Evaluation of Supplemental Water Alternatives–

Technical Memorandum No. 1
Constraints Analysis

Nipomo Community Services District

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1.0 Introduction

The District is currently pursuing design and construction of transmission, storage, and pumping facilities to convey City of Santa Maria water to the District via the proposed Waterline Intertie Project. A 2005 Memorandum of Understanding between the two agencies defined conditions, on a preliminary basis, for transferring this water. The District's costs for that project will include purchase cost for the water from Santa Maria, cost for improvements within the Santa Maria system (if required), as well as capital and operations/maintenance costs for all required transmission, storage, and pumping facilities.

Boyle prepared a 2006 Preliminary Engineering Memorandum for the Nipomo Waterline Intertie Project that provided a preliminary analysis of hydraulic conditions within both the Nipomo and Santa Maria systems; disinfection alternatives; pipeline alignments; and storage/pumping options. Following this evaluation, the District moved to continue work after alternatives were explored. The Board directed staff to assess cost and feasibility for other supplemental water alternatives.

Two types of alternatives were evaluated: 1) those that import supplemental water from outside the NMMA; and 2) those that attempt to better manage the existing NMMA water resources.

Importation alternatives considered in this evaluation include the following:

- Santa Maria River Valley Groundwater – The City of Santa Maria may be willing to sell some of their entitlement to underflow water to the District. Facilities required to utilize this resource would include a wellfield, possibly treatment (based on regulatory review), pumping, storage, and a connection from the proposed wellfield to the District distribution system. It is assumed collector wells would be located along the River, near the end of Hutton Road, at the Bonita Well site, or possibly on other properties along the River.

  The Santa Maria groundwater basin is in adjudication; any activities that modify the hydrologic balance previously presented in testimony that becomes an element of the final stipulation may require Court approval.

- State Water or Exchange through State Water Pipeline – Unused capacity in the State Water Project (SWP) pipeline from one or more Central Coast Water Authority (CCWA) member agencies/project participants or exchange water could be provided via a turnout along the State Water Pipeline within the District boundary. Water would either be delivered directly to the District water system, or indirectly via aquifer storage and recovery.

- Desalinated Seawater or Brackish Water – Facility could be constructed at Nipomo Refinery (using cooling water as a source), another location owned by the District, or at the South San Luis Obispo County Sanitation District (SSLOCSD) Wastewater Treatment Facility.

- Brackish Agricultural Drainage – Either shallow ground water or surface runoff from agricultural lands into Oso Flaco Lake could be used as a water supply. In addition, a project to treat this water for District use could also be designed to improve the health of the Oso Flaco wetlands.

- Nacimiento Water Project – The District could participate in an extension of the Nacimiento Water Project from the City of San Luis Obispo to Nipomo, allowing the District to receive either raw or treated surface water.

Water resource management alternatives considered in this evaluation include the following:

- Groundwater Recharge with Recycled Wastewater Treated effluent from Southland Wastewater Treatment Facility (WWTF) could be applied to percolation ponds to better manage groundwater resources.
- Exchange Treated Wastewater for Direct Use Treated effluent from Southland WWTF could be used for irrigation of crops, parks, or golf courses, in order to reduce pumping by agricultural users near groundwater depressions.

2.0 Project Objective

This report represents Task 1 of the Evaluation of Supplemental Water Alternatives. The objective of the entire evaluation is to identify feasible alternative water supply options for the Nipomo Community Services District, and to recommend a strategy for implementing one or more of these alternative supplies. Tasks 2 and 3 will evaluate alternatives in greater detail.

Boyle reviewed existing sources of information to determine the permitting, legal, engineering, and hydrogeological constraints associated with utilizing each of the water source options listed above. This report includes a discussion of these issues (including identification of any "fatal flaws" associated with any particular option), a matrix to rank the feasibility of each alternative, and a recommended course of action.

The following constraints were addressed:

Physical

- Hydrogeology
- Supply
- Water quality
- Reliability

Institutional and Legal Constraints

- Required approvals from various stakeholders
- Water rights and the Santa Maria Groundwater adjudication litigation

Drinking Water and Wastewater Permitting

- California Department of Health Services
- Regional Water Quality Control Board

Implementation

- Required facilities
- Impacts to environmental resources and required resource agency permits
- Time required for implementation
- Conceptual cost comparison

For comparison to the cost opinions developed in the draft Waterline Intertie Project Technical Memorandum, the design flows for this study were 3,000 acre-feet per year (AFY) and 6,300 AFY.

3.0 Santa Maria Valley Groundwater

Introduction

The City of Santa Maria has rights to three "supplies" of groundwater within the Santa Maria River Basin, which could be available for sale or transfer to NCSD:

- Native Yield from the Santa Maria Valley Management Area (SMVMA) of the Santa Maria Groundwater Basin;
- Additional Yield from the SMVMA due to the implementation of the Twitchell Reservoir; and
- Return flows from State Water Project.

This section considers the constraints associated with acquiring water supplies from the City of Santa Maria and pumping the groundwater from a new well site adjacent to the Santa Maria River. Three possible locations are shown on Figure 3-1.

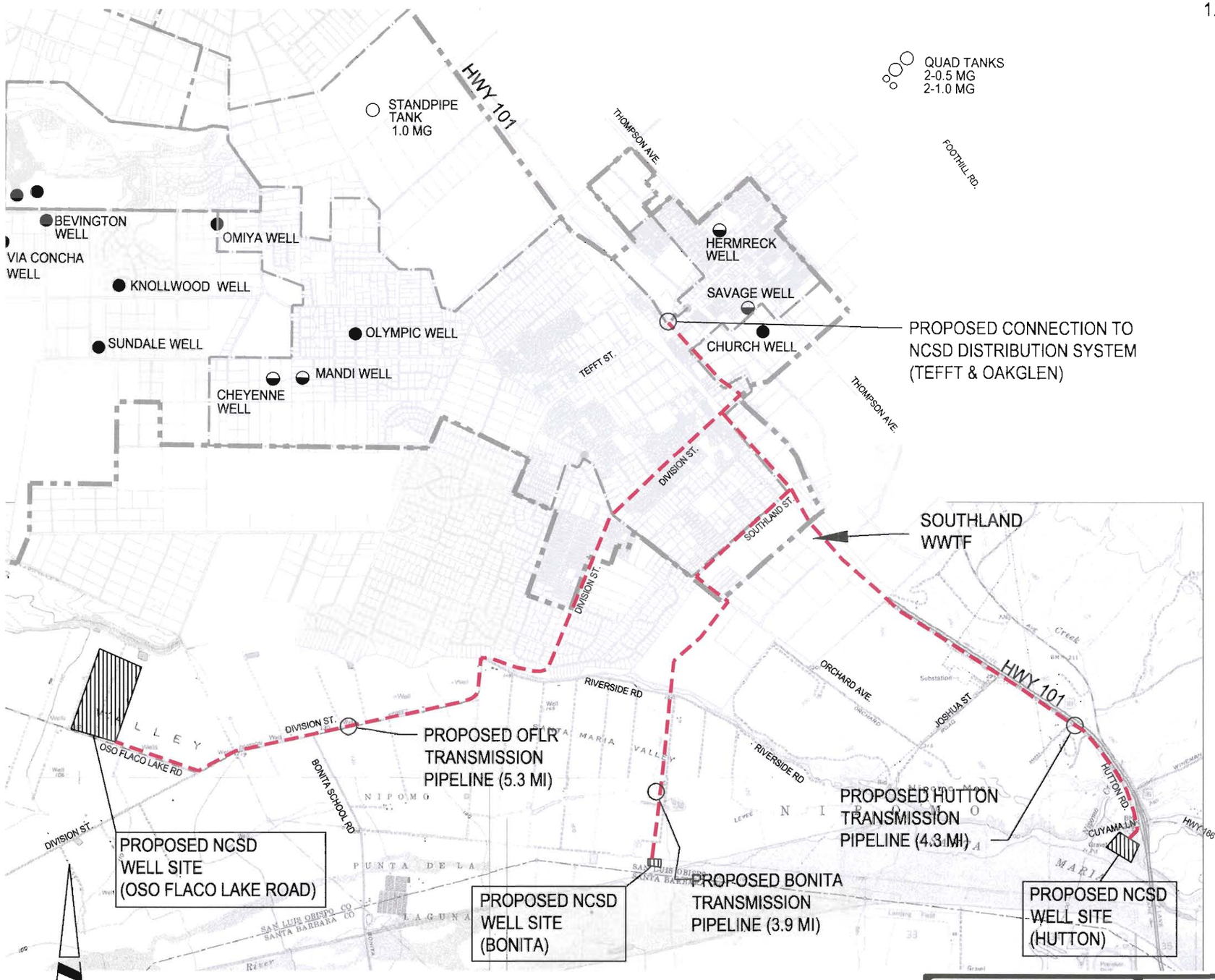
Previous Studies and Documents

The following list summarizes the studies and documents referenced for this evaluation:

- 2005 Urban Water Management Plan for City of Santa Maria, Public Review Draft (CH2MHill, February 2007)
- 2005 Santa Barbara County Groundwater Report (Santa Barbara County Public Works, Water Resources Department, March 2006)
- Water Resources of the Arroyo Grande - Nipomo Mesa Area (DWR Southern District, 2002)
- Stipulation of the Santa Maria Groundwater Litigation (June 30, 2005)
- Statement of Decision Regarding Trial Phase V of the Santa Maria Groundwater Litigation (Jan. 08, 2007)
- Nipomo Mesa Groundwater Resource Capacity Study (SS Papadopulos, March 2004)

NOTES:

1. DISTANCES LISTED REPRESENT ROUTE FROM EACH WELL SITE TO PROPOSED CONNECTION LOCATION. MASTER PLANNED PROJECTS TO IMPROVE TRANSMISSION CAPACITY ACROSS HWY-101 WILL BE CONSTRUCTED AND MAY REDUCE AMOUNT OF PIPELINE REQUIRED FOR THE CONNECTION.



LEGEND

- NIPOMO CSD WELLS
- NIPOMO CSD WELLS (STANDBY)
- NIPOMO CSD TANKS
- FUTURE WATER SYSTEM SERVICE AREA BOUNDARY
- EXISTING WATER SYSTEM SERVICE AREA BOUNDARY
- PROPOSED PIPELINE

BOYLE ENGINEERING CORPORATION

NIPOMO CSD EVALUATION OF SUPPLEMENTAL WATER ALTERNATIVES

SANTA MARIA VALLEY GROUNDWATER

BEC PROJECT NO. 19996.32

FIGURE 3-1

DWG: W:\Nipomo CSD (19996)\19996.32 (Alternative Water Supply)\CAD\Design\Revised Figures and Plates\Figure 3-1_SMV Groundwater.dwg
DATE: Jun 11, 2007 8:35am XREFS: BASE MAP Well Sites Parcels IMAGES: Map1.TIF Map2.TIF SCAN4951_000.tif
USER: cromero

Santa Maria Groundwater Basin

The Santa Maria Groundwater Basin (Basin) is composed of three management areas as described in the Santa Maria Groundwater Litigation proceedings. The three management areas are: (1) Northern Cities Management Area; (2) Nipomo Mesa Management Area (NMMA); and (3) Santa Maria Valley Management Area (SMVMA). The proposed well sites are all located within the Santa Maria Valley Management Area.

It is uncertain whether implementation of this alternative will provide a "new" supply to the NCSD, or if it will merely intercept the existing inflow of groundwater from the SMVMA to the NMMA (SAIC, pers. comm., 2007). The hydrogeologic interaction between NMMA and the SMVMA is currently not well defined. According to the 2005 Santa Barbara County Groundwater Report, these separate management areas appear to have limited interaction. However, the 2002 DWR study notes that groundwater flow from the SMVMA to the NMMA may occur and is dependent on groundwater elevation and hydraulic gradients. That report further estimated inflow to the NMMA from the SMVMA to be between 1,200 and 5,100 AFY in 1995. Current information regarding groundwater elevations and/or hydraulic gradients across the study area is needed to help assess the net effect to the NMMA water budget of pumping groundwater from the proposed well sites.

Of perhaps greater concern is the very real likelihood that extracting groundwater at the locations proposed would lower groundwater elevations, thereby reducing the hydraulic gradient between the SMVMA and the NMMA (SAIC, 2007). If such a reduction in gradient were to occur, the effect would be to reduce the quantity of groundwater flowing from SMVMA to NMMA, and by extension, could also reduce the movement of groundwater from NMMA to the Northern Cities Management Area. These changes in flow between aquifers would likely be prohibited under the pending adjudication.

These considerations, that pumping groundwater from near the Santa Maria River will result in no net gain to the District, *and* that significant institutional and legal obstacles would oppose such pumping, could be considered "fatal flaws" for this alternative.

Supply

Note that the Santa Maria Groundwater Adjudication has not come to final judgment. Therefore, the quantities of groundwater available to the City of Santa Maria summarized below should be considered preliminary estimates.

Local Groundwater Basin Water. The City of Santa Marias's UWMP identifies the city's current and projected groundwater supply at 12,795 AFY. This supply is based on appropriative rights to native yield from the Santa Maria Groundwater Basin as defined in the Stipulation. The Court's Statement of

Decision Regarding Phase 5 of the Trial indicates the City has established prescriptive rights to 5,100 AFY of basin water. Based on personal communication with Mr. Jim Markman (Special Counsel to NCSD) the safe yield based on prescriptive rights is approximately 500-700 AFY within the study area.

Twitchell Water. Twitchell Reservoir releases are controlled to maximize recharge of the groundwater basin through percolation along the Santa Maria River bed. The Santa Maria Groundwater Stipulation identifies the Twitchell Yield to be 32,000 AFY of "Developed Water," and allocates 14,300 AFY to the City of Santa Maria.

Return Flows from SWP. The June 30, 2005 Stipulation of the Santa Maria Groundwater Litigation defines "Return Flows" as "Groundwater derived from use and recharge within the Basin of water delivered through State Water Project facilities."

The City of Santa Maria's SWP Table A Amount is 16,200 AFY with an additional 1,620 AFY of drought buffer through its contract with CCWA. According to the Stipulation, the City of Santa Maria is entitled to recapture 65% of its SWP water used in the basin. The City's 2005 Draft UWMP[1] projects that its purchase of SWP water will remain steady at 13,706 AFY until the year 2030. Consequently, its "Return Flows" are also projected to remain steady at 8,909 AFY.

Thus, the City of Santa Maria has rights to return flows and local basin water equaling 9,409 to 9,609 AFY. Including Twitchell water raises the amount to between 23,709 and 23,909 AFY. Considering that the City plans to increase groundwater use to only 6,858 AFY in the year 2030, it appears sufficient water is available to meet NCSD needs.

The NCSD could acquire rights for up to 3,000 AFY of SWP return flows and prescriptive rights from the City. A place-of-use modification to the Twitchell Reservoir operating license (discussed later) could be used to secure up to 6,300 AFY of Twitchell water.

Quality

Only limited groundwater quality data is available within the study area along the Santa Maria River. Data from a Cuyama Lane Water Company well located just north of the proposed Hutton Well Site is summarized in Table 10-1. The single sample shows a specific conductance value of 530 umhos/cm, a value that would typically correspond with a TDS value of 340 ppm. (This is considered a relatively "soft" water.). It is also expected that nitrate will be an issue within the subject part of the Santa Maria Valley.

As indicated above, the City benefits from a portion of its discharged effluent in the form of SWP return flows recaptured from the commingled groundwater. As shown in Table 10-1, TDS measured in

[1] Table 3-1, Current and Planned Water Supplies for City of Santa Maria

purchased SWP water varies between 97 ppm and 358 ppm for the years 2005 and 2006. TDS from the City of Santa Maria's wells is higher, ranging from 650 ppm to 1300 ppm. TDS levels in the water from the proposed wells are expected to be somewhere between these levels, because the City is importing softer water to the groundwater basin.

Additional investigation of groundwater quality is recommended. The construction of test wells would greatly improve the knowledge of the groundwater quality in the areas in question at the depths to be considered.

Because the makeup of groundwater strata within the Santa Maria River is not well defined, predicting the depths to river underflow[2] and native groundwater as well as the required well depth to intercept both supplies is difficult without site specific field exploration. The average depth to groundwater is 281 feet, with a range of 16 feet to 1,220 feet (DWR, 2002.) It is anticipated that construction of a well that intercepts groundwater from the underlying aquifer will also likely benefit from deep percolation of Twitchell water along the Santa Maria River bed in addition to SWP return flows.

Groundwater extracted from the proposed well sites may be a "commingled" mix of Twitchell water, SWP return flows, and possibly native groundwater. Therefore water quality at the proposed well sites may be influenced by all supplies of groundwater within the Basin. Prior to utilizing groundwater pumped from the Santa Maria Valley, the NCSD will need to further investigate groundwater quality within the vicinity of the proposed well sites. Also, due to the proximity of the Bonita and Hutton well sites to the river, applicability of the Surface Water Treatment Rule (SWTR) at these sites will need to be confirmed as discussed under *Regulatory Constraints.*

It is anticipated the NCSD may need to disinfect and filter the water. Filtration of extracted groundwater would only be necessary if the water was deemed to be under the influence of surface water, or if there was chemical contamination that would require treatment (such as arsenic or exceedance of a secondary MCL). In addition, the District must ensure compliance with the drinking water standards for disinfection byproducts (DBPs) and ensure maintenance of a disinfectant residual.

Reliability

The City of Santa Maria's current water supply is derived, in part, from the groundwater supplies being considered in this analysis. The City of Santa Maria considers its water supply (including SWP water and associated return flows, Twitchell water, & native groundwater) to be 100 percent reliable through the year 2030. Reliability from SWP return flows is essentially the same as that of SWP water. See Section 4 for a discussion of SWP water reliability.

[2] Underflow is assumed to consist of Twitchell water and elements of SWP return flows

Obtaining Santa Maria Valley groundwater in any one year is reasonably reliable due to the large storage volume available, and because over long periods, annual rainfall totals are occasionally extremely high and therefore the likelihood of replacing groundwater pumpage in excess of the native yield is high (SAIC, 2007).

With regards to the reliability of the use of this groundwater by NCSD, it should be understood that the City's groundwater production has been significantly curtailed since receiving its first SWP water deliveries in 1997. Groundwater currently represents approximately 9% of its water supply, with a projected increase in the use of its groundwater to as much as 6,858 AFY in the year 2030.

Winter floodwaters captured annually at Twitchell Reservoir have been released into the Santa Maria River in all but three years since the implementation of the project in 1960. Therefore, Santa Maria River underflow provides a reasonable reliability to the annual supply for any one year (SAIC, 2007).

Required Facilities

Based on this constraints analysis, the following facilities will be required to provide supplemental groundwater from the proposed well sites:

- Collector well field (approximately 4 wells for 3,000 AFY, 8 wells for 6,300 AFY);
- Water treatment to filter and disinfect "surface" water (at the Bonita and Hutton sites only – possibly not required at Oso Flaco Lake Road site);
- Storage;
- Transmission pipeline from proposed well site to existing NCSD distribution system at Tefft
    - Hutton Site: 4.3 miles of pipe; or
    - Bonita Site: 3.9 miles of pipe; or
    - Oso Flaco Lake Road Site: 5.3 miles of pipe
- Interconnection to existing 16-inch NCSD pipeline at Tefft

A schematic map of the Project is shown in Figure 3-1.

Collector Well Field Options

Siting of the well field was considered at three sites: (1) Bonita and; (2) Hutton Road; (3) Oso Flaco Lake Road.

The Bonita Site is located on a 0.5-Acre site owned by NCSD in the Santa Maria Valley[3]. This site is immediately north of the San Luis Obispo/Santa Barbara County line near the northern Santa Maria

[3] NCSD owns an undeveloped well on this property (APN: 092-231-016).

River boundary. NCSD currently shares an easement with the adjacent SWP Coastal Branch pipeline to Riverside Road, however, it doesn't currently use this easement.

The Hutton Road Site is proposed to be located between the southernmost end of Hutton Road and the northern bank of the Santa Maria River. The Oso Flaco Lake Road Site is proposed to be located along Oso Flaco Lake Road just west of the intersection with Division Street. Neither of these sites is currently owned by NCSD.

Treatment System

The proximity of both the Bonita and Hutton Sites to the Santa Maria River requires consideration of the CDHS Surface Water Treatment Rule (SWTR). Based on a review of CDHS's Criteria for Evaluation of Ground Water Sources as discussed under *Regulatory Constraints,* it is assumed that complete treatment under the SWTR will be required at these well sites, but may not be required at the Oso Flaco Lake Road site.

Pipeline and Connection Location

The WIP Preliminary Engineering Memorandum (Boyle 2006) recommended the point of connection for supplemental water to be at Tefft and Oakglen. This same point of connection is recommended for this constraints analysis. In order to minimize lifecycle cost and pressure increases to NCSD's distribution system this connection point would require the installation of an 18-inch pipeline.

Implementation Schedule

It is estimated approximately 4 to 6 years will be required to fully implement this project as described below:

- Negotiations and agreements for transfer of water rights: 1 to 2 years
- Installation of test wells and evaluation water quality: 1 year (concurrent with negotiation)
- Project design: 1 to 2 years and
- Procurement of permits: 2 years[4] (Padre, 2007) (concurrent with negotiation and design)
- Project construction: 1 to 2 years

Constraints

Institutional:

Institutional constraints for the proposed project are identified as follows:

[4] Per Padre Associates Environmental and Permitting Constraints Analysis

- NCSD should consider the final Judgment in the Santa Maria Groundwater Litigation (pending) prior to pursuing this alternative.
- The City of Santa Maria must be willing to sell a portion of their groundwater pumping rights to NCSD. The District will need to initiate negotiations with the City of Santa Maria and the Santa Maria Valley Water Conservation District (SMVWCD), the agency which owns and operates Twitchell Reservoir.
- NCSD must acquire property for the proposed well sites. NCSD must also acquire necessary easements for transmission pipelines.
- Attempting to acquire transfer of Twitchell Yield from any of the Twitchell Participants may require NCSD to financially participate in sediment removal from the reservoir. The Reservoir's useful life is questionable because sediment is filling at a rate higher than initially expected.
- SMVWCD has expressed concerns regarding the District withdrawing water from the proposed wells. They consider that water part of their Twitchell Reservoir release and part of their groundwater recharge flow. SMVWCD's AB3030 Groundwater Management Plan prohibits export of water from the basin.

Legal:

Legal constraints are summarized as follows:

- Extracting groundwater at the locations proposed may lower groundwater elevations, thereby reducing the quantity of groundwater flowing from SMVMA to NMMA, and also reducing the movement of groundwater from NMMA to the Northern Cities Management Area. This change would likely be prohibited by the Basin Adjudication.
- The Phase V Statement of Decision confirms the ability of the SMVWCD to allocate Twitchell Reservoir Yield in the manner provided in the Stipulation. Therefore, NCSD will need to enter into agreements with both the SMVWCD and the City of Santa Maria to acquire a transfer of Twitchell Yield. Furthermore, a memorandum of agreement summarizing each transfer must be filed with the Court and provided to the Twitchell Management Authority in accordance with the Stipulation.
- NCSD will need to carefully structure the transfer of water rights at either of the three proposed well site properties in order to protect the water rights of the overlying users.
- NCSD should avoid a "term" in its agreement if it pursues return flows. Instead, the District should pursue an agreement with the City of Santa Maria that gives NCSD the right to pump return flows so long as the City takes State Water.
- The City of Santa Maria has the right to install a new well in the SMVMA, but any well that NCSD installs outside the NMMA will require adjudication. Any transfer of water from the SMVMA to the NMMA will required adjudication.

Regulatory:

- Twitchell Reservoir is operated under a State Water Resources Control Board license with restrictions on purpose (municipal / industrial) & place of use (within boundaries of Santa Maria Valley Water Conservation District). Use by NCSD may violate place of use restrictions without a permit amendment. Therefore, a place-of-use modification for Twitchell Reservoir will probably be required.
- The proximity of the Bonita and Hutton Sites to the Santa Maria River requires consideration of the CDHS Surface Water Treatment Rule (SWTR). Due to the proximity of both wells to the river, an evaluation is expected to show the source to be "Groundwater Under the Direct Influence" (GWUDI) of surface water, and that complete treatment under the SWTR may be required at both well sites. The Oso Flaco Road site is not expected to be categorized as a GWUDI source.
- Environmental review under CEQA must be initiated and completed for development of either of the well sites, and for the construction of the pipeline and storage facilities.
- Permits from the pertinent regulatory agencies must be secured prior to construction of any of the proposed facilities, including a discretionary development permit by the County of San Luis Obispo, permits from the USACE, RWQCB, and CDFG for any pipeline creek crossings, and a Caltrans encroachment permit for pipeline crossings at Highway 101, if crossed. NOAA Fisheries most likely will not be a key permitting agency under this alternative provided that surface water flows within the Santa Maria River are not affected.

Cost:

The estimated annual costs, including debt service on capital costs and O&M, ranged from $520/af (a 6,300 afy facility with minimal treatment at the Oso Flaco Road site) to $770/af (a 3,000 afy facility requiring coagulation and filtration at the Bonita site). Assuming a purchase price from Santa Maria of $1,250/af (the price for treated Santa Maria drinking water contained in the MOU for the Waterline Intertie Project), the total cost would be between $1,770/af and $2,020/af, plus costs for purchasing the Hutton or Oso Flaco Road site.

Capacity:

As noted above, withdrawing significant quantities of groundwater from a location near the boundary between the SMVMA and the NMMA is likely to affect the movement of water from the SMVMA into the NMMA. Institutional and legal considerations would likely prevent the District from implementing such a withdrawal.

It may be possible for the NCSD to acquire sufficient groundwater pumping rights to provide the full supplemental water needs of 3,000 and 6,300 AFY from other locations within the SMVMA.

4.0 CCWA, State, or "Other" Water

Introduction

The State Water Project (SWP) is a system of dams, reservoirs, power and pumping plants, canals, and aqueducts that conveys water from Lake Oroville to Southern California. The "Coastal Branch" of the SWP consists of water conveyance facilities built by the California Department of Water Resources (DWR) and regional distribution and treatment facilities constructed by the Central Coast Water Authority (CCWA).

Coastal Branch Phase I was completed in 1968. Phase II of the Coastal Branch was completed in 1997 and brings SWP water to San Luis Obispo and Santa Barbara Counties. Key facilities include the 43-MGD Polonio Pass Water Treatment Plant (PPWTP), approximately 143 miles of pipeline, and associated pumping plants and storage tanks. Individual components of the Coastal Branch were built by either the DWR or CCWA. However, CCWA is responsible for operating and maintaining the Polonio Pass Water Treatment Plant and all of the downstream Coastal Branch facilities.

The CCWA was established in 1991 and is presently composed of eight members, all of which are public agencies. Each vote on the CCWA Board of Directors is weighted in proportion to the entity's SWP Table A Amount contained in its original Water Service Agreement. (Although certain agencies subsequently amended their SWP Table A Amounts, their voting percentages remained unchanged.) (CCWA, 2007)

CCWA is a SWP contractor through Santa Barbara Flood Control and Water Conservation District (SBCFC & WCD). San Luis Obispo County Flood Control and Water Conservation District (SLOCFC & WCD) is also a SWP contractor. SWP contractors may request a maximum amount of water each year – the contractual "Table A" amount.

The SWP allocates deliveries in any year among its contractors based on "amounts" shown in Table A of the SWP contracts. However, full delivery of these "Table A Amounts" is not guaranteed. As noted in a DWR study of SWP delivery reliability:

> *Table A is used to define each contractor's portion of the available water supply that DWR will allocate and deliver to that contractor. The Table A amounts in any particular contract, accordingly, should not be read as a guarantee of that amount but rather as the tool in an allocation process that defines an individual contractor's "slice of the pie."* (DWR, 2006)

Therefore, for the remainder of this report we will use the term "Table A Amount" to indicate a numerical value that is used to allocate deliveries among SMP contractors.

During years when the SWP is unable to deliver all of its Table A Amounts, deliveries are cut back to a percentage of each contractor's Table A Amount. Many SWP contractors have established SWP Table A Amounts in excess of their planned deliveries to act as "drought buffers." For example, The City of

Santa Maria's SWP Table A Amount is 16,200 AFY, plus a 10% drought buffer. Therefore, in a year when the SWP restricts deliveries to 75% of Table A Amounts, the City would receive 82.5% (75% + 7.5%) of its 16,200 AFY.

During those years that availability of SWP water exceeds project participants' demand, project participants can store drought buffer water (and unused Table A Amounts) either directly into a groundwater basin or on an in-lieu basis (i.e., by taking delivery of the drought buffer and reducing groundwater pumping by an equal amount). During dry years when availability of SWP water is less than CCWA project participants' demand, stored drought buffer water (and stored Table A Amount water) can be used to augment SWP deliveries. (CCWA, 2007)

The State "Turnback Pool," is an internal SWP mechanism that pools unused SWP supplies early in the year for purchase by other SWP contractors at a set price. The turnback pool mechanism is only for one-year sales of water. (CCWA, 2007)

Each Santa Barbara County participant in the CCWA project is a water purveyor or user located in Santa Barbara County. Their SWP Table A Amounts are listed below.

Agency	SWP Table A Amount (AFY)
City of Buellton	578
Carpinteria Valley Water District	2,000
Goleta Water District	4,500
City of Guadalupe	550
La Cumbre Mutual Water Company	1,000
Montecito Water District	3,000
Morehart Land Company	200
City of Santa Barbara	3,000
Santa Barbara Research Center	50
City of Santa Maria	16,200
Santa Ynez RWCD, ID#1	2,000
Golden State (formerly "Southern California") Water Company	500
Vandenberg Air Force Base	5,500
SUBTOTAL	39,078
CCWA 10% Drought Buffer	3,908
SUBTOTAL	42,986
Goleta Water District additional Drought Buffer	2,500
TOTAL Contractual SWP Table A Amount	45,486

Each San Luis Obispo County water purchaser is a water purveyor or user located in San Luis Obispo County which obtained contractual rights from SLO County to receive water from the SWP. Their SWP Table A Amounts are listed below.

Agency	SWP Table A Amount (AFY)
Avila Beach Community Services District	100
Avila Valley Mutual Water Company, Inc.	20
California Men's Colony (State)	400
County of San Luis Obispo C.S.A. No. 16-1 - Shandon	100
County of San Luis Obispo Operations Center and Regional Park	425
City of Morro Bay	1,313
Oceano Community Services District	750
City of Pismo Beach	1,240
San Luis Coastal Unified School District	7
San Miguelito Mutual Water Company	275
San Luis Obispo County Community College District (Cuesta College)	200
SUBTOTAL	4,830
SLO County Drought Buffer	2,640
Annual Turn Back Sales	17,530
TOTAL Contractual SWP Table A Amount	25,000

The Coastal Branch aqueduct and Polonio Pass Water Treatment Plant were designed to deliver and treat the SWP Table A Amounts listed above, disregarding the drought buffers, Goleta's excess SWP Table A Amount, and SLO County's annual turn back sales. Design capacity = 39,078 + 4,830 = 43,908 AFY.

Previous Studies and Documents

The following list summarizes the studies and documents referenced for this evaluation:

- Pipeline System Modeling: Tank 1 to Santa Ynez Pump Facility - Definition of Available Extra Capacity (Penfield & Smith, June 2005)
- 2005 Santa Barbara County Groundwater Report (Santa Barbara County Public Works, March 2006)
- The State Water Project Delivery Reliability Report 2005 Final (Department of Water Resources, April 2006)
- 2005 Urban Water Management Plan for Central Coast Water Authority, Draft (CCWA, October 2005)

- CCWA meeting minutes, agendas, and other information available on CCWA website: http://www.ccwa.com/
- Final Urban Water Management Plan for Goleta Water District (URS/GWD, December 2005)
- 2005 Urban Water Management Plan for City of Santa Maria, Public Review Draft (CH2MHill, February 2007)
- Contract Between the State of California Department of Water Resources and SBCFC & WCD for a Water Supply (1963)
- Contract Between the State of California Department of Water Resources and SLOCFC & WCD for a Water Supply (1963)
- American States Water Company and Golden State Water Company Securities and Exchange Commission Form 10-K (Fiscal Year Ending December 31, 2006)

Acquisition Scenarios

This section considers constraints associated with obtaining supplemental water from the Coastal Branch of the SWP by way of the following scenarios:

(1) Acquiring unused or excess SWP Table A Amount:

   a. SLOCFC&WCD unused SWP Table A Amount (i.e., the drought buffer or the turn back pool)

   b. SBCFC & WCD suspended SWP Table A Amount

(2) Acquiring State water indirectly through purchase from CCWA project participants including:

   a. Goleta Water District (GWD)

   b. City of Santa Maria

(3) Directly participating in the SWP/CCWA:

   a. Purchasing SWP water as a CCWA Project Participant (outside of Santa Barbara County)

   b. Purchasing SWP water as a San Luis Obispo County Water Purchaser

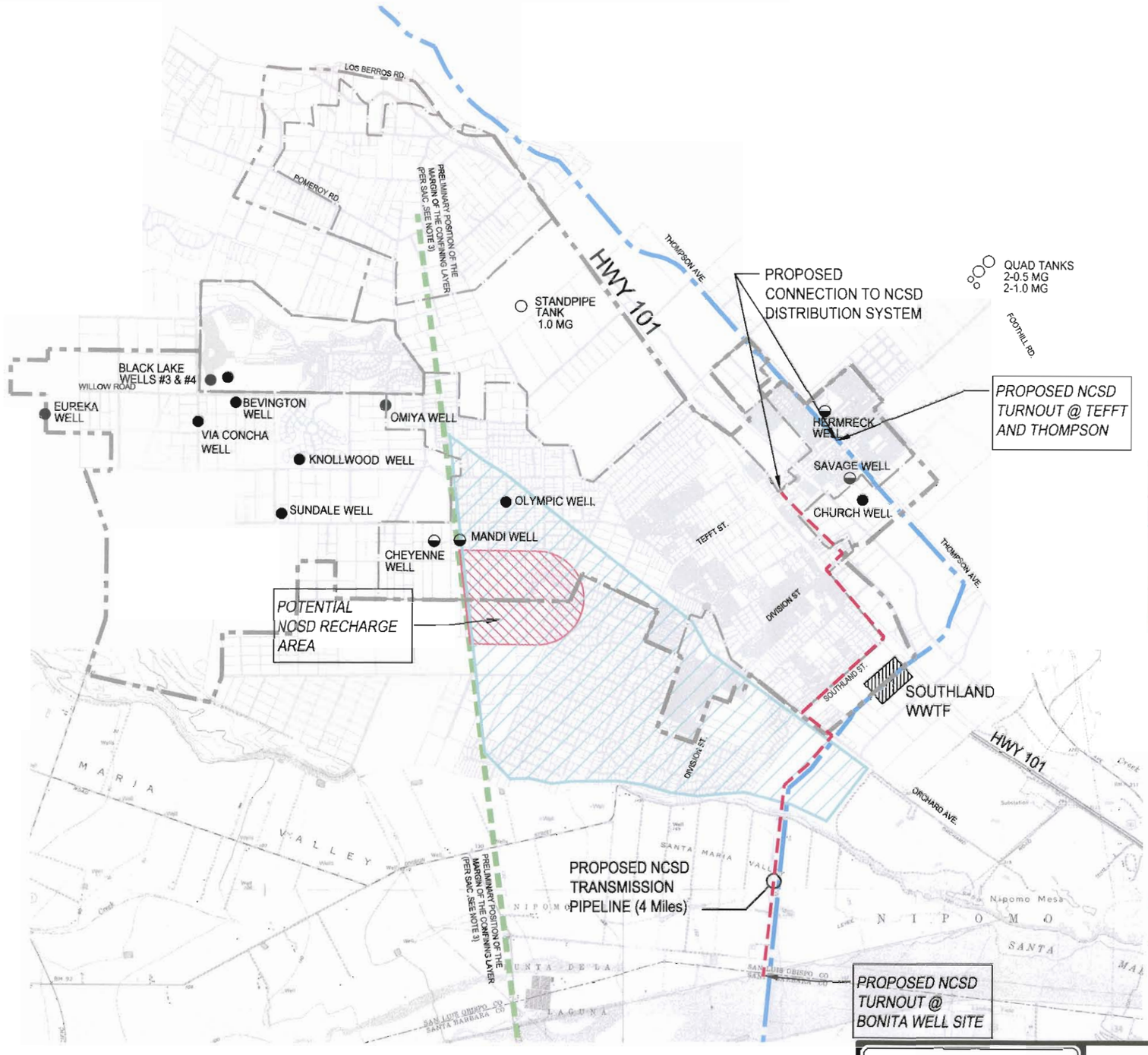
(4) Acquiring "other" water through CCWA project participants including:

   a. Purchase Golden State Water Company (GSWC) Natomas CVP entitlement in exchange for SWP water

   b. Purchase City of Santa Maria water per MOU in exchange for SWP water

Water could be provided to the NCSD via a turnout along the Coastal Branch within the District's boundary. Water would then either be delivered directly to the District water system, or indirectly via aquifer storage and recovery (ASR). A schematic map of the proposed project is shown in Figure 4-1.

This constraints analysis does not consider the use of SWP "Article 21" water. Article 21 water is made available by the SWP during times that abundant water and conveyance capacity is available, typically between January and March of most years. However, use of this water is restricted to the service area of the contractor taking delivery, with one exception: *"Article 21 water may be delivered outside the service area of a participating contractor for storage so long as it is later returned for use in the service area."* (DWR, 2006) Therefore, while Article 21 water may be available, eventually it would need to be returned, and therefore is not considered a true source of supplemental water.



NOTES:

1. POTENTIAL GROUNDWATER RECHARGE LOCATIONS ARE DERIVED FROM THE 2007 GTA EVALUATION OF POTENTIAL RECHARGE LOCATIONS.
2. PRELIMINARY TARGET AREA FOR RECHARGE IS DERIVED FROM THE 2007 SAIC TECH MEMO REGARDING YIELD OF AQUIFER STORAGE AND RECOVERY.
3. POSSIBLE LOCATION OF EASTERN MARGIN OF POSSIBLE CONFINING LAYER

LEGEND

- POTENTIAL GROUNDWATER RECHARGE LOCATION (SEE NOTE 1)
- PRELIMINARY TARGET AREA FOR RECHARGE - AQUIFER STORAGE AND RECOVERY OPTION (SEE NOTE 2)
- NIPOMO CSD WELLS
- NIPOMO CSD WELLS (STANDBY)
- NIPOMO CSD TANKS
- FUTURE WATER SYSTEM SERVICE AREA BOUNDARY
- EXISTING WATER SYSTEM SERVICE AREA BOUNDARY
- PROPOSED PIPELINE
- EXISTING S.W.P. COASTAL BRANCH PIPELINE

BOYLE ENGINEERING CORPORATION

NIPOMO CSD EVALUATION OF SUPPLEMENTAL WATER ALTERNATIVES

C.C.W.A. STATE OR "OTHER" WATER

BEC PROJECT NO. 19996.32

FIGURE 4-1

DWG: W:\Nipomo CSD (19996)\19996.32 (Alternative Water Supply)\CAD\Design\Revised Figures and Plates\Figure 4-1_CCWA State Other Water.dwg
DATE: Jun 11, 2007 8:47am XREFS: BASE_MAP- Well Sites Parcels IMAGES: Map1.TIF Map2.TIF SCAN4951_000.tif
USER: cromero

Supply

This section addresses the constraints associated with the SWP providing either 3,000 acre-feet per year (AFY) or 6,300 AFY under the scenarios listed above. Later sections address constraints associated with delivery and reliability of this supply, as well as institutional, legal, and cost issues.

Scenario 1: Acquiring Unused or Excess SWP Table A Amount

Sufficient supply exists in the form of drought buffer or excess SWP Table A Amount, as shown below:

CCWA 10% Drought Buffer	3,908 AFY
Goleta Water District additional Drought Buffer	2,500
SLO County Drought Buffer	2,640
Annual SLO County Turn Back Sales	17,530
TOTAL Unused or Excess SWP Table A Amount	26,578 AFY

Scenario 2: Purchase Water from CCWA project participants

Clearly, sufficient supply (in the form of existing SWP Table A Amounts) exists to meet the needs noted above. In most cases, a purchase arrangement would need to be made with two or more CCWA participants to provide 3,000 AFY. To provide 6,300 AFY, an arrangement with two or more participants would very likely be required, unless the entire amount can be provided by the City of Santa Maria.

Scenario 3: Direct Participation in the SWP/CCWA

Acquiring a combination of CCWA's 10% drought buffer and GWD's additional drought buffer SWP Table A Amount could provide either 3,000 AFY or 6,300 AFY. Under this scenario the NCSD would become a SWP/CCWA participant through CCWA.

Acquiring a portion of SLO County's annual turn back sales could provide these same amounts. Under this scenario the NCSD would become a SWP/CCWA participant through SLOCFC&WCD.

Scenario 4: Acquiring "Other" Water through CCWA Project Participants

ASWC/GSWC Natomas Entitlement to Central Valley Project Water:

The federally funded and managed "Central Valley Project" may also provide a supply of supplemental water through one of the existing SWP/CCWA participants, under two options described below.

The Golden State Water Company (GSWC) provides water service to Orcutt, Sisquoc, Lake Marie, and Tanglewood areas. American States Water Company (ASWC) is the parent company for GSWC and American States Utility Services (ASUS). ASWC , through its ASUS subsidiary, recently purchased permanent Sacramento River water diversion rights from the Natomas Central Mutual Water Company (Natomas), allowing ASWC to divert up to 5,000 acre-feet of Central Valley Project (CVP) water per year. (ASWC, 2007) Therefore, it may be possible to purchase this 5,000 AFY CVP entitlement from GSWC.

GSWC has also entered into a water transfer agreement with Natomas under which Natomas will supply GSWC with up to 30,000 AFY of water to be used exclusively by GSWC to serve a proposed new service area in Sutter County, California. (ASWC, 2007) In order to provide retail water service to this portion of Sutter County, GSWC has filed for a Certificate of Public Convenience and Necessity with the California Public Utilities Commission (CPUC). Review of this application has been deferred by the CPUC pending completion of an environmental assessment. It may be possible to purchase a portion of this water, and exchange it for some or all of the GSWA CVP entitlement.

City of Santa Maria Water:

The water supply for the City of Santa Maria is 49,710 AFY (CH2MHill, 2007). This supply includes: 13,706 AFY of purchased SWP water; 12,795 AFY of groundwater; 14,300 AFY of Twitchell yield/commingled groundwater; and 8,909 AFY of SWP return flows (i.e., water used for irrigation or other purposes which "returns" via deep percolation to the aquifer.) This supply is greater than projected demands. The city's total projected water demand is estimated at 24,780 AFY in the year 2030, including the 3,000 AFY sold to NCSD and sales to other agencies. Therefore, adequate supply exists for the District to purchase "other" Santa Maria water in exchange for SWP water.

Unused and Excess Capacity for Treatment and Conveyance

Implementation of any of these scenarios requires that the SWP/CCWA treatment and conveyance facilities have sufficient capacity to accommodate proposed deliveries to the NCSD. System capacity will not be an issue under Scenario 2 if the SWP Table A Amount or entitlement is purchased from CCWA participants downstream of NCSD and the delivered volume is equal to the water purveyor's historically delivered SWP Table A Amount. However, system capacity will be an issue if NCSD requests delivery of a drought buffer Table A Amount, an unused Table A Amount, or some other water source, as is the case for the three other scenarios being considered.

The existing treatment and conveyance facilities were designed, constructed, and (in the case of the treatment plant) rated at a contracted capacity equal to the SWP Table A Amounts listed above (neglecting drought buffers, suspended amounts, and undeliverable capacity). Each portion of the system was designed with a small amount of unused capacity. Subsequent experience has shown that

the system is working more efficiently than designed, thereby providing some excess capacity beyond design requirements.

The following table summarizes the contracted, unused, and excess capacity in the existing CCWA treatment and conveyance facilities.

***Table 4-1* Capacities of the CCWA Treatment and Conveyance Facilities**

Facility	Polonio Pass Water Treatment Plant	Pipeline above Lopez Dam	Pipeline from Lopez Dam to Santa Maria
Contracted Capacity	43,908 AFY	43,908 AFY	39,078 AFY
Unused Capacity	0 AFY (a)	3,908 AFY (b)	3,908 AFY (b)
Excess Capacity	5,000 AFY (d)	5,600 to 9,100 AFY (c)	up to 5,600 AFY (c)

(a) CCWA web site shows WWTP design capacity of 43 MGD, giving 44,000 AF in 11 months, a value within the rounding error of contracted capacity.
(b) Penfield & Smith (2005) analysis using design assumptions.
(c) Penfield & Smith (2005) analysis using calibrated model. Pipeline capacities above and below Lopez turnout depend on volume released at Lopez.
(d) "CCWA has determined that the treatment capacity at the Polonio Pass Treatment plant is approximately 5,000 AFY greater than its current permitted rating." City of Santa Maria, Urban Water Management Plan (2007) page 3-13.

Quality

The SWP Coastal Branch conveys surface water which is treated to DHS drinking water standards at the Polonio Pass Water Treatment Plant using advanced coagulation, activated carbon filters, chlorine, and chloramines. Algae; taste and odor; and disinfection byproduct formation are potential water quality issues that may affect SWP participants (CCWA, 2005).

Because NCSD currently disinfects its groundwater with free chlorine and the SWP supplemental water uses chloramines, provisions must be made to either convert the SWP water over to free chlorine residual, or convert NCSD groundwater over to chloramine residual (Boyle 2006).

Reliability

State Water Project

The reliability of State Water Project (SWP) supplemental water will depend on the quantity of water obtained from the SWP (or the CVP), and on the amount of conveyance and treatment capacity obtained from the CCWA.

Being dependent on Northern California hydrological conditions, the SWP is not always able to provide the entire Table "A" amount to all its contractors. In such cases, deliveries are allocated to each contractor based on their Table "A" amount. The probability of receiving SWP deliveries has been estimated in the year 2025, and is summarized in the following figure.

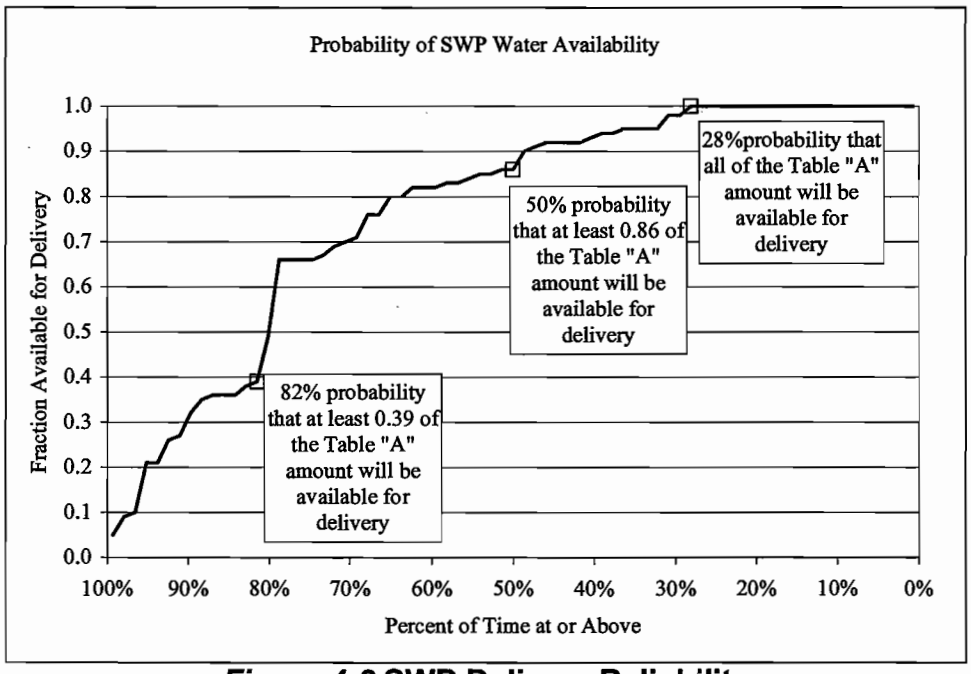


***Figure 4-2* SWP Delivery Reliability**

Source: The State Water Project Delivery Reliability Report 2005, April 2006.

Predicted SWP water deliveries to San Luis Obispo County participants and CCWA participants in Santa Barbara County are dependent on the reliability of the SWP supply and the available CCWA conveyance and treatment capacity (SAIC, 2007), as summarized below.

***Table 4-2* Predicted SWP/CCWA Water Deliveries**

	San Luis Obispo County		Santa Barbara County	
Year Type	Available from SWP (1)	Delivered	Available from SWP	Delivered
"Wet" Year	24,000 AFY	4,830 AFY [2]	43,500 AFY	39,078 AFY [2]
50% Probability	21,000	4,830	38,000	38,000
Long Term Average	19,000	4,830	34,500	34,500
"Dry" Year	16,500	4,830	29,500	29,500

(1) based on full 25,000 AFY Table A Amount held by San Luis Obispo County.
(2) Limited by pipeline and treatment design capacity, although unused and excess capacity may be available, as discussed above.

It is evident that the reliability of any supplemental SWP water will depend on its SWP Table A Amount (including drought buffer), and on the contracted portion of the treatment and conveyance capacity within the CCWA.

Central Valley Project

The reliability of water obtained from the Central Valley project via the Natomas Central Mutual Water Company is assumed to be similar to the reliability of CVP water as a whole. The reliability of CVP deliveries is similar to the SWP, as shown below.

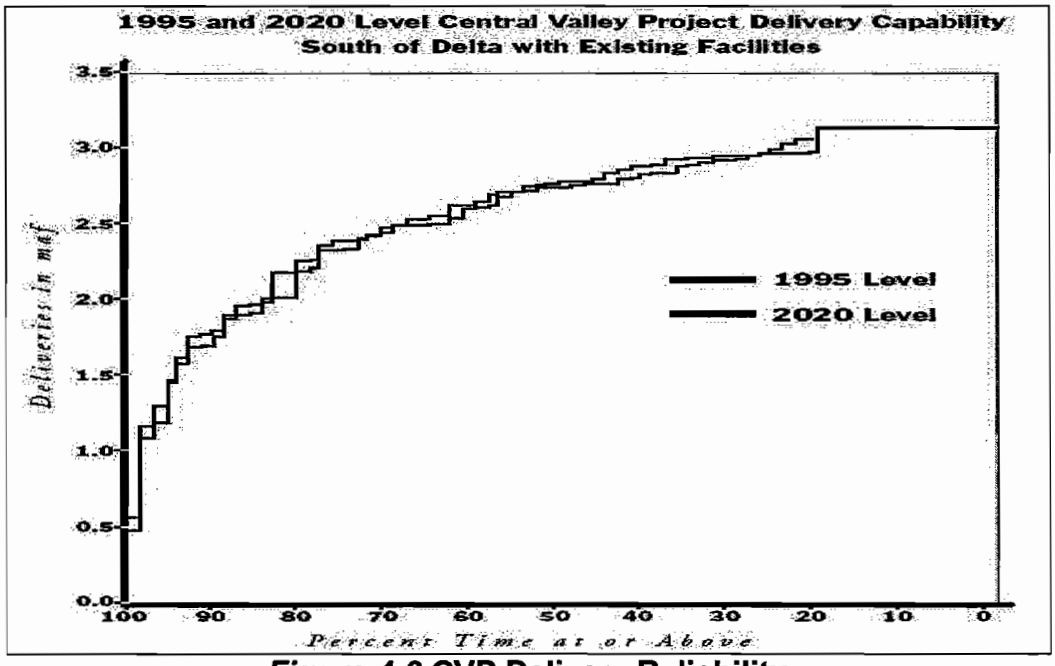


***Figure 4-3* CVP Delivery Reliability**
Source: California Water Plan, Bulletin 160-98,

It has been estimated that in 2020 during "drought" years (defined as the 1990-91 water years, an event with a recurrence interval of about 20 years, or a 5 percent probability of occurring in any given year) the CVP as a whole will be able to deliver 70% of its historical "average" deliveries (DWR, 1998).

Required Facilities

Two physical options to provide supplemental SWP water within the Nipomo CSD study area were considered in this Constraints Analysis. They are as follows:

- Connect the District water system directly to the SWP Coastal Branch; and
- Provide facilities for aquifer storage and recovery (ASR) of SWP water

For the direct connection option, it is anticipated the supplemental water transmission system may originate from a proposed CCWA turnout near the intersection of Tefft Street and Thompson Road or the Bonita Well Site as shown on Figure 4-1. Depending on the final turnout location and disinfection alternative pursued, water treatment, conveyance, and interconnection facilities will also be required for this option.

Implementation of the ASR option will also require a turnout as identified above. Additionally, percolation and/or injection sites in addition to pumping facilities will also be required. It may be possible to incorporate percolation functions into existing or planned facilities, such as over-irrigation of landscaped areas or seasonal percolation through stormwater detention basins. The feasibility of direct injection would have to be evaluated with test facilities. The main concern would be clogging of the aquifer, thus reducing the aquifer transmissivity, over time due to the high nutrient loading from the excess nitrogen present due to the ammonia content in the chloramines in treated CCWA water. (A more detailed description of this option will be provided in Tech Memorandum No. 2.)

Project Components for Direct Connection:

The following facilities will be required for a direct connection to the SWP Coastal Branch Pipeline:

- Turnout facility (including all required appurtenances) from existing 42-inch SWP pipeline at either Tefft and Thompson or at Bonita Well Site;
- Pipeline extension from turnout to existing NCSD distribution system as follows:
  - Turnout at Tefft and Thompson: 0.5 miles of pipe; or
  - Turnout at Bonita Well site: 4.2 miles of pipe
- Water treatment/disinfection facilities as follows:
  - Facilities upstream of interconnection to NCSD system to convert SWP water to free chlorine residual; or

    - Facilities at each well to convert NCSD wells to chloramine residual
- Interconnection to existing NCSD distribution system

Project Components for ASR:

The following facilities will be required for using supplemental SWP water in an aquifer storage and recovery program:

- Turnout facility (including all required appurtenances) from existing 42-inch SWP pipeline at either Tefft and Thompson or at Bonita Well Site;
- Pipeline extension from turnout to proposed spreading pond facilities or injection facilities;
- Water treatment facilities (if required) upstream of direct injection facilities;
- Spreading ponds (dimensions and preferred location(s) will be conceptually reviewed in Technical Memorandum No. 2);
  [Assuming a 6 inch per day percolation rate, and adequate time for pond rotation for drying and maintenance, approximately 50 acres of pond would be sufficient to percolate 6,300 AFY (SAIC, 2007). Likewise, 24 acres of pond would be required to infiltrate 3,000 AFY.]
- Recovery well field and/or upgrades to existing wells (expected recovery rates will be conceptually reviewed in TM No. 2); and
- Pipeline extension from recovery well field to interconnection with existing NCSD distribution system (if required)

Implementation Schedule

Assuming the NCSD moves aggressively to obtain agreements with other agencies, it is estimated approximately 4 to 6 years will be required to fully implement this project. This estimate is based on the following:

• Obtain tentative agreement from providing agency and from CCWA	0.5 to 1.5 years
• Hold special election to obtain agreement of NCSD rate payers	1.0 to 0.5 years
• Site specific investigation of feasibility of percolation or direct injection	0.5 to 1.0 years
• Design, Permitting, and Environmental Review	1.0 to 1.5 years
• Construction and Start Up	1.0 to 1.5 years

Constraints

This section presents an analysis of constraints to obtaining supplemental water from the SWP (or other sources) through the Coastal Branch aqueduct under the following scenarios:

- Acquire unused or excess SWP Table A Amounts from CCWA or SLOCFC&WCD;
- Acquire State Water indirectly through purchase from CCWA project participants (Goleta Water District or City of Santa Maria);
- Directly participating in the SWP/CCWA as either a project participant contracted through CCWA or a water purchaser contracted through SLOCFC&WCD; or
- Acquire "other" water through CCWA project participants (GSWC/Natomas or City of Santa Maria)

Institutional

Any transfer of permanent entitlement from one state water contractor to another requires more than CCWA approval. A transfer would also require SLO County Board of Supervisors, Santa Barbara County Board of Supervisors, and DWR approvals. Therefore, the opinions of many people and the policy deliberations of many elected officials will need to be addressed. NCSD's desire to not pay past costs may be in conflict with State Water contracts, depending on the specifics. (Ogren, pers. comm.)

There exists competing interest among existing project participants with regards to available unused/excess capacity in SWP/CCWA facilities as well as unused Table A allotments.

- CCWA is interested in acquiring SLOCFC & WCD's unused SWP Table A Amount as additional drought buffer to improve water delivery reliability.
- SLOCFC & WCD has developed a proposed policy regarding transfer/sale of its SWP Excess Entitlement. Policies that may hinder NCSD's bid for some of this water include:
    - Existing local Project Participants have first right to utilize excess entitlement for reliability purposes. NCSD is not currently a contracted Project Participant.
    - Interested agencies may be required to "buy into" the District's past costs.
- Both CCWA and the City of Santa Maria are interested in SBCFC&WCD's suspended Table A allotment of 12,214 AFY. It is understood CCWA is actively pursuing a possible repurchase of this allotment for reliability purposes.
- California Department of Water Resources owns the Coastal Branch Pipeline from Tank No. 1 to Tank No. 5 on Vandenberg AFB, however, CCWA is responsible for operating and maintaining it. Furthermore, CCWA owns and operates the Polonio Pass Water Treatment Plant at the State's Tank No. 1 site as well as the 42-mile pipeline extension from Vandenberg AFB to Lake Cachuma. Therefore, it is possible that CCWA could block any agreement between NCSD and

existing project participants for SWP or "other" water. This includes the proposed purchase of Natomas entitlement from GSWC.

Reliability

The long-term rate of delivery for any SWP Table A Amount is approximately 76 %. Reliability for CVP water is similar. Therefore, additional SWP Table A Amounts for "drought buffer" would be required to improve the reliability of this proposed supply.

Conveyance and Treatment Capacity

The City of Santa Maria, among others, is interested in acquiring tentative additional treatment capacity at Polonio Pass WTP. This is contingent on CCWA's successful re-rating of the plant's filters.

- The City of Santa Maria is also interested in acquiring the additional 5,000 AFY available for delivery at the City's turnout as identified in the 2005 P&S Capacity Study and the City's UWMP. This is the additional capacity that could be available for existing project participants and/or Nipomo CSD as discussed in the analysis.
- GSWC's entitlement to 30,000 AFY of Natomas water is intended to serve a proposed new service area in Sutter County. GSWC has filed for a Certificate of Public Convenience and Necessity with the California Public Utilities Commission (CPUC) in order to provide retail water service to this area. It is understood that Rob Saperstein of Hatch & Parent (attorney for GSWC) is currently conducting an analysis that may address both the institutional and legal feasibility for procuring this water. Furthermore, delivery of any portion of this water through the SWP pipeline to NCSD will be restricted by limitations in available pipeline capacity and the City of Santa Maria's mutual interest in acquiring the same as discussed above.
- The City of Santa Maria is opposed to providing NCSD exchange water through a connection to the SWP pipeline within District boundaries. This is their "higher quality" surface water used for blending with pumped groundwater.
- Goleta Water District's additional 2,500 AFY of SWP allotment might be available on a "short term" basis when the District's projected or actual supplies exceed its demand and ability to inject groundwater. However, delivery of any portion of this water is also constrained by limitations in available pipeline capacity and the competing interest for the same as discussed above. NCSD must decide if a "term" contract with GWD is acceptable.

Legal:

Following a meeting with NCSD staff and its legal counsel, it is understood that the District desires to avoid: (1) "term" contracts for obtaining water from existing participants; and (2) buying into SWP construction costs. The following legal constraints attempt to summarize the necessary instruments, agreements, and contracts required for obtaining supplemental water from the SWP pipeline.

- A prior voter referendum regarding NCSD involvement in the State Water Project specified that the District would not contract with the State DWR for State Project water. Therefore the District should require a public vote prior to pursuing any supply option involving CCWA/SWP facilities to convey supplemental water to NCSD.
- As previously indicated, Hatch & Parent (attorney for GSWC) is currently conducting an analysis that may address the legal requirements for NCSD's procurement of a portion of the Natomas water. The legal and contractual terms are currently pending.
- In order to acquire a portion of SBCFC & WCD's suspended 12,214 AFY amount, NCSD will likely need to enter an agreement with both CCWA and the DWR requiring it to pay costs with interest associated with the water.
- NCSD will likely need to enter an agreement with both SLOCFC & WCD and CCWA in order to acquire a portion of SLOCFC & WCD's unused SWP Table A Amount. As described in San Luis Obispo County's Excess Entitlement Policy, NCSD may be required to "buy into" their past costs. Furthermore, since San Luis Obispo County participated in construction of treatment and conveyance facilities for only 4,830 AFY, it is assumed NCSD may also be required to "buy into" a portion of other project participant's construction costs.
- Because existing CCWA Project Participants are provided with SWP water in accordance with their respective agreements with CCWA, NCSD will likely need to obtain their approval and/or enter an agreement with CCWA for any other scenario considered in this evaluation.

Regulatory

- NCSD will also need to satisfy the requirement of a Title 22 Engineering Report for DHS/RWQCB review if aquifer storage-recovery is pursued.
- The construction of a treatment system, pipelines (including multiple stream crossings), and pumping facilities will require permits from local, state, and federal agencies.

Cost

The estimated annual costs for construction and operation of a turnout, pipeline extension, and treatment facilities for a direct connection, including debt service on capital costs and O&M are $380/af with a 3,000 afy facility, and $130/af with a 6,300 afy facility.

Purchase of water from a willing seller will involve an agreement on two cost components: (1) annual costs for CCWA operation, maintenance, and continuing debt service; and (2) buy-in cost for past capital improvement payments made by the seller. For the purpose of this analysis we estimate per acre-foot rates will be similar to those in a recent sale of 400 AFY from Carpinteria Valley Water District. In that sale, annual costs were $1,500/af and initial buy-in costs ("one time" fee) were $5,000/af. (CVWD, 2006)

Therefore buy-in cost would be $15 million for a 3,000 AFY facility and $31.5 million for a 6,300 AFY facility. Financing these costs over 20 years at 6% would result in annual costs equivalent to $436/AF, bringing the total cost to $2,310/AF for a 3,000 AFY facility and $2,070/AF for a 6,300 AFY facility.

Capacity

There is not enough excess or unused delivery capacity in the CCWA conveyance and treatment facilities, nor are there sufficient excess SWP Table A Amounts available to satisfy the NCSD's need for 3,000 AFY or 6,300 AFY, plus the competing interests for the same water as summarized above under *Institutional Constraints*.

- Assuming full delivery of project participant allotments including drought buffers, the SWP pipeline upstream of the Lopez turnout doesn't have enough extra capacity to convey the full SLOCFC & WCD's unused Table A allotment of 20,170 AFY. According to the 2005 P&S Capacity Study, only 9,100 AFY (13.7 cfs) of additional water can be added to the pipeline between Tank No. 1 and the Lopez Turnout where it would be subsequently removed.
- Assuming full delivery of project participant allotments including drought buffers, the SWP pipeline both upstream and downstream of the Lopez Turnout and serving CCWA participants in Santa Barbara County doesn't have enough extra capacity to convey the full SBCFC & WCD's suspended Table A allotment of 12,214 AFY. According to the 2005 P&S Capacity Study, only 4,700-5,600 AFY of additional water can be added to the pipeline between Tank No. 1 and Santa Maria Valley. This is the additional capacity that could be available for existing project participants and/or Nipomo CSD as discussed in the analysis.
- Assuming full delivery of project participant allotments only (no drought buffers), CCWA's Polonio Pass WTP may have only 4,260 AFY[5] of available capacity at the current plant rating of 43-MGD. The WTP may have an additional capacity of 5,000 AFY if it is successfully re-rated by CCWA.

Available Storage:

It has been estimated that the aquifer underlying the NMMA has available storage on the order of 400,000 AF. However, it is possible that hydrogeology considerations limit the area available for percolation ponds to approximately one-quarter of the 20,000 acres in the NMMA. Percolation of up to 6,300 AF within this area would likely raise the groundwater elevations by 10 feet over the 5,000 acres without consideration for likely lateral flow (SAIC, 2007). Therefore, adequate storage exists for the quantities under consideration.

[5] This is equivalent to 3,905 AFY on an 11-month basis.

5.0 Desalination of Sea Water/Cooling Water

Introduction

Desalination of seawater or brackish groundwater could provide the District with a reliable source of additional water. Key factors in the implementation of this approach are the source of the saline water, the location where it will be treated, and where the brine is disposed. For this analysis, three distinct combinations of source, treatment, and disposal are examined:

Table 5-1 Desalination Alternatives

Alternative	Water Source	Treatment Location	Brine Disposal
Partner with Nipomo Refinery	Seawater/brackish water from new wells located on Nipomo Refinery land and "used" Nipomo Refinery cooling water	Nipomo Refinery	Additional capacity in existing Nipomo Refinery outfall through desalination of "used" cooling water.
NCSD Owned Facility	New beach wells	South of State Parks land	New ocean outfall or beach injection
Partner with SSLOCSD with Added NCSD Pipeline	New beach wells located in Oceano	Adjacent to SSLOCSD Wastewater Treatment Plant in Oceano	New District-built ocean outfall or beach injection

These alternatives are briefly described below.

Partner with Nipomo Refinery

<References to the "Nipomo Refinery" option are based on earlier investigations and conceptual analysis regarding this option. A more complete constraints analysis is being performed by another consultant to the District. Therefore, if needed, this section may be revised based on the pending report.>

The Nipomo Refinery was built in 1955 and is designed to provide feedstocks for the San Francisco Refinery. Crude oil is transported by pipeline to the refinery, where it is run through the crude distillation units which have a rated input capacity of 44,400 barrels a day. Manufacturing operations are continuous, 24 hours per day, 365 days per year, except for yearly maintenance and repair shutdowns. (CRWQCB, 2002)

The refinery pumps 800-850 gpm of groundwater for cooling water and discharges 300 gpm of blowdown water and other wastewaters to an existing outfall. (Kennedy/Jenks, 2001.) Treatment of this blowdown water is a key component of this water supply alternative.

> "Most industrial cooling towers use river water or well water as their source of fresh cooling water. The large mechanical induced-draft or forced-draft cooling towers in industrial plants such as power stations, petroleum oil refineries, petrochemical plants and natural gas processing plants continuously circulate cooling water through heat exchangers and other equipment where the water absorbs heat. That heat is then rejected to the atmosphere by the partial evaporation of the water in cooling towers where upflowing air is contacted with the circulating downflow of water. The loss of evaporated water into the air exhausted to the atmosphere is replaced by "make-up" fresh river water or fresh cooling water. Since the evaporation of pure water is replaced by make-up water containing carbonates and other dissolved salts, a portion of the circulating water is also continuously discarded as "blowdown" water to prevent the excessive build-up of salts in the circulating water." (Beychok, 1967, in Wikipedia)

Another key component of this alternative will be utilization of the existing ocean outfall. All process wastewaters and contaminated storm water are collected and treated in a central wastewater treatment facility. This wastewater treatment facility is designed to treat 575,000 gallons per day (approximately 400 gpm). The final treated wastewater discharge is discharged to the Pacific Ocean through an outfall terminating 1,700 feet offshore and 27 feet deep. The discharge has not caused a violation of water quality standards to date, and based on past monitoring results, degradation of the marine environment has not occurred. (CRWQCB, 2002)

The alternative being evaluated would involve:

1. desalination of a portion of the cooling water before it enters the Nipomo Refinery wastewater treatment plant, thereby making additional capacity available in the outfall; or
2. desalination of seawater from new beach wells or brackish water from new wells at an undetermined location, and
3. disposal of the brine in the existing Nipomo Refinery ocean outfall.

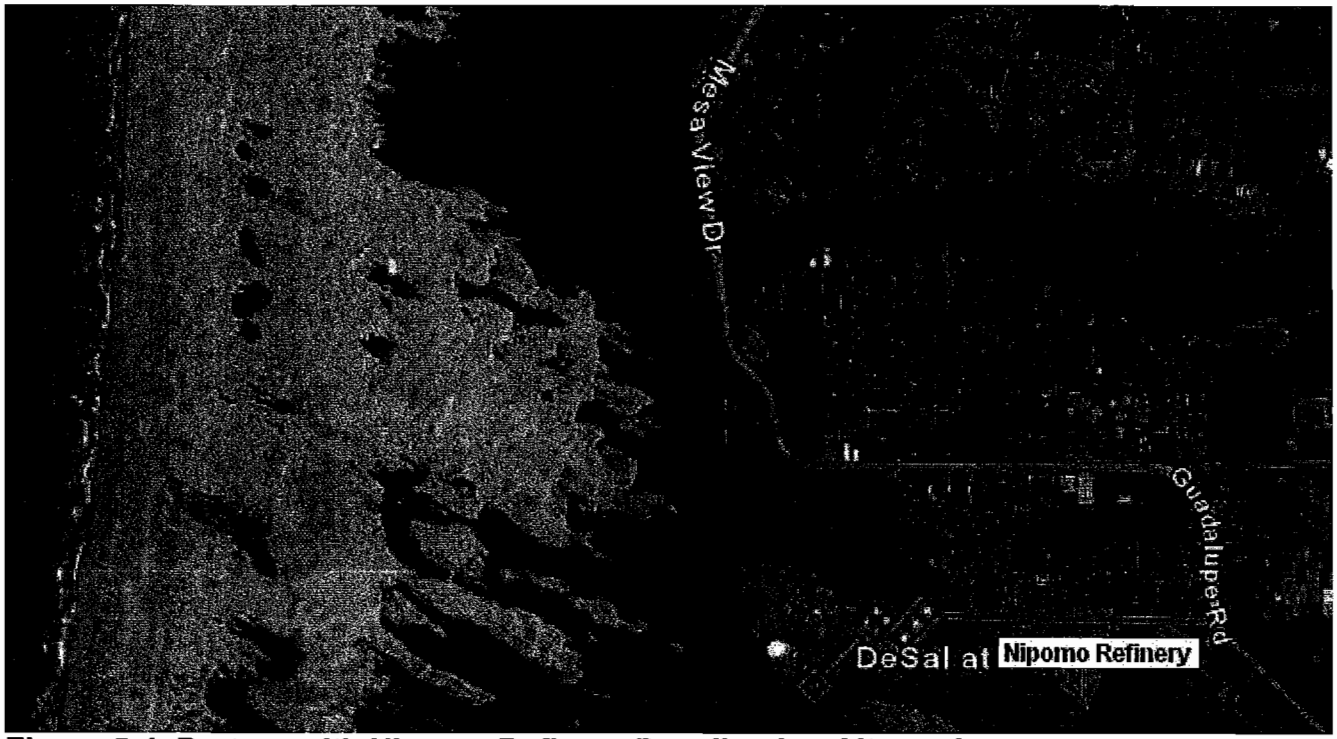


Figure 5-1 Partner with Nipomo Refinery Desalination Alternative

NCSD Owned Facility

This alternative would involve construction of a stand-alone desalination facility, new beach intake and disposal wells, and associated pipelines. For evaluation purposes the desalination plant is assumed to be located on Highway 1 between Oso Flaco road and the Santa Maria River, the intake and brine lines are assumed to pass through the dunes south of State Park lands to the ocean, and the pipeline for the product water runs north up Highway 1 to connect with NCSD pipe network near the Eureka well site. See Figure 5-2.

In the case of an NCSD-owned facility, less environmental impacts, quicker environmental review, and greater likelihood of Coastal Commission approval would be associated with beach wells or other subsurface facilities, rather than direct ocean connections, for both intake and brine disposal. To implement this option the District will need to verify that adequate separation is provided between extraction and injection wells such that the injected brine does not impact the extraction water quality.

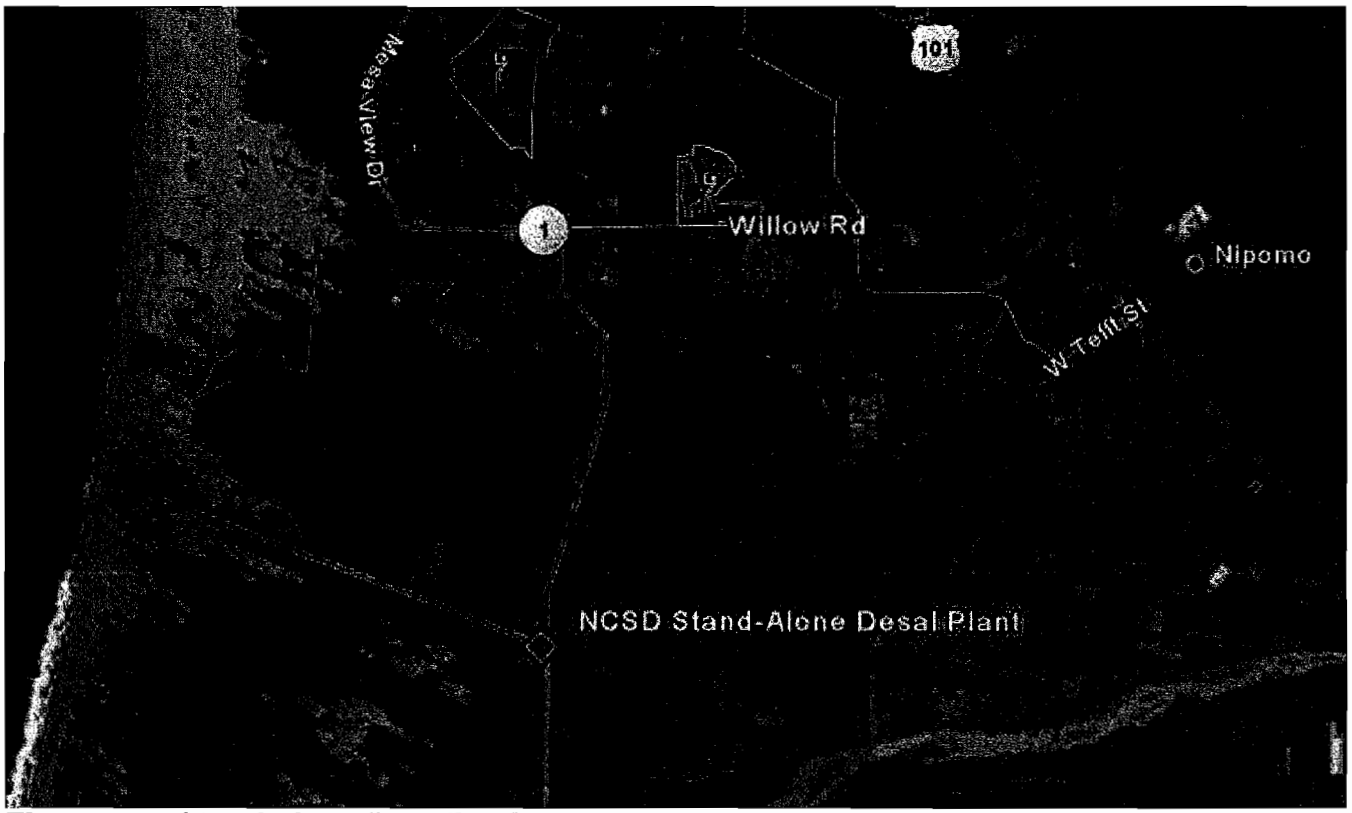


Figure 5-2 Stand-alone Desalination Alternative

Partner with SSLOCSD with Added NCSD Pipeline

This alternative would involve partnering with the cities of Arroyo Grande and Grover Beach, and with the Oceano Community Services District to expand their planned desalination facility at the South San Luis Obispo Community Services District (SSLOCSD) wastewater treatment plant. Unfortunately, it has been reported that the water needs of the SSLOCSD are such that the planned project (for SSLOCSD only) will utilize all the excess capacity in the existing ocean outfall. This lack of excess capacity will require the NCSD to build and permit a new brine disposal facility to accommodate the expanded desalination facility. As noted above, it may be possible to use beach injection to dispose of the brine.

For evaluation purposes it is assumed the pipeline for the product water runs south along Highway 1 to connect with NCSD pipe network near the Eureka well site. See Figure 5-3.

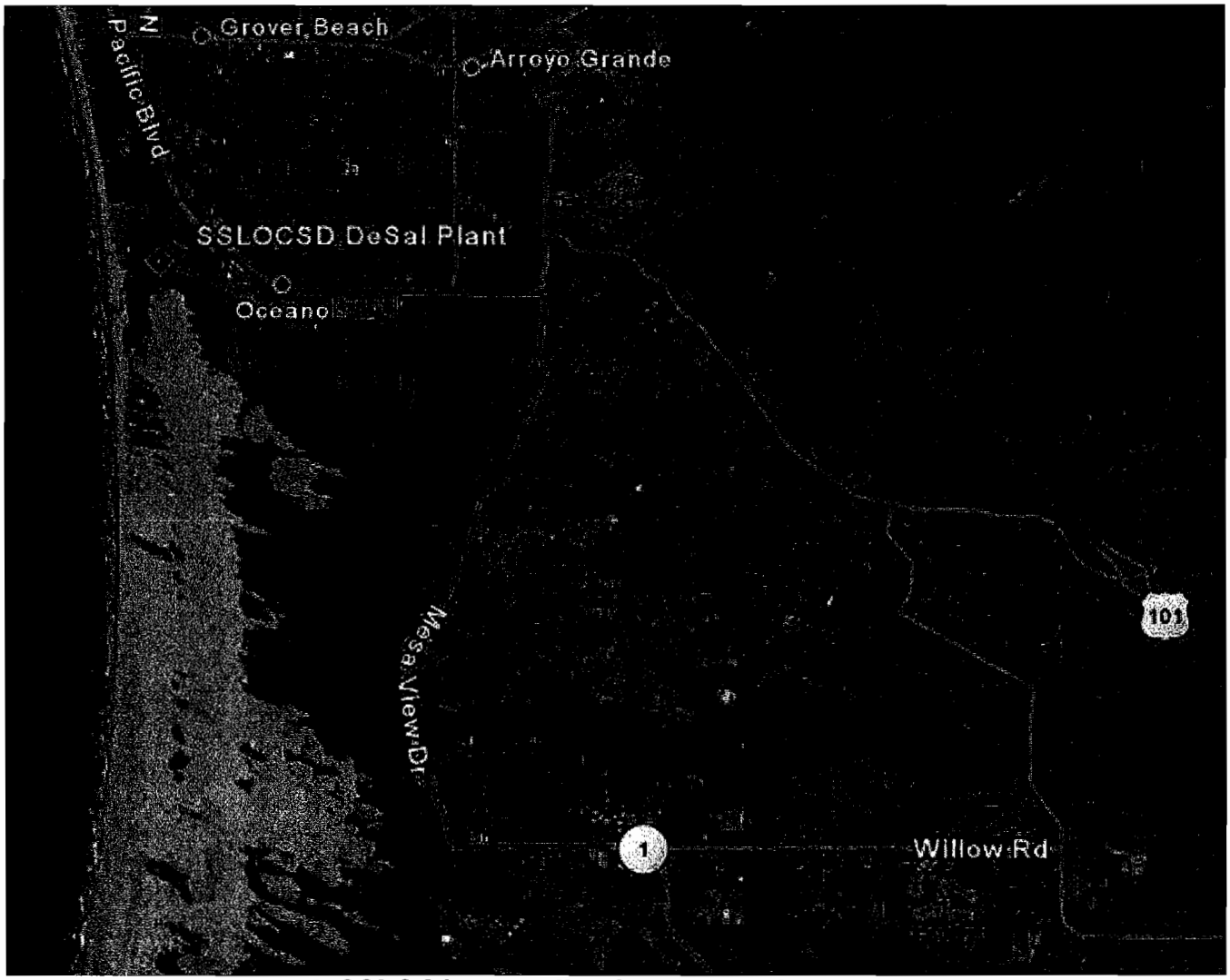


Figure 5-3 Partner with SSLOCSD Desalination Alternative

Previous Studies

Previous studies have been made of the alternatives under consideration, as discussed below.

Partner with Nipomo Refinery – Previous Studies

A 2001 report by Kennedy/Jenks Consultants looked at treating the used blowdown water for re-use as cooling water in the refinery. This additional treatment would reduce Nipomo Refinery need for groundwater by approximately 360 AF/yr. The cost for this source was estimated to be $2,161 /AF

based on year 2001 capital costs of $4 million (excluding land purchase) amortized over 20 years at 8% plus $400,000/year O&M costs.

At the time of this writing (5/9/07) Cannon Associates is preparing a water supply feasibility study utilizing Nipomo Refinery cooling tower effluent, Nipomo Refinery groundwater, brackish/sea water from new NCSD wells, and reverse osmosis treatment. The memo is in draft form, and has not yet been reviewed by Nipomo Community Services District (NCSD).

NCSD Owned Facility – Previous Studies

Boyle is unaware of any previous studies of a proposed NCSD owned seawater desalination facility.

However, numerous studies have been performed regarding construction of seawater desalination facilities for various municipalities and water Districts in California. As of 2004, the California Coastal Commission noted that there were 11 existing seawater desalination facilities on the California coast, with a combined capacity of approximately 3 MGD, or 3,300 afy. At that time, an additional 21 facilities were proposed, with a combined capacity of 240 MGD, or 260,000 afy (CCC, 2004).

Partner with SSLOCSD – Previous Studies

A 2006 report by the Wallace Group looked at the feasibility of desalinating seawater at the South San Luis Obispo County Sanitation District (SSLOCSD) wastewater treatment plant, installing new beach wells for intake and utilizing the existing outfall for brine disposal. Key findings of that report include:

- Approximately 2 MGD (approx 2300 AFY) could be produced.
- Assuming a 50% recovery rate, the projected brine effluent flow rate (2 MGD) would utilize all excess capacity in the existing wastewater treatment plant outfall.
- Capital costs would be $17.5 million. (December 2005 dollars.)
- Annual O&M costs would be $4.5 million, assuming energy costs at $0.15/kwh.
- Assuming a 20-year life cycle and 7% interest, water cost would be $2,400/afy.

Supply

Desalination using the Pacific Ocean as a source would allow for a virtually unlimited water supply, subject to limits imposed by regulatory agencies. These limits are unknown at this time, but for purposes of this screening analysis, are considered unlikely to restrict the amount of water that could be produced to amounts less than those noted above.

Partner with Nipomo Refinery – Supply

<This section will be completed pending the completion of the study being prepared by Cannon Associates.>

NCSD Owned Facility – Supply

Construction of an NCSD-dedicated facility would allow for a virtually unlimited water supply, subject to limits imposed by regulatory agencies.

Partner with SSLOCSD – Supply

According to the water supply study recently completed for Oceano CSD, the City of Grover Beach, and the City of Arroyo Grande, a desalination facility built at the SSLOCSD WWTP to meet the water needs of these agencies would utilize all excess capacity in the existing wastewater treatment plant outfall. Therefore, existing discharge capacity is a constraint on supply for this alternative. Additional discharge capacity would need to be installed for the NCSD to process the additional product water needed. Additional beach wells or other inlet facilities would need to be installed and intake, conveyance, and discharge facilities would need to be enlarged to accommodate the increased flows foreseen.

Quality

Typical product water recovery rates of 45% are reported for reverse osmosis seawater desalination plants on the California coast. Product water quality for these plants is between 284 and 400 ppm TDS. In addition, the RO process can remove unwanted contaminants, such as trihalomethane-precursors, pesticides, and bacteria (CCC, 2003). If the District chooses brackish water or beach well desalination, the lower TDS should result in higher recovery.

There is concern regarding the quality of cooling water due to the anti-scalant chemicals added. NCSD must be able to demonstrate that these chemicals are nontoxic to humans and can be removed in the treatment process.

Additional constituents of concern in sea water include algal toxins, such as domoic acid, and boron, which is not well removed by RO. RO treated water is also highly corrosive and must include provisions for corrosion control.

Reliability

The reliability of these alternatives is considered very high. Temporary interruptions in service may occur due to power outages or maintenance or repairs to supply and delivery lines, but the source itself – the Pacific Ocean – can be considered a reliable source for the foreseeable future.

Required Facilities

Based on this constraints analysis, the facilities required to obtain seawater or brackish water, treat it, dispose of the waste, and transport the treated water to the NCSD distribution system are listed below for production of 3,000 afy and 6,300 afy.

Table 5-2 Facilities Required for Desalination Alternatives – 3,000 afy

Alternative	Intake Structure	Intake Pipeline	Treatment Plant	Delivery Pipeline
a. Partner with Nipomo Refinery	7 Brackish or Beach Wells	24 inch diameter 1 mile	3,000 afy (2.7 MGD)	18 inch diameter 1.9 miles
b. NCSD Owned Facility	7 Beach Wells, 0.9 mgd each	24 inch diameter 3.8 miles	3,000 afy (2.7 MGD) plus 3.8 mile 18" discharge line and ocean outfall	18 inch diameter 3.6 miles
c. Partner with SSLOCSD with Added NCSD Pipeline	7 additional Beach Wells, 0.9 mgd each	Enlarge planned SSLOCSD intake pipeline	Enlarge SSLOCSD facility by 2.7 MGD plus 0.4 mile 18" discharge line and ocean outfall	18 inch diameter 7.8 miles

Table 5-3 Facilities Required for Desalination Alternatives – 6,300 afy

Alternative	Intake Structure	Intake Pipeline	Treatment Plant	Delivery Pipeline
a. Partner with Nipomo Refinery	15 Brackish or Beach Wells	36 inch diameter 1 mile	6,300 afy (5.7 MGD)	24 inch diameter 1.9 miles
b. NCSD Owned Facility	15 Beach Wells, 0.9 mgd each	36 inch diameter 3.8 miles	6,300 afy (5.7 MGD) plus 3.8 mile 24" discharge line and ocean outfall	24 inch diameter 3.6 miles

c. Partner with SSLOCSD with Added NCSD Pipeline	15 additional Beach Wells, 0.9 mgd each	Enlarge planned SSLOCSD intake pipeline	Enlarge SSLOCSD facility by 5.7 MGD plus 0.4 mile 24" discharge line and ocean outfall	24 inch diameter 7.8 miles

Implementation Schedule

Given the time needed for cooperation between agencies/facility owners, extensive environmental review, pilot testing, field investigations, design, construction, and startup, it is expected that implementation of any of these alternatives would take between 6½ and 10½ years. This estimate is based on the following:

- Obtain agreement from cooperating entities — 0.5 to 1.5 years
- Pilot studies of treatment options and Concurrent field investigations of intake/disposal options — 1.0 to 1.5 years
- Design — 1.0 to 1.5 years
- Permitting and environmental review — 3.0 to 4.5 years
- Construction and Start Up — 1.0 to 1.5 years

Constraints

Institutional

Institutional constraints for the proposed project are identified as follows:

- If the District decides to partner with SSLOCSD, then the NCSD should promptly notify SSLOCSD (Oceano CSD and the cities of Arroyo Grande and Grover Beach) of its intentions and receive approval from the existing project participants. They would be unlikely to support any actions that would delay their project.
- In the case of an NCSD-owned facility, construction of pipelines across dunes to the ocean may be prevented by the numerous resource agencies that have an interest in preserving the biological resources there, especially if the proposed pipeline crosses agency-owned land.

Regulatory

- District must obtain approval of the Coastal Commission and the State Lands Commission for construction of intake and discharge facilities.
- Environmental review under CEQA must be initiated and/or completed by way of an EIR.
- The desalination treatment must be piloted to assist in the design of the facilities and demonstrate compliance with regulatory standards. Typically, long-term pilots are proposed for desalination projects - up to 1 year long - to ensure the pretreatment proposed works under all conditions.
- The construction of a treatment system, pipelines (including multiple stream crossings), and pumping facilities will require permits from local, state, and federal agencies.
- The desalted water would also require filtration and disinfection to meet federal and state surface water treatment regulations.
- Under the Nipomo Refinery option, chemicals added to the coolant water must be demonstrated to be nontoxic to humans to get DHS approval to use as a domestic source. Pilot testing would need to demonstrate that these chemicals are removed via the treatment process.

Legal

If the District decides to partner with either SSLOCSD or the Nipomo Refinery owner, then NCSD must enter into an agreement with either entity to secure deliveries from the new facility.

Cost

The estimated annual cost, including debt service on capital costs and O&M of the three alternatives, at the two pumping rates, is summarized below.

Table 5-4 Probable Costs per acre-foot for each Desalination Alternative

Delivery Rate	a. Partner with Nipomo Refinery	b. NCSD Owned Facility	c. Partner with SSLOCSD with Added NCSD Pipeline
3,000 afy	$2,500/af	$2,900/af	$2,600/af
6,300 afy	$2,200/af	$2,400/af	$2,300/af

6.0 Brackish Agricultural Drainage from Oso Flaco Watershed

Introduction

This section considers the constraints associated with treating shallow ground water or agricultural runoff from Oso Flaco Lake and delivering the treated water to the Nipomo Community Services District (NCSD) distribution system. This alternative may include returning a portion of the treated flow to the watershed. A schematic map of the Project is shown in Figure 6-1.

Setting

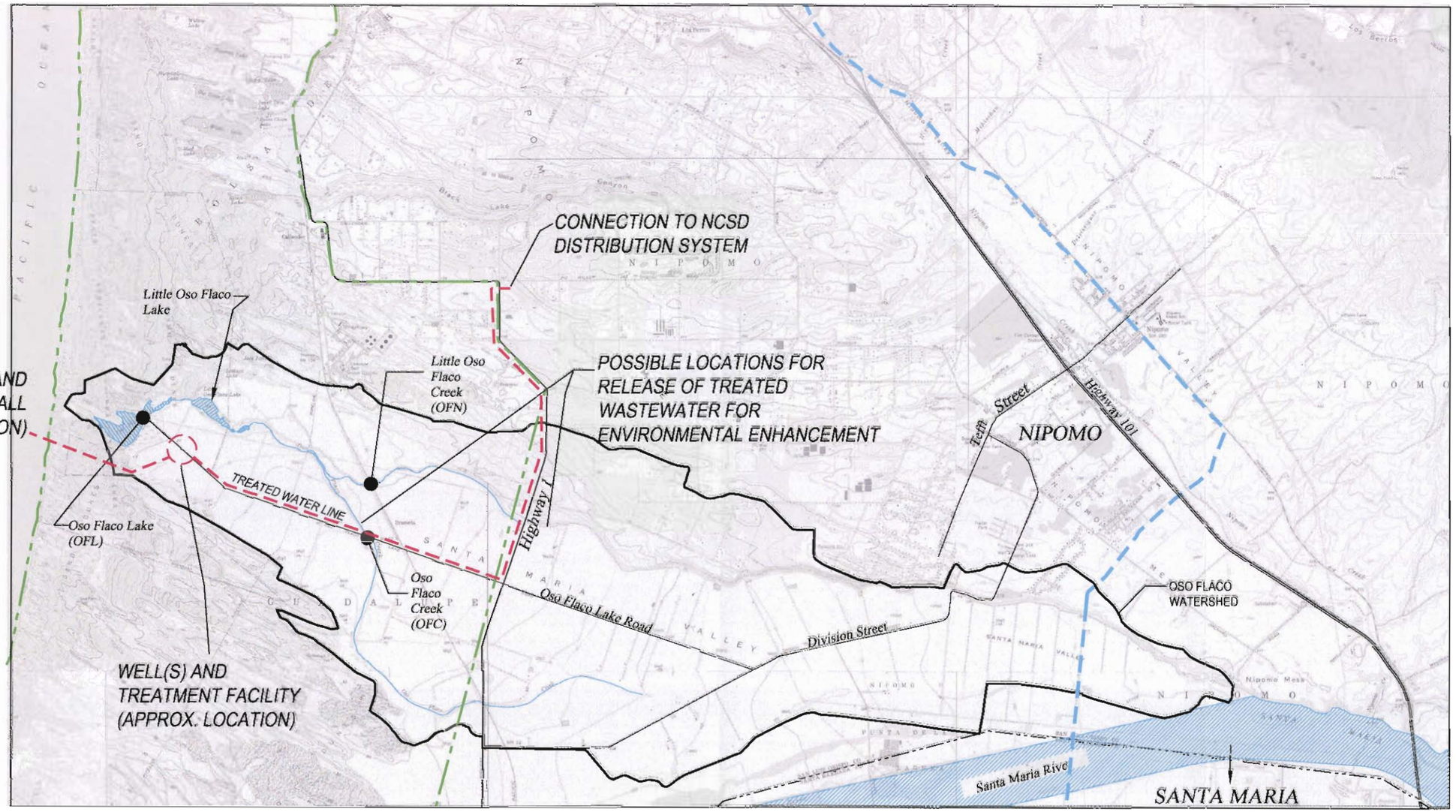
The Oso Flaco Creek Watershed covers approximately 10,370 acres. It is located north of the Santa Maria Estuary in the western portion of the Santa Maria Valley in San Luis Obispo County, California. Land use in the Oso Flaco Watershed is primarily irrigated vegetable row crops. Oso Flaco Creek has become degraded and functions primarily as a drainage channel to receive irrigation tail-water run-off.

The western terminus for the watershed is Oso Flaco Lake, owned by California State Parks. Oso Flaco Creek flows out of the lake and meanders ¼ mile to the Pacific Ocean through active sand dunes. Oso Flaco Lake is the largest of four small freshwater lakes located in the Guadalupe Nipomo Dunes Complex. The freshwater lake occupies a surface area of 82 acres and is classified by the U.S. Fish and Wildlife Service as palustrine emergent wetlands, a valuable habitat for wildlife, and subsequently a resource for many recreational and educational activities. (CRCD, 2004)

Recent Studies

Water quality and associated biological resources in Osos Flaco Lake and its watershed have been recently studied. Pertinent report include:

- Cachuma Resource Conservation District and the Dunes Center. *Draft Nitrate and Sediment Assessment, Oso Flaco Watershed, San Luis Obispo County, California, August 2004.* Report prepared for California Regional Water Quality Control Board, Central Coast Region.
- Central Coast Ambient Monitoring Program (CCAMP). *312 Santa Maria River Hydrologic Unit Draft Report for Sampling Year 2000*



LEGEND:

- *Coastal Zone Boundary*
- *Proposed Treated Water Line*
- *Existing C.C.W.A. Waterline*
- *Oso Flaco Watershed*
- *CCAMP Monitoring Site (Site Code)*

0 5000

SCALE IN FEET

BOYLE ENGINEERING CORPORATION
1194 Pacific St., Suite 204 Tel. 805-542-9840
San Luis Obispo, CA. 93401 Fax 805-542-9990
WWW.BOYLEENGINEERING.COM

NIPOMO CSD EVALUATION OF SUPPLEMENTAL WATER ALTERNATIVES

OSO FLACO WATERSHED

BEC PROJECT NO. 19996.32

FIGURE 6-1

Supply

Average rainfall in the watershed is approximately 12 inches per year, occurring primarily between November and April. Storm runoff to Oso Flaco Lake has been estimated to average 1,512 acre-feet per year (AFY) (Lockhart, pers. comm..)

Older wells in the watershed are pumping from depths of 50 to 150 feet. Wells currently being drilled are drawing from 200 to 400 feet of depth. There is also a perched water table west of Highway 1. Oso Flaco and Little Oso Flaco Lakes are surface water bodies hydraulically connected to perched groundwater. (DWR, 2002) Sea water intrusion is apparently not occurring in this watershed, due to the steep gradient of fresh groundwater coming down the valley. (CRCD, 2004)

Oso Flaco Lake and Little Oso Flaco Lake are usually at maximum pool due to the steady flow of agricultural runoff. It has been estimated that 6,371 acres in the watershed are irrigated, primarily with pumped groundwater, and that 17,564 af/yr of water are applied, resulting in 968 AFY of agricultural runoff. Efforts are currently underway to improve irrigation efficiency to both reduce the quantity of water applied and the volume of agricultural runoff. It has been estimated that if 100% of the irrigated area were to adopt sprinkler/drip systems, the annual runoff volume would decrease to 440 AFY. (CRCD, 2004)

According to the estimates noted above, the total amount of water flowing to Oso Flaco Lake is approximately 1,120 acre-feet per year. It appears reasonable to conclude that extracting either 3,000 AFY or 6,300 AFY from the lake or hydraulically-connected shallow aquifer would significantly lower the existing level of the lake. It is reasonable to assume that such extractions would be opposed by the various regulatory agencies that have jurisdiction, and that this may represent a "Fatal Flaw" with this alternative

Quality and Restoration Efforts

The Central Coast Ambient Monitoring Program (CCAMP) is conducted by the Central Coast Regional Water Quality Control Board's to provide a screening level assessment of water quality, based on a variety of chemical, physical and biological indicators. CCAMP monitoring in the Oso Flaco Creek watershed between 2000 and 2002 included conventional water quality, and sediment chemistry and toxicity. California Department of Fish and Game's Toxic Substances Monitoring Program also collected resident fish at Oso Flaco Lake in August 2001.

CCAMP collected data at three locations in the Oso Flaco Creek watershed, and determined that the 3 sites monitored did not support the beneficial uses of contact recreation, municipal water supply, aquatic

life, fish consumption, agricultural use and non-contact recreation. These CCAMP assessments are summarized in Table 6-1. Additional CCAMP data is summarized in Appendix B.

Table 6-1 CCAMP Findings and Beneficial Uses in the Oso Flaco Creek watershed.

Monitoring site	Unsafe to Swim?	Unsafe to drink?	Are aquatic life uses impaired?	Unsafe to eat fish?	Are agriculture uses impaired?	Are non-contact recreation activities impaired?
Little Oso Flaco Creek at railroad crossing	Yes	Yes	S	-	Yes	Yes
Oso Flaco Creek at Oso Flaco Lake Road	Yes	Yes	Yes	-	Yes	Yes
Oso Flaco Lake at culvert	Yes	Yes	S	Yes	Yes	Yes

(Excerpted from Table 5.1.1b, CCAMP, 2002)
Yes - evidence that a problem exists, No - no evidence that a problem exists, S – some evidence that a problem may exist.

The inability to support these beneficial uses was based on:

- elevated fecal coliform concentrations,
- observed pH > 8.4,
- elevated nitrate concentrations,
- elevated un-ionized ammonia concentrations,
- low dissolved oxygen levels,
- toxicity,
- pesticide residue in fish tissue,
- chlorophyll concentrations,
- algal cover,
- turbidity, and
- measures of biotic integrity.

Oso Flaco Creek and Oso Flaco Lake were listed on the CWA section 303(d) list of impaired waterbodies (CCRWQCB 2002). Oso Flaco Creek was listed for impairment due to fecal coliform and nitrate, and Oso Flaco Lake was listed for impairment due to nitrate.

Oso Flaco Lake was the only water body in the 2000 assessment area specifically identified in the Basin Plan as not supporting the Municipal Supply beneficial use.

The Regional Board is now in the process of developing total maximum daily loads (TMDLs) for nitrates, fecal coliform, and pesticides. Once approved, these TMDLs will establish 1) an allowable amount of a pollutant to each waterbody, 2) proportional responsibility for controlling the pollutant, 3) numeric indicators of water quality, and 4) implementation to achieve the allowable amount of pollutant loading.

Local growers are working with the Cachuma Resource Conservation District to develop and implement practices to reduce agricultural runoff, nitrate loadings, and sediment loads, and to improve habitat.

Reliability

As part of this alternatives study, Oso Flaco surface water and perched water are being compared to other potential sources. For purposes of comparison, each alternative is evaluated under two design flows: 3,000 acre-feet per year (AFY) and 6,300 AFY.

The surface water in Oso Flaco Lake and its associated perched aquifer receive water from precipitation, agricultural underflow, and agricultural runoff. As noted above, efforts are underway to decrease the amount of applied irrigation and agricultural runoff. As also noted above, a more detailed hydrogeological study of the lake, watershed, and perched aquifer would be needed in order to form an opinion of the reliability of this potential source.

Required Facilities

Water quality in Oso Flaco Lake, Oso Flaco Creek, or shallow groundwater associated with either of these sources dictate that a treatment facility must be built to reduce or remove the following constituents:

- Microorganisms
- Nitrate
- Dissolved solids
- Turbidity
- Sulfate

In addition, elevated levels of the following constituents were found in fish tissue or sediment, or through toxicity identification analyses, and therefore may result in additional treatment requirements:

- Chlorpyrifos
- DDT

- Endrin
- Toxaphene

DHS requirements that this "extremely impaired source" be treated with the "best available technology" limit the options for treatment, as shown below:

Table 6-2 Probable Treatment requirements for Oso Flaco Water Source

Treatment Technology	Coagulation, Filtration & Disinfection [1]	Ion Exchange	Reverse Osmosis	Electrodialysis	Granulated Activated Carbon	Packed Tower Aeration
Microorganisms	x		x			
Nitrate		BAT	BAT	BAT		
Dissolved solids			x			
Turbidity	x		x			
Sulfate			x			
Chlorpyrifos						
DDT						
Endrin					BAT	
Toxaphene					BAT	BAT

BAT = best available technology per USEPA, x = effective treatment, probable requirement
(1) or approved alternative filtration technology

Treatment Option:

One treatment option was investigated as part of this constraints analysis:

1. coagulation, filtration and disinfection, followed by
2. reverse osmosis, and
3. granular activated carbon.

Project Components:

Based on this constraints analysis, the following facilities will be required to obtain water from the Oso Flaco Lake perched aquifer, treat it, dispose of the waste, and transport the treated water to the NCSD distribution system:

- Well Site (purchase land);
- Treatment Plant;

    - Subdivide and purchase a site for the wells and the treatment plant;
    - Improvements to electrical grid for required power;
- 2 miles of 18-inch effluent pipeline;
- Ocean outfall; and
- 6 miles of 18-inch pipeline to connect to NCSD distribution system at Eureka well site.

Implementation Schedule

Given the time needed for interagency cooperation, extensive environmental review, design, construction, and startup, it is expected that implementation of any of these alternatives would take between 7 and 10 years. Steps would be similar to the desalination options in the previous section.

Constraints

Institutional

Institutional constraints for the proposed project are identified as follows:

The vast majority of Oso Flaco and Little Oso Flaco Lakes is on land owned by California State Parks. It is expected that State Parks would only support the project if it could be demonstrated to be environmentally beneficial and compatible with current and planned uses of the parkland.

Legal

Oso Flaco drainage is considered a component of the Santa Maria Valley Groundwater Basin, and use of this supply would require approval by all signatory parties to the litigation and subsequent management agreements. This water may be available for development if it drains through Oso Flaco Lake to the ocean and does not recharge the NMMA subbasin. No data or historical documents reviewed define or describe the hydro-geological connectivity of the surface or perched groundwater to the principal production aquifer underlying the NMMA. Additional field investigations would be required to determine the character of hydrological connectivity of the Oso Flaco watershed to the NMMA.

Regulatory

Department of Health Services: For municipal drinking water uses, the California Department of Heath Services (DHS) would probably consider surface water or shallow groundwater from the Oso Flaco watershed an "extremely impaired source" (IES). It would be classified an IES because nitrate and nitrogen concentrations exceed 3 times their MCLs, and because the waters contain a mixture of contaminants of health concern.

The use of this "extremely impaired source" would probably not be approved unless the additional health risk, relative to the use of other available drinking water sources, are known, minimized, and considered acceptable by DHS. DHS policy dictates that an extremely impaired source should not be considered for direct human consumption where alternatives are available. In addition, DHS policy requires that drinking water quality and public health shall be given greater consideration than costs or cost savings when evaluating alternative drinking water sources or treatment processes.

In other words: DHS would approve of this alternative only if it was the best alternative possible, regardless of price.

Before an extremely impaired source can be used for municipal supply the following process must be implemented:

- Determine the extent to which the aquifer or surface water is vulnerable to contaminating activities. (This step has been partially completed through monitoring associated with the CCAMP program.)
- Full characterization of raw water quality. (Additional monitoring would be required.)
- There must be a program in place to control the level of contamination. (At a minimum, best management practices for waste handling and waste reduction would be required.)
- The treatment process must be commensurate with the degree of risk associated with the contaminants present. (As a minimum, treatment would require use of the *best available treatment technology* defined by the EPA. See discussion under Required Facilities.)

California Environmental Quality Act (CEQA). Environmental review under CEQA must be completed for the project. Given the scope of the project, and the potential to impact numerous sensitive resources, it is expected that a full Environmental Impact report (EIR) would be required.

Other Resource Agencies. The construction of a treatment system, ocean outfall, pipelines (including multiple stream crossings), and pumping facilities will require permits from numerous local, state, and federal agencies.

Cost

The estimated annual costs, including debt service on capital costs and O&M, assuming the two delivery rates investigated can be achieved, are $2,700/af with a 3,000 afy facility, and $2,300/af with a 6,300 afy facility.

The cost of this project may be partially offset if suitable grants or loans can be arranged. Examples of funding programs that may be applicable include:

- California Department of Water Resources (DWR) Local Groundwater Assistance Program: Local public agencies with authority to manage groundwater resources can apply for up to

$250,000 for projects providing groundwater data collection, modeling, monitoring and management studies; monitoring programs and installation of equipment; basin management; and development of information systems

- DWR's Water Desalination Program: Local agencies can apply for grants to support development of local water supplies through brackish water and sea water desalination. Up to $25 million is available statewide during the current funding cycle.
- DWR's Agriculture & Urban Water Use Efficiency Program: Local agencies, public agencies, incorporated mutual water companies, and tribes can apply for grants to support agricultural and urban water use efficiency implementation projects or studies that carry out the goals of the California Bay Delta Program's Water Use Efficiency Program. Total Program Funds: $120 million, pending California Department of Finance exemption. Up to $35 million is available statewide during the 2006/2007 funding cycle.

Capacity

The capacity of this alternative is dependent on the amount of water available from the lake and associated shallow aquifer. Any water removed from this watershed would likely lower water levels in the lakes, with the exception of storm waters that otherwise discharge to the ocean. However, in order to utilize storm water, a retention facility would be required to capture short-term storm events and make these waters available over the following months. If withdrawals are limited to agricultural return flows, production would be less than 968 AFY, possibly decreasing to less that 440 AFY if irrigation conservation measures are universally adopted in the watershed.

7.0 Nacimiento Water Project Extension

Introduction

The NWP is a transmission facility that will convey raw water from Lake Nacimiento to communities in San Luis Obispo County. The San Luis Obispo County Flood Control & Water Conservation District (SLOCFCWCD) is managing the design and construction of this facility. The initial contracted participants are the City of El Paso de Robles, Atascadero Mutual Water Company, Templeton Community Services District, Cayucos County Service Area (CSA 10A), and the City of San Luis Obispo.

The NWP consists of 45 miles of transmission pipeline ranging in size from 30 to 12 inches in diameter; storage reservoirs; and booster pump stations. The pipeline ends at the City of San Luis Obispo Water Treatment Plant (SLO WTP) turnout.

This section considers the constraints associated with extending the Nacimiento Water Project (NWP) pipeline from the City of SLO Turnout to the Nipomo Community Services District (NCSD) distribution system. A schematic map of the Project is shown in Figure 7-1.

Previous Studies

The following list summarizes the studies and documents referenced in this evaluation:

- Nacimiento Reservoir: Reliability As a Water Source for San Luis Obispo County (Boyle Engineering, October 2002)
- Nacimiento Water Project: Technical Memorandum (TM) 8 Water Quality Investigations for San Luis Obispo County Flood Control & Water Conservation District (SLOCFCWCD) (Black & Veatch, January 2006)
- Supplemental Water Supply Study: Nacimiento Pipeline Extension for City of Arroyo Grande, City of Grover Beach, and Oceano CSD (Wallace Group, January 2006)
- Nacimiento Water Project: Preliminary Design Report (PDR) for SLOCFCWCD (Black & Veatch, in Association with Boyle Engineering, July 2006 FINAL)
- AIWRP Water Supply Evaluation: Nacimiento Treatment Evaluation for City of El Paso de Robles (Boyle Engineering, September 2006)
- Agendas from NWP Commission and Board of Supervisors of the SLOCFCWCD

LOPEZ LAKE

NCSD QUAD TANKS

HWY 101

NIPOMO

LOPEZ TREATMENT PLANT

REACH 1 (19.5 MILES)

REACH 2 (12.6 MILES)

ALIGNMENT "A" PER 2006 WALLACE STUDY

ORCUTT ROAD

CITY OF ARROYO GRANDE

HWY 101

CITY OF GROVER BEACH

NOTE:
PUMPING, STORAGE, AND TREATMENT FACILITIES NOT SHOWN

NWP TURNOUT (SAN LUIS OBISPO WATER TREATMENT PLANT)

HWY 101

CITY OF SAN LUIS OBISPO

SLO AIRPORT

CITY OF PISMO BEACH

HWY-1

SHELL BEACH

HWY 101

CONNECT TO FUTURE NWP

8000 0 8000 16000

SCALE IN FEET

LEGEND:

REACH 1: PROPOSED NACIMIENTO WATER PROJECT EXTENSION

REACH 2: PROPOSED NACIMIENTO WATER PROJECT EXTENSION

EXISTING S.W.P. COASTAL BRANCH PIPELINE (C.C.W.A.)

BOYLE ENGINEERING CORPORATION

NIPOMO CSD EVALUATION OF SUPPLEMENTAL WATER ALTERNATIVES

NACIMIENTO WATER PROJECT EXTENSION

BEC PROJECT NO. 19996.32

FIGURE 7-1

DWG: W:\Nipomo CSD (19996)\19996.32 (Alternative Water Supply)\CAD\Design\Revised Figures and Plates\Figure 7-1_Nacimiento Extension.dwg USER: cromero
DATE: Jan 11, 2007 8:49am XREFS: CCWA PIPELINE IMAGES: Large Map-grayscale.tif

Supply

The SLOCFCWCD has an annual entitlement of 17,500 acre-feet (AF) within Lake Nacimiento through a 1959 Agreement with Monterey County Water Resources Agency (MCWRA) and is owner of the NWP.

The NWP is designed to convey 15,750 acre-feet per year (AFY) with the remainder of the entitlement set aside for lakeside use. The total delivered entitlement currently under contract is 9,655 AFY. The "Reserved Capacity" (or unsubscribed entitlement) is 6,095 AFY.

Initially the SLOCFCWCD intended to deliver the full Reserved Capacity to the end of the project. In an effort to reduce the construction cost of the NWP, the SLOCFCWCD reduced pipeline size and capacity between Santa Margarita and the City of San Luis Obispo's Turnout. As indicated on the Design Plans for the NWP, the last reach ending at the SLOWTP will be 12-inches in diameter with a current deliverable Reserved Capacity of 2,148 AFY. However, Mr. Hollenbeck indicated the last reach of the NWP could be upgraded to provide up to 3,000 AFY if an interested agency paid for design revisions and were able to sign an agreement with SLO County.

Quality

The NWP will convey raw surface water. Participants will need to treat the water or utilize aquifer storage and recovery. The City of El Paso de Robles plans to construct a surface water treatment plant for NWP water. As discussed in the Water Source Evaluation for the City of Paso Robles (Boyle 2006), the City will treat the raw water, blend it with groundwater, and pump it directly into their distribution system. The City of San Luis Obispo plans to treat its NWP water at its existing water treatment plant located on Stenner Creek Road. TCSD and AMWC plan to use their NWP deliveries for aquifer recharge via spreading ponds.

Nacimiento Water Project PDR identified the following water quality issues that could potentially affect NWP participants:

- Algae;
- Iron and manganese;
- PH, alkalinity, and hardness (corrosion potential);
- Odor;
- Turbidity and color; and
- Disinfection byproduct formation

In order to utilize this water supply, the NCSD will need to filter and disinfect the raw surface water, or develop an aquifer storage and recovery (ASR) system. In addition, the District must ensure compliance with the drinking water standards for disinfection by products (DBPs), ensure maintenance of a disinfectant residual, and address potential corrosion impacts due to the water.

Reliability

The current NWP Delivery Entitlement Contracts provide the initial participants with an annual allocation in Acre-feet (AF) of NWP water, including specified maximum instantaneous flow rates in cubic feet per second (cfs) and maximum allocations for any given month of service. Additionally, the maximum period of delivery for any participant is 11 months in order to allow for routine maintenance of the NWP.

It is understood the City of San Luis Obispo's allocation of 3,380 AFY of NWP water will be delivered at a constant rate for 11 months per year. Similarly, it is understood the current deliverable Reserved Capacity at the SLOWTP pipeline terminus could be delivered at a constant rate for the same 11-month duration. However, as discussed previously in this report, only 2148 AFY will be available for the District.

As indicated in the NWP Preliminary Design Report, backup systems for critical project components (e.g. backup pumps, backup communications) are incorporated into the NWP design to enhance system reliability.

Required Facilities

Two options were evaluated in this Constraints Analysis:

- Participation in a regional project to extend the NWP pipeline to other South County purveyors; and
- Transmission of Nacimiento Water to Nipomo CSD, with no additional partners or South County participants.

Regional NWP Participation

A NWP extension to the NCSD service area will likely require participation from other agencies to help offset the expected high capital and NWP "buy-in" costs. The Cities of Arroyo Grande and Grover Beach and Oceano Community Services District jointly evaluated the feasibility of extending the NWP from its terminus at the SLOWTP to the Lopez Water Treatment Plant for distribution as supplemental water to South County Purveyors (2006 Supplemental Water Supply Study, Wallace Group). The 2006 study conducted by the purveyors considered two alternative alignments for the pipeline extension.

Both alternatives utilized the NWP EIR alignment from the SLOWTP to the SLO Airport area[6] (approximately 9.5 miles). Descriptions of both alternative alignments evaluated by Wallace Group are as follows:

- Alignment A: From SLOWTP to Lopez WTP along Orcutt Road, parallel to the existing State Water Pipeline (17.5 miles total)
- Alignment B: From SLOWTP to Lopez WTP along Orcutt Road, utilizing the planned Plains Oilfield pipeline from Price Canyon, along Highway 227 (18.1 miles total)

Based on a review of this study, the primary assumptions used in Wallace Group's analysis were as follows:

- NWP reserve capacity available for new participants in southern SLO County is 2,100 AFY
- NWP pipe size at SLOWTP is 20-inches inner diameter (I.D.)
- NWP delivered Hydraulic Grade Line (HGL) at SLOWTP turnout is 1295 feet
- Ground Elevation at SLOWTP is 400 feet; Nominal water surface elevation at Lopez Reservoir is 383 feet
- Raw water conveyed by NWP extension will be treated (filtered and disinfected) at the Lopez WTP and conveyed to South County area water purveyors via the Lopez distribution system

Since NWP design had not been completed at the time of the 2006 Wallace Study, the study addressed a range of hydraulic conditions at SLOWTP. The study concluded a 12-inch diameter pipeline would be sufficient to convey approximately 2300 AFY of water along Alignment A given a minimum calculated HGL of approximately 1260-ft at the SLOWTP. A 16-inch diameter pipeline would be required if the available HGL was reduced to 575-ft at the SLOWTP. A booster station would be required for any further reductions in NWP delivered HGL at the SLOWTP turnout. To accommodate this additional flow, the Lopez WTP would need to be expanded and the Lopez Distribution system may need to be upgraded.

Raw water allotted for NCSD could be treated at the Lopez WTP, or conveyed further south to the NCSD service area for treatment and distribution. As shown on Figure 7-1, it may be possible to align the remainder of the pipeline extension from the Lopez WTP to NCSD (approximately 12 miles) parallel to the existing Central Coast Water Authority (CCWA) pipeline and possibly within its easement.

It is anticipated a connection to NCSD's distribution system can be made near the vicinity of Tefft St. and Thompson Rd.; however, the pipeline could be extended to the Quad Tank Site near Foothill Rd. and Tefft St. If treatment is not provided at Lopez Lake, a water treatment facility will be required to filter and disinfect the raw water prior to introduction into the municipal water supply.

[6] This sub-alternative was previously evaluated as part of the December 2003 Final EIR for the NWP

Sole Ownership of Nacimiento WP Extension from SLO WTP to NCSD Service Area

If this option is pursued, the project alignments and facilities discussed above (except treatment at the Lopez WTP) would still be appropriate. However, the District would bear the full cost for all facilities.

Project Components:

Based on this constraints analysis, the following facilities will be required to extend the NWP pipeline from the SLO WTP to the NCSD distribution system. It is assumed project alignments and components would be similar for either alternative mentioned above:

- Reach 1 (SLOWTP to Lopez WTP): Extension of approximately 92,400 linear feet (17.5 miles) of pipe (Alignment A as identified in 2006 Wallace Study);
- Reach 2 (Lopez WTP to NCSD);
    - Pipeline extension: 65,000 linear feet (12.3 miles) of pipe;
    - Connection to existing municipal water system w/possible required upgrades
- Booster pump station(s) and Storage facilities at SLO WTP Turnout, Lopez WTP, and/or Nipomo CSD tie-in; and
- Water treatment plant to filter and disinfect raw NWP water

Implementation Schedule

As of the date this section was written (January 2007), the NWP was nearing 100% design completion and the final bid packages were being prepared for submittal to SLOCFCWCD. The plans and specifications were bid in May 2007 for award sometime later in the year. Additionally, as currently designed, the final reach of the NWP has a deliverable capacity of approximately 2,148 AFY for new South County participants.

As these dates indicate, the project window is rapidly closing for any additional participants. During our January 25, 2007, meeting with Mr. Hollenbeck, he indicated any interested South County participants would need to quickly commit and be able to enter an Agreement with San Luis Obispo County for an entitlement to available NWP water. He also indicated the interested agencies would need to satisfy the CEQA process prior to the County entering an Agreement with them. It is our understanding a Supplemental EIR would need to be initiated and/or Draft completed prior to said Agreement being executed.

With regards to project implementation schedule, the Wallace Study estimated a project timeline of approximately 5 years for Reach 1, from the beginning of agency agreements to completion of construction.

It is estimated approximately five (5) to seven (7) years will be required to fully implement Reach 1 and 2 of this project.

Constraints

Institutional

Institutional constraints for the proposed project are identified as follows:

- NCSD must decide if it wants to further pursue the feasibility of extending the NWP.
- To share costs, the NCSD must quickly mobilize and secure sufficient participation from interested South County communities.
- NCSD must determine its minimum acceptable water volume entitlement for negotiating with SLOCFCWCD and tentative South County Participants. NCSD will not be able to secure the full 3,000 AFY from the NWP extension.
- NCSD must notify SLOCFCWCD of its intentions and receive approval from the existing project participants. They would be unlikely to support any actions that would delay their project, so it is unlikely they would allow the District to contribute toward design and construction of a larger capacity pipeline between Cuesta Tunnel and San Luis Obispo.

Legal

Legal constraints are summarized as follows:

- NCSD and interested South County participants must enter into agreements with SLOCFCWCD to secure NWP deliveries. As a condition for executing this agreement, it is understood environmental review under CEQA must be initiated and/or completed along the pipeline extension corridor by way of a Supplemental EIR.
- As identified in the 2006 Wallace Study, NWP deliveries to South County participants will likely require alteration of the Zone 3 Entitlement Contracts. The existing Lopez Distribution system downstream of the Lopez WTP would probably be utilized for delivery of NWP water. This may delay participation by NCSD's potential project partners.

Regulatory

As indicated above, environmental review under CEQA must be initiated and/or completed along the pipeline extension corridor by way of a Supplemental EIR prior to SLOCFCWCD entering into an agreement with any additional prospective participants.

The construction of a treatment system, storage tanks, pipelines (including multiple stream crossings), and pumping facilities will require permits from local, state, and federal agencies.

The water would also require filtration and disinfection to meet federal and state surface water treatment regulations.

Cost

From the December 14, 2006, Nacimiento Project Commission Agenda Item V.a (Total Project Cost Update-90% Progress Point), the total capital cost for the City of San Luis Obispo is approximately $80.4M ($23,800 per AFY capacity). The estimated annual cost, including annual debt and O&M, is approximately $6.4M to $7.1M. This results in an overall cost of approximately $1900-$2100 per AF, for delivery of 2100 AFY (maximum reserve capacity in pipeline) raw water to the SLO City Turnout.

In addition, the project would require storage, pumping, water treatment, and transmission facilities between the SLO City Turnout and the NCSD distribution system. The project cost for the transmission main (approximately 30 miles) would be over $1 million per mile, assuming 12-in PVC pipe was installed, for a total of $30M. At 6% interest, over a 20-year payback period, the pipeline alone would cost over $1100 per AF for 2100 AFY delivery.

Therefore, the cost of delivery at the SLO City turnout and transmission to the NCSD system would cost $3000-$3200 per AF. With supporting facilities (storage, pumping, and filtration), a planning-level cost of over $4000 per AF may be expected.

WIP would be considerably less expensive at approximately $2100 per AF (including debt service at 6% over 20 years, operations & maintenance, and purchase price from Santa Maria per the MOU). This is based on the $26M budget described in the draft WIP Preliminary Engineering Memorandum (Boyle, 2006).

Capacity

In considering the desired water quantity for NCSD of 3,000 AFY, the desired water quantity in the 2006 Supplemental Water Study for 2,300 AFY, and the Reserved Capacity of 2,148 AFY at the NWP terminus, there is currently not enough deliverable capacity at the end of the NWP pipeline to satisfy all needs. However, as described above, Mr. Hollenbeck indicated it might be possible to marginally increase NWP deliverable capacity to new South County participants. It is doubtful the NWP deliverable capacity can be increased to satisfy the total desired water quantity of 5,300 AFY. If the NCSD pursues this alternative water supply, all potential South County participants (including the NCSD) will likely need to compromise and accept smaller water allocations as the available water is proportioned along the various new participants. If NCSD pursues the NWP extension without any additional partners, only 2,148 AFY (of desired 3000 AFY) would be available.

8.0 Recharge of Groundwater with Recycled Water from Southland WWTF

Introduction

Background

The Nipomo Community Services District (NCSD) owns and operates the Southland Wastewater Treatment Facility (WWTF), located just west of Highway 101 in the southern portion of San Luis Obispo County, California. The WWTF provides secondary treatment for a mixture of domestic and industrial wastewater from part of the Nipomo community under Waste Discharge Requirements (WDR) Order No. 95-75. Existing facility components include four aeration ponds, two sludge-drying beds, and eight infiltration basins. The WWTF has a permitted capacity of 900,000 gallons per day based on the maximum monthly demand.

This analysis considers constraints associated with developing a groundwater recharge program within the Nipomo Mesa Management Area (NMMA) involving recharge of the groundwater basin with recycled water from Southland WWTF.

Objective

Groundwater recharge is proposed to provide a means to manage and help stabilize the groundwater basin within the subject area, and is not a true supplemental water supply alternative. The objectives of this alternative include:

- Stabilize and elevate existing groundwater pumping depressions; and
- Prolong useful life of existing NCSD wells.

Previous Studies/Documents

The following list summarizes the studies and documents referenced for this evaluation:

- Technical Memorandum, Yield of Aquifer Storage and Recovery (SAIC, June 2007)
- Southland Wastewater Treatment Facility Master Plan (Boyle Engineering, Draft February 2007)
- Task 25 – Screening Evaluation of Potential Recharge Locations of Treated Effluent (Garing Taylor & Associates, January 16, 2007)
- Groundwater in Storage Underneath the Nipomo Mesa Management Area As of April 2006, Draft Technical Memorandum (SAIC, October 11, 2006)
- Urban Water Management Plan 2005 Update (SAIC, January 2006)
- Phase V Stipulation of the Santa Maria Groundwater Litigation (June 30, 2005)
- Nipomo Mesa Groundwater Resource Capacity Study (SS Papadopulos, March 2004)
- Water Resources of the Arroyo Grande - Nipomo Mesa Area (DWR Southern District, 2002)
- Final Report: Evaluation of Water Supply Alternatives (Kennedy/Jenks, October 2001)

- Evaluation of Alternative Water Supplies (Bookman-Edmonston, July 1994)

Supply

No Increase in "Supply":

The proposed groundwater recharge alternative is intended to function as a groundwater management program within the subject area of the NMMA. No increase in supply to the District would result because Southland WWTP discharge is assumed to be included in the groundwater budget that has been presented during litigation involving the Santa Maria and Nipomo aquifers. (i.e., WWTP groundwater recharge is already considered as "return flows" to the NMMA.)

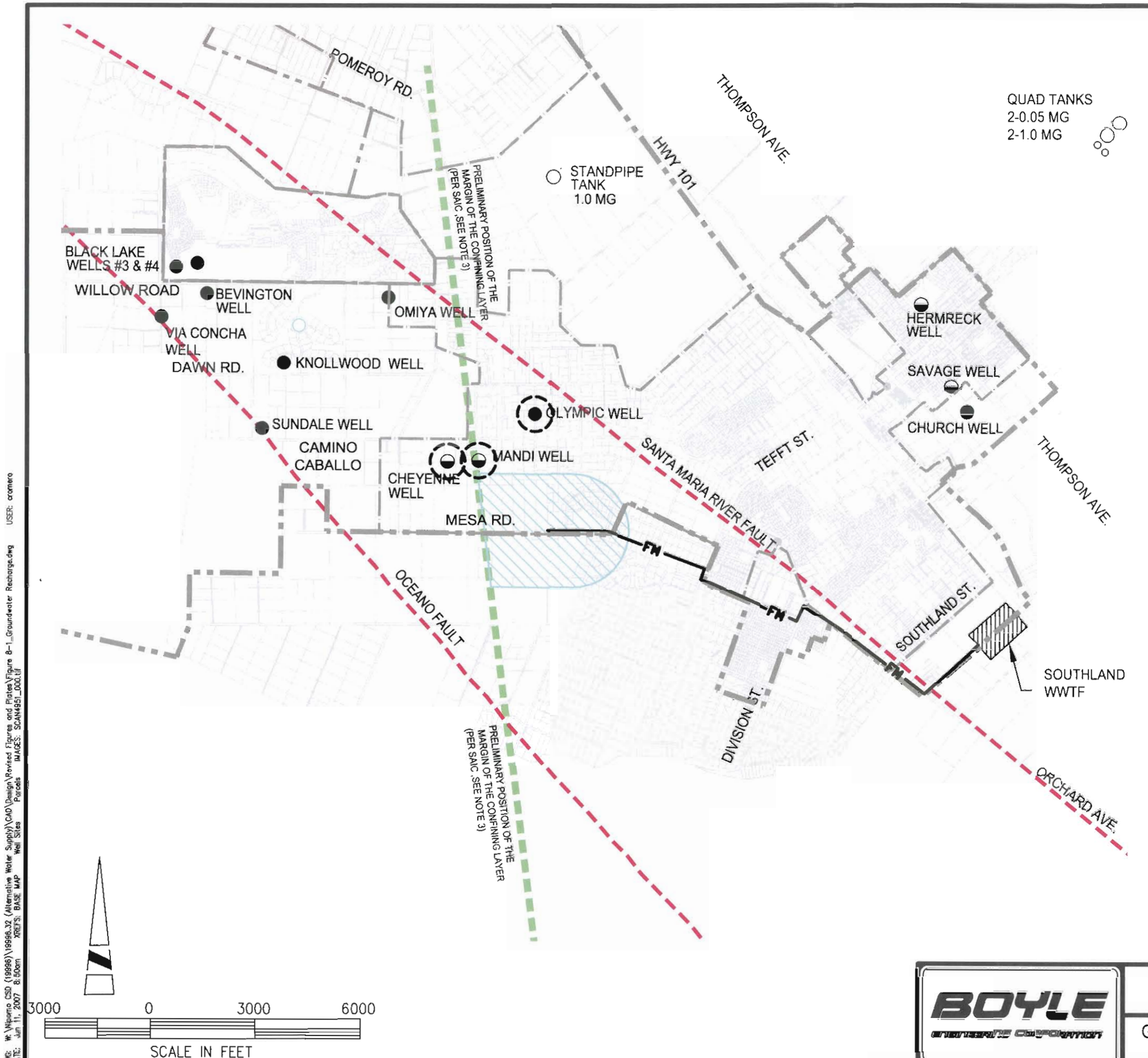
As no new supplemental water will be imported from outside the NMMA, there will be no effect on the overall water balance within the NMMA. However, there may be some benefit to the specific study area, previously described as the depressed groundwater basin within the NMMA bounded by the Oceano and Santa Maria River Faults.

Quantity Available from Southland WWTF:

Average annual flow rates to the Southland WWTP are currently 0.59 MGD, equivalent to approximately 662 acre-feet per year (AFY). These flows are projected to increase to 1,460 AFY (1.3 MGD) in the year 2030. For the purpose of this analysis, it is assumed effluent flows, and therefore flows discharged to the infiltration basins, are equivalent to the existing and projected influent flows.

Hydrogeology:

Review of available data tends to indicate the presence of a low-permeability layer overlying the production aquifer in the western portion of the District. This evidence includes observations of three artesian wells located near the ocean (11N36W12C), anecdotal evidence that Santa Maria River surface flows beyond the Bonita School Road Crossing do not contribute to the underlying principal production aquifer, the existence of and morphology of Black Lake Canyon, and driller reports from District production wells. If additional data and subsequent investigations confirm the presence and extent of this confining layer, then suitable locations for percolation ponds would be limited to an area bounded by the confining layer to the west, Black Lake Canyon to the north, the bluffs to the south, and the Santa Maria River Fault to the east (SAIC, 2007). See Figure 8-1.



NOTES:

1. POTENTIAL GROUNDWATER RECHARGE LOCATIONS AND PIPELINE ALIGNMENTS ARE DERIVED FROM THE 2007 GTA EVALUATION OF POTENTIAL RECHARGE LOCATIONS.
2. PER SECTION 60320.010 OF CDHS GROUNDWATER RECHARGE REUSE DRAFT REGULATIONS (JAN. 4, 2007), RECYCLED WATER SHALL NOT BE EXTRACTED WITHIN 500 FEET OF ANY GRRP SURFACE SPREADING AREA.
3. POSSIBLE LOCATION OF EASTERN MARGIN OF POSSIBLE CONFINING LAYER.

LEGEND

- POTENTIAL GROUNDWATER RECHARGE LOCATION (SEE NOTE 1)
- NIPOMO CSD WELLS
- NIPOMO CSD WELLS (STANDBY)
- NIPOMO CSD TANKS
- FUTURE WATER SYSTEM SERVICE AREA BOUNDARY
- EXISTING WATER SYSTEM SERVICE AREA BOUNDARY
- APPROXIMATE FAULT LINE
- FM — RECYCLED WATER FORCE MAIN

BOYLE ENGINEERING CORPORATION

NIPOMO CSD EVALUATION OF SUPPLEMENTAL WATER ALTERNATIVES

GROUNDWATER RECHARGE OF RECYCLED WATER FROM SOUTHLAND WWTF

BEC PROJECT NO. 19996.32

FIGURE 8-1

DWG: W:\Nipomo CSD (19996)\19996.32 (Alternative Water Supply)\CAD\Design\Revised Figures and Plates\Figure 8-1_Groundwater Recharge.dwg USER: cromero
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Quality

Implementation of this recharge alternative will need to consider and mitigate impacts to groundwater quality. Constituents of concern include salts and nitrogen.

Salt accumulation in the groundwater basin resulting from high dissolved solids in recharged effluent may pose a challenge for this alternative. Total Dissolved Solids (TDS) concentrations in the effluent vary between 980 and 1180 mg/l while TDS in NCSD drinking water is approximately 650 to 675 mg/l. Secondary Maximum Contaminant Levels for TDS are 500 mg/l.

Nitrogen in effluent is also a concern. Nitrate concentrations in District drinking water has averaged between 5.1 and 6.8 mg/l as nitrate during 2005 and 2006, while the Primary MCL for nitrate is 45 mg/l as nitrate, or 10 mg/l as nitrogen. Total Nitrogen in the effluent typically measures at 28-46 mg/l.

Treatment Requirements for Recycled Water from Southland WWTF:

The 2007 Draft Groundwater Recharge Reuse Regulations prepared by CDHS indicate recycled water used for groundwater recharge reuse projects (GRRP) must meet the definition of filtered, disinfected tertiary wastewater. Additionally, the median and maximum total coliform limits are the same as for disinfected tertiary wastewater for unrestricted urban use. The Draft regulations also set forth guidelines for maximum percentage of recycled water and maximum contaminant levels (MCLs) as well as other physical parameters.

It is assumed the requirements and criteria in the draft regulations would be implemented in this reuse project. Because the Southland WWTF currently only provides secondary treatment, treatment plant improvements will be required.

Reliability

Recycled water is considered a reliable water supply. However, its reliability as it pertains to groundwater recharge is contingent on the NCSD's ability to provide and maintain recycled water quality meeting the Draft Groundwater Recharge Reuse Regulations as well as taking additional necessary measures to mitigate salt accumulation in the groundwater basin.

The recharged groundwater will be extracted by existing or new NCSD wells. Therefore, the reliability of the return flows will be approximately the same as the existing groundwater supply. Therefore, its reliability may be hindered by drought conditions within the NMMA and any further development/expansion of the pumping depressions.

Required Facilities

The Southland WWTF Master Plan (Boyle 2007) identified 2 methods for recharge: (1) direct injection with groundwater wells and (2) surface spreading and percolation. The Master Plan indicated the latter option may be preferred because it would allow natural filtration of the percolated wastewater, allowing further biological and filtration treatment. Direct injection is often energy intensive, requiring high capital costs due to the requirement for RO treatment, may present public perception concerns, and may require an additional level of treatment to assure the public that contamination is not a significant risk. For the purposes of this analysis, it is assumed recharge will occur by surface spreading and percolation.

In order to utilize its treated wastewater discharge for groundwater recharge, it is expected the NCSD will upgrade its treatment to provide "Tertiary Recycled Water". This level of treatment will require oxidation, coagulation, filtration and disinfection (Boyle, 2007). The District will also need to provide a potable water source for diluting the recycled water, as required by the Draft CDHS Regulations. In order to convey the recycled water to the recharge facilities/ponds, the NCSD will also need to construct pumping and transmission pipeline facilities.

NCSD selection of recharge sites will need to satisfy the following minimum criteria:

(1) Soil conductivity must be such that percolation capacity is suitable for desired recharge rate
(2) Percolation ponds should be located where recharge will increase available water in aquifer (see Hydrogeology discussion above)
(3) Source of potable diluent water must be available
(4) Extraction shall not be within 500 feet of recharge facility

Based on a preliminary screening of undeveloped properties within the areas noted (GTA, 2007) the general location of the proposed facilities were selected, and are shown in Figure 8-1. As noted above, additional geological investigations will be required in order to determine the feasibility of recharge with recycled water, and to evaluate the suitability of any particular site for infiltration.

Project Components:

The following facilities will be required to implement this groundwater recharge alternative:

- Upgrades to Southland WWTF to provide disinfected tertiary recycled water, including filtration and disinfection;
- Transmission pipeline and/or connection(s) to existing potable water system to provide diluent water;
- Pumping and transmission pipeline facilities to convey recycled water to recharge facilities;
- Percolation ponds (15 acres would be sufficient to percolate 1,460 AFY, the flow rate projected for the Southland WWTP in 2030); and
- Upgrades to existing water pumping, treatment, and transmission facilities.

Implementation Schedule

It is estimated approximately 2 to 4 years will be required to fully implement this project.

Constraints

Institutional

Institutional constraints for the proposed project are identified as follows:

- Public perception with the *use* of recycled water for groundwater recharge may be a problem.
- Public perception may be a problem with regards to *locating* a percolation basin or combination percolation/stormwater detention adjacent to or within a residential development.

Legal

The Court would not consider the proposed groundwater recharge as newly "developed" or "salvaged" water because it is assumed to have been included in the groundwater budget presented during litigation, and thereby already counted as "return flows" to the NMMA.

Regulatory – Water Resources

In order to utilize its wastewater discharge for a groundwater recharge reuse project, the NCSD will need to upgrade its treatment facility. NCSD will also need to revise the Waste Discharge Requirements for Southland WWTF to allow reuse of plant effluent for groundwater recharge.

NCSD should conform to the 1994 CDHS Groundwater Recharge Reuse Draft Regulations for its Groundwater recharge reuse project (GRRP). In doing so, NCSD will be required to prepare and submit an engineering report for approval to CDHS and the RWQCB containing a comprehensive investigation and evaluation of the proposed GRRP and other required information and action plans. Following submission of this report, NCSD will be required to administer an industrial pretreatment and pollutant source control program. It is understood CDHS will conduct public hearings for the proposed GRRP prior to making recommendations to the RWQCB regarding permitting.

The construction of an expanded treatment system, pipelines, percolation basins, and pumping facilities will require permits from local and state agencies.

Cost

The probable cost of improvements is approximately $15 million and includes treatment, conveyance, and percolation facilities. These costs do not include land acquisition.. Amortizing this cost over 20 years and including approximately $30,000 to $40,000 in annual operational costs brings the total annual cost to between $1.4 million and $1.5 million. This alternative recycles between 596 and 1,683 AFY of treated wastewater, but may not produce any "new" return flows. The cost per acre-foot of treated and percolated water is $870 to $2,320, depending on the flow rate, plus the cost of land acquisition, if any.

Capacity

The implementation of this alternative will be constrained by the volume of water treated at Southland WWTP, currently equal to approximately 662 acre-feet per year (AFY), projected to increase to 1,460 AFY in the year 2030. Assuming 10% of the influent flow is lost to evaporation, the resulting recycle flows are 596 AFY rising to 1,341 AFY in the year 2030.

9.0 Direct Use of Recycled Water in-lieu of Groundwater Pumping

Introduction

Background

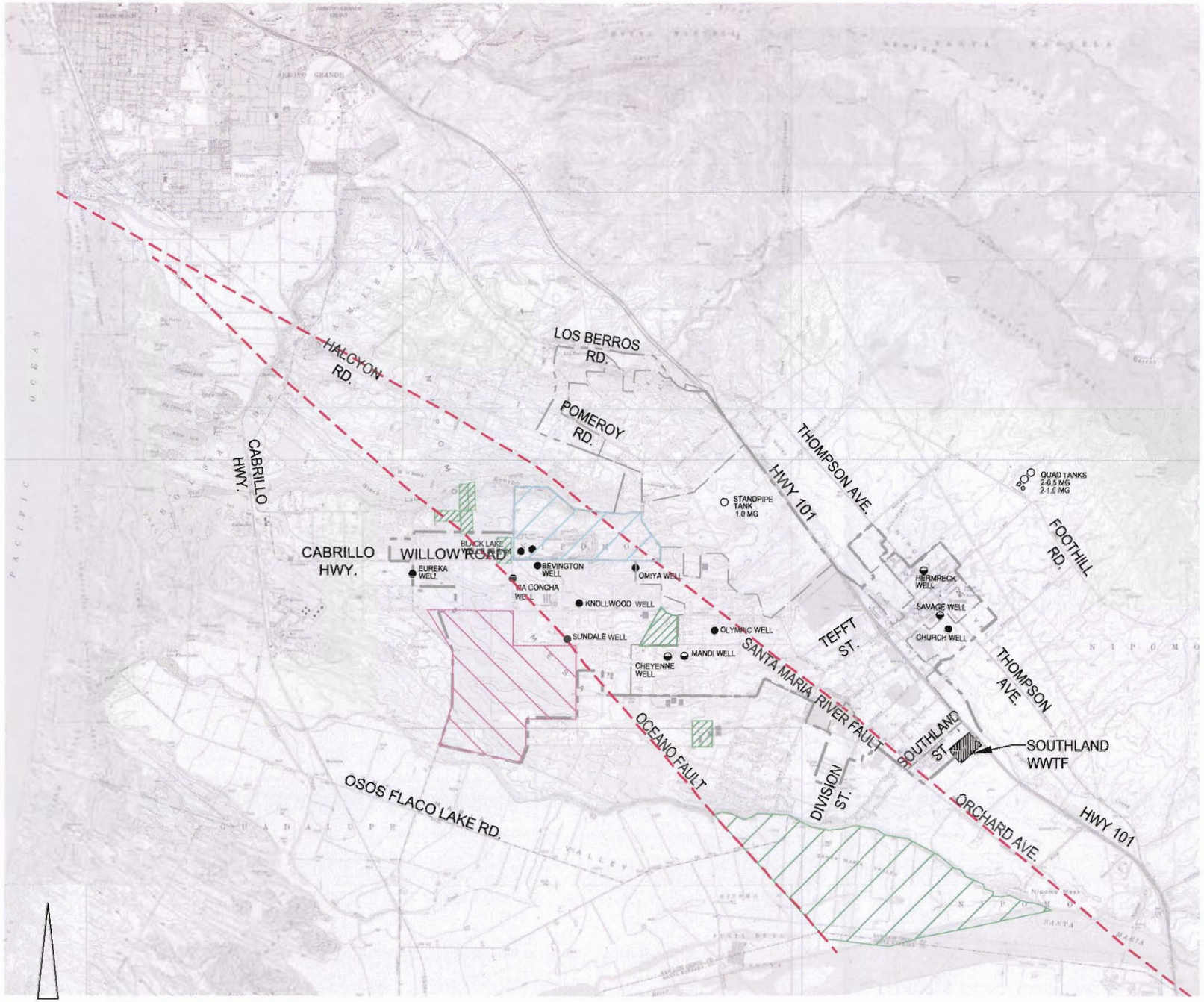
This alternative consists of developing a program involving delivery of recycled water from Southland WWTF to direct use as irrigation in-lieu of groundwater pumping from the principal production aquifer on Nipomo Mesa. This alternative provides for the disposition of effluent from Southland WWTP to locations other than the existing percolation ponds. Additionally, this alternative allows for an increase in operational flexibility of groundwater pumping by reducing the daily pumpage requirements.

Objective

As proposed, this scenario will provide for the transfer of a non-potable water source (reclaimed water from Southland WWTF) to users for direct reuse in irrigation of crops or turfgrass. The net available groundwater made available by this exchange would either be: (1) directly pumped (at the subject wells) and transmitted for use by NCSD; or (2) indirectly extracted by NCSD at existing or new well locations. Therefore, this scenario will effectively function as a groundwater management program and not a true supplemental water alternative.

The objectives of this alternative include:

- Stabilize and elevate existing groundwater pumping depressions; and
- Prolong useful life of existing NCSD wells.



NOTES:

1. AGRICULTURAL LAND USE IS BASED ON THE SOUTH COUNTY-INLAND PLANNING AREA RURAL LAND USE CATEGORY AND COMBINING DESIGNATION MAP.

LEGEND

- NIPOMO CSD WELLS
- NIPOMO CSD WELLS (STANDBY)
- NIPOMO CSD TANKS
- FUTURE WATER SYSTEM SERVICE AREA BOUNDARY
- EXISTING WATER SYSTEM SERVICE AREA BOUNDARY
- APPROXIMATE FAULT LINE
- AGRICULTURAL LAND USE AREA BETWEEN FAULTS
  - 1443 ACRES IN VALLEY
  - 181 ACRES ON MESA
- BLACKLAKE DEVELOPMENT
- WOODLANDS DEVELOPMENT

6000 0 6000 12000

SCALE IN FEET

BOYLE engineering corporation

NIPOMO CSD EVALUATION OF SUPPLEMENTAL WATER ALTERNATIVES

DIRECT USE OF RECYCLED WATER IN-LIEU OF GROUNDWATER RECHARGE

BEC PROJECT NO. 19996.32

FIGURE 9-1

DWG: W:\Nipomo CSD (19996)\19996.32 (Alternative Water Supply)\CAD\Design\Revised Figures and Plates\Figure 9-1_Groundwater Exchange for Direct Reuse.dwg
DATE: Jun 11, 2007 8:56am
XREFS: BASE MAP Well Sites Parcels IMAGES: Rural Land Use.tif Map1.TIF Map2.TIF Map3.TIF Map5.TIF Map6.TIF Map7.TIF Map8.TIF Map9.TIF Map_10.TIF Map_11.TIF Map_12.TIF Map_13.TIF SCAN4951_00
USER: cromero

Previous Studies/Documents

The following list summarizes the studies and documents referenced for this evaluation:

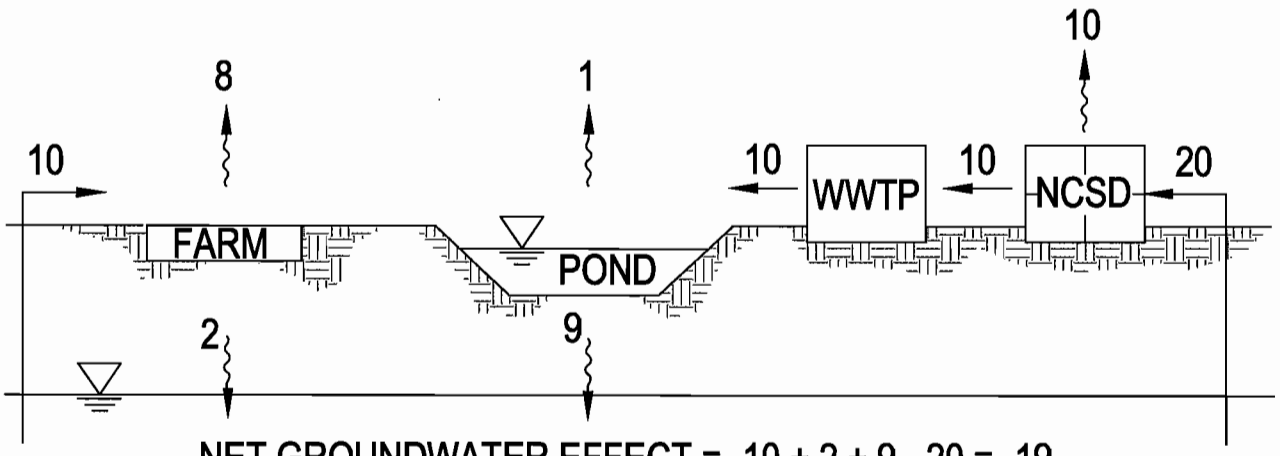
- Southland Wastewater Treatment Facility Master Plan (Boyle Engineering, Draft February 2007)
- Groundwater in Storage Underneath the Nipomo Mesa Management Area As of April 2006, Draft Technical Memorandum (SAIC, October 11, 2006)
- Nipomo Mesa Current and Projected Demands and Potential for Seawater Intrusion, Draft Technical Memorandum (SAIC, October 24, 2006)
- Urban Water Management Plan 2005 Update (SAIC, January 2006)
- Phase V Stipulation of the Santa Maria Groundwater Litigation (June 30, 2005)
- Nipomo Mesa Groundwater Resource Capacity Study (SS Papadopulos, March 2004)
- Water Resources of the Arroyo Grande - Nipomo Mesa Area (DWR Southern District, 2002)
- Final Report: Evaluation of Water Supply Alternatives (Kennedy/Jenks, October 2001)
- Evaluation of Alternative Water Supplies (Bookman-Edmonston, July 1994)

Supply

Small Increase in "Supply":

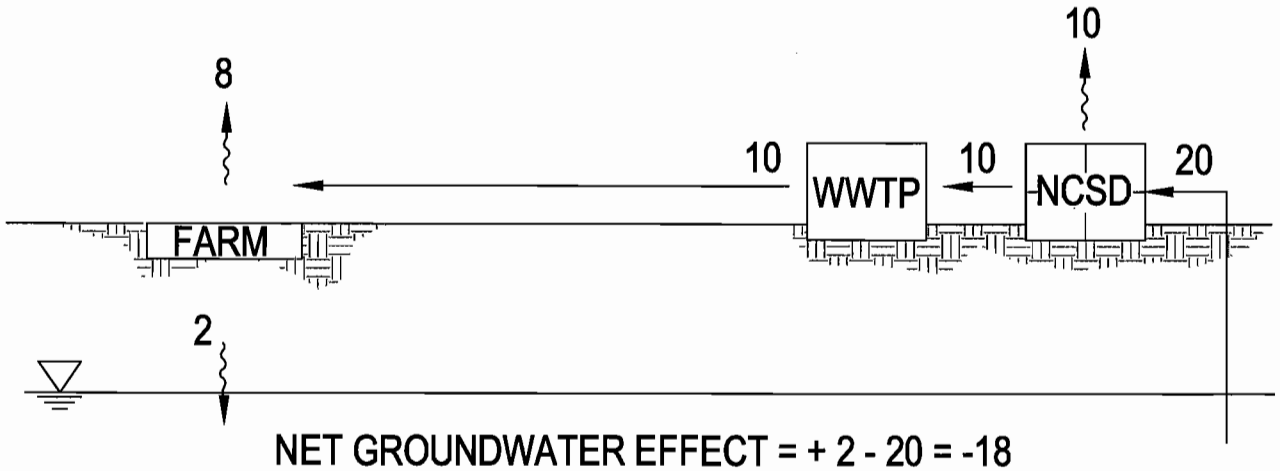
The proposed groundwater exchange alternative is intended to function as a groundwater management program within the subject area of the NMMA. No, or very little, increase in supply to the District would result because the net effect of this type of exchange is much smaller than the volume of water exchanged. Figure 9-2 shows a water balance for a hypothetical exchange of 10 units of water. The assumptions used in this water balance include: (1) 20% of irrigation water returns to the aquifer, while the remainder is lost through evapotransporation or shipped out of the NMMA as agricultural product, (2) approximately half the water demand of the District is used for irrigation with the remainder going to wastewater treatment, and (3) approximately 90% of water applied to the existing Southland WWTP reaches the aquifer, the remainder being lost to evaporation. As shown, the net impact of an exchange of 10 units of water is a net gain of one unit to the underlying aquifer. Small changes in the assumptions would alter this result slightly, but not significantly.

BEFORE



NET GROUNDWATER EFFECT = -10 + 2 + 9 - 20 = -19

AFTER



NET GROUNDWATER EFFECT = + 2 - 20 = -18

TOTAL GROUNDWATER GAIN = (AFTER - BEFORE) = -18 - (-19) = (+1)

BOYLE ENGINEERING CORPORATION	NIPOMO COMMUNITY SERVICES DISTRICT NET EFFECT OF DIRECT USE OF RECYCLED WATER IN-LIEU OF GROUNDWATER PUMPING	BEC PROJECT NO. 19996.32	FIGURE 9-2

DWG: W:\Nipomo CSD (19996)\19996.32 (Alternative Water Supply)\CAD\Design\Revised Figures and Plates\Figure 9-2_Net Effect of Direct Reuse.dwg USER: cromero
DATE: Jun 11, 2007 9:13am XREFS: G-BD8x11h BEClogo IMAGES:

As no new supplemental water will be imported from outside the NMMA, there will be no effect on the overall water balance within the NMMA. However, there may be some benefit to the specific study area, previously described as the depressed groundwater basin within the NMMA if agricultural pumping from this location is decreased.

Quantity Available from Southland WWTF:

Average annual flow rates to the Southland WWTP are currently 0.59 MGD, equivalent to approximately 662 acre-feet per year (AFY). These flows are projected to increase to 1,460 AFY (1.3 MGD) in the year 2030. For the purpose of this analysis, it is assumed effluent flows, and therefore flows discharged to the infiltration basins, are equivalent to the existing and projected influent flows.

Agricultural Demand for Applied Water:

Multiple attempts have been made in previous studies to estimate total demand for applied agricultural irrigation water for varying boundaries within the Nipomo Mesa. The estimated use in 1995 ranges between 1,600 AFY (2002 DWR) and 3,780 AFY (2003 SAIC), while projected use in 2020 ranges from 1,600 AFY (2002 DWR) to 4,410 AFY (2003 SAIC). The variation in these estimates can be explained by differences in the area studied and differences in method and assumptions used.

The range of agricultural demand values was used to develop a recycled water demand duty factor for estimating potential recycled water demand as follows:

- Average of historical and projected applied demands = (1,600 + 4,410 AFY)/2 = 3,005 AFY
- Approximate Agricultural land use in Nipomo Mesa per 2002 DWR study, Table 4 = 1,220 Acres (as of 1995)
- Agricultural irrigation demand duty factor = 3,005 AFY/1,220 Acres ≅ 2.5 feet/year

The potential recycled water demand within the studied area will likely be lower than the total agricultural demand for applied water. Assume 50% of the agricultural users switch to recycled water:

- Recycled water demand duty factor = 50% x 2.5 feet/year = 1.25 ft/year.

This duty factor was then applied to the agricultural zoned parcels within the confines of the study area shown on Figure 9-1:

- Area on Figure 9-1 in agricultural operation = 181 acres
- Estimated recycled water demand within studied area = 1.25 ft/year x 181 acres = 226 AFY.

Landscape Demand for Applied Water:

The Woodlands development plans to use a mixture of treated wastewater and well water to irrigate its golf course and landscaped areas. Total water demand for this mixed water for village landscaping,

business park, golf course, and evaporation from lined ponds is estimated at 824 AFY. The water demand for the development as a whole is estimated to be 1,583 AFY, while the wastewater plant is sized to treat 394 AFY (SLO County, 1998). Therefore, approximately 425 AFY of well water will be mixed with treated wastewater and used for irrigation, and may be available for exchange under this alternative.

The Blacklake development also includes a golf course and residential development, a dedicated wastewater treatment plant, and uses a mixture of treated wastewater and well water to irrigate its golf course and landscaped areas. With a total water demand of 450 AFY, assuming similar rates of wastewater generation and irrigation gives a rough estimate of 130 AFY of well water that is now mixed with treated wastewater for irrigation. This quantity may be available for exchange under this alternative.

Therefore it is estimated that 781 AFY (rounded to 800 AFY for this analysis) would be available for exchange under this alternative.

Quality

The proposed groundwater exchange may have negative impacts to water quality in the local, underlying aquifer due to salt accumulation. The following two criteria were considered in evaluating the quality of water resources proposed for exchange in this alternative:

- Quality of recycled water from Southland WWTF
- Quality of available groundwater for exchange within studied area

Recycled Water from Southland WWTF:

The Southland WWTF provides secondary treatment for wastewater generated within the Nipomo community. Constituents in treated wastewater from the Southland WWTF that may affect recycled water suitability for irrigation of crops or landscape species include salts or "total dissolved solids" (TDS, often estimated by the measurement of electrical conductivity, ECw), sodium adsorption ratio (SAR), bicarbonates, chlorides, and boron. SAR is a measure of sodium hazard and is also used to predict reductions in soil permeability following application. Chlorides, boron, and sodium are ions that can reach toxic concentrations. Different crops vary in their tolerance to these constituents.

Constituents in Southland WWTF effluent with concentrations that may be problematic to crops include:

- Chloride
- Total Nitrogen (excess N may affect production of certain crops)
- TDS

- Sodium

Effluent quality data regarding boron, bicarbonates, ECw, and SAR has not been collected. This data would be required to confirm suitability of reclaimed water for irrigation.

Title 22 of the California Code of Regulations (CCR) provides regulations for median and maximum total coliform limits in reclaimed water as well as usage restrictions. These regulations are driven by concerns for public safety and do not address suitability of reclaimed water for irrigation of crops. It is anticipated NCSD will attempt to meet the most stringent requirements in order to provide flexibility for all uses allowed under the Title 22 criteria.

Exchange Groundwater:

It is assumed the exchange groundwater will likely be pumped from existing NCSD wells. Therefore, water quality should be similar to existing groundwater pumped from within the NMMA.

If groundwater were pumped directly from an exchange participant's wells, and if no confining layer were present between the pumped aquifer and the place of application, water quality of the pumped groundwater could be impacted by the percolation of applied recycled water.

Reliability

Recycled Water from Southland WWTF:

Recycled water is considered a reliable water supply. However, its reliability as it pertains to exchange for direct use is contingent on the NCSD's ability to provide and maintain recycled water quality meeting the appropriate standards as well as taking additional necessary measures to mitigate salt accumulation in the groundwater basin.

Exchange Groundwater:

The groundwater will be extracted by existing or new NCSD wells, or by the exchange participant's wells. Therefore, the reliability of the return flows will be approximately the same as the existing groundwater supply. Therefore, its reliability may be hindered by drought conditions within the NMMA and any further development/expansion of the pumping depressions.

Required Facilities

In order to utilize its wastewater discharge as a resource, it is expected the NCSD will attempt to upgrade its treatment to provide Tertiary Recycled Water for Unrestricted Irrigation. As noted above, this level of treatment will require oxidation, coagulation, filtration and disinfection. The NCSD may

also need to consider blending the recycled water with higher quality groundwater in order to reduce TDS and other constituents of concern. In order to convey its recycled water to agricultural users, the NCSD would also need to construct storage, pumping, and transmission pipeline facilities.

Depending on the location(s) of potential agricultural users, the NCSD may also need to construct pumping and transmission facilities to convey pumped groundwater from the subject agricultural sites to interconnect with existing NCSD facilities. It is also possible NCSD may need to upgrade some of its existing water pumping, treatment, and transmission facilities. The extent of required upgrades is currently unknown.

Project Components:

For the purposes of comparison within the scope of this constraints analysis, the following facilities are assumed to be required to implement groundwater exchange of recycled water for agricultural production:

- Upgrades to Southland WWTF to provide Tertiary Recycled Water, including filtration and disinfection;
- Storage facilities at Southland WWTF, booster pump station(s), and transmission pipelines to convey recycled water to agricultural users; and
- Transmission facilities to convey pumped "exchange groundwater" from agricultural sites to NCSD facilities
- Upgrades to existing water pumping, treatment, and transmission facilities.

Implementation Schedule

It is estimated approximately 2 to 4 years will be required to fully implement this project.

Constraints

Institutional

Public perception with the use of recycled water for irrigation of food crops, non-food crops, and recreation areas may reduce the demand for recycled water.

Legal

NCSD will need to identify interested parties and enter into agreements with users.

Assuming 10% of this groundwater exchange is considered *New Developed Water* as defined in the Phase V Settlement Stipulation, NCSD may be required to obtain an order from the Court, quantifying

and allocating the rights to the New Developed Water, before they have the prior right to the New Developed Water.

Regulatory

In order to allow for unrestricted irrigation of crops, NCSD will need to upgrade its treatment to provide Tertiary Recycled Water. This level of treatment meets the most stringent of Title 22 criteria. NCSD will also need to revise the Waste Discharge Requirements for Southland WWTF to allow reuse of plant effluent for unrestricted urban use.

NCSD will need to satisfy the requirement of a Title 22 Engineering Report for DHS/RWQCB review.

The construction of an expanded treatment system, pipelines, percolation basins, and pumping facilities will require permits from local and state agencies.

Cost

The probable cost of improvements is approximately $19 million and includes treatment and conveyance facilities. Amortizing this cost over 20 years and including approximately $40,000 in annual operational costs brings the total annual cost to $1.7 million. This alternative recycles 800 AFY of treated wastewater, but is expected to produce only 80 AFY of "new" return flows. Therefore, the cost per acre-foot of "new" water is $21,000.

Capacity

Assuming that the Woodlands, Black Lake, and 50% of the agricultural users overlying the groundwater depression were to switch to irrigation with 100% recycled water, the total demand would be approximately 800 AFY. Average annual flow rates to the Southland WWTF are approximately 662 AFY, and are projected to increase to 1,460 AFY in the year 2030. Therefore, adequate supply does not now exist to make full use of this alternative, but is expected to become available within 20 years.

However, as noted above, it is reasonable to assume that for every 10 units of water exchanged, only one additional unit of groundwater would be made available. Therefore, at full capacity of 800 AFY exchange, perhaps as little as 80 AFY of additional water from the NMMA would be available.

10.0 Summary of Water Quality

The following table provides a summary of water quality for some of the alternatives considered. State and national drinking water standards (i.e., Primary and Secondary Maximum Contaminat Levels) are also provided.

Nipomo Community Services District Evaluation of Supplemental Water Alternatives
Table 10-1 Summary of Water Quality Data & Drinking Water MCL's

	CDHS MCL	USEPA MCL	Lake Nacimiento[1] See note 1			CCWA State Water (from PPWTP)[2] 2005			CCWA State Water (from PPWTP)[2] 2006			Nipomo Community Services District - Town Division[3] 2005			Nipomo Community Services District - Town Division[3] 2006			Santa Maria River Surface Water @ Bull Canyon Road[4] 6/1/2000			Cuyama Lane Water Company Well[5] 2006		City of Santa Maria Wells[6] 2005			City of Santa Maria Wells[6] 2006		
			Min	Max	Avg	Min.	Max.	Avg.	Min.	Max.	Avg.	Min.	Max.	Avg.	Min.	Max.	Avg.	Min	Max	Avg.	Only one sample		Min.	Max.	Avg.	Min.	Max.	Avg.
Primary Standards																												
Aluminum (Al), ppm	1					0.05	0.26	0.11	0.049	0.220	0.128	--	0.4	0.067							--							
Antimony, ppm	0.006											--	2	--						0.45	--							
Arsenic (As), ppb	50	10										--	57	7.7	--	8	2.3	in sediment (mg/kg)		5	--		2.0	2.6	2.2	last tested in 2005		
Asbestos, MFL	7	7				4/1/1998		--			--																	
Barium (Ba), ppm	1	2										0.0223	0.062	0.0419						96	--							
Beryllium, ppm	0.004	0.004																		0.028	--							
Cadmium (Cd), ppm	0.005	0.005										--	0.0009	0.00046				in sediment (mg/kg)		0.039	--							
Total Chlorine Residual, ppm						2	3.1	2.5	0.95	3.2	1.8										--							
Chromium, ppm	0.05											--	0.007	0.0016				in sediment (mg/kg)		21	--							
Coliforms, Fecal MPN/100mL	See Note 7							--	see note 7		--			1 month violation				110	700	378 4/1/2001	NEG				--			--
Coliforms, Total, MPN/100mL			0	77,000	38,500			<1			--			--				2300	50,000	19,620 4/1/2001	POS				--			--
Copper, ppm		1.3									--							in sediment (mg/kg)		18	0.96		7/2004		--	last tested in 2004		
Cyanide, ppm	0.15																				--							
Fluoride, ppm	2	4						0.1			0.06	--	3	0.16							--		0.18	0.25	0.22	last tested in 2005		
Haloacetic acids (HAA), ppb	60	60				8.5	24.0	15.0	5.8	17.0	10.2										--		7.5	24.1	15.2	11.0	24.1	16.9
Lead, ppm	0.015	0.015									--							in sediment (mg/kg)		7.1	--		7/2004		--	last tested in 2004		
Mercury, ppb	2	2										0.02	0.04	0.032				in sediment (mg/kg)		0.035	--							
MTBE, ppm	0.013							--			--																	
Nickel, ppm	0.1											--	0.004	--				in sediment (mg/kg)		22	--							
Nitrate (as nitrogen), ppm		10																0.05	0.5	0.264	--							
Nitrate (as NO3), ppm	45					1.8	7.6	4.44			1.6	--	24.4	6.79	--	11.6	5.1	0.223	2.225	1.174 4/1/2001	--		<2	100	29.3	2.1	99	28.7
Nitrate+Nitrite (sum of nitrogen), ppm	10							0.51			0.37							0.05	0.7	0.417	--							
Nitrite (as nitrogen), ppm	1	1																0.015	0.05	0.037	--							
Perchlorate, ppb	See Note 8										--																	
Selenium(Se), ppm	0.05	0										--	0.004	--						1	0.008							
Thallium, ppm	0.002	0.002																in sediment (mg/kg)		0.4	--							
Total organic carbon, ppm			2.8	4.4	4	1.4	4.5	2.4	1.3	2.6	1.8																	
Trichloroethylene (TCE), ppb	5	5																			--		0.82	2.3	1.8	0.66	2.9	1.6
Total trihalomethanes (THM), ppb	80	80				37	72	53	25	47	36	--	3.1	--							72.0		36.7	65.4	54.2	33.6	65.4	46.1
Secondary Standards																												
Aluminum (Al), ppm	0.2	0.05 - 0.2				0.05	0.26	0.11				--	0.4	0.067							--							
Apparent Color(Unfiltered)	15	15						--			3	--	30	--							--				5	last tested in 2005		
Chloride, ppm	250-500	250				21	125	65	21	125	52	43	106	58	44	106	59	20.3	86.6	53.6 4/1/2001	7.5		23	89	48.7	last tested in 2005		
Copper, ppm	1										--							in sediment (mg/kg)		18	0.96		7/2004		--	last tested in 2004		
Corrosivity (Langlier Index)		--	-1.5	0.5	-0.5		--	--			--	-1	0.3	-0.2	-0.7	0.3	-0.2				0.2							
Iron (Fe), ppb	300	300	31	2,800	1,416			--			--	--	1270	204							--							
Manganese, ppm	0.05	0.05	0	0.640	0.320			--			--	--	0.050	--							--							
MTBE, ppm	0.005							--			--																	
Odor Threshold	3	3				1	3	1	1	3	1										--				1			
Specific Conductance, umhos/cm	900					268	730	467	206	666	360	455	1410	903	554	1410	948	983	1610	1,211	530		890	1600	1124	last tested in 2005		
Sulfate (SO4), ppm	250-500	250						58			39	39	332	216	59	332	240	370	540	455 4/1/2001	12		240	560	364			
TDS, ppm	500	500				131	358	239	97	326	172	300	950	645	340	920	676	666	1210	898			650	1300	874	last tested in 2005		
Turbidity, NTU	5		0.7	74	37	0.03	0.12	0.06	0.03	0.26	0.04	--	17.2	2.58				3	350	86	0.8		0.1	0.5	0.2			
Zinc, ppm	5	5																in sediment (mg/kg)		49								
Radioactivity																												
Gross Alpha Particle Activity, pCi/L	15	15										--	8.5	3.65									<1	5.4	4.1	last tested in 2005		
Gross Beta Particle Activity, mrem/yr	4	4												0.394														
Radium-226, pCi/L																												
Radium-228, pCi/L																												
Combined Radium-226 and Radium-228, pCi/L	5	5																										
Strontium-90, pCi/L	8																											
Tritium, pCi/L	20000																						7/2004					
Uranium, pCi/L	20	30 ug/L										0.11	5.37	3.75									3.3	4.3	4	last tested in 2004		
Additional Parameters																												
Alkalinity, mg/L as CaCO3			74	130	102	42	76	63	34	80	57										14							
Bicarbonate, ppm																					17							
Boron, ppm	See Note 9					8/15/02			0.098 ppb			--	0.1	--				0.120	0.230	0.164 4/1/2001			<0.1	0.150	0.118	last tested in 2005		
Bromoform, ppb												--	2.4	--														
Blue Green Algae, #/mm^2			0	232	116																							
Calcium (Ca), ppm			20	38	29	28	74	50	24	68	42							99	155	125 4/1/2001	160							
Chromium VI, ppb								--			--	--	2.2	0.74											1.2	last tested in 2002		
DCPA Di+Mono Acid, ppb																							2.6	13	7.8	7/2003		
Dibromochloromethane												--	0.7	--									2/2002					
Free CO2, ppm			1.2	63	32																							
Hardness as CaCO3, ppm						50	140	98	42	120	76	106	552	343	134	552	351	465	806	576 4/1/2001	850		410	790	558.9	last tested in 2005		
Heterotrophic Plate Count, CFU/mL						<1	2	1	<1	2	1																	
Manganese, ppm	See Note 9		0	0.64	0.32			--			--	--	0.05	--							--							
Magnesium (Mg), ppm								12			9.5							40	102	66 4/1/2001	110							
Odor, Tons			0	15	8																--							
pH		6.5-8.5	6.54	8.86	8	6.7	9	8.1	6.9	8.9	8.2				6.9	7.3	7.2	7.9	8.46	8.232 4/1/2001	7.9		7.3	7.8	7.5	last tested in 2005		
Potassium (K), ppm								2.9			2.3										2		1/2000					
Radon, pCi/L																							615	770	707.8	last tested in 2001		
Sodium, ppm								53			45	45	93	58.6				46.8	81.2	64.3 4/1/2001	190		44	96	59.8	last tested in 2005		
Total Algae, #/mm^2			0	1,400	700																							
Vanadium, ppb	See Note 9					8/15/2002		3.7	8/15/2002		3.7	--	11	5.9				in sediment (mg/kg)		35	14		<3	3.5	3.3	last tested in 2005		
																					sampled in 2004							

Notes:

1. SLO County Flood Control and Water Conservation District Nacimiento Water Project TM 8 Water Quality Investigations - Black and Veatch, 2005. Data collected from 5/1997 to 5/1998 and 8/2001 to 6/2005 and is based on stratified reservoir conditions (Epilimnion and Hypolimnion)

2. Polonio Pass Water Treatment Plant Consumer Confidence Report Data - Central Coast Water Authority, 2005 & 2006

3. NCSD 2005 Town Division Consumer Confidence Report and NCSD 2006 data from "Waterline Intertie Project - Disinfection Alternatives Evaluation by Boyle Engineering dated November 2006

4. CCAMP website www.ccamp.org, Site 312SBC

5. San Luis Obispo County Public Health Dept., Environmental Health Services Division, Lab Report Data

6. City of Santa Maria 2005-Final and 2006-Draft Consumer Confidence Report

7. No more than 5% samples total coliform-positive in a month per USEPA standards

8.Perchlorate has a proposed Primary MCL of 6 ppb

9. California Notification Level as follows:
Boron, NL = 1 ppm
Manganese, NL = .500 ppm
Vanadium, NL = 50 ppb

Symbols:
" blank " means not sampled or data not available

" -- " means value below detection limit; non-detect

mg/kg (dw) = milligrams per kilogram of dry weight sample collected

mg/L = milligrams per liter of sample collected = ppm

MPN/100mL = most probable number method per 100 milliliters of sample collected

NTU = Nephelometric Turbidity Units

ppm = parts per million

ppb = parts per billion

umhos/cm = millisiemens per centimeter

11.0 Comparison of Alternatives

In this section each of the seven alternatives under consideration is compared to the Waterline Intertie Project. Separate comparisons are made concerning supply, water quality, reliability, and the time required to implement, as well as institutional, legal, and regulatory constraints.

Each alternative receives a score (1=best; 8=worst). These scores are then combined and a numerical ranking of alternatives is presented.

Supply

Ability to provide 3,000 AFY or 6,300 AFY

	Constraints	**Supply**	
	Alternative	Notes	Score
1	**Santa Maria Valley Groundwater**	Sufficient supply exists.	1
2	**CCWA, State, or "Other" Water**	Sufficient supply exists.	1
3	**Desalination of Sea Water/Cooling Water**	Sufficient supply exists.	1
4	**Brackish Agricultural Drainage from Oso Flaco Watershed**	440 to 968 AFY, assumed constrained by ag. return flows.	6
5	**Nacimiento Water Project Extension**	2,148 AFY	5
6	**Recharge of Groundwater with Recycled Water from Southland WWTF**	No Increase in Supply	8
7	**Groundwater Exchange of Recycled Water for Direct Reuse**	No or Very Little Increase in Supply	7
8	**Waterline Intertie Project**	Sufficient supply exists, with minor improvements to expand to 6,300 AFY	1

Water Quality

	Constraints	Water Quality	
	Alternative	Notes	Score
1	**Santa Maria Valley Groundwater**	Insufficient data available. High TDS and nitrate may be a concern. Proximity to river makes treatment a likely requirement.	4
2	**CCWA, State, or "Other" Water**	Treated to Municipal Standards. Uses chloramines for disinfection, while District uses chlorine.	1
3	**Desalination of Sea Water/Cooling Water**	Depends on source. Seawater has history of successful treatment with RO. Cooling water may require additional treatment.	7
4	**Brackish Agricultural Drainage from Oso Flaco Watershed**	Poor water quality. Does not support "Municipal Water Supply" in Basin Plan.	8
5	**Nacimiento Water Project Extension**	Raw surface water from Lake Nacimiento	3
6	**Recharge of Groundwater with Recycled Water from Southland WWTF**	Salt, nitrogen, and other contaminants will require additional treatment upgrade at Southland WWTP	6
7	**Groundwater Exchange of Recycled Water for Direct Reuse**	Salt, nitrogen, and other contaminants will require additional treatment upgrade at Southland WWTP	5
8	**Waterline Intertie Project**	Santa Maria disinfects using chloramines. District would need to remove chloramines from new water, or convert existing system to chloramines.	1

Reliability

	Constraints	Reliability	
	Alternative	Notes	Score
1	**Santa Maria Valley Groundwater**	Reliability is good.	5
2	**CCWA, State, or "Other" Water**	Reliability depends on amount of allocation acquired. Long term average delivery = approx. 75% of allocation.	6
3	**Desalination of Sea Water/Cooling Water**	Reliability is good.	1
4	**Brackish Agricultural Drainage from Oso Flaco Watershed**	Unknown. More study required.	8
5	**Nacimiento Water Project Extension**	Reliability is considered good.	6
6	**Recharge of Groundwater with Recycled Water from Southland WWTF**	Reliability is similar to existing groundwater supply.	3
7	**Groundwater Exchange of Recycled Water for Direct Reuse**	Reliability is similar to existing groundwater supply.	3
8	**Waterline Intertie Project**	Reliability is considered good.	1

Implementation Schedule

	Alternative	Time Required	Score
1	**Santa Maria Valley Groundwater**	4 to 6 years	4
2	**CCWA, State, or "Other" Water**	4 to 6 years	4
3	**Desalination of Sea Water/Cooling Water**	6.5 to 10.5 years	7
4	**Brackish Agricultural Drainage from Oso Flaco Watershed**	7 to 10 years	8
5	**Nacimiento Water Project Extension**	5 to 7 years	6
6	**Recharge of Groundwater with Recycled Water from Southland WWTF**	2 to 4 years	2
7	**Groundwater Exchange of Recycled Water for Direct Reuse**	2 to 4 years	2
8	**Waterline Intertie Project**	2 to 3 years	1

Institutional Constraints

	Constraints	Institutional Constraints	
	Alternative	Notes	Score
1	**Santa Maria Valley Groundwater**	Need to purchase water rights from SMVMA user.	3
2	**CCWA, State, or "Other" Water**	Need approval from numerous institutions and voters. May be required to buy into past costs.	5
3	**Desalination of Sea Water/Cooling Water**	Will require cooperation with participants and/or affected landowners.	2
4	**Brackish Agricultural Drainage from Oso Flaco Watershed**	Lake is owned by State Parks, who would likely oppose extraction.	6
5	**Nacimiento Water Project Extension**	Need to act quickly if costs will be shared. **FATAL FLAW** (Project is out to bid.)	8
6	**Recharge of Groundwater with Recycled Water from Southland WWTF**	Public perception issues for use of recycled water and siting of percolation ponds.	7
7	**Groundwater Exchange of Recycled Water for Direct Reuse**	Public perception issues for use of recycled water may block implementation.	4
8	**Waterline Intertie Project**	MOU with City of Santa Maria is in place.	1

Legal Constraints

	Constraints	Legal Constraints	
	Alternative	Notes	Score
1	**Santa Maria Valley Groundwater**	Need to satisfy pending groundwater adjudication. Pumping at boundary may not be possible. **FATAL FLAW.**	8
2	**CCWA, State, or "Other" Water**	Will need to hold an election. Will need contracts to purchase water.	7
3	**Desalination of Sea Water/Cooling Water**	Will require contracts between cooperating participants (if any).	2
4	**Brackish Agricultural Drainage from Oso Flaco Watershed**	Part of the Santa Maria Valley Management Area, therefore requires approval of all litigants.	6
5	**Nacimiento Water Project Extension**	Need to execute appropriate contracts.	3
6	**Recharge of Groundwater with Recycled Water from Southland WWTF**	No "new supply" created.	4
7	**Groundwater Exchange of Recycled Water for Direct Reuse**	Would need court judgement to use any "new" water created.	5
8	**Waterline Intertie Project**	(None identified)	1

Regulatory Constraints

	Constraints	Regulatory Constraints	
	Alternative	Notes	Score
1	**Santa Maria Valley Groundwater**	Use of Twitchell reservoir water will require DWR license modification. DHS will require treatment.	6
2	**CCWA, State, or "Other" Water**	Treatment will require DHS approval. Minor resource agency oversight expected.	1
3	**Desalination of Sea Water/Cooling Water**	Coastal Commission, State Lands, and Resource Agencies' concerns will need to be addressed. Cooperating parties will require mutual agreements. DHS/RWCB permits will be required.	8
4	**Brackish Agricultural Drainage from Oso Flaco Watershed**	DHS would consider this an "Extremely impaired Source." Significant resource agency regulatory involvement expected.	7
5	**Nacimiento Water Project Extension**	CEQA via Supplemental EIR required. Resource agency permits required for construction. State and federal drinking water regulations would apply to treatment plant.	3
6	**Recharge of Groundwater with Recycled Water from Southland WWTF**	Requires new WDR for Southland WWTP, increased regulatory burden for recharging groundwater with recycled water, as well as nominal construction permitting.	5
7	**Groundwater Exchange of Recycled Water for Direct Reuse**	Requires new WDR for Southland WWTP, increased regulatory burden for using recycled water, as well as nominal construction permitting.	4
8	**Waterline Intertie Project**	State and federal drinking water regulations would apply to disinfection improvements. Resource agency permits required for construction.	1

Numerical Ranking of Alternatives

	Constraints	Summary		
	Alternative	Total Score	Rank	Biggest Obstacle
1	**Santa Maria Valley Groundwater**	29	4	**FATAL FLAW** Need to satisfy adjudication.
2	**CCWA, State, or "Other" Water**	24	2	Supply is limited and unreliable. Need significant political and institutional support.
3	**Desalination of Sea Water/Cooling Water**	28	3	Permitting from Coastal Commission and other Resource Agencies
4	**Brackish Agricultural Drainage from Oso Flaco Watershed**	49	8	Insufficient Supply and Poor Water Quality
5	**Nacimiento Water Project Extension**	29	4	**FATAL FLAW** Project is out to bid.
6	**Recharge of Groundwater with Recycled Water from Southland WWTF**	37	7	Not a new source.
7	**Groundwater Exchange of Recycled Water for Direct Reuse**	32	6	Insufficient supply.
8	**Waterline Intertie Project**	10	1	Capital Cost

12.0 Conclusions

Comparison of Alternatives

As discussed in previous sections, the following alternatives appear to have "fatal flaws" that would prevent the District from pursuing them as viable, supplemental water sources:

> **Santa Maria Valley Groundwater** – This alternative would likely affect the flow of water between Santa Maria Valley and the NMMA, and would likely be prevented as a result of the adjudication.
>
> **Nacimiento Water Project Extension** – The Nacimiento Water Project is currently out to bid, and as designed would not deliver the District's desired 3000 AFY. Revisions to the project would cost at least $4000 per AF for extending the pipeline from City of San Luis Obispo to Nipomo, not including costs to increase the pipeline upstream of San Luis Obispo to expand capacity and deliver 3000 AFY.

Oso Flaco Drainage - Although drainage from Oso Flaco could be treated, and this alternative does not have any "fatal flaws", it is not considered to be a feasible supplemental water alternative due to the poor water quality of the water, inadequate quantity, likelihood of requiring approval from parties in Santa Maria Valley adjudication, and lack of support expected from CDHS.

Groundwater Recharge or Reuse - Groundwater recharge of treated wastewater, and direct reuse of this resource, will not increase the water supply available to the District, but may assist with managing groundwater depressions and with providing a market for treated plant effluent because onsite discharge may no longer be desired at Southland WWTF.

Seawater Desalination - Seawater desalination is expected to take many years for implementation, would be an expensive water supply, and would require many years of studies and negotiation with resource agencies, but would represent the most reliable water supply available to the District. While this may not meet the District's short-term need for water, it is recommended that the District consider desalination in long-term water supply planning. Desalination will be addressed in more detail in Task 3 of this evaluation.

State Water or "Other" Water - Although direct purchase of 3,000 AFY or 6,300 AFY of State Water from the SWP pipeline does not appear to be feasible, due to institutional and legal constraints, acquiring off-peak or excess capacity and storing that water in an aquifer storage-recovery facility may be viable. This alternative will be explored in greater detail in Task 2 of this evaluation, and the evaluation will benefit from an ongoing analysis of the Natomas water exchange (currently being conducted by Hatch & Parent, as mentioned previously).

Summary of Relative Costs

Although detailed cost opinions were not developed in this evaluation, cost is considered one of the primary criteria for determining whether alternatives are feasible. The planning-level $/AFY costs developed in previous sections, along with notes identifying any unsubstantiated but expected costs, are summarized below.

Table 12-1 Relative Costs per Acre-Foot

	Alternative	Facilities and O&M	Water Purchase	Other	Total
1	**Santa Maria Valley Groundwater**	$520 to $770	$1,250 (1)	Site purchase at Hutton or Oso Flaco Road	$1,770 to $2,020 plus land cost
2	**CCWA, State, or "Other" Water**	$130 to $380	$1,500 (2)	$436/af (2) refinance past capital costs	$2,070 to $2,310
3	**Desalination of Sea Water/Cooling Water**	$2,200 to $2,600	0	Site purchase or lease cost	$2,200 to $2,600 plus land cost
4	**Brackish Agricultural Drainage from Oso Flaco Watershed**	$2,300 to $2,700	0	Site purchase or lease cost	$2,300 to $2,700 plus land cost
5	**Nacimiento Water Project Extension**	$1,100 (3)	$1,900 to $2,100 (4)	$1,000 + for storage, pumping and treatment	$4,000 or more
6	**Recharge of Groundwater with Recycled Water from Southland WWTF**	$1,100 to $2,320 per AF recycled (No new water supplied)		Site purchase for percolation basins	$1,100 to $2,320 plus land cost
7	**Groundwater Exchange of Recycled Water for Direct Reuse**	$21,000 (80 AFY new water)			$21,000
8	**Waterline Intertie Project**	$470 to $850	$1,250		$1,720 to $2,100

(1) Assumed equal to MOU purchase price.
(2) Carpinteria sale to PXP (CVWD, 2006).
(3) Transmission main only from SLO City turnout.
(4) Assumed equal to estimated cost for delivery to SLO City turnout.

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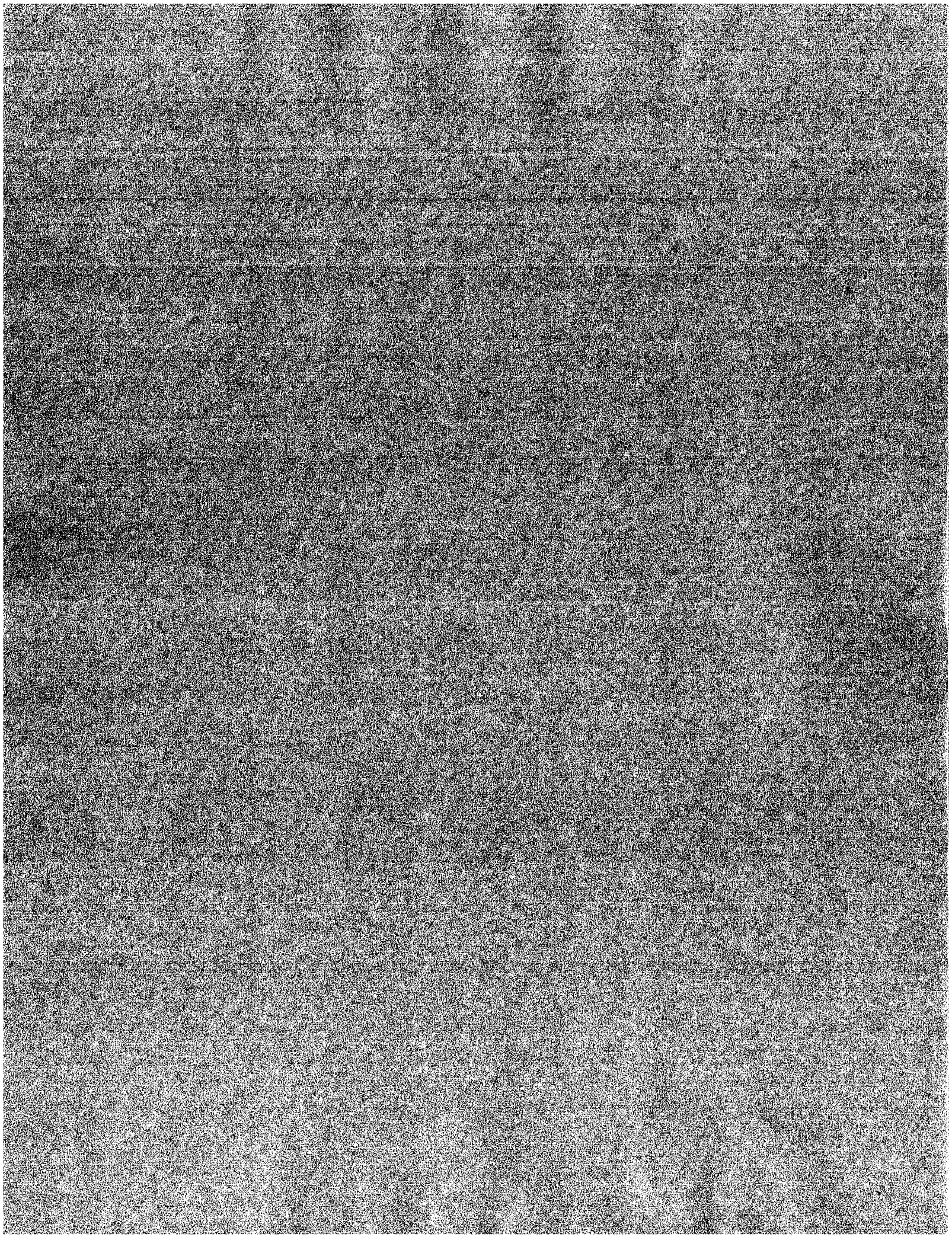

Appendix A - Relative Cost Comparison

For comparison purposes at this level of analysis, the following unit costs were used in developing opinions of probable costs. All costs shown include construction costs + "soft costs" (permitting, engineering, construction management) and a contingency.

Description	Unit	Probable Cost per Unit
Capital Costs		
Pipe Lines - no paving		
18" PVC Water Main - no paving	mile	$ 1,490,000
24" PVC Water Main - no paving	mile	$ 1,610,000
36" PVC Water Main - no paving	mile	$ 1,840,000
Pipe Lines - with paving		
8" PVC Water Main - with paving	mile	$ 1,350,000
18" PVC Water Main - with paving	mile	$ 1,860,000
20" PVC Water Main - with paving	mile	$ 1,910,000
24" PVC Water Main - with paving	mile	$ 2,010,000
Pipe Crossings		
Pipe river crossing, trenched installation - 24" diameter pipe	feet	$ 1,020
Pipe river crossing, HDD installation - 24" diameter pipe	feet	$ 2,775
Pump Stations		
Pump Station, 2.7 MGD (3,000 AFY)	each	$ 810,000
Pump Station, 5.7 MGD (6,300 AFY)	each	$ 1,700,000
Storage		
Tank, Site Improvements and Appurtances	gallon	$ 2.00
Connections		
Inteconnection Facility, 2.7 MGD	each	$ 15,000
Inteconnection Facility, 5.7 MGD	each	$ 30,000
CCWA Turnout	each	$ 500,000
Intake/Discharge Structures		
Well, 0.89 MGD	each	$ 175,000
Ocean Outfall, 2.7 MGD	each	$ 18,900,000
Ocean Outfall, 5.7 MGD	each	$ 21,500,000
Percolation Basin improvements (no land cost)	acre	$ 100,000
Treatment Facilities		
Reverse Osmosis Plant, Stand Alone, 2.7 MGD (3,000 AFY)	each	$ 15,800,000
Reverse Osmosis Plant, Stand Alone, 5.7 MGD (6,300 AFY)	each	$ 23,000,000

Description	Unit	Probable Cost per Unit
Enlarge planned 2MGD SSLOCSD facility by 2.7 MGD	LS	$ 12,000,000
Enlarge planned 2MGD SSLOCSD facility by 5.7 MGD	LS	$ 18,000,000
Chloramination Facilities at existing NCSD wells	LS	$ 1,100,000
Clorine Contact Treatment at Southland WWTP	each	$ 2,319,000
Coag/Filt Plant, 2.7 MGD (1800 gpm) (3,000 AFY)	each	$ 3,900,000
Coag/Filt Plant, 5.7 MGD (3900 gpm) (6,300 AFY)	each	$ 7,800,000
O&M Costs		
Electricity	kWh	$ 0.13
Reverse Osmosis Plant, Stand Alone, 2.7 MGD (3,000 AFY)	acre-feet	$ 1,200
Reverse Osmosis Plant, Stand Alone, 5.7 MGD (6,300 AFY)	acre-feet	$ 1,100
Coagulation and Filtration Treatment Cost	acre-feet	$ 200
Chloramination Treatment Costs	acre-feet	$ 20

Appendix B – Hydrogeology Constraints Analyses

SAIC, Inc., Technical Memoranda:

June 1, 2007, Yield of State Water Project water for Central Coast Water Authority and San Luis Obispo County

June 1, 2007, Yield of Aquifer Storage and Recovery

June 5, 2007, Santa Maria River Underflow

TECHNICAL MEMORANDUM

TO: **Mike Nunely**

FROM: **Brad Newton**

RE: **Questions 1-6: Yield of State Water Project water for Central Coast Water Authority and San Luis Obispo County, SAIC Project Number: 01-0236-00-9785**

DATE: **June 1, 2007**

DRAFT

INTRODUCTION

On February 13, 2007, SAIC entered into a contractual agreement with Boyle Engineering Corporation (Boyle) to provide hydrogeologic services related to evaluating alternative water supplies to Nipomo Community Services District (the District). The District's Board would like to assess, as an alternative water supply, the availability of State Water Project (SWP) water for purchase or an exchange to be conveyed through the SWP pipeline. Subsequently, Boyle requested SAIC address specific questions contained in a memorandum dated May 9, 2007. Provided below and in the attachments hereto is a preliminary assessment of SWP water deliveries based on historical hydrology and Table A amounts for the Central Coast Water Authority (CCWA) and San Luis Obispo County (SLO).

RESULTS

The following are the questions Boyle presented regarding the yield of the State Water Project water:

1. Based on past experience, what is the probability distribution of water available to CCWA? (e.g., "There is an X% probability that during any year available water will exceed YY acre feet.);
2. How much water will be available to CCWA annually on a long-term average basis?;
3. How much will be available in "wet" years?;
4. How much will be available in "dry" years?;
5. Same questions for the San Luis Obispo County SWP entitlement.

The following two sections present the answers to these questions regarding the Central Coast Water Authority, and the County of San Luis Obispo.

Yield of State Water Project for the Central Coast Water Authority (CCWA)

SAIC Engineering, Inc. A Subsidiary of Science Applications International Corporation
5464 Carpinteria Ave., Suite K • Carpinteria, CA 93013 • Telephone 805/566-6400 • Facsimile 805/566-6427

The CCWA State Water Project Table A amount is 45,486 acre-feet per year (AFY). On a long-term average basis roughly 34,500 AFY of SWP water is available to the CCWA (Table 1). In a "wet" year about 43,500 acre-feet (AF) of SWP water is available and in a "dry" year about 29,500 AF of SWP water is available to the CCWA (Table 1). There is a 50% probability that during any year available SWP water will exceed 38,000 AF (Figure 1).

Yield of State Water Project for San Luis Obispo County (SLO)

The SLO State Water Project Table A amount is 25,000 AFY. On a long-term average basis roughly 19,000 AFY of SWP water is available to SLO (Table 2). In a "wet" year about 24,000 AF of SWP water is available and in a "dry" year about 16,500 AF of SWP water is available to SLO (Table 2). There is a 50% probability that during any year available SWP water will exceed 21,000 AF (Figure 2).

METHODOLOGY

The Table A amounts for the Central Coast Water Authority (45,486 AFY) and San Luis Obispo County (25,000 AFY) are based on the SWP Delivery Reliability Report (DWR, 2005). The hydrologic water year type classification is based on the California Department of Water Resources Sacramento Valley index (DWR, 2005). The simulated delivery as a percentage (Column 3 in Tables 1 and 2) for Water Year 1922 through Water Year 1994 is based on Table B-7 of the SWP Delivery Reliability Report (DWR, 2005). The simulated delivery in acre-feet (Column 4 in Tables 1 and 2) is computed by multiplying the simulated delivery as a percentage (Column 3 in Tables 1 and 2) with the Table A amount of 45,486 AFY for the CCWA and 25,000 AFY for SLO. The long-term average delivery is the average of simulated deliveries (as a percentage) over the period from Water Year 1922 through Water Year 1994. The "dry" year and "wet" year delivery is the average of the deliveries made in each respective hydrologic year types. The probability distribution figures of SWP Delivery to CCWA and SLO are based on the simulated deliveries in acre-feet (Column 4 in Tables 1 and 2).

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Table 1. Estimated SWP Deliveries to CCWA (Water Years 1922-1994)

Year of Simulation (Water Year) 1	Hydrologic Year Type 2	Simulated Delivery (% of Full Table A) 3	Simulated Delivery to CCWA (Acre-Feet) 4
1922	AN	98%	44,576
1923	BN	89%	40,483
1924	C	24%	10,917
1925	D	35%	15,920
1926	D	69%	31,385
1927	W	98%	44,576
1928	AN	79%	35,934
1929	C	26%	11,826
1930	D	66%	30,021
1931	C	26%	11,826
1932	D	45%	20,469
1933	C	48%	21,833
1934	C	38%	17,285
1935	BN	90%	40,937
1936	BN	89%	40,483
1937	BN	77%	35,024
1938	W	100%	45,486
1939	D	83%	37,753
1940	AN	96%	43,667
1941	W	99%	45,031
1942	W	100%	45,486
1943	W	87%	39,573
1944	D	84%	38,208
1945	BN	86%	39,118
1946	BN	92%	41,847
1947	D	63%	28,656
1948	BN	63%	28,656
1949	D	64%	29,111
1950	BN	70%	31,840
1951	AN	97%	44,121
1952	W	100%	45,486
1953	W	95%	43,212
1954	AN	93%	42,302
1955	D	43%	19,559
1956	W	100%	45,486
1957	AN	74%	33,660
1958	W	98%	44,576
1959	BN	84%	38,208
1960	D	49%	22,288
1961	D	68%	30,930
1962	BN	76%	34,569
1963	W	98%	44,576
1964	D	74%	33,660
1965	W	78%	35,479
1966	BN	93%	42,302
1967	W	98%	44,576
1968	BN	87%	39,573
1969	W	99%	45,031
1970	W	95%	43,212
1971	W	99%	45,031
1972	BN	66%	30,021
1973	AN	89%	40,483
1974	W	100%	45,486
1975	W	99%	45,031
1976	C	67%	30,476
1977	C	20%	9,097
1978	AN	95%	43,212
1979	BN	85%	38,663
1980	AN	84%	38,208
1981	D	82%	37,299
1982	W	100%	45,486
1983	W	100%	45,486
1984	W	99%	45,031
1985	D	80%	36,389
1986	W	73%	33,205
1987	D	69%	31,385
1988	C	24%	10,917
1989	D	70%	31,840
1990	C	28%	12,736
1991	C	24%	10,917
1992	C	28%	12,736
1993	AN	97%	44,121
1994	C	74%	33,660
Long-term Average (1922-1994)		**76%**	**34,488**

Sacramento Valley Water Year Hydrologic Classification:		Average Simulated Delivery for Year Type Water Years 1922 through 1994 (% of Full Table A)	Average Simulated Delivery for Year Type Water years 1922 through 1994 (Acre-feet)
W	Wet year type	96%	43,645
AN	Above normal year type	90%	41,028
BN	Below normal year type	82%	37,266
D	Dry year type	65%	29,680
C	Critical year type	36%	16,185

Figure 1 - Probability of SWP Delivery - CCWA

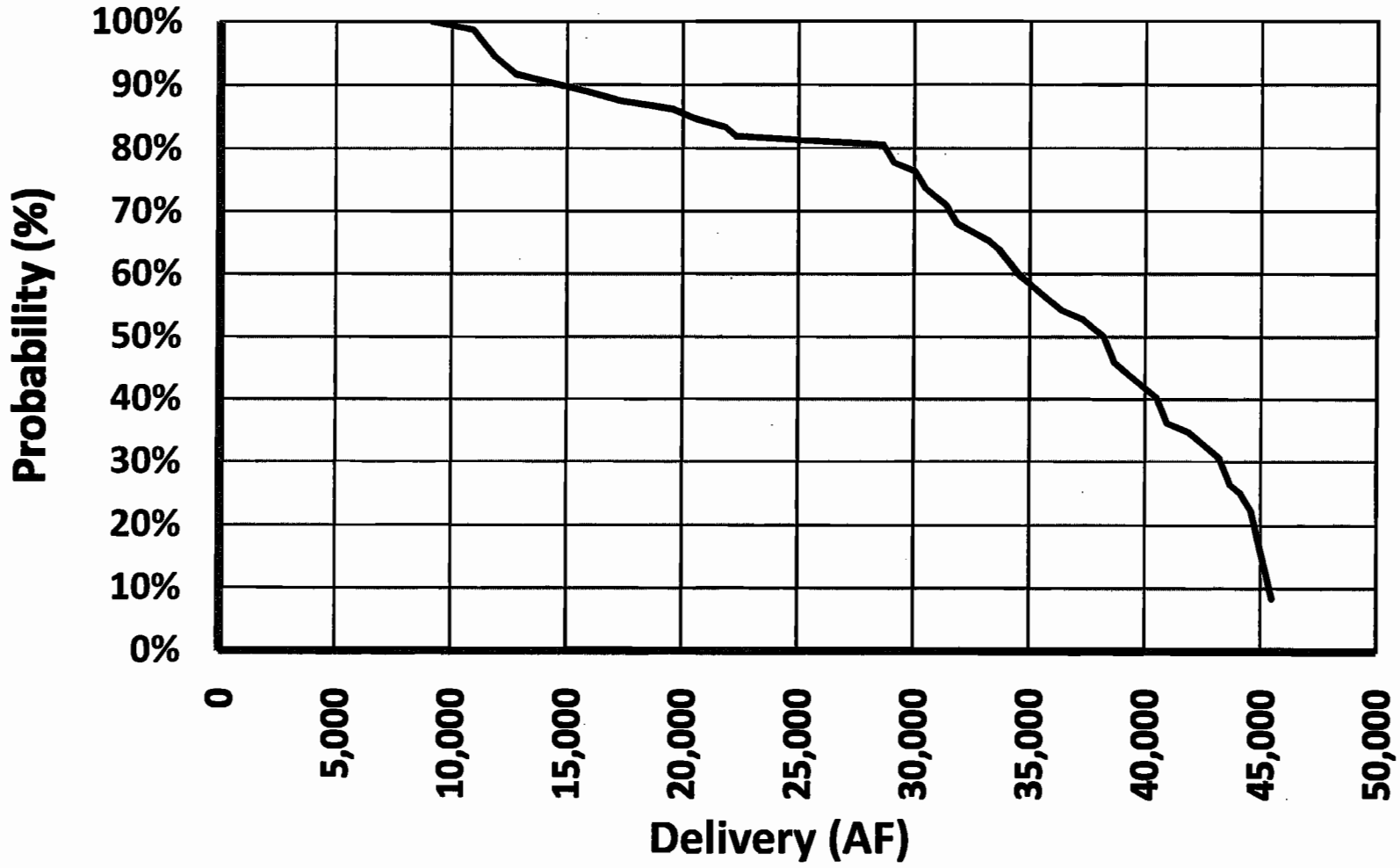

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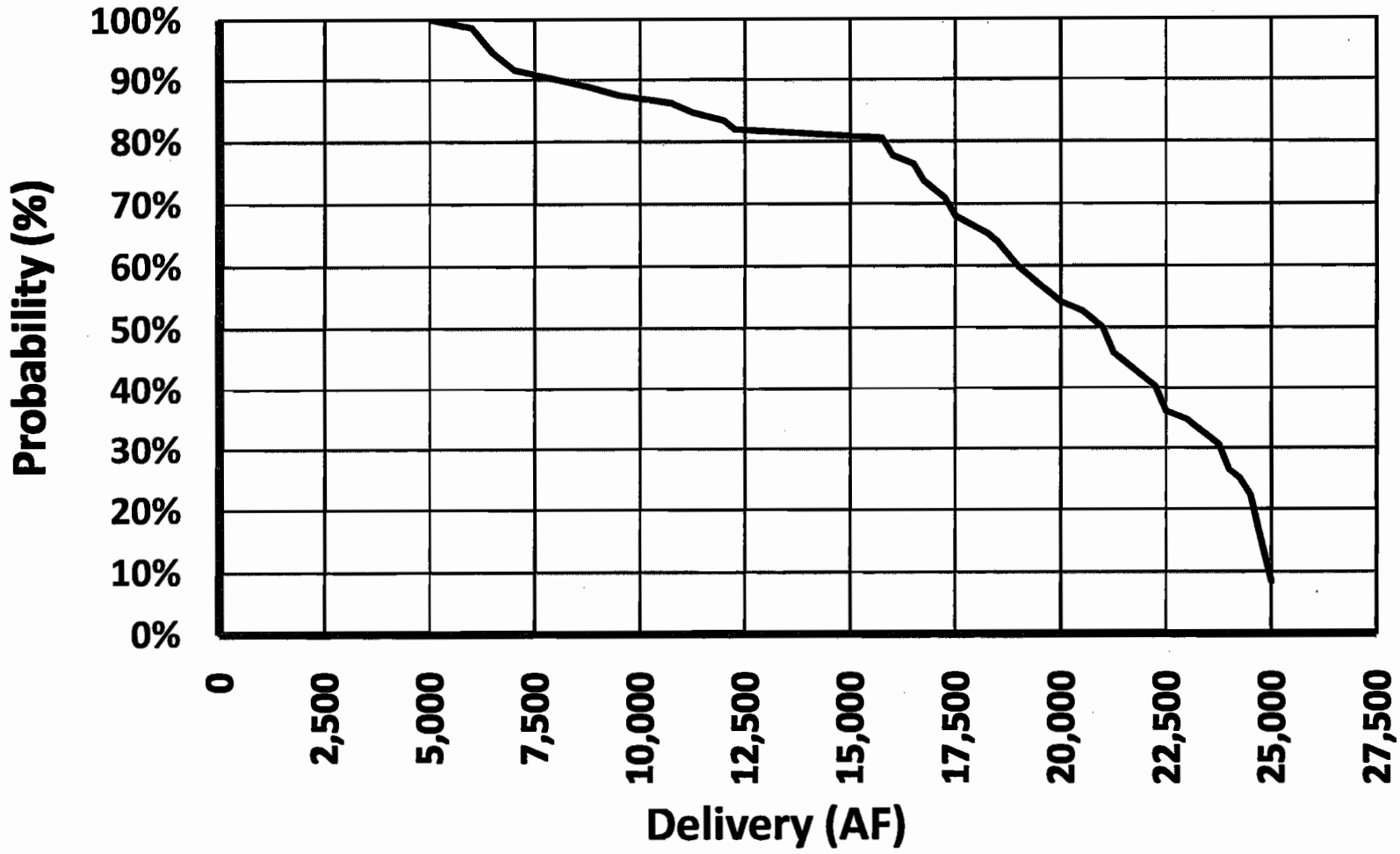
Table 2. Estimated SWP Deliveries to SLO (Water Years 1922-1994)

Year of Simulation (Water Year) 1	Hydrologic Year Type 2	Simulated Delivery (% of Full Table A) 3	Simulated Delivery to SLO (Acre-Feet) 4
1922	AN	98%	24,500
1923	BN	89%	22,250
1924	C	24%	6,000
1925	D	35%	8,750
1926	D	69%	17,250
1927	W	98%	24,500
1928	AN	79%	19,750
1929	C	26%	6,500
1930	D	66%	16,500
1931	C	26%	6,500
1932	D	45%	11,250
1933	C	48%	12,000
1934	C	38%	9,500
1935	BN	90%	22,500
1936	BN	89%	22,250
1937	BN	77%	19,250
1938	W	100%	25,000
1939	D	83%	20,750
1940	AN	96%	24,000
1941	W	99%	24,750
1942	W	100%	25,000
1943	W	87%	21,750
1944	D	84%	21,000
1945	BN	86%	21,500
1946	BN	92%	23,000
1947	D	63%	15,750
1948	BN	63%	15,750
1949	D	64%	16,000
1950	BN	70%	17,500
1951	AN	97%	24,250
1952	W	100%	25,000
1953	W	95%	23,750
1954	AN	93%	23,250
1955	D	43%	10,750
1956	W	100%	25,000
1957	AN	74%	18,500
1958	W	98%	24,500
1959	BN	84%	21,000
1960	D	49%	12,250
1961	D	68%	17,000
1962	BN	76%	19,000
1963	W	98%	24,500
1964	D	74%	18,500
1965	W	78%	19,500
1966	BN	93%	23,250
1967	W	98%	24,500
1968	BN	87%	21,750
1969	W	99%	24,750
1970	W	95%	23,750
1971	W	99%	24,750
1972	BN	66%	16,500
1973	AN	89%	22,250
1974	W	100%	25,000
1975	W	99%	24,750
1976	C	67%	16,750
1977	C	20%	5,000
1978	AN	95%	23,750
1979	BN	85%	21,250
1980	AN	84%	21,000
1981	D	82%	20,500
1982	W	100%	25,000
1983	W	100%	25,000
1984	W	99%	24,750
1985	D	80%	20,000
1986	W	73%	18,250
1987	D	69%	17,250
1988	C	24%	6,000
1989	D	70%	17,500
1990	C	28%	7,000
1991	C	24%	6,000
1992	C	28%	7,000
1993	AN	97%	24,250
1994	C	74%	18,500
Long-term Average (1922-1994)		**76%**	**18,955**

Sacramento Valley Water Year Hydrologic Classification:		Average Simulated Delivery for Year Type Water Years 1922 through 1994 (% of Full Table A)	Average Simulated Delivery for Year Type Water years 1922 through 1994 (Acre-feet)
W	Wet year type	96%	23,988
AN	Above normal year type	90%	22,550
BN	Below normal year type	82%	20,482
D	Dry year type	65%	16,313
C	Critical year type	36%	8,896

Figure 2 - Probability of SWP Delivery - SLO



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2007-05-22 SWP Availablity.xls - SLO Prob
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Created 5/20/2007

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
WATER RESOURCES ENGINEERING - CARPINTERIA

TECHNICAL MEMORANDUM

TO: Mike Nunely

FROM: Brad Newton

RE: Questions 12-17: Yield of Aquifer Storage and Recovery,
SAIC Project Number: 01-0236-00-9785

DATE: June 1, 2007

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INTRODUCTION

Programmatic development of an aquifer storage and recovery system requires an overall understanding of the local and regional hydrogeology. The District is currently investigating the opportunities to develop recharge basins on the Nipomo Mesa to augment the native supply of water to the principal production aquifer, typically the unconsolidated alluvial deposits of the Paso Robles Formation. Cause for concern over the lack of geologic understanding of the Nipomo Mesa is warranted, specifically in that recent sentinel monitoring well observations for sea water intrusion at the coast documented artesian conditions for all three well depths. These observations strongly suggest that a confining layer exists, however its depth, location and areal extent is not currently understood. Additionally, the presence of the Santa Maria River Fault has been interpreted to impede the lateral flow of groundwater, however the data reviewed during this investigation does not support nor deny this hypothesis.

On February 13, 2007, SAIC entered a contractual agreement with Boyle Engineering Corporation (Boyle) to provide hydrogeology services related to evaluating alternative water supplies to Nipomo Community Services District (the District). The District's Board requested an assessment of the yield of aquifer storage and recovery for the main production aquifer contained within the Nipomo Mesa Management Area (NMMA). Subsequently, Boyle requested SAIC address specific questions contained in a memorandum dated May 9, 2007. This technical memorandum constitutes a partial deliverable (Questions 12 – 17) to be included in Boyle's TM #1 Constraints Analysis to the District. Provided below and in the attachments herewith is a preliminary assessment of the plausibility of aquifer storage and recovery.

Several independent lines of evidence reviewed and interpreted herein support a proposed conceptual model of the hydrogeology within the NMMA. Groundwater surface elevations above ground surface at the sentinel monitoring well location on the beach support the geologic interpretation of a confining layer west of NMMA. Twitchell Reservoir water releases operational strategy to enhance groundwater recharge of the principal production aquifer supports the geologic interpretation of a confining layer that extends westward from the Bonita School Road crossing within the Santa Maria River corridor. The presence of Black Lake

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Canyon supports the interpretation that a confining layer exists from the coastal dunes to the east of the canyon head. Drilling logs and well casing records also support the presence of confining layer from the western area of municipal production to Omiya well where the confining layer abruptly thins. Additional drilling logs and casing records would be needed to strengthen the confidence of the presence and extent of a regional confining layer in the western half of the NMMA.

The proposed conceptual model of the hydrogeology within the NMMA is preliminary and may be changed upon reviewing additional data. For the purposes of this constraints analysis, and foregoing any additional data review, the proposed conceptual model provides the context for evaluating the following questions presented in the Boyle memorandum dated May 9, 2007.

RESULTS

12. How will the use of aquifer storage and recovery change the answers to the previous questions 1-5?

The available space of groundwater storage in the aquifer (approximately 400,000 acre-feet [AF]) is sufficient to accommodate the volume of water obtainable from the SWP to meet the District's target additional maximum supply of 6,300 acre-feet per year (AFY). Therefore, the answers to question 1-5 would not change.

13. How much water can be stored in the aquifer underlying the NMMA?

The aquifer underlying the NMMA has an estimated available storage of 400,000 AF above sea level. However, the proposed conceptual model of the hydrogeology constrains the available area for storage capacity to approximately one-quarter of the total 20,000 acres on NMMA as the target recharge area. This target area is bound by the confining layer to the west, the Black Lake Canyon to the north, the topographic boundary to the south, and the Santa Maria River Fault trace to the east, although little is known regarding lateral flow across the fault. The storage of 6,300 AF of water within 5,000 acres area would likely cause an increase in the groundwater surface elevation by approximately 10 feet over the 5,000 acres.

14. Where are the best places to locate percolation/aquifer storage facilities?

The proposed preliminary target area is east of Omiya well, southwest of Santa Maria Fault, and north of the mesa topographic boundary. The ideal location of recharge ponds will be places with high percolation rates and no confining layer or low hydraulic conductivity zones at depth. The proposed preliminary target area is bound by the confining layer to the west, the Black Lake Canyon to the north, the topographic boundary to the south, and the Santa Maria River Fault trace to the east.

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15. If percolation ponds are used, what area would be required?

Based on a typical percolation rate of 6 inches per day, approximately 50 acres of ponds would be required to recharge 6,300 AFY.

16. How many new wells would be needed to recapture the stored water?

Based on wells currently operated by the Nipomo Community Services District (NCSD) five extraction wells with a production rate of 800 gallons per minute (gpm) would be required to capture 6,300 AFY of water.

17. Where should these wells be installed (location and depth)?

We recommend locating the wells east of Highway 1, south of the Black Lake Canyon, west of Santa Maria River Fault, and north of the Woodlands development. This general area will distribute pumping across the NMMA providing for a more even access to the water resource. These wells should be screened in zones that produce large volumes of high quality water, likely within the Paso Robles Formation.

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DISCUSSION

The Paso Robles Formation is overlain by dune sands and younger alluvium, and overlies the Careaga Formation, an accumulation of unconsolidated to well-consolidated, shallow-water marine sands. The Paso Robles Formation is highly variable in color and texture, ranging from gavel and clay, sand and clay, gravel and sand, silt and clay. Most of it is fluvial in origin and in most places correlation between individual beds is not possible. The Careaga Formation is the lower most fresh water bearing formation and water quality is typically poor.

Identifying potential recharge sites on the Nipomo Mesa is contingent upon understanding the geology, the available land for recharge facilities construction, and the existing conveyance facilities or the need for new facility construction. The geologic conditions specific to recharge site identification on the Nipomo Mesa is poorly documented; however, anecdotal information, a few well logs, and existing reports have been reviewed and summarized herein to provide the basis for our current understanding. In general, recharge facilities are constructed over sediments where no confining layer exists in an effort to maximize percolation and therefore recharge to the groundwater aquifer. Set forth below is the summary of document reviews, geologic and topographic map evaluations, site visits, and well logs which indicates the likelihood of a confining layer and location of its inland margin.

Black Lake Canyon is an east-west trending topographic feature resulting from the erosion and transport of unconsolidated sand dune sediments westward to the active dune complex at the ocean. No river exists upstream of the canyon head, and the local surface drainage area at the canyon head is small. Surface water exists along much of the length in the canyon bottom and a terminal lake exists at the canyon mouth in the margin of the active beach dune complex.

No existing reports reviewed during this investigation explained the occurrence or physical processes that created the Black Lake Canyon. However, fine-grained layers in the upper portion of the Paso Robles Formation beneath dune sands are reported to function as a perching layer, and that some of the shallow groundwater that percolates downward within the permeable Nipomo Mesa dune sands is diverted laterally along these low-permeability layers and discharges into Black Lake Canyon and supports Black Lake and other systems of coastal drainages and lakes west of Nipomo Mesa (Papadapolas & Associates, 2004). While not specifically inferred in these reports, the laterally diverted perched shallow groundwater emerging at the ground surface can cause seepage erosion and over time develop a channel head which is likely to migrate up stream. This mechanism may explain the existence of Black Lake Canyon, and substantiate the occurrence of a confining layer above the principle production aquifer.

Santa Maria Valley Water Conservation District releases water stored in Twitchell Reservoir to enhance groundwater recharge by optimizing percolation to the principle production aquifer under the Santa Maria River. Reservoir water is released when there is no water flowing in the Sisquoc River as reported at the gage near Garey. Reservoir water is released at a steady flow rate, typically 300 cubic feet per second (cfs), to maximize groundwater recharge. This flow rate maintains a wetted reach up to but not beyond the Bonita School Road crossing. Anecdotal information suggests that a wetted reach beyond the crossing does not promote groundwater recharge to the principle aquifer because of the occurrence of confining layers at depth.

Drilling logs and well casing documentation may improve the understanding of the subsurface geology. The District provided this information for seven District production wells (Figure 1). Drilling logs were evaluated and correlations were made between well locations in order to identify the existence of a confining layer or sequence of layers. Well completion data documents the depth of the screened interval which is presumably located within the Paso Robles Formation (Table 1). General trends in the lithologies of each drilling log and the position of the screened interval were noted. The occurrence of a sequence of layers with a greater proportion of clay was identified and is interpreted as a confining sequence (Figure 2). The east-west transect of production well log data describes the presence of a confining layer directly above the screened interval in each well, however, the thickness of the confining sequence abruptly thins between the Omiya and Olympic wells. The occurrence of a thin clay layer at the Olympic well may indicate the eastern margin location of the regional confining layer that extends westerly to the ocean.

Drilling logs record the total drilling depth and a description of the lithology. All logs report that drilling ceased upon drilling into a blue clay lithology. This lithology is interpreted as the Franciscan Formation. Well casing is generally installed to total depth with the screened

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interval at bottom, directly above the Franciscan Formation. The elevation of the top of the Franciscan Formation is 100 feet lower on the west side of the Oceano Fault relative to the east side (Figure 2). The Sundale well is more consistent with the geology west of the Oceano Fault than the geology on the east side of the fault. Reviewing additional drilling logs and casing records may improve the understanding of the vertical offset along the Oceano Fault.

The principle production aquifer under the NMMA has an estimated total storage capacity 500,000 AF of groundwater above sea level (DRW, 2002). Currently, generally 90,000 AF (SAIC, 2007) of water is stored above sea level in the aquifer. Therefore, approximately 400,000 AF of groundwater storage is available in the Nipomo Mesa groundwater basin. The district currently is interested in obtaining at most 6,300 AFY of supplemental water from an alternative water supply. Based on these estimates, there is sufficient available storage to accommodate the 6,300 AFY of supplemental water supply.

The Southland Wastewater Treatment Facility (WWTF) operated 3 recharge basins covering 2.8 acres during the period of 1988 to 1992. The aggregate percolation during this 5 year period was 760 AFY (Lawrance, 1993). This is equivalent to 53.6 AFY per acre or 1.8 inches per day per acre. This includes rotation of the ponds between filling, percolating and drying. Typical long-term percolation rates are on the order of 6 inches per day. It is reasonable to expect effective percolation rates for a recharge facility to be less when considering pond rotations for drying and maintenance, typically 2 of 3 ponds are wet at any time. Approximately 50 acres of recharge ponds would be required in order to bank 6,300 AFY. However, this is programmatically less efficient than to firstly utilize the 6,300 AFY of water in direct deliveries, while reducing pumpage, then secondly, to recharge the un-deliverable water in percolation ponds.

The number of wells needed to capture this volume of water can be estimated from current production data. The three most productive wells operated by the NCSD are the Eureka Well, Sundale Well and the Via Choncha Well. The respective capacity of these wells is 850 gpm, 1000 gpm and 700 gpm (Boyle 2002). Assuming an average capacity per well of 850 gpm, it is expected that a properly install production well will produce 1370 AFY. This value takes into account normal well operations such as downtime and maintenance. It is assumed that similar pumping operations would be implemented. To capture 6,300 AFY of water would require approximately 5 wells.

Geologic features present in the basin will dictate the optimal locations for new extraction wells. The wells should be located seaward of the recharge areas with sufficient distance to allow for mixing and natural filtration of the recharged water. However, wells should be placed far enough away from the coast to avoid causing seawater intrusion. We recommend locating the wells in areas where little pumping currently exists, east of Highway 1,

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south of the Black Lake Canyon, west of Santa Maria River Fault, and north of the Woodlands development. This general area will distribute pumping across the NMMA providing for a more even access to the water resource. These wells should be screened in zones that produce large volumes of high quality water, likely within the Paso Robles Formation.

REFERENCES:

Boyle Engineering Corporation, (Boyle, 2002), Water and Sewer System Master Plan 2001, prepared for Nipomo Community Services District, update, March 2002.

Department of Water Resources, (DWR, 2002), Water Resources of the Arroyo Grande – Nipomo Mesa Area, 2002.

Lawrance, Fisk & McFarland, INC., (Lawrance, 1993), Engineering Considerations of Groundwater Yields and Rights on the Nipomo Mesa Sub-Area, San Luis Obispo, California, October 20, 1993.

Science Application International Corporation, (SAIC, 2007), Technical Memorandum #4 Update to Groundwater in Storage NMMA, May 23, 2007.

S.S. Papadapolas & Associates, INC., (Papadopulos et al. 2004), Nipomo Mesa Groundwater Resources Capacity Study, San Luis Obispo County, California, prepared for the County of San Luis Obispo, 2004.

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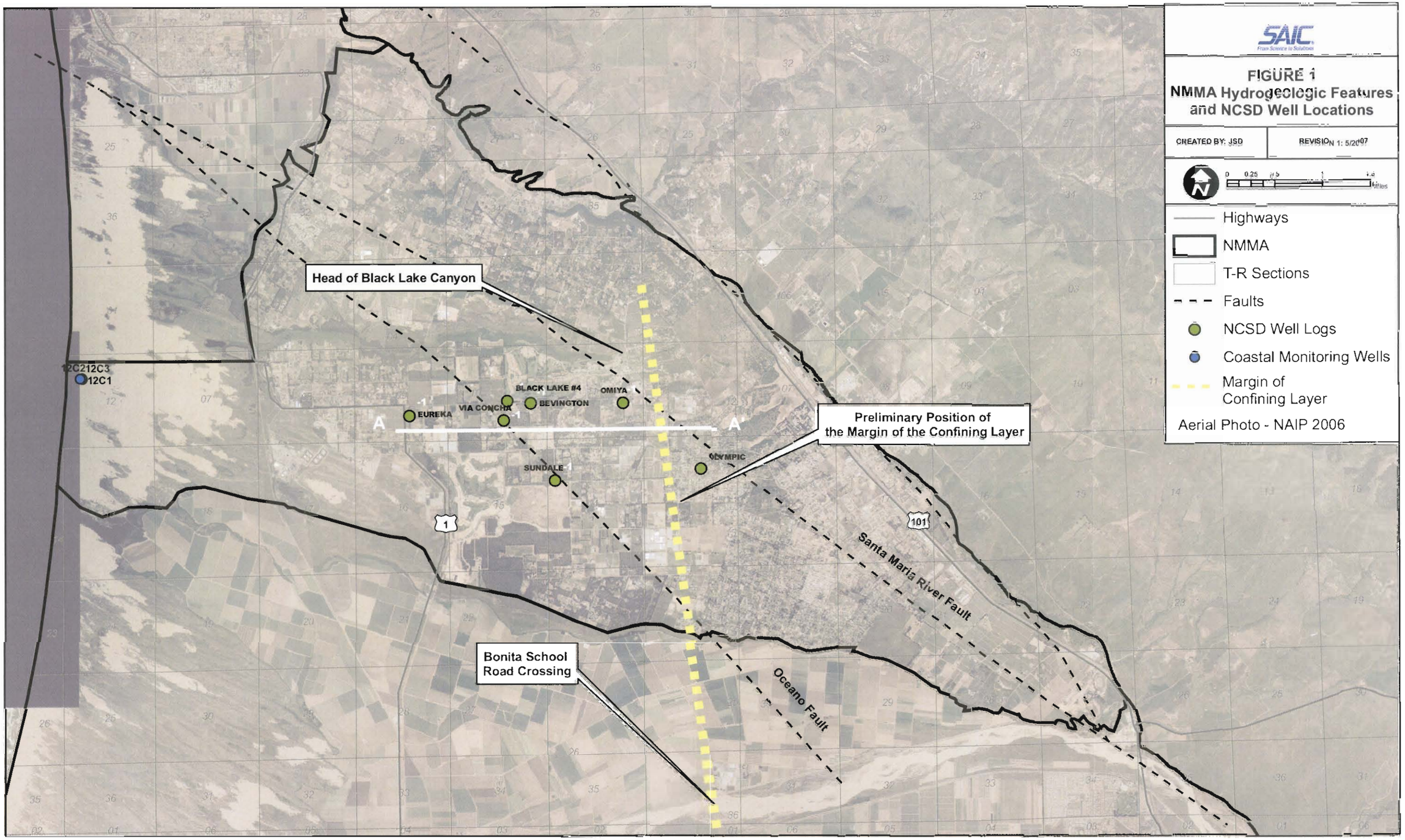

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FIGURE 1
NMMA Hydrogeologic Features and NCSD Well Locations

CREATED BY: JSD | REVISION 1: 5/2007

0 0.25 0.5 1 1.5 Miles

- Highways
- NMMA
- T-R Sections
- Faults
- NCSD Well Logs
- Coastal Monitoring Wells
- Margin of Confining Layer

Aerial Photo - NAIP 2006

Well Completion Table

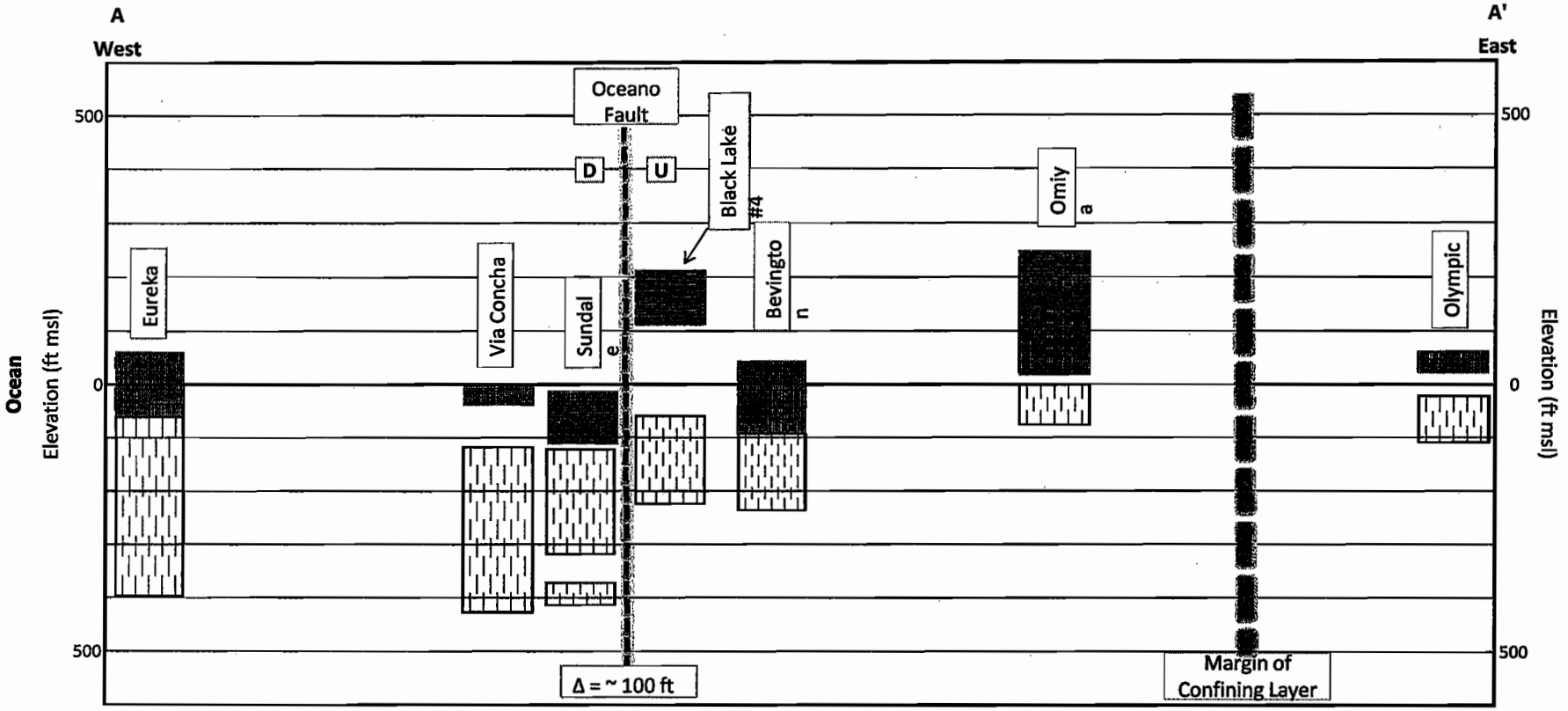
Nipomo Mesa Management Area

Well ID	Latitude	Longitude	Ground Surface Elevation (ft msl)	Total Depth (ft msl)	Screen (ft msl)		Screen Interval (ft)	Comments		
								Confining Layer (ft msl)		Confining Layer Interval (ft)
					Top	Bottom		Top	Bottom	
Eureka 11N35W09K05	35° 02' 44.20"	120° 34' 04.93"	174	-546	-46	-401	355	31	-71	102
Via Concha 11N35W10L01S	35° 02' 40.61"	120° 33' 02.26"	264	-464	-126	-426	300	-4	-54	50
Sundale 11N35W15H01S	35° 02' 07.01"	120° 32' 29.11"	251	-459	-129	-329	200	-19	-119	100
					-379	-419	40			
Black Lake #4	35° 02' 51.19"	120° 32' 59.53"	301	-299	-59	-219	160	207	111	96
Bevington #2 11N35W10J02S	35° 02' 49.57"	120° 32' 43.93"	317	-329	-13	-253	240	47	-93	140
Omiya #2 11N35W11J02S	35° 02' 11.17"	120° 30' 52.05"	390	-260	0	-75	75	255	10	245
Olympic 11N35W13G01S	35° 02' 48.30"	120° 31' 42.57"	346	-129	-19	-109	90	46	28	18

Notes:

Information based on review of driller logs provided by NCSD

Hydrogeology of Nipomo Mesa Mangement Area
Conceptual Model



Note:
All well data is projected to line (Figure 1)

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FIGURE 2
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TECHNICAL MEMORANDUM

TO: Mike Nunley

FROM: Nivan Bhuta, Brad Newton

RE: Response to Boyle Engineering Questions 6-11 - Santa Maria River Underflow

SAIC Project Number: 01-0236-00-9785

DATE: June 5, 2007

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INTRODUCTION

On February 13, 2007, SAIC entered a contractual agreement with Boyle Engineering Corporation (Boyle) to provide hydrogeologic services related to evaluating alternative water supplies to Nipomo Community Services District (the District). The District's Board requested an assessment of the Santa Maria River underflow as an alternative water supply. Subsequently, Boyle requested SAIC address specific questions contained in a memorandum dated May 9, 2007. Provided below is a preliminary assessment of Santa Maria River underflow and Santa Maria groundwater basin characteristics.

FINDINGS

Santa Maria River underflow recharges the Santa Maria groundwater basin. The Santa Maria groundwater basin is currently undergoing adjudication. The District must enter into an agreement with the parties entitled to receive water from the Santa Maria groundwater basin in order to obtain additional water supply from Santa Maria River underflow.

RESULTS

6. What are the typical depths to groundwater and the range of depths observed in the relevant record?

Data showing the depth to groundwater and range of depths to groundwater are not available for Santa Maria River underflow. The average depth to groundwater for the entire basin is 281 feet (ft) with a range of 16 ft to 1,220 ft based on domestic wells (DWR, 2002).

7. What is the quantity of water available?

The quantity of Santa Maria River underflow is not known. Estimates of annual streamflow loss for the Santa Maria River are provided in question number 10. As indicated in the Santa Maria Groundwater Adjudication the native yield of the entire Santa Maria groundwater basin was estimated by GEOSCIENCE to be 60,000 acre-feet per year (AFY) before implementation of the Twitchell Reservoir Project in 1960. This estimate of native yield

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includes 47,300 AFY of streamflow loss, 12,500 AFY of recharge from rainfall and 200 AFY of subsurface inflow to the Santa Maria groundwater basin.

8. What is the quality of water available?

Water quality data for Santa Maria River underflow is not available. For the entire Santa Maria groundwater basin TDS concentrations increase toward the center of the basin beneath the cities of Santa Maria and Orcutt and away from the recharge area of the Santa Maria River (SBCWA 1999; 2001). Nitrate concentrations as high as 240 milligrams per liter (mg/L) have been recorded and some wells sampled from 1990 through 2000 show nitrate concentrations that exceed the minimum contaminant level (DWR, 2002).

9. What is the reliability of this water supply?

While the estimate of native yield for the entire Santa Maria groundwater basin is 60,000 AFY, the volume in storage is on the order of ten times the native yield, therefore providing a reasonable reliability to the annual supply for any one year. The confidence in this reliability estimate is predicated on the understanding that over long periods, annual rainfall totals are occasionally extremely high and therefore the likelihood of replacing groundwater pumpage in excess of the native yield is high.

Winter floodwaters are captured at Twitchell Reservoir annually. Based on USGS gage data (for Water Years 1960 through 1983) releases from Twitchell Reservoir have been made in all but three years since the implementation of the project in 1960. Therefore, Santa Maria River underflow provides a reasonable reliability to the annual supply for any one year.

10. What is a reasonable estimate of its yield?

The estimated annual streamflow loss for the Santa Maria River downstream of the confluence with the Sisquoc River Valley is 60,000 AFY since the implementation of the Twitchell Reservoir Project (Scalmanini, 1997). The estimated yield of the Twitchell Reservoir Project is 35,000 AFY as indicated in the Santa Maria Groundwater Adjudication. The Santa Maria Groundwater Adjudication litigation has concluded, but the court has not rendered a final decision. So, the numbers presented above are still preliminary.

11. What physical connections exist between this water source and other nearby sources that may already be "spoken for"? (i.e., Who else has a reasonable chance of establishing a prior claim to this water?)

Subsurface outflow to the west from the Santa Maria Valley enters the ocean and outflow to the northwest enters the Nipomo Mesa Management Area (NMMA). Cause for concern over changing the subsurface flow dynamics due to an additional pumpage of the Santa Maria River underflow is warranted, specifically in that the current underflow to the NMMA has been historically accounted for in the water supply estimates for the District.

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METHODOLOGY

The answers to the questions posed in the results section are based upon a review of existing documentation related to the Santa Maria groundwater basin and to the Santa Maria Groundwater Adjudication. Provided below is additional analysis and discussion of the questions presented in the results section.

DISCUSSION

The Twitchell Reservoir Project was implemented in 1960 to regulate surface water releases to the Santa Maria River system upstream of the confining layer in order to optimize groundwater recharge to the Santa Maria groundwater basin (Scalmanini, 1997). The Santa Maria Groundwater Adjudication indicates that only Santa Maria Valley parties have paid for, managed and benefited from the Twitchell Reservoir Project. The District would need to purchase a water right from the parties involved in the Twitchell Reservoir Project or make an agreement with parties entitled to water from the Santa Maria groundwater basin in order to access Santa Maria River underflow as an alternative water supply.

6. The depth to groundwater information provided is based on data for the Santa Maria groundwater basin as a whole, including the Northern Cities, the Nipomo Mesa Management Area and the Santa Maria Valley. Data must be collected and analyzed from wells along the Santa Maria River in order to provide a range of depths to groundwater in the vicinity of the Santa Maria River.

7. The quantity of water available (60,000 AFY) presented is for the entire Santa Maria groundwater basin. Previous reports and studies of the Santa Maria groundwater basin have shown varied estimates of native yield. The Santa Maria Groundwater Adjudication litigation has concluded, but the court has not rendered a final decision. So, the estimated native yield for the entire Santa Maria groundwater basin of 60,000 AFY is still preliminary.

The estimated annual streamflow loss for the Santa Maria River downstream of the confluence with the Sisquoc River Valley was 26,000 AFY (for Water Years 1942 through 1959) prior to the Twitchell Reservoir Project and 60,000 AFY (for Water Years 1960 through 1983) after implementation of the Twitchell Reservoir Project (Scalmanini, 1997).

8. The groundwater quality data provided is based on data for the Santa Maria groundwater basin as a whole. Water quality data of Santa Maria River flows and groundwater in the vicinity of the Santa Maria River must be collected and analyzed in order to provide water quality data for the Santa Maria River underflow.

9. The average annual release from Twitchell Reservoir is 39,000 AFY based on USGS gage data (for Water Years 1960 through 1983). Releases have been made in all years since the implementation of the Twitchell Reservoir Project except Water Years 1972, 1976 and 1977.

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10. If all releases from Twitchell Reservoir recharged the Santa Maria groundwater basin, then Santa Maria River underflow would yield approximately 65,000 AFY (26,000 AFY streamflow losses prior to Twitchell Reservoir + 39,000 AFY release from Twitchell Reservoir).

11. Geologically the quaternary alluvium that comprises the principal aquifer is composed of an upper fine-grained member consisting of sand and gravel and a lower coarse grained member consisting of boulders and gravel throughout the valley. The upper member toward the Pacific Ocean is much finer grained and consists of predominately silt and clay. This finer grained upper member (confining layer) confines groundwater to the lower member in areas westward of Santa Maria's water treatment plant. Water flowing in the segment of the Santa Maria River above the confining layer does not recharge into the groundwater basin and wastes to the Ocean (Wort, 1951). The Twitchell Reservoir Project was implemented to regulate flows along the lower reaches of the Cuyama River in order to minimize water waste to the Ocean.

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Appendix C – CCAMP Data for Oso Flaco Watershed

This summary of water quality in Oso Flaco Lake and Oso Flaco Creek is based on the following studies and documents:

- Cachuma Resource Conservation District and the Dunes Center. *Draft Nitrate and Sediment Assessment, Oso Flaco Watershed, San Luis Obispo County, California, August 2004.* Report prepared for California Regional Water Quality Control Board, Central Coast Region.
- Central Coast Ambient Monitoring Program (CCAMP). *312 Santa Maria River Hydrologic Unit Draft Report for Sampling Year 2000*

CCAMP water quality data is summarized below for monitoring sites in the Oso Flaco Creek watershed. Maximum Contaminant Levels (MCLs) and Secondary MCLs are also listed for comparison.

Note that water quality standards shown below for municipal supply are in some cases based on source water quality and in other cases based on distribution system water quality. Surface water treatment must meet "performance standards", and the MCL is deemed to be a "treatment technique". For example, the performance standard for turbidity is 0.3 NTU, and the treatment technique to achieve this would be conventional treatment; however, if an alternative filtration technology is used as the treatment technique, the turbidity performance standard is typically 0.1 NTU.

Table C-1 Water Quality and Maximum Contaminant Levels (MCLs)

Primary Constituent	CDHS MCL	USEPA MCL	Oso Flaco Lake @ culvert (Site 312 OFL)			Oso Flaco Creek @ Oso Flaco Lake Road (Site 312OFC)			Little Oso Flaco Creek (Site 312 OFN)		
			Max	Min	Mean	Max	Min	Mean	Max	Min	Mean
Coliforms, Fecal MPN/100mL	See Note 1		1,300	20	244	35,000	1	3,586	24,000	1	2,314
Coliforms, Total, MPN/100mL			7,000	300	2,437	190,000	199	61,425	127,000	800	21,653
Nitrate as Nitrogen, mg/L		10	37.1	28	31.4	70.2	23.8	37.1	48.8	26.5	34.5
Nitrate(as N03), mg/L	45		165	125	140	312	106	165	217	118	154
Nitrite as Nitrogen, mg/L	1	1	0.42	0.005	0.106	0.54	0.005	0.118	0.144	0.005	0.06
Nitrogen, Total, mg/L	10		37.1	28	31.3	134	26	49	45.1	26.5	32.2

Note 1: The level of pathogenic organisms present in a surface water sources will establish the degree of treatment required, as defined by the USEPA in the Surface Water Treatment Rule guidance and the Long Term 2 Enhanced Surface Water Treatment Rule.
"empty cell " means not reported / no analysis for this constituent
mg/L = milligrams per liter of sample collected = ppm
ppm = parts per million
MPN/100mL = most probable number per 100 milliliters of sample collected

Table C-2 Water Quality and Secondary Standards

Secondary Constituent	Consumer Acceptance Contaminant Levels		Oso Flaco Lake @ culvert (Site 312 OFL)			Oso Flaco Creek @ Oso Flaco Lake Road (Site 312OFC)			Little Oso Flaco Creek (Site 312 OFN)		
	CDHS	USEPA	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean
Chloride, mg/L	250	250	133	82	99	247	43	95	110	60	92
Conductivity, umhos/cm	900		2,763	1,830	2,128	2,820	1,595	2,010	2,350	1,680	2,007
Lab Turbidity (NTU)	5		34.5	1	9.8	526	4	190	85.1	2.1	17.3
Sulfate mg/L	250	250	740	640	678	950	440	656	730	568	633
Total Dissolved Solids, mg/L	500	500	2,040	338	1,470	2,100	387	1,445	2,080	969	1,576
Turbidity, NTU (See Note 1.)	5		34.5	1	9.8	526	4	190	85.1	2.1	17.3

Note 1: Acceptable turbidity levels for treated surface water are based on the treatment technique used, typically 0.1 to 0.3 NTU. There are no established limits for turbidity in raw surface water prior to treatment.

"empty cell " means not reported / no analysis for this constituent
mg/L = milligrams per liter of sample collected = ppm
NTU = Nephelometric Turbidity Units
ppm = parts per million
umhos/cm = millisiemens per centimeter

Additional parameters were measured under the CCAMP program for which water quality MCLs and Secondary Standards do not exist. In some cases these measured parameters indicate the presence of a water-borne contaminant. These results are summarized below:

Table C-3 Sediment Inorganic Chemistry

Inorganic Constituent in Sediment[2]	Little Oso Flaco Creek (Site 312 OFN)	MCL in Water	
		CDHS[1]	USEPA[1]
Antimony in Sediment (mg/kg) [2]	1.50	0.006 ppm	0.006 ppm
Arsenic in sediment (mg/kg) [2]	15	0.05 ppm	0.010 ppm
Barium, in sediment (mg/kg) [2]	160	1 ppm	2 ppm
Berylliumin in sediment (mg/kg) [2]	2.70	0.004 ppm	0.004 ppm
Cadmium in sediment (mg/kg) [2]	0.10	0.005 ppm	0.005 ppm
Chromium in sediment (mg/kg) [2]	40.00	0.05 ppm	
Copper in sediment (mg/kg) [2]	33	1.3 ppm	
Lead in sediment (mg/kg) [2]	20	0.015 ppm	
Mercury in sediment (mg/kg)[2]	0.037	2 ppb	2 ppb
Nickel in sediment (mg/kg) [2]	35	0.1 ppm	
Selenium in sediment (mg/kg) [2]	4	0.05 ppm	0.05 ppm
Thallium in sediment (mg/kg) [2]	1.00	0.002 ppm	0.002 ppm
Vanadium in sediment (mg/kg) [2]	78		
Zinc in sediment (mg/kg) [2]	110	5 ppm	5 ppm

"empty cell " means not reported / no analysis for this constituent

1 MCL applies to constituents dissolved in water

2 MCL does not apply to constituents bound to fine-grained sediment samples collected within the wetted creek channel or the tissue of fish

Table C-4 Sediment Organic Chemistry

Organic chemicals detected in the sediment sample collected at Little Oso Flaco Creek (312OFN) in June 2000. Available criteria are shown for reference. Units of measurement are ppb (ug/kg). ND is non-detect. Criteria exceedances are bold. (CCAMP, 2002, from Table 5.1.5c.)

Site Tag	DDD(p,p')	DDE(p,p')	DDT, Total	Dieldrin	Endrin	Chlorpyrifos	*Total PCB*
312OFN 2000	1.0	5.3	9.3	2.6	1.4	ND	ND
PEL (freshwater)	**8.51**	**6.75**	**4450**	**6.67**	**62.4**		**277**

PEL (probable effect level)

Table C-5 Metals in Fish Tissue

Site specific assessment of data used to assess impairment of aquatic life uses in the Santa Maria River Hydrologic Unit (HU312). **Yes** - evidence that a problem exists, **No** - no evidence that a problem exists. (CCAMP, 2002, from Table 5.1.5a.)

Constituent	Arsenic	Chromium	Copper	Lead	Mercury	Selenium	Zinc
Water Contact Recreation Assessment Threshold	1.5	1	20	2	0.5	2	45
Median International Standards (MIS)	1.0	1.0	20.0	2.0	0.5	0.3	70
California's Office of Environmental Health Hazard Assessment (OEHHA)	1.0				0.3	2.0	
Units	ppm	ppm	ppm	ppm	ppb	ppb	ppm
Matrix	Tis	Tis	Tis	Tis	Tis	Tis	Tis
Sites							
312OFL	**No**	**No**	**No**	**No**	**No**	**No**	**No**

Table C-6 Organic Compounds in Fish Tissue

Organic chemical concentrations in whole fish from Oso Flaco Lake (ng/g or ppb). National Academy of Sciences (NAS) and Food and Drug Administration (FDA) criteria for freshwater fish are shown as exceedances threshold values. Exceedances are **bold**. (CCAMP, 2002, from Table 5.1.4d.)

Site	**Date**	**Aldrin**	**Chlordane**	**Total DDT**	**Dieldrin**	**Endrin**	**Heptachlor**	**Tot PCB**	**TOXAP**
Oso Flaco Lake	Filet		2.2	**345.1**	**25.5**	10.5	< 2.0	NA	**243.0**
NAS [1]	Whole Fish	100	100	1000	100	100	100	500	100
FDA [2]	Filet	300	300	5000	300	300	300	2000	5000
OEHHA [3]	Filet		30	100	2	1000	4	20	30

Notes:
(1) National Academy of Sciences guidelines
(2) U.S Food and Drug Administration Action Levels
(3) California's Office of Environmental Health Hazard Assessment (OEHHA) fish tissue criteria

Table C-7 Toxicity Data

Percent survival of *C. dubia* and *H. azteca* in toxicity tests conducted in the Santa Maria Hydrologic Unit July 2002 through May 2003. Bold numbers indicate survival is significantly different from the control value @ $p<0.05$. NA=not analyzed. (CCAMP, 2002, Table 5.1.5b.) This sample contained chlorpyrifos levels that are known to exceed acute toxicity threshold for *C. dubia.*

Site	*C.dubia* survival Jul-02	*C.dubia* survival Sept-02	*C.dubia* survival Mar-02	*C.dubia* survival May-02	*H. azteca* survival June-02	*H. azteca* survival May-03
312OFC	80	100	100	**30**	**71**	N/A

Tissue Bioaccumulation

Resident fish tissue samples (from Oso Flaco Lake) did not have any metal concentrations which exceeded published Median International or OEHHA Standards.

Appendix D – Environmental and Permitting Constraints Analysis

Padre Associates, Inc., May 25, 2007.

NIPOMO COMMUNITY SERVICES DISTRICT

SUPPLEMENTAL WATER ALTERNATIVES ENVIRONMENTAL AND PERMITTING CONSTRAINTS ANALYSIS

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1.0 INTRODUCTION

At the request of Boyle Engineering Corporation (Boyle), Padre Associates, Inc. (Padre) has prepared this environmental and permitting constraints analysis for supplemental water supply alternatives under consideration by the Nipomo Community Services District (NCSD). The following provides an overview of the primary environmental constraints and permitting issues associated with the six supplemental water supply alternatives under consideration by the NCSD.

1.1 SCOPE OF SERVICES

Padre's scope of services included the following tasks:

- Collection and analysis of existing environmental data for the water supply options;
- Preparation of a constraints analysis identifying potential environmental impacts associated with each of the water supply options;
- Identification of permitting requirements for each alternatives;
- Preparation of a permitting requirements matrix which presents a list of resource surveys and other pertinent environmental information that would be required by permitting and regulatory agencies.
- Preparation of this report presenting Padre's findings regarding the environmental and permitting constraints for the supplemental water alternatives under consideration.

This report is divided into five sections: Section 1 introduces the supplemental water supply alternatives. Section 2 provides a discussion of the federal, state, and local agencies that would be involved in permitting any of the alternatives and types of anticipated permits needed. Section 3 presents an overview of environmental resources that may be affected by the alternative projects and potential constraints to constructing the alternative projects. Section 4 provides a summary of salient points and Padre's recommendations. Section 5 presents the references cited in the report.

1.2 DESCRIPTION OF ALTERNATIVES

Presented below are descriptions of each of the water supply alternatives discussed in this report. Refer to Figure 1 for the relative locations of the proposed features of each alternative.

Alternative No. 1 (Sea Water/Cooling Water):

This alternative would include a water treatment facility located at either the ConocoPhillips (COP) Santa Maria Refinery using process cooling water as a water source, desalination of sea water at another location owned and operated by NCSD, or at the South San Luis Obispo County Sanitation District (SSLOCSD) Wastewater Treatment Facility located in Oceano.

Alternative No. 2 (Oso Flaco Lake Wells): This alternative would involve treating shallow groundwater or agricultural runoff at Oso Flaco Lake and delivering the treated water to the NCSD distribution system. This alternative may include extraction of either shallow ground

water, or surface runoff from agricultural lands into Oso Flaco Lake could be used as a water supply. The NCSD would build a new ocean outfall for the brine. In addition, enough water would be treated so that "cleaner" water would be released into the watershed to improve the health of the Oso Flaco wetlands.

Alternative No. 3 (Water Trading with CCWA Agencies): The State Water Project is a complex system of dams, reservoirs, power and pumping plants, canals, and aqueducts built to convey water from Lake Oroville to the Sacramento Delta, then on to Central and Southern California. The Coastal Branch of the State Water Project consists of (1) water conveyance facilities built by the California Department of Water Resources and (2) regional distribution and treatment facilities constructed by a cooperative group of local water agencies and cities operating as the Central Coast Water Authority (CCWA). Coastal Branch Phase II of the State Water Project was built between 1993 and 1997 to bring State water to San Luis Obispo and Santa Barbara Counties as per the Water Supply Contracts entered into by the State and both counties.

This alternative would consider acquiring unused capacity in the State Water Project (SWP) from one or more CCWA project participants, including acquiring exchange water from one or more CCWA project participants including Golden State Water Company. Water could be provided via a turnout along the State Water Pipeline within the NCSD boundary. This water would then either be delivered directly to the NCSD water system via pipeline from the Tefft Street turn-out, at a Bonita Well turnout, or indirectly via aquifer storage and recovery. As an option, NCSD could buy water directly from the CCWA or utilize aquifer storage and recovery for use of CCWA water for seasonal water needs.

Alternative No. 4 (Santa Maria Valley Groundwater): The City of Santa Maria may be willing to sell some of their entitlement to underflow water to NCSD. Facilities required to utilize this resource would include a wellfield, possibly treatment (based on regulatory review), pumping, storage, and a connection from the proposed wellfield to the District distribution system. It is assumed collector wells would be located along the Santa Maria River, near the end of Hutton Road or at the Bonita Well site.

Alternative No. 5 (Groundwater Recharge from Southland Wastewater Treatment Facility): This alternative would develop a groundwater recharge program within the Nipomo Mesa Management Area (NMMA) involving recharge of the groundwater basin with recycled water from Southland Wastewater Treatment Facility (WWTF). The NCSD owns and operates the Southland Wastewater Treatment Facility (WWTF), located just west of Highway 101 in the southern portion of Nipomo. It is anticipated recycled water could be pumped to the proposed recharge facilities during certain periods of the year. It is understood that the NCSD proposes to locate the proposed recharge facilities within the vicinity of the local groundwater pumping depression identified in previous studies of the Nipomo mesa groundwater basin. As an option under this alternative, NCSD could exchange water rights with Black Lake Golf Course, Black Lake development landscaping, and the Woodlands Golf Course and utilize treated wastewater for irrigation water at these areas.

The proposed groundwater recharge of recycled water within the study limits would not introduce a new supplemental water source from outside the NMMA, however, it would be

intended to provide a means to manage and help stabilize the groundwater basin within the subject area. As proposed, this alternative is intended to function as a groundwater management program and not a true supplemental water alternative.

Alternative No. 6 (Treated Water Exchange with Agricultural Water Users): The Southland WWTF provides secondary treatment for a mixture of domestic and industrial wastewater from part of the Nipomo community. This alternative would include a groundwater exchange program involving delivery of recycled water from Southland WWTF to potential agricultural users within the vicinity of the groundwater pumping depression previously identified in the Nipomo Mesa. As directed by NCSD staff, the boundary limits of this alternative include the depressed groundwater basin bounded by the Oceano and Santa Maria River Faults and within the NMMA.

The proposed groundwater exchange of recycled water for agricultural production will not introduce a new supplemental water source from outside the NMMA; however, it will be intended to provide a means to manage and redistribute the water balance within the subject area of the NMMA. As proposed, this scenario will provide for the transfer of a non-potable water source (reclaimed water from Southland WWTF) to potential agricultural users for either direct reuse in irrigation of crops or for percolation and subsequent recovery. In exchange, the groundwater previously pumped by the same agricultural users would either be: (1) directly pumped (at the subject wells) and transmitted for use by NCSD; or (2) indirectly extracted by NCSD at existing or new well locations.

2.0 PERMITTING REQUIREMENTS

This section lists and discusses the regulatory agencies that have jurisdiction and their permitting requirements within the area of the water supply alternatives under consideration. Proposed alternatives would require various federal, state, and local approvals, depending on the alternative. Refer to Table 1 for a general list of anticipated permitting agencies that would be involved with permitting one or more alternatives. Presented below is a description of each regulatory agency's anticipated role in review and permitting of the proposed alternatives.

2.1 FEDERAL AGENCIES

United States Army Corps of Engineers (USACE). The USACE would likely be the lead federal agency for the proposed project for placement of fill (including temporary trench spoils) within navigable waters of the U.S. under Section 404 of the Clean Water Act. The USACE also issues permits for construction of facilities within navigable waters in accordance with Section 10 of the Rivers and Harbors Act of 1899. During review of a permit application, the USACE will consult with the U.S. Fish and Wildlife Service (USFWS) and National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NOAA Fisheries) to identify potential effects to federally-listed endangered and threatened species as required under Section 7 of the Endangered Species Act (ESA). A Biological Assessment would be required as part of this consultation to provide sufficient information for the USACE, USFWS, and NOAA Fisheries to fully determine the project's potential to affect federally-listed threatened or endangered species. A review of potential impacts to cultural or historical resources is coordinated through consultation with the State Historic Preservation Office.

A Jurisdictional Waters of the U.S. survey (wetlands delineation) may also be required to identify wetlands that may be impacted by the project. The USACE's jurisdiction under Section 404 of the Clean Water extends to the ordinary high water mark of a river or stream.

USACE permitting would likely affect Alternatives 1, 2, 3, and 4, wherever new construction of conveyance pipelines or other facilities would impact federal waters. Without more detailed engineering specifications, it is unclear to what extent federal waters may be affected. Depending on the alternative selected for implementation, the proposed project may potentially fall within one or more Nationwide Permits (NWP) developed by the USACE for major routine types of construction projects within federal waters.

National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NOAA Fisheries). NOAA Fisheries is responsible for the protection of marine fish and mammal species by administering the regulations listed in the ESA, Marine Mammal Protection Act, and the Magnuson-Stevens Fishery Management and Conservation Act. Based on the preliminary information available, NOAA Fisheries may not be involved for onshore portion of the alternatives unless the selected project would result in disturbance within the Santa Maria River or Nipomo Creek. The USACE would consult with NOAA Fisheries for potential impacts to marine fisheries and marine mammals for an ocean outfall pipeline proposed under alternative Nos. 1 or 2.

United States Fish and Wildlife Service (USFWS). The USFWS will be requested to review the project by the USACE with respect to potential impacts to federally-listed threatened

or endangered species. Such consultation will be initiated during the 404 or 10 permit process. Impact of critical habitat may also result in seasonal restrictions and recommendations for habitat restoration. Potential endangered species impacts under alternatives 1 through 4 may include potential takes of listed species known to occur in creeks and wetlands along pipeline routes. Under the Alternative 2 scenario, impacts to water quality or quantity within Oso Flaco Lake or creek could affect habitat. The USFWS would be a key stakeholder in mitigation of potential affects of water withdrawals from the Oso Flaco lake watershed. Additionally, impacts from desalination proposals would be required to avoid takes of habitat or individual Western snowy plover or least tern from proposed seawater intake structures or brine outfall lines.

2.2 STATE AGENCIES

Central Coast Regional Water Quality Control Board (RWQCB). The RWQCB's primary responsibility is to protect the quality of the surface and groundwater within the Central Coast region for beneficial uses. The duty is carried out by formulating and adopting water quality plans for specific ground or surface water bodies, by prescribing and enforcing requirements on domestic and industrial waste discharges, and by requiring cleanup of water contamination and pollution.

Pursuant to Section 401 of the Clean Water Act, the USACE permit under Section 404 is not active until the State of California first issues a water quality certification to ensure that a project will comply with state water quality standards. The authority to issue water quality certifications in the project area is vested with the RWQCB. All of the considered alternatives would involve construction activities which would expose greater than one acre of disturbed construction area to stormwater runoff, and would require enrolling for coverage under the General Construction Stormwater Permit issued by the State Water Resources Control Board and enforced by the RWQCB.

Alternative No. 1 (Seawater/Cooling Water) would likely include requirement of a National Pollutant Discharge Elimination System/Waste Discharge Requirements (NPDES/WDR) permit from the RWQCB for brine discharge to the ocean associated with any of the three scenarios. Also, Alternative No. 2 (Oso Flaco Agricultural Return Water) may also involve the discharge of treated brine to the ocean, requiring a NPDES/WDR permit from the RWQCB. Brine discharges would be required to meet state and federal water quality standards for ocean disposal in accordance with the California Ocean Plan. Impacts to marine organisms from brine discharge would also be considered a potential significant impact under the CEQA.

California Coastal Commission. The California Coastal Commission regulates development activities along California's coastline and within the designated coastal zone under the authority of the California Coastal Act. Within the Nipomo area, the coastal zone boundary extends inland from the coastline to Highway 1. Projects approved by the County within the coastal zone can be appealed to the Coastal Commission for independent review for consistency with the Coastal Act. Additionally, projects with construction activities seaward of mean high tide line or affecting coastal streams or environmental sensitive habitat areas (ESHAs) fall within the Coastal Commission's original jurisdiction and would require a Coastal

Development Permit issued by the Coastal Commission. Alternatives 1 and 2 would be located within the coastal zone and would be subject to Coastal Commission review and approval.

California State Lands Commission (CSLC). The CSLC manages the state's submerged tidelands along the California coast from the mean high tide line and seaward for three nautical miles. Construction of facilities within CSLC jurisdiction would require a state lands lease. Approval of the state lands lease is made by the commission, composed of the lieutenant governor, the state controller, and the state finance director. Alternatives 1 and 2 would include ocean outfall structures placed in CSLC jurisdiction and would require a state lands lease.

California Department of Fish and Game (CDFG). CDFG administers Section 1600 of the California Fish and Game Code. The regulation requires a Lake or Streambed Alteration Agreement (SAA) between CDFG and the applicant before the initiation of any construction project that will: 1) divert, obstruct, or change the natural flow or the bed, channel, or bank of any river, stream, or lake; 2) use materials from a streambed; or 3) result in the disposal or deposition of debris, waste, or other loose material where it can pass into any river, stream, or lake.

The CDFG also administers a number of laws and programs designed to protect fish and wildlife resources. Principle of these is the California Endangered Species Act of 1984 (CESA - Fish and Game Code Section 2050), which regulates the listing and take of state endangered (SE) and threatened species (ST). Under Section 2081 of CESA, CDFG may authorize the take of an Endangered and/or Threatened species, or candidate species through an Incidental Take Permit. However, plant or animal species that are "Fully Protected" under state law cannot be taken and no Incidental Take Permits may be issued. In the project area, the California least tern, the Southern sea otter, and the white-tailed kite are all fully-protected species.

Alternatives 1, 2, 3, and 4 would likely require SAA permits from the CDFG for pipeline creek crossings. The CDFG is a trustee agency under CEQA, and would likely provide comment on the CEQA document regarding potential project impacts to animal and plant species designated rare, threatened/endangered, or fully-protected status.

California Department of Health Services (DHS). DHS is responsible for overseeing the quality of water once it is in storage and distribution systems. DHS oversees the self-monitoring and reporting program implemented by all water purveyors, performs inspections, and assists with financing water system improvements for the purpose of providing safer and more reliable service. A Water Supply Permit Amendment would be required from DHS for any of the alternatives under consideration.

California Department of Transportation (Caltrans). Caltrans is responsible for managing California's highway and freeway systems and works collaboratively with local agencies to ensure proper management of local roadway systems. Caltrans reviews all requests from utility companies, developers, volunteers, nonprofit organizations, etc., desiring to conduct various activities within their right-of-way (ROW). Construction activity being proposed along a Caltrans ROW would require a Standard Encroachment Permit from Caltrans prior to project implementation. This could potentially occur with all alternatives except Alternatives 5 and 6.

2.3 LOCAL AGENCIES

County of San Luis Obispo. All of the alternatives would be within the jurisdiction of San Luis Obispo County land use regulations (SLO County). SLO County will require that a conditional (or minor) use permit, grading permit, and building permit be issued for the construction and operation of the project facilities (i.e. pipelines, wells, and storage) and will analyze the project to determine consistency with any applicable standards or policies. SLO County may impose specific requirements/conditions be incorporated into the permit governing the design or operation of the project and may not approve the permit unless it is found to be consistent with the County's General Plan and Land Use Ordinance. The County would be a permitting agency under CEQA and would rely on the NCSD's CEQA determination in issuance of permits. Encroachment along county roadways would require a standard encroachment permit issued by the County Public Works Department.

San Luis Obispo County Air Pollution Control District (APCD). The APCD would review proposed project for compliance with applicable Federal, State and local air quality control criteria. For any of the alternatives, NCSD likely would be required to submit a Construction Activity Management Plan to the APCD which will address construction-related dust control and equipment emissions. The CAMP will be required to address construction-related air impacts through various mitigation techniques. Detailed documentation of proposed project emissions (such as from organics removal during treatment) will be required to obtain Authority to Construct/Permit to Operate permits, if needed.

San Luis Obispo County Division of Environmental Health. The County Division of Environmental Health (SLODEH) is the local approval agency for issuance of water supply well permits or injection wells within a drinking water aquifer. Wellhead protection regulations require a minimum separation of water supply wells from wastewater disposal facilities. Under Title 22 regulations, the SLODEH may require any injected water to meet drinking water standards prior to injection.

2.4 CALIFORNIA ENVIRONMENTAL QUALITY ACT

The NCSD would act as the lead agency for compliance with the California Environmental Quality Act (CEQA) for implementation of any of the water supply alternatives under consideration. The NCSD would prepare an Initial Study/ Mitigated Negative Declaration (IS/MND) or Environmental Impact Report (EIR) for the selected project, depending on the level of impacts anticipated. During the CEQA process, NCSD would consult with other state and local agencies regarding concerns and suggested mitigation for environmental impacts. Environmental issues that arise during CEQA processes will be addressed through project design modifications or mitigation measures included in the CEQA document. Following completion of the CEQA process, the NCSD would submit permit applications to regulatory agencies as appropriate and negotiate permit conditions as needed.

Table 1. Permit Requirements Summary

Agency	Permit/Approval	Regulated Activity	Authority
Federal Agencies			
U.S. Army Corps of Engineers (USACE)	Section 404 permit Section 10 permit	Discharge of dredged or fill material into water of the U.S. during construction. Jurisdictional water include territorial seas, tidelands, rivers, streams, and wetlands	Section 404 Clean Water Act (33 USC 1344). Rivers and Harbors Act
U.S. Fish and Wildlife Service (USFWS)	Endangered Species Act, Section 7 consultation	Impacts to federally-listed species and species proposed for listing.	16 USCA 1513 50 CFR Section 17
NOAA Fisheries	ESA, Section 7 consultation	Impacts to federally-listed species and species proposed for listing.	16 USCA 1513 50 CFR Section 17
State of California Agencies			
Regional Water Quality Control Board	Section 401 Water Quality Certification SWPPP Permit NPDES/WDRs	Discharges that may affect surface and ground water quality.	Clean Water Act Porter-Cologne State Water Quality Act (1969)
California Coastal Commission	Appeal Jurisdiction within Coastal Zone	Projects within Coastal Zone approved by County can be appealed to Coastal Commission for review and approval.	California Coastal Act
California Department of Fish and Game (CDFG)	1602 Permit Section 2081 Management Agreement	Crossing of streams and rivers that will result in disturbance to the streambed. Potential adverse effects to State-listed species	Sections 1601-1607 of California Fish and Game Code. Section 2081 of the Fish and Game Code
California State Lands Commission	State Lands Lease	Project activities offshore of mean high tide line.	California Public Resources Code, Division 6.
California Department of Health Services	Water Supply Permit Amendment	New water source	Ca Health and Safety Code, Div. 104, Part 12, Chapter 4 Article 7, Section 116525
California Department of Transportation	Standard Encroachment Permit	Construction activity within Caltrans right-of-way.	California Streets and Highway Code
Local Agencies			
County of San Luis Obispo Planning and Building Department	Development, Grading, Building Permit	Land use, grading, drainage, encroachment permit	San Luis Obispo County Code
San Luis Obispo APCD	Authority to Construct	Emissions associated with construction may require permits.	Clean Air Act
County of San Luis Obispo Division of Environmental Health	Well Construction Permit	Construction new water supply wells	California Water Code

3.0 ENVIRONMENTAL CONSTRAINTS

The following section describes the potential environmental constraints associated with the six water supply alternatives under consideration by the NCSD. Based on Padre's initial review of the project alternatives and review of permitting requirements, the probable issues that will need to be addressed during the permitting process for this project are biological resources including wetlands, cultural resources, geology and soils, and hydrology/ water quality. The following provides an overview of the environmental issue areas with emphasis on the sensitive biological resources that are expected to occur within the project area due to the presence of suitable habitat. The resources and required mitigation, if any, will be the focus of the respective regulatory agency review during the permit acquisition phase of the project.

3.1 BIOLOGICAL RESOURCES

Padre conducted a desk-top review to determine potential biological resource constraints within the vicinity of the identified water supply alternative location. This review included a query of the California Natural Diversity Database (CNDDB [CNDDB, 2006]) for the purposes of identifying documented occurrences of special-status plant and animal species within the vicinity of the alternative projects. Figures 2 through 5 illustrate the known occurrences of special-status species in relationship to the water supply alternatives under consideration. The figures illustrate a representative sample or ranges for known species occurrences.

3.1.1 Federally-Listed Animal Species

California red-legged frog (*Rana aurora draytonii*). The California red-legged frog (CRLF) is a federally-listed threatened species and a California species of special concern. The CRLF occurs in different habitats depending on their life stage and season. CRLF breed from November through March. All stages are most likely to be encountered in and around breeding sites, which include marshes, springs, permanent and semi-permanent natural ponds, ponded and backwater portions of streams, as well as artificial impoundments such as stock ponds, irrigation ponds, and siltation ponds. This species prefers dense emergent and bank vegetation including willow (*Salix* sp.), cattail (*Typha* sp.), and bulrush (*Scirpus* sp.). The absence of these plant species within the site does not exclude the possibility that the site provides CRLF habitat, but the presence of one or all of these plants is an important indicator that the site may provide foraging or breeding habitat (USFWS, 2005).

CRLF is a concern for alternatives 1, 2, and 4 due to the known presence or suitable habitat in creeks and wetlands within the project Nipomo area, especially around Oso Flaco Lake and Oso Flaco Creek. As such, formal Section 7 consultation pursuant to Section 404 of the Clean Water Act would be useful between the USACE and the USFWS to further assess potential CRLF impacts due to project implementation and the need for project-specific avoidance and minimization measures. This would include preparation of a Biological Opinion (BO) by the USFWS which will ultimately result in approval for authorized individuals to survey for and, as necessary, relocate CRLF from the project area during project implementation (i.e., "Take Statement").

Steelhead – Southern California ESU (*Oncorhynchus mykiss irideus*). Steelhead have been divided into 15 evolutionary significant units (ESU) based on similarity in life history, location, and genetic markers. The Southern California ESU was listed as federally endangered by the NOAA Fisheries in 1997. Southern California steelhead is also a California species of special concern. Steelhead are an anadromous form of rainbow trout that reproduce in freshwater, but spend much of their life cycle in the ocean, where increased prey density provides a greater growth rate and size. The Southern California ESU includes all naturally spawned populations of steelhead (and their progeny) in streams from the Santa Maria River (inclusive) to the southern extent of the species' range (U.S. – Mexico border). Historical information suggests that the Santa Maria River supported a steelhead run in the early 1900s. Currently, there is no evidence suggesting presence of this species in the Santa Maria River for several decades. However, it is assumed this species has the potential to occur within the Santa Maria River during periods of adequate flow (i.e., January through April).

Steelhead may not be a significant species of concern for the alternatives under consideration unless there would be an affect to the Santa Maria River. Existing fish migration barriers that exist at Nipomo Creek currently impede migration of steelhead upstream of the Hutton Road area. As part of the USACE permit process, Section 7 consultation per the ESA will be conducted with NOAA Fisheries to further assess potential steelhead impacts due to project implementation and the need for project-specific avoidance and minimization measures.

Western Snowy Plover (*Charadrius alexandrinus*) . The coastal population of nesting western snowy plover is federally-listed threatened species and a California species of special concern. The western snowy plover frequents sandy beaches and estuarine shores within the project site; requiring sandy, gravely or friable soil substrates for nesting. Western snowy plover breeding and nesting is currently being monitored by State Parks as part of their ongoing efforts to document snowy plover activity within the area. Plovers are known to occur in suitable habitat areas from Guadalupe Dunes to Pismo Beach. This species would be of concern for alternative Nos. 1 and 2 associated with any construction activities within Nipomo-Guadalupe dune complex.

California Least Tern (*Sterna antillarum brownii*). The California least tern is a migratory bird that is protected under both the provisions of the federal and California endangered species acts as endangered. Many areas of coastal habitat for the California Least Tern have been significantly modified by human activities, such as marinas and industrial development, and housing. Other threats to tern populations include increased predation (a result of anthropogenic factors and habitat modification), potential for washouts by significantly high tides, and recreation. Least tern spring migrants arrive and move through the area around the latter part of April. Egg-laying usually occurs at most of the sites by late May, with hatching chicks present in mid June. Least tern are known to occur in suitable habitat areas from Guadalupe Dunes to Pismo Beach.

3.1.2 Special-Status Plants

Gambel's water cress (*Rorippa gambellii*). Gambel's watercress is a federally and state-listed endangered species in the mustard family (Brassicaceae). Gambel's water cress occurs in freshwater or brackish marshes and swamps between 5 and 330 meters. This

species typically blooms from April to September. Gambel's water cress is known to occur in only four remaining locations in California.

La Graciosa thistle (*Cirsium loncholepis*). La Graciosa thistle is a federally endangered, state threatened species, and a CNPS List 1B species. This species is a perennial herb in the sunflower family (Asteraceae) that typically blooms May through August. La Graciosa thistle occurs in coastal dunes, brackish marshes, or riparian scrub often in association with lake edges, riverbanks, and other wetlands.

Nipomo Mesa lupine (*Lupinus nipomensis*). Nipomo Mesa lupine is an annual herb in the pea family (Fabaceae) that occurs in coastal dune habitat between 10 and 50 meters. This species typically blooms from December through May. Nipomo Mesa lupine is a federally endangered, state threatened species, and a CNPS List 1B species. This species is known from only one extended occurrence of five populations on Nipomo Mesa in San Luis Obispo County.

San Luis monardella (*Monardella frutescens*). San Luis monardella is a rhizomatous herb in the mint family (Lamiaceae). San Luis monardella is a CNPS List 1B species that is known to occur in San Luis Obispo and Santa Barbara Counties. This species inhabits coastal dunes and coastal scrub habitat associated with sandy soils between 10 and 200 meters. San Luis monardella generally blooms from May to September.

Blochman's leafy daisy (*Erigeron blochmaniae*). Blochman's leafy daisy is a rhizomatous herb in the sunflower family (Asteraceae) known to occur in San Luis Obispo and Santa Barbara Counties. Blochman's leafy daisy is a CNPS List 1B species. This species typically blooms from June through August and occurs in coastal dune and coastal scrub habitat between 3 and 45 meters.

Dune larkspur (*Delphinium parryi* ssp. *blochmaniae*). Dune larkspur is a CNPS List 1B species known to occur in San Luis Obispo, Santa Barbara, and Ventura Counties. This species is a perennial herb in the buttercup family (Ranunculaceae) that inhabits coastal dune and chaparral habitat between 0 to 200 meters. Dune larkspur generally blooms from April through May.

3.1.3 Other Potentially Occurring Special-Status Species

Although species described in this section are not indicated on the occurrences maps included (Figures 2 – 5), they have been included based on their occurrences within the Nipomo area.

Coast horned lizard (*Phrynosoma coronatum frontale*). The coast horned lizard is a federal species of concern and a California species of special concern that occurs in a variety of open habitats that provide sites for basking, sandy or sandy-loam substrates for night-time burial, and a suitable prey base (the species feeds almost exclusively on native ants). It was historically distributed throughout the Central and Coast Range of California, but now occurs at scattered, disjunct locations within this former range. The coast horned lizard produces clutches of 6 to 21 eggs from May to June and hatching typically occurs in August through September. A single coast horned lizard was observed within the non-native grassland/coastal sage scrub habitat area along the south side of the Santa Maria River in 2005 (Douglas Wood &

Associates, Inc., 2006). The coast horned lizard has the potential to occur throughout the Nipomo area. As such, mitigation to avoid and/or minimize impacts to coast horned lizard during project implementation would be determined during consultation with CDFG.

Southwestern pond turtle (*Clemmys marmorata pallida*). The southwestern pond turtle is a federal species of special concern and a California species of special concern. It is an aquatic turtle inhabiting streams, marshes, ponds, and irrigation ditches within woodland, grassland, and open forest communities. However, it requires upland sites for nesting and over-wintering. Stream habitat must contain large, deep pool areas (six feet) with moderate-to-good plant and debris cover, and rock and cobble substrates for escape retreats. Southwestern pond turtle was observed in Nipomo Creek during a reconnaissance-level survey conducted by Padre in July 2004. Therefore, it has been determined that this species has the potential to occur within Nipomo Creek area during implementation, including portions of the Santa Maria River. As such, mitigation to avoid and/or minimize impacts to southwestern pond turtle during project implementation would be determined during consultation with USFWS and CDFG.

Two-striped garter snake (*Thamnophis hammondi*). The two-striped garter snake is a California species of special concern which is highly aquatic and is typically found near permanent fresh water streams associated with willow habitat. This species occurs historically and currently throughout southern California streams, including the central coast. Small mammal burrows are used as over-wintering sites for the snake (Jennings, 1994). This species has the potential to occur within Nipomo Creek. Mitigation to avoid and/or minimize impacts to two-striped garter snake during project implementation would be determined during consultation with CDFG.

Blochman's ragwort *(Senecio blochmaniae).* Blochman's ragwort is a CNPS list 4 species. This species typically occurs in coastal dunes and coastal floodplains. Blochman's ragwort is a subshrub, perennial herb that blooms from May to October. A sparsely scattered population of this species (<50) was identified by Padre in 2004 within the northern sand banks of the Santa Maria River channel, directly adjacent to the existing concrete processing facility located directly west of Highway 101. Suitable habitat for this species exists along the Santa Maria River corridor. Measures to avoid and/or mitigate impacts to Blochman's ragwort would be determined during consultation with CDFG.

Nuttall's milk-vetch (*Astragalus nuttallii* var. *nuttallii*). Nuttall's milk vetch is a CNPS list 4 species, which was identified in the project area during the 2005 biological survey of the project area (Douglas Wood & Associates, Inc., 2006). Both locations were along the southern levee of the Santa Maria River within the disturbed grassland and coastal sage scrub habitat areas. Suitable habitat for this species exists along the Santa Maria River corridor. Measures to avoid and/or mitigate impacts to Nuttall's milk-vetch would be determined during consultation with CDFG.

Monarch Butterfly *(Danaus plexippus).* The Monarch butterfly does not have federal or state listing status, but is included as a sensitive species by the CNDDB and is a species of local concern in San Luis Obispo County. Winter roost sites extend from Northern Mendocino to Baja California, Mexico. The listing by CDFG is based on limited wintering roost sites within the Central California coast portion of the butterfly's West Coast wintering range. The Monarch butterfly can be found in a variety of habitats, especially those supporting milkweed plants

(Asclepias sp.), the primary food source of the caterpillars. These butterflies frequent grasslands, prairies, meadows, and wetlands, but avoid dense forests. In the winter, Monarchs cluster together in large numbers in eucalyptus, cypress, and Monterey pine trees, often on the edge of open areas. Measures to avoid and/or minimize impacts to Monarch butterflies and/or pre-activity surveys would be determined during the CEQA process and consultation with CDFG.

Raptor and Migratory Bird Species. Raptor and migratory bird species protected under the Migratory Bird Treaty Act (16 USC 703-712); CDFG Code Section 3503, and CDFG Code Section 3503.5 may nest within the area during project implementation. These include ground nesters (western meadowlark and lark sparrow), small tree/shrub nesters (bushtit, American robin, northern mockingbird, loggerhead shrike, house finch, and lesser goldfinch) and several raptors which require large trees, such as eucalyptus for nesting purposes (turkey vulture, red-tailed hawk, red-shouldered hawk, great-horned owl, barn owl, white-tailed kite and Cooper's hawk). Short-term impacts to these species may occur from vegetation clearing, debris removal, trenching and HDD operations, dust deposition and noise disturbance associated with the construction activities. Vegetation removal and subsequent grading activities may destroy nests, nestlings, or hatchlings of these protected bird species, and would be considered a significant impact. As such, measures, such as seasonal constraints and/or pre-activity nesting bird surveys to avoid and/or minimize impacts to raptors and migratory birds, would be determined during the CEQA process and consultation with CDFG.

3.2 WETLANDS/WATERS OF THE U.S.

The USACE is responsible for the issuance of permits for the placement of dredged or fill material into waters of the United States (waters) pursuant to Section 404 of the Clean Water Act (33 USC 1344). As defined by the USACE at 33 CFR 328.3(a)(3), waters are those that are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters that are subject to the ebb and flow of the tide; tributaries and impoundments to such waters; all interstate waters including interstate wetlands; and territorial seas. (Note: Based on the recent U.S. Supreme Court decision in *Solid Waste Agency of Northern Cook County v. U.S. Army Corps of Engineers* [2001], and guidance from the U.S. Army Corps of Engineers and U.S. Environmental Protection Agency [2001], the Federal government no longer asserts jurisdiction over isolated waters and wetlands under Section 404 of the Clean Water Act based on the "migratory bird rule." Further guidance on the issue of isolated wetlands and waters is expected (U.S. Army Corps of Engineers, 2001).

Wetlands are a special category of waters, and are defined at 33 CFR 328.3(b) as: "...those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas."

In non-tidal waters, the lateral extent of USACE jurisdiction is determined by the ordinary high water mark (OHWM), which is defined as the: "*...line on the shore established by the fluctuations of water and indicated by physical characteristics such as clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial*

vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas." (33 CFR 328[e]).

In addition, a wetland definition has been adopted by the USFWS to include both vegetated and non-vegetated wetlands, recognizing that some types of wetlands may lack vegetation (e.g., mudflats, sandbar, rocky shores, and sand flats), but still provide functional habitat for fish and wildlife species (Cowardin, et al., 1979). These wetlands are defined as "*...lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. For purposes of this classification, wetlands must have one or more of the following three attributes: (1) at least periodically, the land supports predominantly hydrophytes; (2) the substrate is predominantly undrained hydric soil; and (3) the substrate is non-soil and is saturated with water or covered by shallow water at some time during the growing season of each year.*" Some of the USFWS-defined wetlands are not regulated by the Federal government.

The upper (landward) limit of USFWS-defined wetlands are the boundary between land with predominantly hydrophytic cover and land with predominantly mesophytic or xerophytic cover; the boundary between soil that is predominantly hydric and soil that is predominantly non-hydric; or in the case of wetlands without vegetation or soil, the boundary between land that is flooded or saturated at some time each year and land that is not (Cowardin et al., 1979). The lower limit in inland areas is established at a depth of 6.6 feet below the water surface; unless emergent plants, shrubs, or trees grow beyond this depth, at which the deepwater edge of such vegetation is the boundary (Cowardin et al., 1979).

Based on the definitions above, both waters of the U.S. and USACE-defined wetlands are present within the Santa Maria River floodplain, Nipomo Creek, and the Oso Flaco Lake and Oso Flaco Creek areas. Oso Flaco Lake occupies a surface area of 82 acres is classified by the USFWS as a palustrine emergent wetland. Additionally, several of the nearby drainages and associated storage ponds that act as tributaries to Nipomo Creek and the Santa Maria River, such as those occurring along the Nipomo Mesa have the potential to fall under the USACE jurisdiction. Wetlands and creeks impacted by pipeline installation activitieswould need to be restored or replaced. In the event a selected alternative would affect designated wetlands, an agency-approved Wetlands Mitigation and Monitoring Plan would need to be implemented as part of the project.

3.3 CULTURAL RESOURCES

Alternatives involving construction activities and placement of project-related infrastructure (i.e. pipelines, tanks, treatment plants) would require evaluation and analysis of the potential for effect on culturally-sensitive resources. Alternatives would require delineation of pipeline routes and placement of project facilities prior to implementing cultural records searches and/or surveys. The Dana Adobe, located on South Oakglen Avenue, is a designated California Historical Landmark. Sensitive cultural sites are known to exist near the Dana Adobe in eastern Nipomo.

3.4 GEOLOGY AND SOILS

The information discussed in this section was determined through a review of the San Luis Obispo County Safety Element (1998). Depending on jurisdiction, project alternatives would be reviewed for geologic (e.g. active faults, liquefaction) and other safety issues. Within the general project area (i.e. south-western San Luis Obispo County and the Santa Maria area), there is a potentially active fault (Santa Maria River Fault) and areas of moderate to high liquefaction, particularly in the coastal dune areas around Oso Flaco Lake. Areas located within 100-year flood plain zones include the Santa Maria River and the Oso Flaco Lake area. This area is also considered a "dam inundation zone". Additionally, areas east of the Guadalupe-Nipomo Dunes Complex (e.g. Conoco-Phillips Refinery, Nipomo) are subject to substantial wildland fire risk. Although no specific permits may be required in relation to these hazards, the projects will be reviewed for land-use policy consistency during the CEQA and County permitting process.

3.5 HYDROLOGY AND WATER QUALITY

Water Quality. It is Padre's understanding that Boyle will provide the NCSD with an assessment of water quality issues associated with the development of the water supply alternatives and provision of potable water in accordance with state and federal water quality standards within a separate document. The following discussion focuses on water quality and hydrologic impacts that may arise from the construction of each of the water supply alternatives. Water quality impacts would be connected to construction site erosion/spills/etc, frac-outs (as discussed), and discharges from each alternative. Hydrologic impacts would be due to extractions from certain sources and discharges to certain locations.

With increased development and storm water runoff, a wide variety of nutrients and constituents of concern have been introduced into state waters. Nutrient wastes in the form of sewage, agricultural fertilizers, and manure lead to reduced dissolved oxygen in surface waters and limit the capacity of water to support aquatic organisms. Constituents of concern, such as industrial wastes, insecticides, and herbicides, can poison wildlife and become concentrated in the food chain.

Oso Flaco Lake and Oso Flaco Creek has been identified by the RWQCB as an "impaired water body" under Section 303d of the Clean Water Act because of elevated levels of nitrates associated with irrigated agriculture within the watershed. Oso Flaco Creek is also listed as an impaired water body for elevated fecal coliform bacteria concentrations. Restoration of water quality at Oso Flaco Lake by the RWQCB has focused primarily on agricultural return water quality and quantity (RWQCB, 2006). Additionally, Nipomo Creek has been designated an "impaired water body" under Section 303d because of elevated fecal coliform bacteria concentrations.

HDD Drilling Techniques. Horizontal directional drilling (HDD) techniques involve the installation of pipelines without open-trenching. HDD installation methods are environmentally-preferable to open-trenching in most cases because it can be utilized to avoid impacts to sensitive resources such as creeks and wetlands. "Frac-outs", or the loss of drilling fluids to the surrounding environment, are a risk in utilizing HDD drilling techniques. The potential for "frac outs" should be minimized by incorporating engineering and geologic information and

developing a drilling and drilling fluid monitoring program that is appropriate for the existing subsurface geological conditions. The HDD drilling plans should specify drilling parameters such as drilling equipment capacity, directional bore depths, entry, and exit angles. Drilling fluid properties including fluid weight, viscosity, water loss, and gel strength should be designed and monitored by a qualified engineer. Only bentonite-based drilling mud is allowed for use within state waters in California. Compounds that may be toxic to fish are prohibited from use as additives to drilling mud mixtures.

4.0 SUMMARY AND RECOMMENDATIONS

The following section provides a summary of the permitting issues and requirements for the water supply alternatives under consideration by the NCSD. A summary of the permitting requirements is presented in Table 2, followed by general recommendations on a permitting strategy.

4.1 SUMMARY OF ENVIRONMENTAL/PERMITTING ISSUES BY ALTERNATIVE

The following provides an overview of the expected agency jurisdictional issues and associated permits that may be required for the various water supply alternatives:

Alternative No. 1 (Seawater/Cooling Water): Although specific locations are not identified under this alternative, proposals for desalination facilities along California's coast have raised unique issues that would need to be addressed through project design and agency negotiations. The California Coastal Commission has raised concerns about brine disposal impacts to marine resources. Open seawater intakes structures have been effectively prohibited by the Coastal Commission due to entrainment and take of marine organisms. One method of mitigating concerns associated with desal intake system construction within the beach areas would be to utilize existing intake structures or outfall pipelines. As a result of concerns about open ocean intake pipelines, most desalination facilities currently under consideration along the Central and South Coasts of California include beach water intake systems that utilize wells or intake galleries that would draw brackish water from permeable zones within the coastline and beach areas.

The design of a beach well intake system can result in a separate set of environmental impacts. The Nipomo-Guadalupe Dune complex is a unique and sensitive area that has been heavily protected by land acquisition, land use planning, and regulatory activities. Numerous threatened or endangered species, such as the Western snowy plover and the California least tern, are present within the dune complex and along the beach areas of the Nipomo-Guadalupe dunes.

The area around the Conoco-Phillips refinery is known to contain special-status plant species (e.g. Nipomo Mesa Lupine, La Graciosa Thistle, Dune Larkspur), as well as sensitive habitat (Central Coast Dune Scrub).

Selection of one of the seawater or cooling water alternatives will require review and approval of a Coastal Development Permit by the County of San Luis Obispo which would be appealable to the Coastal Commission. The State Lands Commission would require a state lands lease for placement of an ocean outfall line in state waters. The ocean outfall line would also require a Section 404/10 permit from USACE for construction in navigable waters. Pipeline

facilities associated with any of the options would likely require permits from the USACE, RWQCB, and CDFG for pipeline creek crossings. A Caltrans encroachment permit would be required for pipeline crossings at Highway One. A RWQCB NPDES/WDR permit would be required for the disposal of brine into the Pacific Ocean or other form of injection or disposal options that may affect surface or ground water quality.

Alternative No. 2 (Oso Flaco Lake Watershed): This alternative would involve treating shallow groundwater or agricultural runoff within the Oso Flaco Lake watershed and delivering the treated water to the NCSD distribution system. This alternative may include returning a portion of the treated flow to the watershed for environmental uses.

The Oso Flaco Creek Watershed covers approximately 10,370 acres. The western terminus for the watershed is Oso Flaco Lake, owned by California State Parks. Oso Flaco Creek flows out of the lake and meanders ¼-mile to the Pacific Ocean through active sand dunes. Oso Flaco Lake is the largest of four small freshwater lakes located in the Guadalupe Nipomo Dunes Complex. The freshwater lake occupies a surface area of 82 acres and is classified by the U.S. Fish and Wildlife Service as palustrine emergent wetlands, a valuable habitat for wildlife, and subsequently a resource for many recreational and educational activities.

Oso Flaco Lake and Little Oso Flaco Lake are usually at maximum pool due to the steady flow of agricultural runoff. It has been estimated that 6,371 acres in the watershed are irrigated, primarily with pumped groundwater, and that 17,564 acre-feet per year (AFY) of water are applied, resulting in 968 AFY of agricultural runoff. Efforts are currently underway to improve irrigation efficiency to both reduce the quantity of water applied and the volume of agricultural runoff. It has been estimated that if 100% of the irrigated area were to adopt sprinkler/drip systems, the annual runoff volume would decrease to 440 AFY (CRCD, 2004).

The critical environmental issue associated with this alternative is ensuring that significant negative impacts would not occur to Oso Flaco Lake, Little Oso Flaco Lake or associated creeks. Impacts would be considered significant if less environmental flows to the creeks and lakes would result in reduced habitat for endangered species. The County of San Luis Obispo has designated Oso Flaco Lake as a Sensitive Resource Area in its South County Coastal Area Plan (1988). Activities within Sensitive Resource Areas are required to undergo extra scrutiny to ensure that damage to the resource will not result from proposed projects. Hydrologic modeling of the watershed would be required to show that water levels within the lakes would not be significantly affected through water withdrawal upstream. A project that improves water quality in Oso Flaco Lake could be leveraged as a desirable outcome for stakeholders in the area, including State Parks, RWQCB, USFWS, CDFG, the Dunes Center, and agricultural water users.

This alternative project would require review and approval of Coastal Development Permits by the County of San Luis Obispo and the Coastal Commission for the outfall line extending into the ocean. The State Lands Commission would require a state lands lease for placement of an ocean outfall line. The ocean outfall line would also require a Section 404/10 permit from USACE for construction in navigable waters. Pipeline facilities associated with any of the options would likely require permits from the USACE, RWQCB, and CDFG for pipeline creek crossings. A Caltrans encroachment permit would be required for pipeline crossings at Highway One. A RWQCB NPDES/WDR permit would be required for the disposal of brine into

the Pacific Ocean or other form of injection or disposal options that may affect surface or ground water quality.

Formal Section 7 consultation would be required with the USFWS due to the presence of CRLF within the Oso Flaco Creek area. NOAA Fisheries would be consulted by the USACE for potential impacts associated with an ocean outfall to marine fisheries and marine mammals. The level of disturbance during construction of pipelines to environmentally sensitive areas could be minimized through the use of HDD construction techniques.

Alternative No. 3 (Water Trading with CCWA Agencies): This alternative would consider acquisition of unused capacity in the State Water Pipeline (SWP) from one or more CCWA project participants, including acquiring exchange water from one or more CCWA project participants. Water could be provided via a turnout along the State Water Pipeline within the NCSD boundary. This water would then either be delivered directly to the NCSD water system, or indirectly via aquifer storage and recovery.

As new construction activities would be minimal with this alternative, agency jurisdictional issues would be less than other alternatives. The use of a CCWA interconnection at the Tefft Street site may require a pipeline crossing at Nipomo Creek. If it can be determined that creek and wetland crossings can be avoided, USACE, RWQCB, and CDFG permits would not be required. Furthermore, impacts to special-status wildlife and plants could be minimized if construction is limited to disturbed and developed areas. NOAA Fisheries most likely will not be a key permitting agency under this alternative provided that surface water flows within the Santa Maria River are not affected. Existing fish passage barriers in Nipomo Creek have almost eliminated the likelihood of steelhead in Nipomo Creek. A Caltrans encroachment permit would be required for a pipeline crossing at Highway 101, if required.

Recent litigation regarding the State Water Project's Harvey O. Banks intake facility have included the judge's threat to require the California Department of Water Resources (DWR) to stop pumping water from the delta. The main issue centers around fish takes that are have not been permitted by the USFWS and NOAA Fisheries under the Endangered Species Act. It is Padre's understanding that CDFG and DWR are in negotiations with NOAA Fisheries and the USFWS which may result in an agreement being enacted to allow continued water withdrawals from the delta area with allowed incidental take of fish species.

Alternative No. 4 (Santa Maria Groundwater): This alternative would include the development of wells at either the Hutton Road area or at the Bonita well site to extract groundwater, which then would be conveyed to NCSD through a pipeline. Selection of one of the seawater or cooling water alternatives will require review and approval of a discretionary development permit by the County of San Luis Obispo. Pipeline facilities associated with any of the options would likely require permits from the USACE, RWQCB, and CDFG for any pipeline creek crossings. A Caltrans encroachment permit would be required for pipeline crossings at Highway 101, if crossed. NOAA Fisheries most likely will not be a key permitting agency under this alternative provided that surface water flows within the Santa Maria River are not affected. Existing fish passage barriers in Nipomo Creek have almost eliminated the likelihood of steelhead in Nipomo Creek.

Alternative No. 5 (Groundwater Recharge from Wastewater Treatment Facility): This alternative would include the construction groundwater recharge facilities within a specified area where groundwater depressions are known. This alternative would require a discretionary permit from the County of San Luis Obispo for the construction of water transmission and disposal facilities. It is anticipated that pipeline alignments associated with this alternative could be designed to avoid wetlands and sensitive habitat areas through environmental planning and site design. It is also anticipated that wetland and creek pipeline crossings would not be required for this alternative. A WDR permit modification from the RWQCB would be required for the disposal of treated wastewater at the proposed recharge facilities. No Caltrans encroachment permit would be required if conveyance facilities did not cross Highways 1 or 101.

Alternative No. 6 (Treated Water Exchange with Agricultural Water users). This alternative would include an exchange of treated wastewater for agricultural water within a specified area where groundwater depressions are known. This alternative would require a discretionary development permit from the County of San Luis Obispo for the construction of water transmission and storage facilities. It is anticipated that pipeline alignments associated with this alternative could be designed to avoid wetlands and sensitive habitat areas through environmental planning and site design. It is also anticipated that wetland and creek pipeline crossings would not be required for this alternative. A WDR permit modification from the RWQCB would be required for the beneficial re-use of treated wastewater at the proposed agricultural lands. No Caltrans encroachment permit would be required if conveyance facilities did not cross Highways 1 or 101.

4.2 GENERAL RECOMMENDATIONS

Biological Resources. The preliminary review of the project alternatives identified potential constraints related to habitat for protected species within the Oso Flaco Lake, Nipomo-Guadalupe Dunes and other wetland/creek areas in the project area. The following are recommendations to minimize impacts to biological resources:

- Complete required CRLF protocol-level surveys during the CRLF breeding season (January 1 through June 30) to identify all known populations of CRLF within the limits of the project boundary and nearby areas. This would be accomplished once project alternative details and engineering specifications can clearly define areas of potential impact. As an example, potential impacts to the CRLF and associated habitat areas can be avoided and/or minimized through additional pipeline-route deviations and/or adjustments.
- Where necessary, the use of HDD construction methods across creeks and streams would minimize impacts to wetland/ jurisdictional waters and special-status species with the potential to occur in the area.
- Rare plant species (e.g. Nipomo Mesa Lupine, La Graciosa Thistle, Dune Larkspur) are located within the vicinity of Oso Flaco Lake and the Conoco-Phillips Refinery. Coastal Dune Scrub, considered a sensitive habitat, is common in this area. Botanical surveys may be needed to determine the likelihood of impacts within any final selected pipeline alignments, or other treatment plant facilities. Impacts to rare

plants may be avoided through route-deviations or other strategic placement as feasible, and/or through seed collection and restoration, as necessary.

Wetlands/Waters of the U.S. A high-level preliminary review of the project alternatives and site survey(s) conducted to date identified potential constraints related to regulated waters of the U.S. and wetlands. Following are recommendations to minimize impacts to wetlands and Waters of the U.S.:

- Where necessary, the use of HDD construction methods across creeks and streams would minimize impacts to wetland/ jurisdictional waters and special-status species with the potential to occur in the area.
- Whenever possible, limit construction activities to within previously disturbed or developed areas to avoid impacting sensitive habitat areas. A wetland delineation may be required to determine the likelihood of impacts to identified wetlands within final selected pipeline alignments and other impacted areas.
- "Frac-outs", or the loss of drilling fluids to the surrounding environment, and potential release of drilling mud into sensitive aquatic areas, are considered serious offenses by regulatory agencies. The potential for "frac-outs" should be minimized by incorporation of engineering and geologic information and development of a drilling and drilling fluid monitoring program that considers the existing geological conditions.
- Creek crossings and/or HDD operations may be limited by CDFG, RWQCB, and NOAA Fisheries to April 15 through October 15 to avoid impacts to water quality and associated sensitive species.

Cultural Resources. Alternatives involving construction activities and placement of project-related infrastructure (i.e. pipelines, tanks, treatment plants) would require evaluation and analysis of the potential for effect on culturally-sensitive resources. Alternatives would require delineation of pipeline routes and placement of project facilities prior to implementing cultural records searches and visual survey.

Table 2. Matrix of Required Permits by Alternative

Alternatives/Options	USACE – 404/10 Permit	USFWS – Section 7	NOAA Fisheries – Section 7	Cal County Coastal Commission Appeal Jurisdiction	California State Lands Commission	CDFG - SAA	Regional Water Quality Control Board (RWQCB) – 401 Cert.	RWQCB - NPDES/WDR	RWQCB - SWPPP	DHS - Water Supply Permit	Caltrans – Encroachment Permit	County of San Luis Obispo Permits	SLO APCD – Authority to Construct	SLO Environmental Health	Relative Difficulty for Permitting (Low to High)	Biological related mitigation Required (H-High, L-Low)	Permitting Time Requirement
Alternative 1 – Seawater/Cooling Water Treatment	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	H	H	24-36 mos.
Alternative 2 – Oso Flaco Agricultural Water	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	H	H	24-36 MOS.
Alternative 3 – Water trading with CCWA agencies	☒	☒	☒	☐	☐	☒	☒	☐	☒	☒	☒	☒	☐	☐	L	L	12-18 MOS.
Alternative 4 – Santa Maria Groundwater	☒	☒	☒	☐	☐	☒	☒	☐	☒	☒	☐	☒	☐	☒	L	L	12-24 MOS.
Alternative 5 – Groundwater Recharge with Treated Water from Southland WWTF	☐	☐	☐	☐	☐	☐	☐	☒	☒	☒	☐	☒	☐	☒	L	L	12 MOS.
Alternative 6 – Agricultural Water Exchange	☐	☐	☐	☐	☐	☐	☐	☒	☒	☒	☐	☒	☐	☐	L	L	12 MOS.

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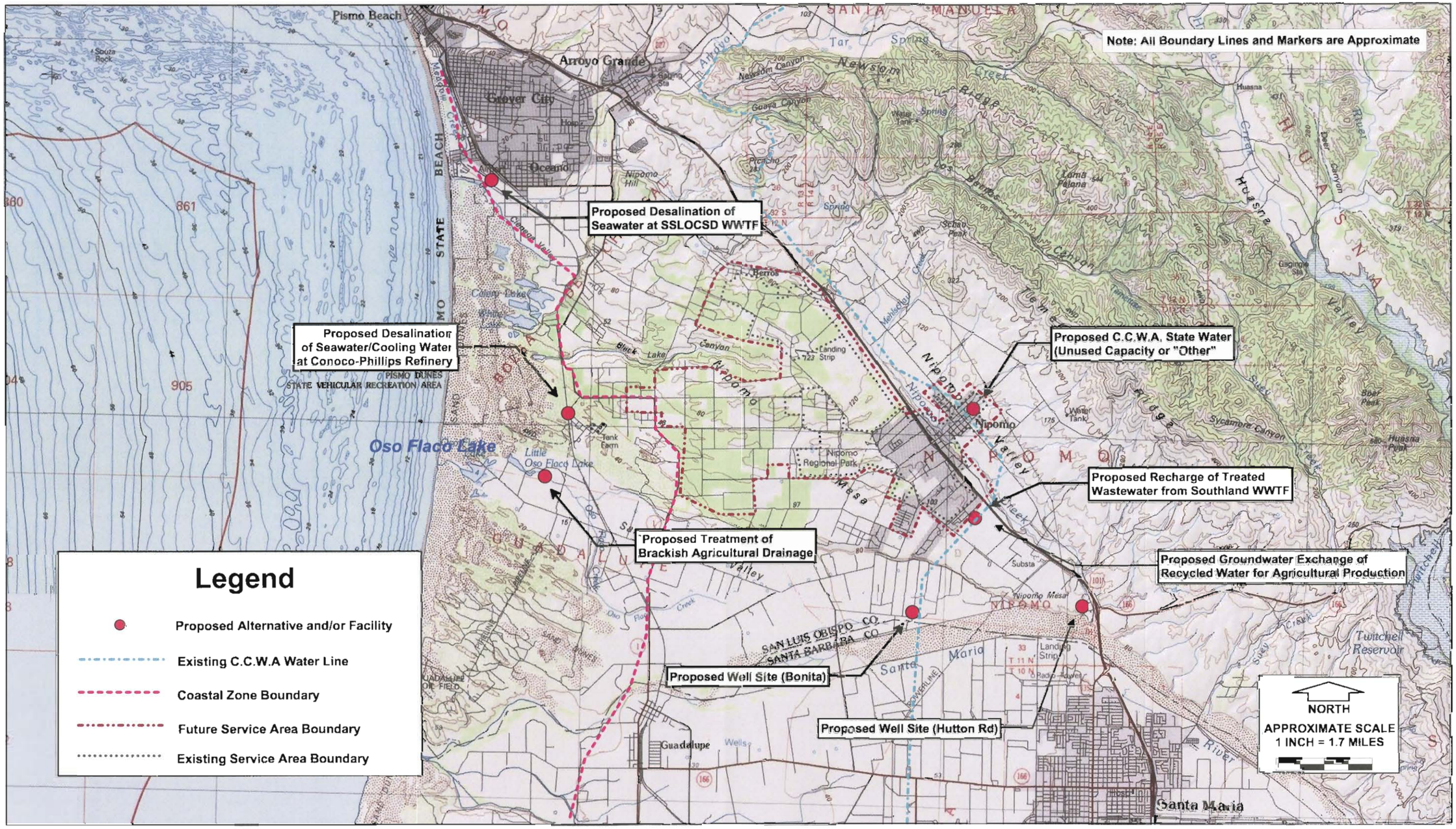


Source: Boyle Engineering; TOPO! c 2001 National Geographic Holdings (www.topo.com)

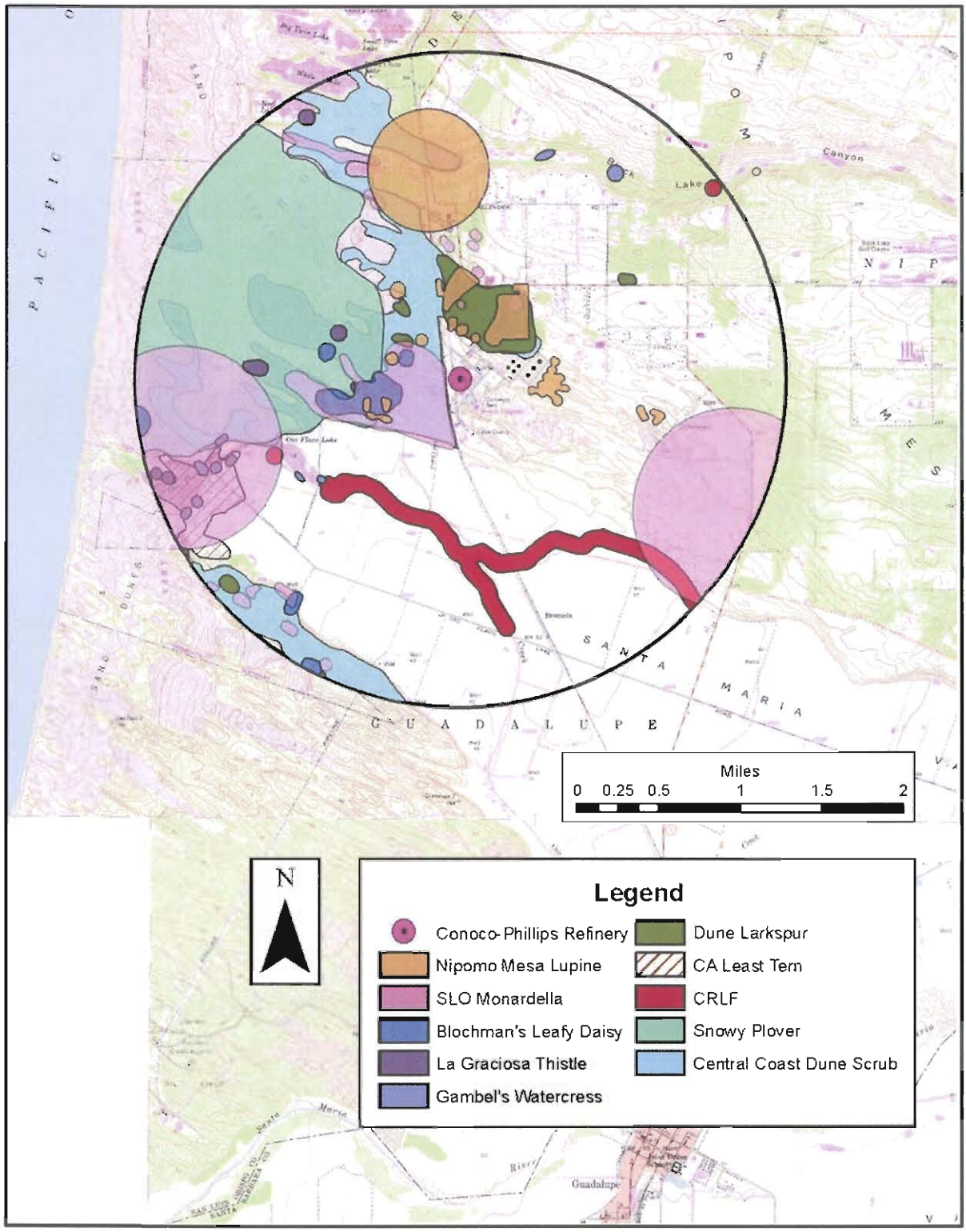
padre associates, inc.
ENGINEERS, GEOLOGISTS & ENVIRONMENTAL SCIENTISTS

NCSD - Supplemental Water Supply
Alternatives Constraints Analysis

PROJECT ALTERNATIVES LOCATION MAP

FIGURE 1

May 2007
Project No. 0602-0901



Source: CNDDB RareFind 3

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NCSD - Supplemental Water Supply
Alternatives Constraints Analysis

FIGURE 2

Special-Status Species Occurrences in 2-Mile Radius of Conoco-Phillips Refinery

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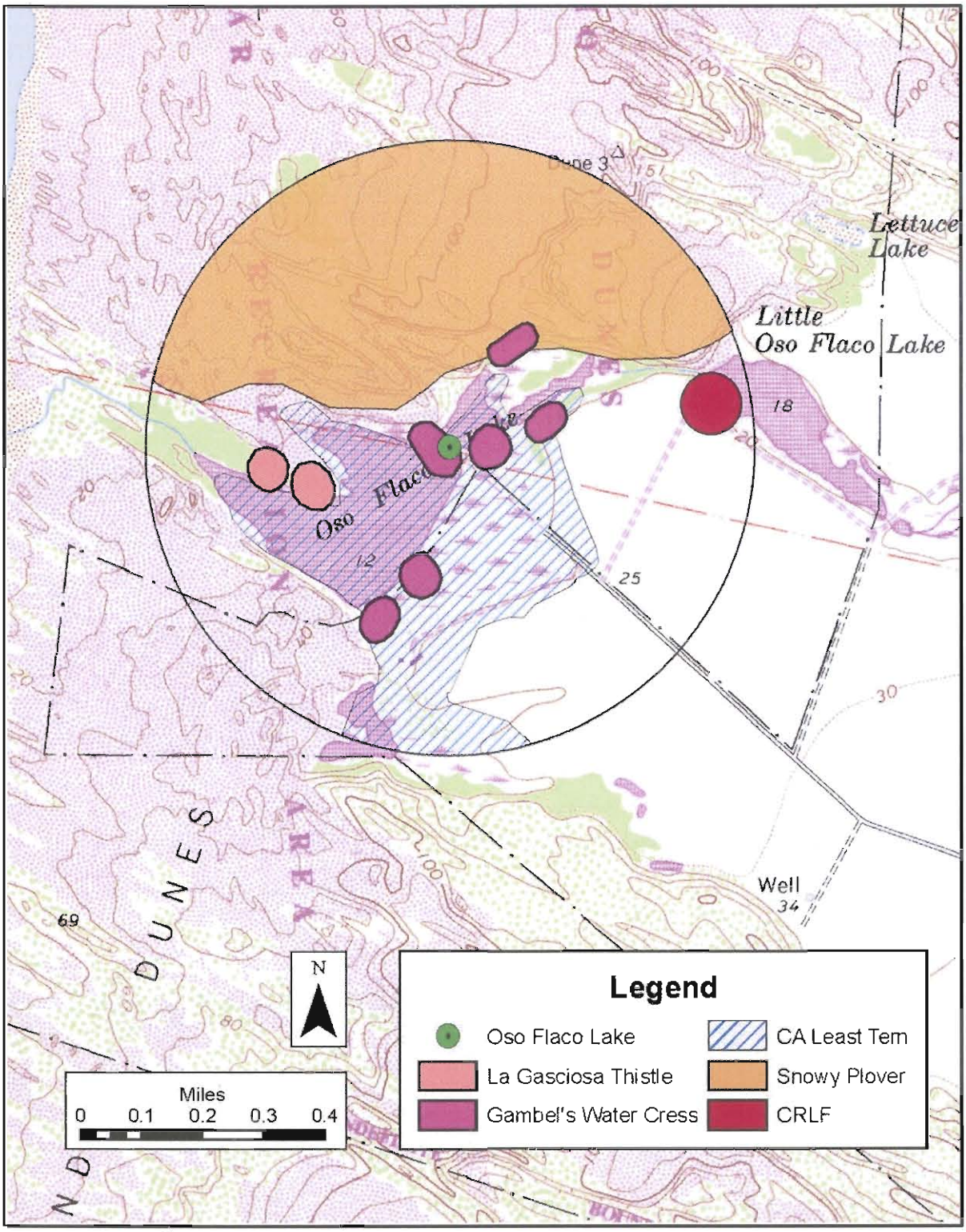

Source: CNDDB RareFind 3

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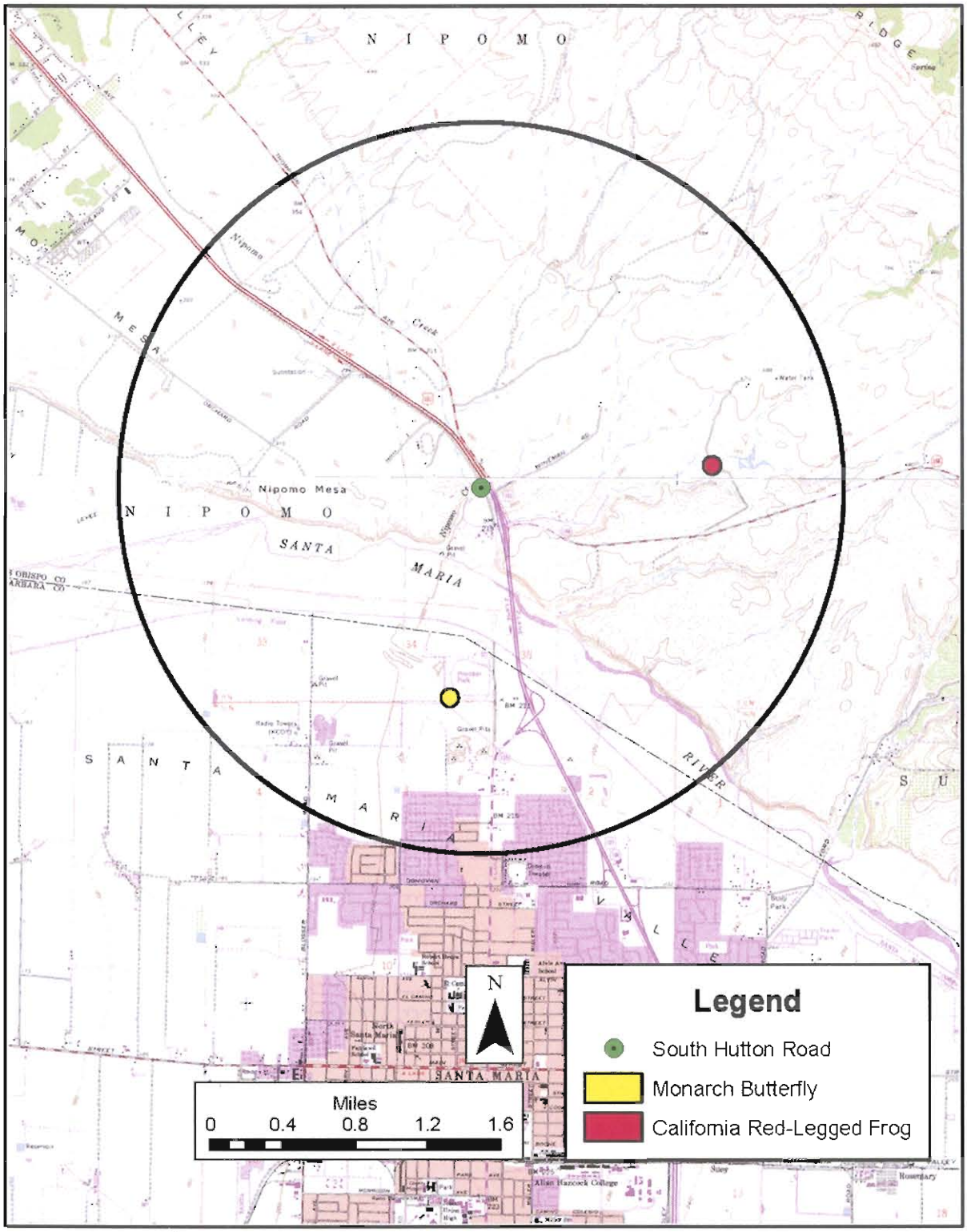
FIGURE 3

Special-Status Species Occurrences in 0.5-mile Radius of Oso Flaco Lake



Source: CNDDB RareFind 3

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FIGURE 4

Special-Status Species Occurrences in 2-Mile Radius of South Hutton Road

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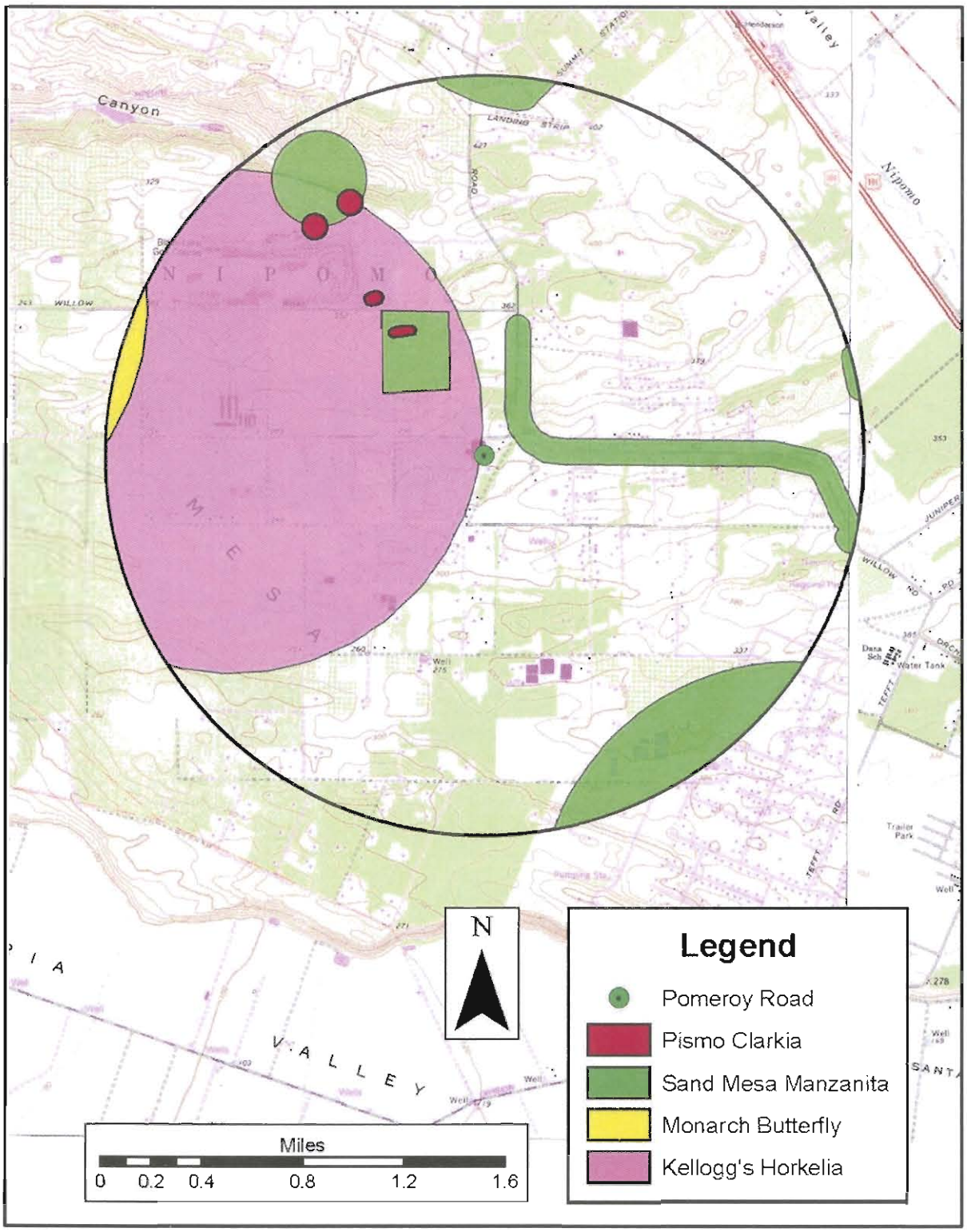

Source: CNDDB RareFind 3

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Alternatives Constraints Analysis

FIGURE 5

Special-Status Species Occurrences in 2-Mile Radius of Pomeroy Road