upstream of the facility, correcting the long-term incision of the river related to decades of in-channel gravel mining in the Saticoy vicinity.

Following the construction of the Freeman Diversion, the Noble spreading basins (1995) were constructed to store and recharge additional river water, particularly during wet periods. The Saticoy well field was constructed in 2003 to pump down the groundwater mound that develops beneath the Saticoy spreading grounds during periods of heavy spreading. In late 2009 United acquired the Ferro and Rose basins, former mining pits located in the Oxnard Forebay that will be used for future groundwater recharge activities. United intends to construct facilities to convey Santa Clara River water diverted at the Freeman Diversion to these basins. An additional use for the Ferro basin under consideration is the recharge of recycled water sourcing from the City of Ventura (Carollo Engineers, 2010) or the City of Oxnard. United anticipated that the City of Ventura might desire to move recycled water to the District's recharge basins (or alternatively, potable water

from the Forebay to east Ventura) in the future and arranged for “pipe hangers” to be added to the Highway 118 bridge over the Santa Clara River during its reconstruction in 1993.

1.3 UWCD ORGANIZATION

The District is governed by a seven-person board of directors elected by division, and receives revenue from property taxes, groundwater extraction (pump) charges, recreation fees, and water delivery charges.

1.4 UWCD OPERATIONS AND FACILITIES

United Water Conservation District operates a series of water conservation facilities from the tributaries of the Santa Clara River to the Oxnard Plain and Pleasant Valley (Figure 1-1). These facilities store winter runoff for later release during the dry season, divert water from the Santa Clara River, recharge the aquifers through spreading basins, and deliver surface water and groundwater to cities and growers so that groundwater pumping is reduced in critically overdrafted areas.

1.4.1 SANTA FELICIA DAM AND LAKE PIRU

Santa Felicia Dam was constructed in 1955 for the conservation of runoff on Piru Creek. The main function of the dam is to retain the high flows in Piru Creek during the winter and spring months, and release the stored water in the fall when the downstream basins and the facilities at the Freeman Diversion have the capability to receive the most benefit from the release. The current capacity of the dam is 82,300 AF (See Figure 1.4-1 for storage history). The operational minimum pool is set at 20,000 AF of storage.

The 2010 conservation release reduced the storage volume down to the minimum pool of 20,000 AF. An early rain in December 2010 brought the lake up to 31,000 AF of storage by January 1, 2011. Due to the above normal rainfall in 2011, the Piru watershed produced inflows totaling 61,800 AF, approximately double the historical average. The Santa Felicia Dam is fitted with a hydro electric plant that is currently not operable although a Federal Energy Regulatory Commission (FERC) License is still required. Efforts to re-license this facility are currently underway and as part of this new license, release requirements for Santa Felicia Dam were implemented this year and are discussed in more detail in section 1.6.3.

Summary of surface water hydrology at Lake Piru:

	Calendar year 2011
Minimum Storage	31,000 AF
Maximum Storage	76,400 AF
Inflow at USGS Sta. 11109600	61,800 AF
FERC License minimum releases	4,400 AF
Conservation Release	31,700 AF
State Water (Not released)	2,520 AF

1.4.2 PIRU DIVERSION AND SPREADING GROUNDS

The Piru Diversion is operated to divert surface water into the Piru Spreading Grounds for groundwater recharge. The diversion is located on the western bank of lower Piru Creek just south of the old Center Street Bridge in the town of Piru. Part of the diversion dam is built under the two roadway bridges crossing lower Piru Creek at Center Street.

The existing diversion consists of an earthen berm that extends out across the river channel, a sluice channel that can accommodate approximately 200 cfs, and a diversion structure with a trash rack and four 24-inch inlets leading to a 48-inch diversion pipe that conveys diverted water to the spreading grounds. The structure is not in compliance with National Marine Fisheries (NMFS) standards for diverting water in a stream that may possibly contain endangered southern California steelhead. Therefore the facilities have been included as part of the Habitat Conservation Plan (HCP) so that the facility will be covered for incidental take. The diversion will not be put back into operation until a take permit has been issued.

1.4.3 FREEMAN DIVERSION AND SATICOY SPREADING GROUNDS

The Freeman Diversion is located on the Santa Clara River about 10 miles upstream from its mouth at the Pacific Ocean. The concrete diversion structure was completed in 1991 and replaced the previous diversion method of building temporary sand and gravel diversion dikes, levees, and canals. The prior method of diverting water from the Santa Clara River near Saticoy had been in practice since the 1920s. The Freeman Diversion facility replaced the former method of building temporary sand and gravel diversion dikes, levees, and canals along the Santa Clara River near Saticoy. With each high flow in the river the dikes were washed out, eliminating the ability to divert water until construction crews were able to work in the riverbed. Construction of the Freeman Diversion has increased the conservation of flood flows by extending the time each year when flows can be diverted and not discharged to the ocean. The current facility consists of the following structures: diversion structure, fish passage facilities, canal, headworks, flocculation building, and

desilting basin. A total of 92,600 acre-feet of surface water was diverted from the Santa Clara River at the Freeman Diversion in calendar year 2011.

The diversion is operated to redirect surface water from the Santa Clara River to United's recharge basins located in Saticoy, El Rio and the Noble Basins for the purpose of recharge the aquifers underlying the Oxnard Forebay and Oxnard Plain. In 2011 a total of 71,960 AF was recharged to these basins. The remainder of the diverted water was delivered directly to agricultural users for irrigation purposes. These deliveries are designed to reduce groundwater pumping in areas where overdraft conditions and related water quality issues exist, such as where aquifers are most susceptible to saline water intrusion and the upwelling of saline waters. Water releases from Lake Piru and a portion of the natural runoff from the Santa Clara River are diverted by the Freeman Diversion.

1.4.4 EL RIO FACILITY AND SPREADING GROUNDS

The El Rio Spreading Grounds are located at the terminus of the El Rio branch of the main supply line, approximately two miles southwest of the Saticoy spreading grounds. Surface water diverted from the Santa Clara River is distributed to a series of ponds totaling approximately 80 acres for the purpose of groundwater recharge. During the 2011 water year approximately 37,850 acre-feet of surface water was routed to the El Rio Spreading Grounds and recharged to the Oxnard Forebay groundwater basin.

1.4.5 MUNICIPAL WATER DELIVERIES

United built the Oxnard-Hueneme (O-H) system in 1954 to move municipal groundwater extraction on the Oxnard Plain away from coastal areas subject to seawater intrusion. The well field for the O-H system surrounds the El Rio recharge basins, and water produced by the well field is a blend of recharge water that has filtered down through the aquifer, and water drawn laterally from surrounding areas. The El Rio well field includes both upper and lower aquifer wells, allowing a blending of sources for water quality purposes. In practice, the Lower Aquifer System (LAS) wells are rarely used. Water deliveries on the Oxnard-Hueneme Pipeline totaled 10,750 acre-feet for the 2011 calendar year, some 27,100 AF less than the volume of water that was spread in the nearby El Rio recharge basins over the same time frame.

The California Department of Health Services requires the publication of an annual water quality summary of water delivered by the O-H system. The 2011 Consumer Confidence Report for the O-H water delivery system is included in Appendix A. The O-H delivery system is operated as an enterprise fund, with water rates supporting operation and improvements to the system. Major customers include the City of Oxnard, the Port Hueneme Water Agency, and a number of mutual water companies in the Oxnard Forebay and the northern Oxnard Plain.

1.4.6 AGRICULTURAL WATER DELIVERIES

Water deliveries for agricultural purposes are achieved through two systems, the Pumping Trough Pipeline (PTP) System and the Pleasant Valley Delivery System. These systems are discussed separately in the following two subsections. See Figure 1-1 for locations.

1.4.6.1 PTP DELIVERY SYSTEM

The Pumping Trough Pipeline (PTP) delivery system was designed to serve surface water from the Santa Clara River to a portion of the Oxnard Plain where the Upper Aquifer System was determined to be in severe overdraft. Five Lower Aquifer System wells were constructed along the pipeline to provide additional water to the system when surface water supplies are incapable of meeting demand. During the 2011 calendar year a large conservation release from Lake Piru and greater-than-average flow in the Santa Clara River allowed 90 percent of the demand on the PTP to be met with surface water supplies (Table 1.4-2). Surface water deliveries to this system totaled 7,629 AF in the 2011 calendar year. The four UAS wells of the Saticoy well field, completed in 2004, can also provide groundwater to the agricultural pipelines when groundwater elevations are high near the Saticoy Spreading Grounds. The Saticoy well field pumped a total of 737 AF in calendar year 2011, and 261 AF this water was distributed to the PTP delivery system.

1.4.6.2 PLEASANT VALLEY DELIVERY SYSTEM

Water diverted from the Santa Clara River is delivered to the Pleasant Valley County Water District (PVCWD) via the Pleasant Valley Pipeline. The pipeline terminates at the Pleasant Valley Reservoir, located east of the Camarillo Airport near the City of Camarillo. PVCWD operates the reservoir and eleven LAS wells in the western Pleasant Valley basin, supplying water to agricultural customers via a delivery system linking the wells and the reservoir. The delivery of diverted river water to PVCWD offsets pumping of irrigation wells in the area. Surface water deliveries to PVCWD totaled 12,189 AF in the 2011 calendar year, and an additional 476 AF of water was supplied by the Saticoy well field. Deliveries in 2011 were about 1,300 AF greater than the average annual (water year) delivery since the completion of the Freeman Diversion in 1991. Since 2002 PVCWD has also received surface water from the Conejo Creek Diversion, operated by Camrosa Water District. In 2011 PVCWD received 6,657 AF of surface water from that source. Water year 2011 deliveries to the Pumping Trough and Pleasant Valley pipelines are shown in Figure 1.4-2.

1.5 GROUNDWATER ISSUES AND CONCERNS

United's core mission is to manage, conserve and protect the water resources that exist within the District boundaries. United operates Santa Felicia Dam and maintains contractual arrangements with a number of upstream agencies to store or convey surface runoff to the lower portions of the Santa Clara River watershed. United does not regulate the use of groundwater within the District, but operates a number of facilities intended to maximize the conjunctive use of surface water and

groundwater resources. Aside from United's annual State Water imports of up to 3,150 acre-feet, the lower valley of the Santa Clara River is wholly dependent on local water resources for irrigation and potable supply, an uncommon arrangement in southern California.

Despite long-term efforts to import more water to the District and optimize the use of local resources, water deficits exist in a number of areas throughout the District. In some places the depletion of groundwater reserves has simply resulted in lowered water tables. In other places significant water quality problems developed in response to conditions of overdraft. In some areas water quality problems are related to land use practices, or exist naturally.

Listed below are summaries of several of the water supply and water quality issues that exist within United's district boundaries. In some cases United's involvement includes groundwater recharge or water delivery to actively address issues related to overdraft. In other cases United has conducted or sponsored research in order to better define existing problems and help identify potential physical projects or management strategies to mitigate the problem. United management and staff are knowledgeable concerning groundwater management practices and have expertise in conducting monitoring programs and with applying various methods for evaluating basin conditions (e.g., Bachman et al, 2005).

1.5.1 OVERDRAFT CONDITIONS

Although high chloride levels in groundwater was first documented near Port Hueneme in the 1930s (California Department of Water Resources [DWR], 1954), the conditions for widespread seawater intrusion in the Upper Aquifer System (UAS) on the Oxnard Plain were initiated as early as the 1940s, when groundwater levels beneath the southern portion of the Oxnard Plain basin dropped below sea level (FCGMA, 2007). Within 5 to 10 years, chloride concentrations in wells in the Port Hueneme area started to increase rapidly. At that time, seawater had only affected a few wells in the Port Hueneme area, encompassing an area less than one square mile. Overdraft conditions were recognized in the Lower Aquifer System (LAS) in the late 1980s after the impairment of water quality in the Upper Aquifer System led to the implementation of a Fox Canyon Groundwater Management Agency (FCGMA) strategy to require new or replacement wells to be drilled into the LAS to lessen pumping on the UAS. The overdraft conditions eventually expanded into the adjacent Pleasant Valley groundwater basin and resulted in up to 2.6 feet of permanent land subsidence (Hanson et al, 2003).

Overdraft conditions in the Oxnard Plain and Forebay groundwater basins continue today with the annual overdraft amount estimated to be about 20,000 to 25,000 ac-ft/yr (UWCD, 2012)

1.5.2 SALINE WATER INTRUSION

High chloride levels were first detected on the Oxnard Plain in the vicinity of the Hueneme and Mugu submarine canyons in the early 1930s (CA DWR, 1971) and became a serious concern in the

1950s. Early monitoring programs used only existing production wells and abandoned wells as monitoring points; sampling of these wells indicated that there was a widespread area of elevated chloride concentrations in the Hueneme to Mugu areas. In 1989, the U.S. Geological Survey initiated their Regional Aquifer-System Analysis (RASA) study and cooperative studies with United Water Conservation District on the Santa Clara-Calleguas groundwater basin. As part of those studies, a series of 14 nested well sites, with three or more wells installed at each site, were drilled and completed at specific depths in the Oxnard Plain basin (Densmore, 1996).

Figure 1.5-1 shows the locations of the RASA well sites on the Oxnard Plain. Prior to the RASA study, it was believed that an area of the UAS extending from approximately Channel Islands Blvd. (2 miles north of Port Hueneme) and across to the area near Hwy 1 and Nauman Road, then south to include the area underlying Point Mugu Navy base was intruded by seawater. The installation of a dedicated monitoring network and detailed chemical analysis of water samples from the new wells and other wells yielded new interpretations on the extent of seawater intrusion on the Oxnard Plain. It is now known that some areas of the southern Oxnard Plain are not intruded by seawater, and that high chloride readings from older production wells were the result of perched water leaking down failed well casings and contaminating the aquifer (Izbicki, 1992; Stamos and others, 1992; Izbicki and others, 1995; U.S. Geological Survey, 1996). Maps presented in this report delineate the approximate extent of high-chloride water at various depths on the Oxnard Plain (Section 4.3.6).

In addition to drilling the monitoring wells, the USGS conducted geophysical surveys to determine the general extent of the high-saline areas (Stamos and others, 1992; Zohdy and others, 1993). This work indicated that the high-saline areas consisted of two distinct lobes, with relatively fresh water separating the lobes (U.S. Geological Survey, 1996). These areas were resurveyed in 2010 by United (UWCD, 2012a). The lobes originally identified by the USGS form the basis of the areas of high chloride concentration shown on the maps in this report. Additional down-hole conductivity surveys by the USGS (also resurveyed recently by United) indicate that the edges of the lobes are relatively distinct, with the first saline intrusion occurring in thin individual beds of permeable sand and gravel. As intrusion continues, more individual beds are impacted, resulting in increasing chloride levels. Thus, the interpretation of high-chloride areas shown on Figure 1.5-1 and other enclosed maps combine measured concentrations from the monitoring wells, geophysical measurements, and study results about the nature of the intrusion front.

In addition, isotope studies of samples from the nested wells indicate that the cause of the elevated chloride levels varies on the Oxnard Plain (Izbicki, 1991; Izbicki, 1992; Izbicki et al, 2005a). Four major types of chloride degradation have been documented:

Lateral Seawater Intrusion - the inland movement of seawater adjacent to the Hueneme and Mugu submarine canyons;

Cross Contamination - the introduction of poor-quality water into the fresh water supply via existing wellbores that were improperly constructed, improperly destroyed, or have been corroded by poor-quality water in the Semi-Perched zone;

Salt-Laden Marine Clays - the dewatering of marine clays, interbedded within the sand and gravel-rich aquifers, yields high concentrations of chloride-enriched water. This dewatering is the result of decreased pressure in the aquifers, caused by regional pumping stresses (also see Section 1.5.4); and

Lateral Movement of Brines from Tertiary formations - the lateral movement of saline water from older geologic formations that have been uplifted by faulting. The lateral movement occurs across a buried fault face near Pt. Mugu where Tertiary rocks are in contact with the younger aquifers (also see Section 1.5.4).

Chloride degradation from each of the processes identified above is directly related to water levels in the basin. The water balance of the Oxnard Plain and the offshore component of the aquifer units is a dynamic relationship between groundwater recharge, groundwater extraction and change in aquifer storage. The primary source of groundwater recharge for the Oxnard Plain groundwater basin is the unconfined northeastern portion of this basin, known as the Oxnard Forebay (and formerly the Montalvo Basin). High water levels in the Forebay exert a positive pressure on the confined aquifers of the Oxnard Plain, and water flows from the recharge areas toward the coast (Figure 4.3-22). While the pressure exerted by high water levels in the Forebay propagates rapidly through the aquifers, the actual movement of water is very slow, approximately 3 feet per day or less in the Forebay (Izbicki et al, 1992). The pressure (piezometric) surface of the confined aquifer are diminished by the extraction of water from the system. If pressure heads at the coast fall below sea level, the lateral intrusion of seawater will occur, resulting in aquifers being recharged with seawater due to landward pressure gradients. The dewatering of marine clays will occur if heads in the surrounding sediments remain below their historic levels for prolonged periods, allowing formerly immobile salts to enter surrounding aquifer material. The slow compaction of these clays also contributes to land subsidence.

1.5.3 DECLINING WATER LEVELS

In addition to the overdraft conditions in the coastal basins discussed in previous sections, long-term declining water levels have been observed in the Santa Paula Basin. Groundwater elevations in many of the wells (43 of 57 wells) in both the eastern and western portions of the Santa Paula basin failed to fully recover to 1998 levels after near-record precipitation in 2005. This observation is consistent with an observed long-term, gradual decline in basin groundwater elevations (Santa Paula Basin Technical Advisory Committee, 2011).

An evaluation of the spatial and temporal distribution of groundwater pumping in the basin (UWCD, 2011) concluded that no significant changes in pumping locations occurred over a 30-year study period (1980 to 2009) and that water level fluctuations observed from 1980 to 2009 in the Santa Paula Basin cannot be attributed solely to spatial or temporal variations in pumping. The Santa Paula Basin Technical Advisory Committee has initiated several specialty studies (Section 2.1.3) to provide additional data on the possible hydrologic cause(s) of the observed decline in groundwater elevations.

In 2003, a basin study titled "Investigation of Santa Paula Basin Yield" by experts from the City of Ventura, Santa Paula Basin Pumpers Association and United Water Conservation District suggested that the yield of the basin is probably near the historic average pumping amount (Santa Paula Basin Experts Group, 2003).

In March 1996, as a result of legal action relating to declining groundwater levels in the Santa Paula Basin during the 1984 to 1991 drought and the City of Ventura's stated intention to increase pumping from the basin, the Superior Court of the State of California for the County of Ventura approved a Stipulated Judgment for Santa Paula Basin (*United Water Conservation District vs. City of San Buenaventura,* original judgment March 7, 1996, amended judgment August 24, 2010). The Stipulated Judgment established pumping allocations for each basin pumper.

1.5.4 UPWELLING SALINE WATER

The upwelling of saline waters has been documented in a number of production wells in the Pleasant Valley basin. Advancements in the tools used in sampling pumping production wells has allowed for the documentation of flow and water quality profiles in long-screen production wells (Izbicki et al, 2005a, 2005b). Data from some area wells indicate that poor water quality at the wellhead results from saline water entering the well from specific aquifer zones. High chloride concentrations in the deepest portion of the well can be indicative of brines migrating from deeper zones towards a water level depression (low pressure area) created by long-term overpumping. This upwelling of brines is another form of saline intrusion, and like the compaction of marine clays, occurrence is not limited to coastal areas (Izbicki, 1992).

1.5.5 EXPORTATION OF GROUNDWATER

As agricultural land value continues to increase throughout the District, and as continued urbanization removes farmland from the valley floor, the development of the hillside lands located near a reliable supply of water is also expanding. In many cases the hillside properties will not support a productive well, and water is supplied to the property from a nearby groundwater basin or established surface water diversion. Both options result in the increased use of existing water resources. Most basins within the District lack clear policy or regulation regarding the "export" of water from the basin floor to surrounding uplands, although numerous area ranches have employed such an arrangement for many years. An export policy is currently under development for the Piru and Fillmore groundwater basins.

1.5.6 NITRATE IN FOREBAY GROUNDWATER BASIN

The Oxnard Forebay is vulnerable to nitrate contamination for some of the same reasons the basin is valued for water resource projects. The coarse alluvial sediments common to the area allow the rapid vertical transport of water from the near-surface to the water table. During wet periods, the regional water table is often only tens of feet below the land surface in the Forebay. Nitrate is

highly soluble and very mobile, making it susceptible to leaching from soils and transport to groundwater. Public supply wells in some areas of the Oxnard Forebay periodically exceed the California Department of Public Health's maximum contamination level (MCL) for nitrate, which is 45 mg/l nitrate (or 10 mg/l nitrate as N). Exceedence of this MCL can result in methemoglobinemia (or "blue baby syndrome") a condition where ingested nitrogen interferes with the blood's ability to carry oxygen. Infants less than three months of age are most sensitive to this condition (Canter, 1997). United has conducted a series of studies to determine the extent of nitrate concentrations and the possible causes of this contamination. The Santa Clara River, which provides much of the natural and artificial recharge to the Forebay, is consistently low in nitrate (averaging 7 mg/l nitrate, UWCD, 1996a). Nitrate loading to the groundwater is principally related to land uses within the Forebay, with the most significant sources being agricultural fertilizers and septic systems. United's groundwater recharge activities in the Oxnard Forebay introduce large volumes of low-nitrate water to the groundwater flow system, providing a water quality benefit to both local wells and wells located greater distances down-gradient from the recharge facilities.

Nitrate levels in the El Rio area have fluctuated widely through time, with highest nitrate levels commonly observed during and following drought periods, and relatively low nitrate levels are often recorded during wet periods (UWCD, 1998). Nitrate levels tend to stay relatively low during wet periods when low-nitrate Santa Clara River water is spread by United in the El Rio recharge basins and natural recharge to the basin is abundant. However, when there is not sufficient river water to spread at El Rio, nitrate levels in the O-H wells sometimes rise, particularly in the northeastern portion of the spreading grounds. Blending with water from other O-H wells with low nitrate concentrations keeps nitrate concentrations in delivered water within the health standard for potable supply.

During the drought of the late 1980s and early 1990s, nitrate peaks increased in intensity. Following previous droughts, nitrate concentrations in the wells generally decreased to low levels during the intervening wet years. However, following the 1980s to 1990s drought, nitrate levels in a series of wells even increased during the dry season of wet or average precipitation years when flow in the Santa Clara River was low and United was not recharging water at El Rio. The distribution of nitrate both laterally and with depth is difficult to document with certainty, but the sampling of monitoring wells installed over the past decade has shown that the highest nitrate concentrations are often recorded in the shallowest portions of the aquifer (UWCD, 2008). Whereas the large-scale groundwater flow patterns within the Upper Aquifer System (UAS) of the Forebay are believed to be fairly well understood, the individual flow paths of small volumes of water are often complex. This complexity of flow paths, unknown travel times, and an imprecise knowledge of nitrogen inputs often limits what can be concluded about nitrate provenance from the basic chemical analyses common to many routine groundwater monitoring programs.

In response to long-term concerns about water quality in the Oxnard Forebay and down-gradient areas, and a regulatory order issued by the Los Angeles Regional Water Quality Control Board, areas of high-density septic systems in the greater El Rio area have been converted to sanitary

sewers. More than 1,400 properties were connected to sewer between the years 2005 and 2011, with project costs totaling $35 million. The County of Ventura managed the eleven phases of this successful project. Ongoing programs also exist to promote efficient irrigation and fertilizer practices among area growers. These educational programs are conducted regularly by the University of California Cooperative Extension, the Ventura County Farm Bureau and various agricultural product suppliers or manufacturers.

1.6 SURFACE WATER ISSUES AND CONCERNS

Complex and variable interactions between surface water and groundwater flow systems exist within the valley of the Santa Clara River. Along the length of the Santa Clara River there are several areas where flow in the river commonly percolates entirely, resulting in dry reaches of the riverbed. Surface flow resumes some distance downstream as "rising groundwater" and discharges flow to the river, usually near a boundary of one of the groundwater basins in the valley. Flow from tributary streams sometimes reaches the confluence with the river, while at other times stream flow percolates to groundwater upstream of the main river channel.

Given the complex dynamics related to the gaining and losing reaches of the Santa Clara River and its major tributaries, management activities for both water resources and environmental protection are more complicated than might be imagined. Flows in the river are naturally variable seasonally and annually, but dry reaches are common in all but the wettest of years. These variables often complicate permitting requirements and management efforts to maintain various river habitats. In addition, water quality issues generally require consideration of the interaction of surface water and groundwater, as do efforts to convey stored surface water to points lower in the watershed via natural stream channels.

1.6.1 SANTA CLARA RIVERBED STABILIZATION

The construction of the Vern Freeman Diversion structure accomplished two primary objectives for the District: creating a diversion structure highly resistant to storm damage, and stabilizing the elevation from which surface water is diverted from the river. Following extensive mining of aggregate from the channel of the Santa Clara River in the Forebay area, riverbed elevations near Saticoy had dropped by about twenty feet by the late 1980s. Scour associated with large flow events in the river allowed the riverbed degradation to propagate ever farther upstream, and United was repeatedly required to move its Saticoy diversion location farther upstream. The completed structure has prevented further down-cutting of the river upstream of the facility as expected, and some recovery of channel elevations between Santa Paula Creek and the Freeman Diversion has been documented (Stillwater Sciences, 2007). Since completion in 1991 the elevation of the Freeman diversion point has been stable at 162 feet, and the facility has enabled the diversion of river flow soon after large storm events.

When the Freeman Diversion was constructed, the riverbed elevation upstream of the structure was elevated about ten feet, and materials excavated during construction were used to raise floodplain elevations in an area extending approximately 2,000 feet upstream of the facility. The dam structure extends about 90 feet in the subsurface and rests on a bench of low-permeability Pico Formation. While the facility was not intended to pond surface water, it does act as a dam in the subsurface. Groundwater elevations at an upstream location near the diversion structure vary little from the crest elevation of 162 feet, as groundwater moving through shallow river alluvium stages up behind the Freeman structure (Figure 1.6-1). Construction of the Freeman Diversion has benefited groundwater elevations in the Santa Paula basin as incision of the river was lowering the discharge elevation for shallow groundwater in the basin was arrested and partially restored (Santa Paula Basin Experts Group, 2003).

1.6.2 INCREASED CHLORIDE CONCENTRATION IN SANTA CLARA RIVER

The watershed of the Santa Clara River is one of the largest in southern California, draining over 1,600 square miles in Los Angeles and Ventura Counties. The Piru groundwater basin underlies the Santa Clara River just west of the LA-Ventura County line, and the nature of the river channel is such that much of the time the entire flow of the river emanating from upstream areas infiltrates to groundwater in the eastern portions of the Piru basin. Water quality in the river has suffered periodically due to land use practices in Los Angeles County, and water quality impacts have been shown to persist in the groundwater of the Piru basin for many years after corrections have been made to restore quality in surface water.

In the 1950s and 1960s brines from oil production in the greater Newhall area were discharged to the Santa Clara River, and very high chloride and TDS concentrations were recorded during this period. These practices ceased in the early 1970s after the passage of the federal Clean Water Act, but residual degradation of groundwater quality was noted when water quality objectives were formulated by the Regional Water Quality Control Board years later (UWCD, 2006). Another episode of chloride contamination has occurred more recently and is associated with wastewater discharges from the City of Santa Clarita. Beginning in 1999, rapid urban growth and the increasing popularity of self-regenerating water softeners resulted in increased flow and rising chloride concentrations in the Santa Clara River at the Los Angeles County line. A clear trend of increasing chlorides continued until late 2004, when recorded chloride concentrations in the river peaked around 150 mg/l. Wells in the eastern Piru basin responded rapidly to the changes in the quality of the recharge water to the basin, and a group of concerned growers and other Ventura County interests repeatedly requested to the Regional Board to take action to regulate the chloride discharges which exceeded regulatory limits and advisory thresholds for agricultural use (100 mg/l).

Following several years of study and a successful groundwater modeling effort to predict the impacts of various discharge scenarios on downstream areas, a compromise solution emerged that was endorsed by most area stakeholders and approved by the Regional Board in fall 2008. The approved project was to allow chloride discharges as high as 117 mg/l to the Santa Clara River,

and to construct a series of extraction wells, desalting facility and pipeline to convey blended water across the dry reach of the Piru basin. The local (Santa Clarita) board of the Sanitation Districts of Los Angeles County has refused to authorize the rate increases necessary to implement the approved project. In the meantime, the successful removal of most water softeners from Santa Clarita and lower chloride concentrations in imported State Water has resulted in wastewater chloride concentrations below the peak concentrations seen in the mid-2000s. The chloride plume associated with the worst of the past discharges continues to migrate with groundwater flow across the Piru basin, and now extends past the midpoint of the basin.

1.6.3 WATER FOR ENVIRONMENTAL INITIATIVES

Because of the Federal regulatory mandates, both Santa Felicia Dam and the Freeman Diversion have implemented bypass flows to maintain migration corridors for southern California steelhead and habitats downstream of the facilities. Santa Felicia Dam is regulated by the Federal Energy Regulatory Commission (FERC) due to a small 1.2 Mega Watt hydroelectric plant at the outlet works. The Freeman Diversion is included in a Habitat Conservation Plan (HCP) that is under development and is expected to take several years to complete.

1.6.3.1 SANTA FELICIA DAM ENVIRONMENTAL FLOWS.

The original water rights license for Santa Felicia Dam requires a minimum release of 5 cfs or natural inflow, whichever is less. Due to the conditions in the FERC license which were adopted in 2011, the bypass flows have now been changed to a minimum of 7 cfs with conditions which require higher flows to maintain downstream habitat when the monthly cumulative precipitation is above the historic average measured at County Station 160, located at the guard station entering Lake Piru. Release migration flows of 200 cfs have been implemented for fisheries migration in Piru Creek when the Santa Clara River has elevated flows due to storm runoff. The trigger to initiate migration releases occurs when the USGS gauging station on the Santa Clara River above Piru measures over 200 cfs at 8:00 am and is expected to stay above 200 cfs through the following day. Migration flows are to continue as long as flows at the county line are over 200 cfs.

Based on recommendations from NMFS, FERC has also imposed license conditions on the rate at which United may decrease flows when ending conservation releases or environmental flows. Release ramping rates are to be adjusted so that flow in Piru Creek never decreases more than two inches per hour. Ramping down the conservation release in fall 2011 took five days and a minimum of 25 adjustments to go from 300 cfs down to seven cfs.

The FERC bypass flow plan was not adopted until late May 2011. As a result of the license a habitat flow of a minimum of nine cfs was implemented on May 27, 2011 and maintained until October 1st. After October 1st minimum flows were decreased to 7 cfs until the appropriate triggers are met to change the flows.

Before the final bypass flows were accepted for the license, United proposed several plans during negotiations with NMFS. Each plan was rejected for various reasons. On October 6th 2009 NMFS recommended bypass flows that would have substantially reduced the yield of the Santa Felicia Dams operations. After further negotiations, and due to United's efforts and familiarity with the hydrology, the agencies agreed upon the above mentioned plan that is now part of the license. A yield calculation was done for the operations at Santa Felicia Dam comparing the actual operations to both the approved bypass flows in the FERC license and the recommended flow proposed by NMFS during the negotiations. In 2011 the actual storage in the lake started at 31,000 Acre-Feet in January 1st, and ended up at 75,500 Acre- Feet by June 1st. If the new FERC bypass flow plans were implemented the total storage of the lake by June 1st would have been 71,700 due to some storms that would have triggered migration releases and additional habitat flows. The recommended release schedule by NMFS required a substantially higher migration flow release from the dam which would have resulted in the final storage reaching only 56,300 AF, or a loss of storage of 19,200 Acre-Feet over the actual conditions, and 15,400 acre-feet over the proposed license (Figure 2.2-1).

After the conservation release, a short duration high impulse release of 600 cfs was done in order to perform a geomorphology study as a part of the FERC license conditions. This study took an additional 2,400 AF of water and was designed to evaluate sediment transport in various reaches within Piru Creek. The experimental release water was either diverted at the Freeman Diversion or percolated upstream. Figure 2.2-1 shows the average daily flows of the geomorphic test with the conservation release.

1.6.3.2 HABITAT CONSERVATION PLAN

The Freeman Diversion currently provides bypass flows for the upstream and downstream migration of the endangered southern California steelhead. State Water Rights Permit 18908 allows United to divert its license amounts as long as 40 cfs is provided through the fish ladder for 48 hours after the total river flow subsides below 415 cfs. These migration flow requirements are limited to storms that occur between February 15th and April 31st of each year. As part of the HCP development United remains consultation with National Marine Fisheries Service (NMFS) and is currently operating the bypass flows to better meet the needs of the species for migration between the ocean and the Freeman Diversion. In 2011, four storms provided sustained flow in the Santa Clara River and allowed for the fish ladder to be in operation nearly continuously from February 19th to June 8th, 2011. An estimated 2,400 to 3,000 AF of water was directed to fish migration flows that otherwise would have been used for groundwater recharge. However during this same year 92,600 AF were diverted from the river and Forebay water levels near the Saticoy Spreading Grounds reached maximum elevations due to groundwater mounding in this vicinity.

2 PROJECTS AND INITIATIVES

Figure 2.1-1 is a matrix introducing United's current projects underway by the Groundwater Department and the issues those projects address. The projects vary in scope and application. The groundwater and surface water projects are discussed in the following sections of this report.

2.1 GROUNDWATER

Section 2.1 introduces the groundwater projects that have been conducted by United. These consist of a wide range of projects which are discussed separately in the following sub-sections of this report. These are the same projects introduced in Figure 2.1-1.

2.1.1 UPDATE REGIONAL GROUNDWATER FLOW MODEL

The Ventura Regional Groundwater Model (VRGWM) is a numerical modeling tool developed to evaluate multifaceted conjunctive use, water recycling, and water conservation projects designed to alleviate seawater intrusion, overdraft, land subsidence, and other problems. A calibrated groundwater flow model allows the prediction of benefits or impacts associated with either specific water supply projects (such as well fields, water deliveries, recharge projects, reservoir releases, etc.) or more global changes within the model domain (changing irrigation demands, changing rainfall patterns, extended drought). Both United and the FCGMA have relied upon the existing VRGWM for planning and groundwater management activities.

The VRGWM was originally developed by the U.S. Geological Survey as part of the Regional Aquifer Systems Analysis (RASA) in the late 1980s and early 1990s. The VRGWM simulates regional groundwater flow in the Piru, Fillmore, Santa Paula, Mound, and Oxnard sub-basins of the Santa Clara River Valley Basin, and the Pleasant Valley Basin, Arroyo Santa Rosa Valley Basin, and Las Posas Valley Basin in the Calleguas Creek watershed. The MODFLOW model uses a finite difference grid consisting of 114 rows and 229 columns for a total of over 24,000 active cells with nodal spacing of approximately 900 feet throughout most of the model domain. The model presently uses 3 layers to simulate regional groundwater flow in the region's Upper Aquifer System, Lower Aquifer System, and shallow alluvial aquifers.

Since completion of the original model by the USGS in 1996, UWCD has completed several modifications to the VRGWM to improve its predictive capabilities and better address project-specific questions:

- Model Grid Size Reduction – Reduced cell size from 1/2 mile to 1/6 mile for improved accuracy;

- Model Layer Addition – Added a third model layer to simulate groundwater flow and groundwater-surface water interactions in the shallow alluvial units in the Piru, Fillmore, and Santa Paula sub-basins;
- Conceptual Model Updates – Added/modified groundwater flow barriers and hydrogeologic properties;
- Expanded Calibration Period - Added 1994 to 2000 hydrology;
- Model Recalibration – Recalibrated the Oxnard Basin to 1998 to better reflect the new conjunctive use projects built after USGS originally calibrated the model; and
- Improved Predictive Simulations – Expanded the forward model (predictive tool) period to a full 55 years that reflect the climate and hydrology of the years 1944 through 1998.

While the existing VRGWM has been successfully used in this capacity for more than a decade, the model must be updated in order to answer the increasingly complex and detailed questions water managers are now faced with. As environmental stewardship, climate change, drought preparedness, and recycled water have become integral aspects of groundwater management, the level of analysis required to support planning has become increasingly more detailed in both time and space, as compared to the early 1990s when the model was developed. In its current form, the VRGWM is not fully capable of evaluating the complex issues Ventura County water managers are faced with today or expect to confront in future years.

Grant funds were used to start the VRGWM update process. The VRGWM update is divided into two geographic areas that will be completed in two separate, but linked project phases. The first phase includes the Oxnard Forebay and Oxnard Plain. The second phase will include other basins such as Mound, Piru, Fillmore, Santa Paula, and Pleasant Valley. Each project phase has three tasks: (1) Develop Basin Conceptual Model; (2) Develop Groundwater Flow Model; and (3) Calibrate Groundwater Flow Model. The grant funding is to facilitate completion of Tasks 1 and 2 of the first project phase, which will be completed within the two year grant period (estimated: fall 2013). The remaining VRGWM update tasks are funded via other sources.

The basin conceptual model provides the basis for developing the numerical groundwater flow model. The goal of Task 1 is to update the basin conceptual model for the Oxnard Forebay and Plain with improved geologic understanding so a more detailed groundwater flow model can be constructed. Currently, the VRGWM is based on a conceptual model that uses an aquifer system framework where multiple aquifers are grouped into upper and lower systems. This approach ignores difference in water levels and properties between the aquifers in each system, which are significant in most areas. As groundwater management issues become more complex, the need for aquifer-specific answers increases. Thus, a key objective of Task 1 is to expand the basin conceptual model to include aquifer-specific data.

Updating the basin conceptual model is a two-step process – data collection and data analysis. Data collection includes identifying and compiling available geological data. United has focused on

subsurface data contained in water, oil, and gas well logs. District staff have identified available geophysical logs and prioritized the logs for digitization. The digitized logs were georeferenced and input into GIS for analysis. United's hydrogeologists thereafter identified and correlated regional hydrogeologic units (aquifers and aquitards); constructed geologic cross-sections; and identified regional facies changes that affect the occurrence and movement of groundwater within the hydrogeologic units. Geologic maps and studies were also reviewed to identify geologic structures (faults and folds) that are barriers or partial barriers to groundwater flow. Ultimately, the goal is to use this work to build a 3-dimensional (3-D) geologic model of the basins for use in developing the numerical groundwater flow model (Task 2).

The goal of Task 2 is to develop the numerical model architecture and initial inputs that will be used for calibration. The model will be constructed using USGS's Modular Three-Dimensional Ground Water Flow Model code (MODFLOW) and the commercial pre-processing package Groundwater Vistas offered by Environmental Simulations, Inc. Groundwater model development is a three-step process that includes: (1) grid design, (2) establishing boundary conditions, and (3) assigning initial parameter values. As part of the model construction process, data will be georeferenced and input into GIS.

Grid Design

United's groundwater staff will construct a finite-difference grid for the model domain based on the 3-D geologic model prepared in Task 1. Model layers will be used to represent the different hydrogeologic units, where possible. The grid node spacing will be determined by evaluating the impact of cell size on model calculation run times. The goal will be to minimize the nodal spacing while not creating excessive run times. This will depend on the number of layers and the geographic extent of the model domain. If necessary, the numerical model will be broken into separate (but linked) models for different sets of basins to achieve an acceptable level of detail and run times.

Boundary Conditions

Boundary conditions are used to represent flow barriers (no-flow boundary), recharge and discharge processes (i.e. stream percolation, pumping, etc.), and inflow/outflows to/from other basins and the ocean. The geologic model will dictate the location of no-flow barriers representing low permeability bedrock units and fault barriers. Recharge estimates will be derived from prior studies and agency records of artificial recharge, as updated by new data collected by UWCD and others since the early 1990s. The primary discharge mechanism is pumping. Pumping locations and rates are available from UWCD and FCGMA pumping records. Other Inflows and outflows to the model domain will be implemented as either specified-flux boundaries or as head-dependent flow boundaries. These include flow in and out of adjacent basins and the ocean.

Initial Parameter Values

Once the model grid has been constructed, initial aquifer parameter values (hydraulic conductivity storage coefficient, etc.) will be assigned to each active cell in the model grid. These values will be estimated using available aquifer test data and the texture descriptions from the geologic model. Partial flow barriers and estimates of their hydraulic properties (conductance) will also be input during this step. Where possible, UWCD will seek opportunities to perform aquifer tests or collect other data that will help quantify the hydraulic properties of the different aquifers and flow barriers.

Following the successful construction and calibration of the groundwater flow model, the model can be utilized to evaluate specific water supply projects or broader pumping or precipitation changes within the watershed. The evaluation of individual projects requires the construction of model input files that define changes in pumping or recharge associated with the project under consideration. Model scenarios that include the new water project are typically compared to a "base case" scenario that characterizes how the basin or basins operate without the new project. United anticipates that the calibrated VRGWM will be used to assist cities or management agencies such as the FCGMA in evaluating large and/or complex water supply or water management proposals.

2.1.2 AB3030 GROUNDWATER MANAGEMENT PLAN UPDATE

The AB3030 Groundwater Management Plan (GMP), which is currently in draft form, is a cooperative effort of United Water, the City of Fillmore, and water companies/pumpers in the Piru and Fillmore Groundwater basins (Piru/Fillmore Groundwater Management Council, 2011). The original 1996 GMP was formulated with input gained from public information meetings and hearings. This 2011 GMP is an update of the original 1996 Plan (Piru/Fillmore Groundwater Planning Council, 1996).

The GMP uses the groundwater management plan authority contained in California Water Code Section 10750 et seq. initially enacted in 1992 through Assembly Bill 3030. An initial 1995 Memorandum of Understanding (MOU) between United, the City of Fillmore, and the water companies/pumpers, was incorporated in the plan and established the GMP as a cooperative groundwater management plan for the basins. The MOU outlines the roles of the various parties in implementing the Plan (M.O.U., 1995). The Piru and Fillmore basins are considered part of the Ventura Central Basin which is subject to critical conditions of overdraft (California Department of Water Resources, 1980).

United, as the lead agency, has formally adopted the GMP, which was formulated to ensure local control of groundwater management. It is the intent of the GMP to foster local control in as many aspects of the management of the basins as possible. The draft 2011 GMP update includes numeric Basin Management Objectives (BMO) for groundwater levels, groundwater quality, and surface water quality. Water Code Section 10753.7 now requires the inclusion of BMOs in a GMP for any local agency seeking state funds administered by the California Department of Water Resources for the construction of groundwater projects or groundwater quality projects. In addition

the update includes a formal groundwater export policy which was a requirement of the original GMP.

2.1.3 SANTA PAULA BASIN SPECIALTY STUDIES

In March 1996, the Superior Court of the State of California for the County of Ventura approved a stipulated Judgment for the Santa Paula Basin. (*United Water Conservation District vs. City of San Buenaventura etc, Ventura County Superior Court Case No. CIV115611,* Judgement entered March 7, 1996, and amended August 24, 2010) [hereinafter "Judgment"]). The Judgment recognized that all of the parties have an interest in the Santa Paula Basin, and in the proper management and protection of both the quantity and quality of this important groundwater supply. The basin is a significant water resource in the County of Ventura. Members of the Santa Paula Basin Pumpers Association and the City of San Buenaventura exercise rights to pump water from the basin for reasonable and beneficial uses. The United Water Conservation District does not produce water from the basin, but the basin is located within its boundaries and the District is authorized to engage in groundwater management activities and to commence actions to protect the water supplies which are of common benefit to the lands within the District or its inhabitants.

In 2010 the Judgment was amended to join various groundwater pumpers that were not previously joined as parties to the adjudication, and to clarify certain provisions pertaining to shortage conditions, the responsibilities of the Santa Paula Basin Pumpers Association and groundwater production by its members, and water rights transfer procedures.

The Judgment provides for the creation of a Technical Advisory Committee (TAC). The committee is charged with establishing a program to monitor conditions in the basin, including, but not necessarily limited to, verification of future pumping amounts; measurements of groundwater levels; estimates of inflow to and outflow from the basin; increases and decreases in groundwater storage; analyses of groundwater quality; studies relative to the basin; development of programs for its conjunctive use and operation; and other information useful in developing a management plan for the basin. The Judgment also authorizes the TAC to consider and attempt to agree on the safe yield of the basin.

The Judgment among other things requires the TAC to monitor and annually report individual and cumulative groundwater production from the basin. The Judgment further specifically provides that *"United Water Conservation District shall have the primary responsibility for collecting, collating, and verifying the data required under the monitoring program, and shall present the results thereof in annual reports to the Technical Advisory Committee*." The United Water Conservation District submits draft annual reports to the Santa Paula Basin TAC members for review, comment, and approval.

The 2008 Annual Report, filed with the Court in 2010, noted that the TAC has observed a long-term, but gradual, decline in basin groundwater elevations. The Annual Report stated that the TAC would over the following 12-24 months seek to determine the cause of the long-term gradual decline in the

groundwater elevations, and formulate remedial actions to reverse the problem should it persist (United Water Conservation District, 2009).

In 2011 the Santa Paula Basin TAC created a Santa Paula Basin Working Group to investigate the cause of the long-term gradual decline in groundwater elevations. The Working Group consists of technical experts from the United Water Conservation District, the Santa Paula Basin Pumpers Association and the City of San Buenaventura. The Working Group has initiated a series of studies that will address the cause of the long-term gradual decline in groundwater elevations.

In August 2011, the TAC issued a list of ten work items which were evaluations and studies to be completed for the Santa Paula Basin. These items are listed below:

- Investigation of Hydrologic Base Period.
- Investigation of groundwater and surface water inflow at Fillmore-Santa Paula Basins boundary.
- Evaluate groundwater confinement and differentiate measured wells by aquifer.
- Evaluate water level trends in both confined and unconfined parts of the Santa Paula Basin.
- Identify crop change over time.
- Investigation of groundwater storage change.
- Evaluate historical changes to the Santa Paula Creek channel and potential effects on basin recharge.
- Refine and finalize spatial and temporal Pumping Trends Report.
- Compilation of Santa Clara River infiltration data.
- Compilation of Santa Paula Creek infiltration data.

The technical evaluation of the spatial and temporal pumping trends within the basin has been completed (UWCD, 2011b), and the Technical Working Group of the TAC concluded that the long-term gradual decline of water levels in the basin are not due to shifts in pumping locations or magnitude over time.

2.1.4 DISTRICT-WIDE GROUNDWATER LEVEL MONITORING

United monitors groundwater elevations in all or portions of eight groundwater basins within the District boundaries. The regular monitoring of a large number of wells in the multiple aquifers throughout the District is necessary to adequately define the regional influences of groundwater extractions as well as natural and artificial groundwater recharge to the basins. Measurements are collected from both active production wells and dedicated monitoring wells. “Nests” of monitoring wells exist in some locations, allowing determination of heads in various aquifer units, and vertical gradients between aquifer zones at these locations.

In excess of 2,400 water level measurements were collected by District staff in 2011, on either a monthly, bimonthly, quarterly or semi-annual basis. The semi-annual runs are the most extensive runs and are scheduled to document annual high groundwater conditions in the spring and annual low groundwater conditions in the fall. The locations of wells measured by United at various frequencies are shown by basin in Figure 2.1-2. The locations of wells with groundwater elevation measurements are represented in various figures in Section 4 of this report.

In the Santa Paula basin, a more extensive groundwater elevation monitoring effort was initiated in 1998 and is continuing. The monthly, bimonthly and semi-annual monitoring of wells is conducted to assist technical work in progress to determine the perennial yield of the basin, and related to a March 1996 Court Settlement regarding pumping in the basin.

Beginning in the spring of 1999 the number of Upper and Lower Aquifer System wells monitored in the Oxnard Forebay, Oxnard Plain, Pleasant Valley and Mound basins was increased substantially. The increased frequency and distribution of groundwater elevation data in the coastal basins is intended to better define areas of groundwater abundance and deficit, and how these conditions relate to groundwater recharge and extraction in the basins, and geologic features within and between the basins. The implementation of an extensive semi-annual (spring and fall) water level measurement program in these basins is also intended to define the extremes of water levels throughout the year.

Beginning in 2009, United has increased its efforts to instrument additional wells in each groundwater basin with pressure transducers ("transducers"). These units consist of a compact pressure transducer and data logger, and are commonly suspended in a well by a special cable that allows records to be retrieved without removing the device from the well. The transducers are programmed to record water levels at frequent time intervals, allowing the acquisition of data sets that would be impossible or impractical to collect by hand. The automated collection of head measurements are very useful in evaluating transient events, such as tidal influences, the area of influence surrounding pumping wells, and water table responses to both natural and artificial recharge events. As of fall 2011, approximately 65 pressure transducers were deployed throughout the District (Figure 2.1-2).

A number of other Ventura County agencies routinely measure and record groundwater elevations in their wells, most commonly on a monthly or quarterly basis. Most cities and the larger mutual water companies measure water levels in their wells, often under both static and pumping conditions. Water levels are also routinely measured in monitoring wells at a number of environmental sites, such as landfills, large scale contaminant sites, or wastewater percolation ponds. United obtains water level records from these various sources and archives the records in a central database.

The Groundwater Section of the Water and Environmental Resources Division of the Ventura County Watershed Protection District also maintains a long-term groundwater elevation monitoring program (VCWPD, 2012). As with United's monitoring program, the lengthy water levels records

now associated with many of the wells in the County's program are valuable records for assessing long-term changes in water levels within area basins. United and the County of Ventura regularly exchange groundwater elevation records. The County of Ventura in turn reports groundwater elevation records to the California Department of Water Resources (DWR) as part of the California Statewide Groundwater Elevation Monitoring (CASGEM) program. This reporting program was authorized by the Legislature in 2009 as part of bill SBX7 6, and encourages local agencies to develop monitoring programs that adequately characterize groundwater conditions in their areas and regularly report the records to DWR for archiving and improved public accessibility.

2.1.5 DISTRICT-WIDE WATER QUALITY SAMPLING

United's water quality monitoring program integrates the District's sampling with sampling conducted by a variety of other organizations. Together, this monitoring serves the following varied purposes:

- For purveyors' wells, monitoring of a variety of regulated constituents ensures that groundwater is safe for potable use, and ensures taste and odor are within established guidelines.
- The saltwater intrusion monitoring network tracks the migration of saline water by direct seawater intrusion and the movement of chloride from clay layers between the aquifers. The network monitors the full series of aquifers from the Oxnard to the Grimes Canyon aquifer.
- Monitoring of wells allows documentation of both abrupt and long-term changes in water quality.

United staff samples numerous monitoring and production wells on a regular basis in order to evaluate the quality of groundwater within the District. Monitoring programs sometimes focus on specific areas within the District, typically for a specific type of degradation or improvement of water quality. In addition to United's regular sampling programs, water quality data are routinely acquired from other sources, most notably the California Department of Public Health (DPH) and the County of Ventura's Groundwater Section. Other sources of information include the California Department of Water Resources, cities, consultant reports and technical studies, landfill operators and individual well owners.

United routinely samples production wells and dedicated monitoring wells throughout the District, but monitoring is performed with increased frequency and density in two critical areas. One such area is the Oxnard Forebay basin, where United operates its main groundwater recharge facilities and the well field supplying the Oxnard-Hueneme potable water system. The monitoring serves to document both typical conditions and the variability of groundwater quality in areas of groundwater recharge and areas of groundwater production near specific land uses. Another area of frequent monitoring is the coastal area near and between the Hueneme and Mugu submarine canyons. Elevated chloride levels from the intrusion of saline waters continue to be a concern in this area,

especially in the area surrounding the naval base at Point Mugu. In recent years there has been interest in documenting increasing chloride conditions in the Piru basin. Water quality monitoring has increased in that basin, with much of the increased sampling being performed by the Groundwater Section of the Ventura County Watershed Protection District.

When water is delivered to the public, the California Department of Public Health enforces minimum monitoring requirements to assure that delivered water is free of chemical and biological contaminants. Testing requirements vary depending on the number of people served by the system and a system's vulnerability to contamination, as determined by the DPH. United regularly collects samples from the wells supplying the O-H potable water system, with sampling frequency exceeding the minimum DPH requirements. Water purveyors throughout California are required to report results of all water analyses to the DPH, and United regularly obtains these water quality records from the DPH for integration into United's water quality database.

United's groundwater staff regularly collects water quality samples from approximately 150 monitoring wells located throughout the District. Nearly all of these wells are PVC wells with a diameter of two inches. A portable submersible sampling pump is lowered into the well in order to purge the well prior to collecting a sample. Alternatively, an air compressor and long air line are used to purge other wells, where compressed air is released in the well below the water surface and water is "air lifted" to the surface by the air exiting the well. Most of the monitoring wells have a short screened interval, allowing the collection of water from a limited section of the aquifer. Many monitoring wells were installed as a nest or cluster of wells in a single borehole, allowing the collection of piezometric head and water quality samples from multiple depths at the same location. United measures field parameters during sampling, but all water quality analyses are performed by a commercial laboratory.

United also monitors a number of private domestic and irrigation wells throughout the District as part of its regional monitoring programs. The sampling of production wells spares the expense of drilling new monitoring wells, and provides examples of water quality pumped by groundwater users. However, the long screen intervals common to most production wells often draws water from multiple water-bearing zones, which can mask poor quality water that may source from specific aquifer zones. The Groundwater Section of the Ventura County Watershed Protection District also conducts annual sampling of a number of production wells in Ventura County, commonly in the fall of the year. The County sampled over 200 wells in 2011, and this sampling significantly contributed to the water quality sample coverage for several basins within United's district boundary.

The distribution of wells sampled by United is shown in Figure 2.1-3. As shown in the map, the Oxnard Forebay and the coastal areas of the southern Oxnard Plain have the highest density of monitoring wells. Production wells belonging to private parties and monitored by United are concentrated around the Oxnard Forebay and in the basins of the Santa Clara River Valley. The figure includes a table showing the number of wells monitored in each basin.

Special water quality studies are occasionally conducted within Ventura County. One significant recent study was the Groundwater Ambient Monitoring and Assessment (GAMA) program, conducted by the United States Geological Survey (USGS) in cooperation with the CA State Water Resources Control Board. This project sampled a number of "representative" wells throughout the Santa Clara River valley and the Oxnard Plain in order to assess the quality of local groundwaters commonly used for public supply. Many wells were sampled in spring 2007 for a broad suite of compounds at very low concentrations in order to document both the character of natural waters and the nature of contamination where it exists. While the identities of the wells sampled remain confidential, results from this sampling effort allowed characterization of groundwater in the study area. Contamination related to human activities was found to be relatively uncommon, and associated with shallow wells screens and younger waters when present. Older and deeper groundwater in some areas has somewhat elevated mineral content, and may have elevated iron and manganese concentrations related to reducing groundwater conditions (Burton el al, 2011). The geologic setting and nature of the area's aquifers are largely responsible for the high mineral content in the water, resulting in some aesthetic issues but not health concerns.

2.1.6 SALINE WATER INTRUSION MAPPING

The intrusion of saline waters remains the principal water quality threat to the groundwater resources of the Oxnard Plain and the Pleasant Valley basin. As described in Section 1.5.2, the movement of brines into fresh aquifer units remains a concern as long-term overdraft conditions persist in these basins, and chloride impacts are no longer limited to the coastal areas adjacent the Hueneme and Mugu submarine canyons. Water with elevated chloride concentration is not suitable for either potable use or for irrigation water. In recent years United has conducted several investigations to better define the extent of saline water in the coastal basins. Some of the subprojects of this effort include:

- Seismic reflection survey on south Oxnard Plain – this subproject focused on meso-scale geologic structures/features that were postulated to impact groundwater movement on the south Oxnard Plain;
- Time domain electromagnetic survey in the Port Hueneme and Point Mugu areas – this subproject was designed to reassess the areal extent of saline water intrusion and compare it to the USGS data from the early 1990s;
- Borehole electrical conductivity surveys in existing piezometers in the Port Hueneme and Point Mugu areas - conductivity profiling in existing wells/piezometers was performed to determine if the saline waters have begun to impact strata other than the screened intervals; and
- Collection of flow profile data and discrete-depth water quality samples - conduct flow profiling, depth-specific sampling with water quality analyses, and mass balance calculations are proposed on existing production wells to identify salinity changes for Mugu and Hueneme saline water impact areas that may be masked in a high capacity well.

To date, two of these subprojects have been completed and brief summaries of the project results are presented below.

2.1.6.1 SEISMIC REFLECTION SURVEY ON SOUTH OXNARD PLAIN

In 2010 United conducted an approximate 6 mile high-resolution seismic reflection survey in the southern Oxnard Plain that was supported by a California Department of Water Resources Grant (UWCD, 2011a). The overall purpose of the seismic reflection survey was to resolve the structural geology in the area east of Port Hueneme to provide additional subsurface data to assist with the design of the western portion of the proposed Seawater Intrusion Injection Barrier. A primary goal of the project was to better understand the structural geology and stratigraphy associated with the aquifers in the area. The seismic reflection data was obtained along four lines totaling about 6 miles in length. In spite of the semi-urban environment and the challenging site conditions, the seismic reflection survey successfully provided high-resolution images of the Plio-Pleistocene stratigraphy in the study area at depths ranging from as shallow as 60 feet to over 2,000 feet below ground surface. By correlating the stacked migrated reflection sections and data from nearby oil and water wells, United Water was able to establish an interpretation that approximates the depth, thickness, and configuration of the two major aquifer systems in the area; the Upper Aquifer System (UAS) and the Lower Aquifer System (LAS).

The base of the LAS is reported to represent the bottom of the sediments containing fresh water underlying the Oxnard Plain. United's interpretation also identified reflecting horizons within these systems that could represent the boundaries of their component aquifers such as the Oxnard and Mugu aquifers in the UAS and the Fox Canyon and Grimes Canyon aquifers in the LAS. In addition, the interpretation identified three unconformities associated with the aquifers, including a strong continuous reflector that correlates with the unconformity that forms the boundary between the UAS and LAS.

One of the objectives of the seismic reflection survey was to confirm or deny the existence of an igneous "dome" structure in the central portion of the field area (extending between the UAS and LAS). A sedimentary mound type structure was also considered to possibly occur at that location instead of the igneous dome. The existence of the structure(s) was based on conflicting data. The study concluded that no igneous dome was interpreted to exist and the subsurface materials were deemed to be sedimentary. United's interpretation of the seismic reflection data does confirm the existence of a mound of stratigraphic origin.

One significant localized thick section of low-permeability material was resolved in the data and interpretation. The body of low-permeability material is located northeast of Port Hueneme. The thick part of the body is approximately 1.8 miles (northeast-southwest direction) by 1.3 miles (northwest-southeast direction) in lateral extent and is approximately 600 feet thick. It is directly in line with the submarine canyon at Port Hueneme and is described in literature as "clay deposits Old Hueneme Canyon" (Hanson et al, 2003). It likely represents the landward extension of the submarine canyon by Port Hueneme during a transgression of the sea.

This body of low-permeability material will have an effect on the placement and design of a proposed LAS injection barrier well field to prevent further saline intrusion on the southern Oxnard

Plain. It is located directly adjacent to the saline water "plume" on the northeast side. Wells will need to avoid that area at the depths of the low-permeability material in order to be successful at injecting water. The lateral limits and thickness/depth of the materials is defined well enough for the design of the barrier injection wells. In addition the low-permeability body can be strategically used for saline water blockage in part of the injection barrier system.

2.1.6.2 TIME DOMAIN ELECTROMAGNETIC SURVEY IN THE PORT HUENEME AND POINT MUGU AREAS

United Water performed a Time Domain Electromagnetic (TDEM) geophysical survey on the southern Oxnard Plain to assess the lateral limits of saline water intrusion in the Upper Aquifer System (UAS) and Lower Aquifer System (LAS) at four different depth ranges (UWCD, 2012a). The survey was designed to replicate a study performed by the USGS in the early 1990s that provided information about the vertical and horizontal extent of saline water intrusion (Zohdy et al, 1993). The field survey area was approximately 35 square miles and extended along the coast between Port Hueneme and Point Mugu (approximately 7 miles) and inland for approximately 5 miles. One hundred twenty five (125) soundings (data points) were obtained in agricultural fields, open private land, open preservation land, game preserve land, and in open areas on the Mugu Naval Air Station. The data were forward and inverse modeled for each sounding. The model data were used to construct resistivity maps, at four depth ranges typical of the UAS and LAS.

The investigation was successful at delineating earth resistivity values that are typical of saline and brackish water in both aquifer systems. Resistivities typical of saline water occurred along the coast and extended farther inland near Point Mugu with brackish water inferred at various locations inland. The resistivity maps also exhibited configurations that are typical of geologic features which may be groundwater pathways for the migration of saline waters.

2.1.6.3 BOREHOLE ELECTRICAL CONDUCTIVITY SURVEYS IN EXISTING PIEZOMETERS IN PORT HUENEME AND POINT MUGU AREAS

United Water performed conductivity profiling in existing piezometers along the South Oxnard Plain in summer and fall 2011 to determine if the saline waters have begun to impact strata other than the screened intervals. United Water routinely records water levels and collects and analyzes water quality samples from several piezometer nests in the south Oxnard Plain. These piezometers provide much of the information about how chloride and TDS values have changed over time. The chloride concentrations are not constant with time or depth. These piezometer nests provide the opportunity to evaluate the vertical change in TDS over time. When the piezometer nests were initially constructed, borehole geophysical logs were performed in each borehole. Changes in the conductivity over time can be used to infer changes in the water chemistry. This technology works in PVC-cased piezometers (i.e., the conductivity tool can collect readings through the casing). By relogging these piezometers, the changes in the conductivity in the formation outside of the blank casing intervals can be assessed. Conductivity profiling of the piezometers, coupled with the production profiles from existing wells, will greatly increase our ability to evaluate how the vertical

distribution varies in the study area. Data from the conductivity profiling is currently being evaluated and findings have yet to be published.

2.1.6.4 COLLECTION OF FLOW PROFILE DATA AND DISCRETE-DEPTH WATER QUALITY SAMPLES

This proposed subproject includes conducting flow profiling, depth-specific sampling with water quality analyses, and mass balance calculations on production wells to identify salinity changes for Mugu and Hueneme saline water impact areas that may be masked in a high capacity well. United Water proposes to field verify the TDEM geophysical results by performing production profiles and discrete-depth water quality sampling from existing production wells located near the leading edge of the saline zones identified by the TDEM survey. Production profiles (also called flowmeter surveys) are performed on wells to determine the distribution of water entering the perforated intervals. The results of a production profile are often presented as gallons/minute (gpm) per ft of perforated interval or percentage of the total flow per perforated interval.

Inflow rates to a production well can be measured and typically the flow rates are not equal along the length of the perforations. By identifying the proportional flow rates, discrete-depth water samples can be collected from each flow interval and mass balance calculations can be used to determine the water chemistry in the aquifer surrounding the inflow zones. These techniques are in use by many water districts and the USGS to better understand the impact well hydraulics have on water quality sampling and evaluate variations in groundwater geochemistry with depth. For our study, we propose to use this technique to look for production intervals within existing wells that have elevated chloride values and determine the depths at which the well has been impacted by saline waters. Funding for this subproject has been included in United's draft budget for the 2012-13 fiscal year.

In 2002 United sponsored a similar study for a number of high-capacity production wells in the Pleasant Valley Basin. Researchers from the USGS performed flow profiling and collected water quality samples at specific depths within the screened interval of the wells under pumping conditions. The work demonstrated that deeper portions of these wells generally produced little water but tended to have higher chloride concentrations (Izbicki et al, 2005a and Izbicki et al, 2005b). This study was proposed by United and funded by DWR through an AB303 local groundwater assistance grant.

2.1.7 FOREBAY AQUIFER DELINEATION/MAPPING USING SURFACE GEOPHYSICS

Reconnaissance-level time domain surveys performed by UWCD in 2010 identified previously unrecognized geologic conditions (e.g., faults, thick clay sequences) underlying several of the District's recharge basins. Previous investigations (e.g., Daniel B. Stephens & Associates, 2008) depict the presence of clay units (aquitards) in the Oxnard Forebay, but the lateral continuity and presence/absence of faulting were not addressed. The Oxnard Forebay is a critical component of

the region's water supply system and is envisioned as a location for expansion of future groundwater pumping and the potential introduction of recycled water for aquifer recharge. As the groundwater resource utilization in the Forebay intensifies, a more refined understanding of the hydrogeologic conditions is needed to facilitate optimization of this resource.

The Fox Canyon Groundwater Management Agency (FCGMA) is assisting financially with a Forebay Basin surface geophysical survey being performed by United Water with a grant from their *Groundwater Supply Enhancement Assistance Program (GSEAP)*. This is an ongoing project with 50+ time domain electromagnetic (TDEM) geophysical soundings collected to date. Additional field work is planned in 2012. United Water field crews have enjoyed extensive cooperation from land owners who have readily provided access to their property.

2.1.8 PIEZOMETER INSTALLATION ALONG SANTA CLARA RIVER

In fall 2011 United contracted for the installation of eleven new monitoring wells in the Oxnard Forebay. Nine of the wells are located along either bank of the Santa Clara River, from the Saticoy area to the area near the RiverPark pits. Two wells were installed adjacent United's Noble Pit recharge basins. The boreholes were drilled by a hollow stem auger rig and most of the wells were screened from approximately 60 to 100 feet below the land surface. These new wells were installed in order to better characterize groundwater recharge sourcing from flows in the Forebay reach of the Santa Clara River, and to evaluate how recharge from United's recharge operations in areas near the river interact with groundwater mounding associated with natural recharge within the river channel. Matching funds of 50% were supplied by the Fox Canyon GMA as part of their Groundwater Supply Enhancement and Assessment Program (GSEAP). The locations of the eleven new wells are shown on Figure 2.1-2.

2.2 SURFACE WATER

The interaction of surface water and groundwater is complex and dynamic in the valley of the Santa Clara River. Surface water flows are often highly variable both between years and seasonally within single years. The water quality of stream flow also commonly varies throughout the year, with mineral content typically increasing as flows decrease. United's interest in surface water flows has historically centered on the Santa Clara River near Saticoy, where water is diverted from the river and routed to various facilities for either groundwater recharge or direct use as irrigation water. Because of various regulatory requirements imposed upon the District by the federal government, United has recently devoted more effort to the study and characterization of flow in the river and its major tributaries in order to better understand aquatic habitat within the lower watershed of the Santa Clara River. Of particular interest are seasonal migration opportunities for the endangered southern California steelhead and how United's activities affect flows in Piru Creek and the Santa Clara River.

2.2.1 STREAM FLOW

Flows in the Santa Clara Watershed are recorded by United, United States Geological Survey (USGS) and the Ventura County Watershed Protection District (VCWPD). Flows in the main stem of the Santa Clara River are recorded by the USGS at the Los Angeles/ Ventura County line (funded by United) and by the VCWPD downstream at Victoria Bridge near Oxnard. United also records continuous flows diverted at the Freeman Diversion. All of the major tributaries are monitored coming into the Ventura County portion of the watershed. United Water funds the USGS to monitor the flows above and below Lake Piru. The VCWPD funds the USGS to record Sespe and Santa Paula Creek while the VCWPD records Hopper and Pole Creek.

Additionally in 2011, over 150 manual discharge measurements were made in locations that are not at a continuous gauging location. These data provides the information needed to estimate benefits to each basin during the conservation/State Water release, discharge/percolation rates of each basin, and adjustment of environmental flows.

2.2.2 WATER QUALITY

United maintains a water quality monitoring program and samples from a number of locations (Figure 4.2-4) either seasonally, monthly or every two weeks. Sampling sites are generally located near groundwater basin boundaries or on major tributaries near their confluence with the Santa Clara River. Sampling of tributaries and the upstream reaches of the Santa Clara River assure that waters are acceptable for natural groundwater recharge. Sampling is conducted on a quarterly basis and consists of either a full general mineral suite or several key constituents. Water temperature and pH is documented at the time of sample collection. Sampling is conducted more frequently along the Santa Clara River near the Los Angeles County line (monthly) and at the Freeman Diversion (every two weeks).

Beginning in January 1999, United has sampled the Santa Clara River at Blue Cut near the Los Angeles County line each month. This monitoring is intended to improve understanding of how urbanization and community water supply decisions in the Santa Clarita area affect the quality and quantity of water flowing into Ventura County. From the late 1990s through 2003 discharges from the Valencia Water Reclamation Plant increased steadily in both volume and chloride concentration, with chloride concentrations exceeding 200 mg/l at the end of this period. Discharge rates continued to increase for several more years before diminishing slightly. Chloride concentrations in the discharges have fallen to levels common to the early 1990s (Figure 4.3-6), the result of lower chloride levels in State Water Project imports and a successful ban of self-regenerating water softeners in area homes.

Water quality monitoring of the river water diverted at the Freeman Diversion is performed every two weeks to confirm that the water is acceptable for use in both aquifer recharge and for irrigation deliveries. The mineral content of water in the river at this location exhibits a strong negative

correlation with flow, where higher flows are less mineralized. Nitrate concentrations are routinely low in the river and do not show a strong correlation with flow. The County of Ventura maintains and operates composite sampling device at the Freeman, and samples storm flow and dry weather base flows several times per year. These samples are analyzed for a broad suite of organic contaminants and metals as part of a storm water quality program required by the Los Angeles Regional Water Quality Control Board.

In recent years both the City of Fillmore and the City of Santa Paula have eliminated discharges of treated wastewater to the Santa Clara River upstream of the Freeman Diversion. Santa Paula's new treatment plant came on-line in 2010 and utilizes percolation basins for wastewater disposal. Fillmore completed a new plant in 2009 and now distributes reclaimed water to both percolation basins near the plant site and a network of subsurface irrigation systems constructed in parks and school fields throughout the city.

2.2.3 SANTA FELICIA DAM CONSERVATION RELEASES

United's conservation releases are designed to replenish the Piru, Fillmore and Santa Paula Basins by direct percolation from the Santa Clara River. The remaining portion of the release is diverted at the Freeman Diversion and is either spread for percolation into the Forebay, or is sent to the Oxnard Plain or Pleasant Valley Basins via the surface water delivery system. The conservation release can be adjusted in quantity (duration and magnitude) and timing to optimize benefits within the district. The quantity in most years is limited by the supply from the wet season runoff and the amount of State Water purchased. Lake Piru maintains a minimum pool of 20,000 AF of storage that is designed to keep the sediment deposits in the lake away from the outlet works. Releases beyond this point are only done when State Water released from Pyramid Lake is expected to fill the lake back to the minimum pool shortly after the conservation release.

In 2011 there was 56,400 AF of stored water available for the conservation release. The following factors were considered when deciding on how much of the stored water was to be released:

- Provide enough storage capacity in Lake Piru to minimize the chances of spilling in 2012;
- Meet the needs of the downstream basins;
- Meet the needs of the surface water deliveries to Pleasant Valley and the PTP system; and
- Hold over enough water in the lake in case 2012 was a dry year.

The analysis found that the optimal volume to be released was 31,700 AF leaving 46,100 AF (with minimum pool) in the lake for the following year in case it was dry. Figure 2.2-1 shows the basic hydrology of inflows and outflows of Lake Piru.

Because the water levels were relatively high in the Piru and Fillmore basins due to the wet year and a 11,000 AF release from Castaic Lake, the release was designed to concentrate more on the lower basins. A higher release rate normally accomplishes this goal. The release started at 400 cfs in order to cut a channel across the Piru Basin so that a higher percentage of the release would end up downstream in Santa Paula basin and the Coastal basins (the Oxnard Forebay, Oxnard Plain, Mound, West Las Posas and Pleasant Valley basins). Once the channel was cut, the release was tapered back so that the duration of the release could be extended using the same volume of water. This type of release is now called a tapered release and has been done several times in the past few years.

The timing of the release was designed to coincide with the maximum demand for the surface water deliveries out in the Oxnard Plain. Peak demand occurs with the planting of the strawberries that take place from mid September to the end of October. Heavy groundwater pumping at the end of the dry season would otherwise meet this demand. The release started on September 12 and ended on November 6. Consideration was also given to allow enough time to dry out and prepare the percolation ponds so that they are ready for the 2012 wet season.

Of the 31,700 AF released from Santa Felicia Dam in 2011, approximately 15,700 AF (50%) of the water directly percolated into the Piru and Fillmore basins (Upper basins). The remaining 16,000 AF either percolated into the Santa Paula basin or was diverted at the Freeman Diversion for groundwater recharge or surface water deliveries. Below is a table showing the estimates of the distribution of percolated flows in each basin during the conservation releases since 1999 with 2011 being near the 12 year average of the releases in terms of total quantity of the release and the direct benefit to each basin. Figure 2.2-2 shows the conservation release and the associated direct benefit to each basin. Discharge measurements were made near the Piru and Fillmore basin boundary to calculate the amount of water that percolated into the Piru Basin, and measurements were also made at Willard Rd. for the Fillmore Santa Paula basin boundary to calculate what percolated in the Fillmore Basin. The remaining discharge measured at Willard Rd. is assumed to either benefit the Santa Paula Basin or diverted at the Freeman Diversion ("Lower Basins" in following tables).

Table 2-1 Benefits of the SFD Conservation Release due to direct percolation

Year	Total Released from SFD AF	Direct Deliveries in AF. of SFD Release to:			
		Piru Basin	Fillmore Basin	Lower Basins (groundwater recharge)	Surface water Deliveries PTP and PV
1999	22,800	5,700	3,500	11,200	2,400
2000	47,200	13,800	6,100	24,150	3,150
2001	47,400	14,000	2,900	28,300	2,200
2002	20,200	8,000	5,100	6,530	570
2003	29,000	21,000	3,500	3,600	900
2004	12,200	8,000	2,150	1,600	550
2005	9,100	na	na	4,500**	0
2005	23,400	na	na	17,200**	150
2006	30,900	na	na	17,200**	1,600
2007	40,700	15,900	6,300	12,200	6,400
2008	44,400	15,400	5,700	17,400	5,800
2009	26,700	13,200	4,700	5,200	3,000
2010	33,000	14,500	4,800	10,700	3,200
2011	**31,700**	**12,400**	**3,300**	**14,100**	**1,600**
Average	29,907	12,900	4,368	12,420	2,251
13 yr. Total	448,607	154,800	52,418	186,300	33,771

*2005 had two conservation releases. Portion of the release includes spill water when the lake was full

** measured at the Freeman Diversion

2.2.4 IMPORTATION OF STATE WATER

Ventura County has a 20,000 AF allocation of State Water. United Water's share of the allocation is 5,000 AF. Port Hueneme Water agency uses 1,850 AF of the original 5,000 AF and takes delivery through Metropolitan Water District. The remaining 3,150 AF of water is permitted to be released from Pyramid Lake and sent to Lake Piru through the natural water course of Piru Creek. United may receive this water from November 1st through the end of February of each year. Typically the conservation release will end before the State Water has arrived in Lake Piru. In order to release the state water that year, United will continue the release below the lake's minimum pool to the volume of State Water that was purchased, knowing that state water will fill it back to the minimum pool by the end of November. The State Water allows the conservation release to be extended a

few extra days due to the extra volume of water. The volume of water that percolates into each basin on the extended days of the release was considered to be the direct benefit to each basin.

In 2011 the State Water Project made available 80% of water allocations held by subscribers to the system. United received its 80% or 2,520 AF by a release from Pyramid Lake in November and December of 2011. Due to the wetter than normal conditions United chose to store the State Water until 2012 when it can be delivered at the end of the conservation release, along with any other additional State Water purchased for 2012.

The table below is a summary of all the state water purchased by United Water along with the direct benefits to each basin from percolation. Detailed stream flow measurements are taken near the basin boundaries throughout the releases to determine where the state water is percolating.

Table 2-2 Summary of State Water Release from Santa Felicia Dam

	Summary of State Water Released From Santa Felicia Dam in 1991-2011 (Values in AF)				
Year State Water Purchased	From Santa Felicia Dam	Release to Upper Basins (Fillmore and Piru)	Releases to the Lower Basins (Santa Paula and Coastal Basins)	Delivered to PV. And PTP	Recharge To Lower Basins
1991	4,836	3,603	1,233	0	1,233
1992	988	84	904	0	904
2000	2,200	406	1,794	69	1,725
2002	3,150	1,455	1,695	192	1,503
2003	3,150	2,041	1,109	70	1,039
2004	4,047.5	3,348	700	228	472
2007	1890	844	1046	116	930
2008	1980	673	1307	306	1001
2009	3150	1045	2105	724	1381
2010	3150	917	2233	559	1674
2011	**2520***				
Total	28,542	14,416	14,126	2,264	11,862

* To be released in 2012 conservation release

The benefit of the conservation release along with the State Water released can be seen in Figure 2.2-3. Since November of 2007 a transducer has been monitoring water levels in a monitoring well near the river in the Piru Basin. The graph shows the immediate rise in water levels in a well during the releases (shown in red). Because the well is approximately 600 feet from the flow in the river, a mound will build rapidly when the release starts and dissipate a little more slowly at the end of the release. Water levels are always considerably higher following the release, compared to the projection of water levels trends before the release.

2.2.5 PIRU DIVERSION EVALUATION

The Piru Diversion has been historically operated to divert surface water into United's nearby spreading grounds for groundwater recharge however this facility has not been operated since September of 2008. The diversion is located on the western bank of lower Piru Creek just south of the old Center Street Bridge in the town of Piru. Part of the diversion dam is built under the two roadway bridges crossing lower Piru Creek at Center Street.

The existing diversion consists of an earthen berm that extends out across the river channel, a sluice channel that can accommodate approximately 200 cfs, and a diversion structure with a trash rack and four 24-inch inlets leading to a 48-inch diversion pipe that conveys diverted water to the 44- acre spreading grounds.

The structure is not in compliance with National Marine Fisheries Service standards for diverting water in a stream that is considered by NMFS to constitute anadromous waters for Southern California steelhead. Therefore the facilities have been included as parts of United's Habitat Conservation Plan (HCP) so that the facility will be covered for incidental take. The diversion will not be put back into operation until the take permit has been issued and the facility has been retrofitted.

2.2.6 SANTA CLARA RIVER FLOW DIVERSIONS

The Freeman Diversion diverted 92,600 AF in 2011. This represents about 150% of the historical average diversions since 1955. In wet years such as 2011 various operational strategies were implemented to assure maximum yield at the diversion. Such strategies included limiting turbidity turn-outs, shifting the locations to spread water to reduce mounding near the river, alternating ponds to insure the maximum possible percolation rates, and implementing new SCADA controls to optimize canal levels. Some of these strategies are discussed below.

High flows in the river are normally associated with high turbidity. During times when the river is at its peak, diversions stop so that the sediment-laden water is not diverted. A recently implemented more aggressive schedule to divert more turbid water allowed the facility to divert 2,000 to 3,000 acre feet more than it would have in prior years. This more aggressive turn in procedure increases the use of the desilting basin, resulting in the need for more frequent cleanouts.

United's aggressive wet season spreading at Saticoy and the Noble Basin increased water levels in the surrounding area to a point where groundwater from spreading in the Saticoy and Noble basins was discharging back to the river near the Highway 118 Bridge. Rising groundwater in this area reached around 50 cfs of discharge in the river in the month of April. The spreading ponds further away from the river were used to limit the amount of discharge back to the river. The discharging water is in large part due to the degradation in the riverbed near the Highway 118 Bridge. The riverbed is currently about 20 feet lower than it was in the early 1950's allowing for a larger elevation differential between the pond and the river. A portion of the discharging water will

percolate downstream of the discharging point. With the balance of the discharging river that breached the Forebay to become part of the environmental flows that were needed to maintain downstream passage for the Southern California steelhead.

Nearly 72,000 AF were spread for groundwater recharge at United's three recharge facilities. El Rio recharged nearly half of the water, with Saticoy and the Noble Basins making up the other half (Figure 2.2-4). The remaining 20,600 AF went to surface water deliveries discussed in Section 1.4.6.

2.2.6.1 EL RIO RECHARGE BASIN

Recharge to El Rio exceeded the 56 year average in all months except for August. The total volume recharged was approximately 160% of normal. El Rio became the preferred facility to recharge due to the mounding of water and discharge back to the river at the other facilities. Due to the active O-H well field surrounding the facility, the groundwater mounding does not reach the surface thereby reducing percolation rates.

Table 2-3 Recharge to El Rio for 2011 calendar year

Recharge to El Rio AF		
	2011 Year	average since 1955
Jan	3,776	2,691
Feb	3,617	3,123
Mar	5,283	3,473
Apr	6,070	2,709
May	2,188	2,035
Jun	2,594	1,053
Jul	1,459	871
Aug	224	1,144
Sep	2,283	1,604
Oct	4,370	1,705
Nov	3,520	1,548
Dec	2,461	2,138
Totals	37,845	24,096

2.2.6.2 NOBLE RECHARGE BASIN

The Noble Basin is normally the last of United's Forebay facilities to be used for groundwater recharge. It is difficult to maintain the ponds during the wet season due to greater water depths and proximity to groundwater. During 2011, water was spread into the basin for a portion of four months

during the natural runoff period, and two months during the conservation release. The average spreading at this facility was nearly double the average since it was built in 1994.

Table 2-4 Recharge to the Noble Basin for calendar year 2011

Recharge to Noble Basin AF		
	2011	average since 1994
Jan	766	275
Feb	2,507	808
Mar	2,259	1,279
Apr	4,305	1,385
May	0	614
Jun	0	435
Jul	0	210
Aug	0	108
Sep	0	150
Oct	137	153
Nov	705	160
Dec	0	175
Totals	10,679	5,754

2.2.6.3 SATICOY RECHARGE BASINS

The Saticoy facilities recharged 23,400 AF in 2011, which is about average for the 55-year period since construction of Lake Piru. As mentioned above, mounding was occurring under the ponds and recharged water was flowing back out to the river. Priority was given to the El Rio facility at this time to attempt to decrease the amount of rising groundwater going back to the river. Regardless of the mounding, United was able to divert its instantaneous surface water diversion license limits with consideration to the environmental bypass flows for the entire year.

Table 2-5 Recharge to Saticoy for calendar year 2011

Recharge to Saticoy AF		
	2011	average since 1955
Jan	7,608	2,229
Feb	1,946	2,504
Mar	2,208	3,361
Apr	4,478	3,074
May	265	2,377
Jun	164	1,461
Jul	0	1,233
Aug	0	1,076
Sep	816	1,453
Oct	5,041	1,927
Nov	909	1,270
Dec	0	1,662
Totals	23,435	23,627

2.2.7 SATICOY WELL FIELD USAGE AND CREDIT SYSTEM BALANCE

In conjunction with the conservation releases from Santa Felicia Dam, United temporarily stores surface water beneath the Saticoy Spreading Ground for later delivery to the overdrafted areas of the Pleasant Valley and Oxnard Plain basins. United constructed the Saticoy well field in 2004, allowing the pumping of mounded groundwater for delivery to the PV and PTP systems. The Fox Canyon Groundwater Management Agency adopted a resolution that created a pump- back storage program of the Saticoy spreading system and its well field usage. Recharged water from the conservation release at the Saticoy Facility to the surface water delivery system can be pumped back for a period of two years. At the end of the two years the storage credits expire. Below is a table showing the history of the credit/ balance of this system. To date an additional 24,900 AF have been stored during the conservation releases at Saticoy, with a total of 9,550 AF extracted for surface water deliveries. The credit system does not include the State Water that is part of the conservation release or the well field pumping when the water levels have “mounded”.

Table 2-6 Credit system for the Saticoy Well Field

	Total Available at the Start of year	Saticoy Well Field S.W. deliveries	Unused allocation	Recharged to Saticoy at end of year less state water
2006	0	0		7,846
2007	7,846	1,753	6,093	3,247
2008	9,340	3,845	5,495	5,695
2009	8,942	2,455	6,487	1,045
2010	6,740	759	5,981	1,821
2011	2,866	737	2,129	5,237

2.2.8 CASTAIC LAKE FLOODFLOW RELEASE

United is the lead member of a water conservation agreement between the California Department of Water Resources and the Downsteam Water Users (DWU). The DWUs consist of United, Los Angeles County, Newhall Land and Farming, and Valencia Water District. The program is designed to hold back flood flows in Castaic Lake and release them at a later date in a manner that allows the flows to percolate in the basins downstream of the dam, benefiting the DWU's. United takes the lead role for the DWUs in requesting the storage and releases, and by monitoring of the associated release to make sure that the flows are benefiting the basins. In 2011 approximately 11,000 AF of captured flood flows were released. Most of the released water percolated into the Piru Basin with some of it making it to the Fillmore Basin. Figure 2.2-5 shows the water level increase in a key well in Piru Basin during the associated release. Figure 2.2-6 shows the inflows/outflows from Castaic Lake in 2011.

2.2.9 BOUQUET RESERVOIR RELEASES

United has an agreement with the Los Angeles Department of Water and Power (LADWP) that provides for the release of flows from Bouquet Reservoir to recharge the aquifers of the Santa Clara River Valley to the extent that they were recharged from Bouquet Canyon outflows prior to construction of the reservoir. The agreement stipulates that LADWP release between 2,100 and 2,194 acre feet per year. This quantity is based on historical annual inflows to the reservoir. The agreement requires a continual release of 5 cfs between April 1st and September 30th; and 1 cfs between October 1st and March 31st of each year.

The prescribed flows were interrupted following an extreme weather event in 2005 that resulted in raising the streambed and pushing it toward Bouquet Canyon Road. In several locations the stream is higher than the road and on occasion stream flows have entered the road posing a threat to public safety. When water is observed on the road, flows from Bouquet Reservoir are reduced.

To complicate matters, this area of Bouquet Creek is designated critical habitat for unarmored three-spined stickleback, and flow changes require special consideration for this species. United has been participating in the stakeholders meetings to ensure that the deficit of water will eventually be released. By 2008 the deficit was approximately 4,400 AF. Since releases have at times been more than the required release, the overall deficit has been reduced to 3,328 AF.

3 HYDROGEOLOGY OF DISTRICT

United Water Conservation District overlies all or portions of eight groundwater basins in central and southern Ventura County. The geologic setting of the basins, the regional aquifers, and some characteristics of each basin are discussed in this section. Discussion related to 2011 conditions in the basins are included in Chapter 4 of this report.

3.1 GEOLOGIC SETTING

The United Water groundwater basins are part of the Transverse Ranges geologic province where the mountain ranges and basins are oriented east-west rather than the typical northwest-southeast trend of much of California. The geology associated with the Transverse Ranges is primarily east to west trending folds and faulting (fold axes trend east-west). This configuration creates the elongate mountains and valleys that dominate Santa Barbara County and Ventura County.

The boundaries of United Water Conservation District are located within the more regional Ventura Basin, which is an elongate east to west trending structurally complex syncline within the Transverse Range province (Yeats, et. al., 1981). The seven basins that underlie the District are the Piru, Fillmore, Santa Paula, Mound, Oxnard Forebay, Oxnard Plain, and Pleasant Valley basins (Figure 1-1). The western portion of the West Las Posas Basin also falls within the District boundary.

The Santa Clara River Valley occupies the Ventura Basin, which is one of the major sedimentary basins in the geomorphic province. The total stratigraphic thickness of upper Cretaceous, Tertiary, and Quaternary strata exceeds 55,000 feet (Sylvester and Brown, 1988).

Active thrust/reverse faults border the basins of the Santa Clara River Valley, contributing to the uplift of the adjacent mountains and down-dropping of the basins. The Piru, Fillmore, and Santa Paula basins are bounded by the Oak Ridge fault to the south and the San Cayetano fault system to the north. The Oxnard Plain and Mound basins extend across the offshore marine shelf to the shelf/slope break (the edge of the shelf).

The basins are filled with substantial amounts of Tertiary and Quaternary sediments that were deposited in both marine and terrestrial settings. The basins on the coast, including the Mound

basin, are filled with recent sediments deposited on a wide delta complex that formed at the terminus of the Santa Clara River. Figure 3.1-1 shows the local formations which form the mountain ranges, surface/subsurface geology, and the major faulting in relation to the United Water basins.

3.2 AQUIFERS

Most of the coastal basins within United Water Conservation District have a shallow perched aquifer zone, and the aquifers of all the basins can be classified as part of an Upper Aquifer System (UAS) and Lower Aquifer System (LAS) (e.g., Turner, 1975; Mukae and Turner, 1975). The UAS consists of the Oxnard and Mugu aquifers. The LAS consists of the Hueneme, Fox Canyon and Grimes Canyon aquifers. The aquifers contain gravel and sand deposited along the ancestral Santa Clara River, from alluvial fans along the flanks of the mountains, from a coastal plain/delta complex at the terminus of the Santa Clara River, and marine deposits from transgressional seas. The aquifers are recharged by infiltration of streamflow (primarily the Santa Clara River), artificial recharge of diverted streamflow, mountain-front recharge along the exterior boundary of the basins, direct infiltration of precipitation on the valley floors of the basins and on bedrock outcrops in adjacent mountain fronts, and irrigation return flow in some agricultural areas.

Figure 3.2-1 is a schematic of the UAS and LAS showing their subsurface sequence. The figure also shows general depths in feet. However, more recent work with geophysical logs has suggested that some of the aquifers are actually deeper than originally thought and indicated on this schematic. Also note that the clay layers (aquicludes) shown in the UAS are inter-fingering and in some places discontinuous.

3.2.1 PERCHED/SEMI-PERCHED

On the Oxnard Plain, the uppermost silt and clay deposits of the Oxnard aquifer are overlain by sand layers of the “semi-perched zone,” which generally contains poor-quality water. This zone extends from the surface to no more than 100 ft in depth. The confining clay of the upper Oxnard aquifer generally protects the underlying aquifers from contamination from surface land uses. Deep percolation of rainfall and irrigation return flows are the major components of recharge to the semi-perched zone. The semi-perched zone is rarely used for water supply on the Oxnard Plain.

3.2.2 UPPER SYSTEM

The Upper Aquifer System (UAS) consists of the Oxnard and Mugu aquifers. These aquifers are characterized by recent alluvium (Oxnard aquifer) of Holocene age and older alluvium (Mugu aquifer) of late Pleistocene age. The Oxnard aquifer rests unconformably on the Mugu aquifer. A clay layer occurs between the aquifers.

Recent river channel deposits comprise the uppermost water-bearing units along portions of the Santa Clara River basins. These deposits are generally up to 100 ft in thickness. In the Santa Paula basin, nested monitoring wells indicate that this upper alluvial aquifer is somewhat isolated from the underlying aquifers of the San Pedro formation. The alluvial unit, from which there is considerable water production in the Santa Clara River basins, may be time-equivalent to portions of the UAS on the Oxnard Plain, but has not been assigned to the UAS in the literature.

3.2.2.1 OXNARD

The Oxnard aquifer materials generally consist of lagoonal, beach, river, floodplain and alluvial fan deposits (Turner, 1975). The Oxnard aquifer is present throughout the Oxnard Plain and other basins. The Oxnard aquifer is the primary aquifer used for groundwater supply on the Oxnard Plain. This highly-permeable assemblage of sand and gravel is generally found at a depth of approximately 100 ft to 250 ft below land surface elevation.

3.2.2.2 MUGU

The Mugu aquifer materials generally consist of lagoonal, beach, river, floodplain, alluvial fan terrace and marine terrace deposits. The Mugu aquifer rests unconformably on the LAS. Basal conglomerates occur in many areas (Hanson et al, 2003). In the Oxnard Plain, these coarse-grained basal deposits comprise the Mugu aquifer (Turner, 1975). The Mugu aquifer is generally penetrated at a depth of 255 ft to 500 ft below land surface.

3.2.3 LOWER SYSTEM

The Lower Aquifer System (LAS) consists of the Grimes Canyon, Fox Canyon, and Hueneme aquifers (Figure 3.2-1). The LAS is part of the Santa Barbara, San Pedro, and Saugus formations of Plio-Pleistocene age (Mukae and Turner, 1975).

In any of the basins, the aquifers of the LAS may be isolated from each other vertically by low-permeability units and horizontally by regional fault systems. The LAS is folded and tilted in many areas, and has been eroded along an unconformity that separates the upper and lower aquifer systems.

3.2.3.1 HUENEME

The Hueneme aquifer is considered to underlie the Oxnard Plain basin (Hanson et al, 2003). The Hueneme aquifer materials generally consist of terrestrial fluvial sediments, and marine clays and sands. In the basins along the Santa Clara River, the deeper aquifer system is generally considered to be the San Pedro Formation (Mann, 1959) or the time-equivalent Saugus Formation, although the U.S. Geological Survey considers this deeper aquifer to be equivalent to the Hueneme aquifer (Hanson et al, 2003).

3.2.3.2 FOX CANYON

The Fox Canyon aquifer underlies the Las Posas, Pleasant Valley, Oxnard Forebay and Oxnard Plain basins. The Fox Canyon aquifer materials generally consist of marine shallow regressive sands and some clays. The Fox Canyon aquifer is the lower unit in the San Pedro formation. This same unit also extends north into the Mound basin, but the character of the sediments change to more finely-bedded deposits (UWCD, 2012).

3.2.3.3 GRIMES

The lowest water-bearing unit of the East Las Posas and Pleasant Valley basins is commonly referred to as the Grimes Canyon aquifer (CA DWR, 1954; Turner, 1975). The Grimes Canyon aquifer materials generally consist of marine shallow regressive sands.

3.3 GROUNDWATER BASINS

The groundwater basins within the District vary in their water production and ability to be recharged rapidly. The groundwater basins detailed here are really sub-basins of the larger basin of the Santa Clara River Valley (CA DWR, 2003). Hydraulic connection exists between all basins within the District boundaries. The Fillmore basin receives recharge as underflow from the Piru basin, and the Santa Paula basin receives significant recharge from the Fillmore basin. The Mound basin receives recharge from the Santa Paula basin and from the Oxnard Plain and Oxnard Forebay basins, although head differentials across the western Santa Paula basin boundary are greater than those between the other sub-basins of the Santa Clara River valley. The Oxnard Forebay basin is widely recognized as the primary recharge area for aquifers in the Oxnard Plain. Many of the confining clays present in the aquifer systems of the Oxnard Plain are absent or discontinuous in the Oxnard Forebay basin, creating a window for recharge to other down-gradient aquifers. High groundwater elevations in and near the Oxnard Forebay promote groundwater flow to the nearby Mound and West Las Posas basins. The Pleasant Valley basin is more distant from the Oxnard Forebay and receives less direct benefit from United's recharge operations, but pipelines have been constructed to convey irrigation water directly to water users in Pleasant Valley and on the southern Oxnard Plain.

3.3.1 PIRU

The Piru basin consists of recent and older alluvium underlain by San Pedro (Saugus) Formation. The recent and older alluvium is made up of coarse sand and gravel that are present to a depth of approximately 60 to 80 feet throughout the basin. The San Pedro Formation consists of permeable sand and gravel and extends to a depth of approximately 8,000 feet. Two faults bound the Piru basin, the Oak Ridge fault to the south and the San Cayetano fault to the north (UWCD, 1996b).

Groundwater flow in the alluvium of the Piru basin tends to be westerly, parallel to the river channel. Similarly, the flow gradient in the San Pedro Formation is westerly with a small north/south component as the groundwater moves parallel to the axis of the syncline that forms the basin. The basin is considered to be an unconfined groundwater basin. The Santa Clara River and Piru Creek are major sources of recharge to the Piru basin, with minor sources from smaller streams, from outcrops to the north of the basin, and from percolation of rainfall. United occasionally operates the Piru Spreading Grounds, a 44-acre recharge basin which diverts water from Piru Creek for groundwater recharge. The Piru basin readily accepts large volumes of recharge as surface water percolates to groundwater in the channel of the river. During United's conservation releases from Lake Piru a significant percentage of flow infiltrates through the river channel and serves to recharge the Piru basin.

Under low-flow conditions (up to approximately 100 cfs), all of the surface flow of the Santa Clara River coming from Los Angeles County commonly infiltrates into the Piru basin above the confluence of Piru Creek, so that there is no continuity of river flow across the basin. Continuous surface flow may extend the length of the basin following large winter storms, during large releases from Castaic Lake, and in the winter and early spring of exceptionally wet years. A lengthy "dry gap" of approximately five miles commonly exists in the central portion of the Piru basin, extending from the point of complete percolation of surface water east of Piru Creek to areas near the downstream end of the basin. During United's conservation releases flows ranging from 100-200 cfs are often required to establish surface flow between Piru Creek and the west end of the basin. In the area west of Hopper Creek groundwater flow is constricted as the basin narrows and shallow groundwater intersects the river channel. This "rising groundwater" contributes or restores surface flow in the river near the west end of the basin. When groundwater levels in the Piru basin are high, the area of rising groundwater extends farther east than in drier times, and the total flow of the discharge to surface water is greater. At the lower end of the Piru basin, a significant amount of groundwater flows into the Fillmore basin as underflow (Mann, 1959).

The channel of the Santa Clara River stays along the basin's southern edge over the length of the basin, likely secured in that position by the alluvial fans of Piru and Hopper Creeks entering the basin from the north. Chloride impacts associated with wastewater discharges sourcing from Los Angeles County over the past decade are now observed in wells along the northern portions of the middle of the basin. The northerly extent of these chloride impacts suggests the primary groundwater flow paths down the basin are north of the modern river channel. Groundwater flow paths are likely influenced by both geologic structure within the basin and the extraction of groundwater in the northern portions of the basin.

3.3.2 FILLMORE

The Fillmore basin consists of varying alluvial deposits resting on the San Pedro Formation. The younger alluvial deposits comprise recent sands and gravels of the Santa Clara River and Sespe Creek in the southern and eastern parts of the basin. Southward-sloping alluvial fan material forms

the Sespe uplands in the north-central portion of the basin, and alluvial fan material of the Pole Creek Fan underlies the City of Fillmore (UWCD, 1996b). Alluvial thickness varies from 60 to 120 ft. The San Pedro Formation, folded into an east-west syncline, underlies most of the Fillmore basin. Along the main axis of the syncline, the San Pedro Formation reaches a depth of 8,430 feet. At the western basin boundary, the San Pedro Formation extends to a depth of 5,000 to 6,000 feet.

The groundwater flow gradient in the Fillmore basin generally creates an east to west movement of groundwater through the alluvium. Groundwater that infiltrates from Sespe Creek generally flows towards the southwest. In the San Pedro Formation, the movement of groundwater is believed to be southerly beneath the Sespe fan, changing to westerly near the axis of the syncline. The basin is considered an unconfined groundwater basin. The Santa Clara River and Sespe Creek are two major sources of recharge to the Fillmore basin, as is underflow from Piru basin. As with the Piru basin to the east, the Fillmore basin readily recharges in years of abundant rainfall and streamflow.

The Fillmore basin narrows at the downstream end, resulting in an extensive area of rising groundwater and gaining flow in the Santa Clara River. Extensive wetlands exist in this area, and are easily visible on aerial photographs. Groundwater underflow into the Santa Paula basin is likely significant, although some suggest surface flow related to rising groundwater comprises a larger component of the discharge from the basin (Mann, 1959).

3.3.3 SANTA PAULA

The Santa Paula Basin is located along the Santa Clara River, extending from approximately Kimball Road and the town of Saticoy in the west to Santa Paula Creek in the east. The basin is bounded by the Sulphur Mountain foothills on the north and South Mountain on the south. The basin is elongated in a northeast-southwest direction, about 10 miles long and as much as 3.5 miles wide. The surface area of the basin is approximately 13,000 acres, and ranges in elevation from 130 feet above sea level near Saticoy to 270 feet above sea level near the City of Santa Paula. Ongoing uplift along the Oak Ridge and other faults has created a deep basin, with Plio-Pleistocene deposits exceeding 10,000 feet in thickness.

The principal fresh water-bearing strata of the Santa Paula Basin are the Pleistocene San Pedro Formation, Pleistocene river deposits of the ancient Santa Clara River, alluvial fan deposits shed from the uplifted mountain blocks, and recent river and stream sediments deposited locally along the Santa Clara River and its tributaries. These water-bearing sediments are underlain by relatively impermeable Pliocene and older units. The sediments of the basin have been warped into a syncline that is oriented in a northeast-southwest direction along the center of the basin. To the east, the Santa Paula Basin is considered to be in hydraulic connection with the Fillmore Basin. To the south, the Oak Ridge fault forms a partial barrier to groundwater movement. On the north, the portion of the aquifer represented by the San Pedro Formation is exposed in an outcrop along the Sulphur Mountain foothills. The Santa Paula basin borders the Oxnard Forebay and Mound basins on the west. The western boundary of the Santa Paula Basin is more complex, with local uplift and

faults mapped by some investigators. Although there is general agreement that there is some hydraulic connection between Santa Paula Basin and the Mound Basin, the degree of connection is uncertain.

Long-term records of groundwater elevations within the Santa Paula basin demonstrate that the basin has a more muted recharge response to wet years than the Piru and Fillmore basins to the east. Much of the recharge likely occurs in the eastern portion of the basin (Santa Paula Basin Experts Group, 2003). Groundwater levels in many wells in the central and western portions of the basin show significant seasonal variability, suggesting some degree of confinement. During high rainfall years, monitor wells in the southern portion of the basin near the Freeman Diversion, and historically some other wells near Saticoy, have shown artesian flow. The complex subsurface geology in the western portion of the basin complicates interpretations of groundwater flow in this area.

3.3.4 MOUND

The principal fresh water-bearing strata of the Mound basin are the upper units of the San Pedro Formation and overlying Pleistocene deposits that are interpreted to be correlative with the Mugu aquifer of the Oxnard Plain basin. There is an upper confining layer of Pleistocene clay approximately 300 feet in thickness. The basin extends several miles into the offshore.

The sediments of the basin have been warped into a syncline that is oriented in an east-west direction that roughly follows Highway 126. Structural disruption along the Oak Ridge fault in the southern portion of the basin has resulted in considerable uplift and erosion of the San Pedro and younger sediments. This disruption is the cause of the topographic “mounds” near the intersection of Victoria Avenue and U.S. 101, for which the basin is named. The Montalvo anticline has traditionally been used to define the southern extent of the basin. These structural features generally offset only the deeper LAS units of the adjacent Oxnard Plain. The deposits of the Upper Aquifer System overlie the faults and folds along the southern margins of the basin, but the character of the deposits change as they extend to the north, becoming more finely bedded and fine-grained (UWCD, 2012b).

The limited number of wells in the Mound basin, especially in the northern half of the basin, complicates efforts to ascertain the primary sources of recharge to the basin. There likely is some component of recharge from precipitation falling on aquifer units that outcrop in the hills along the northern margin of the Mound basin (Figure 3.1-1), but no wells exist to provide evidence of this occurrence. There is general agreement that the basin benefits from recharge from the Oxnard Forebay and Oxnard Plain to the south, especially during periods of high water level on the Plain (GTC, 1972; Fugro, 1996; UWCD 2012b). The hydrogeologic boundaries of the Mound basin are not coincident with the structural boundaries of the basin, so there is hydrologic connection between the Mound basin and adjoining groundwater basins (UWCD, 2012b). The amount of recharge from the Santa Paula basin to the east is also unclear, but high heads in some wells in the eastern

Mound basin suggests some degree of connection and recharge. Mann (1959) suggested that there is little underflow from the Santa Paula basin to the Mound basin, although more recent studies suggest it may be significant (Fugro, 1996; UWCD, 2012b).

Groundwater flow in the Mound basin is generally to the west and southwest with modest to weak gradients, especially in times of drought. The poor distribution and limited number of wells with water level records complicates efforts to contour groundwater elevations in the basin. During periods of drought and increased pumping, a pumping trough forms along the southern portion of the basin that significantly modifies groundwater gradients.

3.3.5 OXNARD FOREBAY

Both UAS and LAS aquifers are present in the Oxnard Forebay and Oxnard Plain basins. The Oxnard Forebay maintains direct hydraulic connection with confined aquifers of the Oxnard Plain basin, which extends several miles offshore beneath the marine shelf where outer edges of the aquifer are in direct contact with seawater. In areas near Port Hueneme and Pt. Mugu where submarine canyons extend nearly to the coastline, the fresh-water aquifers may be in direct contact with seawater a short distance offshore.

The Forebay is the main source of recharge to the Oxnard Plain basin. Recharge to the Forebay benefits other coastal basins (Mound, West Las Posas, Pleasant Valley) but a majority of the water recharged to the Forebay flows downgradient to the confined aquifers of the Oxnard Plain. The shallow sediments of the basin are dominated by coarse alluvial deposits of the ancestral Santa Clara River. The absence of low-permeability confining layers between surface recharge sources and the underlying aquifers in the Forebay allow rapid groundwater recharge in the Forebay. The recharge to the Forebay comes from percolation of Santa Clara River flows, artificial recharge from United's spreading basins, irrigation return flows, percolation of rainfall, and likely lesser amounts of underflow from the Santa Paula basin and mountain-front recharge from the nose of South Mountain. In the area of the Forebay between the El Rio and Saticoy spreading grounds, the LAS has been uplifted and truncated along its contact with the UAS. In this area recharge from surface sources may enter both the UAS and the underlying LAS. The U.S. Geological Survey estimates that about 20% of the water recharged to this area reaches the LAS, with the remainder recharging the UAS. In some areas of the Forebay significant clays are present among the deposits of the LAS.

3.3.6 OXNARD PLAIN

The Oxnard Forebay is hydraulically connected with the aquifers of the Oxnard Plain basin, which is overlain by an extensive confining clay layer. Thus, the primary recharge to the Oxnard Plain basin is from underflow from the Forebay rather than the deep percolation of water from surface sources on the Plain. Natural and artificial recharge to the Forebay serves to raise groundwater elevations in this up-gradient area of the groundwater flow system for the Oxnard Plain. High water levels in

the Forebay increase the hydrostatic pressure in the confined aquifers extending from the margins of the Forebay to the coastal and offshore portions of these continuous aquifer units. While the physical movement of groundwater out of the Forebay is fairly slow, the pressure response in the confined aquifers distant from the Forebay responds more rapidly to significant recharge events in the Forebay. When groundwater levels are below sea level along the coastline, there may also be significant recharge by seawater flowing into the aquifers.

Vertical gradients also commonly exist between aquifer units on the Oxnard Plain, resulting in some degree of water movement through low-permeability units that occur between most of the major aquifers. When LAS water levels are substantially lower than UAS water levels (creating a downward gradient), there may be substantial leakage of UAS water into the LAS through the confining clays. Likewise, a downward pressure gradient can exist between the Semi-perched aquifer and the Oxnard aquifer when heads in the shallow confined Oxnard aquifer are lowered (either regionally by drought conditions or locally by pumping wells). The movement of poor quality water from the semi-perched zone to the Oxnard aquifer has been documented in some locations, with abandoned or improperly constructed wells being a notable pathway for this downward flow (Izbicki, 1992; Stamos et al, 1992).

The highly-permeable deposits of the UAS are relatively flat lying across approximately the upper 400 feet of the Oxnard Plain. In the northern Oxnard Plain heads are often similar in the Oxnard and Mugu aquifers, but heads in the Mugu are considerably deeper in the greater area surrounding Mugu Lagoon. Deposits of the LAS are generally finer-grained and have been deformed by folding and faulting in many areas. An uneven distribution of pumping, along with structural and stratigraphic changes within the deposits of the LAS result in varied heads among the deep wells across the Oxnard Plain and Pleasant Valley.

3.3.7 PLEASANT VALLEY

Pleasant Valley is bounded to the south by the Santa Monica Mountains, to the north by the Camarillo Hills, and to the west by the Oxnard Plain. The Bailey fault runs along the base of the Santa Monica Mountains, and the Camarillo fault along the Camarillo Hills to the north.

The Pleasant Valley basin is differentiated from the Oxnard Plain basin by a general lack of UAS aquifers (Turner, 1975). The UAS is composed of alluvial deposits about 400 feet thick. In Pleasant Valley much of the UAS is fine grained and not extensively pumped for water supply (Turner, 1975; Hanson et al, 2003). Although where coarse-grained deposits are present, wells in the UAS underlying Pleasant Valley can yield large quantities of water to wells.

The LAS is composed of the Hueneme, Fox Canyon, and Grimes Canyon aquifers to a depth of about 1,400 feet. The Hueneme aquifer is composed of alternating layers of sand and finer grained deposits. The Fox Canyon and Grimes Canyon aquifers are composed of thick sequences of relatively uniform marine sand. The Fox Canyon aquifer is the major water-bearing unit in the basin.

In Pleasant Valley the LAS is surrounded and underlain by partly consolidated marine deposits and volcanic rocks. Marine deposits are present in the Camarillo Hills and in the western edge of the Santa Monica Mountains near the coast. As a result of faulting and uplift of the underlying marine deposits near Mugu Lagoon the LAS is not hydraulically connected to the Pacific Ocean in this area (Izbicki, 1996a; Hanson et al., 2003). Volcanic rocks consisting of basalts, submarine volcanic flows, and debris flows are present in the Santa Monica Mountains along the southern edge of the valley (Weber et al., 1976). The underlying marine deposits and volcanic rocks both contain high-chloride water.

Under predevelopment conditions groundwater movement in the UAS and LAS was likely from recharge areas in the eastern part of Pleasant Valley toward the Oxnard Plain to the southwest. The LAS in Pleasant Valley appears to be fairly isolated from sources of recharge, and the time since recharge of the ground water ranges from 3,000 to more than 6,000 years before present (Izbicki, 1996b). Groundwater age increases with depth and water within deeper aquifers has contacted aquifer material longer, reacting to a greater extent with these materials than water in overlying aquifers. Over the past two decades water levels in two wells in northern Pleasant Valley have recovered more than 250 feet. The re-establishment of surface flow in Arroyo Las Posas that subsequently percolates at the northern margin of the basin is now recognized as a source of recharge to the basin.

High-chloride concentrations are present in water from wells throughout Pleasant Valley, especially along the southern edge of the valley near the Bailey Fault. Wells yielding high-chloride water in this area may have been drilled too deep and directly penetrated deposits having high-chloride water, or high-chloride water may have invaded deeper freshwater aquifers from surrounding and underlying deposits as a result of pumping. However, despite their isolation from sources of ground water recharge, chloride concentrations in water from deep wells in Pleasant Valley increase during dry periods when ground-water pumping increases. Conversely, chloride concentrations decrease during wetter periods when alternative sources of irrigation water are available from surface supplies and groundwater pumping decreases. Regardless of the source, changing hydraulic pressure as water levels within the lower aquifer system decline as a result of pumping wells, especially during dry periods, may increase chloride concentrations in water produced from deeper wells if the proportion of high-chloride water yielded to the well from underlying deposits increases (Izbicki et al., 2005a). In addition to water from surrounding and underlying rocks, irrigation return also may contribute to high chloride concentrations in deep wells that are partly screened in the upper aquifer system. More recently, groundwater recharge from Arroyo Las Posas in the northern portion of the basin has been recognized as an additional source of salt in the basin.

3.3.8 LAS POSAS

The West Las Posas basin lies adjacent the northeast Oxnard Plain in the area south of South Mountain and north of the Camarillo Hills. The basins generally consists of a broad alluvial plain sloping to the south, and is drained by Beardsley Wash which flows west around the Camarillo Hills.

Only the western portion of the West Las Posas basin lies within United's District boundary. Tree crops are the dominant land use in this agricultural area. Much of this area is served by groundwater imports from the Oxnard Plain, but some agricultural pumping is reported from deep wells near Beardsley Wash and the South Mountain foothills.

Most groundwater production in the West Las Posas basin is from deposits of the San Pedro Formation. Beneath most of the Las Posas Valley, the upper San Pedro Formation consists of low permeability sediments with lenses of permeable sediments which are age-equivalent to Hueneme Aquifer on Oxnard Plain (DWR, 1975). The permeable lenses form isolated, yet, locally important water sources. The water-bearing zones in the upper San Pedro Formation are not well connected. Some recharge to the deeper Fox Canyon aquifer may source from downward leakage from the upper San Pedro Formation. Many wells in the Las Posas Basin are perforated in the Fox Canyon aquifer, making it the principal water-bearing unit (Mukae, 1988). The FCA is exposed almost continuously along the southern flank of South Mountain. South of the outcrop, beds of the Fox Canyon aquifer dip below the valley and are folded into a series of anticlines and synclines. Groundwater in the Fox Canyon aquifer exists under confined conditions beneath the valley and unconfined conditions at the valley margins where the aquifer is folded upward and exposed at the surface. Much of the groundwater recharge to the western portion of the West Las Posas basin is believed to source from the Oxnard Plain. Minor amounts of recharge are derived likely from infiltration of precipitation and runoff in the outcrop areas.

4 ANNUAL HYDROLOGIC CONDITIONS

This section details the range of hydrologic conditions observed throughout United's district boundaries in the year 2011. While the emphasis is placed on surface water and groundwater conditions over the past year, some discussion is devoted to the comparison of recent conditions to conditions documented in the historical record. Recorded rainfall totals were commonly several inches greater than average, but significant storm events occurring in December 2010 and March 2011 resulted in high base flows in the Santa Clara River and its major tributaries. The groundwater response to the above-average flow in stream channels, increased surface water deliveries and reduced pumping associated with the wet conditions was favorable.

4.1 PRECIPITATION AND EVAPOTRANSPIRATION

United participates in data collection in partnership with the Ventura County Watershed Protection District's three rainfall gauges, two of which are also evaporation stations. The VCWPD maintains approximately 125 gauges around the county (Figure 4.1-1). United's gauges are located at the field offices in Saticoy, El Rio, and at the guard station at the Lake Piru. United also maintains records from the gauge at the office in Santa Paula for its own use. United's monitoring stations showed that precipitation was about 136% of normal for the water year, with December and March

accounting for 65% of the rainfall. Lake Piru recorded 28.48 inches of rainfall, approximately 8.6 inches more that the average received at that location, and in the top 20% in terms of rainfall totals for this station.

Table 4-1 Monthly Precipitation for water year 2011

Monthly Precipitation Data - 2010-11 Water Year													
Gauge Location	**Gauge no.**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**
El Rio	**231**	1.87	1.01	8.43	0.53	2.34	4.58	0.00	0.55	0.10	0.00	0.00	0.00
Lake Piru	**160**	2.04	1.54	11.92	0.62	5.27	6.22	0.06	0.80	0.01	0.00	0.00	0.00
Santa Paula	**245**	2.11	1.07	9.61	0.30	3.64	6.03	0.00	0.89	0.14	0.00	0.00	0.00

4.2 SURFACE WATER

The Santa Clara River Watershed is extensively monitored by multiple agencies for rainfall, daily stream discharge and flood flows. Data for many of the monitoring sites goes back to the early 1900s giving a long period of record for comparison purposes. The year 2011 overall would fall in the normal to wet category in terms of both precipitation and run-off. Below is a brief discussion of how 2011 compares to the historical record. Daily and monthly data for all the sites discussed can be obtained on-line at websites maintained by the USGS and VCWPD.

4.2.1 SANTA CLARA RIVER SYSTEM

The Santa Clara River is the largest river system in southern California remaining in a relatively natural state. The headwaters start on the northern slopes of the San Gabriel Mountains and the river flows approximately 84 miles to an estuary and river mouth at the Pacific Ocean near Ventura Harbor on the northern Oxnard Plain. The major tributaries include Castaic Creek and San Francisquito Creek in Los Angeles County, and Sespe, Piru and Santa Paula creeks in Ventura County. While the Los Angeles portion of the watershed accounts for 40% of the total area, it only produces about 20% of the total river flow, with dry-season base flows sustained by discharges from wastewater treatment plants and rising groundwater from the Eastern groundwater basin. As mentioned in other sections of this report, even though 2011 was wetter than most years, large sections of the main stem of the Santa Clara River remained dry for most of the year.

4.2.1.1 FLOW IN THE SANTA CLARA RIVER WATERSHED

Surface water flows in the Santa Clara River system were well above normal for the 2011 calendar year. The season started out wet with an early storm in December 2010, before the reporting period for this report. Figure 4.2-1 shows monthly flows in each of the tributaries. The storm peaked Sespe flows over 3,000 cfs a couple of times before runoff subsided in late February. Two

smaller storms were then followed by a large March storm where the Sespe's peak flow exceeded 35,000 cfs. Flows in the Sespe were over 1,000 cfs for the next 10 days. Figure 4.2-2 shows the monthly flows in the Sespe compared to the monthly average flows. The response to the March storm was much different in the Piru watershed due to the elevation difference between the two watersheds. The higher elevations in the Piru watershed accumulated several feet of snow. The storm resulted in flows peaking at about 600 cfs in Piru Creek at Pyramid Lake. The runoff then subsided to less than 200 cfs over the next couple of days. A warm period then melted the snow, creating diurnal fluctuations in runoff of up to 600 cfs in Piru Creek (Figure 4.2-3).

The USGS station 111090000, Santa Clara River near Piru, measures the entire contribution from Los Angeles County's portion of the watershed that flows into Ventura County. This station recorded a peak flow of nearly 9,000 cfs in the March storm. Flows subsided to a little over 300 cfs within a couple of days after the peak. A large release from Castaic Lake in the month of April brought the average flow up to 11,000 AF that month.

Table 4-2 Total Discharge for various stream flow stations

USGS/VCWPD Stream flow Stations	Total Discharge for 2011
	AF
Santa Clara River Near Piru USGS Sta. 11109000	61,824
Piru Creek Above Santa Felicia Dam USGS Sta. 11109600	61,787
Piru Creek Below Santa Felicia Dam USGS Sta. 1110900	36,175
Sespe Near Fillmore USGS Sta. 1111300	124,500
Santa Paula Creek VCWPD 709	29,700
Santa Clara River at Victoria VCWPD 723	121,052

The natural runoff in most of the tributary watersheds was about 130% to 140% of average. The main exceptions were flows coming from Los Angeles County which were 156% of the average, and flows below Santa Felicia Dam which were near normal. Los Angeles County's flows may have been proportionally higher than the other watersheds for two reasons. Wastewater discharge to the river has been gradually increasing since the late 1970s, and the DWR did not appropriate any storm inflow into Castaic Lake in 2011 because all stored inflows could be beneficially used downstream in April and May. See Section 2.2.8 for discussion concerning the Castaic flood flow release.

4.2.1.2 WATER QUALITY

United maintains a surface water quality monitoring program and collects samples from a number locations at frequencies ranging from quarterly to every two weeks. Sampling sites are generally located on the Santa Clara River near groundwater basin boundaries and at the major tributaries near the confluence with the river. Additional water quality sampling sites include the Santa Clara River at the Freeman Diversion and the weir where surface water arrives at United's El Rio

recharge basins. Sample analysis commonly consists of either a full inorganic general mineral suite or several key constituents such as TDS, chloride and nitrate. This surface water quality monitoring provides documentation of variations in surface water quality and information on the quality of water that is recharging the groundwater basins of the District. Sampling is conducted every three month at most of the sites, but more frequently at some key locations (Santa Clara River: every month near County Line and every two weeks at Freeman Diversion).

Water quality at the various sampling sites throughout the District tends to vary seasonally, with the lowest annual mineral concentrations commonly recorded in the winter and spring when flow is higher. Results from United's 2011 surface water sampling are shown on Figures 4.2-4 and 4.2-5, where the annual recorded maximum concentrations of chloride and TDS, respectively, are displayed over the annual minimum values. The range in values is from four seasonal samples at most locations, so the true range in quality in the water bodies is likely greater than what is documented.

Water quality in Piru Creek is influenced by Pyramid Lake located higher in the Piru Creek watershed, which receives large volumes of water from the State Water Project. Water in middle Piru Creek is a blend of State Water and local runoff from the upper Piru Creek watershed. When chloride concentrations in State Water are high, the chloride in middle Piru Creek and Lake Piru can be much higher than what would occur naturally. In 2011 the maximum-recorded chloride above Lake Piru was 57 mg/l, a value lower than many recent years due to lower State Water chloride concentrations and above-average precipitation in the watershed.

Chloride concentrations in the Santa Clara River near the Los Angeles County line are also influenced by chloride in imported State Water, as Castaic Lake Water Agency delivers State Water to water retailers in the greater Santa Clarita area. Nearly 50% of the chloride load in wastewater discharges is from the chloride load in delivered water (LACSD, 2008). Additional chloride loading occurs during beneficial use of the delivered water, but loading has been significantly reduced in recent years as the Los Angeles County Sanitation District has managed a successful campaign to remove thousands of self-regenerating water softeners from the community. The Sanitation Districts are trying to satisfy regulatory requirements for the quality of their effluent, but the approach to be taken is not yet clear as community residents have resisted funding a chloride TMDL proposed by the Sanitation Districts and approved by the Los Angeles Regional Water Quality Control Board in December 2008.

Over the past decade chloride concentrations in the Santa Clara River have varied considerably near the Los Angeles County line as water quality at this location is heavily influenced by discharges from the Valencia Water Reclamation Plant. From the late 1990s through 2003 the discharges from the Valencia plant increased steadily in both volume and chloride, with chloride concentrations exceeding 200 mg/l near the end of this period. Since 2003 chloride concentrations in the discharges have fallen somewhat: however, chloride in the river commonly exceeds the 100 mg/l surface water objective during months without significant rainfall (Figure 4.2-6). The lower chloride concentrations in the Santa Clara River in recent years are largely related to lower chloride

in wastewater discharges from the Valencia WRP (Figure 4.3-6). This is likely the result of lower chloride levels in State Water Project imports and a successful ban of self-regenerating water softeners in City of Santa Clarita area homes. Prior to 1970 the discharge of oilfield brines significantly impaired water quality in the river at this location, but flows associated with this poor water quality were likely minor.

Beginning in January 1999, United has sampled the Santa Clara River near the Los Angeles County line each month for chloride and other analytes. Sampling in 2011 documented chloride concentrations ranging from 79 to 132 mg/l. Chloride concentrations in the water released from Lake Piru ranged from 47 to 59 mg/l over the same time period (Figure 4.2-4). All surface water sample locations recorded lower-than-average chloride in 2011 following the abundant rainfall in the winter and spring.

In recent years both the City of Fillmore and the City of Santa Paula have eliminated discharges of treated wastewater to the Santa Clara River. Santa Paula's new treatment plant came on line in 2010 and now utilizes percolation basins for wastewater disposal. Fillmore completed a new plant in 2009 and now distributes reclaimed water to both percolation basins near the plant site and a network of subsurface irrigation systems constructed in parks and school fields throughout the City. The City of Fillmore has banned installation of self-regenerating water softeners as part of its efforts to reduce chloride loading to the watershed. There are now no Ventura County water reclamation plants discharging flow to the Santa Clara River. Continuous river flow from Los Angeles County to the Freeman Diversion is uncommon, but when there is connection flows are usually high in the lower watershed and the recycled water component sourcing from Los Angeles County is very minor. The maximum-recorded chloride concentration in the Santa Clara River at Freeman Diversion in 2011 was 69 mg/l (Figure 4.2-4).

United frequently monitors water quality in the Santa Clara River at the Freeman Diversion, the point where water is diverted from the river for either direct deliveries to agricultural users or groundwater recharge in the Oxnard Forebay. Samples are collected at the Freeman Diversion approximately every two weeks to confirm that the water is acceptable for use in both aquifer recharge and for irrigation deliveries. The TDS and chloride content of water in the river at this location exhibits a strong negative correlation with flow, with higher flows being less mineralized (Figure 4.2-7 and Figure 4.2-8). Under dry conditions groundwater discharge from the Fillmore basin comprises a large portion of the river flow at the Freeman Diversion. Under wetter conditions tributary flow, most notably from Sespe and Santa Paula Creeks, contribute flow to the lower river and improves water quality compared to low-flow conditions. High river flows resulting from the direct runoff of precipitation commonly has the lowest dissolved mineral content, as does the recession limb of hydrographs from large flow events (Figure 4.2-7). United commonly diverts large volumes of water from the river for groundwater recharge during these periods of high flow and good water quality. Recorded TDS concentrations at the Freeman Diversion ranged from 570 to 1150 mg/l in 2011 (Figure 4.2-5).

Nitrate concentrations in the Santa Clara River at Freeman Diversion show some negative correlation with flow but concentrations are routinely low in the river during both high and low flows (Figure 4.2-9). A weak seasonal signature has been observed, with nitrate concentrations rising slightly in the fall (UWCD, 2008). For the 26 samples collected at Freeman Diversion in 2011 the maximum-recorded nitrate concentration was 8.4 mg/l, well below the CA DPH health standard of 45 mg/l.

The County of Ventura maintains and operates composite sampling device at the Freeman Diversion, and samples storm flow and dry weather base flows several times per year. These samples are analyzed for a broad suite of organic contaminants and metals as part of a storm water quality program required by the Los Angeles Regional Water Quality Control Board. Detections of organic contaminants such as pesticides are uncommon and generally of low concentration (VCWPD, 2010)

4.2.2 CALLEGUAS CREEK

United does not actively gauge or sample surface water in the Calleguas Creek watershed. Much of the monitoring activity in the Calleguas Creek watershed is currently associated with the Salts TMDL under development for the watershed.

4.3 GROUNDWATER

Groundwater is utilized extensively for municipal and agricultural use throughout the boundaries of United Water Conservation District, as imported water supplies are unavailable over much of this area. United has a responsibility to monitor conditions in the basins throughout the District so that the basins are understood and managed as needed. Many small water supply projects are completed without United's direct involvement, but proponents of most large water projects engage United's support in some way (e.g., data sets, technical support, financial assistance, etc.).

The following sections detail 2011 basin conditions within the eight groundwater basins which fall wholly or partially within United's District boundaries. Following the favorable recharge conditions in the watershed in the winter and spring of the year, and large releases from Lake Piru and Castaic Lake, groundwater conditions were generally good compared to other recent years. Some discussion in the following section is devoted to comparing current conditions to past periods of drought, or periods pre-dating some major water supply projects within the District.

4.3.1 PIRU BASIN

The Piru basin has the capacity to rapidly accept water from the channel of the Santa Clara River and tributary streams. Some component of the water stored in the basin is slowly discharged to the downstream Fillmore basin, so that in some ways the Piru basin acts as a "forebay" to downstream groundwater basins in the Santa Clara River Valley. Surface water discharge of rising groundwater

at the west end of the basin is greater when water levels are higher in the downstream portions of the basin. Groundwater elevations tend to remain well above historic lows, but over the past decade chloride impacts sourcing from Los Angeles County have migrated down past the midpoint of the basin.

4.3.1.1 WATER LEVELS

Historical groundwater elevations for United's Piru basin key well, located northwest of the confluence of Piru Creek and the Santa Clara River are shown on the hydrograph in Figure 4.3-1. The historical record for this well shows that groundwater elevations in the Piru basin fluctuate dramatically, and that the basin is capable of rapid recovery of water levels following drought periods. Water level recovery at this location is largely related to channel recharge associated with high and prolonged flow in the Santa Clara River and in Piru Creek, such as that which occurs during reservoir releases or large winter storms.

The basin fills in wet years such as 1998 and 2005, as shown by the flat-topping of groundwater elevations at 620 feet. Although 2011 was a moderately wet year the basin did not fill to historical highs. The 2011 recorded high groundwater elevation at United's key well is approximately 12 feet lower than recorded high groundwater elevations. The groundwater elevation recorded in this well in 1991 was 510 feet above sea level, at the end of a period of drought.

Piru basin groundwater levels have benefited from the recharge of recycled water discharged to the Santa Clara River by water reclamation plants in Los Angeles County. Historically the Santa Clara River has maintained perennial flow in the vicinity of Blue Cut and the County line, with the flow sustained by groundwater discharge from the Eastern groundwater basin. The City of Santa Clarita began importing State Water in 1980, and steady growth in that community resulted in steady increases in wastewater discharges until recent years, when discharge has diminished slightly. United's fall conservation releases from Lake Piru provide an additional source of recharge to the basin. Release volumes vary year-to-year, and variable channel conditions affect the percentage of the released water that percolates in the Piru basin. Recharge through the channel of Hopper Creek is likely another source of significant recharge during wet years like 2011.

Groundwater elevation contours were interpreted from measured groundwater elevation highs from the spring of 2011 and groundwater elevation lows from the fall of 2011, and are shown in Figures 4.3-2 and 4.3-3 respectively. Groundwater flow is consistently from east to west, roughly following the land surface gradient of the river channel. Depths to water are greater along the northern portions of the basin where alluvial fan deposits elevate the land surface. Groundwater elevations were similar in the spring and fall of 2011, in part due to a large fall release from Lake Piru and a late spring release of stored runoff from Castaic Lake.

The tight contours shown in the eastern Piru Basin, just west of United's District boundary, indicate that this eastern portion of the basin is an area of significant recharge. This is the area where surface water sourcing from Los Angeles County infiltrates to groundwater and the river often goes

dry. Spring 2011 groundwater elevations are approximately 20 feet higher than in fall 2011 in this area.

Groundwater rises near the constriction at the downstream west end of the basin, contributing flow to the Santa Clara River. Groundwater elevations near the constriction at the west end of the basin are historically more stable than those in the central and eastern portions of the basin. Recorded groundwater elevations are approximately the same in this area in the spring and fall of 2011. The contours also show groundwater flow to the Fillmore basin to the west.

4.3.1.2 GROUNDWATER EXTRACTIONS

Reported groundwater extractions from 101 active wells in the Piru Basin totaled 11,700 acre-feet for the 2011 calendar year. This is 720 acre-feet less than the historical average for the period 1980 to 2011, the period of available records. A portion of the Piru basin extends east of United's District boundary and any pumping from this portion of the basin is not reported to United. The historical annual extractions for the Piru basin are shown in the histogram in Figure 4.3-4. Only a small percentage of groundwater pumping in the Piru basin is for municipal and industrial use, consistent with agriculture being the dominant land use within the basin.

Figure 4.3-5 is a map showing reported groundwater extractions from individual wells in the Piru Basin for the 2011 calendar year. Pumping magnitude is indicated by dot size and color. Agriculture is the predominant land use within the Piru basin, and pumping is shown to be distributed throughout the basin. Few active wells exist along the southeastern margin of the basin, and some crops here are irrigated with water piped in from other areas. Two private mutual water companies operate within the basin. The Piru Mutual Water Company diverts water from Piru Creek for agricultural use in the north-central portion of the basin, and Warring Water Company pumps water primarily for domestic use in the town of Piru.

In some canyon and upland areas, orchards are irrigated with groundwater pumped from lower areas of the basin and piped to higher elevations. In recent years a large number of orange orchards have been removed and replaced by row crops or box tree nurseries.

The primary losses of groundwater from the Piru basin are the result of discharge of groundwater to the Santa Clara River at the western boundary of the basin, the subsurface outflow of groundwater at the western boundary of the basin and extraction of groundwater by wells.

4.3.1.3 WATER QUALITY

Over the past decade the main water quality concern in the Piru basin has been impacts associated with high chloride concentrations in the Santa Clara River flows sourcing from Los Angeles County. Discharge from the Valencia Water Reclamation Plant located next to the river at Interstate 5 significantly influences the flow and water quality of this reach of the river, which normally percolates completely in the eastern Piru basin (UWCD, 2006; CH2M Hill, 2006). The chloride

concentration of plant discharges began to increase in the late 1990s and peaked at over 210 mg/l in 2003 (Figure 4.3-6). The chloride plume associated with these discharges has made a steady advance with groundwater flow down the Piru basin. The extent of chloride impacts is now approaching Hopper Creek in the western third of the basin (Figure 4.3-7). Irrigation of salt-sensitive crops such as strawberries and avocado with water over 100 mg/l chloride is generally not recommended, and growers in Ventura County remain concerned about the westward progression of these impacts. More recently, chloride concentrations in Los Angeles County wastewater discharges are improving, the result of a successful campaign to remove self-regenerating water softeners from Santa Clarita residences and lower chloride concentrations in imported State Water Project deliveries. In the western portion of the basin chloride concentrations are generally less than 70 mg/l, indicative of background levels within the basin (DWR, 1989).

The Piru basin generally does not have problems with nitrate contamination, and samples collected in 2011 show only one well exceeding the MCL of 45 mg/l (VCWPD, 2012). Many wells record TDS concentrations of 1,200 mg/l or less, but some wells record TDS concentration twice this value (VCWPD, 2012). Water quality of the Piru basin is characterized more thoroughly in the revised Groundwater Management Plan for the Piru and Fillmore basins (Piru/Fillmore Groundwater Management Council, 2011).

4.3.2 FILLMORE BASIN

The City of Fillmore overlies the northeast portion of the Fillmore basin, and relies entirely on groundwater for water supply. Sespe Creek is the largest tributary to the Santa Clara River and enters the basin from the north. Sespe Creek is an important source of recharge to the basin, providing high-quality water from a largely undeveloped watershed draining the southern slopes of the Pine Mountain complex in the Los Padres National Forest. Groundwater supports extensive acreage of agriculture in the basin, ranging from row crops and nursery stock near the valley floor to citrus and avocado plantings at both low and high elevations. Discharge to the downstream Santa Paula basin is thought to be significant, especially during high groundwater conditions such as those observed in 2011.

4.3.2.1 WATER LEVELS

Many water levels in the Fillmore basin behave in a manner similar to the Piru basin. Water levels from a key well in the Bardsdale area shows that water levels rise to a threshold elevation in significant wet years, as evidenced by the flat topping of groundwater elevations in 1998 and 2005 (Figure 4.3-8). In this vicinity south of the confluence of Sespe Creek and the Santa Clara River, groundwater elevations do not fluctuate as dramatically as those in the Piru basin.

Groundwater elevations at United's key well for the basin show that in 2011, a moderately wet year, the basin did not fill completely. The 2011 recorded high groundwater elevation at United's key well is approximately 3.1 feet lower that the 1998 recorded high groundwater elevation, and

approximately 26 feet higher than the recorded low groundwater elevation during the 1987 to 1991 drought.

Fillmore basin groundwater levels likely benefit from increased discharge from the Piru basin as that basin has sustained fairly high water levels in recent decades. The Fillmore basin also benefits from United's fall conservation release from Lake Piru which helps stabilize groundwater elevations. The Fillmore basin receives most of its recharge from the Santa Clara River and Sespe Creek.

Groundwater elevation contours are shown for spring and fall 2011 in Figures 4.3-2 and 4.3-3. Groundwater flow is predominantly east to west in the area of the Santa Clara River alluvium. In the Pole Creek fan area underlying the City of Fillmore, groundwater flow is generally westerly, but few wells exist here, which constrains interpretations of groundwater flow. Well control in the Sespe Upland area is also poor, but groundwater flow here is thought to be predominantly north to south. Along the valley floor groundwater gradients are quite uniform and are similar for the spring and fall of 2011. The contours merge at the west end of the basin where the groundwater flow is east to west. Groundwater elevations in wells located in the Sespe Upland area and in the Pole Creek fan area of the basin generally exhibit more variability than well wells along the valley floor.

The relatively tight contours shown in the eastern Fillmore Basin near the basin boundary show a steeper gradient as groundwater moves from the constriction of the Piru narrows and moves into the basin. In this area surface water commonly infiltrates to groundwater, resulting in diminished surface flow and a greater component of flow as groundwater. As in Piru basin, groundwater is forced to the surface near the downstream end of the Fillmore basin as geologic structure constricts the main aquifer units of the Fillmore basin. In this area groundwater elevations are more stable than elsewhere in the basin. At this discharge area of the basin contouring shows that spring and fall 2011 groundwater elevations are approximately the same (Figures 4.3-2 and 4.3-3). Extensive wetlands in this area are clearly visible on aerial imagery.

4.3.2.2 GROUNDWATER EXTRACTIONS

Reported groundwater extractions from 266 wells in the Fillmore Basin totaled approximately 40,855 acre-feet for the 2011 calendar year. This is 3,337 acre-feet less than the historical average from 1980 to 2011. The historical annual extractions for the Fillmore basin are shown in the histogram in Figure 4.3-9. Recently and historically, agriculture has been the predominant user of groundwater in the basin.

Figure 4.3-5 is a map depicting reported groundwater extractions from individual wells in the Fillmore Basin for the 2011 calendar year. This graphic shows that: 1) the City of Fillmore pumps from three wells located in the north Pole Creek fan area near Sespe Creek and no longer pumps from wells located near the Santa Clara River; 2) there are numerous wells in the Bardsdale area pumping small volumes of water, as there is no mutual water company distributing potable water in this area; 3) few active wells in the Sespe Upland area and most active wells are located at lower elevations; and 4) Groundwater extractions from wells at the Fillmore Fish Hatchery located at the

eastern boundary of the basin accounts for a significant portion of the groundwater extractions of the basin. In 2011 Fillmore Fish Hatchery wells reported pumping of 9,146 acre-feet (22% of the total groundwater extractions from the basin).

Twelve mutual water companies operate in the Fillmore Basin, serving water primarily for irrigated agriculture. Fillmore Irrigation operates a surface water diversion on Sespe Creek, supplying water to nearby agricultural lands. Several water companies operate wells near the valley floor and pump water to higher elevation where groundwater is not as plentiful. Plantings in Timber Canyon and many areas of the Sespe Uplands are served by such arrangements. In recent years many orange orchards at lower elevations have been removed and replaced by row crops or box tree nurseries. Plantings of citrus and avocado remain the primary agricultural land use at higher elevations.

Discharge of groundwater to the Santa Clara River at the western boundary of the basin, subsurface outflow of groundwater to the Santa Paula Basin and extraction of groundwater by wells are the three primary losses of groundwater from the basin. The extensive wetlands and stands of *Arundo donax* (an invasive giant cane) at the west end of basin likely transpire large volumes of water. By some estimates *Arundo donax* may transpire up to six times the amount of water as native vegetation (CA Invasive Plant Council, 2011)

4.3.2.3 WATER QUALITY

The Fillmore basin is not known for having any pervasive water quality problems. TDS concentrations can be somewhat elevated in some locations, as in other groundwater basins along the Santa Clara River Valley. The City of Fillmore no longer uses wells near the Santa Clara River, favoring locations near Sespe Creek where TDS tends to be lower. Deeper aquifer units may have elevated concentrations of iron and manganese, a common occurrence throughout Ventura County.

Chloride concentrations from samples collected in 2011 are shown on Figure 4.3-7. Recorded concentrations exceeding 70 mg/l are uncommon, and limited to the area located south of the Santa Clara River. Concentrations in the 40s and 50s in the downstream/discharge portion of the basin are likely indicative of background chloride concentrations in the basin.

4.3.3 SANTA PAULA BASIN

Groundwater storage in the Santa Paula basin is generally less dynamic than in surrounding basins. Pumping in the Santa Paula basin is managed by a stipulated Judgment which assigns pumping allocations to each basin pumper that restricts the amount or groundwater each pumper can extract (within a seven-year rolling average). The City of Santa Paula occupies the eastern portion of the basin and relies entirely on groundwater for its water supply. Extensive water delivery systems have long existed in the basin, delivering water to areas with poor water quality or areas of the basin that are not readily recharged.

4.3.3.1 WATER LEVELS

Long-term records of groundwater elevations in the Santa Paula Basin indicate that water levels do not recover as readily as in the Piru and Fillmore basins. The channel of the Santa Clara River is located south of the Oakridge fault in the central portion of the basin, and overlies sediments of low permeability. The basin likely receives significant recharge as underflow from the Fillmore basin. Recent gauging of Santa Paula Creek and the Santa Clara River suggests the amount of recharge the basin receives from these sources, at least during low-flow conditions, is limited. An extensive flood control project on lower Santa Paula Creek, completed in the late 1990s, may have negatively affected the amount of recharge derived from this source.

Historical groundwater elevations dating from 1923 to present are shown in a hydrograph for United's key well for the basin (Figure 4.3-10). The well is located near Peck Road and Highway 126 in the eastern portion of the basin. The hydrograph shows that groundwater elevations in spring 2011, a moderately wet year, were higher than in spring 2010, a year of nearly average precipitation. The hydrograph also shows that the recorded high groundwater elevation for 2011 was approximately 8 feet lower than the recorded high groundwater elevation in 1998, and approximately 30 feet higher than the recorded low groundwater elevation during the 1987 to 1991 drought.

Evaluation of the key well hydrograph and other the hydrographs for other wells located throughout the basin show that water levels in many of the wells (43 of 57 wells) in both the eastern and western portions of the Santa Paula basin failed to fully recover to 1998 levels after near-record precipitation in 2005. This lack of complete recovery is consistent with an observed long-term, gradual decline in basin groundwater elevations (UWCD, 2009; Santa Paula Basin Technical Advisory Committee, 2011).

Figure 4.3-11 and Figure 4.3-12 show groundwater elevation contours in the Santa Paula Basin for spring and fall 2011, respectively. The spring contours represent the annual basin high groundwater elevations and the fall contours represent the annual basin low groundwater elevations. The difference between the spring high groundwater elevations and the fall low groundwater elevations is approximately 10 feet throughout the basin.

The contours show a general east to west flow direction with groundwater underflow from the Fillmore basin to the Santa Paula Basin and groundwater underflow from the Santa Paula Basin to the Mound basin. The relatively tight contours just west of the Santa Paula-Fillmore boundary show an area of recharge to the basin. The complex subsurface geology related to extensive faulting in the most western portion of the basin complicates the interpretation of groundwater flow in this area.

4.3.3.2 GROUNDWATER EXTRACTIONS

A histogram of reported basin pumping from 1980 to 2011 is shown in Figure 4.3-13. In recent years municipal pumping has accounted for more than 20% of the total pumping from the basin. The total reported groundwater extractions from 124 active wells in the Santa Paula Basin totaled 24,265 acre-feet for the 2011 calendar year. This is 1,432 acre-feet below the long-term average of 25,697 acre-feet. A 2003 basin study titled "Investigation of Santa Paula Basin Yield" was conducted by experts from the City of Ventura, Santa Paula Basin Pumpers Association and United. The study suggested that the yield of Santa Paula basin is probably near the historic average pumping of about 26,000 acre-feet per year.

Figure 4.3-14 is a map showing groundwater extractions by wells in the Santa Paula Basin in year 2011. The map shows significant pumping within the Santa Paula city limits and near the Fillmore basin boundary. Numerous wells report pumping in agricultural areas in the central portion of the basin. Few active wells exist north, west and south of this vicinity. In the western third of the basin, significant pumping is reported south of Highway 126 and west of Ellsworth Barranca, and in the area north of Highway 126 and west of Brown Barranca.

Several private irrigation companies are active in the Santa Paula basin, operating wells and delivery pipelines that distribute large quantities of water around the basin. Farmers Irrigation Company pumps groundwater primarily from the eastern portion of the basin and distributes the water by pipeline for agricultural use in areas of the central and western basin. Also affiliated with Farmers Irrigation Company are Canyon Irrigation Company and Thermal Belt Mutual Water Company. Canyon Irrigation operates the Harvey Diversion on Santa Paula Creek, and some wells in the eastern basin, delivering water to agriculture in the area of Santa Paula Canyon. Thermal Belt Mutual pumps groundwater from the east basin for pipeline distribution for agriculture in the Foothill Road area and upland area of the north central basin. Alta Mutual Water Company extracts water from the Saticoy area in the west basin, and delivers water primarily to agricultural areas north of Telegraph Road. These extensive water delivery systems were largely established to deliver water to areas of the Santa Paula basin having poor quality groundwater. In the canyons and foothills along the northern flank of the basin, both well production and water quality are generally poor.

Farmers Irrigation Company, Thermal Belt Mutual Water Company and Canyon Irrigation Company pumped a combined total of 9,125 acre-feet in 2011. This pumping totaled approximately 38% of all groundwater extracted from the basin in 2011.

4.3.3.3 WATER QUALITY

Water quality is fairly variable throughout the Santa Paula basin, but water quality is generally worse in the western portion of the basin. The maximum recorded TDS concentrations for Santa Paula basin wells in calendar year 2011 are shown in Figure 4.3-15, with the highest concentrations recorded in the west. In these wells sulfate is commonly a large contributor to TDS. Deeper wells

in the basin tend to have elevated iron and manganese concentrations, and both the City of Santa Paula and City of Ventura operate treatment facilities to reduce these constituents in delivered municipal water. Recorded nitrate concentrations from wells within the basin are generally low, with one well measuring nitrate over the MCL of 45 mg/l in 2011.

United conducts groundwater quality monitoring at the two nested monitoring well sites in the Santa Paula Basin, and in several production wells in the basin. Mineral concentrations are observed to vary with groundwater elevation in some wells. More thorough characterizations of groundwater quality in the Santa Paula basin can be found in other publications (DWR, 1989; Santa Paula Basin TAC, 2011).

4.3.4 MOUND BASIN

The Mound Basin is located in the westerly portion of the District and has experienced over time a progression of groundwater use that was historically dominated by agriculture, followed by a period of time when municipal and industrial pumping was dominant, and most recently a return to greater pumping by agriculture than by municipal and industrial users.

4.3.4.1 WATER LEVELS

Historical groundwater levels for a key monitoring well in the Mound Basin are shown in Figure 4.3-16. Measured water levels have varied over about a 90-foot range over the period of record for this well, located in the eastern portion of the basin near Kimball Road. An extended period of low water levels was recorded in the late 1980s and early 1990s when water levels declined to below sea level. Water levels recovered in the 1990s and generally have remained more than 15 feet above sea level over the past decade, except when falling below sea level in 2004.

Recharge of the aquifers in this basin comes from multiple sources such as direct precipitation, mountain-front recharge, and subsurface flow from adjoining basins (e.g., Santa Paula, Oxnard Forebay, and Oxnard Plain). Recharge from the Oxnard Forebay and Oxnard Plain is thought to be significant, most notably during periods of high water levels in these adjacent basins (GTC, 1972; UWCD, 2012b).

Groundwater elevation records exist for nearly 60 active and historic wells located within the Mound Basin. A number of important wells have water levels dating to the late 1920s, allowing an evaluation of long-term water level trends within the basin. However, the distribution of wells is heavily skewed towards the southern half of the basin, with relatively few wells existing north of Telephone Road. In the western portion of the basin wells are concentrated along Olivas Park Drive and near the railroad tracks south of Highway 101. This poor distribution of active and historic wells complicates the assessment of potential mountain-front recharge to the basin from the north. The southern and eastern boundaries of the basin are defined by structural features, and water level records from adjacent areas help assess the nature of the basin boundaries in these

areas. Water level trends for many wells within the basin are similar, with evidence of recharge from adjacent basins to the east and south (UWCD, 2012b). The main groundwater flow pattern is down the axis of the basin from east to west. The slope of the potentiometric surface within the basin is quite flat during dry periods and the gradient increases somewhat following periods of above-average rainfall. During dry periods, groundwater elevations in many wells fall below sea level.

The contouring of past water level conditions is complicated at times by sparse data. Available groundwater elevation data for the spring and fall of 2011 are presented in Figures 4.3-17 and 4.3-18. Increased collection of water level records is recommended in this basin to better define groundwater gradients between this basin and adjacent basins. The recent installation of monitoring wells north of the Santa Clara River near the northwestern margin of the Forebay should be helpful in better defining the flow of groundwater from the Oxnard Forebay to areas north of the Montalvo anticline (see Section 2.1.8). Relatively few wells, however, exist along the southeastern portion of the Mound basin, an area of sparse well records and known structural complexity.

4.3.4.2 GROUNDWATER EXTRACTIONS

The City of Ventura is the major municipal and industrial groundwater pumper in the Mound basin, with its wells concentrated in the area near the Ventura County Government Center. Agricultural pumping was historically the majority use of groundwater in the Mound Basin, but municipal and industrial use exceeded or approximately equaled agricultural use for the period 1999 through about 2006 (Figure 4.3-19). Municipal pumping peaked in 2003 and has declined fairly steadily in recent years, with agricultural use predominating since 2007. Since the mid-1980s agricultural pumping has averaged nearly 4,200 acre-feet per year with a peak annual production of 5,850 acre-feet recorded in 1990. In 2011 reported agricultural pumping totaled 3,120 acre-feet with municipal and industrial pumping reaching 1,525 acre-feet.

4.3.4.3 WATER QUALITY

While the quality of the groundwater produced by most wells within the Mound Basin is suitable for municipal and agricultural uses, the basin is not known for the high quality of its groundwater. Water quality is variable between wells, and many records indicate somewhat elevated concentrations of TDS, sulfate, hardness and other analytes. Water quality appears to be relatively stable among many of the Mound basin wells having long-term water quality records, although some municipal production wells (e.g., Victoria 1 and 2) in the central portion of the basin have been experiencing declining water quality (i.e., increasing TDS values) that currently reach about 1,800 mg/L. Available records from wells nearest the coast do not show evidence of saline intrusion.

A map showing recorded TDS concentrations in Mound basin wells from 2011 is shown as Figure 4.3-20. The map plots TDS (by summation) from production well samples collected by the

Groundwater Section of the Ventura County Watershed Protection District, as well as TDS (by residue) as sampled by United Water and the City of Ventura. Without the sampling by the County's Groundwater Section, coverage in the basin would be very poor. The distribution of sampled wells within the basin for 2011 is better than in most prior years. TDS in the production wells ranged from 1,150 to over 2,200 mg/l. Sulfate commonly contributes roughly half the TDS in these samples, and water quality results are often variable among nearby wells.

4.3.5 OXNARD FOREBAY

The Oxnard Forebay basin is an area of critical importance to the water resources of the Oxnard Plain. This is the unconfined portion of the Oxnard Plain where units of low permeability are generally absent or discontinuous, allowing water to percolate deep into the ground and recharge the underlying aquifers. The basin readily accepts large volumes of recharge water under wet hydrologic conditions. A time series of estimated changes in available groundwater storage within the Forebay is shown in Figure 4.3-21. The graphic shows that storage in the basin can change rapidly, especially when the basin is filling.

Coarse gravel deposits deposited by high flows of the ancestral Santa Clara River are common in the Oxnard Forebay. These gravels have historically been extensively mined, both within the river channel and in nearby upland areas. The high permeability of these coarse alluvial deposits also comprise an ideal substrate for groundwater recharge. Groundwater recharge occurs naturally where water percolates through the bed of the Santa Clara River, and in upland areas near the river where United distributes diverted river water to a series of recharge basins. United's recharge activities are sometimes termed "artificial recharge" because the activities augment the recharge that would naturally occur in this area. The term "managed aquifer recharge" has become more popular in recent years.

Groundwater recharge to the Forebay serves to raise groundwater elevations in this upgradient area of the groundwater flow system for the Oxnard Plain. High water levels in the Forebay increase the hydrostatic pressure in the confined aquifers extending from the margins of the Forebay to the coastal and offshore portions of these continuous aquifer units. While the physical movement of groundwater out of the Forebay is fairly slow, the pressure response in the confined aquifers distant from the Forebay responds more rapidly to significant recharge events in the Forebay. During wet climatic years the Forebay has the ability to quickly accept large volumes of water, allowing storage of surface water that otherwise would be lost from the system. Water stored in the Forebay slowly bleeds out to the outlying areas, flowing naturally from areas of high elevation to areas of lower elevation on the Oxnard Plain and near the coast, and serves to raise or sustain groundwater elevations in wells in downgradient areas. Groundwater extraction by wells, both in the Forebay and in the confined aquifers of the Oxnard Plain, hastens the decline of Forebay water levels as water is removed from the system. Under drought conditions, groundwater elevations in the Forebay may approach sea level, resulting in flattened groundwater gradients and only minor groundwater flow out of the Forebay. Ventura County has not experienced a prolonged

drought since completion of the Freeman Diversion in 1991, and estimates of available storage show the basin has filled to historic highs in subsequent years with above-average precipitation (Figure 4.3-21). Storage estimates suggest little available storage existed in the basin in spring 2011.

4.3.5.1 WATER LEVELS

Groundwater elevation contours for the Upper Aquifer System (UAS) in the spring of 2011 are shown in Figure 4.3-22. An area of closely-spaced contours is shown beneath the Saticoy and Noble recharge basins in the up-gradient portion of the basin. This is an area of groundwater mounding due to United's recharge activities. A fairly uniform groundwater gradient is interpreted to exist beneath the channel of the Santa Clara River. The groundwater elevation contours deflect around the El Rio Spreading Grounds, where in the spring the volume of water recharged at this location greatly exceeded that pumped and delivered to the southern Oxnard Plain. Overall, natural and artificial recharge to the Forebay was abundant in winter and spring 2011, largely related to two large storm events and other lesser storms that resulted in sustained high flows in the Santa Clara River.

Figure 4.3-23 displays UAS groundwater elevation contours for the Oxnard Plain in fall 2011. Groundwater mounding is again apparent beneath the Saticoy Spreading Grounds, as a portion of the water from the fall conservation release from Lake Piru is routed here for groundwater recharge. Southwest of this location groundwater elevation contours show greater spacing than in the spring of the year, and are more consistent with the regional gradient across the Oxnard Plain to the south. Adjacent to the Forebay in the northeast Oxnard Plain groundwater elevations are similar or slightly higher than elevations were in the spring. Water stored in the winter mounding of groundwater within the basin is now flowing to down-gradient areas, and in this year counters the effects of groundwater extractions which normally result in annual water level lows in the fall when pumping exceeds local recharge. The general direction of groundwater flow in the basin remains similar throughout the year. Water level records show a slight pumping depression in the fall beneath the El Rio Spreading Grounds.

Historical water level hydrographs from selected wells in the Forebay are shown in Figure 4.3-24. UAS water levels in the Forebay fluctuate by as much as 100 feet, with groundwater elevations dropping below sea level in drought periods and recovering during wet periods. Historic highs were recorded in a number of wells in recent years, following a number of consecutive wet years and the expansion of United's recharge facilities.

4.3.5.2 GROUNDWATER EXTRACTIONS

Reported 2011 groundwater extractions from the Forebay totaled nearly 18,500 acre-feet. Figure 4.3-25 shows reported extractions for the basin since 1980. Pumping in the Forebay has decreased for five consecutive years, with pumping totals from the past two years being below the

average annual extraction rate of 25,000 AF. Pumping from the Forebay is often more variable than in other basins within the District, caused by the variable amount of groundwater pumping for delivery to the Oxnard Plain and Pleasant Valley basins. Agricultural pumping in 2011 was similar to that in 2010, but the big change from the prior year was a reduction in municipal pumping at the O-H well field at United's El Rio Spreading Grounds. O-H customers used nearly 5,000 AF less water in 2011 compared to the prior year. The reduction in use was partially related to a large construction project which required a realignment of the O-H supply pipeline.

In the 2011 calendar year some 37,800 AF of water were spread for groundwater recharge at the El Rio Spreading grounds. Over this same period 10,740 AF was pumped from UAS wells at El Rio for deliveries to the O-H system.

The distribution of UAS pumping for calendar year 2011 is shown in Figure 4.3-26. Significant pumping is apparent surrounding the El Rio Spreading Grounds, where municipal pumping in the basin is centered. The majority of the pumping in the up-gradient areas of the Forebay is for irrigation purposes, including the pumping on the south side of United's Saticoy Spreading Grounds. Wells screened in units of the Lower Aquifer System are uncommon in the Forebay, and 2011 pumping from LAS wells is shown in Figure 4.3-27.

4.3.5.3 WATER QUALITY

Water quality records from Forebay basin wells near the Santa Clara River and United's recharge facilities show that groundwater quality in these areas is similar to that of the Santa Clara River. The most recharge from the river takes place when flows are high, which is generally when water quality in the river is best. Some characterization of Santa Clara River water quality is included in Section 4.2 of this report. During the dry season when river flows are lower and mineral content is generally higher, much of the diverted surface water is blended with well water and used for irrigation in areas served by the PTP and Pleasant Valley pipelines.

Occasional high nitrate concentrations in UAS wells has historically been the water quality issue causing concern in the Forebay. A definitive evaluation of sources of nitrate and flow paths to area wells has proven difficult, but septic systems and fertilizer from irrigated agriculture are commonly believed to be major contributors of nitrate to the groundwater flow system (UWCD, 1998). The highest nitrate concentrations are often observed during drought periods, when nitrogen inputs continue but the diluting influence of natural and artificial recharge is reduced. High nitrate has also been documented in wells as water levels rise following periods of drought, as nitrogen stored in the vadose zones is mobilized as sediments become saturated by a rising water table. Installation of additional monitoring wells in the Forebay has contributed to the understanding that the highest nitrate concentrations are often observed in the shallowest wells (UWCD, 2008). Once high-nitrate water enters the groundwater flow system its movement is likely very complex. An incomplete understanding of nitrate inputs to the Forebay basin and the complexity of water movement in the unsaturated and saturated zones of the subsurface make predictions of future nitrate impacts to area wells impractical.

Maximum-recorded nitrate concentrations from wells in the Forebay and northern Oxnard Plain in 2011 are shown in Figure 4.3-28. Few samples exceed 23 mg/l, a value half the nitrate MCL of 45 mg/l. A single Forebay well recorded very high nitrate, a shallow monitoring well in the south-central portion of the basin. Near United's Saticoy Spreading Grounds UAS nitrate concentrations ranged from three to eight mg/l, values that match the range of nitrate concentrations recorded for diverted Santa Clara River water spread nearby. The public supply wells in the El Rio community and at the El Rio Spreading Grounds also recorded relatively low nitrate concentrations in 2011.

A major effort to sewer the El Rio community was recently completed, significantly reducing nitrate loading in this areas of shallow unconfined groundwater. Residents and regulators are hopeful that significant nitrate impacts will be avoided in future droughts, but a cautionary statement from a recent UC Davis report on nitrate contamination is repeated here as a reminder that flow paths to production wells are often not well understood, and may be longer and more complex than many might imagine: "Travel times of nitrate from source to wells range from a few years to decades in domestic wells, and from years to many decades and even centuries in deeper production wells. This means that nitrate source reduction actions made today may not affect sources of drinking water for years to many decades" (Harter and Lund, 2012).

4.3.6 OXNARD PLAIN BASIN

Early newspaper accounts suggest that the confined aquifers of the Oxnard Plain were first drilled for water supply wells in the early 1870s. Artesian conditions existed on the Oxnard Plain at this time, and the well installations that received press coverage were wells providing impressive flow at the land surface without a pump in the well. Artesian conditions are believed to have persisted through the late 1800s. The town of Oxnard was established in 1897, and in 1899 a large sugar beet processing facility began operations. The large water demands associated with irrigation of beets and other crops on the Oxnard Plain, along with the growing population and industrial uses, lowered the pressure in the Oxnard aquifer. By the turn of the century widespread artesian conditions were generally absent, requiring wells to be fitted with pumps to lift water from elevations below the land surface (Freeman, 1968).

Over the approximately 110 years since the initial depressuring of the Oxnard Aquifer in the late 1800s, artesian conditions have periodically returned to the Oxnard Plain during wet climatic cycles. Documentation of water levels in the aquifers of the Oxnard Plain are sparse until the early 1930s, but artesian conditions were documented in Oxnard City well #9 in the winters of 1917, 1919, 1922 and 1923 (CA Division of Water Rights, 1928). The early 1940s was a wet period, and widespread artesian conditions likely existed at that time. The year 1945 marked the beginning of a long dry period during which water levels fell across the plain and problems with saline intrusion intensified in coastal areas. These alarming developments at a time of urban and economic growth in Ventura County prompted significant investments in water resource projects, including the O-H well field at El Rio and a pipeline delivery system to urban areas on the coastal plain. In subsequent years pumping patterns continued to change as the City of Oxnard grew. The city once had water supply

wells distributed throughout its service area, but now pumping is centralized in two primary well fields. As farmland around the city margins has converted to urban areas, pumping has generally been transferred to the City of Oxnard's main well field in the northern Oxnard Plain. Much of the population growth in the cities of Oxnard and Port Hueneme has been supported by State Water Project supplies, imported and delivered by Calleguas Municipal Water District.

Widespread artesian conditions were again present on the Oxnard Plain in the late 1990s following the completion of the Freeman Diversion and high precipitation totals in 1993, 1995 and 1998. More recently, artesian conditions periodically existed in coastal areas surrounding Port Hueneme, and are more common in UAS wells than in wells with deeper screened intervals.

Following a period of drought in the 1970s and expansion of the areas impacted by saline intrusion, the Fox Canyon Groundwater Management Agency (FCGMA) was established in 1982 as a local agency with regulatory authority to bring overdraft conditions under control in southern Ventura County. The agency has successfully implemented a number of mandatory cutbacks for production from public supply wells, and agricultural pumpers are required to demonstrate the use of efficient irrigation practices. One early strategy was a shift of pumping from the Upper Aquifer System to the Lower Aquifer System on the Oxnard Plain. This shift in pumping resulted in improved conditions in the UAS but considerable overdraft of deeper aquifers. An update to the FCGMA's management plan was completed in 2007, and describes a number of projects and strategies that might be employed to bring pumping in the Oxnard Plain, Pleasant Valley and Las Posas basins into balance with recharge to the aquifers of these highly-developed basins (FCGMA, 2007).

The primary water quality concern on the Oxnard Plain is degradation associated with the intrusion of saline waters. The direct lateral intrusion of seawater remains the primary threat in coastal areas, with the near-shore submarine canyons at Port Hueneme and Point Mugu exposing aquifer beds to the sea. The vertical movement of deep brines and shallow water of poor quality has also been documented. This movement of poor-quality groundwater is also related to overdraft conditions, but is not limited to coastal areas. Nitrate problems have been documented periodically in specific Oxnard Plain wells. In some cases this degradation is related to the downward movement of poor-quality water, in other locations it may be related to nitrate contamination sourcing from the Oxnard Forebay (UWCD, 2008).

4.3.6.1 WATER LEVELS

As discussed in the groundwater basin descriptions of the Oxnard Forebay and Oxnard Plain, large volumes of groundwater flow from the Oxnard Forebay to the Oxnard Plain. Contouring of recorded UAS water levels from wells shows that groundwater flows radially from recharge areas in the Forebay to surrounding areas (Figures 4.3-22 and 4.3-23). Recharge from the Forebay serves to raise or sustain water levels in wells on the Oxnard Plain, countering the decline in groundwater elevations resulting from groundwater extractions. When water levels are high across the basin groundwater may flow past the coastline to the offshore extension of the aquifers of the plain, or exit the system at near-shore canyons as discharge to the sea.

Precipitation totals in 2011 were higher than average, and a large storm event in March helped sustain above-average flows in the Santa Clara River through the spring of the year. Significant natural and artificial recharge occurred in the Forebay, and mounded groundwater conditions are evident in Figure 4.3-22. A sizable storm hit the area in December 2010, allowing an early start to wet-season recharge to the basins. Artesian conditions existed in coastal areas of the north and central Oxnard Plain by March and April 2011, the period when water levels were collected for contouring spring conditions.

In fall 2011 UAS groundwater elevations in most areas of the Oxnard Plain were similar to what they were in the spring, suggesting that between spring and fall the amount of groundwater pumped on the Plain was similar to the amount of water moving from the Forebay to the Plain. It is more typical for water levels in the confined aquifers of the Oxnard Plain to exhibit a distinct annual signature, with increased pumping stresses and reduced recharge in the summer and fall resulting in water level declines of ten feet or more (Figure 4.3-29). In the southern Oxnard Plain the sea level (0 feet) contour is mapped more than two miles inland from the coast in fall 2011. In this area south of Hueneme Road, piezometric heads in the Mugu aquifer of the UAS are commonly at least 20 feet lower than in the Oxnard aquifer. The selected hydrographs shown in Figure 4.3-29 show spring 2011 heads were often about ten feet below historic highs, but in some cases 60 feet higher than historic lows.

LAS heads are contoured for the spring and fall of 2011 for the Oxnard Forebay, Oxnard Plain and Pleasant Valley basins (Figures 4.3-30 and 4.3-31). These contours show a new interpretation for LAS groundwater flow. Evaluation of well construction, interpretation of geophysical well logs and construction of stratigraphic cross-sections for the area indicate that a number of wells in the Oxnard Forebay and north Oxnard Plain, utilized in the past construction of LAS contours, and previously classified as LAS wells, are likely influenced by heads in the UAS. Some of these wells may be screened in both the LAS and UAS. South of a certain point these “shallow LAS” wells are absent, and wells are screened much deeper due to structural and stratigraphic changes in the subsurface.

A better understanding of UAS and LAS stratigraphy and the structural deformation of the LAS has allowed United staff to better interpret water levels recorded in the Oxnard Forebay. Groundwater elevations recorded in the deep monitoring wells at the El Rio Spreading Grounds, utilized in this new interpretation, better conform to groundwater elevations of LAS wells in the central and south Oxnard Plain.

The inclusion of the “shallow LAS” wells in earlier contouring resulted in a steep break in groundwater elevations that was thought to be indicative of a structural barrier to groundwater flow. This revised interpretation of LAS groundwater elevations functionally expands the pumping depression seen along the eastern Oxnard Plain and western portions of the Pleasant Valley Basin north into the Forebay. Above sea level LAS groundwater elevations near the Saticoy Spreading Grounds, however, indicates that the LAS pumping depression does not extend north to this area of the Forebay. Water level records and associated contouring shows that in the aquifers of the LAS,

groundwater flows from the Oxnard Forebay to the large pumping depression in the eastern Oxnard Plain and the Pleasant Valley basin.

Also notable in this interpretation (of deeper LAS wells) is higher LAS heads along the coast in the western Oxnard Plain than in most other areas of the basin. Maps showing LAS pumping locations within the basin (next section) are consistent with the contouring. The LAS contouring presented here is somewhat preliminary and subject to modification in the future as work on the hydrogeology in this area is ongoing.

In the northwestern Oxnard Plain, LAS groundwater flow is likely from the Oxnard Forebay towards the coast. Few LAS wells exist in this area (Figure 4.3-27), as recharge to the Oxnard Forebay is very effective in sustaining groundwater elevations in this area (UWCD, 2010). LAS wells near Victoria Avenue and the northern boundary of the Oxnard Plain record groundwater elevations similar to nearby UAS wells (UWCD, 2010), and artesian conditions were observed in a LAS monitoring well near the coast in spring 2011 (Figure 4.3-30.). The exclusion of "shallow LAS" groundwater elevations from Figures 4.3-30 and 4.3-31 provides an incomplete representation of LAS heads in the northwestern Oxnard Plain.

Historical water level records from selected LAS wells on the Oxnard Plain are shown on Figure 4.3-32. Periods of drought are clearly evident in some of the wells, with measured water level declines exceeding 100 feet in some wells. Annual water level fluctuations of greater than thirty feet are common in the confined conditions of the LAS. Water levels in wells near the coast are more muted, as recharge by seawater prevents heads from falling as low as they do in inland areas.

4.3.6.2 GROUNDWATER EXTRACTIONS

The groundwater resources of the Oxnard Plain are heavily utilized to support overlying land uses. The area is famous for its highly productive agriculture, supporting year-round production of a wide variety of agricultural products. Groundwater supports much of the agriculture on the Plain, but surface water is available in some areas. The area also supports an extensive urban population. The Cities of Oxnard and Ventura maintain active wells on the Oxnard Plain, but also rely on other sources of water. The City of Port Hueneme and other coastal communities generally maintain wells in reserve status and import water from inland areas given their location near the coast and vulnerabilities with respect to seawater intrusion.

The distribution of reported UAS pumping shown in Figure 4.3-26 is typical of pumping patterns in recent years. The City of Oxnard operates several wells at its main well field near Third Street and Oxnard Blvd., and at a smaller facility some distance to the northeast. Aside from these locations UAS pumping is uncommon in the urban areas of the Oxnard Plain. Agricultural interests pump extensively from the UAS in the northwest Oxnard Plain, as well as in the northeastern portion of the basin near the Oxnard Forebay. Additional pumping is scattered across the central Plain east

of the City of Oxnard, where a number of wells reporting minor pumping are small domestic wells. Few UAS wells are active south of Hueneme Road on the southern Oxnard Plain.

The distribution of LAS pumping on the Oxnard Plain is concentrated in the eastern half of the basin, as shown in Figure 4.3-27. Near the basin boundary in the northwestern Oxnard Plain the City of Ventura operates two wells at the Ventura Municipal Golf Course, and exports water for municipal use in the Mound basin. LAS extractions are common for irrigation in the northeastern Oxnard Plain, as they are in the east-central portion of the basin. South of Hueneme Road LAS aquifers are pumped extensively for irrigation, in contrast to the UAS which is pumped very little in this area. Also notable is the near-absence of LAS pumping in the northwest portion of the basin.

A histogram of historical extractions from the Oxnard Plain and the portions of the Pleasant Valley and West Las Posas basins within United's District boundary are shown in Figure 4.3-33. Pumping in the portions of the West Las Posas and Pleasant Valley basins within United's district boundary are included with the Oxnard Plain due to the way records are processed within United's Finance Department. Reported pumping for both agricultural and municipal uses were slightly higher in 2011 than in 2010. Despite 2011 rainfall totals being slightly higher than 2010, the timing and rainfall totals for 2010 storms may have been more favorable for avoiding pumping for irrigation on the Oxnard Plain and surrounding areas.

The 60,300 acre-feet of pumping reported for the Oxnard Plain in 2011 was considerably less than reported pumping in 1990, when a record 105,000 acre-feet of pumping was reported. The Freeman Diversion was completed the following year, which improved the quantity and reliability of surface water delivered to the Oxnard Plain. Completion of the Conejo Creek Diversion in 2002 brought additional surface water to the Pleasant Valley area. Municipal and Industrial (M&I) pumping has been subject to cutbacks mandated by the FCGMA, beginning with 5% in 1992 and currently at 25%. Municipal pumping has not actually been reduced by this amount: pumping allocations have been transferred to the Cities of Oxnard and Camarillo, as these cities have expanded into agricultural areas. As noted in earlier sections, large volumes of potable water are imported from both the Oxnard Forebay and from northern California, so the extraction totals represented in Figure 4.3-33 are less than the total demand for agricultural and M&I water in the area.

4.3.6.3 WATER QUALITY

Seawater intrusion was first recognized on the Oxnard Plain in the 1930s and since that time this issue has dominated water quality concerns in southern Ventura County (CA DWR, 1971; FCGMA, 2007). In areas not impacted by saline intrusion, groundwater quality is somewhat variable among wells but generally is adequate for most agricultural and municipal/industrial uses. Water in the confined aquifers of the Oxnard Plain tends to be somewhat mineralized due the marine deposition of many of the aquifers (TDS, sulfate, iron, manganese), but contamination by organic contaminants is uncommon (Burton et al, 2011). Nuisance concentrations of iron and manganese are most commonly associated with LAS wells where reducing conditions are present.

In the northern portion of the Oxnard Plain samples for some wells in 2011 show elevated concentrations of nitrate. The provenance of the high nitrate detected in these wells is generally difficult to determine, but high and variable concentrations are likely related to the downward leakage of near-surface waters (Izbicki, 1992, Zohdy et al, 1993). On the southern Oxnard Plain nitrate concentrations in wells are not commonly detected, and the rare detects are related to damaged or improperly constructed wells.

Recorded chloride concentrations across the central Oxnard Plain were consistently low in 2011, as shown in Figure 3.4-34. These values are similar to native chloride concentrations in the basins of the Santa Clara River Valley. South of Hueneme Road some wells record chloride concentrations of greater than 16,000 mg/l, concentrations similar to seawater.

4.3.6.3.1 SALINE INTRUSION

Since the 1930s the southern Oxnard Plain in Ventura County has been subject to seawater intrusion. The Oxnard, Mugu, Fox Canyon, and Grimes Canyon aquifers are believed to be geologically vulnerable, to varying degrees, to seawater intrusion by their exposure in offshore submarine outcrop in the walls of submarine canyons and along the broader offshore shelf. Concerns related to the expansion of intruded areas in the 1970s and 1980s helped motivate the funding of cooperative studies with the U.S. Geological Survey.

In 1989 the U.S. Geological Survey initiated the Regional Aquifer-System Analysis (RASA) study in the Santa Clara-Calleguas groundwater basin. As part of this project a series of fourteen nested monitoring well sites were installed in coastal areas. Extensive sampling was conducted, and a number of advanced analytical techniques were used to provide a much better understanding of the nature and extent of saline intrusion on the Oxnard Plain. The USGS studies concluded that some areas classified as seawater intrusion in the past were in fact subject to increased chloride concentrations from connate saline water squeezed from fine-grained sediments within and separating the aquifers (Izbicki, 1992). The USGS mapped areas of high salinity in the major aquifer units of the southern Oxnard Plain, and classified sources of salinity as either seawater intrusion or saline intrusion from local sediments. A major product of the RASA study for the Santa Clara-Calleguas study area was a calibrated groundwater flow model. A solute transport component of the model was proposed in the scoping of the study, but this component was later abandoned after initial efforts proved unsuccessful.

United continues to sample the network of monitoring wells on the southern Oxnard Plain. In all of the recent samples from the southern Oxnard Plain, calcium or sodium are the dominant cations. Among samples not affected by high salinity, sulfate and bicarbonate are the dominant anions. For most samples impacted by saline waters, sodium and chloride are the dominant ions (UWCD, 2007). Major ion analysis is helpful in determining chemical conditions and changes over time, but not necessarily the source of brine causing water quality degradation. Researchers from the USGS have advanced methods for determining whether high chloride is sourcing from direct seawater intrusion or rather from deep or stranded brines (Izbicki, 1992 and Izbicki et al, 2005a). The minor

ions iodide and bromide, along with the trace elements boron and barium, are useful indicators for delineating the source of brines impacting fresh aquifers. Analysis of minor ion concentrations and trace element ratios from coastal monitoring wells suggest that some wells are impacted by the recent intrusion of seawater via the near-shore submarine canyons at Port Hueneme and Point Mugu. Other wells are likely impacted by inland brines, such as those expelled from buried fine-grained marine deposits. Clays within these deposits compact over time in response to regional pumping stresses, allowing the brines to enter adjacent permeable beds within the aquifer system (UWCD, 2007).

Over the past decade the sampling of coastal monitoring wells has indicated that near Port Hueneme chloride conditions have generally improved as heads in most aquifers have remained near or above sea level. United's sampling of wells and contouring of groundwater elevations in this area suggest the chloride plumes associated with past periods of drought are now migrating southeast towards the Mugu area, most notably in the UAS (UWCD, 2004). Figure 4.3-35 displays chloride records for selected UAS monitoring wells in coastal areas of the southern Oxnard Plain. The figure shows well A1-195 located north of Port Hueneme has totally recovered from chloride impacts in the early 1990s. The chloride plume shown east of Hueneme Harbor likely extended north from Hueneme Canyon during the drought (chloride spike in well A1-195), and since that time the plume has slowly shifted towards the southeast (groundwater flow is perpendicular to the groundwater elevation contours shown on Figure 4.3-23). Within the plume of displaced seawater, samples from well CM4-275 remain above 6,000 mg/l, and chloride continues to rise in well CM7-190 some 20 years after the drought ended. In the Mugu area, however, saline groundwater would likely flow out from the groundwater basin if a significant seaward groundwater gradient could be maintained, but such conditions have not existed for many years. In inland areas surrounding Mugu Lagoon aquifers of the UAS remain impaired by high chloride. One well in the western portion of this area has shown some improvement in recent years, but chloride is still over 2,000 mg/l (Figure 4.3-35). Other UAS wells show continued degradation by either brines or direct intrusion of seawater (UWCD, 2007).

Selected chloride time series for Lower Aquifer System monitoring wells on the southern Oxnard Plain are shown in Figure 4.3-36. Near Hueneme Canyon few wells show chloride impacts, but well CM2-760 shows increasing chloride at concentrations greater than 10,000 mg/l. In the greater Mugu area chloride degradation is severe in a number of wells, and chloride is trending upwards in many wells. Degradation by brines continues unabated in LAS monitoring wells at the Q2 well site, located about two miles north of Mugu Canyon. Degradation in these wells is related to chronically depressed water levels in the area, allowing brines to migrate into the aquifers from surrounding sediments or deeper zones hosting poor-quality groundwater (UWCD, 2007).

Given the chronic groundwater depression existing north and northeast of the Mugu area, basin managers wish to better understand the extent of existing chloride impacts and the potential for further degradation. While additional monitoring wells allow the ability to sample discrete zones within an aquifer and identify vertical head gradients, expansion of the network of monitoring wells

is an expensive endeavor. United received California DWR grant funding in 2006 for an additional nested monitoring well installation located about a mile north of and between the existing DP and Q2 well sites, and samples from these new wells do not have high chloride concentrations (UWCD, 2007). A better understanding of the extent of saline water impacts and the rate of change in recent years will help both pumpers and water managers plan and prepare for water quality changes that may make groundwater unsuitable for beneficial uses in specific areas.

United has recently sponsored geophysical studies on the southern Oxnard Plain to assess conditions over a broad area in this productive agricultural region (see Section 2.1.6). One such project was a Time Domain Electromagnetic (TDEM) geophysical survey on the southern Oxnard Plain to assess the lateral extent of saline water intrusion over four different depth ranges (UWCD, 2012a). The survey was designed to replicate a study performed by the USGS in the early 1990s, conducted as part of the RASA project (Zohdy et al, 1993). United's field survey area was approximately 35 square miles and extended along the coast between Port Hueneme and Point Mugu (approximately 7 miles) and inland for approximately 5 miles. One hundred twenty five soundings were collected throughout the study area and the data were forward and inverse modeled for each sounding. The model data were used to construct resistivity maps, at four depth ranges typical of the UAS and LAS.

United's TDEM investigation was successful at delineating earth resistivity values that are typical of saline and brackish water in both the Upper and Lower Aquifer Systems. Resistivities typical of saline water occurred along the coast and extended farther inland near Point Mugu with brackish water inferred at various locations inland. An image of contoured resistivity values at depths approximating the lower portions of the UAS are shown in Figure 4.3-37. A second image of contoured resistivity values for the shallower portions of the LAS are shown in Figure 4.3-38. Groundwater salinity estimates from the TDEM surveys generally correlated well samples from areas monitoring wells. The work suggested that geologic features such as paleochannels may affect groundwater flow and the migration of chloride, particularly in deposits of the UAS (UWCD, 2012a).

Local water managers share a common desire to better understand the extent of saline water impacts on the southern Oxnard Plain and how rapidly it might be migrating toward the more large scale pumping to the north. There exists relative few monitoring wells in the coastal areas of the southern Oxnard Plain and the extent of saline impacts is not precisely known, but it is well understood that elimination of groundwater overdraft conditions will largely mitigate the worsening of chloride impacts on the southern Oxnard Plain. Prevention of additional water quality degradation is a common goal for all stakeholders as degraded aquifers can negatively affect land values. Restoration of degraded aquifers is a difficult prospect, especially in areas already suffering from groundwater overdraft.

4.3.7 PLEASANT VALLEY BASIN

The Pleasant Valley basin lies adjacent and east of the Oxnard Plain, occupying the area south of the Camarillo Hills. Aquifers of the Upper Aquifer System are poorly developed in this basin and dominated by fine-grained deposits. This change in UAS deposits forms the basis for the basin boundary with the Oxnard Plain. Aquifers of the Lower Aquifer System are continuous with areas to the west on the Oxnard Plain. The City of Camarillo occupies the northern portion of the basin. Agriculture is the predominant land use in the remainder of the basin, where the Pleasant Valley County Water District operates an extensive water delivery system. The entire area of the basin falls within the Calleguas Creek watershed.

4.3.7.1 WATER LEVELS

Most wells in the Pleasant Valley basin area are completed in units of the Lower Aquifer System. Some wells are perforated in coarse basal units of the UAS, but pumping and water level measurements from UAS wells are uncommon as the UAS in the Pleasant Valley basin is predominantly comprised of fine-grained sediments (UWCD, 2003). United does not attempt to contour UAS water levels in the Pleasant Valley basin.

Groundwater elevation hydrographs for selected LAS wells are shown in Figure 4.3-39. The LAS well located in the northeast corner of the Pleasant Valley basin near Las Posas Road and Lewis Road recorded groundwater elevations approximately 140 feet below sea level in the early 1990s. Since the early 1990s water levels in this well have increased dramatically, reaching levels of nearly 120 feet above sea-level in 2011. This recovery is related to increased surface water flow in Arroyo Las Posas and the associated groundwater recharge in the northern portion of the basin. Since the 1990s flow in the Arroyo Las Posas has increased dramatically, largely due to population growth in upstream areas and related water imports and wastewater discharges (LPUG, 2011). This recharge in recent years has lead to the recognition that the basin is unconfined in this area and may be considered a forebay area for the Pleasant Valley basin (Hopkins, 2008). Some recovery in this well is likely related to the relatively wet period the area has experienced since the drought period ending in 1991. The degree to which this recharge has influenced water levels in the central portion of the basin is a topic of current study.

The groundwater elevation hydrograph for the LAS well located at the intersection of Las Posas Road and Pleasant Valley Road shows a clear response to drought conditions in the late 1980s, with water levels reaching approximately 180 feet below sea level in 1991. Since that time, with the onset of a relatively wet period, groundwater elevations have increased steadily except for a slight decline during a dry period from 2002 to 2004. Since 2004, however, groundwater elevations have increased considerably above the water levels recorded in the late 1980s and early 1990s. This recent recovery is most likely related to the utilization of surface water diverted from Conejo Creek and delivered to agricultural users in the basin. Camrosa Water District constructed the Conejo Creek Diversion in 2002 and has negotiated agreements to provide water to Pleasant Valley County

Water District (PVCWD), a major supplier of agricultural water in the Pleasant Valley basin. From 2004 to 2011, diversions from Conejo Creek have averaged approximately 5,600 acre-feet per year. Use of this water for irrigation has reduced pumping demands in the basin. Despite the water level recovery in this well over the past twenty years, recent records show levels remain 26 feet below sea level.

The groundwater elevation hydrograph for a well in the southern Pleasant Valley area, located along Laguna Road, shows a 1991 drought groundwater elevation of 174 feet below sea level. Since 1993, groundwater levels have returned to pre-drought levels and annual high water levels have remained fairly stable. Annual variability in groundwater elevation appears to be greater following the drought, which could be the influence of a nearby well. Unlike some wells in the northern portion of the basin, spring high water levels recorded in this well are not appreciably higher than they were in the 1980s. The highest recorded groundwater elevation for this well is approximately twenty feet below sea level.

Groundwater elevation contours for LAS wells measured in spring and fall 2011 are shown in Figures 4.3-30 and 4.3-31. The LAS contours on the maps show the significant pumping depression that exists in west Pleasant Valley and the eastern Oxnard Plain, where groundwater elevations are well below sea level over a broad area. The fall maps show groundwater elevations in the pumping depression in excess of sixty feet below sea level, and approximately twenty feet lower than water levels recorded in the spring of 2011. The contours for both spring and fall indicate groundwater flow from the west Oxnard Plain and from the Oxnard Forebay to the north. A better understanding of the stratigraphy in the area between the Oxnard Forebay and the Pleasant Valley pumping depression has resulted in a change in the way water levels are contoured in this area (see discussion in Section 4.3.6.1). A steep groundwater gradient likely exists between the pumping depression and the recharge area along Calleguas Creek in the northern part of the basin, but this area is not contoured due to sparse well control and the unknown influence of faulting in the northern basin.

4.3.7.2 GROUNDWATER EXTRACTIONS

Maps showing reported groundwater pumping from LAS wells in the Pleasant Valley basin and on the Oxnard Plain are shown in Figure 4.3-27. The northern and eastern portions of the basin fall outside of United's district boundary, and pumping in those areas is not shown on figures in this report. Pumping from the LAS is concentrated along the western portion of the basin, and aligns with the areas where water levels are deepest in the basin. Pumping of the UAS is limited, and skewed towards the eastern portion of the basin that lies within United's boundary (Figure 4.3-26). A majority of the UAS wells report minor pumping and are likely used for domestic supply.

A majority of the pumping in the Pleasant Valley Basin occurs within United's boundaries. In 2011 5,684 acre-feet of groundwater was pumped from LAS wells, and 881 acre-feet of water was pumped from UAS wells in the Pleasant Valley Basin within United's boundary.

4.3.7.3 WATER QUALITY

The map showing the maximum groundwater chloride concentrations recorded in 2011 is shown as Figure 4.3-34. Samples from wells in the Pleasant Valley basin are distinctly higher than those from the Oxnard Plain to the west. Many wells in the Pleasant Valley Basin had chloride concentrations well over 100 mg/l, a common advisory chloride level for sensitive agricultural crops. A number of the samples are from wells operated by Pleasant Valley County Water District, which blends well water with surface water diverted from Conejo Creek and the Santa Clara River before delivery to areas growers.

During the RASA study in the early 1990s USGS investigators recognized high chloride in some Pleasant Valley basin wells. Innovative techniques were employed to profile flow and chloride concentrations in deep production wells. It was recognized that the highest chloride and TDS was commonly sourcing from the deepest portions of these deep LAS wells, but these zones contributed little water to the well. In 2001 United sought and was awarded an AB303 grant from the California Department of Water Resources to study the nature of the inland saline intrusion problem in the Pleasant Valley basin (UWCD, 2003). A major part of this study was depth dependent sampling and flow profiling of eight deep production wells in the basin. The USGS was contracted to perform this work, which included chemical analysis of major ions and trace elements as well as specific isotopes and chemical tracers. United staff characterized overdraft in the basin and performed groundwater modeling to assess how much additional water might be needed to bring the basin into balance. Geochemical analysis by the USGS was not complete before the project due date, and United's report titled *"Inland Saline Intrusion Assessment Project*" was submitted without the geochemical analysis. The report concluded that chloride increased with pumping during past period of drought, and that increased delivery of surface water to the area of the Pleasant Valley Basin pumping depression would help groundwater levels recover and likely decrease chloride concentrations in water produced from deep wells in the basin.

In 2005 the USGS published technical papers detailing the results of their sampling of Pleasant Valley wells, which included depth-dependent groundwater sampling, flow profiling, and analysis of isotopic and chemical tracers (Izbicki et al, 2005a; Izbicki et al, 2005b). The results detailed by the USGS included that: 1) high chlorides were entering wells from various sources at different depths; 2) concentrations of chlorides in the upper portion of some wells influenced by irrigation return flow were as high as 220 mg/L; 3) concentrations of chlorides in wells with depths greater than 1400 feet were as high as 500 mg/L and had the chemical and isotopic composition trending toward oil field production water in the area; 4) higher chloride concentrations occurred in deep wells near faults that bound the valley such as the Camarillo fault in the north basin and the Bailey Fault on the south side of the basin; and 5) chlorides increase with increased pumping during droughts.

A recommendation by the USGS was that the sealing of the low-yield and poor-quality lower portions of some deep wells would act to improve water quality in many production wells without sacrificing appreciable yield. The 2011 chloride concentrations shown in Figure 4.3-34 suggests that a majority of the wells in the basin are impacted by elevated chloride concentrations. These

impacts are likely to continue as chronic overdraft conditions persist in the basin and deep brines migrate upward in response to the hydraulic gradients produced by over-pumping. Figure 4.3-40 displays maximum chloride concentrations from calendar year 1990, a year when extensive sampling was conducted by the USGS as part of the RASA study. In this drought year few wells recorded chloride less than 100 mg/l. Comparison of chloride records from 1990 to 2011 reveals that recent samples from a number of wells record higher chloride now than they did in a past period of drought.

Recharge water sourcing from Arroyo Las Posas in the northern portion of the Pleasant Valley basin is another significant chloride input to the basin. Chloride loading associated with this recharge is currently under evaluation as part of a proposed desalter project for this area. The effort is being lead by the City of Camarillo in partnership with other parties.

4.3.8 WEST LAS POSAS BASIN

The West Las Posas basin is the western most of a series of three sub-basins that are referred to collectively as the Las Posas Basin. The other sub-basins of the Las Posas Basin are the East Las Posas Basin and South Las Posas Basin. The West Las Posas Basin is bounded to the north by South Mountain, to the south by the Camarillo Hills, to the west by the Oxnard Plain and to the east by the East Las Posas Basin. Only approximately the western one-third of the West Las Posas basin is included within the boundaries of United Water Conservation District (Figure 1-1).

The Los Posas Basin Users Group (LPUG) is currently in the process of formulating a Basin Specific Groundwater Management Plan for the Las Posas Basin. The portion of the basin within the District, however, is excluded from the Plan. Del Norte Mutual Water Company made a formal request of the LPUG to be excluded from the Las Posas Basin Plan on the basis of groundwater conditions, groundwater source, and political jurisdiction. LPUG agreed that the District's portion of the Las Posas Basin should not be managed under the Las Posas basin plan, because groundwater users pay pump charges for groundwater recharge and management activities conducted by United (LPUG, 2011). Although the United portion of the West Las Posas Basin will not be managed by the LPUG plan, it will be monitored because it is hydraulically connected to the remainder of the West Las Posas sub-basin.

4.3.8.1 WATER LEVELS

Groundwater levels have been monitored for nearly a century in the Las Posas Valley. Groundwater elevations in the West Las Posas Basin are monitored by UWCD and Ventura County Watershed Protection District (VCWPD) with private entities also providing data. Fewer wells are monitored in this basin than for most other basins within the District.

In the West Las Posas basin, piezometric heads range from approximately 100 feet below mean sea level (msl) near the Central Las Posas fault to approximately 50 feet above msl near the

Oxnard Plain, indicating a general northwest to southeast flow direction (LPUG, 2011). The flow pattern in the West Las Posas basin suggests the aquifer is receiving inflow from the Oxnard Plain and recharge along the northern flank of the valley. Groundwater moves across the sub-basin toward an area of focused pumping near Bradley Road where there has been a long history of depressed water levels (LPUG, 2011).

4.3.8.2 GROUNDWATER EXTRACTIONS

During calendar year 2011, a reported 3,536 acre-feet of groundwater were pumped from the portion of West Las Posas basin that lies within United's boundaries. The areal distribution of pumping in the UAS and LAS in 2011 is shown in Figures 4.3-26 and 4.3-27. In addition Del Norte Water Company pumps water from its well yard, located near Highway 118 and Santa Clara Avenue on the Oxnard Plain, for agricultural use in northern portions of the West Las Posas Basin within United's District boundary. In 2011 Del Norte pumped and exported 1,455 acre-feet from the Oxnard Plain to the West Las Posas Basin.

Pumping for domestic or potable supply is minimal in the western portion of the West Las Posas basin, as agriculture remains the predominant land use in this area.

4.3.8.3 WATER QUALITY

Water quality samples from wells in the West Las Posas basin indicate groundwater quality is generally adequate for agricultural and municipal use, however, localized exceedances of the MCL for TDS, nitrates, and sulfates have been reported.

Ventura County Watershed Protection District (2012) reports that six wells in the basin exceeded the MCL for TDS (average of 966 mg/L) with two wells having concentrations above the MCL for nitrate, and three wells having concentrations above the MCL for sulfate. Groundwater with this degree of mineralization is common throughout United's service area, and slightly elevated salt content does not pose a health risk. In the West Las Posas basin TDS and chloride concentrations tend to be higher in the northern and western portions of this basin compared to other areas, suggesting that mountain front recharge along the southern flank of South Mountain and inflow from the Oxnard Plain Basin are the sources of higher TDS and chloride concentrations (LPUG, 2011).

5 SUMMARY

United Water continues to evaluate various strategies to best manage and protect the surface and groundwater resources within the District. Current and on-going considerations include: the characterization of groundwater conditions, the most-efficient use of existing infrastructure and the need for additional or modified facilities, current and future water demands, current and anticipated water quality issues, and effective utilization of existing allocations of imported State Water Project water. United Water's goal is to identify the best use of local water resources and infrastructure, and to work with other agencies to implement these strategies, while honoring a coherent strategy and set of priorities that guides all future infrastructure and water management decisions.

The District's groundwater and surface water projects and programs are keyed to the issues and concerns that impact or potentially impact the water resources of the region. These issues and concerns evolve over time and United Water strives to adjust, modify, or devise new projects or programs in response to changing water resource challenges. Many of the projects and programs undertaken by United Water have long-term implementation schedules (e.g., District-wide groundwater level measurements, conservation releases), however, these types of efforts provide the critical data needed to make sound water resource management decisions that provide for the maintenance of reliable, sustainable, local water resources for the benefit of both agricultural and municipal and industrial water users in central and southern Ventura County.

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7 FIGURES AND TABLES

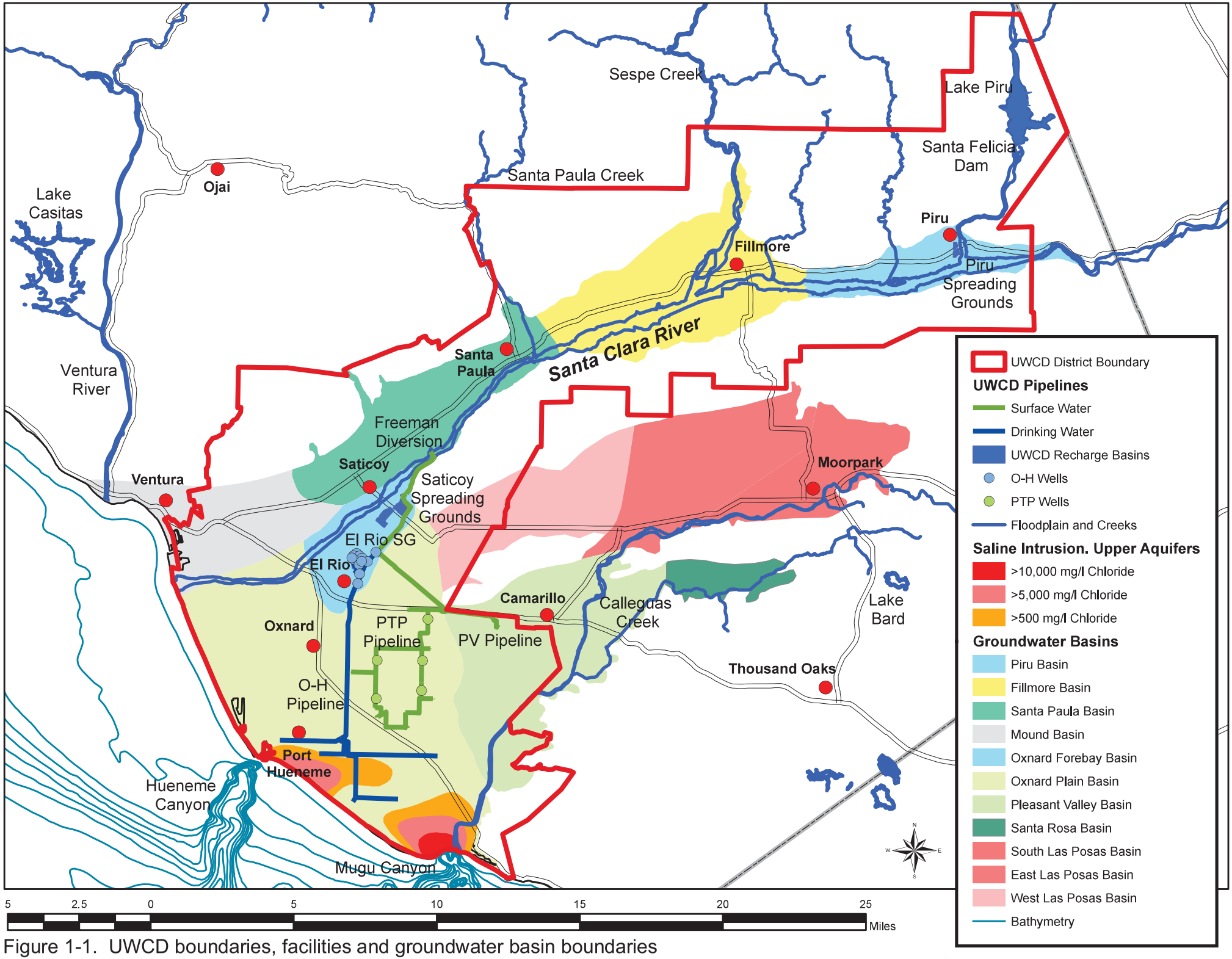


Figure 1-1. UWCD boundaries, facilities and groundwater basin boundaries

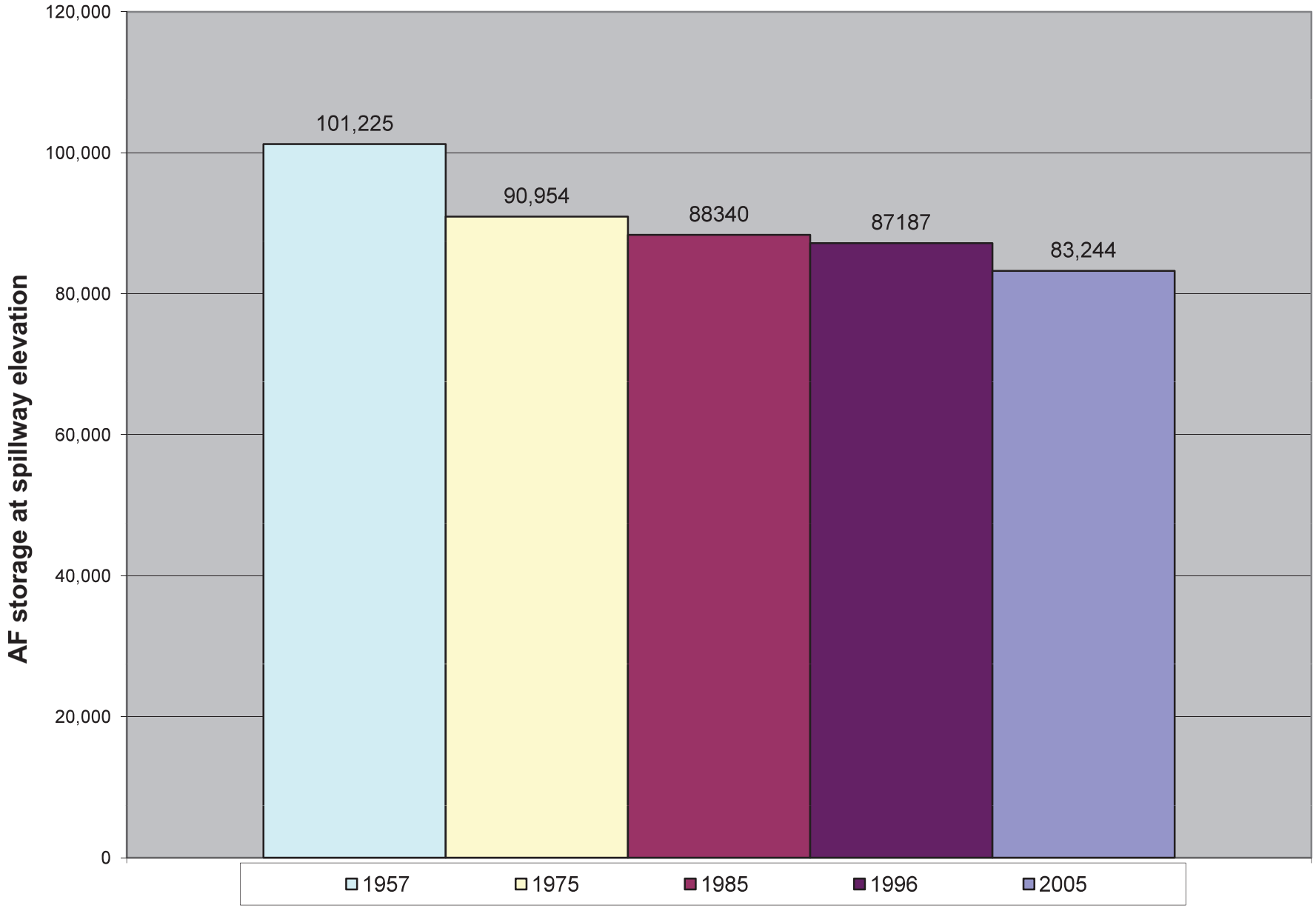


Figure 1.4-1. Silt surveys showing historic storage capacity in Lake Piru

Agricultural Water Deliveries			
	Surface water deliveries to the PTP (AF)	Ground water deliveries to the PTP (AF)	Surface water deliveries to Pleasant Valley Water District (AF)
JAN	346	160.6	385
FEB	362	85.8	453
MAR	376	0.1	643
APR	776	45.6	1,352
MAY	932	63.6	1,433
JUN	776	41.0	1,143
JUL	839	22.1	1,102
AUG	952	60.0	880
SEP	622	79.2	1,255
OCT	1,392	221.4	1,603.4
NOV	544	35.1	849.7
DEC	527	0.8	1,091.7

Figure 1.4-2. (Table showing) surface water deliveries to agriculture, 2011

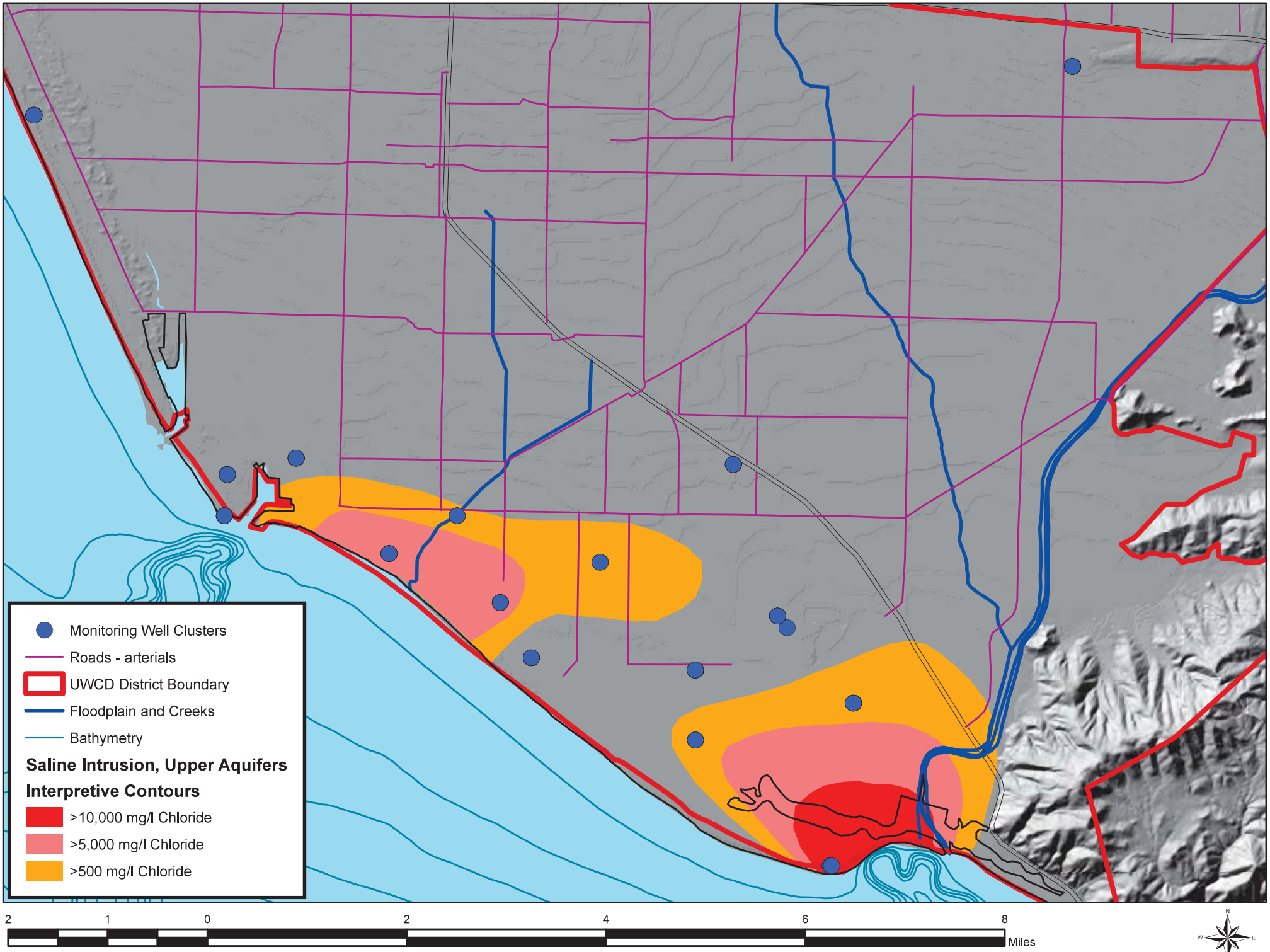


Figure 1.5-1. Locations of RASA coastal monitoring well clusters

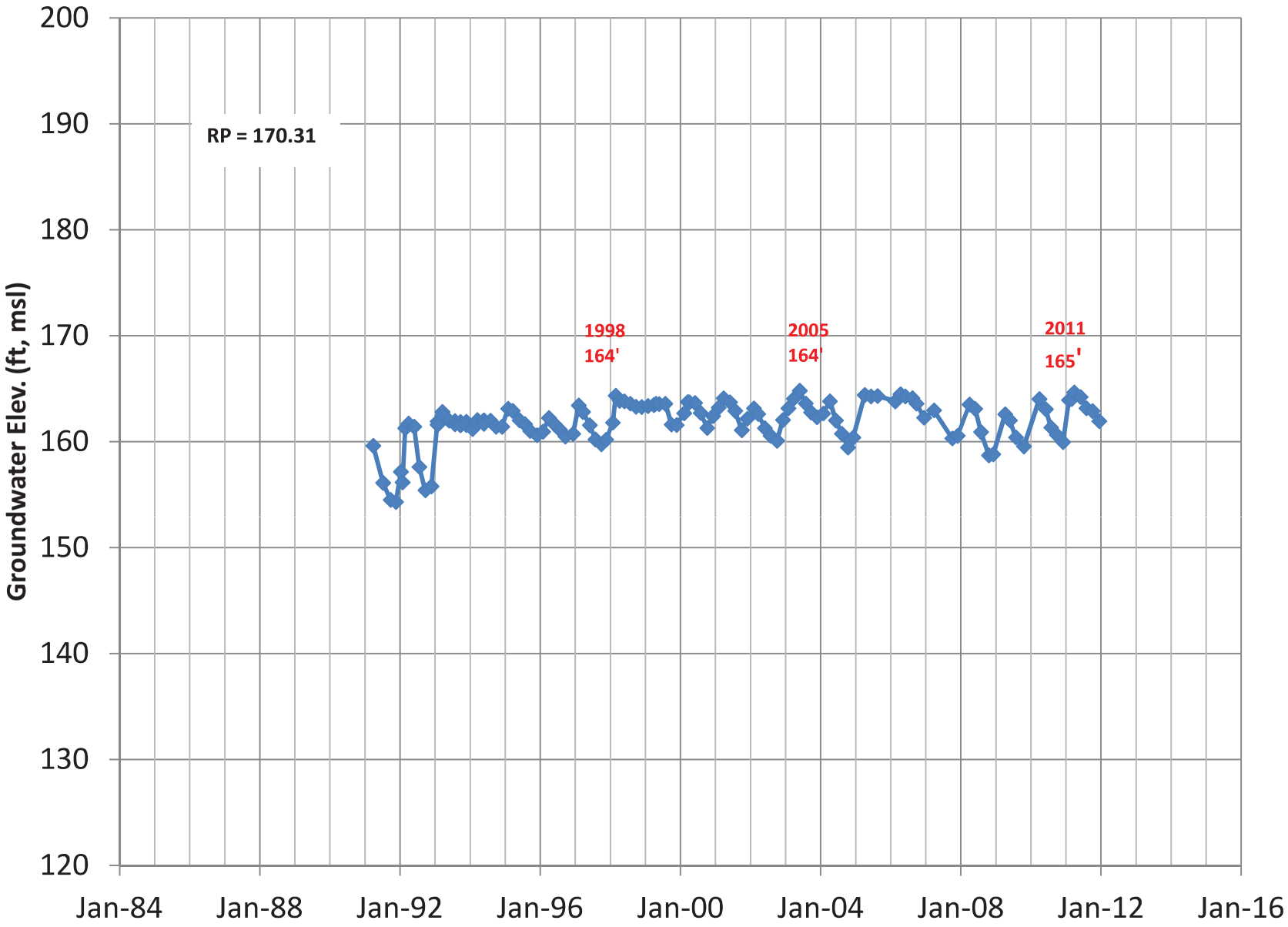


Figure 1.6-1. Groundwater elevations near the Freeman Diversion

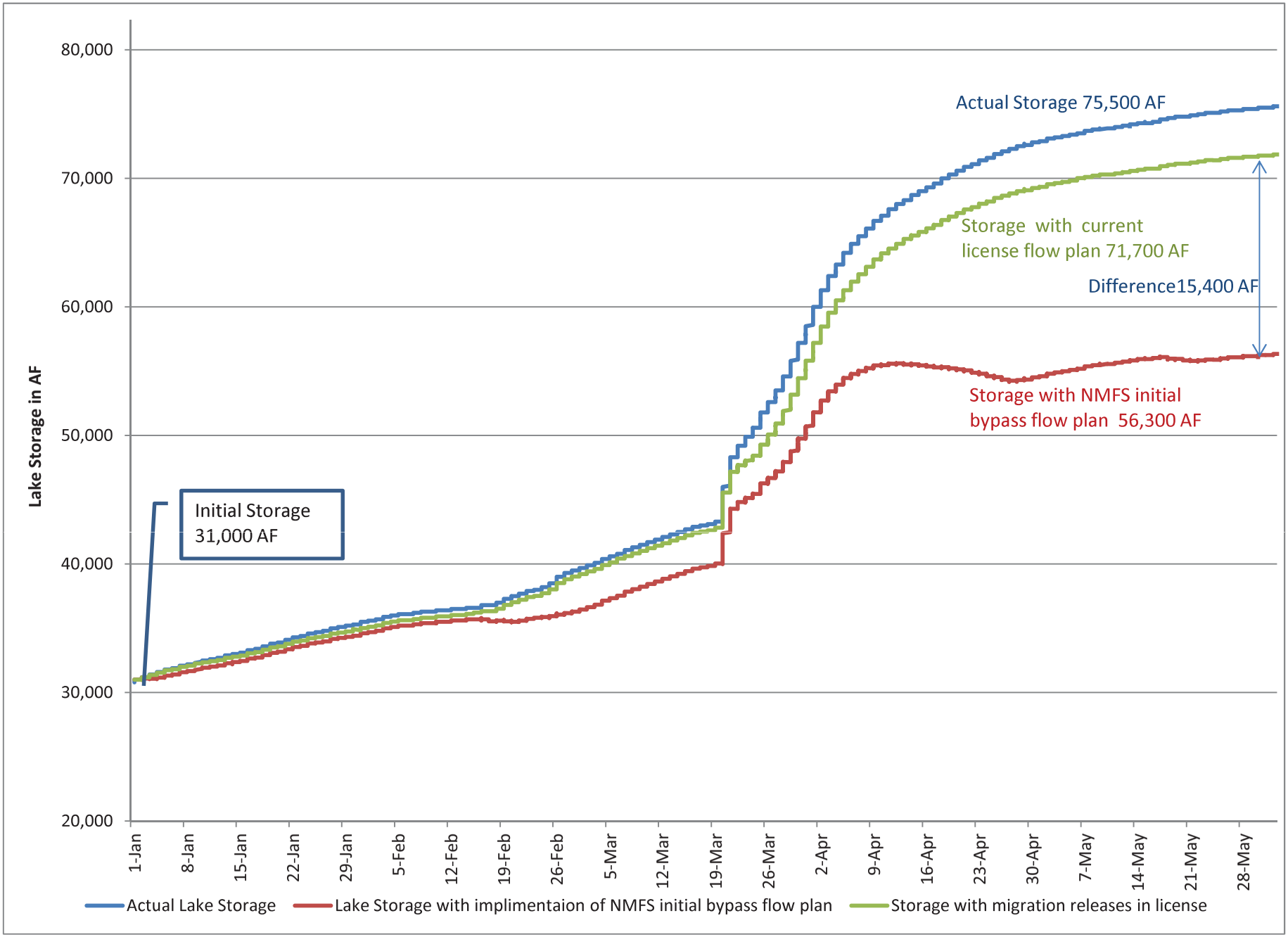


Figure 1.6-2. Possible lake levels with the current FERC license and NMFS recommended flows

Project	Overdraft Conditions	Declining Water Levels	Groundwater Exports	Saline Water Intrusion	Upwelling Saline Water	Riverbed Stabilization	Biological Opinion-SFD	Biological Opinion-VFD	VFD Operation	Aquifer Mapping	Recharge Optimization	Water Quality Degradation
Update Regional GW Flow Model	X	X	X	X	X	X				X	X	X
AB3030 Piru/Fillmore GW Management Plan Update			X								X	X
Santa Paula Basin TAC and Specialty Studies		X	X			X			X	X	X	
District-Wide GW Level Measurements / Piezometers	X	X	X	X	X	X	X	X	X		X	X
District-Wide Water Quality Sampling & Analyses	X	X	X	X	X						X	X
District-Wide Stream Gauging	X	X				X	X	X	X		X	X
Surface Geophysical Studies (Seismic Reflection, TDEM)	X	X		X						X	X	
SCR/Forebay Piezometer Installation		X					X	X	X		X	

Figure 2.1-1. Groundwater issues and concerns versus projects

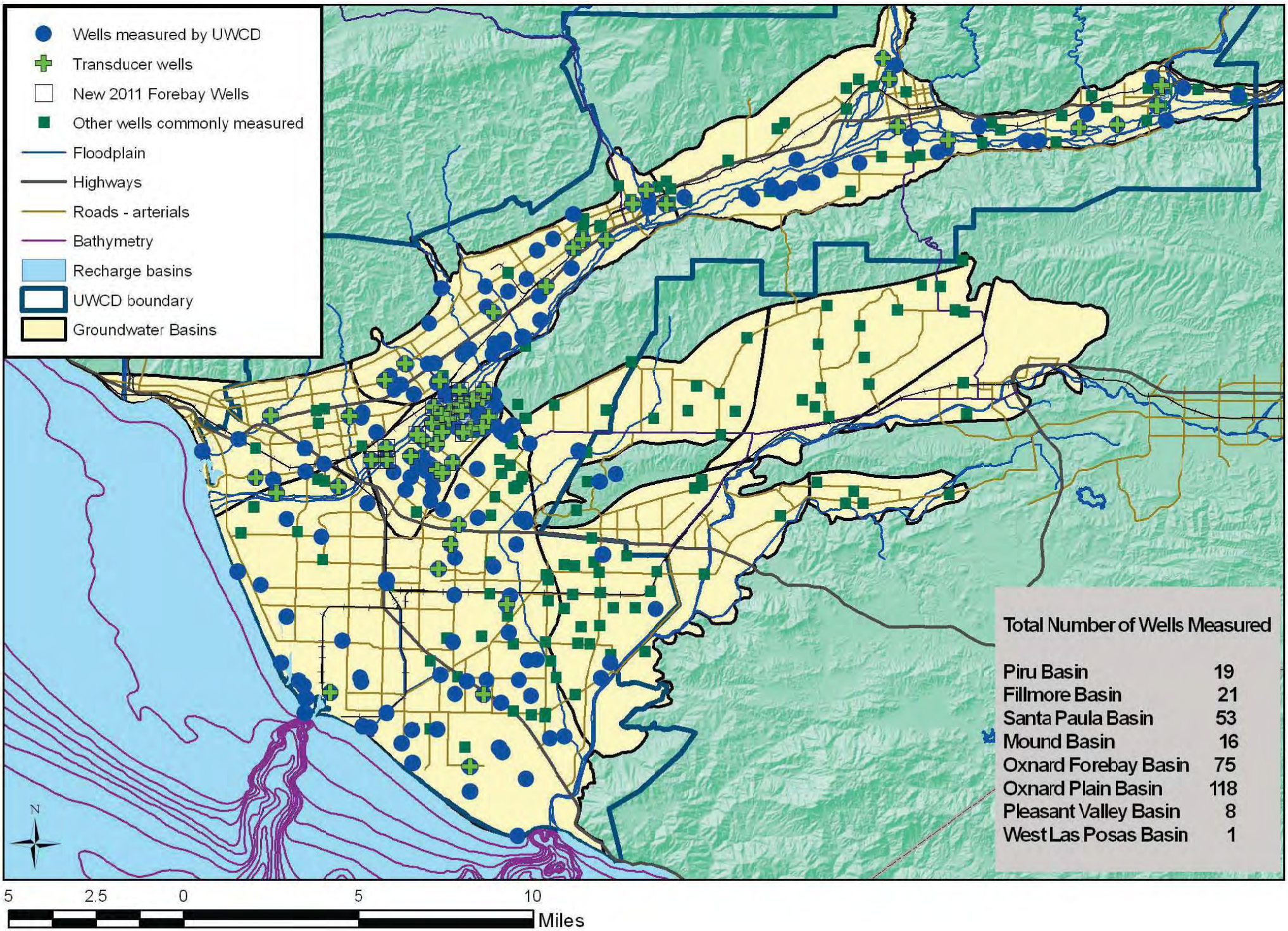


Figure 2.1-2. Wells monitored by United for water levels

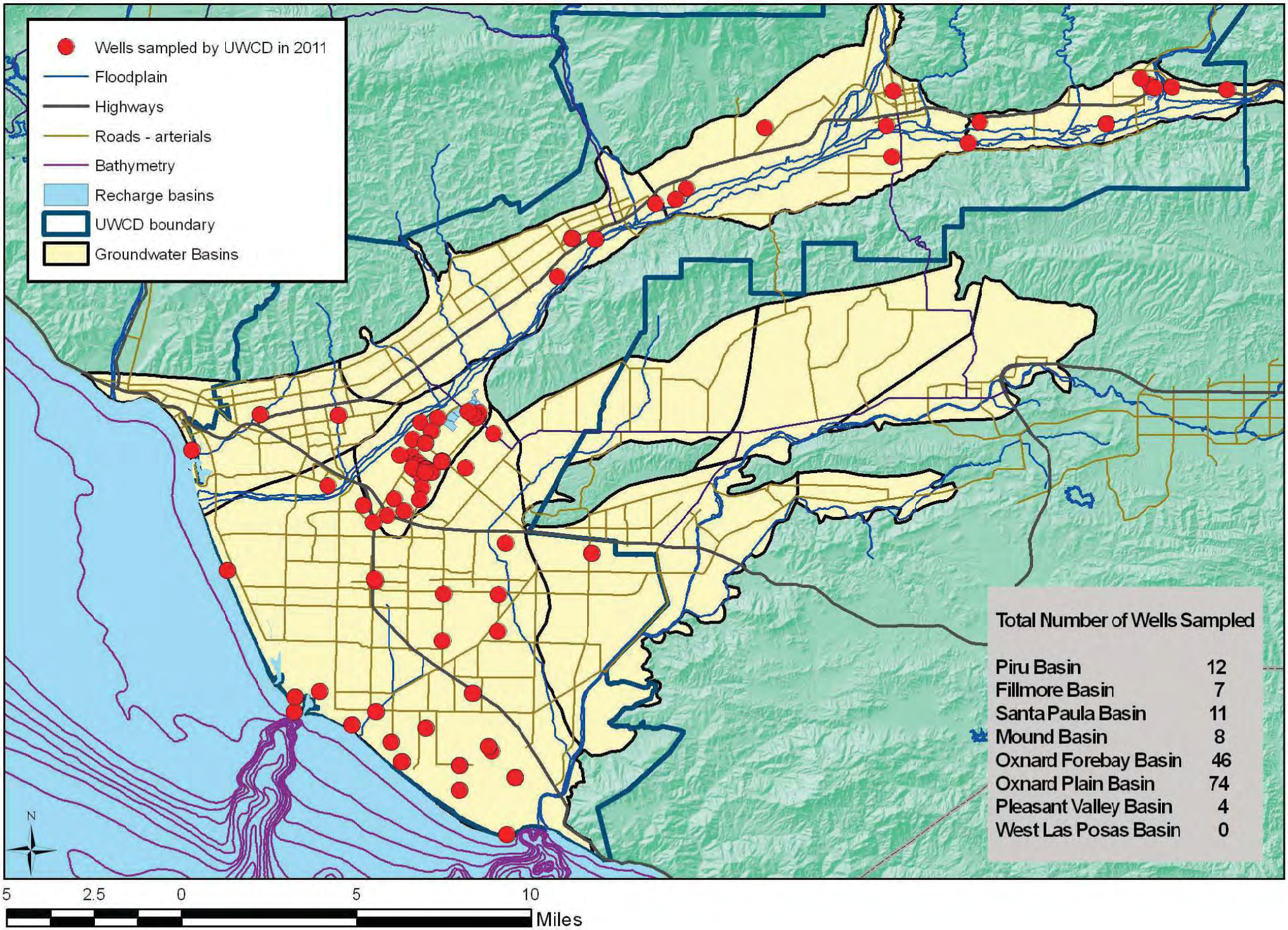


Figure 2.1-3. Wells sampled by United for water quality

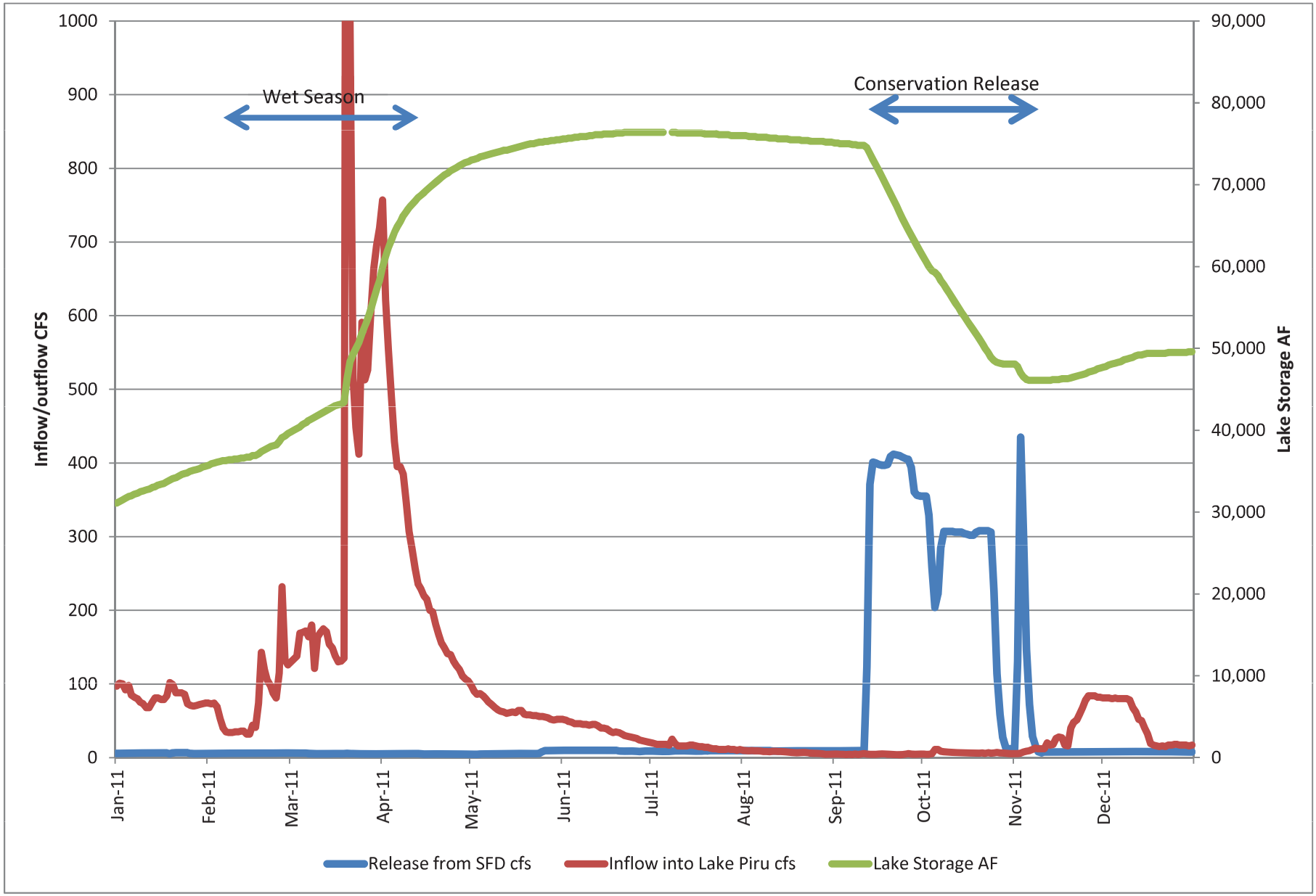


Figure 2.2-1. Basic hydrology for 2011 at Lake Piru

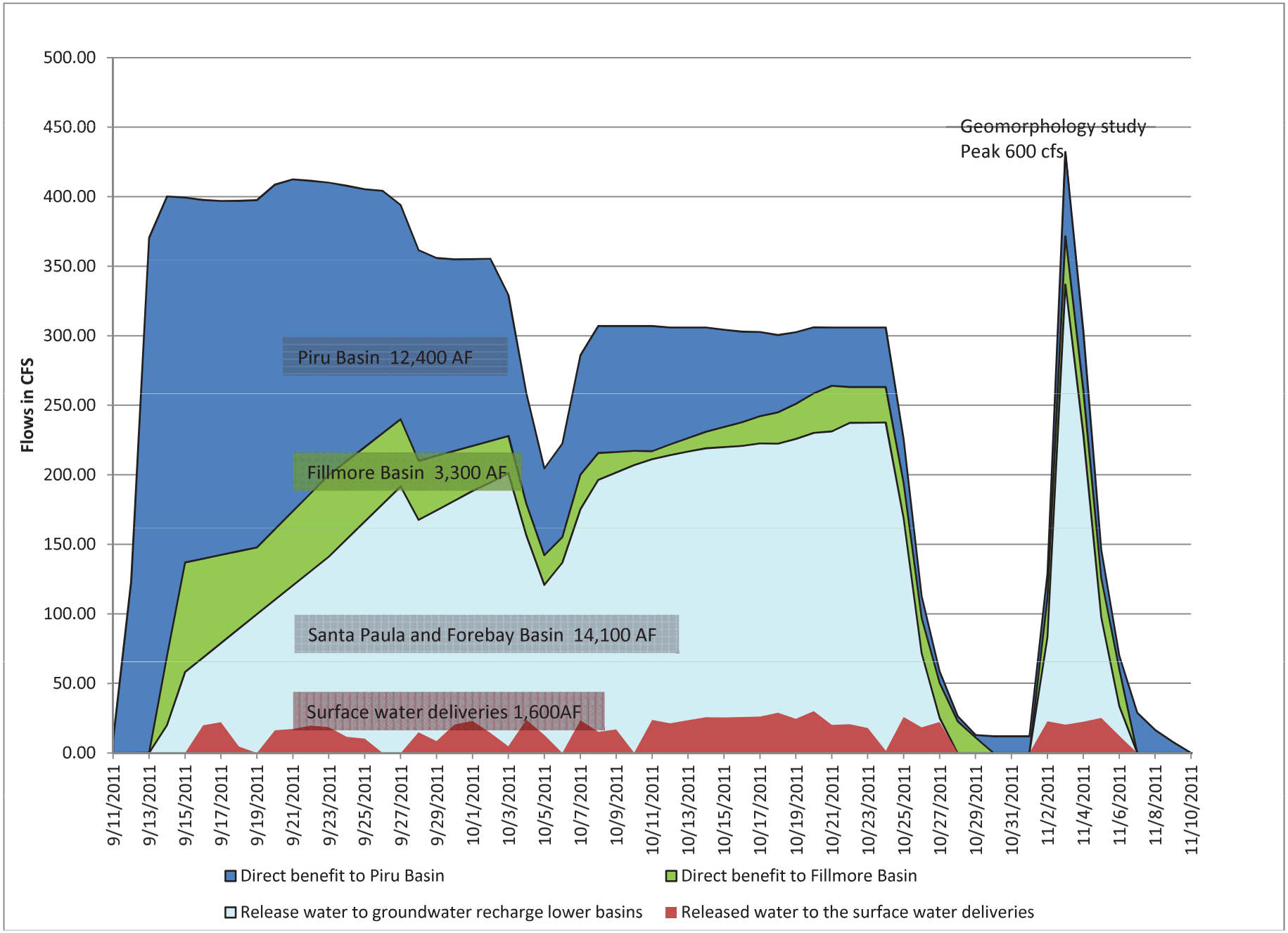


Figure 2.2-2. Benefit to each basin from direct percolation during 2011 conservation release

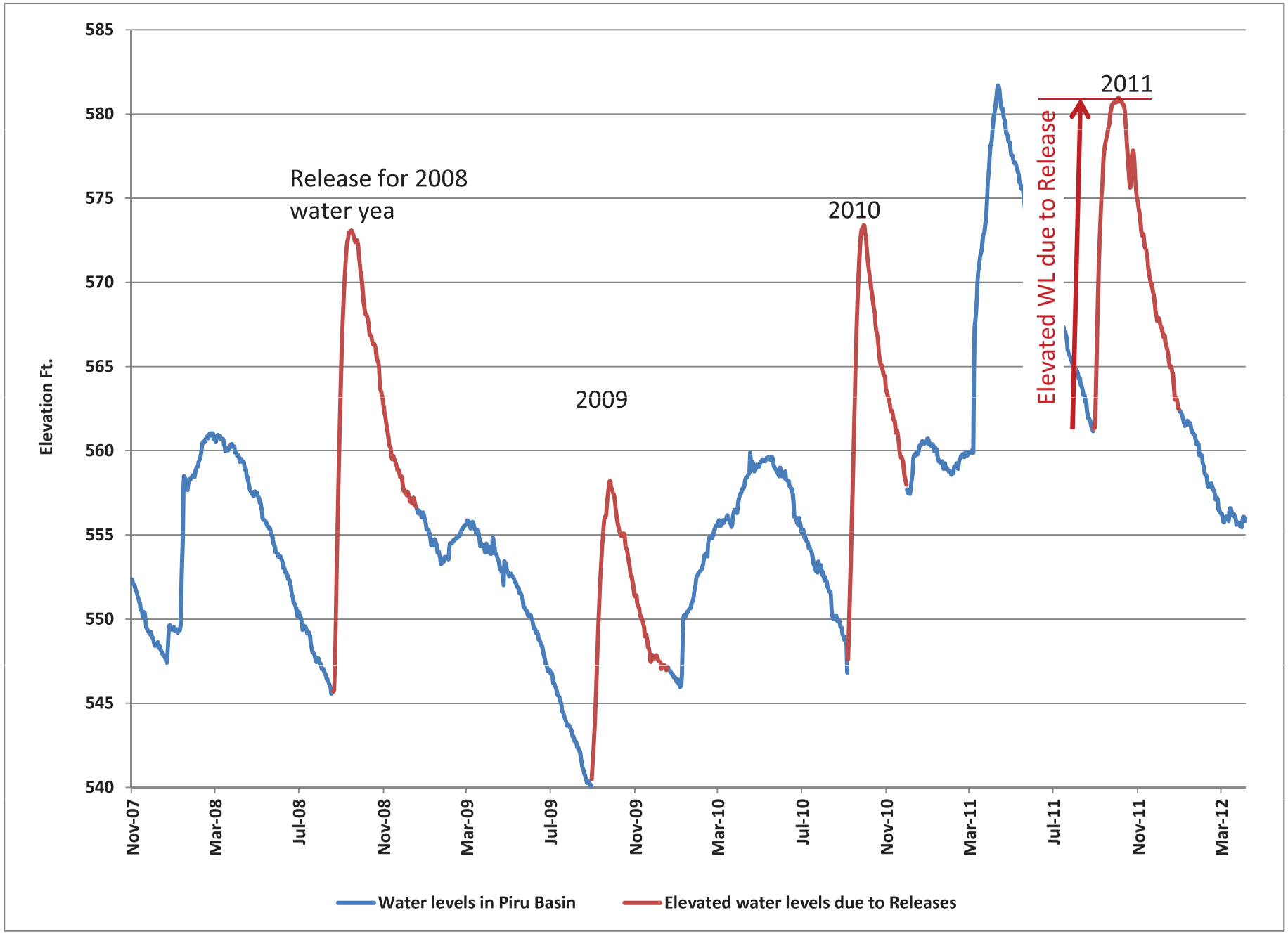


Figure 2.2-3. Groundwater response in the Piru Basin to conservation release from Santa Felicia Dam (well 04N18W31D07S)

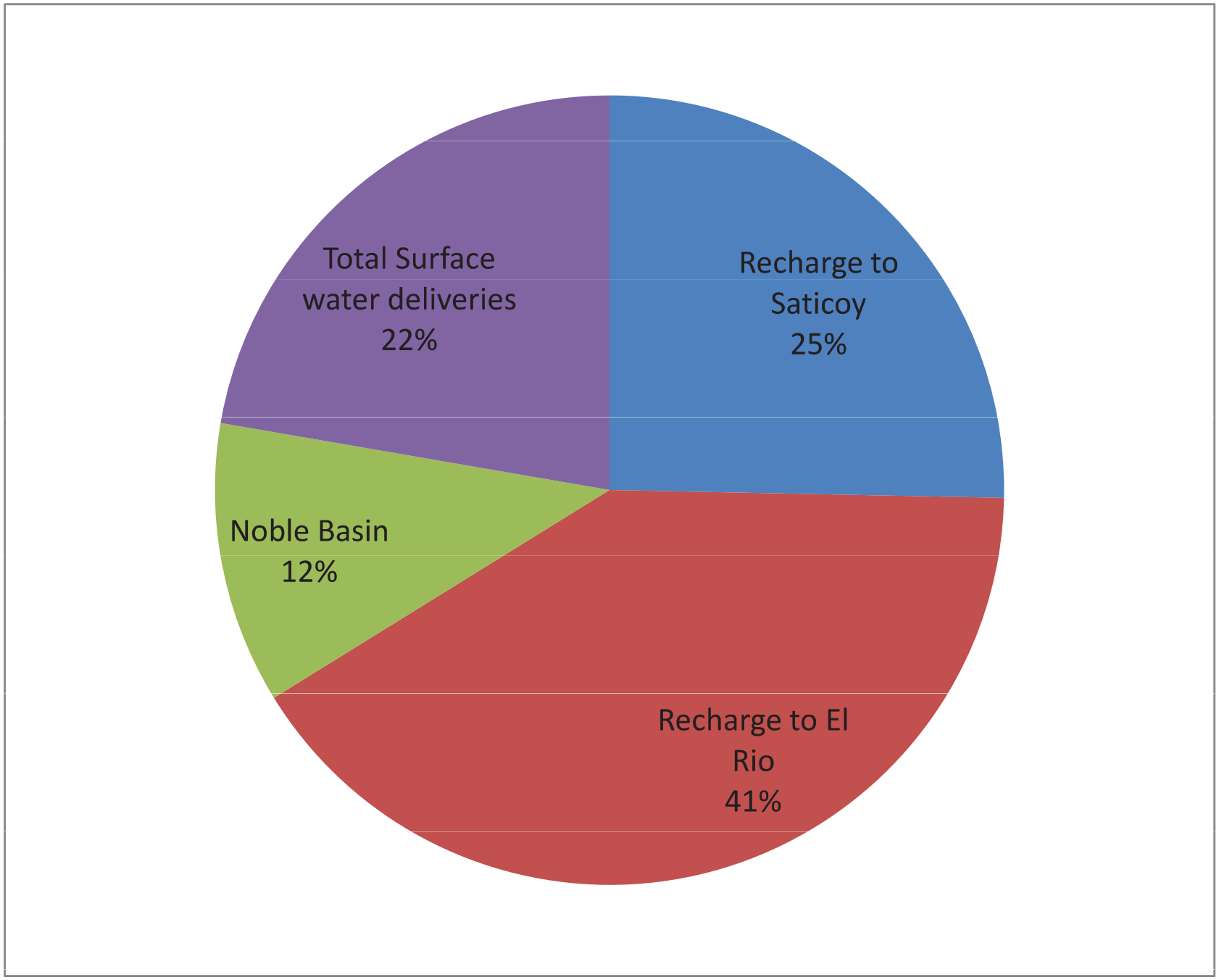


Figure 2.2-4. Distribution of water diverted at Freeman Diversion, 2011

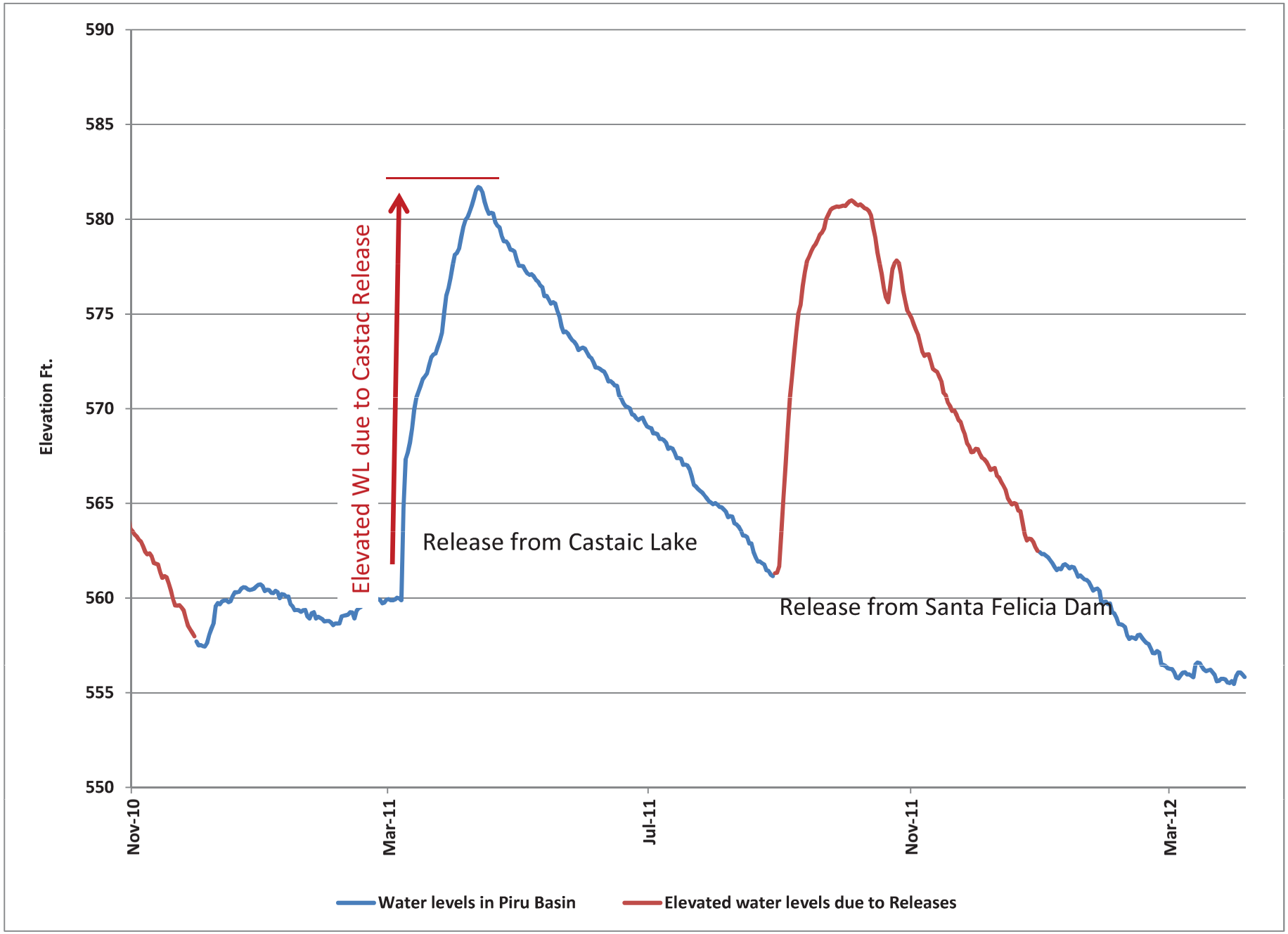


Figure 2.2-5. Groundwater response in the Piru Basin to Castaic floodflow release (well 04N18W31D07S)

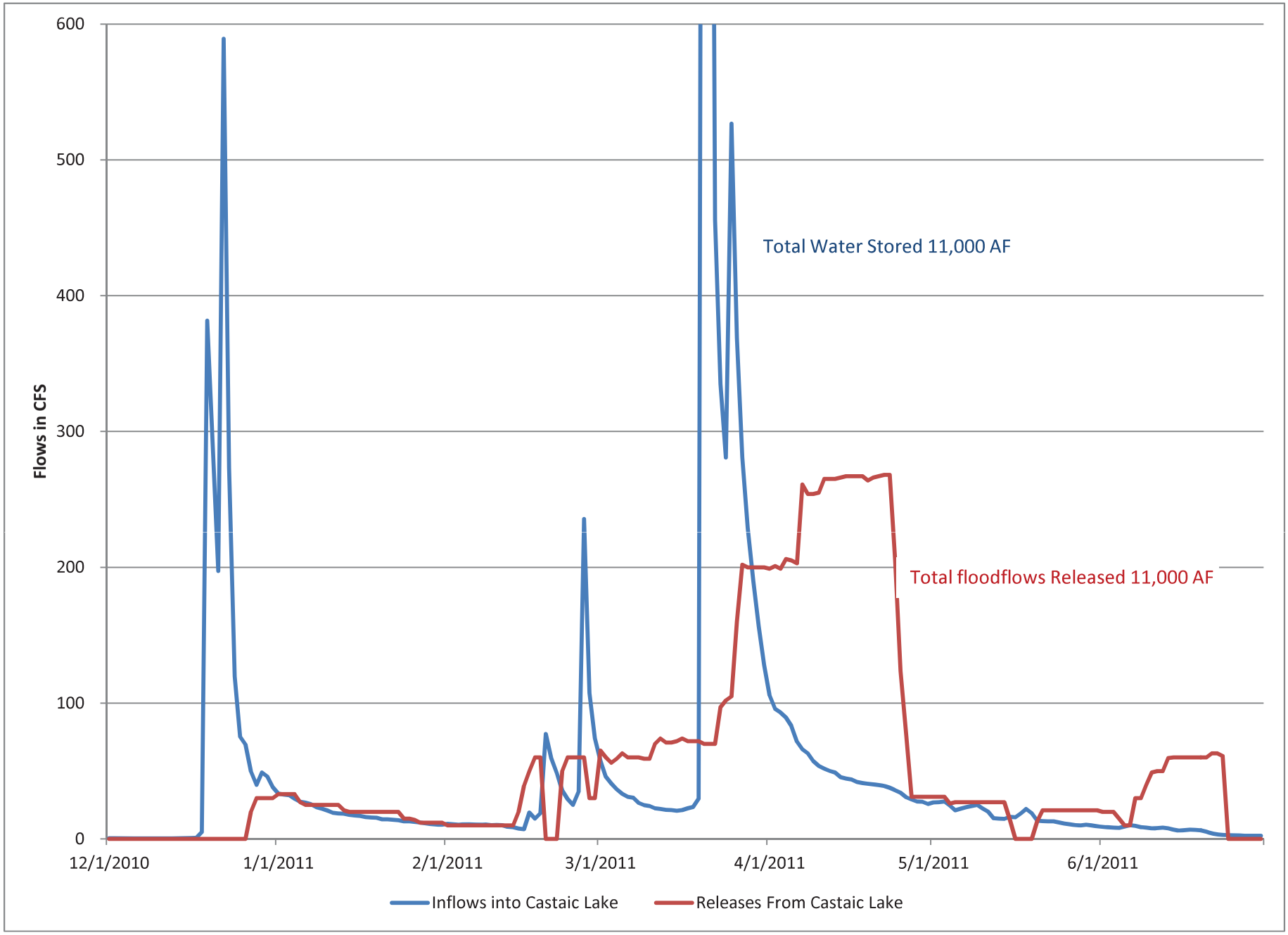


Figure 2.2-6. Conservation release from Castaic Lake for downstream water users

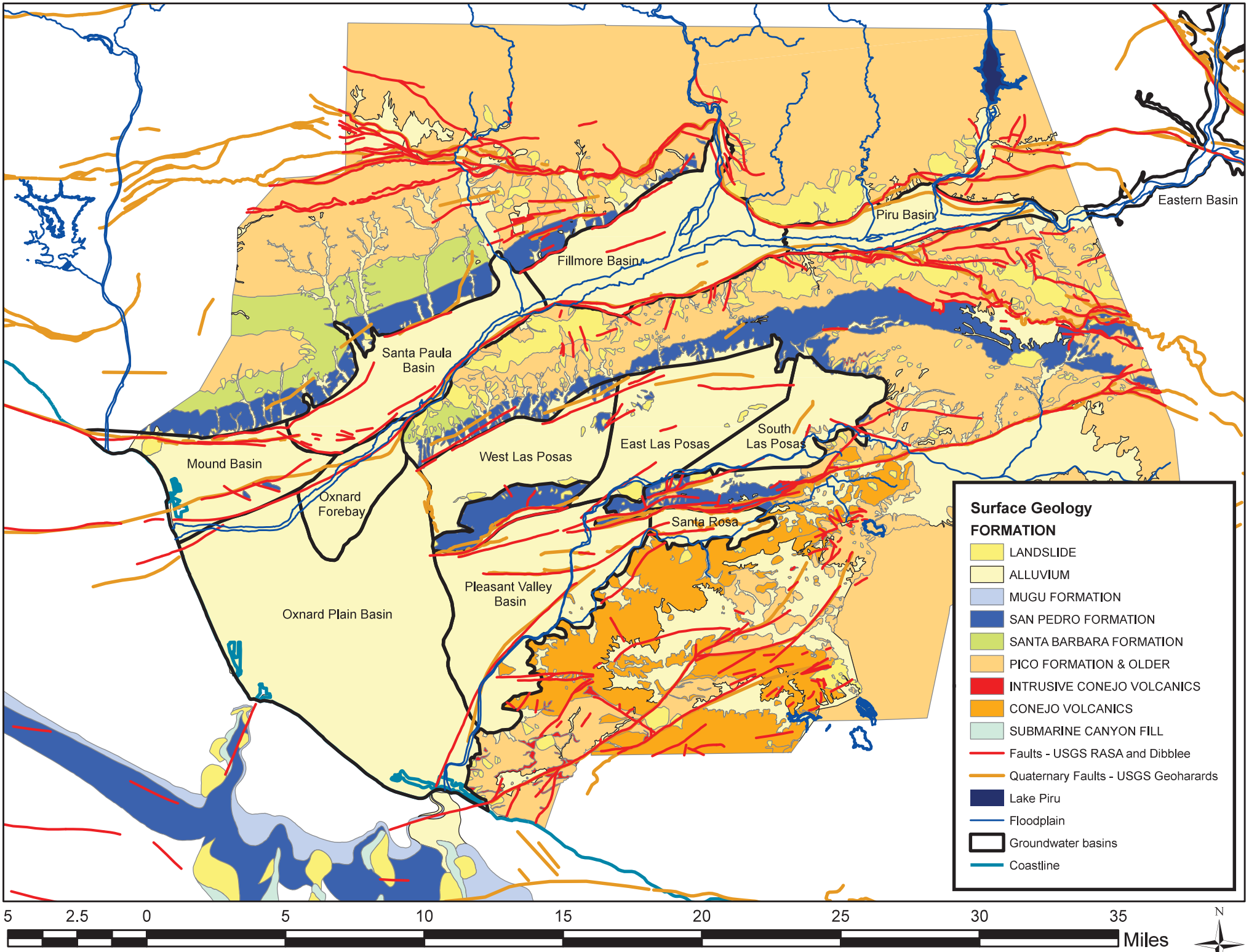


Figure 3.1-1. Surface geology and faults

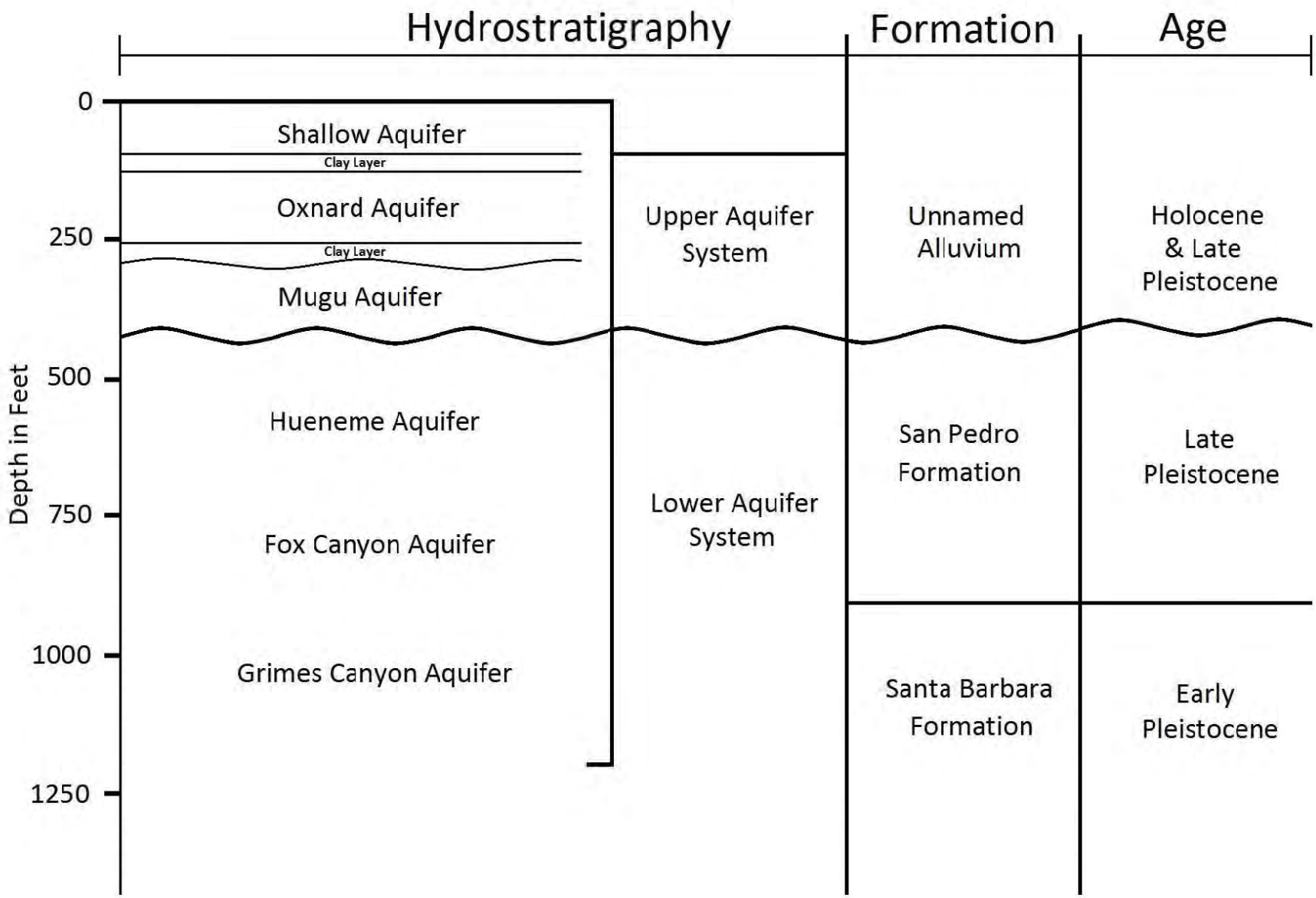


Figure 3.2-1. Schematic of UAS and LAS aquifer systems

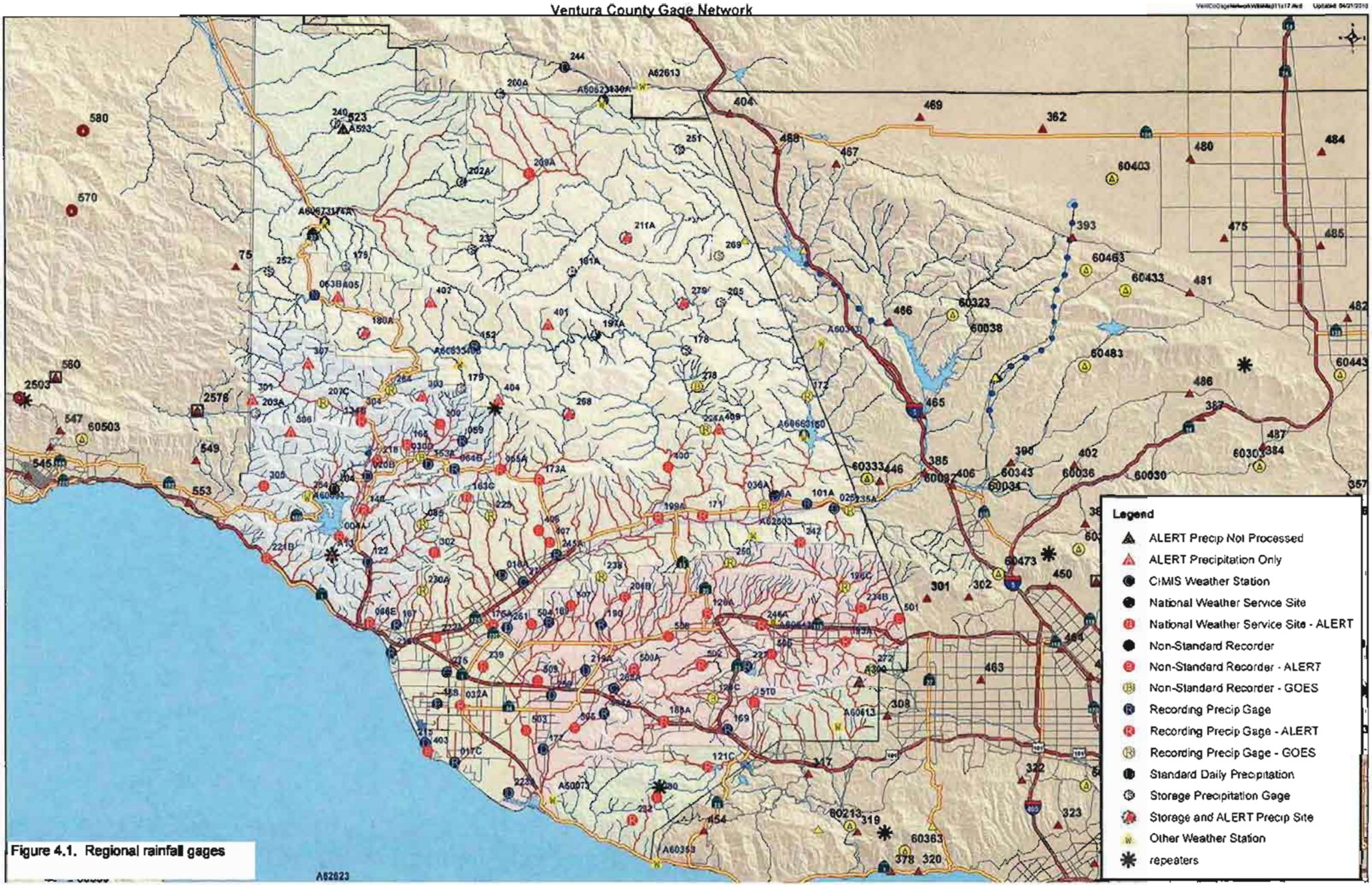


Figure 4.1. Regional rainfall gages

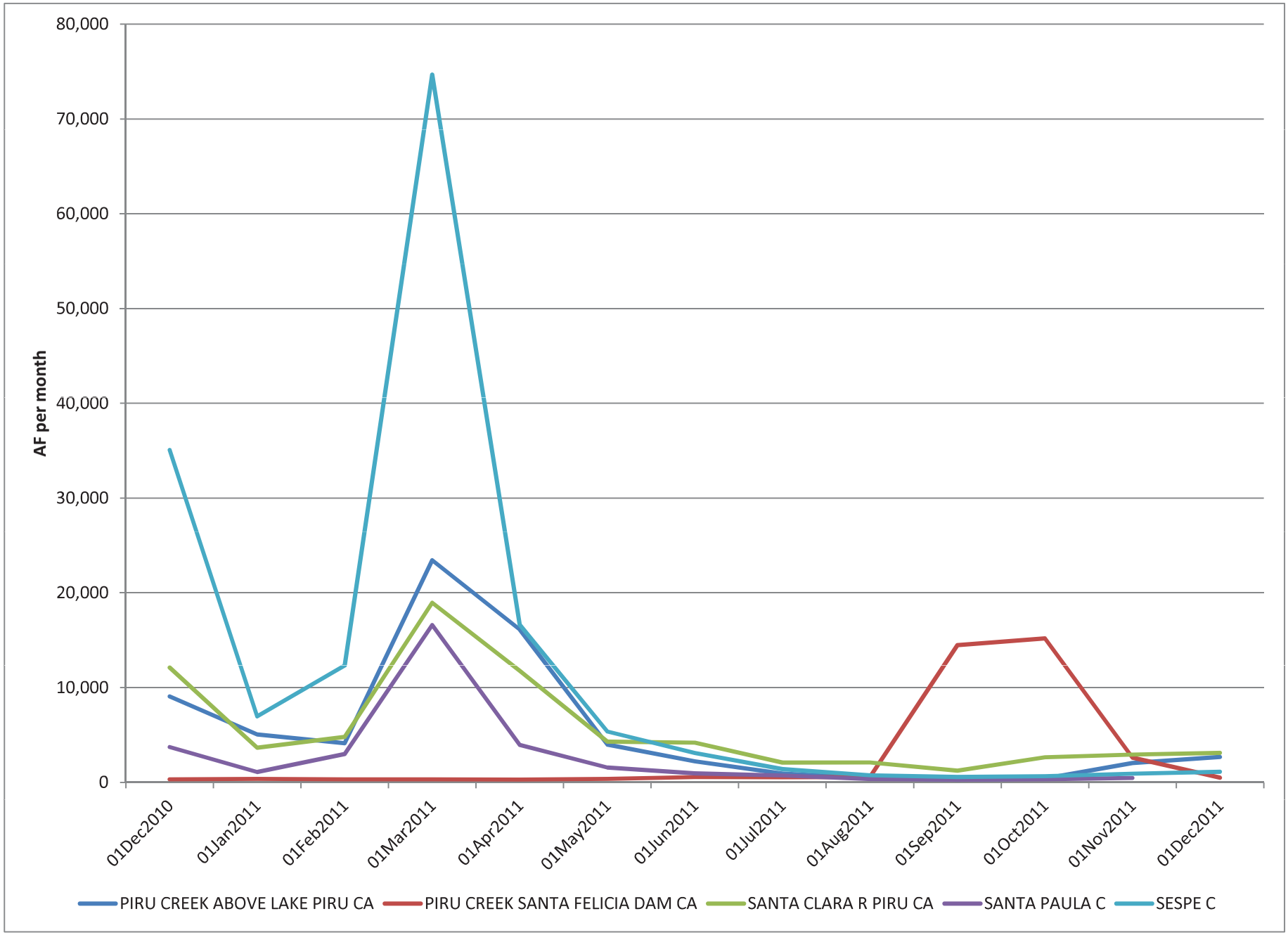


Figure 4.2-1. Monthly flows of the major tributaries in the Santa Clara River Watershed

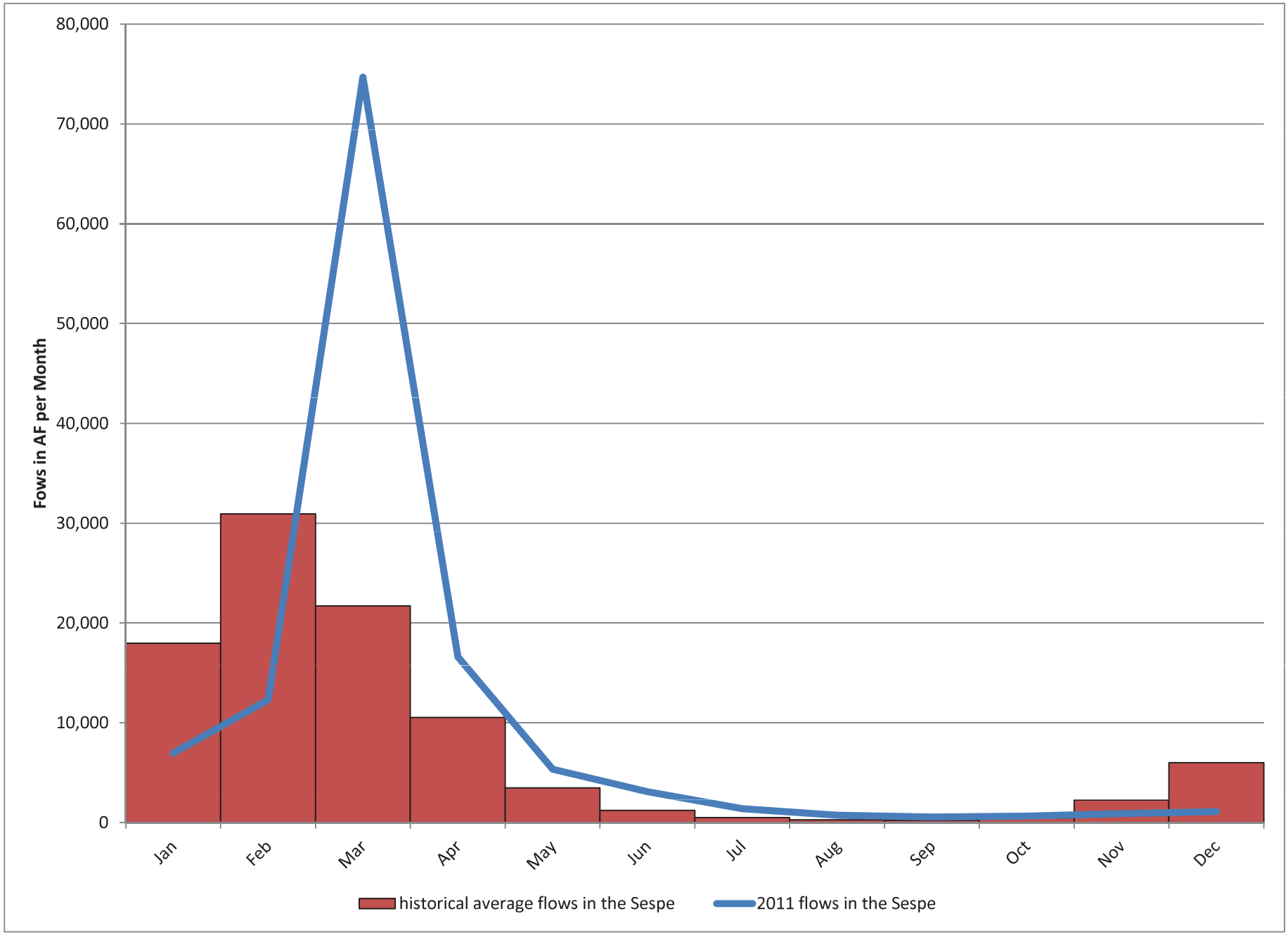


Figure 4.2-2. 2011 Flows in the Sespe Creek compared to average flows (1972-2010)

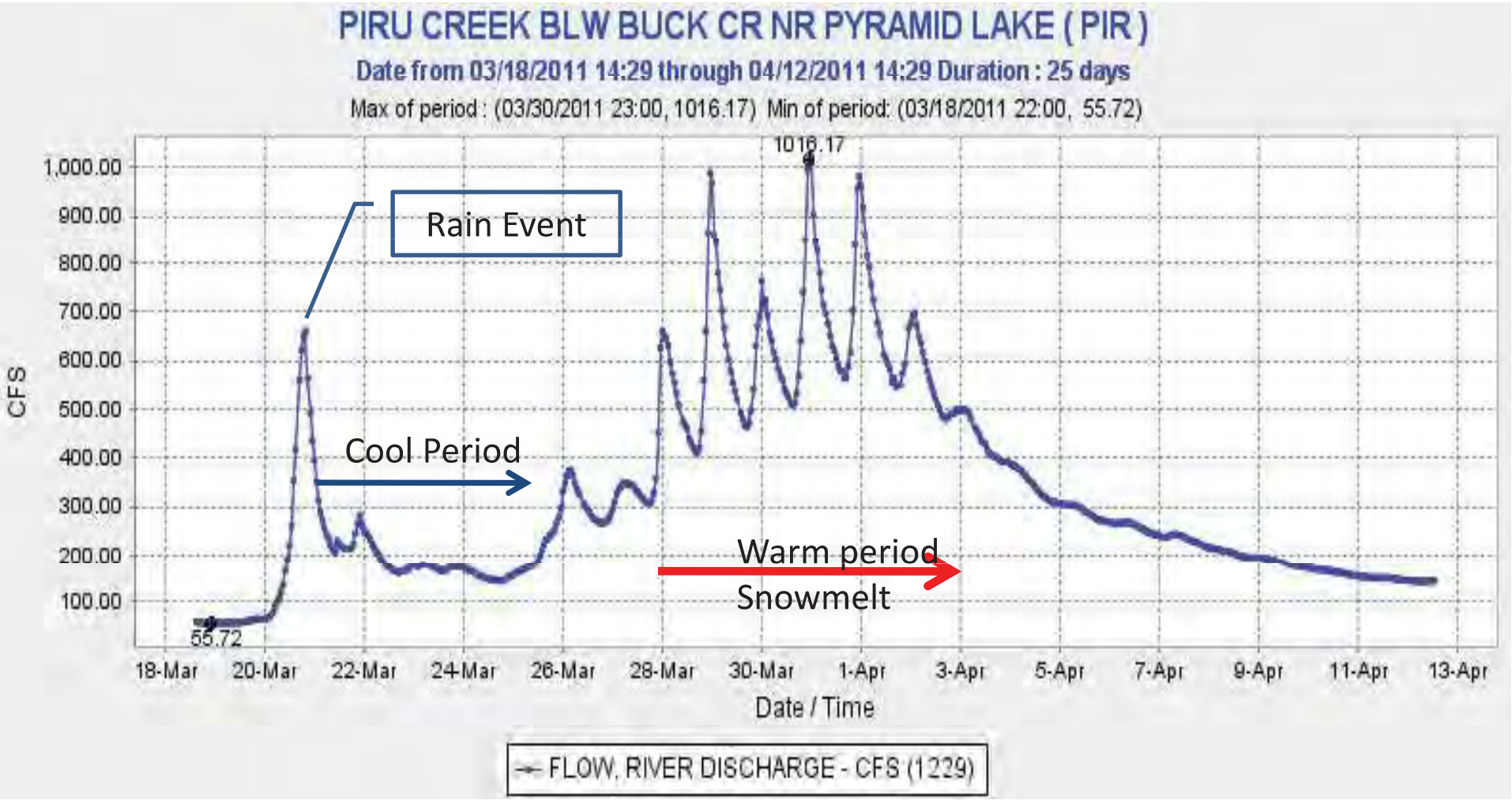


Figure 4.2-3. Spring 2011 snowmelt event in the Piru Watershed

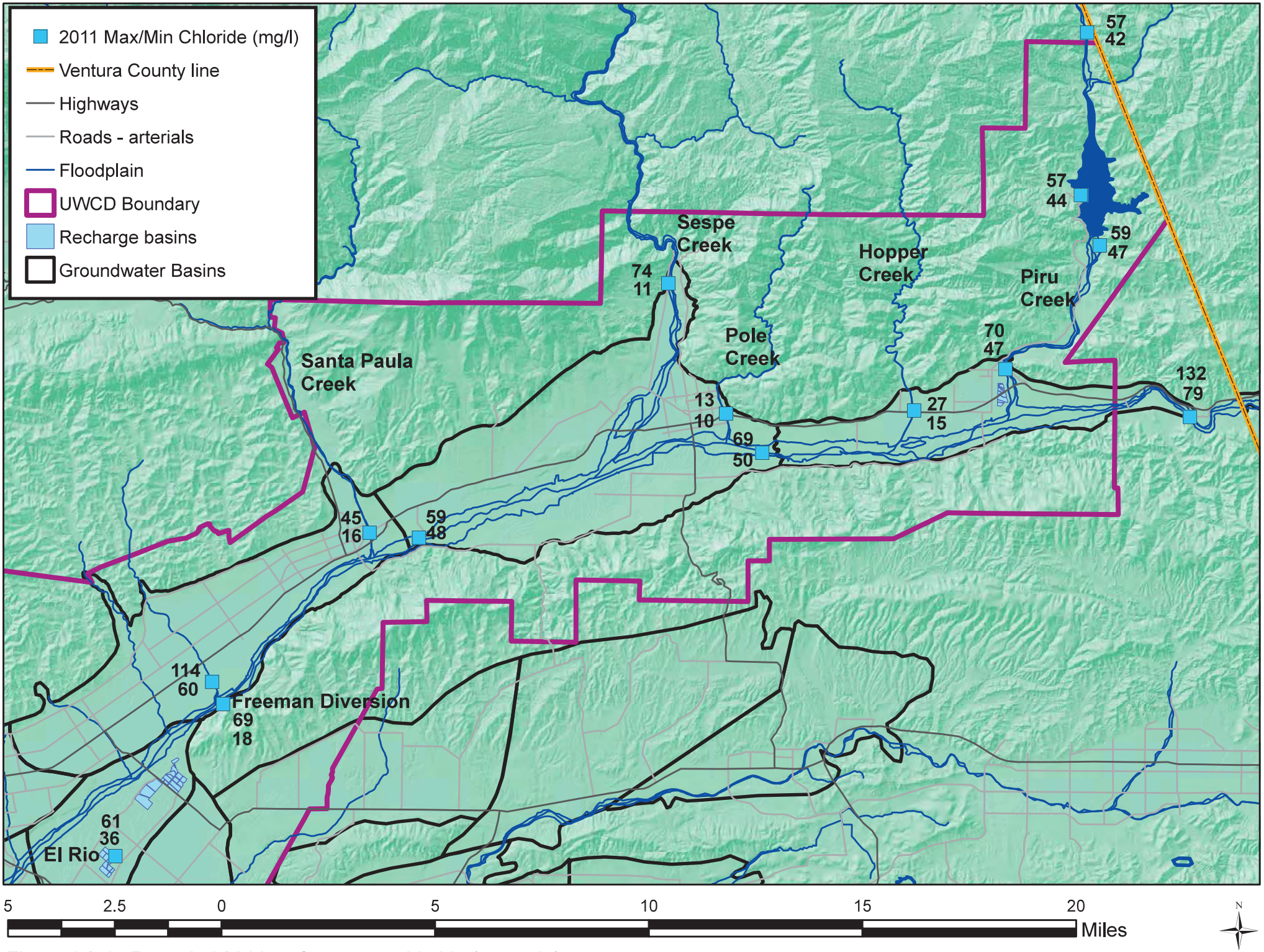


Figure 4.2-4. Recorded 2011 surface water chloride (max-min)

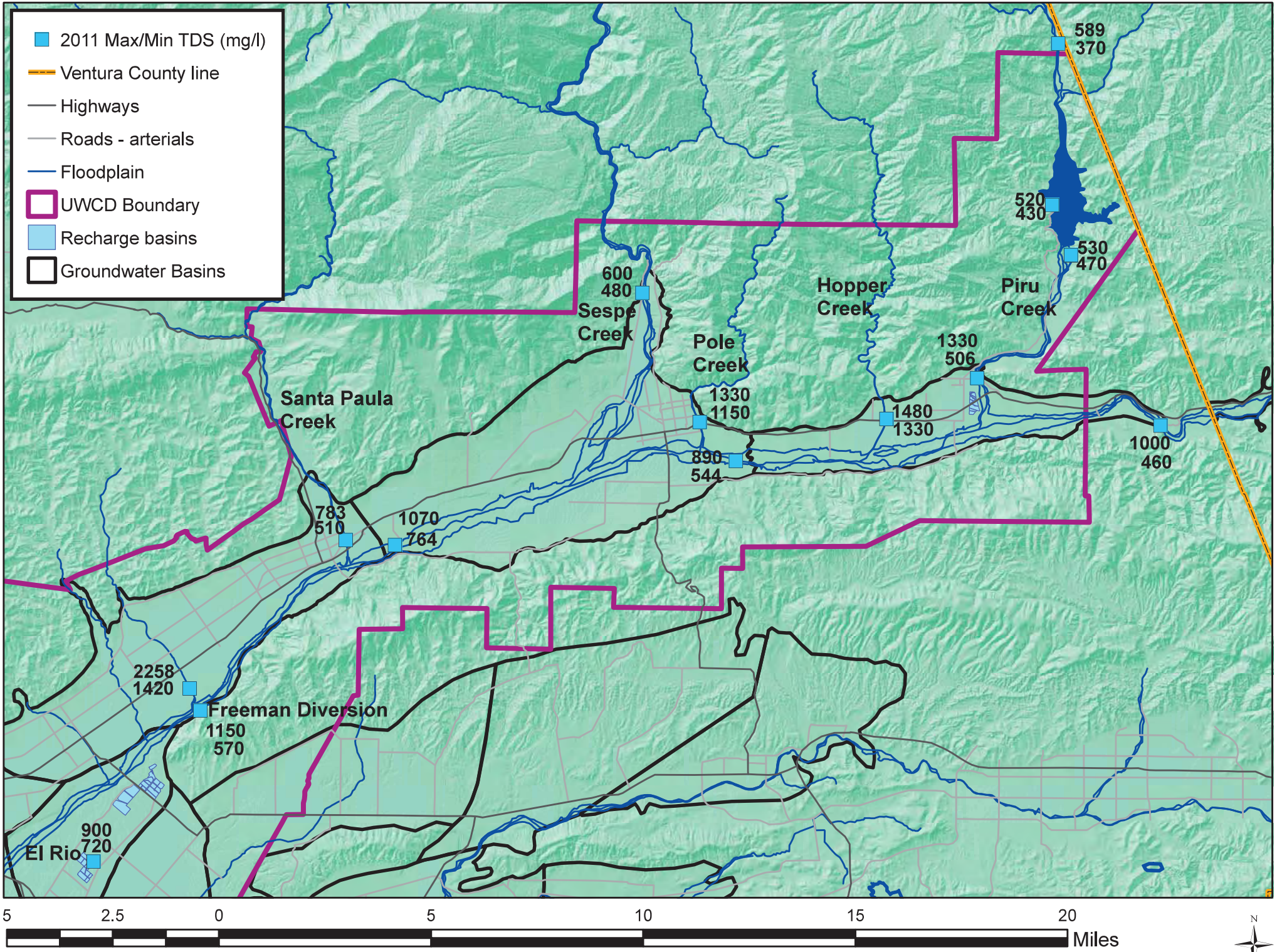


Figure 4.2-5. Recorded 2011 surface water TDS (max-min)

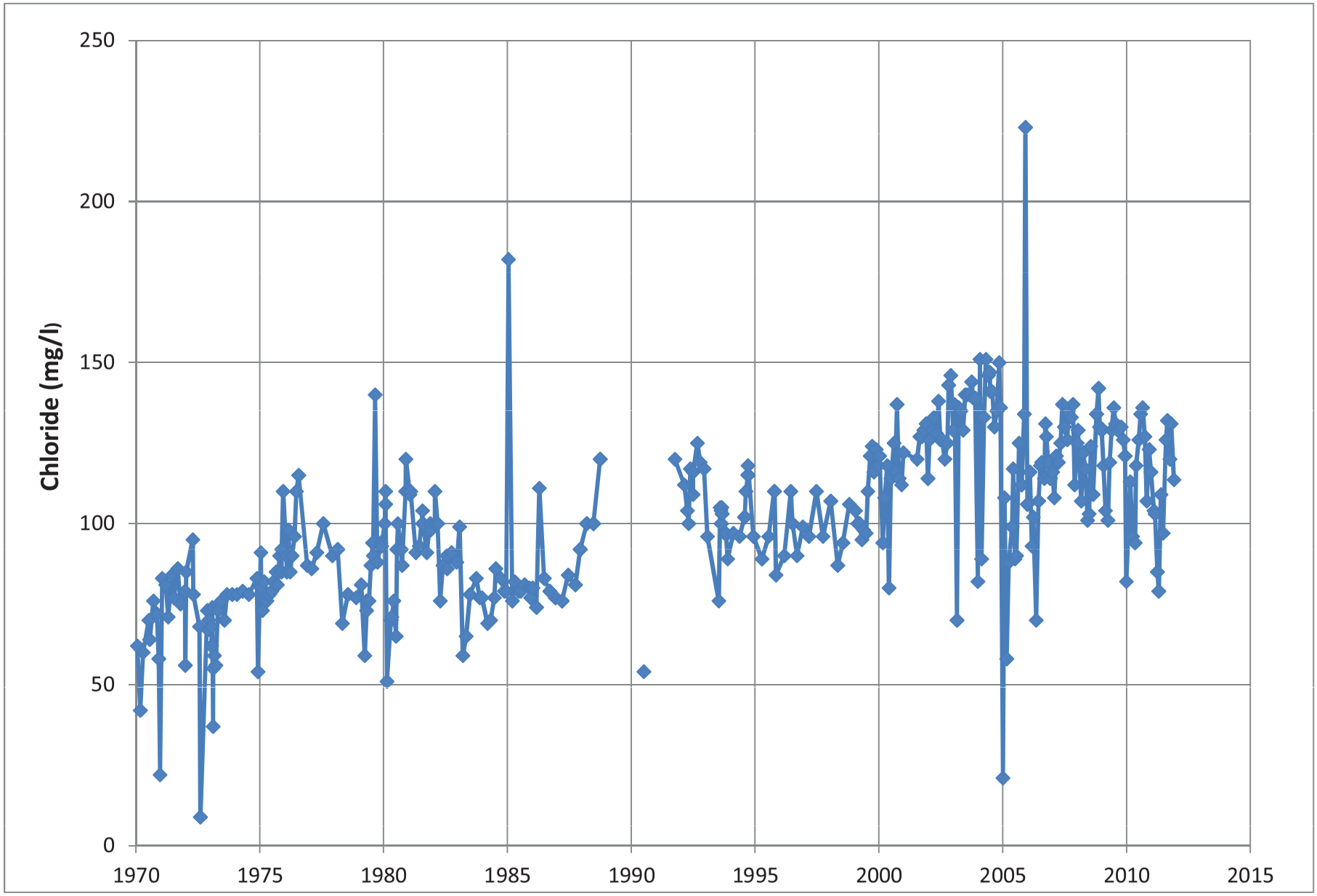


Figure 4.2-6. Historical chloride concentrations in the Santa Clara River near the Ventura-Los Angeles County line

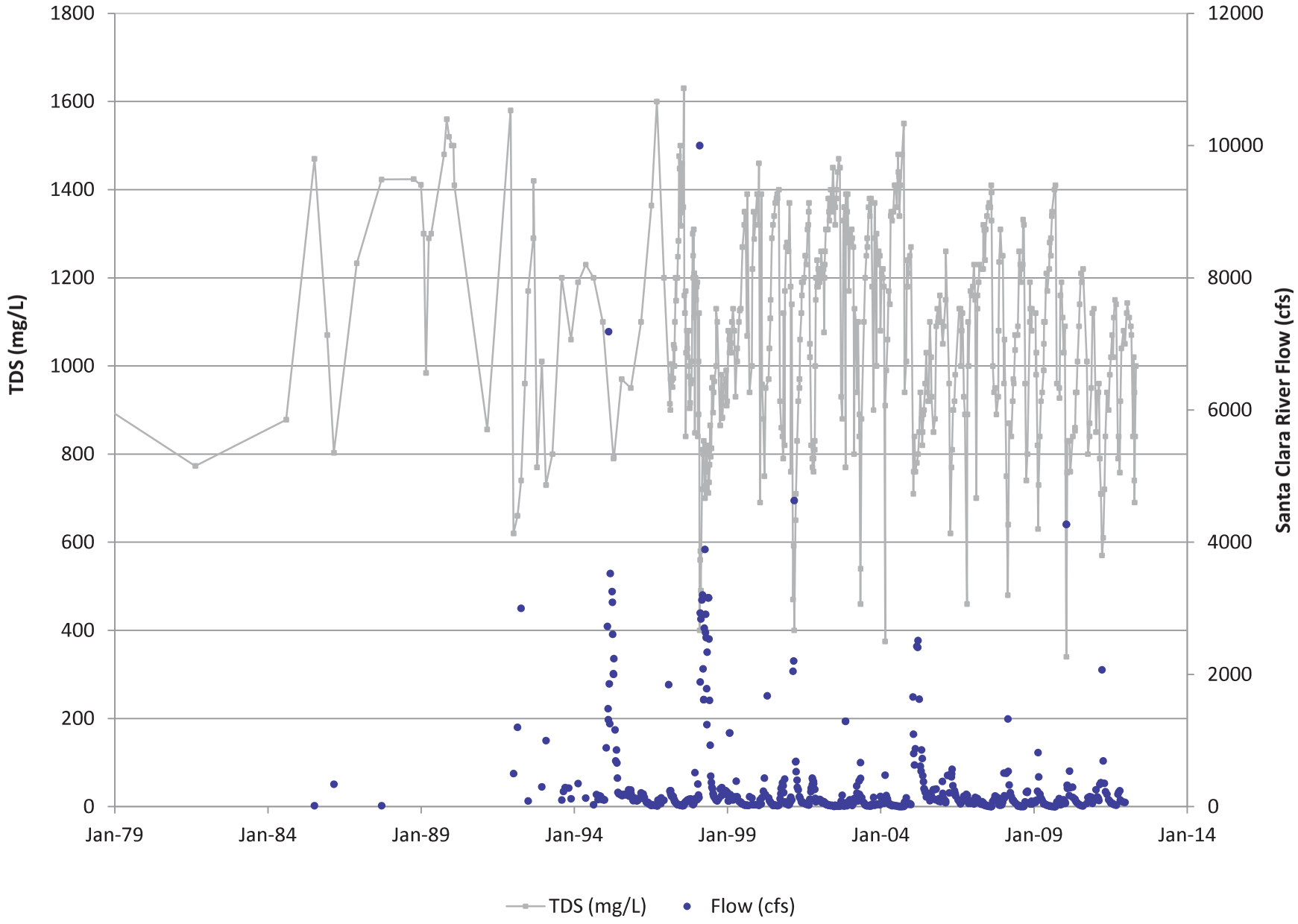


Figure 4.2-7. Historical TDS concentrations in the Santa Clara River at the Freeman Diversion

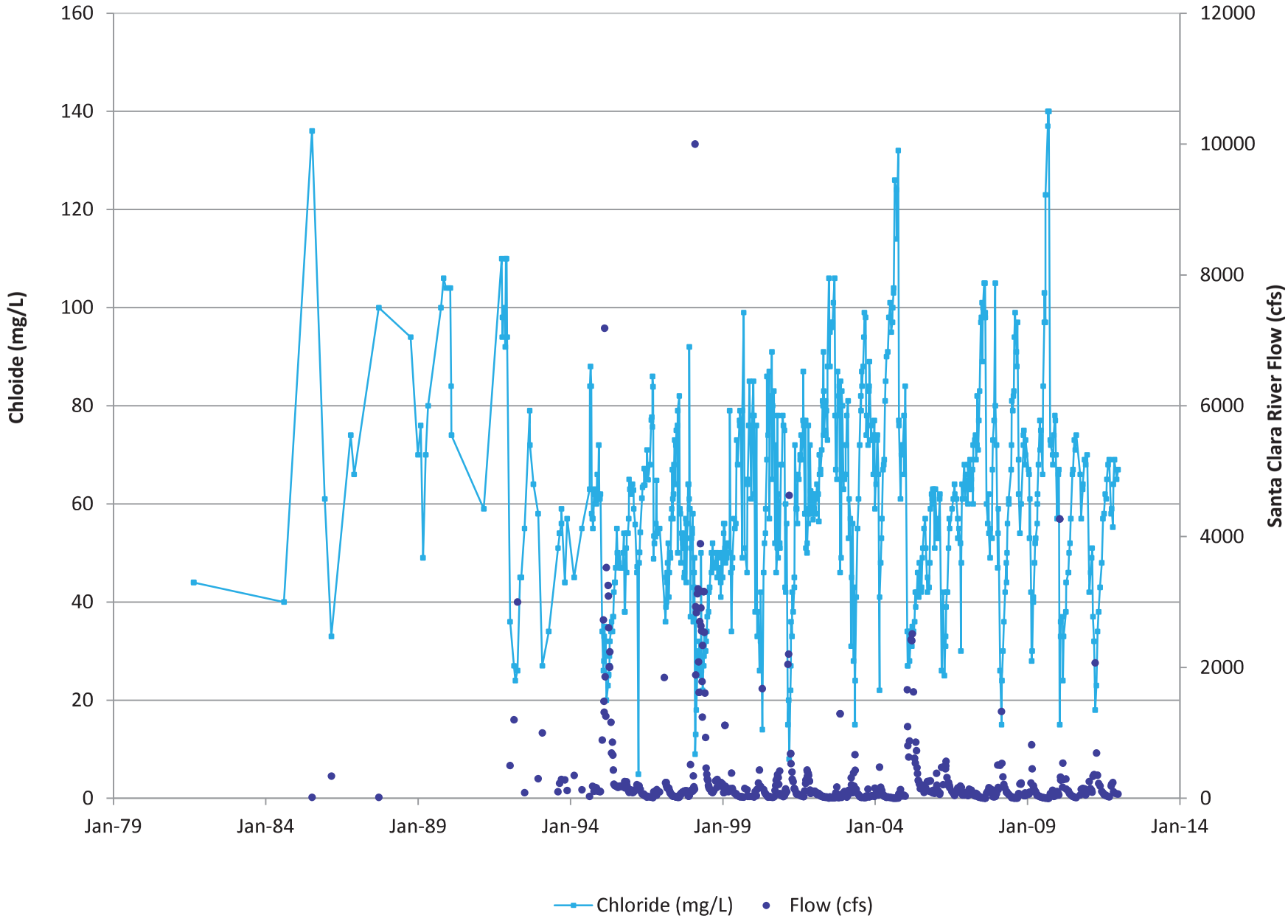


Figure 4.2-8. Historical chloride concentrations in the Santa Clara River at the Freeman Diversion

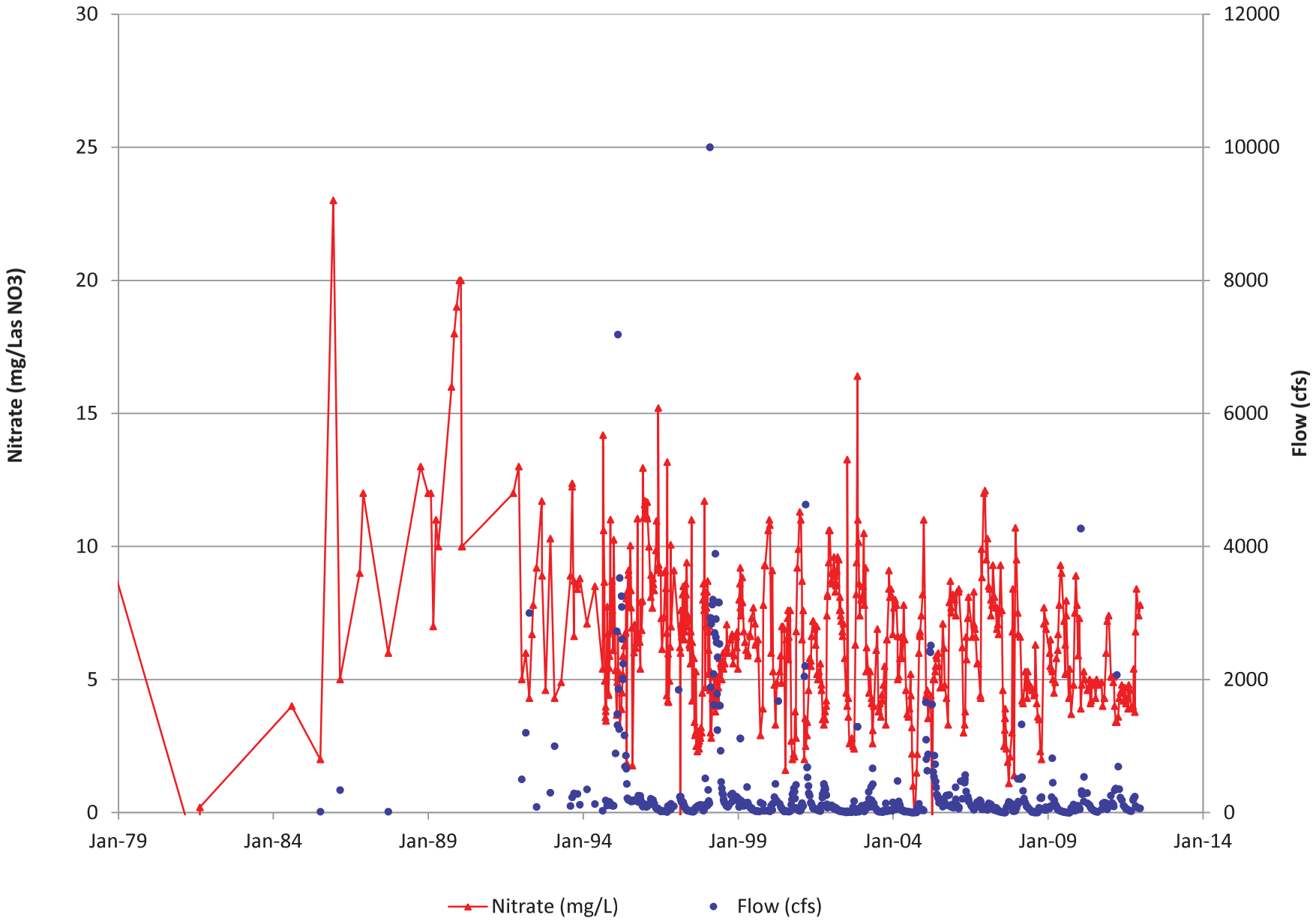


Figure 4.2-9. Historical nitrate (NO3) concentrations in the Santa Clara River at the Freeman Diversion

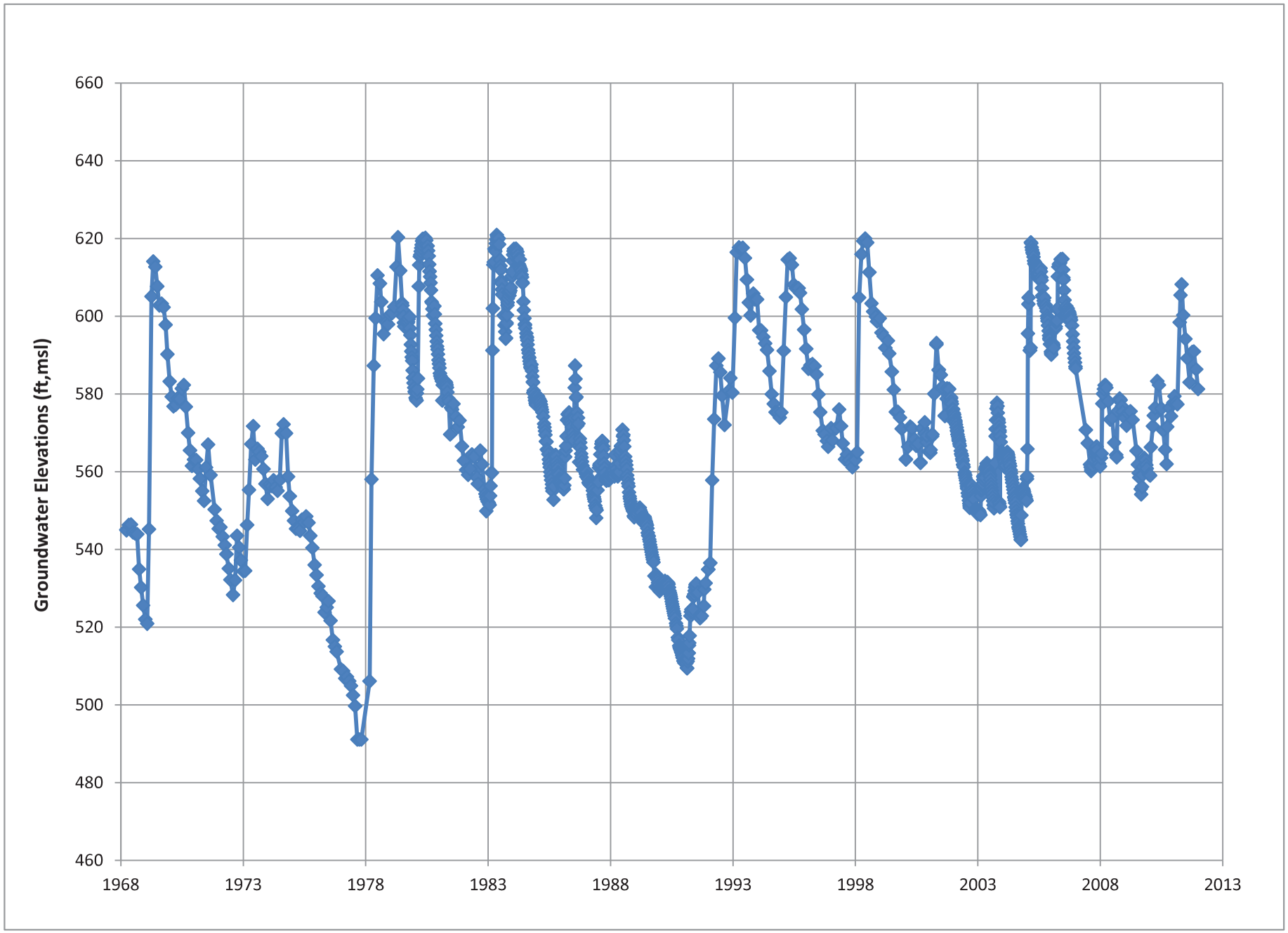


Figure 4.3-1. Historical groundwater elevations in Piru Basin key well

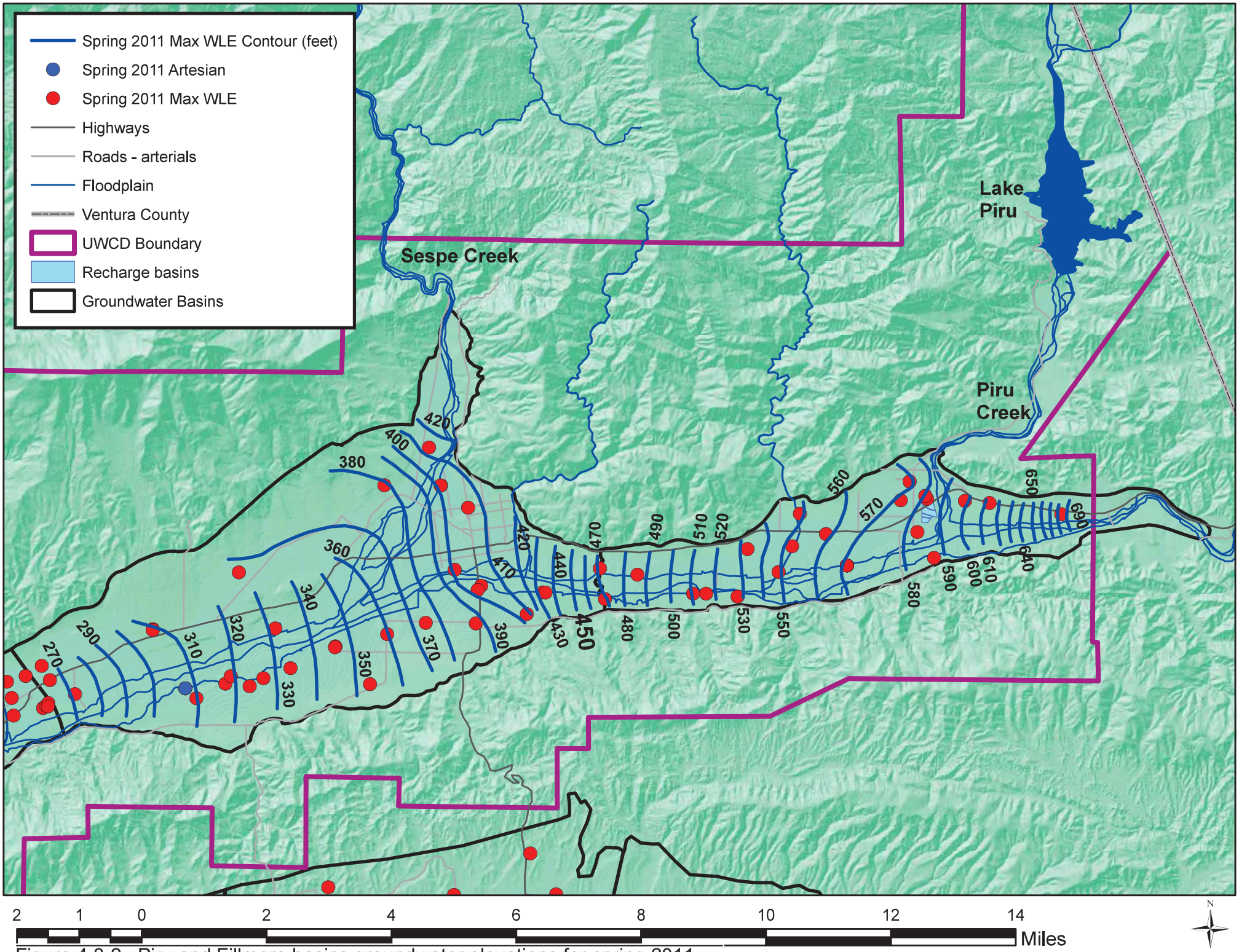


Figure 4.3-2. Piru and Fillmore basins groundwater elevations for spring 2011

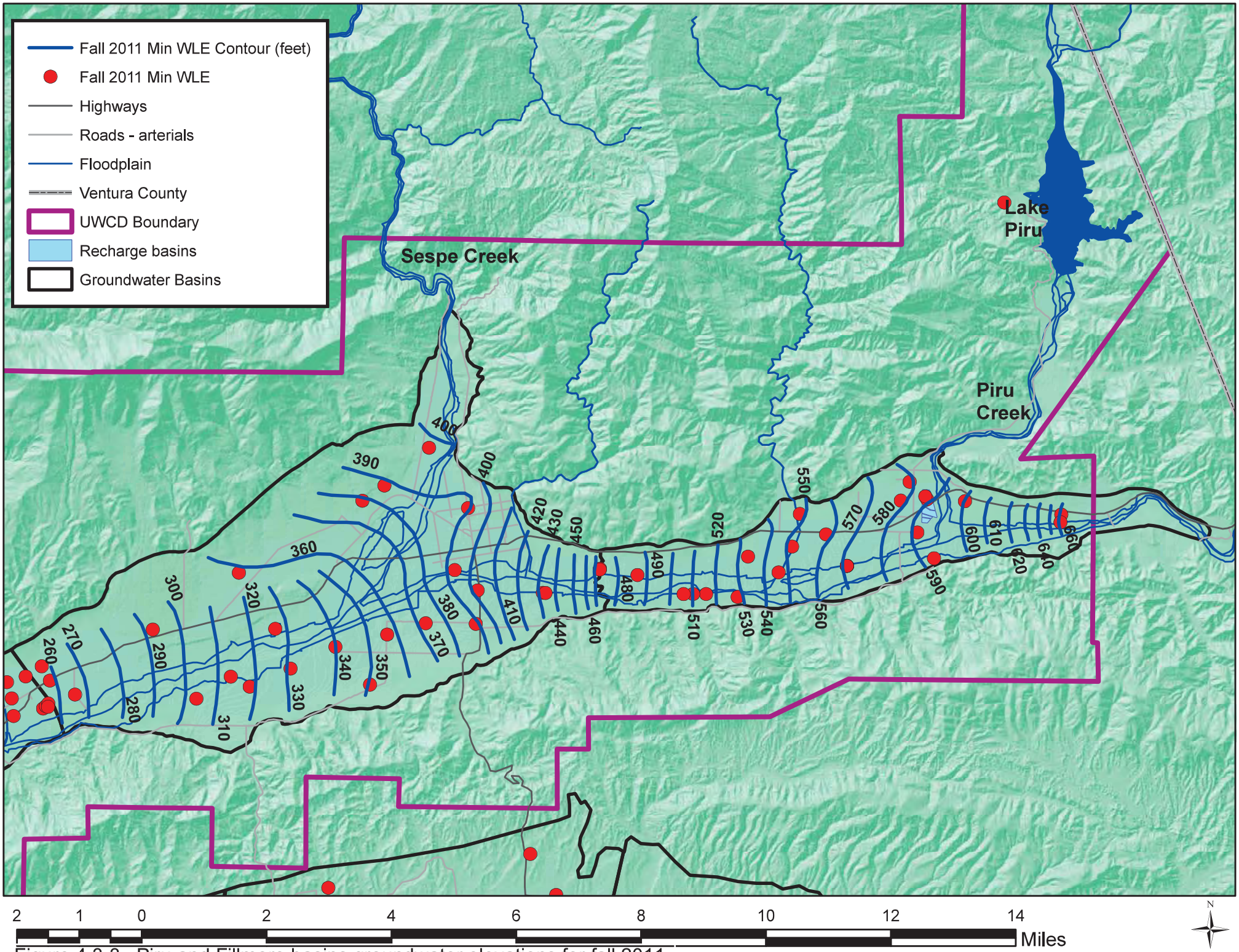


Figure 4.3-3. Piru and Fillmore basins groundwater elevations for fall 2011

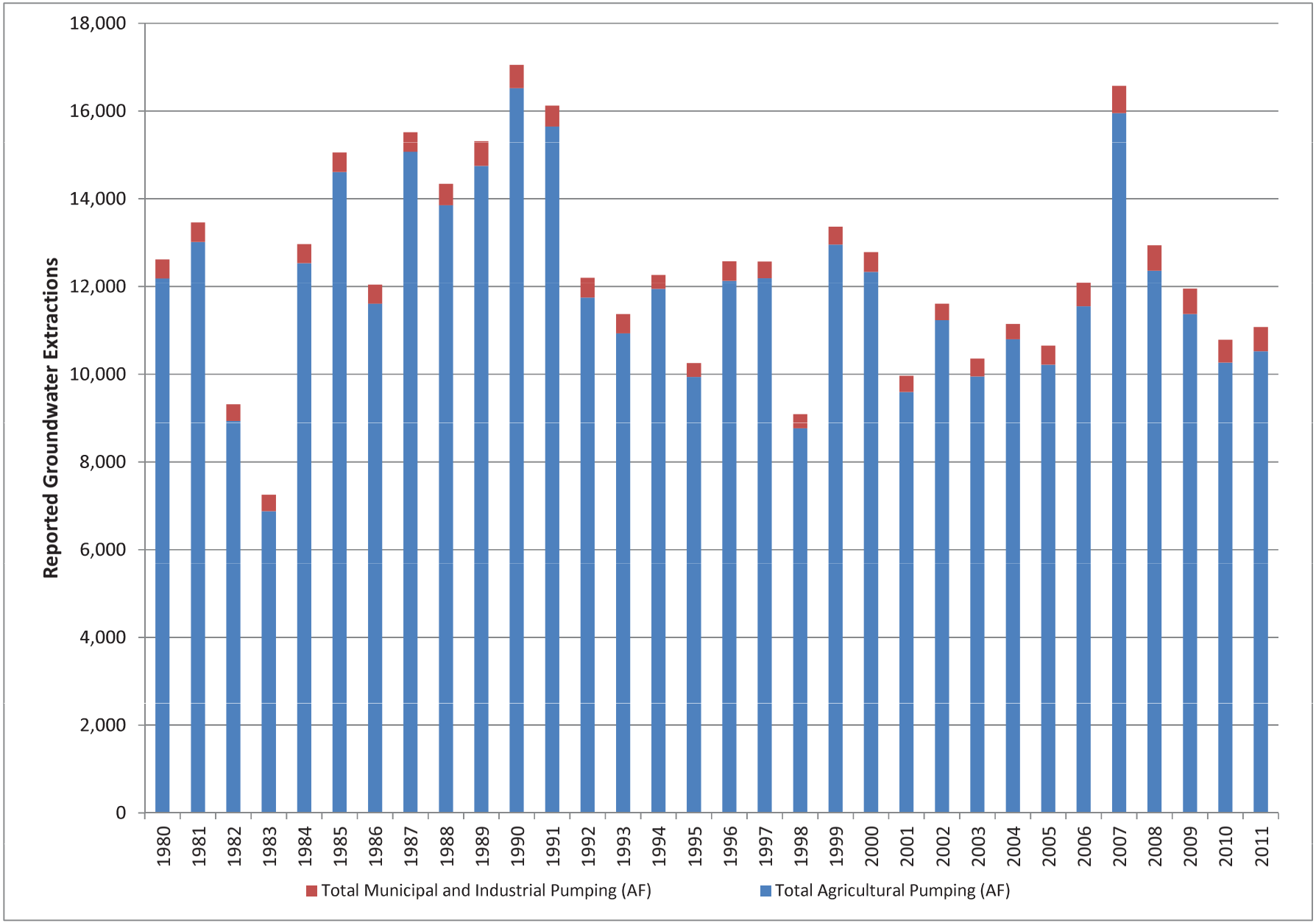


Figure 4.3-4. Historical reported groundwater extractions for the Piru Basin

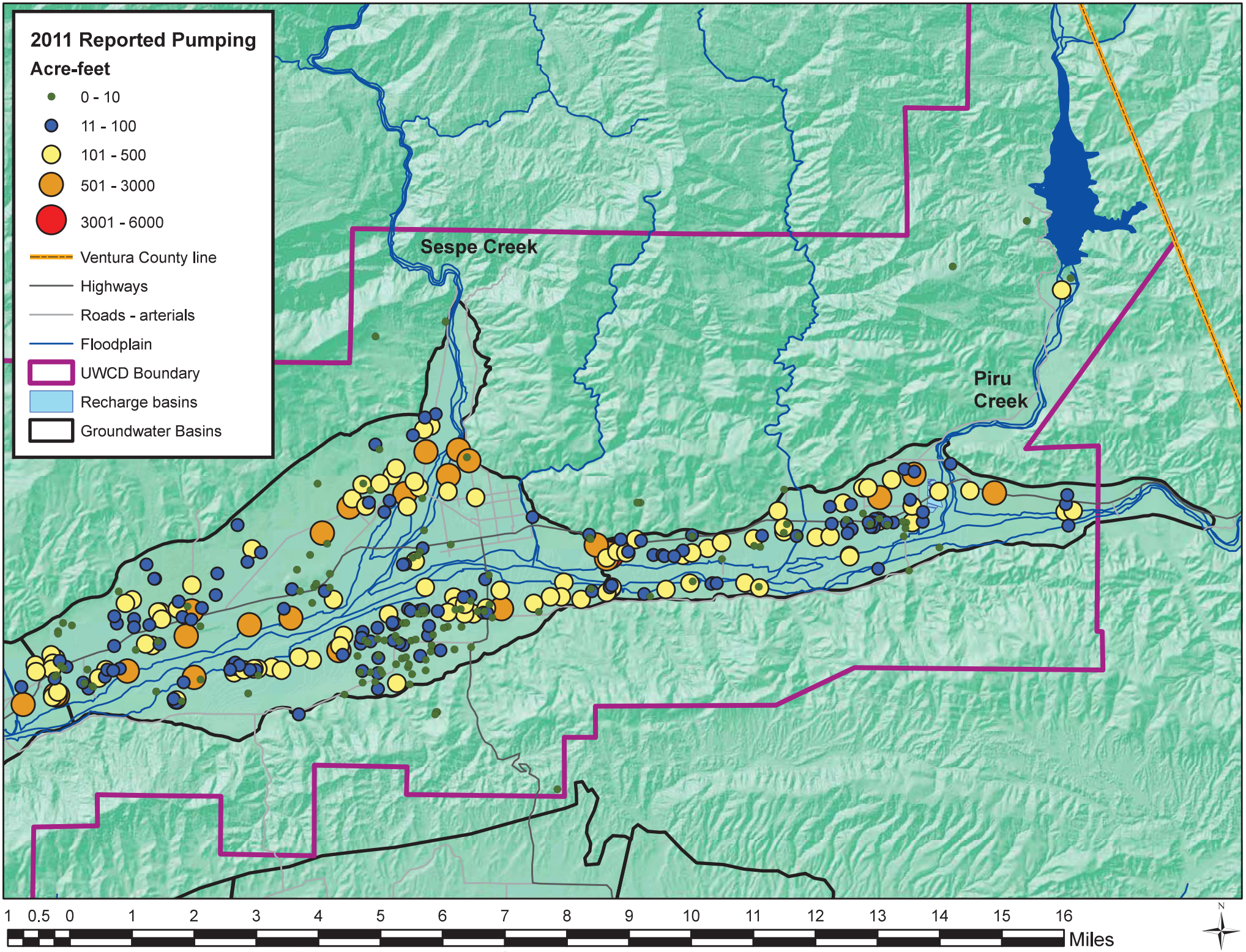


Figure 4.3-5. Reported Piru and Fillmore basin pumping for 2011

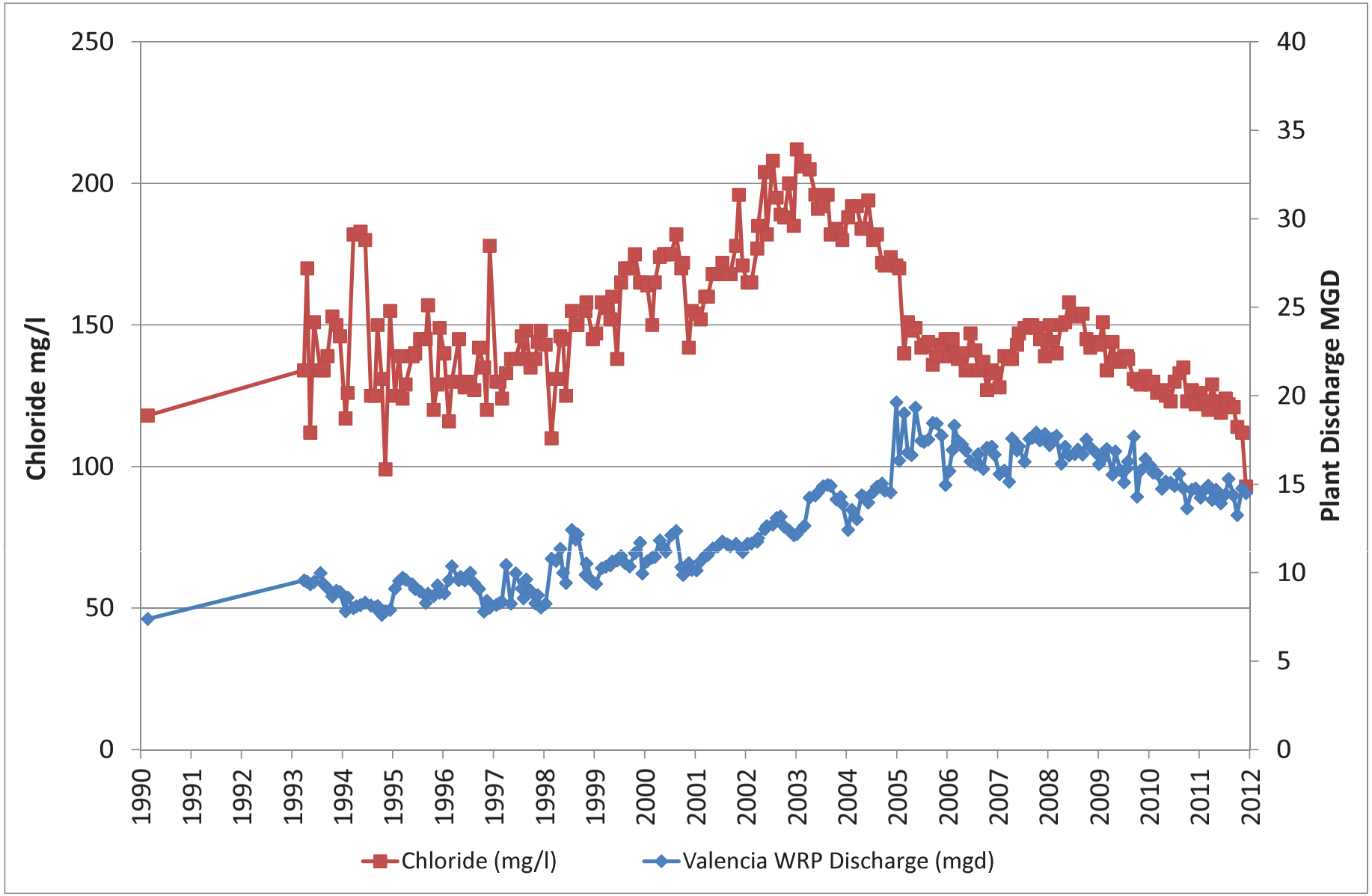


Figure 4.3-6. Historical chloride and discharge volumes at Valencia WRP

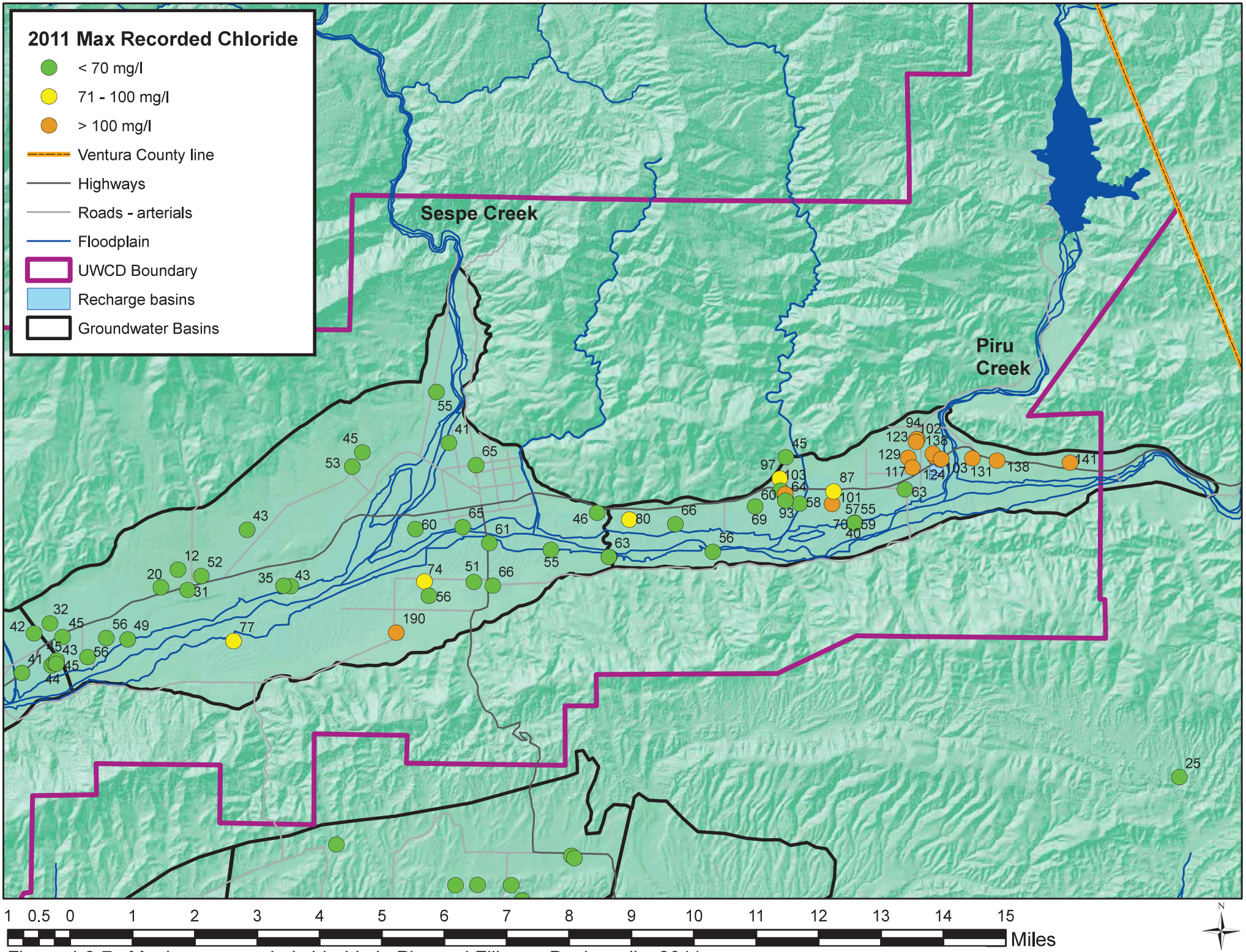


Figure 4.3-7. Maximum recorded chloride in Piru and Fillmore Basin wells, 2011

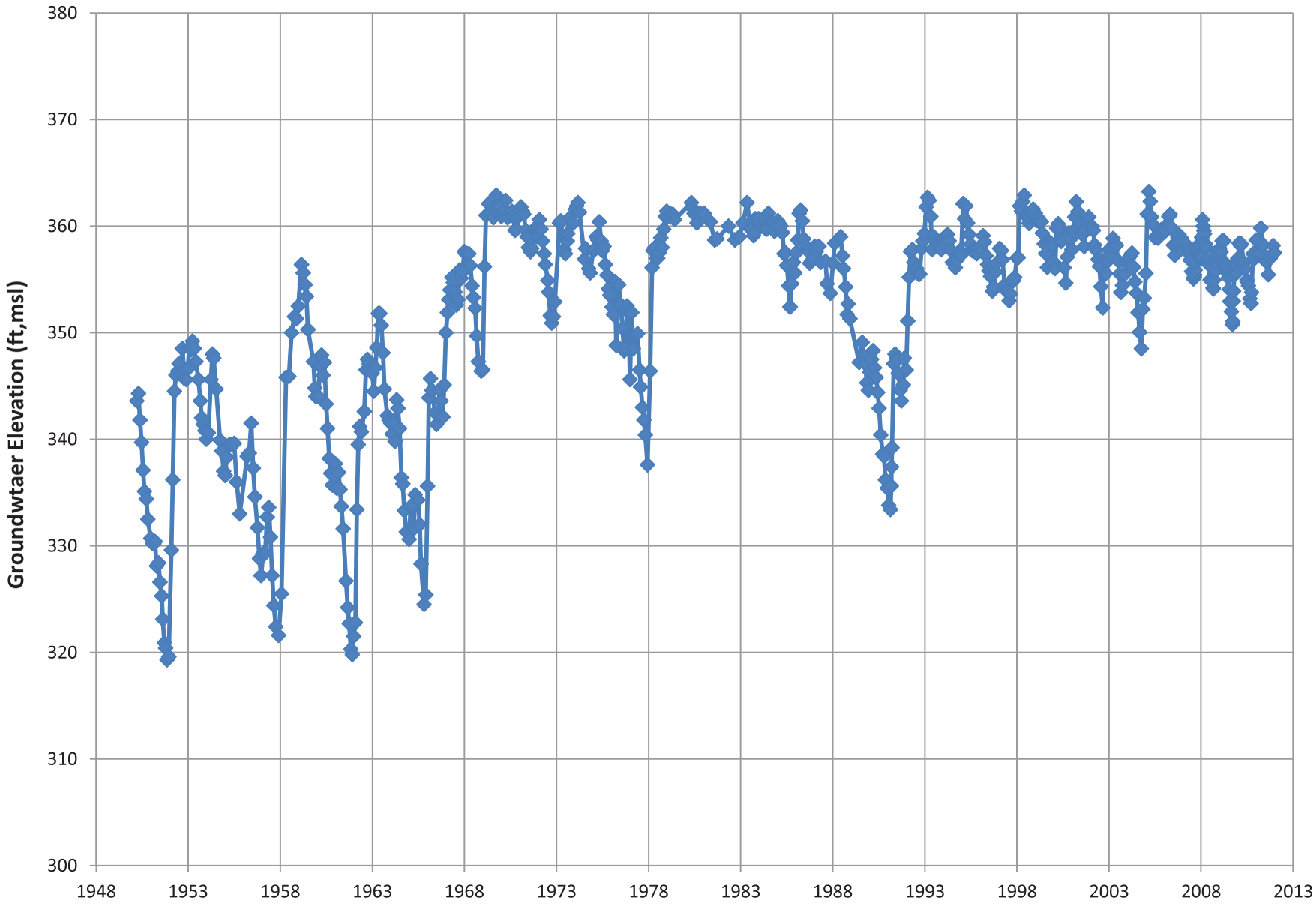


Figure 4.3-8. Historical groundwater elevations in Fillmore Basin key well

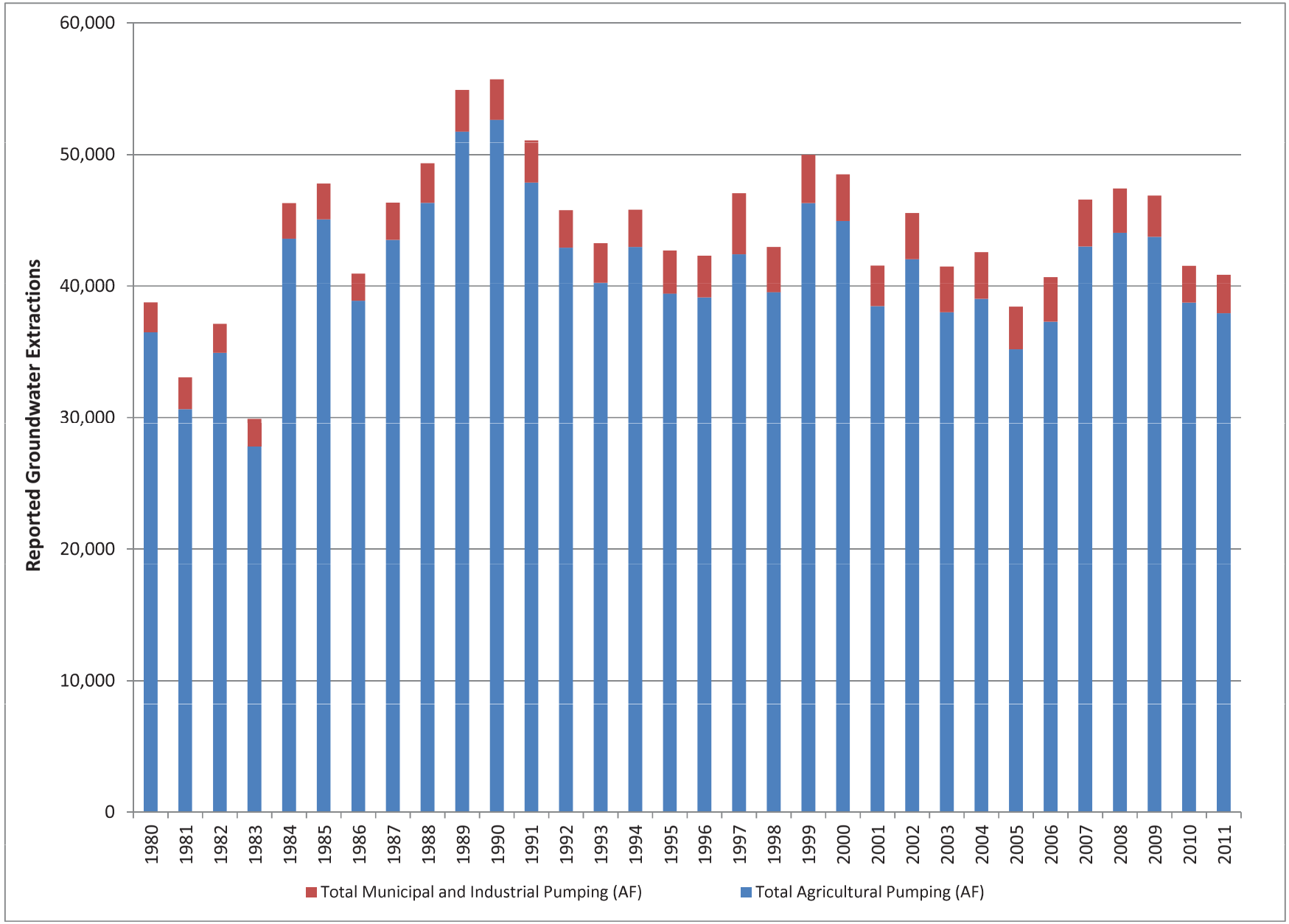


Figure 4.3-9. Historical reported groundwater extractions for the Fillmore Basin

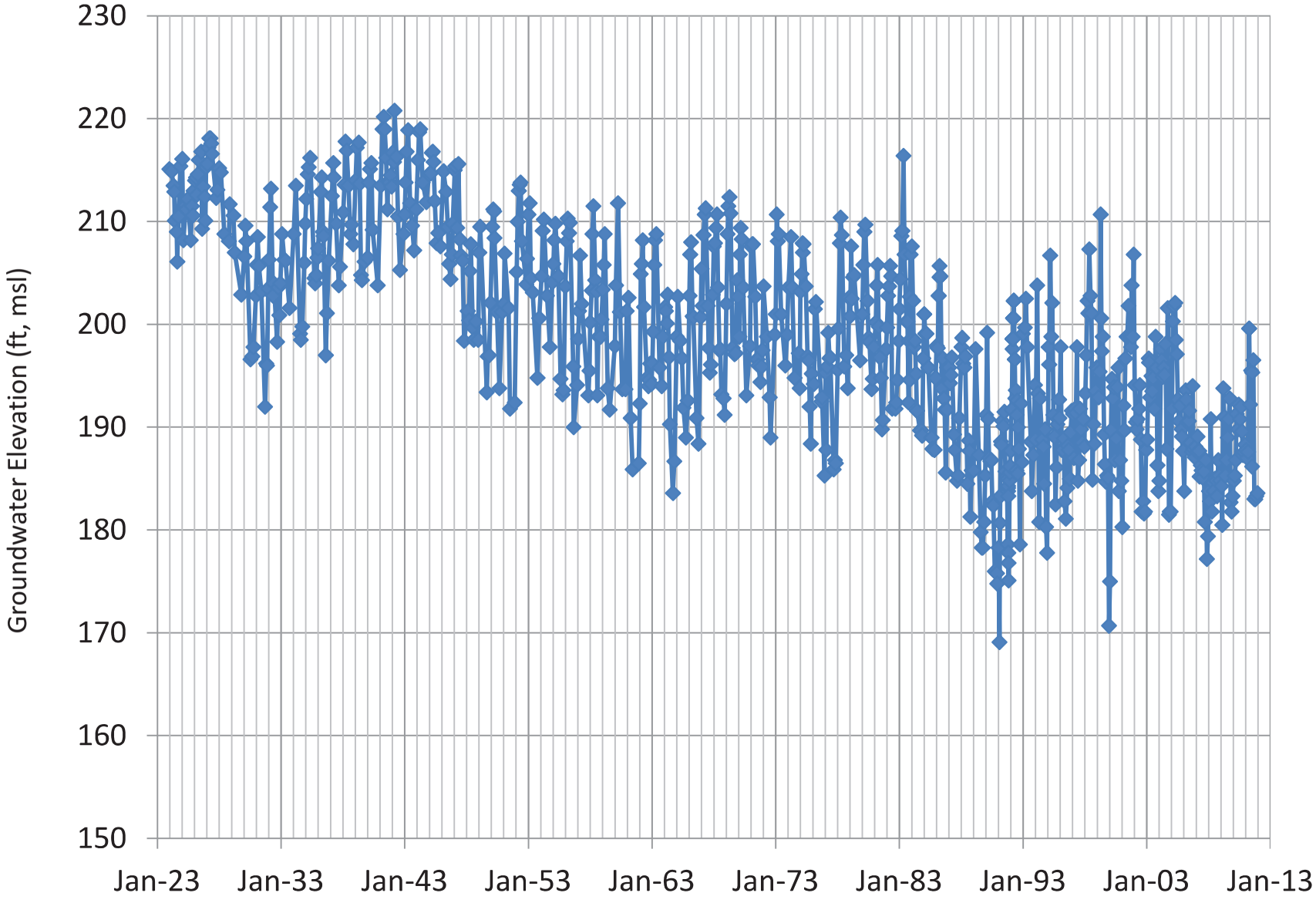


Figure 4.3-10. Historical groundwater elevations in Santa Paula Basin key well

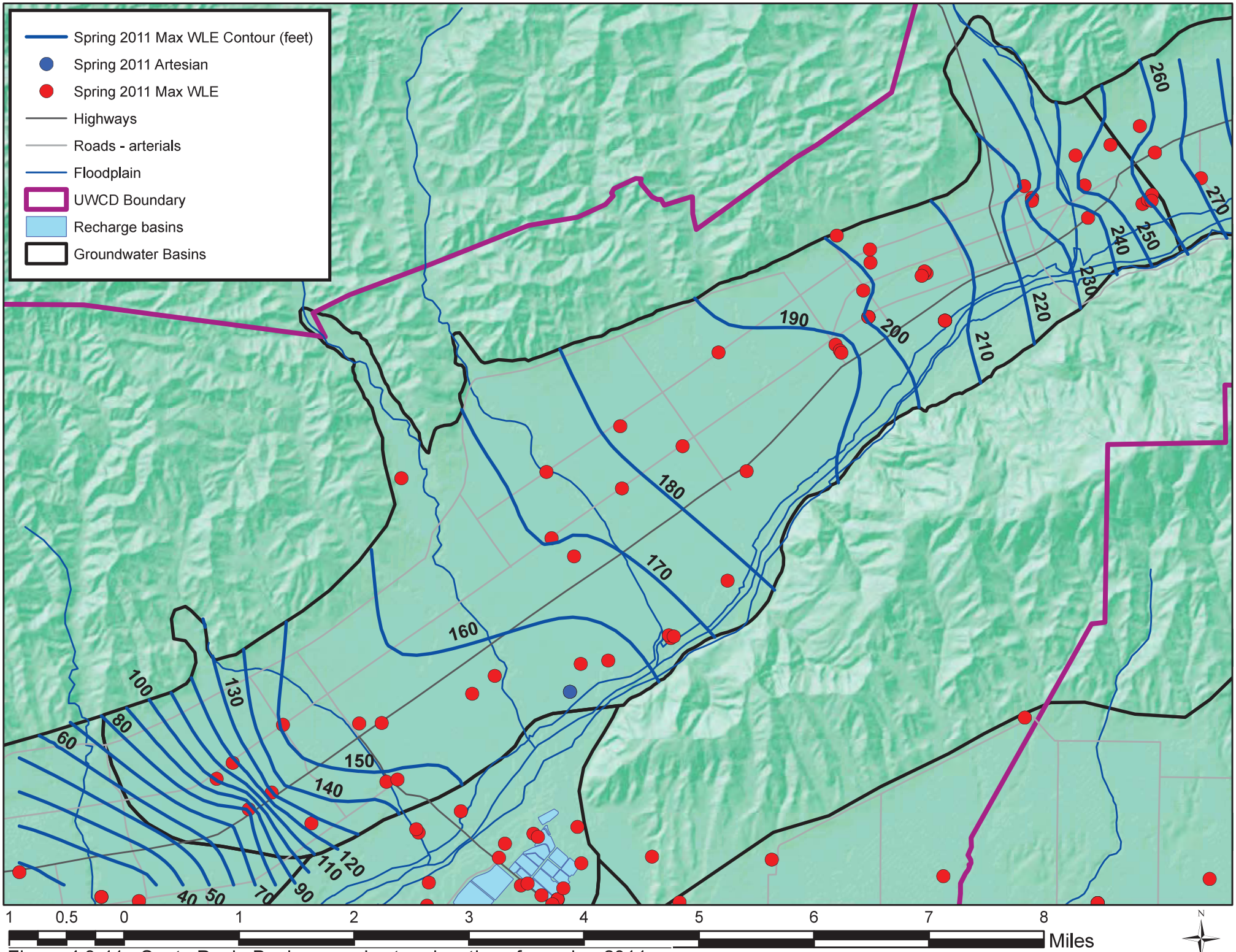


Figure 4.3-11. Santa Paula Basin groundwater elevations for spring 2011

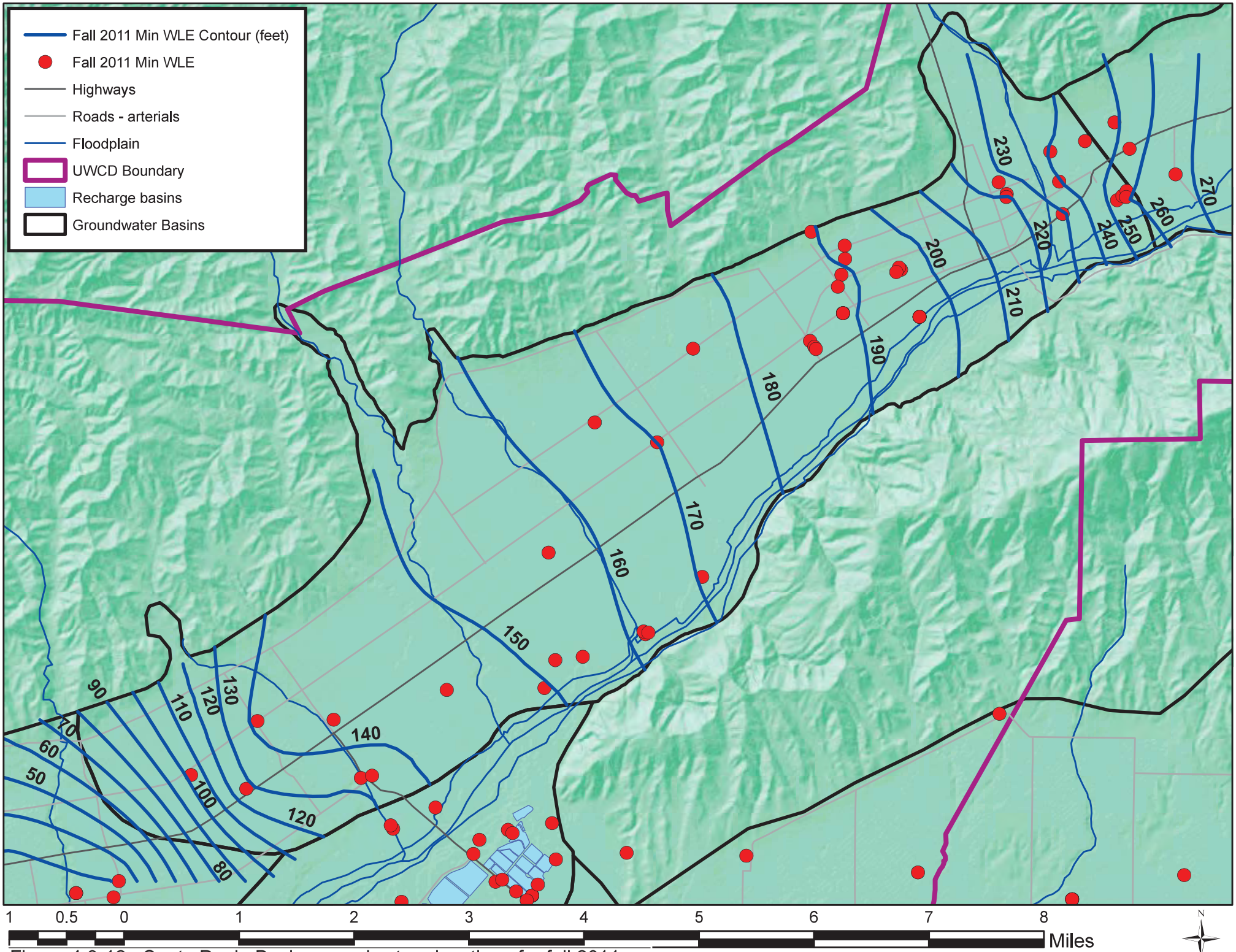


Figure 4.3-12. Santa Paula Basin groundwater elevations for fall 2011

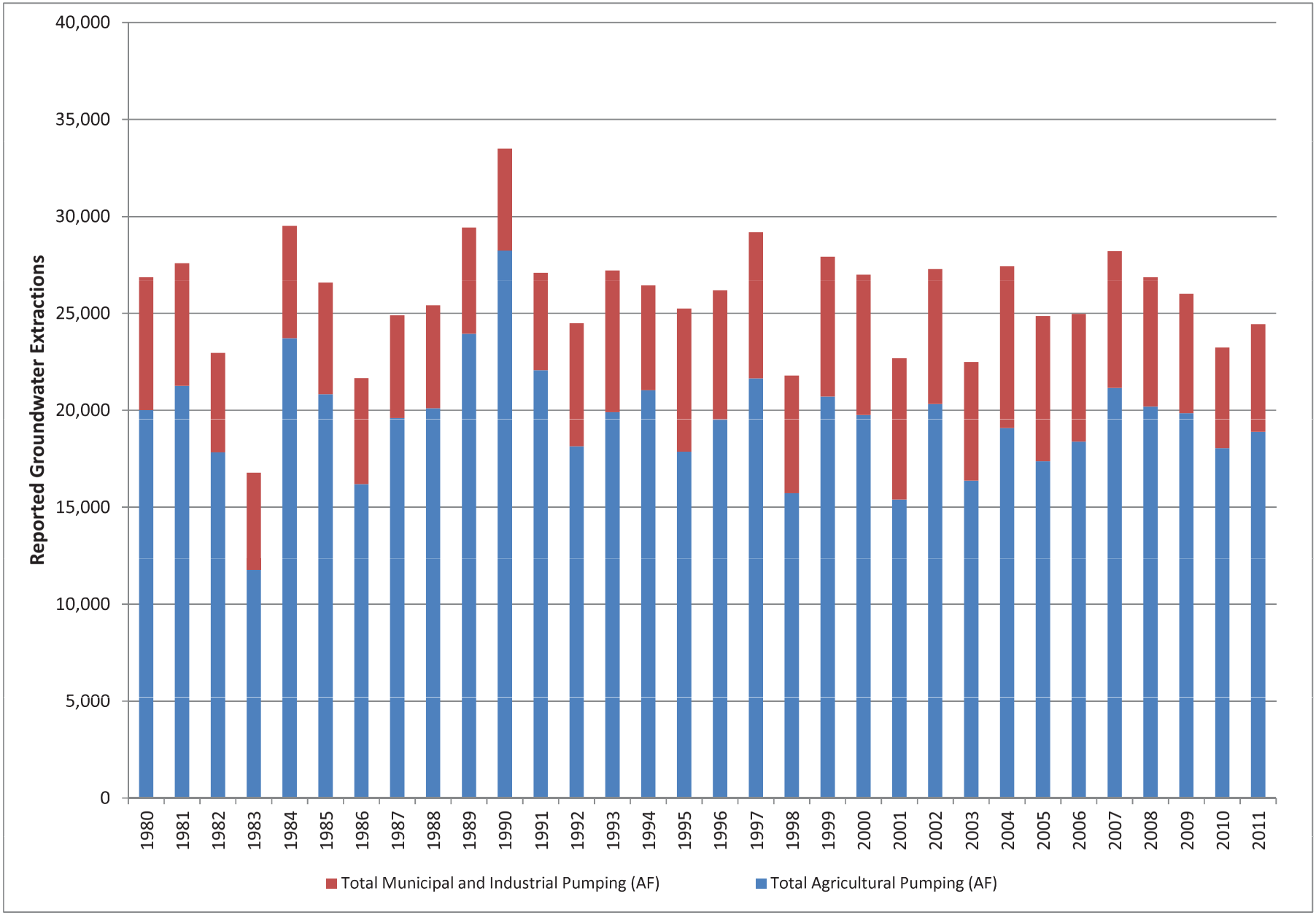


Figure 4.3-13. Historical reported groundwater extractions for the Santa Paula Basin

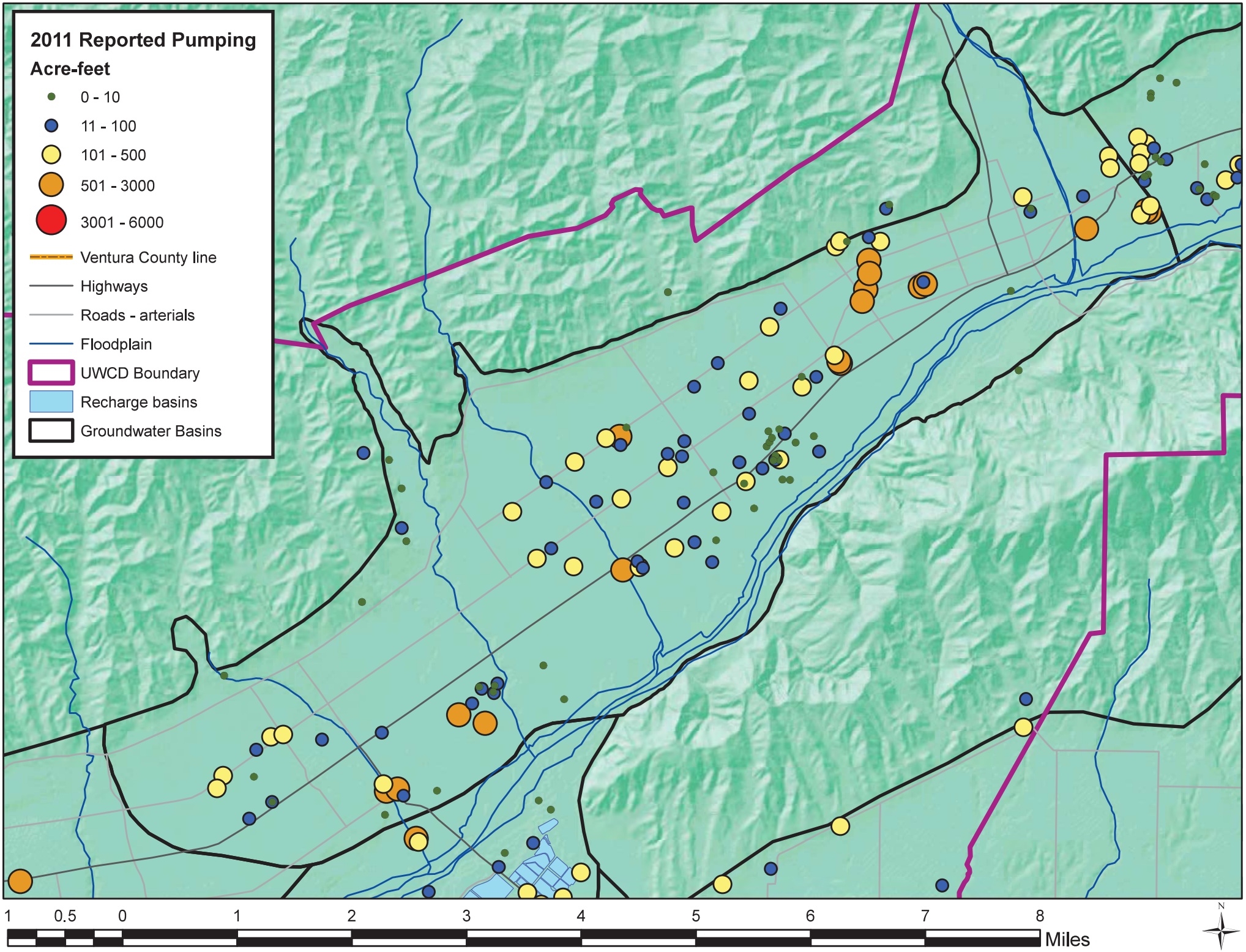


Figure 4.3-14. Reported Santa Paula Basin pumping for 2011

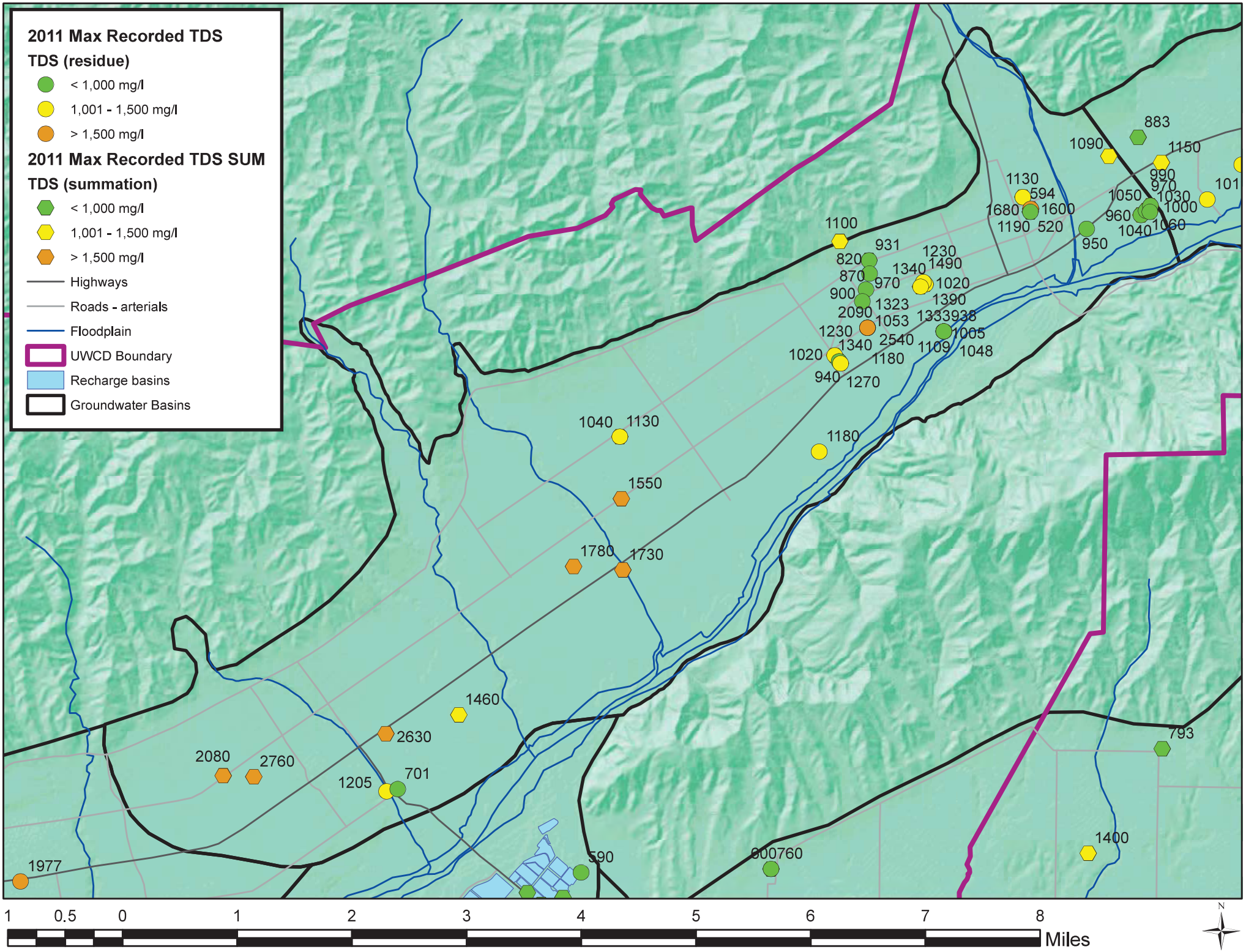


Figure 4.3-15. Maximum recorded TDS in Santa Paula Basin wells, 2011

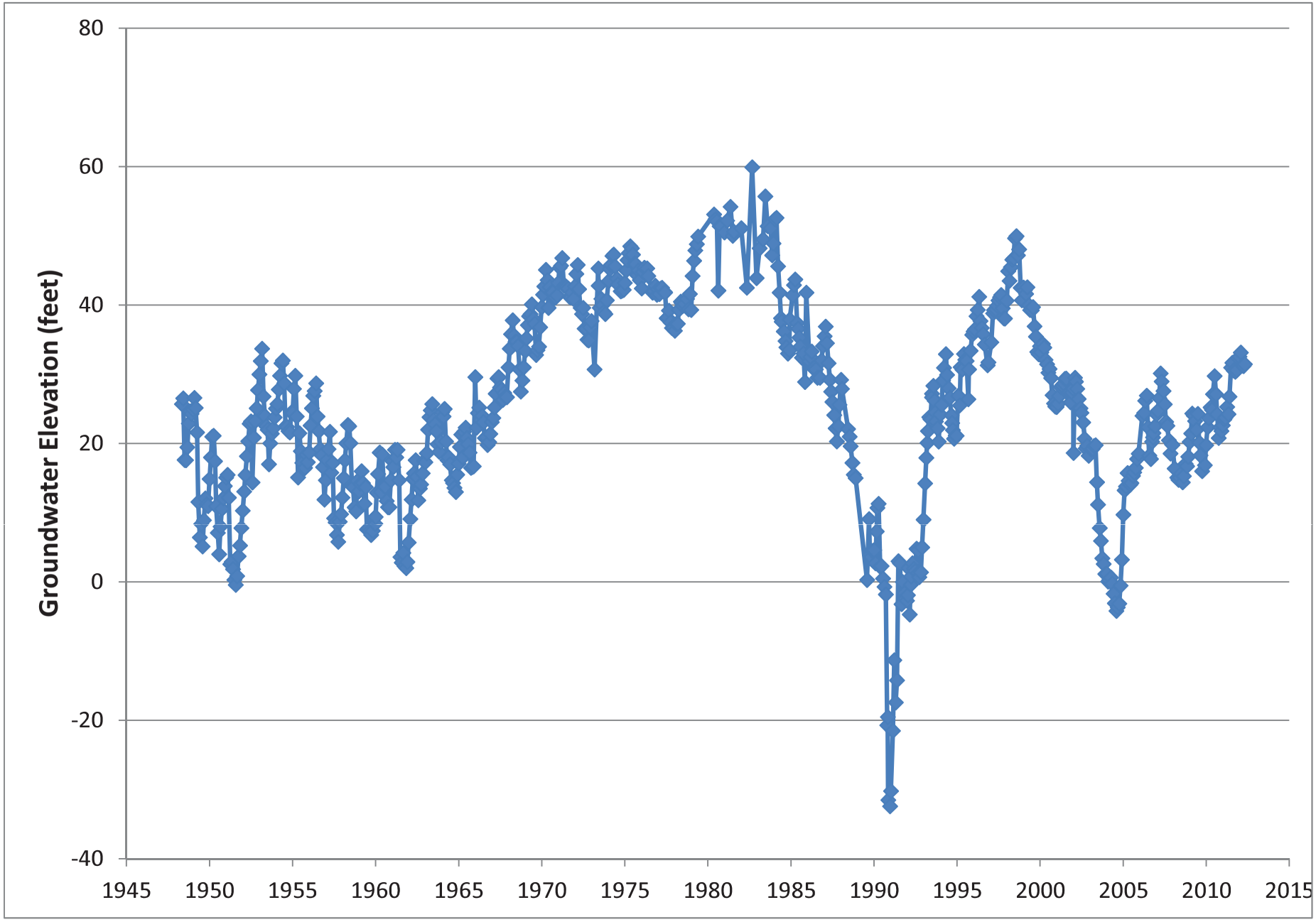


Figure 4.3-16. Historical groundwater elevations in Mound Basin key well

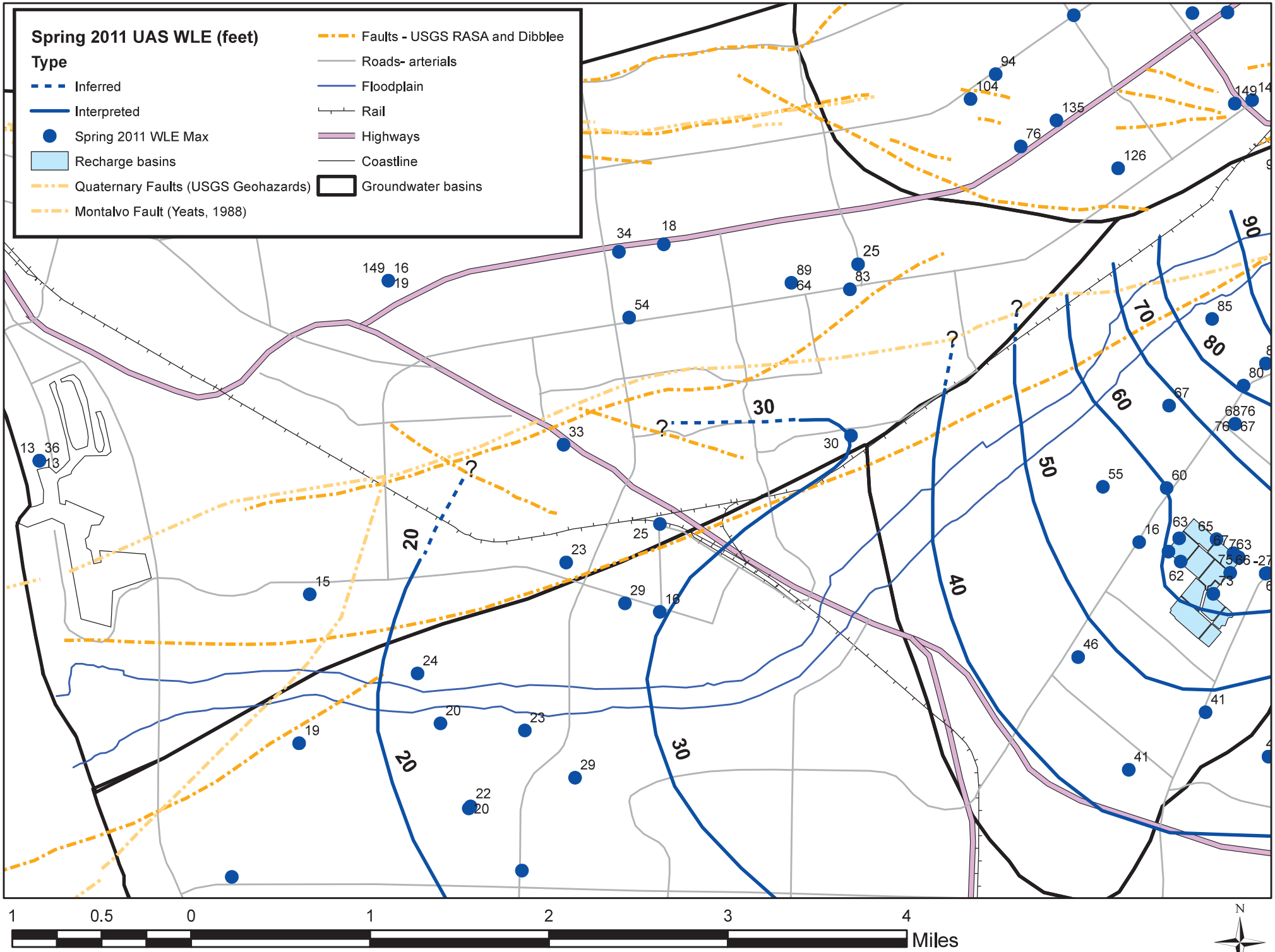


Figure 4.3-17. Mound Basin groundwater elevations for spring 2011

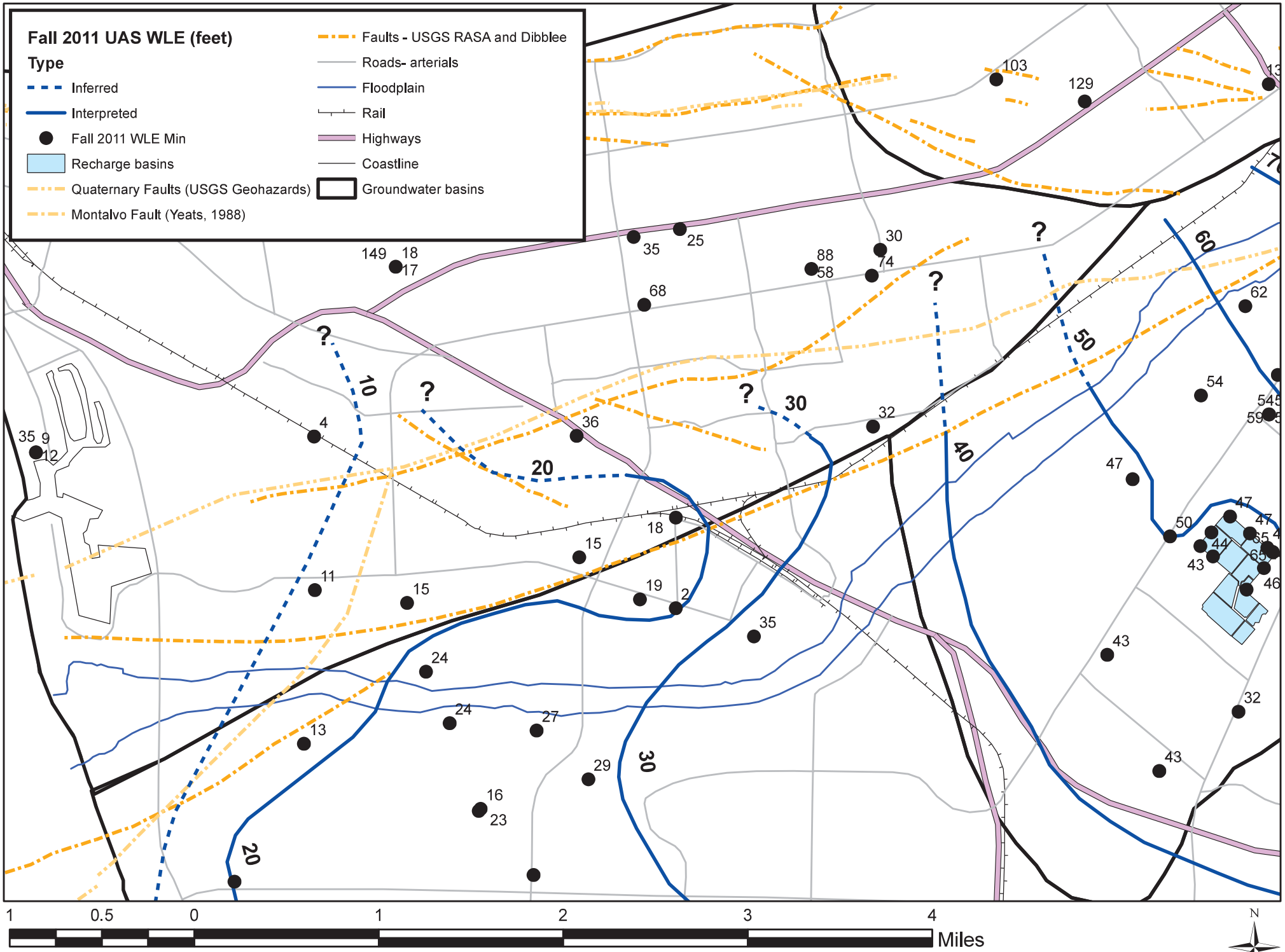


Figure 4.3-18. Mound Basin groundwater elevations for fall 2011

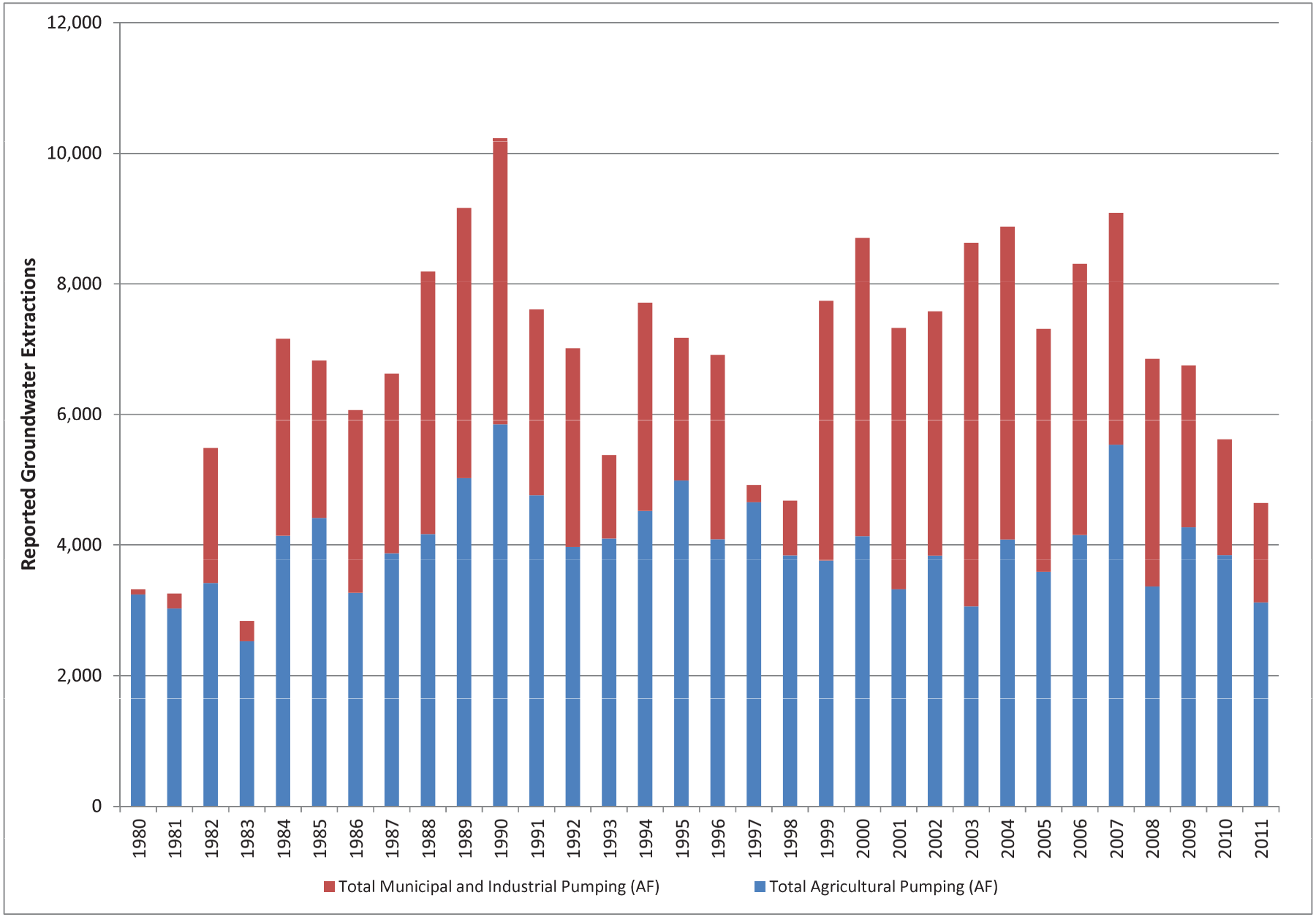


Figure 4.3-19. Historical reported groundwater extractions for the Mound Basin

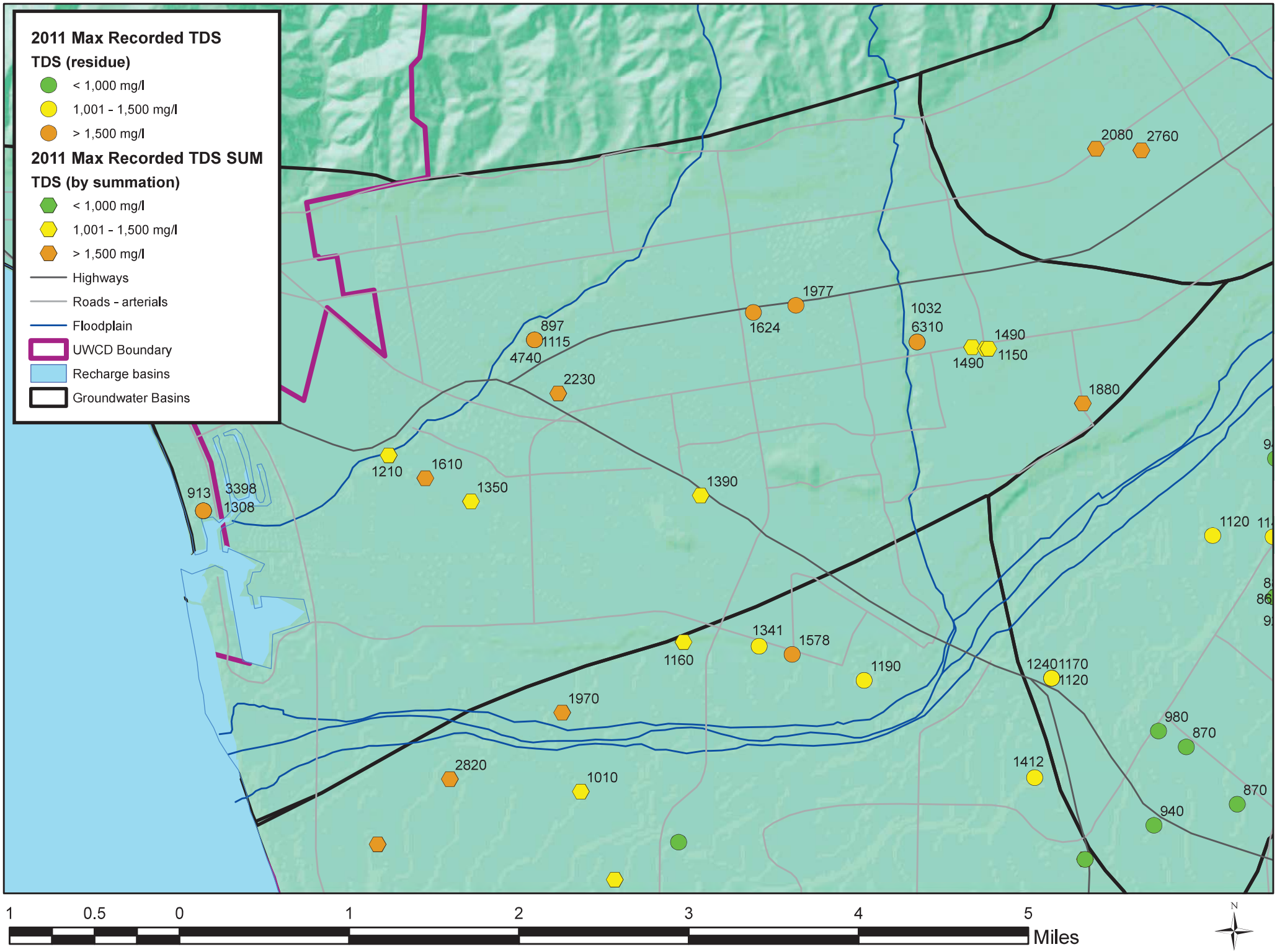


Figure 4.3-20. Maximum recorded TDS in Mound Basin wells, 2011

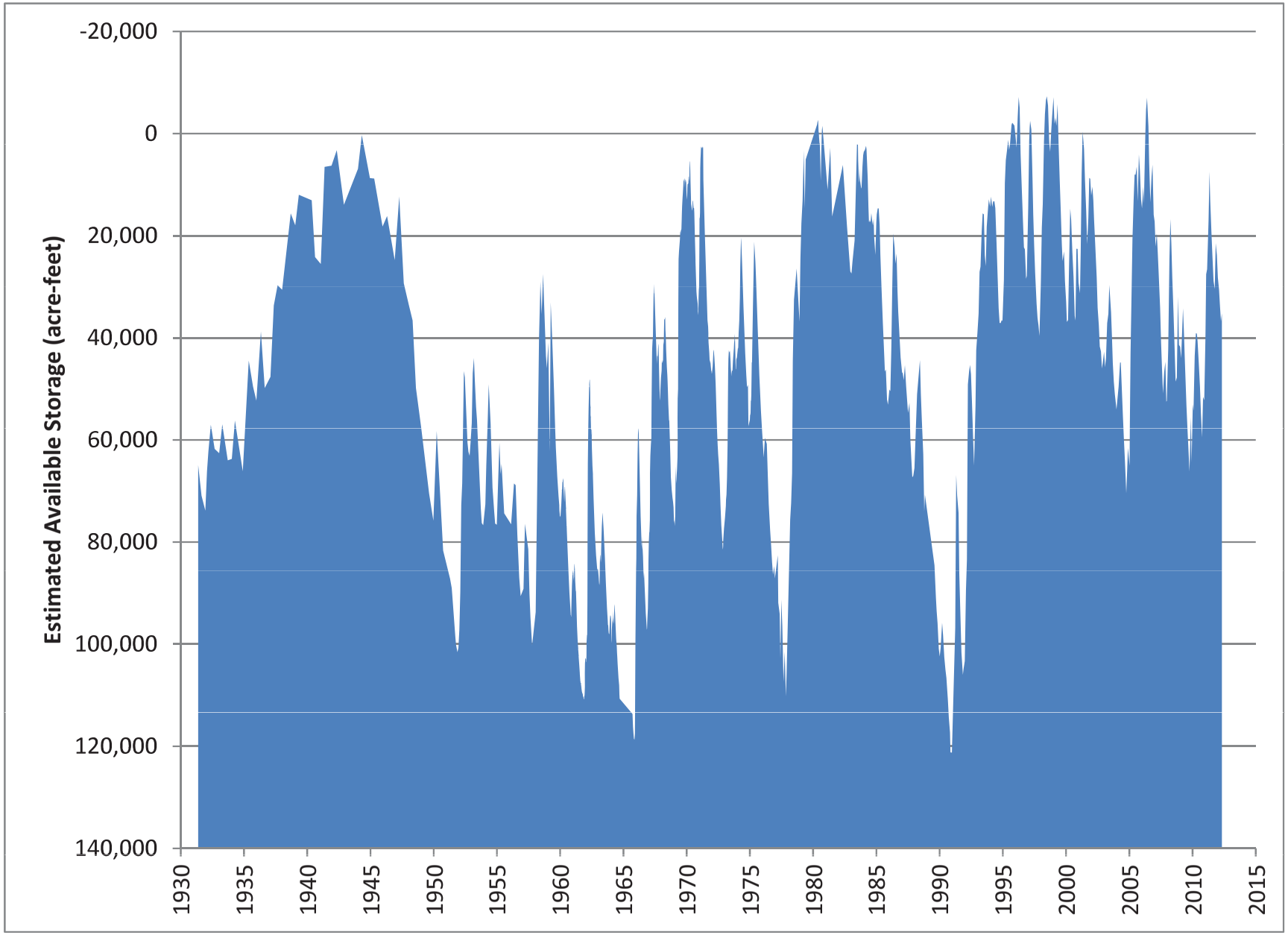


Figure 4.3-21. Historical estimates of available groundwater storage, Oxnard Forebay Basin

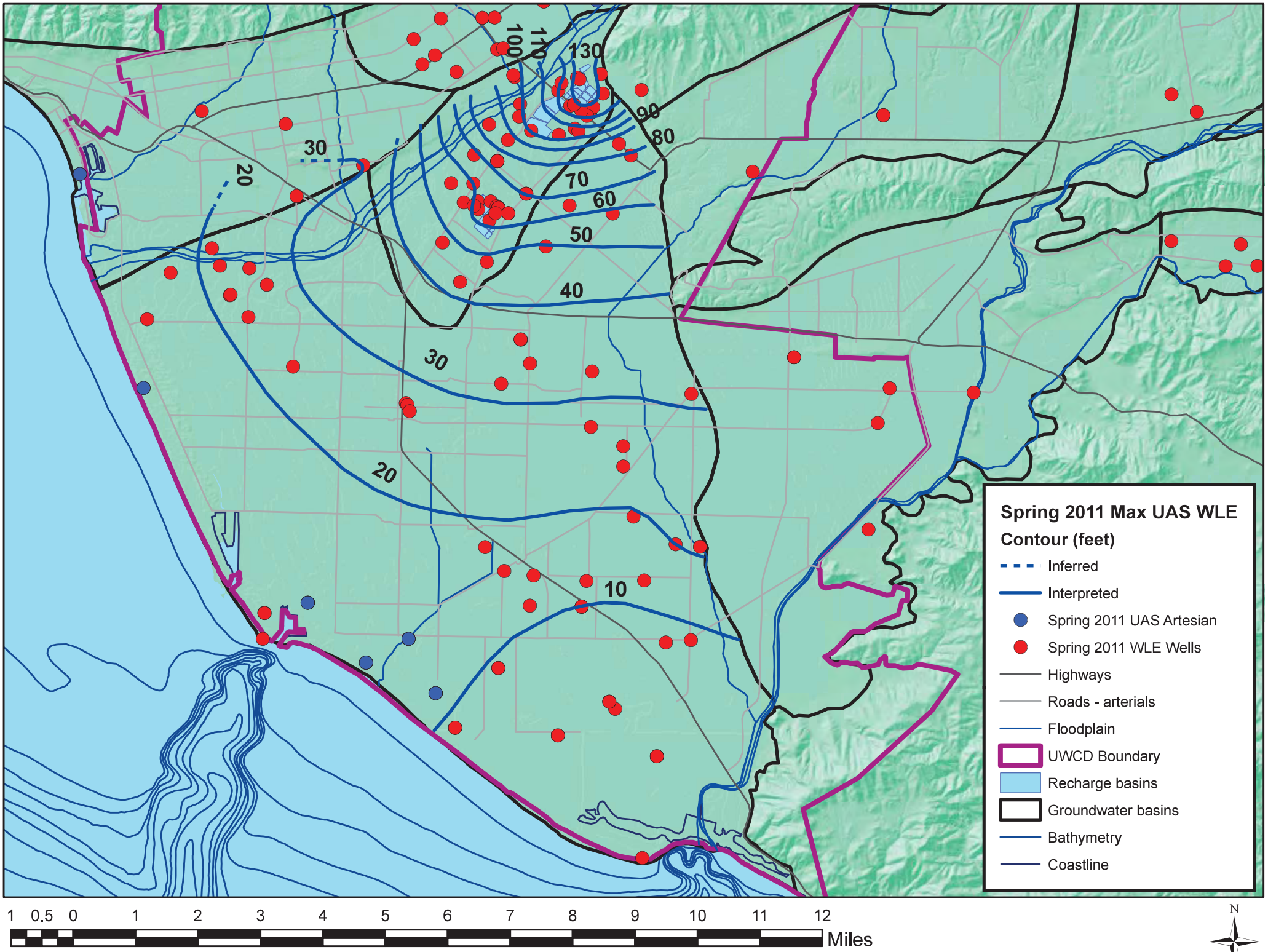


Figure 4.3-22. Oxnard Forebay-Oxnard Plain Upper Aquifer System (UAS) groundwater elevations for spring 2011

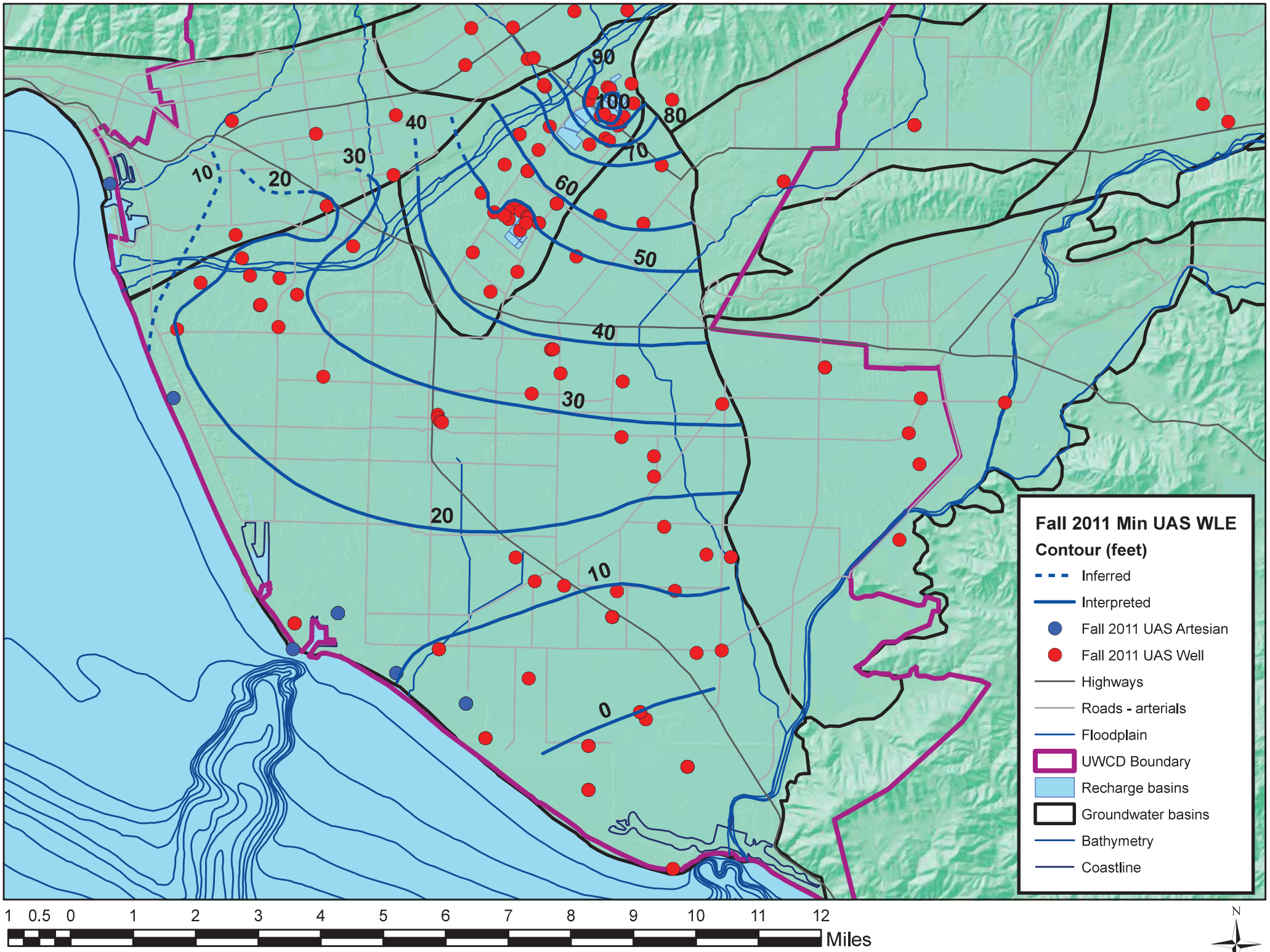
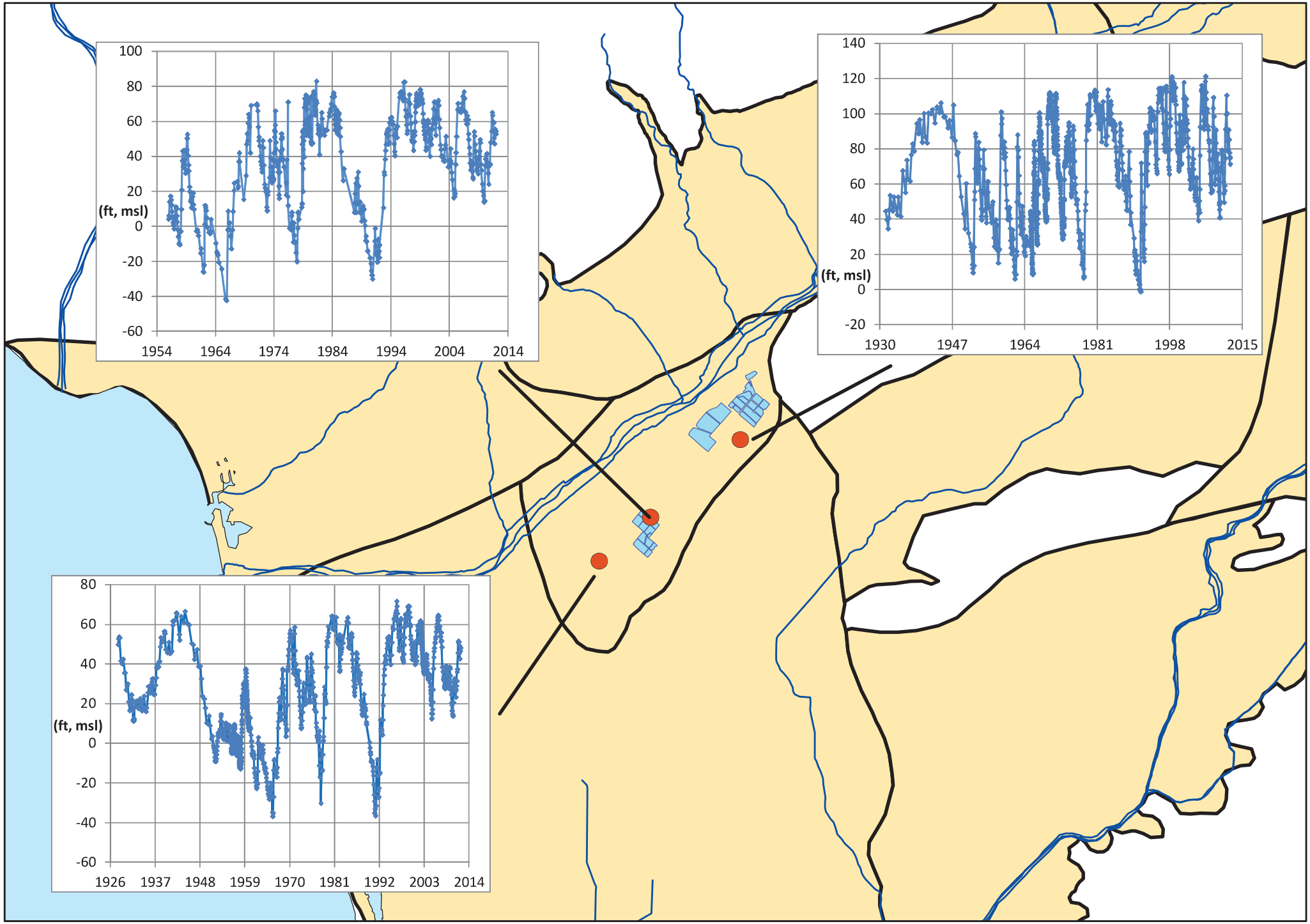


Figure 4.3-23. Oxnard Forebay-Oxnard Plain Upper Aquifer System (UAS) groundwater elevations for fall 2011



1 0.5 0 1 2 3 4 5 6 7 8 9 10 Miles

N W E S

Figure 4.3-24. Oxnard Forebay Upper Aquifer System (UAS) groundwater elevation hydrographs, selected wells

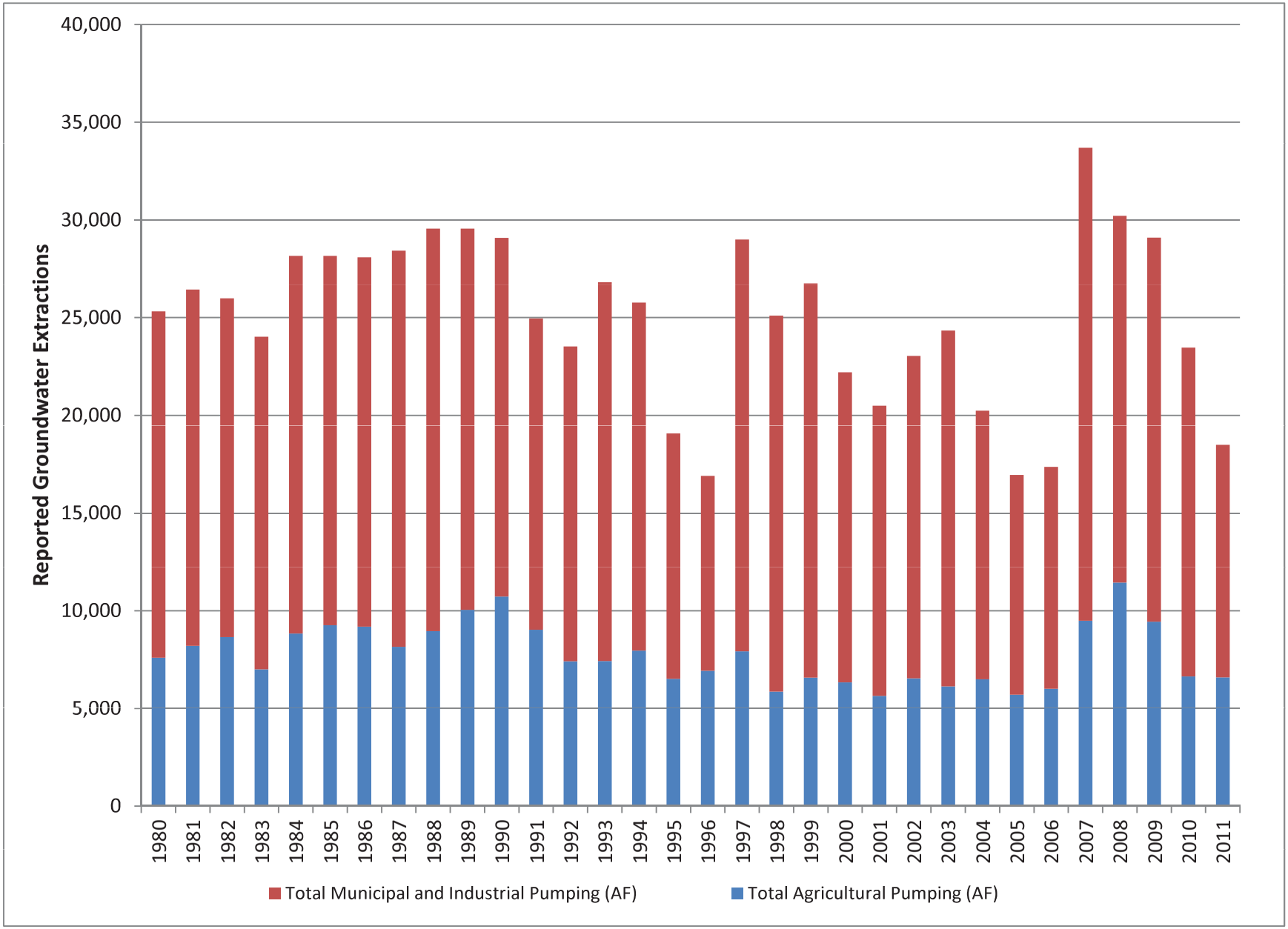


Figure 4.3-25. Historical reported groundwater extractions for the Oxnard Forebay

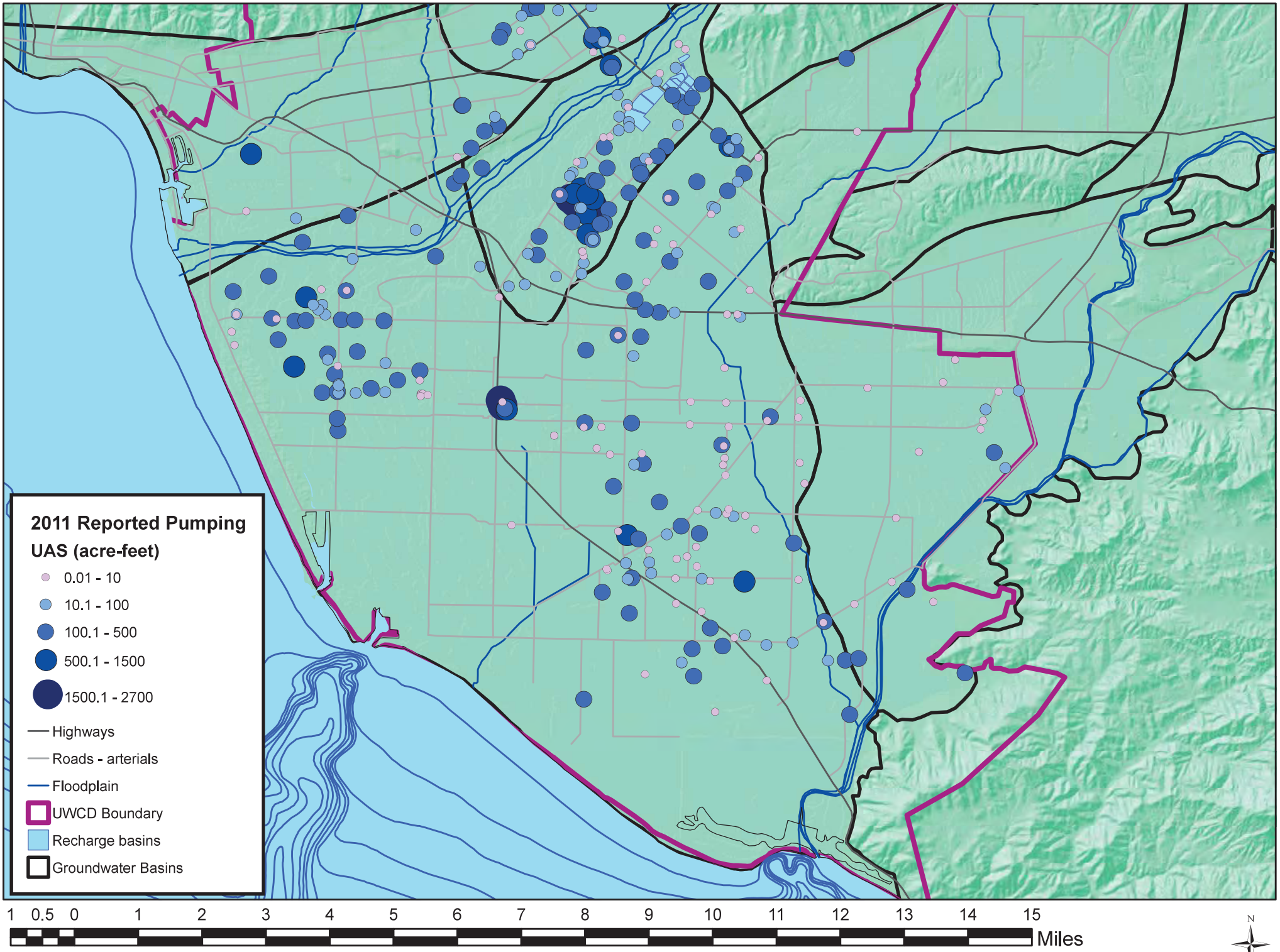


Figure 4.3-26. Reported Oxnard Forebay- Oxnard Plain Reported Upper Aquifer System (UAS) Pumping for 2011

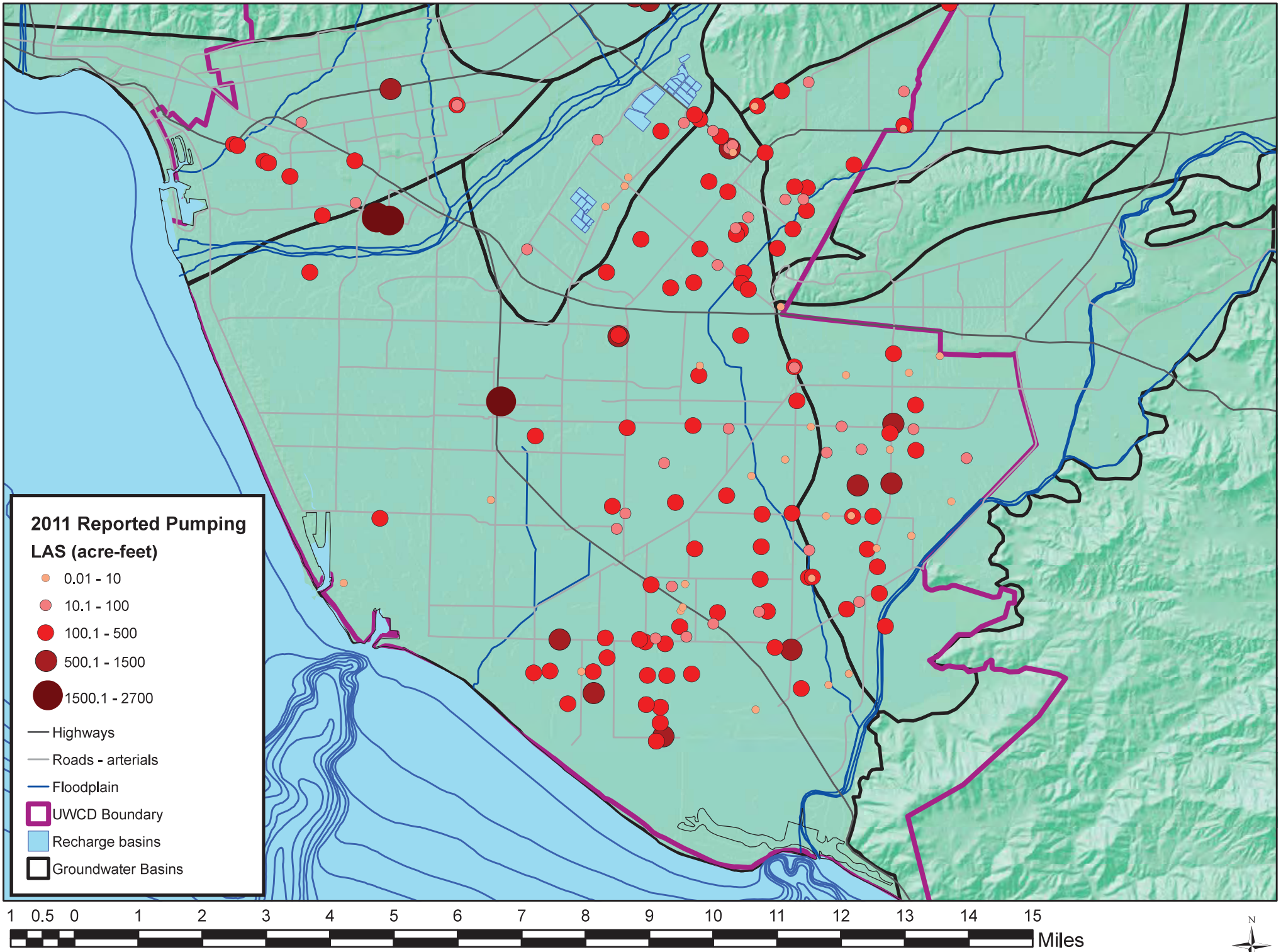


Figure 4.3-27. Reported Oxnard Forebay-Oxnard Plain Lower Aquifer System (LAS) Pumping for 2011

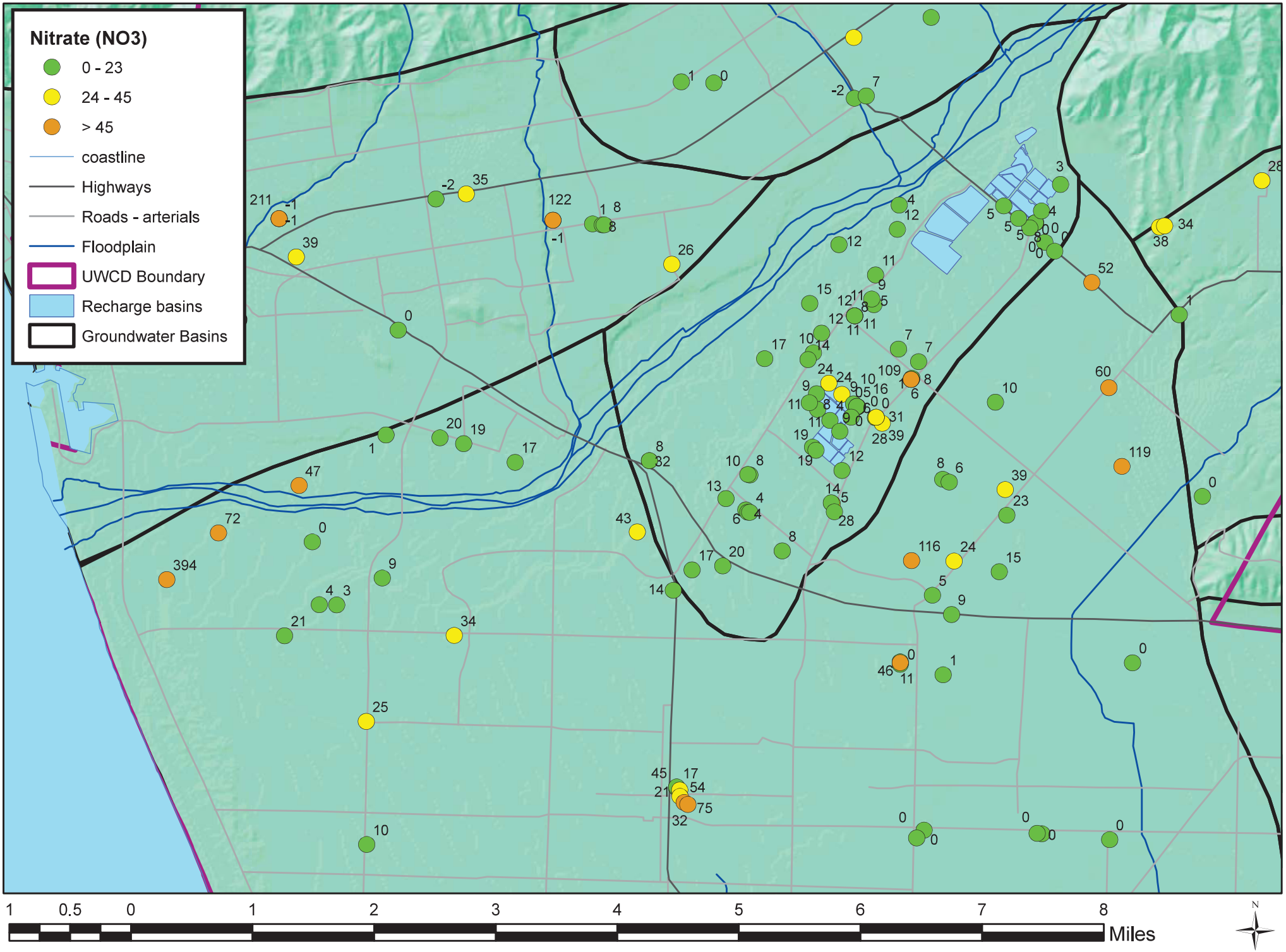


Figure 4.3-28. Maximum recorded nitrate (NO3) in Oxnard Forebay-Oxnard Plain wells, 2011

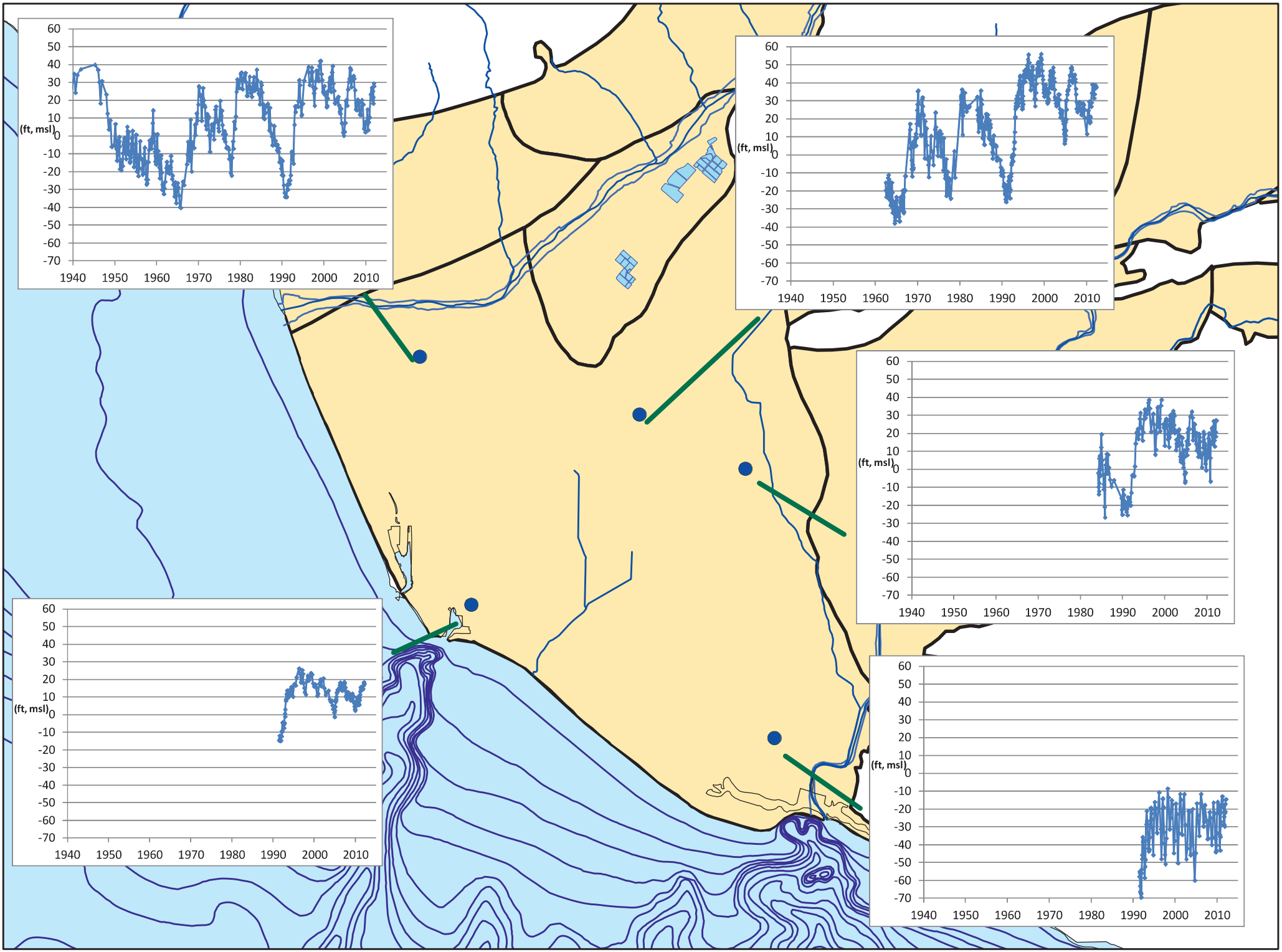


Figure 4.3-29. Oxnard Plain Upper Aquifer System (UAS) groundwater elevation hydrographs, selected wells

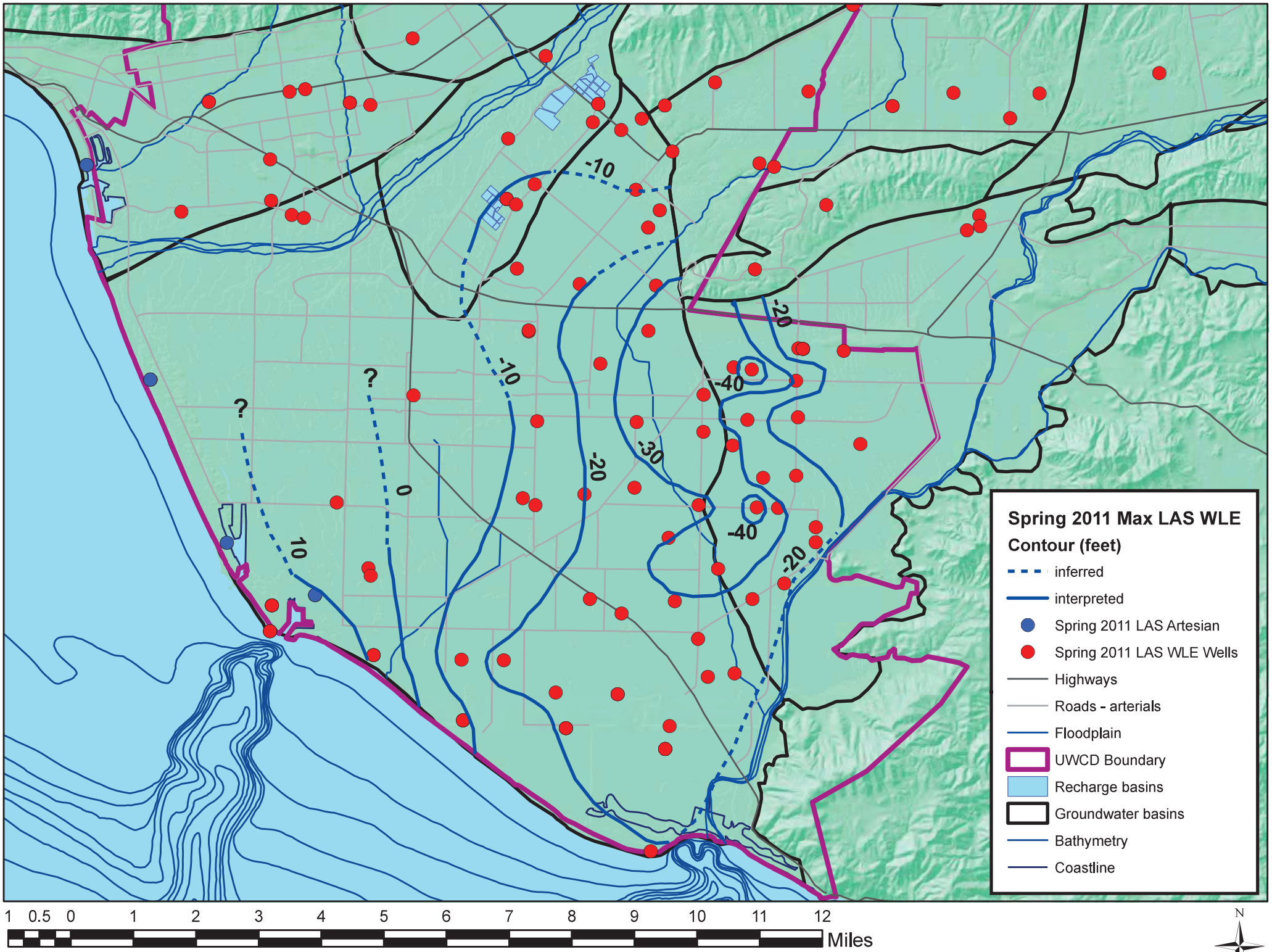


Figure 4.3-30. Oxnard Forebay-Oxnard Plain Lower Aquifer System (LAS) groundwater elevations for spring 2011

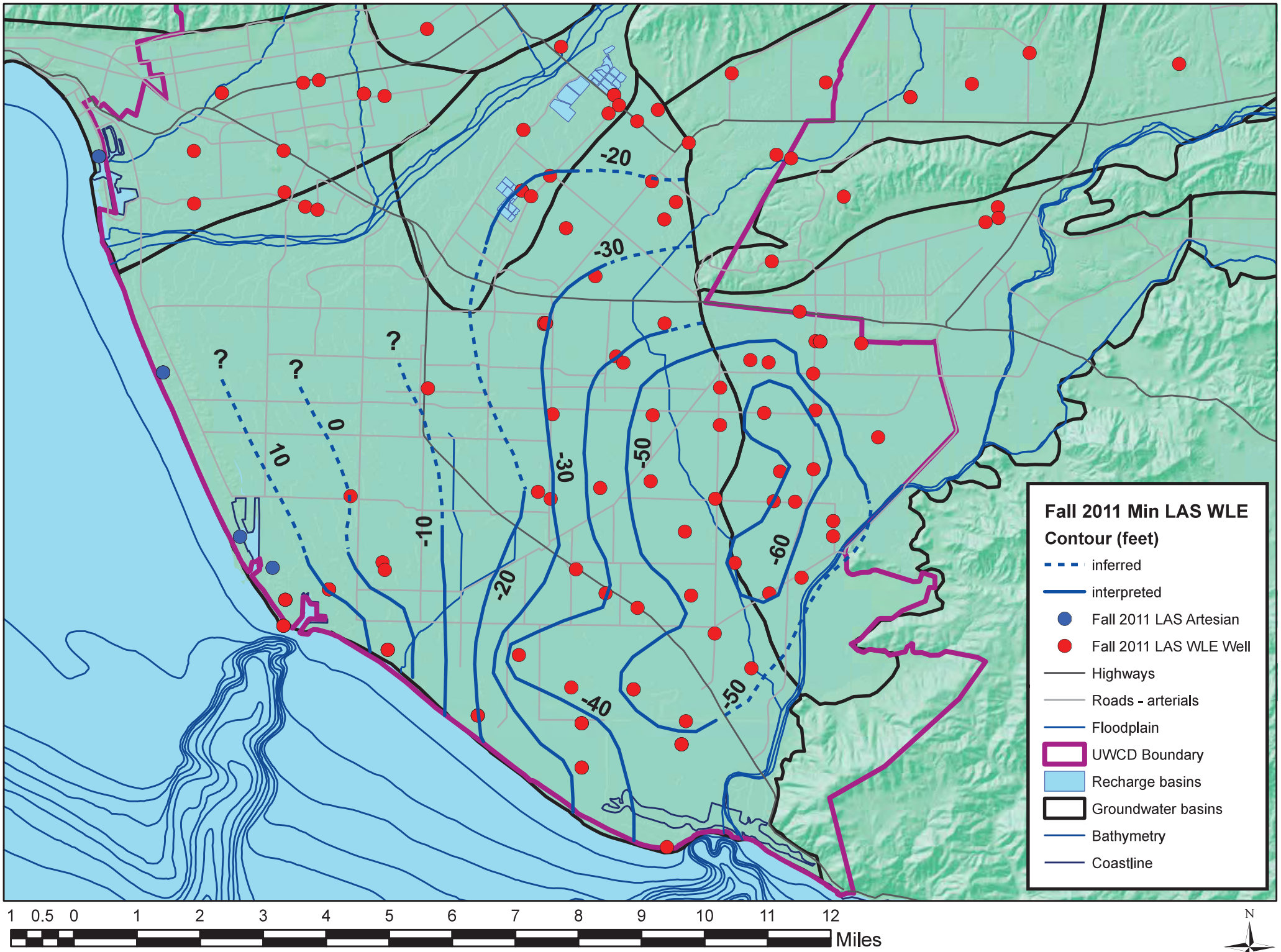


Figure 4.3-31. Oxnard Forebay-Oxnard Plain Lower Aquifer System (LAS) groundwater elevations for fall 2011

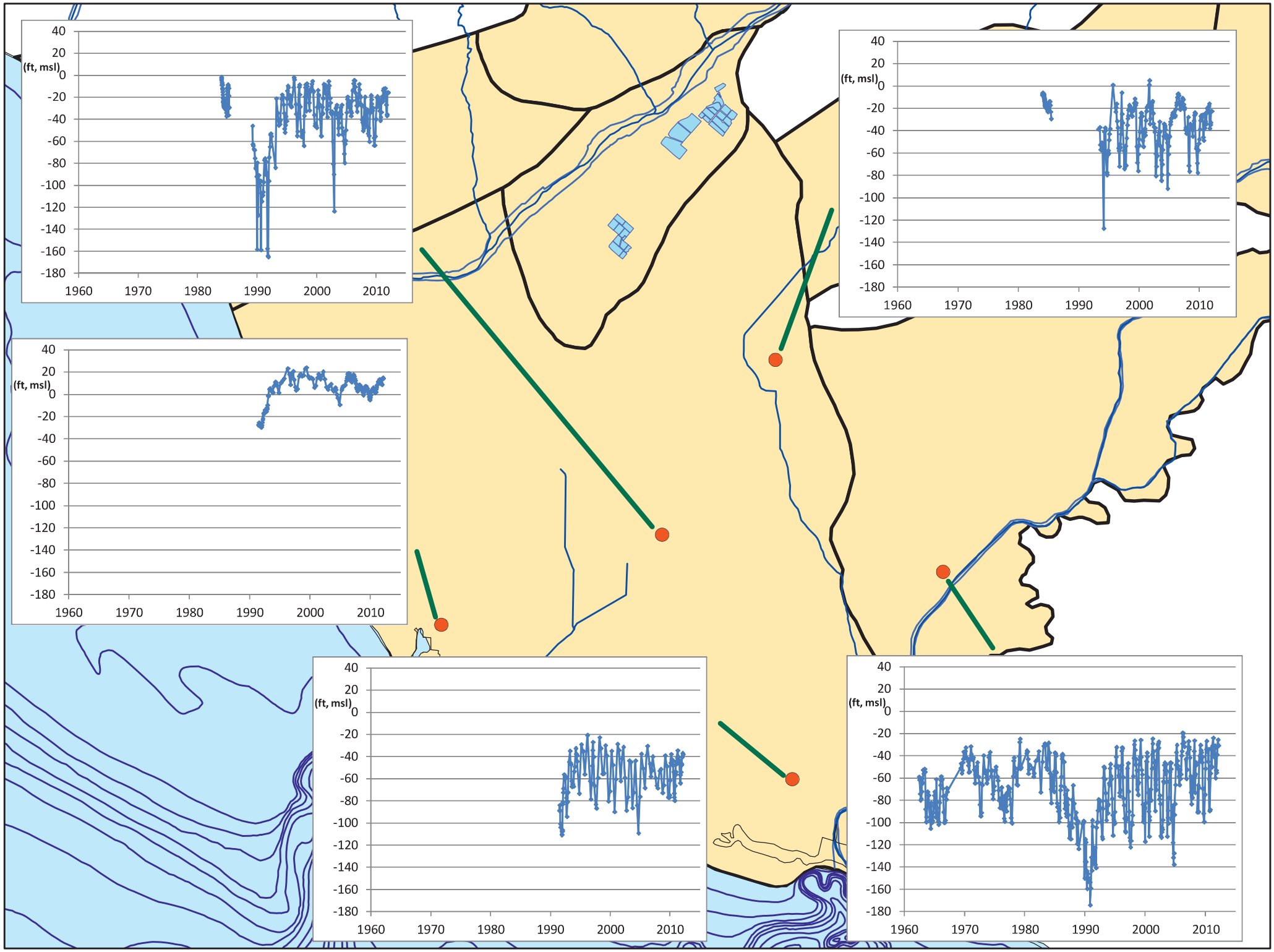


Figure 4.3-32. Oxnard Plain Lower Aquifer System (LAS) groundwater elevation hydrographs, selected wells

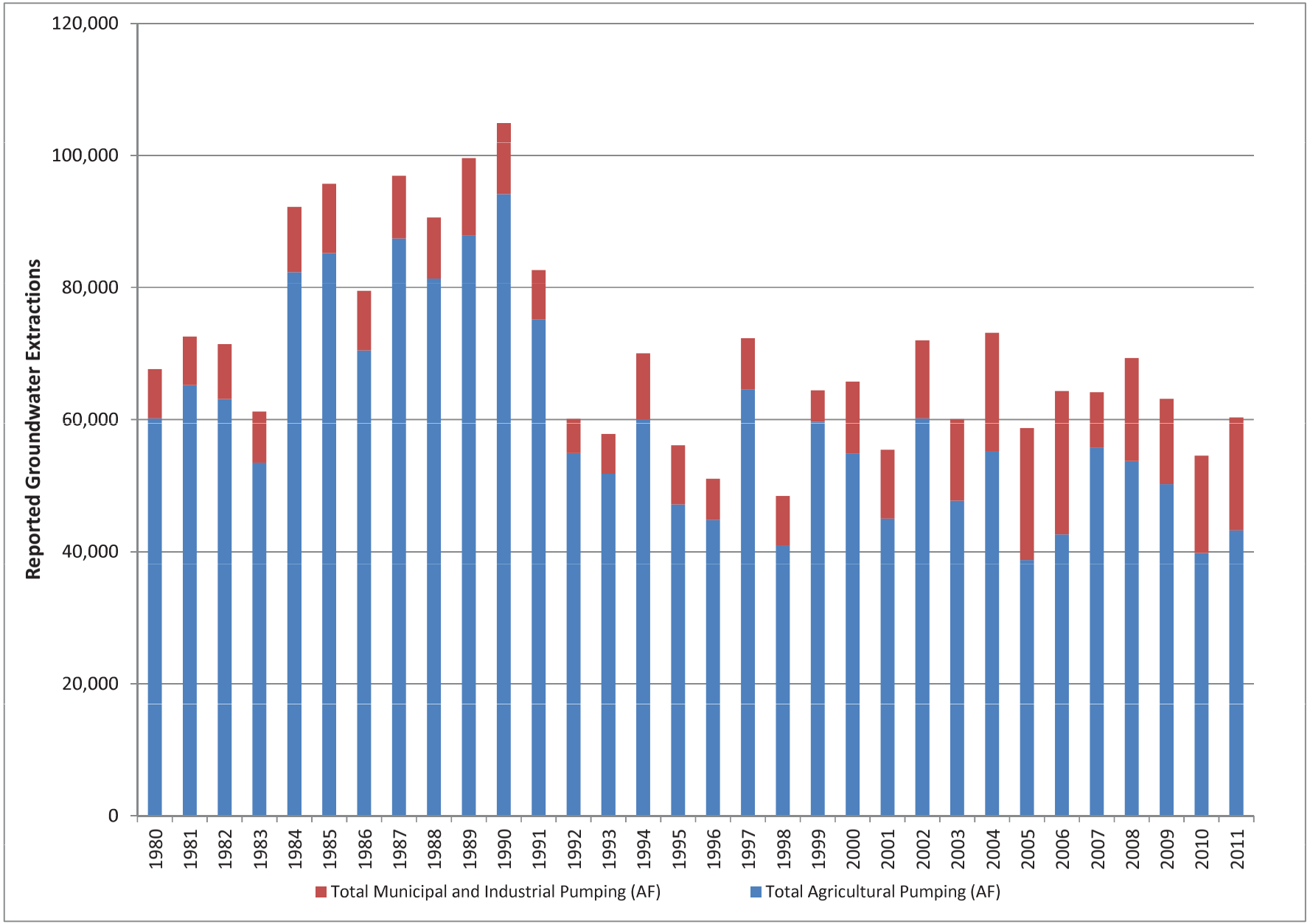


Figure 4.3-33. Historical reported groundwater extractions for the Oxnard Plain and portions of Pleasant Valley and the West Las Posas Basin

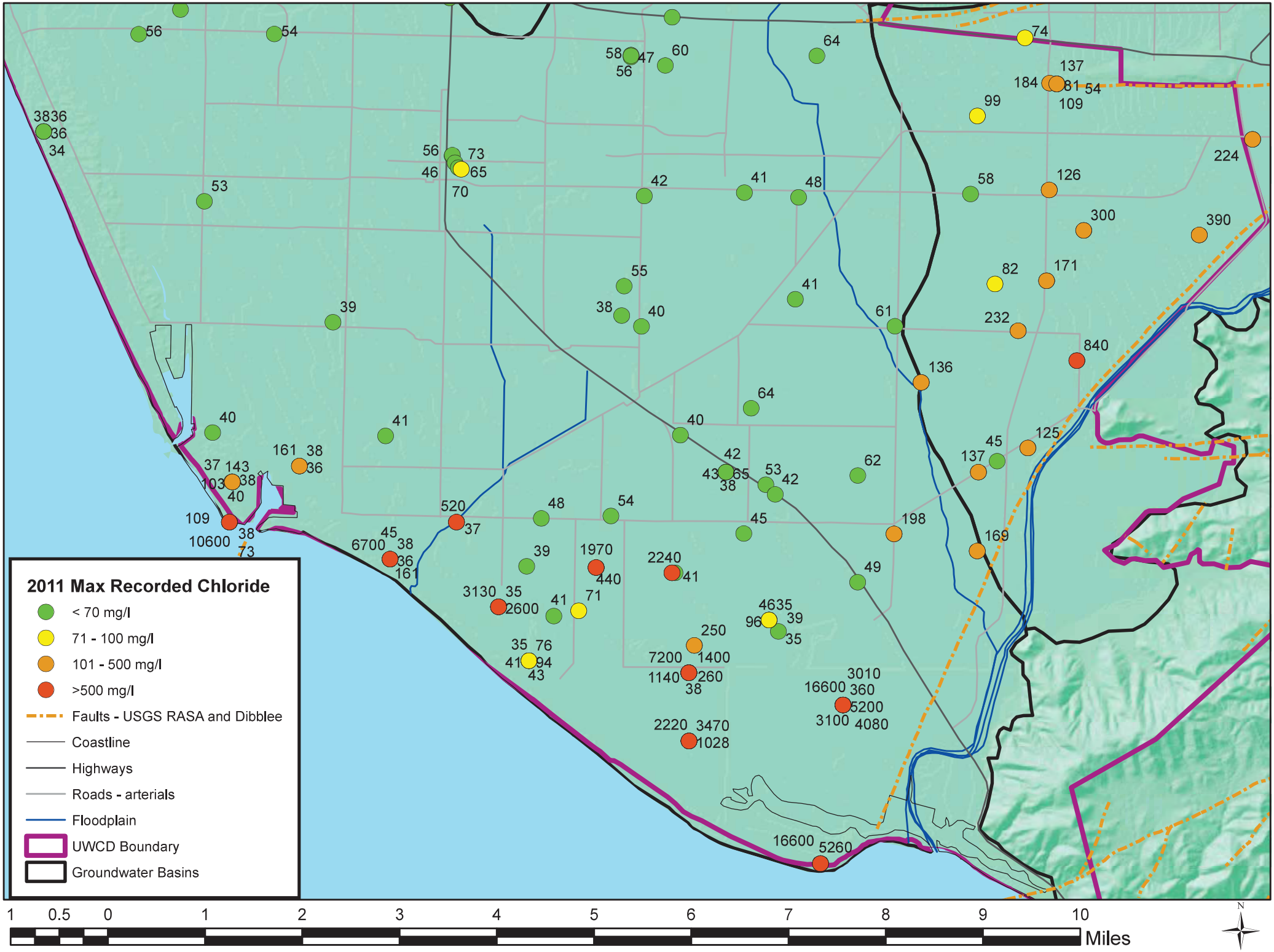


Figure 4.3-34. Maximum recorded chloride for Oxnard Plain and Pleasant Valley Basin wells, 2011

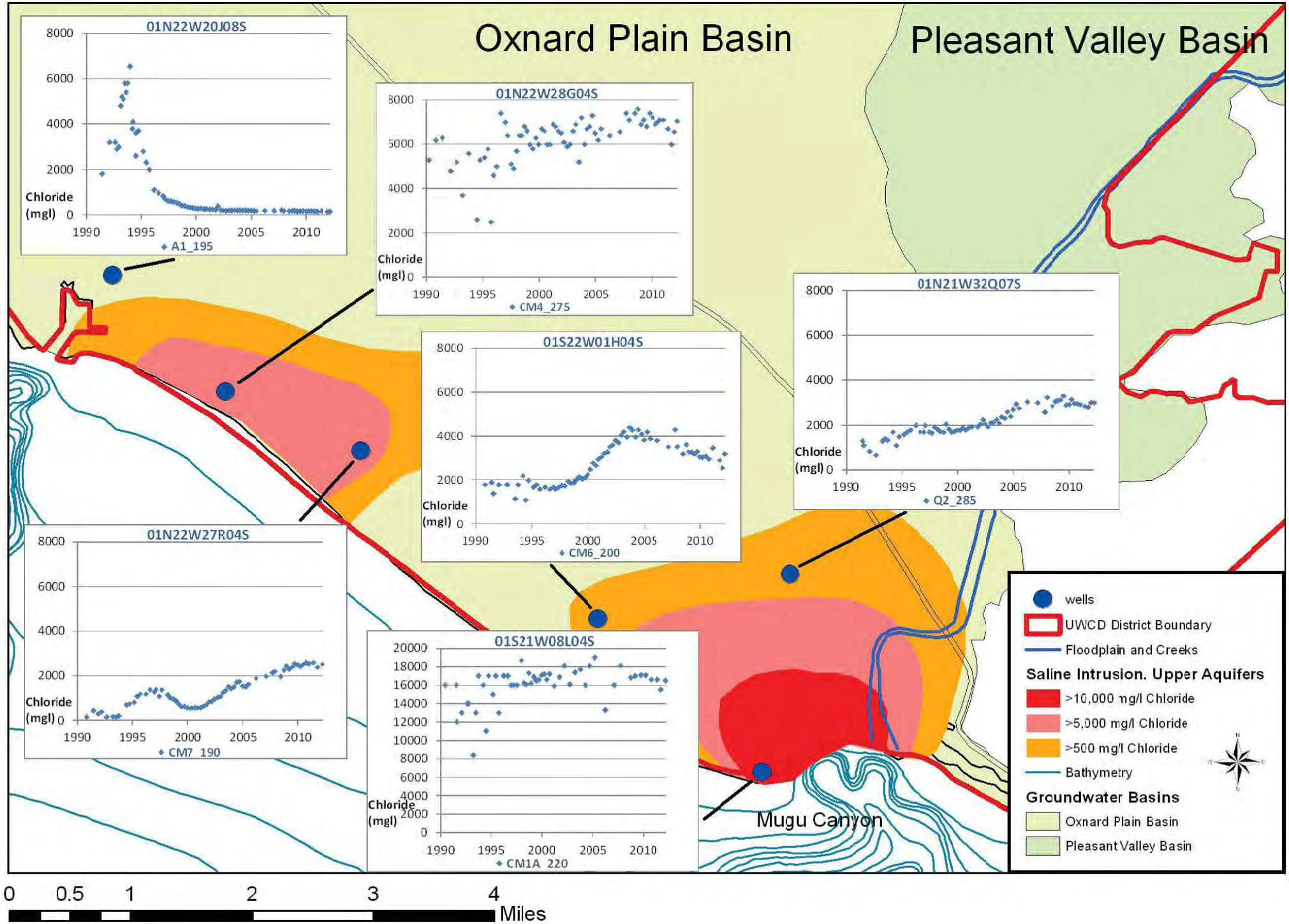


Figure 4.3-35. Chloride time series for selected Upper Aquifer System (UAS) wells, southern Oxnard Plain

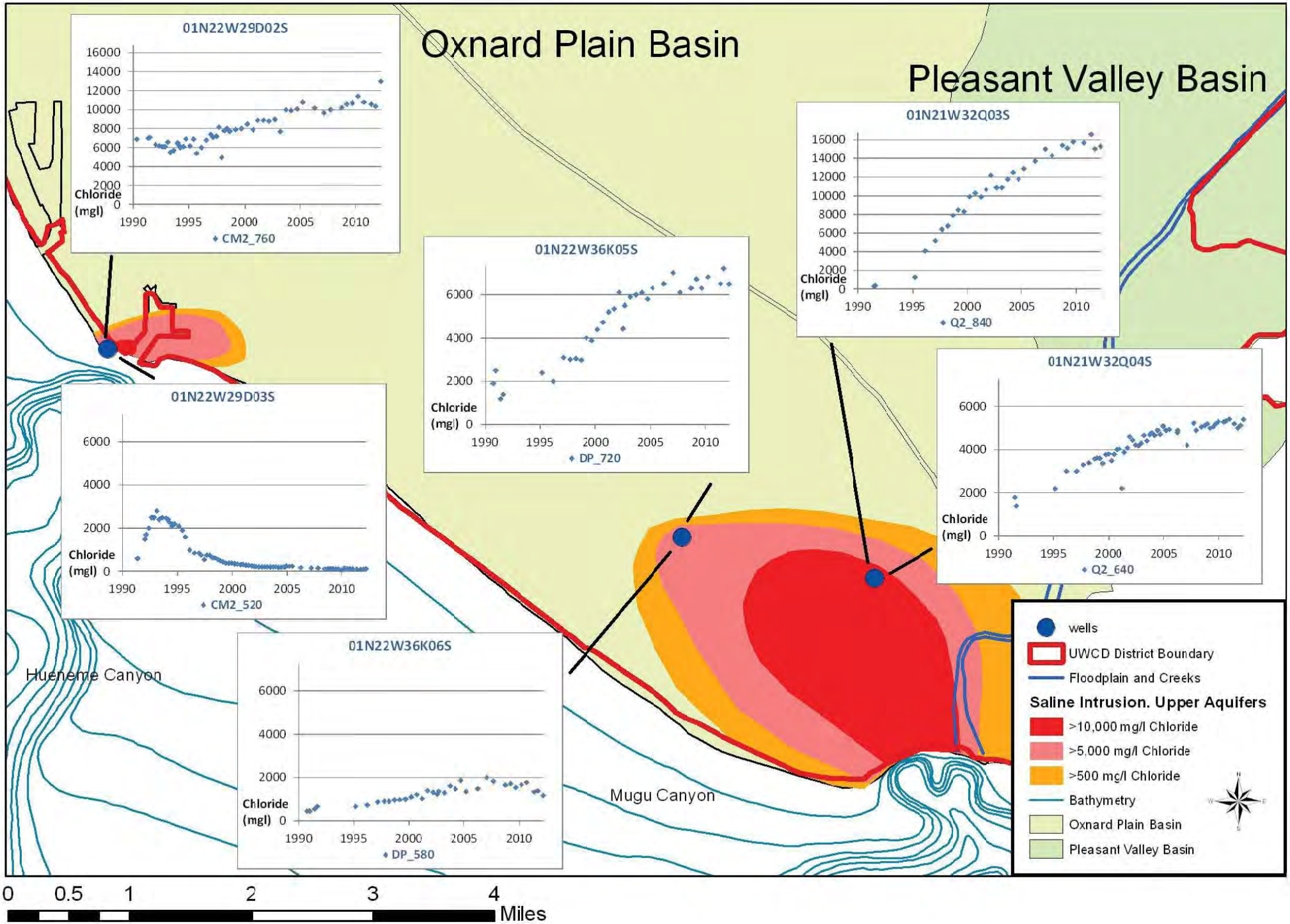


Figure 4.3-36. Chloride time series for selected Lower Aquifer System (LAS) wells, southern Oxnard Plain

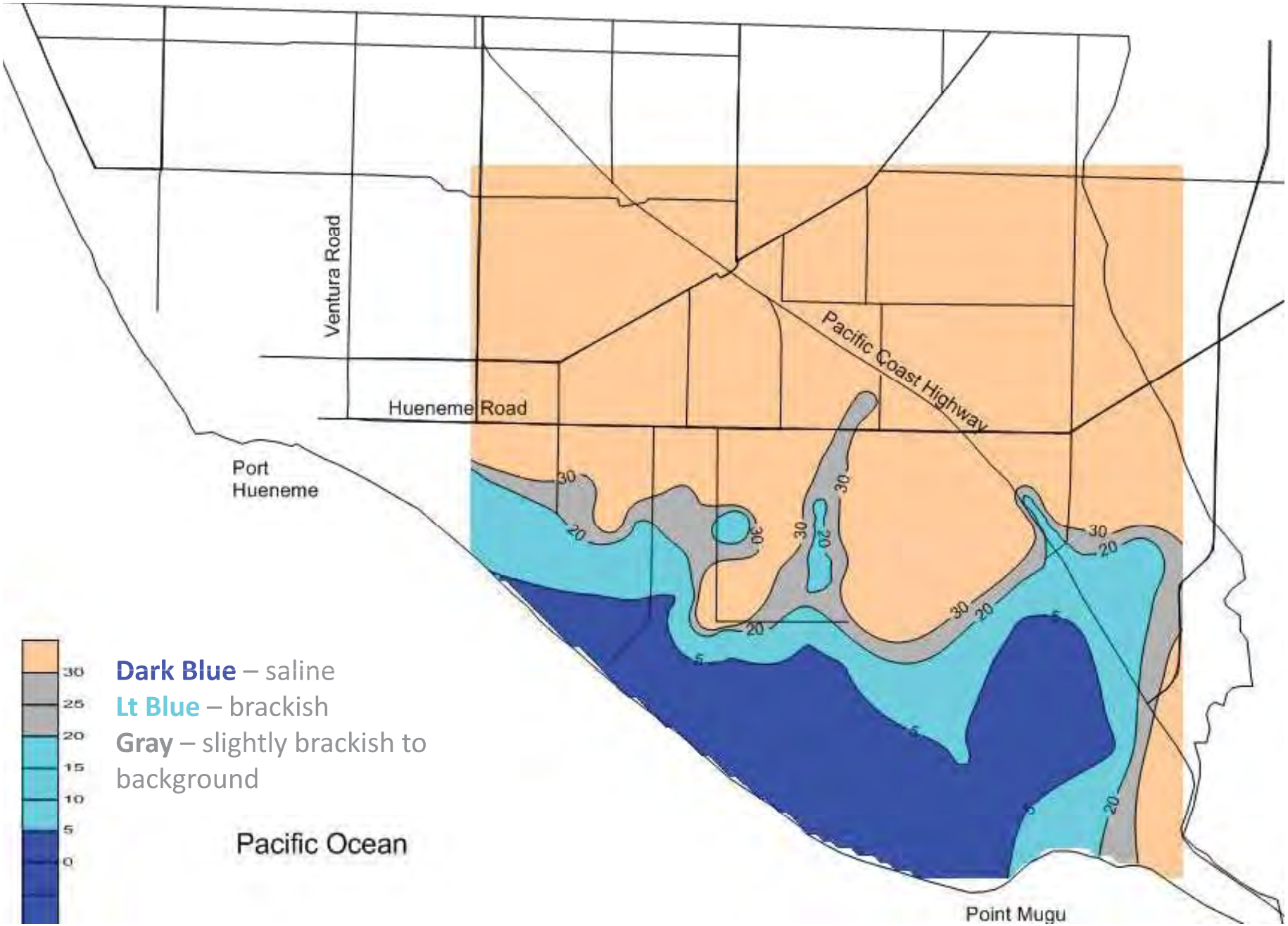


Figure 4.3-37. Geophysical survey (TDEM) of deep Upper Aquifer System (UAS) salinity, southern Oxnard Plain

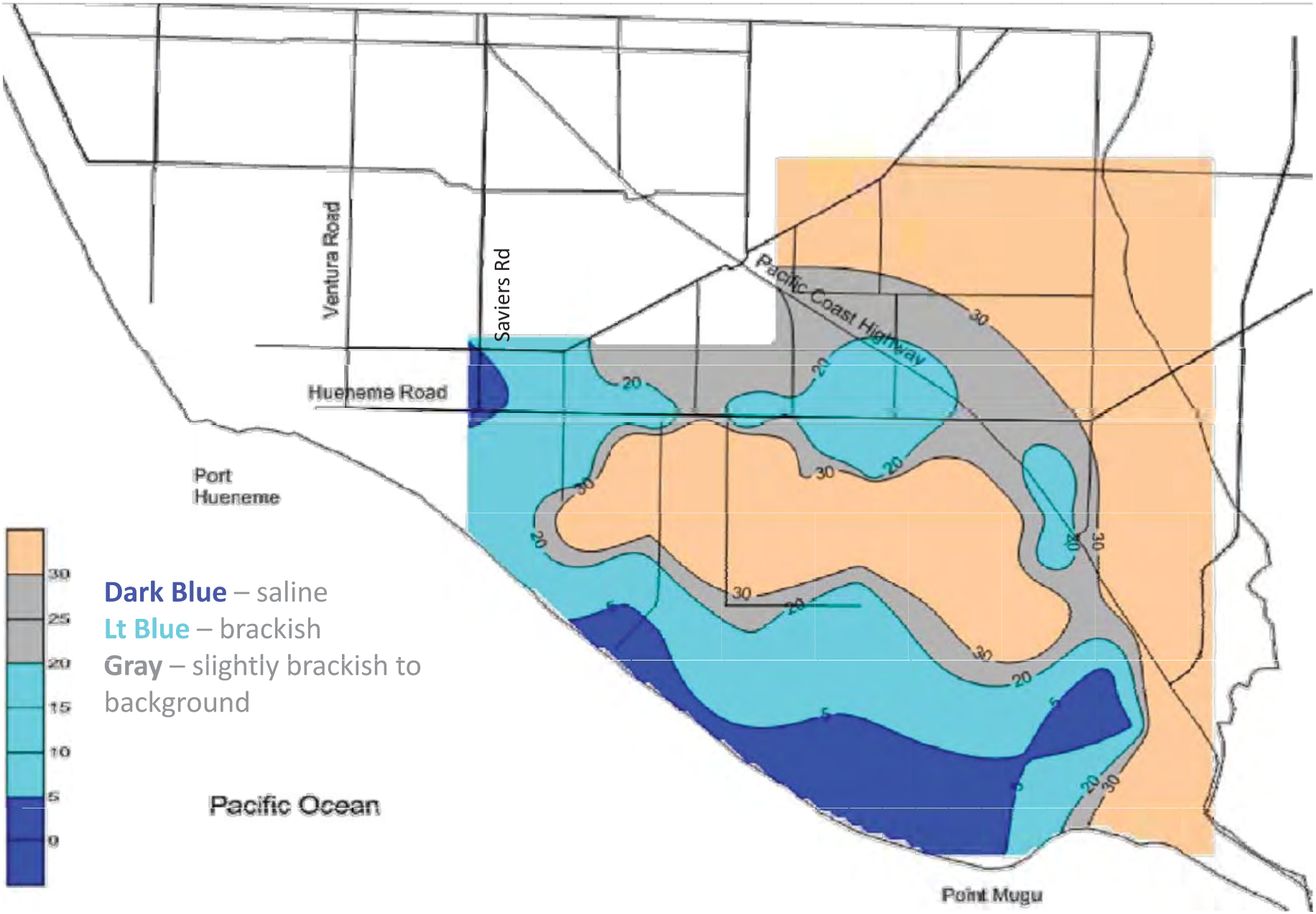


Figure 4.3-38. Geophysical survey (TDEM) of shallow Lower Aquifer System (LAS) salinity, southern Oxnard Plain

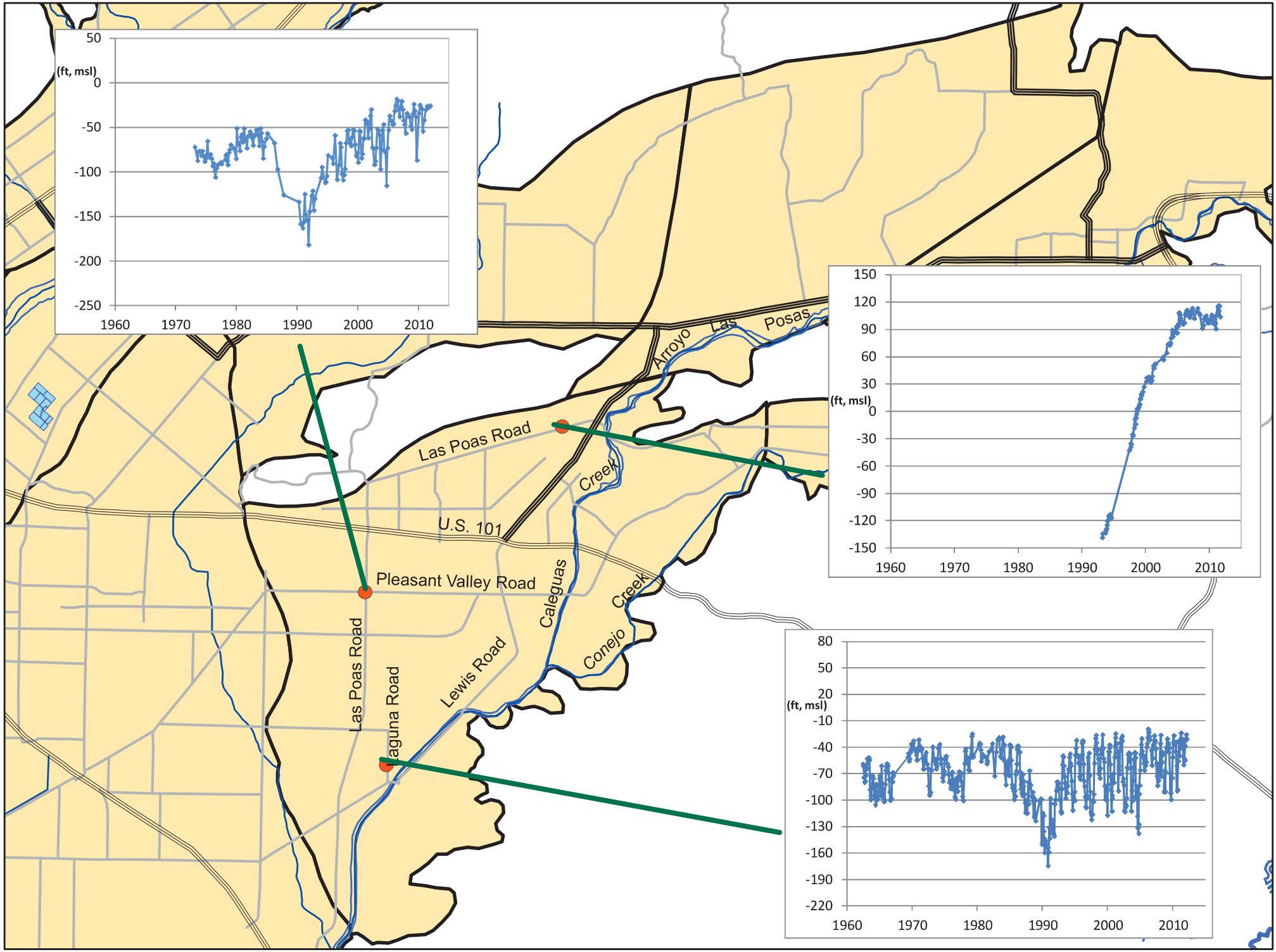


Figure 4.3-39. Pleasant Valley Basin Lower Aquifer System (LAS) groundwater elevation hydrographs, selected wells

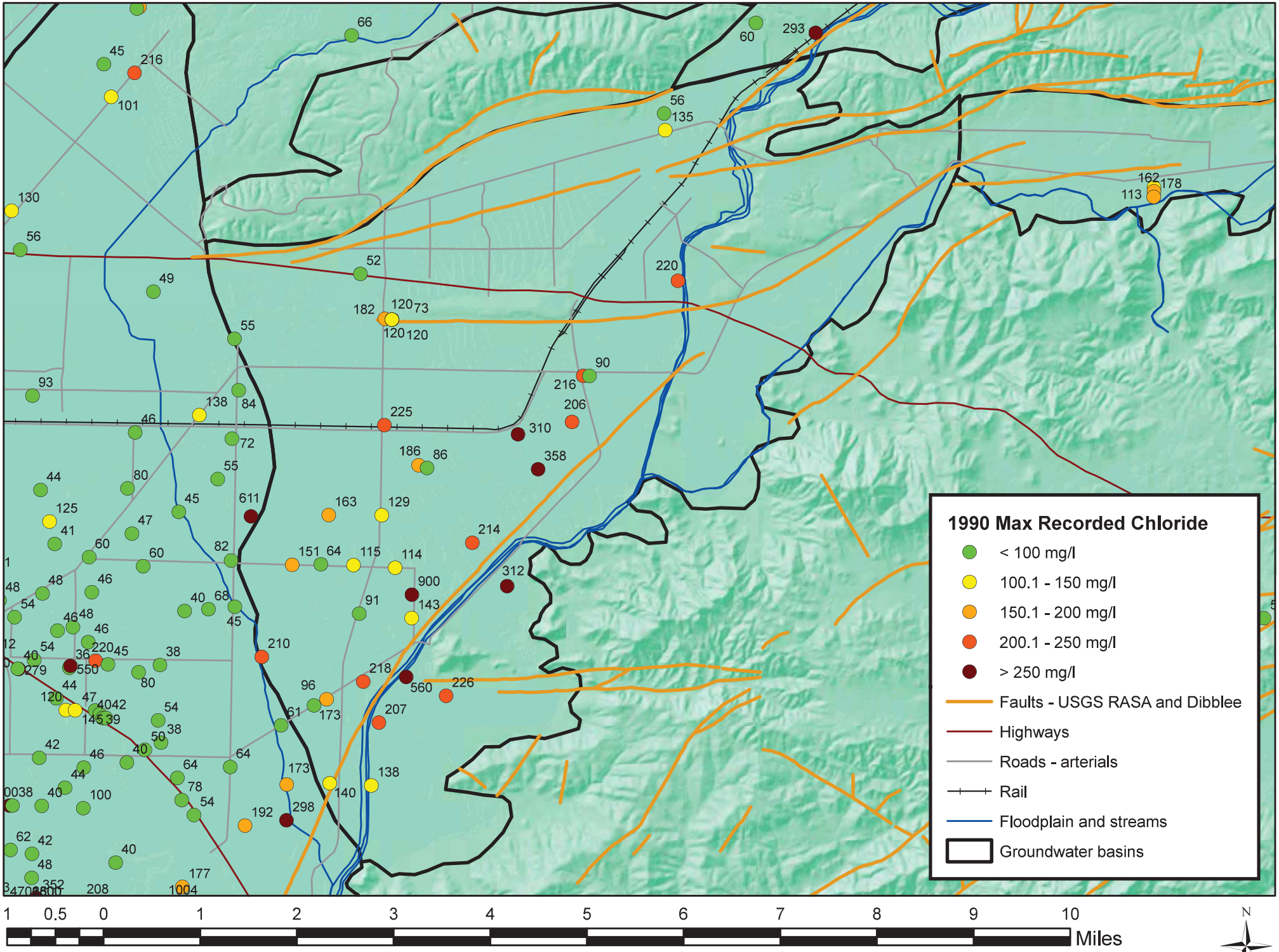


Figure 4.3-40. Maximum recorded chloride in Pleasant Valley Basin wells, 1990

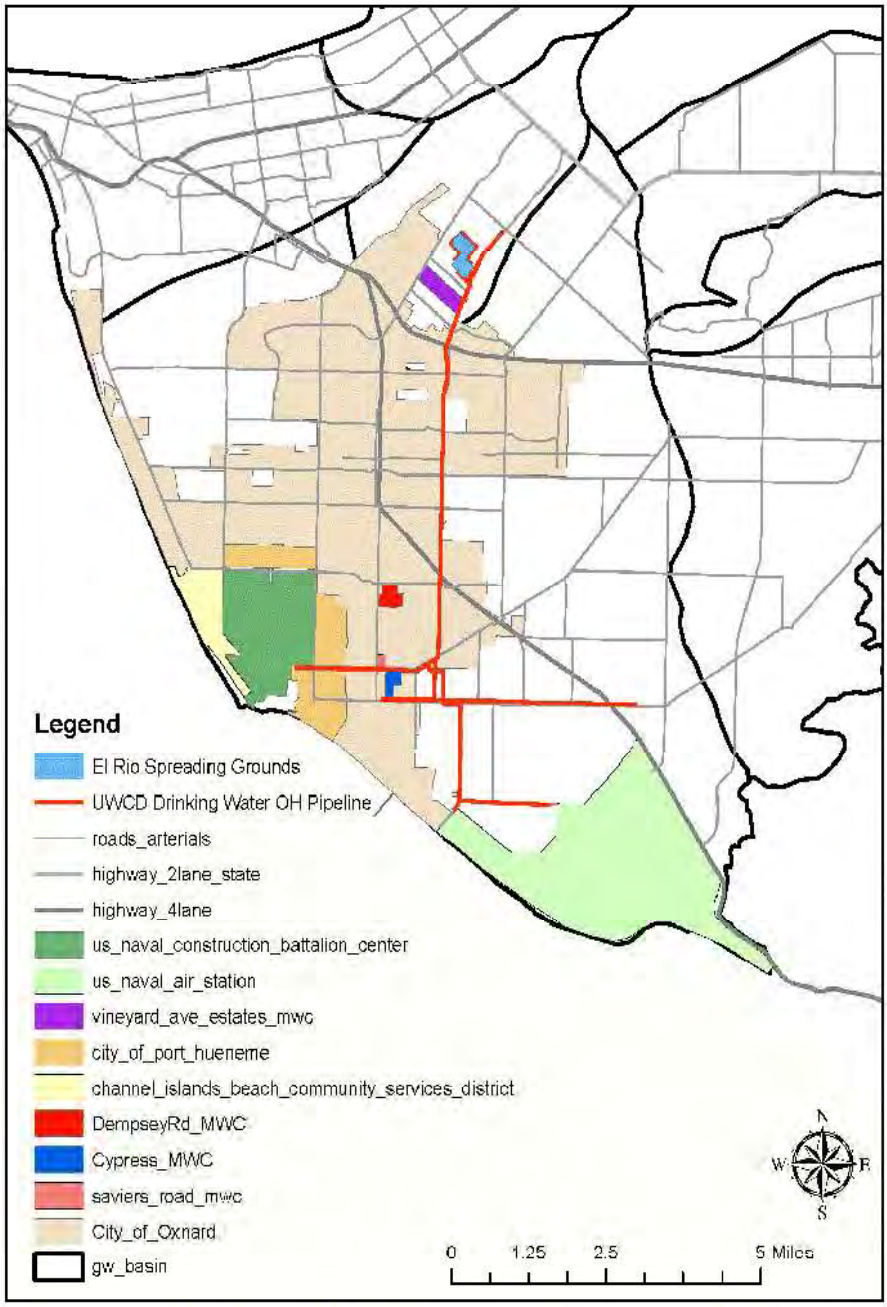
8 APPENDIX A. 2011 CONSUMER CONFIDENCE REPORT, O-H SYSTEM

United Water Conservation District

Oxnard-Hueneme Water Delivery System

2011 Consumer Confidence Report

UWCD Drinking Water Customer Service Area



Testing and Results

Last year we conducted thousands of tests for over 180 chemicals and contaminants that could be found in your drinking water. We did not detect any contaminants that would make the water unsafe to drink. This report highlights the quality of water we delivered to our customers last year. Included are details about where your water comes from, what it contains, and how it compares to State standards. For more information about your water, please call our Operations & Maintenance Manager, Mike Ellis at (805) 485-5114.

Public Meetings

Our monthly Board meetings are usually held on the second Wednesday of every month at 1:00 PM in our board room at 106 North 8th Street in Santa Paula. Our meetings are open to the public and we would welcome your questions and comments.

About Your Water Supply

United Water's Oxnard-Hueneme Delivery System supplies about 15,000 acre-feet of water per year to several agencies in the Oxnard Plain, including the cities of Oxnard and Port Hueneme, two Naval bases, and several smaller water companies. Those agencies supply our water to over 222,000 people, most of it treated or blended with other supplies. Our water source is 100% local groundwater, pumped from wells near El Rio, north of Oxnard. Water from those wells has its origin in the mountains and valleys of the 1,600 square mile Santa Clara River watershed. The wells are in an aquifer called the Oxnard Forebay. Our water is naturally high in minerals that affect its taste, but is safe to drink. Our groundwater is considered to be "under the influence of surface water," which means we do extensive monitoring of turbidity and other parameters to meet health regulations.

United Water Conservation District
106 North 8th Street
Santa Paula, CA 93060
805/525-4431 Fax 805/525-2661
www.unitedwater.org

Water produced by our wells is naturally filtered through the ground. We use chlorine as a disinfectant to kill bacteria, parasites, and viruses. Then we add chloramines to provide a long-lasting disinfection residual to keep the water safe until it reaches our customers. Due to the longer-lasting residual of chloramines, owners of pet fish must treat their tap water before putting it into aquariums or ponds.

Types of Potential Contamination

In general, sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves, naturally-occurring minerals and, in some cases, radioactive material can pick up substances resulting from the presence of animals or from human activity. Contaminants that may be present in source water include:

Microbial contaminants, such as viruses and bacteria, which may come from sewage treatment plants, septic systems, agricultural livestock operations, and wildlife.

Inorganic contaminants, such as salts and metals, which can be naturally-occurring or result from urban stormwater runoff, industrial or domestic wastewater discharges, oil and gas production, mining, or farming

Organic chemical contamination, including synthetic and volatile organic chemicals, which are by-products of industrial processes and petroleum production, and can also come from gas stations, urban stormwater runoff, agricultural application, and septic systems.

Pesticides and herbicides, which may come from a variety of sources such as agriculture, urban stormwater runoff, and residential uses.

Radioactive contaminants, which can be naturally-occurring or be the result of oil and gas production and mining activities.

In order to ensure that tap is safe to drink USEPA and the California Department of Public Health prescribes regulations that limit the amount of certain contaminants in public drinking water. We treat our water to meet these health regulations. The Department's regulations also establish limits for contaminants in bottled water, which must provide the same protection for public health. Scientists and health experts are continually studying the effects of various chemicals in drinking water to make sure the public water supply is safe.

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the USEPA's Safe Drinking Water Hotline (1-800-426-4791).

Definitions

Public Health Goal (PHG): The level of a contaminant in drinking water below which there is no known or expected risk to health. PHGs are set by the California Environmental Protection Agency.

Maximum Contaminant Level Goal (MCLG): The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs are set by the U.S. Environmental Protection Agency.

Maximum Contaminant Level (MCL): The highest level of a contaminant that is allowed in drinking water. Primary MCLs are set as close to the PHGs (or MCLGs) as is economically and technologically feasible. Secondary MCLs are set to protect to odor, taste and appearance of drinking water.

Primary Drinking Water Standard (PDWS): MCLs for contaminants that affect health along with their monitoring and reporting requirements, and water treatment requirements.

Maximum Residual Disinfectant Level (MRDL): The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.

Maximum Residual Disinfectant Level Goal (MRDLG): The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLG's do not reflect the benefits of the use of disinfectants to control microbial contaminants.

Treatment Technique (TT): A required process intended to reduce the level of a contaminant in drinking water.

Detection Limit for Reporting (DLR): The level above which a chemical is to be reported.

NA: Not applicable

ppm: parts per million, or milligrams per litre

ppb: parts per billion, or micrograms per litre

ND: none detected

pCi/L: picocuries per litre (a measure of radioactivity)

Turbidity

Turbidity is a measure of the cloudiness of the water. We monitor it because it is a good indicator of the effectiveness of our water treatment. Turbidity is measured in units called NTUs. We achieved 100% compliance with turbidity standards in 2011.

Contaminants Detected in 2011

Chemical	State MCL MRDL	State DLR	PHG MCLG MRDLG	Units	Range	Avg	Date	Major Sources in Drinking Water
Primary Standards - Clarity								
Delivered water turbidity	TT	N/A	N/A	NTU	0.14 - 0.04	0.07	2011	Well corrosion byproducts. Microscopic soil particles.
Primary Standards - Radioactivity Contaminants								
Gross Alpha	15	3	NA	pCi/L	6.68 - 4.30	5.29	2011	Decay of natural and man-made deposits.
Uranium	20	1	0.43	pCi/L	8.41 - 4.63	6.64	2011	Erosion of natural deposits.
Radon	N/A	100	NA	pCi/L	364 - 129	273.25	2011	Decay of natural deposits.
Primary Standards - Inorganic Contaminants								
Arsenic	10	2	0.04	ppb	3 - ND	1.5	2011	Erosion of natural deposits.
Fluoride	2	0.1	1	ppm	0.8 - 0.7	0.75	2011	Erosion of natural deposits.
Nitrate (as NO_3)	45	2	45	ppm	9.5 - 4.7	6.72	2011	Leaching from fertilizers and septic systems.
Selenium	50	5	30	ppb	9 - 5	7	2011	Erosion of natural deposits. Discharge from mines, runoff from livestock lots.
Primary Standards - Disinfection								
Chloramine Residual (as Cl_2)	4	4	4	ppm	2.4 - 1.3	1.91	2011	Drinking water disinfectant added for treatment.
Total Haloacetic Acids	60	NA	NA	ppb	6 - 1	4.06	2011	By-product of drinking water disinfection.
Dibromoacetic Acid	N/A	2	NA	ppb	6 - 4	5.45	2011	By-product of drinking water disinfection.
Monobromoacetic Acid	none	1		ppb	1 - 1	1	2011	By-product of drinking water disinfection.
Trichloeoacetictic Acid	none	1		ppb	1 - 1	1	2011	By-product of drinking water disinfection.
Primary Standards - Disinfection By-Products								
Total Trihalomethanes	80	N/A	1.8	ppb	49.8 - 19.8	30.3	2011	By-product of drinking water disinfection.
Bromodichloromethane	N/A	1	NA	ppb	6.2 - 3.3	4.5	2011	By-product of drinking water disinfection.
Bromoform	N/A	1	NA	ppb	23.7 - 7.8	12.5	2011	By-product of drinking water disinfection.
Chloroform	N/A	1	NA	ppb	1.3 - 0.6	1	2011	By-product of drinking water disinfection.
Dibromochloromethane	N/A	1	NA	ppb	19.1 - 8.0	12.4	2011	By-product of drinking water disinfection.
Microbiological Contaminants								
Total Coliform bacteria	Systems that collect <40 samples/month: no more than 1 positive		0	Absense/ Presence/ 100ml	Absent	Absent	2011	Naturally present in the environment.
Fecal Coliform bacteria and E.*coli*	A routine and repeat sample are total coli-form positive, and one of these is fecal or E.coli positive		0	Absense/ Presence/ 100ml	Absent	Absent	2011	Human and animal fecal waste.
Secondary Standards								
Sodium	N/A	N/A	N/A	ppm	79 - 71	75	2011	Leaching from natural mineral deposits.
Sulfate	500	0.5	N/A	ppm	420 - 308	374.31	2011	Runoff/leaching from natural deposits.
Total Dissolved Solids, TDS	1,000	NA	N/A	ppm	900 - 670	803.85	2011	Leaching from natural mineral deposits.
Total Hardness	N/A	N/A	N/A	ppm	467 - 400	433.5	2011	Leaching from natural mineral deposits.
Total Organic Carbon (TOC)	N/A	0.3	N/A	ppb	1.3 - 0.8	1.03	2011	Naturally present in the environment.
Unregulated Chemicals								
Boron	N/A	100	N/A	ppb	600 - 500	550	2011	Erosion of natural deposits.

Water Quality Data

The table on page 3 lists all of the drinking water contaminants that we detected during the 2011 calendar year. The presence of these contaminants in the water does not indicate that the water poses a health risk. In addition to the contaminants on the table, we tested for many other chemicals which were not detected at significant levels. Please call us if you would like a copy of the complete list of chemicals we tested for and the test results.

Total Dissolved Solids and Sulfate

Total Dissolved Solids, or TDS, is a measure of the total mineral content of the water. TDS and sulfate are secondary standards related to the taste of the water, and water exceeding the MCL is generally safe for human consumption. Our water exceeds the secondary standards for TDS and sulfate because of naturally occurring minerals in the water.

Source Water Assessment

United Water completed a Source Water Assessment for its drinking water wells in October 2001. The current report is available for public review at our office in Santa Paula. The assessment provides a survey of potential sources of contamination of the groundwater that supplies our wells. Activities that constitute the highest risk to our water are the following: petroleum storage tanks and fueling operations, septic systems, and animal feed lots that are no longer in use. The most recent update for the Surface Water Sanitary Survey was completed in January of 2011 and was submitted to the Department of Health Services.

Cryptosporidium

Cryptosporidium is a microbial pathogen found in surface water throughout the U.S. Although filtration removes Cryptosporidium, the most commonly-used filtration methods cannot guarantee 100 percent removal. Our monitoring indicates the presence of these organisms in our source water and/or finished water. Current test methods do not allow us to determine if the organisms are dead or if they are capable of causing disease. Ingestion of Cryptosporidium may cause cryptosporidiosis, an abdominal infection. Symptoms of infection include nausea, diarrhea, and abdominal cramps. Most healthy individuals can overcome the disease within a few weeks. However, immuno-compromised people are at greater risk of developing life-threatening illness. We encourage immuno-compromised individuals to consult with their doctor regarding appropriate precautions to take to avoid infection. Cryptosporidium must be digested to cause disease, and it may be spread through means other than drinking water.

Radon

Radon is a radioactive gas that you cannot see, taste or smell. It is found throughout the U.S. Radon can move up through the ground and into a home through cracks and holes in the foundation. Radon can build up to high levels in all types of homes. Radon can also get into indoor air when released from tap water from showering, washing dishes and other household activities. Compared to radon entering the home through soil, radon entering the home through tap water will be a small source of radon in indoor air. Radon is a known human carcinogen. Breathing air containing radon can lead to lung cancer. Drinking water containing radon may also cause increased risk of stomach cancer. If you are concerned about radon in your home, you may test the air in your home. There are simple ways to fix a radon problem that are not too costly. For additional information, call the National Safety Council's Radon Hotline (800-SOS-RADON).

About Nitrate

Nitrate in drinking water at levels above 45 ppm is a health risk for infants of less than six months of age. High nitrate levels in drinking water can interfere with the capacity of the infant's blood to carry oxygen, resulting in a serious illness. Symptoms include shortness of breath and blueness of the skin. High nitrate levels may also affect the ability of the blood to carry oxygen in some individuals, such as pregnant women and those with certain specific enzyme deficiencies. Nitrate levels may rise quickly because of rainfall or agricultural activity and groundwater movement. If you are caring for an infant, or are pregnant, you should ask advice from your doctor, or choose to use bottled water for drinking and for mixing formula and juice for your baby.

Immuno-compromised Persons

Some people may be more vulnerable to contaminants in drinking water than the general population. Immune-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly and infants, can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. USEPA/Centers for Disease Control (CDC) guidelines on appropriate means to lessen the risk of infection by *Cryptosporidium* and other microbial contaminants are available from the Safe Drinking Water Hotline (1-800-426-4791).

Security of your Water

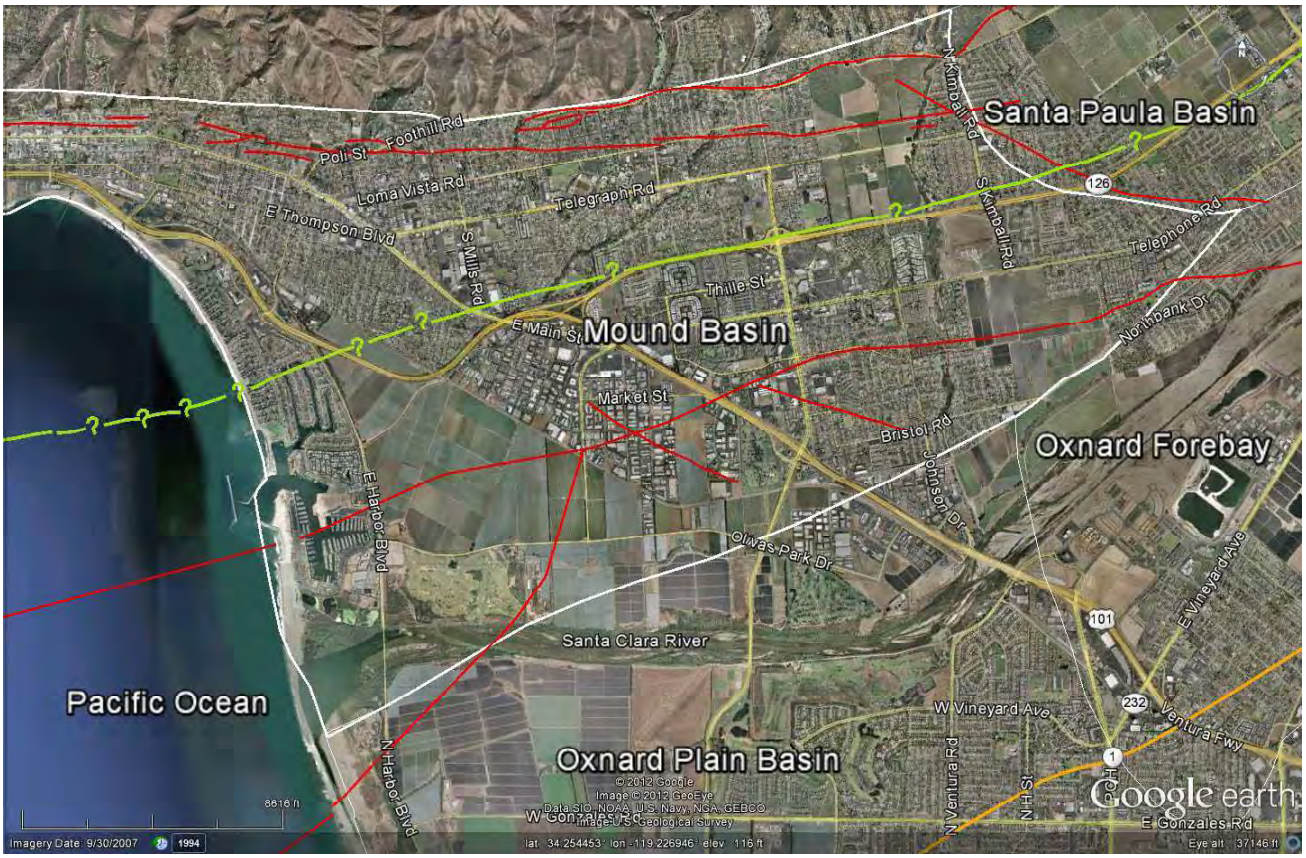
We have completed a Vulnerability Assessment of our OH water facilities. This work, funded by an EPA grant, has improved the security and safety of our water supply.

Hablamos Español

Para información en español llámenos al (805) 525-4431.

HYDROGEOLOGIC ASSESSMENT OF THE MOUND BASIN

United Water Conservation District
Open-File Report 2012-01
May 2012



THIS REPORT IS PRELIMINARY AND IS SUBJECT TO MODIFICATION BASED UPON FUTURE ANALYSIS AND EVALUATION

PREPARED BY:

GROUNDWATER DEPARTMENT

UNITED WATER CONSERVATION DISTRICT

HYDROGEOLOGIC ASSESSMENT OF THE MOUND BASIN

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Citation: United Water Conservation District, 2012, Hydrogeologic Assessment of the Mound Basin, United Water Conservation District Open-File Report 2012-001, June 11, 2012 update.

HYDROGEOLOGIC ASSESSMENT OF THE MOUND BASIN

UWCD OPEN-FILE REPORT 2012-001

EXECUTIVE SUMMARY / ABSTRACT

This open file report addresses the hydrogeologic and geologic conditions of the Mound Basin in Ventura County, California. The United Water Conservation District (United Water) manages the surface water and groundwater resources for either all or part of eight groundwater basins. United Water manages the most significant portion of the Mound Basin. Much of the Mound Basin lies within the boundaries of the City of Ventura. The downtown, midtown, and west side areas of the city fall within the boundaries of the Casitas Municipal Water District. Areas south and east of midtown Ventura fall within the United Water Conservation District.

The Mound Basin has a limited amount of data for characterization of the conditions within the basin. However, the purpose of this report is to assess and outline the hydrogeologic conditions of the Mound Basin with the data that are available. This includes the geology, hydrogeology and groundwater dynamics within the basin as they relate to water supply issues. This was completed by compiling United Water's direct technical data and information from previous works related to the Mound Basin. This information can potentially be used for establishing a basis for further development and management of the groundwater resources of the basin. The scope of work included:

- Assessing the geology and hydrogeology which characterizes the Mound Basin;
- Assessing recharge characteristics and mechanisms for the basin;
- Assessing water level hydrograph records for key wells;
- Assessing water quality data for the basin;
- Assessing changes in well status throughout the basin; and
- Assessing groundwater extractions from the basin for recent years.

The Mound Basin is essentially characterized by a low lying alluvial plain mainly occupied by the City of San Buenaventura. Much of the remainder of the basin is occupied by agricultural lands. The present day boundaries of the basin include: the Ventura fault and foothills to the north, the Country Club fault to the east, the Montalvo anticline to the south and the Pacific Ocean to the west. The Santa Paula Basin borders the Mound Basin on the east side and the Oxnard Plain Basin and Forebay Basin are adjacent to the Mound Basin on the south side.

The Mound Basin lies within the greater regional Ventura Basin which is part of the Transverse Ranges geologic province. In the Ventura Basin the total stratigraphic thickness of upper Cretaceous, Tertiary, and Quaternary strata exceeds 55,000 feet

The Mound Basin is characterized by a significant east-west trending fold axis (Ventura syncline) and a significant amount of faulting. This study conducted a thorough review of geologic articles and reports, which covered 87 years of information, to generate the Mound Basin conceptual geologic model. The Mound Basin water-bearing sediments are generally Pleistocene (San Pedro formation) and Holocene (alluvium) deposits. These deposits are limited to approximately the upper 3,000 feet. The faulting is primarily reverse faulting, with some strike-slip movement, on the north (Ventura and Foothill faults), south (Oak Ridge, McGrath faults, Mound NW 3, and Mound NW 2 faults), and east (Country Club fault) sides of the basin. The Ventura and Oak Ridge faults contribute to the structural boundaries on the north and south side of the basin. The Montalvo anticline located south of the Oak Ridge fault is the present day southern boundary of the basin. However, some researchers suggest that the Oak Ridge fault may be a more appropriate southern structural boundary of the basin, as it forms the southern structural fault and uplift on the south side of the basin.

Aquifer materials and sediments within the adjacent Oxnard Plain and Forebay Basins extend into the Mound Basin. However, the sediments change in character. Some of the shallow alluvium is dominated by clays in the Mound Basin. In addition, the Fox Canyon aquifer zone becomes much more lenticular in nature on the northern side of the Mound Basin. Water level records suggest groundwater likely flows from the Oxnard Plain Basin, Forebay Basin, and Santa Paula Basin into the Mound Basin. Although there are some appreciable offsets on the faults bounding the Mound Basin, the low-permeability Santa Barbara formation does not extend to sufficiently shallow depths to impede groundwater flow. In most cases, there is a significant thickness of the San Pedro formation (aquifer materials) existing above the faults, or on both sides of the faults. The nature of the faults themselves as an impedance to flow is not known. However, groundwater flow and basin recharge across these zones is most probable.

Water levels vary considerably within the Mound Basin as evidenced in the few wells that are located within the basin. Groundwater flows generally from east to west. Gradients within the basin remain fairly flat most of the time (especially during dry periods) and water levels tend to vary somewhat among nearby wells. Water levels in many wells respond in a similar fashion to wet and dry periods, although deeper wells often have lower groundwater elevations. Groundwater production is concentrated in several areas within and around the basin, creating the potential for pumping interference in some water-level measurements.

Agricultural pumping has been the main water user in the Mound Basin (approximately 70 percent). Since the mid-1980s agricultural pumping has averaged nearly 4,200 acre-feet per year with a peak annual production of 5,850 acre-feet recorded in 1990. The City of Ventura's pumping generally increased through the 1980s, and was variable in the 1990s. Municipal pumping peaked in 2003 and has declined fairly steadily in recent years.

While the quality of the groundwater produced by most wells within the Mound Basin is suitable for municipal and agricultural uses, the basin is not known for the high quality of its groundwater. In addition, the lenticular nature of many San Pedro formation sediments within the basin, and their suggested connate waters that likely remain in this setting, impair water quality in many zones. Although groundwater flow likely occurs through areas where interconnected or continuous aquifer materials exist, the less-continuous nature of some highly permeable deposits within the basin (compared to nearby basins) have likely inhibited the flushing of poor-quality waters from the basin. Water quality is variable between wells, and many records indicate somewhat elevated concentrations of TDS, sulfate, hardness and other analytes. Water quality appears to be relatively stable among many of the Mound Basin wells having long-term water quality records. Available records from wells near the coast do not show evidence of saline intrusion.

1 INTRODUCTION AND BACKGROUND

United Water Conservation District (United Water) is a public agency within Ventura County, California that is charged with conserving the water of the Santa Clara Rivers and tributaries. United Water works to manage the surface water and groundwater resources within all or part of eight groundwater basins. These basins include the Piru, Fillmore, Santa Paula, Oxnard Forebay, Oxnard Plain, Pleasant Valley, and parts of the west Las Posas and Mound basins. Figure 1-1 shows the locations of the basins relative to each other.

United Water stores surface water in a surface reservoir (Lake Piru impounded by Santa Felicia Dam), replenishes the groundwater aquifers along the Santa Clara River, diverts natural and reservoir released water, replenishes groundwater through percolation ponds, and delivers both diverted surface water and pumped water to those areas vulnerable to overdraft and saline water intrusion. Since the 1950s, United Water has been studying means to improve groundwater management throughout the District. Projects for improved conservation of water and groundwater management have been executed since the 1950s and these efforts continue to the present day.

During the 1990s and up to the present represents a period of more detailed studies by United Water to improve the understanding of the hydrogeology, basin yields, additional water quality issues, river dynamics, and impacts of the continued high demand for water resources. These studies progressively became more fine-tuned to address more localized issues. One major issue is to actively assess and outline the hydrogeologic conditions of the Mound Basin. This includes understanding the geology, hydrogeology and groundwater dynamics within the basin. The purpose of this study is to establish a basis for planned development and management of the groundwater resources of the Mound Basin.

1.1 OBJECTIVE AND PURPOSE

The objective of this report is to investigate and compile direct technical data and other information from previous works related to the Mound Basin. This information is required to manage the

groundwater resources of the basin to maximize its long-term supply, protect the groundwater quality of the basin, and balance long-term average annual water replenishment and extractions. The direct technical data are data that United Water has had direct access or has developed from its own efforts. A review of previous work, spanning eighty-seven years of available literature related to the Mound Basin, was also conducted.

The scope of this report includes the following tasks:

- Assess geology and hydrogeology which characterizes the Mound Basin;
- Assess recharge characteristics and mechanisms for the basin;
- Assess water level hydrograph records for key wells;
- Assess water quality data for the basin;
- Assess changes in well status throughout the basin; and
- Assess groundwater extractions from the basin for recent years.

Since this report is intended to be a tool for the management of the groundwater resources of the Mound Basin it relies heavily on basic hydrogeologic and GIS data from United Water, as well as data obtained from the City of San Buenaventura and the County of Ventura.

1.2 PHYSICAL SETTING

The Mound Basin is located in Ventura County, California, and has been an important source of water supply to both agricultural and municipal users since at least the 1920s. The basin is characterized by a low-lying alluvial plain which gently rises in a northerly direction. It is the westernmost basin within the Santa Clara River Valley drainage. The basin is approximately 7 miles long and 4 miles wide and contains approximately 10,000 acres. The majority of the Mound Basin is occupied by the city/suburban environment of San Buenaventura (Ventura), California. The remainder of the basin is occupied by agricultural lands.

The present day mapped boundaries of the Mound Basin are indicated on Figure 1-2. The southern boundary extends from approximately the mouth of the Santa Clara River and trends northeastward toward South Mountain. This boundary approximately coincides with the axis of the subsurface structure consisting of the Montalvo anticline. The northern boundary consists of the Ventura Foothills north of the City of Ventura with the approximate trace of the Country Club fault forming the eastern boundary. The Country Club fault does not have a surface expression and is considered to be a concealed fault. The Pacific Ocean borders the basin to the west. The Oxnard Forebay Basin and Oxnard Plain Basin are directly adjacent to the Mound Basin on the south side and the Santa Paula Basin is directly adjacent on the eastern side.

As evidenced in Figure 1-2, most of the Mound Basin is occupied by the City of San Buenaventura. The city streets and structures occupy approximately 70 percent of the basin. The remainder of the

basin is occupied by agricultural lands. Generally, the main crops in the agricultural fields consist of citrus, avocadoes, berries, and row crops. Occasionally celery is grown during the offseason of berry crops. Highway 101 cuts through the Mound Basin in a northwest-southeast direction. One other major highway (Highway 126) cuts through the basin and runs generally east-west.

2 GENERAL GEOLOGY

The groundwater basins managed by United Water are part of the Transverse Ranges geologic province where the mountain ranges and basins are oriented east-west rather than the typical northwest-southeast trend over much of California. These basins are located within the more regional Ventura Basin, which is an elongate east-to-west trending structurally complex syncline within the Transverse Range province (Yeats, et. al., 1981). The Santa Clara River Valley occupies the Ventura Basin, which is one of the major sedimentary basins in the geomorphic province. The total stratigraphic thickness of upper Cretaceous, Tertiary, and Quaternary strata exceeds 55,000 feet (Sylvester and Brown, 1988).

Active thrust/reverse faults border the basins of the Santa Clara River Valley contributing to the uplift of the adjacent mountains and down-dropping of the basins. This configuration creates the elongate mountains and valleys that dominate Santa Barbara and Ventura Counties. The basins are filled with sediments that were deposited in both marine and terrestrial settings. The basins on the coast, including the Mound Basin, are filled with recent sediments deposited on a wide delta complex that formed at the terminus of the Santa Clara River. Figure 2-1 is a regional geologic map showing the general geology of the region. Figure 2-1 shows the local formations which form the mountain ranges, surface geology, and the major faulting in relation to the United Water basins.

As discussed above, the geology associated with the Transverse Ranges is primarily east to west trending folds and faulting (fold axes trend east-west). As per the regional geology, the Mound Basin is characterized by a prominent syncline (Ventura syncline) whose axis trends east-west and plunges to the west.

The surface and shallow materials in the Mound Basin are characterized by Quaternary alluvium (Holocene and late Pleistocene). These are composed of lagoonal, beach, river/flood plain, alluvial fan, terrace, and marine terrace deposits. Underlying the Quaternary alluvium are the upper Pleistocene San Pedro formation (marine and continental clays, silts, sands and gravels) which hosts most of the aquifers in the area; the lower Pleistocene Santa Barbara formation (mudstone, shale and minor sandstone); and the lower Pleistocene Pico formation (marine mudstones, siltstones, sandstones, and conglomerates) (Mukae and Turner, 1975). The Pleistocene deposits outcrop in the hills bordering the Mound Basin to the north. The two mounds located in the south-central part of the basin, the namesake of the basin, are characterized by outcrops of the San Pedro formation.

2.1 MOUND BASIN FOLDING

Figure 2-2 is a generalized geology map of the Mound Basin. The geology as shown in Figure 2-2 is discussed in this section of this report. The Ventura syncline (called the Santa Clara River syncline by some researchers) axis trends through the Mound Basin in an east-west direction and the approximate location of the axis is indicated on Figure 2-2. The syncline plunges gradually to the west. The Montalvo anticline is approximately parallel to the Ventura syncline and is located south of the syncline near the present day southern structural boundary of the Mound Basin (Geotechnical Consultants, Inc., 1972). The southern leg of the Ventura syncline forms the northern leg of the Montalvo anticline. Some workers also place a parallel fault at the location of the Montalvo anticline (Mann, 1959; Fugro West, Inc., 1996). Seismic reflection data from Fisher et al (2005) does confirm that an anticline exists at that location. It is unlikely that the Montalvo anticline is a simple fold. Some faulting is involved on the northern flank of the Montalvo anticline (McGrath fault, Mound NW 3 fault, Mound NW 2 fault, Oak Ridge Fault).

2.2 MOUND BASIN FAULTING

The Mound Basin is characterized by several faults. The faults are discussed in the following sections.

2.2.1 VENTURA AND FOOTHILL FAULTS

The Ventura fault (Figure 2-2) is located in the northern section of the basin and trends east-west. It is a reverse fault that dips to the north at a high angle, with the up-thrown side on the north contributing to the Ventura foothills (Yerkes et al, 1987). Figure 2-3 is a cross-section interpretation showing the Ventura fault. The fault was mapped by the United States Geological Survey (USGS) near the base of the Ventura Foothills. The Ventura fault extends offshore where it is referred to as the Pitas Point fault by Greene et al (1978), however, the USGS and other workers still refer to it as the Ventura fault. The Foothill fault is also mapped as an east-west trending fault in the northeast section of the Mound Basin. It is not referenced in most publications for the geology of the area. However, it was included in the GIS coverage from the USGS website (United States Geological Survey, 2011). Yerkes et al (1987) do show an inferred fault at the approximate location of the Foothill fault where it is shown in Figure 2-2. However it is not shown on Figure 2-3. The assumed motion along the fault is that of a reverse fault with the up-thrown side to the north.

2.2.2 COUNTRY CLUB FAULT

The Country Club fault is an arc shaped fault that trends northwesterly along the eastern edge of the Mound Basin and mainly forms the structural boundary between the Mound Basin and the Santa Paula Basin to the east (Figure 2-2). It is a steeply dipping (almost vertical) reverse fault with some appreciable left-lateral displacement (Turner, 1975). United Water's inspection of oil well data indicate a displacement of 1,600 to 1,800, feet with the south side of the fault displaced

upward relative to the northern side which is consistent with the offset reported by other investigators [Fugro West (1996) indicates approximately 2,000 feet of offset; Geotechnical Consultants, Inc. (1972) shows approximately 1,700 feet of offset].

2.2.3 Oak Ridge fault/McGrath fault/Mound NW faults

An understanding of the location (Figure 2-3) and nature of the Oak Ridge fault, McGrath fault, Mound NW 2 fault and Mound NW 3 fault share a more complex development in historical literature. The Mound NW 2 fault and Mound NW 3 fault both are located adjacent to a topographic mound referred to as "pressure ridges".

U.S. Geological Survey Bulletin 753 (USGS, 1924) does not extend the overall fault coverage map to the Mound Basin, although they produced a geology map of Los Angeles and Ventura Counties. This suggests that the Mound Basin was not studied at that time. In 1933 the Division of Water Resources Bulletin 46 (California Department of Water Resources, 1933) presents the results of a geological investigation of Ventura County, however, the Oak Ridge fault, McGrath fault, Mound NW 2 fault, or Mound NW 3 fault are not shown pertaining to the Mound Basin. In addition, the Ventura and Montalvo anticlines are not shown. The California State Water Resources Board Bulletin No. 12 (California State Water Resources Board, 1953) contains a geologic map which shows the Oak Ridge fault in the Santa Paula Basin only. It extends to another fault referred to as the Saticoy fault (predecessor in study of the modern Oak Ridge fault) partially extending into the Mound Basin (Figure 2-4). The Saticoy fault is mapped to the east side of the Mound Basin, however, if projected to the west it would trend through or just north of the Mound NW 2 and Mound NW 3 faults (and pressure ridges). The McGrath fault is not shown. The map does show the Montalvo anticline which is depicted as partially coincident with the Santa Clara River.

John F. Mann Jr. and Associates (1959) appears to replace the Montalvo anticline with the "Montalvo fault" on his map. However, he does refer to the Montalvo anticline in his text. The Saticoy fault, as per Bulletin 12, is included in this publication. The McGrath fault or the Mound NW 2 and Mound NW 3 faults (and pressure ridges) are not shown on maps or included in the text. His cross-section shows the Montalvo fault extending to the surface with the up-thrown side to the southeast (Figure 2-5). In 1972 Geotechnical Consultants, Inc. show the Oak Ridge fault extending in a general east-west direction across the entire Mound Basin. It is depicted as touching one Mound NW fault and pressure ridge. There is only one Mound NW fault and pressure ridge shown. The Montalvo anticline is also shown. In map view, they show the McGrath fault approximately coincident with the Montalvo anticline trending approximately parallel to the Oak Ridge fault. GTC's McGrath fault is very similar to the Montalvo fault shown in Mann (1959). No Saticoy fault, or McGrath fault as shown in Figure 2-2, is included. In cross-section, the Oak Ridge fault is shown to partially extend upward into the San Pedro Formation and displaces less than 200 feet of the Santa Barbara formation adjacent to the San Pedro formation at a depth of 2,300 feet.

Turner and Mukae (1975) have the Oak Ridge fault extending through the Mound Basin in a general east-northeast orientation north of the pressure ridges (Figure 2-6). They show the

McGrath fault extending from the main part of the Oak Ridge fault. It connects with the Oak Ridge fault east of the pressure ridges. The McGrath fault section is north of the Santa Clara River for its entire length. The Montalvo anticline merges with the McGrath fault in the western portion of the Mound Basin. The Country Club fault also merges with the Oak Ridge fault. In cross-section, both the Oak Ridge and McGrath faults extend into the alluvial deposits in the area (Figure 2-7) with the southern side up-thrown for both faults. The Santa Barbara formation is not shown on their cross-sections as they only address the effective base of fresh water. However, the San Pedro formation and overlying alluvium are shown to extend across both faults for thicknesses between 1,000 and 1,600 feet according to the cross-sections.

Yerkes et al (1987) map the Oak Ridge fault extending through the Mound Basin in a general east-northeast orientation located north of the pressure ridges. They also show the McGrath fault as an unnamed fault which connects to the Oak Ridge fault west of the pressure ridges and curves westward extending south of the Santa Clara River (Figure 2-8). An oversize plate from Yerkes et al (1987) also shows the Oak Ridge fault at a different scale. From that scale it can be observed that the Oak Ridge fault is located directly north of the two pressure ridges located adjacent to the Mound NW 3 and Mound NW 2 faults. In fact the Oak Ridge fault actually "touches" the mound (pressure ridge) adjacent to Mound NW 2. Yerkes et al (1987) state that the Oak Ridge is a zone of faulting that forms the southern boundary of the Ventura synclinal trough in the western Ventura Basin (Mound structural basin) rather than the Montalvo anticline as mapped by earlier researchers. They state that the faults in the area are buried and known only from subsurface data. They describe the Oak Ridge as a steeply dipping reverse fault with stratigraphic separation of about 350 meters (1150 feet) at the base of the San Pedro formation. Yerkes et al describe the pressure ridges as two isolated, elongate northwest trending structural uplifts. They are described as compressional features and are compatible with left-lateral slip along the adjacent Oak Ridge fault. It suggests a significant strike-slip component along the Oak Ridge fault as well as a reverse fault uplift on the south side.

Yeats (1988) maps the Oak Ridge fault extending through the Mound Basin in a general east-northeast orientation north of the pressure ridges (Figure 2-9). He refers to the McGrath fault as the "Montalvo" fault and shows the fault extending southwestward in an arcuate shape extending from the Oak Ridge fault. It connects with the Oak Ridge fault west of the pressure ridges and trends south of the Santa Clara River where it goes out to sea. Both faults are mapped as concealed. The Yeats configuration of the Oak Ridge fault and McGrath fault (Yeats' Montalvo fault) agrees with the Yerkes et al (1987) which is used for Figure 2-2. United Water uses that configuration. Yeats contains two cross-sections (A-A' and B-B') over the Oak Ridge fault and McGrath fault (Montalvo fault) (Figure 2-10). Cross-section A-A' is oriented north-northwest and crosses both the Oak Ridge fault and the McGrath fault. Cross-section B-B' is also oriented north-northwest and crosses the Oak Ridge fault in the vicinity of the pressure ridges. Cross-section A-A' shows that the McGrath ("Montalvo") fault actually merges with the Oakridge fault at a depth of approximately 2 kilometers (6,562 feet) (Figure 2-11). The Oak Ridge fault is shown as a reverse fault with the up-thrown side on the south side. The McGrath fault is also a reverse fault with the up-thrown side on the south side. Therefore, the area between faults as they appear in map view is actually up-

thrown in whole. Both cross-sections indicate that the top of the Oak Ridge fault exists at a depth of 1.0 to 1.5 kilometers bgs (3,300 feet to 4,900 feet). Yeats et al (1982) contends that the upper edge of the Oak ridge fault is buried by Quaternary sediment 1,250 meters thick (4,100 feet) in the Ventura Basin near Ventura, California. This is much deeper than the aquifer systems in the San Pedro formation.

Fisher et al (2005) conducted a high resolution and medium resolution marine seismic reflection survey over the Oak Ridge fault and the McGrath fault offshore south of Ventura, California. Using data from Huftile and Yeats (1995), Fisher et al show the Oak Ridge fault upper edge greater than a kilometer (3,300 feet) deep as measured under the continental shoreline where it goes out to sea. Seismic reflection data obtained from approximately 6 kilometers (~19,700 feet or 3.7 miles) as well as 9 kilometers (~29,500 feet or 5.6 miles) offshore image the Oak Ridge fault. These data are interpreted to image an unconformity, at a depth estimated to be approximately 80 meters (265 feet) below the sea floor that is probably at the base of the upper Pleistocene and Holocene strata which is not offset by the Oak Ridge fault. The upper edge of the Oak Ridge fault extends to the unconformity, however, the unconformity and strata above it are not offset. The McGrath (Montalvo) fault is also interpreted by Fisher et al (2005) to be truncated by an unconformity below the sea floor approximately 3 kilometers (9,850 feet or 1.9 miles) offshore.

3 HYDROSTRATIGRAPHY

In the Mound Basin, alluvial deposits and the San Pedro formation represent the principal water bearing strata. Underlying deposits, which include the Santa Barbara and Pico formations, are considered non-water bearing in the Mound Basin area even though they yield a limited amount of water for domestic wells elsewhere in Ventura County.

Figure 3-1 is a schematic cross-section of the Mound Basin taken from Greene (1978). Although the faulting may not be consistent with the latest understanding of the basin, it shows the general formations within the basin discussed in the following paragraphs of this report. It also shows the Montalvo anticline on the right hand side of the figure. Figure 3-2 shows the relationship between the major hydrostratigraphic units (i.e., aquifers and aquifer systems) and the geologic formations and their ages as typically defined for the region. In general the Oxnard aquifer and Mugu aquifer zones comprise the Upper Aquifer System (UAS) with the Lower Aquifer System (LAS) containing the Hueneme, Fox Canyon, and Grimes aquifers. These hydrostratigraphic units extend into the Mound Basin from adjacent basins, however, they change character (e.g., lithology, thickness, degree of interbedding) in places. Generalized conceptual groundwater flow paths are depicted in Figure 3-3. Figure 3-4 is a southwest to northeast cross-section, across the Oxnard Plain, located southeast and adjacent to the Mound Basin. The Grimes Canyon aquifer is not shown on the cross-section.

3.1 UPPER AQUIFER SYSTEM

The UAS is composed of Holocene (Oxnard aquifer) and late Pleistocene (Mugu aquifer) alluvium separated by an unconformity that functions as a clay aquitard (Figure 3-2). The boundary between the UAS and LAS is an unconformity.

Undifferentiated younger alluvium (Holocene Oxnard aquifer zone) and older alluvium (late Pleistocene Mugu aquifer zone) comprise the water bearing alluvial deposits in the UAS in the Mound Basin. The younger alluvium in the Mound Basin is composed of flood plain and active river deposits in the vicinity of the Santa Clara River, and fan deposits which mantle much of the remaining portion of the basin. These deposits are predominately interbedded, lenticular clays with some silts, sands, and gravels. Geotechnical Consultants, Inc. (1972) report a maximum thickness of approximately 290 feet near the southwest corner of the Mound Basin. These deposits unconformably overlie the older, late Pleistocene alluvium. In the nearby Oxnard Plain Basin, the younger alluvium is reportedly nearly 250 feet thick on average (Turner, 1975) and contains a permeable coarse-grained unit at its base (Oxnard aquifer). As the Oxnard aquifer zone in the Mound Basin is dominated by clay deposits, the coarse grained units tend to be more sparse and lenticular in nature.

Undifferentiated older alluvium (late Pleistocene) unconformably overlies the late Pleistocene San Pedro formation. Older alluvium can be divided into an upper and lower portion. The upper portion consists mainly of confining zones (clay and silty clay) with minor amounts of sand and gravel. Interstratified sand and gravel, with variable amounts of clay, comprise the lower portion of these deposits. In the Mound Basin this coarse-grained portion is thickest near the Santa Clara River and becomes generally thinner to the north toward the foothills. The coarse grained strata at the base of the older alluvium in the Mound Basin are considered equivalent to the Mugu Aquifer, which has been traced into the Mound Basin from the Oxnard Plain Basin. Most wells in the Mound Basin contain perforations in the Mugu Aquifer. Older alluvium reported thicknesses are variable ranging from approximately 125 feet (Geotechnical Consultants, Inc., 1972) in the eastern part of the basin to about 450 feet (Turner, 1975) near the coast. Borehole geophysical logs reviewed for this investigation (Figures 3-5, 3-6, and 3-7) suggest Mugu hydrostratigraphic unit thicknesses up to about 425 ft.

3.2 LOWER AQUIFER SYSTEM

The Hueneme and Fox Canyon aquifers are part of the late Pleistocene San Pedro formation with the Grimes Canyon aquifer being part of the early Pleistocene Santa Barbara formation.

The San Pedro formation deposits are upper Pleistocene in age and underlie the alluvial deposits in the Mound Basin along a marked angular unconformity. Exposures of the San Pedro formation occur in the foothills which form the northern boundary of the basin. They attain a maximum thickness of 2,300 feet in this region (Geotechnical Consultants, Inc., 1972). The thickness of the San Pedro formation is considerably less at the southern edge of the Mound Basin as a result of

complex folding and faulting and subsequent erosion in that area (Montalvo anticline). This is evidenced in oil well geophysical logs inspected by United Water. The maximum thickness of the San Pedro formation occurs at the axis of the Ventura syncline near the center of the basin. Oil well data show that the maximum thickness is approximately 4,500 feet (Yerkes et al, 1987; Fugro West, 1996).

Upper portions of the San Pedro formation contain variable amounts of clay, silty clay, and sand. A series of interbedded water-bearing sands in this section form the time equivalent of the Hueneme aquifer in the Oxnard Plain Basin. Structural complexities and erosion have removed a portion of these beds in the southern part of the Mound Basin. In the central and northern part of the basin e-log signatures indicate changes in the aquifer units compared to the Oxnard Plain. However, thick sections of the Hueneme aquifer (or its time equivalent) do occur in the Mound Basin, as oil well e-logs interpreted by United Water indicate variable amounts of aquifer materials. Some areas appear to be characterized by significant clays. Most of the deeper wells in the Mound Basin are perforated in the Hueneme aquifer.

Lower portions of the San Pedro formation consist principally of sand and gravel zones with variable thicknesses of interstratified clay and silt. In a northerly direction across the Mound Basin these coarser grained water bearing strata are somewhat lenticular and generally become thinner (Mann, 1959, Geotechnical Consultants, Inc., 1972). This predominantly sand and gravel zone located at or near the base of the San Pedro formation is known as the Fox Canyon Aquifer in the Oxnard Plain Basin and extends into the Mound Basin. These deposits occur at great depths in the Mound Basin and are generally not targeted for water production.

The Fox Canyon Aquifer is continuous and traceable across the Oxnard Plain. As discussed above these beds apparently partially pinch out and become more lenticular in a northerly direction across the Mound Basin. Exposures near the base of the San Pedro formation in the foothills on the north side of the Mound Basin do not indicate the same aquifer thickness, or sediment coarseness, as at the type location of the Fox Canyon zone on the south flank of South Mountain, located several miles southeast of the basin. Nevertheless, in the Mound Basin (and surrounding areas) the distinct borehole geophysical log signature of the Fox Canyon Aquifer can be used as an aid in defining the base of the San Pedro formation.

United Water created several cross-sections by correlating borehole geophysical data from oil wells and some water wells. Figure 3-5 is a location map for two cross-sections that cross the Mound Basin in a general southwest-northeast (Cross-section J-J'; Figure 3-6) and north-south orientation (Cross-section P-P'; Figure 3-7). Both cross-sections illustrate the spatial relationships between the hydrostratigraphic units in the Mound Basin. On Section J-J' the large stratigraphic offset between the second and third well on the southwest side of the profile likely represents the McGrath fault. At that location, there appears to be approximately 700 feet of throw on the top of the Santa Barbara formation with the up-thrown side on the south. It has put some Santa Barbara formation in contact with the San Pedro formation. However, there is still approximately 1,200 feet of San Pedro formation and alluvium above the Santa Barbara formation. Interestingly, offset across the Oak

Ridge fault is not readily apparent which may be a function, at least in part, of the log spacing (i.e., wells are far apart). The Oxnard and Mugu alluvial aquifers do not appear to have been offset by either the McGrath or Oak Ridge faults. Overall, the UAS and a significant portion of the LAS hydrostratigraphic units are continuous across these faults.

On the northeast half of Cross-section J-J', the depth to the bottom of the Hueneme aquifer zone and Fox Canyon aquifer zone (San Pedro formation) in the Ventura syncline are not resolved by the well data (the wells are not deep enough). The Hueneme and Fox Canyon aquifer zones are deeper than the available well log data. The northern leg of the Ventura syncline is very steep on the northeast side of the profile as it extends upward to form the foothills.

On the southern portion of Cross-section P-P' the Fox Canyon aquifer zone extends upward and is in contact with the Mugu aquifer. This is likely the expression of the Montalvo anticline. Part of the extreme upward extension of the Fox Canyon aquifer zone in that area may be due to the Oak Ridge fault. There is approximately 200 feet of offset in the Mugu aquifer zone between wells 02N22W08L01S and 02N22W08P04S which may be caused by the Oak Ridge fault or related splays. Typically the UAS aquifers are not offset by the fault except for this location. The Hueneme aquifer zone is missing between Wells 2N22W17G01S and 2N22W17Q04S. Geotechnical Consultants Inc. (1972) also indicate that structural complexities and erosion have removed the Hueneme aquifer zone in the southern part of the Mound Basin. However, it is present further to the south. The contact between the Fox Canyon aquifer (beneath the Oxnard Plain) and the thick section of Mugu aquifer might serve a source of recharge to LAS aquifers in the Mound Basin.

3.3 IMPACT OF STRUCTURAL FEATURES ON HYDROSTRATIGRAPHY

The hydrostratigraphy of the Mound Basin has been impacted by the development of the structural features such as folding (e.g., Venture syncline, Montalvo anticline) and/or faulting (e.g., Country Club fault, Oak Ridge fault, McGrath fault) that created the Mound structural basin. Some researchers have suggested that the major faults within the basin or basin bounding faults function as impediments to groundwater flow and in some cases as barriers to flow. In most cases, researchers have proposed that low permeability geologic deposits have been uplifted into a juxtaposed position with the aquifers. Review of the readily available literature (Section 2) on the structural geology provided insight into data used to develop the historical perspectives.

The top of the Montalvo anticline has been eroded and the truncated edges of the Hueneme aquifers may be in hydraulic communication with the shallower aquifer zones in that area. Such a contact likely serves as a source of recharge to aquifers in the Mound Basin under certain water level conditions (Fugro West, 1996).

No readily available research on the influence the faults themselves have on groundwater flow has been identified. Their impact on groundwater has not been quantified.

3.3.1 Country Club fault

The Country Club fault has been speculated to be significant barrier to groundwater flow on the eastern boundary of the Mound Basin. However, it only displaces a portion of the low permeability Santa Barbara formation against the aquifer rich San Pedro formation. GTC (1972) shows approximately 1,300 feet of the San Pedro formation and alluvium exists above the up thrown Santa Barbara formation at that location. Fugro West (1996) shows approximately 1,500 feet of San Pedro formation and alluvium on top of the up thrown Santa Barbara formation at that location.

With the San Pedro formation on both sides of the Country Club fault above the displaced Santa Barbara formation, the Country Club fault zone likely conducts groundwater flow. Approximately 1,500 feet of San Pedro formation and younger Quaternary alluvium is continuous across the top of the Country Club fault forming a section that is possible for groundwater flow and recharge to the Mound Basin. The deeper section of the fault where the Santa Barbara formation is in contact with the San Pedro formation may act as a groundwater flow barrier only at depths below a minimum of 1,500 feet. The fault is not considered to extend upward through the alluvium (GTC, 1972).

3.3.2 Oak Ridge fault / McGrath fault / Mound WN faults

Mann (1959) depicts (Figure 2-5) the low-permeability Santa Barbara formation plotted adjacent to the San Pedro formation for approximately 500 feet, at a depth of 900 feet below ground surface (bgs). Therefore, there would be some hydraulic connection in the San Pedro formation (aquifers of the San Pedro formation) for water to recharge or flow on both sides of the “Montalvo fault” for a thickness of 900 feet.

GTC (1972) shows that hydraulic connection could occur for a significant thickness (~2,300 feet) on both sides of the Oak Ridge fault. GTC’s McGrath fault extends upward through the San Pedro formation however it does not penetrate the 400 feet of alluvium above it. The fault does displace 500 to 600 feet of Santa Barbara formation adjacent to the San Pedro formation at a depth of 800 to 1,100 feet (depending on which of the cross-sections used). Accordingly, there may be significant hydraulic connection between the aquifers of the San Pedro formation across GTC’s McGrath fault. There is a thickness of 800 feet to 1,100 feet of San Pedro formation and alluvium overlying the highest up-thrown section of Santa Barbara formation. Therefore it is likely that there is flow in that zone and recharge to the Mound Basin.

Turner and Mukae (1975) cross sections show the San Pedro formation and overlying alluvium extending across both the Oak Ridge and McGrath faults for thicknesses of between 1,000 and 1,600 feet. Therefore there could be hydraulic connection between the aquifers of the San Pedro formation across both faults. Mapping in the California DMG Open File Report 76-5 (California Division of Mines and Geology, 1975) is very similar to Turner and Mukae (1975) as far as the surface mapping of the faults is concerned. However, the western section of the McGrath fault is located south of the Santa Clara River. In addition, the eastern section of the McGrath fault does not connect with the Oak Ridge fault. It is mapped to end before it merges with the Oak Ridge fault.

Cross-Section D-D' from Yerkes et al (1987) (Figure 2-3) is a full cross-section that extends north-south from the Ventura foothills past the Oak Ridge fault and shows insignificant stratigraphic offset along the Oak Ridge fault (approximately 100 feet). The cross-section shows the San Pedro formation as having a thickness of approximately 1,500 feet on both sides of the Oak Ridge fault overlying the low permeability Santa Barbara formation. This is a significant thickness for possible groundwater flow and recharge.

Yeats et al (1982) depict the San Pedro formation and most of its aquifers as continuous across the top of the Oak Ridge fault and extending between the Oxnard Plain Basin and the Mound Basin unimpeded by the Oak Ridge fault along the southern boundary of the basin. The McGrath fault (Yeats Montalvo fault) extends upward to shallower depths close to the land surface. However, the McGrath fault only traverses a small portion of the southern boundary of the Mound Basin. The shallower aquifer systems of the Oxnard Plain and Forebay Basins extend between the basins across the top of the fault. This configuration, for both faults, suggests hydraulic connection and flow to the Mound Basin from the Oxnard Plain Basin and Forebay Basin.

The seismic data presented in Fisher (2005) suggests that a 265 feet thickness of aquifer materials (below the sea floor) exist continuously across the top of the Oak Ridge fault several miles offshore (3.7 and 5.6 miles).

4 WATER LEVELS

Groundwater elevation records exist for nearly sixty wells located within the Mound Basin. A number of key wells have water levels dating to the late 1920s, allowing an evaluation of long-term water level trends within the basin. However, the distribution of wells is heavily skewed towards the southern half of the basin, with relatively few wells existing north of Telephone Road. In the western portion of the basin wells are concentrated along Olivas Park Drive and near the railroad tracks south of Highway 101. This distribution of active and historic wells complicates the assessment of potential mountain-front recharge to the basin from the north. The southern and eastern boundaries of the basin are defined by structural features, and water level records from adjacent areas help assess the nature of the basin boundaries in these areas. Water level trends for many wells within the basin are similar, with evidence of recharge from adjacent basins to the east and south. The main groundwater flow pattern is down the axis of the basin from east to west. The slope of the potentiometric surface within the basin is quite flat during dry periods and the gradient increases somewhat following periods of above-average rainfall. During dry periods, groundwater elevations in many wells fall below sea level.

A major structural feature of the Mound Basin is the Ventura syncline, with the axis following an alignment similar to that of Highway 126. Several wells are located near the axis of this syncline, providing water level information in the center of the basin. Recharge on the north flank of the structure is believed by some to be likely, where the San Pedro formation crops out in the foothills (Geotechnical Consultants, Inc., 1972). The influence of faulting along the northern margin of the basin is undetermined, but may limit the potential for recharge from the adjacent uplands. Water

level records are known to exist for only one well in the northern portion of the Mound Basin (well 02N23W01P01S, total depth 300 feet). Water level records are only available for the mid-1970s, when recorded water levels were about 100 feet higher than in other wells from the central portion of the basin. Monitoring well 02N22W07M03S was constructed in 1995, located near the intersection of Highways 101 and 126, and screened from 210-270 feet below grade. Groundwater elevations in this well are similar to those recorded earlier in well 02N23W01P01S, and show very little seasonal or annual variability (Figures 4-1 and 4-2). Samples from the monitoring well show water quality to be consistently very poor, supporting the water level record as evidence of a perched groundwater system (of unknown extent) in this vicinity. Water levels in the aquifer units that may exist on the north flank of the Ventura syncline are not known to exist. Test holes drilled near the mouth of Lake Canyon (near Foothill Road and Victoria Ave) in the early 1970s apparently did not penetrate productive aquifer units and were not completed as production wells.

The eastern boundary of the Mound Basin sits adjacent the western Santa Paula basin. This boundary between sub-basins of the Ventura Central basin is generally defined by the concealed trace of the Country Club fault (Turner, 1975 and Geotechnical Consultants, Inc. 1972). The geology of the western Santa Paula basin is structurally complex, and faulting and folding in this vicinity may complicate groundwater flow within the regional groundwater flow system down the Santa Clara River valley. Groundwater elevations in the western Santa Paula basin generally range from 80 to 140 feet above sea level, and individual wells in this area exhibit somewhat muted water level variability, common to groundwater discharge areas of the other sub-basins of the valley. Groundwater elevations in three wells (02N22W09K05S, -09L03S and -09L04S) near Kimball Road in the eastern Mound Basin are similar to those recorded in the western Santa Paula basin, and are some 40 to 80 feet higher than other nearby wells (Figure 4-4). The high heads in these three deep wells may suggest some aquifer zones have a better connection to the Santa Paula basin. A fourth well located south of the Oak Ridge fault and in section 02N22W09 has a record of groundwater elevations in the 1970s approximately 20 to 30 feet higher than nearby wells. However, recorded groundwater elevations in shallower wells in the eastern Mound Basin are often 80 to more than 100 feet lower than those in western Santa Paula. This differential in head produces a large hydraulic gradient across the basin boundary, and likely results in groundwater flow from the Santa Paula to the Mound Basin. The magnitude of this flow, however, remains unquantified.

Along its southern margin, the Mound Basin sits adjacent to the Oxnard Forebay in the east and the Oxnard Plain to the west. A number of past researchers adopted the Montalvo anticline as the southern boundary of the Mound Basin, and this same feature has been mapped by others as the Montalvo fault or McGrath fault (Mann, 1959 and Geotechnical Consultants, Inc. 1972). More recently, others have refined the existence and location of the Oak Ridge fault about 4,000 feet to the north (Figure 2-2 geology section), and argue this is a more appropriate southern boundary for the Mound “structural” basin (Yerkes et al, 1987, Yeats et al, 1988). This more northern interpretation of the basin structural boundary leaves few production wells in the central portion of the Mound Basin. Historic water level records exist for a few wells located in the area north of the Oak Ridge fault, but the amount of water produced from these older wells is unknown. In the early

1980s municipal pumping in section 02N22W08 increased rapidly, reaching 3,000 acre-feet in 1984 and averaging slightly more than this amount annually through the end of 2010. Groundwater elevations around 40 feet above sea level were common in this area throughout the 1970s, but rare in years since (Figure 4-1). Regardless of this change in pumping in the area, a long-term profile of groundwater elevations from selected wells located near the axis of the basin shows a fairly consistent and gradual decline in heads from east to west [from the Kimball Road area to the coast near Ventura Harbor (Figures 4-5 and 4-6)]. Significant agricultural pumping also exists in the areas east and northeast of the harbor.

The annual water level responses for the wells located south of the Oak Ridge fault are similar, with the more eastern wells (up-gradient wells) having higher heads than the wells closer to the coast (Figures 4-7 and 4-8). Deeper wells throughout the basin tend to have lower groundwater elevations, but recorded water levels in most Mound Basin wells tend to converge during dry periods. In periods of drought, water elevations in many wells in the central portion of the basin fall below sea level. Contouring of water levels in the central portion of the basin is difficult given the poor distribution of wells and a common variability in water levels among nearby wells of up to 20 feet.

Comparison of water level records from the northern Forebay/Oxnard Plain and the area between the Montalvo Anticline and the Oak Ridge fault of Yerkes and Yeats appear to support the appropriateness of the more-northern boundary. Contouring of available groundwater elevations from wells south of the Oak Ridge fault generally show a relationship with those from adjacent areas to the south, namely, the former “Zone C” area north of the Santa Clara River and the northern Oxnard Plain in areas south of the Santa Clara River (Figures 4-7 and 4-8; Appendix B). Wells located north of the Montalvo anticline and closest to the Forebay (e.g., well 02N22W16K01S) predictably exhibit the greatest annual variability, but the range of recorded water levels is less than that in wells in the main recharge areas of the Forebay. Groundwater flow to the Mound basin from the Forebay and northern Oxnard Plain has been noted in older reports, but also noted was reduced opportunity for recharge north across the Montalvo anticline during times of depressed groundwater elevations on the Oxnard Plain (GTC, 1972; Fugro, 1996). United Water’s contouring of water levels north of the Montalvo anticline support these prior findings, showing good agreement with water levels in the northern Forebay and Oxnard Plain in the spring of some recent wet years (e.g., 2001, 2005). Contouring also suggests that during drier periods the southern strip of the Mound basin (located south of the Oak Ridge fault and north of the Montalvo anticline) exhibits heads that are commonly 5 to 15 feet lower than those to the south, with the head differential between the basins increasing towards the coast.

The contouring of past water level conditions is complicated at times by sparse data. Increased collection of water level records is recommended in this greater area in order to better define groundwater gradients between these adjacent basins. The recent installation of monitoring wells north of the Santa Clara River near the northwestern margin of the Forebay should be helpful in better defining the flow of groundwater from the Oxnard Forebay to areas north of the Montalvo anticline. However, relatively few wells exist along the southeastern portion of the Mound basin, an

area of sparse well records and known structural complexity. In recent times no active production wells have been located within a mile of the coast, so in 1995 United Water and the City of Ventura jointly funded the installation of three monitoring wells at Marina Park near the north side of Ventura Harbor to assess groundwater conditions near the ocean. Artesian conditions are common in the shallowest of these wells, screened 170 to 240 feet below the land surface. Heads 20 feet above the land surface are commonly recorded, suggesting recharge from the Ventura foothills to the north. In fall 2004 water levels in most wells in the western Mound Basin were below sea level, but heads in this well remained high. No active wells in the area are screened in this shallow aquifer zone. A deeper well at Marina Park (screened 480-660' deep) commonly displays weak artesian conditions, and recorded heads six feet below sea level in 2004. The deepest well at this site rarely has artesian flow, but often has groundwater elevations above sea level. In the agricultural area east of Ventura Harbor, production wells record water levels below sea level in dry periods (Figure s 4-9 and 4-10). Heads of 25 feet below sea level were recorded here in 1991, and 14 feet below sea level in 2004.

As discussed in this chapter and the hydrostratigraphy chapter (Section 3), the Mound Basin is structurally complex. The current distribution of wells and water level records within and surrounding the basin allows an imperfect understanding of groundwater source and movement in some locations. Available information indicates the Mound Basin receives groundwater recharge from both the Santa Paula basin to the east and the Oxnard Forebay/ Oxnard Plain to the south. Overall, water levels in many wells respond in similar fashion to wet and dry periods. Gradients within the basin remain fairly flat most of the time. Water levels tend to vary among nearby wells, with deeper wells often having lower groundwater elevations. Groundwater production is concentrated in several areas with the basin, creating the potential for pumping interference in some water level measurements. In some production wells, the large distance to water may lead to occasional errors in water level measurement.

5 GROUNDWATER EXTRACTION

Much of the Mound groundwater basin lies within the boundaries of the City of Ventura. The Downtown, Midtown and West Side areas of the City fall within the boundaries of Casitas Water District, and water supplied to these areas source from Lake Casitas and various City wells located near the community of Casitas Springs. Areas south and east of Midtown Ventura fall within the boundary of United Water Conservation District. The City chose to concentrate Mound Basin pumping in the area near the Ventura County Government Center. Deep municipal wells were constructed here in 1975, 1994 and 2000, and since 1982 the great majority of municipal pumping in this central portion of the basin has been from the City's wells. The City also operates high-capacity production wells near the San Buenaventura Golf Course on the Oxnard Plain, and pumps water north to businesses and residents located in the Mound Basin. Other areas in the eastern portion of the City receive water from a production well in the Santa Paula basin.

Historically, agricultural pumping has been the majority water user in the Mound Basin, and agricultural pumping totaled nearly 70 percent of reported pumping in calendar year 2010. Agricultural pumping is concentrated in three main areas of the basin: farmland near Olivas Park Drive in the south, the agricultural areas east of Ventura Harbor, and the so-called Serra area extending southeast from the southern terminus of Kimball Avenue (Figure 5-1). A fourth agricultural area, located north of Hwy 126 and west of Kimball Avenue, is served by water imported from the Santa Paula basin. These areas of agricultural land use have not been incorporated by the City and are not served by the City's potable water system.

The distribution of historic pumping between agricultural and municipal uses in the Mound Basin is displayed in Figure 5-2. The city's pumping generally increased through the 1980s, and was variable in the 1990s. Municipal pumping peaked in 2003 at over 5,500 acre-feet, and has declined fairly steadily in recent years. Since the mid-1980s agricultural pumping has averaged nearly 4,200 acre-feet per year, with peak annual production of 5,850 AF recorded in 1990. The above pumping totals are for the Mound Basin defined as the area north of the Montalvo anticline. If the Mound Basin were defined as the area north of the Oak Ridge fault, pumping along Olivas Park Drive would be included with Oxnard Plain pumping totals. In this case, 2010 pumping would total 4,630 AF, with agricultural usage totaling 64 percent of the reported pumping.

6 WATER QUALITY

While the quality of the groundwater produced by most wells within the Mound Basin is suitable for municipal and agricultural uses, the basin is not known for the high quality of its groundwater. The Geotechnical Consultants, Inc. (1972) investigation of the Mound Basin noted structural complexity and the lenticular nature of many San Pedro Formation sediments within the basin, and suggested connate waters continue to impair water quality in many zones. Structural deformation and the less-continuous nature of highly permeable deposits within the basin (compared to nearby basins) have likely inhibited the flushing of poor-quality waters from the basin. Water quality is variable between wells, and many records indicate somewhat elevated concentrations of TDS, sulfate, hardness and other analytes. Water quality appears to be relatively stable among many of the Mound basin wells having long-term water quality records. Available records from wells near the coast do not show evidence of saline intrusion.

Relatively few dedicated monitoring wells exist in the Mound Basin. Six monitoring wells, jointly funded by United Water and the City of Ventura, were installed in 1995. One nest of wells exists at Marina Park, at the north side of the Ventura Harbor. Water quality in these three wells has been fairly stable since the wells were installed. The deepest well, screened 970 to 1070 feet bgs, routinely records TDS concentrations near 1,300 mg/l and sulfate concentrations of approximately 500 mg/l. A shallower well, screened between 480 and 660 feet below the surface, records slightly better water quality, with TDS around 900 mg/l and sulfate around 400 mg/l. The shallowest well at this location, well 02N23W15J03S, is screened from 170 to 240 feet bgs has the poorest water quality. In this shallow well TDS concentrations are above 3,000 mg/l and chloride values average

nearly 100 mg/l. As noted in the previous section on water levels, strong artesian heads are consistently recorded in this well. The high heads in this well suggest offshore groundwater gradients in this vicinity. Near-shore submarine canyons, such as those that exist near Port Hueneme and Point Mugu, do not incise the offshore portion of the Mound groundwater basin. The absence of near-shore canyons, high heads in coastal wells and the lack of active production wells near the coast results in a minimal threat of saline intrusion under current basin conditions.

A second cluster of three monitoring wells was installed at Camino Real Park in the central portion of the basin. Sampling of these wells has resulting in the only water quality records known to exist for wells located north of Highway 126. As with the Marina Park wells, mineral content is slightly higher in the deeper San Pedro unit (screened 1,200 to 1,280 feet bgs) than in a shallower zone (screened 710 to 780 feet bgs). In the deeper screened interval TDS concentrations of 1,100 mg/l are commonly recorded. TDS is generally less than 1,000 mg/l in the shallower screened well CP-780 (Figure 6-1). Sulfate anions account for about half of the total mineral content of the water as is typical for other wells in the basin.

The shallowest of the three wells at the Camino Real Park site (screened 210 to 280 feet bgs) records some of the worst groundwater quality in the basin. TDS in this well sometimes exceeds 5,000 mg/l. Chloride and nitrate are also found at high concentrations in this well. These analytes are rarely elevated in other Mound Basin wells. Groundwater elevations are very stable in this well and are also much shallower than in other nearby wells. The anomalous groundwater elevations and water quality from this well suggest perched groundwater conditions, or an aquifer zone otherwise isolated from aquifer units utilized for groundwater production elsewhere in the basin.

The two newest monitoring wells in the Mound Basin were installed near Kimball and Telegraph Roads in 2008 as part of a siting study for a potential new production well for the City of Ventura (Hopkins Groundwater Consultants, Inc., 2008). Limited samples exist for these wells to date. The shallower well (screened 480 to 510 feet bgs) records very poor water quality. A recent sample recorded TDS of 6,300 mg/l, sulfate of 3,700 mg/l and hardness of 2,650 mg/l. Nitrate and chloride concentrations were also high. The deeper well (screened 890 to 950 feet bgs) records water quality more typical of wells within the basin. Both of these wells have groundwater levels higher than some other surrounding wells. It is unclear at this time whether the higher heads are related to groundwater recharge from the nearby Santa Paula basin, or associated with aquifer zones that are poorly connected with other permeable zones within the stratigraphic section that are currently utilized for groundwater production.

Municipal pumping in the Mound basin is concentrated in section 02N22W08 with production wells located around the perimeter of the Ventura County Government Center. The City's Victoria 1 well was constructed in 1975 with five screened intervals within the depth range of 460 to 1,405 feet below ground surface. Water quality was very consistent in this well from the early 1980s through the 1990s, with TDS commonly measured near 1,500 mg/l. In the late 1990s production shifted to the new Victoria 2 well and sampling of Victoria 1 became infrequent as the well was maintained in standby status. A few samples in 2001 and 2002 did however show a distinct increase in dissolved

mineral content, with TDS peaking above 2,000 mg/l and sulfate approaching 1,200 mg/l. The nearby Victoria 2 well (02N22W08F01S) has two screened intervals (580-640 and 900-940 feet bgs). Water quality records from this well show a steady long-term decline. Early TDS concentrations of less than 1,000 mg/l slowly increased to values of 1,400 to 1,800 mg/l common to recent samples (Figure 6-2). A third well, Mound 1, was constructed in 2000 (screened 580 to 650 feet bgs) and began reporting production in 2003. Water quality records from 2006 to 2011 show fairly consistent TDS concentrations of around 1,800 mg/l, with some samples exceeding 2,000 mg/l. The cause of the water quality changes in this vicinity is not readily apparent. The multiple screened intervals in the Victoria 1 well do however provide an opportunity for depth-dependent water quality sampling. Sampling devices are now available to measure both water quality and groundwater production from various depths within an active production well. This type of information might assist the designers of future wells in this area in avoiding aquifer zones of poor water quality.

Water quality samples from wells in an area of former municipal pumping, the Montalvo area in the southern portions of Section 02N22W17, record a period of significant deterioration in water quality. Quality problems began in the early 1970s and continued through the 1980s. Pumping records are not available prior to 1980, so it is unclear if water quality changes in this vicinity were related to an increase in groundwater pumping in the 1970s. A peculiarity of these records is that chloride concentrations rose along with TDS and sulfate.

A map showing recorded TDS concentrations in Mound basin wells from 2011 is shown as Figure 6-3. The map plots TDS (by summation) from production well samples collected by the Groundwater Section of the Ventura County Watershed Protection District, as well as TDS (by residue) as sampled by United Water and the City of Ventura. It is easily seen that without the sampling by the County's Groundwater Section, coverage in the basin would be very poor. The distribution of sampled wells within the basin for 2011 is better than in most prior years. TDS in the production wells ranged from 1150 to over 2,200 mg/l. Also shown is sulfate sample results from 2011 (Figure 6-4). These two maps show that sulfate commonly contributes roughly half the TDS in these samples, and water quality results are often variable among nearby wells.

Mapping the maximum values of all available water quality samples for Mound basin wells reveals that many of the highest chloride concentrations are recorded in wells located near mapped faults in the southern portion of the basin (Figure 6-5). Many of these high values are likely associated with times of drought, but some may be outlier records from individual wells. The maximum-recorded chloride concentrations from the 2011 calendar year are shown in Figure 6-6. One production well located near the intersection of highways 101 and 126 recorded chlorides above 100 mg/l, a target water quality threshold for many agricultural operations.

Many of the active wells in the basin are operated for agricultural water supply and sampling of these wells tends to be less consistent than in the public supply wells. If samples are collected, the results often are not shared with regulators or water management agencies. A good water quality record does exist for well 02N22W16K01S. This well is located east of Harmon Barranca and just

north of the mapped location of the Montalvo anticline axis. Water quality records for this well exist for the years 1953 through 1997. The water quality record shows some variability (upward deflections) but no clear trending over the period of record. This well is screened from approximately 290 to 350 feet bgs. Water quality in this well is relatively good, with most recorded TDS concentrations less than 1,200 mg/l. In the western basin near Ventura Harbor, well 02N23W14K01S provides another example of a well with good water quality for the period of record from 1933 to 1981. Concentrations for most analytes are fairly stable, with TDS concentrations averaging less than 1,200 mg/l (Figure 6-7). This agricultural well is screened from 475 to 915 feet bgs. One outlier record of elevated chloride exists from 1962. This outlier of 376 mg/l is shown just inland of Ventura Harbor in Figure 6-5. Otherwise the records from this coastal production well show no evidence of saline intrusion.

7 DISCUSSION

There are a limited number of wells within the Mound Basin. Wells are absent along the northern portions of the basin, and the western extent of the basin also lacks wells as this area is supplied by surface water and groundwater from Ventura River valley. Some public supply wells exist in the central portion of the Mound basin but significant quantities of groundwater are imported from Oxnard Plain to the south, in part due to the better water quality associated with those wells. The amount of data available for characterization of basin conditions is somewhat limited. The water supply scenario for the Mound Basin is atypical for the region, with groundwater imports from three adjacent basins. The other basins managed by United Water are dominated by agricultural land use with some urban environment. The Mound Basin is dominated by the urban environment of the City of San Buenaventura and surrounded by some agricultural lands. Pumping records indicate that agricultural pumping often exceeds municipal pumping in the Mound basin.

The Mound basin is a complex basin due to its physical and geologic setting. Characteristics of the Mound Basin are different than most of the other basins that are managed by United Water. Despite its unique characteristics the Mound Basin shares similar hydrogeologic dynamics and processes with the other basins in the Santa Clara River Valley and Oxnard Plain.

The present day boundaries of the Mound Basin consist of: the Ventura foothills/Ventura fault to the north, the Country Club fault to the east, the Pacific Ocean to the west, and the Montalvo anticline to the south. The Oak Ridge fault runs sub-parallel to the Montalvo anticline approximately one half to one mile north of the anticline. Although the Montalvo anticline is presently used for the southern boundary it has been suggested that perhaps the Oak Ridge fault should be used for the southern basin boundary. Yerkes et al (1987) state that the Oak Ridge is a zone of faulting that forms the southern boundary of the Ventura synclinal trough in the western Ventura Basin (Mound groundwater basin) rather than the Montalvo anticline. Since the basin is characterized by faults along the northern and eastern boundaries it is arguable that the southern boundary should be defined by a fault, forming a consistent structural architecture to the basin rather than a geographical basin for groundwater management. Groundwater elevations in the zone between the

Oak Ridge fault and the Montalvo anticline are responsive to water levels in the Oxnard Forebay, especially during periods of above-average recharge in the Forebay.

There are some appreciable offsets of geologic formations across the faults bounding the Mound Basin. Several previous studies by others and recently reviewed borehole geophysical data suggest that the low-permeability Santa Barbara formation does not extend to sufficiently shallow depths to impede groundwater flow across the faults or above the faults. In most cases the faults do not extend close enough to the surface to disturb San Pedro or alluvial sediments. In those cases, there is a significant thickness of the San Pedro formation (aquifer materials) existing on both sides of the faults. The degree of aquifer offset is site-specific along the trace of the faults, however, there are significant data to suggest that the UAS and to a somewhat lesser degree the LAS, are continuous across most of the basin-bounding faults. This implies that the hydrogeological boundaries of the basin are not necessarily coincident with its' structural boundaries and that there is hydrologic connection between the Mound basin and the adjoining groundwater basins.

The nature of the faults themselves as an impedance to groundwater flow is not known. However, groundwater flow and basin recharge across these zones is most probable. Recharge from the Oxnard Plain basin, Forebay basin, and Santa Paula basin into the Mound Basin is likely occurring across the geologic features that currently delineate the Mound basin. Groundwater flow within the basin is generally east-to-west, and groundwater flows from recharge areas to surrounding down-gradient areas. These recharge and flow dynamics are consistent with the accepted and well-documented groundwater flow systems in the Oxnard Forebay/Oxnard Plain and other coastal California basins.

In the Mound Basin water levels in many wells respond in similar fashion to wet and dry periods. Gradients within the basin remain fairly flat most of the time and water levels tend to vary somewhat among nearby wells. Deeper wells often have lower groundwater elevations. Records of groundwater samples from Mound basin wells reveal that salt concentrations are somewhat elevated compared to adjacent basins, but the water is generally suitable for municipal and agricultural uses. Although groundwater flow may occur through areas where interconnected or continuous aquifer materials exist, the less-continuous lens-like nature of some highly-permeable deposits within the basin (compared to nearby basins) have likely inhibited the flushing of poor-quality waters from the basin (possible connate waters). Active production wells are not currently located near the coast, and available records from coastal wells do not show evidence of saline intrusion.

Since there is somewhat limited data for characterization of the Mound basin, it is recommended that some additional studies be performed to better define basin conditions. One study would be to assess and better characterize the Country Club fault. Geophysical surveys (TDEM) can be utilized across the assumed location of the Country Club fault. Since the Santa Barbara formation is easily recognizable in electric logs (very low resistivity), its depth along a profile or profiles extending from the Santa Paula Basin into the Mound Basin may be defined using this technique. From that data

the actual location of the Country Club fault and the throw on the fault might be resolved. This would provide information regarding the thickness of the San Pedro formation above the up-thrown Santa Barbara formation. Once those data are resolved a pump test could be conducted with a pumping well on one side of the fault and observation wells on both sides of the fault. This type of study can furnish information on flow dynamics on both sides of the fault and across and/or over the fault. A similar study could also be conducted in the vicinity of the Oak Ridge fault.

Additional study is also warranted in the southern portion of the basin, in the greater area surrounding the Montalvo anticline and the Oak Ridge fault. This area of geologic complexity likely provides significant recharge to the Mound basin. The complexity of the zone appears to influence water quality as well, with some of the basin's highest historical chloride concentrations located in this area. A number of active wells currently exist in this area, but data collection from these wells has been poor or inconsistent to date.

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9 APPENDIX A – GENERAL FIGURES

Figure 1-1: Map of Basins Managed by United Water Conservation District.

Figure 1-2: Map Showing Boundaries of the Mound Basin.

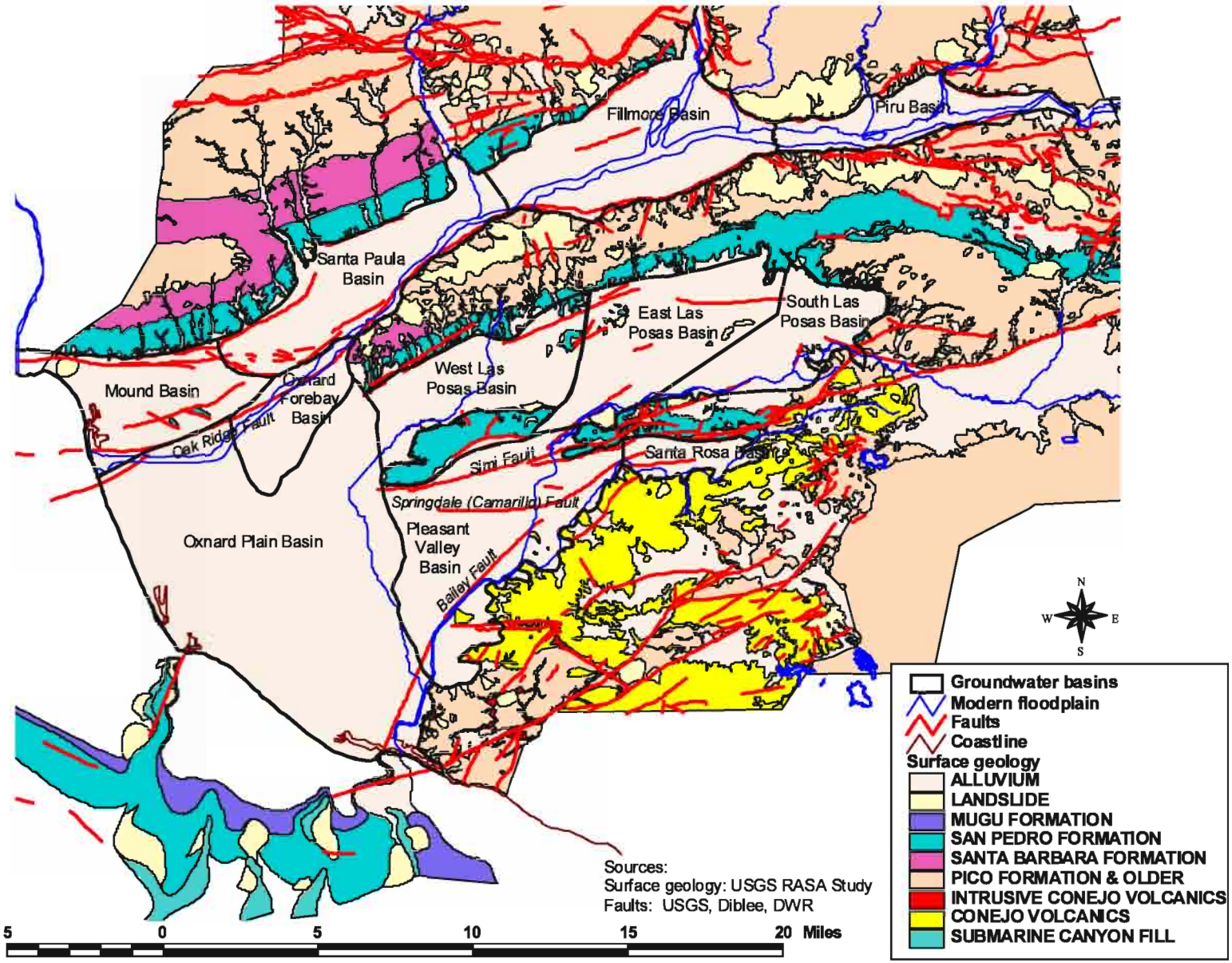


Figure 2-1: Overall geologic map showing groundwater basins including the Mound Basin.

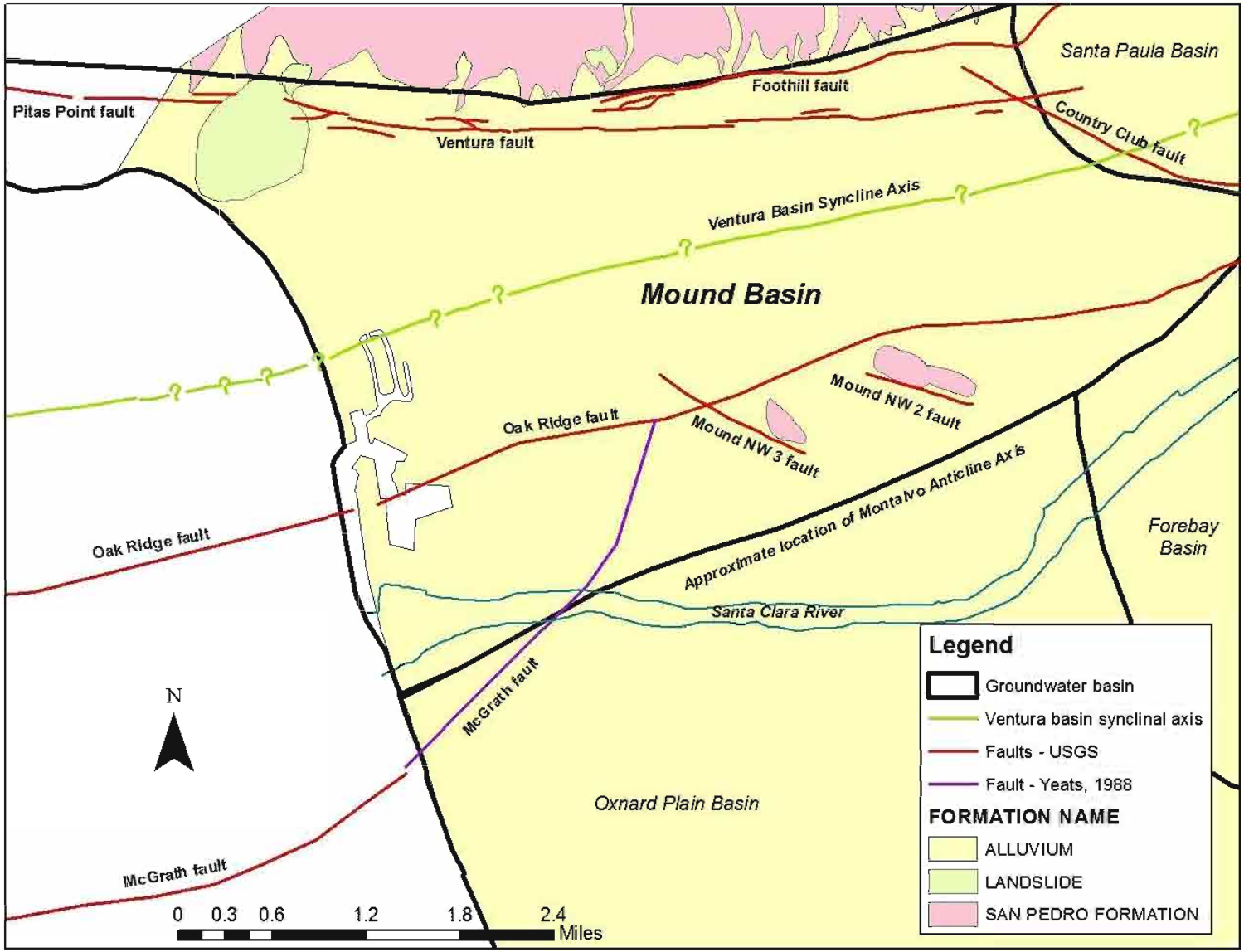


Figure 2-2: Generalized geologic map of the Mound Basin.

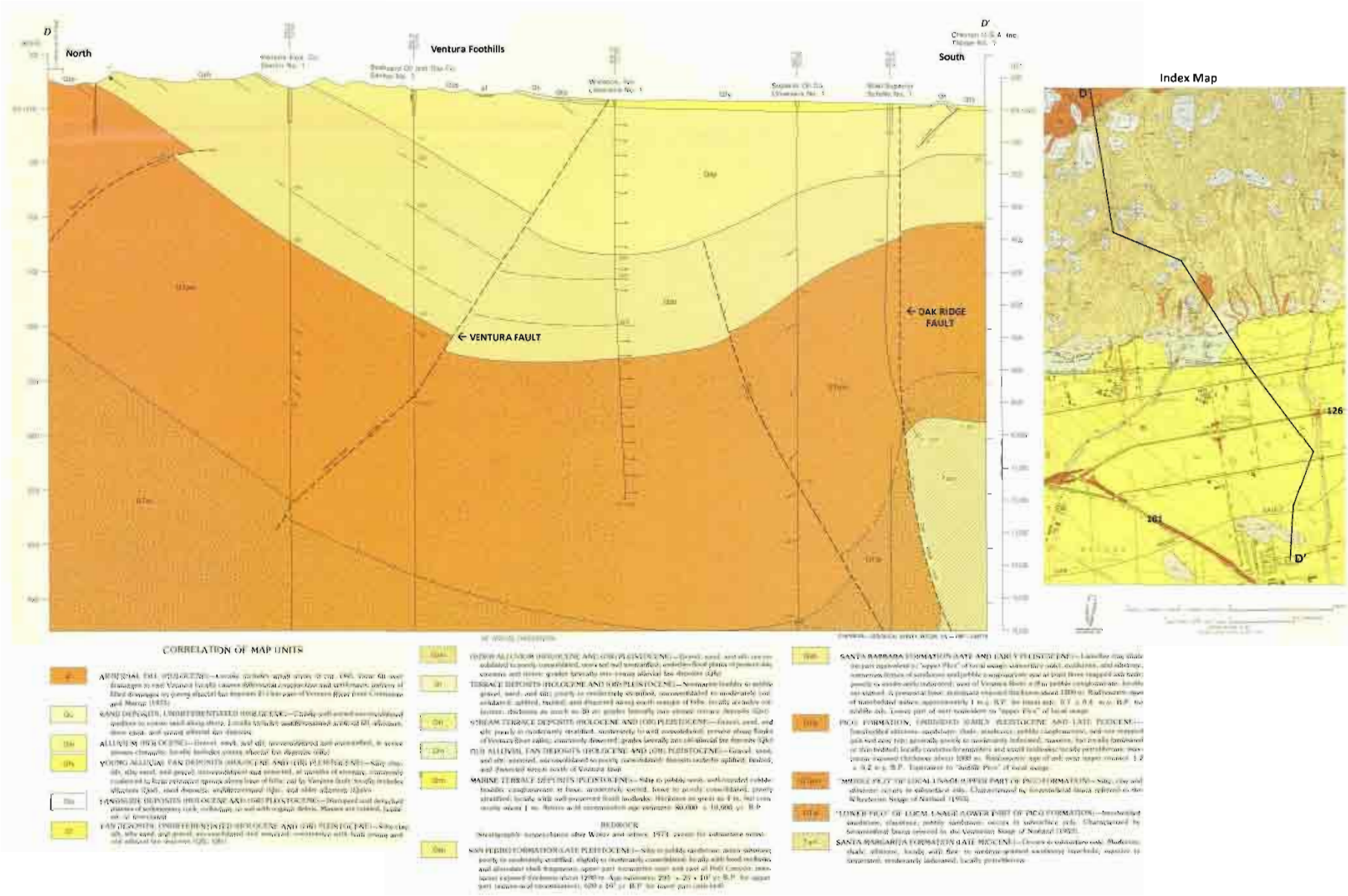


Figure 2-3: Cross-section of the Mound Basin showing the Ventura fault and Oak ridge fault interpretations (Yerkes et al, 1987).

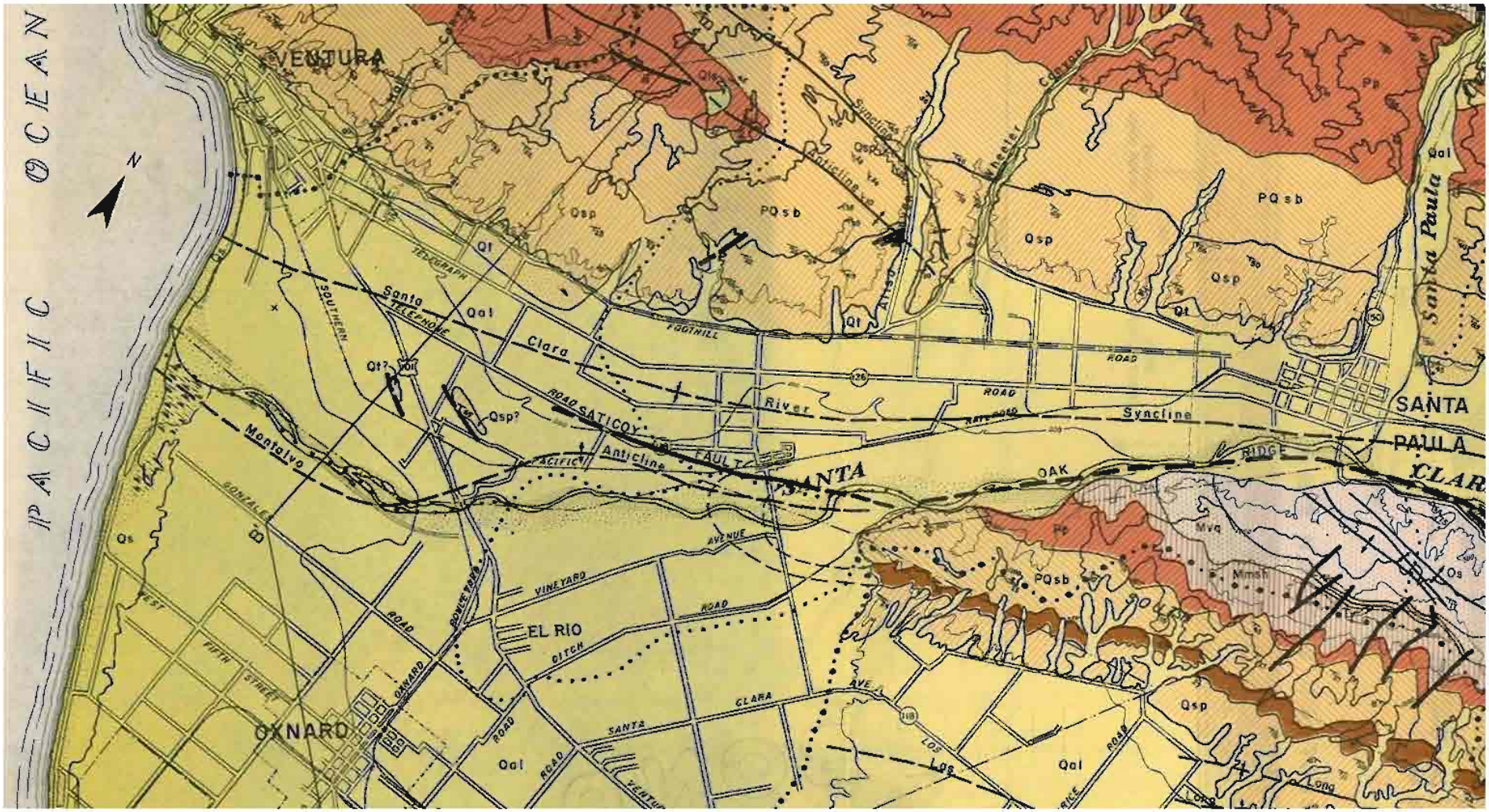
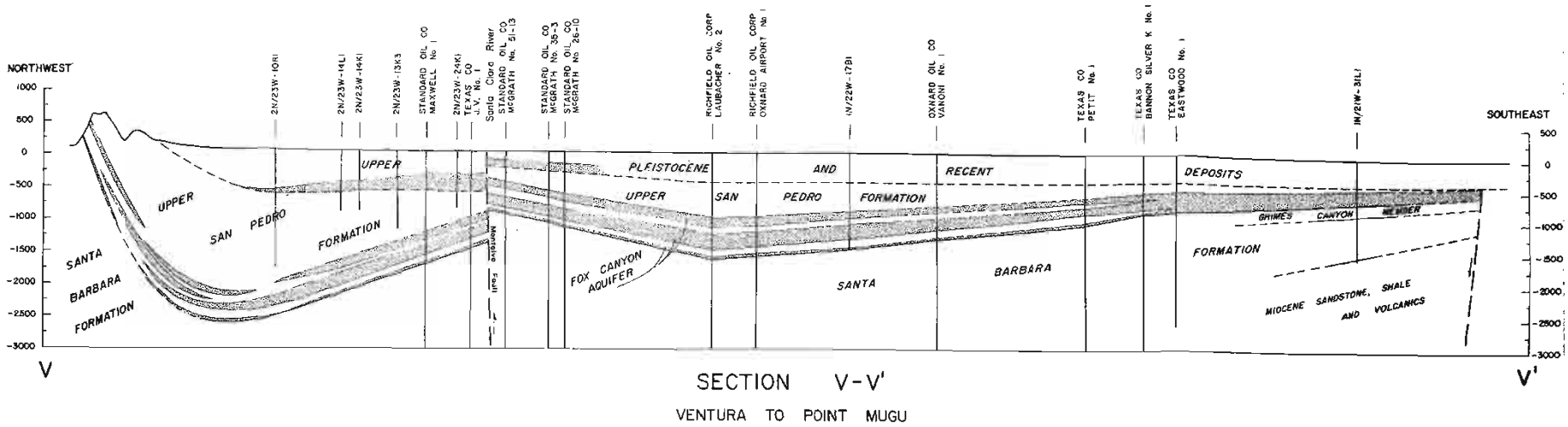


Figure 2-4: Map showing Oak Ridge fault near Santa Paula leading to the "Saticoy Fault" on the eastern side of the Mound Basin (California State Water Resources Board, 1953).



SECTION V-V'

VENTURA TO POINT MUGU

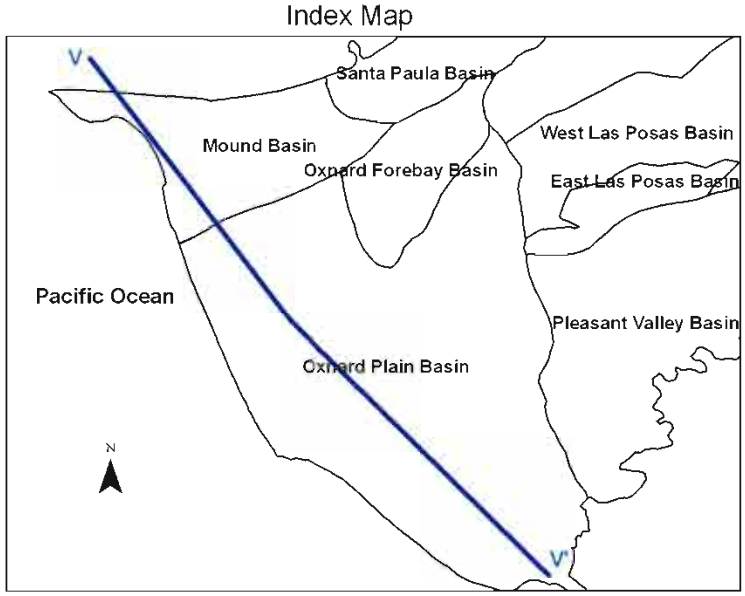


Figure 2-5: Cross-section taken from Mann (1959). The Montalvo fault is shown to form the southern boundary of the Mound Basin. Note that the Ventura fault is not shown.

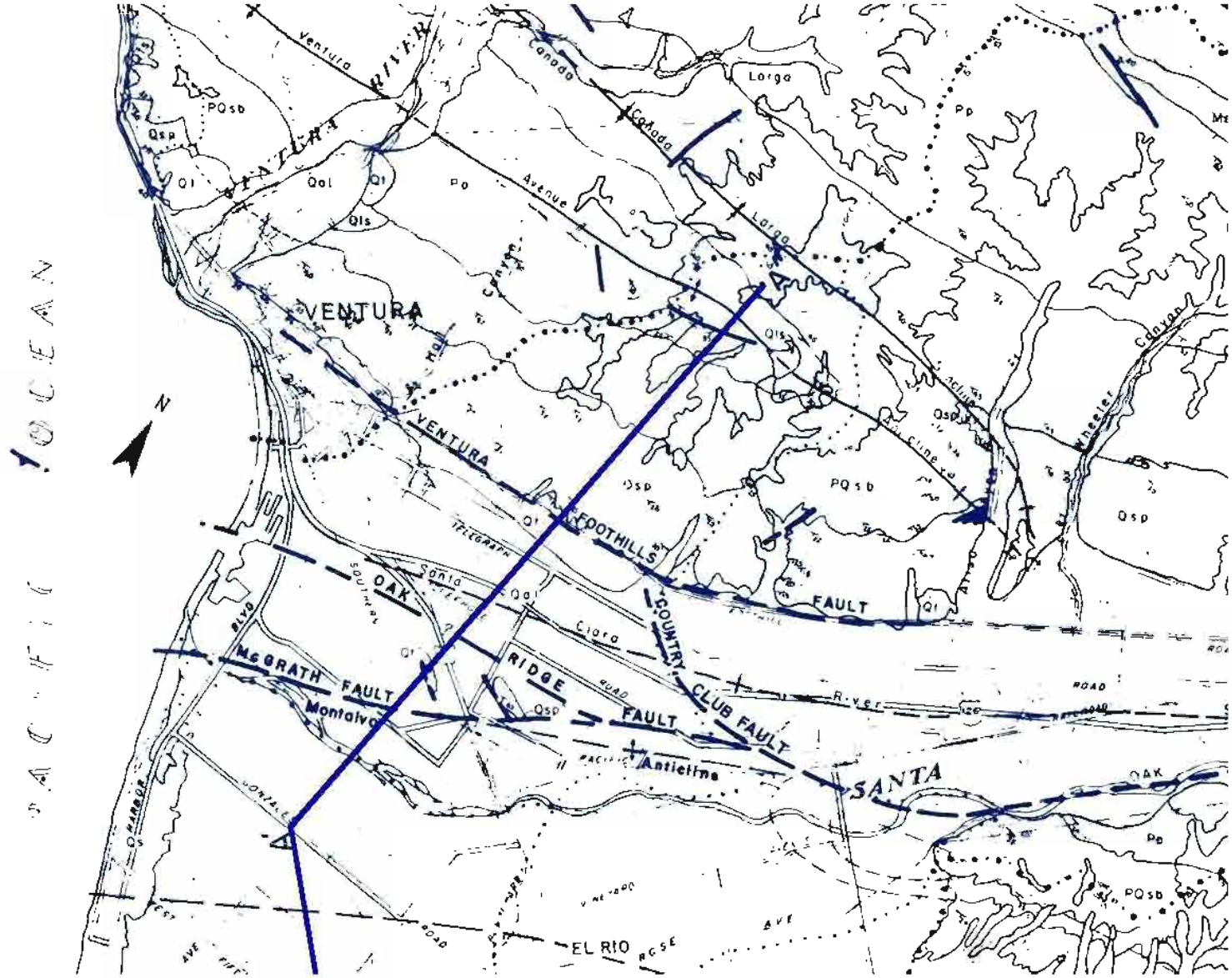


Figure 2-6: Turner and Mukae (1975) map showing Oak Ridge fault and McGrath fault. The Montalvo anticline is shown which forms the southern boundary of the Mound Basin. The location of cross-section A-A' is also shown.

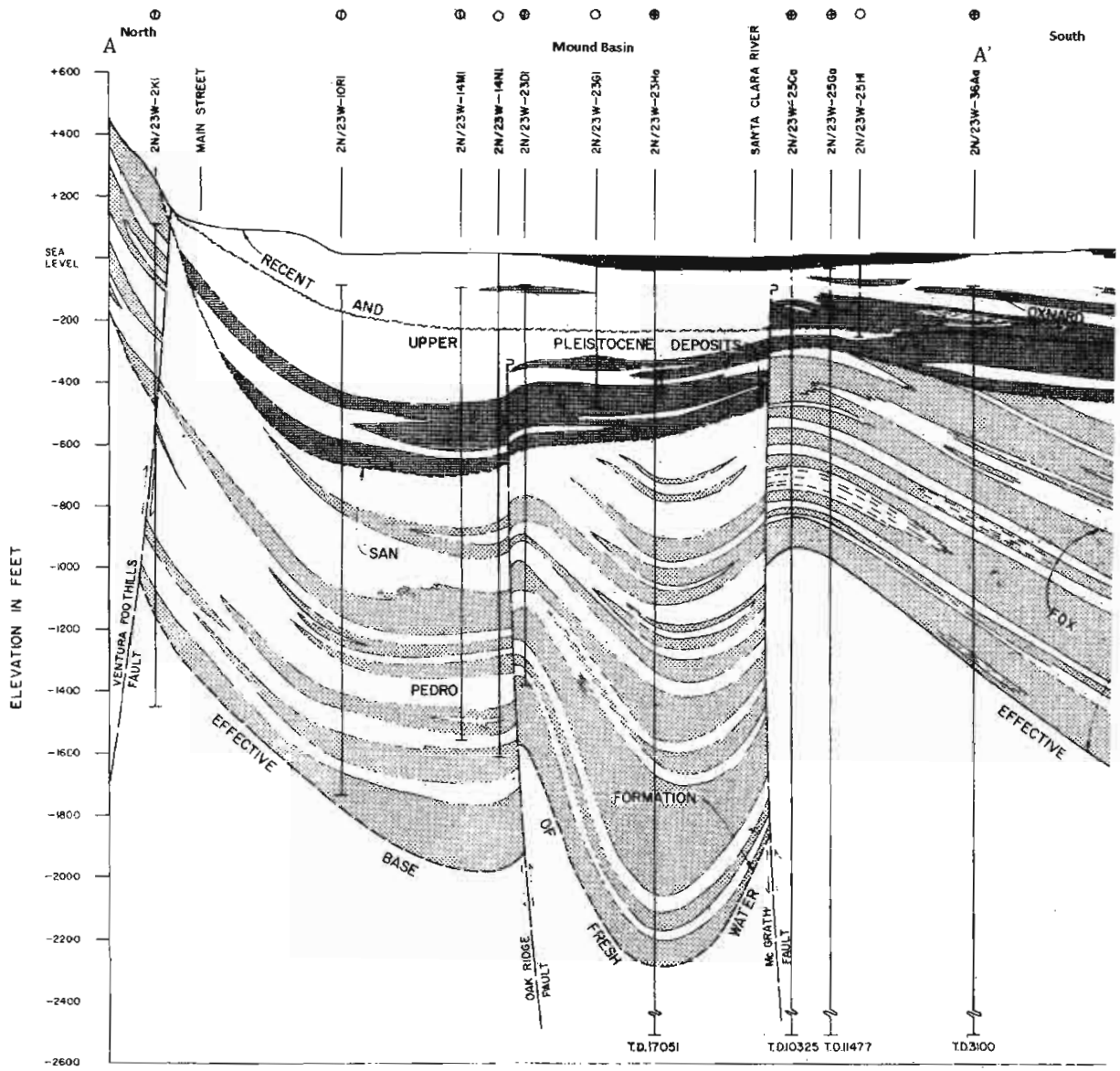


Figure 2-7: Turner and Mukae (1975) cross-section A-A' of Mound Basin near the coast showing the Oak Ridge fault and McGrath fault.

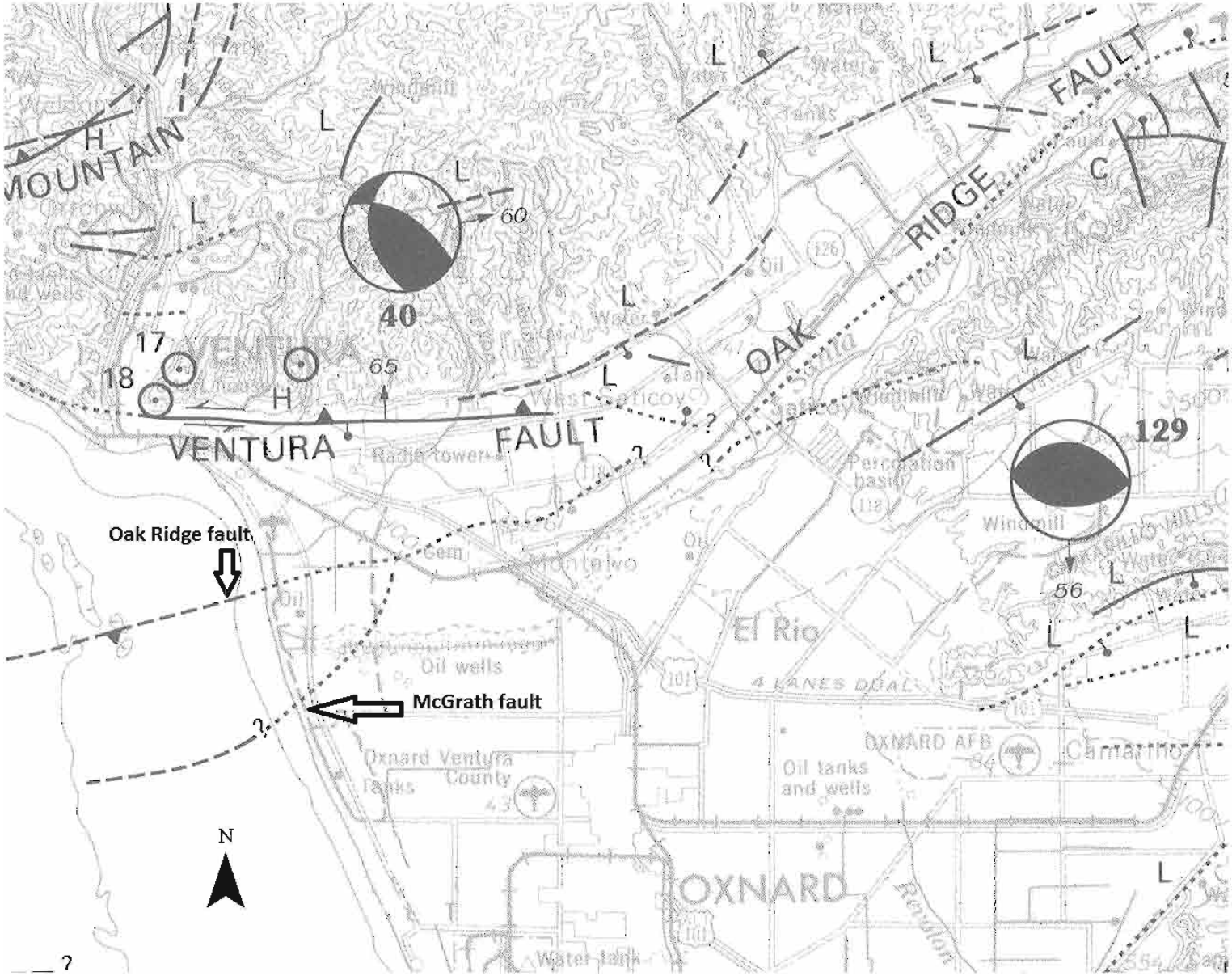


Figure 2-8: Yerkes et al (1987) map showing the Oak Ridge fault and McGrath fault.

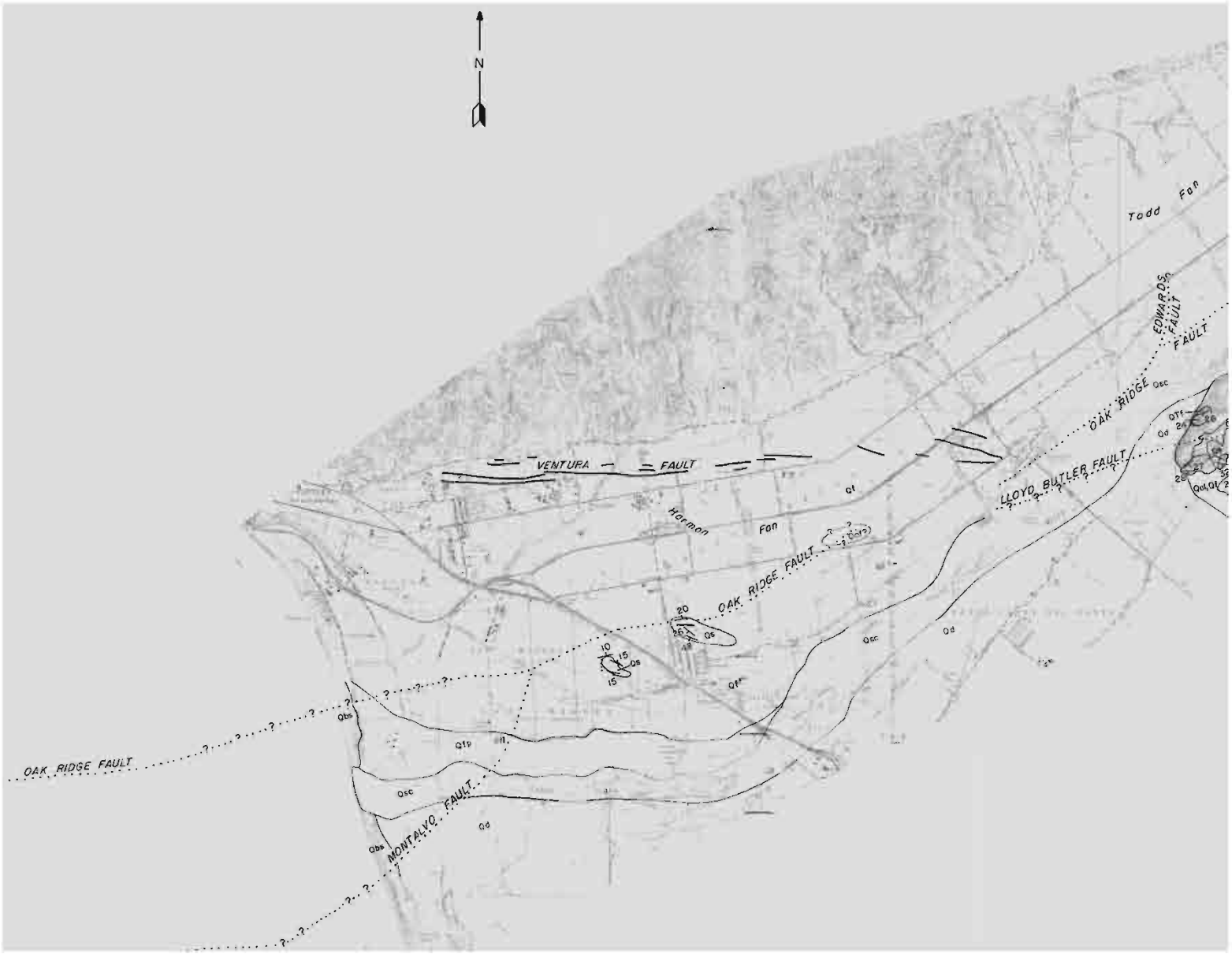


Figure 2-9: Yeats et al (1988) map showing the Oak Ridge fault and McGrath fault. Yeats refers to the McGrath fault as the "Montalvo" fault.

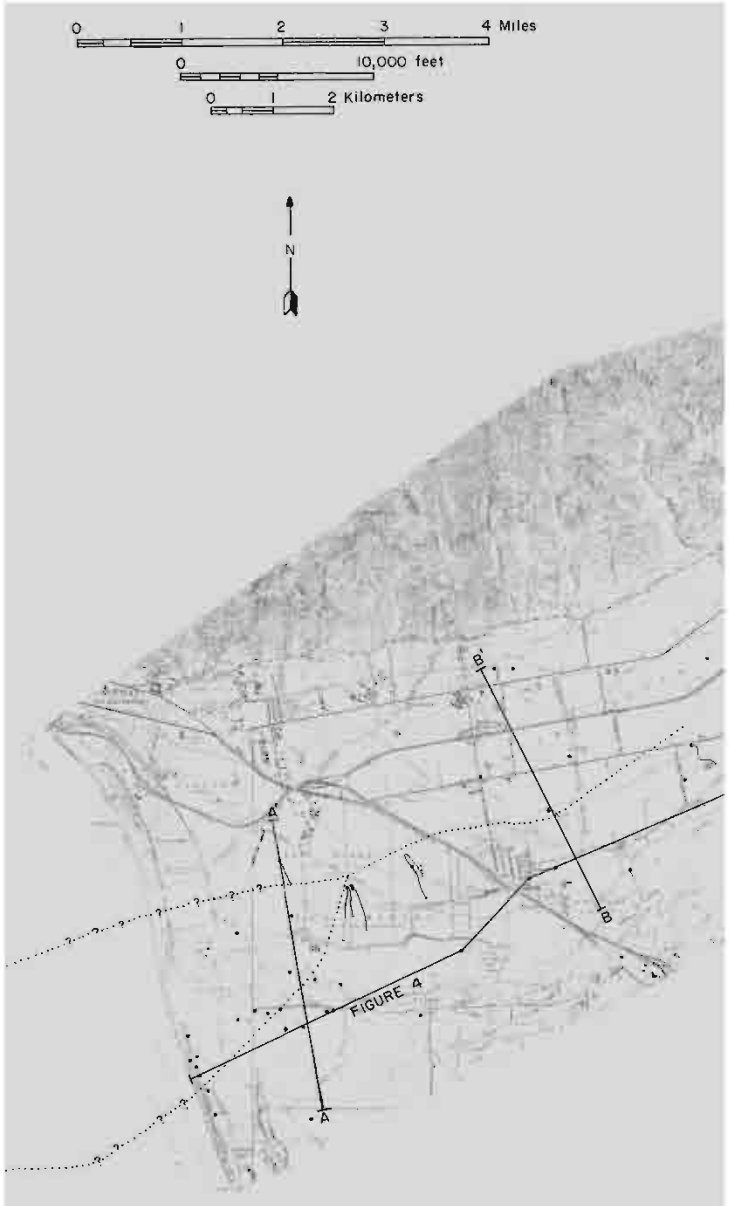


Figure 2-10: Yeats et al (1988) map showing Cross-sections A-A' and B-B' locations over the Oak Ridge fault and McGrath fault ("Montalvo" fault).

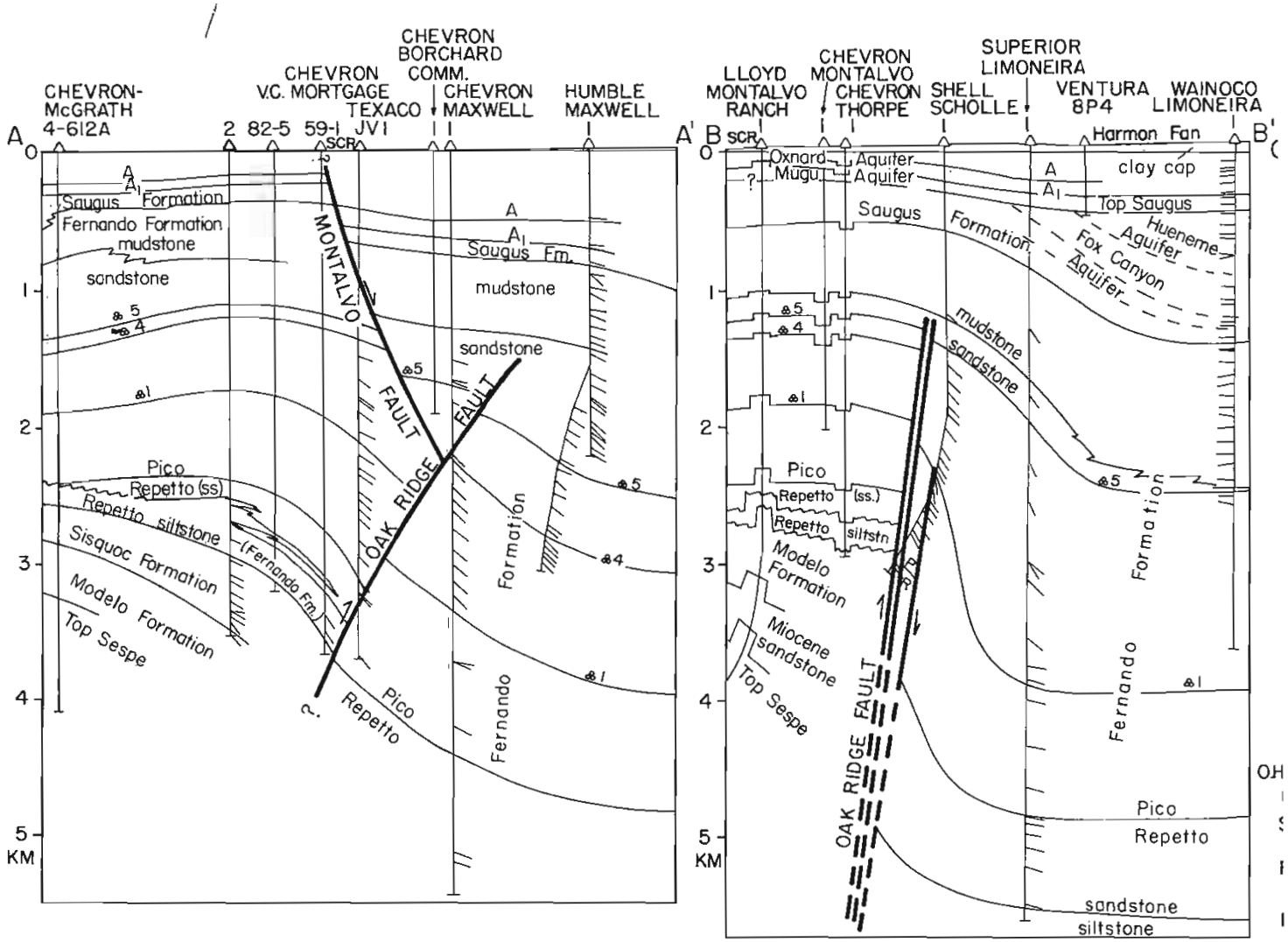
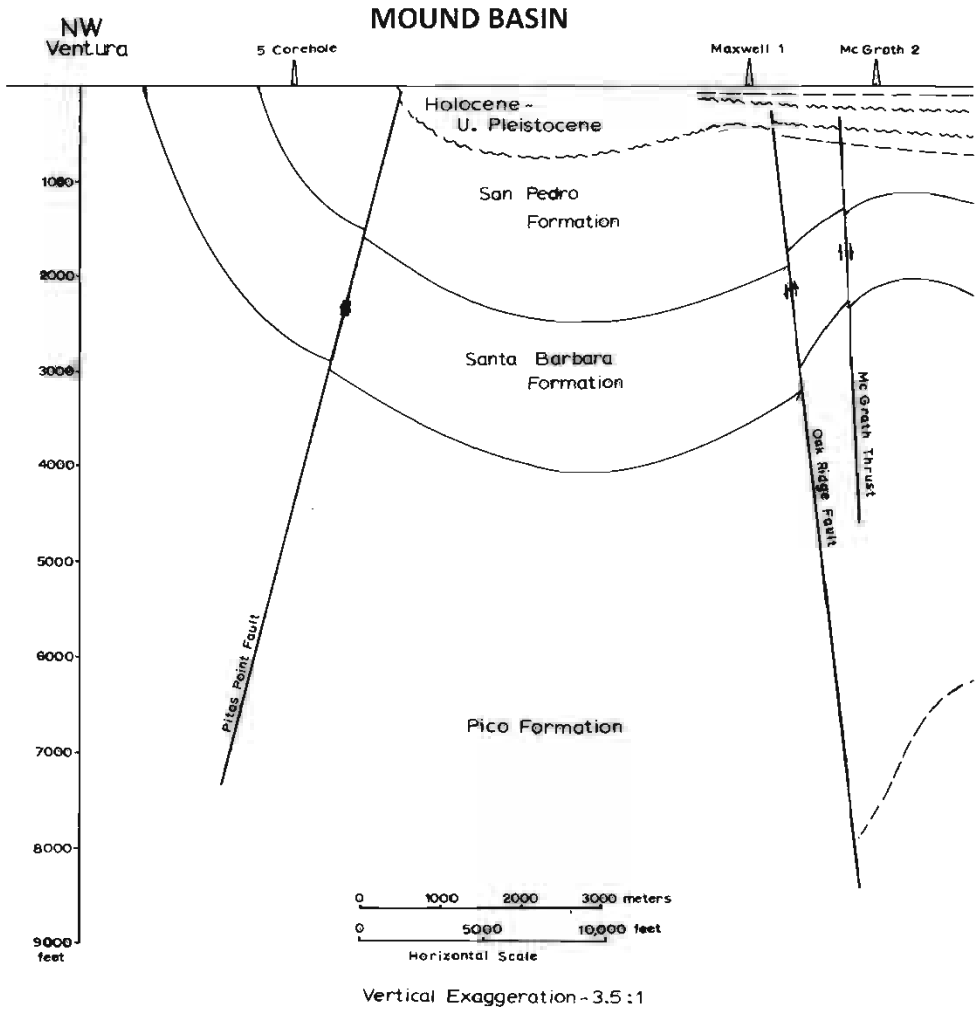
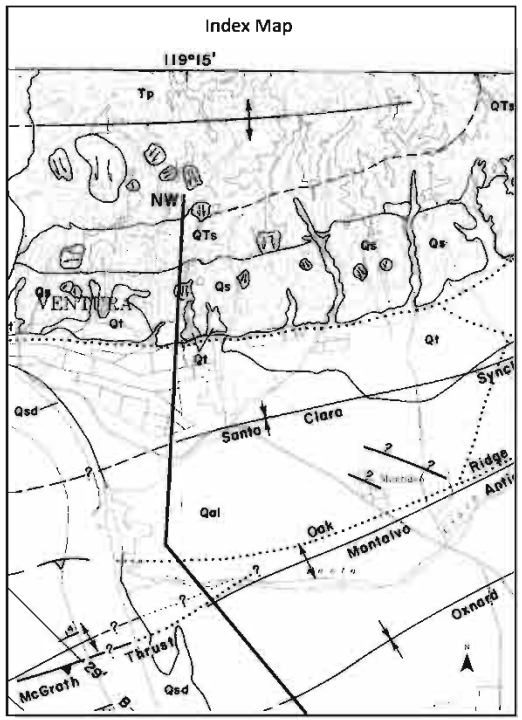


Figure 2-11: Yeats et al (1988) Cross-sections A-A' and B-B' over the Oak Ridge fault and McGrath fault ("Montalvo" fault).





Generalized onshore stratigraphic cross-section across the coastal portion of Oxnard Plain. See Plate 2 for areal extent and orientation of cross-section. (Modified after Paschall and others, 1956; State of California, 1965; Ogle, 1969; Turner, 1971, oral commun.)

Figure 3-1: Schematic Cross-Section of the Mound Basin taken from Greene et al (1978).

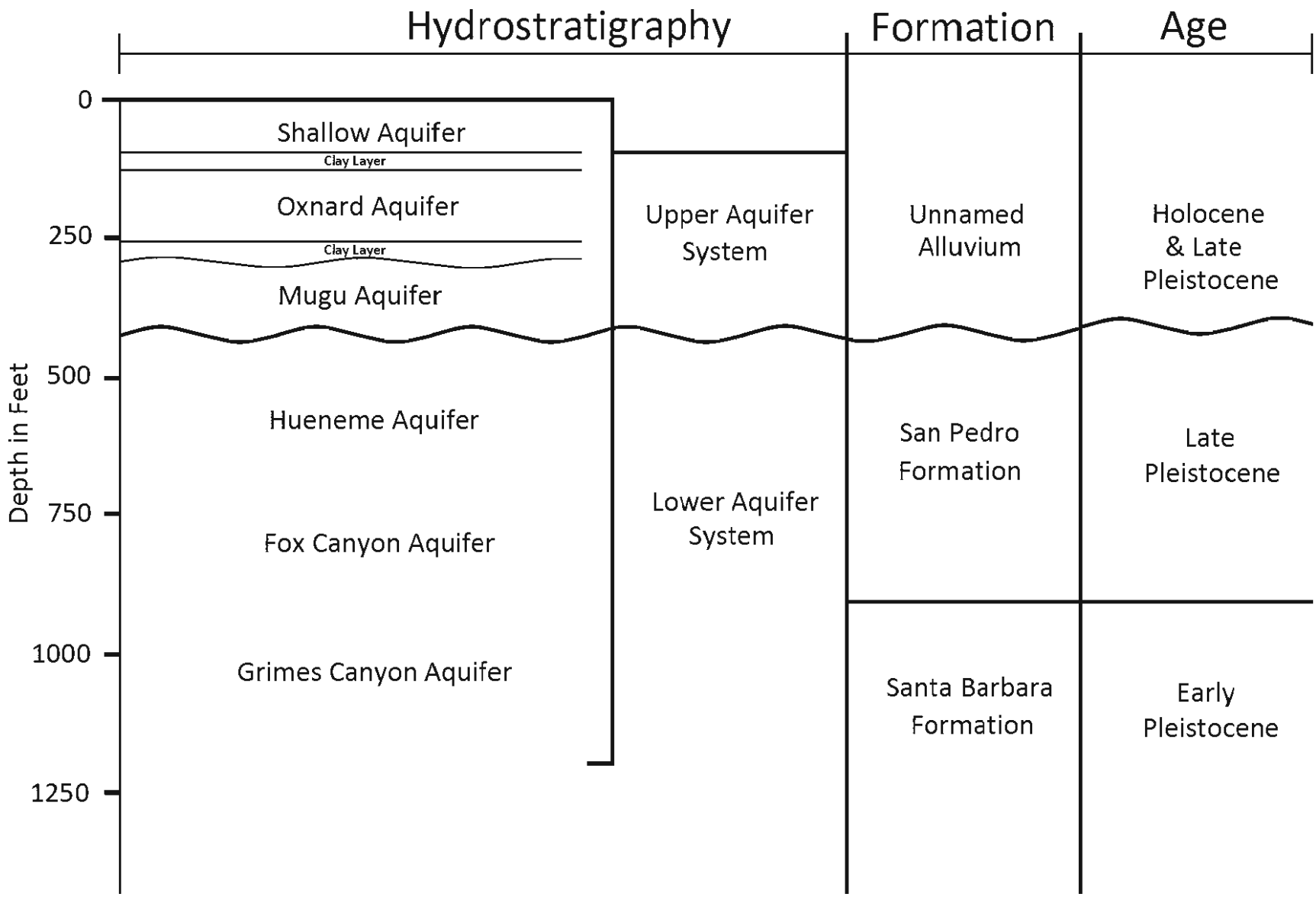


Figure 3-2: Schematic diagram of general aquifer systems.

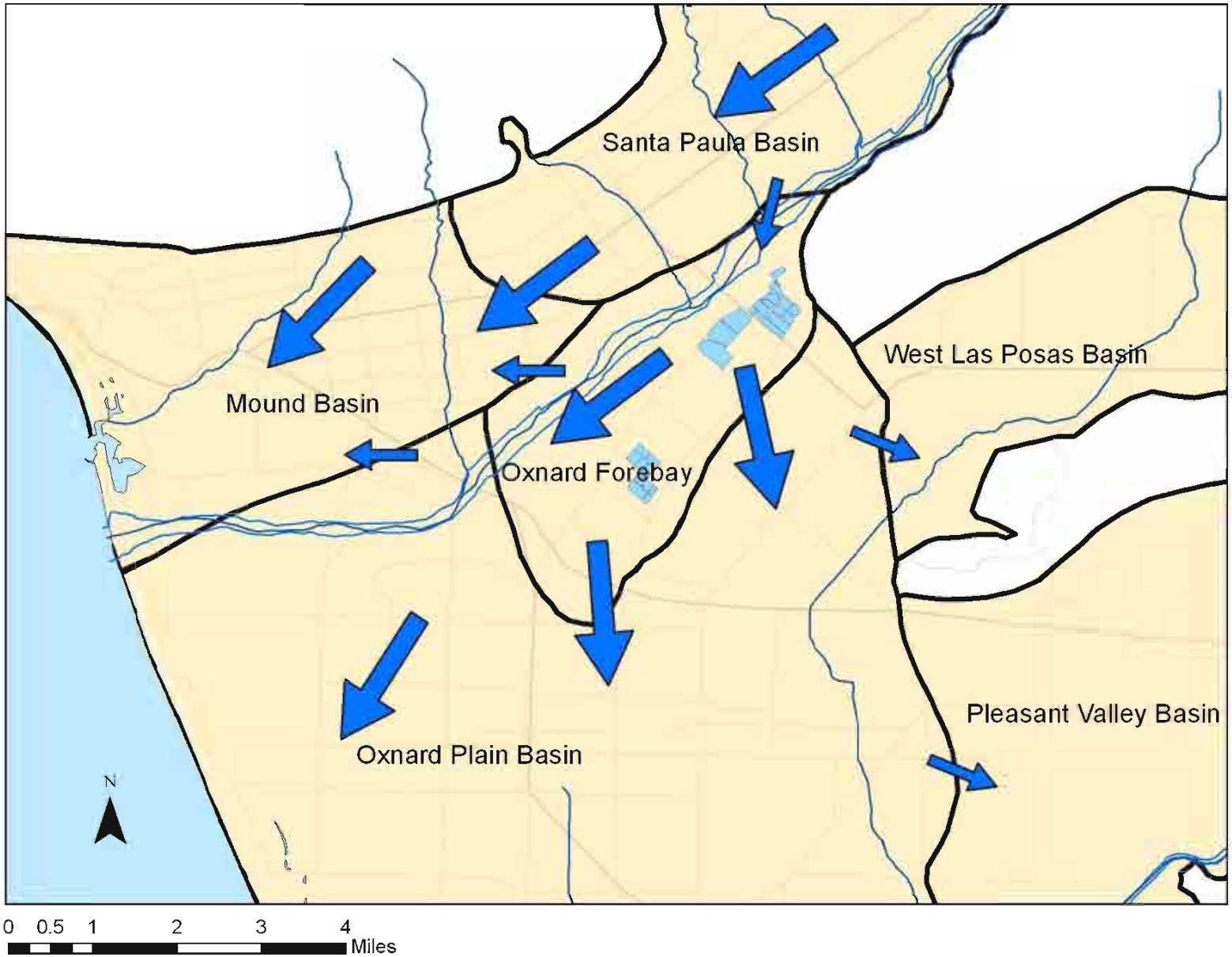


Figure 3-3. Generalized conceptual groundwater flow paths.

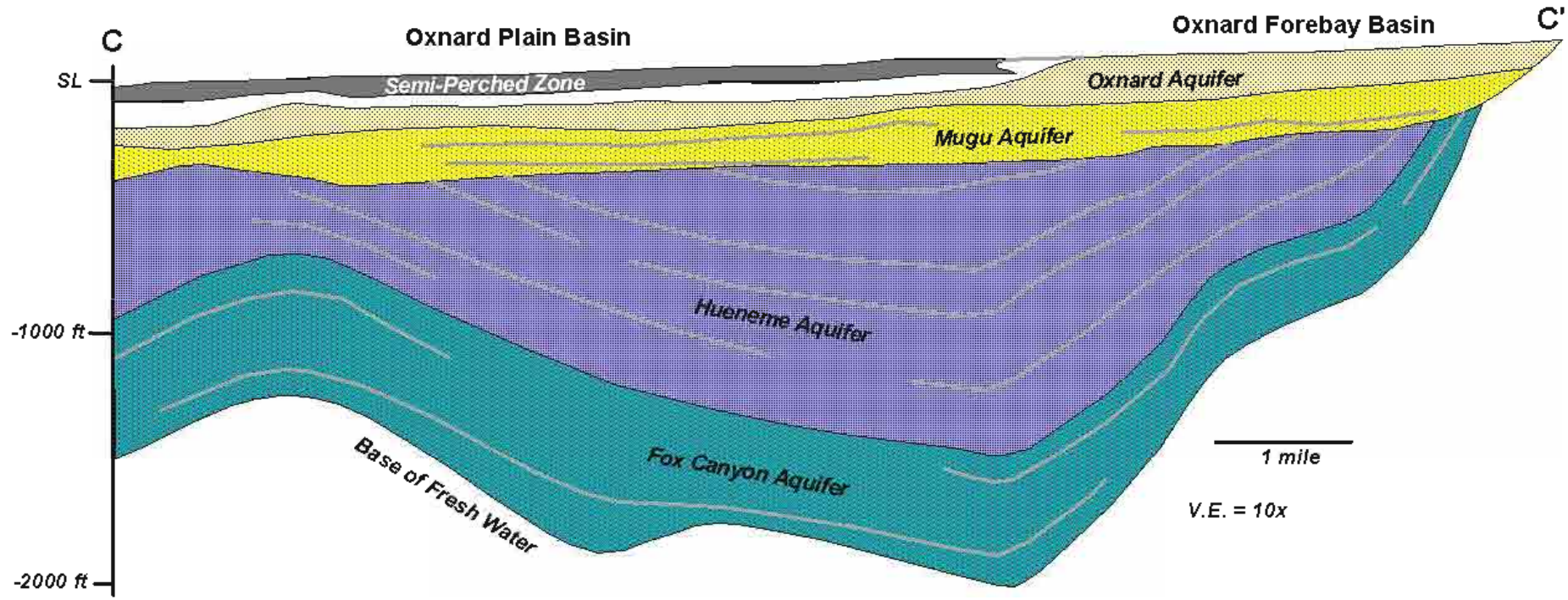


Figure 3-4: Schematic Cross-Section of Aquifer Systems in the adjacent Oxnard Plain south of the Mound Basin.

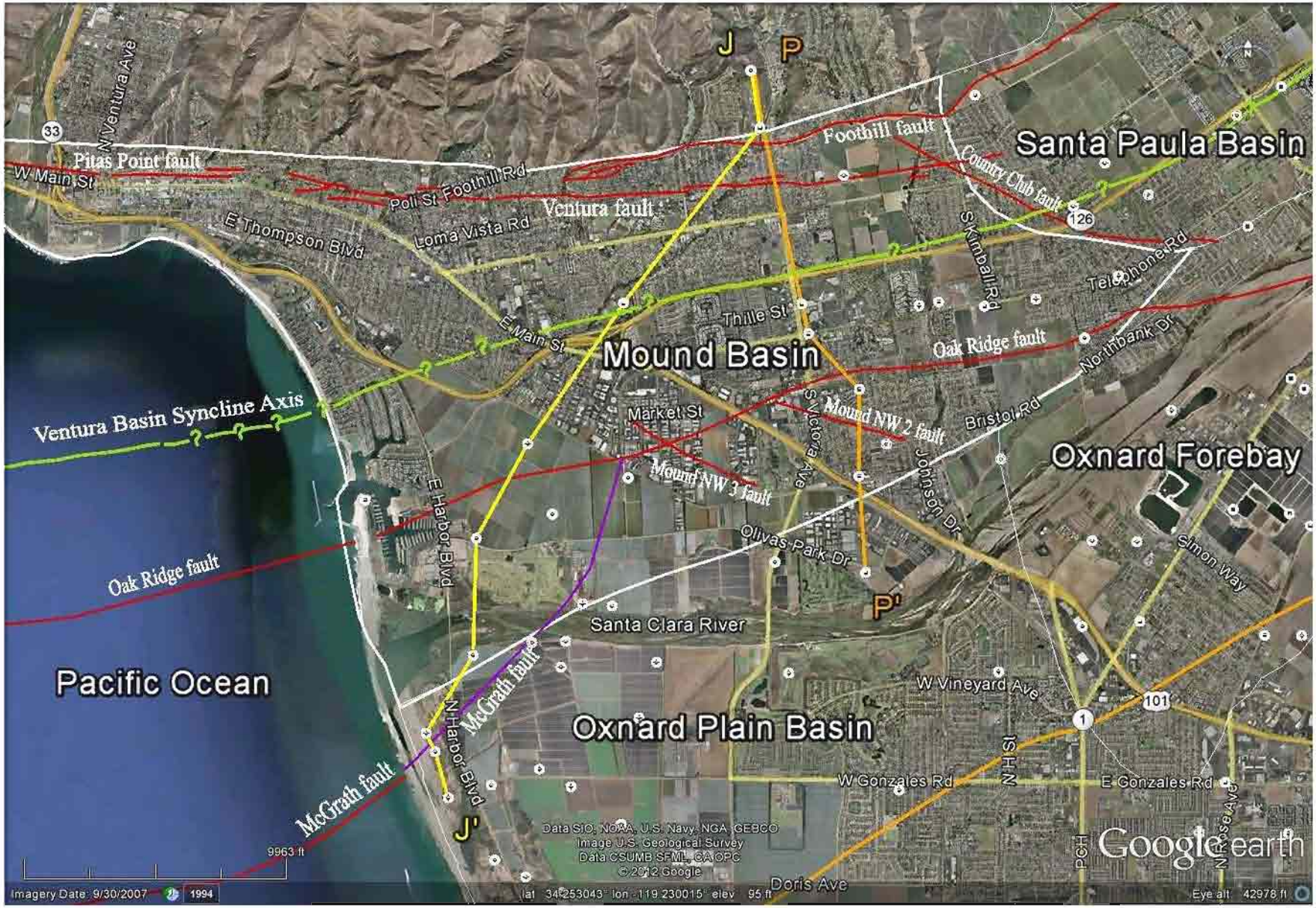


Figure 3-5: Location Map for United Water Cross-Sections J-J' and P-P'.

Cross-Section J-J'

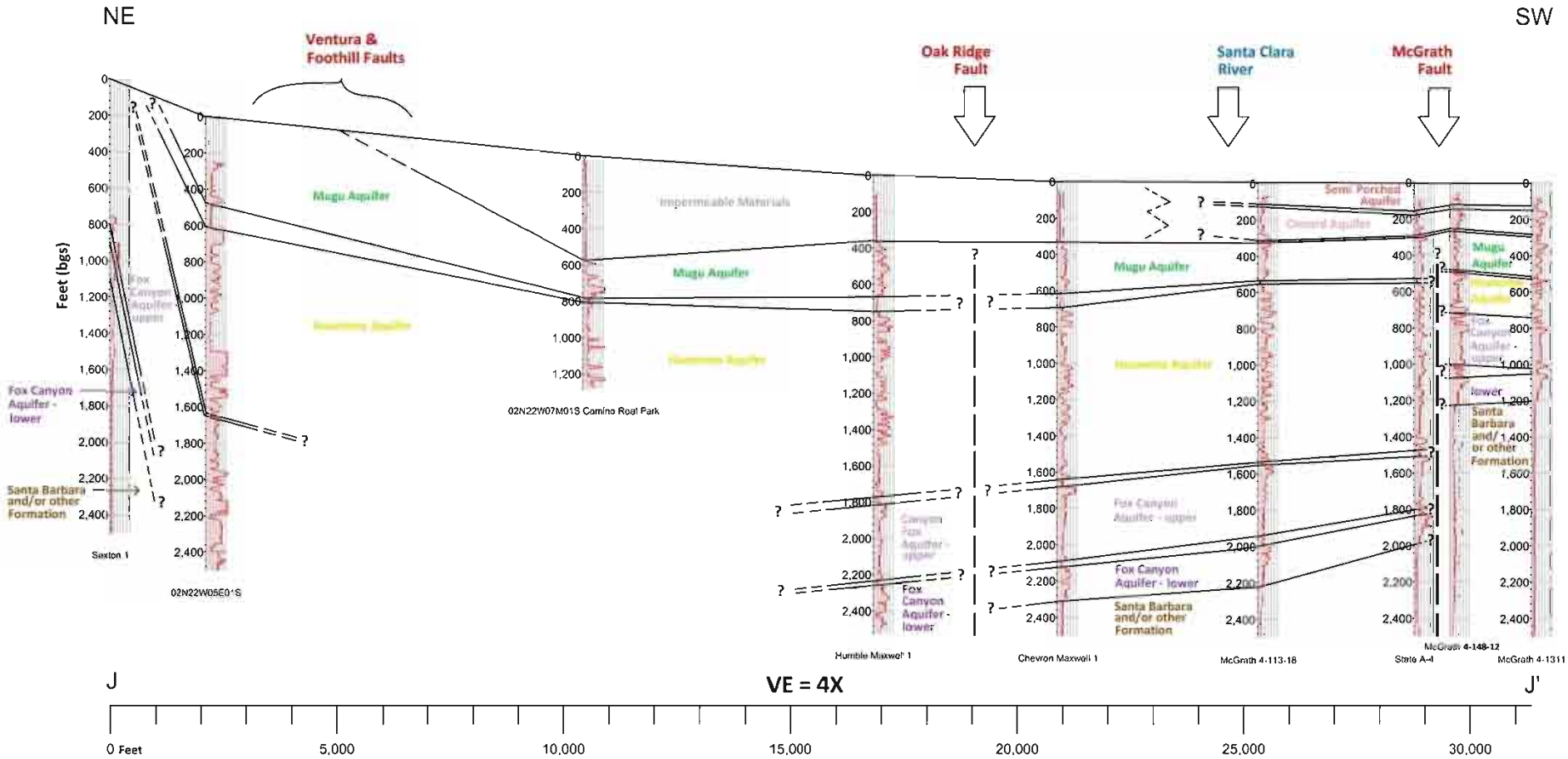


Figure 3-6: United Water Cross-Sections J-J'.

Cross-Section P-P'

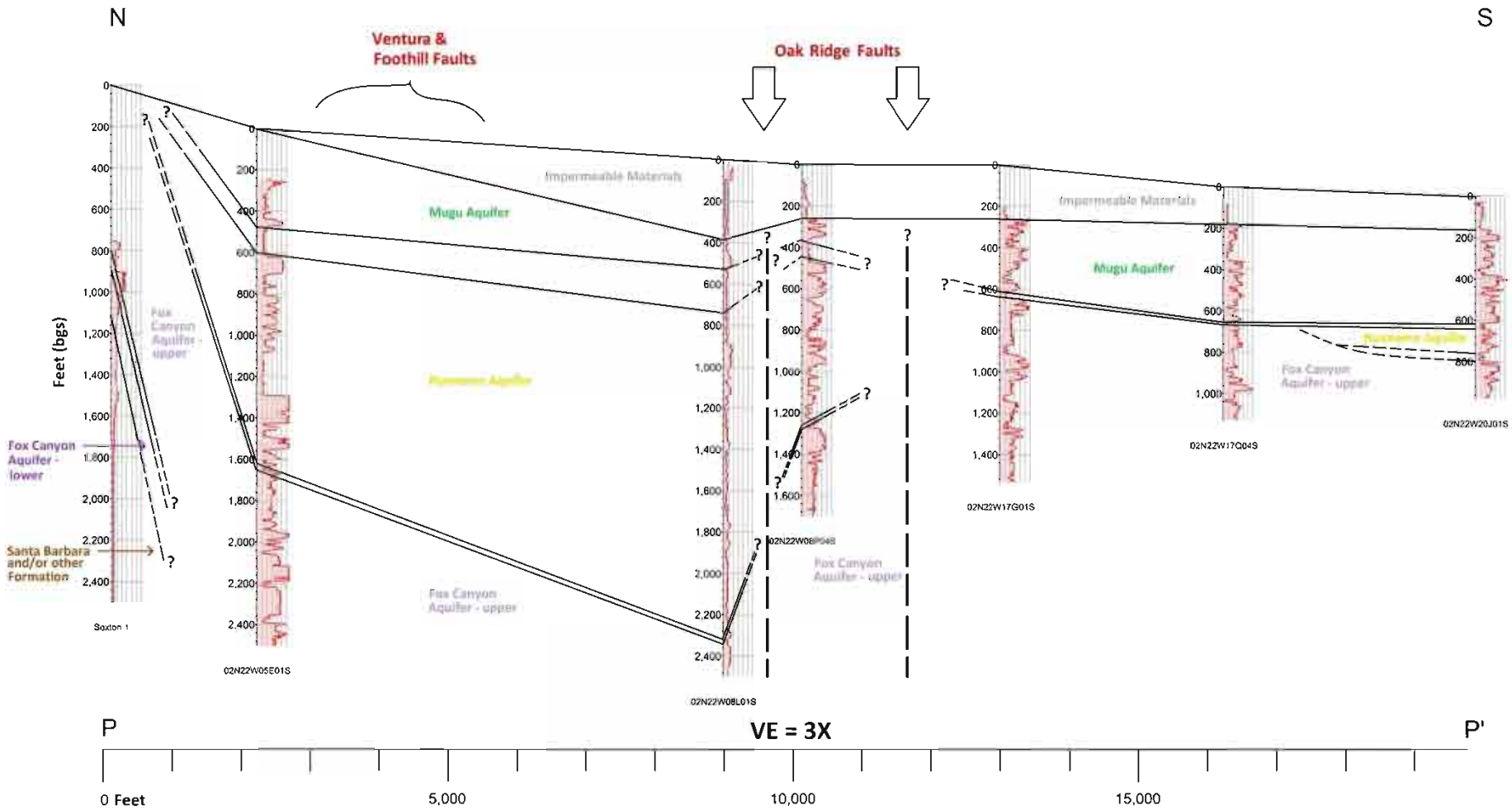


Figure 3-7: United Water Cross-Sections P-P'.

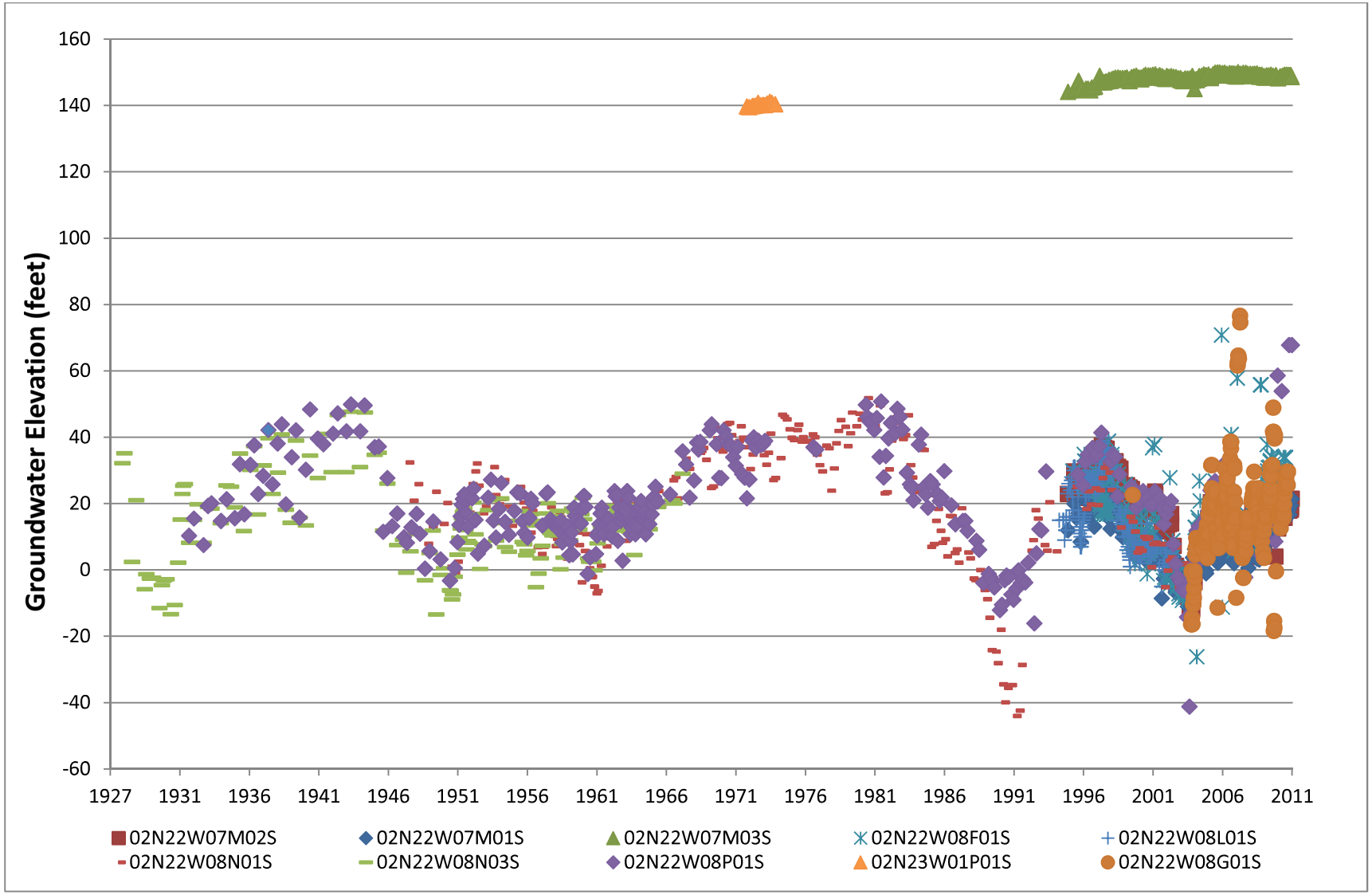


Figure 4-1. Recorded groundwater elevations, north and central Mound basin.

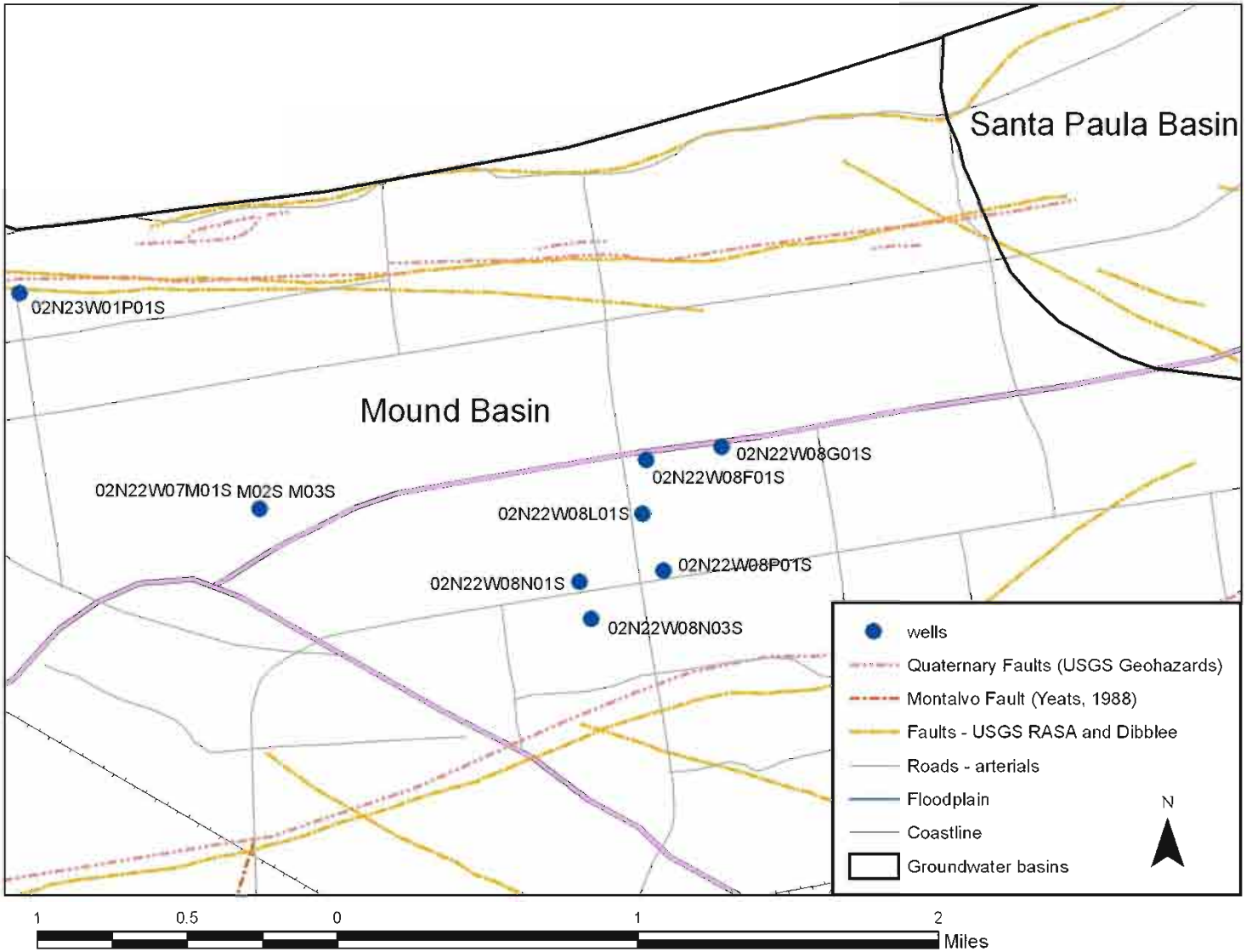


Figure 4-2. Location map for north and central Mound basin wells with WLE records.

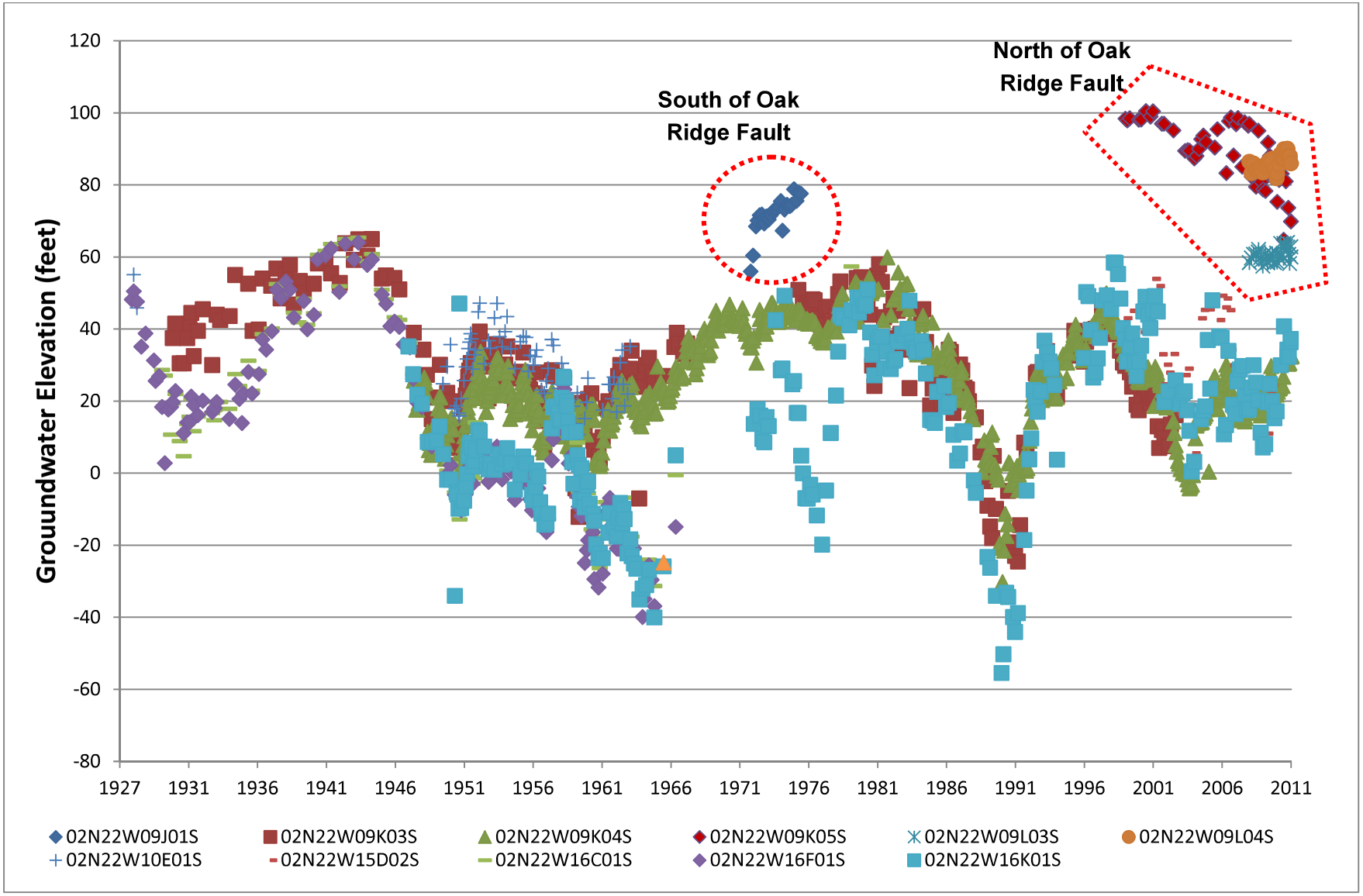


Figure 4-3. Recorded groundwater elevations, eastern Mound basin.

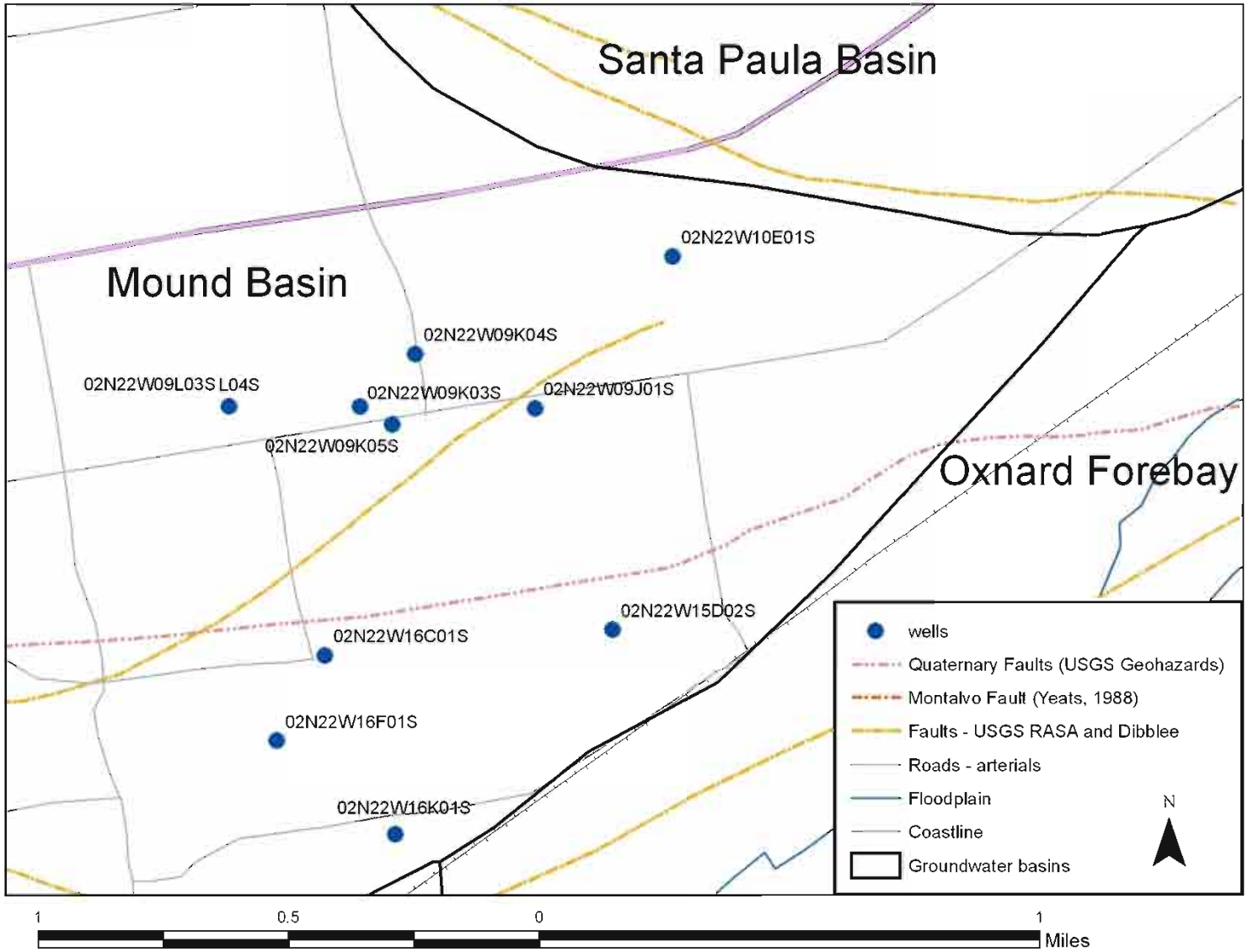


Figure 4-4. Location map for eastern Mound basin wells with WLE records.

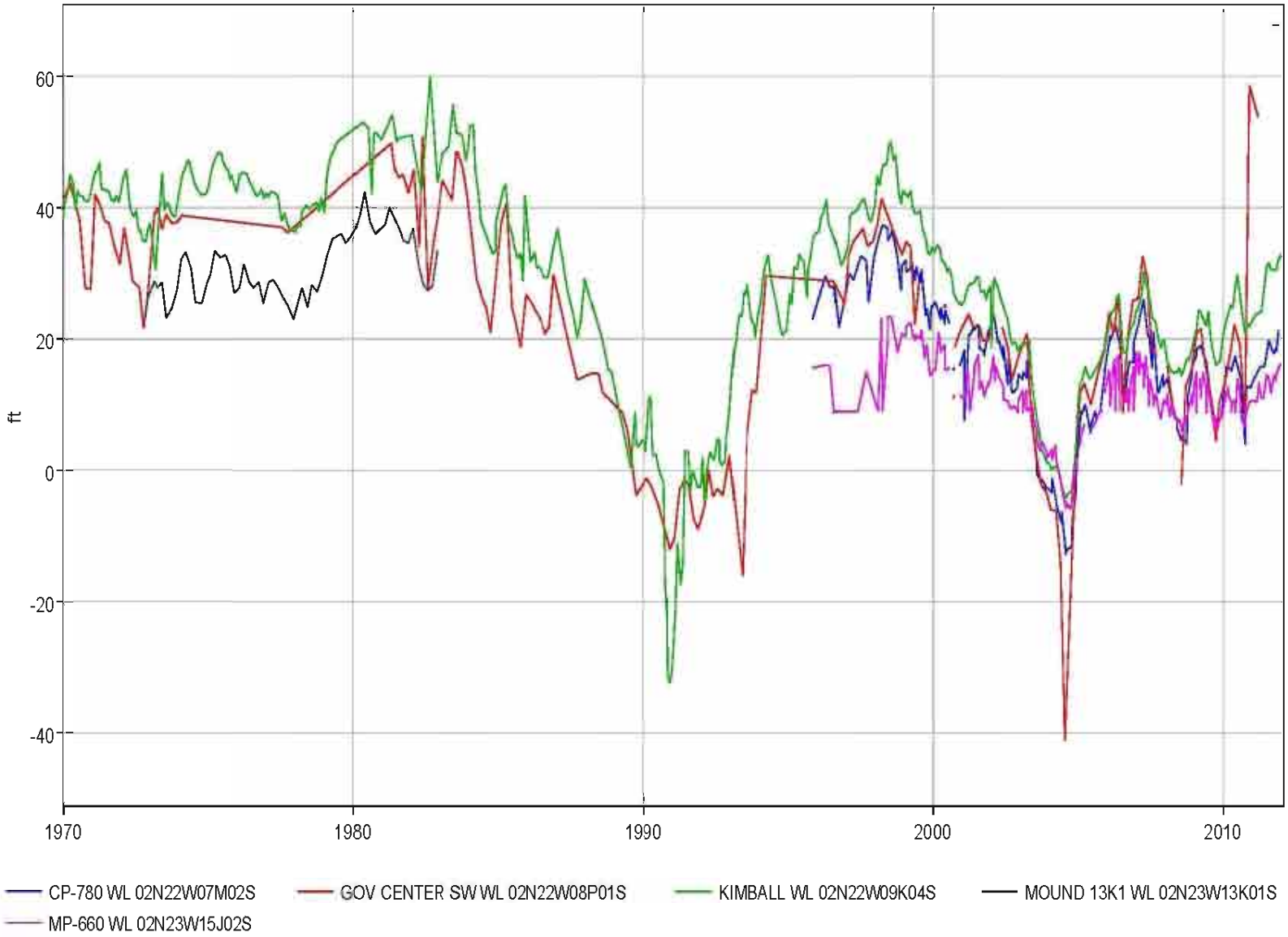


Figure 4-5. Recorded groundwater elevations, central Mound basin.

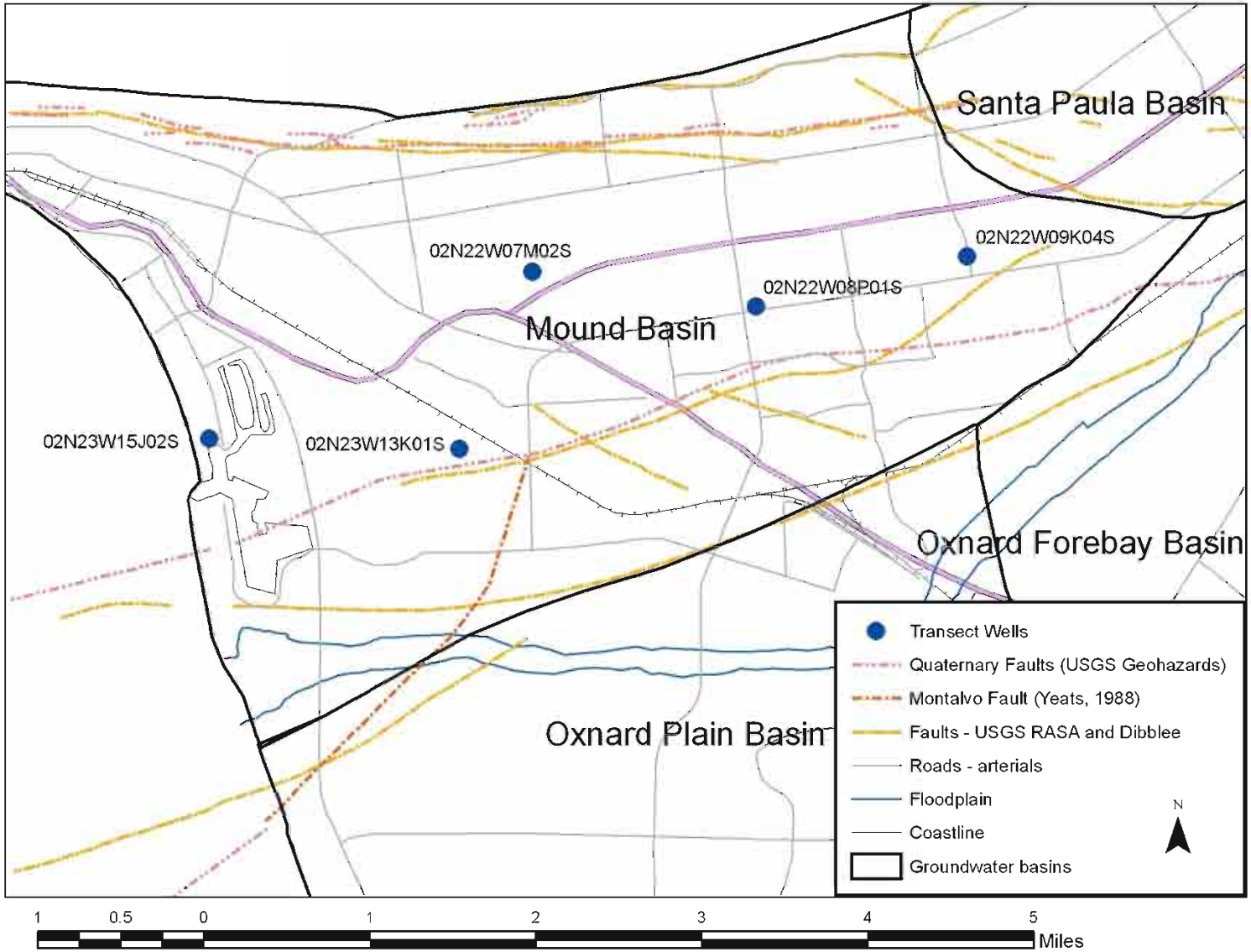


Figure 4-6. Location map for central Mound basin wells with WLE records.

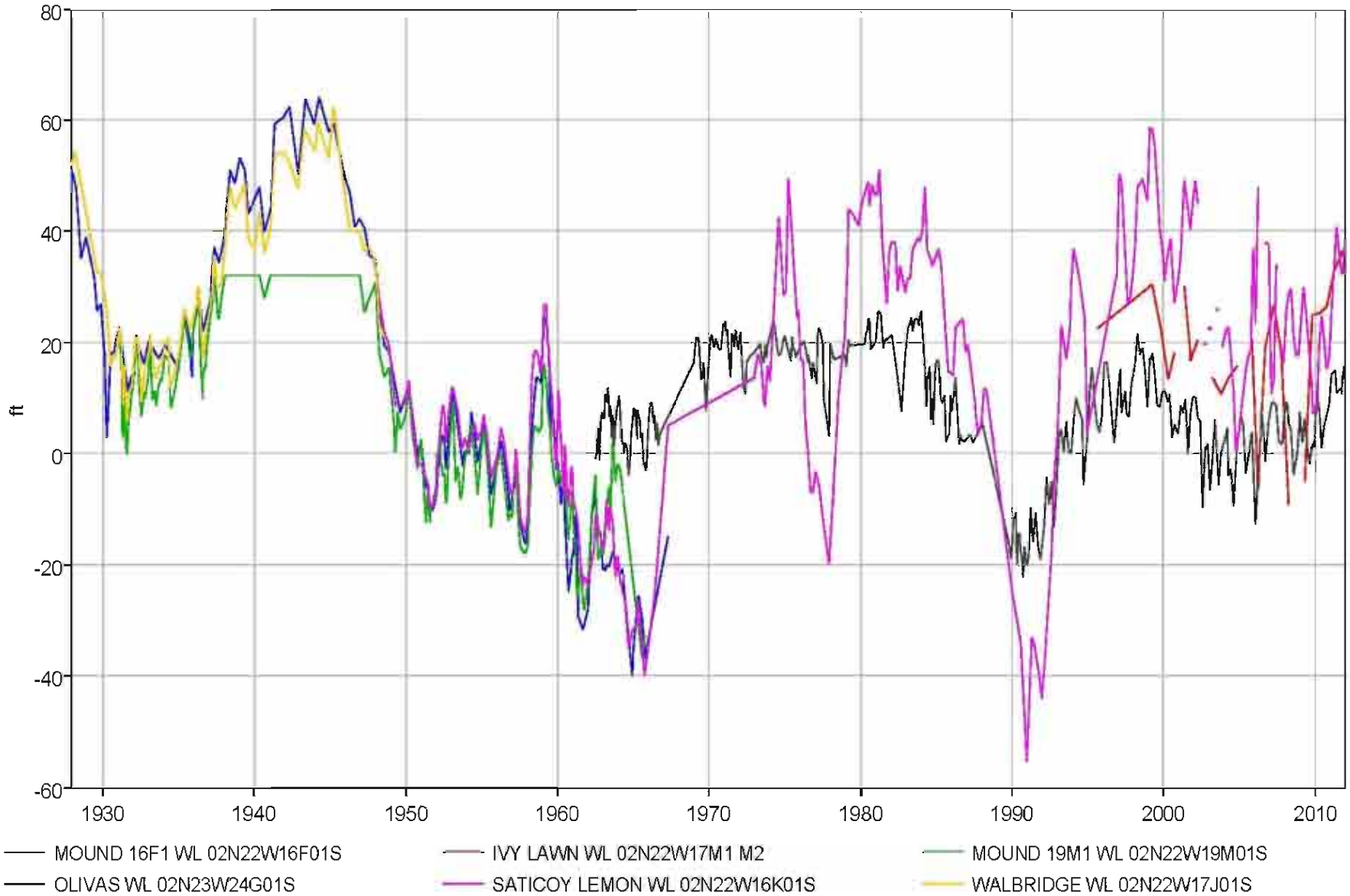


Figure 4-7. Recorded groundwater elevations, southern Mound basin.

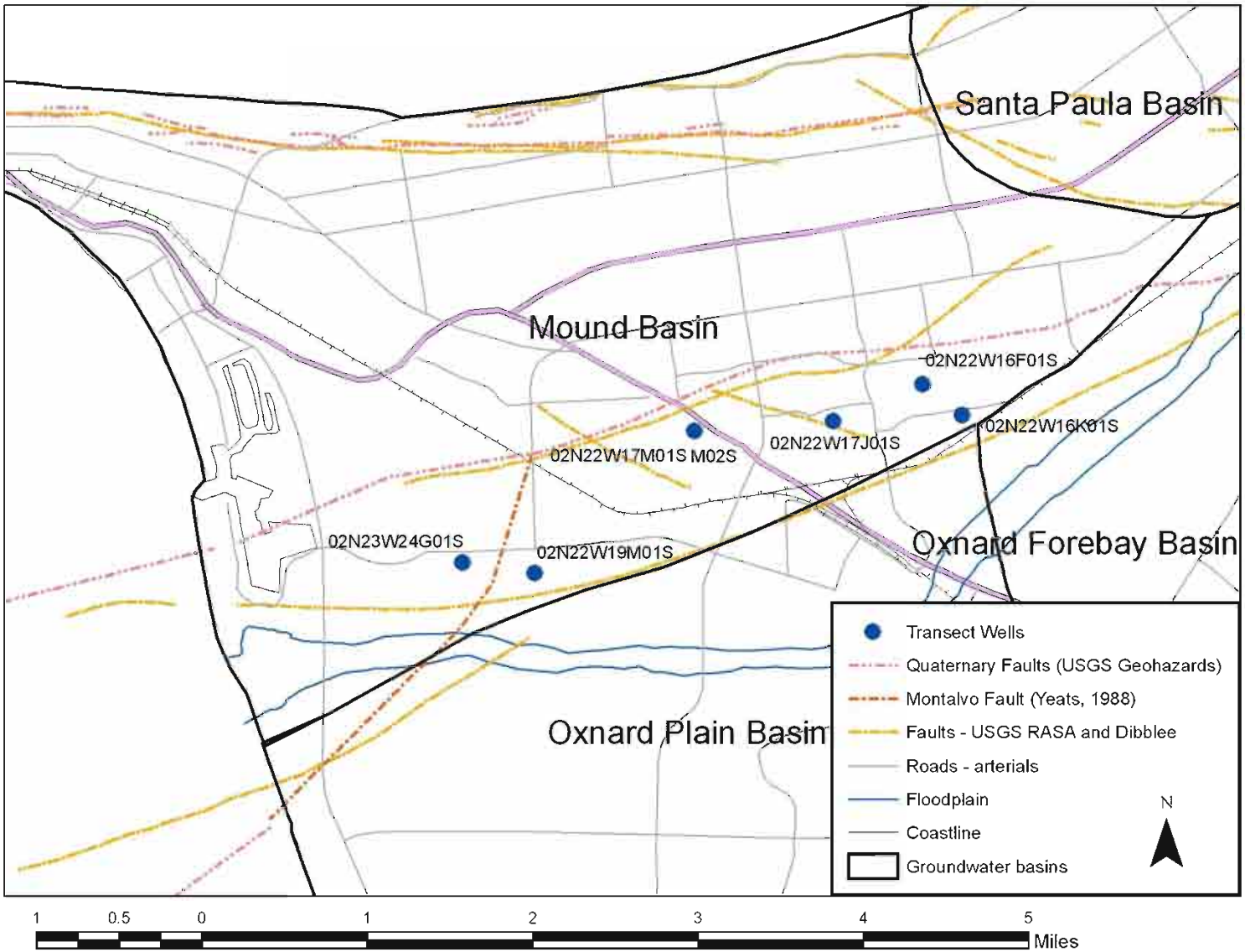


Figure 4-8. Location map for southern Mound basin wells with WLE records.

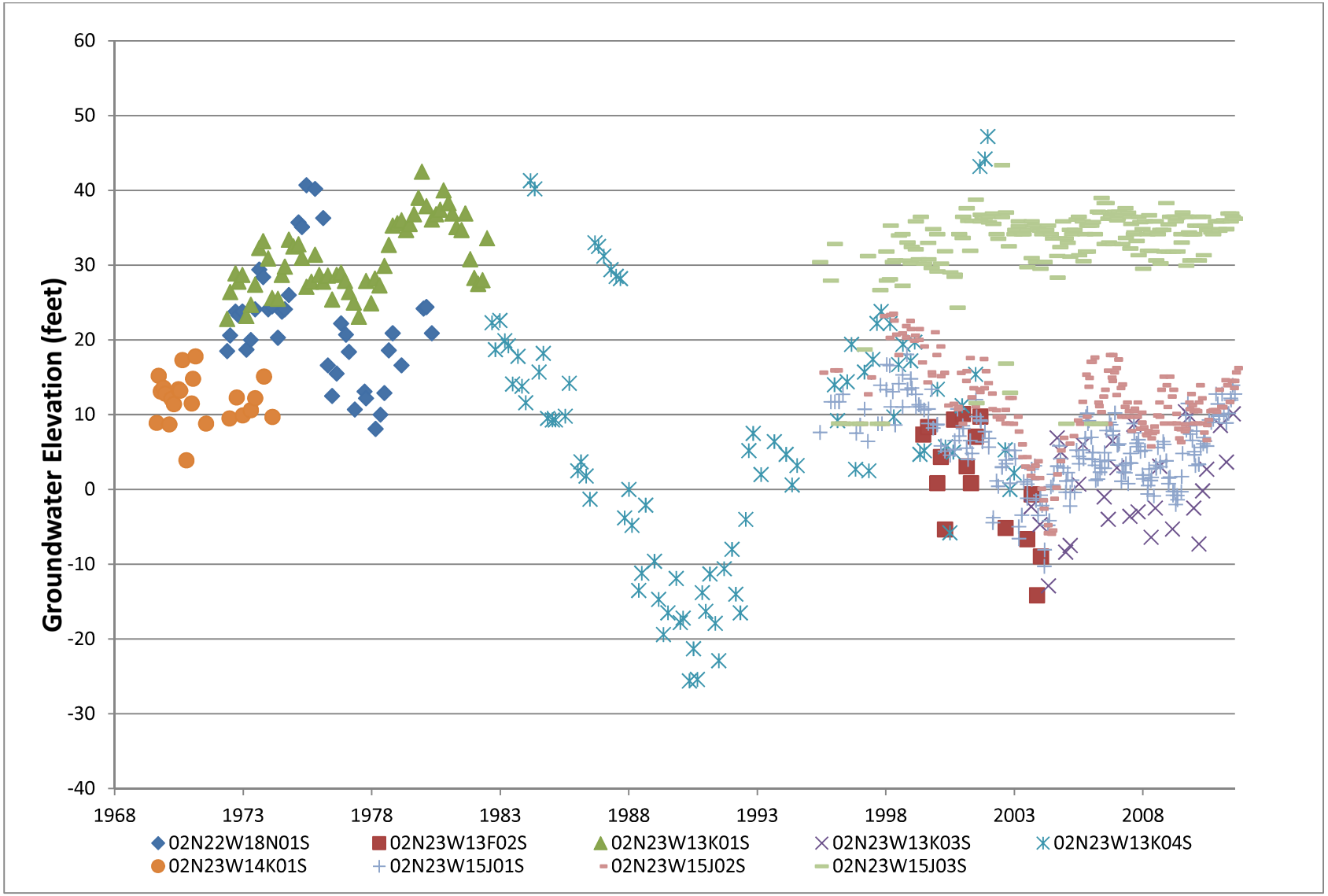


Figure 4-9. Recorded groundwater elevations, western Mound basin.

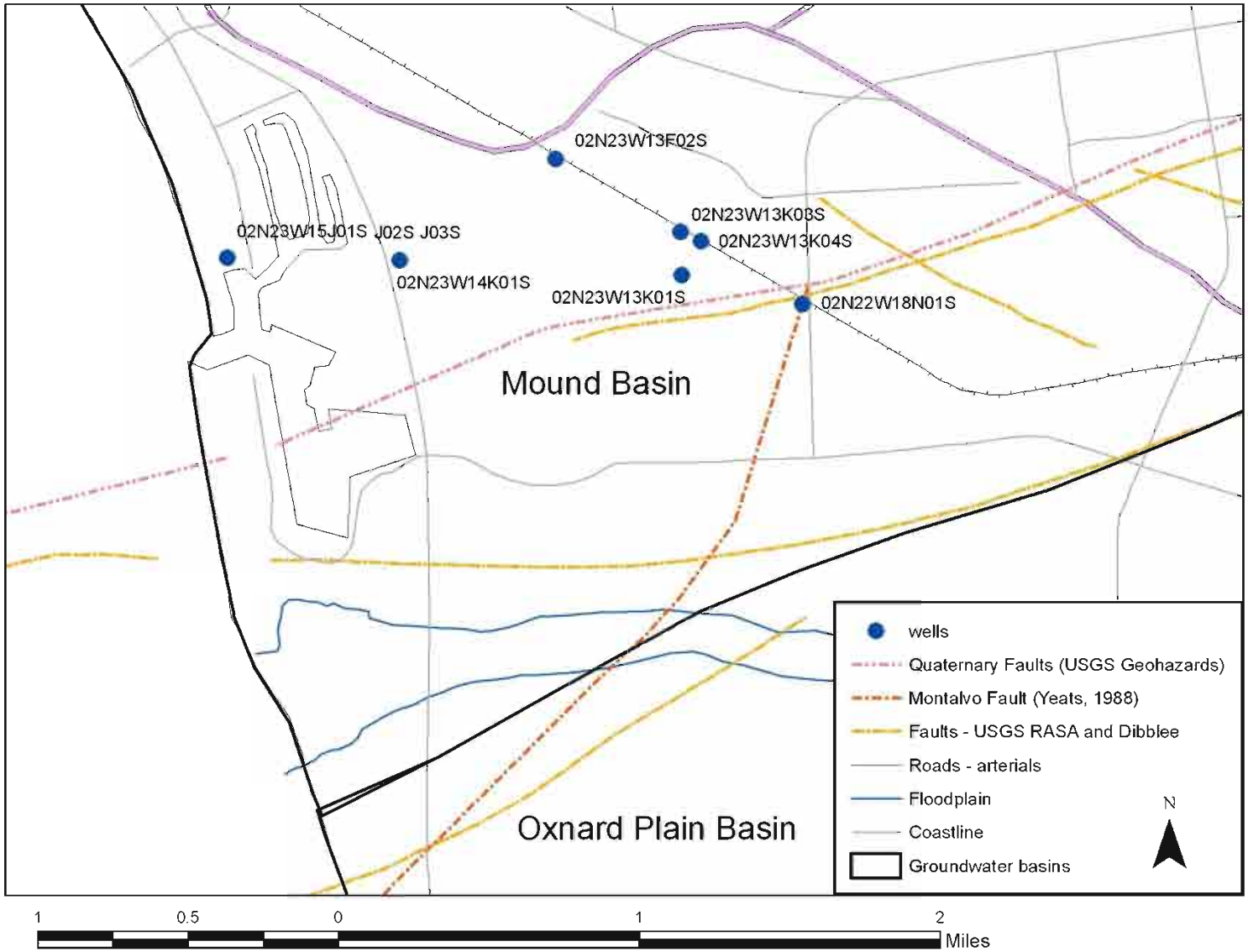


Figure 4-10. Location map for western Mound basin wells with WLE records.

Figure 5-1. Distribution of Mound basin pumping, 2010 calendar year.

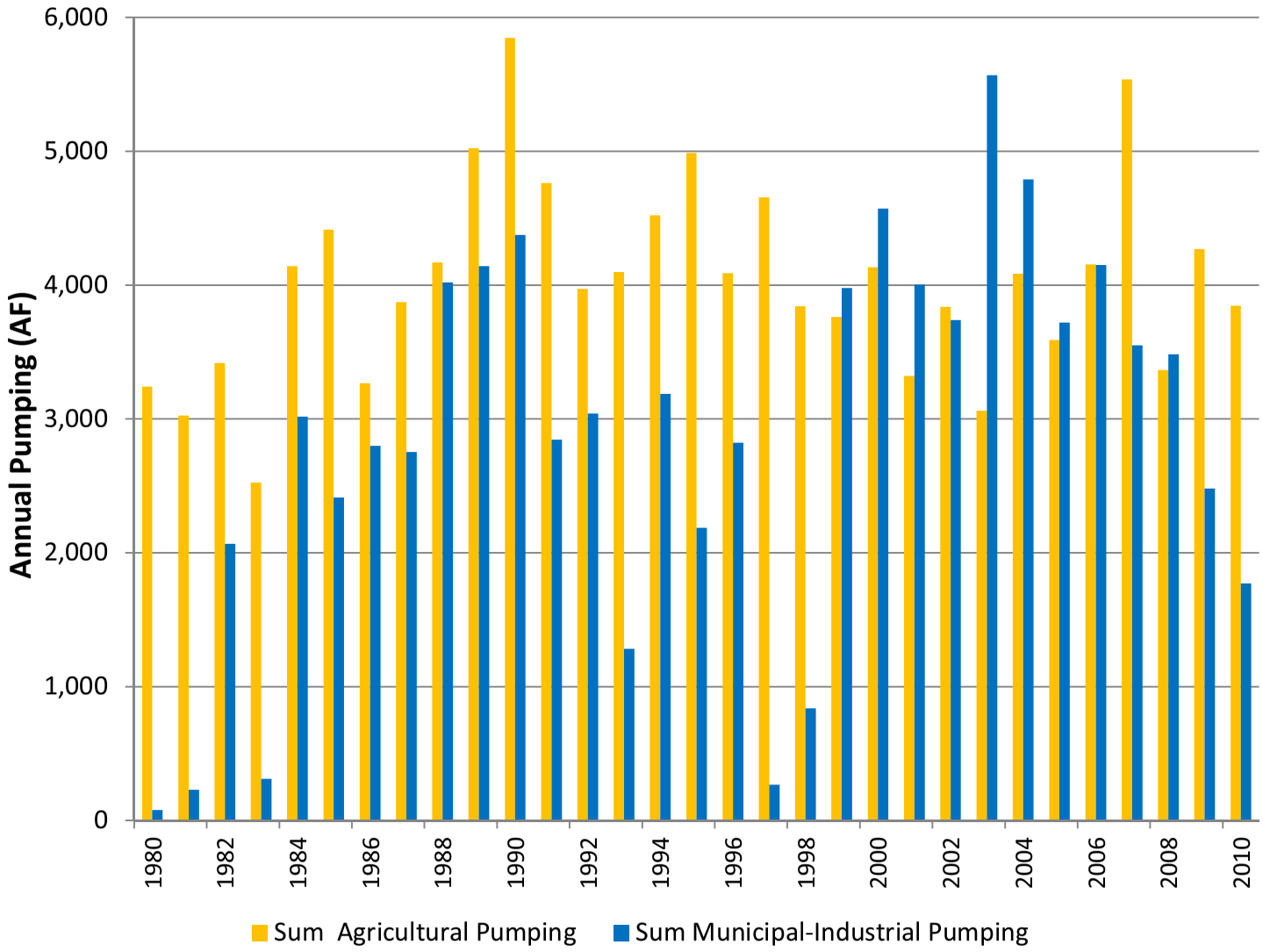


Figure 5-2. Annual Mound basin pumping totals by water use.

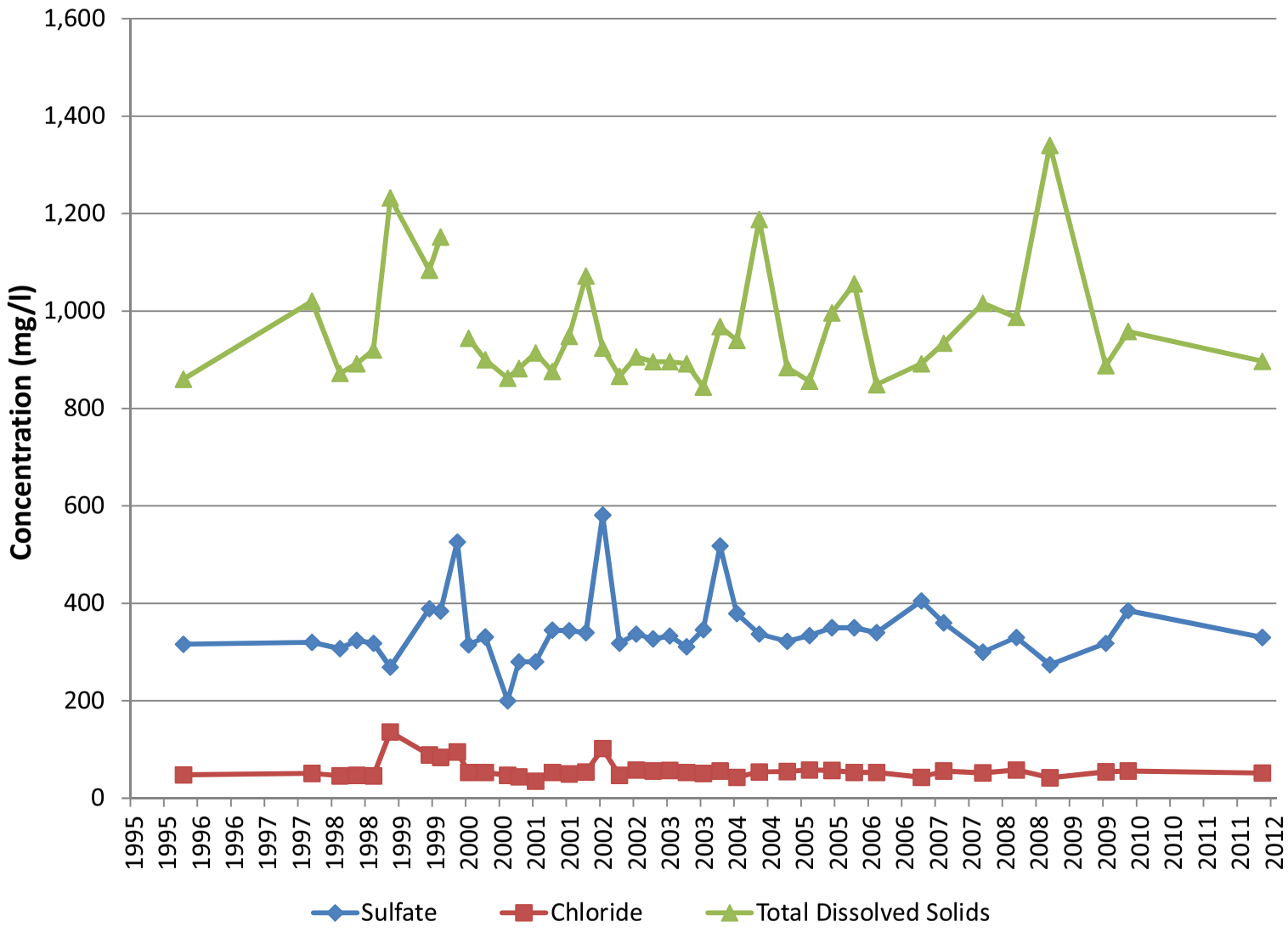


Figure 6-1. Well 02N22W07M02S water quality records (monitoring well CP-780).

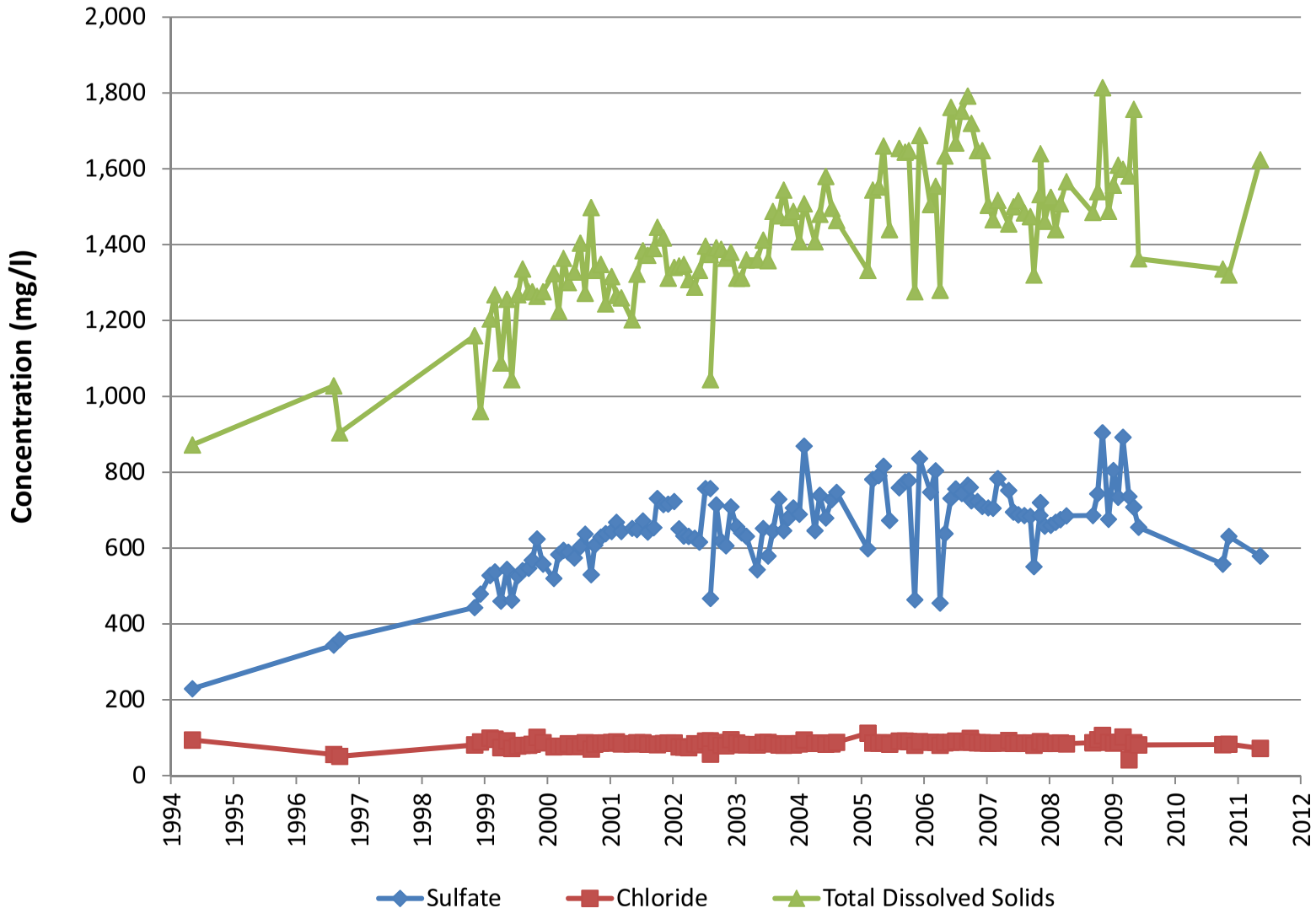


Figure 6-2. Well 02N22W08F01S water quality records (Victoria 2).

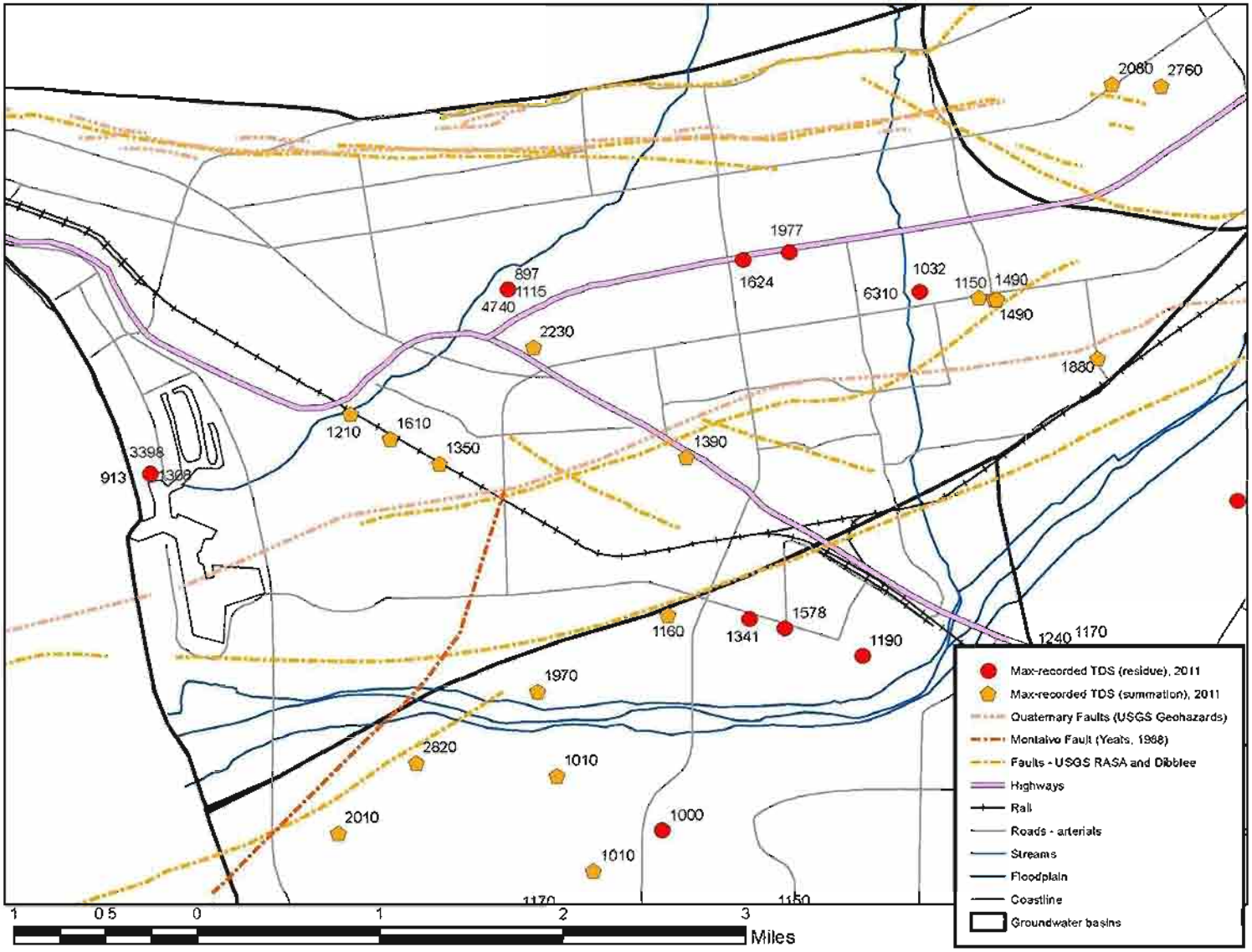


Figure 6-3. Maximum-recorded Total Dissolved Solids in 2011.

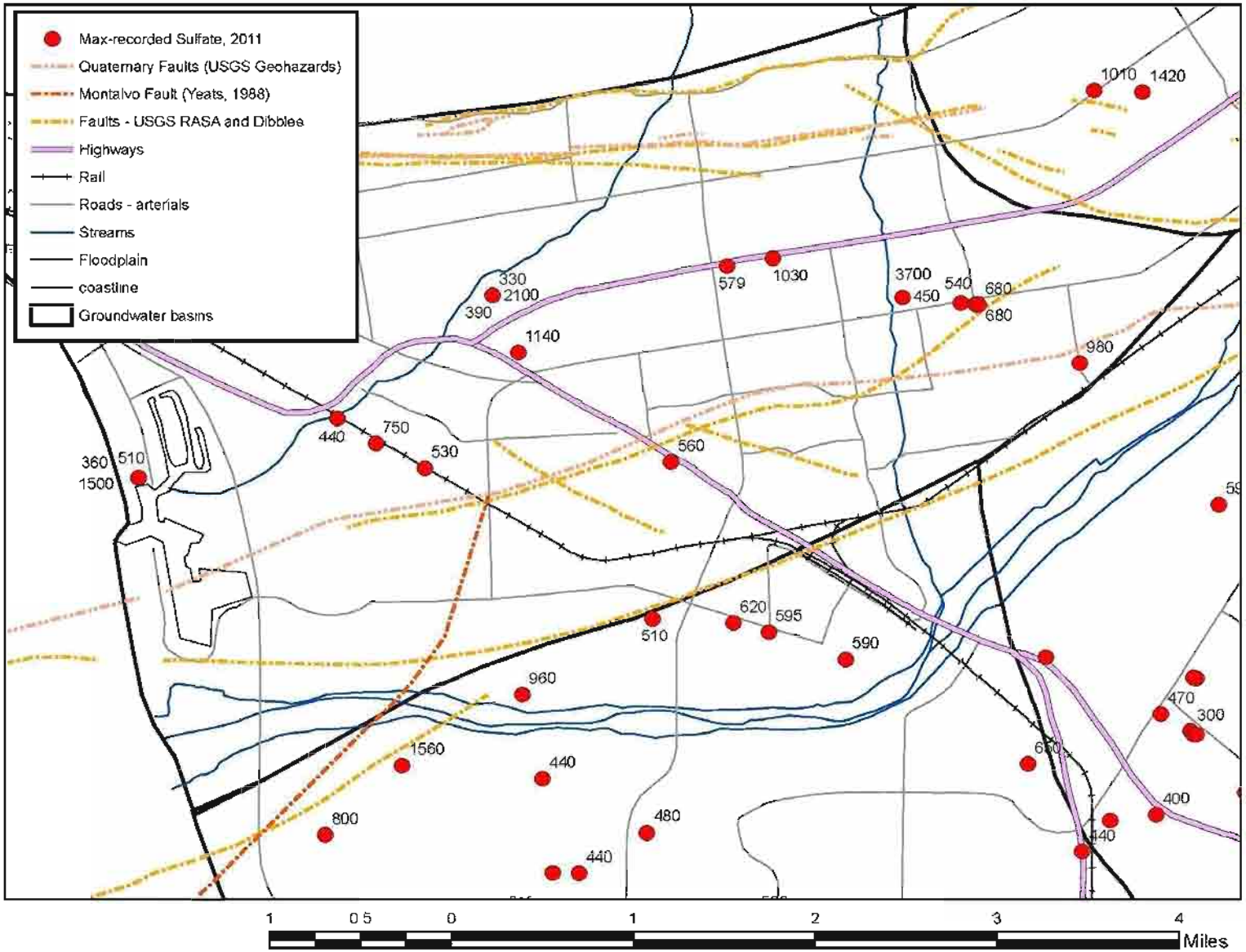


Figure 6-4. Maximum-recorded sulfate concentration in 2011.

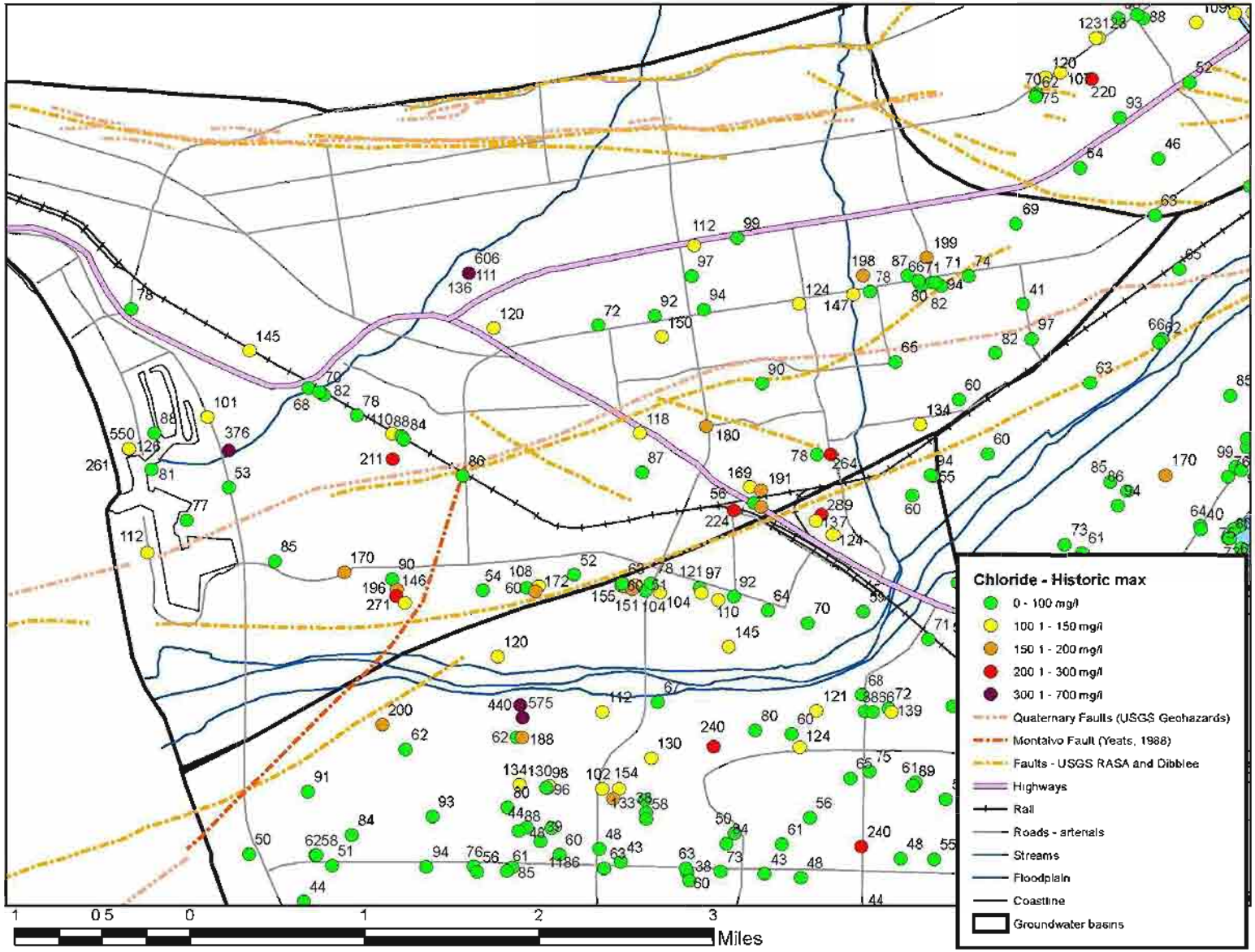


Figure 6-5. Maximum-recorded chloride concentration, all historic records.

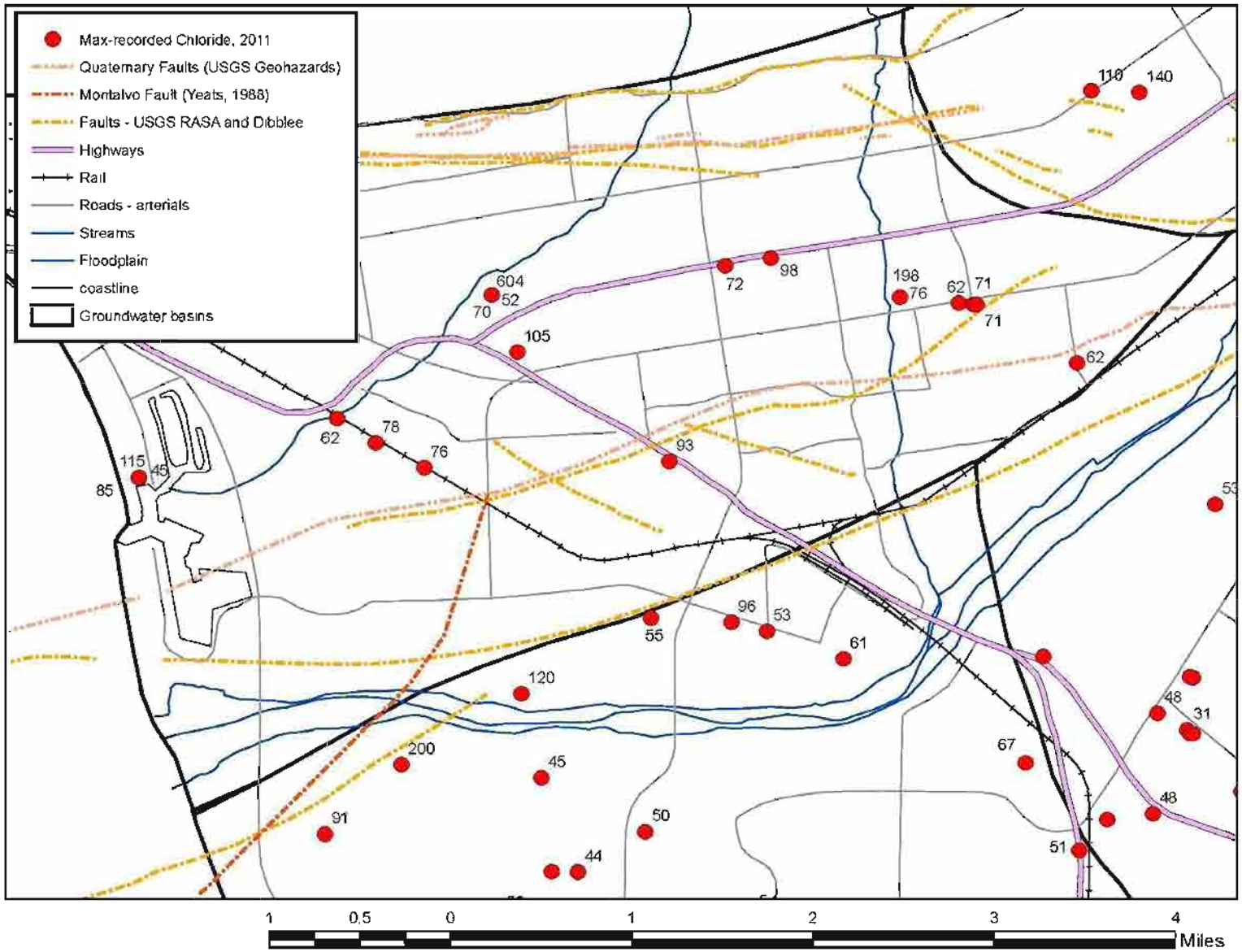


Figure 6-6. Maximum-recorded chloride concentration in 2011.

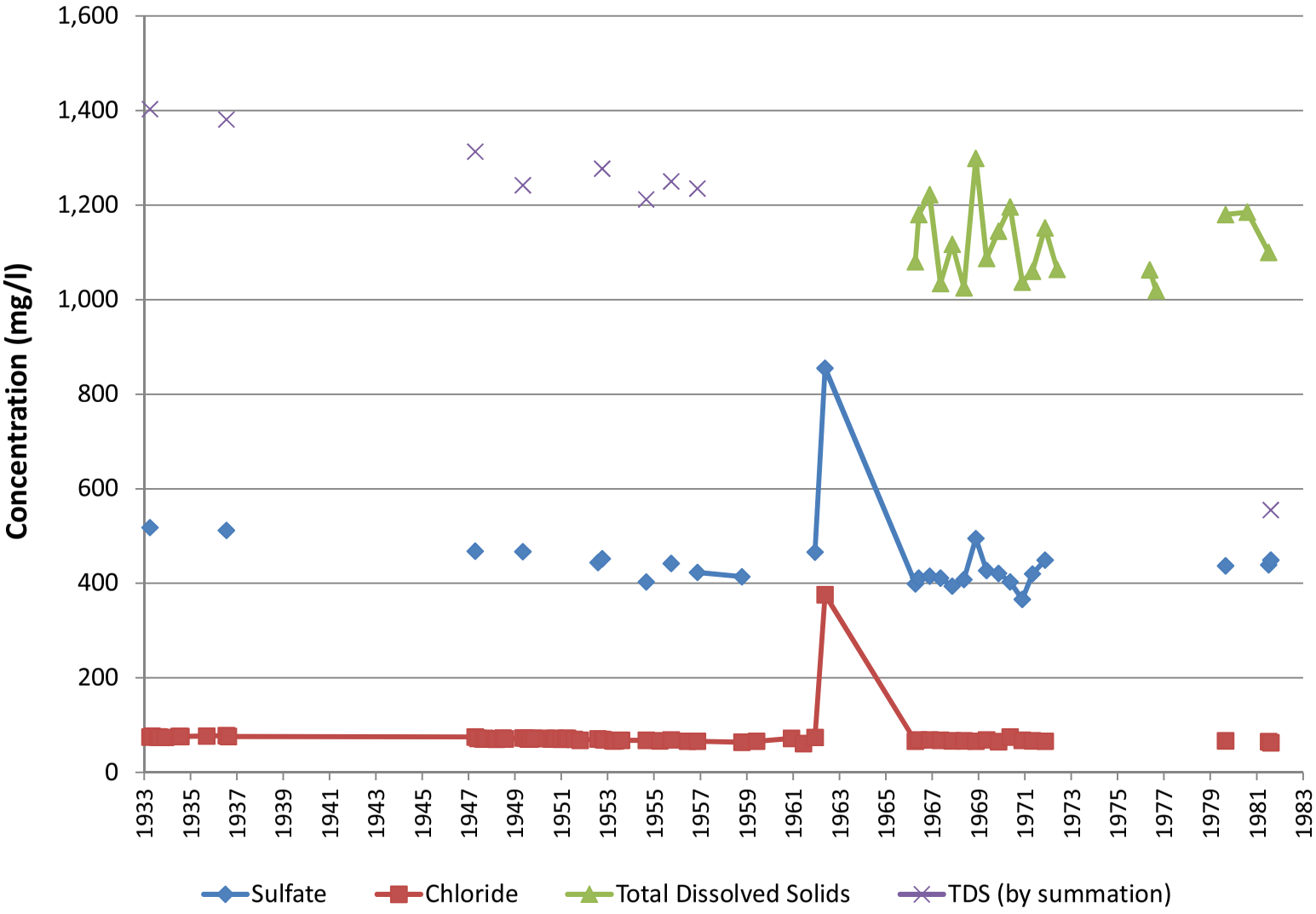
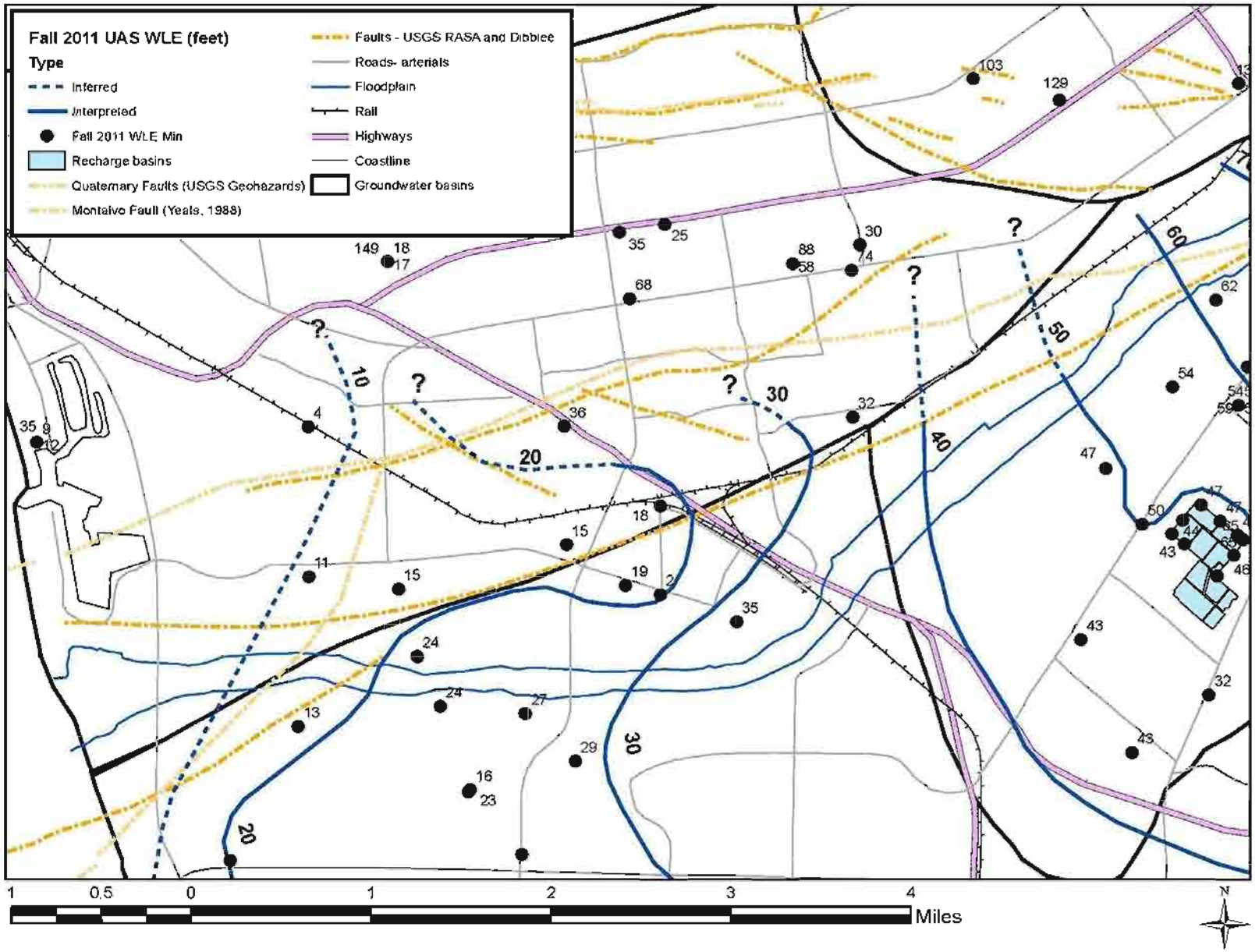
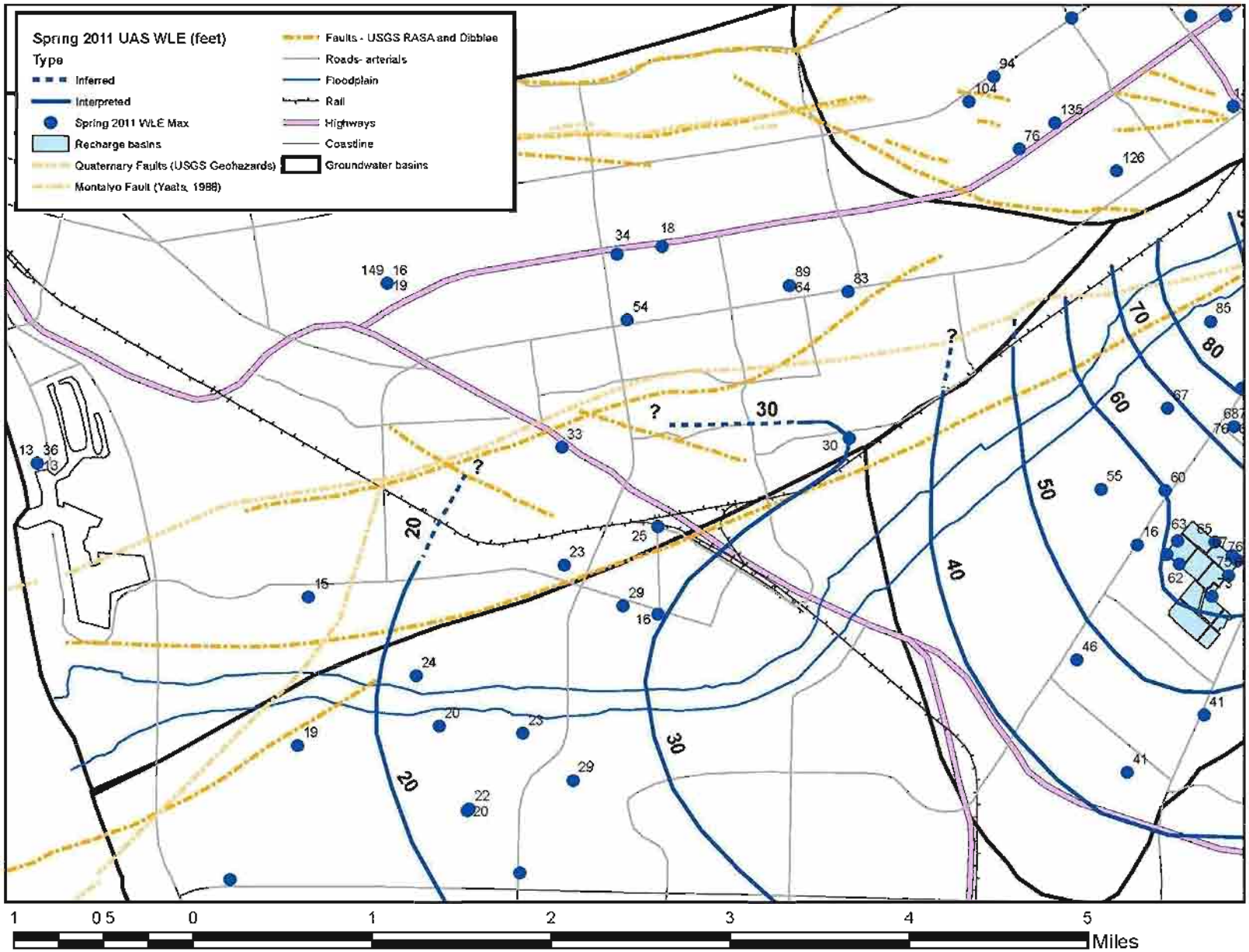


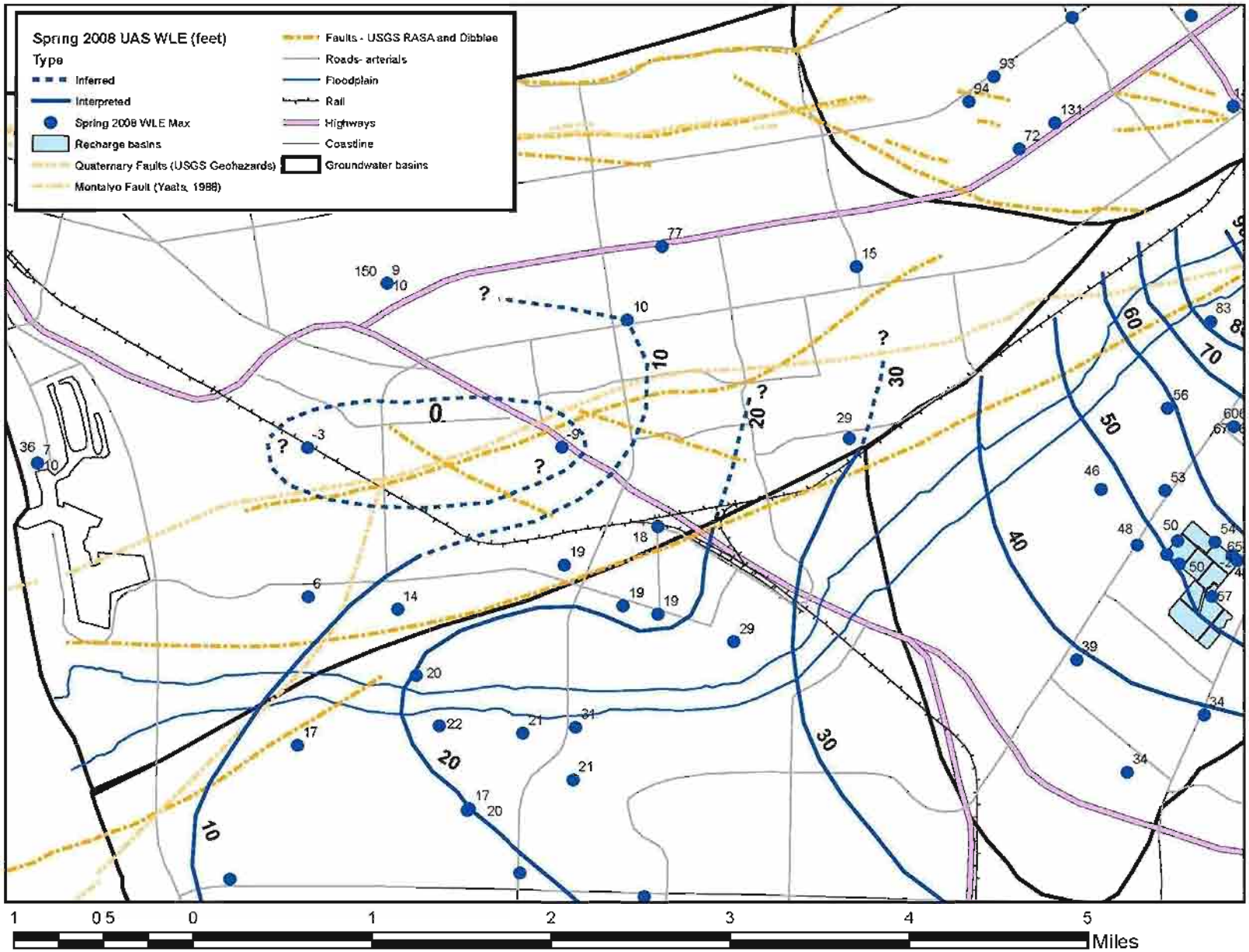
Figure 6-7. Well 02N23W14K01S water quality records.

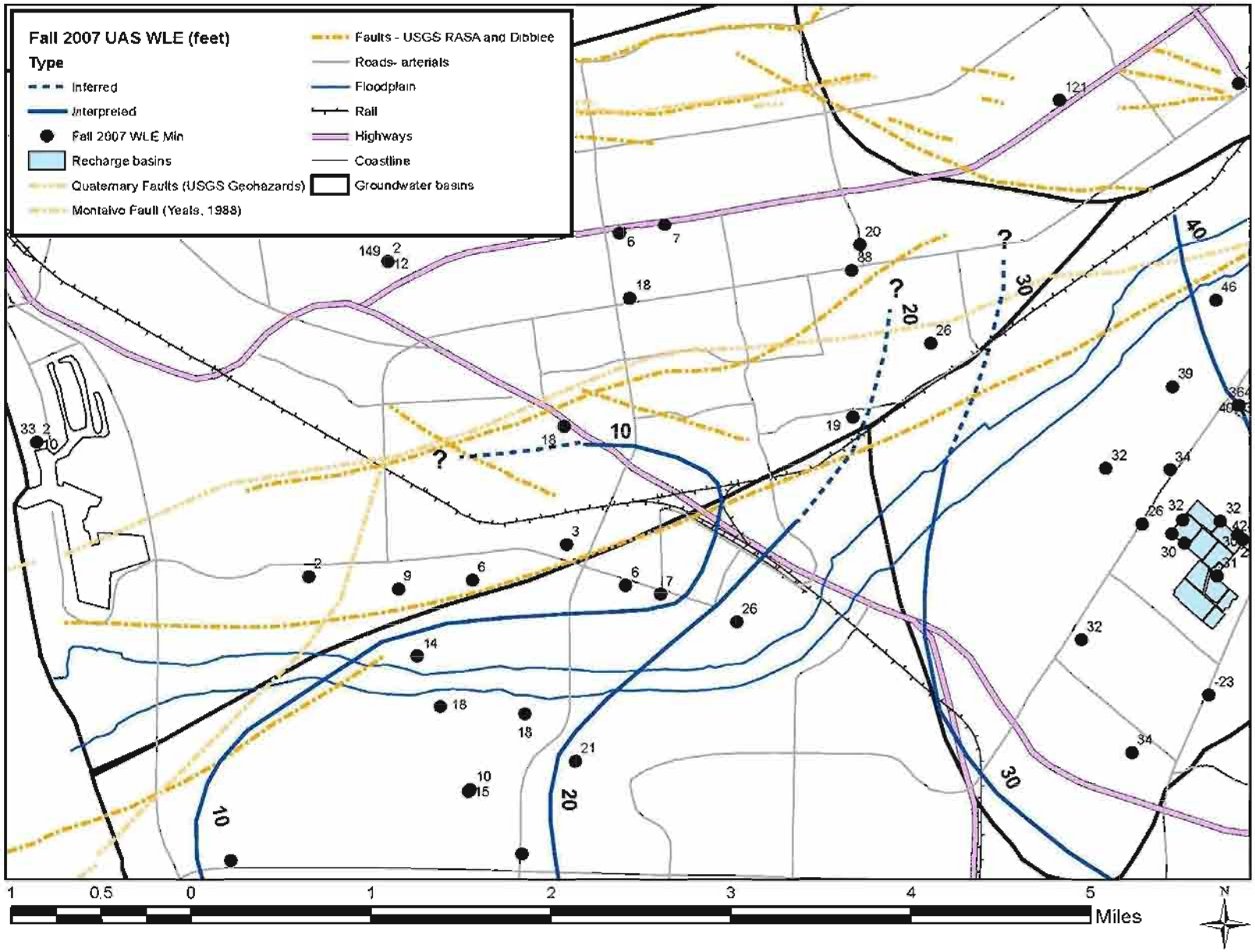
10 APPENDIX B - GROUNDWATER ELEVATION MAPS

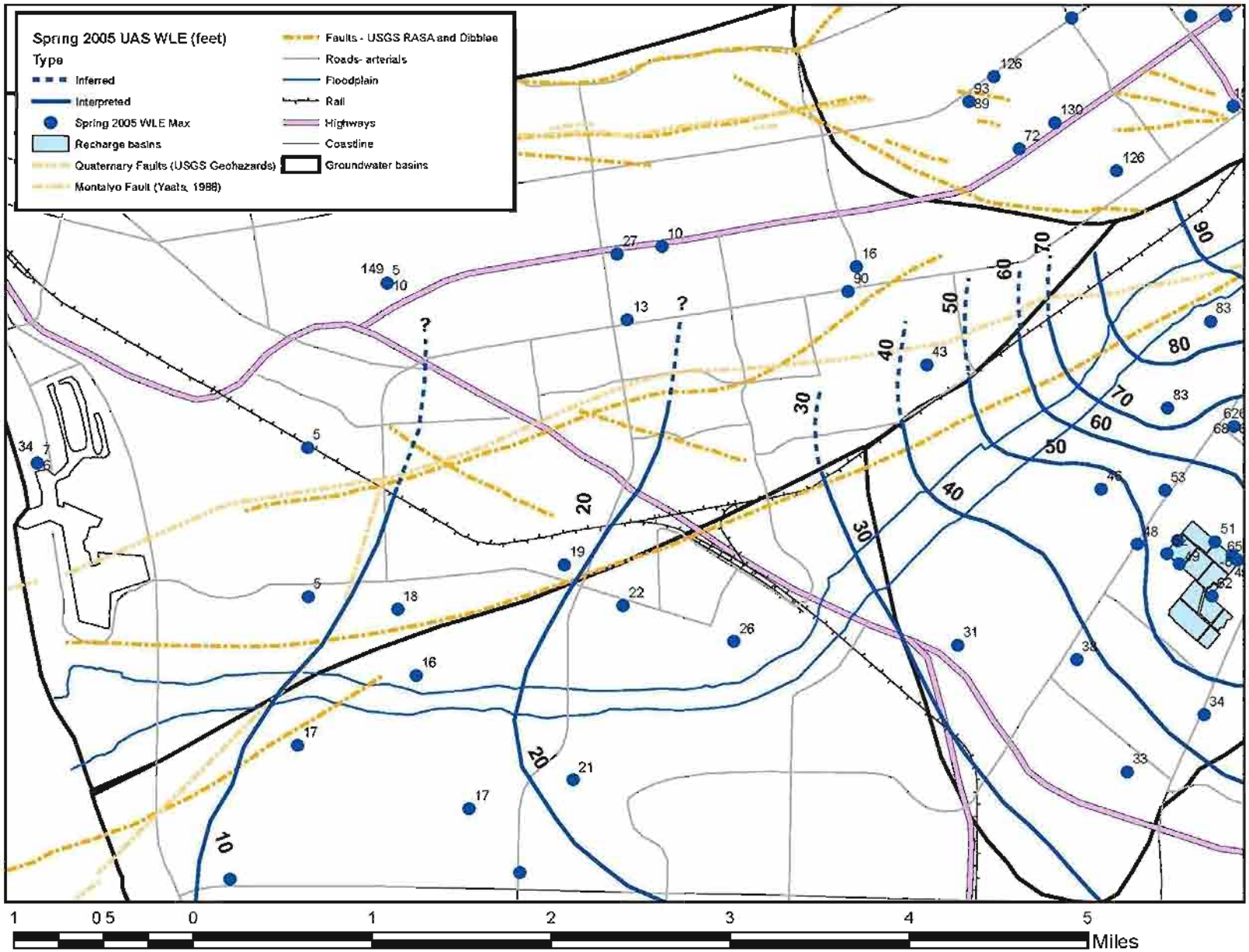
Appendix B contains representative groundwater elevation maps for 2001-2001. If sufficient data were available, both spring and fall groundwater elevation maps are included.


Fall 2011 UAS WLE (feet)
Type
Inferred
Interpreted
Fall 2011 WLE Min
Recharge basins
Quaternary Faults (USGS Geohazards)
Montalvo Fault (Yeats, 1988)
Faults - USGS RASA and Dibblee
Roads- arterials
Floodplain
Rail
Highways
Coastline
Groundwater basins
1 0.5 0 1 2 3 4
Miles
N


Spring 2011 UAS WLE (feet)
Type
Inferred
Interpreted
Spring 2011 WLE Max
Recharge basins
Quaternary Faults (USGS Geohazards)
Montalvo Fault (Yeats, 1988)
Faults - USGS RASA and Dibblee
Roads- arterials
Floodplain
Rail
Highways
Coastline
Groundwater basins
1 0 5 0 1 2 3 4 5
Miles


Spring 2008 UAS WLE (feet)
Type
Inferred
Interpreted
Spring 2008 WLE Max
Recharge basins
Quaternary Faults (USGS Geohazards)
Montalvo Fault (Yeats, 1988)
Faults - USGS RASA and Dibblee
Roads- arterials
Floodplain
Rail
Highways
Coastline
Groundwater basins
1 0.5 0 1 2 3 4 5
Miles


Fall 2007 UAS WLE (feet)
Type
Inferred
Interpreted
Fall 2007 WLE Min
Recharge basins
Quaternary Faults (USGS Geohazards)
Montalvo Fault (Yeats, 1988)
Faults - USGS RASA and Dibblee
Roads- arterials
Floodplain
Rail
Highways
Coastline
Groundwater basins
1 0.5 0 1 2 3 4 5
Miles
N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Faults - USGS RASA and Dibblee
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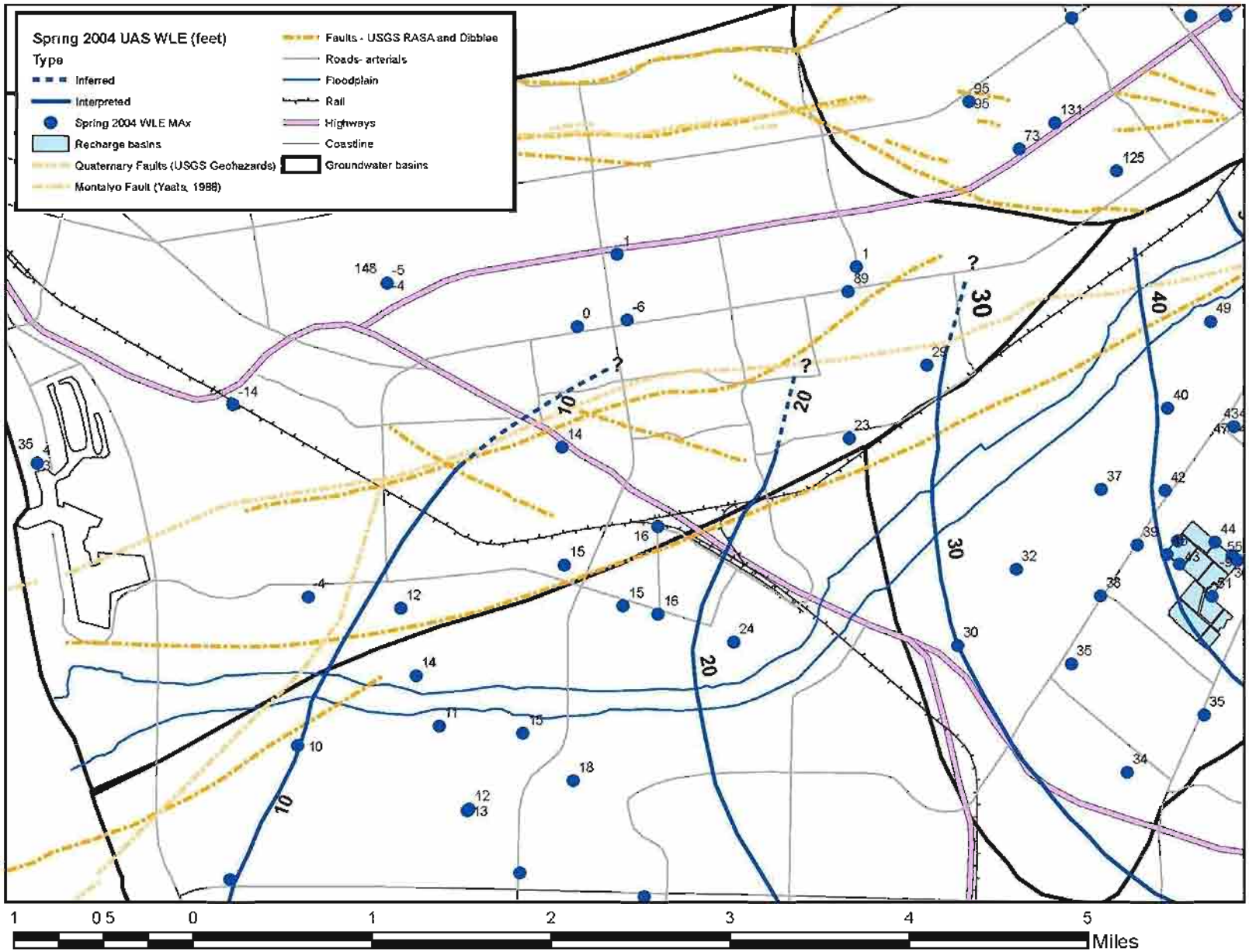
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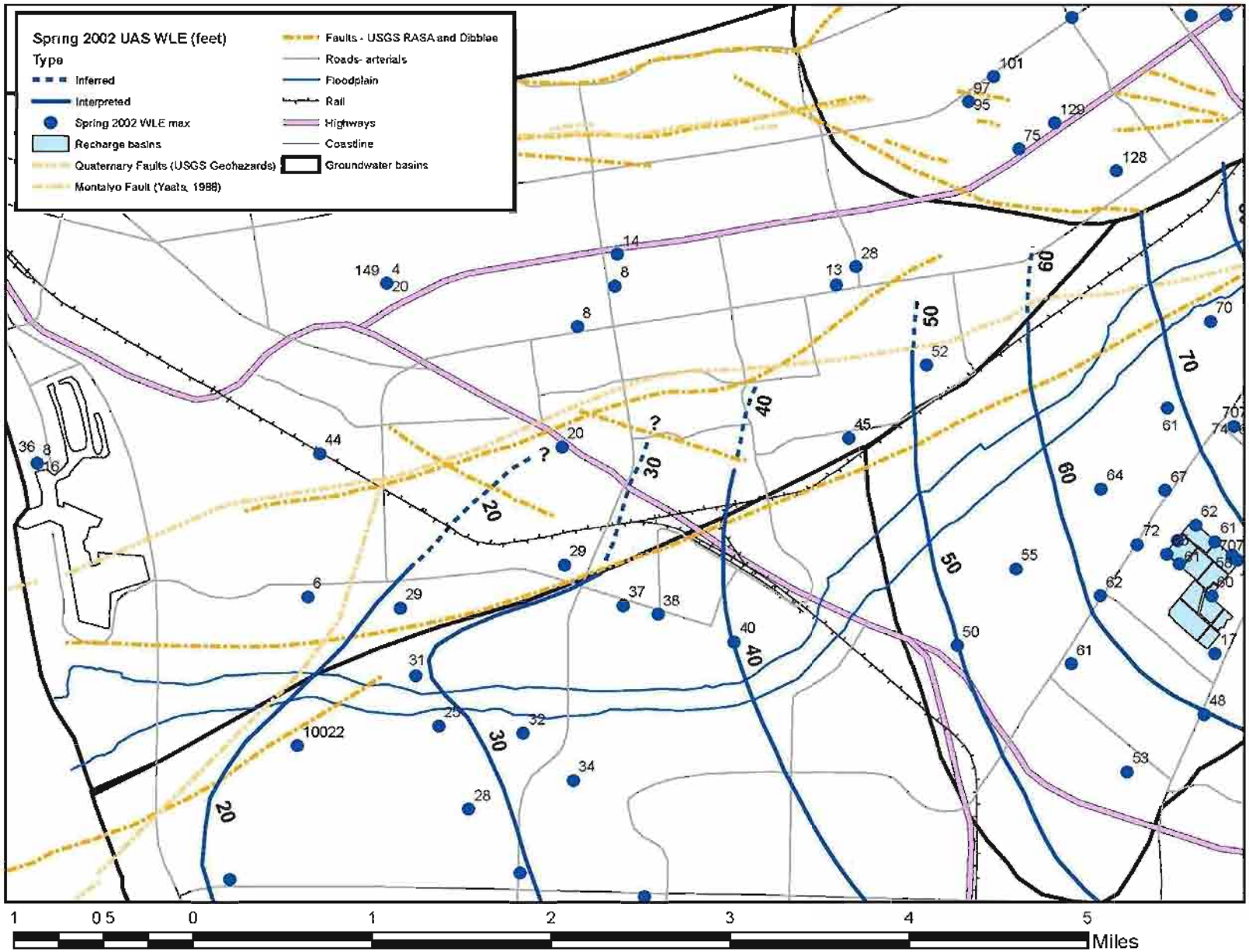
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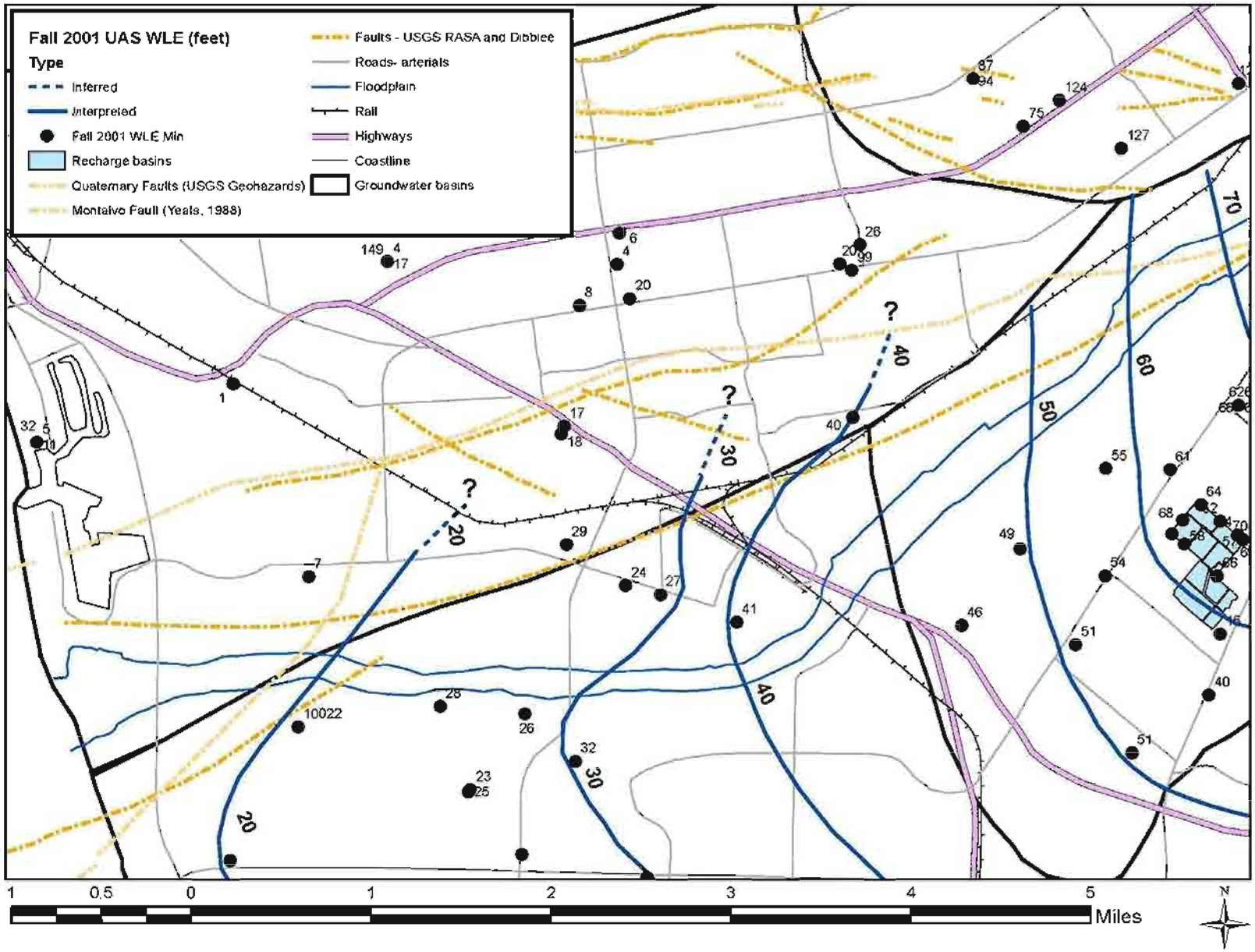
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Faults - USGS RASA and Dibblee
Roads- arterials
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Highways
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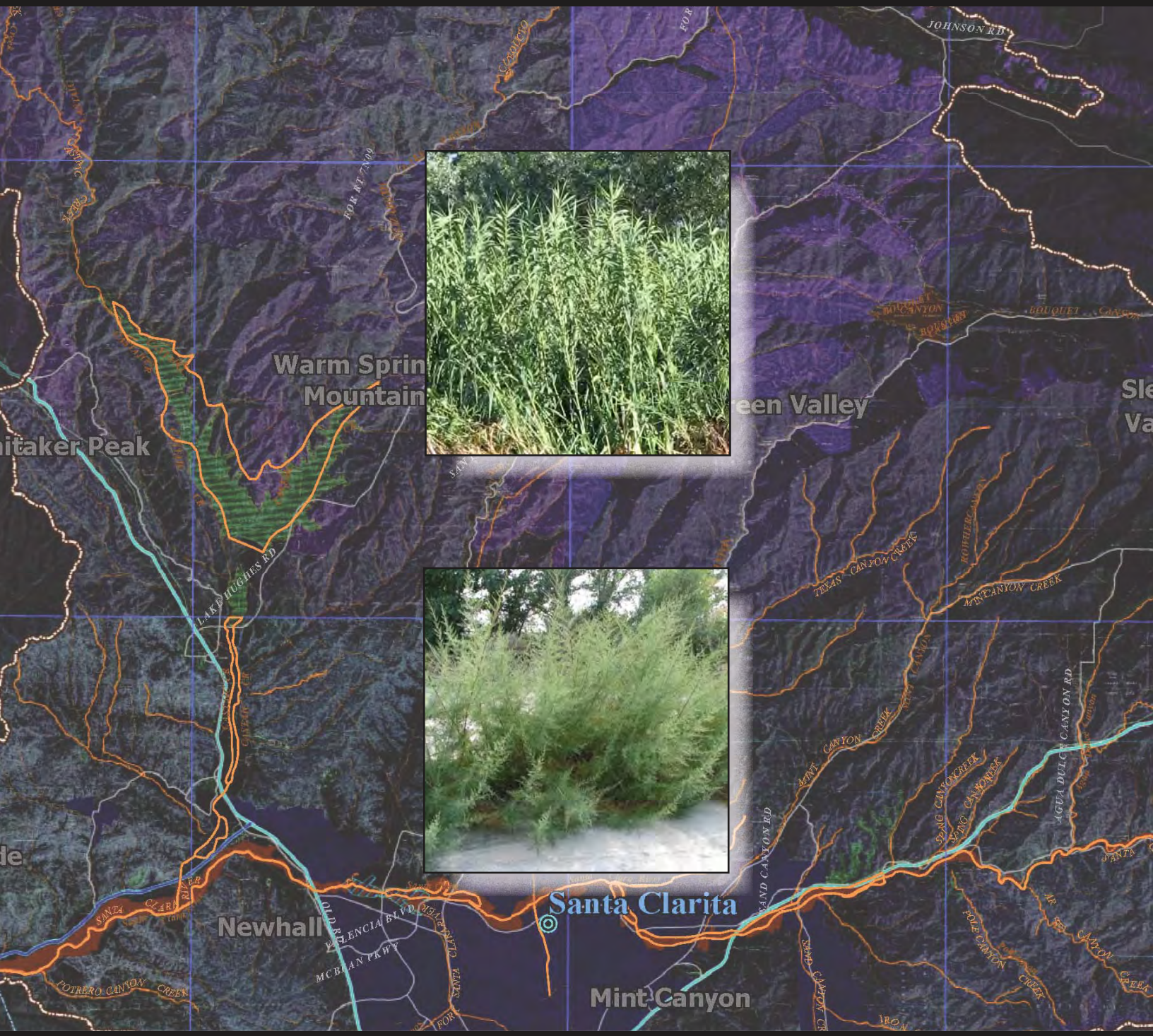
Upper Santa Clara River Watershed
Arundo and Tamarisk Removal Program

Long-Term Implementation Plan



Ventura County Resource Conservation District

June 2006

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List of Acronyms

Acronym	Definition
°C	degrees Celsius
af	acre-feet
BMP	best management practices
Cal-IPC	California Invasive Plant Council
CDFA	California Department of Food and Agriculture
CDFG	California Department of Fish and Game
CA Parks/Rec	California Department of Parks and Recreation
CDPR	California Department of Pesticide Regulations
CESA	California Endangered Species Act
CLWA	Castaic Lake Water Agency
CNDDB	California Natural Diversity Database
CNPS	California Native Plant Society
CWA	Clean Water Act
DWR	California Department of Water Resources
FSCR	Friends of the Santa Clara River
FESA	Federal Endangered Species Act
I-5	Interstate 5
LADPW	Los Angeles County Department of Public Works
LBV	least Bell's vireo
MBTA	Migratory Bird Treaty Act
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
msl	mean sea level
NGO	Non-governmental organization
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
QAPP	Quality Assurance Project Plan
RGP	Regional General Permit
RWQCB	Regional Water Quality Control Board
SARMB	Santa Ana River Mitigation Bank
SCARP	Santa Clara River Arundo and Tamarisk Removal Program
SCREMP	Santa Clara River Enhancement Management Plan
SMSLRWMA	Santa Margarita and San Luis Rey Watershed Weed Management Area
SWFC	Southwestern willow fly-catcher
TADN	Team Arundo del Norte
TDS	total dissolved solids
TMDL	Total Maximum Daily Load
TNC	The Nature Conservancy
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UWCD	United Water Conservation District
VCRCD	Ventura County Resource Conservation District
VCWPD	Ventura County Watershed Protection District

1.0 Introduction

The Santa Clara River, its tributaries and the associated riparian or streamside habitats comprise one of the largest natural river systems remaining in Southern California. From its headwaters in the San Gabriel Mountains southeast of the town of Acton, the Santa Clara River flows for 84 miles through Los Angeles and Ventura Counties terminating at the Pacific Ocean. The 45-mile-long portion of the Santa Clara River and its associated tributaries within Los Angeles County are referred to as the upper Santa Clara River. Along this 45-mile course, the Santa Clara River crosses national forest land, large areas of moderately developed private rural lands, the growing City of Santa Clarita, and then large tracts of rural farmland extending west to the county line. The Santa Clara River and this wide range of adjacent land uses comprise the upper Santa Clara River watershed, which consists of approximately 680 square miles (409,703 acres). This area is the focus of this plan (Fig. 1).

The Santa Clara River system and its associated riparian habitats provide major benefits to the surrounding communities including groundwater recharge, urban and agricultural water supplies, flood conveyance, visual relief, and recreational opportunities. In addition, the types of habitat found in the Santa Clara River's riparian areas are some of the most valuable wildlife habitat in the state, in terms of both species diversity and abundance, and provide habitat for some of the state's most threatened and endangered wildlife. This is especially important since as much as 90 percent of California's streamside riparian plant communities have been eliminated by urban and agricultural development within the last 150 years.

Many threats to the values provided by the Santa Clara River and its tributaries exist, including encroaching development, increased urban runoff, and the spread of invasive, non-native plant species. According to the National Invasive Species Council, an "invasive species" is one that is a) non-native (or alien) to the ecosystem under consideration and b) whose introduction causes or is likely to cause economic or environmental harm or harm to human health.

In particular, the widespread establishment of two invasive plant species, arundo or giant reed (*Arundo donax*) and tamarisk or salt cedar (*Tamarix* spp.), severely threaten many of the benefits described above. Arundo and tamarisk have spread throughout the Santa Clara River and most of its tributaries such that their presence has become an important issue for the surrounding communities. Major stands of arundo dominate large sections of the Santa Clara River in northeast Los Angeles County and are even more prevalent throughout its reaches in Ventura County. Although less prevalent than arundo, tamarisk is also a major problem in some portions of the central and upper watershed.

1.1 Project Goals and Scope

The Upper Santa Clara River Watershed Arundo/Tamarisk Removal Plan (SCARP) provides guidance to stakeholders for implementing procedures to remove invasive, non native plants. The primary objective of the plan is to guide and facilitate the implementation of arundo and/or tamarisk removal projects within the upper Santa Clara River watershed of Los Angeles County. The SCARP is a living document and will be updated periodically as new technologies become available, regulations change, or new resources/issues are identified. The project focus is on approximately 16,300 acres of land within the 500 year floodplain of the Santa Clara River and its primary, secondary, and tertiary tributaries. These floodplain lands, particularly within the banks and channel of the Santa Clara River and tributaries, are where arundo and tamarisk infestations are primarily contained and where the bulk of removal activities would occur. However, additional activities such as access, equipment staging and storage, transport, and disposal may occur outside of the 500-year floodplain.

The SCARP has been prepared to provide local landowners, municipalities, environmental groups, and other stakeholders with a broad menu of available techniques for removal of arundo and tamarisk and guidance in obtaining proper permits and approval for removal. The SCARP also provides best management practices (BMP) needed to minimize impacts during removal projects. The following factors have been researched and considered in the development of this SCARP:

- Potential eradication methods
- Degree of infestation
- Existing habitats
- Presence of threatened and/or endangered species
- Access
- Land use
- Current work being conducted or planned
- Pre-existing environmental agency restrictions and permits
- Funding mechanisms in place and strategies for future funding

Taken together, these factors provide a framework for a long term eradication program and associated monitoring to facilitate removal of arundo and tamarisk from the upper Santa Clara River watershed and the restoration and maintenance of natural, economic and community values provided by these riparian corridors.

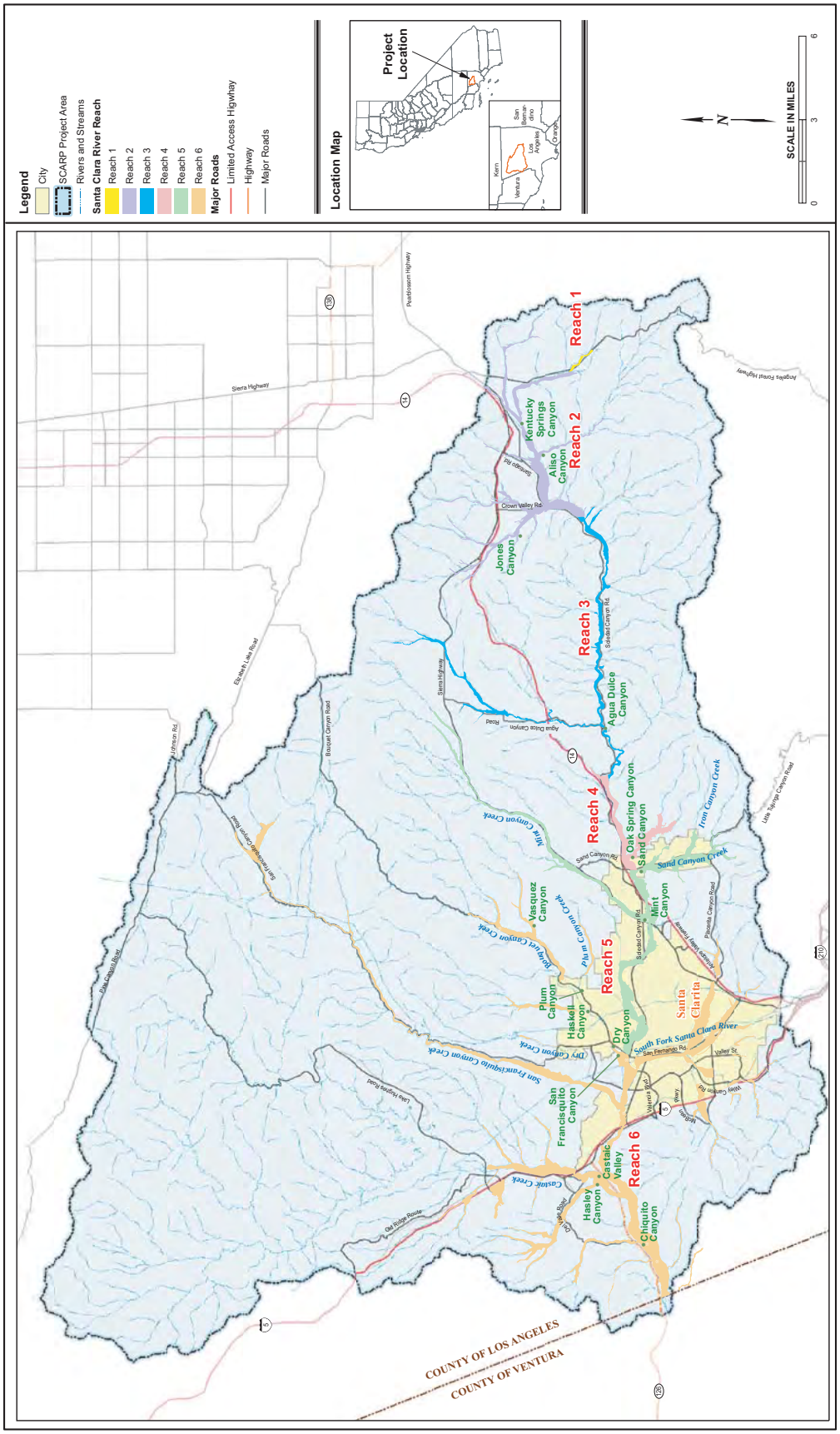
1.2 Project Partnerships

The lead agency directing this effort is the Ventura County Resource Conservation District (VCRCD). The VCRCD is one of 104 resource conservation districts in California and is a special district of the state, which receives funding primarily through grants. The VCRCD manages a diversity of programs including soil and water conservation projects, wildlife habitat enhancement and restoration, control of invasive plants species, and environmental education. The VCRCD has developed a Memorandum of Understanding (MOU) to show support for the SCARP project. The agencies and organizations, which have completed MOUs, are listed below and copies of these memoranda are included in Appendix 1:

- Antelope Valley Resource Conservation District (AVRCD)
- U.S. Forest Service (USFS)
- U.S. Fish and Wildlife Service (USFWS)
- Los Angeles County Department of Public Works (LADPW)
- Los Angeles Agricultural Commissioner's Office
- Los Angeles County Weed Management Area (LAWMA)
- City of Santa Clarita
- Friends of the Santa Clara River (FSCR)
- UC Cooperative Extension

A SCARP Working Group was also created to collaborate with the various organizations and agencies within the upper Santa Clara River watershed. There are many other local agencies and organizations assisting in various ways with the SCARP development such as the U.S. Army Corps of Engineers (USACE), the California Department of Fish and Game (CDFG), the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS), the Los Angeles Regional Water Quality Control Board (RWQCB), the Ventura County Arundo Task Force, and the Ventura County Watershed Protection District (VCWPD).

Figure 1: SCARP Project Location and Associated River Reaches



Upper Santa Clara River Sub-Watershed – Santa Clara River Reaches

SCARP

2.0 Invasive Plant Species in the Santa Clara River

The primary focus of this program is the eradication of arundo and tamarisk from the upper Santa Clara River watershed. These species and the issues involving them are described in detail in this section. However, the SCARP recognizes that arundo and tamarisk are not the only non-native invasive plant species present in the upper Santa Clara River watershed. Other species that have been identified within the project area are listed at the end of this chapter. While the removal methods described in Chapter 10 are primarily listed for their use in eradicating arundo and tamarisk, they may also be used to remove other non-native invasive species that are encountered during an individual eradication project.

2.1 Background on Arundo

Arundo is native to the Mediterranean region. It was introduced to the western United States by Spanish settlers in the early 1800s and became abundant in the Los Angeles River by the 1820s. It was historically used as a windbreak, soil stabilizer, fodder, and for making reeds for woodwind instruments. Material from this plant was also commonly woven into mats and used as building material. It is no longer widely used or harvested for these traditional products, but is still used in landscaping.

Arundo is a tall, perennial grass that can reach up to 30 feet in height. It is light to dark green in color and has long, broad blades, with large plume-like flowers. Arundo is one of the fastest growing plants in the world and grows quickly in response to elevated nitrogen levels. This plant is tolerant of both drought and flooding, and can survive extended periods of salinity exposure. Arundo reproduces vegetatively from rhizomes (underground stems) and stem segments. Stem segments usually need two nodes or points for both roots and shoots to grow, but shoots have been observed on stem segments with a single node. Once introduced, arundo has the capability to spread rapidly, forming extensive rhizome systems that out-compete native riparian vegetation and require human intervention to remove. A single clump typically has hundreds of stems that grow very closely together and very rapidly, up to several inches per day during the spring and summer months. Arundo does not usually spread from seed.

Arundo thrives in warm, tropical environments and is most often invasive in coastal riparian areas, where it forms dense monocultures. The invasiveness of arundo substantially affects water quality, water conservation, native biological resources, flooding, erosion hazards, and wildfire risks. Arundo uses at least twice the amount of water as native riparian plants, and can use as much as 17.3 liters/m^2 per day, which is nearly 20 times the amount used by native vegetation (Hendrickson and McGaugh 2005). Arundo is extremely flammable throughout most of the year and is highly adapted to fire. The height of arundo growth spreads fires to tree canopies and the dense growth in the river channels spread fires up and down the river system. The rhizomes also respond quickly after fires, sending up new shoots, and quickly outgrow native species that may have otherwise taken root or sprouted in a burned site (Bell 1997).

2.2 Background on Tamarisk

Similar to arundo, tamarisk is a native of south Eurasia and may have been introduced by Spanish settlers. It was present in California by the early 1900s. Tamarisk was historically, and is currently, used for windbreaks, firewood, shade, and in landscaping. There are currently five known species of tamarisk in California including *Tamarix ramosissima*, *T. parviflora*, *T. gallica*, *T. aphylla*, and *T. chinensis*. Tamarisk is found in rivers, streams, wetlands, desert alkali sinks, playas, and springs throughout Southern and Central California and the western United States.

Although currently less of a problem than arundo in this watershed, tamarisk may be spreading and has potential to cause substantial long-term effects on the water quality, water conservation, native biological resources, flood control, and fire hazards. Tamarisk is a hardy, perennial shrub or small to medium-sized tree, which under favorable circumstances can reach 30 to 40 feet in height. Tamarisk foliage is light to dark green, with small, alternate scale-like leaves. The bark varies from smooth to rough and is reddish-brown. The plants are able to flower after one year of growth.

Tamarisk spreads by seed dispersal and vegetative reproduction. Full-grown mature trees can produce

500,000 seeds per year. These seeds remain viable up to five weeks after being produced and some may survive to the next spring (DiTomaso 2003). These seeds are extremely small with a terminal tuft of exposed fibers that allows them to travel greater distances via wind or water. Unlike arundo, seed dispersal is tamarisk's primary form of reproduction and spreading. However, under favorable moist conditions, tamarisk can also become easily established from stem and root segments.

Tamarisk is an aggressive invasive plant that has a long taproot capable of extending down to the water table. Because of this long taproot, tamarisk is capable of obtaining water in inhospitable and fluctuating groundwater environments, which allows it to out-compete native vegetation. In particular, tamarisk displaces native woody species, such as cottonwood, willow, and mesquite, especially in disturbed areas. Tamarisk consumes at least twice the amount of water that native vegetation uses, or about 3.3 liters/m^2 per day (Hendrickson and McGaugh 2005). Tamarisk further impacts the environment by its ability to concentrate soil salts. Tamarisk leaves collect salt brought up from the soil by the roots. As leaf litter accumulates under the plant, the surface soil can become highly saline, thereby impeding future colonization by many native understory plant species (Carpenter 1998). In addition, dense stands of tamarisk can be highly flammable and tamarisk is likely to persist following fire and expand its dominance with repeated burning of low-elevation riparian plant communities (Busch 1995).

2.3 Long-term Effects of Arundo and Tamarisk Invasion

Both arundo and tamarisk are officially recognized as undesirable invasive plants. Both plants are listed as 'A-1' invaders (the most invasive and widespread wildland pest plants) by the California Invasive Plant Council (Cal-IPC) [formerly known as California Exotic Pest Plant Council] and as noxious weeds by the California Department of Food and Agriculture (CDFA). While the degree and specifics of problems associated with these species vary, general negative effects associated with the establishment of arundo and tamarisk within the watershed.

2.3.1 Water Quality and Supply

Both arundo and tamarisk consume large amounts of water, which negatively affects both instream and groundwater availability. Reduced water availability also adversely affects water-dependent plants and wildlife, and reduces the water available for beneficial urban and agricultural uses. Although native riparian plants have similar transpiration rates per unit of surface area to arundo and tamarisk, arundo and tamarisk have approximately two or more times greater leaf surface area. Therefore, they transpire more water than native plants (Kelly 2003). Water consumption by these species is so high that dense infestations can desiccate riparian areas (seeps, springs, rivers) in arid habitats (Egan and Walker 2000; Dudley 2000). Major arundo infestations can cause an overall increase in water temperature by reducing shade in riparian areas. Increased water temperature can ultimately lead to a reduction of dissolved oxygen, making the water unsuitable for aquatic organisms (Bell 1997). In addition, increased light exposure and temperature may encourage algal blooms, and consequently increase pH levels and severely reduce available habitat for aquatic organisms (Adamus et al. 1997). Increased pH also facilitates the conversion of usable ammonia to a toxic byproduct, which degrades water quality. All of these changes can adversely affect wildlife, including rare and sensitive species.

2.3.2 Flooding and Erosion

Both arundo and tamarisk are known to increase flood hazards and the potential for erosion of adjacent lands, particularly for farmland along the Santa Clara River. Both plants can alter stream geomorphology by trapping and stabilizing sediment, which narrows stream channels, widens floodplains, and causes increased flooding (Carpenter 1998; Lovich 2000; Zouhar 2003). Large stands of arundo and tamarisk may also obstruct flows and shunt floodwaters into areas that historically have not experienced water flow. This can exacerbate bank erosion problems and lead to an unnatural increase in the loss of adjacent public and private property that is often valuable farmland. Arundo provides less protection for steam banks from erosion, because its dense but shallow root masses are more easily undercut than

deep-rooted native riparian vegetation. In addition to increasing flood magnitudes, arundo and tamarisk debris may accumulate downstream of the infestations, trapping sediments, and impeding natural water flow. Arundo debris can create new establishments downstream and on the beach. In many cases, costly clean up efforts or repairs are required.

2.3.3 Fire Hazards

Both arundo and tamarisk contribute to increased fire hazards. Under natural conditions, riparian areas act as firebreaks, but as they are overcome by invasive species, they not only enable wildfires to spread more rapidly, but they can also become sites where fires may originate. Arundo, in particular, is highly flammable and burns more intensely than native riparian vegetation even when green (Bell 1997; Dudley 2000). Because arundo is able to grow to substantial heights, it can act as a ladder fuel, effectively carrying, fire into tree canopies, thereby causing "crown fires" that increase tree mortality. Further, fire disturbance encourages regrowth of arundo. Burned areas also favor tamarisk regrowth, generating a positive feedback loop which is ultimately destructive to native habitat and dangerous to human developments (Bell 1997). Tamarisk leaf litter is also highly flammable, and because both plants are more flammable than native riparian vegetation, fires may occur more frequently and contribute to the eventual exclusion of native plant species (Bell 1997; Carpenter 1998; Lovich 2000).

2.3.4 Native Habitats and Wildlife

Arundo and tamarisk threaten native riparian habitats and the wildlife that depends upon these habitats by excluding native plants from water resources, growing space, and sunlight. Arundo often forms dense monocultures that exclude native vegetation by monopolizing water resources, shading, and altering flood regimes critical to the establishment of native riparian vegetation (Bell 1997; Dudley 2000). The salt-laden leaf litter of tamarisk also precludes such native understory from establishing. Both plants do not offer the same amount of shade as native vegetation (Carpenter 1998). Both arundo and tamarisk reduce habitat quality and food supply for native wildlife, including insects and bird species (Bell 1997; Dudley 2000; Herrera 2003). Insects and other grazers are not able to use arundo as a food source due to the noxious chemicals it contains and its defensive cellular structure (Bell 1997). This is particularly important for federal and state listed species, such as least Bell's vireo, southwestern willow flycatcher, and yellow-billed cuckoo, which utilizes insects as a food source. Documented decreases in wildlife usage of riparian areas have occurred due to massive stands of arundo (Dudley 2000).

2.4 Other Invasive Species

In addition to arundo and tamarisk, perennial pepperweed is a third significant threat to the watershed. Once established, it is very difficult to remove, and the monocultures it creates effectively displace native flora and fauna. Similar to tamarisk, perennial pepperweed also has the ability to concentrate salts near the ground surface (Renz 2000). The following list contains additional noxious and invasive plant species, which may be treated when encountered. The Cal IPC and CDFA also have lists of noxious and invasive plant species. The removal project manager, in coordination with the resource agencies, will make a determination regarding the level of effort that should be exerted in removing each species. For example, mustard may only require treatment if it occurs in stands greater than 0.25 acre at greater than 50-percent cover. Table 1 below lists additional invasive plant species.

Table 1: Invasive Plant Species

Scientific Name	Common Name
Ageratina adenophora	eupatory
Ailanthus altissima	tree of heaven
Aptenia spp.	iceplant
Atriplex semibaccata	Australian saltbush
Avena spp.	non-native grasses
Bassia hyssopifolia	five hook bassia
Brassica spp.	mustard species
Bromus spp.	non-native grasses
Cardaria chalepensis or *C. draba*	hoary cress, white top
Carduus pycnocephalus	Italian thistle
Carpobrotus spp.	iceplant
Centaurea melitensis	tocalote
Centaurea solstitialis	yellow starthistle
Cirsium arvense	Canada thistle
Cirsium vulgare	bull thistle
Conium maculatum	poison hemlock
Cortaderia jubata or *C. selloana*	pampas grass
Cynara cardunculus	artichoke thistle
Cynodon spp.	non-native grasses
Cytisus scoparius	scotch broom
Erodium cicutarium	red stem filaree
Eucalyptus spp.	eucalyptus
Foeniculum vulgare	fennel
Genista monosperma	bridal veil broom
Hedera helix	English ivy
Lepidium latifolium	pepper weed
Linaria dalmatica	dalmation toadflax
Mesembryanthemum spp.	iceplant
Nerium oleander	oleander
Nicotiana glauca	tree tobacco
Phoenix canariensis	canary island palm
Ricinus communis	castor bean
Robinia pseudoacacia	black locust
Salsola spp.	Russian thistle
Schinus spp.	pepper trees
Silybum marianum	milk thistle
Washingtonia spp.	fan palm

3.0 Description of Project Area Reaches

This section provides specific details on the physical and environmental characteristics for each of the upper Santa Clara River's six designated reaches and discussion of future removal program issues and recommendations. The same general analysis is also provided for each of the upper Santa Clara River's ten major tributary systems. In some reaches, removal work may have been conducted prior to the development of the SCARP. The goal of this background information and analysis is to facilitate an understanding among and between future removal project applicants and concerned state and federal resource agencies about the issues surrounding arundo and tamarisk removal proposals. An additional goal is to set the stage for resource agencies such as CDFG, USFWS, and USACE to issue programmatic permits, which will facilitate future removal projects while still protecting critical resources. Reach discussions are generally organized from east to west; with Reach 1 beginning upstream at the eastern project boundary, and Reach 6 ending downstream at the western project boundary.

The upper Santa Clara River's ten main tributaries are grouped based on their hydrological connections to one another and their point of intersection with the mainstem. Eight of these tributaries are located on the north side of the watershed and extend into USFS land. Two tributaries are located on the south side of the watershed. Tables 2 and 2a list the reaches and tributaries within the upper Santa Clara River watershed. The location of the project area is shown in Figure 1. Mainstem and tributary surveys performed by AMEC are described in the text, however detailed tributary surveys conducted by Condor Environmental are included as a separate document in the Appendices. Additional information for each reach and its respective tributaries such as summary tables for reach characteristics, channel cover, and sensitive species can be found in Appendix 6.

Table 2: Reach Descriptions

Reach	Location (east to west)	Length of Reach (miles)	Arundo Coverage (acres)	Tamarisk Coverage (acres)
Reach 1	Eastern Project Boundary to the Angeles Forest Highway	3.6	0	0
Reach 2	Angeles Forest Highway to Acton	8.0	0	2.5
Reach 3	Acton to Spring Canyon	11.4	111	30
Reach 4	Spring Canyon to Sand Canyon	3.9	70.7	21.3
Reach 5	Sand Canyon to Bouquet Canyon	7.9	98.7	202.5
Reach 6	Bouquet Canyon to the Los Angeles County Line	11.0	464.3	190.3

Table 2a: Tributary Descriptions

Reach	Tributary Name	Length of Reach (miles)	Arundo Coverage Greater than 50% (acres)	Tamarisk Coverage Greater than 50% (acres)
Reach 1	No tributaries	n/a	0	0
Reach 2	Jones Canyon Tributaries	9.0	0	0
	Soledad	6.87	0	0
	Aliso Canyon	3.02	0	0
	Escondido Canyon	6.41	0	0
	Santiago Road	n/a	0	0
Reach 3	Aqua Dulce Canyon Tributary	4.7	0	0.15
Reach 4	Oak Spring	5.13	0	0
Reach 5	Sand Canyon Creek	8.5	0	0
	Mint Canyon Creek	13.6	3	0
Reach 6	Bouquet Canyon Creek	25.0	0	0
	South Fork Tributaries	7.5	0	0
	San Francisquito Canyon Creek	21.7	5	0
	Castaic Creek	23.5	3	2
	Hasley Canyon	5.4	0	0
	Chiquito Canyon Tributary	4.9	0	0
	Potrero	3.61	0	0
	Salt	7.24	0	0
	San Martinez Grande	3.22	0	0

3.1 Reach 1: Eastern Project Boundary to Angeles Forest Highway

Characteristics

Extending 3.6 miles, Reach 1 comprises the headwaters of the Santa Clara River which are located in Soledad and Kentucky Springs Canyons; and the river flows through Soledad Canyon for many of the following reaches. Kentucky Springs Canyon is fed by several small streams originating in the San Gabriel Mountains. Reach 1 lies entirely within the Angeles National Forest, although there are several private in-holdings. Reach 1 is an ephemeral stream, where surface water is present only after major storm events. The stream channel within this reach is narrow and steep due to surrounding topography. The 500-year floodplain of Reach 1 ranges between 250 and 500 feet in width and has primarily natural streambanks.

The vegetation in Reach 1 is dominated by big sagebrush and chamise. The remainder of the floodplain is dominated by juniper and walnut woodlands. Sensitive species including the coast horned lizard (state candidate for listing) and the short-joint beavertail cactus (state species of concern) have been reported in Reach 1 (CDFG 2004). This reach's high quality habitat may support other sensitive species; however, this area has only been partially surveyed.

Target Species

No known infestations of arundo, tamarisk, or other invasive plant species have been observed in Reach 1 and therefore no eradication projects are currently anticipated. Although this reach is not threatened or highly suitable for arundo or tamarisk, this reach should be monitored for development of arundo and tamarisk colonies, as presence of these species can lead to infestations downstream.

3.2 Reach 2: Angeles Forest Highway to Acton

Characteristics

Reach 2 begins where Angeles Forest Highway crosses the Santa Clara River at its intersection with BP & L Road and extends eight miles towards the town of Acton. Tributaries draining into the reach include Jones, Acton, and Aliso Canyons. Reach 2 contains substantial acreage of low-level development associated with the town of Acton. Low-density development is present throughout the reach, although it is primarily concentrated around the town of Acton and toward the western end of the reach. This development includes residential housing, ranches, campgrounds, recreation fields, and recreational vehicle parks. The channel within Reach 2 is an open, often shallow, low-gradient wash. The 500-year floodplain is relatively wide near the reach's western boundary, varying between 350 feet in width near its eastern extent and 2,250 feet near Acton.

Vegetation in this reach gradually shifts from dense brush to sparse scrub, with pinyon-juniper woodland in the east transitioning into high desert scrub in the west. Sensitive species in Reach 2 include the coast horned lizard and Mason's neststraw (CNPS List 1B), both known to occur within the 500-year floodplain of the reach (CDFG 2004). As with Reach 1, the lack of reported sensitive species may be due the lack of area surveys.

Target Species

No arundo infestation has been reported within the 500-year floodplain of Reach 2. However, tamarisk occurs in a few small stands at low densities within one mile of the western boundary of the reach.

3.2.1 Acton, Jones, and Kashmere Canyon Tributaries

Characteristics

The Jones Canyon tributaries are located north of the mainstem and connect with the Santa Clara River in Acton. These tributaries include Acton, Jones, and Kashmere Canyons. These canyons consist primarily of private land and scattered rural residences are located in the upper sections of these canyons. These tributaries tend to be arid washes with little or no surface flow of water except under high rain conditions. All three are dominated by desert vegetation and scrub. Sightings of coast horned

lizard have been recorded in these tributaries.

Target Species

Neither tamarisk nor arundo have been recorded in these tributaries. However, the tributaries are susceptible to infestation from ornamental landscaping by proximate private landowners. Therefore, residents in the area should be educated about arundo and tamarisk and the area should be monitored for possible future infestations.

3.2.2 Aliso Canyon Tributary

Characteristics

Aliso Canyon is located south of the mainstem in Reach 2. Aliso Canyon is also an arid wash, except in high rain conditions. Scattered rural residences and areas of agricultural production exist along portions of the canyon. Similar to the Jones Canyon tributaries, Aliso Canyon is characterized by desert vegetation and scrub and coast horned lizards have been sighted.

Target Species

Neither tamarisk nor arundo have been recorded in these tributaries. However, they are also susceptible to infestation from ornamental landscaping by proximate private landowners. Therefore, residents in the area should be educated about arundo and tamarisk and the area should be monitored for possible future infestations.

3.3 Reach 3: Acton to Spring Canyon

Characteristics

Reach 3 is the longest reach in the project area and extends for 11.4 miles from Acton to Spring Canyon. The only major tributary draining into Reach 3 is Agua Dulce Canyon, entering the mainstem from the north about two miles east of Spring Canyon. Development within the floodplain totals approximately 141 acres, including rural-residential housing, recreational vehicle parks, and campgrounds. Reach 3 traverses deep, narrow Soledad Canyon for nearly its entire length. The river channel is correspondingly narrow, with the 500-year floodplain generally limited to 200 and 500 feet in width. The stream channel is broad and often dry at its eastern border, transitioning into a steep narrow canyon for virtually its entire 11-mile extent. The majority of Reach 3 is bounded by natural banks that rise sharply from the channel, with minor areas of concrete hard bank protection.

This reach provides large areas of relatively high quality native riparian habitat Cottonwood woodland dominates this reach, occupying 329 acres of the floodplain, with 119 acres of open unvegetated channel breaking up these expanses of woodlands. These woodlands and associated habitats, such as the mixed willow and big sage, provide several uninterrupted one to two mile stretches of high value native habitat, particularly in the central portions of this reach. This area supports known resident populations of the federal and state endangered arroyo toad, unarmored threespine stickleback, and slender-horned spineflower. Potential suitable breeding habitat for the federal and state endangered least Bells' vireo and southwestern willow flycatcher also exist.

Target Species

There are only a few minor stands of arundo or tamarisk in the eastern five miles of Reach 3. Dense arundo stands occupy a total of 111 acres along this reach. With dense stands occurring approximately one mile both upstream and downstream of the confluence with Agua Dulce Creek. Tamarisk infestation occurs at low-to-moderate densities with approximately 30 acres of the reach's total area. Tamarisk is located in the same general areas of dense arundo stands, including upstream from Indian Springs Road, one mile upstream and downstream of the Agua Dulce tributary intersection, and near Capra Road.

3.3.1 Agua Dulce Canyon

Characteristics

Agua Dulce Canyon is a narrow canyon on the north side of the mainstem with headwaters near Vasquez Rocks County Park. It passes through steep rock walls and intersects with the mainstem in Reach 3 approximately four miles downstream from the headwaters. Near the headwaters, the stream channel is wash-like and has only seasonal surface flow. This section of the

canyon is used for rural residences and small ranches. As the canyon approaches the mainstem, it narrows and becomes steeper, especially downstream near the canyon's intersection with the mainstem. The only development in the base of the canyon is Agua Dulce Road.

The vegetation in Agua Dulce Canyon is dominated by mixed riparian vegetation and some desert species. There is no single dominant plant assemblage within Agua Dulce Canyon. Small cottonwood stands occur throughout the creek, as well as other riparian tree species. Sparse mule fat and other riparian scrub species occur within the creek, as well as scattered desert species such as juniper. Sensitive wildlife species that may be present in the canyon include the arroyo toad, coast horned lizard, and unarmored threespine stickleback.

Target Species

Arundo occurs in scattered, but dense stands along the streambed and on the banks of Agua Dulce Canyon. Due to the narrow nature of this tributary, many of the stands are smaller in size (approximately 5 meters in diameter), except for elbows in the tributary where some larger stands exist. Tamarisk occurs primarily in one stand mid-way to the headwaters off Agua Dulce Road, but additional stands may exist. Surrounding ranches provide sources of arundo and tamarisk.

3.4 Reach 4: Spring Canyon to Sand Canyon

Characteristics

Reach 4 extends 3.9 miles from Spring Canyon to Sand Canyon through the eastern extent of the City of Santa Clarita. The communities of Pine Tree and Canyon Country lie north of the Santa Clara River in this reach, while the communities of Lang and Sulfur Springs extend south from the Santa Clara River. Reach 4 is composed mainly of residential and mining development (91 acres) among sparsely scattered great basin and riparian vegetation. The 500-year floodplain through Reach 4 varies in width from 1,500 feet at its eastern border to 350 feet near Shadow Pines Boulevard and widening to 1,800 feet near Sand Canyon Road. Sand mining in the area near Spring Canyon has lowered the channel approximately 40 feet from its historic elevation.

Reach 4 is dominated by open channel, particularly in its central sections. Great basin and coastal scrub communities total 131 acres of the floodplain along this reach. At the reach's east end, stands of cottonwood woodland are intermixed with the scrub habitats. Sensitive species reported from Reach 4 are limited to coast horned lizard (state species of concern) from the northern margin of the east end of the reach. The two-striped garter snake (state species of concern) has been observed to the south and may occur when water is present in the floodplain area (CDFG 2004). The endangered slender-horned spineflower may also grow along the stream bank in the upstream portions of Reach 4, but its presence has not been confirmed (AMEC 2004).

Target Species

Arundo infestations range from low-to-high density throughout the 500-year floodplain, occupying approximately 71 acres. There are two extensive arundo stands located at the reach's east end, near the private River's End Campground (located in Reach 3). A one-mile section starts at the vicinity of Lang Station Road. Tamarisk is present on 21 acres of the floodplain in generally medium-to-low densities. With the exception of a small patch at the western end of Reach 4, tamarisk concentration within the 500-year floodplain is limited to the area between Lang Station Road and Poppy Meadows Street.

3.4.1 Oak Spring Tributary

Characteristics

Oak Spring Canyon feeds into the western extent of Reach 4. The golf course at the mouth of Oak Spring Canyon has contoured the channel throughout the golf course. Sensitive species reported in these tributaries include the two-striped garter snake.

Target Species

Neither tamarisk nor arundo have been recorded in these tributaries. However, they are also susceptible to infestation from ornamental landscaping by proximate private landowners. Therefore, residents in the area should be educated about arundo and tamarisk and the area should be monitored for possible future infesta-

tions.

3.5 Reach 5: Sand Canyon to Bouquet Canyon

Characteristics

Reach 5 extends 7.9 miles from Sand Canyon Road downstream to Bouquet Canyon Road. The majority of this reach falls within the City of Santa Clarita. Major tributaries to Reach 5 include those from Sand Canyon joining the mainstem from the south at the junction between Reaches 4 and 5, and Mint Canyon flowing into the Santa Clara River from the north approximately two miles downstream from this junction. Approximately 360 acres of the 500-year floodplain is developed along Reach 5, which is mostly within the City of Santa Clarita. The 500-year floodplain in Reach 5 varies in width from 500 feet by the Sierra Highway bridge to nearly 2,500 feet in the developed area off Oak Avenue.

Open channel dominates this reach, occupying 404 acres of the floodplain, with great basin plant communities concentrated along the east and west ends of the reach. The channel is heavily braided. Native vegetation communities are dominated by scalebroom and big sagebrush. Although there are scattered groves of cottonwoods and willows along the channel margins in the western portion of this reach, the riparian vegetation consists primarily of mule fat. This reach has limited native vegetation and only sparse data on sensitive species are available. However, the western spadefoot toad (state species of concern), arroyo chub (state species of concern), and the endangered unarmored threespine stickleback, federal threatened California red-legged frog have reported observations in Reach 5. Others that may be present are the coast horned lizard (state species of concern) and western whiptail (state candidate). Similarly, sensitive plant species have not been observed, but the floodplain in Reach 5 has the potential to support the endangered slender-horned spineflower and federally threatened spreading navarretia.

Target Species

Arundo and tamarisk occupy 302 acres together in low-to-moderate densities throughout this reach. Arundo is established on approximately 203 acres. Large stands of low-density arundo extend downstream for approximately 3.5 miles from the eastern boundary of Reach 4. Within the mainstem, one source of arundo is one mile west of the conservation camp near the stream channel. The Angeles National Forest cleared one-mile of the channel in 1995 downstream of the conservation camp. A large, high-density stand of arundo is also located downstream from where the Los Angeles aqueduct crosses the river. Additional large areas of low- and medium-density infestations are heavily intermixed with high-quality habitat at the western boundary. Tamarisk occupies approximately 99 acres. Dense stands occur one mile east of Bouquet Canyon Road, and are scattered throughout the eastern portion of the reach. Other invasive plant species identified in Reach 5 included tree tobacco, black locust, and pepper tree.

3.5.1 Sand Canyon Tributaries

Characteristics

The Sand Canyon tributaries are located on the south side of the mainstem and include Sand Canyon and Iron Canyon. Sand Canyon joins the mainstem at the intersection between Reaches 4 and 5. Iron Canyon joins Sand Canyon approximately two miles upstream from the mainstem. Channels of Sand Canyon tributaries tend to be narrow with seasonal surface water flows. Rural residences surround the majority of the Sand Canyon tributaries, many of which are sited in the 500-year floodplain. The headwaters of these tributaries are generally surrounded by protected open space. The Sand Canyon tributaries support scattered mule fat within the channel and live oaks near the stream banks. This stream channel supports only seasonal surface flow. Sensitive species reported in these tributaries include the western spadefoot toad reported in Sand Canyon.

Target Species

Arundo and tamarisk have not yet been identified in any of these tributaries; however, introductions may occur due to landscaping of rural residences.

3.5.2 Mint Canyon Tributaries

Characteristics

The Mint Canyon tributaries are located on the north

side of the Santa Clara River and join the mainstem about two miles downstream from the Reach 4 boundary. These tributaries include Mint and Rowher Canyons. The 500-year floodplain in Mint Canyon varies between 300 and 1,000 feet wide at its mouth. The streambed is narrow and channelized for 3.5 miles upstream from the mainstem. Surface water is seasonal within Mint Canyon.

Scattered mule fat and great basin scrub communities dominate the stream channel. In some areas, robust cottonwood-willow groves are also present. Southern sycamore-alder riparian forest is also found in a minor tributary near the headwaters of Mint Canyon. Slender-horned spineflower and slender mariposa lily have been reported within Mint Canyon. These occurrences were in the 3.5-mile stretch extending downstream from the intersection of Sand Canyon Road to the mainstem, and species may have since been extirpated by recent development.

Target Species

Tamarisk is present in moderate levels and arundo is present at low to moderate levels within and adjacent to the stream channel throughout Mint Canyon. Much of these infestations are associated with residences using arundo and tamarisk as landscaping plants, which now grow wild in stands. Pepper trees are also present within the stream corridor and are beginning to establish within Mint Canyon.

3.6 Reach 6: Bouquet Canyon to Ventura County Line

Characteristics

Reach 6 begins in Santa Clarita where Bouquet Canyon drains into the mainstem and stretches west 11 miles to the Ventura County line. Six main tributaries drain into Reach 6: Bouquet Canyon, South Fork, San Francisquito Canyon, Castaic Creek, Hasley Canyon, and Chiquito Canyon. Interstate 5 (I-5) divides Reach 6 into two characteristically distinct sections at the western border of Santa Clarita. The land surrounding this reach east of I-5 within Santa Clarita is heavily developed with residential, commercial, and industrial land uses. A public recreational path borders Reach 6 for its entire length between Bouquet Canyon Road and the South River Village Apartment Complex. The width of the 500-year floodplain on this part of the reach ranges between 700 to 1,000 feet. West of I-5, with the exception of the Six Flags Magic Mountain Theme Park (located adjacent to the Santa Clara River just west of I-5), the Santa Clara River is bordered by agricultural and other undeveloped open land. The majority of the land here is under the ownership of the Lennar-LNR. From I-5 to the Ventura County line, Reach 6 traverses a broad open valley, with a 500-year floodplain of ranging between 1,800 and 3,000 feet in width.

Water flow within Reach 6 is braided and subsidized year-round by effluent from two wastewater treatment plants: the Saugus Wastewater Treatment Plant and the Valencia Water Reclamation Plant. Over 600 acres of Reach 6 is currently open un-vegetated channel. The perennial water flows, cottonwood woodlands, and associated habitats such as mixed willow, mule fat, and big sage provide high quality habitat for several sensitive species. In particular, this reach includes the only known occurrences along the mainstem of the Santa Clara River for breeding of endangered least Bells' vireo. Further, these riparian habitats provide extensive suitable breeding habitat for the endangered southwestern willow flycatcher. This reach also supports known populations of the endangered arroyo toad and unarmored threespine stickleback. Declining sensitive aquatic species such as the western pond turtle (state species of concern) and the two-striped garter snake (state species of concern) are also present.

Target Species

The environmentally sensitive habitats along Reach 6 are also the section of the upper Santa Clara River watershed most heavily infested with arundo. Tamarisk is present to a lesser extent. Large areas of arundo and tamarisk occur at a low density infestation range of about 355 acres. An additional 176 acres of arundo occurs at densities of high density infestation range.

3.6.1 Bouquet Canyon Tributaries

Characteristics

The Bouquet Canyon tributaries are located on the north side of the mainstem and include Bouquet

Canyon, Dry Canyon, Haskell Canyon, Texas Canyon, Vasquez Canyon, and Plum Canyon. Land use surrounding Bouquet Canyon transitions from a highly urbanized area near the confluence to residential and rural residential upstream, before Bouquet Canyon enters Angeles National Forest. Land currently developed is used for campgrounds or rural residences. The length of the tributary that flows from the intersection of Plum Canyon and Bouquet Canyon through Santa Clarita to the mainstem is channelized. Above Plum Canyon, Bouquet Creek is often confined to a narrow natural channel. Scattered groves of cottonwood, oaks, and willows intermixed with mule fat are located throughout this section of the reach. Upstream, past the USFS boundary, cottonwood woodland transitions to dense live oak woodland. Portions of several of Bouquet Canyon's tributaries, notably the lower portions of Plum, Haskell, Vasquez, and Texas Canyons, contain 500-year floodplains that fall within the project boundary. These canyons vary from broad floodplain supporting scrub habitats with scattered cottonwoods to areas with higher quality riparian habitats. Some areas have been subject to extensive development and the streams are largely channelized.

Target Species

Bouquet Canyon exhibits heavy arundo infestation throughout the lower reaches of the canyon, and lacks public access to the tributary in some of the most heavily infested areas. Once beyond the channelized portion of the tributary, Bouquet Canyon is heavily infested with arundo. Arundo is also present north of the Angeles National Forest boundary. These infestations are smaller and are closely associated with private properties. No tamarisk was observed within Bouquet Canyon. Scattered stands of eucalyptus, pine trees, and pampas grass are located throughout Bouquet Canyon.

3.6.2 South Fork Tributaries

Characteristics

The South Fork of the Santa Clara River is a system of major tributaries, passing through the City of Santa Clarita. Tributaries include South Fork, Pico Canyon, Newhall Creek, and Placerita Creek. These tributaries are mostly contained within the limits of urban development. With the exception of Placerita Creek, the streams are channelized throughout much of South Fork system. The waterways therefore tend to be fairly degraded, with little or no vegetation growing within most of the channels. However, the four mile section of the South Fork tributary just prior to where it enters the mainstem is wider and contains more native vegetation, including scattered great basin scrub and mule fat. The channel has seasonal flow, which may be supplemented by urban runoff.

Target Species

Arundo is present in Placerita Creek, near its intersection with South Fork. Due to the channelization of the remaining waterways, there is little potential for invasive species to establish.

3.6.3 San Francisquito Canyon

Characteristics

San Francisquito Canyon is a large tributary of the Santa Clara River, stretching nearly 22 miles from headwaters on the northeastern boundary of the watershed to the mainstem. It enters the mainstem from the north in Santa Clarita near McBean Parkway. Much of the northern portion of the canyon is located within Angeles National Forest. As with Bouquet Canyon, land use surrounding San Francisquito Creek transitions from highly urban at the confluence to rural residential in the middle reaches and protected open space in the upstream half of the canyon. The 500-year floodplain of the San Francisquito Canyon ranges between 700 and 1,200 feet in the lower portion of the canyon. Most of San Francisquito Canyon has a wide, shallow stream channel with low velocity water flow, although some upstream sections are narrow and undeveloped, particularly near the headwaters in Angeles National Forest. San Francisquito Canyon provides large areas of relatively high value natural habitat, including sage scrub, cottonwood forest, mixed willow forest, sycamore and alder forest, coast live oak woodland.

Target Species

Arundo occurs at moderate to high densities throughout San Francisquito Canyon and presents a

threat to both resources in this tributary and the Santa Clara River's mainstem. Moderate density arundo infestations exist at and downstream of the Los Angeles County Fire Station. Small infestations were observed as high in the watershed as Bee Canyon. No infestations were observed beyond Bee Canyon. No tamarisk was identified within San Francisquito Canyon.

San Francisquito Canyon has had continuing efforts for arundo removal since 1995, which were initiated by the Angeles National Forest Service. The program was expanded in 1999 to include the LADWP property. During 2000 and 2001, the lowest 2.5 miles of San Francisquito were treated for mitigation as a result of a bridge construction and bank stabilization project. Other areas on San Francisquito have been treated by commercial property companies as mitigation for development impacts.

3.6.4 Castaic Creek Tributaries

Characteristics

The Castaic Creek tributaries are located on the northern side of the mainstem. Castaic Creek tends to be low velocity. Water flow may be subsurface throughout much of the year. The streambed is wide at the mouth of the creek, and is constrained by a barrier fence and agricultural lands on either side. Most of the adjacent land in this area is agricultural with a small amount of recreational open space. Water availability in the downstream section of the Castaic Creek is regulated by dam releases from Castaic Lake. Castaic Lake creates an artificial disjunct in the streambed geomorphology, which is broad with low velocity flow downstream and narrow and deeply incised upstream. Most of the land upstream of Castaic Lake is protected USFS land and is outside of the project area.

Target Species

Tamarisk and arundo are present in the area of Castaic Creek near where Commerce Center Drive meets Highway 126 and upstream of Castaic Lake on USFS property.

3.6.5 Hasley Canyon Tributary

Characteristics

Hasley Canyon is a small tributary that drains north from Castaic Creek. In general, the channel tends to have little vegetation, but contains some intermittent coastal scrub and live oaks. The channel has been contoured and directed by residents within much of the canyon. A large construction effort has widened the stream channel near the intersection of Hasley Canyon Road and Commerce Center Drive. Rural residential land surrounds most of Hasley Canyon, although the mouth of the tributary does pass through an unincorporated urbanized area.

Target Species

No arundo or tamarisk was identified within Hasley Canyon. The majority of other invasive species in the canyon persist as an artifact of private landscaping. Eucalyptus and pepper trees have sprouted outside private yard areas and are colonizing the canyon in areas. Sensitive species, which have been reported in Hasley Canyon, include the San Fernando Valley spineflower, the Los Angeles sunflower, and the Santa Ana sucker.

3.6.6 Chiquito Canyon Tributaries

Characteristics

The Chiquito Canyon tributaries consist of Chiquito Canyon and San Martinez Grande Canyon. In general, these tributaries are heavily affected by surrounding rural residences, with many landscaping plants encroaching on the stream channel. The stream channels tend to be narrow, and are sometimes paved-over at road crossings and other areas to avoid erosion. In general, there is little water, except for that introduced via runoff and over watering. However, higher amounts of water are present after heavy rain events. Rural residential areas and open space surround the Chiquito Canyon tributaries.

Great basin sagebrush and limited cottonwoods are present within the stream channel although in most areas the stream channel has no vegetation. Disturbed oak savanna, which appears to have been grazed historically, is present along downstream portions of the tributaries. The headwaters are dominated by high-quality coastal sage scrub. The San Fernando Valley spineflower is the only sensitive species known to be present in these

tributaries.

Target Species

There is little to no arundo within the Chiquito Canyon tributaries. Tamarisk is present at moderate densities within the Chiquito Canyon tributaries as individual plants have escaped residential cultivation and have become established along the stream bank. San Martinez Grande Canyon tends to have more tamarisk than Chiquito Canyon. Landscaping plants and non-native grass are the primary invasive species within the Chiquito Canyon tributaries. Liquid amber trees and pepper trees are also present within and along the stream channel.

4.0 Biological Resources

The upper Santa Clara River drains an area that extends from the mountainous areas along the western edge of the Mojave Desert in the east and north of the watershed, west to the inland extent of areas that are typically dominated by coastal habitat associations. The habitats present along the Santa Clara River itself and in the surrounding areas reflect the Santa Clara River's transit of habitats ranging from high desert and montane associations in the inland areas to coastal valley associations near the project area's western boundary. A similar transition from high desert or montane also occurs along many of the Santa Clara River's larger tributaries. Mapping has been completed for the mainstem and tributaries of the upper Santa Clara River watershed (Appendices 6 and 7). A plant and wildlife species list was compiled during these surveys and is included in Appendix 5.

Special status plant and wildlife species are recognized by the California Native Plant Society, CDFG, or USFWS because these species have limited populations. It is important to recognize these species and avoid impacts to them because of various regulatory restrictions as discussed in Chapter 9.

4.1 Special Status Plant Species

A total of 19 special status plant species with the potential to occur within the project area were identified (Table 3). The potential for these species to occur in the study area is based on a review of historical sensitive plant species locations identified in the CNDDB (CDFG 2002).

4.2 Special Status Wildlife Species

A total of 21 special status wildlife species with the potential to occur within the project area were identified (Table 4). The potential for these species to occur in the study area is also based on a review of historical wildlife species locations identified in the CNDDB), and a review of pertinent literature. Of these 21 species, eight are federally listed under the Federal Endangered

Table 3: Special Status Plant Species

Scientific Name	Common Name	Status[1]	Habitat	Potential to Occur in Each Reach/Tributary	Potential to Occur (High, Medium, Low, and Why)
Allium howellii var. *clokeyi*	Mt. Pinos onion	List 1B	Pinyon and juniper woodlands and Great Basin scrub; 4,265-6,000 feet above msl.	Potential to occur in Reaches 1 and 2 and all tributaries. Known to occur in Castaic Creek tributaries.	Low: The project area elevation is 4,265 feet at its highest point. This plant does not grow in the riparian flood channel where weed removal will occur.
Arenaria macradenia var. *kuschei*	Kusche's sandwort	List 1B	Granitic openings in chaparral; 4,000- 5,700 feet above msl.	Potential to occur in Reaches 1, 2, and 3 and all tributaries.	Low: The elevation for this plant is close to the highest elevation for the project (4,265 feet). This plant does not grow in the riparian flood channel where weed removal will occur.
Berberis nevinii	Nevin's barberry	SE, FE, List 1B	Chaparral, cismontane woodland, coastal scrub, riparian scrub/sandy or gravelly soils; 1,000-2,700 feet above msl.	Potential to occur in Reaches 2 though 6 and all tributaries. Known to occur in San Francisquito Canyon.	High: This plant grows in habitats (e.g., riparian scrubs) that could be impacted during weed removal and in habitats where access roads may need to be built.
Calochortus clavatus var. *gracilis*	Slender mariposa lily	List 1B	Chaparral and coastal sage scrub; 1,100-3,200 feet above msl.	Potential to occur in Reaches 3 though 6 and all tributaries. Known to occur in Mint Canyon Tributaries and in San Francisquito Canyon.	Low: This plant does not grow in the riparian flood channel where weed removal will occur.
Calochortus plummerae	Plummer's mariposa lily	List 1B	Chaparral, cismontane woodland, coastal scrub, lower montane coniferous forest, valley and foothill grassland in rocky habitats; 330-5,600 feet above msl.	Potential to occur in all reaches and tributaries. Known to occur in Agua Dulce Canyon and in the South Fork Tributaries.	Low: This plant does not grow in the riparian flood channel where weed removal will occur.
Castilleja gleasonii	Mt. Gleason Indian paintbrush	SR, List 1B	Lower montane coniferous forests and pinyon and juniper woodlands; 3,800-7,100 feet above msl.	Potential to occur in Reaches 1, 2, and 3 and all tributaries.	Low: The elevation for this plant is close to the highest elevation for the project (4,265 feet). This plant does not grow in the riparian flood channel where weed removal will occur.
Centromadia parryi var. *australis*	Southern tarplant	List 1B	The margins of marshes and swamps, valley and foothill grasslands, and vernal pools; 0-1,400 feet above msl.	Potential to occur in Reaches 5 and 6 and all tributaries.	High: This plant grows in habitats (e.g., margins of marshes and swamps) that could be impacted during weed removal and where access roads may need to be built.
Chorizanthe parryi var. *fernandina*	San Fernando Valley spineflower	SC, FC, List 1B	Sandy soils in coastal scrub; 500-4,000 feet above msl.	Potential to occur in Reaches 3 though 6 and all tributaries. Known to occur in Reach 6 and in Castaic Creek and Chiquito Canyon Tributaries	Medium: This plant grows in coastal sage and alluvial scrub habitats.

Scientific Name	Common Name	Status[1]	Habitat	Potential to Occur in Each Reach/Tributary	Potential to Occur (High, Medium, Low, and Why)
Dodecahema leptoceras	Slender-horned spineflower	SE, FE, List 1B	Sandy soils in chaparral, cismontane woodland, and coastal scrub (alluvial fans); 650-2,500 feet above msl.	Potential to occur in Reaches 2 though 6 and all tributaries. Known to occur in Reaches 3 and 5 and in Mint Canyon, South Fork, and Halsey Canyon Tributaries.	High: This plant grows in habitats (e.g., alluvial fans) that could be impacted during weed removal and in habitats where access roads may need to be built.
Erodium macrophyllum	Round-leaved filaree	List 2	Clay soils in cismontane woodland, valley and foothill grassland; 50-4,000 feet above msl.	Potential to occur in all reaches and tributaries.	Low: This plant does not grow in the riparian flood channel where weed removal will occur.
Galium grande	San Gabriel bedstraw	List 1B	Broadleaved upland forest, chaparral, cismontane woodland, lower montane coniferous forest; 1,400-5,000 feet above msl.	Potential to occur in all reaches and tributaries. Known to occur in Castaic Creek Tributaries.	Low: This plant does not grow in the riparian flood channel where weed removal will occur.
Helianthus nuttallii ssp. *parishii*	Los Angeles sunflower	List 1A	Coastal salt and freshwater marshes and swamps; 30-1,600 feet above msl.	Potential to occur in Reaches 3 through 6 and all tributaries. Known to occur in Reach 6.	High: This plant grows in habitats (e.g., marshes and swamps) that could be impacted during weed removal.
Lilium parryi	Lemon lily	List 1B	Mesic areas in lower montane coniferous forest, meadows and seeps, riparian scrub, upper montane coniferous forest; 4,300-8,600 feet above msl.	Potential to occur in Reaches 1 and 2 and all tributaries.	Low: The project area elevation is 4,265 feet at its highest point. This plant does not grow in the riparian flood channel where weed removal will occur.
Malacothamnus davidsonii	Davidson's bush mallow	List 1B	Chaparral, cismontane woodland, coastal scrub, riparian woodland; 600-2,800 feet above msl.	Potential to occur in Reaches 2 though 6 and all tributaries.	High: This plant grows in habitats (e.g., riparian woodland) that could be impacted during weed removal and in habitats where access roads may need to be built.
Navarretia fossalis	Spreading navarretia	FT, List 1B	Chenopod scrub, marshes and swamps (assorted shallow freshwater), playas, vernal pools; 100-4,300 feet above msl.	Potential to occur in all reaches. Known historically in Reach 5 and the Plum Canyon Tributary.	High: This plant grows in habitats (e.g., marshes and swamps) that could be impacted during weed removal and in habitats where access roads may need to be built.
Opuntia basilaris var. *brachyclada*	Short-joint beavertail	List 1B	Chaparral, Joshua tree woodland, Mojavean desert scrub, pinyon and juniper woodlands; 1,400-5,900 feet above msl.	Potential to occur in all reaches and tributaries. Known to occur in Reach 1 and in Bouquet Canyon and South Fork Tributaries.	Low: This plant does not grow in the riparian flood channel where weed removal will occur.

Scientific Name	Common Name	Status[1]	Habitat	Potential to Occur in Each Reach/Tributary	Potential to Occur (High, Medium, Low, and Why)
Orcuttia californica	California Orcutt grass	List 1B	Vernal pools; 50-2,200 feet above msl.	Potential to occur in Reaches 3 though 6 and all tributaries. Known to occur in Bouquet Canyon and in South Fork Tributaries.	Low: This plant does not grow in the riparian flood channel where weed removal will occur.
Senecio aphanactis	Rayless ragwort	List 2	Alkaline areas in chaparral, cismontane woodland, coastal scrub; 50-2,600 feet above msl.	Potential to occur in Reaches 2 though 6 and all tributaries. Known to occur in the South Fork Tributaries.	Low: This plant does not grow in the riparian flood channel where weed removal will occur.
Stylocline masonii	Mason's neststraw	List 1B	Sandy soils in chenopod scrub, pinyon, and juniper woodlands; 330-4,000 feet above msl.	Potential to occur in all reaches and tributaries. Known to occur in Reach 2.	Low: This plant does not grow in the riparian flood channel where weed removal will occur.

[1]FC: federal candidate
FE: federally listed as endangered
FT: federally listed as threatened
SC: state candidate
SR: state listed as rare
ST: state listed as threatened
CNPS List 1A: plant species are presumed extinct in California
CNPS List 1B: plant species are rare, threatened, or endangered in California and elsewhere
CNPS List 2: plants species are rare, threatened, or endangered in California, but more common elsewhere

Table 4: Special Status Wildlife Species

Scientific Name	Common Name	Status	Habitat	Potential to Occur in Each Reach/Tributary	Potential to Occur (High, Medium, Low) and Why
Mammals					
Neotoma lepida intermedia	San Diego desert woodrat	SC, SSC	Pinyon-Juniper in association with rocky outcrops, including burrows of ground squirrels and woodrats.	Upstream and middle reaches of project area.	Medium potential to occur since it is not a riparian species. Uplands surrounding riparian zone have greater potential for this species.
Perognathus alticola inexpectatus	Tehachapi pocket mouse	SSC	Prefers open, sandy upland habitats, with friable soils.	Potentially found in adjacent upland habitats in all reaches and tributaries.	Low potential since this species is primarily associated with upland habitats.
Taxidea taxus	American badger	SSC	Prefers open, sandy upland habitats.	Potentially found in adjacent upland habitats in all reaches and tributaries.	Medium potential to occur, but seldom seen due to its fossorial ecology. Not usually associated with riparian habitats, but found in adjacent upland habitats.
Birds					
Accipiter cooperii	Cooper's Hawk	SSC	Found in a variety of habitats, including riparian and uplands, as well as urban areas.	Found in all reaches and tributaries.	High potential to occur, for breeding, roosting, and foraging.
Athene cunicularia	Burrowing owl	SC, SSC	Typically found in open scrub habitats in uplands.	Potentially found in high-quality upland habitats in all reaches and tributaries.	Low potential, since this species does not typically inhabit riparian zones.
Coccyzus americanus occidentalis	Western yellow-billed cuckoo	SE	Prefers dense riparian habitats, including willow-cottonwood.	Potentially found in all reaches, although the species is very rare.	Low potential given the scarcity of this species, but it could be found in any reach with an overstory of riparian hardwoods.
Dendroica petechia brewsteri	Yellow warbler	SSC	Prefers willow riparian and associated habitats.	Potentially found throughout all reaches and tributaries.	Medium potential since this species will occur disjunctly throughout appropriate habitats.
Empidonax traillii extimus	Southwestern willow flycatcher	FE, SE	Riparian scrub, willow and mule fat, including arundo stands.	Known in Reaches 3 and 6.	High potential to occur in downstream reaches, below Soledad Canyon where high quality riparian habitat is prevalent.
Pilioptila californica californica	Coastal California gnatcatcher	FT, SSC	Coastal sage scrub	Known in Plum and Placerita Canyons.	Low potential, since this species does not typically inhabit riparian zones.

Scientific Name	Common Name	Status	Habitat	Potential to Occur in Each Reach/Tributary	Potential to Occur (High, Medium, Low) and Why
Gymnogyps californianus	California condor	FE, SE	Montane and cliff habitats, primarily limited to Sespe Wilderness area and adjacent lands.	Potentially found in all reaches, although the species is very rare.	Low potential to occur since no breeding sites are located within the project area, although this species has large home ranges and could potentially forage within the project area.
Icteria virens	Yellow-breasted chat	SSC	Riparian scrub, willow and mule fat, including arundo stands.	Likely to be found in all reaches with willow riparian habitat	High potential to occur in downstream reaches, below Soledad Canyon where high quality riparian habitat is present.
Toxostoma lecontei	Le Conte's thrasher	SSC	Open desert scrub, primarily found in habitats dominated by common saltbush.	Potentially found in Real 1 and 2.	Medium potential to occur in scrub habitats areas.
Vireo bellii pusillus	Least Bell's vireo	FE, SE	Riparian scrub, willow and mule fat, including arundo stands.	Most likely to be encountered in the downstream reaches, but possibly occurs throughout the Santa Clara River.	High potential to occur in downstream reaches, below Soledad Canyon.
Reptiles					
Aspidoscelis tigris stejnegeri	Coastal western whiptail lizard	SC	Chaparral, riparian scrub.	Can be found in open riparian scrub, but chiefly associated with upland habitats.	High potential to occur in appropriate habitats throughout The Santa Clara River.
Phrynosoma coronatum blainvillei	Coast horned lizard	SC, SSC	Chamise chaparral.	This species is unlikely to occur in riparian habitats in the project area, but can be found in uplands.	High potential to occur in appropriate habitats throughout the Santa Clara River.
Thamnophis hammondii	Two-striped garter snake	SC, SSC	Riparian habitat.	May be found throughout project area.	High potential to occur throughout project area. Forages widely, and usually active during the day on highly vegetated stream banks.
Amphibians					
Bufo californicus	Arroyo toad	FE, SE	Sandy alluvial stream courses and adjacent uplands.	Possible throughout project area. Known in Reaches 3 and 6 and Castaic and San Francisquito Creeks.	Medium potential to occur since the species will be locally abundant in the few areas it is found, and thorough surveys of the entire project area are lacking.
Rana muscosa	Mountain yellow-legged frog	FE	Montane streams at higher elevations.	None	Species does not occur in the project area.

Scientific Name	Common Name	Status	Habitat	Potential to Occur in Each Reach/Tributary	Potential to Occur (High, Medium, Low) and Why
Scaphiopus hammondii	Western spadefoot toad	SC, SSC	Upland and riparian habitat. Breeds in ephemeral pools.	Potential to occur throughout the project area.	High potential to occur, where intact native upland habitat contacts riparian areas.
Rana aurora draytonii	California red-legged frog	FT, SSC	Prefers permanent water with vegetated edges.	Known only from remnant population in San Francisquito Creek, but could occur elsewhere.	High potential in San Francisquito Creek where current population exists, low potential elsewhere.
Fishes					
Catostomus santaanae	Santa Ana sucker	FT	Swift flowing stretches of Santa Clara River.	Primarily in upstream reaches, but can be found elsewhere during high flows.	High potential to occur when water is present, but low detectability in the absence of trapping/netting surveys.
Gasterosteus aculeatus williamsoni	Unarmored threespine stickleback	FE, SE, DFG: Fully Protected	Typically in slow moving water with vegetated edges.	Possible throughout entire project area.	High potential to occur when water is present, but low detectability in the absence of trapping/netting surveys.
Gila orcutti	Arroyo chub	SC, SSC	Prefers slow water with sand or mud bottom.	Possible throughout project area.	High potential to occur when water is present, but low detectability in the absence of trapping/netting surveys.

FE: federally listed as endangered
FT: federally listed as threatened
SC: state candidate
SE: state listed as endangered
SSC: state species of special concern
ST: state listed as threatened
DFG Fully Protected: The Fish and Game Codes sections dealing with Fully Protected species state that these species "...may not be taken or possessed at any time and no provision of this code or any other law shall be construed to authorize the issuance of permits or licenses to take any fully protected" species, although take may be authorized for necessary scientific research. This language arguably makes the "Fully Protected" designation the strongest and most restrictive regarding the "take" of these species. In 2003, the code sections dealing with fully protected species were amended to allow the Department to authorize take resulting from recovery activities for state listed species. More information on Fully Protected species and the take provisions can be found in the Fish and Game Code (birds at §3511, mammals at §4700, reptiles and amphibians at §5050, and fish at §5515). Additional information on Fully Protected fish can be found in the California Code of Regulations, Title 14, Division 1, Subdivision 1, Chapter 2, Article 4, §5.93. The category of Protected Amphibians and Reptiles in Title 14 has been repeated. The Fish and Game Code is available online at: http://www.leginfo.ca.gov/cgibin/calawquery?codesection=fgc. Title 14 of the California Code of Regulations is available at http://ccr.oal.ca.gov

Species Act (FESA).

5.0 Project Planning

Coordinated removal projects can lead to control of an invasive plant species in the entire watershed. However, before implementing a removal project, it is important to consider the various project elements, which include:

- integrated weed management
- project prioritization
- working with landowners
- public outreach
- surveys and mapping
- methods
- regulatory requirements
- scheduling
- costs
- funding

5.1 Integrated Weed Management

Integrated Weed Management (IWM) is a comprehensive strategy for the control of weeds. It considers each of the various factors influencing a weed removal strategy, such as different removal methods, the timing of the project, the location of the project, and potential impacts to the environment. There are also other factors such as overall project goals, specific agency policies, and local politics. The federal Noxious Weed Act further narrows the concept of Integrated Weed Management. It defines IWM as "a system for the planning and implementation of a program, using an interdisciplinary approach, to select a method for containing or controlling undesirable plant species or groups of species using all available methods, including education, prevention, physical or mechanical methods, and general land management practices."

Integrated Weed Management is vital for the control and potential eradication of invasive plant species. Removal projects often achieve the most success when a variety of strategies are implemented. For example, it may be effective to implement herbivory as a control measure in one section of a removal project area, while other sections undergo eradication measures. Active surveying can assist with controlling outlier populations of invasive plants that have not established yet. Strategies to prevent the spread of invasive species are also part of IWM. This can be approached from a cultural aspect as educating the public about the threat invasive species pose to the environment may help to avoid the use of these species in residential landscaping.

With IWM practices in place, it is also important to minimize the project impacts. Individual projects will utilize Best Management Practices to reduce impacts to the environment, ensure public health and safety, and increase worker safety. These BMPs are listed in Chapter 14. BMPs can be adapted and modified for each individual project depending upon the removal techniques and sensitive habitat and species present.

The Best Available Technologies are used in addition to the BMPs to achieve successful management strategies. The Best Available Technologies will change over time, as research, technologies, and methods are updated. Geographic Information Systems (GIS) and Global Positioning System units (GPS) assist with surveying and mapping while new methods and equipment can increase removal efficiency. The SCARP is a living document and will be revised as necessary to incorporate the Best Available Technologies.

5.2 Prioritization

Individual projects can be conducted anywhere in the upper Santa Clara River watershed. However, since arundo and tamarisk tend to spread downstream, it is best to begin projects at the headwaters of the mainstem of the Santa Clara River and smaller tributary watersheds such as San Francisquito Canyon to ensure effective invasive plant removal. Ideally, the collective effect of the individual projects will eventually be to control invasive plant populations in the watershed.

There are other factors that influence the project site beyond its location in the watershed. These include landowner cooperation, budget, scheduling, regulatory requirements, and many others. Prioritization of projects beyond starting at the highest known establishment should be oriented toward: 1) early detection and control of outlier establishments, 2) control and restoration of limited infestations where sensitive resources are located, and 3) control and restoration of large infesta-

tions.

Early detection and control of outlier establishments

This strategy concentrates on areas where arundo or tamarisk have small, limited infestations and do not have any upstream source populations. This strategy may be more time and labor intensive due to potentially difficult logistical issues such as hard to reach locations and/or careful hand-removal techniques of arundo or tamarisk to avoid impacts to wildlife. However, this strategy prevents dense establishment of invasive plant species where there is moderate to good habitat.

Control and restoration of limited infestations where sensitive resources are located

This strategy concentrates on areas where arundo or tamarisk have limited infestations and where sensitive resources are located. This strategy may be more time and labor intensive due to careful implementation of hand-removal techniques of arundo or tamarisk to avoid impacts to wildlife. However, this strategy also prevents dense establishment of invasive plant species where there is moderate to good habitat.

Control and restoration of large infestations

This strategy concentrates on areas where arundo or tamarisk are dense monocultures in order to completely eradicate their presence and to restore habitat. It may be easier and/or more cost-efficient to use mechanical removal techniques or broadcast foliar spraying in areas with thick infestations. This strategy allows the restoration of large areas, which previously had no habitat value.

6.0 Surveying and Mapping

Project applicants should develop detailed maps for their specific project areas. Maps are integral to effective eradication of establishments of invasive plant colonies. They are important for documenting the current vegetation status, detecting and tracking pioneer colonies of invasive plant clusters, and monitoring the level of success after invasive plant removal.

Effective mapping is a result of organized and consistent data collection. In planning an invasive species removal project, applicants should follow an established protocol for their data collection efforts. Data collection can be accomplished using field forms, aerial maps, photo documentation, and/or GPS units. Utilization of established protocols for data collection also facilitates the sharing of weed information with other agencies that have a stake in controlling and eradicating invasive plant species.

There are numerous mapping techniques with different protocols and different nomenclature (naming) systems. Maps can be prepared manually via the annotation of aerial photographs, or via various GIS software packages in tandem with GPS hand-held units for data capture. Maps may simply reflect the extent of infestations, or may also contain additional attribute information that further characterizes the infestation. Resources for current mapping protocols include the CDFA weed mapping handbook and The Nature Conservancy's Weed Inventory and Mapping System (WIMS), which is currently being adapted by Cal-IPC for California's wildland weeds. CDFG promotes vegetation mapping according to A Manual of California Vegetation (Sawyer and Keeler-Wolf 1995).

AMEC Earth and Environmental performed mainstem vegetation surveys and a preliminary tributary overview in Winter 2004-2005, which are both discussed within the text of this document. Condor Environmental performed tributary vegetation surverys in Fall 2005. Detailed maps are provided as individual files in the Appendices.

The vegetation mapping surveys undertaken by the VCRCD for the Upper Santa Clara River identified 43 vegetation series located within the 500-year floodplain of the mainstem. Vegetation falling outside of the 500-year floodplain was not mapped. Most of the mapped vegetation series were delineated on maps created from aerial photographs following the vegetation series listed in A Manual of California Vegetation (Sawyer and Keeler-Wolf 1995). However, several of the vegetation series incorporated in the SCARP were not derived from the preceding document, but were rather based on the dominant and associated plant species present (e.g., Pepper Tree).

The VCRCD has a long-term interest in the removal of invasive species from the Upper Santa Clara River watershed. As such, the VCRCD recommends that applicants follow an established protocol of data collection so that consistency of data can be achieved, and for ease of future monitoring efforts. Project applicants are encouraged to use the existing VCRCD maps not only for refer-

ence, but also as models for their own map products.

7.0 Working With Landowners

The majority of the mainstem of the upper Santa Clara River as well as the lower middle reaches of the tributaries are privately owned. A cooperative working relationship with private landowners is critical in order to address the areas of heavy infestations. Several large landowners such as Lennar-LNR and various sand and gravel mining companies own substantial portions of the Santa Clara River. Hundreds of small- and mid-sized parcels are also located throughout the Santa Clara River's middle and upper reaches as well as the lower tributaries. These parcels include private campgrounds, mobile home parks, small ranches, and residential estates. The cooperation of both large and small landowners is essential for successful eradication. Landowners may not be aware of the impacts caused by invasive plants to public safety, property, and the environment. Education and outreach will increase knowledge of these impacts.

Landowners can work with Non-Governmental Organizations (NGOs), Resource Conservation Districts (RCDs), or other groups to perform removal work on their property. Agencies such as RCDs can assist with the regulatory process as well. Project applicants that do not own the property they wish to work on should request a cooperative landowner agreement prior to starting a project.

8.0 Public Outreach

Members of the public are often not aware of the negative impacts that invasive species bring to an ecosystem. The public typically assumes that the presence of any variety of greenery in the environment is beneficial and associates scenic value to it. Therefore, increasing public awareness of the impacts from these invasive species and support for their eradication is a critical component of project success. Public outreach activities should focus on a particular audience and have a specific goal, and individual projects should focus on outreach efforts prior to initiating removal. For example, local residents who live adjacent to removal sites should be notified of project activities, removal techniques, and potential impacts such as noise or visual changes before the commencement of the project.

Various organizations and municipalities are already engaged in outreach activities supporting the removal of invasive plants as well as the preventative measures that help reduce the spread of these plants. CAL-IPC is a non-profit organization that works with the California Department of Food and Agriculture's (CDFA) Weed Management Areas (WMA) and other local agencies to educate the public and municipalities on invasive plants and their eradication. Additionally, the Los Angeles Weed Management Area has created a Best Management Practices for Vegetation Removal as well as a children's booklet on invasive plants. There are numerous brochures from the various agencies on how to prevent the spread removal invasive plants. See Chapter 19.0 for resource information.

Where arundo is targeted for removal from private parcels, personal contact with parcel owners must be made to in order to gain access to removal sites. Landowners are often concerned about the impacts the removal activities will cause, and care should be taken to acknowledge and address their concerns. While one-on-one meetings may be time consuming, they are a beneficial investment towards a successful removal program. Typical landowner concerns include issues relating to privacy, liability, property damage, impacts to natural resources, erosion, and regulatory problems.

When removal projects are planned for sites that

are adjacent to developed areas, especially residential zones, it is important to notify or otherwise communicate with residents about the removal activities. Tolerance and support of residents for removal projects is enhanced via outreach and education efforts. This can be achieved via an informational postcard mailing, or by distributing brochures or handouts on a door-to-door basis.

The success of outreach efforts can be enhanced by incorporating the following points:

- Understand Your Audience: Do not assume individuals are versed in issues pertaining to invasive plant species. Present the information in a manner that is informative and engaging. Photographs and other visual cues are often very helpful in illustrating important points.
- Keep It Basic: Focus on primary issues. Over whelming your audience with information may not necessarily inspire them to join your cause. However, casting illumination on the most important issues will initiate a constructive increase in awareness of the problem.
- Be Context Aware: If members of the public initiate casual dialogue about a removal project with you, a casual response will be more appropriate than a technical monologue.
- Signage: Post signs where removal work is already underway. Incorporate photos that illustrate "before" and "after" scenarios to reinforce the benefits of the project.

For its own arundo removal efforts, the VCRCD has initiated several public outreach activities; selected examples are listed below:

- Prepared and distributed brochures containing information about arundo and tamarisk and the problems they cause, as well as the benefits of removal.
- Held public workshops such as those associated with the EIR/EA scoping in January 2005, as well as more recent workshops in Santa Clarita and Acton about the infestation problem in general.
- Created the SCARP Working Group to facilitate community and agency coordination on this issue.
- Contacted local schools to educate students about invasive plants and Weed Awareness Week.
- Sent out postcards to local residents around the Santa Clarita project site to inform them about the various aspects of the individual project.
- Held two public hearings inviting comments regarding the EIR/EA.
- Participated in the Santa Clara River Rally, a river clean-up event organized by the City of Santa Clarita.

Another important aspect of public outreach is the utilization of local resources. Various organizations and municipalities already support the removal of invasive plant species, and many have implemented preventative measures to reduce the spread of these species. The events they organize help raise public awareness about specific environmental hazards and the measures being taken to remove them. The VCRCD has participated in many such events in an effort to bring additional attention to the Upper Santa Clara River project . The various agencies and/or events that address invasive species are listed below:

- City of Santa Clarita sponsored events such the Santa Clara River Rally, Arbor Day, and Earth Day
- Los Angeles County sponsored events such as the County Fair and Earth Day
- Los Angeles County Weed Management Area Meeting
- Southern California Wetlands Recovery Project (SCWRP) Task Force Meetings
- Santa Clarita Organization Planning for the Environment (SCOPE)
- Friends of the Santa Clara River
- The Nature Conservancy
- Sierra Club
- California Native Plant Society
- Audubon Society
- Santa Clarita Well Owners Society
- Local Schools

9.0 Regulatory Setting

A primary goal of the SCARP is to facilitate the permitting of arundo and tamarisk removal projects by state and federal regulatory agencies, consistent with protection of sensitive resources. VCRCD is coordinating with regulatory agencies to develop a programmatic regulatory framework for future removal projects. As this process may take several years, individual permits may be necessary for removal projects. The following discussion provides an overview of the primary existing regulatory structure covering removal projects. Table 5 provides guidance for individual project applicants for regulatory compliance on their projects.

9.1 U.S. Army Corps of Engineers

Under Section 404 of the Clean Water Act (CWA), a permit is required by USACE for any activity that results in discharge of dredged or fill material into "waters of the United States (U.S.)" and associated wetlands. Waters of the U.S. refers to water in drainages that occurs below the plane of the ordinary high water mark. Examples of dredged or fill material for the SCARP projects that would be subject to USACE regulation would include earthmoving associated with temporary water diversions, temporary access roads, and below-ground biomass removal. Different permitting options are available through the USACE. For example, Regional General Permit (RGP) 41 is an existing permit for no or minimal impact invasive plant removal projects for infestations greater than 50 percent cover. Project sites with infestations lower than 50 percent or which have more than minimal impacts require another type of 404 permit such as a nationwide or individual permit.

9.2 U.S. Fish and Wildlife Service

Species listed as endangered or threatened by the USFWS are protected under the Federal Endangered Species Act (FESA). If listed species could be affected by removal activities, consultation with the USFWS is required. Consultations result in a set of formalized protection measures that become a part of the project.

9.3 California Department of Fish and Game

Streambed Alteration Agreement

Pursuant to Section 1602 2 of the Fish and Game Code, the CDFG has jurisdiction over activities that affect the "bed, channel, or bank of any river, stream, or lake that has or benefits fish or wildlife". CDFG jurisdiction includes streamside (riparian) habitat on top of banks as well as the drainage itself.

California Endangered Species Act

The California Endangered Species Act (CESA) provides protection to endangered and threatened species in California. If a project may affect state-listed species, coordination with CDFG is required. In some cases, an incidental take permit may be required.

9.4 Regional Water Quality Control Board

A project that requires a Section 404 permit from the USACE will also require a Water Quality Certification (401 certification) from the RWQCB. A 401 permit certifies that the proposed activity will not violate state or federal water quality standards.

9.5 Southern California Air Quality Management District

Projects that propose controlled burning or incineration of biomass require consultation of the Southern California Air Quality Management District.

9.6 California Department of Transportation Encroachment Permit

The use of California State highways for other than normal transportation purposes may require written authorization from the Department of Transportation. As the responsible Department for protecting the public's investment in the State highway system, CalTrans reviews all requests from utility companies, developers, volunteers, nonprofit organizations, etc., desiring to conduct various activities within the right of way.

9.7 Los Angeles Department of Public Works Encroachment Permit

Project sites that utilize areas owned by or having easements by the Los Angeles Department of Public Works will require an encroachment permit. Road Construction permits are necessary for the construction of driveways, curb drains, sidewalks, curbs and gutters and other types of surface construction. Road Excavation permits are necessary when digging within the road right-of-way, which often includes the portion of land beyond the curb and all the way to the sidewalk. Road Encroachment permits are necessary when you wish to place anything in the road right-of-way temporarily or long term.

9.8 Los Angeles County Grading Permit

The Los Angeles County Building Code requires a grading permit to perform any grading except for the following work:

An excavation that: 1) is less than 2 feet (61 cm) in depth or; 2) does not create a cut slope greater than 5 feet (1.5 m) in height and steeper than 1 unit vertical in 2 units horizontal (50% slope) and does not exceed 50 cubic yards (38.3 m^3).

A fill not intended to support structures and which does not obstruct a drainage course if such fill (a) is placed on natural grade that has a slope not steeper than five horizontal to one vertical and is less than 1 foot (30.5 cm) deep, or (b) is less than 3 feet (91.4 cm) in depth at its deepest point, measured vertically upward from natural grade to the surface of the fill, and does not exceed 50 cubic yards (38.2 m^3), or (c) does not exceed 20 cubic yards (15.3 m^3) on any one lot.

9.9 California Environment Quality Act

The California Environmental Quality Act (CEQA) is intended to provide information to public agencies, decision-makers, and the public regarding the environmental impacts from implementation of a proposed project. CEQA compliance is required for all local and state public agencies, municipalities, and private entities that undertake an activity, which requires a permit, or discretionary approval from a government agency, or that may cause either a direct physical change in the environment or a reasonably foreseeable indirect change in the environment.

The environmental review process was established to enable public agencies to evaluate a project in terms of its environmental consequences, to examine and implement methods of eliminating or reducing any potentially adverse impacts, and to consider alternatives to the project. While CEQA requires major consideration be given to avoid environmental impacts, the lead agency and other responsible public agencies must balance adverse environmental effects against other public objectives, including social and economic goals, in determining whether and in what manner a project should be approved.

Projects using the methods in this long-term plan may utilize the SCARP programmatic EIR once the programmatic permit structure has been developed. Other projects may require a CEQA exemption, negative declaration, mitigated negative declaration, or environmental impact report.

9.10 National Environmental Protection Act

The National Environmental Protection Act (NEPA) requires federal agencies to consider potential environmental consequence of proposed actions in their decision-making process. The law's intent is to protect, restore, or enhance the environment through well-informed federal decisions. Projects which require a permit or discretionary approval from a federal agency will also require NEPA compliance.

The regulatory process may involve a significant investment of time. Table 5 is provided as a planning aid and offers an example illustration of the amount of time applicants can expect to use for this phase of their projects.

Table 5: Guide to Regulatory Compliance

Timeline	Task
1-2 months	Use SCARP to develop project and choose removal or control method.
1-6 months depending on scope and scale of project, engineered design, and other project elements.	Develop project description, including analysis of impacts, avoidance, and minimization measures.
1- 2 months	Complete and submit application materials for: 404 permit (USACE); 401 certification (RWQCB); 1602 Streambed Alteration Agreement (CDFG)
1-3 months depending on agency availability	Agencies require additional information or modification to application or project description. Coordinate with agencies to modify application or project description as necessary.
1-2 months	Agencies accept revised application or project description.
After receipt of complete application	USACE begins consultation with USFWS
3 months to over a year depending on type of consultation	USFWS issues Letter of Concurrence or Biological Opinion.
Usually within 3 months of completed applications and completed consultation with USFWS	Agencies issue permits.
Upon receipt of all permits	Implement project

10.0 Removal Methodology

A wide range of techniques is currently used in the control and removal of arundo and tamarisk. These include hand removal, mechanical removal, herbicide application, tarping, controlled burning, and biological control, as well as various combinations of these techniques. Based upon a review of available literature and contact with different agencies and specialists, it has been determined no single method has been proven most effective for every situation. Different agencies and organizations involved in control of arundo and tamarisk tend to favor differing approaches to control and removal based on their experience, resources, and local environmental and policy circumstances. This is also reflected in the literature, where different researchers have noted variable findings for the effectiveness of different techniques.

For example, the Santa Margarita and San Luis Rey Watersheds Weed Management Area (SMSLRWMA) rely primarily on a fall-period foliar spray application, followed by spring biomass removal for arundo removal. The SMSLRWMA reports this method as having the highest success rate for their arundo infestation problem (Giessow 2005). In contrast, in its initial focused projects, the VCRCD has used various methods, including foliar spray application or the cut and daub technique accompanied by biomass removal, with chipping and reuse of the arundo mulch outside the stream channel. Other groups, such as Circuit Rider Productions, prefer tarping as a non-herbicidal approach, and have found it highly effective on smaller stands of arundo.

Ultimately, the selection of the appropriate removal method for each project will depend upon:

- the time of year
- severity of infestation
- the presence of native plants and wildlife
- the degree of intermixing of invasive species with sensitive native habitats
- the presence of sensitive native species
- access
- proximity to surface water
- budget
- permitting standards

Regardless of the method chosen, all projects will require follow-up treatments and monitoring, and have the potential to impact sensitive species in certain habitat areas. Due to the range of variables that influence the control and removal of these invasive species, and the differences among opinion on which techniques are the most effective and environmentally appropriate for a given circumstance, the SCARP presents a menu of options for different removal techniques. Each technique is described in terms of typical procedures involved and the general circumstances where it is usually employed including a discussion of the general pros and cons of each approach, which is summarized in Table 6.

The general analysis of the pros and cons of available control options is further refined in terms of their potential utility for application to various reaches of the Santa Clara River and its associated tributaries. For planning purposes, the Santa Clara River has been subdivided into six reaches (Chapter 3) based on similar traits such as channel morphology, water availability, vegetation types, and surrounding uses and access. Each major tributary is treated individually with the major tributaries broken into upper, middle, and lower reaches where appropriate based on differing physical characteristics.

The Santa Clara River's reaches and its tributaries vary considerably not only in terms of physical and ecological characteristics, but also in degree of infestation, intermixing of invasive species with native habitats, environmental sensitivity, and access. These factors in turn guide, but not entirely limit, the choice of removal options preferable for a certain reach. For example, the environmental sensitivity of a certain reach may warrant use of more labor intensive but environmentally sensitive techniques (e.g., cut and daub) and limit the widespread use of more intrusive techniques (e.g., mechanical clearing), particularly during the bird breeding season. However, sub-sections of this reach may be less sensitive and warrant consideration of mechanical clearing or other more invasive approaches. For this reason, the methods section is generally inclusive in terms of available techniques. However, regardless of the technique selected, all potential options are accompanied by an extensive list of BMPs in Chapter 14.

Table 6: Summary of Removal Method Options

Method	Appropriate Use	Timing	Tools	Instructions	Advantages	Disadvantages
Hand Removal (Above-Ground only)	Small infestations where there is concern regarding herbicide use.	Removal can be performed anytime, but most effective time to cut arundo and tamarisk is during the growing season (spring through fall). Rain and high water can limit wet season access.	Loppers, machete, chainsaw, bladed weed whipper, or similar equipment.	Stems, canes, and trunks are cut as close to the ground as possible. Cut biomass is generally removed from the project site and chipped, burned, or disposed of at a landfill to prevent reestablishment of cuttings. Roots and rhizomes are left in the ground.	Specific, minimizes damage to native plants/ animals. Minimizes soil disturbance.	Labor and time intensive. Very low mortality rates require repeated re-treatment (>5 years) to be effective which increases the project cost and frequency of disturbance to sensitive areas. Extensive debris removal.
Hand Removal (Above and Below-Ground)	Young plants and small stands, or when there is concern about herbicide use.	Removal can be performed anytime. Rain and high water can limit wet season access.	Pick-axe, mattock, shovel, loppers, machete, chainsaw, picks, or similar equipment.	Above-ground trunks, stems, or canes are first cut near the base. After clearing the material, roots and rhizomes are dug up using hand tools.	Specific, minimizes damage to native plants/animals. Effective if rhizomes and root masses are thoroughly cleared from site.	Labor and time intensive. Requires careful cleaning of roots/ rhizomes and debris removal. Soil disturbance and erosion potential.
Mechanical Removal (Above-Ground only)	Areas with easy access for heavy equipment and on stands not intermixed with native plants.	Removal can be performed anytime, but most effective time to cut arundo and tamarisk is during the growing season (spring through fall). Rain and high water can limit wet season access.	Tractor-mounted mower, towed disc, plow, flail mower, or similar equipment.	The stalks, stems, and canes are cut using the mower, disc or plow as close to the ground as possible. Cut biomass is removed from the project site immediately following cutting to prevent reestablishment of the cut material. Roots and rhizomes will remain in the ground.	Effective biomass removal for extensive stands.	Very low mortality rate requires repeated re-treatments. Extensive manual debris removal necessary when biomass is large enough to resprout. Requires site access by equipment.
Mechanical Removal (Above and Below-Ground)	Areas with easy access for heavy equipment and on stands not intermixed with native plants.	Removal can be performed anytime. Rain and high water can limit wet season access.	Backhoe, excavators or other heavy machinery.	A backhoe or tractor is to be used to simultaneously remove the plants and their root system. If roots/rhizomes remain, the equipment can be used to excavate these larger segments. Hand crews using shovels can dig out smaller fragments.	Effective if rhizomes and root masses are thoroughly cleared from site. Effective for removing very large establishments in open and accessible terrain.	Extensive debris removal. Major soil disturbance and erosion potential. Possible impacts to native wildlife and plant species. Requires site access by equipment.
Tarping	Small stands (<0.25 acres) not intermixed with native plants.	Tarps applied in late spring/ early summer and remain for up to 5 months, usually from June to November.	Chainsaws, machetes, loppers, or similar equipment to cut plants. Opaque thick tarps or pond liners, stakes or weights to hold tarps down.	Stalks and branches should be cut within inches of the ground. Chipped biomass should be placed over cut stalks. The opaque tarp or pond liner is laid over the cut material and secured with stakes or weights. The tarp remains on the target area for a period of five months and is then removed. Dead biomass is removed from the project area and roots and rhizomes are left in the ground.	High success rate when properly applied. Available for active channel areas. Minimizes soil disturbance. Effective on small stands.	Application of method is limited by size of stand. May damage soil microorganisms. Not appropriate for areas that may flood (i.e. channel).
Foliar Spray or Basal Bark Treatment	Any size stand not intermixed with native plants or where herbicide applicators can avoid native plants.	Apply herbicide anytime, but most efficient in early fall through winter when plant energy is transferred to roots. Herbicide should be applied on dry days and during low winds.	Herbicide, applicators such as backpack sprayer, ATV-mounted boom sprayer, spray rig, helicopter, or similar equipment.	Crews apply herbicide using sprayers or wicking on leaves and stems of arundo and foliage or basal bark of tamarisk. Follow herbicide label instructions. Personnel must be trained in the use and handling of herbicides. Timing of application is dependent upon type of herbicide used.	Short duration of labor. Low concentrations of herbicide. Effective on any size of stand. Minimizes soil disturbance.	Risk of drift to non-target plants and wildlife or adjacent sensitive receptors. Herbicide application should not be used in areas where there is great concern regarding herbicide use. Weather conditions must be suitable for herbicide application.

Method	Appropriate Use	Timing	Tools	Instructions	Advantages	Disadvantages
Cut and Paint/Daub	Any size stand. Allows– allows controlled application of herbicide on stands heavily intermixed with native plant species.	Apply herbicide anytime, but most efficient in early fall through winter when plant energy is transferred to roots. Herbicide should be applied on dry days and during low winds.	Chainsaws, loppers, or similar equipment can be used for cutting. Herbicide. Paintbrushes, sponge daubers, or similar equipment for herbicide application.	Trunks, stems, and canes of arundo and/or tamarisk are cut within one foot of the ground and removed. Herbicides is applied to the cut stem surface using brushes or daubers. Timing of application is dependent upon herbicide used. Follow herbicide label instructions. Personnel must be trained in the use and handling of herbicides.	Very high mortality rate. Efficient use of herbicide. Highly selective with little risk of drift of herbicide onto non-target plants or sensitive wildlife species. Little soil disturbance.	Very labor intensive. High concentrations (90-100%) of herbicide. Extensive debris removal is often required. Higher initial labor and herbicide costs than other methods, although less retreatment is required. Weather conditions must be suitable for herbicide application.
Cut, Resprout, and Spray or Paint/Daub	Any size stand not intermixed with native plants or where herbicide applicators can avoid native plants.	Cut one to two months prior to spraying. Apply herbicide when resprouts are 2-4 feet tall, but most efficient in early fall through winter when plant energy is transferred to roots. Herbicide should be applied on dry days and during low winds.	Loppers, chainsaws, flail mower, or similar equipment for cutting. Herbicide. Paintbrushes, sponge daubers,, applicators such as backpack sprayers, ATV-mounted boom sprayers, spray rigs, helicopter, or similar equipment for herbicide application.	Trunks, stems, and canes of arundo and/or tamarisk are cut within one foot of the ground and removed. Herbicide is applie Apply herbicide after a sufficient period has elapsed (approximately one to two months) to allow for re-sprouting. Follow herbicide label instructions. Personnel must be trained in the use and handling of herbicides.	Low soil disturbance associated with this method if hand tools are used. Less risk of herbicide drift than when spraying full-grown canes.	Waiting for resprouts after cutting can be impractical when working in remote areas. Large equipment (such as flail mowers) can substantially disrupt the soil and damage native, non-target species and habitat. Weather conditions must be suitable for herbicide application.
Cut and Spray	Any size stand not intermixed with native plants or where herbicide applicators can avoid native plants.	Apply herbicide anytime, but most efficient in early fall through winter when plant energy is transferred to roots. Herbicide should be applied on dry days and during low winds.	Loppers, chainsaws, flail mower, or similar equipment for cutting. Herbicide. Backpack sprayers, applicators such as backpack sprayer, ATV-mounted boom sprayers, spray rigs, or similar equipment for herbicide application. .	Crews will cut plant to four or five feet and then apply herbicide using hand held sprayers on leaves and stems of arundo and foliage or basal bark of tamarisk. Personnel must be trained in the use and handling of herbicides.	Moderate mortality rate. Minimizes soil disturbance. Minimizes risk of drift onto non-target species.	Biomass removal is labor intensive. Stalks intended for spraying may be trampled. Weather conditions must be suitable for herbicide application.
Controlled Burning	Large stands of pure arundo and tamarisk or for girdling of individual tamarisk trees.	Removal can be performed anytime.Anytime. Burning is most effective during growing season.	Flamethrowers weed burners, or similar equipment. Fuel.	Crews to either broadcast burn large stands or employ flamethrowers or weed-burners to spot treat small clusters, or heat-girdle stems at the base of individual plants. For larger controlled burns, fire crews would likely be required to monitor fires to prevent unintentional spread. . Fires applied during the rain season may help prevent spread of wildfires.	Highly effective in removing biomass.	Requires permits to perform burns and repeated burning to control biomass. Low mortality rates make it ineffective as sole or primary tool. Large potential for regrowth. Potential for associated collateral impacts to native habitat and wildlife. Risk of fire spread to non-intended targets. Arundo and tamarisk readily recover from fire which allows them to out-compete native riparian vegetation in post-fire circumstances.

Method	Appropriate Use	Timing	Tools	Instructions	Advantages	Disadvantages
Controlled Burning with Herbicide Treatment	Large stands of pure tamarisk.	Removal can be performed anytime.Anytime. Burning is most effective during growing season. Herbicide application most effective in the fall through winter.	Flame throwers or weed burners, or similar equipment. Fuel. Herbicide, sponge daubers, paintbrushes, and backpack sprayers.	Crews Controlled burning involves using crews to either broadcast burn large stands or employ flamethrowers or weed-burners to spot treat small clusters, or heat-girdle stems at the base of individual plants. For larger controlled burns, fire crews would likely be required to monitor fires to prevent unintentional spread. Fires applied during the rain season may help prevent spread of wildfires. Herbicide is then may be applied to cut canes or stumps, or applied to resprouts after a sufficient period has elapsed (approximately one to two months). Personnel must be trained in the use and handling of herbicides.	Highly effective in removing biomass.	Requires permits to perform burns. Potential for associated collateral impacts to native habitat and wildlife. Risk of fire spread to non-intended targets. Weather conditions must be suitable for herbicide application.
Grazing	Large stands of pure arundo or tamarisk where herbicide use is a concern.	Anytime. Most effective during growing season.	Grazing animals such as goats, temporary fencing.	Although grazing can be used to reduce or eliminate tamarisk sprouts and reduce arundo growth, this technique requires focusing the grazers on areas with high densities of the target vegetation. This may require fencing, herding, or other techniques to ensure that the method is effective and that grazers do not target native vegetation.	If grazing animals are readily available, then may be effective temporary control of new growth. Provides animal forage.	Labor and time intensive. Very low mortality rates require repeated re-treatment (>5 years) to be effective which increases the project cost and frequency of disturbance to sensitive areas. May be difficult to focus grazing on target species. Concentrated areas of animal waste may cause negative impacts to treatment areas.
Biological Control	Control of large infestations.	Dependent upon pathogen or species released.	Dependent upon pathogen or species released.	Biological control would involve the controlled release of a pathogen, or insect species from these plants' native range to feed upon, create disease in, or otherwise impair the growth, spread, and/or reproduction of arundo and tamarisk. All such biological controls are monitored and regulated by the USDA and it would be necessary to coordinate with that agency.	When implemented, biological control is expected to be effective in controlling the spread of infestations, but may not be extremely effective in the eradication of the target species populations.	No biological control agent is approved for use in the upper Santa Clara River for either arundo or tamarisk as of this writing.

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11.0 Herbicides

The range of herbicides available for use on arundo and tamarisk infestations is limited due to the label restrictions of application to wildlands. However, application of herbicides can be one of the most effective tools for control and eradication of these invasive plants. Most herbicides work by disrupting amino acid production in plants. As humans and wildlife do not share these same metabolic pathways, herbicide function is not directly relevant to health risk assessment. Herbicides are effective when used alone to control infestations, but are often used in conjunction with other techniques such as cutting or mowing. The use of herbicides can substantially increase mortality rates of persistent invasive plants, reducing the need for invasive hand or mechanical excavation of roots and rhizomes and associated soil disturbances. However, the utility of herbicide application in control of arundo and tamarisk can be affected by its relatively high initial cost, restrictions on use in proximity to water, the degree of intermixing of invasive plants with natives, and the presence of sensitive species. These factors can all restrict the type of herbicide allowed, the location and timing of use, and the method of application.

The success of herbicide application primarily depends upon selecting the appropriate herbicide for the task and closely adhering to label directions. Many herbicides are prohibited for use around open water and all may exhibit seasonal variations in effectiveness. The most effective method of application can vary between brands and types of herbicides. Most herbicides require the use of a surfactant, which may be included in the product or added prior to application to increase effectiveness. Colorants are also often added to herbicide solutions to enable spray crews to see where they have sprayed after initial evaporation of the solution. The USEPA and the California Department of Pesticide Regulation (CDPR) must register the herbicides prior to their use in California. Further, the large-scale application of herbicides must be overseen by a licensed professional. Appendices 9 and 10 contain detailed descriptions of herbicides, issues surrounding application, and appropriate techniques for application.

The three herbicides most commonly used in the eradication of arundo and tamarisk in riparian areas of Southern California are glyphosate, triclopyr, and imazapyr. While these herbicides are available under a variety of brand names, the focus of our discussion pertains specifically to these respective active ingredients. Formations of glyphosate and triclopyr for use near aquatic habitats are available, and a formulation of imazapyr is pending for use near water. Different mixtures of these herbicides are effective under different circumstances as discussed in more detail in Appendix 9.

11.1 Glyphosate

Glyphosate can be used to treat arundo and tamarisk is the active ingredient in the retail products such as Aquamaster®, Rodeo®, Glypro®, and Roundup®. The USEPA has approved Rodeo® and Aquamaster® for use in aquatic environments, making glyphosate one of the primary herbicides currently available for use when surface water is present. Roundup®, conversely, is only approved for use in areas where water is not present.

Glyphosate is most effective when used on perennial plants, such as arundo and tamarisk, when applied in the late summer and fall when the plant is entering dormancy, as this permits transmission of the herbicide to the plant's root system (Sonoma Ecology Center 1999).

11.2 Imazapyr

Imazapyr can also be used to treat arundo and tamarisk and is the active ingredient in Stalker® and the new aquatic habitat formulation, Habitat®. Imazapyr is a non-selective herbicide used for the control of a broad range of weeds including terrestrial annual and perennial grasses and broadleaved herbs, wood species, and riparian and emergent aquatic species (Tu, et al. 2001). a low potential for leaching into groundwater. It has low toxicity to invertebrates and is non-toxic to fish, mammals, and birds (USFS 1995). Unlike glyphosate, it can damage adjacent non-target plants, with the exception of conifers, by transfer between root networks.

11.3 Triclopyr

Triclopyr can be used to treat tamarisk and is a selective systemic herbicide. It has little or no impact on

grasses (e.g. arundo). Triclopyr is the active ingredient in Garlon® and Pathfinder® formulations, and is known as Access® in other states. Garlon® 4 and Pathfinder® II are approved for terrestrial habitats. Garlon® 3A is approved for use in closed aquatic habitats such as wetlands and lakes. It is not allowed for use on streams and rivers. It is recommended for use within 300 feet of water by the USFWS.

11.4 Adjuvants

Herbicides generally need to be applied with an adjuvant. There are several types of adjuvants including surfactants, non-foaming agents, and colorants. A surfactant is any compound that is added to an herbicide formulation or tank mix to facilitate the emulsifying, dispersing, spreading, wetting, or other properties of a liquid by modifying its surface characteristics (Vencill 2002). Surfactants, also known as stickers/spreaders, are similar to detergents in their action, reducing water surface tension to allow wetting and penetration of the plant tissues. The surfactant helps to achieve optimum herbicide adsorption into and adherence from the herbicide onto the plant. Surfactants may also improve an herbicide's efficacy so that the concentration or total amount of herbicide required to achieve a given effect is reduced, sometimes as much as five- or ten-fold (Tu et al. 2001). In this way, adding an appropriate surfactant can decrease the amount of herbicide applied and lower total costs for weed control (Tu et al. 2001). All herbicide labels recommend surfactants and other additives to improve herbicide effectiveness. In some cases, the herbicide will already have the surfactant included, but in other cases, it will be necessary to buy one. Herbicide applicators should check the label prior to adding surfactant. USEPA regulated adjuvants should be approved by the regulatory agencies. Non-ionic surfactants, such as Agridex®, are recommended by the USFWS.

12.0 Access and Staging Areas

Staging areas are often utilized during larger removal projects. Staging areas are used for the storage of and servicing of equipment, the chipping and temporary storage of biomass, and the subsequent loading of chipped material onto trucks for removal from the project area. Staging areas are typically 0.25 to 0.5 acres in size.

Staging area selection is based on available space, ease of access from surrounding roads, ease of access to the eradication site, and the least potential to conflict with adjacent land uses. Permission for use of each staging area may need to be coordinated with the appropriate landowner. Staging areas are typically enclosed with orange construction fencing, or by a six-foot-tall chain link fence to prevent unauthorized access and to ensure public safety.

Staging areas should be located outside of the 25-year floodplain on the upper terrace, levee, or bank of the river or tributary where removal is occurring. In staging areas where chipping is not compatible with surrounding land uses (i.e., near residences, schools, and parks), chipping should occur at the nearest staging area that is appropriate for chipping. Each staging area may be used to accommodate equipment storage and maintenance, portable sanitation facilities, emergency decontamination kits, and handheld equipment when not in use. Unsecured herbicides should be removed from the staging areas each night. All handheld equipment, including chainsaws and backpack sprayers, should be removed from the staging area at the end of each work day and not left at the project site. If large equipment, including ladders, tractors, chippers, and booms, are to be left at the work site overnight, they should be stored in the staging area. Large equipment should also be kept in the staging area when not in use. All maintenance and refueling activities should be performed within the staging areas to minimize risk of leakage/spills.

13.0 Disposal Options

Arundo and tamarisk biomass may be disposed of in a variety of ways.

13.1 Drying

Treated biomass is stacked at staging areas and completely dried, so it is no longer viable and able to resprout. The dried biomass can be left at the site, burned, chipped, or taken to a landfill for permanent disposal. Biomass may be left in piles in upland areas outside the 25-year floodplain to enhance wildlife habitat for small mammals only if cut prior to seed production. If left on site, biomass should be monitored for re-growth. Drying may not be appropriate for rhizomes due to their ability to resprout when exposed to moisture, even after long periods of drying,

13.2 Chipping

A chipper is used at the staging area, or on the banks of the river or tributary, or within the river channel itself (often directly into the back of trucks) to shred the arundo canes or smaller tamarisk branches. The chipper should be placed at an appropriate distance from potentially sensitive groups and all noise reduction accessories should be employed. The biomass may either be stacked and dried before being fed into the chipper, or may be fed into the chipper while still green. It is recommended that a large chipper be used as arundo can break the blades of smaller chippers. Chipped arundo biomass is suitable for beneficial reuse as mulch if chips are less than four inches, as longer segments often still remain viable Chipped tamarisk biomass may be contaminated with seed or salt (from foliage). It is recommended that tamarisk mulch be allowed to dry for two weeks to ensure seeds are no longer viable. Chipped biomass of arundo or tamarisk may also be disposed of off-site in a landfill for permanent disposal.

13.3 Incineration

Disposal of biomass occurs by burning cut material (that has not been chemically treated) at the staging area after the biomass has dried. Incineration requires obtaining a permit from the Los Angeles County Fire Department and the Los Angeles Air Quality Management District and would only be appropriate outside of fire season. Incineration should only be used under low wind conditions. Necessary fire control equipment (e.g., extinguishers, water hoses, etc.) should be on hand to prevent any unintended spread of the fire.

13.4 Landfill Disposal

The cut biomass is transported off-site to a landfill for permanent disposal. Chiquita Canyon Landfill is the closest landfill to the project area available for use. Landfills typically charge per load or by ton, which can add to the overall project cost.

13.5 Beneficial Re-use

13.5.1 Commercial and Cottage Industries

Removed arundo stalks may occasionally be sold for commercial purposes. Manufacturers of reeds for woodwind instruments, as well as those producing pressed board and paper products often have an interest in aquiring cut arundo canes. Arundo biomass may also be used to handcraft flutes, walking canes, and other such items as part of a cottage industry. However, as the overall goal of any removal project is to eradicate arundo, the sale of cut arundo for profit, and the development of commercial distribution channels is not encouraged. Project applicants who are approached by commercial entities who either wish to acquire the cut biomass, or who offer cutting/harvesting services, should only undertake such arrangements after entering into contract negotiations with the commercial entity. Appendix 12 lists guidelines that should be included in such a contract.

13.5.2 Cogeneration

Dried arundo and tamarisk biomass may be used as an environmentally friendly fuel in cogeneration power plants. However, and as mentioned above, the establishment of arundo for commercial applications is not encouraged as the overall goal is to eradicate arundo.

14.0 Best Management Practices and Mitigation Measures

Although the primary goal of arundo and tamarisk eradication programs is to improve habitat quality, some eradication techniques have the potential to negatively impact native habitat surrounding, and within, the project footprint. BMPs are intended to reduce the ecological cost of eradication projects and minimize deleterious impacts, while allowing the most appropriate eradication techniques to be used. Regulatory permits require implementation of BMPs. Most BMPs are implemented at the time work is conducted in the field, however some can be implemented prior to commencement of work.

The BMP project checklist provided below (Table 7) is designed to facilitate the application of BMPs for all possible projects. The list is based on three elements that will need to be considered for each project before it is implemented:

(1) how invasive species are to be removed from the project site;
(2) how the biomass of dead invasive plants will be disposed of and removed from the project site after treatment; and
(3) what types of sensitive species are either present or have the potential to be present on the site.

Note that all general BMPs shall be applied to all projects, no matter how small, in order to ensure that removal of invasive species does not adversely affect the remaining habitat quality. To use the checklist, answer the questions in gray bars, and see the text sections of the SCARP referred to next to the answer.

14.1 General BMPs

The following general BMPs are applicable to all removal scenarios and must be implemented for all related projects.

14.1.1 Limits to Site Disturbance

- All projects will coordinate with the regulatory agencies to obtain appropriate permits.
- Work area will be limited to smallest area possible.
- Vehicle use will be limited to the maximum extent possible. If vehicles are to be used, rubber-tired vehicles are preferred over tracked equipment.
- Soil disturbance will be limited to the maximum extent possible.
- Native vegetation and tree damage or removal will be limited to the maximum extent possible.
- No project activities will occur in flowing or ponded water.
    - If water must be crossed, an appropriate spanning method such as a temporary bridge consisting of planks or a steel grate/plate is to be used.
    - If work must occur in areas of flowing or ponded water, approved techniques for water diversion are to be used prior to beginning project activities.
- Staging areas will be located outside the active channel on the upper terrace, levee, or bank of the river or tributary.
- Staging areas will be located in compacted and de graded areas, preferably near access points when site conditions allow.
- Movement of personnel and equipment will be limited to designated work zones, staging areas, and access roads.
- Access points will be located at pre-existing ramps/roads, in areas infested with non-native or invasive plant species, or in areas that are already degraded. Areas with compacted soil will be used preferentially over areas with loose soils. Soil from access points infested with noxious species will be compacted, and biomass from such access points will be mulched to avoid distribution of seeds.

14.1.2 Site and Personnel Management

- All OSHA (Occupational Safety and Health Administration) regulations will be followed by project personnel.
- Chemical toilets for personnel shall be kept in staging areas during removal activities.
- Project activities will be limited to normal business hours.
- Extraneous noise will be limited to the maximum

extent possible (e.g., radios for entertainment).

- Equipment and machinery use will comply with all applicable local noise ordinances and policies.
- Smoking will not be allowed on site.
- Pets of project personnel will not be allowed on site.
- Prior to removal activities, treatment areas will be marked, and signs will be clearly posted along access points to the project site.
- Signs will be posted on affected trails for a sufficient time to warn trail users of heavy-duty equipment crossings. The signs will be posted on either side of the active access and shall be maintained for the entire period of project-related trail use.
- Signs and flaggers shall be used in areas where equipment use would access high speed roads (e.g. blind corners).
- All neighbors within 100 feet of proposed areas will receive notice of proposed projects one month before start of work.

14.1.3 Personnel Education

- All project personnel will be briefed on environmental concerns regarding the project, including the use of herbicides, appropriate work practices (including spill prevention and response mesures), and other measures needed to minimize project impacts. Personnel will be informed of the

Table 7: BMP Checklist

*	All general BMPs (Section 14.1 and all sub sections) must be adhered to at all times.	
1	How will invasive species be removed from the project site?	
	Biomass Removal	14.2.1
	Herbicides	14.2.2
	Foliar Application	14.2.3
	Cut and Paint	14.2.4
	Cut and Spray Resprouts	14.2.5
	Tarping	14.2.6
	Controlled Burning	14.2.7
	Biological Control	14.2.8
	Grazing and Herbivory	14.2.9
2	What method of biomass disposal will be used?	
	Drying	14.3.1
	Chipping	14.3.2
	Incineration	14.3.3
	Landfill Disposal	14.3.4
3	If sensitive species are present on site, what type? (For a description of sensitive species see Section 4.0, Biological Resources.)	
	Birds	14.4.1
	Amphibians/Reptiles	14.4.2
	Fish	14.4.3
	Plants	14.4.4

locations of foot and vehicle access paths, areas that are sensitive, and areas that are closed to access. The construction contractor shall monitor all construction-related activities to ensure that all of the environmental protection measures are followed throughout initial project activities and subsequent activities.

- All project personnel will participate in an educational program to identify the target plant species (arundo or tamarisk), incidental noxious plant species on the site, and native plant species on the site prior to proposed activities.
  This training will include how the target and incidental plant species are distributed in order to prevent spread of viable biomass.
- If special status plant or wildlife species (or species of concern) occur on site, a qualified biologist will conduct an educational program on how to avoid impacts to these species for all project personnel prior to proposed activities. This training will cover a description of all listed species (or species of concern), which occur within the project boundary and their habitats. This training shall also include a description of the applicable regulations such as the ESA and the State Fish and Game regulations, the need to adhere to these regulations, penalties associated with violations, and measures being implemented to conserve the species within the project area.

14.1.4 Air and Water Quality And Site Contaminant Prevention and Control

- All vehicles will observe a maximum speed limit of 15 miles per hour or lower at the project site and staging areas to avoid generation of dust.
- Appropriate dust suppression methods will be used during on-site removal activities. Recommended methods include application of water, use of wind break enclosures, covers on soil piles and dump truck loads, use of silt fences, and suspension of earth-movement activities during high wind conditions.
- Emissions from construction equipment will be controlled by adherence to the recommended maintenance schedules for each individual equipment type. Repairs to malfunctioning equipment will be made as soon as possible.
- All trash items will be enclosed in sealed containers and regularly removed from the site.
- Disposal of project waste materials such as trash, used equipment, oil, grease, and chemicals will be done in accordance with federal, state, and local regulations.
- Erosion control measures (e.g., silt fencing, mulch, matting, soil binder, seeding) will be implemented as appropriate to inhibit sediment transport into the waterways.
- If work is to occur during the rainy season, no work will occur unless there is a three-day clear weather forecast. No work will occur during rain events.
- No unchipped biomass greater than four inches in length will be left overnight within the stream channel.
- Stockpiled biomass, loose soil, or other debris will not be left overnight within the stream channel or on its banks. If stockpiled biomass must be left overnight, it will be moved to staging areas.
- All equipment and clothing will be inspected and cleaned at the end of each work day to prevent the further spread of invasive species.
- Herbicide storage during application, and the fueling and lubrication of mechanical equipment will be confined to staging areas.
- All vehicles and equipment shall be moved to a staging area or removed from the site overnight.
- Immediate control, containment, and cleanup of fluids and herbicides due to spills or equipment failure (broken hoses, punctured tanks, etc.) will be implemented. All contaminated materials will be disposed of promptly and properly to prevent contamination of the site. To reduce the potential for spills, the refueling of portable equipment shall occur within a contained area. Where that is not possible, barriers shall be placed around the site where the fuel nozzle enters the fuel tank. The barriers shall be such that spills shall be contained and easily cleaned up. Refueling activities shall ensure that the potential for spillage from overfilling, nozzle removal, or other action is minimized to the extent feasible.

14.1.5 Biological Resources (If Listed Species or Species of Concern Have Potential to Occur)

- If listed species or species of concern have potential to occur in the area, the project manager shall coordinate with the appropriate resource agencies and a qualified biologist to conduct surveys and implement measures to avoid impacts.
- If listed species or species of concern are known to occur in the area, a qualified biologist will be retained to recommend measures to protect these species such as the project scheduling, delineation of the work area, staging area, and access points.
- If listed species are present, a qualified biologist will monitor project activities as directed by regulatory agencies.
- Impacts to nesting birds per Migratory Bird Treaty Act (MBTA) will be avoided by:
- the cessation of work during bird breeding season (March 15 – September 15);
- the performance of surveys by a qualified biologist to determine presence/absence of nesting birds prior to undertaking work;
- the establishment of appropriate exclusionary buffers around nests, if present.

14.2 Technique-Specific BMPs

14.2.1 Biomass Removal

- Target species' canes/trunks will be cut to less than twelve inches in height and straight across to prevent sharp points from injuring project personnel or the public.

14.2.2 Herbicides

- A DPR licensed Pest Control Advisor (PCA) will prepare a written recommendation for the use of all materials/herbicides on agricultural areas (as defined by CDPR); the recommendation will be submitted to the Los Angeles County Agricultural Commissioner's Office.
- All material/herbicide usage on agricultural areas (as defined by CDPR) will occur only as directed by the written recommendation from a licensed PCA.
- Only herbicides registered for use in California by the EPA and the DPR will be used.
- Only herbicides approved for aquatic use may be used within the banks of rivers and tributaries. Roundup® may not be used within the active channel of rivers and tributaries.
- All adjuvants will be registered by the EPA and approved for use by the resource agencies.
- Herbicide application will be conducted only by personnel with an operator identification number from the Agricultural Commissioner's Office or supervised by a DPR certified or licensed Qualified Applicator (QAC or QAL).
- Herbicide usage will be limited to the minimum amount required to be effective.
- Herbicides shall be applied according to the manufacturer's label specifications.
- Herbicides will be colored with a biodegradable dye to facilitate visual control of application.
- Avoidance measures such as pulling back or temporarily tarping desired vegetation will be used to the extent feasible to prevent unintended herbicide impacts.
- Herbicides will be secured or removed from staging areas at night.

14.2.3 Foliar Application (Full Stands, Cut Stands, Resprouts)

- Herbicide will not be applied when conditions are windless or greater than ten miles per hour (mph).
- Herbicide will not be applied if air temperature exceeds volatization limits of herbicide, unless adjacent native species are protected (e.g., tarped).
- Tarps shall be used to cover desired vegetation (to the extent feasible) to prevent unintended herbicide impacts.
- Booms or ladders will not be employed for foliar spraying within 200 feet of residences, parks, schools or similar sensitive receptors. Foliar spray applications shall be limited to the cut and spray technique within this setback.

14.2.4 Cut-and-Paint

- See BMPs for biomass removal and herbicides.

14.2.5 Cut and Spray Resprouts

- See BMPs for biomass removal and herbicides.

14.2.6 Tarping

- Target species' canes/trunks will be cut to less than twelve inches in height and straight across to prevent sharp points from injuring project personnel or the public.
- Mechanical equipment will not be driven over tarped areas.
- Tarps shall be manually transported into seasonally and perennially wet areas.
- Tarping material will be removed and disposed of properly after completion of the project.

14.2.7 Controlled Burning

- This method will be used in compliance with all local laws and regulations and will be conducted in conjunction with the local fire department and AQMD.
- Adjacent land uses and land ownership will be considered prior to implementing controlled burns.
- All controlled burns will be conducted during the rainy season.
- All controlled burns will be supervised by qualified fire personnel.
- All controlled burns will be conducted during low-wind conditions.
- Adjacent landowners will be notified prior to implementing controlled burns.

14.2.8 Biological Control

- Biological control vectors will not be released without USDA approval.

14.2.9 Grazing and Herbivory

- The use of grazing animals shall be restricted to areas outside of flowing water with a minimum setback of 50 feet for grazing from any flowing water.
- Grazing will be controlled by erection of temporary fencing to restrict grazing animal to the target area.

14.3 Storage and Disposal Methods

14.3.1 Drying

- Drying of biomass will occur outside of the active channel at designated staging areas.

14.3.2 Chipping

- All chipped biomass will be disposed of off site in a landfill or will be used as mulch.
- All measures shall be taken to reduce the noise of chipper and to prevent noise disturbance to potentially sensitive receptors.
- Necessary measures shall be taken to reduce and control dust generated by chipping.
- Chipping shall occur on staging areas only with prior approval of the appropriate landowner and/or agency.

14.3.3 Incineration

- All federal, state, and local laws and provisions regarding incineration of biomass shall be followed, including those of the local fire department and AQMD.
- All incineration will take place at appropriate designated locations.

14.3.4 Landfill Disposal

- Cut biomass is transported off-site to a landfill for permanent disposal. Chiquita Canyon Land fill is the closest landfill to the project area avail able for use. Landfills typically charge per load or by ton, which can add to the overall project cost.

14.4 Threatened and Endangered Species-Specific BMPs

14.4.1 Birds (Western Yellow-Billed Cuckoo, Southwestern Willow Flycatcher, California Condor, Least Bell's Vireo, Coastal California Gnatcatcher)

- Project activities (e.g., application of herbicide, mechanical trimming, and/or removal, etc.) shall be conducted between 15 September and 15 March to avoid impacts to listed bird species such as least Bell's vireo and southwestern willow

flycatcher during the breeding season, or shall provide a 500 foot radius buffer around each nest, if either species is present.

- Noise levels will not exceed 60 dBA (A-weighted decibel scale) within 500 feet of nests.

14.4.2 Amphibians (Arroyo Toad, California Red-legged Frog)

- No work will be conducted within areas of known or potential arroyo toad habitat during the breeding season (February to August).
- Vehicles and equipment shall be removed from the habitat before sunset in sensitive amphibian areas.
- Stockpiles of biomass will not be kept in habitat areas, but will be moved to upland areas outside the 25-year floodplain immediately to minimize amphibian and reptile usage.

14.4.3 Fish (Unarmored Threespine Stickleback, Santa Ana Sucker)

- No work will occur in flowing or ponded water.
- Grading and excavation will be set back a minimum of 50 feet from the edge of the active channel. Grazing areas will be fenced to prevent animals from entering water. The boundaries of excavated projects will be demarcated by temporary construction fencing or flagged stakes.

14.4.4 Plants (e.g., Nevin's Barberry, Slender-Horned Spineflower, Spreading Navarretia)

- All listed plant locations will be fenced to avoid disturbance and accidental damage/mortality.
- Herbicides will not be used near known or probable locations of sensitive plant species.

Areas identified as potential special status plant habitat will be surveyed by a qualified botanist prior to commencing work.

15.0 Maintenance and Monitoring

Arundo and tamarisk are aggressive invasive plants with an extraordinary ability to spread, reproduce, and thrive under a wide range of conditions. As such, any removal program for substantial infestations requires a long-term commitment of resources, repeated treatments, and ongoing monitoring in order to be successful (Table 8). This adds to the overall cost of removal efforts, but without such repeated treatments and monitoring, successful removal projects can quickly experience reinvasion, with the potential for a treated area to return to a pre-removal condition, sometimes within a few years.

The issue is exacerbated within the upper Santa Clara River watershed because extensive infestation increases the chance of re-infestation from offsite sources. Therefore, all removal methods will require at least three years of continuous monitoring and follow-up treatments. Even approaches with high initial mortality rates such as cut and daub/paint will require this extent of monitoring, and likely follow-up treatments in spots. For methods with lower mortality rates, monitoring times and the number of required re-treatments may increase to five years. Monitoring site visits are recommended quarterly for the first year and biannually for years two to five.

Table 8: Comparison of Re-Treatment Requirements of Removal Methods

Method	Average 1st Year Mortality Rate	Level of Re-Treatment Effort Required	Average Number of Re-Treatments Required
Hand Above-Ground Removal	<50%	Same as initial treatment.	>5
Hand and Mechanical Above-Ground Removal	5-50%	Varies depending on success of initial treatment. Potentially the same as initial treatment.	>5
Mechanical Above-Ground Removal	<50%	Same as initial treatment.	>5
Mechanical Above- and Below-Ground Removal	5-50%	Varies depending on success of initial treatment. Potentially the same as initial treatment.	>5
Tarping	50-95%	Few resprouts – little effort.	At least 3
Foliar Spray	50-95%	Few resprouts – little effort.	3-5
Cut and Spray or Paint/Daub	50-90%	Few resprouts – little effort.	3-5
Cut, Resprout, and Spray	~50%	Some resprouts – close to the same amount of effort as initial treatment.	3-5

The level of intensity, duration, and frequency of required re-treatment depends on many factors such as the skill of the crews involved, initial budget, etc. As such, this table is provided for general reference only.
Source: Sonoma Ecology Center 1999.

16.0 Habitat Restoration and Revegetation

There are two types of revegetation: passive and active. Passive revegetation means there will be natural recruitment from native species while active revegetation means introducing native species by planting seeds, cuttings, or container stock.

Passive revegetation means replanting by natural processes. Surrounding native plant habitats provide seed sources for propagation. Once the competition of arundo or tamarisk is removed, native species will continue to propagate and grow there. This method requires the least effort and expertise to restore native riparian vegetation. It also doesn't require repeated disturbance for maintenance and ensures the revegetation of local genetic stock. However, passive revegetation may take several years or more to become established. If invasive plants are established upstream of the project area or in surrounding areas, the site is at risk of being repopulated by invasive plants.

Passive revegetation is most appropriate when:

- There are native plant and seed sources, either on-site or upstream.
- The site does not contain extensive disturbed, unvegetated, exposed ground that would attract non-native pest plants.
- The soils are stable and at low risk of erosion.
- The site tends to flood each year, allowing nearby native plant material to settle and become established.

If these conditions exist, passive revegetation may be a more appropriate use of time and resources than active revegetation.

Active revegetation means collecting and planting seeds, cuttings, or container stock. Active revegetation is recommended for sites are located on upper banks where natural recruitment is unlikely to occur or on areas which have erosion problems. Project sites should be monitored during removal activities for natural recruitment of native species. Supplemental water or irrigation may be required. Active revegetation is often planned after removal activities have been completed to avoid impacts to newly planted vegetation. Active revegetation may take from three to five years.

Active revegetation is most appropriate when:

- The site is located downstream from, or near invasive plant species. In such cases, prompt revegetation with natives may be necessary to prevent reinvasion of the treated site.
- The soil or stream bank is unstable and at high risk of erosion.
- A landowner strongly desires a privacy screen.
- There are special status species utilizing the project area.
- Natural recruitment is not providing species diversity.

There are several different revegetation techniques. Depending upon the project site conditions and desired habitat diversity, a combination of revegetation techniques may be used. Active revegetation alone may not provide sufficient soil or bank stabilization. Soil retention materials and stabilizing structures may be needed to adequately prevent erosion and bank failure. In such cases, materials such as erosion control fabrics and engineered structures should be considered before engaging in invasive plant removal. For structural changes, consult with a professional engineer or landscape architect, or a government agency such as Resource Conservation Districts.

Depending upon the level of habitat restoration desired and various individual project factors, the project costs will vary. A successful revegetation project will provide habitat, include a diverse set of plant types and species, reduce erosion, and require minimal annual management (CDFG 2003). If revegetation of a project site is intended, it is advisable to plan ahead to obtain local native plant material, grow container stock if necessary or prepare seeds for planting, and create a schedule for planting and maintenance. Planting cuttings or container stock usually works well for species that do not germinate well from seed or need intensive seed preparation. Seeding can be applied to species that germinate well from seed. It is important to consider the species diversity and local genetics when planning the plant palette. Native plant material such as seeds and cuttings should be obtained from the project site or as close as possible. Site preparation may include reducing the weed seed bank in the soil by herbicide application or disking prior to seed set. If there is a large

weed seed bank, this process may be performed several times. Planting or seeding is usually performed in the fall season to take advantage of rains for germination and encourage root growth. If rains are late, revegetation may occur in the winter or early spring. If planting or seeding is performed at another time of year, supplemental water or irrigation should be considered (Sonoma Ecology Center 1999).

Revegetation techniques include:

- Hand broadcasting of native grass, forb, and/or shrub seed mixes
- Hydroseeding of native grass, forb, and/or shrub seed mixes, may also contain binders for erosion control
- Drill, imprint, or pit seeding
- Direct planting of tree or shrub seeds
- Planting of tree and/or shrub cuttings
- Planting of tree, shrub, forb, and/or grass container plants

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16.1 Planting Methods

16.1.1 Broadcast Seeding

Broadcast seeding can be performed by hand, with hand-held or rolling broadcast seeders, or larger broadcasters towed by all-terrain vehicles or tractors. The soil bed should be prepared prior to seeding. If there is compaction, the soil should be disked or tilled. Also, the soil should be raked before and after seeding to incorporate the seeds into the soil. If available, large equipment such as a harrow and a ring roller can assist with working the seeds into the soil and enhance soil compaction after seeding. The seeding rate for broadcast seeding is usually 25 to 30 pounds per acre.

Drill or Imprint Seeding

Dry seeding can also be performed with large equipment such as drills, imprinters, or pitters. A tractor-drawn drill makes small furrows, deposits seeds in the furrows, and covers the seed with soil. Drills come in different sizes and types with attachments to improve seeding different species. Imprinters have a hydraulic wheel system with different seed boxes and a roller with teeth. These allow for diverse seed mixes and fertilizer or mycorrhizal inoculum to be applied at the same time. Both of these seeding applications can be faster and more uniform than broadcast seeding. The seeding rate for drilling or imprinting is usually 12 to 18 pounds per acre.

16.1.2 Hydroseeding

Hydroseeding uses hydraulic equipment to spread a wet mixture of seeds, fertilizer, mycorrhizae, erosion control binder, and green daya dye. This method can seed a large area quickly. The hydroseed mixture can be applied from a turret on top of a truck while driving or with a hose. Hydroseeding is most effective during the fall or early spring when rains will encourage germination. However, if supplemental water is available, it can be applied at other times of the year. It is important for the components of the hydroseed mixture to be correctly combined in appropriate proportions and the soil

bed is prepared prior to application. The California Native Grass Association recommends a two step process: 1) applying seed, a small amount of virgin wood fiber mulch, mycorrhizal inoculum, compost , and an organic time-released fertilizer first and; 2) applying a second layer of wood fiber and compost to cover. If erosion control is necessary on steep slopes, apply a third layer of rice or native straw with a tackifier.

16.1.3 Transplanting Emergent Plants

Rushes, sedges, and tulles are often called "emergent" plants since they usually emerge from water. These plants may grow from seeds or spread by rhizomes, which makes them good candidates for transplanting. Plants with intact rhizomes should be harvested in the winter or early spring. Several small clumps from a variety of larger clumps should be taken to ensure the parent population will survive and to include genetic diversity in the new planting area. Collected plant material should be stored in moist soil and transplanted within a reasonable time. Collected specimens should be planted in a large enough hole to accommodate the entire rhizome, soil should be packed around the rhizome, and thoroughly watered. Above ground portions of plant should be trimmed to stimulate growth.

16.1.4 Planting Cuttings

Willows, cottonwoods, Mexican elderberry, and many other riparian species can be planted from cuttings. These plants have the ability to grow roots from stems. Cuttings should be made when plants are dormant during winter months. Cuttings should be sliced so that the inner side of the branch is at an angle to indicate the end that will be planted in the ground. The cuttings may be a variety of sizes with different diameters and lengths depending upon the plant species and the location of the planting. Cuttings should have several viable buds along the stem in order to ensure new growth. Cuttings may be stored in water until ready to use, grown in water until roots appear, or planted as container stock. Cuttings should be planted in soil with angled, cut side down (buds should be pointing up) with three-quarters of the cutting in the ground and one-quarter exposed. If holes are augured, fertilizer or mycorrhizal innoculum may be added to the hole or mixed with the backfill soil before planting. Cuttings can also be driven into the ground with a mallet if soil is soft. Damage to the top of cuttings may be, sliced off.

16.1.5 Planting Container Plants

Container plants may be ordered in a wide variety of species from a native plant nursery. Ideally, container stock with be grown from locally collected plant material. Container plants will require supplemental water – from either winter rains or irrigation. Holes should be dug twice as wide and twice as deep as the container plant. In addition, fertilizer or mycorrhizal innoculum may be added to the hole or mixed with the backfill soil before planting. The hole should be firmly backfilled to depth of the rootball, and then the container plant placed inside.

17.0 Developing a Budget and Schedule

17.1 Cost of Removal

Removal costs vary greatly and are influenced by many factors including the extent and degree of infestation, labor rates, the ease of site access, the removal method employed, the frequency, duration, and level of effort required for follow-up treatments, biomass transport distances, and disposal techniques. Typical costs associated with various arundo and tamarisk removal methods are not well documented and can vary greatly from project to project. Removal of minor or isolated stands of arundo or tamarisk can often be accomplished relatively inexpensively (less than $2,000 per acre). However, current available methods which are suitable for successful removal of major infestations are all relatively expensive, ranging in price from approximately $2,500 to $9,500 per acre, depending on many variables. Techniques with the highest initial mortality rates and the lowest resultant follow-up monitoring and re-treatment costs tend to be the most expensive in terms of up-front costs, but the least expensive over longer periods. A project checklist is provided in Table 9.

Because such a wide range of factors affect removal project cost, it is not possible to provide precise estimates. Similar removal methods employed under generally similar circumstances can even exhibit variations in cost if just one key factor, such as difficulty of access or material transport, increases substantially due to factors such as distance or variable landfill tipping fees.

17.2 Cost Effectiveness

The SCARP proposes several methods for removal. Each method has advantages and disadvantages in different respects. Public agencies need to balance needs across the entire geographic area under their jurisdiction, as issues of social justice and environmental justice are important considerations in public and private policy and planning. (LAWMA 2005).

Although there may be certain concerns over the use of herbicides in the environment, this method may be more cost-effective in terms of funds and time. However, local communities or organizations may choose non-chemical methods of control, which may not be as cost-efficient. These groups have options to obtain additional funding for alternative methods of control such as volunteer programs and grants.

Development of a project schedule is an integral component to any removal project. Table 9 is provided as a planning aid and offers examples of the steps applicants can expect to incorporate in their projects.

18.0 Funding

There are several ways to fund invasive plant removal projects. Local agencies and non-profit organizations may apply for funding through grants, restoration loans, cost-share programs, in-lieu fees, mitigation banking, or through alternative sources. Individual landowners should contact their local agencies or NGOs for grant or cost-share opportunities.

18.1 Grants

Grants are provided by governmental agencies or NGOs. There is usually a lengthy process for the application of grants. The process may take up to two years before funding is obtained. Each source will have different applications and contract requirements. There may be a two-part application, which consists of a pre-proposal or conceptual proposal and a final proposal if the pre-proposal is accepted. Grants often need to have matching funds provided by donated cash, labor, or equipment.

Some agencies and organizations that provide grants are listed below:

- State Water Resources Control Board
- National Fish and Wildlife Foundation
- State Resources Agency
- California Department of Parks
- Recreation Land and Water Conservation Fund
- Habitat Conservation Fund
- Natural Resource Conservation Service

Websites, which provide information regarding available grants, are listed below:

- http://www.epa.gov/watershedfunding
- www.calwatershedfunds.org
- http://www.invasivespecies.gov/toolkit/grants-info.shtml

Table 9: Project Checklist

PREPARATION	
	Choose site - from headwaters down
	Obtain Landowner Cooperative Agreement
	Perform site assessment - level of infestation, potential for wildlife, staging areas, access
	Prepare project description - site plan, maps, choose removal/disposal methods, BMPs
	Survey project boundary
	Determine level of CEQA and which permits are necessary
	Complete vegetation/habitat surveys
	Complete wildlife surveys
	Complete sensitive species surveys
	Prepare CEQA - Initial Study, Negative Declaration, Mitigated Negative Declaration, Environmental Impact Report
	Contact resource agencies and prepare permits, including fees - CDFG, USACE, RWQCB, USFWS, AQMD, LADPW
	Prepare SWPPP
	Prepare specifications - safety, access to water, ingress/egress, removal methods, transport, disposal
	Prepare maintenance and monitoring plan
	Prepare bid package
	Contact youth groups such as CCC or City Corps for labor
	Notify and educate any surrounding residents via postcards, brochures, or handouts.
CONSTRUCTION	
	Mobilization - move in equipment, portable restrooms, signage, security fencing
	Clear & grub - staging areas, access roads, debris removal
	Construct access roads - equipment, dust/weed issues, watering truck for dust control
	Dewatering, if necessary
	Remove invasive species - labor, equipment, & herbicides
	Biological monitoring
	Transportation - to staging area (equipment & labor)
	Disposal - landfill, chipping/landfill, chipping - onsite/offsite mulch, incineration (equipment, landfill fees, transportation costs)
	Clean up, deconstruct access roads
	Demobilization - move out equipment, portable restrooms, signage, security fencing
MAINTENANCE & MONITORING (3- 5 years)	
	Remove invasive species - labor, equipment, & herbicides
	Biological monitoring
	Transportation - to staging area (equipment & labor)
	Disposal - landfill, chipping/landfill, chipping - onsite/offsite mulch, incineration (equipment, landfill fees, transportation costs)
	Annual reports to resource agencies
	Management

- http://www.wcb.ca.gov
- http://www.cdfa.ca.gov/phpps/ipc/weedmg-mtareas/Funding/funding_hp.htm

Further information regarding available public and private grants can be obtained from the Foundation Center Libraries (http://fdncenter.org). Locations of these libraries include:

Ventura County Community Foundation
Funding and Information Resource Center
1355 Del Norte Road
Camarillo, CA 93010
(805) 988-0196

California Community Foundation
Funding Information Center
606 S. Olive St. Suite 2400
Los Angeles, CA 90014-1526
(213) 413-4042

Los Angeles Public Library
West Valley Regional Branch Library
19036 Vanowen Street
Reseda, CA 91335
(818) 345-4393

Santa Monica Public Library
1343 Sixth Street
Santa Monica, CA 90401-1603
(213) 458-8859

18.2 Resource Loans

The State Water Resource Control Board has low interest loans for restoration and conservation projects. The Federal Water Pollution Control Act (Clean Water Act or CWA), as amended in 1987, provides for establishment of a State Revolving Fund (SRF) loan program. The program is funded by federal grants and State bond funds. The purpose of the SRF loan program is to implement the CWA and various State laws by providing financial assistance for the construction of facilities or implementation of measures necessary to address water quality problems and to prevent pollution of the waters of the State. The SRF Loan Program provides low-interest loan funding for construction of publicly-owned wastewater treatment facilities, local sewers, sewer interceptors, water reclamation facilities, as well as, expanded use projects such as implementation of non-point source (NPS) projects or programs, development and implementation of estuary Comprehensive Conservation and Management Plans, and storm water treatment. There is more information available on the website: http://www.swrcb.ca.gov/funding/srf.html.

18.3 Cost-Share Programs

The NRCS has two cost-share programs to assist private landowners perform restoration and conservation projects.

18.3.1 Environmental Quality Incentives Program – EQIP

The Environmental Quality Incentives Program (EQIP) provides a voluntary conservation program for farmers and ranchers that promote agricultural production and environmental quality as compatible national goals. EQIP offers financial and technical help to assist eligible participants install or implement structural and management practices on eligible agricultural land.

EQIP offers contracts with a minimum term that ends one year after the implementation of the last scheduled practices and a maximum term of ten years. These contracts provide incentive payments and cost-shares to implement conservation practices. Persons who are engaged in livestock or agricultural production on eligible land may participate in the EQIP program. EQIP activities are carried out according to an environmental quality incentives program plan of operations developed in conjunction with the producer that identifies the appropriate conservation practice or practices to address the resource concerns. The practices are subject to NRCS technical standards adapted for local conditions. The local conservation district approves the plan.

EQIP may cost-share up to 75 percent of the costs of certain conservation practices Incentive payments may be provided for up to three years to encourage producers to carry out management practices they may not otherwise use without the incentive. However, limited resource producers and beginning farmers and ranchers may be eligible for cost-shares up to 90 percent. Farmers and ranchers may elect to use a certified third-party provider for technical assistance. An individual or entity

may not receive, directly or indirectly, cost-share or incentive payments that, taken together, exceed $450,000 for all EQIP contracts entered during the term of the Farm Bill.

18.3.2 Wildlife Habitat Incentives Program - WHIP

This program is available for all landowners with less than $2 million income. The Wildlife Habitat Incentives Program (WHIP) is a voluntary program for people who want to develop and improve wildlife habitat primarily on private land. Through WHIP, USDA's Natural Resources Conservation Service provides both technical assistance and up to 75 percent cost-share assistance to establish and improve fish and wildlife habitat. WHIP agreements between NRCS and the participant generally last from five to 10 years from the date the agreement is signed.

WHIP has proven to be a highly effective and widely accepted program across the country. By targeting wildlife habitat projects on all lands and aquatic areas, WHIP provides assistance to conservation minded landowners who are unable to meet the specific eligibility requirements of other USDA conservation programs.

18.4 In-Lieu Fee Program

The in-lieu-fee program is a program run by the USACE to offset impacts to Waters of the United States, which are permitted under Section 404 of the CWA. In-lieu-fee mitigation occurs in circumstances where a permittee provides funds to an in-lieu-fee sponsor instead of either completing project-specific mitigation or purchasing credits from a mitigation bank approved under the Banking Guidance. Funds collected from the permittees under in-lieu-fee arrangements are used for replacing wetland and riparian functions and values and are not used to finance non-mitigation programs and priorities such as education projects or research. Currently no in-lieu-fee program agreements exist within the SCARP project area. To further research the in-lieu-fee program option or to develop an in-lieu-fee program, contact the USACE Los Angeles District office.

18.5 Mitigation Bank

Invasive weed removal can serve as compensatory mitigation for certain projects affecting aquatic resources and can be incorporated into the BMPs of many projects. The USACE, RWQCB, and CDFG can require permittees whose activities involve temporary or construction-related disturbance of aquatic areas to ensure that the disturbed areas are not invaded by arundo, tamarisk, or other weeds. This can help reduce proliferation of infestation, as often happens in recently disturbed areas. When on-site mitigation is not appropriate, the Corps can direct permittees to mitigate the impacts of their activities by removing invasive weeds in strategic areas of the watershed; thereby contributing to the overall control program. Wetland mitigation banks strive to establish large, contiguous wetland areas, which can be used to mitigate for a number of independent impacts. This allows eligible permittees to purchase compensatory mitigation credits from another entity that has already produced and banked them, thereby eliminating the need to produce compensatory mitigation areas on-site (ELI and IWR 1994). Mitigation banks advance effective regional habitat conservation by encouraging the bundling of mitigation "credits" at sites recognized to be high priorities for habitat protection and restoration in watersheds and ecosystems and provide a mechanism that assigns a monetary value to habitat, which in turn allows a landowner to obtain a financial return for conserving land rather than developing it. The USACE has been an active participant in the establishment a mitigation bank in the Santa Ana River, which is focused on invasive weed removal. The goal of the Santa Ana River Mitigation Bank (SARMB) is to reestablish native riparian ecological diversity and other riparian functions through the removal of invasive weeds. Currently, a mitigation bank has not been established for the Santa Clara River, although the SARMB may serve as a template for the development of one in the future.

19.0 Resources

The following list of resources provides further information and guidance to project applicants.

19.1 Local Agency and NGO Contacts

Large amounts of material already exist on the problems posed by arundo and tamarisk including the benefits of removal, and general approaches and techniques to successful removal. When combined with the detailed information contained in the SCARP document, ample information is available both to the public and to future project applicants. The primary points of contact for the public would be:

Ventura County Resource Conservation District
P.O. Box 147 (Mailing address)
3380 Somis Road (Street Address)
Somis, Ca 93066
(805) 386-4685

Antelope Valley Resource Conservation District
44811 N. Date Ave., Suite G
Lancaster, CA 93534
(661) 945-2604

Other agencies and organizations that can provide assistance are provided in Table 10.

Table 10: Agencies and Organizations Assistance

Agency or Group Name	Assistance Available	How to Contact
Los Angeles County Agricultural Commissioner	Regulates herbicide use. Provides information to obtain certification or licenses. Also provides Operator Identification Number and safety training for application of non-restricted materials.	(626)575-5471 12300 Lower Azusa Road Arcadia, CA 91006-5872 http://acwm.co.la.ca.us/
Southern California Air Quality Management District	May require permit for controlled burning or incineration of biomass. Advises days when burning can occur.	(909)396-2000 21865 Copley Dr Diamond Bar, CA 91765 http://www.aqmd.gov/
County or Local Water Districts	May require a permit to access properties.	(661)259-3610
California Conservation Corps (CCC) (Camarillo/Los Angeles/ Norwalk)	Eradication of invasive plants and restoration of native plants	(805)484-4345 1878 South Lewis Rd. Unit 60 Camarillo, CA 93010 http://www.ccc.ca.gov/
Los Angeles Conservation Corps	Eradication of invasive plants and restoration of native plants	(213)747-1872 P.O. Box 15868 Los Angeles, CA 90015 http://www.lacorps.org/
Concerned Resource Environmental Workers (CREW)	Eradication of invasive plants and restoration of native plants	(805)646-5085 P.O. Box 1532 Ojai, CA 93024 (No Website)
California Department of Fish and Game (San Diego)	Issues Streambed Alteration Agreements and consults for impacts to state listed species.	(916)445-0411 1416 Ninth Street Sacramento, California 95814 http://www.dfg.ca.gov/
California Invasive Plant Council	Provides information on non-native invasive plants in California.	(510)843-3902 1442-A Walnut St., #462 Berkeley, CA 94709 http://www.cal-ipc.org/

Agency or Group Name	Assistance Available	How to Contact
Los Angeles County or local Fire Department	Provides information for fire safety. May issue a burn permit.	(818)890-5783 12605 Osbourne St Pacoima, CA 91311 http://www.lacofd.org/
Natural Resource Conservation Service (Lancaster)	Provides information for erosion control, non-native plant removal, habitat restoration, and funding	(661)945-2604 44811 N. Date Avenue, Suite G, Lancaster, CA 93534 http://www.ca.nrcs.usda.gov
Antelope Valley and Ventura County Resource Conservation District	Provides information for non-native plant removal, habitat restoration, permitting, and funding	(805)386-4685 P.O. Box 147 Somis, CA 93066 http://www.vcrcd.org
Los Angeles County Public Works	Issues encroachment permits	(626)458-4300 900 South Fremont Avenue Alhambra, CA 91803 http://ladpw.org/wmd/
Team Arundo del Norte (Sonoma Ecology Center)	Provides information on eradication techniques, biology, grant information, regional eradication coordination	(707)996-0712 P.O. Box 1486 Eldridge CA 95431 http://www.sonomaecologycenter.org/
Arundo Task Force	Provides information on eradication techniques, biology, and grant information.	(805)386-4685 P.O. Box 147 Somis CA 93066 http://www.arundotaskforce.org
US Army Corps of Engineers (Los Angeles Region)	Issues Section 404 permit (for earthmoving or fill in stream)	213) 452-3908 P.O. Box 532711 Los Angeles CA 90053-2325 http://www.spl.usace.army.mil/
US Fish and Wildlife Service (San Diego)	Provides consultations for potential impacts to federal listed species and may have potential funding through Partners for Wildlife or Santa Clara River Trustee Council	1-800-344-WILD 2493 Portala Road, Suite B Ventura, CA 93003 http://www.fws.gov/
Regional Water Quality Control Board (Los Angeles)	Provides information on water quality issues and issues 401 Water Quality Certification (for earthmoving or fill in stream)	(213) 576-1364 P.O. Box 2815 Sacramento, CA 95812-2815 http://www.calepa.ca.gov/
US Bureau of Land Management	Potential funding through War on Weeds	(202) 452-5125 1849 C Street, Room 406-LS Washington, DC 20240 http://www.blm.gov/nhp/index.htm
City of Santa Clarita, Environmental Services Division	Provides information on City activities	(661)222-7222 23920 Valencia Boulevard, Ste. 300 Santa Clarita, California 91355 http://www.santa-clarita.com/
Los Angeles Weed Management Area	Provides information on weed management	(626)575-5471 12300 Lower Azusa Road Arcadia, CA 91006-5872 http://acwm.co.la.ca.us/

Agency or Group Name	Assistance Available	How to Contact
The Nature Conservancy	Provides information on eradication methods	(805)642-0345 3639 Harbor Boulevard, Suite 201 Ventura, CA 93001 http://www.tnccalifornia.org
California Native Plant Society (Ventura)	Provides information on California native plants	(916) 447-2677 2707 K Street, Suite 1 Sacramento, CA 95816-5113 http://www.cnps.org/
Society for Ecological Restoration (SER Cal)	Provides information on California native habitat restoration	2701 20th Street Bakersfield, CA 93301-3334 Tel. (661) 634-9228 http://www.sercal.org/
Chiquita Canyon Landfill	Closest landfill to the project area	3 miles west of Interstate 5 on State Route 126 in Santa Clarita Valley. http://www.chiquitacanyon.com

19.2 Books

The Nature Conservancy Handbook:

Weed Control Methods Handbook: Tools & Techniques for Use in Natural Areas

Cal IPC Handbook:

The Weedworker's Handbook: A Guide to Techniques for Removing Bay Area Invasive Plants

Team Arundo del Norte Handbooks:

Arundo: A Landowner Handbook

Controlling Arundo in Your Watershed: A Guide For Organizations

19.3 Web Resources

ARUNDO

NPS PCA	http://www.nps.gov/plants/alien/fact/ardo1.htm
SAWPA	http://www.sawpa.org/arundo/
SMSLRWMA - Arundo Biology	http://www.nps.gov/plants/alien/fact/ardo1.htm
Team Arundo del Norte	http://teamarundo.org/
TAdN Arundo Reference Library	http://teamarundo.org/research_reference/index.html#biblio
TNC - Arundo Stewardship Abstract	http://tncweeds.ucdavis.edu/esadocs/documnts/arundon.html
TNC - Arundo Images	http://tncweeds.ucdavis.edu/esadocs/arundona.html
USDA	http://plants.usda.gov/cgi_bin/plant_profile.cgi?symbol=ARDO4
USACE - Arundo Removal	http://www.wes.army.mil/el/pmis/plants/html/arundo_d.html

TAMARISK

CAIN NBII - Tamarisk	http://cain.nbii.gov/crisis/crisiscat/viewResource?resource=http://cain.nbii.gov%2Fcrisis%2Finvasive_terms%23Tamarix
Earlham College	http://www.earlham.edu/~biol/desert/invasive.htm
Invasive Species.gov - Saltcedar profile	http://www.invasivespecies.gov/profiles/saltcedar.shtml
Proceedings Saltcedar Workshop June 12, 1996	http://www.invasivespecies.gov/education/workshopJun96/index.html
NPS	http://www.nps.gov/plants/alien/fact/tama1.htm
TNC – Tamarisk Stewardship Abstract	http://tncweeds.ucdavis.edu/esadocs/tamaramo.html
USFS	http://www.fs.fed.us/database/feis/plants/tree/tamspp/all.html
WA NWCB	http://www.nwcb.wa.gov/weed_info/saltcedar.html
USACE	http://www.wes.army.mil/el/pmis/plants/html/tamarix_.html

INVASIVE PLANT ORGANIZATIONS

Cal IPC	http://www.cal-ipc.org/
California Weed Management Areas	http://www.cdfa.ca.gov/phpps/ipc/weedmgtareas/
L.A. County Weed Management Area	http://acwm.co.la.ca.us/scripts/wma_2.htm
Santa Barbara County Weed Management Area	http://www.countyofsb.org/agcomm/wma/
Santa Margarita & San Luis Rey Weed Mgmt	http://smslrwma.org/
Invasive Species Information Node (ISIN) of the NBII	http://invasivespecies.nbii.gov/
Noxious Weed Information Project	http://www.cdfa.ca.gov/phpps/ipc/noxweedinfo/noxweedinfo_hp.htm
Center for Invasive Plant Management	http://www.weedcenter.org/
NPS - Monitoring Invasives	http://science.nature.nps.gov/im/monitor/invasives.htm
USACE Aquatic Plant Control	http://www.wes.army.mil/el/aqua/
SFWI NIS Guidebook	http://www.sfei.org/nis/NISguidebook.pdf
TNC Weed Removal Handbook	http://tncweeds.ucdavis.edu/handbook.html
Global Invasive Species Specialists Groups	http://www.issg.org/

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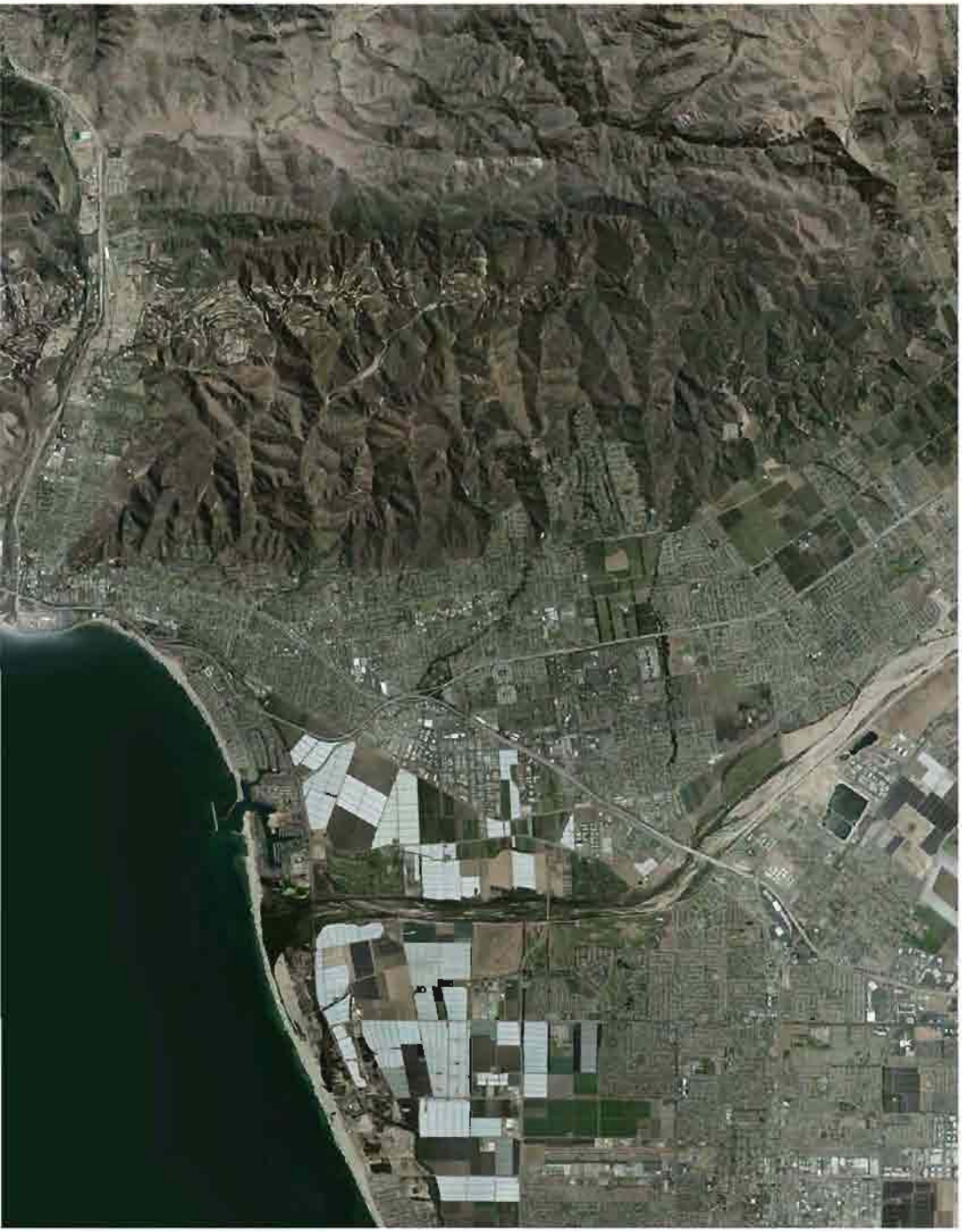
DRAFT
2013 Comprehensive Water Resources Report



Prepared for:

CITY OF VENTURA

Prepared by:

RBF Consulting,
a Company of Michael Baker Corporation

RBF CONSULTING
A Baker Company

2013 COMPREHENSIVE WATER RESOURCES REPORT

DRAFT Report

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February 2013

EXECUTIVE SUMMARY

Introduction

On July 26, 2010 Public Works conducted a workshop with City Council that included information on the City's current water supply issues. It was presented that with continued years of drought, tightening water restrictions and environmental responsibilities, Ventura's water supply was being impacted by several factors. These factors included and continue to include the following:

- The City's historical water rights to the Ventura River may be significantly limited as concern for the health of the endangered Southern California Steelhead and its habitat ecosystem restrict how much and at what time of the year this water source is available. Storm events over the past 15 years have restricted our ability to withdraw historical amounts from this source.
- City allocation from two groundwater basins, Oxnard Plain Basin and Santa Paula Basin, are increasingly regulated and monitored. Studies being conducted by the oversight agencies have indicated that potential overdraft and water quality issues may occur in the near future.
- The Mound Groundwater Basin has experienced water quality degradation and projections for reliable supply may be lower than originally anticipated.

A recommendation from the workshop was to provide a comprehensive evaluation of current and projected water supply needs.

In addition, as a part of this year's City Council Priority Projects, the Community Development (Planning) Department and Ventura Water have focused their time and energy on streamlining and documenting the development review process as it pertains to water and wastewater services. More specifically, we are working to:

- Ensure transparency and consistency to our customers,
- Create equity in assigning costs; and
- Protect the reliability of our water and wastewater infrastructure.

In order to provide a comprehensive evaluation of the City's current and projected water supply needs, Ventura Water has been engaged with the City's Planning Department to provide their input and expertise on what development has taken place since the 2005 General Plan, the pace of proposed development and what water demands those developments may require. This Report will review previously developed water demand projections, anticipated water supplies and planned development projects and compare

them to where the City is today for each of these three categories. City staff is collaboratively looking forward to help plan the City's water resources to accommodate future development in the most responsible manner for its customers.

Purpose

The main purpose of this report is twofold. The report will identify water demand and water supply conflicts in various reports and will evaluate how current and future anticipated water demands match current and future anticipated water supply. Ventura Water and Planning recognize the need to develop a process that tracks proposed development projects, consistently calculates the anticipated increase in water demand associated with each proposed development project, and the evaluates the impact on the current water supply. This Comprehensive Water Resources Report ("Report") is intended to be a tool in the development review process as it pertains to water supply and demand.

Water Supply

The City's potable water supply is derived from local groundwater basins, Lake Casitas and sub-surface water from the Ventura River. The City also has a 10,000 acre-foot per year allocation from the California State Water Project. To date the City has not received any of this water because there are no facilities to get the water to the City. There are presently five local water sources that provide water to the City water system:

- Casitas Municipal Water District (Casitas)
- Ventura River Foster Park Area (Foster Park)
    - Surface Water Intake
    - Upper Ventura River Groundwater Basin/Subsurface Intake and Wells
- Mound Groundwater Basin (Mound Basin)
- Oxnard Plain Groundwater Basin (Fox Canyon Aquifer)
- Santa Paula Groundwater Basin (Santa Paula Basin)

The City also provides recycled water from the Ventura Water Reclamation Facility (VWRF).

Estimated Water Demand

Based on the known supply conditions and the calculated water demand for the present condition, it appears that the current water demand exceeds the available supply. However, it is apparent that the "calculated" water demand for the current condition (22,754 AFY) is overly conservative. The current water demand figures calculated within this Report utilize a baseline water demand from 2005 of 20,808

AFY. Based on the FY 2011-2012 water consumption data, it is likely that the City's current water demands are closer to 17,300 AFY, below the current available supply of 19,600 AFY.

Utilizing development projections developed as a part of the 2005 General Plan, the anticipated growth in water demand through 2025 is 4,020 AFY, which results in a total projected water demand of 26,774 AFY, well above the predicted 24,200 AFY of supply (which is on the high end of the range). The future water demand projections utilize the water demand factors published in the 2005 General Plan FEIR. The demand factors are "planning-level" numbers, and therefore are on the conservative side. It is likely that the actual water demand factors are much lower than those used to project the future demands.

Figure ES-1 provides a graphical representation of the current water consumption, water demand projections and water supply range.

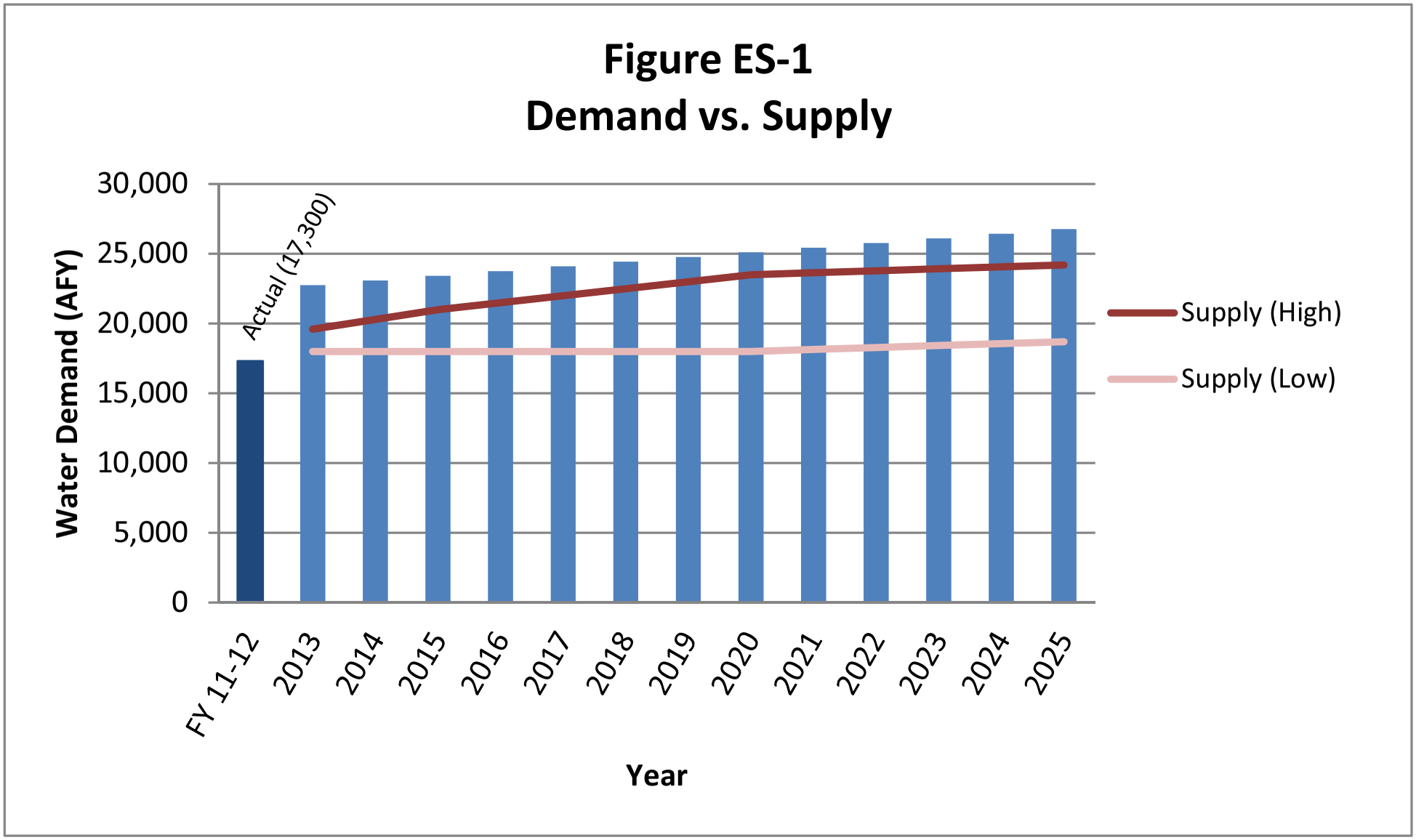
Figure ES-1
Demand vs. Supply
30,000
25,000
20,000
15,000
10,000
5,000
0
Water Demand (AFY)
Actual (17,300)
FY 11-12
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Year
Supply (High)
Supply (Low)

Recommendations

Moving forward, it is recommended that the City utilizes current consumption data to develop both the existing demand condition, and also develop more realistic demand factors for the various land uses within the City. In order to develop more realistic demand factors, the City will need to accurately define the existing land use conditions for the various land use categories within the City. In addition, the water consumption data will need to be attributed to the correct land use categories. This can be accomplished by mapping the water billing classifications with the General Plan land use categories, and perhaps developing a new set of water demand factor classifications. By utilizing current water consumption data, and current land use data, a more accurate set of water demand factors can be determined. The more accurate demand factors will allow for a more realistic projection of future water demands where the development plan has been identified.

Due to the wide range of demand and supply estimates in this initial analysis, it is clear that a thoughtful and multi-faceted approach to managing and planning for Ventura's water supply will be absolutely critical in the coming years to support economic growth and quality of life.

1. INTRODUCTION

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Over the past several years, the City has prepared various documents that address water demand and water supply. More specifically, there are three documents that have been used as a reference document for both historical figures and future projections. The three documents are:

- 2005 General Plan, 2005 General Plan FEIR and 2007 Supplement
- 2010 Urban Water Management Plan (amended in 2011)
- 2011 Water Master Plan

The following section provides the background on each report and includes a summary table to compare the reports information. Each report was completed at a different time and for a specific purpose therefore, the following section includes the following information on each report: the purpose of the report; the resources utilized for the report; the water demand factors utilized and the estimated water demands based on those factors in each report and the anticipated current and future water supply in each report.

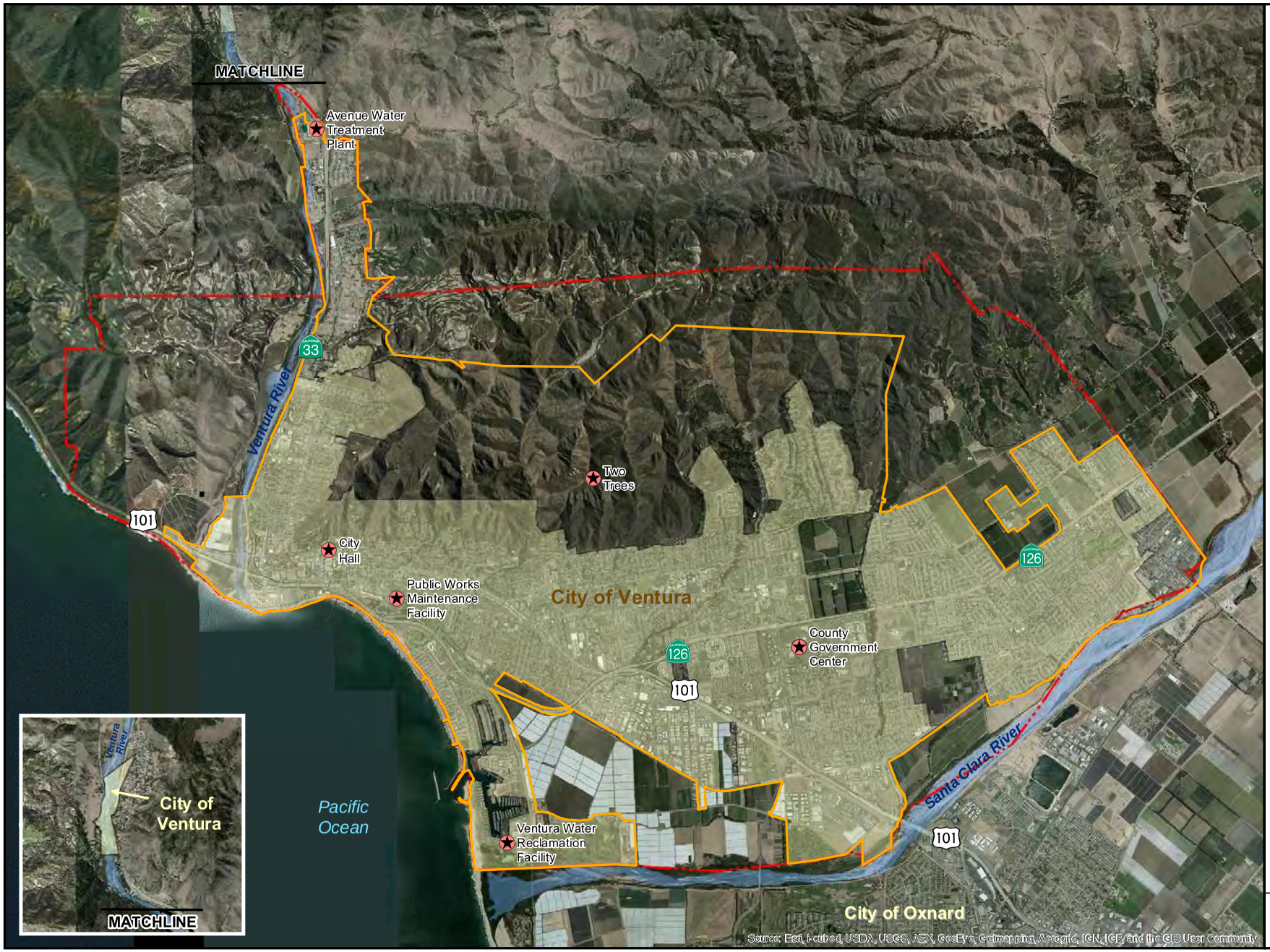
C. STUDY AREA

The City of San Buenaventura is located 62 miles north of Los Angeles and 30 miles south of Santa Barbara along the California coastline. The City is located within the County of Ventura, and bound by the City of Oxnard to the south, by unincorporated Ventura County to the east and north, and by the Pacific Ocean to the west. The northwest portion of the City is bound by the Ventura River, while the southern portion is bound by the Santa Clara River. The Ventura Freeway (101) bisects the City in the north-south direction, while the Santa Paula Freeway (126) runs east to west through the center of the City. The Ojai Freeway (33) runs along the northwestern edge of the City. The City currently occupies an estimated 21 square miles and has an estimated population of 109,000 persons. Exhibit 1-1 identifies the City of San Buenaventura boundary, the Sphere of Influence and General Plan boundary.

Ventura Water provides potable water service to a population of approximately 113,500 persons and has approximately 32,000 service connections. The City's existing water service area includes all portions within the City limits, as well as portions of unincorporated Ventura County that meet the City's policy for water connections outside City limits (Municipal Code Section 22.110.055).

Ventura Water also operates the Saticoy Country Club (SCC) water system, which consists of residences and country club facilities that are located east of the City. They have their own stand-alone system, which includes two groundwater wells, a booster pump station and two storage tanks. The ownership responsibility for the system is shared between the City and SCC (1/3 and 2/3, respectively). The SCC system has a separate Domestic Water Supply Permit from the California Department of Public Health.

On January 16, 2013, the Ventura County Local Agency Formation Commission (LAFCo) adopted resolution LAFCo 13-01S, which updated the City of Ventura Sphere of Influence (see Appendix). The Sphere of Influence (SOI) included in this Report depicts the updated SOI.



CITY OF VENTURA

City Overview

Legend

- Location Sites
- Ventura City Limit
- General Plan Boundary
- City Sphere of Influence

0 0.5 1
Miles

Source: Eagle Aerial, 2010

RBF CONSULTING

Exhibit 1-1

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D. DOCUMENT COMPARISON

1. 2005 General Plan, General Plan FEIR and 2007 Supplement

State law requires each California city to adopt a comprehensive, long-term General Plan for the physical development of the community that guides local decision-making by expressing community goals about the future distribution and character of land uses and activities. The General Plan serves as a long-term guide, establishing policies for day-to-day land use decisions over a 20-year planning horizon. The General Plan is a policy document that sets over-arching goals for the future development of the City and specifies policies and actions to achieve these over-arching goals.

The 2005 General Plan Final Environmental Impact Report (FEIR) provides an analysis of the potential environmental impacts associated with the potential development identified in the General Plan.

The City prepared a supplement to the FEIR in 2007 to address the impact of an additional 329,000 square feet of non-residential development in the Ventura Harbor area.

<u>Land Use</u>

Chapter 3 of the City's 2005 General Plan defines the City's plan for growth over the 20-year planning horizon (through 2025). Specifically, Table 3-2 of the General Plan provides the estimated amount of development that could reasonably be expected to occur within the City and the Sphere of Influence by 2025, and together with Figure 3-1 provides a picture of where such change might occur. The 2007 FEIR Supplement included an additional potential of 329,000 square feet of non-residential development in the 20-year planning horizon.

<u>Water Supply</u>

Chapter 4.13 of the 2005 General Plan FEIR addresses the impacts of the General Plan on the public utilities, which includes the water system. Table 4.13-7 summarizes the City's historic and projected water supply. The source used in preparation of Table 4.13-7 is the City's 2004 Biennial Water Supply Report, which provides projections for the

City's future water supply and demand based on current information at the time (thru 2003).

Water Consumption (Demands)

Table 4.13-8 summarizes the City's historical and projected water consumption. The source used in preparation of Table 4.13-8 is the City's 2004 Biennial Water Supply Report. Projected demands are based on the post-mandatory water conservation demand factor of 0.179 AFY/capita, the 2000 U.S. Census and the City growth rate of 0.9%. However, the table only projects out to Year 2020. In order to identify the water demand projections for Year 2025, you must utilize the projected water demands developed in Table 4.13-15 (5,806 AFY) in conjunction with the calculated demand increase (115 AFY) identified in the 2007 FEIR Supplement. The demand projections in Table 4.13-15 are based on a set of water demand factors to be discussed later in this Section.

2. 2010 Urban Water Management Plan

An Urban Water Management Plan (UWMP) is a long-term planning tool that provides water purveyors and their customers a broad perspective on water supply issues. The UWMP is a management tool, providing the framework for action, but not functioning as a detailed project development plan. Preparation of the UWMP is a requirement of the California Urban Water Management Planning Act. UWMP's must be prepared every five years. The primary goals of the UWMP are to: 1) plan the water supply over a 20-year period, 2) identify and quantify water supply for future demands in normal, single-dry and multiple-dry year conditions, and 3) implement conservation and efficient water use practices in urban settings.

Land Use

The UWMP does not evaluate land use. The UWMP projects water demands based on population projections. The population projections are based on historical data provided by the California Department of Finance (2000 Benchmark). Future projections are based on the 0.88 percent annual growth rate as identified in the City's 2005 General Plan, and are shown in Table 2-1 of the 2010 UWMP.

Water Supply

Table 3-1 in the 2010 UWMP provides a summary of the existing and projected water supply. The water supply data are based on historical production data and estimates of current water supply sources available and operational constraints.

Water Consumption (Demands)

Table 2-5 in the 2010 UWMP provides a summary of the past, current and projected water demands. The 2005 and 2010 water demand data are the actual metered demands based on billing records. The water demand projections are based on the per capita water demand factor of 168 gallons per capita day, multiplied by the population growth projections identified in Table 2-1 of the UWMP.

3. 2011 Water Master Plan

A Water Master Plan (WMP) is a document that is typically prepared every 5-10 years. They are not mandated by state law, but most water purveyors prepare a WMP to document the plan for improvement or expansion of the existing water distribution system. The master plan provides a comprehensive evaluation of the water system infrastructure to determine the systems' capacity to meet the current and future water demand, and evaluates the operational efficiency of the system. The primary focus of a master plan is to evaluate the capacity of the system facilities (pipelines, pump stations, reservoirs, wells, etc.) to provide a safe and reliable water supply to the customers at minimum specified criteria. The criteria will include system pressure, pipe velocity, fire flow availability, reservoir storage, pump capacity, etc., which are based on guidelines provided by the American Water Works Association (AWWA), Environmental Protection Agency (EPA), and California Department of Public Health (DPH). The primary goal of a WMP is to develop a capital improvement program that identifies specific projects, costs and priorities for system improvements.

Land Use

The 2011 Water Master Plan utilized the land use data provided in Table 3-1 of the 2005 General Plan to establish the existing land use condition. The future "near-term" land use conditions were based on the City's 2006 Pending Project list. The ultimate land use condition was based on the remaining vacant land as identified in the 2005 General Plan,

less the proposed projects listed on the 2006 Pending Project list. The figures are summarized in Tables II-1 thru II-4 in the 2011 Water Master Plan.

Water Supply

The summary of the current (2010) water supplies are identified in Table V-14. The current water supply is shown as a historical supply projection range from 18,760 – 25,800 AFY.

Water Consumption (Demands)

The existing water demands identified in the 2011 Water Master Plan are based on actual billing records taken from a two-year period from January 2004 through December 2005. The actual billing records, coupled with the existing land use identified in the 2005 General Plan were used to develop "actual" water demand factors. The actual demand factors were increased by approximately 10% to account for water loss. The demand factors were applied to the 2006 Pending Project list and then to the remaining vacant land to calculate the future water demands.

The water supply and water demand figures provided within each document are summarized on Table 1-1. The table includes the source of the data used to develop the figures presented within each document, and the various factors and methods used to come up with the projections. As you will note, the water supply projections in the 2005 General Plan documents are the most optimistic and the water demand projections in the 2005 General Plan documents are the most conservative. This is likely due to the fact that these projections were made based on actual data available through Year 2003, and obviously could not factor in the economic conditions of later in the decade, nor the drought and water supply limitations of the same time frame.

It is prudent to point out that comparing the demand and supply projections within each of these three documents is not an "apples to apples" comparison, as each document was prepared at a different time using actual data from different time periods, incorporating current information regarding water supply sources at that specific time, using different methodologies (land use based vs. population based) to calculate future projections, using different demand factors and making different assumptions.

E. DEMAND FACTOR COMPARISON (from previous documents)

Demand factors are used to calculate the future water demand projections. Demand factors are either land use based (per area (acre/ksf) or per dwelling unit) or population based (per capita). Demand factors are typically derived from actual water consumption data, and a safety factor is applied for planning purposes. Demand factors were used in each of the three documents described above to arrive at the future demand projections presented within each report. As briefly described above and shown in Table 1-1, the demand factors and methodologies used within each document vary. Since each document uses different methodologies and demand factors, an “apples to apples” comparison is difficult. Table 1-2 lists the demand factors used within each report. In an attempt to show an “apples to apples” comparison, the residential demand factors have been converted to similar units and are shown on Table 1-3.

The Appendix includes water usage factors from other local agencies with similar characteristics – population, climate and water supply sources. These include Simi Valley, Thousand Oaks, Irvine Ranch Water District and Santa Margarita Water District.

Table 1-1
Summary of Previous Documents

Total Water Supply (AFY)							
Document	**2000**	**2005**	**2010**	**2015**	**2020**	**2025**	**Data Source & Factors**
2005 General Plan, GP FEIR and 2007 Supplement	*21,566* [1]	26,300	28,262	28,262	28,262	28,262	Table 1 of the 2004 Biennial Water Supply Report - Based on actual water production data thru 2003 - Future projections based on assumptions and limitations for each supply source known at the time (2004) - [1] Figure includes 1,129 AFY for raw water and oil operation use - Figures do not include recycled water
2010 Urban Water Management Plan	n/a	n/a	20,600	22,000	24,600	24,700	Table 3-2 of the 2010 UWMP - Water production data for 2010 is based on annual average data from 2000 - 2009 as presented in Table V-14 of the 2011 WMP - Future projections based on assumptions and limitations for each supply source known at the time (2011) - Figures do not include raw water and oil operation use - Figures include 700 AFY of recycled water annually
2011 Water Master Plan	n/a	n/a	n/a	n/a	n/a	25,800	Tables V-1, V-2, V-7, V-10, V-13 and V-14 of 2011 WMP - Based on actual water production data thru 2009 - Future projections based on assumptions and limitations for each supply source known at the time (2011) - Figures do not include raw water and oil operation use - Figures do not include recycled water

Total Water Demand / Consumption (AFY)							
Document	**2000**	**2005**	**2010**	**2015**	**2020**	**2025**	**Data Source & Factors**
2005 General Plan, GP FEIR and 2007 Supplement	*20,437*	20,594	21,724	22,918	24,181	27,421 [2]	Tables 2, 3 and 4 of the 2004 Biennial Water Supply Report - Based on actual water consumption data thru 2003 - Historical population based on 2000 U.S. Census - Growth rate in City = 0.9%, outside City = 0.6% - Water Use Factor = 0.179 AFY/capita - [2] Year 2025 projections based on demand factors provided for FEIR
2010 Urban Water Management Plan	n/a	*20,808*	*17,351*	22,286	23,256	24,270	Table 2-5 of the 2010 UWMP - Based on actual water consumtion data through 2010 - Historical population based on California Department of Finance Table E-4 Population Estimates for Cities, Counties and the State (2000 Benchmark) - Growth rate in City = 0.88%, outside City = 0.1258% in connections - Water Use Factor = 168 gpcd = 0.188 AFY/capita
2011 Water Master Plan	n/a	*16,190*	17,896	n/a	n/a	22,708	Table IV-5 and Figure IV-2 of the 2011 WMP - Based on actual billing records from 2004-2005. - Near-term projections (allocated to 2010) based on actual billing data from 2004-2005, calculated demand factors from the same period applied to the 2006 Pending Projects list. - Long-term projections (allocated to Year 2025) based on applying the calculated demand factors to the remaining developable land as identified in the 2005 GP, excluding the land accounted for in the 2006 Pending Projects list.

Table 1-2
Summary of Water Demand Factors in Previous Documents

General Plan FEIR, August 2005

Land Use Description	Density (DU/Acre)	Demand Factor [1]	Unit
Residential	n/a	450	gpd/du
Retail	-	250	gpd/ksf
Office	-	250	gpd/ksf
Industrial	-	315	gpd/ksf
Hotel	-	500	gpd/ksf

[1] Provided in email corrspondence from Chandra Chandrashaker, City CD, (January 8, 2013). Only used to calculate the year 2025 projections.

Note: Future projections through year 2020 based on population data and 0.179 AFY/capita factor

2010 Urban Water Management Plan

Land Use Description	Density (DU/Acre)	Demand Factor [1]	Unit
Single-Family	n/a	0.33	AFY/Acct
Multi-Family	n/a	1.71	AFY/Acct
Commercial	-	1.69	AFY/Acct
Industrial	-	10.87	AFY/Acct
Institutional/Governmental	-	2.80	AFY/Acct
Landscape	-	4.86	AFY/Acct
Petroleum Recovery	-	465	AFY/Acct
Other	-	0.83	AFY/Acct

[1] Adapted from 2005 data in Tables 2-5 and 2-6 of the 2010 UWMP.

Note: Future projections based on population data and 168 gpcd factor = 0.188 AFY/capita

Water Master Plan, March 2011

Land Use Description [1]	Density (DU/Acre) [1]	Demand Factor [2]	Unit
Neighborhood Low (NL)	0-8	1.20	gpm/acre
Neighborhood Medium (NM)	9-20	2.00	gpm/acre
Neighborhood High (NH)	21-54	5.00	gpm/acre
Commerce (C)	-	1.60	gpm/acre
Industry (I)	-	1.60	gpm/acre
Public and Institutional (PI)	-	0.75	gpm/acre
Parks and Open Space (POS)	-	0.10	gpm/acre
Downtown Specific Plan	21-54	2.55	gpm/acre

[1] Source: 2005 General Plan

[2] Per Table III-1 of WMP. Factors are calculted based on 2004-2005 billing data, and 2005 General Plan land use data.

Table 1-3
Comparison of Residential Water Demand Factors in Previous Documents

Comparison of Residential Demand Factors					
2005 General Plan FEIR		**2010 UWMP [2]**		**2011 Water Master Plan [1]**	
Residential	450 gpd/du	Single-Family	293 gpd/du	Low (NL)	432 gpd/du
				Medium (NM)	199 gpd/du
		Multi-Family	1530 gpd/du	High (NH)	192 gpd/du

[1] Assumes the average density (du/acre)
[2] Assumes 1 account = 1 du

F. CURRENT PLANNING DATA

The Community Development Department maintains a database of all projects that are in the planning, design or construction phase. These projects are known as the "Pending Projects." The pending projects database is updated constantly as new projects are proposed or existing projects are modified.

Table 3-2 in the 2005 General Plan predicted the anticipated development intensity and pattern throughout the City through 2025. The Community Development Department provided actual development data for the period from 2005 – 2012. This Report will take into account the actual development data provided by the City for years 2005-2012 to determine the current land use condition. This Report will utilize the date provided in Table 3-2 of the 2005 General Plan, less the actual development data from 2005-2012 to determine the remaining developable land through year 2025.

G. 2012 LAFCo Municipal Service Review

It should be noted that in 2012, the Ventura Local Agency Formation Commission (LAFCo) completed the Municipal Service Review for nine Ventura County cities, including the City of San Buenaventura. LAFCos exist for each county in California. LAFCos are responsible for achieving three primary objectives: encouraging the orderly formation and expansion of local government agencies; preserving agricultural land and open space resources; and discouraging urban sprawl. To accomplish these objectives, LAFCos are responsible for coordinating logical and timely changes in local government boundaries, conducting special studies that review ways to reorganize and streamline government structure and preparing a sphere of influence for each city and special district over which they have authority.

LAFCos are required to review, and as necessary, update the sphere of influence for each city or special district every five years. Prior to updating a sphere of influence, LAFCo is required to conduct a Municipal Service Review (MSR). MSRs consist of written determinations relating to seven different factors, one of which is the "present and planned capacity of public facilities, adequacy of public services, and infrastructure needs or deficiencies related to … municipal and industrial water… within or contiguous to the sphere of influence."

The MSR for the City of San Buenaventura (City) was accepted by the LAFCo Board on November 14, 2012. LAFCos findings regarding the potable water system concluded the City's current potable water demand is 88 percent of the supply, with approved development projects it increases to 94 percent of the supply, with proposed development projects it increases to 96 percent of the supply, and in drought conditions the normal water demand exceeds supply.

A copy of the MSR for the City is included as an Appendix.

H. REFERENCE DOCUMENTS

The following documents were used as reference for the preparation of this Comprehensive Water Resources Report. Specific excerpts and data sources from these documents used in the preparation of this Report are included in the Appendix.

2004 Biennial Water Supply Report

2005 Ventura General Plan (August 2005), City of San Buenaventura.

2005 Ventura General Plan Final EIR, Volumes I and II (August 2005), City of San Buenaventura.

2007 General Plan FEIR Supplement

2010 Urban Water Management Plan (June 2011), Kennedy/Jenks Consultants.

Water Master Plan (March 2011), RBF Consulting.

Municipal Service Reviews for Nine Ventura County Cities (November 14, 2012), Ventura Local Agency Formation Commission (LAFCo).

2. LAND USE

A. EXISTING LAND USE

In order to determine the existing land use make-up within the City's water service area as of year-end 2012, existing land use data from the 2005 General Plan was used in conjunction with the "Development Entitlement Report 2005-2012" as provided by the City Planning Department (see Appendix). It should be noted that the "Development Entitlement Report 2005-2012" includes a listing of all development areas that have been constructed, are currently under construction, or are approved for construction. Since a breakdown of the construction status for the development areas listed in the table are not available at this time, then all of the development area listed is assumed to be "existing" as of the end of year 2012 for the purposes of this Report.

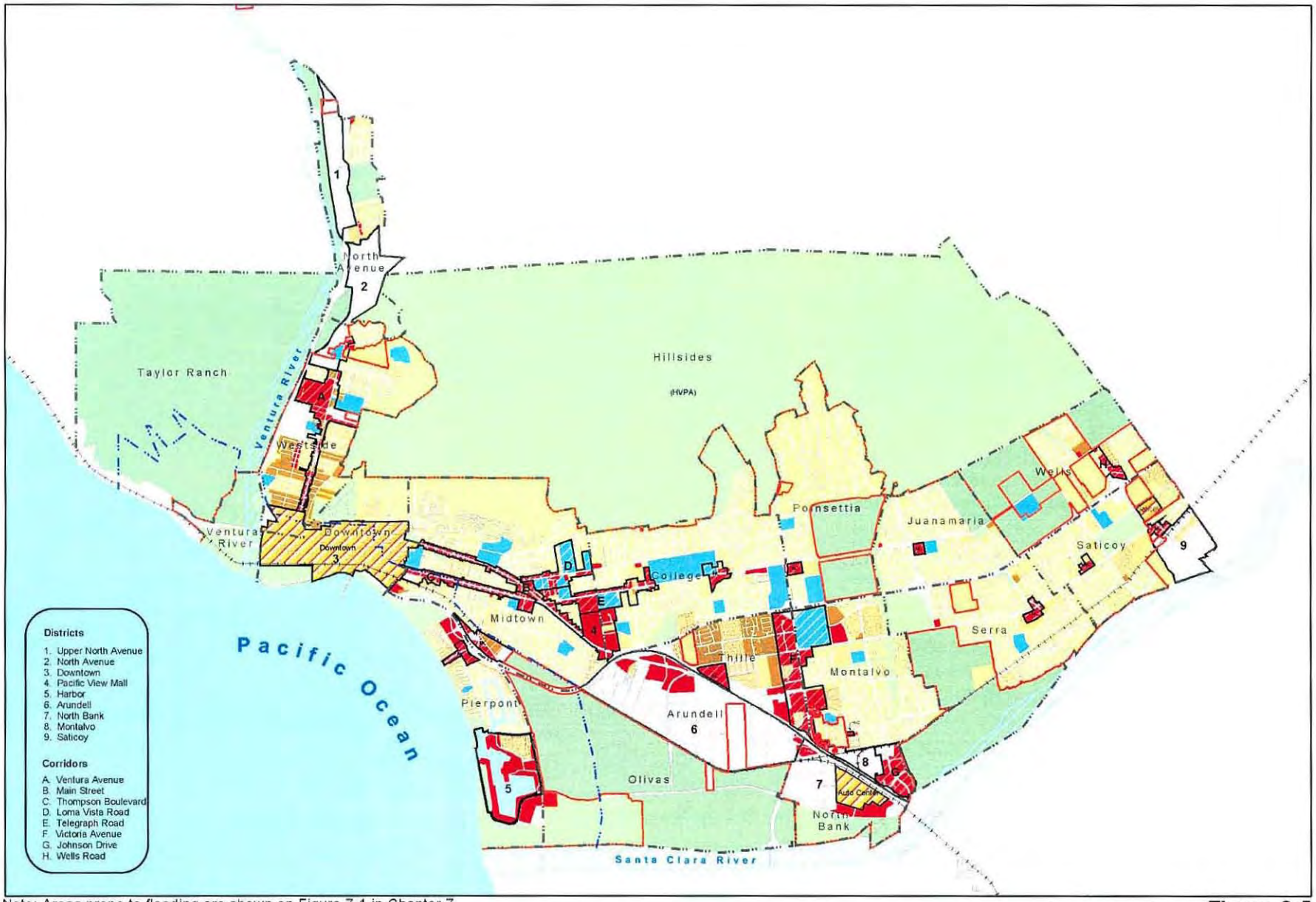
Table 3-1 of the 2005 General Plan (see Appendix) identifies the existing land uses (as of year-end 2004) in dwelling-unit count and square-footage, and the additional potential development area within the General Plan boundary. Table 2-1 herein provides a summary of the existing development as of year-end 2004 and the potential future development within the General Plan land use categories. Exhibit 2-1 (a copy of Figure 3-5 from the General Plan) depicts the land use designations throughout the City as identified in the 2005 General Plan.

Table 2-2 summarizes the existing development identified in the 2005 General Plan into Residential and Non-residential categories. The development information for years 2005-2012 provided by the City was added to the existing land use information from the 2005 General Plan to determine a snap-shot of the current land use condition for year-end 2012.

Table 2-1
Existing Land Uses per 2005 General Plan [1]

Planning Designation	Allowed Density (du/acre)	Existing Development as of 2004		
		Single Family (units)	Multi Family (units)	Comm/Ind (sf)
Neighborhood Low	0-8	19,425	3,335	49,386
Neighborhood Medium	9-20	1,163	8,965	149,513
Neighborhood High	21-54	814	2,468	194,143
Commerce		257	490	4,995,248
Industry		29	31	8,299,840
Public and Institutional		4	0	54,422
Park and Open Space		6	0	15,491
Agriculture		4	0	19,550
Downtown Specific Plan	21-54	332	1,543	1,795,401
Harbor District		0	310	350,160
Total		**22,034**	**17,142**	**15,923,154**

[1] Source: Table 3-1 of 2005 Ventura General Plan



Note: Areas prone to flooding are shown on Figure 7-1 in Chapter 7.

Figure 3-5

GENERAL PLAN DIAGRAM

Neighborhood
- Low (up to 8 du/ac)
- Medium (9-20 du/ac)
- High (21-54 du/ac)

- Commerce
- Industry
- Public and Institutional

- Agriculture
- Parks and Open Space
- Specific Plan Area

- Corridors, Neighborhood Centers (NC)
- Districts

- City Limits
- Planning Communities
- California Coastal Zone Boundary

This map is a product of the City of San Buenaventura, California. Although reasonable efforts have been made to ensure the accuracy of this map, the City of San Buenaventura cannot guarantee its accuracy.

Exhibit 2-1

Table 2-2
Summary of Existing Land Use

	Residential Development (units)	Non-Residential (sf)
Existing (as of 2005 General Plan) [1]	39,176	15,923,154
Constructed (2005 thru 2012) [2]	3,035	1,280,823
Total Existing Land Use (through 2012)	**42,211**	**17,203,977**

[1] Source: Table 3-1 of 2005 General Plan.
[2] Source: Attachment D: Development Entitlement Report (2005-2012) (Approved, Under Construction and Built Projects), provided by City 02/26/2013.

B. FUTURE LAND USE

Table 3-2 of the 2005 General Plan (see Appendix) identifies the predicted development intensity and pattern that was anticipated to occur within the General Plan boundary through the planning horizon of year 2025. As mentioned previously, the City provided information as to the development areas that have been constructed, are currently under construction, or are approved for construction since the 2005 General Plan through the end of year 2012. Table 2-3 provides a summary of the 2005 General Plan predicted development, a summary of the 2005-2012 development report, and calculates the remaining developable land through the 2025 planning horizon. It should be noted that in each of the referenced tables, the residential unit count is not divided up by the density.

Table 2-3
Summary of Predicted Development, Actual Development and Remaining Development

	Residential Development (units)	Non-Residential				
		Retail (sf)	Office (sf)	Industrial (sf)	Hotel (sf)	Total (sf)
2005 General Plan Prediction [1]	8,318	1,241,377	1,213,214	2,235,133	530,000	5,219,724
Actual Development (through 2012) [2]	3,035	258,974	485,733	449,116	87,000	1,280,823
Remaining Developable Land (through 2025)	**5,283**	**982,403**	**727,481**	**1,786,017**	**443,000**	**3,938,901**

[1] Source: Table 3-2 of 2005 General Plan.

[2] Source: Attachment D: Development Entitlement Report (2005-2012) (Approved, Under Construction and Built Projects), provided by City 02/26/2013.

3. WATER DEMANDS

A. Existing Demand Condition

Typically, the existing demand condition can be determined by evaluating the most recent historical water consumption records maintained by the City. Water consumption data is available through FY 2011-2012, however, as discussed in Section 2, the land use data is not currently available to directly correlate the FY 2011-2012 water demand data with the occupied land use at that time. For that reason, it makes it more difficult to project the future demands. Therefore, in order to determine the existing water demand condition, and also to project the future demand conditions, this Report will utilize water consumption data from water demands with data for the year 2005, which can be directly correlated to the land use data at that time. The "existing" water demand will be projected based on the 2005 consumption and land use data, the current land use condition as described in Section 2, and water demand factors identified in the 2005 General Plan FEIR (see Appendix).

The City's water production to meet the annual metered consumption of its customers in 2005 was approximately 20,808 AFY, per the 2010 UWMP. In comparison, the FY 2011-2012 water consumption was approximately 17,300 AFY. Utilizing the development data provided by the City for 2005-2012, and applying the water demand factor for each land use as identified in the 2005 General Plan FEIR, the estimated current water demand in the City water service area is 22,754 AFY (see Table 3-1).

B. Future Demand Projection (through 2025)

The 2005 General Plan FEIR water demand factors were then applied to the remaining developable area, per Table 2-3, to calculate the anticipated water demand increase. Per Table 3-2, the water demand is projected to increase by 4,020 AFY, resulting in an estimated future water demand in the City water service area of 26,774 AFY in 2025.

Table 3-1
Current Water Demand Projection

	Usage Factor [1]	Quantity [2]	Estimated Average Annual Water Demand	
2005 Water Demand [3]				20,808 AFY
Water Demand Projections (2005-2012)				
Residential	450 gpd/du	3,035 du	1,365,750 gpd	1,530 AFY
Retail	250 gpd/ksf	259 ksf	64,744 gpd	73 AFY
Office	250 gpd/ksf	486 ksf	121,433 gpd	136 AFY
Industrial	315 gpd/ksf	449 ksf	141,472 gpd	158 AFY
Hotel	500 gpd/ksf	87 ksf	43,500 gpd	49 AFY
Total Current Water Demand				***22,754 AFY***

[1] Per Table 1-2 "General Plan FEIR" water demand factors.

[2] Per Table 2-3.

[3] Per Table 2-5 of 2010 UWMP.

Table 3-2
Future Water Demand Projection (through 2025)

	Usage Factor [1]	Quantity [2]	Estimated Average Annual Water Demand	
Current Water Demand [3]				22,754 AFY
Future Water Demand Projections (thru 2025)				
Residential	450 gpd/du	5,283 du	2,377,350 gpd	2,663 AFY
Retail	250 gpd/ksf	982 ksf	245,601 gpd	275 AFY
Office	250 gpd/ksf	727 ksf	181,870 gpd	204 AFY
Industrial	315 gpd/ksf	1,786 ksf	562,595 gpd	630 AFY
Hotel	500 gpd/ksf	443 ksf	221,500 gpd	248 AFY
Total Future Demand Projection				***26,774 AFY***

[1] Per Table 1-2 "General Plan FEIR" water demand factors.

[2] Per Table 2-3.

[3] Per Table 3-1.

4. WATER SUPPLY

A. INTRODUCTION

The City's potable water supply is derived from local groundwater basins, Lake Casitas and sub-surface water from the Ventura River. The City also has a 10,000 acre-foot per year allocation from the California State Water Project. To date the City has not received any of this water because there are no facilities to get the water to the City. There are presently five local water sources that provide water to the City water system:

- Casitas Municipal Water District (Casitas)
- Ventura River Foster Park Area (Foster Park)
    - Surface Water Intake
    - Upper Ventura River Groundwater Basin/Subsurface Intake and Wells
- Mound Groundwater Basin (Mound Basin)
- Oxnard Plain Groundwater Basin (Fox Canyon Aquifer)
- Santa Paula Groundwater Basin (Santa Paula Basin)

The City also provides recycled water from the Ventura Water Reclamation Facility (VWRF). The six current water supply sources are presented in the following section. Please refer to Exhibit 4-1 for the locations and boundaries of the City's current supply sources.

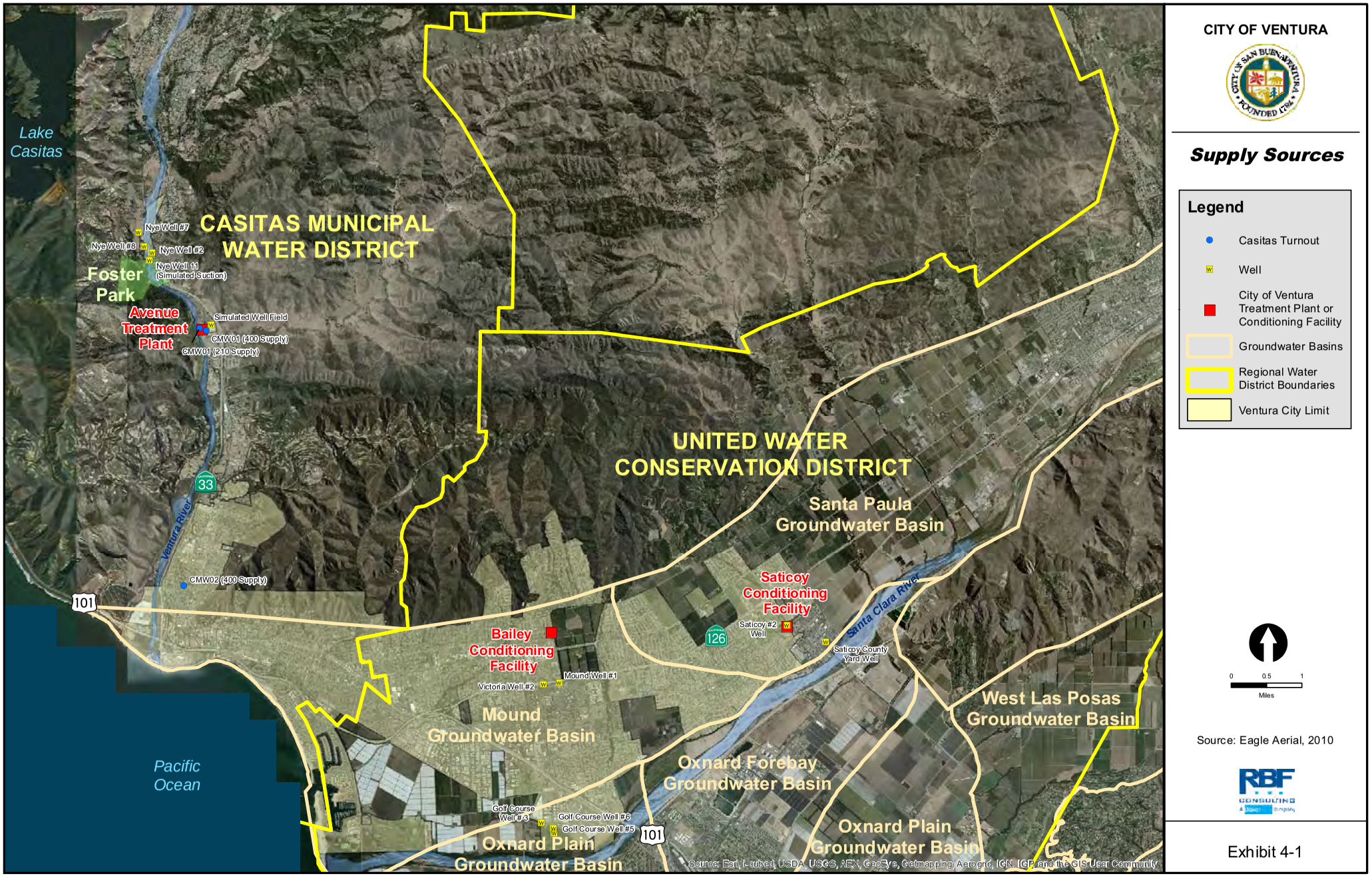


Exhibit 4-1

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B. CURRENT WATER SUPPLY SOURCES

1. Casitas Municipal Water District (Casitas)

The City purchases treated water from Casitas Municipal Water District to provide water supply to a portion of the City. In the western portion of the City approximately 30 percent of the City's water accounts are located within the Casitas service area. Storm water runoff from local watersheds is stored in Lake Casitas, located approximately 10 miles northwest of the City, then treated and delivered to customers by Casitas. Casitas supplies potable water to agricultural, domestic, municipal, and industrial users within its service area. The Casitas service area includes the Ojai Valley, the western part of the City, and the coastal area between the City and Santa Barbara County. Use of Casitas water is restricted to areas within its boundaries.

The "'safe yield" of Lake Casitas is defined to be the amount of water that can be removed from the lake each year without excessive risk that the lake will become dry. The safe yield of Lake Casitas is currently estimated to be 21,920 acre-feet per year (AFY), based on the critical historical dry period from 1944 to 1965. Studies by Casitas' engineering department have shown that this period represents the most critical dry spell for the lake's watershed of all the years which historical data is available.

To maintain the future operation of Lake Casitas at safe yield, Casitas established an allocation program for its customers in 1992. The City's allocation can be as high as the in-District demand for Stage I (wet or average year or 8,000 AFY), or reduced to 7,090 AFY for Stage 2 (dry conditions). This amount is incrementally reduced during Stages 3 and 4 dry weather conditions and results in 4,960 AFY for Stage 5 (extremely dry conditions). Stage 2 is initiated when Lake Casitas storage drops below 95,000 AF and Stage 5 is initiated when levels drop below 65,000 AF. The lower allocation remains in effect until the storage is recovered to 90,000 AF. A possible future impact to the multistage allocation system may be the operation of the fish ladder at the Robles Diversion. Casitas is currently reviewing its allocation program and this may limit the amount of water available to the City.

In July 1995, the City signed the present operating agreement with Casitas establishing the City's minimum annual purchase at 6,000 AFY, which is subject to the allocation program described above during drought periods. However, due to recent demand reductions within the Casitas boundary City customers are currently using approximately 5,000 AFY. The City is presently renegotiating the water supply agreement with Casitas. While additional supply (up to 8,000

AFY) may be available to the City in future years, the present annual supply used within the Casitas district boundary of the City service system is approximately 5,000 AFY. Therefore the City's current reliable water supply from Casitas is 5,000 AFY.

2. Ventura River Surface Water Intake and Upper Ventura River Groundwater Basin/Subsurface Intake and Wells (Foster Park)

Surface water from the Ventura River is collected via surface diversion, subsurface collector, and shallow wells and delivered to the Avenue Treatment Plant through the City's Foster Park facilities. Production from this source is a function of several factors including diversion capacity, local hydrology, environmental impacts, and the storage capacity of the Ventura River alluvium and upstream diversions.

The Ventura River water source is dependent upon local hydrology. Currently, the surface intake structure at Foster Park is unused due to the natural channeling of the active river channel bypassing the structure. Each year the flows can change the position of the active river channel in relation to the intake structure. According to a model of the Ventura River developed in 1984 and modified in 1992, the Upper Ventura River Basin fills after one or more years of above average rainfall. Once full, it takes three successive years of drought, with below average rainfall to deplete the river basin subsurface storage and cause river water production to drop until the drought ends. More recent ongoing studies are looking at the interaction between groundwater diversion and surface water flow in the Foster Park reach.

The Foster Park facilities produce groundwater throughout the year. However, due to storm flows, the wells are subject to inundation and erosion. The early 2005 winter storms destroyed Nye Well 1A and damaged Nye Wells 2, 7 and 8. The pipeline between Nye Wells 7 and 8 along the west bank of the river and the pipeline that crosses the river from Nye Well 8 to the intake pipeline for the Avenue Treatment Plant were also damaged during the storms. Nye Wells 7 and 8 were repaired in late 2006, the pipeline across the river was repaired in late 2007 and the pipeline repair between Nye Wells 7 & 8 was completed in early 2009. To date, Nye Well 2 has not been repaired.

With input from resource agencies and consultants in 2008, the City began conducting studies of the Ventura River flow conditions and is presently operating the Foster Park facilities in an environmentally responsible manner. Presently the City operations staff has voluntarily adopted a

well production schedule that limits its pumping based on annual rainfall conditions. The City intends to work with experts to ascertain a pumping regime that will balance production demands with environmental concerns and is presently studying the relationship between groundwater production and surface flows.

Estimations of approximately 6,000 AFY on average is available based on this operational scenario and is comparable to the 50-year average historical City production records between 1960 and 2009. However, current operational constraints allow a diversion efficiency of up to 70 percent (average 4,200 AFY) to be obtained under the City's operations schedule, which can be considered reliable for planning purposes and is roughly equal to the annual average for the last 10 years. Therefore the City's current reliable water supply from the Ventura River / Foster Park is 4,200 AFY. This supply number may further be drastically reduced by proposed regulatory and environmental constraints.

3. Mound Groundwater Basin (Mound Basin)

The Mound Groundwater Basin has historically provided water for overlying beneficial uses and satisfies agricultural, municipal, and industrial demands. Historical use has been documented to temporarily exceed the yield of the basin and result in water levels that have fallen below sea level and created a threat of seawater intrusion. To abate this threat the City abandoned its historical coastal well facilities and located groundwater extraction near the center of the Mound Basin. A report (Fugro, 1997) compiled as part of a 1996 study of the basin indicated that historical data supports a basin yield of at least 8,000 AFY during drought conditions as long as pumpage is reduced during wet years to allow water levels to recover.

The 1983 to 1996 average annual production from the Mound Basin was approximately 5,000 AFY (Fugro, 1997). While the resulting water levels in the basin over that time period reportedly ranged from significantly below sea level to a sufficient elevation about sea level to control seawater intrusion, the basin water level trend did not indicate an average production significantly above 5,000 AFY could be sustained without creating adverse conditions.

Currently, two wells withdraw water from the Mound Groundwater Basin; Victoria Well No. 2, which was installed in 1995, and Mound Well No. 1, which began production in April 2003. Victoria Well No. 1, which was installed in 1982, is considered an inactive well at this time due to maintenance and water quality issues and is scheduled for destruction.

Historical agricultural and private well uses have typically extracted about 2,000 AFY while the City's average annual extraction for the last ten years has been approximately 4,000 AFY. Therefore the City's current reliable water supply from the Mound Basin is 4,000 AFY.

4. Oxnard Plain Groundwater Basin (Fox Canyon Aquifer)

Wells near the Buenaventura Golf Course have drawn from the Oxnard Plain Groundwater Basin since 1961. Currently, two wells, Golf Course Wells No. 5 and 6, produce potable water for the City's system and a third well (Golf Course Well No. 3) is out of service for major rehabilitation. This third well could be used as an emergency source and will only return to service during a drought, following the replacement of wellhead, pump, electrical and raw water connection. These wells pump from the Fox Canyon Aquifer of the Oxnard Plain Groundwater Basin.

The Fox Canyon Groundwater Management Agency (GMA) was created by state legislation in 1982 to manage local groundwater resources in a manner to reduce overdraft of the Oxnard Plain and stop seawater intrusion. A major goal of the GMA is to regulate and reduce future extractions of groundwater from the Oxnard Plain aquifers, in order to operate and restore the basin to a safe yield. In August 1990, the GMA passed Ordinance No. 5, which required existing groundwater users to reduce their extractions by five percent every five years until a 25 percent reduction was reached by the year 2010.

The City's historical allocation was set by the GMA at 5,472 AFY, which was the average extraction from the Golf Course Wells for the base period 1985 to 1989. Beginning in 1992, historical extractions set by the GMA were reduced by five percent (5%) to 5,198 AFY, in 1995 it was reduced to 4,925 AFY, in 2000 it was reduced to 4,651 AFY and further reduced in 2010 to the current allocation of 4,100 AFY. Therefore the City's current reliable water supply from the Oxnard Plain Basin is 4,100 AFY.

5. Santa Paula Groundwater Basin (Santa Paula Basin)

The Saticoy Water Company was acquired by the City in 1968, which included Saticoy Well No. 1 that produced water from the Santa Paula Basin. Due to casing failure, the well was destroyed and replaced in 1991 with a new well designated as Saticoy Well No. 2. Well No. 2 was placed in

the same general location as Well No. 1. In May 2003, Saticoy Well No. 2 was rehabilitated. After rehabilitation, the resulting sustainable well supply was 1,600 AFY.

In March 1996, the City ended a five-year stalemate over the use of the Santa Paula Basin. Under a court stipulated judgment, the United Water Conservation District (United), the Santa Paula Basin Pumpers Association (an association of ranchers and businesses) and the City all have an interest in the Santa Paula Basin. The City can pump on average 3,000 AFY from the Santa Paula Basin. The City is not limited to this allocation in any single year, but may produce seven times its average annual allocation (21,000 AF) over any running seven-year period. In addition, the City may pump an additional 3,000 AFY in case of an emergency resulting from a long-term drought situation.

If the court finds that the safe yield of the basin is less than the total pumping allocations, then the City may have reductions in pumping allocations. Stage 2 reduces the City's pumping to 1,141 AFY, Stage 3 reduces the City's pumping allocations to 641 AFY, Stage 4 reduces the City's pumping allocations to 481 AFY and Stage 5 reduces the City's allocations to zero.

However, due to the existence of only the one well, the City can only reliably count on the production of that well to provide supply at this time. Therefore the City's current reliable water supply from the Santa Paula Basin is 1,600 AFY.

6. Recycled Water

The City collects and treats wastewater at their Ventura Water Reclamation Facility (VWRF). The reclamation facility has a current capacity of 12 MGD. Average annual flows to the reclamation facility total approximately 9 MGD. A portion of the effluent is pumped to recycled water customers and the remaining effluent is discharged to the Santa Clara River Estuary (Estuary). The recycled water produced from the VWRF is used for general irrigation of the two golf courses, a City park and landscape irrigation areas located along the existing distribution alignment. The City's average annual recycled water demand is approximately 700 AFY.

The City's existing water supply portfolio is summarized in Table 4-1.

Table 4-1
Summary of Current Water Supply

Water Supply Source	Current Supply (AFY)
Casitas Municipal Water District	5,000
Ventura River / Foster Park	4,200
Mound Groundwater Basin	4,000
Oxnard Plain Groundwater Basin	4,100
Santa Paula Groundwater Basin	1,600
Recycled Water	700
Total	**19,600**

C. FUTURE WATER SUPPLY

1. Casitas Municipal Water District (Casitas)

While additional supply (up to 8,000 AFY) may be available to the City in future years, the present annual supply used within the Casitas district boundary of the City service system is approximately 5,000 AFY. Since the estimated future water demands within the Casitas district boundary of the City will only nominally increase, the anticipated future water supply from Casitas will remain approximately 5,000 AFY.

2. Ventura River Surface Water Intake and Upper Ventura River Groundwater Basin/Subsurface Intake and Wells (Foster Park)

In conjunction with the Matilija Dam Ecosystem Restoration Project, two additional wells were installed at Foster Park as part of the mitigation measures. The wells, identified as the Foster Park Wellfield Restoration Project (Wells no. 12 and 13), were constructed by and funded through a grant received by the Ventura County Watershed Protection District for the City in order to mitigate for water lost as a result of increases in turbidity due to the removal of Matilija Dam. To date these wells have not been activated and are not to be operated until the project related impacts after removal of Matilija Dam necessitate the activation of these new wells. These two wells will be operated in accordance with the National Marine Fisheries Biological Opinion for the project.

It is anticipated that future construction of the Foster Park Wellfield Production Restoration Project and the expansion of the Avenue Treatment Plant to its maximum capacity will increase the supply from this source in the future. These improvements are anticipated to restore historical production capabilities to produce up to 6,700 AFY.

3. Mound Groundwater Basin (Mound Basin)

The City anticipates conducting a study within the next few years to review the perennial yield of the Mound Basin and determine if the annual average yield of the basin is still believed to be accurate. The anticipated future water supply from the Mound Basin will remain approximately 4,000 AFY.

4. Oxnard Plain Groundwater Basin (Fox Canyon Aquifer)

The anticipated future water supply from the Oxnard Plain Basin will remain as 4,100 AFY per the discussions in the previous section on the basin.

5. Santa Paula Groundwater Basin (Santa Paula Basin)

In March 1996, the City ended a five-year stalemate over the use of the Santa Paula Basin. Under an agreement with the United Water Conservation District (United) and the Santa Paula Basin Pumpers Association (an association of ranchers and businesses), the City can pump on average 3,000 AFY from the Santa Paula Basin. The City is not limited to this allocation in any single year, but may produce seven times its average annual allocation (21,000 AF) over any running seven-year period. In addition, the City may pump an additional 3,000 AFY in case of an emergency resulting from a long-term drought situation.

The City is currently constructing Saticoy Well No. 3, which will improve the water supply from the Santa Paula Basin. It is anticipated that Saticoy Well No. 3 will have an operational capacity of 2,000 gpm, thereby maximizing use of the City's 3,000 AFY allocation from the Santa Paula Basin in the near future.

However, as stated in the previous section on the Santa Paula Basin, there is potential for future reductions in the available supply. Therefore, the anticipated future water supply from the basin has a range from zero to 3,000 AFY.

6. Recycled Water

The City's existing Reclaimed Water Policy continues to encourage the use of recycled water. New development located near existing recycled water mains or within the defined recycled water focus area is required to use recycled water in lieu of potable water for irrigation and other uses as appropriate. In 2007, Kennedy Jenks Consultants completed a study on the potential recycled water market within the City. The total demand within the City limits that could potentially utilize recycled water was estimated at 1.3 MGD. Therefore, the anticipated future water supply from the VWRF at this time is 1,400 AFY.

The City's future water supply portfolio is summarized in Table 4-2.

Table 4-2
Summary of Future Water Supply
From Existing Sources

Water Supply Source [1]	2015 Supply (AFY)	2020 Supply (AFY)	2025 Supply (AFY)
Casitas Municipal Water District	5,000	5,000	5,000
Ventura River / Foster Park	4,200	4,200 - 6,700	4,200 - 6,700
Mound Groundwater Basin	4,000	4,000	4,000
Oxnard Plain Groundwater Basin	4,100	4,100	4,100
Santa Paula Groundwater Basin [2]	0 - 3,000	0 - 3,000	0 - 3,000
Recycled Water	700	700	1,400
Total	**18,000 – 21,000**	**18,000 – 23,500**	**18,700 – 24,200**

[1] None of these numbers preclude the City's water rights.

[2] The Santa Paula Basin Judgment allows the City to utilize on average 3,000 AF annually. There is potential for future reductions, therefore the supply range is shown from zero to 3,000 AFY.

D. POTENTIAL ADDITIONAL FUTURE SUPPLY SOURCES

This section will briefly describe any planned or proposed projects which may affect the water supply sources for the City.

1. State Water Project

The City has a 10,000 acre-foot per year allocation from the California State Water Project (SWP). The base contractual agreements concerning the City's annual entitlement to 10,000 acre-feet of SWP are: (1) the 1963 State Water Supply Contract of 20,000 acre-feet entitlement of SWP water between the Department of Water Resources (DWR) and Ventura County Watershed Protection District (VCWPD) known formerly as Ventura County Flood Control District (VCFCD); (2) the 1970 agreement between VCFCD and Casitas known formerly as the Ventura Municipal Water District that assigned the 20,000 acre-feet entitlement to Casitas; and (3) the 1971

agreements between Casitas and the City providing the City with an annual entitlement of 10,000 acre-feet and Casitas and United providing United with an annual entitlement of 5,000 acre-feet. Ventura's 10,000 acre-foot entitlement offers the City the potential future advantage of using the SWP entitlement to augment the current water supply. At this time the City does not have the facilities required to deliver SWP water into the distribution system. The City's goal has been to protect and provide the additional water supply for our community, while minimizing the financial impact of keeping this entitlement.

The City pays annual SWP Table A water fees to DWR, which cover construction costs for SWP facilities and administration to deliver allotments of water throughout the state. In addition, the citizens of Ventura voted November 3, 1993 in favor of desalinating seawater over importing water through the SWP, as the preferred supplemental water supply option. However, based on the City Attorney's review of the City's SWP Table A water, the City cannot unilaterally end its involvement in the SWP's financial obligations and SWP Table A water without great risk.

The Monterey Amendment to the State Water Contract in 1999 provided the City a formal mechanism to allow the City to place their SWP water into a "turn back" pool to be purchased by other SWP contractors. The City has taken part in the SWP "turn back" pool over the past several years which has provided a small annual revenue offset. The City has also worked recently with United who requested to receive the City's allocation at the "turn back" pool rate which provided water benefits to the County area as a whole.

Recent changes in the regulations and the current potential market for state water has provided a possible opportunity for the City to recover a more significant revenue offset. However, at the same time the annual costs associated with SWP water are anticipated to increase substantially while the available supply from the state has gone down resulting in a reduction of allocation to SWP Contractors in recent years to 40-50%. The higher costs and lower supplies are due to proposed projects in the Sacramento-San Joaquin Delta because of several years of drought and environmental concerns over protecting endangered species. The City is evaluating the existing policy on SWP water and the City's options related to short term and long term leases of its SWP entitlement.

2. Saticoy County Yard Well

In 2004 the County of Ventura proposed relocating their maintenance yard from the existing location to a site within the Saticoy Community contiguous to the City's water system. In exchange for City water service, which required an extraterritorial water service agreement, the County provided the City with a new well and pipeline facilities. The new well was provided to offset the County's anticipated water demand, as well as, provide significant additional water supply. The pipeline facilities provided by the County included approximately 2,320 feet of 14" pipeline from the new well to a location where the City would eventually complete the remainder of the raw water pipeline to the City's existing Saticoy Conditioning Facility for treatment.

A domestic pipeline was also provided that tied into the City's existing pipeline system at two locations. The County's' facilities were completed in 2006. The City's Capital Improvement Program (CIP) Plan included the City's portion of the raw water pipeline that connected the County provided raw water pipeline to the City's Saticoy County Yard Well. The City's' portion was completed in 2009. In November 2009 the City Council was to certify the Final EIR for the Saticoy & Wells Community Plan and Development Code. During the certification process the Fox Canyon Groundwater Management Agency (FCGMA) and United voiced concerns regarding the water supply anticipated from the Saticoy Yard Well for the project area. Consequently, the City approved a *Limitation and Tolling Agreement* whereby the parties agreed to a cooperative Operations Testing Plan to provide testing of the impact of the water drawn from the Saticoy County Yard Well. As a result of the testing under the Operations Plan it was determined that the April 2004 County of Ventura Saticoy Operations Yard EIR was not sufficient for the anticipated operations of the Saticoy County Yard Well and therefore additional environmental clearance is warranted for operation of the well.

Therefore, the anticipated future water supply from the Saticoy County Yard Well is unknown at this time. It should be noted that the City's 2005 Urban Water Management Plan (UWMP) and 2008 Biennial Water Supply Report included the Saticoy County Yard Well as a water supply source of up to 2,400 acre-feet per year.

3. Recycled Water

a. Ventura Water Reclamation Facility (VWRF)

As mentioned previously, currently the City's Water Reclamation Facility (VWRF) discharges most of its tertiary treated effluent to the Santa Clara River Estuary (Estuary) with approximately 700 acre-feet per year (AFY) diverted as recycled water for landscape irrigation by several users.

The City's current and past recycled water planning efforts have centered on issues related to the beneficial uses of the Estuary. These issues have required the City to consider whether or not discharge from the VWRF provided enhancements to the beneficial uses of the Estuary, and consequently affects the amount of recycled water that can supplement domestic water supply. The following describes the history and issues related to recycled water planning within the City's service area.

Historically, the VWRF has been permitted to discharge the majority of its effluent to the Estuary. However, during the 2008 re-issuance process, controversy arose on whether or not the City should be permitted to continue its current volume of discharge into the Estuary. The Discharge Permit issued by the RWQCB allowed continuation of the discharge but required the City to perform three extensive studies.

The studies included the Estuary Subwatershed Study (completed March 2011), Phase 1 Recycled Water Market Study (completed March 2010), and Treatment Wetlands Study (completed March 2010). The Discharge permit also identified a Phase 2 of the Recycled Water Study.

A draft of the Phase 2 Recycled Water Study was recently completed and a Stakeholder Workshop was held at the City on February 21, 2013. The intent of the study was to answer the following question, "What is the best use of the treated water resources from the VWRF to protect the health of the Estuary?" The previous studies mentioned and previous workshops narrowed potential project alternatives down to the most feasible and most beneficial. Some of the alternatives being considered in the Draft Phase 2 Recycled Water Study have the potential of providing the City with some amount of additional water supply in the future. This could be additional recycled water to offset

current potable uses or an additional water supply utilizing indirect or direct potable reuse.

b. Ojai Valley Sanitary District (OVSD)

In 2007, the City in partnership with the Ojai Valley Sanitary District (OVSD), completed a preliminary feasibility analysis for the re-use of effluent currently discharged from OVSD into the Ventura River. The discharge averages approximately 2 million gallons per day, and enters the river approximately 5 miles upstream of the Pacific Ocean. The first part of the analysis focused on environmental issues primarily related to impacts of reduced discharge flow on the receiving environment, and possible impacts to water quality as a function of reduced flows. The second part of the analysis considered engineering and market issues related to different levels of effluent re-use. Ultimately, from an economic perspective, the cost and difficulty of providing the infrastructure necessary to supply recycled water to potential users has to be balanced against the demand for such water, and the willingness of potential users to pay for it.

The engineering and market analysis identified a cost-effective combination of localized users that minimized the additional infrastructure necessary to supply the recycled water. The primary users identified were Aera Energy and local growers, with Aera accounting for the bulk of the demand. These users, which are currently supplied water from the City with a combination of untreated and potable water, could utilize recycled water in the future. The primary users in the 2007 study have reduced their water demands and the combined FY 2011-2012 water consumption of these users is approximately 300 AFY. Collectively, the environment, engineering and market analysis suggested that the re-use of at least a portion of the effluent is sufficiently feasible to justify further consideration, although full CEQA documentation and review will be necessary prior to implementation. The City and OVSD continue to discuss and work together to investigate the potential reuse of OVSD effluent.

4. Water Conservation Measures/Water Efficiency Plan

Water conservation measures may help sustain existing water use and delay the need for new water supplies. In 2011, City Council adopted a five-year Water Efficiency Plan that focuses, amongst other efforts, on educating the youth and reducing outdoor landscape watering. Outdoor

landscaping accounts for 40% to 60% of water use for residential units. The second year of the plan continues to focus efforts on reducing residential landscape watering. The efforts concentrate on appropriate watering for mature landscape as well as the planting of more sustainable gardens. Ocean Friendly Gardens provide potable water use savings as well as environmental sustainability capturing storm runoff. The City currently meets the State mandated 20% reduction target. City efforts now focus on maintaining this savings threshold and possibly providing a buffer in a three year drought period. This will be a continuing challenge for the City.

5. Establish Water Rights Ordinance

In September 2012, Ventura Water took the concept of a water rights ordinance to Council. As new development is proposed, a consistent methodology is important for securing water rights and projecting water demands. To maintain the City's supply levels and support long term sustainability, Ventura Water is drafting language for inclusion in a new water rights ordinance. The draft language includes providing rights, buying rights to offset new development demand, purchasing the City's rights as well as the payment of in-lieu fees. Parcels that are within the Fox Canyon Groundwater Management Agency (FCGMA) boundary that use groundwater for current water use have an opportunity to bring water rights with any proposed development. According to the FCGMA current policies, if a parcel has an "allocation" from a well within the boundary, the "allocation" may be transferred to the City so that the City's current allocation will be increased by that amount. This would generally be the case where the "allocation" is currently a municipal and industrial use (M&I). In the case where the parcel is in agriculture use and is utilizing the FCGMA's agriculture efficiency policy then the "allocation" that may be transferred to the City would be 1.5 acre-feet of groundwater "allocation" per acre of land. Parcels that are within the Santa Paula (SP) Basin boundary may have an allocation from an existing well that is serving that parcel or several parcels. Under the SP Basin Stipulated Judgment, the SP Basin Technical Advisory Committee has transfer procedures where a property owner may transfer water rights associated with the parcel to the City.

5. CONCLUSIONS & RECOMMENDATIONS

A. Conclusions

Based on the known supply conditions and the calculated water demand for the present condition, it appears that the current water demand exceeds the available supply. However, it is apparent that the "calculated" water demand for the current condition (22,754 AFY) is overly conservative. The current water demand figures calculated within this Report utilize a baseline water demand from 2005 of 20,808 AFY. Based on the FY 2011-2012 water consumption data, it is likely that the City's current water demands are closer to 17,300 AFY, below the current available supply of 19,600 AFY.

However, it is also well documented that current water demands are at historically low levels, mainly due to drought, environmental and economic factors. The City's average annual water demand for years 2005-2009 was 19,300 AFY, which is uncomfortably close to the current water supply available.

Utilizing development projections developed as a part of the 2005 General Plan, the anticipated growth in water demand through 2025 is 4,020 AFY, which results in a total projected water demand of 26,774 AFY, well above the predicted 24,200 AFY of supply (which is on the high end of the range). The future water demand projections utilize the water demand factors published in the 2005 General Plan FEIR. The demand factors are "planning-level" numbers, and therefore are on the conservative side. It is likely that the actual water demand factors are much lower than those used to project the future demands.

The City's available water supply is constantly changing, depending upon environmental and legal constraints. At any time, the available water supply for the City could drop to an annual average of 18,000 AFY.

Figure 5-1 provides a graphical representation of the existing and projected water demand

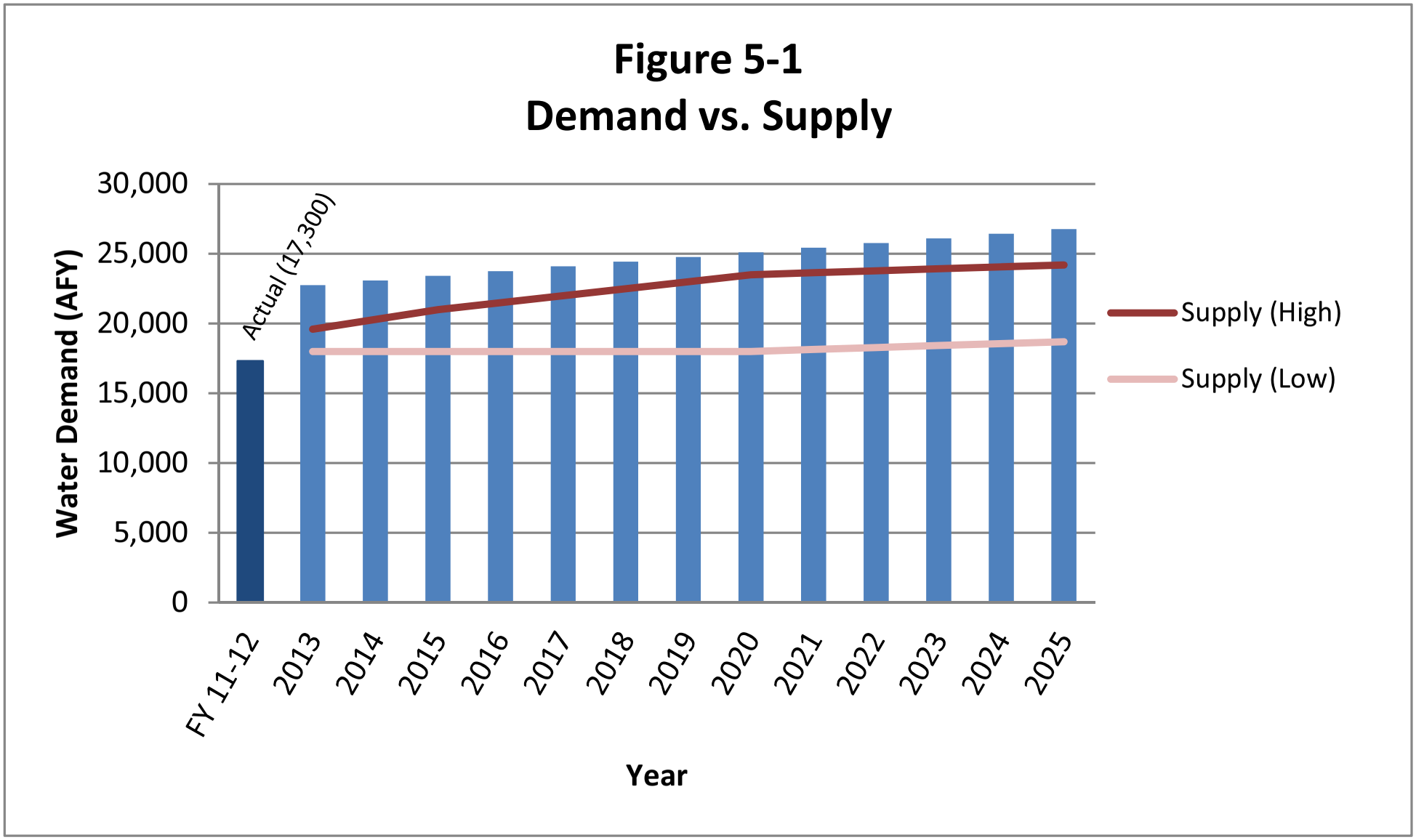
Figure 5-1
Demand vs. Supply
30,000
25,000
20,000
15,000
10,000
5,000
0
Water Demand (AFY)
Actual (17,300)
FY 11-12
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Year
Supply (High)
Supply (Low)

B. Recommendations

Moving forward, it is recommended that the City utilizes current consumption data to develop both the existing demand condition, and also develop more realistic demand factors for the various land uses within the City. In order to develop more realistic demand factors, the City will need to accurately define the existing land use conditions for the various land use categories within the City. In addition, the water consumption data will need to be attributed to the correct land use categories. This can be accomplished by mapping the water billing classifications with the General Plan land use categories, and perhaps developing a new set of water demand factor classifications. By utilizing current water consumption data, and current land use data, a more accurate set of water demand factors can be determined. The more accurate demand factors will allow for a more realistic projection of future water demands where the development plan has been identified.

APPENDICES

Demand Factors from Other Agencies:
- Simi Valley (VCWWD No. 8)
- Thousand Oaks
- Irvine Ranch Water District
- Santa Margarita Water District

LAFCo 13-01S Sphere of Influence Report

2005 General Plan:
- Table 3-1
- Table 3-2
- Figure 3-1
- Figure 3-5

2005 General Plan FEIR:
- Table 4-13.7
- Table 4-13.8
- Table 4-13.15

2010 UWMP:
- Table 2-1
- Table 2-5
- Table 3-1

2011 Water Master Plan:
- Tables II-1 thru II-4
- Table V-14

LAFCo MSR Report

Attachment D: Development Entitlement Report 2005-2012 (Approved, Under Construction and Built Projects)

2005 General Plan FEIR Water Demand Factors (email correspondence)

C. Water Demand and Peaking Factors

The water demand factors for different land use types within the District are as follows:

Table III - 1: Water Demand Factors

Land Use Description	Density (DU/Acre)	Demand Factor*	Unit*
High Density Residential	10.1 – 18.1+	5.70	gpm/acre
Medium Density Residential	3.1 – 10	1.40	gpm/acre
Low Density Residential	0 – 3	1.10	gpm/acre
Detached Residential			
Small, up to 9,999 SF lot	--	420	gal/du/day
Medium, 10,000 to 22,000 SF lot	--	840	gal/du/day
Large, 22,001 to 1 Acre SF lot	--	1680	gal/du/day
Condominium	--	259	gal/du/day
Multi-Family Apartment	--	222	gal/du/day
Retirement Facility (per room)	--	92	gal/du/day
Senior Apartment	--	111	gal/du/day
Commercial – Light	--	1.75	gpm/acre
Commercial – Heavy	--	2.35	gpm/acre
Commercial – Office	--	2.00	gpm/acre
Industrial – Light	--	1.95	gpm/acre
Industrial – Heavy	--	9.20	gpm/acre
Industrial – Business Park	--	2.00	gpm/acre
Parks	--	1.10	gpm/acre
Hospitals	--	1.85	gpm/acre
Schools	--	1.20	gpm/acre
Community Services	--	1.35	gpm/acre

*Factor shall be applied to raw acreage and not building footprint.

Peaking factors are used to estimate maximum month, maximum day and peak hour demands. These factors, wherever possible, are based on actual water usage. When actual water data is not available, peaking factors are based on typical industry standards for water purveyors in Southern California.

Table 3-1 Land Use and Water Use Factors

		Land Use		Local Demands			Irrigation Demands	
Code	Land Use description	Agency	Average Density	Local Interior	Local Exterior	Total	% Irrigated Area	Irrigation Factor
1100	*Residential*		*DU/Ac*		*Gal/DU/Day*			*Gal/Ac/Day*
1111	Res - Rural Density	Orange	0.30	300	750	1,050	5	2,800
1121	Res - Estate Density	Orange	1.20	300	300	600	8	2,900
1131	Res - Low Density	Orange	4.00	300	300	600	15	2,900
1141	Res - Low-Medium Density	Orange	10.50	200	100	300	22	3,300
1161	Res - Medium Density	Orange	19.50	225	185	410	17	3,100
1122	Res - Estate Density	Irvine	0.50	300	600	900	7	2,800
1132	Res - Low Density	Irvine	3.00	225	180	405	16	3,000
1162	Res - Medium Density	Irvine	7.50	200	110	310	20	3,100
1172	Res - Medium-High Density	Irvine	17.50	165	15	180	25	3,600
1182	Res - High Density	Irvine	32.50	180	20	200	20	3,300
1133	Res - Low Density	Newport Beach	1.00	250	190	440	17	3,100
1153	Res - Medium-Low Density	Newport Beach	2.75	250	200	450	10	2,800
1163	Res - Medium Density	Newport Beach	5.00	190	60	250	22	3,300
1183	Res - High Density	Newport Beach	12.25	155	20	175	25	3,600
1134	Res - Low Density PC	Tustin	4.50	225	185	410	17	3,100
1164	Res - Medium Density PC	Tustin	11.80	155	15	170	25	3,600
1184	Res - High Density PC	Tustin	17.40	135	15	150	15	3,700
1115	Res - Rural Density	County	0.26	300	750	1,050	05	2,800
1135	Res - Suburban Density	County	9.25	225	180	405	16	3,000
1175	Res - Urban Density	County	29.00	165	15	180	25	3,600
1200	*Commercial*		*KSF/Ac*		*Gal/KSF/Day*			*Gal/Ac/Day*
1210	Comm - General Office		25.00	56	4	60	30	4,000
1221	Comm - Community		9.09	209	11	220	30	3,500
1222	Comm - Regional		10.53	180.5	9.5	190	20	5,000
1230	Comm - Recreation		8.33	54	6	60	30	4,500
1240	Comm - Institutional		8.88	39.38	5.62	45	50	2,750
1244	Comm - Hospital		8.70	218.50	11.50	230	25	2,850
1260	Comm - School		13.33	14.25	0.75	15	50	2,500
1273	Comm - Military Air Field							
1300	*Industrial*		*KSF/Ac*		*Gal/KSF/Day*			*Gal/Ac/Day*
1310	Industrial - Light		25.00	56	4	60	25	4,000
1320	Industrial - Heavy		25.00	4,500	500	5,000	25	4,000
	Open Space & Other							*Gal/Ac/Day*
1820	Park - Community						90	3,400
1830	Park - Regional						85	2,100
2100	AG - Low-Irrigated						100	1,800
2200	AG - High-Irrigated						100	3,100

Note: The database includes the following land use codes that do not use set factors or do not generate water demands: 0 = area not served by IRWD; 1411 = Airports; 1413 = Freeway and Major Roads; 1850 = Park-Wildlife Preserve; 1880 = Park-Open Space (Rec); 1900 = Vacant; 4100 = Water Body; 9100 = Mixed Use (uses a combination of factors)

Pipe velocities should be a minimum of 1 foot per second (fps) in order to adhere to required water quality regulations and maintain proper circulation throughout the system.

C. WATER DEMAND FACTORS

The City does not currently have published water demand factors for different land use types. For future planning projects, a more detailed list of conservative demand factors is recommended. The following demand factors, listed in Table III-1, are based on industry standards for water purveyors in the Southern California region.

Table III-1
Water Demand Factors

Land Use Description	Density (DU/Acre)	Demand Factor	Unit
High Density Residential	15-30	180	gal/du/day
Medium Density Residential	4.5-15	310	gal/du/day
Low Density Residential	2-4.5	405	gal/du/day
Very Low Density Residential	0-2	440	gal/du/day
Reserve Residential (ultimate need)	0-2	440	gal/du/day
Commercial/Residential (High Density)	15	200	gal/du/day
Commercial	-	130	gal/ksf/day
Industrial	-	60	gal/ksf/day
Institutional	-	45	gal/ksf/day
Elementary School	-	15	gal/ksf/day
Intermediate School	-	15	gal/ksf/day
High School	-	15	gal/ksf/day
Existing Parks, Golf Courses, Open Space	-	3400	gal/ac/day
Proposed Park and Recreation Areas	-	3400	gal/ac/day
Residential Developable Land (ultimate need)	0.2-1.0	440	gal/du/day

Table 3-1 Land Use and Water Use Factors

		Land Use		Local Demands			Irrigation Demands	
Code	Land Use description	Agency	Average Density	Local Interior	Local Exterior	Total	% Irrigated Area	Irrigation Factor
1100	*Residential*		*DU/Ac*		*Gal/DU/Day*			*Gal/Ac/Day*
1111	Res - Rural Density	Orange	0.30	300	750	1,050	5	2,800
1121	Res - Estate Density	Orange	1.20	300	300	600	8	2,900
1131	Res - Low Density	Orange	4.00	300	300	600	15	2,900
1141	Res - Low-Medium Density	Orange	10.50	200	100	300	22	3,300
1161	Res - Medium Density	Orange	19.50	225	185	410	17	3,100
1122	Res - Estate Density	Irvine	0.50	300	600	900	7	2,800
1132	Res - Low Density	Irvine	3.00	225	180	405	16	3,000
1162	Res - Medium Density	Irvine	7.50	200	110	310	20	3,100
1172	Res - Medium-High Density	Irvine	17.50	165	15	180	25	3,600
1182	Res - High Density	Irvine	32.50	180	20	200	20	3,300
1133	Res - Low Density	Newport Beach	1.00	250	190	440	17	3,100
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1184	Res - High Density PC	Tustin	17.40	135	15	150	15	3,700
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1135	Res - Suburban Density	County	9.25	225	180	405	16	3,000
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1200	*Commercial*		*KSF/Ac*		*Gal/KSF/Day*			*Gal/Ac/Day*
1210	Comm - General Office		25.00	56	4	60	30	4,000
1221	Comm - Community		9.09	209	11	220	30	3,500
1222	Comm - Regional		10.53	180.5	9.5	190	20	5,000
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1260	Comm - School		13.33	14.25	0.75	15	50	2,500
1273	Comm - Military Air Field							
1300	*Industrial*		*KSF/Ac*		*Gal/KSF/Day*			*Gal/Ac/Day*
1310	Industrial - Light		25.00	56	4	60	25	4,000
1320	Industrial - Heavy		25.00	4,500	500	5,000	25	4,000
	Open Space & Other							*Gal/Ac/Day*
1820	Park - Community						90	3,400
1830	Park - Regional						85	2,100
2100	AG - Low-Irrigated						100	1,800
2200	AG - High-Irrigated						100	3,100

Note: The database includes the following land use codes that do not use set factors or do not generate water demands: 0 = area not served by IRWD; 1411 = Airports; 1413 = Freeway and Major Roads; 1850 = Park-Wildlife Preserve; 1880 = Park-Open Space (Rec); 1900 = Vacant; 4100 = Water Body; 9100 = Mixed Use (uses a combination of factors)

Table IV - 1
Santa Margarita Water District
Improvement District Nos. 4C, 4E, 5 & 6 Plan of Works
Domestic Water Use Factors

Land Use	Demands			
	Interior	Exterior	Total	
A. Residential				
Detached Residential	300	150	450	gpd/ DU
Attached Residential	175	0	175	gpd/ DU
Apartments	175	0	175	gpd/ DU
Senior SFR	200	100	300	gpd/ DU
B. Non-Residential Uses				
Commercial/ Industrial			225	gpd/ 1000sf
Community Facilities			225	gpd/ 1000sf
Elementary School			10	gpd/ student
Middle School			10	gpd/ student
High School			15	gpd/ student

VENTURA LOCAL AGENCY FORMATION COMMISSION

STAFF REPORT

Meeting Date: January 16, 2013

Agenda Item 12

TO: LAFCo Commissioners

FROM: Kim Uhlich, Executive Officer KU

SUBJECT: LAFCo 13-01S City of San Buenaventura Sphere of Influence Review and Update

---

RECOMMENDATIONS:

Adopt attached Resolution LAFCo 13-01S making determinations and updating the sphere of influence for the City of San Buenaventura.

BACKGROUND:

For each city and special district LAFCo must determine and adopt a sphere of influence. A sphere of influence is defined as a plan for the probable physical boundaries and service area of a local agency, as determined by the Commission (Government Code §56076). Effective January 1, 2001 each LAFCo is required to review and, as necessary, update the sphere of influence ("sphere" or "SOI") of each city and special district on or before January 1, 2008, and every five years thereafter (Government Code §56425(g)). Prior to updating a SOI, LAFCo is required to conduct a municipal service review ("service review" or "MSR") (Government Code §56430).

On March 21, 2007 the Commission accepted a MSR report and, on June 13, 2007, updated the City of San Buenaventura sphere of influence to conform to assessor parcel boundaries and exclude all territory subject to the Hillside Voter Participation Act. Based on a work plan for the second round of sphere reviews adopted by the Commission in May 2008, a sphere of influence review for the nine cities was scheduled for completion in 2012. On November 14, 2012 LAFCo accepted the MSR report for nine cities in Ventura County, including the City of San Buenaventura.

COMMISSIONERS AND STAFF

COUNTY:	CITY:	DISTRICT:	PUBLIC:
Kathy Long	Carl Morehouse	Bruce Dandy	Linda Ford-McCaffrey
Linda Parks	Janice Parvin, Chair	Gail Pringle, Vice Chair	
Alternate:	*Alternate:*	*Alternate:*	*Alternate:*
Steve Bennett	Carol Smith	Elaine Freeman	Lou Cunningham
Executive Officer:	Dep. Exec. Officer	Office Mgr/Clerk	Legal Counsel
Kim Uhlich	Kai Luoma	Debbie Schubert	Michael Walker

DISCUSSION:

Based on the recently accepted MSR report for the nine cities, no significant changes to the sphere for the City of San Buenaventura appear to be necessary at this time. However, a minor amendment to the sphere of influence is being recommended to remove several agricultural and rail road right of way parcels located between Highway 101 and Channel Drive (Attachment 1). The reason is to correct a recently discovered mapping error. According to County Information Technology Services Department staff, the subject territory was erroneously included in the sphere when the County transitioned to GIS from a CAD (computer aided design) system prior to 2001. Since that time, each subsequent sphere map adopted by the Commission included the territory so any decision to exclude it may only be done through formal Commission action.

The County General Plan land use designation for the territory is "Agricultural-Urban Reserve" and it is zoned "Coastal Agriculture, 40 acre minimum". The City Comprehensive Plan land use designation is "Agriculture" and is therefore subject to the City SOAR ordinance which prohibits any amendment of the agricultural land use designation without an affirmative vote of the people. The area is currently in agricultural production, no City services are being provided and no proposals for development are pending with the City. As the territory has not been designated for non-agricultural use by the City's General Plan and is not likely to be developed within five years, removal of the area from the sphere would be consistent with the Commission's general policies pertaining to agricultural and open space preservation.

Attachment 2 is a December 20, 2012 letter from Jeffrey Lambert, Community Development Director for the City of San Buenaventura, acknowledging the recommended sphere of influence update and commenting that any future decision by the City to convert the affected territory to non-agricultural uses would be largely influenced by provisions of the California Coastal Act and the City's Local Coastal Program relating to the protection of coastal agricultural lands.

For CEQA purposes, the City of San Buenaventura sphere of influence update is exempt from CEQA under Section 15061(b)(3) of the CEQA Guidelines. This is the "general rule" exemption, meaning that it can be seen with certainty that there is no possibility that the activity in question may have a significant effect on the environment because the recommended sphere of influence update reduces the extent of territory planned to be included within the City's physical boundaries and service area.

Pursuant to Government Code Section 56425(e) it is recommended that the Commission consider and adopt written statements of its determinations with respect to each of the following:

(1) *The present and planned land uses in the area, including agricultural and open-space lands.* – The sphere of influence update for the City of San Buenaventura is to provide for all areas currently developed and within the City boundary to be

included in the City's sphere of influence, and to correct a previous mapping error which resulted in the inadvertent inclusion of agricultural and rail road right of way segments within the sphere. The affected territory is currently being used for agriculture and no changes in land use are anticipated at this time.

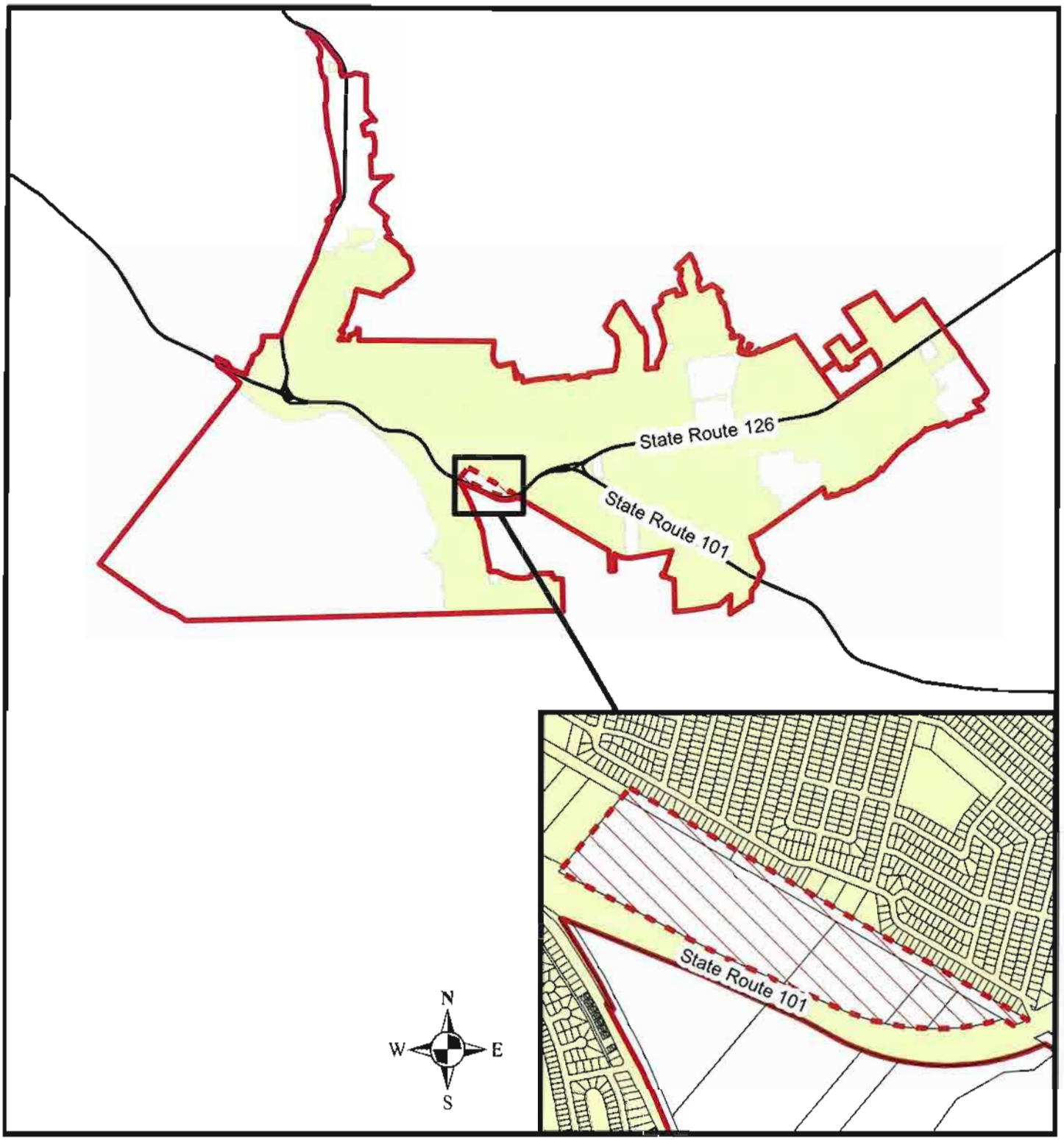
(2) *The present and probable need for public facilities and services in the area.* – No changes in public facilities or services provided by the City will result from this sphere of influence update.

(3) *The present capacity of public facilities and adequacy of public services that the agency provides or is authorized to provide.* – The sphere of influence update will not affect the present capacity of public facilities or the adequacy of the services provided by the City of San Buenaventura.

(4) *The existence of any social or economic communities of interest in the area if the commission determines that they are relevant to the agency.* - The sphere of influence update will not affect any social or economic communities of interest in the area.

(5) *The present and probable need for City sewer, municipal and industrial water, or structural fire protection services for any disadvantaged unincorporated communities within the existing sphere of influence.* – The Commission determined that the community of Saticoy, located within the City sphere of influence, is a disadvantaged unincorporated community (Commissioner's Handbook Section 3.2.5). Saticoy receives wastewater services from the Saticoy Sanitary District, an independent special district which serves only the community of Saticoy. Potable water services are provided by the City and customers are subject to the City's water surcharge for service provided outside of City limits. City policy generally precludes new or expanded water services greater than a ¾-inch meter, thus, limiting the amount of multi-family, commercial, and industrial development/redevelopment that can occur within the community. Law enforcement services are provided by the County Sheriff's Office and fire protection services are provided primarily by the City under a mutual aid agreement.

Attachments:
(1) City of San Buenaventura Sphere of Influence Map
(2) Letter from City of Ventura Community Development Director Jeff Lambert dated December 20, 2012
(3) Resolution LAFCo 13-01S – City of San Buenaventura Sphere of Influence Update



LAFCo 13-01S
City of San Buenaventura
Sphere of Influence Review/Update

Legend

- Current Sphere of Influence
- Area to be Excluded from Sphere
- City of San Buenaventura

CITY OF
VENTURA

December 20, 2012

Ms. Kim Uhlick
Ventura LAFCo Executive Officer
800 South Victoria Avenue
Mail Stop 1850
Ventura CA 93009-1850

Subject: LAFCo Sphere of Influence (SOI) Review and Updates

Dear Kim:

City staff met recently with LAFCo staff to discuss your current effort to review and update the City of San Buenaventura Sphere of Influence (SOI). LAFCo is mandated to initiate and complete this review and your intent to provide the review and update to the Commission at their January 2013 hearing.

During your review process, you found that a mapping error has occurred during the conversion of hard maps to the County GIS system for the City's SOI boundary. The subject properties in question involve several agricultural and rail road right of way parcels located between Highway 101 and Channel Drive (see attached Map and County GIS/IT Services staff memorandum). Based upon the current review effort, LAFCo seeks to correct the SOI boundary by removing the subject properties. You also provided SOI boundary documentation maps from 1981 and 1991, in addition to a 1992 City letter from then Community Development Director Everett Millais, all of which identifies the properties outside of the SOI boundary. You concluded that the SOI map adopted on June 12, 2002 is when the properties were mistakenly included in the SOI.

The City has reviewed your request and researched our historical files regarding the property site and the SOI boundary. If the mapping error is correct, then the erroneous boundary has been tracking across many planning efforts at the City. For example, the City's 1989 Comprehensive Plan includes the subject properties, the 2002 re-adoption of the Ventura-Oxnard Greenbelt excludes the properties because they were identified in the SOI, and lastly the 2005 General Plan and EIR also included the sites within the SOI, are designated under County SOAR, and were studied as part of the City's Potential Expansion Areas. The City cannot make a conclusive determination of the error or not, and therefore the Commission will need to complete their review and decide their action.

Regardless of the SOI boundary line and any future LAFCo action to update it or not, these properties are within the City's coastal zone and as such are subject to the Local

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Coastal Program (LCP) and Coastal Act provisions for agricultural resource protection. Conversion of this land to non-agricultural uses would require significant evidence and justification to overcome the strong agricultural resource protection findings of the LCP. Therefore in the framework of local/state land use regulations processes, the LCP and any necessary amendment is frankly the most important determinant for current and future land uses.

Sincerely,

Jeffrey Lambert, AICP
Community Development Director

c: Dave Ward, Planning Manager

Enclosure: County Memorandum and Map Exhibit, June 9, 2010

MEMORANDUM

DATE: 6-9-2010

TO: Kim Uhlich, Ventura LAFCo Executive Officer

FROM: David Hutchison, Sr. GIS Specialist, IT Services Department, GIS Division

SUBJECT: The Relationship of Assessor Parcels 080-0-020-150, -170, - 210, and - 290 to the City of Ventura Sphere of Influence Boundary as Reflected in the County's Initial GIS mapping records

---

The following is provided in response to your request for information about the subject territory in relation to the City of Ventura sphere of influence boundary at the time the County's Cadds data was first converted into a GIS format. As you are aware, the sphere boundary reflected in the original GIS mapping records included the subject territory and was the basis for the sphere boundary that LAFCo "re-adopted" for the City of Ventura in 2002.

The parcels in question are located between US 101 and Ventura city limits and include APNs 080-0-020-150, -170, - 210, and -290 and the freeway annexation LAFCO Resolution 69-44, Freeway Addition No. 1.

Process description: The dataset was initially developed by interpreting legal descriptions and matching boundaries to the existing parcel layer (property lines). Updates are made by merging or detaching recent city annexation or detachments polygons into the existing city sphere data.

In 1998 County GIS (formally – PWA, Engineering Mapping) started the conversion of Cadds data into a GIS format. Polygon parcels were created in ArcInfo (GIS format) from Cadds line work. City Boundaries and City Sphere boundaries were created using the same process.

In the latter months of 2001 County GIS began the process of converting City Annexations from a Cadds environment into a GIS environment. Cadds line work was imported into the GIS program and polygons were created. The polygons created were assigned attributes fields and those fields were populated. The program at the time did not allow for null polygons (holes or islands) within the boundaries. A field was created called "Island" and a value given. If the polygon was not an annexation or detachment with value fields the island field was populated with the value "y" which meant yes.

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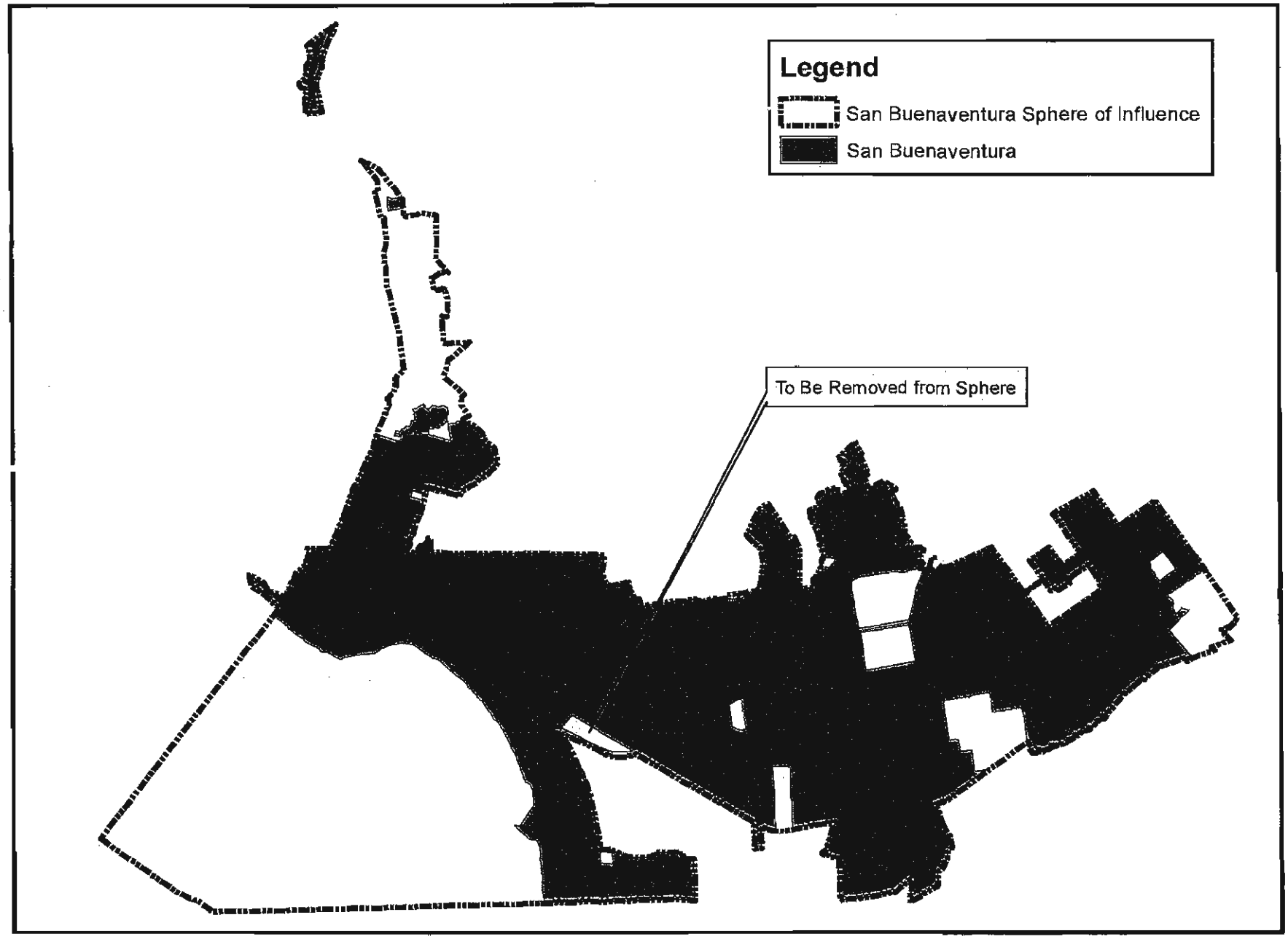
http://www.ventura.lafco.ca.gov

In order to minimize the update process for city boundaries and for the spheres to have coincident geometry for shared boundaries a work flow was developed to maintain the city annexations. The appropriate polygons were exported out to create the city boundaries and merged or detached from the sphere boundary.

The archive computer logs show:
During the creation of the city sphere for the City of Ventura the city annexations were merged to create the sphere boundary (where applicable). An island was missed as being excluded in this process (it is assumed as being missed as no documentation or correspondence can be found to support its' inclusion)* and incorporated into the sphere boundary.

*County GIS works closely with the Public Works Agency, Survey Engineering group and LAFCO to insure the accuracy of its data. After the data was converted into a GIS format the annexations, boundaries and spheres were internally checked by GIS then reviewed by Survey Engineering and LAFCO. There is no documentation or correspondence to support the inclusion of this area and it can only be assumed that at this time this was an overlooked error, as another island in a different area was not included.
It should also be noted that LAFCO Resolution 69-44 Freeway Addition No. 1 Ordinance No. 1592 Recorded on October 22, 1969 does not mention the inclusion of that area into the sphere either.


Legend
San Buenaventura Sphere of Influence
San Buenaventura
To Be Removed from Sphere

LAFCo 13-01S

RESOLUTION OF THE VENTURA LOCAL AGENCY FORMATION COMMISSION MAKING DETERMINATIONS AND APPROVING THE UPDATE OF THE SPHERE OF INFLUENCE FOR THE CITY OF SAN BUENAVENTURA

WHEREAS, Government Code Section 56425 et seq. requires the Local Agency Formation Commission (LAFCo or Commission) to develop and determine the sphere of influence of each local governmental agency within the County; and

WHEREAS, Government Code Section 56425(g) requires that LAFCo, as necessary, review and update the adopted sphere of influence boundaries on or before January 1, 2008 and every five years thereafter; and

WHEREAS, Government Code Section 56430 requires that a municipal service review be conducted prior to or in conjunction with a sphere of influence update; and

WHEREAS, LAFCo conducted a municipal service review of the services provided by the City of San Buenaventura and adopted written determinations as required by Government Code Section 56430 on November 14, 2012 for the services provided by the City; and

WHEREAS, the City staff has reviewed the changes proposed for this sphere of influence update and have no objections; and

WHEREAS, no change in regulation, land use or development will occur as a result of updating the City's sphere of influence; and

WHEREAS, at the times and in the manner required by law, the Executive Officer gave notice of the consideration of this action by the Commission; and

WHEREAS, the sphere of influence update action was duly considered at a public hearing on January 16, 2013; and

WHEREAS, the Commission heard, discussed and considered all oral and written testimony for and against the sphere of influence update including, but not limited to, testimony at the public hearing on January 16, 2013 and the LAFCo Executive Officer's staff report and recommendation;

NOW, THEREFORE, BE IT RESOLVED, DETERMINED AND ORDERED as follows:

(1) The Executive Officer's Staff Report and Recommendation for approval of the sphere of influence update for the City of San Buenaventura, dated January 16, 2013 is adopted.

(2) The Commission has considered the criteria set forth in Government Code §56425(e) and determines as follows:

a) *The present and planned land uses in the area, including agricultural and open-space lands.* – The sphere of influence update for the City of San Buenaventura is to provide for all areas currently developed and within the City boundary to be included in the City's sphere of influence, and to correct a previous mapping error. There will be no development, no change in land use and no impact to agricultural and open space lands as a result of the sphere of influence update.

b) *The present and probable need for public facilities and services in the area.* – No changes in public facilities or services provided by the City will result from this sphere of influence update. The City bases its public facilities and services on the extent of its existing infrastructure and its General Plan.

c) *The present capacity of public facilities and adequacy of public services that the agency provides or is authorized to provide.* – The sphere of influence update will not affect the present capacity of public facilities or the adequacy of the services provided by the City of San Buenaventura.

d) *The existence of any social or economic communities of interest in the area if the commission determines that they are relevant to the agency.* – The sphere of influence update will not affect any social or economic communities of interest in the area.

e) *The present and probable need for City sewer, municipal and industrial water, or structural fire protection services for any disadvantaged unincorporated communities within the existing sphere of influence.* – The Commission determined that the community of

Saticoy, located within the City's existing sphere of influence, is a disadvantaged unincorporated community (Commissioner's Handbook Section 3.2.5). Saticoy receives wastewater services from the Saticoy Sanitary District, an independent special district which serves only the community of Saticoy. Potable water services are provided by the City and customers are subject to the City's water surcharge for service provided outside of City limits. City policy generally precludes new or expanded water services greater than a ¾-inch meter, thus, limiting the amount of multi-family, commercial, and industrial development/redevelopment that can occur within the community. Law enforcement services are provided by the County Sheriff's Office and fire protection services are provided primarily by the City under a mutual aid agreement.

(3) The sphere of influence for the City of San Buenaventura is hereby updated to be the area shown as "proposed sphere of influence", as generally depicted on Exhibit A attached hereto.

(4) The Commission directs staff to have the official sphere of influence geographic information system data maintained for the Ventura LAFCo by the Ventura County Information Technology Services Department as the official sphere of influence record for the City of San Buenaventura updated consistent with this action.

(5) In accordance with the Executive Officer's determination, the Commission, as lead agency for the purposes of the California Environmental Quality Act (CEQA), hereby determines that the sphere of influence update for the City of San Buenaventura is exempt pursuant to Section 15061(b)(3) of the CEQA Guidelines.

(6) The Commission directs staff to file a Notice of Exemption as lead agency under Section 15062 of the CEQA Guidelines.

This resolution was adopted on January 16, 2013.

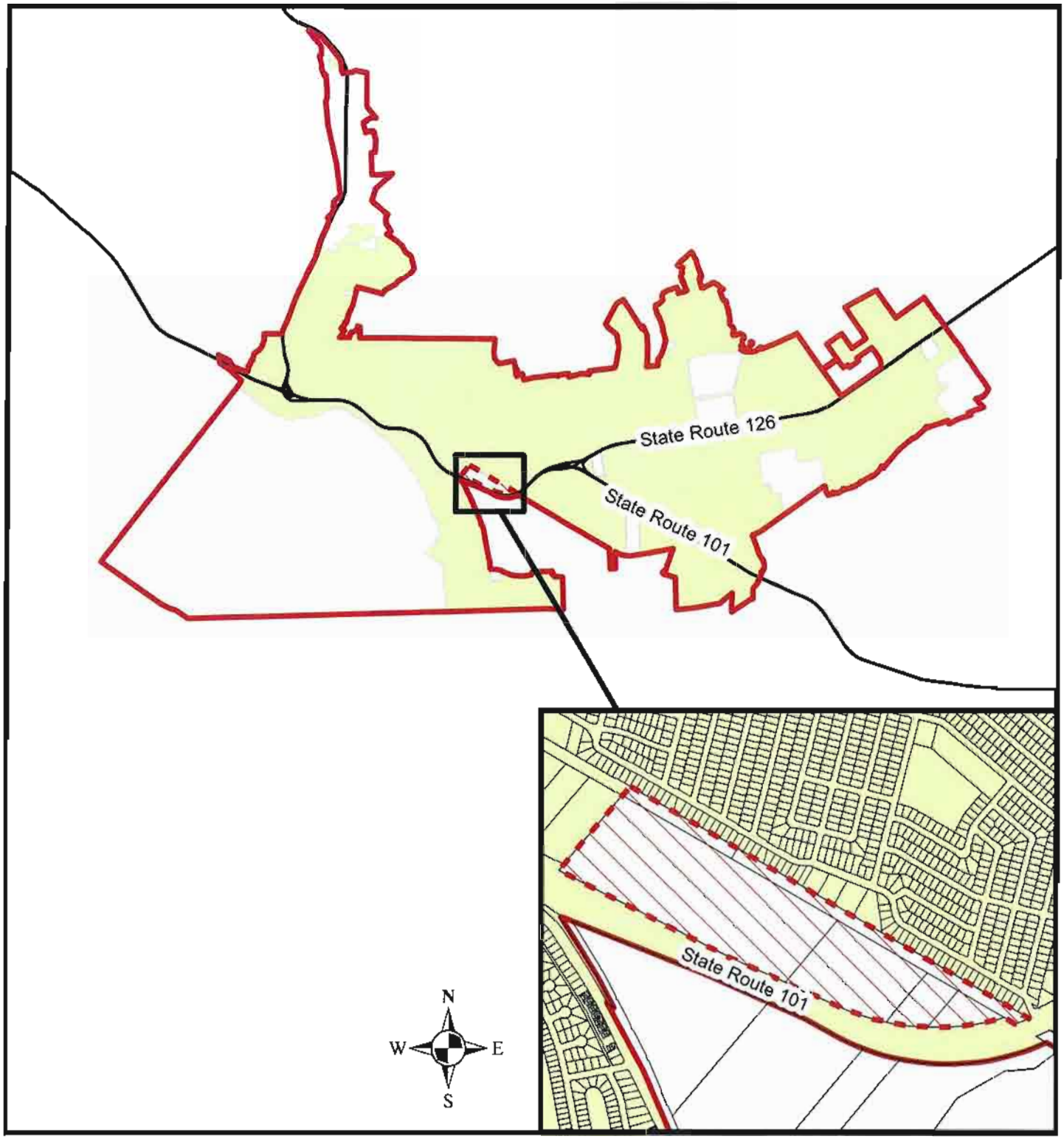
	AYE	NO	ABSTAIN	ABSENT
Commissioner Dandy	☐	☐	☐	☐
Commissioner Long	☐	☐	☐	☐
Commissioner Ford-McCaffrey	☐	☐	☐	☐
Commissioner Morehouse	☐	☐	☐	☐
Commissioner Parks	☐	☐	☐	☐
Commissioner Parvin	☐	☐	☐	☐
Commissioner Pringle	☐	☐	☐	☐
Alt. Commissioner Bennett	☐	☐	☐	☐
Alt. Commissioner Cunningham	☐	☐	☐	☐
Alt. Commissioner Freeman	☐	☐	☐	☐
Alt. Commissioner Smith	☐	☐	☐	☐

Dated:_____ _____

Chair, Ventura Local Agency Formation Commission

Attachments: Exhibit A

Copies: City of San Buenaventura
Ventura County Surveyor
Ventura County Geographic Information Systems Officer
Ventura County Planning Department



LAFCo 13-01S
City of San Buenaventura
Sphere of Influence Review/Update

Legend

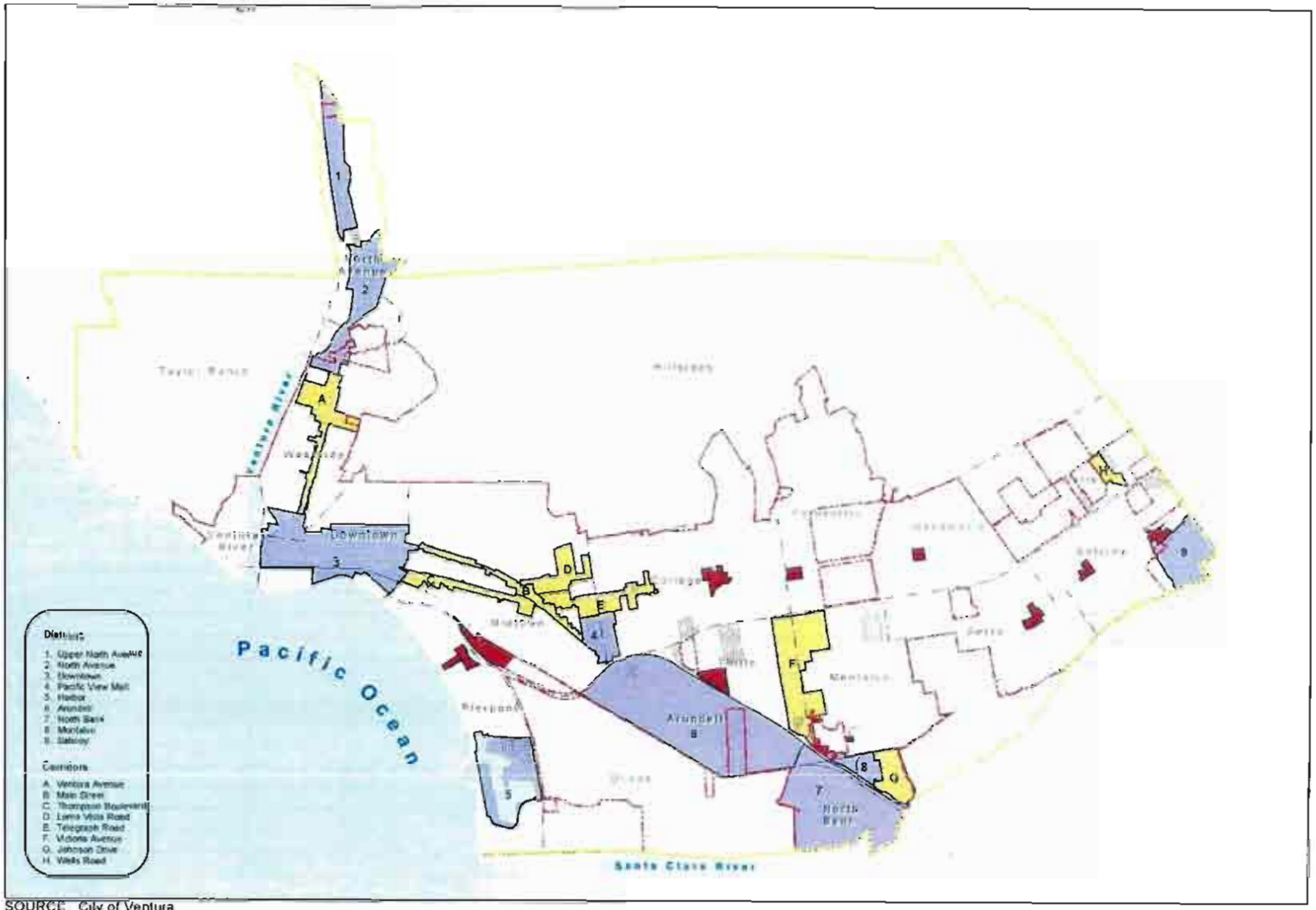
- Current Sphere of Influence
- Area to be Excluded from Sphere
- City of San Buenaventura

Table 3-1. Potential Development Based on Carrying Capacity of Land Area

Planning Designation	Allowed Density (du/acre)	Existing Development 2004					General Plan Capacity			
		Single Family Units	Multi Family Units	Comm./Ind. Sq. Ft.	Parcels	Acres	Vacant Parcels	Vacant Acres	Additional Potential[3] Units	Additional Potential[3] Sq. Ft.
Neighborhood Low	0-8	19,425	3,335	49,386	22,511	4,629	108	426	1,221	
Neighborhood Medium	9-20	1,163	8,965	149,513	4,414	1,061	32	116	4,859	
Neighborhood High	21-54	814	2,468	194,143	1,634	303	8	16	8,477	
Commerce[1]		257	490	4,995,248	1,366	808	95	108	7,892	22,328,276
Industry[2]		29	31	8,299,840	1,037	1,401	89	392	4,724	34,215,483
Public & Institutional		4	0	54,422	66	571				
Park & Open Space		6	0	15,491	264	11,693				
Agriculture		4	0	19,550	154	6,857				
Downtown Specific Plan	21-54	332	1,543	1,795,401	1,174	307	45	20	2,500	450,000
Harbor District		0	310	350,160	10	254	1	21	300	876,100
Total		**22,034**	**17,142**	**15,923,154**	**32,630**	**27,884**	**378**	**1099**	**29,910**	**57,869,859**

1. Commerce residential unit capacity is for property within a Corridor, District, or Neighborhood Center and assumes buildout to the maximum FAR and that 25% of floor area would be commercial (with the remainder residential).
2. Industry residential unit capacity is for property within a Corridor, District, or Neighborhood Center and assumes buildout to the maximum FAR and that 75% of floor area would be industrial (with the remainder residential).
3. "Additional Potential" assumes a historic buildout rate of 70% for both residential and non-residential.

Table 3-2. Predicted Development Intensity & Pattern	Residential Development (units)	Non-Residential Development (square feet)				
		Retail	Office	Industrial	Hotel	Total
DISTRICTS						
Upper North Avenue	100	10,000	50,000	150,000	-	210,000
North Avenue	50	10,000	50,000	250,000	-	310,000
Downtown Specific Plan	1,600	100,000	200,000	-	150,000	450,000
Pacific View Mall	25	25,000	-	-	-	25,000
Harbor	300	315,000	-	-	230,000	545,000
Arundell	200	25,000	300,000	1,000,000	-	1,325,000
North Bank	50	300,000	50,000	300,000	-	650,000
Montalvo	50	-	50,000	25,000	-	75,000
Saticoy	50	-	-	25,000	-	25,000
Subtotals (Districts)	**2,425**	**785,000**	**700,000**	**1,750,000**	**380,000**	**3,615,000**
CORRIDORS						
Ventura Avenue	800	40,000	100,000	50,000	-	190,000
Main Street	100	15,000	40,000	-	-	55,000
Thompson Boulevard	300	15,000	40,000	-	-	55,000
Loma Vista Road	25	15,000	40,000	-	-	55,000
Telegraph Road	250	15,000	40,000	-	-	55,000
Victoria Avenue	50	15,000	40,000	-	-	55,000
Johnson Drive	150	50,000	20,000	-	-	70,000
Wells Road	50	15,000	20,000	-	-	35,000
Subtotals (Corridors)	**1,725**	**180,000**	**340,000**	**50,000**	**0**	**570,000**
SPHERE OF INFLUENCE (SOI)/OTHER INFILL/NEIGHBORHOOD CENTERS						
101/126 Agriculture	200	-	-	-	-	-
Wells/Saticoy	1,050	-	-	-	-	-
Pierpont	100	30,000	-	-	-	30,000
Other Neighborhood Centers	100	-	-	-	-	-
Second Units	300	-	-	-	-	-
Underutilized	250	-	-	-	-	-
Vacant	450	165,000	50,000	-	-	215,000
Subtotals (Other Infill)	**2,450**	**195,000**	**50,000**	**0**	**0**	**245,000**
TOTAL INFILL	***6,600***	***1,160,000***	***1,090,000***	***1,800,000***	***380,000***	***4,430,000***
PLANNED AND PENDING DEVELOPMENTS						
Downtown	50	1,072	-	-	150,000	151,072
Ventura Avenue/Westside	238	7,086	-	27,000	-	34,086
Midtown	34	13,751	-	-	-	13,751
College (Telegraph/Loma Vista)	4	2,718	8,843	-	-	11,567
Telephone Road Corridor	256	-	54,785	-	-	54,785
Montalvo/Victoria	296	-	4,300	-	-	4,300
Saticoy/East End	840	7,950	5,600	-	-	13,550
Arundell	-	41,640	42,614	18,080	-	102,334
Olivas	-	7,160	7,066	390,053	-	404,279
Subtotals (Planned/Pending)	**1,718**	**81,377**	**123,214**	**435,133**	**150,000**	**789,724**
TOTAL (Infill+SOI/Other+Pending)	**8,318**	**1,241,377**	**1,213,214**	**2,235,133**	**530,000**	**5,219,724**

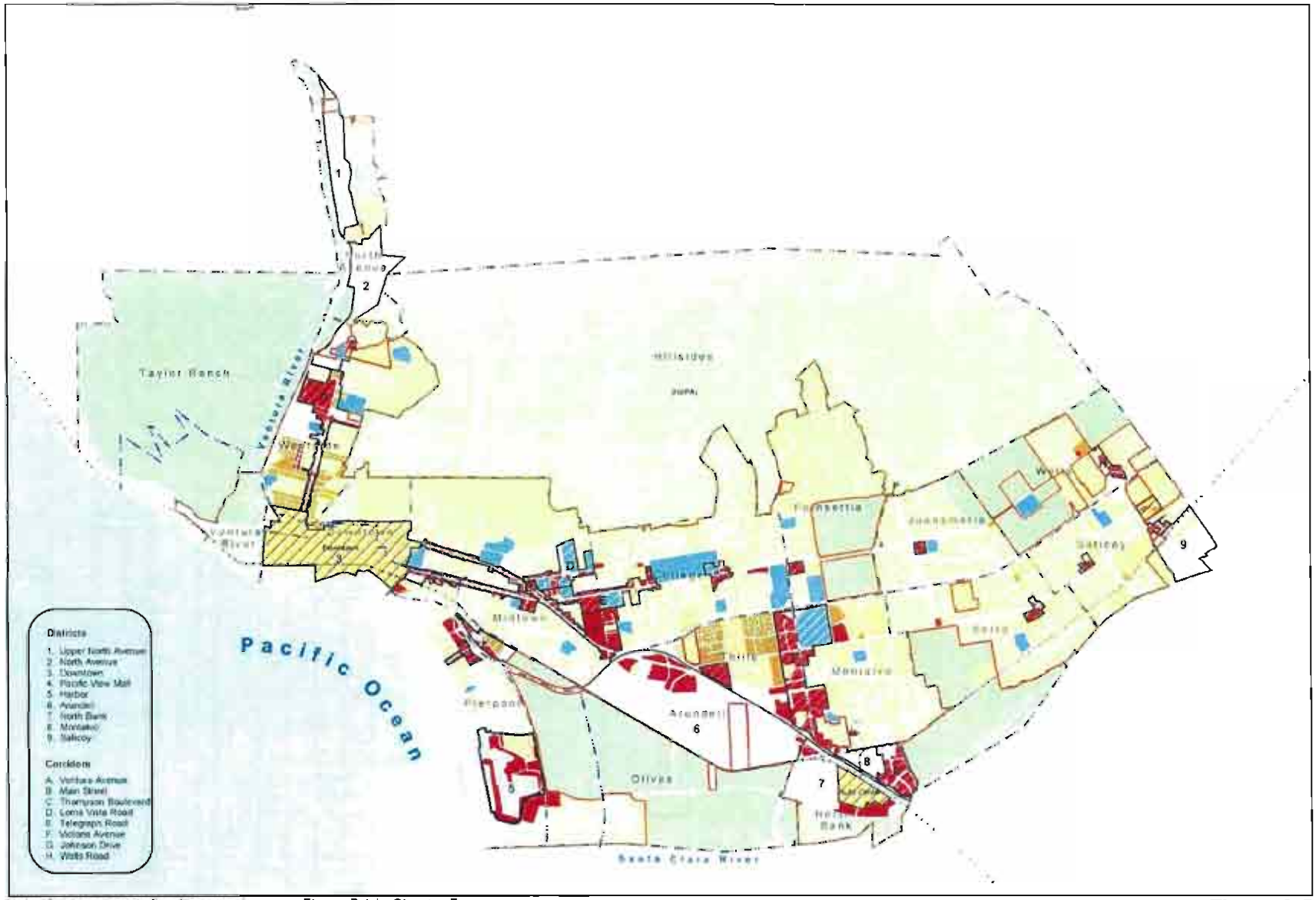


SOURCE City of Ventura

Infill Sites

- Corridor
- Neigborhood Center (NC)
- District
- City Limits
- Planning Boundary
- Planning Neighborhoods

Figure 3-1
Infill Areas



Note: Areas prone to flooding are shown on Figure 7-1 in Chapter 7.

Figure 3-5
GENERAL PLAN DIAGRAM

Neighborhood
- Low (up to 8 du/ac)
- Medium (9-20 du/ac)
- High (21-54 du/ac)

- Commerce
- Industry
- Public and Institutional

- Agriculture
- Parks and Open Space
- Specific Plan Area

- Corridors, Neighborhood Centers (NC)
- Districts

- City Limits
- Planning Communities
- California Coastal Zone Boundary

There are presently five water sources that provide water to the City water system.

- *Casitas Municipal Water District*
- *Ventura River Surface Water Intake, Subsurface Water and Wells (Foster Park)*
- *Mound Groundwater Basin*
- *Oxnard Plain Groundwater Basin (Fox Canyon Aquifer)*
- *Santa Paula Groundwater Basin*

Table 4.13-7 summarizes historic and projected water supply from these sources, as detailed in the 2000 City Urban Water Management Plan. The historic delivery values shown represent the capacity of available sources. The projected numbers in the table estimate available water supply levels under normal, non-drought conditions. Actual water supply levels in any given year may be significantly higher or lower than these averages.

Table 4.13-7
Historic and Projected Water Source Supply Availability
(Acre Feet)

Year	Surface Water		Groundwater				Total Water Supply
	Lake Casitas	Ventura River	Mound Basin	Oxnard Plain Basin	Santa Paula Basin	Saticoy Yard Well	
Historic							
1980	7,544	7,276	0	5,198	2,129	0	22,147
1985	9,099	5,493	2,360	6,172	46	0	23,170
1990	6,175	2,859	4,365	5,749	0	0	19,148
1995	1,622	9,042	2,169	2,603	2,594	0	18,030
1996	4,456	7,926	2,789	2,768	1,599	0	19,538
1997	7,089	7,052	213	3,452	2,025	0	19,831
1998	4,328	8,069	802	4,312	1,033	0	18,544
1999	7,061	6,419	3,955	1,621	1,669	0	20,725
2000	5,836	6,779	4,579	2,674	1,698	0	21,566
2001	6,292	5,727	4,030	905	2,006	0	18,960
2002	7,127	5,951	3,720	1,978	1,157	0	19,933
2003	4,874	6,722	5,546	2,898	316	0	20,356
Projected							
2005	8,000	6,700	4,200	4,400	3,000	0	26,300
2010	8,000	6,700	4,200	4,100	3,000	2,262	28,262
2015	8,000	6,700	4,200	4,100	3,000	2,262	28,262
2020	8,000	6,700	4,200	4,100	3,000	2,262	28,262

Source: City of Ventura Urban Water Management Plan, December 2000
City of Ventura 2004 Biennial Water Supply Report as amended, September 2004 (see Appendix F).

The City generally uses its water supplies in the following order: (1) Ventura River; (2) Lake Casitas; and (3) groundwater basins. Water is used in this order to maximize the amount of surface water that would otherwise be lost to runoff before using stored groundwater.

Table 4.13-8
Historic and Projected Water Production
(Acre Feet)

Year	Estimated Population Served	Per Capita Use (1)	Treated Water Production	Raw Water Production	Total Water Production
Historic					
1980	73,774	0.236	17,381	4,766	22,147
1990	94,856	0.177	16,831	2,317	19,148
1995	99,668	0.165	16,428	1,602	18,030
1996	100,482	0.180	18,038	1,500	19,538
1997	101,096	0.178	18,002	1,829	19,831
1998	101,610	0.165	16,775	1,769	18,544
1999	102,224	0.192	19,658	1,067	20,725
2000	103,238	0.198	20,437	1,129	21,566
2001	104,153	0.173	18,071	889	18,960
2002	105,267	0.180	18,965	968	19,933
2003	106,782	0.183	19,510	846	20,356
Projected					
2005	109,465	0.179	19,594	1,000	20,594
2010	115,774	0.179	20,724	1,000	21,724
2015	122,447	0.179	21,918	1,000	22,918
2020	129,504	0.179	23,181	1,000	24,181

Sources: City of Ventura Urban Water Management Plan, Dec. 2000
City of Ventura 2004 Biennial Water Supply Report as amended, September 2004 (see Appendix F).
(1) Per capita use excludes raw water and oil use.

Water Quality. The following terms are used to describe water quality:

- *Maximum Contaminant Level (MCL): The highest level of a contaminant allowed in drinking water. Primary MCLs are set as close to the Federal Public Health Goals or State Maximum Contaminant Level Goals as is economically and technologically feasible. Secondary MCLs are set to protect the odor, taste and appearance of drinking water.*
- *Primary Drinking Water Standard: MCLs for contaminants that affect health along with their monitoring and reporting requirements, and water treatment requirements.*
- *Maximum Contaminant Level Goal: The level of contaminant in drinking water below which there is no known or expected risk to the health; set by EPA.*
- *Public Health Goal: The level of a contaminant in drinking water below which there is no known or expected risk to health; set by the California EPA.*

Table 4.13-15
Projected Water Demand
Intensification / Reuse Only (Scenario 1)

	Residential		Non-Residential Development						Grand Totals
	Number of Units	Water (AFY)	Retail (sf)	Office (sf)	Industrial (sf)	Hotel (sf)	Total (sf)	Water (AFY)	Water (AFY)
Districts									
Upper North Avenue	100	50	10,000	50,000	150,000		210,000	70	120
North Avenue	50	25	10,000	50,000	250,000		310,000	105	130
Downtown	1,600	807	100,000	200,000		150,000	450,000	168	975
Pacific View Mall	25	13	25,000	0			25,000	7	20
Harbor	300	151	66,000			150,000	216,000	54	205
Arundell	200	101	25,000	300,000	1,000,000		1,325,000	444	545
North Bank	50	25	300,000	50,000	300,000		650,000	204	229
Montalvo	50	25		50,000	25,000		75,000	23	48
Saticoy	50	25	0		25,000		25,000	9	34
Subtotals (Districts)	**2,425**	**1,223**	**536,000**	**700,000**	**1,750,000**	**300,000**	**3,286,000**	**1,084**	**2,307**
Corridors									
Ventura Avenue	800	404	40,000	100,000	50,000		190,000	57	460
Main Street	100	50	15,000	40,000			55,000	15	66
Thompson Boulevard	300	151	15,000	40,000			55,000	15	167
Loma Vista Road	25	13	15,000	40,000			55,000	15	28
Telegraph Road	250	126	15,000	40,000			55,000	15	142
Victoria Avenue	50	25	15,000	40,000			55,000	15	41
Johnson Drive	150	76	50,000	20,000			70,000	20	95
Wells Road	50	25	15,000	20,000			35,000	10	35
Subtotals (Corridors)	**1,725**	**870**	**180,000**	**340,000**	**50,000**	**0**	**570,000**	**163**	**1,033**
SOI/Other Infill									
101/126 Agriculture	200	101					0	0	101
Wells/Saticoy	1,050	530					0	0	530
Pierpont	100	50	30,000				30,000	8	59
Other Neighborhood Centers	100	50						0	50
Second Units	300	151						0	151
Underutilized	250	126						0	126
Vacant	450	227	165,000	50,000			215,000	60	287
Subtotals (Other Infill)	**2,450**	**1,236**	**195,000**	**50,000**	**0**	**0**	**245,000**	**69**	**1,304**
Totals (Intensification/Reuse)	**6,600**	**3,329**	**911,000**	**1,090,000**	**1,800,000**	**300,000**	**4,101,000**	**1,316**	**4,645**
Planned and Pending Developments									
Downtown	50	25	1,072			150,000	151,072	84	110
Ventura Avenue/Westside	238	120	7,086		27,000		34,086	12	132
Midtown	34	17	13,751				13,751	4	21
College (Telegraph/Loma Vista)	4	2	2,718	8,849			11,567	3	5
Telephone Road Corridor	256	129		54,785			54,785	15	144
Montalvo/Victoria	296	149		4,300			4,300	1	151
Saticoy/East End	840	424	7,950	5,600			13,550	4	427
Arundell		0	41,640	42,614	18,080		102,334	30	30
Olivas		0	7,160	7,066	390,053		404,279	142	142
Subtotals (Planned/Pending	**1,718**	**867**	**81,377**	**123,214**	**435,133**	**150,000**	**789,724**	**295**	**1,162**
Totals (Intensification + Expansion + Pending)	**8,318**	**4,196**	**992,377**	**1,213,214**	**2,235,133**	**450,000**	**4,890,724**	**1,611**	**5,806**

2.3 Population

The City water service area is essentially an established community comprised primarily of residential areas with opportunities for infill development. Large commercial and industrial areas exist along Main Street, Harbor Boulevard, Telephone Road, Ventura Avenue, Telegraph Road and Victoria Avenue[2]. In 2005, the City of Ventura adopted the 2005 Ventura General Plan to redirect future growth toward 'Infill First' with an emphasis on encouraging more intense development of housing alongside commercial uses in the above mentioned commercial corridors, as well as Johnson Drive and Wells Road. The City's estimated population growth for the water service area is shown in Table 2-1. The population numbers reflect both the population within the City of Ventura limits as well as the population served by the public water system that is not within the City limits. Historical population data within the City is based entirely from the California Department of Finance Table E-4 Population Estimates for Cities, Counties, and the State with 2000 Benchmark. Historical population for the areas served by the water system that are outside of the City are based on the number of connections, multiplied by 2.57 persons per connection[3].

Future projections for areas within the City reflect a 0.88 percent annual growth rate based on the City's General Plan. Projections for areas served by the water system outside of the City are based on the historical annual growth rate of 0.1258 percent in the number of connections. Population estimates were extrapolated to fit 5 year increments. It is important to note that these figures are not intended to represent support for, nor reflect any commitment to, this level of growth. Rather, it is to provide a safe margin in planning for long-term water improvements that might be needed given the amount of growth that could be allowed under the City's 2005 updated General Plan as assessed in the certified EIR. Included for comparison is the EIR population projection for 2025 reflecting the two possible growth scenarios: (1) 1.14 percent annual population growth, which is equivalent to the annual growth rate in the City from 1984 to 2004; and (2) 0.88 percent annual population growth, which is equivalent to the annual growth from 1994 to 2004.

TABLE 2-1
POPULATION PROJECTIONS

	2010	2015	2020	2025	2030	2035
Projected Planning Area Population	113,478	118,416	123,575	128,963	134,592	140,472
General Plan EIR (0.88%)	-	-	-	126,153	-	-
General Plan EIR (1.14%)	-	-	-	133,160	-	-

Note: General Plan EIR only provides estimate for year 2025.

2.4 Existing and Target Per Capita Water Use

2.4.1 Base Daily Per Capita Water Use for SBX7-7 Reduction

As described in Senate Bill 7 of Special Extended Session 7 (SBX7-7), it is the intent of the California legislature to increase water use efficiency. The legislature has set a goal of a 20 percent per capita reduction in urban water use statewide by 2020. The requirements of

[2] City of San Buenaventura Water Master Plan, 2011.
[3] Based on City's General Plan Environmental Impact Report (EIR) dated 2005.

TABLE 2-5
PAST, CURRENT, AND PROJECTED WATER DEMANDS (AFY)

	Single-Family	Multi-Family	Commercial	Industrial	Institutional/ Governmental	Landscape	Petroleum Recovery Operations	Other	Total
2005	7,483	3,887	4,279	163	541	1,079	930	2,447	20,808
2010	7,006	3,678	3,384	64	495	1,044	368	1,312	17,351
2015	9,197	4,562	4,551	163	690	1,416	400	1,306	22,286
2020	9,615	4,761	4,749	170	720	1,478	400	1,363	23,256
2025	10,052	4,969	4,956	178	751	1,542	400	1,423	24,270
2030	10,508	5,185	5,173	185	784	1,610	400	1,485	25,330
2035	10,984	5,412	5,399	193	818	1,680	400	1,550	26,436

Note: 2005 and 2010 are actual demands. 2015 and beyond are projected.

TABLE 2-6
WATER SERVICE ACCOUNTS

	Single-Family	Multi-Family	Commercial	Industrial	Institutional/ Governmental	Landscape	Petroleum Recovery Operations	Other	Total
2005	22,834	2,269	2,537	15	193	222	2	2,966	31,038
2010	23,158	2,372	2,536	4	185	258	2	3,131	31,646
2015	25,627	2,545	2,733	7	200	279	2	3,375	34,769
2020	24,953	2,481	2,664	7	195	272	2	3,291	33,865
2025	26,095	2,590	2,781	7	204	283	2	3,434	35,396
2030	27,288	2,703	2,902	7	213	296	2	3,584	36,994
2035	28,534	2,821	3,029	8	222	309	2	3,741	38,665

Note: 2005 and 2010 are actual demands. 2015 and beyond are projected.

TABLE 3-1
SUMMARY OF WATER SUPPLY SOURCES

Water Supply Sources (AFY)	2010	2015	2020	2025	2030	2035
Existing Supplies						
Imported Wholesale Supplies						
Casitas Municipal Water District[a]	6,000	6,000	6,100	6,200	6,500	7,000
Supplier Produced Groundwater						
Mound Basin[b]	4,000	4,000	4,000	4,000	4,000	4,000
Oxnard Plain Basin[b]	4,100	4,100	4,100	4,100	4,100	4,100
Santa Paula Basin[b]	1,600	1,600	1,600	1,600	1,600	1,600
Supplier Produced Surface Water						
Ventura River (Foster Park)[b]	4,200	4,200	4,200	4,200	4,200	4,200
Recycled Water[c]	700	700	700	700	700	700
Transfers in	None	None	None	None	None	None
Exchanges in	None	None	None	None	None	None
Desalinated Water	None	None	None	None	None	None
Other	None	None	None	None	None	None
Total Existing Supplies	***20,600***	***20,600***	***20,700***	***20,800***	***21,100***	***21,600***
Planned Supplies						
Supplier Produced Groundwater						
Mound Basin (Well No. 2)[d]	0	0	0	0	0	0
Oxnard Plain Basin (Golf Course Well No. 7)[d]	0	0	0	0	0	0
Santa Paula Basin (Saticoy Well No. 3)[e]	0	1,400	1,400	1,400	1,400	1,400
Supplier Produced Surface Water						
Ventura River (Foster Park Wells Improvements)	0	0	2,500	2,500	2,500	2,500
Total Planned Supplies	***0***	***1,400***	***3,900***	***3,900***	***3,900***	***3,900***
Total Existing and Planned Supplies	***20,600***	***22,000***	***24,600***	***24,700***	***25,000***	***25,500***
FCGMA Groundwater Credit[f]	***30,000***	***22,000***	***22,000***	***22,000***	***22,000***	***22,000***

Notes:
(a) Estimated demand based on population growth within the Casitas service area served by Ventura Water .
(b) Average annual supply based on 2011 City of San Buenaventura Water Master Plan, Table V-14.
(c) Based on current and expected usage.
(d) Replacement wells for supply reliability.
(e) Well will allow full use of 1996 stipulated Judgment allocation.
(f) FCGMA Groundwater Credit is drought/reliability supply source; not a firm supply available for new development. 30,249 AF available for 2010 per Water Master Plan (See Oxnard Plain supply description, Section 3.3.1.2.) reduced to 22,000 AF by 2015 in the event of a drought or operational/production/treatment constraints from other supply sources.

3.2 Imported Supplies

The City has a contract Table A Amount of 10,000 AFY of State Water Project (SWP) water with DWR. However, there are no facilities to deliver this water to the City. The following describes the history of this allocation and the potential for future use of SWP supply.

In 1964, Ventura County Flood Control District contracted with the State of California for future delivery of up to 20,000 AFY of SWP water to Ventura County. In 1971, administration of the contract for SWP water was assigned to Casitas. The City executed an agreement in 1971 with Casitas and the Department of Water Resources (DWR) to allocate 10,000 AFY of the

B. EXISTING LAND USE

The City water service area is essentially a built-out community comprised primarily of residential areas. Large commercial and industrial areas exist along Main Street, Harbor Boulevard, Telephone Road, Ventura Avenue, Telegraph Road and Victoria Avenue. A large amount of land within the General Plan Boundary, over 11,500 acres, is dedicated to parks and open space.

Existing land use information was compiled from the 2005 General Plan. The various land use types and densities that are located within the City General Plan Boundary are listed in Table II-1.

Table II-1
Existing Land Use within City General Plan Boundary

Planning Designation	Allowed Density (du/acre)	Area (acres)
Neighborhood Low	0 – 8	4,629
Neighborhood Medium	9 – 20	1,061
Neighborhood High	21 – 54	303
Commerce/Mixed Use	N/A	808
Industry	N/A	1,401
Public and Institutional	N/A	571
Park and Open Space	N/A	11,693
Agriculture	N/A	6,857
Downtown Specific Plan	21 – 54	307
Harbor District	N/A	254
Total	-	**27,884**

Note: The difference in land use area stated in Table II-1 and Exhibit II-1 is due to the fact that Table II-1 does not include the area for vacant or additional potential parcels, however Exhibit II-1 does.

Refer to Exhibit II-1 at the end of this Section for the Land Use Map.

C. FUTURE LAND USE

The number of customers served from the City's water system is expected to increase due to planned future developments and changes in land use. Land use changes will impact the operation of the City's distribution system. Proper planning for these changes will enable the City to continue to meet demands, provide adequate fire protection and provide quality service to its customers.

Most of the land within the City's existing water service area is developed. Anticipated changes in land use will primarily occur through redevelopment of existing land and small developments

(in-fill projects) in the various vacant parcels scattered throughout the City. This section will be broken down to describe the anticipated near-term developments and redevelopments and the ultimate build-out of the City as identified by the 2005 General Plan.

1. Near-Term Developments and Redevelopments

The City's Community Development Department compiles proposed and current development projects throughout the entire City in a Pending Project Status Report. These projects are considered to be near-term because some level of planning has occurred and the projects are anticipated to be completed within the next 2-3 years (it should be noted that some of the projects identified below may have begun construction or have been completed at the time of finalization of this report). The majority of the projects are redevelopments of commercial land and new residential developments. Refer to Exhibit II-2 for the locations of the near-term projects as identified in the January 2006 Pending Project List and Appendix A for a list of the projects. See Table II-2 for a summary of the near-term land use.

Table II-2
Near-Term Land Use Summary

General Plan Land Use Category	Acreage	DU
Neighborhood Low (NL)	221	662
Neighborhood Medium (NM)	188	699
Neighborhood High (NH)	41	256
Commerce/Mixed Use (C)	78	459
Industry (I)	86	-
Public and Institutional (PI)	19	-
Parks and Open Space (POS)	440	-
Downtown Specific Plan (DTSP)	23	445
Total	**1,097**	**2,521**

A few of the larger near-term projects anticipated within the City water service area are listed in Table II-3.

Table II-3
Large Near-Term Development Project Summary

Project Name	Project Address	DU	Acreage	Land Use Category	Project Number
Parklands	Southwest corner of Wells Rd & Telegraph Rd	252	66.7	NM	RS-99
Parklands	Southwest corner of Wells Rd & Telegraph Rd	235	-	NL	RC-85
Harmony	South of Thille Rd @ Ringo St	182	15.8	NH	RC-61
Island View	NW Corner of Hill Rd and Moon Dr	120	26.9	NM	RS-87
The Grove	Copland Dr & Telephone Rd	75	25.6	NM	RS-98
Melody	Northwest corner of Telegraph Rd & Saratoga	74	15.7	NH	RC-64
Hails	Henderson Rd, West of Montgomery	172	40.1	NL	RS-92
Hails	Henderson Rd, West of Montgomery	60	-	NL	RC-70

2. Ultimate Build-out

The ultimate build-out is classified as projects expected to occur at some point in the future, but planning stages of the projects has yet to begin. These projects include the anticipated development of all vacant parcels within the City's potential water service area not included in the near-term development summary, as identified in the 2005 General Plan. The total area of vacant land that can be ultimately developed are summarized by Land Use Types in Table II-4. Further discussion of the demands generated by the build-out of all vacant lands is described in Section IV.

Table II-4
Existing Vacant Lands by Land Use (2005 General Plan Capacity)

Planning Designation	Allowed Density (du/acre)	Area (acres)
Neighborhood Low	0 – 8	426
Neighborhood Medium	9 – 20	116
Neighborhood High	21 – 54	16
Commerce	N/A	621
Industry	N/A	1,178
Public and Institutional	N/A	0
Park and Open Space	N/A	0
Agriculture	N/A	-
Downtown Specific Plan	21 – 54	30
Harbor District	N/A	41
Total	-	**2,428**

Table V-14
Summary of Current Water Supply

Water Supply Source	Historical Supply Projection (AFY)	Average Annual Supply (2000-2009) (AFY)	Present Operational Supply Constraint (AFY)
Casitas	4,960 – 8,000	6,200	6,200
Ventura River (Foster Park)	4,200 – 6,700	4,200	4,200
Mound Groundwater Basin	2,500 – 4,000	4,000	5,500 [1]
Oxnard Plain Groundwater Basin	4,100	4,100	6,775 [2]
Santa Paula Groundwater Basin	3,000	1,340	1,600 [3]
Total	**18,760 – 25,800**	**19,840**	**24,275**

[1] Assumes two wells operational, one well at 1,500 gpm and one at 2,000 gpm

[2] Assumes two wells operational at 2,100 gpm each.

[3] Assumes one well operational at 1,000 gpm.

B. POTENTIAL WATER SUPPLY

A water supply capacity evaluation is described later in this report (Section VIII). This section will briefly describe any planned or proposed projects which may affect the water supply sources for the City.

1. State Water Project

The City also has a 10,000 acre-foot per year allocation from the California State Water Project (SWP). The base contractual agreements concerning the City's annual entitlement to 10,000 acre-feet of SWP are: (1) the 1963 State Water Supply Contract of 20,000 acre-feet entitlement of SWP water between the Department of Water Resources (DWR) and Ventura County Watershed Protection District (VCWPD) known formerly as Ventura County Flood Control District (VCFCD); (2) the 1970 agreement between VCFCD and Casitas known formerly as the Ventura Municipal Water District that assigned the 20,000 acre-feet entitlement to Casitas; and (3) the 1971 agreements between Casitas and the City providing the City with an annual entitlement of 10,000 acre-feet and Casitas and United providing United with an annual entitlement of 5,000

VENTURA LOCAL AGENCY FORMATION COMMISSION

MUNICIPAL SERVICE REVIEWS

Nine Ventura County Cities

Cities of:

Camarillo
Fillmore
Moorpark
Ojai
Oxnard
San Buenaventura
Santa Paula
Simi Valley
Thousand Oaks

Prepared By

Ventura Local Agency Formation Commission
800 S. Victoria Avenue
Ventura, CA 93009-1850

Accepted November 14, 2012

2012 MUNICIPAL SERVICE REVIEWS

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INTRODUCTION

Local Agency Formation Commissions ("LAFCos"), which exist in each county in California, were formed for the purpose of administering state law and local policies relating to the establishment and revision of local government boundaries. As provided by what is now known as the Cortese-Knox-Hertzberg Local Government Reorganization Act of 2000 (California Government Code Section 56000 et seq.), LAFCos are responsible for achieving three primary objectives: encouraging the orderly formation and expansion of local government agencies; preserving agricultural land and open space resources; and discouraging urban sprawl. To accomplish their objectives, LAFCos are responsible for coordinating logical and timely changes in local government boundaries, conducting special studies that review ways to reorganize and streamline governmental structure and preparing a sphere of influence for each city and special district over which they have authority. A sphere of influence is a plan for the probable physical boundaries and service area of a local agency, as determined by LAFCo (Government Code §56076).

Beginning in 2001 each LAFCo was required to review and, as necessary, update the sphere of each city and special district on or before January 1, 2008, and every five years thereafter (Government Code §56425(g)). Prior to updating a sphere of influence, LAFCo is required to conduct a municipal service review (service review" or "MSR"). California Government Code §56430(a) provides that MSRs consist of written determinations relating to the following seven factors:

1. Growth and population projections for the affected area.
2. The location and characteristics of any disadvantaged unincorporated communities within or contiguous to the sphere of influence.
3. Present and planned capacity of public facilities, adequacy of public services, and infrastructure needs or deficiencies including needs or deficiencies related to sewers, municipal and industrial water, and structural fire protection in any disadvantaged, unincorporated communities within or contiguous to the sphere of influence.
4. Financial ability of agencies to provide services.
5. Status of, and opportunities for, shared facilities.
6. Accountability for community service needs, including governmental structure and operational efficiencies.
7. Any other matter related to effective or efficient service delivery, as required by Commission policy.

Municipal service reviews are:

- The written determinations adopted by a LAFCo for the services provided by cities and special districts.
- Not applicable to counties, except for special districts governed by a county board of supervisors.
- May include studies of private providers of public services, such as private water companies or public utilities regulated by the state Public Utilities Commission.
- Not investigations. While authorized to prepare studies relating to their role as boundary agencies, LAFCos have no investigative authority.

Between 2002 and 2007, the Ventura LAFCo completed 21 MSRs and 57 sphere of influence reviews/updates among 10 cities and 50 special districts. The first MSR for the cities was completed in 2007.

The MSRs contained in this report examine each of the cities in Ventura County except the City of Port Hueneme. The City of Port Hueneme is surrounded by the City of Oxnard on three sides and the Pacific Ocean on the fourth, and the City boundary and sphere of influence are co-terminus. As there is no further opportunity for the City to expand beyond its current boundary and sphere of influence, LAFCo has determined that no sphere of influence review or MSR is necessary.

The information used to prepare this service review report was obtained from several sources, including:

- 2012 MSR Questionnaire - Each city was requested to complete a questionnaire, which collected general information about the city (contact information, governing body, financial information, etc), as well service specific data.
- City Budgets – Information regarding services and funding levels was obtained from the adopted budgets of each city.
- General Plans – Each city's General Plan provided information regarding land use, populations, and service levels.
- City Documents – Various city documents were used to obtain supplementary information relating to service provision, including, but not limited to, 2010 urban water management plans, wastewater master plans, and water master plans.
- City Websites – Provided information primarily regarding parks and recreation, fire protection, and police services.
- City Staff – City staff provided information that was either not available or not clear in the above documents.

The 2007 MSR prepared for the cities utilized financial information obtained from *The Cities Annual Report* published annually by the State Controller. The Annual Report is a comprehensive listing of each agency's revenue and expenditures specific to municipal services. At the time that the 2012 MSRs were being prepared, the latest Cities Annual Report that was available was for fiscal year 2009-10. Thus, it did not provide any information for the current or previous two fiscal years and its use would not have adequately portrayed the current fiscal realities of each city.

This report contains nine city MSRs, one in each of the nine main sections. Each of the nine sections is divided into four subsections, which include:

- Profile – This subsection contains a summary profile of important information for each city, including contact information, the governing body, financial information, and staffing levels;
- Growth and Population Projections – This subsection provides past, current, and projected population for each city. As necessary, a discussion of future anticipated development is provided;
- Review of Municipal Services – This subsection contains a discussion of the municipal services that each city provides; and
- Written Determinations – This subsection contains the recommended determinations for each of the seven mandatory factors for each city.

The appendices include:

- Appendix A – This appendix provides comparison tables summarizing key information discussed in the MSRs, including each city's geographic area, population, services that are provided, and funding amount for specific services.
- Appendix B – This appendix provides a discussion on the challenges that each city faces to fund future street maintenance services.

The result of this report will be the adoption of determinations by LAFCo, via a separate resolution for each city addressing each of the seven mandatory factors, based on the recommendations in the Written Determinations subsection of each MSR. Everything else in this report should be considered as background information.

CITY OF SAN BUENAVENTURA
PROFILE

Contact Information	
City Hall:	501 Poli Street, Ventura, CA 93001
Mailing Address:	PO Box 99, Ventura, CA 93002
Phone Number:	(805) 654-7800
Web Site	www.cityofventura.net
E-mail	*firstinitiallastname*@ci.ventura.ca.us

Governance Information	
Date Incorporated	March 10, 1866
Organization	City Charter
Form of Government	Council - Manager
City Council	• Seven member city council; members elected at-large to staggered, four year terms of office; elections held in odd numbered years; Mayor elected by the city council to a two year term • The city council regularly meets on Monday each week, except during August and on holidays. The meetings begin at 6:00 p.m. City Council meetings are broadcast live on the City's government cable TV channel

Population & Area Information

	Population	Area (sq. mi.)
City	107,166 [1]	21.99
Sphere of Influence	Not available	35.44[2]

Services

Floodplain Management	Parks
Community Development	Police
Fire	Sewers (collection & treatment)[3]
Emergency Medical Services	Streets & Highways (inc. storm drains)
General Government	Street Lighting
Golf Courses	Street Trees & Landscaping
Libraries	Water
Parking Facilities	

[1] CA Dept. of Finance estimate Jan. 1, 2012
[2] Includes approximately 10.07 square miles of Pacific Ocean
[3] The Montalvo Community Services District provides these services for the Montalvo Community

Staffing – Full Time Equivalent Positions[1]

Departments	2008-09	2009-10	2010-11	2011-12	2012-13
- General Government					
City Attorney	7.00	7.60	7.10	7.10	7.30
City Manager/City Clerk	18.50	10.75	7.00	7.00	8.00
Finance and Technology	47.75	46.50	46.50	49.00	47.75
Human Resources	13.00	12.75	12.75	12.00	12.25
- Community Development[2]	33.50	28.90	46.75	46.90	46.90
- Parks, Recreation & Community Partnerships[3] (Community Services)	32.25	32.25	62.25	65.00	56.25
- Public Safety					
Fire[4]	112.00	103.75	74.00	74.00	83.00
Police	185.25	172.00	161.00	1610	165.00
- Public Works	226.50	217.60	177.50	177.50	83
- Ventura Water	0	0	0	0	98.60
Total	**675.75**	**632.10**	**594.85**	**599.5**	**608.05**

Public Agencies with Overlapping Jurisdiction

Casitas Municipal Water District
Fox Canyon Groundwater Management Agency
Montalvo Community Services District
Saticoy Sanitary District
South Coast Area Transit
United Water Conservation District
Ventura County Air Pollution Control District
Ventura County Transportation Commission
Ventura County Watershed Protection District
Ventura Port District
Ventura Regional Sanitation District
Ventura Unified School District

[1] Source: City of San Buenaventura staff, September 27, 2012
[2] The 2010-11 increased staffing is primarily due to relocation of the Building and Safety division from the Fire Department to the Community Development Department
[3] The 2011-12 increased staffing is primarily the result of department restructuring
[4] The 2010-11 reductions due to reduction of 9 sworn personnel and the reorganization which moved building and safety functions to Community Development

Summary Financial Information[1]

Revenues

	2009-10 Actual	2010-11 Actual	2011-12 Actual	2012-13 Adopted	2013-14 Adopted
General Fund					
General Government					
City Attorney	1,063,789	368,941	457,156	0	0
City Manager/City Clerk	37,440	34,126	3,593	1,100	1,100
Finance and Technology					
- Property tax	20,647,117	17,747,281	19,862,975	21,205,522	19,552,847
- Sales tax	14,598,479	13,749,457	14,231,683	14,359,979	15,197,873
- Utility users tax	9,019,830	8,719,233	8,774,362	8,963,885	8,674,953
- Franchise tax	3,713,057	2,984,316	3,278,468	4,089,964	4,346,250
- Transient lodging	3,707,592	3,477,798	3,431,094	3,500,743	3,500,743
- Transfers - other funds	2,315,080	3,208,128	1,108,790	1,843,613	1,619,310
- State motor vehicle license	8,480,754	8,194,617	8,342,441	7,841,913	7,945,913
- Other revenue	14,702,434	13,988,296	11,736,134	17,301,011	17,731,005
Human Resources	18,859	12,238	6,120	300	300
Community Development	1,065,929	909,352	1,533,323	1,933,684	1,229,585
Parks, Recreation, & Community Partnerships	2,218,786	2,219,923	2,692,310	2,549,919	2,572,919
Public Safety					
Fire	2,984,246	1,200,614	1,050,412	1,229,241	1,132,241
Police	4,101,850	2,401,356	2,038,697	2,115,300	2,115,300
Public Works	1,011,388	968,014	138,934	132,666	157,666
Total General Fund	**89,686,630**	**80,183,690**	**78,686,492**	**87,068,840**	**85,778,005**
Total Building & Safety Fund	--	**1,985,918**	**2,308,762**	**1,741,385**	**1,726,099**
Ventura Water[2]					
Wastewater	--	--	--	19,782,428	20,428.911
CIP - Wastewater	--	--	--	11,115,000	4,865,000
Water	--	--	--	23,586,955	25,345,631
CIP - Water	--	--	--	19,896,497	10,850,000

[1] City of San Buenaventura Adopted Budget for Fiscal Years 2012-13 & 2013-2014 and Adopted Budget for Fiscal Year 2011-12

[2] Ventura Water became operational in 2011

Expenditures

	2009-10 Actual	2010-11 Actual	2011-12 Actual	2012-13 Adopted	2013-14 Adopted
General Fund					
General Government					
City Attorney	2,202,140	1,304,185	1,331,314	1,711,112	1,622,315
City Council	240,580	210,876	195,057	231,421	299,091
City Manager/City Clerk	2,265,694	1,776,925	1,150,956	1,537,376	1,502,960
Finance and Technology	10,766,376	10,087,345	12,561,756	16,809,442	11,729,298
Human Resources	1,952,090	958,777	758,217	1,048,815	1,001,014
Community Develop.	4,601,367	3,629,692	5,030,789	5,461,141	5,247,886
Parks, Rec, & Comm. Partnerships	6,484,203	6,348,738	11,096,801	11,861,865	11,953,828
Public Safety					
Fire	19,648,534	15,715,345	14,421,806	15,308,562	15,947,264
Police	30,024,089	27,852,555	27,310,957	27,416,970	28,747,808
Public Works	13,938,077	12,449,124	6,034,469	7,405,073	7,726,541
Total General Fund	**89,921,010**	**79,029,377**	**79,892,122**	**88,791,777**	**85,778,005**
Total Building & Safety	--	**2,077,472**	**2,222,923**	**1,741,385**	**1,726,099**
Ventura Water[1]					
Wastewater	--	--	3,252,299	19,782,428	20,428,911
CIP - Wastewater	--	--	127,718	11,115,000	4,865,000
Water	--	--	4,312,605	23,586,955	25,345,631
CIP - Water	--	--	0	20,697,789	10,850,000

[1] Ventura Water became operational in 2011

GROWTH AND POPULATION PROJECTIONS

City Annual Growth Projections

According to the US Census, from 2000 to 2010, the City increased in population from 100,916 to 106,433. The California Department of Finance estimates the City's population to be 107,166 as of January 1, 2012. Thus, from 2000 to 2012, the City grew by an estimated 6,250 people, or 6.19 percent. This 6.19 percent growth rate over 12 years equates to an estimated average annual growth rate of 0.52 percent. The following table reflects the City's projected population in 5 year increments based on this estimated rate of growth. The table also reflects the annexation of the community of Montalvo to the City in 2012:

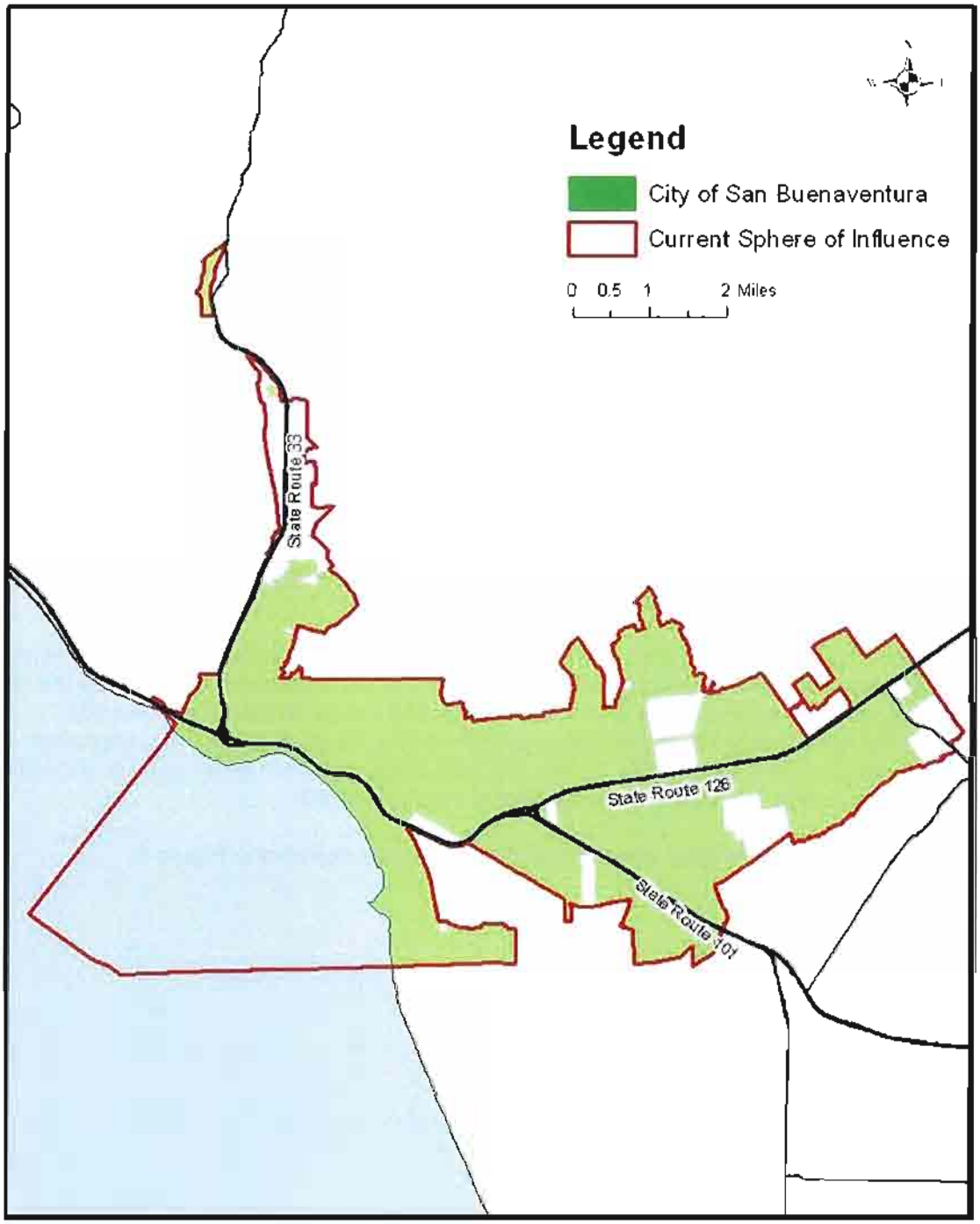
	2012	**2015**	**2020**	**2025**	**2030**
City Population	107,166	108,847	111,706	114,641	117,653
Montalvo	632	632	632	632	632
Total Population	**107,798**	**109,479**	**112,338**	**115,273**	**118,285**

The City updated its General Plan in 2005. The EIR prepared for the update included population projections based on an annual growth rate of 0.88 percent (average from 1994-2004) and a 2004 population of 104,952. The projections used in the General Plan would result in an estimated 2012 population of approximately 112,500, substantially higher than the current estimate by the Department of Finance. Thus, it appears that the anticipated growth rate projected in the General Plan EIR is overestimated based on the most recent population estimate from the California Department of Finance.

According to City Planning staff, the City has approved 2,434 residential units that have not yet been constructed. Using the average 2.57 person per household identified by the US Census, development of these units would add 6,255 people to the City. If the 685 residential units that are currently being considered for approval are, in fact, approved, it would add another 1,760 people. When the total population from these units is added to the current population, it results in a population of nearly 116,000.

The City's current boundary and sphere of influence are depicted in Figure 6.

Figure 6: City of San Buenaventura Sphere of Influence



REVIEW OF MUNICIPAL SERVICES

The following review of City services is based on provisions of state law requiring LAFCo to make determinations regarding the present and planned capacity of public facilities, the adequacy of public services, infrastructure needs and deficiencies and the City's financial ability to provide these services.

A. Fire Services

The City's Fire Department is an "all risk" department providing emergency medical response (paramedic), fire prevention, fire suppression, hazmat inspection/response, ocean rescue, and urban search and rescue throughout the City. Ambulance services are provided via a County contract with American Medical Response.

Fire Stations

The City operates 6 fire stations, each of which contains a fire engine company. In addition, a paramedic is assigned to each engine. Each station is located within a primary response area, or sector:

Sector 1 – Includes the west end of the City and western portion of downtown
Sector 2 – Includes eastern downtown, midtown and the harbor area
Sector 3 – Generally includes the northern-central area of the City
Sector 4 – Generally includes the southern central area of the City
Sector 5 – Generally includes the southeast portion of the City
Sector 6 – Includes the eastern portion of the City

According to responses to the MSR questionnaire, in addition to these primary response sectors, the Fire Department has entered into a contract with the County to provide initial response to the "North Ventura Avenue" area located outside City boundaries. Mutual aid agreements also provide for fire response to all areas located outside of the City. In addition, the City has entered into a reciprocity agreement with the City of Oxnard to provide emergency mutual aid.

Response Times

	Goal	Average Time	Percentage of Responses Meeting Goal
Non Emergency	No goal	2011: 6 min. 56 sec. 2012 (1st quarter): 6 min 32 sec	Not tracked
Emergency	Under 5 min. 90% of the time	2011: 5 min. 11 sec. 2012 (1st quarter): 4 min. 48 sec.	2010: 48% 2011: 48% 2012 (1st quarter): 58%

In 2010 and 2011, on average the City met its response time goal for less than half of all emergency calls. That percentage increased substantially at the beginning of 2012. The inability to meet the response time goal more than half the time in 2010 and 2011 appears to the be directly related to the City's closure of the fire station in Sector 4 in 2010 due to budgetary constraints. As a result of this closure, staffing levels fell to those of 1974 and

response times in the eastern half of the City met the City's goal only 16 percent of the time[1]. In mid 2011, the City was awarded a $2.3 million grant from the Department of Homeland Security to reopen the fire station. However, in order to receive the grant, the City had to contribute an additional $1.2 million. The City estimates that the $3.5 million would fund operation of the fire station for approximately three years ($1.2 million per year). The decreased level of service was a significant concern for the Ventura LAFCo during its consideration of a 2011 annexation proposal to the City (LAFCo 11-06 Parklands), so much so that LAFCo conditioned its approval on the City's acceptance of the $2.3 million grant. In late 2011 the City identified a source of funding for its share of the cost, received the grant, increased staff by 9 firefighter/medic positions, and reopened the fire station in January 2012.

Current Staffing Levels
The following Fire Department staffing levels are currently provided:

Administration	1 Fire Chief 1 Management Analyst 1 Secretary
Operations	1 Assistant Fire Chief 1 Battalion Chief - Training 3 Battalion Chiefs 1 EMS Coordinator 1 Secretary 21 Fire Captains 21 Fire Engineers 24 Firefighter/paramedics
Prevention	1 Fire Marshal 1 Secretary 2 Fire Prevention Specialists 1 Fire Prevention Technician 2 Hazmat Inspectors

The *Ventura Fire Department and Police Department Operational Details Report*, (ODR) dated February 15, 2012, was prepared to assist the City in understanding various operational aspects of the Fire Department. It included an analysis of the City's Fire Department staffing levels. According to the ODR, 25 Fire Captains, 25 Fire Engineers, and approximately 28 Firefighter/Paramedics are needed to sufficiently staff the City's six fire stations. In addition to responding to calls, this level of staffing allows for adequate time for incident documentation, apparatus and station maintenance, training, and various administrative tasks. It also minimizes the use of overtime to backfill minimum staffing slots due to personnel vacancies or personnel who are on various types of leave. The ODR recommends that either the Department be staffed with sufficient employees so that a capacity exists to frequently cover the absence of one shift worker without requiring overtime; or provide additional budgeted overtime to cover staff vacancies when needed. However, the ODR notes that excessive overtime can lead to staff "burnout".

[1] Ventura LAFCo 11-06 staff report, dated October 19, 2011

Costs
The adopted 2012-13 budget allocates $15,308,562 from the General Fund for fire services, an increase on nearly $900,000 from the last year's budget. The per capita cost for 2012-13 is approximately $142.

Future Staffing Levels

According to the City's response in the 2012 MSR questionnaire, the federal grant and required matching funds that enabled the Sector 4 fire station to reopen will fund operation of the fire station through November 2014. In order to avoid the substantial decrease in fire protection services in 2015 and beyond, the City will need to identify alterative long-term funding sources to keep all existing fire stations operational.

If the increased service demands anticipated from the over 8,000 estimated residents resulting from currently approved and proposed development projects are considered, the ODR staffing level recommendation would need to be further increased.

B. Library Services

The City of Ventura is served by two public libraries: the E.P. Foster Library, located downtown, and the Avenue Library, located on the west side of the City on Ventura Avenue. The libraries are administered and staffed by the Ventura County Library System.

Due to budget constraints, the H.P Wright Library, which provided services to the eastern portion of the City, was closed in November 2009. In May 2012 the City adopted a Library Strategic Plan, which identifies a 5-year plan during which current services/facilities are to be enhanced and a new library branch is to be constructed to serve the east side of the City by 2017.

Costs
According to the Library Strategic Plan, the amount of revenue received from property taxes is $17 per capita. The City provides an additional $90,000 per year and the County Library System provides an additional $350,000 in funding, bringing the per capita spending to almost $24. The national and state average per capita spending for library services is $48 and $33, respectively.

C. Police Services

The City's Police Department provides a wide variety of law enforcement services, including patrol, traffic enforcement, SWAT, school resource officers, investigations, and dispatch.

Current Staffing Levels

Administration	1 Chief 1 Assistant Chief 3 Secretaries 1 Civic Engagement Specialist
Field Operations	3 Commanders 8 Sergeants 8 Corporals 67 Police Officers

Investigations	1 Commander 2 Sergeants 22 Detectives 3 Police Services Officers 1 Crime Analyst
Dispatch	1 Sergeant 4 Corporals 12 Dispatchers 2 Police Service Officers
Records	1 Supervisor 10 Records Specialists 2 Dictation clerks
Professional Standards	1 Commander 2 Sergeants 1 Police Service Officers
Traffic	1 Sergeant 1 Corporal 4 Officers
Business Services	1 Business Services Officer 1 Payroll Specialist

In 2008, the City funded 134 sworn officer positions, for a ratio of 1 officer to approximately 794 residents (using 2010 population). Beginning In 2009, the number of officers funded by the City was reduced to 122, for a ratio of 1 officer per 878 residents. The City subsequently experienced a 24 percent increase in violent crime, as well as substantial increases in gang activity and other criminal behavior between 2010 and 2011. In fact, according to the City's website, in 2011 the City had the highest per capita violent crime rate in the County despite having one of the highest officers to resident ratios in the County.

For fiscal year 2012-13, the City has budgeted for an additional five sworn officers, for a total of 127 sworn officers, a ratio of 1 officer per 849 residents. An additional two officers are anticipated to be added next fiscal year.

Response Times

	Goal	Percentage of Responses Meeting Goal in 2011
Non Emergency	No goal	Not measured
Emergency	Under 5 min. 90% of the time for Priority 1 calls	62%

Operational Costs

For the current fiscal year, $28,510,749 was allocated for police services, of which $27,416,970 is to come from the General Fund. The total per capita cost for police services for the current fiscal year is $264.

Future Staffing Levels

In order to maintain the current ratio of 1 officer per 849 residents for approved and proposed residential development, an additional 9.5 sworn officers will be required. Without these additional officers the ratio of officer to resident would be 1 to 911, which is lower than the 2009 ratio that corresponded to a spike in violent crime. In order to maintain the current staffing ratio of one officer per 844 residents for the projected population in 2030, a total of 139 sworn officers will be required.

D. Recreation and Park Services

The City provides a wide variety of park facilities and recreational programs, services, and activities for City residents and nearby communities. Non-City residents who participate in recreational programs are charged an additional $5.00 for programs costing $25-$75 and $10 for programs costing more than $75.

Park Facilities
The City General Plan identifies three type of parks: 'Neighborhood Parks' are typically under 8 acres in size and primarily serve a specific residential area; 'Community Parks' provide specialized recreational opportunities for more than one neighborhood and can include formal sports fields, courts, and recreational buildings; 'Citywide Parks' provide recreational opportunities that draw a wide range of ages and interest groups throughout the City. The City also operates special use parks and linear parks.

The table on the following page is a list of all parks and facilities operated by the City.

	Acres	Play-ground	Basket-ball	Tennis Courts	Soft-ball	Sports Fields	Trails
Neighborhood Parks							
Barranca Vista	8.7	•					
Blanche Reynolds	3.4	•					
Cemetery Memorial	7.1						
Chumash	6.1	•					
Downtown Mini	0.4						
Hobert	7.1	•					
Juanamaria	5.0	•	•	•			
Junipero Serra	2.7						
Marion Cannon	5.0		•				
Mission	1.5						
Montalvo Hill	7.0	•	•				
Ocean Avenue	1.3	•	•				
Plaza	3.7	•					
Promenade	1.0						•
Thille	5.0	•	•				
Community Parks							
Fritz Huntzinger Sports*	18.3				•	•	
Ventura Community	100				•	•	•
Westpark	7.3	•	•			•	
Citywide Parks							
Arroyo Verde	129.3	•					•
Camino Real	38.2	•	•	•	•	•	•
Grant	107.3						
Harry A. Lyon	10.7		•	•	•	•	
Marina	15.3	•					
Special Use							
Albinger Archeological	0.9						
Eastwood	0.7						
Linear Parks	46.0						•
Olivas Adobe Historical	22.5						
Ortega Adobe	0.3						
Seaside Wilderness	24.0						•
Surfers Point at Seaside	3.4						

The City provides approximately 589 acres of developed park facilities. According to the City General Plan, the City parkland standard is to provide 10 acres per 1,000 residents. To meet this standard for a current population of approximately 108,000, 1,080 acres would need to be provided.

The City also operates the Ventura Avenue Adult Center at which seniors can receive various services or participate in classes and activities, as well as two recreation centers, and two golf courses.

Recreation Programs
Among the parks and recreation programs offered by, or in conjunction with, the City are:

- Youth and adult sports classes, clinics, camps and leagues including basketball, golf, soccer, softball, volleyball and fitness programs
- Aquatics programs and activities
- Special interest and life enrichment classes for youth, teens and adults
- Arts and crafts programs, dance, music, and other creative classes
- Various cultural events
- Senior services, including computer, recreational, social, health, and fitness programs

E. Solid Waste Services

Solid waste services are provided via franchise agreements with E.J. Harrison & Sons. The City funds a number of services related to solid waste, including managing contracts, customer service, waste reduction programs, and hazardous waste disposal.

F. Streets, Highways and Drainage

According to the City's 2012 MSR questionnaire responses, the City is a direct provider of street construction and maintenance and street lighting services. Street sweeping and landscape maintenance are provided via contract. The City estimates that it has 1,240 paved lane miles.

According to the transmittal letter for the City's proposed 2012-13 budget, the City "is failing to keep up with repair of streets, sidewalks, storm drains, alleys, parks, public buildings and facilities."

Street Maintenance
City's 2012-13 General Fund budget allocates $1,193,473 for pavement maintenance, or $962.48 per lane mile. The allocation for street pavement maintenance has dropped steadily from approximately $1.5 million in 2009. According to City staff, based on the latest data, in order for the City to maintain a good Pavement Condition Index (PCI) average of 75, a one-time investment of $27 million is needed and $9.6 million annually thereafter. Annual funding levels (including Gas Tax) are at $3.9 million for street resurfacing and preventive maintenance, which means the City would need an additional $5.7 million per year.

According to the adopted budget, Gas Tax revenues will provide approximately $16.3 million in capital improvements for streets, including street repaving, slurry seal, and bike lane improvements.

Street Lighting
A total of $2,076,338 is allocated for both street lighting and traffic signal maintenance. This includes $1,368,760 for Street light District 36, which provides for maintenance and operation for the Southern California Edison-owned street lights. Currently, the General Fund allocates $487,124 toward the maintenance of the City's Street light District 36.

Stormwater
The City provides stormwater and flood control services to comply with the Ventura Countywide Municipal Stormwater National Pollutant Discharge Elimination System (NPDES) permit. The City provides public outreach, illicit discharge response and abatement, public infrastructure maintenance, new development discharge controls, and construction site pollution controls. The 2012-13 budget allocates $738,990 toward this program, a per capita cost of $6.90. An additional $904,784 is allocated for stormwater utility maintenance.

Street Sweeping
Street sweeping services are provided via contract with a private provider. Residential streets are swept once per month. Commercial and industrial streets are swept twice per month. Downtown streets and major thoroughfares are swept three to five times per week.

G. Water Services

The City supplies potable water to all areas within the City. It also provides potable water to unincorporated areas outside the City, including North Ventura Avenue, Saticoy, and the Saticoy Country Club community. Customers outside the City pay a surcharge of $0.73 dollars per each 750 gallons of water.

Current Potable Water Demand and Supply
According to the City's 2010 Urban Water Management Plan (UWMP), water demand in 2010 was 17,351 acre feet per year, substantially lower than the 2005 demand of 20,808 acre feet. This reduction in demand is likely attributable to a variety of water conservation efforts during the drought, which ended in 2011 (indeed, the UWMP projects that water demand for 2015 will be 22,286 acre feet). For demand projection purposes, the UWMP assumes a daily per capita use of 168 gallons, which is the average demand from 2000-2009. Using a current population estimate of approximately 108,000, current demand within the City is estimated to be 20,324 acre feet per year. Overall demand would be expected to be higher when considering the 2,000-3,000 inhabitants and commercial/industrial uses in Saticoy and the North Ventura Avenue area. However, based on the City's water billing records for the City's water service area and an assumed 6.5 percent increase due to unaccounted for water uses, total demand in 2011-12 is estimated at 17,242 AF[1].

According to City staff[2] and the UWMP, the City's current water supply sources are as follows:

Casitas Municipal Water District	5,000 acre feet per year
Groundwater from City wells	9,700 acre feet per year
Surface water (Ventura River)	4,200 acre feet per year
Recycled water	700 acre feet per year
Total	19,600 acre feet per year

Thus, current water demand within the City service area appears to consume approximately 88 percent of the current total supply.

[1] Memo from Ventura Water Water Resource Manager, Susan Rungren, to LAFCo Executive Officer, Kim Uhlich, dated October 30, 2012
[2] Ibid

Future Potable Water Demand and Supply
The UWMP estimates that the population in the City's water service area will increase to 140,272 by 2035, resulting in a demand of 26,436 acre feet per year (AFY). However, state law requiring a per capita reduction in water demand by 2020 results in a target demand of 22,345 by 2035.

According to the UWMP, the City will have constructed an additional groundwater well by 2015 that will allow the City to increase pumping from the Santa Paula Groundwater Basin from the current 1,600 AFY to its full 3,000 AFY year allocation. The City also anticipates that, by 2020, it will complete improvements to wells drawing water near the Ventura River that will provide an additional 2,500 AFY. Based on these estimates, the City's anticipated water supplies by 2035 are as follows:

Casitas Municipal Water District	5,000 acre feet per year
City-pumped groundwater	11,100 acre feet per year
Surface water (Ventura River)	6,700 acre feet per year
Recycled water	700 acre feet per year
Total	23,500 acre feet per year

Anticipated water supply in five year increments through by 2035 is as follows:

City's Anticipated Water Supply (AFY)

2012	2015	2020	2025	2030	2035
19,600	21,000	23,500	23,500	23,500	23,500

According to the City Planning Division, there are 2,170 residential units that have been approved, but are not yet built, and 264 units currently under construction, for a total of 2,434 units. Using the 2.57 average persons per household identified by the 2010 Census, these 2,434 residential units will house approximately 6,255 people. At 168 gallons per capita per day, the anticipated water demand from these units would be 1,177 AFY, for a total demand of 18,419 AF. Thus, currently, 94 percent of the City's water supply has been allocated to existing and approved development. In addition, another 685 residential units are currently being considered for approval, which would result in an additional 331 AFY of demand for a total of 18,750 AFY, or 96 percent of current supply.

It should also be noted that during drought conditions, the UWMP estimates that supply from the Ventura River would be reduced by 700 AF during the second year of drought and 2,200 AF the third year. In addition, pursuant to a 1996 stipulated judgment, in multi-year drought conditions groundwater supply from the Santa Paula basin must be reduced from 3,000 AFY to 1,141 AFY, a reduction of 1,859 AF. Additional groundwater pumping could provide 1,500 AF. Therefore, according to the UWMP, during drought conditions, the City's water supply could be reduced by as much 2,559 AFY. It appears that during drought conditions, the City may not have adequate supplies to meet normal demand in upcoming years and measures would need to be put in place to reduce demand.

The City is exploring a number of measures to increase supply and/or reduce demand, including using additional reclaimed water from the Ventura Water Reclamation Facility, partnering with the Ojai Valley Sanitary District for use of reclaimed water, various conservation measures and public education, implementation of the City's Water Efficiency plan, continued implementation of the City's Reclaimed Water Policy, and the possible

development of a water rights ordinance. The effectiveness of these measures has yet to be determined and the timeframes for their implementation are unclear.

H. Wastewater Services

The City provides wastewater conveyance and treatment services to approximately 98 percent of the residences within in the City as well as McGrath State Beach Park and the communities along the coast north of the City within Ventura County Service Area No. 29. The City anticipates taking over wastewater treatment services from the Montalvo Community Service District in the near term and the Saticoy Sanitary District in the long term. The City's wastewater collection system consists of approximately 285 miles of gravity sewers ranging in size from 4 to 42 inches, approximately 5 miles of force mains, 11 wastewater lift stations, and the Ventura Water Reclamation Facility (WRF), a tertiary treatment plant. The collection system sewers convey flows generally from east to west and north to south, culminating at the Ventura Water Reclamation Facility for treatment.

Wastewater Demand, Treatment, and Conveyance
The City's 2010 Wastewater Treatment Master Plan evaluated the condition of the wastewater conveyance system. It identified a number of existing, short-term, and ultimate (General Plan build-out) system deficiencies in the collection system and the projected costs to correct them, as follows:

- Existing – 339 pipe segments totaling 86,500 feet ($36,400,000)
- Near term – 233 pipe segments totaling 61,760 feet ($16,400,000)
- Ultimate – 318 pipe segments totaling 81,800 feet ($21,500,000)

These deficiencies are located throughout the City and include both mainlines and large trunk lines.

According to the 2012 MSR questionnaire responses, the WRF has a treatment capacity of 12.1 million gallons of wastewater per day and currently treats an average of 8.63 million gallons per day. According to the City's 2010 Wastewater Treatment Master Plan, the City's treatment plant has a permit-rated capacity of 14.0 million gallons per day, however, many of the facilities at the treatment plant are operating beyond a typical design life and the conditions of the facilities were not assessed as part of the Master Plan. Additional assessments of these facilities will be necessary and depending on their condition, a comprehensive replacement program may need to be developed before the plant can be expanded to a 14.0 million gallon per day treatment capacity.

According to the Wastewater Master Plan, near-term development within the City and in areas outside the City but within the City's wastewater service area will increase the volume of wastewater flows to approximately 11.4 million gallons per day, or 94% of the current capacity of the treatment facility. Build-out of the current General Plan and demand within the anticipated service area is projected to generate 13.0 million gallons per day, exceeding the treatment plant's current capacity.

In 2011, the City entered into a long term settlement of pending legal challenges to the discharge of wastewater into the Santa Clara River estuary. It commits the City to invest in new facilities to divert 100 percent of the wastewater to "beneficial uses" in coming decades. Funding to accomplish this goal and provide for the necessary infrastructure will be derived from increased rates to customers.

WRITTEN DETERMINATIONS

A. Growth and population projections for the affected area

According to the US Census, from 2000 to 2010, the City increased in population from 100,916 to 106,433. The California Department of Finance estimates the City's population to be 107,166 as of January 1, 2012. Thus, from 2000 to 2012, the City grew by an estimated 6,250 people, or 6.19 percent. This 6.19 percent growth rate over 12 years equates to an estimated average annual growth rate of 0.52 percent. The following table reflects the City's projected population in 5-year increments based on this estimated rate of growth. The table also reflects the annexation of the community of Montalvo to the City in 2012:

	2012	2015	2020	2025	2030
City Population	107,166	108,847	111,706	114,641	117,653
Montalvo	632	632	632	632	632
Total Population	**107,798**	**109,479**	**112,338**	**115,273**	**118,285**

The City updated its General Plan in 2005. The EIR prepared for the update included population projections based on an annual growth rate of 0.88 percent (average from 1994-2004) and a 2004 population of 104,952. The projections used in the General Plan would result in an estimated 2012 population of approximately 112,500, substantially higher than the current estimate by the Department of Finance. Thus, it appears that the anticipated growth rate projected in the General Plan EIR is overestimated based on the most recent population estimate from the California Department of Finance.

According to City Planning staff, the City has approved 2,434 residential units that have not yet been constructed. Using the average 2.57 person per household identified by the US Census, development of these units would add 6,255 people to the City. If the 685 residential units that are currently being considered for approval are, in fact, approved, it would add another 1,760 people. When the total population from these units is added to the current population, it results in a population of nearly 116,000.

B. The location and characteristics of any disadvantaged unincorporated communities within or contiguous to the sphere of influence

As defined by Section 56033.5 of the Government Code, a "Disadvantaged Unincorporated Community" (DUC) is a community with an annual median household income that is less than 80 percent of the statewide annual median household income. The Ventura LAFCo has determined that the community of Saticoy, abutting the City to the southeast and located within the City's current sphere of influence, is a DUC. The following demographic information was obtained from the 2010 Census:

Population:	1,029
Median Household income:	$21,343
Poverty rate:	28.4%
Race:	87% Hispanic

Saticoy receives wastewater services from the Saticoy Sanitary District, an independent special district which serves only the community of Saticoy. Potable water services are

provided by the City and customers are subject to the City's water surcharge for service provided outside of City limits. City policy generally precludes new or expanded water services greater than a ¾-inch meter, thus, limiting the amount of multi-family, commercial, and industrial development/redevelopment that can occur within the community. Law enforcement services are provided by the County Sheriff's Office and fire protection services are provided primarily by City under a mutual aid agreement.

C. Present and planned capacity of public facilities, adequacy of public services, and infrastructure needs or deficiencies

Fire services:

- The City operates six fire stations which serve the City and nearby unincorporated communities.
- The closure of Fire Station 4 in 2010 resulted in substantial reductions in response times for emergency services to approximately the eastern half of the City. In 2011, the City obtained funding to reopen the fire station through most of 2014. However, the availability of funding for this station beyond 2014 is uncertain at this time.
- The current level of staffing does not appear to be sufficient to provide personnel adequate time to perform their duties and to maintain adequate emergency response staffing without incurring substantial overtime costs.

Library services:

- Library services are provided by two libraries, both of which are located on the west end of the City. The city has adopted a 5-year plan with the goal of improving services and constructing a new library to serve the east side of the City.
- Per capita library spending is below the national and state averages.

Police services:

- The City provides a high ratio of sworn officers to residents.
- Recent reductions in police staffing correlated to a significant increase in violent crime in the 2011. The City has budgeted for an additional five sworn police officers and plans for another two officers next fiscal year.
- In order to maintain the current ratio of sworn officers to residents for approved and proposed residential development, an additional 9.5 sworn officers will be required.

Recreation and parks services:

- The City provides a wide range of park facilities and recreation programs.
- The City's goal is to provide 10 acres of park space per 1,000 residents. To meet this goal for the current population, 1,080 acres would need to be provided.
- The City provides 589 acres of developed park facilities.

Solid waste services:

- The City has entered into franchise agreements with a refuse collection company for solid waste collection and disposal services. Customers are billed directly by the service provider for these services.
- The City funds a number of additional solid waste-related services to encourage recycling, hazardous waste collection, and community beautification and enhancement.

Streets and highways:

- The City provides street and landscaping maintenance and storm drain maintenance services. Street sweeping services are provided as part of the franchise agreements with solid waste providers. A large majority of street lighting in the City is owned and maintained by Southern California Edison and is funded by the City. The City does maintain street lights owned by the City.
- Maintenance of City streets is significantly underfunded and likely to result in continued deterioration of City streets.

Potable water:

- The City provides potable water to the City and to areas adjacent to the City.
- It appears that current demand within the City's water service areas is 88 percent of current total supply.
- It appears that the water demands from approved, but not built, development will increase demand to 94 percent of current supply.
- It appears that currently-proposed development would increase water demand to 96% of current supply.
- It appears that anticipated reductions in supply during drought conditions will result in current and future normal water demand exceeding supplies, requiring implementation of measures to reduce demand.

Wastewater:

- The City provides wastewater collection and treatment services to the City and to adjacent unincorporated areas.
- The City's collection system currently experiences capacity deficiencies. In addition, the City has identified short-term capacity deficiencies and deficiencies at buildout of the General Plan.
- The City's Treatment Plant has adequate capacity to accommodate current wastewater flows. Anticipated wastewater flows from buildout of the General Plan will exceed the current capacity of the City's treatment plant. Additional assessment must occur in order to demonstrate that expansion of the treatment facility is feasible.

D. Financial ability of agencies to provide services

- Long-term funding needed to keep all currently operating fire stations open beyond 2014 has not been identified.
- In order to maintain the current Police officer-to-resident staffing ratios for new and proposed development, an additional 9.5 sworn officers are required. It is unclear how these positions will be funded.
- The City has identified funding shortfalls of up to $5.7 million per year for maintenance services necessary to prevent further deterioration of City streets.
- The costs to address the current deficiencies identified in the City wastewater collection system are projected to exceed $36 million. The source of funding and the timing of the improvements have not been identified.
- Sewer system improvements needed to accommodate near term and ultimate future growth and development is projected to cost approximately $38 million. The source of funding and the timing of the improvements have not yet been identified. In addition, the cost to construct the infrastructure necessary to divert wastewater for "beneficial uses" per the City's legal settlement has not been identified.

E. Status of, and opportunities for, shared facilities

- No other obvious additional opportunities for shared facilities were noted.

F. Accountability for community service needs, including governmental structure and operational efficiencies

- The City is locally accountable through an elected legislative body, adherence to applicable government code sections, open and accessible meetings, dissemination of information, and encouragement of public participation.
- The City's website contains a significant amount of information on the current and previous City budgets, services and programs, City happenings and activities, public meetings, development activities, and City documents. Current and past City Council minutes and agendas are posted and agenda items are linked to staff reports.
- Meetings of the City Council are broadcast live on the City's cable channel. Archived videos of past meetings are available for viewing on the City's website.
- To achieve operational efficiencies for storm water quality purposes, the City is covered under the County's National Pollutant Discharge Elimination System permit.

G. Any other matter related to effective or efficient service delivery, as required by Commission policy

- No other matters were identified.

ATTACHMENT D: DEVELOPMENT ENTITLEMENT REPORT 2005-2012
(Approved, Under Construction and Built Projects)

	2005 Retail (sf)	2012 Retail (sf)	% Projected	2005 Office (sf)	2012 Office (sf)	% Projected	2005 Industrial (sf)	2012 Industrial	% Projected	2005 Hotel	2012 Hotel	% Projected	2005 Total Non-Residential	2012 Total Non-Residential	% Projected	2005 Residential Dwelling Units	2012 Residential Dwelling Units	% Projected
DISTRICTS																		
Upper North Avenue	10,000	0	0	50,000	0	0	150,000	0	0	0	0	0	210,000	0	0	100	0	0
North Avenue	10,000	0	0	50,000	0	0	250,000	0	0	0	0	0	310,000	0	0	50	0	0
Downtown Specific Plan	100,000	18,807	19	200,000	123,66[illegible]	62	0	0	0	150,000	0	0	450,000	142,472	32	1,600	449	28
Pacific View Mall	25,000	16,981	68	0	7,434	743,400	0	0	0	0	0	0	25,000	24,415	98	25	0	0
Harbor	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0	0	0	0	[illegible]	[illegible]	0	545,000	21,350	4	300	300	100
Arundell	25,000	11,826	47	300,000	2,320	1	1,000,000	55,667	6	0	0	0	1,325,000	69,035	5	200	0	0
North Bank	300,000	30,282	10	50,000	0	0	300,000	394,029	131	0	0	0	650,000	424,311	65	50	0	0
Montalvo	0	0	0	50,000	0	0	25,000	0	0	0	0	0	75,000	0	0	50	0	0
Saticoy	0	0	0	0	0	0	25,000	0	0	0	0	0	25,000	0	0	50	0	0
Subtotals (Districts)	785,000	98,998	13	700,000	133,419	19	1,750,000	449,116	26	380,000	0	0	3,615,000	681,833	19	2,425	749	31
CORRIDORS																		
Ventura Avenue	40,000	7,029	18	100,000	7,300	7	50,000	0	0	0	0	0	190,000	14,329	8	800	240	30
Main Street	15,000	6,082	41	40,000	593	1	0	0	1	0	0	0	55,000	6,675	12	100	46	46
Thompson Boulevard	15,000	17,716	118	40,000	0	0	0	0	0	0	0	0	55,000	17,716	32	300	34	11
Loma Vista	15,000	5,100	34	40,000	341,660	854	0	0	1	0	0	0	55,000	346,760	630	25	0	0
Telegraph Road	15,000	0	0	40,000	0	0	0	0	0	0	0	0	55,000	0	0	250	0	0
Victoria Avenue	15,000	0	0	40,000	0	0	0	0	0	0	0	0	55,000	0	0	50	154	308
Johnson Drive	50,000	840	2	20,000	0	0	0	0	0	0	0	0	70,000	840	1	150	0	0
Wells Road	15,000	25,000	167	20,000	0	0	0	0	0	0	0	0	35,000	25,000	71	50	173	346
Subtotals (Corridors)	180,000	61,767	34	340,000	349,553	103	50,000	0	0	0	0	0	570,000	411,320	72	1,725	647	38
SPHERE OF INFLUENCE(SOI/OTHER INFILL/NEIGHBORHOOD CENTERS																		
101/126 Agriculture	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	200	0	0
Wells/Saticoy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,050	554	66
Pierpont	30,000	20,230	67	0	0	0	0	0	0	0	0	0	30,000	0	0	100	136	136
Other Neighborhood Centers (includes Seaward/Allessandro+College/ Day+Gateway Plaza+Victoria Plaza+Bristol+Kimball/Telegraph+Petit/Telephone+Telephone/ Cachuma+Saticoy)	0	20,965	2,095,600	0	0	0	0	0	0	0	87,000	8,888,900	0	107,965		100	0	0
Second Units	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	300	55	18
Underutilized	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	250	0	0
Vacant	165,000	0	0	50,000	0	0	0	0	0	0	0	0	215,000	0	0	450	0	0
Subtotals (SOI/Other Infill/NC)	195,000	41,195	21	50,000	0	0	0	0	0	0	87,000	8,888,900	245,000	107,965	44	2,450	887	36

	2005 Retail (sf)	2012 Retail (sf)	% Projected	2005 Office (sf)	2012 Office (sf)	% Projected	2005 Industrial (sf)	2012 Industrial	% Projected	2005 Hotel	2012 Hotel	% Projected	2005 Total Non-Residential	2012 Total Non-Residential	% Projected	2005 Residential Dwelling Units	2012 Residential Dwelling Units	% Projected
Planning Communities (Not included within District/Corridor/Center above)																		
Downtown	1,072	0	0	0	0	0	0	0	0	150,000	0	0	151,072	0	0	80	0	0
Ventura Ave/Westside	7,086	0	0	0	0	0	27,000	0	0	0	0	0	34,086	0	0	238	0	0
Midtown	13,751	0	0	0	0	0	0	0	0	0	0	0	13,751	0	0	34	3	9
College (Telegraph/Loma Vista)	2,718	0	0	8,843	1,761	20	0	0	0	0	0	0	11,561	1,761	15	4	14	350
Telephone Road Corridor	0	0	0	54,785	0	0	0	0	0	0	0	0	54,785	0	0	256	0	0
Montalvo/Victoria	0	0	0	4,300	0	0	0	0	0	0	0	0	4,300	0	0	296	0	0
Saticoy/East End	7,950	56,102	706	5,600	0	0	0	0	0	0	0	0	13,550	56,102	414	840	220	26
Arundell	41,640	0	0	42,614	0	0	18,080	0	0	0	0	0	102,334	0	0	0	0	0
Olivas	7,160	0	0	7,066	0	0	390,053	0	0	0	0	0	404,279	0	0	0	0	0
Pierpont	0	912	91,200	0	0	0	0	0	0	0	0	0	0	912	91,200	0	0	0
Serra	0	0	0	0	1,000	100,000	0	0	0	0	0	0	0	1,000	100,000	0	232	23,200
Thille	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	120	12,000
Wells	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Westside	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	163	16,350
Subtotal (Planning Communities)	81,377	57,014	70	123,208	2,761	2	435,133	0	0	150,000	0	0	789,718	59,775	8	1,718	752	44
TOTAL	1,241,377	258,974	21	1,213,208	480,733	40	2,235,133	449,115	20	530,000	87,000	16	5,219,718	1,280,823	25	8,318	3,035	36

Gustorf, Kevin

From: Rungren, Susan <srungren@venturawater.net>
Sent: Tuesday, January 08, 2013 2:45 PM
To: Gustorf, Kevin
Cc: Rungren, Susan
Subject: Fwd: Ventura utility section

fyi

Susan Rungren
Principal Engineer
Ventura Water
(805) 652-4523

From: "Chandra Chandrashaker" <cchandrashaker@ci.ventura.ca.us>
To: "Susan Rungren" <srungren@ci.ventura.ca.us>, "Betsy Cooper" <bcooper@ci.ventura.ca.us>
Cc: "Lucho Rodriguez" <lrodriguez@ci.ventura.ca.us>
Sent: Tuesday, January 8, 2013 2:36:25 PM
Subject: Fwd: Ventura utility section

Susan,

Here are the water demand factors for non-residential uses identified in the GP EIR. Chandra

---

From: "Joe Power" <JPower@rinconconsultants.com>
To: "Chandra Chandrashaker (cchandrashaker@ci.ventura.ca.us)" <cchandrashaker@ci.ventura.ca.us>
Sent: Tuesday, January 8, 2013 9:53:48 AM
Subject: FW: Ventura utility section

Chandra:

Below are the water demand factors from the General Plan EIR. The same factors were used citywide.

Joe

From: Mike Swan [mailto:mswan@psomas.com]
Sent: Tuesday, January 08, 2013 9:43 AM
To: Joe Power
Subject: RE: Ventura utility section

Joe –

I was not able to find the exact final table included in the document you sent but I did find some preliminary water demand projection worksheets that included the demand factors and I tested them in the tables you provided and they worked. So here are the demand factors used:

Residential 450 gpd/du

Retail	250 gpd/ksf
Office	250 gpd/ksf
Industrial	315 gpd/ksf
Hotel	500 gpd/ksf

ksf = thousand square feet

We had some other demand projections that were acreage-based but these should work with the tables you referenced.

Call if you have any questions.

Michael D. Swan, PE
PSOMAS | *Balancing the Natural and Built Environment*
Senior Project Manager
Water & Wastewater Infrastructure
3 Hutton Centre Drive Suite 200
Santa Ana CA 92707 714.751.7373
Direct 714.481.7979

From: Joe Power [mailto:JPower@rinconconsultants.com]
Sent: Monday, January 07, 2013 3:41 PM
To: Mike Swan
Subject: Ventura utility section

Hi Mike:

Those tables are 4.13-15 through 4.13-20 in the attached document. Thanks.

Joe Power
Principal

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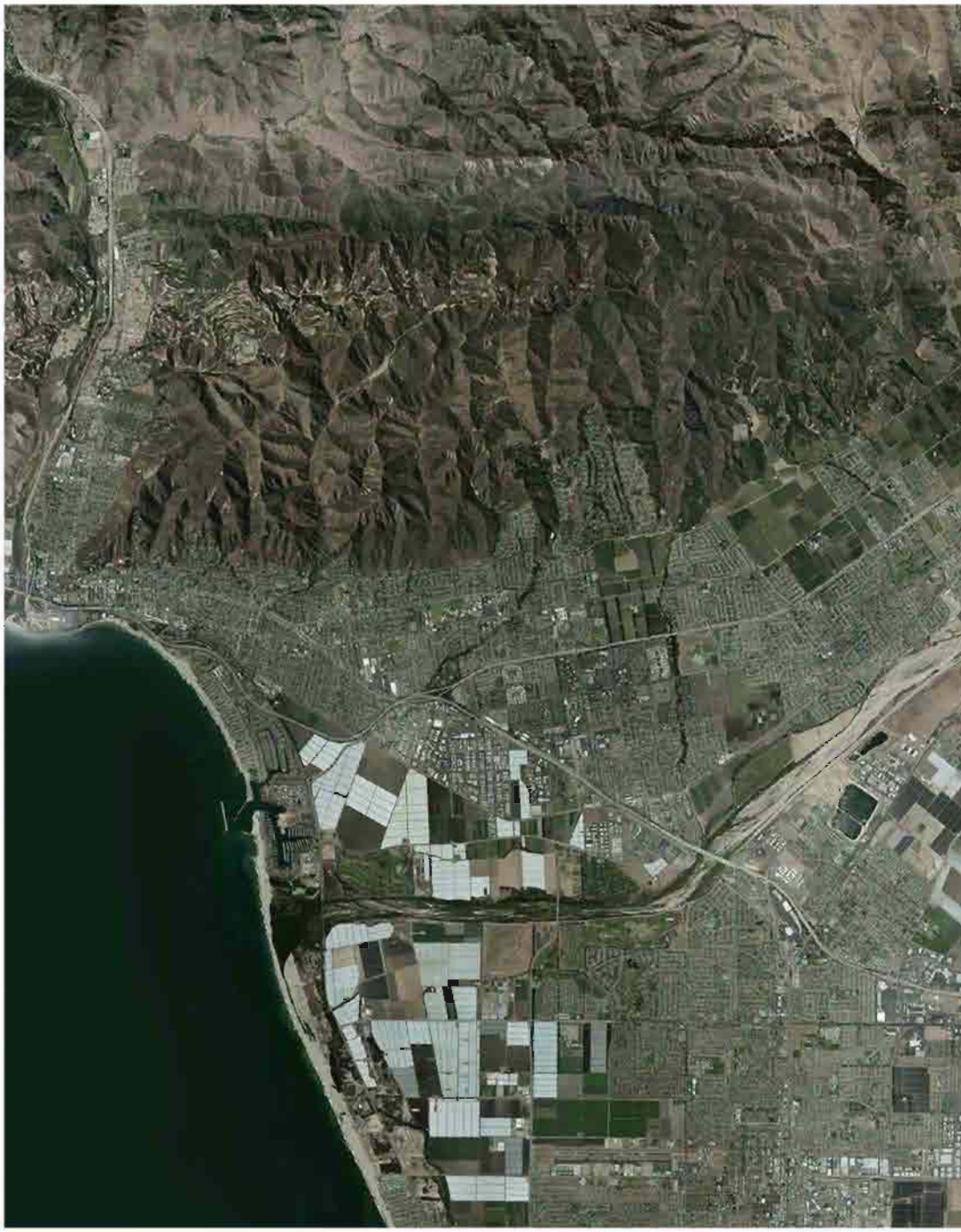
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