City of Santa Barbara

Urban Water Management Plan

2010 Update – Adopted June 2011

(Including Addendum Dated June 12, 2012)

Prepared by the City of Santa Barbara, Water Resources Division,
pursuant to California Water Code, Section 10631

Adopted by the Santa Barbara City Council on June 14, 2011
as Agenda Item No. 15

City Council:

Helene Schneider, Mayor
Grant House, Councilmember
Dale Francisco, Councilmember
Frank Hotchkiss, Councilmember
Michael Kathleen Self, Councilmember
Harwood "Bendy" White, Councilmember
Randy Rowse, Councilmember

Board of Water Commissioners:

Landon Neustadt, Chair
Barry Keller, Vice-Chair
Russell Ruiz, Commissioner
James Smith, Commissioner
Bill Thomas, Commissioner

(This page intentionally left blank.)

Addendum

City of Santa Barbara

Urban Water Management Plan

2010 Update – Adopted June 2011

June 12, 2012

(This page intentionally left blank.)

Addendum

June 12, 2012

City of Santa Barbara

Urban Water Management Plan

2010 Update Adopted June 2011

On June 14, 2011, the Santa Barbara City Council adopted the City's 2010 update to its Urban Water Management Plan (UWMP) as Agenda Item No. 15. The plan was submitted in hard copy and electronic format to the California Department of Water Resources (DWR) in accordance with requirements of Urban Water Management Planning statutes. In November, after DWR's Data Online Submittal Tool (DOST) became available, the City entered applicable data on the City's UWMP into DOST. In May 2012, DWR staff provided the City with comments on the UWMP and requested that an addendum be prepared to address those comments relevant to the 2010 update. DWR also provided additional comments for consideration during preparation of the City's 2015 update.

DOST Table 29: Factors Resulting in Inconsistency of Supply

Average Year and Single Dry Year: The discussion at the bottom of page 40 of the UWMP was intended to highlight that supplies available in a single dry year are similar to an average year, due to the multi-year storage capacity of Lake Cachuma. The City uses 2010 (as noted in DOST Table 27) as representative of "average" or "normal" supply conditions based on:

- Reflective of current reservoir capacities and yields;
- Approximately average rainfall, sufficient to allow average deliveries from Gibraltar Reservoir;
- Storage volume at Lake Cachuma sufficient to provide delivery of full entitlement, with a portion of that carried over to address potential drought;
- Approximately average State Water Project delivery allocation and deliveries from Mission Tunnel and groundwater pumping.

DOST Table 11: Total Water Use

The definition of Gross Water Use does not include supplies provided by recycled water. Therefore, for consistency, the City has not included recycled water deliveries as a part of supplies, nor in the tabulation of Total Water Use in DOST Tables 3 – 11. Table 6 on page 14 of the UWMP

tabulates all demands and uses of potable water supplies, including potable water added to recycled water for blending purposes. Because the City's historical water supply planning has been based on demand as measured by production of both potable and recycled water, recycled water sales are included separately on UWMP Table 6 and Table 9, but only for informational purposes and to maintain the historical demand tracking methodology. Note also that the reference to "Table 11" in the note under the first section of UWMP Table 6 refers to DOST Table 11 – Total Water Use, not UWMP Table 11.

DOST Table 21: Recycled Water – Wastewater Collection and Treatment, and DOST Table 22: Wastewater Disposal – Recycled and Non-Recycled

The following table provides information on wastewater collection and recycled water treatment and discharges, with all values in AFY. All wastewater collected is treated by the City. Note that total wastewater collection is projected to remain essentially flat at 7.7 MGD as shown on UWMP page 7, or 8,630 AFY. Minor increases in demand are expected to be offset by improved water use efficiency. Recycled water treatment and distribution projections reflect the City's plan to increase recycled water demand from 800 AFY to 1,000 AFY by 2030.

	Actual		***Projected***			
	2005	**2010**	**2015**	**2020**	**2025**	**2030**
Wastewater Collected & Treated	9,860	8,630	8,630	8,630	8,630	8,630
Tertiary Treated Recycled Water	719	696	875	950	1,025	1,100
Disposal to Ocean	Secondary Treatment	7,934	7,755	7,680	7,605	7,530
Usage at Recycled Water User Sites	Tertiary Treatment	696	875	950	1,025	1,100
	Total:	8,630	8,630	8,360	8,630	8,630

Table 33 : Supply and Demand Comparison - Single Dry Year, and Table 34 : Supply and Demand Comparison During Projected Single and Multiple Dry-Year Events

The City's dry year planning is based on critical drought period analysis using a worksheet model as described on UWMP pages 37-41. UWMP Appendix E includes chart data on a range of water supply scenarios as derived from the model. To complete DOST Table 33 and Table 34, the

model was used to provide projections on 5-year intervals for single dry years and multiple dry year periods for 2015 through 2030. These projections are itemized in Exhibit A-1 and Exhibit A-2, included as a part of this addendum. Total potable supplies are tabulated based on declining yield from Lake Cachuma due to sedimentation, projected deliveries of State Water per UWMP Table 11, and critical drought period assumptions as described in UWMP pages 37-41.

Addendum approved pursuant to City Council authorization, Item 15, June 14, 2011:

Rebecca Bjur for

Christine F. Andersen, Public Works Director

6-12-2012

Date

* * * * *

(This page intentionally left blank.)

Exhibit A-1

DOST Table 33 : Supply and Demand Comparison - Single Dry Year (1977 example)

Water Supplies - Projected (AF)

	Projected			
Potable Water Supplies	**2015**	**2020**	**2025**	**2030**
Wholesaler: CCWA/State Water	217	250	282	315
Less State Water Deliveries to Carryover/Banked Storage	0	0	0	0
Cachuma Project	8,172	8,070	7,967	7,863
Less Project Water to Local Carryover Storage	0	0	0	0
Gibraltar Reservoir/Devils Canyon	3,206	3,206	3,206	3,206
Mission Tunnel	699	699	699	699
Groundwater	1,820	1,640	1,550	1,530
Drought Supplies (banked supplies, purchases, or desalination)	0	0	0	0
Total Potable Supplies:	**14,114**	**13,865**	**13,704**	**13,613**
Less Blend Water:	-300	-275	-275	-275
Less Net Exports to GWD:	0	0	0	0
Less Export to Groundwater Storage:	0	0	0	0
Potable Supplies Available for Retail Demand:	**13,814**	**13,590**	**13,429**	**13,338**
Less Projected Retail Demand:	-12,436	-12,226	-12,093	-12,005
Available for Safety Margin:	**1,378**	**1,364**	**1,336**	**1,333**
% Available for Safety Margin (10% goal per City policy):	**10.0%**	**10.0%**	**10.0%**	**10.0%**
Total Demands:	**12,736**	**12,501**	**12,368**	**12,280**

Notes:

1) Maximum CCWA deliveries per Table 11 in City SB UWMP
2) Assume no SWP or Cachuma carryover during single worst dry year
3) Projections reflect minor projected increases in demand, which are offset by demand reduction from new conservation & recycled water
4) Cachuma Project yield reflects 5% reduction over 20-year planning period due to sedimentation
5) Gibraltar yield is assumed same as normal years, since this value is less than Cachuma DEIR modeled data for 1977
6) Mission Tunnel yield based on Draft EIR for Cachuma water rights hearing
7) Groundwater: as needed to maintain 10% safety margin; no groundwater recharge

(This page intentionally left blank.)

Exhibit A-2

DOST Table 34 : Supply and Demand Comparison - Multiple Dry Years

Projected Water Supplies (AF)

	5-Year Period Ending 2015					*5-Year Period Ending 2020*					*5-Year Period Ending 2025*					*5-Year Period Ending 2030*				
Potable Water Supplies	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
Wholesaler: CCWA/SWP	1,132	1,132	1,132	1,132	1,132	1,145	1,145	1,145	1,145	1,145	1,110	1,159	1,159	1,159	1,159	1,065	1,173	1,173	1,173	1,173
Less/Plus SWP Deliveries to/from Carryover/Banked Storage					1,320					1,320					1,320					1,320
Cachuma Project	8,174	7,833	6,539	5,231	4,185	8,070	7,833	6,456	5,165	4,132	7,967	7,833	6,373	5,099	4,079	7,863	7,833	6,290	5,032	4,026
Less/Plus Project Water to/from Local Carryover Storage	15	525	60				425						500					500		
Gibraltar Reservoir/Devils Canyon	3,206	3,161	877	1,961	0	3,206	3,161	877	1,961	0	3,206	3,161	877	1,961	0	3,206	3,161	877	1,961	0
Mission Tunnel	847	656	550	527	500	847	656	550	527	500	847	656	550	527	500	847	656	550	527	500
Groundwater	1,300	1,315	3,700	3,250	4,150	775	775	3,555	3,060	4,000	700	980	2,950	2,965	4,000	700	850	2,925	2,935	4,000
Drought Supplies (purchased water or desalination)					760					725					640					600
Total Potable Supplies:	**14,674**	**14,622**	**12,858**	**12,101**	**12,047**	**14,043**	**13,995**	**12,583**	**11,858**	**11,822**	**13,830**	**13,789**	**12,409**	**11,711**	**11,698**	**13,681**	**13,673**	**12,316**	**11,629**	**11,619**
Less Blend Water:	-600	-600	-300	-300	-300	-275	-275	-275	-275	-275	-275	-275	-275	-275	-275	-275	-275	-275	-275	-275
Less Net Exports to GWD:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Less Export to Groundwater Storage:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Potable Supplies Available for Retail Demand:	**14,074**	**14,022**	**12,558**	**11,801**	**11,747**	**13,768**	**13,720**	**12,308**	**11,583**	**11,547**	**13,555**	**13,514**	**12,134**	**11,436**	**11,423**	**13,406**	**13,398**	**12,041**	**11,354**	**11,344**
Less Projected Retail Demand (adjusted for Planned Demand Reductions):	-12,669	-12,614	-11,301	-10,622	-10,570	-12,397	-12,352	-11,082	-10,429	-10,392	-12,195	-12,166	-10,926	-10,298	-10,279	-12,072	-12,053	-10,832	-10,217	-10,205
Available for Safety Margin:	**1,404**	**1,408**	**1,257**	**1,179**	**1,177**	**1,371**	**1,368**	**1,226**	**1,154**	**1,155**	**1,359**	**1,348**	**1,209**	**1,138**	**1,144**	**1,334**	**1,345**	**1,209**	**1,137**	**1,139**
% Available for Safety Margin (10% goal per City policy):	**10.0%**	**10.0%**	**10.0%**	**10.0%**	**10.0%**	**10.0%**	**10.0%**	**10.0%**	**10.0%**	**10.0%**	**10.0%**	**10.0%**	**10.0%**	**10.0%**	**10.0%**	**10.0%**	**10.0%**	**10.0%**	**10.0%**	**10.0%**
Total Demands:	13,269	13,214	11,601	10,922	10,870	12,672	12,627	11,357	10,704	10,667	12,470	12,441	11,201	10,573	10,554	12,347	12,328	11,107	10,492	10,480

Notes:

1) Maximum CCWA deliveries per Table 11 in City SB UWMP (Average deliveries for six-year 1929-1934 dry period assumed)
2) Deliveries from banked SWP 2015 based on 2/3 of 2,000 AF banked, based on Dudley Ridge banking example (2011).
3) Projections reflect minor projected increases in demand, which are offset by demand reduction from new conservation & recycled water
4) Cachuma Project yield based on deliveries during 1947-1951 critical drought period; interpolated from 2010 to 2030 to reflect estimated reduction in project yield, per below; assume up to 600 AF of carryover available for use during drought
5) Gibraltar yield is assumed to be local critical drought period of 1947- 1951 for each 5-year period
6) Mission Tunnel yield based on Draft EIR for Cachuma water rights hearing (1947-1951 critical drought period)
7) Groundwater: as needed to maintain 10% safety margin; no groundwater recharge

(This page intentionally left blank.)

City of Santa Barbara

Urban Water Management Plan

2010 Update

Section 1: Plan Preparation

This Urban Water Management Plan (UWMP) has been prepared pursuant to the requirements of the California Water Code, Section 10631. Preparation was by staff of the Public Works Department in consultation with the City's Board of Water Commissioners and staff of the Community Development Department. The UWMP updates the previous plan updated by the City in December 2005. The approach used was to present a concise summary of the City's water supply system, updated to reflect changes since 2005 and to conform to new reporting requirements of State law. Much of the updated plan is based on the analysis completed in support of the *Plan Santa Barbara* process (General Plan update) and a concurrent update of the City's Long Term Water Supply Plan (LTWSP).

After numerous public meetings to consider pertinent information, the plan was reviewed by the Board of Water Commissioners on May 9, 2011, at which time the Commission unanimously voted to support staff's efforts to complete the plan in compliance with State UWMP requirements and in conformance with the City's updated LTWSP. A public hearing, with public notice pursuant to California Government Code Section 6066, was held before the City Council as Agenda Item No. 15 on June 14, 2011, at which time the Council voted unanimously to adopt the plan. Documentation of public noticing and City Council action is included in Appendix A.

Following are the more commonly used abbreviations and volumes in this plan:

Abbreviations	
AF	Acre-feet (1 AF = 325,851 gallons, or 435.6 HCF)
BMP's	Best Management Practices of the CUWCC
CUWCC	California Urban Water Conservation Council
DOF	California Department of Finance
GPCD	Gallons per Person, per day
HCF	Hundred Cubic Feet (1 HCF = 748 gallons)
LTWSP	City of Santa Barbara "Long Term Water Supply Plan," the City's water supply policy document, updated in conjunction with this Urban Water Management Plan update.
MGD	Million Gallons per Day
SWRCB	California State Water Resources Control Board
USGS	United States Geological Survey

Except where noted, annual data in this plan are based on fiscal years, running from July through June. In some cases existing data are tabulated in calendar years or water years (October through September) and are not practical to convert. However, all calculations related to determination of baselines and urban water use targets pursuant to the Water Conservation Act of 2009 (SB7x-7) are based on fiscal years.

Community Involvement and Interagency Coordination

Water supply management has been a key issue in the effort to update the City's General Plan, which began in 2005. Updates of the City's LTWSP and UWMP were conducted in conjunction with this widely publicized effort. In addition, Water Supply Management Reports are presented annually to the Water Commission and City Council. All meetings of the City Council and Water Commission are publicly noticed and agenda packets are posted online for easy public access. Following is a tabulation of public outreach efforts and dates related to the development of the City's updated UWMP, and the LTWSP, which was developed to support both the General Plan update and the UWMP update.

Table 1
Public Outreach in Development of UWMP Update

Date	Activity
January 2005	Planning Commission: General Plan Update - Conditions, Trends and Issues: Water Supply
July 2008	Planning Commission: Plan Santa Barbara – Water Supply Issues
April 2009	Water Commission: In Progress Review: Developed Water Supply Sources
June 2009	City's water newsletter features an article on the ongoing process of updating the Long Term Water Supply Plan and Urban Water Management Plan; mailed to each household in the City.
July 2009	Water Commission: Presentation of Estimated Annual Water Supply – Existing Conditions
October/November 2009	Water Commission: Review of Water Supply Planning Study (Carollo Engineers)
March 2010	Water Commission: Appointment of *Plan Santa Barbara* Subcommittee
April 2010	Water Commission: Recommendation on water supplies section of *Plan Santa Barbara* Draft EIR
September 2010	Water Commission: Presentation on Water Conservation Technical Evaluation (Maddaus Water Management)
October/November 2010	Water Commission: Demand Planning Issues and Demand Target for Water Supply Planning
December 2010	Water Commission: Review of Proposed 6-year Drought Planning Analysis
February/March 2011	Water Commission: Review Initial Drafts of LTWSP
April 2011	Joint City Council – Water Commission Work Session on LTWSP; and Commission Recommendation to Approve LTWSP
April 2011	Planning Commission Meeting – Water Supply Planning Briefing
May 2011	Water Commission: Review draft of UWMP
May 25, 2011	Posting of final draft UWMP on City Internet web site
May 25, 2011	Draft UWMP posted on City website for public comment, with notification to key community organizations (see below)
May 24/29/31, 2011	Publication dates for Notice of Public Hearing on UWMP
June 14, 2011	Public Hearing and UWMP Adoption

It was during these various meetings that key technical and policy issues were addressed by City Councilmembers, Commissioners, and members of the public. These issues included:

- Projection of new development, and associated water use, in conjunction with the City's

General Plan Update process;
- Updated water demand factors, by which future water use was estimated; and establishment of a target demand for long term planning purposes;
- Projected demand reductions from ongoing water conservation program measures;
- Review of updated economic and technical information related to proposed policies on the role of the City's desalination facility and consideration of water banking and/or purchases as alternatives to desalination;
- Effects of the ongoing economic crisis on City water demand;
- Discussion of the 2009 State Water Project Delivery Reliability Report and its implications for City water supply;
- Projected sedimentation impacts on surface water reservoirs;
- Review of long standing assumptions as to groundwater availability;
- Assessment of potential additional recycled water uses and policy on amounts of potable water blending to improve recycled water quality;
- Consideration of a policy to plan for a 6-year critical drought period, as opposed to historical frequency of 5 years;
- Evaluation of potential for extraordinary short-term demand reductions as a tool for addressing a critical drought period; and
- Formulation of a Long Term Water Supply Plan and an Urban Water Management Plan that will cost effectively meet the requirements of the Water Conservation Act of 2009.

Upon completion of the numerous public meeting identified above, the City prepared final drafts of the 2010 Urban Water Management Plan and the companion Long Term Water Supply Program. A number of key community organizations and affected agencies were notified of the availability of the May 24, 2011 drafts of the two documents. Those notified include:

- City of Santa Barbara, Community Development Department
- County of Santa Barbara, Clerk of the Board
- Central Coast Water Authority
- Goleta Water District
- Montecito Water District
- Carpinteria Valley Water District
- Santa Ynez River Water Conservation District, Improvement District No. 1
- Santa Ynez River Water Conservation District
- Santa Barbara County Water Agency
- Citizens Planning Association
- U. S. Bureau of Reclamation
- Hispanic Chamber of Commerce
- Santa Barbara Restaurant and Lodging Association
- Channel Islands Chapter California Landscape Contractors Association
- Allied Neighborhood Association
- Citizens Planning Association
- American Institute of Architects
- Community Environmental Council
- Santa Barbara Board of Realtors
- Santa Barbara Chamber of Commerce

- Downtown Organization
- Milpas Community Association

No additional feedback was received from the organizations contacted.

The City has coordinated with the Central Coast Water Authority on information about forecasted deliveries of water from the State Water Project.

Lake Cachuma is the City's primary source of water supply and the City coordinates regularly with the Cachuma Operation and Maintenance Board (COMB), the Joint Powers Agency that operates portions of the Cachuma Project and coordinates with the U.S. Bureau of Reclamation on contract issues and deliveries of project water. The Board meets monthly, as does an Operating Committee consisting of the Member Unit managers and the COMB General Manager.

The City has also been an active participant in the development and adoption of the 2007 Santa Barbara Countywide Integrated Regional Water Management Plan, and is currently participating in an update of the plan.

Current collaborative efforts among various parties on the Santa Ynez River to implement the 1989 Upper Santa Ynez River Operations Agreement are another example of regional cooperation to manage water resources.

At the June 14, 2011 public hearing, a representative of the local avocado growers acknowledged the City Council's support of agriculture and the chair-elect of the City Water Commission conveyed the Commission's support for adoption of the plan as presented.

Copies of the plan were sent to the office of the Clerk of the Board, County of Santa Barbara and the California State Library at the time of submittal of this plan to the Department of Water Resources. There are no other cities in which the City of Santa Barbara provides water.

A copy of the plan will be posted on the City's Internet site within 30 days of the filing date and will be available for review at the City Water Resources Division offices during normal business hours.

Contact Information

This plan was prepared by the Water Resources Division, Public Works Department, City of Santa Barbara, under the management of Rebecca Bjork, Water Resources Manager. The preparation was coordinated by Bill Ferguson, Water Resources Supervisor, who can be reached by email at BFerguson@SantaBarbaraCA.gov or by phone at (805) 564-5571.

Section 2: System Description

The City of Santa Barbara operates the water supply system that serves most of the properties within the City limits (except for the City airport, which is served by the Goleta Water District), and selected areas located outside the City limits. A map of the water service area is included as Appendix B. The following information gives a general description of the service area and water system:

Service Area Population:

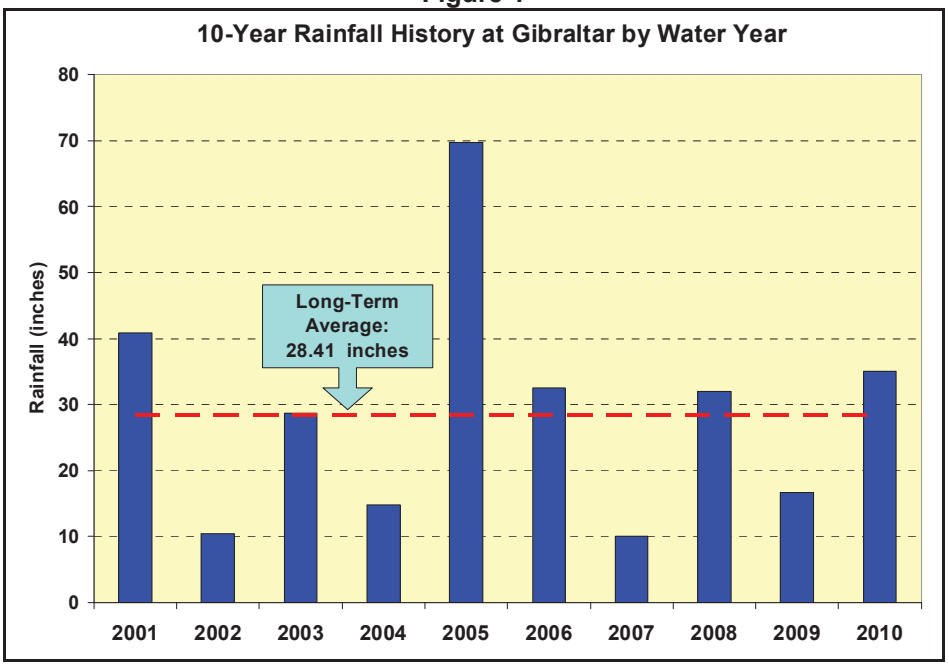
	Current	Projected[1]			
	2010	***2015***	***2020***	***2025***	***2030***
Total Service Area:	91,416	93,091	94,766	96,441	98,116

[1] Projections based on 2010 State of California Department of Finance population estimates for the City of Santa Barbara, adjusted using U.S. Census Bureau data to add out-of-City areas served by City distribution system and to deduct in-City areas not served by City distribution system. Growth assumptions from City of Santa Barbara *Plan Santa Barbara* (General Plan update) process projecting population increase of 6,700 persons through 2030.

Elevation of Service Area: 0' - 1,400'

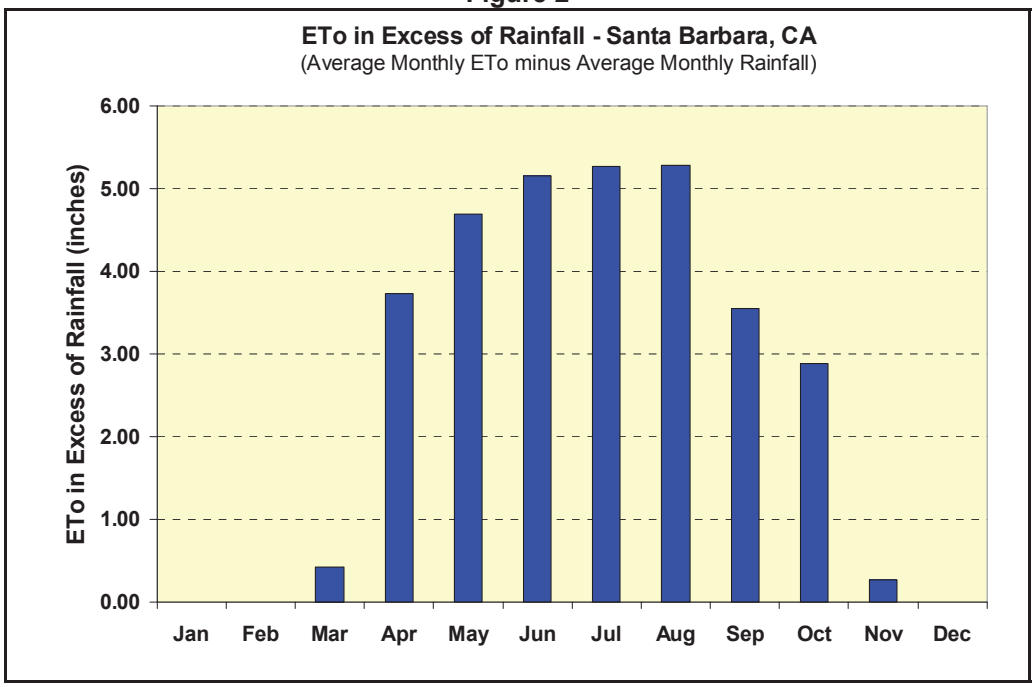
Average Annual Rainfall (see Figure 1 for data for past 10 years at Gibraltar):
Santa Barbara (1960-2010): 18.61"
Gibraltar Reservoir (1960-2010): 28.41"

Figure 1



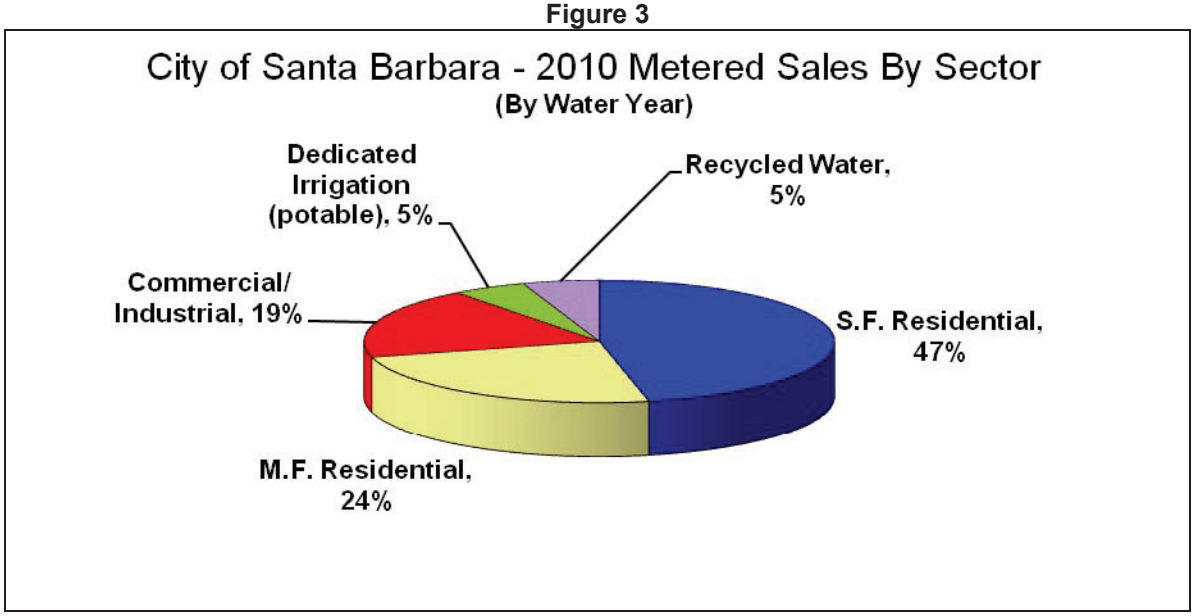
Average Annual Evapo-transpiration Rate: 44.6”
Average Annual ETo in Excess of Rainfall: 31.3” (See Figure 2 for monthly breakdown.)

Figure 2



Demographic Characterization: Figure 3 uses 2010 water sales by sector to give an overview of the demographic makeup of the City's water service area. Residential use is predominant. The City is largely built-out, though it should be assumed that infill and redevelopment will continue at roughly the same rate as in the recent past, resulting in a small amount of new demand in the residential and commercial sectors. The relative distribution of demand by sector is expected to remain very similar to current conditions. The City has completed environmental analysis of a proposed General Plan Update process which sets the range of projected demand growth from new development.

Figure 3



Water System Facilities:

	Potable Water System	Recycled Water System
Miles of Distribution Main:	320	14
Balancing Reservoirs:	13	2
Pumping Stations:	12	2
Production Wells:	9	NA
Water System Employees:	72	

Wastewater System Description:

Collection system:	277 miles of sewer pipe 9 lift stations
Wastewater Treatment Plant:	
Design Capacity:	11 MGD
Average 2010 Flow:	7.7 MGD
Recycled Water Demand:	1.0 MGD
Treatment Level:	Secondary, with tertiary treatment of recycled water
Disposal Method:	Recycled to landscape irrigation and toilet flushing in public restrooms, with balance discharged to Pacific Ocean. (See Recycled Water information in Section 4 for more details on use of recycled water)
Wastewater System Employees:	58

The water and wastewater systems are administered by the Water Resources Division of the City's Public Works Department. The water demand projection was coordinated with the City's Community Development Department as a part of the process to update the City's General Plan.

(This page intentionally left blank.)

Section 3: System Demands

Historical Demand

The City's water demand history is shown in Figure 4. Produced water is used as the traditional indicator of demand since water is produced to meet the demand. With construction of the 1989 Water Reclamation Project, the City began tracking total water demand based on production to the potable water and recycled water distribution systems. The combined total is referred to as "system" demand. Figure 5 shows metered sales by sector for 1987 to present. Both figures illustrate the demand response to severe drought in the late 1980's and early 1990's, and partial recoveries of demand once drastic measures were no longer needed. Variations from 1998 onward are primarily the result of year-to-year variations in weather as illustrated in Figure 6.

Figure 4

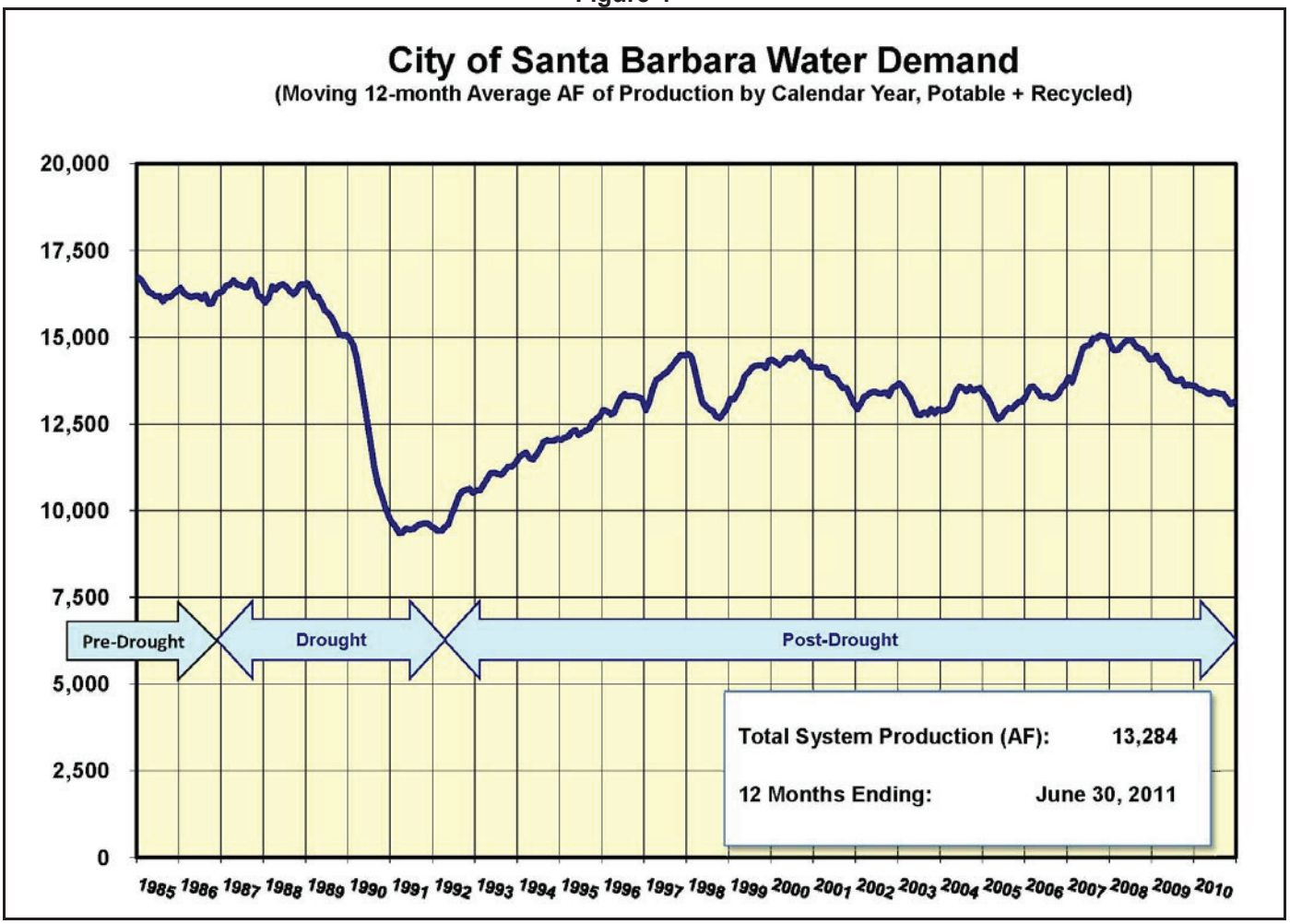


Figure 5

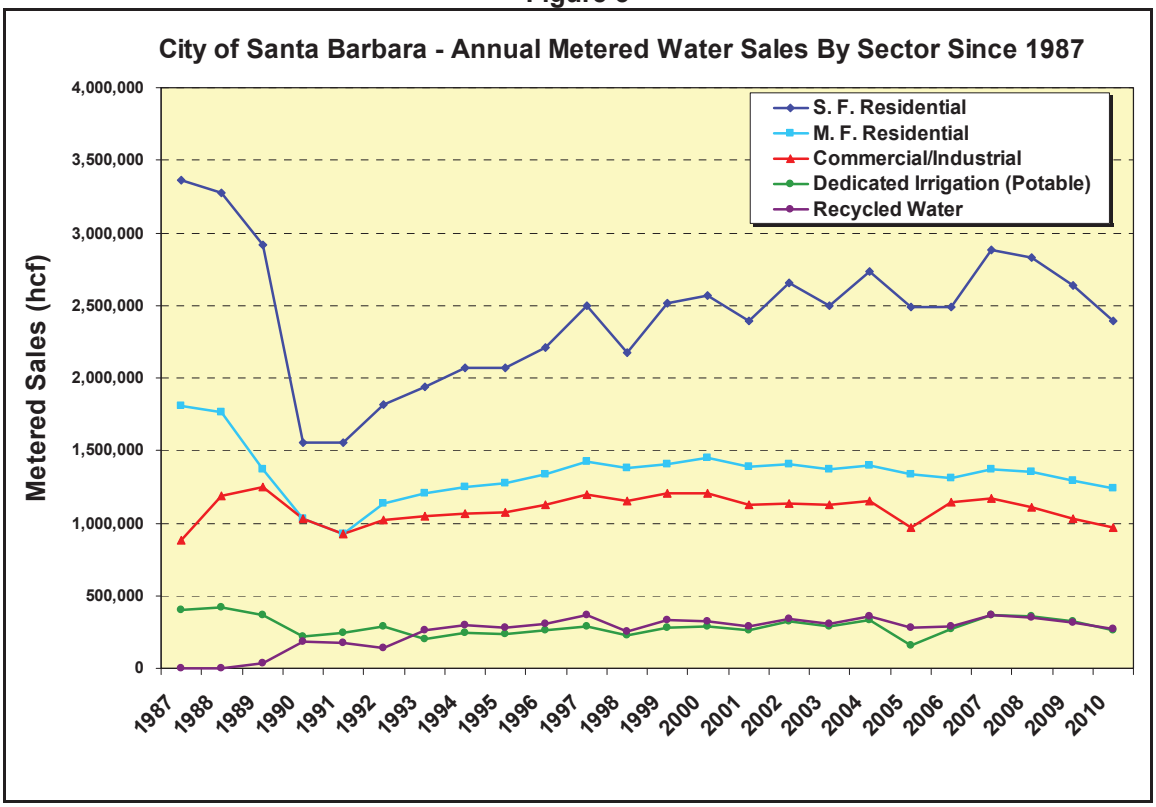
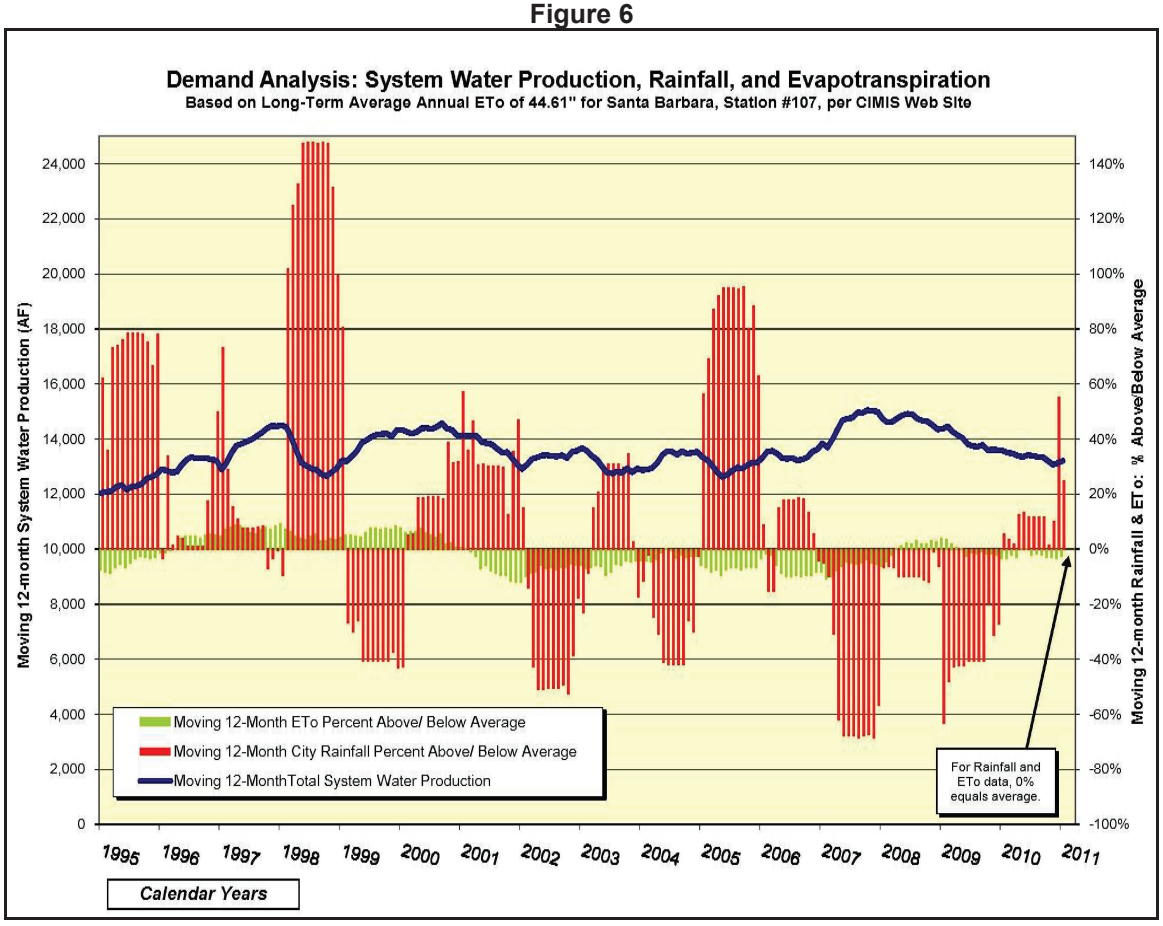


Figure 6



Baselines and Targets

Pursuant to the Water Conservation Act of 2009 (SB7x-7) and related official methodologies, baseline per capita water use is required for two base periods, a 10 to 15 year period and a 5-year period. Recycled water deliveries for 2008 equal 5.9% of total deliveries. This is below 10%, thereby requiring use of a 10-year base period. Required data for the 10-year and 5-year base periods are shown in Table 2 and Table 3 respectively, calculated individually for the City of Santa Barbara water service area. A map of the City's service area is included as Appendix B. The service area includes in-City census tracts and out-of-City census tracts served by the distribution system, and excludes in-City census tracts not served.

Table 2
Base Daily Per Capita Water Use: 10-Year Range

Base Period Year		Distribution System Population	Daily System Gross Water Use (per UWMP Guidebook Definition)		Annual daily per capita water use (gpcd)
Sequence Year	Fiscal Year		(AFY)	(mgd)	
Year 1	2000	92,229	13,792	12.3	134
Year 2	2001	92,807	13,344	11.9	128
Year 3	2002	93,390	12,879	11.5	123
Year 4	2003	93,267	12,223	10.9	117
Year 5	2004	93,315	13,073	11.7	125
Year 6	2005	92,882	12,528	11.2	120
Year 7	2006	91,946	12,860	11.5	125
Year 8	2007	91,934	14,106	12.6	137
Year 9	2008	92,776	14,432	12.9	139
Year 10	2009	93,017	13,576	12.1	130
				Base Daily Per Capita Water Use:	**128**

Table 3
Base Daily Per Capita Water Use: 5-year Range

Base Period Year		Distribution System Population	System Gross Water Use		Annual daily per capita water use (GPCD)
Sequence Year	Fiscal Year		(AFY)	(mgd)	
Year 1	2006	91,946	12,860	11.5	125
Year 2	2007	91,934	14,106	12.6	137
Year 3	2008	92,776	14,432	12.9	139
Year 4	2009	93,017	13,576	12.1	130
Year 5	2010	91,416	13,276	11.9	130
				5-Year Base Daily Per Capita Water Use:	**132**

Population values in the base period tables are based on California Department of Finance (DOF) data for the City of Santa Barbara. City population for 2000 was compared with U.S. Census Bureau data to confirm approximate equality. Adjustments to add out-of-City population served by the City distribution system and deduct in-City population not served by the City system were made using 2000 census block data. The percentage increment of total population served in excess of the official City population value was calculated for 2000 and applied to DOF data for subsequent years. Year-to-year variations are partly explained by adjustments made by DOF from time to time.

Gross Water Use values are calculated as Total Water Received, including local surface water and groundwater, imported State Water for City use via the Central Coast Water Authority (CCWA), receipt of State Water for conveyance to La Cumbre Mutual Water Company (LCMWC). Deducted from this are agricultural deliveries, net exports to Goleta Water District (GWD), State Water conveyance to LCMWC, and export to long-term storage (groundwater injection and recharge). Consistent with State methodologies, calculation of Gross Water Use includes potable water used for blending (as discussed below), and excludes the recycled water component of deliveries to recycled water customers. A sample calculation for FY 2010 is shown in Table 4. Historical calculations for 1996 to present are shown in Table 5.

Table 4
Sample Calculation of Gross Water Use for FY 2010 (AFY)

City Supplies:		
Cachuma Project	7,637	
Gibraltar Reservoir	2,933	
Mission Tunnel	1,220	
Devils Canyon Creek	0	
Groundwater	1,164	
Desalination	0	
Subtotal City Supplies:		12,954
Imported Supplies (SWP via CCWA):		541
State Water Received for LCMWC:		947
Total Water Received:		**14,442**
Less Agricultural Deliveries		106
Less Net Exports to GWD		38
Less State Water Conveyance to LCMWC		947
Less Export to Long Term Groundwater Storage		75
Gross Water Use:		**13,276**

Based on use of DWR's Urban Water Use Target Method #3 and location in the Central Coast Hydrologic Region, the urban water use target is 95% of the region target, or 117 GPCD. Table 3 shows calculation of the 5-year base period, resulting in a Base Daily Per Capita Water Use of 132 GPCD, 95% of which is equal to 125 GPCD. Since the urban water use target of 117 GPCD is not greater than 125 GPCD (i.e. it results in a targeted reduction of at least 5% compared to the 5-year base period) the target of 117 GPCD is confirmed. The interim target for 2015 is calculated as:

(128 GPCD Base Daily Water Use + 117 Urban Water Use Target) / 2 = 123 GPCD.

Table 5

Tabulation of Historical Gross Water Use

Water into distribution system; less net exports, diversions to long-term storage (groundwater injection), and agricultural deliveries

Year	Cachuma	Gibraltar	Mission Tunnel	Devils Canyon	Ground Water	Desal	Total From Own Sources	From Imported Sources (CCWA/ SWP)	SWP Received for La Cumbre Mutual Conveyance	Total Water Received	Agricultural Deliveries	Net Exports to Goleta Water Dist.	Conveyance to La Cumbre Mutual	Export to Long Term Storage (GW Injection)	Gross Water Use
1996	5,561	5,452	1,692	71	-	-	12,776	-	-	**12,776**	103	44	-	75	**12,554**
1997	7,301	4,217	1,427	280	-	-	13,225	-	-	**13,225**	114	33	-	-	**13,078**
1998	7,269	3,962	1,803	79	73	-	13,186	-	1,012	**14,198**	81	648	1,012	-	**12,457**
1999	5,879	5,273	1,872	38	134	-	13,196	-	1,042	**14,238**	107	(294)	1,042	-	**13,383**
2000	11,300	1,394	1,149	-	357	-	14,200	-	646	**14,846**	120	179	646	109	**13,792**
2001	5,523	5,573	1,886	-	280	-	13,262	-	830	**14,092**	113	(276)	830	81	**13,344**
2002	7,373	3,827	1,267	3	8	-	12,478	539	945	**13,962**	114	(48)	945	72	**12,879**
2003	6,484	3,127	942	31	-	-	10,584	1,924	742	**13,250**	113	172	742	-	**12,223**
2004	7,777	3,414	1,256	20	-	-	12,467	890	776	**14,133**	134	62	776	88	**13,073**
2005	7,523	1,879	1,585	70	-	-	11,057	1,903	550	**13,510**	105	312	550	15	**12,528**
2006	5,305	4,546	1,786	-	906	-	12,543	659	511	**13,713**	134	208	511	-	**12,860**
2007	7,804	3,783	1,409	-	434	-	13,430	667	804	**14,901**	157	(227)	804	61	**14,106**
2008	10,734	1,576	1,093	160	751	-	14,314	609	879	**15,802**	155	212	879	124	**14,432**
2009	8,236	2,569	1,142	76	1,112	-	13,135	496	902	**14,533**	139	(225)	902	141	**13,576**
2010	7,637	2,933	1,220	-	1,164	-	12,954	541	947	**14,442**	106	38	947	75	**13,276**

(This page intentionally left blank.)

Table 6
Water Demands and Total Water Use (AF)

	Actual				*Projected*							
	2005		**2010**		**2015**		**2020**		**2025**		**2030**	
Water use sectors	**# of accts.**	**Volume (AF)**	**# of accts.**	**Volume (AF)**	**# of accts.**	**Volume (AF)**	**# of accts.**	**Volume (AF)**	**# of accts.**	**Volume (AF)**	**# of accts.**	**Volume (AF)**
Single family	16,850	5,758	16,920	5,824	17,007	5,684	17,094	5,588	17,181	5,527	17,268	5,487
Multi-family	5,786	3,094	6,126	2,931	6,417	2,860	6,417	2,812	6,417	2,781	6,417	2,761
Commercial	2,364	2,230	2,530	2,066	2,565	2,016	2,600	1,982	2,635	1,960	2,670	1,946
Industrial	53	360	56	255	56	249	56	245	56	242	56	240
Institutional/ Government (included w/ Comm.)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Landscape	624	556	729	541	749	528	769	519	789	513	809	510
Agriculture	56	105	59	106	59	103	59	102	59	101	59	100
Total Potable Accts. & Deliveries (Metered Sales)	25,733	12,104	26,420	11,722	26,854	11,441	26,996	11,248	27,138	11,125	27,280	11,045
Sales to Other Agencies		0		0		0		0		0		0
Net Exports to Other Districts		312		38		0		0		0		0
Groundwater Recharge		15		75		75		75		75		75
Blending to Recycled Water		645		651		300		275		275		275
System Losses		NA		1,009		995		978		967		960
Total Water Use		**13,076**		**13,495**		**12,811**		**12,576**		**12,443**		**12,355**

Note: "Total Water Use" above and as illustrated in Table 11 is not intended to equal "Gross Water Use" that is the basis of the Urban Water Use Target calculation.

Tabulation of Target & Projected Urban Water Use:

	2015		**2020**		**2025**		**2030**
Potable Metered Sales:	11,441		11,248		11,125		11,045
Potable System Losses:	995		978		967		960
Blending to Recycled Water System:	300		275		275		275
Less Agriculture Deliveries:	-103		-102		-101		-100
Gross Water Use:	12,632		12,399		12,267		12,180
Projected Service Area Population:	93,091		94,766		96,441		98,116
Target Urban Water Use (GPCD):	123		117		117		117
Projected Urban Water Use (GPCD):	121		117		114		111

	2005		**2010**		**2015**		**2020**		**2025**		**2030**	
Recycled Water Sales	**# of accts.**	**Volume (AF)**	**# of accts.**	**Volume (AF)**	**# of accts.**	**Volume (AF)**	**# of accts.**	**Volume (AF)**	**# of accts.**	**Volume (AF)**	**# of accts.**	**Volume (AF)**
	76	718	84	697	99	875	114	950	129	1,025	144	1,100

(This page intentionally left blank.)

Water Demands

Table 6 shows the various demands on the City water system at 5-year intervals. These include metered sales by customer class, net exports, groundwater recharge, blend water into the recycled water system for managing mineral content, and system losses. Also included is a tabulation of target and projected values for urban water use, consistent with methodologies for implementing SBx7-7 water use reduction requirements.

Table 7 summarizes water use projected to be needed to serve single-family residential and multi-family residential housing needed for lower income households. The information is derived from Appendix C, which was prepared by staff of the City's Community Development Department using information from the Plan Santa Barbara General Plan Certified Final EIR dated September 2010 and the City of Santa Barbara General Plan Housing Element, September 2010 Proposed Final. These demands have been included in the overall water use projections in Table 6.

Table 7
Low-Income Projected Water Demand (AFY)

	2010	2015	2020	2025	2030
Single Family Residential	552	560	568	576	584
Multi-Family Residential	192	213	235	256	278
Total	**744**	**774**	**803**	**832**	**862**

The City of Santa Barbara receives wholesale deliveries of State Water from the Central Coast Water Authority. Table 8 shows the projections of water use from CCWA, as they were provided to CCWA.

Table 8
Retail Agency Demand Projections Provided to Wholesale Supplier (AFY)

	2010	2015	2020	2025	2030
Central Coast Water Authority	2,084	2,064	2,043	2,023	2,002

Water Use Reduction Plan

The City's long term commitment to water conservation is evident in reductions in water demand achieved over the past twenty years. Total system demand has dropped from approximately 16,300 AFY in the late 1980's to approximately 14,000 AFY currently. To achieve the next level of demand management reductions it was important to evaluate the effects of updated plumbing codes and appliance standards, ongoing implementation of the CUWCC BMP's, and added measures that can be cost effectively implemented to further offset water demand.

The City hired Maddaus Water Management (MWM), an engineering firm widely recognized for expertise in demand management, to analyze the existing conservation program and use its proprietary Demand Management Decision Support System (DSS) to model current and potential water conservation measures. The DSS also quantified the demand reduction effects of these measures along with the effects of plumbing codes and appliance standards. Key findings, including the effect of assumed development consistent with the City's General Plan update process, are as follows:

- The 2030 system demand would be expected to increase by 1,202 AFY (compared to the 2006 model reference point of 13,623 AFY) to 14,825 AFY, if the effects of already adopted plumbing codes and appliance standards were not considered. (Note that this will not actually occur, but it is a useful reference point to illustrate the ongoing effect of stricter codes and standards on both new and existing development.)

- The effects of the plumbing code and appliance standards are estimated to reduce 2030 demand by 919 AFY, to 13,906 AFY, not including the effects of conservation program activities and measures.

- Conservation Program B, which includes current conservation program measures along with those that together meet a utility benefit-cost ratio of 1.0, is estimated to reduce demand by an additional 498 AFY, to 13,408 AFY.

The results described above are illustrated in Figure ES-1 of the Executive Summary of the Technical Memorandum prepared by MWM, which is included in this plan as Appendix D. The benefit-cost ratios shown in Table ES-3 of Appendix D were calculated on the basis of an avoided cost of $600 per AF, which is an average of the variable costs associated with State Water Project Table A deliveries, groundwater produced from the Ortega Groundwater Treatment Plant, and deliveries of purchased water through the State Water Project during non-critical drought periods. Program B was selected on the basis of its cost effectiveness. The model results have been incorporated into the demand and Urban Water Use projections itemized in Table 9 and graphed in Figure 7. The results of these projections indicate that the City will meet its 2020 Urban Water Use Target by implementing the water conservation measures in Program B, adding 150 AFY of new recycled water user demand to offset potable usage, and reducing the amount of potable blend water from a 2010 amount of 651 AFY to 250 AFY. The required new recycled demand is about half of what has already been identified in planning studies and much of the blend water reduction will come from planned corrections to the secondary treatment process. The conservation measures of Program B are identified in Table ES-1 of Appendix D.

Figure 7

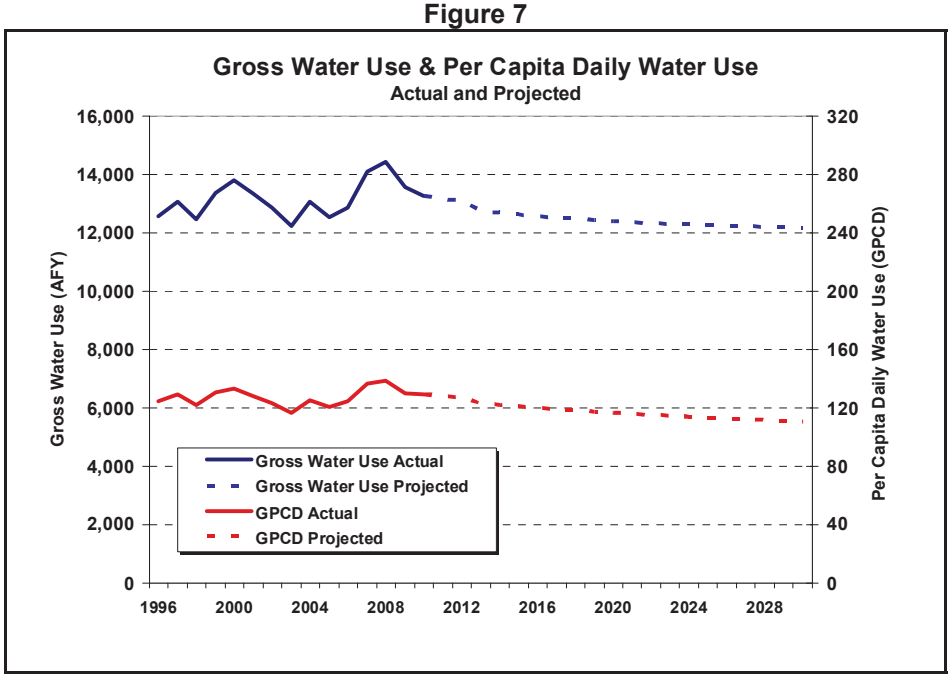


Table 9

Demand & Urban Water Use Projections

Volumes in AF, except as noted

Input assumptions:

300 = Planned Potable Demand Reduction from New Recycled Water Connections
Row 27 = Projected "Program B" demand reductions, including plumbing codes & conservation program
0 = Additional 20-year demand reductions from conservation above "Program B"
275 = Target Blending Amount After Secondary Improvement (starting 2015)

Summary Information:

300 = Total Demand Reductions from New Recycled Water
1320 = Total Demand Reductions from New Water Conservation
150 = Demand reductions from incr. recycled water by 2020
802 = Conservation reductions projected by 2020

Service Area Growth Projection - Per Plan SB Final EIR:

20-Year Breakout by Sector:	20-year Total	Annual Amount
Single Family Residential	166	8.31
Multi-Family Residential	445	22.26
Non-Residential	283	14.16
Total:	**895**	**44.73**

0 = Calculated average annual required conservation demand reductions in excess of "Program B"

6,700 = 20-year Population Growth Projection (from Plan SB Final EIR)
335 = Annual average population increase

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Starting Potable Production		12,731	12,669	12,614	12,557	12,497	12,436	12,397	12,352	12,314	12,270	12,226	12,195	12,166	12,140	12,115	12,093	12,072	12,053	12,036	12,020
Demand from New Devel.																					
SFR		8.31	8.31	8.31	8.31	8.31	8.31	8.31	8.31	8.31	8.31	8.31	8.31	8.31	8.31	8.31	8.31	8.31	8.31	8.31	8.31
MFR		22.26	22.26	22.26	22.26	22.26	22.26	22.26	22.26	22.26	22.26	22.26	22.26	22.26	22.26	22.26	22.26	22.26	22.26	22.26	22.26
Non-Resid.		14.16	14.16	14.16	14.16	14.16	14.16	14.16	14.16	14.16	14.16	14.16	14.16	14.16	14.16	14.16	14.16	14.16	14.16	14.16	14.16
Demand Reductions																					
New Recyceld Water Use		-15	-15	-15	-15	-15	-15	-15	-15	-15	-15	-15	-15	-15	-15	-15	-15	-15	-15	-15	-15
New Conserv. - Prog B		-92	-84	-87	-90	-91	-69	-74	-68	-73	-74	-61	-59	-56	-54	-52	-50	-49	-47	-46	-44
New Conserv. > Prog B		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ending Potable Production	12,731	12,669	12,614	12,557	12,497	12,436	12,397	12,352	12,314	12,270	12,226	12,195	12,166	12,140	12,115	12,093	12,072	12,053	12,036	12,020	12,005
Plus Blend Water to Recycled	651	600	600	300	300	300	275	275	275	275	275	275	275	275	275	275	275	275	275	275	275
Less Agriculture Deliveries	-106	-105	-105	-104	-104	-103	-103	-103	-102	-102	-102	-101	-101	-101	-101	-101	-100	-100	-100	-100	-100
Gross Water Use:	**13,276**	**13,164**	**13,109**	**12,752**	**12,693**	**12,632**	**12,568**	**12,524**	**12,486**	**12,443**	**12,399**	**12,369**	**12,340**	**12,314**	**12,289**	**12,267**	**12,246**	**12,228**	**12,210**	**12,195**	**12,180**
Service Area Population:																					
Starting Amount		91,416	91,751	92,086	92,421	92,756	93,091	93,426	93,761	94,096	94,431	94,766	95,101	95,436	95,771	96,106	96,441	96,776	97,111	97,446	97,781
Added Population		335	335	335	335	335	335	335	335	335	335	335	335	335	335	335	335	335	335	335	335
Ending Amount	91,416	91,751	92,086	92,421	92,756	93,091	93,426	93,761	94,096	94,431	94,766	95,101	95,436	95,771	96,106	96,441	96,776	97,111	97,446	97,781	98,116
Per Capita Use (GPCD):	**130**	**128**	**127**	**123**	**122**	**121**	**120**	**119**	**118**	**118**	**117**	**116**	**115**	**115**	**114**	**114**	**113**	**112**	**112**	**111**	**111**
Recycled Production:	696	815	830	845	860	875	890	905	920	935	950	965	980	995	1,010	1,025	1,040	1,055	1,070	1,085	1,100
System Production:	**13,427**	**13,484**	**13,444**	**13,402**	**13,357**	**13,311**	**13,287**	**13,257**	**13,234**	**13,205**	**13,176**	**13,160**	**13,146**	**13,135**	**13,125**	**13,118**	**13,112**	**13,108**	**13,106**	**13,105**	**13,105**

(This page intentionally left blank.)

Section 4: System Supplies

Water Sources

The City operates a diverse water supply. The various sources of supply are described below. The following descriptions are intended as a brief summary and shall not be construed as exhaustive or as a waiver of any right or interest in water.

Cachuma Project

Description: Earth filled dam (Bradbury Dam) located on the Santa Ynez River 25 miles northwest of Santa Barbara; owned and operated by U.S. Bureau of Reclamation; constructed early 1950's; interim seismic retrofit completed 1996, permanent repairs were deemed substantially complete in 2001; water is delivered through the Santa Ynez Mountains to the South Coast via 6.4 mile Tecolote Tunnel, 24.3 mile South Coast Conduit, and four regulating reservoirs, completed in 1956;

Drainage Area: 417 square miles (including Gibraltar drainage area)

Current Capacity: 186,636 AF (approximately 195,600 AF with modifications to allow a 3' surcharge for fish releases)

Max. Normal Pool: El. 750 (El. 753 with modifications to allow fish account surcharge)

Annual Yield: The current total project operational yield equals 25,714 AFY. The City's share is 32.19% or 8,277 AFY.

Operating Criteria: The project operates under a permit granted by the State Water Resources Control Board (SWRCB). The current Water Right Order 94-5 continued earlier requirements for releases to protect downstream interests (e.g. the City of Lompoc, Improvement District No. 1 of the Santa Ynez River Water Conservation District and riparian groundwater pumpers along the Santa Ynez River) and required hearings in 2002 and 2003 to address outstanding issues related to potential project impacts on vegetation, fish, and downstream users. The hearings have been completed and a decision by the SWRCB has long been pending completion of environmental documentation.

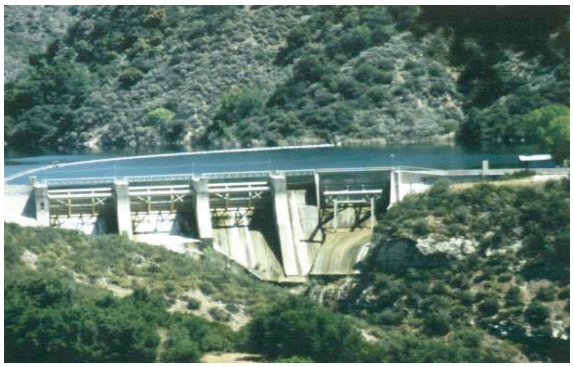
Project water is accumulated to the extent that inflow is not needed to satisfy the release requirements. It is delivered to the member units in accordance with a Master Contract between U.S. Bureau of Reclamation, and the Santa Barbara County Water Agency and the Cachuma Project member units. The contract was renewed in 1996 for a twenty five-year term. Siltation rate at Cachuma has been projected to be approximately 5% of current volume between now and 2030. Water quality has traditionally been good enough to require only conventional filtration. Impacts from a recent major fire in the watershed and tighter regulations on disinfectant byproducts have led to the planned advance treatment/ozone project at Cater Treatment plant.

A key policy of the City's 2011 LTWSP is that drought planning should be based on a six-year critical drought period rather than the historical five-year period. Since the current project yield of 25,714 AFY is based on the five-year historical drought, the City's operations will be based on deferring use of some current normal year entitlement in order to build carryover for use in the sixth year of a drought.

Cost Information: The water supply contract with the U.S. Bureau of Reclamation sets the unit cost of the City's share of project yield at about $120/AF, or approximately $1,000,000 annually. Since this is treated as a payback of capital cost, it is not considered a variable cost. Additional annual fixed costs include about $1,500,000 for the City's share of the Cachuma Operation and Maintenance Board (COMB) budget for administration, operation, maintenance, and capital improvement of the project, and about $200,000 for the City's share of Cachuma Conservation Release Board (CCRB) expenses associated with managing the members' water rights at Cachuma and implementing the Lower Santa Ynez River Fish Management Plan. Variable costs consist of the marginal cost of treatment at Cater Treatment Plant, which is currently approximately $100/AF. Seismic reinforcement of the dam and rehabilitation of the dam's gates have been completed. Upcoming capital costs focus on upgrade and rehabilitation of the South Coast Conduit portion of the project.

Gibraltar Reservoir

Description: Constant radius, concrete arch dam located on the Santa Ynez River, 8 miles north of Santa Barbara; owned by City of Santa Barbara; constructed 1913-20, with an original capacity of 15,783 AF; raised to current elevation in 1949; strengthened in 1990-91;



water delivered through the Santa Ynez Mountains to Santa Barbara via Mission Tunnel

Current Capacity: 5,251 Acre Feet (per 2010 Bathymetric Study)

Drainage Area: 216 square miles

Max. Normal Pool: El. 1,400

Annual Yield: Yield will be dictated by management as described under "Operating Criteria" below. (See discussion of Operating Criteria below.)

Operating Criteria: Current Gibraltar Reservoir operations are based on the 1989 Upper Santa Ynez River Operations Agreement (Pass Through Agreement) by which the City agreed to defer a second enlargement of the reservoir in exchange for the right to receive a portion of its Gibraltar water through Lake Cachuma. The intent of this arrangement was to allow the City and other parties to continue to experience Santa Ynez River supplies that would reflect the Gibraltar storage volume as it was in 1988.

The City is working to obtain a Warren Act agreement necessary for the Pass Through mode of the agreement. Pass Through mode involves tracking the yield of a hypothetical "Base Reservoir" that is equal to the 1988 storage capacity of 8,567 AF, and operated under the procedures defined in the Pass Through Agreement. The Pass Through mode allows Gibraltar Reservoir diversions (including diversions to Mission Tunnel and the portion taken through Cachuma) up to the amount that could have been diverted under the "Base Reservoir" operations. Modeling done in 1989 indicated that long-term average yield of the Base Reservoir would be 5,160 AFY. Yield under the actual Pass Through operations can be expected to be somewhat less on average, due to potential losses associated with conveyance of water between Gibraltar and Cachuma, and spill and evaporation of Pass Through water at Cachuma. For conservative estimates of Gibraltar yield, it is assumed that deliveries will average 70% of the amounts estimated in the environmental analysis on the Cachuma Water rights hearings before the SWRCB. In normal years, this results in an estimated yield of 3,206 AFY.

Water quality is affected by turbidity during high flow periods, which temporarily interrupts diversions. In addition, residual water quality impacts from the 2007 Zaca Fire continue to affect the level of dissolved organic material in Gibraltar water, resulting in significantly increased treatment costs using interim procedures pending completion of an advanced treatment/ozone project at the City's Cater Treatment Plant.

Cost Information: Costs for this source of supply are primarily "sunk" costs, including the original cost of construction, plus a cost of $9 million for strengthening in 1990-91, plus the cost of Mission Tunnel. Variable costs for Gibraltar are the same as for Cachuma water, which is approximately $100/AF.

Devil's Canyon Creek

Description: The City maintains a small diversion works on Devil's Canyon Creek below Gibraltar Dam which diverts water from Devil's Canyon Creek into Mission Tunnel.

Annual Yield: Average: 118 AFY
Range: 0 AFY - 557 AFY

Operating Criteria: Water is diverted as available to help improve the quality of water going into Mission Tunnel. Diverted water is counted as a part of allowable diversions under the Pass Through Agreement.

Cost Information: Variable costs are the same as Gibraltar water or approximately $100/AF.

Mission Tunnel

Description: A 3.7 mile tunnel through the Santa Ynez Mountains running from the North Portal, located approximately 1,700 feet downstream of Gibraltar Dam to the South Portal, located on Mission Creek approximately 3 miles north of downtown Santa Barbara; constructed 1904-1910; rehabilitation work completed December 1994.

Annual Infiltration: For the period of 1976 through 2005, infiltration ranged from 500 AFY to 2,375 AFY, with an average of 1,125 AFY.

Operating Criteria: Tunnel infiltration augments water conveyed from Gibraltar Reservoir, normally flowing to Cater Treatment Plant via the penstock, hydroelectric facility, and Lauro Reservoir; a portion of this combined flow is sometimes diverted to Mission Creek for groundwater recharge purposes. Water quality is relatively hard, as is typical of the region, but otherwise good.

Cost Information: Variable costs are the same as Cachuma and Gibraltar water or approximately $100/AF.

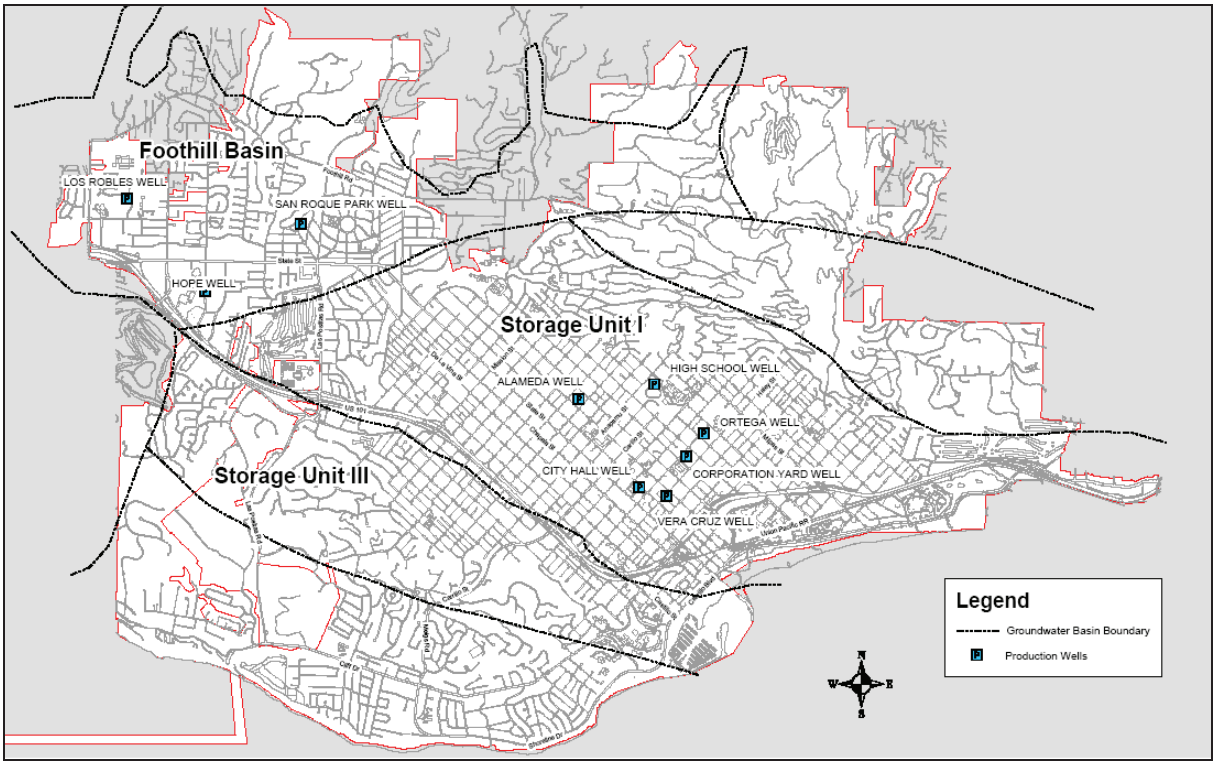
Groundwater

Description: In addition to groundwater obtained from infiltration to Mission Tunnel, the City obtains pumped groundwater primarily from two hydrogeologic units: Storage Unit No. 1 (in the downtown area) and the Foothill Basin (in the outer State Street area) as shown in Figure 8. The estimated long-term safe yield of these two basins is approximately 1,800 AFY. Extraction by private pumpers is estimated at 500 AFY, leaving a safe yield of about 1,300 AFY available to the City. Pumping historically averages less than this safe yield amount, except for rare critical drought periods as described below. State Bulletin 118 does not list City basins as being in overdraft, which is consistent with City experience.

The City has six production wells in Storage Unit No. 1 and three in the Foothill Basin, though the wells are in need of varying degrees of maintenance or replacement. Well depths range from about 315 feet to 670 feet. While the estimated total pumping capacity is approximately 4,500 AFY, a capacity of 4,150 AFY is assumed for planning purposes. The total usable storage capacity of these two basins is estimated at 16,000 AF of City pumping.

A third basin (Storage Unit No. 3 in the Las Positas Valley area) provides additional safe yield of approximately 100 AFY, but water quality is inferior and is not planned for use.

Figure 8
Groundwater Basins and Well Locations



Seawater intrusion into Storage Unit No. 1 is a key issue because the groundwater basin is in contact with seawater that can flow into the basin during periods of heavy pumping. Under normal periods of little or no pumping, the groundwater flow is toward the ocean, which stops intrusion and pushes the seawater interface seaward. The City's Multiple Objective Optimization Model (developed by USGS) was used to estimate pumping levels during a critical drought period that represent a compromise between maximizing production and minimizing seawater intrusion. The model results in total pumping of up to about 17,800 AF during the drought period, allowing some intrusion for the last portion of the drought. This modeling was based on one additional well in each basin, which may have implications for future capital program needs. In Storage Unit No. 1, the assumption was that new wells would be placed further inland to minimize intrusion. Update and enhancement of this model by USGS is underway.

Perennial Yield: The portion of the perennial yield available to the City from Storage Unit No. 1 and the Foothill Basin is approximately 1,300 AFY.

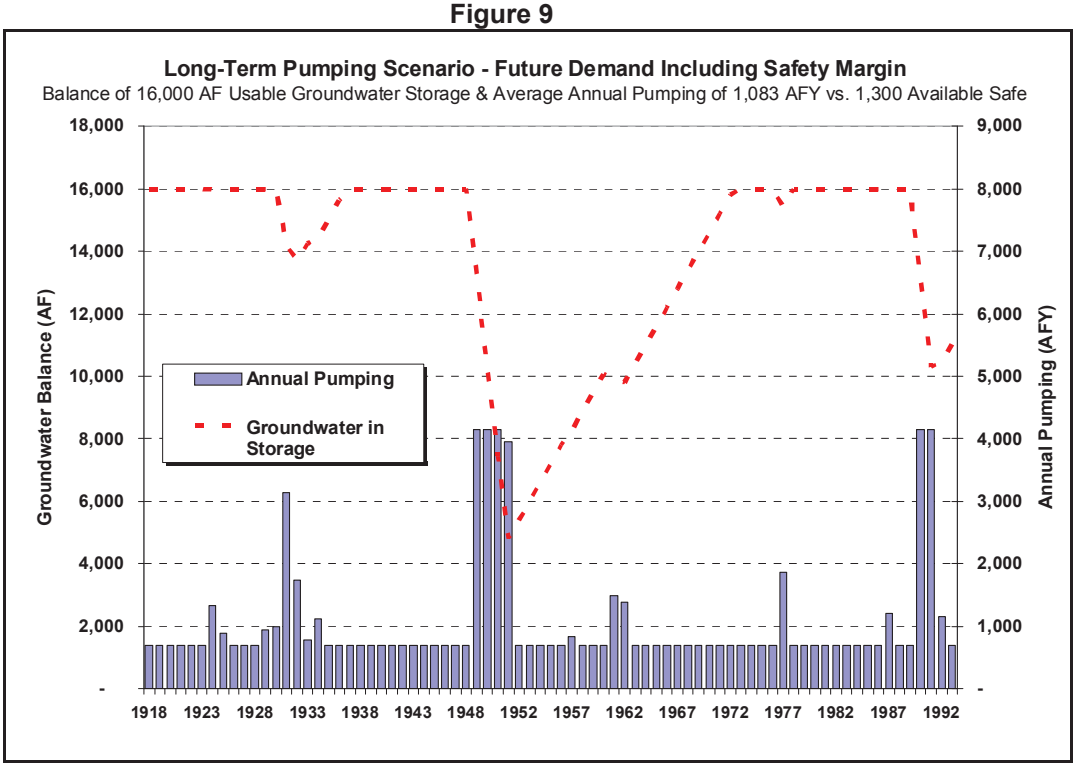
Operating Criteria: Under a conjunctive management program, the City pumps more groundwater to replace surface supplies lost during drought and less during periods of ample surface supplies, when basins are allowed to recharge. Natural recharge is augmented through releases to Mission Creek and injection at two production wells. A primary goal is to attempt to utilize the perennial yield of the groundwater basins, while maximizing available storage for back-up during drought. Recent pumping by basin is shown in Table 10, and is based on volumetric meter data.

Table 10
Groundwater Pumped by Fiscal Year (AF)

	2006	2007	2008	2009	2010
Storage Unit No. 1	326	108	203	398	475
Foothill Basin	580	326	548	714	689
Total:	906	434	751	1,112	1,164

Figure 9 illustrates a long-term pumping scenario based on the conservative supply and demand scenario discussed in Section 5. Average pumping is 1,083 AFY compared to an available safe yield of 1,300 AFY.

Figure 9



Water quality constraints (primarily due to high levels of sulfide, iron, and manganese) are being addressed through an upgrade of the Ortega Groundwater Treatment Plant in Storage Unit No. 1. Seawater intrusion has been addressed in part by adding wells further inland, at Alameda Park and Santa Barbara High School and by more sophisticated modeling

as a part of the current USGS work. The production capacity of 4,150 AFY is the target for meeting long-term supply requirements, but is only used on a limited basis to avoid exceeding the long term perennial yield or causing excessive seawater intrusion. Water quality in the Foothill Basin is better and typically only wellhead disinfection is required.

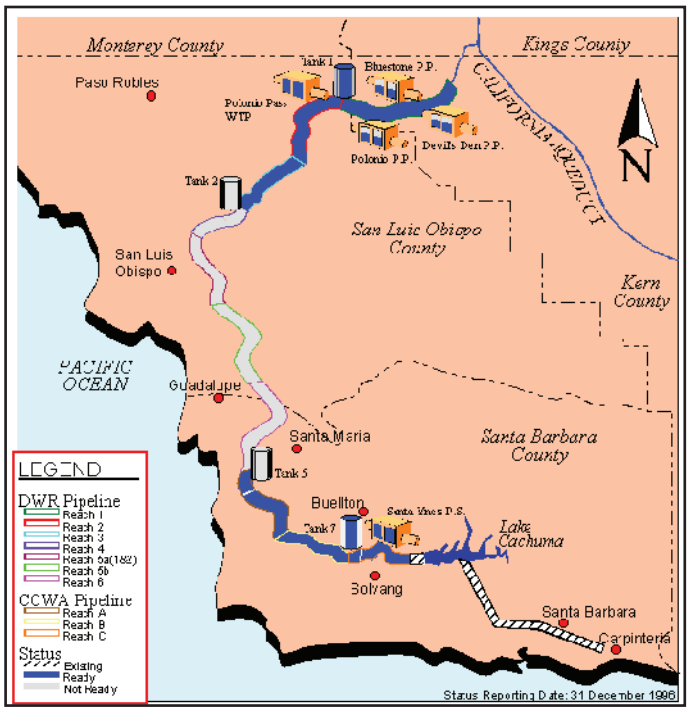
The City has managed groundwater under longstanding Pueblo Water Rights and there is no adjudication or formal groundwater management plan. However, policy direction in the recently updated LTWSP includes development of a groundwater management plan in conformance with State requirements. The City has volunteered to monitor and report groundwater levels under the California Statewide Groundwater Elevation Monitoring (CASGEM) program.

Cost Information: Variable costs for groundwater production range from $120/AF to $610/AF.

State Water Project

Description: The City, through CCWA, is a participant in the State Water Project and is eligible to receive State Project water via the 102 mile Coastal Branch of the State Aqueduct and the 42-mile Santa Ynez Extension ending at Lake Cachuma. Construction was completed in 1997. When ordered by project participants, water is delivered from Cachuma through Tecolote Tunnel along with Cachuma Project water. The City first took delivery of State Water in 2002.

Annual Yield: The City's "Table A" amount is 3,300 AFY, including a 10% drought buffer. This amount is projected to remain the same throughout the planning period of 2010 to 2030. Deliveries are subject to availability. Average long-term deliveries are estimated at 1,980 AFY in the most recent DWR State Water Project Delivery Reliability Report. Further discussion of reliability occurs later in this plan.



Operating Criteria: State Project water orders have ranged from a minimum of about 600 AF during normal supply conditions, up to the full 3,300 AF Table A amount

when dry weather reduced Cachuma storage below 100,000 AF. While there is uncertainty about future State Water Project reliability, the 2009 State Water Project Delivery Reliability Report is the best estimate of expected deliveries, and has been used by CCWA to project future deliveries through the planning period for a range of hydrologic conditions, as shown in Table 11. The City has confirmed with CCWA its intent to use these estimates for future planning, except as such projections may be modified for sensitivity analysis of future water supply reliability. Available deliveries are expected to be used as appropriate given current conditions, including delivery as needed to meet current demands, carryover, sale to other agencies, and/or banking for improved future supply reliability.

Table 11
Maximum Table A Amount in Selected Drought Conditions (AF)

Drought Condition	2010	2015	2020	2025	2030	2035
Long Term Average	2,084	2,064	2,043	2,023	2,002	1,982
Single Dry Year 1977	184	217	250	282	315	348
2-year drought 1991-1992	872	870	867	865	863	861
2-year drought 1990-1991	1,161	1,067	974	880	786	692
4-year drought 1929-1932	1,112	1,128	1,144	1,160	1,177	1,193
4-year drought 1989-1992	1,181	1,156	1,131	1,106	1,081	1,056
6-year drought 1929-1934	1,118	1,132	1,145	1,159	1,173	1,186
6-year drought 1987-1992	1,247	1,192	1,137	1,082	1,028	973

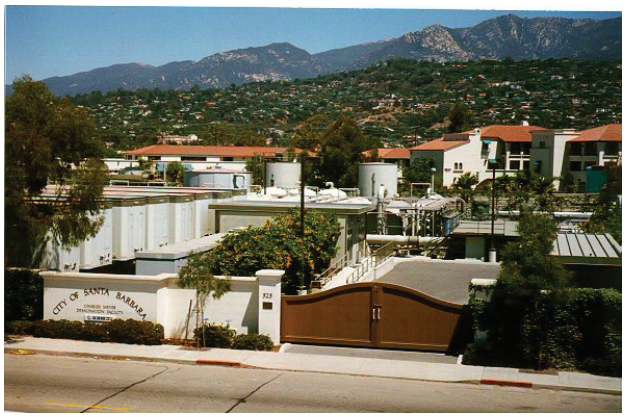
Besides delivering project water, the pipeline can be utilized to take advantage of available non-project water on a year-to-year basis to firm up deliveries during drought.

Cost Information: The variable costs for State Water are approximately $200/AF for water provided by exchange with SYRWCD-ID#1 and $300 for State Water delivered into Lake Cachuma, plus the treatment cost of $100/AF at Cater Treatment Plant. The total project capital costs include costs for the State portion and the local (CCWA) portion of the project. The State portion capital cost is approximately $461 million. The City's share is 7%, or approximately $32.3 million. The local portion has a capital cost of approximately $119 million, with a City share of 13%, or approximately $16 million. The unit cost, including amortized capital costs and variable costs, is approximately $1,600/AF.

Desalination

Description: The City constructed a reverse osmosis seawater desalination facility as an emergency water supply during the drought of 1987-1992. The facility has since been incorporated into the City's long-term supply plan as a way of reducing shortages due to depleted surface supplies during drought. Two neighboring water purveyors participated in the temporary project, but have since dropped out of the project. A portion of the reverse osmosis

filtration capacity was subsequently sold, leaving current capacity of 3,125 AFY. This capacity is entirely dedicated to City use, though it is currently in a long-term storage mode to reduce maintenance costs and would require approximately one year to recommission. This time frame is consistent with the anticipated use of the facility during drought, a water shortage condition that develops rather slowly.



Annual Capacity: With the departure of the co-participants and sale of a portion of the capacity, the desalination facility now has a production capacity of up to 3,125 AFY, subject to time and costs to recommission as noted below.

Operating Criteria: Relatively high variable costs for desalination make this supply the last to be used during periods of shortage. Recently updated water supply policies identify a key goal of deferring reactivation until at least the sixth year of a critical drought period.

Cost Information: A 2009 study by Carollo Engineers estimated variable costs at $1,470/AF and a capital cost of $17.7 million for reactivation. The original capital cost for construction of the facility was $34 million. Approximately $3 million is set aside as a reserve for this purpose. The balance would be budgeted as a part of the Water Fund Capital Program.

Recycled Water

Description: The City initiated planning for a water reclamation project in the early 1980's. Phase I was completed in 1989. It included addition of tertiary treatment with carbon filtration and disinfection at El Estero Wastewater Treatment Plant, a 600,000 gallon distribution reservoir and pumping station, and 5.1 miles of distribution main. Phase II was completed in 1992, adding an additional pumping station, a 1.5 million gallon reservoir, and 8.3 miles of distribution main. The system now provides recycled water to 80 accounts that serve 440 acres of landscaped area at parks, schools, golf courses, and other large landscaped areas. Several public restrooms have been retrofitted to use recycled water for toilet flushing. Water is provided at 80% of the potable water irrigation rate as an incentive for using recycled water and to compensate for additional irrigation requirements associated with salt leaching. Monitoring of salt levels in the soil was conducted twice per year from 1993 through 2003. No long-term build-up of soil salt was indicated.

Annual Capacity: The system has the capacity to treat and deliver 1,400 AFY; current demand is approximately 800 AFY, plus approximately 300 AFY of process water for use at EEWTP.

Future Uses: Optimization of the use of recycled water has been mostly accomplished with the completion of Phase II. Distribution pipelines have been constructed to all cost effective use areas, and most existing potential user sites are now connected. Use of recycled water for toilet flushing has been implemented in selected public restrooms and others are being added. New development in proximity to the recycled water main is required to utilize recycled water for landscape irrigation. Conversion or remaining potable use at current user sites, addition of new users along the existing distribution, and some limited expansion of the distribution system are expected to allow an additional 300 AFY of new usage. Recycled water users enjoy a rate that is 20% below potable irrigation for recreational sites and 60% below rates for commercial customers.

Operating Criteria: Recycled water is a non-variable supply in that it can only be supplied to those customers that are connected to the recycled water system. Usage is relatively constant regardless of drought conditions. Some potable water is blended with recycled water as a means of maintaining acceptable recycled water quality.

Cost Information: Variable costs, including pumping and treatment, range from $157/AF for the Phase 1 zone to $247/AF for the Phase 2 zone. The capital cost for the construction of Phases I and II was approximately $15.2 million. The annualized unit cost, including amortized capital costs and variable costs, is approximately $1,450/AF.

Projected Water Supplies

Table 12 itemizes projected water supplies at five-year increments from 2010 to 2030. Some deliveries are projected to be reserved to build banked storage and carryover in preparation for a critical drought period. A safety margin of 10% is maintained, consistent with City water supply policies, in case of unanticipated added demand, such as annexations, or supply shortages.

Transfer Opportunities

The City's primary water supply challenge is enduring the occasional prolonged droughts that have reoccurred roughly every 40 years, and are projected to occur more frequently as a result of climate change. At other times, the combination of multi-year storage capacity at Lake Cachuma and groundwater supplies to supplement reduced deliveries from Gibraltar Reservoir provides ample water supplies. Accordingly, the most attractive exchange or transfer opportunity will be the use of water banking to build a reserve for use during the critical drought period. State Water supplies in excess of year-to-year needs are projected to be available in amounts averaging 376 AFY in the long-term scenario of future conditions described in Section 5. Approximately 4,400 AF is available in the six years preceding the local critical drought period of 1947 to 1951. This projected availability is the basis of updated water supply policy to investigate banking opportunities as the primary means of deferring use of desalination until at least the sixth year of a drought.

(Continued on second page following)

(This page intentionally left blank.)

Table 12

Water Supplies - Current and Projected (AF)

	Actual	Projected			
Potable Water Supplies	**2010**	**2015**	**2020**	**2025**	**2030**
Wholesaler: CCWA/State Water	2,084	2,064	2,043	2,023	2,002
Less State Water Deliveries to Carryover/Banked Storage	0	-150	-250	-300	-200
Cachuma Project	8,277	8,172	8,070	7,967	7,863
Less Project Water to Local Carryover Storage	-640	-1,300	-1,283	-1,313	-1,297
Gibraltar Reservoir/Devils Canyon	2,933	3,206	3,206	3,206	3,206
Mission Tunnel	1,220	1,125	1,125	1,125	1,125
Groundwater	1,164	1,083	1,083	1,083	1,083
Desalination	0	0	0	0	0
Total Potable Supplies:	**15,038**	**14,200**	**13,994**	**13,791**	**13,782**
Less Blend Water:	-651	-300	-275	-275	-275
Less Net Exports to GWD:	-38	0	0	0	0
Less Export to Groundwater Storage:	-75	-150	-150	-150	-150
Potable Supplies Available for Retail Demand:	**14,274**	**13,750**	**13,569**	**13,366**	**13,357**
Less Projected Retail Demand:	-12,731	-12,436	-12,226	-12,093	-12,005
Available for Safety Margin:	**1,543**	**1,314**	**1,343**	**1,273**	**1,352**
% Available for Safety Margin (10% goal per City policy):	**11%**	**10%**	**10%**	**10%**	**10%**

Notes:

1) Above projections assume years of normal supply availability
2) Adequate water supply during critical drought depends on carryover/banking of SWP and/or Cachuma water during normal years
3) Projections reflect minor projected increases in demand, which are offset by demand reduction from new conservation & recycled water
4) State Water delivery projections per CCWA
5) Cachuma Project yield reflects 5% reduction over 20-year planning period due to sedimentation
6) Gibraltar yield based on 70% of estimates used in Draft EIR for Cachuma water rights hearing (Mitigation Mode - normal years)
7) Mission Tunnel yield based on Draft EIR for Cachuma water rights hearing
8) Groundwater: average pumping amounts for 2030 conditions under LTWSP performance analysis at 14,000 + 10% safety margin

	Actual	Projected			
Recycled Water Supplies	**2010**	**2015**	**2020**	**2025**	**2030**
Recycled Water from Tertiary Filters (net of process water)	45	575	675	750	825
Blend Water	651	300	275	275	275
Total Production for Recycled Retail Demand:	**696**	**875**	**950**	**1,025**	**1,100**

Notes:

1) 2010 reflects current secondary process issues; assumed to be resolved by 2015, allowing reduction in blend amounts
2) Reflects connection of 300 AFY of new recycled water demand by 2030

(This page intentionally left blank.)

Future Water Supply Projects

As mentioned above, investigation of options for banking unused supplies of State Water is expected be the primary option for deferring reactivation of the desalination facility. Other planned water supply projects include:

- Demand Reduction/Water Conservation Program: As described herein, the City will continue to implement a cost effective water conservation program in compliance with the CUWCC BMP's and equivalent to Program B as identified in the Water Conservation Technical Evaluation prepared by Maddaus Water Management.

- Sedimentation Management: An updated assessment of the City's Gibraltar Reservoir is planned to determine if there are cost effective options for halting loss of storage capacity. Additionally, the City will promote the development of a long term strategy to minimize loss of storage at Lake Cachuma, in conjunction with Cachuma Project Member Units and other appropriate parties, including State and Federal agencies.

- Pass Through Operations for Gibraltar Reservoir: As noted above, the existing Upper Santa Ynez River Operations agreement provides for storing Gibraltar water in Lake Cachuma to replace storage capacity lost to sedimentation. The City is working with the other parties to the agreement to develop information for environmental analysis of a Warren Act contract between the City and the U. S. Bureau of Reclamation.

- Ortega Groundwater Treatment Plant Rehabilitation: As described under the Groundwater section, water quality in Storage Unit No. 1 requires that pumped water be treated to remove sulfides, iron, and manganese prior to introduction into the distribution system. Final design has been completed and the project is expected to be bid in late 2011 or early 2012.

- Optimized Groundwater Management: Updated groundwater modeling by USGS will be used to assess strategies for groundwater management, including optimal use of available recharge, injection of potable water for artificial recharge, injection of recycled water as a barrier to seawater intrusion. Sites for new or replacement production wells will be evaluated with the goal of minimizing seawater intrusion. The City will develop a Groundwater Management Plan, consistent with State law, to provide for the orderly and responsible use of the City's groundwater resources.

- Expanded Recycled Water Use: Remaining system capacity of 300 AFY will be used to connect new users, primarily along the existing distribution system constructed during Phase 1 and Phase 2 of the project, with possible extensions where cost effective. Improvements to the secondary treatment process are planned, which will have the added benefit of reducing blend water requirements for recycled water. Options for further reducing blending will be investigated.

Implementation Schedule

Table 13 identifies implementation time frame for items related to the UWMP and provides notes on implementation of plan elements since adoption of the 2005 UWMP.

Table 13
Implementation Schedule

Description of Item	Implementation Schedule	Notes on Implementation Since 2005 UWMP Adoption
Water Conservation Program	Ongoing pursuant to MOU Regarding Urban Water Conservation, Long Term Water Supply Plan, and Water Conservation Act of 2009 Implement "Program B" water conservation measures	The program has been ongoing since adoption of the 2005 UWMP update. Results suggest demand reduction in excess of the program goal of 1,500 AFY.
Sedimentation management at surface reservoirs	Conduct sedimentation management alternatives assessment at Gibraltar Reservoir during FY 2012 Promote a joint effort to develop a long term strategy for sedimentation management at Lake Cachuma	Regular bathymetric surveys are conducted to monitor change in reservoir capacities
"Pass Through" operations for storage and conveyance of Gibraltar water at Lake Cachuma	Warren Act contract expected to be executed in FY 12, allowing "pass through" accounting to commence	Pass Through Agreement continues to guide operation of Gibraltar Reservoir; decision to implement Pass Through mode was motivated by substantial siltation from 2007 Zaca Fire.
Ortega Groundwater Treatment Plant Rehabilitation	Completion expected in FY 14	Comprehensive feasibility, design, and pilot testing completed.
Optimized groundwater management	Initiate development of a Groundwater Management Plan during FY 12 Identify production wells in need of replacement or relocation; FY 12 & 13	Multiple Objective Optimization Model (MOOM) by USGS is available for use in testing water supply scenarios, seawater intrusion impacts, and optimal well placement. Initiated a 3-year project with USGS to update MOOM and add 3-dimensional water quality component for more accurate assessment of seawater intrusion. Second of two new wells constructed completed.
Expanded recycled water use	Ongoing requirements for use of recycled water where available. Inventory of potential added uses being verified. Add 75 AFY of new recycled water demand by 2015 as a part of compliance with Water Conservation Act of 2009.	Plant inventory has been created and is made available to recycled water users. Development applications subject to the City's recycled water use requirement, as applicable. Recycled water demonstration garden established at El Estero Wastewater Treatment Plant

Description of Item	Implementation Schedule	Notes on Implementation Since 2005 UWMP Adoption
Enhancement of yield from State Water Project facilities	Investigate options for banking unused State Water when available, for use in mitigating effects of critical drought period and deferring reactivation of the desalination facility. Investigation planned for FY 2012.	Held initial discussions on water banking with relevant contacts.
Desalination Facility	Maintain as permanent part of City water supply in long term storage mode to minimize maintenance costs; ongoing.	Long-term storage mode has continued
Demand/Revenue Tracking	Ongoing, with monthly water production reports and semi-annual revenue reports to Water Commission and City Council	Demand and revenue tracking are an integral part of the budget adoption process and have continued.
Conduct an emergency water supply analysis to update current emergency procedures and evaluate the accuracy and scope of expected scenarios.	Anticipated during FY 12 & FY13	Improvements have been made to SCADA systems, distribution system, and back-up power supplies.

(This page intentionally left blank.)

Section 5: Water Supply Reliability and Water Shortage Contingency Plan

Water Supply Reliability and Drought Planning

During the recent update of the LTWSP, the City paid particular attention to the effects of water shortage caused by drought. This is appropriate based on a long history of drought in this region. Two key issues related to drought were analyzed:

1. Planned Duration of Critical Drought Period ("Multiple Dry Year Period")

   The critical drought period for the City's water supply occurs when there are multiple consecutive years of below average rainfall. This is due to the particular hydrology of the Santa Ynez River, where little or no inflow to Lake Cachuma typically occurs until at least average rainfall has occurred. When this condition of average or less rainfall continues for multiple years in succession, the storage level of Lake Cachuma drops and shortages in deliveries occur. Based on historical data, the critical drought period has had a duration of five years, with the worst local drought being the drought of 1947-1951.

   Climate change has the potential to impact the water supply, though it is still unclear whether this will have a significant effect during the planning period. To the extent information is available for the local area, overall rainfall amounts would be expected to be similar to recent history, but an increasing frequency of extreme rainfall events can be expected. This has the potential to result in an extended irrigation season with some associated increase in demand. From a water supply perspective, more concentrated rainfall events may have the benefit of increased inflow to Lake Cachuma. Guidance from the state planning agencies is that California can expect a 20% increase in both the frequency and the duration of dry periods. For the City's water supply this would suggest a critical drought period frequency of perhaps once every 30 years, instead of 40 years, and a duration of 6 years, instead of 5 years. Even though climate change impact information is incomplete and still undergoing critical review, the six-year drought period is a reasonable test and staff has used it for critical drought period analysis of the water supply, as discussed below under "Water Supply Performance."

2. Role of Desalination

   The City's desalination facility is a vital resource as a back-up for potential prolonged drought and unforeseen interruptions of the water supply and would help mitigate the economic impact of such situations. It is also a reliable source of water, once in operation. However, as noted above, reactivation of the facility will result in significant costs, if only for the planning and design work that would be needed to start the process. In recent years, a dry period of only three years has been enough to trigger the start of planning to reactivate the facility in case of continuing dry weather. In 2004, after three years of drought, the storage level at Lake Cachuma had been reduced to about 70,000 AF out of 190,000 AF (37% of capacity) and the City was beginning this process of planning for reactivation.

As a result of discussion of this issue between staff and the Water Commission, the water supply has been modeled to stretch available Cachuma supplies over a potential 6-year drought period, with the goal of deferring the reactivation process, i.e. to plan for operation in the sixth year of a critical drought period instead of the fifth year. This would reduce the frequency of the planning and design effort, as well as reducing the likelihood that the substantial expense of actually reactivating the desalination facility would be needed. This is another basis for the six-year critical drought period used in performance modeling.

Water Supply Performance – Multiple Dry Year Periods

The three charts included in Appendix E are based on a worksheet model developed to provide a long-term simulation of the City's water supply as a part of the LTWSP update. The City considers this sort of long term analysis to be the best way to illustrate water supply vulnerability during multiple year dry periods of various durations.

The worksheet uses a water supply target of 14,000 AFY of potable and recycled water production, plus 10% safety margin as applicable based on the various scenarios. The target is based on:

- The combined effects of new development during the planning period;
- Reductions in water use due to updated plumbing codes and appliance standards, the effects of the City's water conservation program; and
- The statutory requirement to meet a reduction in per capita daily water use by 2020.

The 14,000 AFY value also represents the rounded 5-year average demand for 2006 through 2010. Note that this is conservative compared to actual projected urban water use under the Water Conservation Act of 2009. Given uncertainties in water supply in California, it is appropriate to be conservative when viewing water management from the supply perspective.

Local supplies are estimated using results from the Santa Ynez River Hydrology Model developed by the Santa Barbara County Water Agency. State Water delivery estimates are based on the "Future Conditions" assumptions in DWR's 2009 State Water Project Delivery Reliability Report (as used for CCWA delivery projections for 2030), but modified to assume a delivery limit of 50% of Table A amount in any year. This is to provide a sensitivity analysis to illustrate the potential effect of restrictions similar to those experienced during the period of 2008-2010.

An additional hypothetical year was added at the end of the 1947-1951 drought (the worst historical drought on record for the Santa Ynez River) to simulate a 6-year critical drought period. For this sixth year, deliveries from Gibraltar, Mission Tunnel, and SWP are assumed to be the average of the preceding five years of drought. Cachuma is assumed to have negligible inflow during year six and the 5-year modeled yield is stretched out over the 6-year period. The charts illustrate how the City's water supplies would be used in the most cost effective manner to meet the projected demand during varying water supply conditions, ranging from very wet to very dry. The worksheet was used to explore the potential to defer the use of desalination at least until the sixth year of a drought.

Three scenarios are represented:

- The first represents “Current Conditions”, with Cachuma entitlement of 8,277 AFY and no use of the safety margin.

- The second represents the near-term condition with Cachuma entitlement also at 8,277, but with a 10% safety margin included.

- The third represents 2030 conditions, with projected future Cachuma entitlement at 7,863 AFY and 10% safety margin included.

Planned demand reductions during the critical drought period are set at 10% in year 4, 15% in year 5, and 15% in year 6.

A category called “Drought Supplies” is used to indicate water that would be used defer the use of desalination, either from unused State Water that is banked for use during dry periods or from the purchase of water during the critical drought period. The worksheet estimates that approximately 4,400 AF of unused State Water would be available for banking if contractual arrangements could be made to store the water for future use. Assuming a 50% deduction for the service of banking the water, about 2,200 AF of water would be available to meet the need for drought supplies. Water purchases would be pursued if additional water were needed. The desalination facility is proposed to remain a part of the City’s water supply and would be used, if needed, to address shortages remaining after the use of banked water and purchased water.

The worksheet uses supplies as needed to meet the water supply target according to the following sequence of priorities:

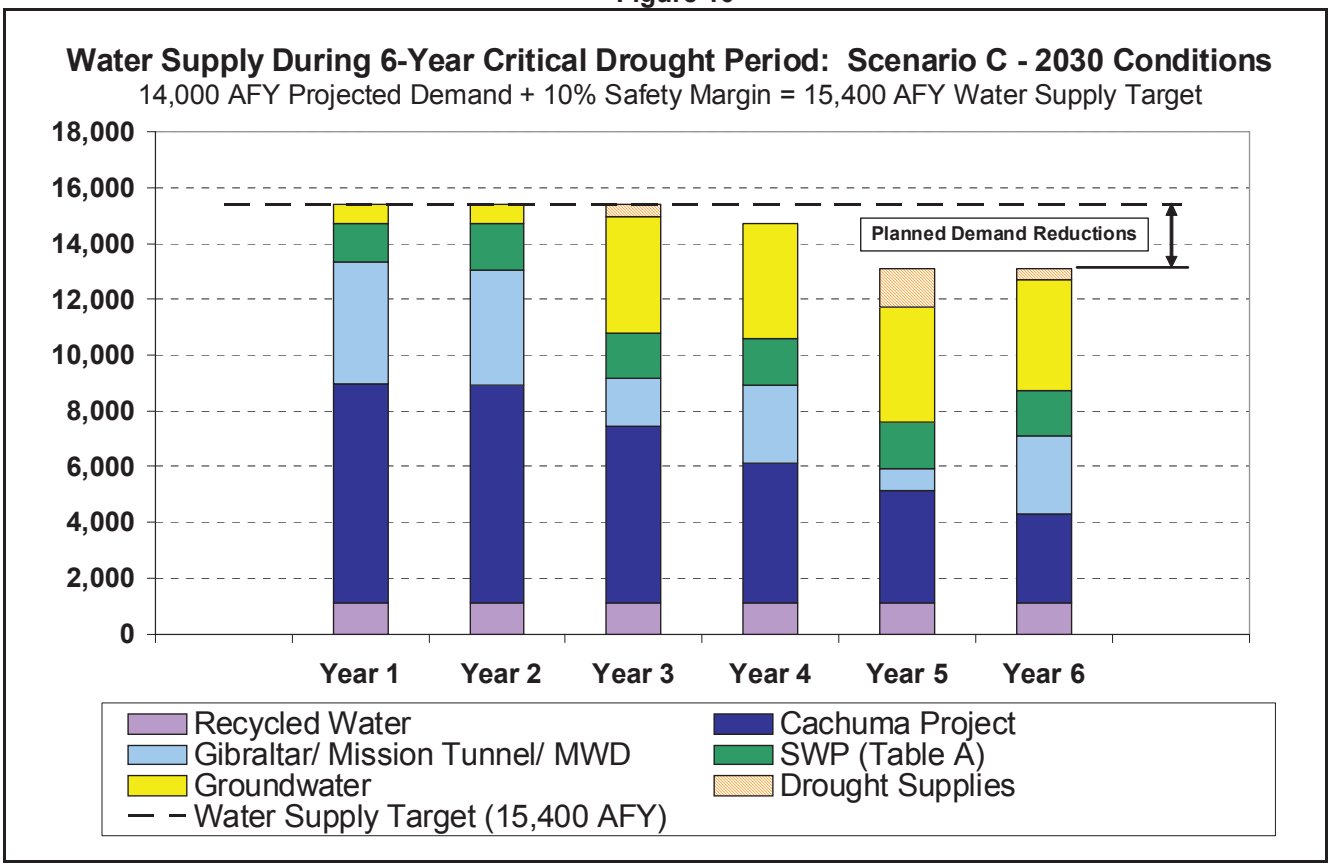
1. All available water from Gibraltar, Mission Tunnel and the Montecito Water District transfer, plus the 1,100 AFY of recycled water;
2. Minimum groundwater usage of 700 AFY;
3. The City’s “exchange water” obligation of SWP Table A water (600 AFY);
4. Available Cachuma entitlement (except that remaining SWP Table A water is taken in year 2 and later to preserve available Cachuma water)
5. Remaining available SWP Table A water;
6. Added groundwater pumping up to the maximum amount of 4,150 AFY, subject to a cumulative pumping limit to minimize seawater intrusion;;
7. Deliveries of “Drought Supplies” (banked water or purchased water as available) through SWP facilities.
8. Desalination (if necessary)

The worksheet is set up to invoke Planned Demand Reductions in years 4, 5, and 6 prior to taking delivery of Drought Supplies. The cumulative drawdown of available groundwater is tracked.

The water supply charts illustrate that the City’s water supply can be met in most years with limited groundwater pumping, an average of only about 75% of available State Water, no drought supplies (banked water, purchased water, or desalination), and no need for extraordinary demand reductions. The real test of the water supply is the six-year critical drought period, beginning with model year 1947. Note that the sixth year is a hypothetical year

that extends the historical 5-year drought to a 6-year drought. The 6-year critical drought period is highlighted in Figure 10 below.

Figure 10



Key points illustrated include:

- Years 1 & 2: much like any non-drought year (mostly surface water, plus limited groundwater pumping)
- Year 3: Cachuma deliveries reduced to stretch remaining supplies; maximum groundwater pumping begins; small amount of Drought Supplies required
- Year 4: First year of Planned Demand Reductions (4% of allowed 10%); further reduction at Cachuma is offset by some increased inflow at Gibraltar; no Drought Supplies required
- Year 5: 15% Planned Demand Reductions; 1,364 AF of Drought Supplies taken; zero water delivered from Gibraltar
- Year 6: 15% Planned Demand Reductions; maximum pumping constrained slightly by the cumulative limit; some Drought Supplies required as a result; rainfall provides water from Gibraltar, but not enough to increase Cachuma deliveries.

Single Dry Year and Three Year Dry Periods

As discussed above, the City's diverse water supply and multi-year storage capacity at Lake Cachuma minimize the effect of a single dry year. An example is 1977 where rainfall in the local (Santa Ynez River) and State Water Project watershed were below average. The water supply charts illustrate that State Water deliveries are significantly reduced, but local surface

water deliveries remain about average and the small difference is made up with added groundwater, with no need to implement any extraordinary measures. A dry period over the next three years is best illustrated by Year 1 through Year 3 in Figure 10.

Water Quality Impacts on Reliability

Water quality has potential impacts on the City's water supply in three areas:

- Reaction of Dissolved Organic Material to Produce Disinfectant Byproducts: More stringent State drinking water standards for disinfection byproducts have been adopted, causing the potential for violations due to relatively high levels of dissolved organics in water coming to Cater Treatment Plant from surface water supplies. The City has recently finished a complete rehabilitation of the plant and is in the pilot stage of a study to determine the best manner to insure the Cater water can continue to meet applicable standards for disinfection byproducts. Several feasible options have been identified and it is expected that facilities can be constructed to successfully address the problem.

- Groundwater Quality: Much of the City's groundwater supply exceeds secondary standards for taste and odor, as well as iron and manganese. In the Foothill Basin, the levels are low enough that they can be successfully treated at the wellhead. In Storage Unit No. 1, water has traditionally been pumped to the Ortega Groundwater Treatment Plant before being put into the distribution system. A complete overall of the plant is planned. It has just completed the pilot phase and is being designed. The completed project will allow full use of the City's groundwater resources and may play a part in complying with new standards for disinfection byproducts mentioned above.

- Recycled Water: Due to hardness of local water supplies, many customers use the ion exchange process to soften water at their homes and businesses. The result is added salt, particularly sodium chloride, in the City's recycled water. This has been addressed by monitoring salt levels in the soil over a ten-year period and by blending potable water with recycled supplies to meet water quality standards for irrigation. The City also promotes the use of potassium chloride as a substitute for sodium chloride.

Water Shortage Contingency Plan

On November 1, 1988 the City Council adopted a Drought Contingency Plan in anticipation of worsening drought. While the plan provided useful guidance during the drought, the City's experience during the drought suggested that a revised plan should have more flexibility. This is especially important with the increased diversity of the City's current water supply. Accordingly, the original Drought Contingency Plan has been updated and is included herein.

The plan is intended to provide guidance, rather than absolute direction, for City action in response to water shortage. The stages are defined in relation to maximum acceptable shortage of 10% - 15% per policy in the updated Long-Term Water Supply Plan. A moving 12-month total of production is used to monitor water usage during periods of normal supply and during water shortages, with actual consumption compared to the target on a monthly basis.

Water Use Restrictions

Chapter 14.20 of the Santa Barbara Municipal Code (applicable portions attached as Appendix F) defines specific water use restrictions that apply during water shortage conditions, subject to Council direction. These include the following:

1. Prohibition on water waste (prohibited at all times regardless of stage);
2. Runoff prohibited (prohibited at all times regardless of stage);
3. Use of potable water prohibited when recycled water is available and deemed feasible (applicable at all times regardless of stage);
4. Restaurant notices required; no water service without request;
5. Prohibition on hosing of hard surfaces;
6. Operation of ornamental fountains prohibited;
7. Water shortage notices required in hotel/motel rooms;
8. Restrictions on irrigation (degree of restriction may vary from night-time irrigation only to complete prohibition on irrigation, except by hand-held bucket);
9. Shut-off nozzle required for boat and vehicle washing;
10. Introduction of water to swimming pools restricted;
11. Potential interruption of service to irrigation meters.

Action under each shortage stage includes a determination as to which, if any, of the above measures are necessary.

Rates and Revenue Issues

Since 1989 the City has used an inverted block rate billing system providing standardized allotments for residential customers based on the type of building and number of dwelling units. Fiscal Year 2011 rates are shown in Appendix G. Historical usage has not been used as the basis for allotments since it tends to penalize customers who practice efficient water use. Commercial and industrial allotments are based on historical off-peak usage since standardized allotments are infeasible for such customers. The system worked well during the 1987-1992 drought when allotments and block prices were modified as necessary to shape demand and insure adequate revenue. The system proved to be workable even for the 50% shortages experienced. It is important to note that even severely increased rates will have the mixed effect of reducing demand and providing added revenue to offset losses from reduced overall consumption. The City's experience has been that block prices and allotments are best determined based on actual circumstances rather than trying to determine appropriate values in advance based on hypothetical situations. It is important to note that a continuing decline in demand will result in increased unit rates to generate the revenue required to fund the mostly fixed costs of operating the water system.

Normal Supply Stage

Definition: Supplies are considered normal when the projected water supply availability is sufficient to equal or exceed the projected normal demand for the next three years.

Actions:

- ⇨ Continue efforts to preserve water supply sources, such as management of watersheds to minimize siltation, banking of water as feasible to firm up deliveries through the State Water Project, and development of optimal groundwater pumping capacity;
- ⇨ Continue promotion of long-term water conservation practices designed to improve efficiency without impacting lifestyles, including high efficiency plumbing retrofits, low water using landscaping, efficient irrigation practices, public information regarding water awareness, and inverted block rate pricing;
- ⇨ Extend the use of recycled water where feasible and cost effective;
- ⇨ Monitor demand in terms of actual consumption and cumulative commitments to serve;
- ⇨ Water use restrictions are limited to prohibition of water waste.

Stage 1 Water Shortage Condition -- "Water Shortage Watch"

Definition: A short-term water shortage condition declared by Resolution of the City Council upon being advised that projected supply availability during the next three years may be approximately 10% less than projected normal demand.

Actions:

- ⇨ Staff prepares a report to the Water Commission and City Council addressing:
  - Status of surface water supplies;
  - Status of City's groundwater resources and pumping capability;
  - Availability of desalination facility and related cost and permitting issues;
  - Projected deliveries of State Water Project entitlement;
  - Anticipated availability of banked water and one-time purchase of water through the State Dry Weather Purchase Program or other short term transfers of water;
  - Possible reduction in Cachuma deliveries to City in excess of reductions agreed to by member units to allow build-up of City carryover at Cachuma.
  - A range of water supply scenarios based on various levels of assumed rainfall;
- ⇨ Water Commission and City Council consider Staff recommendation regarding adoption of a resolution declaring a Stage I Water Shortage Condition.
- ⇨ Cachuma Project deliveries reduced by up to 20% as agreed by Member Units when Project storage drops below 100,000 AF;
- ⇨ Public advised of the City's water supply situation; extraordinary reductions in water use are not anticipated to be necessary at this stage.
- ⇨ Water use restrictions are limited to prohibition of water waste.

Stage 2 Water Shortage Condition -- "Water Shortage Alert"

Definition: A short-term water shortage condition declared by Resolution of Council upon being advised that projected supply availability during the current or impending water year is anticipated to be approximately 10% less than projected normal demand.

Actions:

- ⇨ Staff prepares a report to the Water Commission and City Council addressing:
  - Updated water supply scenarios based on various levels of assumed rainfall;
  - Need for:
    - ✓ Demand reduction by the public;
    - ✓ Water use restrictions;
    - ✓ Design and permitting work associated with temporary water supply augmentations;
    - ✓ Possible activation of the desalination facility;
  - Revenue projections and appropriate changes in water rates;
- ⇨ City Council considers staff and Water Commission recommendation regarding adoption of a resolution declaring a Stage II Water Shortage Condition.
- ⇨ Public advised of need for 10% added water conservation savings.
- ⇨ City Council considers need to begin planning and design work for activation of the desalination facility.
- ⇨ Suspension of development approvals is considered.
- ⇨ Determine the need for water use restrictions pursuant to SBMC Section 14.20.215 and incorporate appropriate exemptions into the water shortage resolution.
- ⇨ Public information effort is aimed at advising the public regarding:
  - The City's water supply situation;
  - Efforts being made by the City to minimize impacts of the water shortage;
  - The public's role in achieving demand reductions;
  - Staff enforces water use restrictions, pursuant to Council direction; and
  - Staff implements rate changes, pursuant to Council direction.

Stage 3 Water Shortage Condition -- "Water Shortage Emergency"

Definition: A short-term water shortage condition declared by Resolution of Council upon being advised that there is a projected supply shortage of greater than 10% as compared to the projected normal demand.

Actions:

- ⇨ Staff prepares a report to the Water Commission and City Council addressing:
  - Updated water supply scenarios based on various levels of assumed rainfall;
  - Need for:
    - ✓ Further demand reduction by the public;
    - ✓ Increased water use restrictions, including potential prohibition on uses other than drinking water and sanitation;
    - ✓ Accelerated design, permitting, and construction work associated with temporary water supply augmentations;
  - Review of revenue projections and appropriate changes in water rates;
  - Evaluate supply availability from desalination facility:
- ⇨ City Council considers staff and Water Commission recommendation regarding adoption of a resolution declaring a Stage III Water Shortage Emergency Condition pursuant to

California Water Code, Chapter 3.

- ⇨ Revised demand reduction target is announced to public, accompanied by information about how to achieve required reductions and efforts being made by the City to resolve the water shortage condition.
- ⇨ Water use restrictions adjusted as necessary pursuant to Santa Barbara Municipal Code Section 14.20.215.B.
- ⇨ Project potential need for activating desalination facility, including potential expansion of capacity.
- ⇨ Evaluate revenues and the need for further rate changes; staff implements changes pursuant to Council direction.
- ⇨ Consider further action regarding suspension of development approvals.
- ⇨ Water use restrictions enforced by staff pursuant to Council direction.

While the City's long-term supply planning is based on a maximum planned shortage of 10% - 15%, unforeseen circumstances may result in the need to respond to shortages of up to 50%. Based on the City's experience with the 1987-1991 drought, the measures identified above are expected to be useful in achieving short-term demand reductions of up to 50%, carefully tailored to the situation at hand. Flexible application of block rates and allotments, water use restrictions, and public information will be used to meet the required demand reduction target. Steeply inclined block rates would partially offset lost revenue due to demand reductions. City reserve policies dictate maintaining Water Fund reserves at about $12 million (about 30% of annual budget) to address a variety of contingencies. This will also help mitigate revenue impacts associated with a severe shortage. In addition, a separate $3 million reserve is maintained for potential reactivation of the City's desalination facility, or other capital projects associated with severe drought.

Measuring and Monitoring Actual Reductions

Water is produced into the distribution system to meet the demand. Therefore measurement of water production is a simple mechanism for monthly, weekly, or even daily monitoring of water demand to determine the effectiveness of demand reduction measures. Such monitoring proved feasible and useful during the previous severe drought.

Catastrophic Supply Interruption

Besides drought, the City may experience a catastrophic interruption of the water supply as a result of natural disasters such as earthquake or tsunami, a regional power outage, terrorism, wildfire, or sabotage. Emergency administrative procedures are detailed and kept updated in the City's Emergency Operations Center Manual. Noted below are planning and response measures particularly associated with the City's water supply.

Preparations for responding to catastrophic events:

- A diverse portfolio of supplies provides redundancy that increases the likelihood of being able to meet emergency needs even under catastrophic conditions.

- Primary water supply sources and the main treatment plant have been planned to flow to the City by gravity to reduce normal operating costs and minimize disruption during disasters.
- A groundwater production system has been developed and maintained to augment supplies to the distribution system or provide direct emergency drinking water supplies should the distribution system be put out of service. In the event of prolonged power outage, power would be provided by portable generators.
- Back-up power supplies with automatic transfer switching and SCADA control capability have been installed at the primary water treatment plant and critical distribution pump stations.
- The potentially unstable and uncovered Sheffield Reservoir has been demolished and replaced with underground tanks designed and built to current seismic standards.
- Computerized telemetry system (SCADA) is being provided throughout the distribution system to monitor system problems, whether minor day-to-day problems or major disruptions.
- An ongoing program of water main replacement targets sections of the distribution system with the highest history of breaks.
- Upgraded security, including more secure fencing, video monitoring, and alarms, is being provided at all water supply facilities.
- Public access to water supply facilities has been limited for security reasons.
- City distribution system crews are trained in pipe repair and replacement as a part of their normal duties and are continually ready to perform such work on an emergency basis as needed.
- All City employees are designated as emergency service workers and would be activated to do damage assessment and repairs, and to fill gaps left by staff that live out of town and may be unable to get to Santa Barbara due to disaster.
- The City's emergency response program includes emergency communications procedures that would be used for notifying the public about emergency water use restrictions, potential need to boil tap water prior to drinking, and locations where drinking water is available in the event of widespread distribution system failure.

Actions to be implemented during catastrophic conditions:

- Mobilization:
    - Supervisors assemble at Public Works Yard, 630 Garden Street
    - Determine which staff are present and which need to be contacted
    - Contact absent staff and direct them to report once families are safe
    - Check status of all equipment, refuel, and restock supplies on vehicles
    - Water Resources Laboratory staff mobilize at City lab and prepare for anticipated water quality test requests
- Dispatch crews to inspect, patrol, and report on condition of facilities and distribution piping in designated areas of the system:

<u>Group A</u>:

Vic Trace Reservoir & La Coronilla Pump Station
La Mesa Reservoir
Escondido Reservoir & Pump Station

Hope (Calle Las Caleras) Pump Station,
Hope Reservoir
Campanil Hills Pump Station

Group B:
Reservoir No. 1
East Reservoir & Bothin Pump Station
El Cielito Reservoir and Skofield Pump Station
Skofield Reservoir
La Vista Reservoir
Northridge Pump Station

Group C:
Reservoir No. 2
Sheffield Reservoirs No. 1 and No. 2 and El Cielito Pump Station
South Portal of Mission Tunnel
Rocky Nook Pump Station
Sheffield Pump Station
Tunnel Road Reservoir & Pump Station
Cater Cross-Tie Pump Station

Group D:
Wastewater Lift Stations at:
Campanil
Braemar
Cliff Drive
Linda Lane
El Camino De la Luz

Group E:
Wastewater Lift Stations at:
Skofield
La Colina
Via Lucero
Tallant Road
Miradero Lane
Andante
Vista Elevada

- Assign qualified staff to use SCADA telemetry system, to the extent it is still functional, to determine the extent of system damage and the most critical isolation points on the distribution system.
- Conduct a complete inspection of the Cater Water Treatment Plant and Ortega Groundwater Treatment Plant to determine status and extent of damage.
- Contact Cachuma Project operators (USBR and COMB) to determine condition of Bradbury Dam and related facilities.
- Contact the City's dam caretaker at Gibraltar Reservoir to determine condition of Gibraltar Dam and related facilities.
- Assess condition of City groundwater wells by measuring water levels and well depth, and taking water samples for analysis of water quality.
- Assess the condition of two tunnels (Tecolote Tunnel from Lake Cachuma and Mission Tunnel from Gibraltar Reservoir) by measuring flow from the tunnels. While earthquake

may result in tunnel collapse, it is likely that some residual flow from tunnel infiltration will be available and will flow to the City's treatment plant by gravity.

- Assign qualified staff to utilize the City's hydraulic computer model to simulate identified field deficiencies and run scenarios to identify the most efficient repair, isolation, or reconstruction recommendations.
- Prioritize distribution system repairs to best meet critical needs, including fire fighting, drinking water, and sanitation; consider reserving a portion of available potable supply for drinking water purposes in the event of prolonged interruption.
- Develop materials list for treatment plant and distribution system repairs and communicate with potential suppliers.
- Allocate available portable generators and pumps according to highest need for groundwater wells, flood remediation, sanitation, firefighting, or powering emergency facilities.
- Develop a clear message for dissemination to the public regarding:
    - Status of distribution system
    - Water use prohibitions
    - Allowable water uses
    - Potential need to boil drinking water prior to consumption
    - Location and availability of emergency drinking water in the event of distribution system failure.

Potential Catastrophic Interruption Scenarios

Given the diversity of the City's water supply, there is a range of catastrophic supply interruption scenarios that may occur. At the extreme end of the range, a catastrophic seismic event could include failure of both Gibraltar Dam and Bradbury Dam (Lake Cachuma), also impacting State Water deliveries. Damage to groundwater wells would be expected as well. Table 14 summarizes some foreseeable interruptions of lesser, but more probable, magnitude. In an actual event, detailed analysis would be conducted to assess the extent and duration of interruption and the alternatives for short term replacement of lost supplies.

Table 14
Catastrophic Interruption Scenarios

Description	Projected Water Supply Reduction	Anticipated Duration	Response
Damage limited to distribution system: Main breaks in various parts of the City	No reduction in supply; delivery capability interrupted to portions of the City	Ranging from days to months depending on extent of damage	• Valve off damaged sections • Inventory customers without service & provide for access to emergency drinking water as necessary • Prioritize repair efforts based on health, safety, and sanitation
Collapse of Mission Tunnel: Supplies from Gibraltar Reservoir and Mission Tunnel infiltration interrupted	Initial loss of 35% to 50% of potable supplies; reduced to 12% to 27% by increasing Cachuma deliveries and groundwater pumping	Ranging from months to a year or more	• Assess extent of remaining tunnel flow • Restrict irrigation uses • Water usage restrictions, pricing, and public notification to reduce water use to targeted level based on actual circumstances • Consider increases in State Water Project delivery requests • Initiate emergency design and construction process for repair of tunnel
Collapse of Tecolote Tunnel: Supplies from Lake Cachuma, tunnel infiltration, and State Water Project interrupted	Initial loss of 50% to 65% of potable supplies; reduced to 15% to 30% by increasing Gibraltar deliveries and groundwater pumping	Ranging from months to a year or more	• Assess extent of remaining tunnel flow • Curtail most or all irrigation uses • Water usage restrictions, pricing, and public notification to reduce water use to targeted level based on actual circumstances • Consider extent to which supplies are available to assist neighboring agencies affected by loss of Cachuma deliveries • Participate with COMB & USBR in emergency design and construction process for repair of tunnel
Collapse of both Tecolote and Mission Tunnels: Supplies from Cachuma, Tecolote Tunnel infiltration, State Water Project, Gibraltar Reservoir and Mission Tunnel infiltration interrupted	Initial loss of up to 100% of normal potable supplies; reduced to 66% by initiating groundwater pumping	Ranging from months to a year or more	• Assess extent of remaining tunnel flow • Activate all available groundwater wells at maximum production levels • Consider public notification to accumulate emergency personal drinking water supplies while distribution system remains functional • Curtail all customer use other than water used for drinking – priority will be to maintain all available supplies and distribution capability for drinking water, sanitation, and firefighting • Initiate selected shut-down of portions of the distribution system to maintain functional pressure and flow in the remaining system; priority areas will be identified based on firefighting needs and feeding emergency drinking water distribution stations • Consider shutting off customer service connections to assist in maintaining distribution system functionality • Initiate emergency design and construction process for repair of tunnels • Initiate emergency design and construction process for reactivation of desalination facility for mid-range contribution to water supplies

(This page intentionally left blank.)

Section 6: Demand Management Measures

The City is a long-term leader in water conservation. The City's Water Conservation Program began as a response to drought in the late 1970's. In 1988, the Water Conservation Program was expanded pursuant to recommendations in the City's Five-Year Water Policy Action Plan. The program experienced increased participation due to the 1987-1991 California Drought. The subsequent 1994 Long Term Water Supply Program identified a goal of 1,500 AFY of additional water conservation, at target that was met and exceeded.

The City's current Water Conservation Program is a combination of the City's commitment to carrying out the California Urban Water Conservation Council's (CUWCC) Best Management Practices and the City's dedication to water conservation as an element of the 2011 Long-Term Water Supply Plan.

The City joined the CUWCC in January 1992 by signing the Memorandum of Understanding Regarding Urban Water Conservation. Since that time, the City has been actively carrying out the Best Management Practices as well as additional water conservation measures.

Earlier sections of this plan detail the analysis that went into determining the appropriate conservation measures for cost effectively managing the City's water demand and complying with urban water use targets. Appendix D summarizes the Water Conservation Technical Evaluation completed by Maddaus Water Management in October 2010. Appendix H includes the City's CUWCC reports documenting ongoing compliance with the MOU.

(This page intentionally left blank.)

Appendix A:

Documentation of Public Noticing, Community Notifications, Interagency Coordination, and City Council Action

(This page intentionally left blank.)

City of Santa Barbara

City Clerk's Office

www.SantaBarbaraCA.gov

735 Anacapa Street
P.O. Box 1990
Santa Barbara, CA
93102-1990
Tel.: 805.564.5309
Fax: 805.897.2623

PUBLIC NOTICE
City of Santa Barbara

NOTICE IS HEREBY GIVEN that the City Council of the City of Santa Barbara will conduct a Public Hearing on Tuesday, June 14, 2011, during the afternoon session of the meeting which begins at 2:00 p.m. in the Council Chamber, City Hall, 735 Anacapa Street, Santa Barbara. The hearing is to consider a recommendation to adopt the 2010 update of the City's Urban Water Management Plan (UWMP) as required by State law, and to adopt the City's updated Long Term Water Supply Plan (LTWSP), which is the basis for water supply information in the UWMP. The meeting is open to the public. Questions can be directed to the City's Water Hotline at (805) 564-5460.

Drafts of the UWMP and LTWSP will be available as a news item on the City's homepage at www.SantaBarbaraCa.gov beginning Tuesday, May 24, 2011. Any comments are requested by 12:00 noon, Friday, June 3, 2011 so they can be considered in preparation of the final drafts to be included in the City Council packet for the hearing on June 14, 2011. Written comments should be addressed to the City Council via the City Clerk's Office, P.O. Box 1990, Santa Barbara, CA 93102-1990. You are also invited to attend the hearing and address your comments to the City Council.

On Thursday, June 9, 2011, an Agenda with all items to be heard on Tuesday, June 14, 2011, will be available at 735 Anacapa Street and at the Central Library. Agendas and Staff Reports are also accessible online at www.SantaBarbaraCA.gov; under Quick Links, click on Current Council Agenda & Packet. Regular meetings of the Council are broadcast live and rebroadcast on Wednesdays and Thursdays at 7:00 p.m. and on Saturday at 9:00 a.m. on Channel 18. These meetings can also be viewed over the Internet at www.santabarbaraca.gov: Click on the Government tab, click City Council Meeting Videos (under Quick Links), and then click on the Video link for the meeting date.

In compliance with the Americans with Disabilities Act, if you need special assistance to gain access to, comment at, or participate in this meeting, please contact the City Administrator's Office at 564-5305 or inquire at the City Clerk's Office on the day of the meeting. If possible, notification at least 48 hours prior to the meeting will enable the City to make reasonable arrangements in most cases.

(SEAL)

Cynthia M. Rodriguez, CMC
City Clerk Services Manager
May 24, 2011

Printed on 100% post-consumer recycled paper

(This page intentionally left blank.)

SANTA BARBARA NEWS PRESS
Proof of Publication
(2015.5C.C.P)

Superior Court of
the State of California
In and for The County of Santa Barbara

Envelope No. 42322

In the Matter of: **PUBLIC NOTICE**

The undersigned, being the principal clerk of the printer of the Santa Barbara News Press, a newspaper of general circulation, printed and published daily in the City of Santa Barbara, County of Santa Barbara, California and which newspaper has been adjudged a newspaper of general circulation by the Superior Court in the County of Santa Barbara, State of California, Adjudication Number 47171; and that affiant is the principal clerk of said Santa Barbara News Press. That the printed notice hereto annexed was published in the SANTA BARBARA NEWS-PRESS, in the issues of the following named dates

MAY 24, 29, 31 / 2011

all in the year 2011 I hereby certify (or declare) under penalty of perjury that that foregoing is true and correct.

Executed on this 1st of JUNE 2011 at Santa Barbara, CA.

Signature

PUBLIC NOTICE
City of Santa Barbara

NOTICE IS HEREBY GIVEN that the City Council of the City of Santa Barbara will conduct a Public Hearing on Tuesday, June 14, 2011, during the afternoon session of the meeting which begins at 2:00 p.m. in the Council Chamber, City Hall, 735 Anacapa Street, Santa Barbara. The hearing is to consider a recommendation to adopt the 2010 update of the City's Urban Water Management Plan (UWMP) as required by State law, and to adopt the City's updated Long Term Water Supply Plan (LTWSP), which is the basis for water supply information in the UWMP. The meeting is open to the public. Questions can be directed to the City's Water Hotline at (805) 564-5460.

Drafts of the UWMP and LTWSP will be available as a news item on the City's homepage at www.SantaBarbaraCa.gov beginning Tuesday, May 24, 2011. Any comments are requested by 12:00 noon, Friday, June 3, 2011, so they can be considered in preparation of the final drafts to be included in the City Council packet for the hearing on June 14, 2011. Written comments should be addressed to the City Council via the City Clerk's Office, P.O. Box 1990, Santa Barbara, CA 93102 1990. You are also invited to attend the hearing and address your comments to the City Council.

On Thursday, June 9, 2011, an Agenda with all items to be heard on Tuesday, June 14, 2011, will be available at 735 Anacapa Street and at the Central Library. Agendas and Staff Reports are also accessible online at www.SantaBarbaraCA.gov; under Quick Links, click on Current Council Agenda & Packet. Regular meetings of the Council are broadcast live and rebroadcast on Wednesdays and Thursdays at 7:00 p.m. and on Saturday at 9:00 a.m. on Channel 18. These meetings can also be viewed over the Internet at www.santabarbaraca.gov: Click on the Government tab, click City Council Meeting Videos (under Quick Links), and then click on the Video link for the meeting date.

In compliance with the Americans with Disabilities Act, if you need special assistance to gain access to, comment at, or participate in this meeting, please contact the City Administrator's Office at 564-5305 or inquire at the City Clerk's Office on the day of the meeting. If possible, notification at least 48 hours prior to the meeting will enable the City to make reasonable arrangements in most cases.

Cynthia M. Rodriguez, CMC
City Clerk Services Manager

MAY 24, 29, 31 / 2011 -- 42322

Santa Barbara Daily Sound

Proof of Publication (2015.5C.C.P.)

Superior Court of
The State of California
In and for The County of Santa Barbara

In the Matter of: Public Notice- 6/14 Hearing for UWMP & LTWSP

Case Numbers:

The undersigned, being the principal clerk of the printer of the Santa Barbara Daily Sound, a newspaper of general circulation, printed and published in the City of Santa Barbara, County of Santa Barbara, California and which newspaper has been adjudged a newspaper of general circulation by the Superior Court in the County of Santa Barbara, State of California, Adjudication Case No. 1243692; and that affiant is the principal clerk of said Santa Barbara Daily Sound. That the printed notice hereto annexed was published in the Santa Barbara Daily Sound, in the issue(s) following named date(s)

May 24 and 31, 2011

I hereby certify (or declare) under penalty of perjury that the forgoing is true and correct.

Executed on May 31, 2011

Allen Feld

Allen Feld

PUBLIC NOTICE
City of Santa Barbara

NOTICE IS HEREBY GIVEN that the City Council of the City of Santa Barbara will conduct a Public Hearing on Tuesday, June 14, 2011, during the afternoon session of the meeting which begins at 2:00 p.m. in the Council Chamber, City Hall, 735 Anacapa Street, Santa Barbara. The hearing is to consider a recommendation to adopt the 2010 update of the City's Urban Water Management Plan (UWMP) as required by State law, and to adopt the City's updated Long Term Water Supply Plan (LTWSP), which is the basis for water supply information in the UWMP. The meeting is open to the public. Questions can be directed to the City's Water Hotline at (805) 564-5460.

Drafts of the UWMP and LTWSP will be available as a news item on the City's homepage at www.SantaBarbaraCa.gov beginning Tuesday, May 24, 2011. Any comments are requested by 12:00 noon, Friday, June 3, 2011, so they can be considered in preparation of the final drafts to be included in the City Council packet for the hearing on June 14, 2011. Written comments should be addressed to the City Council via the City Clerk's Office, P.O. Box 1990, Santa Barbara, CA 93102 1990. You are also invited to attend the hearing and address your comments to the City Council.

On Thursday, June 9, 2011, an Agenda with all items to be heard on Tuesday, June 14, 2011, will be available at 735 Anacapa Street and at the Central Library. Agendas and Staff Reports are also accessible online at www.SantaBarbaraCA.gov; under Quick Links, click on Current Council Agenda & Packet. Regular meetings of the Council are broadcast live and rebroadcast on Wednesdays and Thursdays at 7:00 p.m. and on Saturday at 9:00 a.m. on Channel 18. These meetings can also be viewed over the Internet at www.santabarbaraca.gov: Click on the Government tab, click City Council Meeting Videos (under Quick Links), and then click on the Video link for the meeting date.

In compliance with the Americans with Disabilities Act, if you need special assistance to gain access to, comment at, or participate in this meeting, please contact the City Administrator's Office at 564-5305 or inquire at the City Clerk's Office on the day of the meeting. If possible, notification at least 48 hours prior to the meeting will enable the City to make reasonable arrangements in most cases.

(SEAL)

_____
Cynthia M. Rodriguez, CMC
City Clerk Services Manager

STATE OF CALIFORNIA)
)
COUNTY OF SANTA BARBARA) ss.
)
CITY OF SANTA BARBARA)

I, Cynthia M. Rodriguez, City Clerk Services Manager in and for the City of Santa Barbara, California, DO HEREBY CERTIFY that the minute order is a true and correct copy of the record of the City Council proceedings concerning the meeting on June 14, 2011, Item No. 15, Adoption Of Long-Term Water Supply Plan And Urban Water Management Plan.

IN WITNESS WHEREOF, I have hereunto set my hand and caused the official seal of said City to be affixed this 13th day of July, 2011.

(SEAL)

Cynthia M. Rodriguez
City Clerk Services Manager

CITY OF SANTA BARBARA
CITY COUNCIL

MINUTE ORDER

DATE June 14, 2011

ROLL CALL Mayor Helene Schneider, Councilmembers Dale Francisco, Frank Hotchkiss, Grant House, Randy Rowse, Michael Self, Bendy White

ITEM No. 15 (Administrative Item)

Subject: Adoption Of Long-Term Water Supply Plan And Urban Water Management Plan (540.08)

RECOMMENDATION That Council:

A. Hold a Public Hearing regarding adoption of the City's updated Long-Term Water Supply Plan (LTWSP) and the 2010 update of the City's Urban Water Management Plan (UWMP);
B. Adopt the City's updated LTWSP as the policy basis for management of the City's water supply for the period through approximately 2030; and
C. Adopt and authorize the Public Works Director to transmit the City's updated UWMP to the California Department of Water Resources, such adoption to include modifications as may be approved by the Public Works Director to ensure compliance with State UWMP requirements, provided that any such modifications are not inconsistent with the updated LTWSP.

ACTION Councilmembers House/White to approve the recommendations.

Unanimous voice vote

Ferguson, Bill

From: Ferguson, Bill
Sent: Friday, May 27, 2011 11:55 AM
To: 'allen@co.santa-barbara.ca.us'
Subject: Urban Water Management Plan - City of Santa Barbara

Notice of Public Hearing (Pursuant to California Water Code, Section 10642)

The City has posted a draft of its 2010 Urban Water Management Plan (UWMP) for public review and comment. This is a State mandated document that demonstrates compliance with water management requirements, including recently adopted mandatory targets for Statewide water conservation.

Also posted is a draft of the City's Long Term Water Supply Plan, which will update the 1994 version. This is a City policy document that was the basis for the water supply analysis in the UWMP.

The documents can be accessed at: www.santabarbaraca.gov\water

A public hearing is scheduled for June 14, 2011 at 2:00 p.m. in the City Council Chamber, 735 Anacapa Street. Written comments are requested by June 3, 2011 for consideration before preparation of the final draft and should be addressed to the City Council via the City Clerk's Office, P.O. Box 1990, Santa Barbara, CA 93102-1990. You are also invited to attend the hearing and address your comments to the City Council.

Questions can be directed to 564-5460.

Bill Ferguson, Water Resources Supervisor
City of Santa Barbara Public Works Department
P.O. Box 1990, Santa Barbara, CA 93102
Street Address: 630 Garden Street, Santa Barbara, CA 93101
Phone: (805) 564-5571
FAX: (805) 897-2613
E-mail: BFerguson@SantaBarbaraCA.gov

Ferguson, Bill

From: Lancy, Theresa
Sent: Thursday, May 26, 2011 2:02 PM
To: Lancy, Theresa
Cc: Ferguson, Bill
Subject: Draft Urban Water Management Plan Posted

Greetings,

The City has posted a draft of its 2010 Urban Water Management Plan (UWMP) for public review and comment. This is a State mandated document that demonstrates compliance with water management requirements, including recently adopted mandatory targets for Statewide water conservation.

Also posted is a draft of the City's Long Term Water Supply Plan, which will update the 1994 version. This is a City policy document that was the basis for the water supply analysis in the UWMP.

The documents can be accessed at: www.santabarbaraca.gov\water

A public hearing is scheduled for June 14, 2011 at 2:00 p.m. in the City Council Chamber, 735 Anacapa Street. Written comments are requested by June 3, 2011 for consideration before preparation of the final draft and should be addressed to the City Council via the City Clerk's Office, P.O. Box 1990, Santa Barbara, CA 93102-1990. You are also invited to attend the hearing and address your comments to the City Council.

Please feel free to contact Bill Ferguson at bferguson@santabarbaraca.gov or 564-5571, if you have any questions.

Bill Ferguson, Water Resources Supervisor
City of Santa Barbara Public Works Department
P.O. Box 1990, Santa Barbara, CA 93102
Street Address: 630 Garden Street, Santa Barbara, CA 93101
Phone: (805) 564-5571
FAX: (805) 897-2613
E-mail: BFerguson@SantaBarbaraCA.gov

Ferguson, Bill

From: Ferguson, Bill
Sent: Wednesday, May 25, 2011 7:42 PM
To: 'jlb@ccwa.com'; 'JMcInnes@goletawater.com'; 'tom@montecitowater.com'; 'charles@cvwd.net'; 'cdahlstrom@syrwd.org'; 'bwales@syrwcd.com'; 'ESalazar@usbr.gov'; dwilliams@mp.usbr.gov; Mike Alvarado
Cc: Bjork, Rebecca; Taylor, Catherine; Lancy, Theresa; Jordan, Alison; Shelton, Barbara; Landon Neustadt (lneustadt@lagunablanca.org); Barry Keller (kyrrab.cal@verizon.net); jasmith181 @aol.com; Bill Thomas (BLT83@cox.net); Russell Ruiz (ruizsblaw@cox.net); Russell Ruiz
Subject: Draft Urban Water Management Plan Posted

The City has posted a draft of its 2010 Urban Water Management Plan (UWMP) for public review and comment. This is a State mandated document that demonstrates compliance with water management requirements, including recently adopted mandatory targets for Statewide water conservation.

Also posted is a draft of the City's Long Term Water Supply Plan, which will update the 1994 version. This is a City policy document that was the basis for the water supply analysis in the UWMP.

The documents can be accessed at: www.santabarbaraca.gov\water

A public hearing is scheduled for June 14, 2011 at 2:00 p.m. in the City Council Chamber, 735 Anacapa Street. Written comments are requested by June 3, 2011 for consideration before preparation of the final draft and should be addressed to the City Council via the City Clerk's Office, P.O. Box 1990, Santa Barbara, CA 93102-1990. You are also invited to attend the hearing and address your comments to the City Council.

Please feel free to contact me at 564-5571, if you have any questions.

Bill Ferguson, Water Resources Supervisor
City of Santa Barbara Public Works Department
P.O. Box 1990, Santa Barbara, CA 93102
Street Address: 630 Garden Street, Santa Barbara, CA 93101
Phone: (805) 564-5571
FAX: (805) 897-2613
E-mail: BFerguson@SantaBarbaraCA.gov

Ferguson, Bill

From: Ferguson, Bill
Sent: Wednesday, May 25, 2011 7:30 PM
To: 'info@sbhispanicchamber.org'; 'info@GSBLRA.org'; 'citizensplanningsb@gmail.com'; 'sharon@mcasb.org'; 'brianp@vistapro.com'; 'President@sb-allied.org'; 'evangeline@aiasb.com'; 'ddavis@cecmail.org'; 'jnisbet@sbaor.com'; 'steve@sbchamber.org'; 'bcollyer@sbdo.org'; 'cao@co.santa-barbara.ca.us'; 'mnaftal@cosbpw.net'
Subject: Draft Water Supply Plans Available - City of Santa Barbara

The City has posted a draft of its 2010 Urban Water Management Plan (UWMP) for public review and comment. This is a State mandated document that demonstrates compliance with water management requirements, including recently adopted mandatory targets for Statewide water conservation.

Also posted is a draft of the City's Long Term Water Supply Plan, which will update the 1994 version. This is a City policy document that was the basis for the water supply analysis in the UWMP.

The documents can be accessed at: www.santabarbaraca.gov\water

A public hearing is scheduled for June 14, 2011 at 2:00 p.m. in the City Council Chamber, 735 Anacapa Street. Written comments are requested by June 3, 2011 for consideration before preparation of the final draft and should be addressed to the City Council via the City Clerk's Office, P.O. Box 1990, Santa Barbara, CA 93102-1990. You are also invited to attend the hearing and address your comments to the City Council.

Questions can be directed to 564-5460.

Bill Ferguson, Water Resources Supervisor
City of Santa Barbara Public Works Department
P.O. Box 1990, Santa Barbara, CA 93102
Street Address: 630 Garden Street, Santa Barbara, CA 93101
Phone: (805) 564-5571
FAX: (805) 897-2613
E-mail: BFerguson@SantaBarbaraCA.gov

City of Santa Barbara

Public Works Department

www.SantaBarbaraCA.gov

Main Office
630 Garden Street
P.O. Box 1990
Santa Barbara, CA
93102-1990

Administration
Tel: 805.564.5377
Fax: 805.897.2613

Engineering
Tel: 805.564.5363
Fax: 805.564.5467

Facilities
Tel: 805.564.5415
Fax: 805.897.2577

Street Maintenance
Tel: 805.564.5413
Fax: 805.897.1991

Transportation
Tel: 805.564.5385
Fax: 805.564.5467

Water Resources
Tel: 805.564.5387
Fax: 805.897.2613

April 13, 2011

Michael Allen, Chief Deputy Clerk of the Board
County of Santa Barbara
105 East Anapamu Street, Room 407
Santa Barbara, CA 93101

SUBJECT: Notification of Public Hearing Regarding Urban Water Management Plan Update

Dear Mr. Allen:

Pursuant to State law, we are hereby providing notice that the City of Santa Barbara is in the process of updating its Urban Water Management Plan. The City Council is scheduled to hold a Public Hearing at 2:00 p.m. on June 14, 2011 in the Council Chambers, City Hall, 735 Anacapa Street in Santa Barbara for the purpose of receiving public input on and considering adoption of the proposed update.

Questions regarding this matter can be directed to Bill Ferguson, Water Resources Supervisor, at (805) 564-5571, or by email at: BFerguson@SantaBarbaraCA.gov.

Thank you.

Sincerely,

Rebecca Bjork
Water Resources Manager

BF/dm

cc: Matt Naftaly, Santa Barbara County Water Agency Manager, 123 East Anapamu Street, Santa Barbara, CA 93101

Ferguson, Bill

From: Ferguson, Bill
Sent: Wednesday, May 11, 2011 11:33 AM
To: 'jlb@ccwa.com'
Cc: Bjork, Rebecca
Subject: UWMP Water Use Projections

Notification of Water Use Projection Data for Urban Water Management Planning

The City of Santa Barbara has reviewed the water use projections provided by Central Coast Water Agency in its letter dated March 29, 2011. We are responding that we expect to use those projections as the basis for expected availability of State Water Table A amounts under the range of water shortage scenarios identified in the current Urban Water Management Plan Guidebook. Such available Table A amounts will be used by the City as appropriate, including for delivery as needed to meet current demands, carryover, sale to other agencies, and/or banking for improved future water supply reliability. In the "Water Supply and Water Shortage Contingency Planning" section of our Urban Water Management Plan update, we also will include a sensitivity analysis based on more conservative assumptions on our water supplies, as a way of illustrating a "worst likely" case performance of our water supply. Please advise if you have any questions.

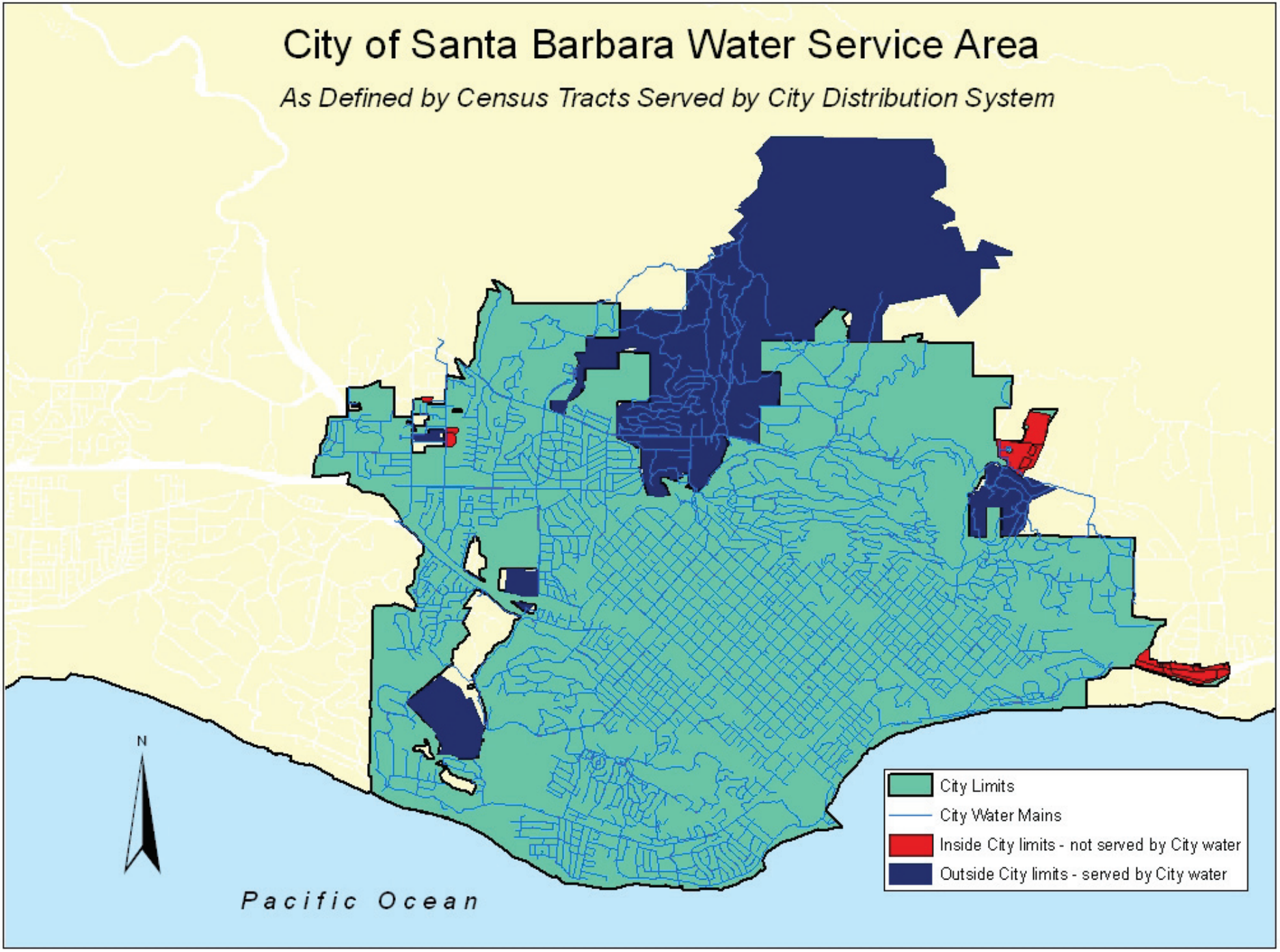
Thank you for your assistance.

Bill Ferguson, Water Resources Supervisor
City of Santa Barbara Public Works Department
P.O. Box 1990, Santa Barbara, CA 93102
Street Address: 630 Garden Street, Santa Barbara, CA 93101
Phone: (805) 564-5571
FAX: (805) 897-2613
E-mail: BFerguson@SantaBarbaraCA.gov

Appendix B:

Water Service Area Map

(This page intentionally left blank.)


City of Santa Barbara Water Service Area
As Defined by Census Tracts Served by City Distribution System
N
Pacific Ocean
City Limits
City Water Mains
Inside City limits - not served by City water
Outside City limits - served by City water

(This page intentionally left blank.)

Appendix C:

Documentation of Lower-Income Housing Data

(This page intentionally left blank.)

Existing and Projected Housing Units in City of Santa Barbara

	2010 Baseline	**2015**	**2020**	**2025**	**2030**	**Total Projected Housing Units** (2010-2030)
Existing Housing *(2010)*						
Total housing units in City[1] (includes SF & MF units)	37,720 du					
Housing types[2] single-family (53.5%) multiple-family (46.5%)	20,193 du 17,527 du					
Existing lower-income housing units in City[3] (6.8%)	2,580 du					
Projected Housing						
Net increase in housing units in City (incl SF & MF units)[3]		700	700	700	700	2800
Total housing units in City[4]		38,420	39,120	39,820	40,520	40,520
Net increase in lower-income housing units in City[5]		154	154	154	154	616
Total lower income housing units in City[6]		2,734	2,888	3,042	3,196	3196 (7.8%)

Notes:

1. **Total Existing Housing Units in City (2009),**
   Sources: City of Santa Barbara General Plan Housing Element Table H-17 p. 132 (September 2010 Proposed Final); Dept of Finance
2. **Existing Housing Types in City (2009)**
   Sources: City of Santa Barbara General Plan Housing Element Table H-17 p. 132 (September 2010 Proposed Final); Dept of Finance
3. **Existing Lower-Income Housing Units in City (2010) -** Lower Income Housing Units are defined as affordable to 80% of median household income
   Includes single-family (SF) and multiple-family (MF) units w/ recorded affordability agreements (not vouchers & certificates that travel with resident)
   Source: City Housing & Redevelopment Division, Steven Faulstich
3. **Projected Net Increase in Housing Units in City**
   Additional housing unit projections are based on *Plan Santa Barbara* General Plan Certified Final EIR growth assumptions for the Plan Santa Barbara project which estimates build-out of a total of up to 2,800 net new dwelling units between 2010 and 2030.
   Source: Certified Final Environmental Impact Report for *Plan Santa Barbara* General Plan Update (September 2010)
4. **Total Projected Housing Units in City =** Existing 2010 Total Housing Units + Projected Net Increase in Housing units
5. **Projected Net Increase in Lower Income Housing Units in City**
   Source: City of Santa Barbara General Plan Housing Element Table H-47 Quantified Objectives 2007-2014, p. 195 (September 2010 Proposed Final)
   New Construction Objectives 2010-2014: Extremely Low 50 du; Very Low 50 du; Low 110 du = 210 du x 3 = estimated 630 du to 2030, approximately 22% of total 2800 du estimated to build out. Assume 22% of total build-out for each five-year increment of growth.
6. **Total Projected Lower Income Housing Units in City** = Existing 2010 Lower Housing Units + Projected Net Increase in Lower Income Housing Units

Additional Note: Breakdown of Affordable *and* Assisted Housing Units and Shelter/Group Beds in City (June 2010):
2,580 units with recorded affordability agreements (includes senior rental, rental not senior only, resident-owned mobilehome spaces)
340 units owner-occupied and secondary units with recorded affordability agreements
1,375 section 8 certificates and vouchers in use
574 single-family owner-occupied rehabilitation
416 beds in group homes or shelters
5,285

(This page intentionally left blank.)

Appendix D:

Executive Summary:
Water Conservation Technical Evaluation

Maddaus Water Management

(This page intentionally left blank.)

EXECUTIVE SUMMARY

Introduction

This conservation technical analysis was conducted by Maddaus Water Management (MWM) for the City of Santa Barbara (City). The purpose of the analysis is to:

1. Evaluate current conservation measures and identify new conservation measures that will reduce future water demand.
2. Estimate the costs and water savings of these measures.
3. Combine the measures into increasingly more aggressive programs and evaluate the costs and water savings of these programs.

Long-Term Conservation Program Analysis

A list of 92 potential conservation measures was developed from known water saving technologies and services. Twenty-three conservation measures, selected by the City and local stakeholders during an evaluation workshop, were further analyzed by the Least Cost Planning Decision Support System Model (DSS Model). The DSS Model is a planning tool that assists water planners with evaluating alternative water conservation programs. The model itself is an end use model that calculates water savings, costs and benefits from individual measures, and programs of a number of measures. Projections of future water demand with and without water conservation programs are made for the City water service area. Calculations are made for every year in the 30-year analysis period. In addition, twenty one measures, both current and potential future measures, were put into a "Tool Kit" for further qualitative evaluation.

Based on analysis by the model, conservation measures were grouped into alternative programs of increasingly higher water savings and implementation costs (Table ES-1). Conservation Program A consists of 10 measures that are part of the existing City water conservation program. Conservation Program B includes all of Program A, plus those additional measures that have an individual benefit-cost ratio of 0.9 or greater, for a total of 17 measures. Conservation Program C includes all measures evaluated, except for Measure 5 which is replaced with the enhanced Measure 6. The measures included in Conservation Programs A, B, and C are identified in Table ES-1 in the columns at the right. Figure ES-1 shows the projected demand without the effects of the plumbing code, with the plumbing code effects, and with the plumbing code and three conservation program alternates. Water savings were evaluated and benefit-cost ratios computed for 20–year period of 2011 to 2030, coinciding with the City's water supply planning period. Savings were then calculated to the year 2030 for each of these programs (see Table ES-2).

Table ES-3 shows the relative demand reductions in the year 2030, conservation program costs for the utility, present value economic information, and the utility cost of water saved for each of the alternate programs. Demand reduction by 2030 is measured from the 14,825 AFY projected 2030 demand without the effects of the plumbing code. Additional resources and customer contacts as embodied in the conservation programs identified in this memorandum, are required to reach higher levels of potential water savings. Utility costs include the cost to the City to run the program, including staff time, rebates, any contracted services, expense, etc. While utility cost is the primary consideration, this memorandum also considers customer costs and community costs to some extent, as described in the body of the memorandum. The plumbing code is included as passive baseline savings in addition to the long-term conservation program in Programs A-C. Most of the future program water savings consist of outdoor landscape improvements.

A Benefit-Cost ratio, which is the ratio of the present value of benefits to the present value of costs, is the most accurate indicator of cost-effectiveness. When the ratio of the Present Value of the benefits to the Present Value of the costs is greater than 1.0 for a particular program of measures, that program can be said to be cost-effective. Benefits for the utility can also be expressed as the value to the utility of the saved water. For the City, the value of the saved water is the cost savings from not producing the water that is saved. This could range from not treating pumped groundwater to not buying water from the State Water Project. An

assessment was made by the City and the value of the saved water was determined to be $600 per acre-foot. This value is hereafter referred to as the City's "Avoided Costs".

Program A reflects estimated water savings derived from the plumbing code and continuing the current program. The additional measures that create programs B and C produce increasing incremental water savings and costs. Figure ES-2 illustrates there are apparent diminishing returns when measures are added beyond Program B. Demand reductions for year 2030 range from 920 to 1,919 AF/Yr. As the plumbing code water savings do not cost the City any money, the graph starts at the plumbing code water savings in 2030.

Table ES-1
Conservation Measures Selected for Programs

No.	Measure Name (ND = Requirements for New Development)	Program A	Program B	Program C
1	Promote Water Efficiency in Green Buildings		✓	✓
2	ND Require High Efficiency Toilets		✓	✓
3	ND Require High Efficiency Faucets and Showerheads		✓	✓
4	Fixture Replacement SB 407		✓	✓
5	Financial Incentives for Irrigation and Landscape Upgrades (Current)	✓	✓	
6	Financial Incentives for Irrigation and Landscape Upgrades			✓
7	Washer Rebates	✓	✓	✓
8	Washer Rebates for High Efficiency Machines			✓
9	High Efficiency Toilet (HET) Rebates	✓	✓	✓
10	Single Family Water Check Up	✓	✓	✓
11	Multifamily Water Check Up	✓	✓	✓
12	Existing Commercial Washer Rebate	✓	✓	✓
13	Cisterns/Rain Catchments			✓
14	Gray water Retrofit SF			✓
15	Current High Efficiency Urinal Rebate (<0.25 gallon)	✓	✓	✓
16	ND Require 0.5 gal/flush or less urinals in new buildings		✓	✓
17	School Building Retrofit		✓	✓
18	Irrigation (Landscape) Water Budgets	✓	✓	✓
19	Irrigation Water Surveys	✓	✓	✓
20	Mulch Program			✓
21	CII Water Check Up Level 1	✓	✓	✓
22	CII Water Check Up Level 2		✓	✓
23	Customized CII Incentive Program			✓
	Total Measures in each Program	10	17	22

Figure ES-1

Long Term Demands with Conservation Programs
(Demand is measured by total water system production, including potable and recycled water)

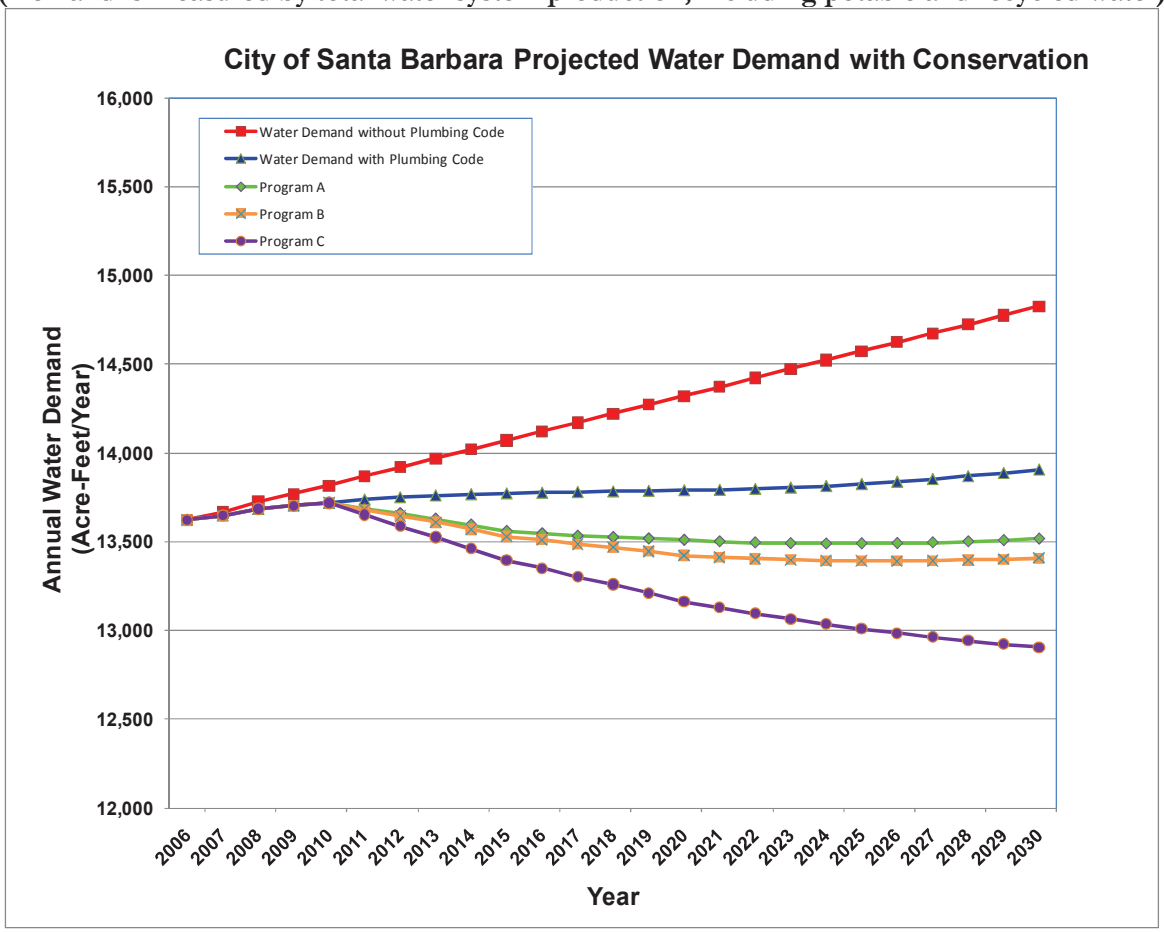


Table ES-2

Conservation Program Description and Future Water Savings

Conservation Program	Description	2030 Demand Reduction (AF/Yr)
-	No Conservation Programs, Plumbing Code Only	919
A	Continue Current Conservation Program (10 measures) and Plumbing Code	1,308
B	Add 7 Cost-Effective Measures to Current Program A and Plumbing Code	1,417
C	Add 5 More Measures to Program B and Plumbing Code	1,919

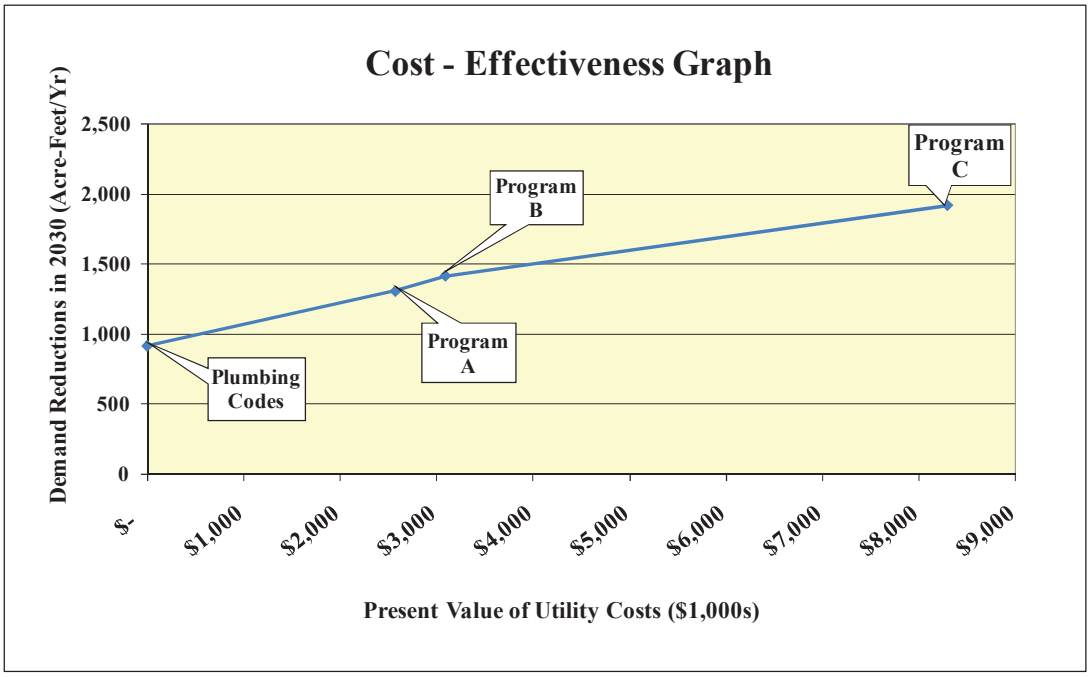
Table ES-3
Economic Summary of Long-Term Conservation Programs
(Excluding Tool Kit Measures)

Conservation Program	Demand Reduction by 2030 (AFY)	Total 20-Year Conservation Program Water Savings (AF)	Average Annual Program Cost to Utility ($)	Present Value of Utility Benefits ($)	Present Value of Utility Costs ($)	Utility Benefit - Cost Ratio	Utility Cost of Water Saved ($/AF)
Plumbing Code Only	919	11,085	NA	NA	NA	NA	NA
Program A + Plumbing Code	1,308	16,419	$194,000	$2,455,000	$2,570,000	0.96	$482
Program B + Plumbing Code	1,417	17,801	$233,200	$3,131,000	$3,089,000	1.01	$460
Program C + Plumbing Code	1,919	23,193	$629,400	$5,867,000	$8,287,000	0.71	$684

Notes:
1. The DSS model is a 30-year model. It was run for 2006 to 2036 to include the base year of 2006 and the 20-year conservation program period of 2011 to 2030.
2. Demand Reduction by 2030 is measured from the 14,825 AFY projected 2030 demand without the effects of the Plumbing Code.
3. Average Annual Program Cost excludes any potential costs for the 21 measures in the Tool Kit
4. Utility Cost of Water Saved somewhat undervalues the cost of savings because program costs are discounted to present value and the water benefit is not. Utility Benefit-Cost ratio is the most accurate measure of cost effectiveness, because it accounts for the time value of money.

Figure ES- 2

Present Value of Utility Costs versus Cumulative (Total) Water Saved



Appendix E:

City of Santa Barbara

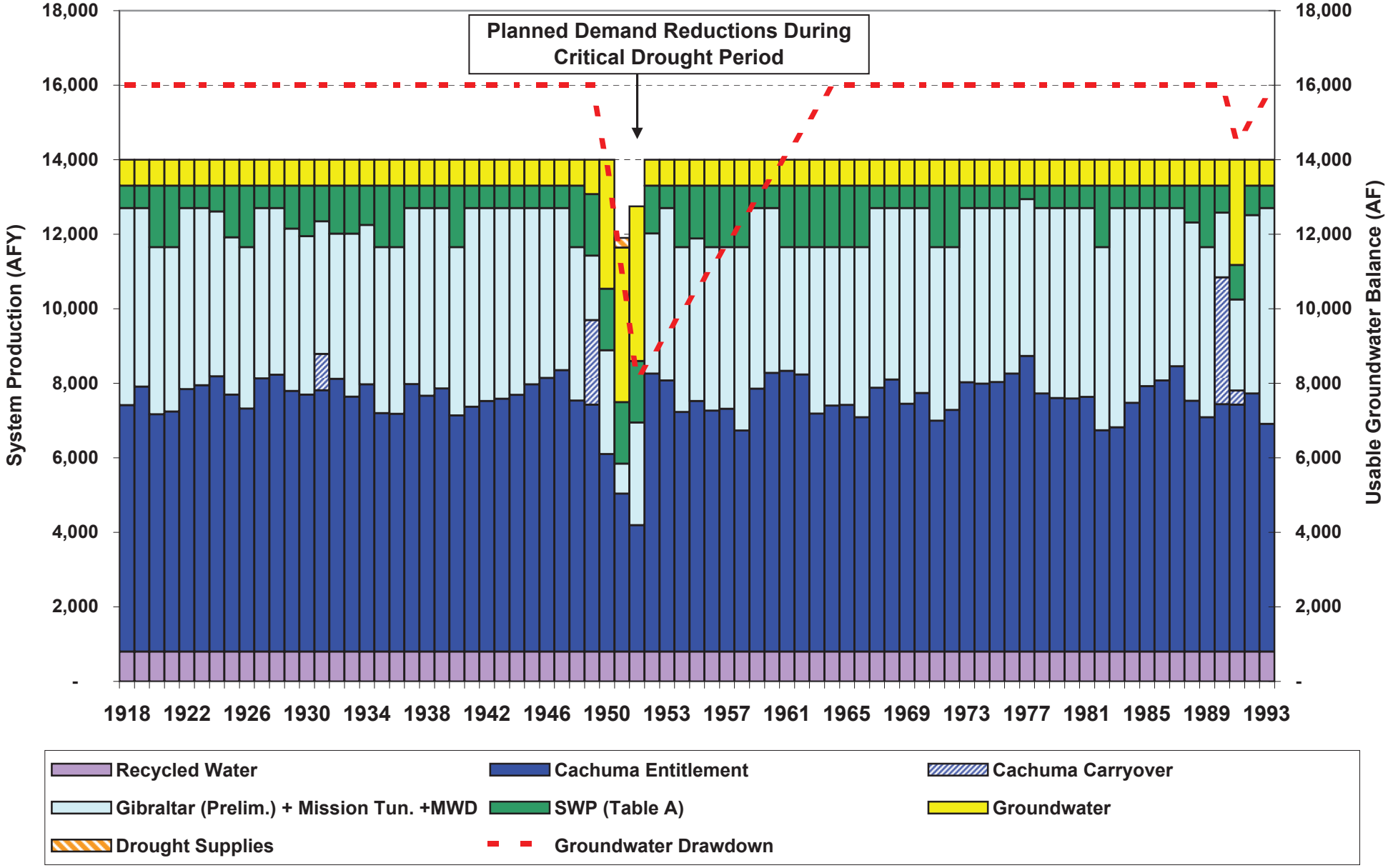
Long-Term Water Supply

Performance Charts

(This page intentionally left blank.)

Water Supply Performance: Scenario A - Current Conditions

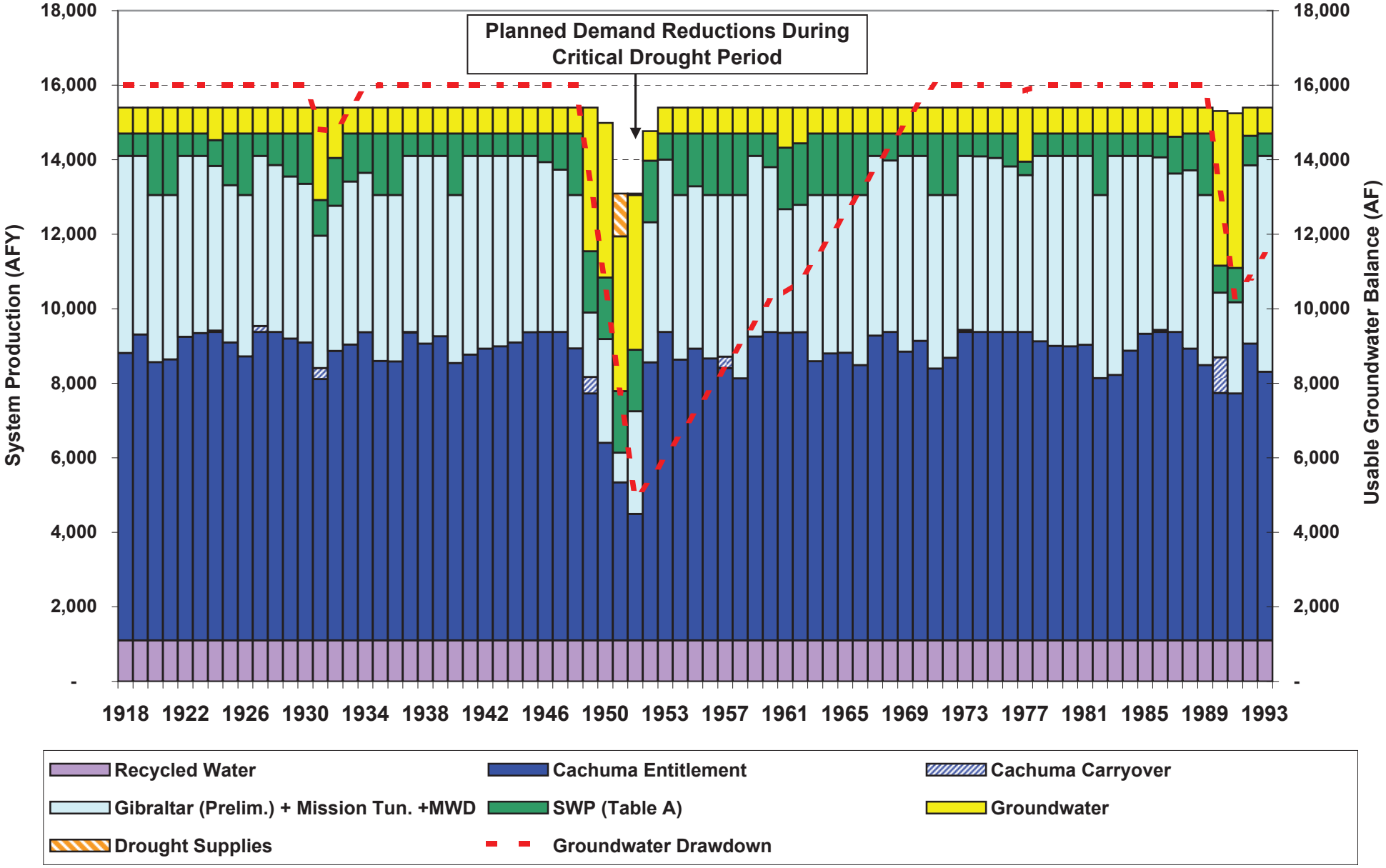
Projected System Demand (AFY):	**14,000**	Water Supply Target (including Safety Margin):	**14,000**		
Cachuma Yield Assumption:	**Current Entitlement**	Planned Demand Reductions:	Stage 1	Stage 2	Stage 3
Total Critical Period Drought Supplies Required (AF):	**262**		**10%**	**15%**	**15%**



(This page intentionally left blank.)

Water Supply Performance: Scenario B - Near Term

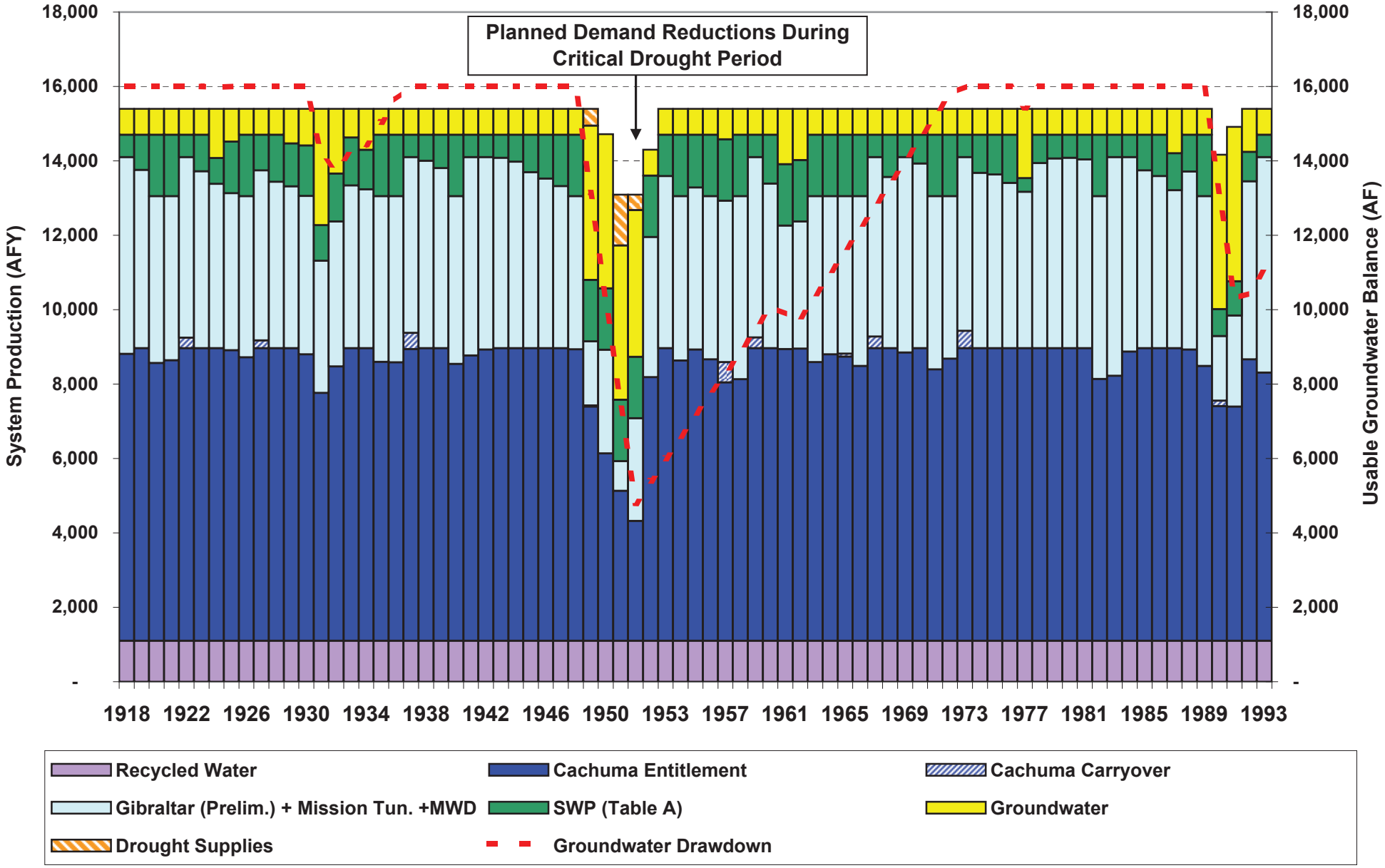
Projected System Demand (AFY):	**14,000**	Water Supply Target (including Safety Margin):	**15,400**		
Cachuma Yield Assumption:	**Current Entitlement**	Planned Demand Reductions:	Stage 1	Stage 2	Stage 3
Total Critical Period Drought Supplies Required (AF):	**1,195**		**10%**	**15%**	**15%**



(This page intentionally left blank.)

Water Supply Performance: Scenario C - 2030 Conditions

Projected System Demand (AFY):	**14,000**	Water Supply Target (including Safety Margin):	**15,400**		
Cachuma Yield Assumption:	**Projected Entitlement**	Planned Demand Reductions:	Stage 1	Stage 2	Stage 3
Total Critical Period Drought Supplies Required (AF):	**2,228**		**10%**	**15%**	**15%**



(This page intentionally left blank.)

Appendix F:

Excerpts from Santa Barbara Municipal Code, Chapter 14.20, Regarding Water Use Regulations During Drought Conditions

(This page intentionally left blank.)

Excerpts from Santa Barbara Municipal Code, Chapter 14.20, Regarding Water Use Regulations During Drought Conditions

14.20.215 Water Use Regulations During Drought Conditions.

A. STAGE TWO DROUGHT CONDITION. Upon adoption by the City Council of a resolution declaring a Stage Two Drought Condition and for as long as that condition exists, the following water use regulations, and such other regulations as may be adopted by resolution of the City Council, shall apply to all use of water, other than reclaimed wastewater, that is provided by the City water supply system.

1. The use of running water from a hose, pipe, or faucet for the purpose of cleaning buildings and paved, tile, wood, plastic or other surfaces shall be prohibited, except in the event the Director determines that such use is the only feasible means of correcting a potential threat to health and safety.
2. All restaurants that provide table service shall post, in a conspicuous place, a Notice of Drought Condition as approved by the Director and shall refrain from serving water except upon specific request by a customer.
3. The operation of and introduction of water into ornamental fountains and bodies of water shall be prohibited.
4. Operators of hotels, motels, and other commercial establishments offering lodgings shall post in each room a Notice of Drought Condition as approved by the Director.
5. Any use of water that causes runoff to occur beyond the immediate vicinity of use shall be prohibited.
6. The use of potable water for cleaning, irrigation and construction purposes, including but not limited to dust control, settling of backfill, flushing of plumbing lines, and washing of equipment, buildings and vehicles, shall be prohibited in all cases where the Director has determined that use of reclaimed wastewater is a feasible alternative.
7. Irrigation at any time from 8:00 a.m. to 6:00 p.m. of any yard, orchard, park, recreational area, or other area containing vegetation shall be prohibited.
8. Boats and vehicles shall be washed only at commercial car washing facilities equipped with water recycling equipment or by use of a bucket and hose equipped with a self-closing valve that requires operator pressure to activate the flow of water.

B. STAGE THREE DROUGHT CONDITION. Upon adoption by the City Council of a resolution declaring a Stage Three Drought Condition and for as long as that condition exists, the following water use regulations, and such other regulations as may be adopted by resolution of the City Council, shall apply to all use of water, other than reclaimed wastewater, that is provided by the City water supply system.

1. Each of the Stage Two water use regulations set forth in Subsections A.1 through A.6 of this Section shall be applicable.
2. The introduction of water into swimming pools and spas shall be prohibited.
3. The use of water through a meter that is restricted to irrigation uses shall be prohibited, and the City shall have the right to shut off water service to any such meter without notice to the account holder or any other person.
4. Irrigation of any yard, orchard, park, recreational area, or other area containing vegetation shall be prohibited, except by means of a hand-held bucket.
5. Boats and vehicles shall be washed only by use of a hand-held bucket or at commercial car washing facilities equipped with water recycling equipment.

C. EXEMPTIONS. Exemptions to the water use regulations set forth in this Section may be granted by the Director for specific uses of water, on the basis of hardship and in accordance with such guidelines for exemptions as the City Council may adopt. A denial of a request for an exemption may be appealed to a review committee consisting of the Director, the Parks Director or his designated representative, one member of the Board of Water Commissioners appointed by the Board, and such other persons, if any, as the City Council may appoint. The decision of the review committee shall be final.

D. Upon the declaration of and during a Stage Three Drought Condition, the failure of a mobilehome park owner to introduce water into a swimming pool or spa located in a mobilehome park, in accordance with the requirement of Paragraph B.7 of this Section, shall not be considered an increase in "rent" for purposes of Municipal Code Section 26.08.030.N. (Ord. 4558, 1989.)

14.20.225 Violations.

A. Any failure to comply with a provision of this Chapter shall constitute a violation, regardless of whether the failure to comply is caused by an account holder, a consumer or any other person or entity.

B. Where the failure to comply is continuing and intentional, each successive hour of such failure to comply shall be a separate and distinct violation. (Ord. 4558, 1989.)

14.20.226 Penalties and Charges.

A. The following penalties shall apply to any violation of any provision of this Chapter:

1. For the first violation within the preceding twelve (12) calendar months, the Director shall issue a written notice of the fact of such violation.

2. For a second violation within the preceding twelve (12) calendar months, the Director shall impose a surcharge against the account holder for the property where the violation occurred or is occurring, in an amount not to exceed two-hundred and fifty dollars ($250.00).

3. For a third violation within the preceding twelve (12) calendar months, the Director:

a. Shall impose a surcharge against the account holder for the property where the violation occurred or is occurring, in an amount not to exceed two-hundred and fifty dollars ($250.00); and

b. May install a flow restricter on the service where the violation occurred or is occurring, for a period to be determined by the Director.

4. For a fourth and any subsequent violation within the preceding twelve (12) calendar months, the Director:

a. Shall impose a surcharge against the account holder for the property where the violation occurred or is occurring, in an amount not to exceed two-hundred and fifty dollars ($250.00); and

b. May install a flow restricter on or shut off water service to the property where the violation occurred or is occurring, for a period to be determined by the Director.

B. If a flow restricter is installed or water service shut off pursuant to Subsection A of this Section, prior to restoration of normal water service the account holder whose service is affected shall be required to reimburse the City for whatever cost it has incurred and will incur in installing and removing a flow restricter and in shutting off and turning on water service.

C. Any surcharge imposed pursuant to this Section shall be added to the account of the account holder for the property where the violation occurred or is occurring and shall be due and payable on the same terms and subject to the same conditions as any other charge for regular water service. The maximum amount of surcharges which an account holder may be required to pay during any twelve-month period shall be one thousand dollars ($1,000.00).

D. Nothing in this Chapter shall limit or be construed to limit the right of an account holder to seek reimbursement of a surcharge from a tenant or other consumer. (Ord. 4558, 1989.)

14.20.227 Notice of Violation - Hearing.

A. For each violation of this Chapter, the Director shall give notice as follows:

1. By sending written notice through the U.S. mail to the account holder for the property where the violation occurred or is occurring, at the current billing address shown in the City's water billing records; and

2. By personally giving written notice thereof to the person who committed the violation or by leaving written notice with some person of suitable age and discretion at the property where the violation occurred or is occurring; or

3. If neither the person who committed the violation nor a person of suitable age and discretion can be found, then by affixing written notice in a conspicuous place on the property where the violation occurred or is occurring.

B. Any written notice given under this Section shall contain a statement of:

1. The time, place and nature of the violation;

2. The person(s) committing the violation, if known;

3. The provision(s) of this Chapter violated;

4. The possible penalties for each violation;

5. The account holder's right to request a hearing on the violation and the time within which such a request must be made; and

6. The account holder's loss of the right to a hearing in the event the account holder fails to request a hearing within the time required.

C. Any account holder provided a notice of violation in accordance with the provisions of this Chapter shall have the right to request a hearing. The request must be made in writing and must be received by the Director within ten (10) calendar days of the date of the notice of violation. The Director shall conduct the hearing, at which both written and oral evidence may be presented, and shall decide whether a violation occurred and the appropriate penalty. In determining the appropriate penalty, the Director shall consider whether the account holder knew of the violation at the time it occurred and whether he or she took reasonable action to correct the violation upon notification of it. In addition, the Director shall exercise his discretion in accordance with such guidelines as the City Council may adopt by resolution.

1. For a first or second violation within a twelve (12) month period, the decision of the Director shall be final.

2. For a third or subsequent violation within a twelve (12) month period, the account holder shall have the right to appeal the decision of the Director by requesting a hearing before the Board of Water Commissioners ("Board"). The request for hearing before the Board shall be in writing and shall be delivered to the Director not later than seven (7) calendar days after the date of the decision of the Director. At the hearing, the Board may receive and hear both written and oral evidence and shall have the authority to affirm, reverse, or modify the decision of the

Director. The decision of the Board shall be final.

D. If an account holder fails to request a hearing before the Director or the Board within the period(s) provided in this Section, the action of the Department shall be deemed final.

E. There shall be no installation of a flow restricter or shut off of water service until a notice of violation has become final or there is a final decision of the Director or the Board ordering installation of a flow restricter or shut-off of water service. (Ord. 4558, 1989.)

(This page intentionally left blank.)

Appendix G:

Water and Wastewater Service Rates

Fiscal Year 2011

(This page intentionally left blank.)

City of Santa Barbara - Public Works Department

Rates for City Water and Sewer Service

Resolution No. 10-044 (for Fiscal Year 2011)

1 hcf = 100 cubic feet = 748 gallons

Customer Class	Water Service Rates[1]	Sewer Service Rates
Single Family Residential	First 4 hcf @ $2.93 Next 16 hcf @ $4.90 All other @ $5.16	$12.51 per month; plus $2.17 per hcf, up to 10 hcf per month
Multi-Family Residential, 1-4 dwelling units	First 4 hcf per dwelling unit @ $2.93 Next 8 hcf per dwelling unit @ $4.90 All other @ $5.16	$12.51 per month per dwelling unit; plus $2.17 per hcf, up to 8 hcf per dwelling, per month
Multi-Family Residential, 5+ dwelling units	First 4 hcf per dwelling unit @ $2.93 Next 8 hcf per dwelling unit @ $4.90 All other @ $5.16	$12.51 per month per dwelling unit; plus $2.17 per hcf, up to 7 hcf per dwelling, per month
Commercial	100% of base allotment[2] @ $4.90 per hcf; All other @ $5.16	$2.46 per hcf; subject to minimum charge by meter size (see table below)
Industrial & High Strength Commercial	100% of base allotment[2] @ $4.90 per hcf; All other @ $5.16 per hcf	$2.98 per hcf; subject to minimum charge by meter size (see table below)
Irrigation - Residential	Billed as if used through associated residential meter, OR annual allotment[3] of 654 hcf/acre @ $4.90; all other @ $5.16	Not applicable
Irrigation - Recreation/Parks/ Schools	Annual allotment[3] of 1,404 hcf/acre @ $2.31 Next 240 hcf/acre/year @ $4.90 All other @ $5.16	Not applicable
Irrigation - Commercial	100% of base allotment[2] @ $4.90 per hcf; All other @ $5.16/hcf	Not applicable
Irrigation – Agriculture	Annual allotment[3] of 1080 hcf/acre @ $1.45 Next 240 hcf/acre/year @ $4.90 All other at $5.16/hcf	Not applicable
Recycled Water	All usage @ $1.85/hcf	Charges based on type of use. Not applicable for irrigation.
Outside City Limits	130% of corresponding in-City rates	Same as in-City rates, except that residential accounts not receiving City water are charged at maximum rate.

Monthly Water Meter Service Charges By Meter Size[1]

Meter Size	5/8"	3/4" *	1"	1½"	2"	3"	4"	6"	8"	10"
Monthly Service Charge:	$12.31	$18.50	$30.80	$61.58	$98.56	$197.10	$307.97	$615.94	$984.68	$1,416.66

Minimum Monthly Sewer Charges by Meter Size for Non-Residential Customers

Meter Size	5/8"	3/4" *	1"	1½"	2"	3"	4"	6"	8"	10"
Commercial	$23.51	$35.27	$41.03	$70.42	$117.41	$234.72	$292.96	$586.79	$1,026.91	$1,576.28
Indus/HS Com.	$29.31	$43.96	$51.37	$88.22	$146.71	$293.35	$366.81	$733.48	$1,283.55	$2,017.13

* This meter size no longer available for new installations.

Typical City Water and Sewer Fees for Connection of a Single-Family Residence

Water: $2,102 (1" service connection, with 5/8" meter) + $5,691 (buy-in fee, per residence) = $7,793

Sewer: $638 (4" sewer tap) + $313 (trench inspection) + $4,118 (buy-in fee, single-family residence)[4] = $5,069

For more information, contact the City's Water Hotline at (805) 564-5460

[1] Utility users tax of 6% added to metered water charges and monthly water meter service charges.

[2] Base allotment = average monthly consumption during most recent January - June period.

[3] Annualized allotments run July to June; new allotments available for the July water bill; unused allotments do not carry forward, except for agricultural irrigation customers.

Revised: July 7, 2010

(This page intentionally left blank.)

Appendix H:

California Urban Water Conservation Council

Best Management Practices Reports

(This page intentionally left blank.)

CUWCC BMP RETAIL COVERAGE REPORT 2009-2010

Foundation Best Management Practices for Urban Water Efficiency

Agency: City of Santa Barbara **District Name:** City of Santa Barbara, PWD **CUWCC Unit #:** 88
Retail

Primary Contact Alison Jordan **Telephone** 805 564-5574 **Email:** ajordan@SantaBarbaraCA.gov

Compliance Option Chosen By Reporting Agency: **Traditional**

Foundational BMPs

BMP 1.1 Operational Practices

Conservation Coordinator provided with necessary resources to implement BMPs?

		2009	2010
1.Conservation Coordinator provided with necessary resources to implement BMPs?	Name	Alison Jordan	Alison Jordan
	Title	Water Conservation Coordinator	Water Conservation Coordinator
	Email		ajordan@SantaB
		On Track	On Track

2. Water waste prevention documentation

On Track if any one of the 6 ordinance actions done, plus documentation or links provided

	2009	2010
Descriptive File	SBMC TITLE 14 Water and	SBMC TITLE 14 Water and Sewers, Waste of Water Enforcement Policy, Landscape Design Standards August 12, 2008, 2008 Adopting
Descriptive File 2010		
URL	Waste of Water Enforcement Policy, per City Ordinance No.	
URL 2010		0
Describe Ordinance Terms	Waste of Water Enforcement Policy, per City Ordinance No.	
Describe Ordinance Terms 2010		Waste of Water Enforcement Policy, per City Ordinance No. 4558, adopted on February 1989, prohibits the waste of water defined as gutter
	On Track	On Track

Agency: City of Santa Barbara
Retail

District Name: City of Santa Barbara, PWD

CUWCC Unit #: 88

CUWCC BMP RETAIL COVERAGE REPORT 2009-2010

Foundation Best Management Practices for Urban Water Efficiency

BMP 1.2 Water Loss Control

	2009		
Complete a prescreening Audit	Yes	On Track	On Track if Yes
Metered Sales	2,536		
Verifiable Other Uses	34		
Total Supply	2,570		
(Metered Sales + System uses)/ Total Supply >0.89	1.00	On Track	On Track if =>.89, Not on Track if No
If ratio is less than 0.9, complete a full scale Audit in 2009?	N/A	On Track	On Track if Yes
Verify Data with Records on File?	Yes	On Track	On Track if Yes
Operate a system Leak Detection Program?	Yes	On Track	On Track if Yes

	2010		
Compile Standard Water Audit using AWWA Software?	Yes	On Track	On Track if Yes, Not on Track if No
AWWA file provided to CUWCC?	WaterAudit FY10_City of	On Track	On Track if Yes, Not on Track if No
AWWA Water Audit Validity Score?	55		Info only until 2012
Completed Training in AWWA Audit Method?	yes		Info only until 2012
Completed Training in Component Analysis Process?	Yes		
Complete Component Analysis?	No		Info only until 2012
Repaired all leaks and breaks to the extent cost effective?	Yes	On Track	On Track if Yes, Not on Track if No
Locate and repair unreported leaks to the extent cost effective.	Yes	On Track	On Track if Yes, Not on Track if No
Maintain a record-keeping system for the repair of reported leaks, including time of report, leak location, type of leaking pipe segment or fitting, and leak running time from report to repair.			Info only until 2012
Provided 7 types of Water Loss Control Info			Info only until 2012

Leaks Repaired	Value Real Losses	Value Apparent Losses	Miles Surveyed	Press Reduction	Cost of Interventions	Water Saved
0	$ -	$ -	0	Off	$ -	0

Agency: City of Santa Barbara
Retail

District Name: City of Santa Barbara, PWD

CUWCC Unit #: 88

CUWCC BMP RETAIL COVERAGE REPORT 2009-2010

Foundation Best Management Practices for Urban Water Efficiency

1.3 METERING WITH COMMODITY RATES FOR ALL NEW CONNECTIONS AND RETROFIT OF EXISTING CONNECTIONS

If signed MOU prior to 31 Dec 1997, On Track if all connections metered; If signed after 31 Dec 1997, complete meter installations by 1 July 2012 or within 6 yrs of signing and 20% biannual reduction of unmetered connections.

		2009		2010		
Exemption or 'At least as Effective As' accepted by CUWCC						
Numbered Unmetered Accounts	2008	0	On Track	0	On Track	On Track if no unmetered accounts
Metered Accounts billed by volume of use		Yes	On Track	Yes	On Track	Volumetric billing required for all connections on same schedule as metering
Number of CII accounts with Mixed Use meters		2,289		2,289		Info only
Conducted a feasibility study to assess merits of a program to provide incentives to switch mixed-use accounts to dedicated landscape meters?		No	On Track	No	On Track	Required in 2011
Feasibility Study provided to CUWCC?		No	On Track	No	On Track	Required in 2011
Completed a written plan, policy or program to test, repair and replace meters		Yes	On Track	Yes	On Track	On Track if Yes, Not on Track if No

CUWCC BMP RETAIL COVERAGE REPORT 2009-2010

Foundation Best Management Practices for Urban Water Efficiency

Agency: City of Santa Barbara
Retail

District Name: City of Santa Barbara, PWD

CUWCC Unit #: 88

Coverage Report Date: June 26, 2011

Primary Contact Alison Jordan

Email: ajordan@santabarbaraca.gov

1.4 Retail Conservation Pricing

Metered Water Rate Structure

Date 2009 data received May 26, 2011
Date 2010 data received May 26, 2011

On Track if: Increasing Block, Uniform, Allocation, Standby Service; Not on Track if otherwise

Customer Class	2009 Rate Type	Conserving Rate?	Customer Class	2010 Rate Type	Conserving Rate?
Single-Family	Increasing Block	Yes	Single-Family	Increasing Block	Yes
Multi-Family	Increasing Block	Yes	Multi-Family	Increasing Block	Yes
Commercial	Increasing Block	Yes	Commercial	Increasing Block	Yes
Industrial	Increasing Block	Yes	Industrial	Increasing Block	Yes
Dedicated Irrigation	Allocation Based	Yes	Dedicated Irrigation	Allocation	Yes
	On Track			On Track	

Year Volumetric Rates began for Agencies with some Unmetered Accounts

Info only

Agencies with Partially Metered Service Areas: If signed MOU prior to 31 Dec. 1997, implementation starts no later than 1July 2010. If signed MOU after 31 Dec. 1997, implementation starts no later than 1July 2013, or within seven years of signing the MOU,

Agency: City of Santa Barbara
Retail

District Name: City of Santa Barbara, PWD

CUWCC Unit #: 88

Coverage Report Date: June 26, 2011

CUWCC BMP RETAIL COVERAGE REPORT 2009-2010

Foundation Best Management Practices for Urban Water Efficiency

Adequacy of Volumetric Rates) for Agencies with No Unmetered Accounts

Customer Class	2009 Rate Type	2009 Volumetric Revenues $1000s	2010 Rate Type	2010 Volumetric Revenues $1000s
Single-Family	Increasing Block	$ 10,370	Single-Family	$ 10,691
Multi-Family	Increasing Block	$ 5,355	Multi-Family	$ 4,476
Commercial	Increasing Block	$ 5,148	Commercial	$ 4,581
Industrial	Increasing Block	$ 838	Industrial	$ 250
Dedicated Irrigation	Allocation Based	$ 925	Dedicated Irrigation	$ 1,041
Other		$ 641		$ 552
Other		$ -		$ -
Total Revenue Commodity Charges (V):		$ 23,277		$ 21,591
Total Revenue Fixed Charges (M):		$ 6,013		$ 6,264
Calculate: V / (V + M):		79%		78%
		On Track		On Track

Agency Choices for rates:

A) Agencies signing MOU prior to 13 June2007, implementation starts 1 July2007: On Track if (V / (V + M) ≥ 70% x .8 = **56% for 2009** and 70%x0.90 = **63% for 2010**; Not on track if (V / (V + M)) < 70%;

B) Use Canadian model. Agencies signing MOU after 13June2007, implementation starts July 1 of year following signing.

Canadian Water & Wastewater Rate Design Model Used and Provided to CUWCC	No	No
If Canadian Model is used, was 1 year or 3 year period applied?		

Wastewater Rates

	2009		2010
Does Agency Provide Sewer Service?	Yes	If 'No', then wastewater rate info not required.	Yes

Customer Class	2009 Rate Type	Conserving Rate?	Customer Class	2010 Rate Type	Conserving Rate?
Single-Family	Allocation Based	Yes	Single-Family	Allocation Based	Yes
Multi-Family	Allocation Based	Yes	Multi-Family	Allocation Based	Yes
Commercial	Uniform	Yes	Commercial	Uniform	Yes
Industrial	Uniform	Yes	Industrial	Uniform	Yes
	Select a Rate Structure			Select a Rate Structure	
	Select a Rate Structure			Select a Rate Structure	
	Select a Rate Structure			Select a Rate Structure	
	On Track			On Track	

On Track if: 'Increasing Block', 'Uniform', 'based on long term marginal cost' or 'next unit of capacity'

CUWCC BMP RETAIL COVERAGE REPORT 2009-2010

Foundation Best Management Practices for Urban Water Efficiency

BMP 2. EDUCATION PROGRAMS

BMP 2.1 Public Outreach Actions Implemented and Reported to CUWCC

	2009	2010
1) Contacts with the public (minimum = 4 times per year)	6	6
2) Water supplier contacts with media (minimum = 4 times per year, i.e., at least quarterly).	7	11
3) An actively maintained website that is updated regularly (minimum = 4 times per year, i.e., at least quarterly).	Yes	Yes
4) Description of materials used to meet minimum requirement.	Newsletter articles on conservation Flyers and/or brochures, bill stuffers, messages Landscape water conservation media campaigns General water conservation information Website News releases Newspaper contacts Radio contacts	Newsletter articles on conservation Flyers and/or brochures, bill stuffers, messages Landscape water conservation media campaigns General water conservation information Articles or stories resulting from outreach News releases Newspaper contacts Radio contacts
5) Annual budget for public outreach program.	$ 88,551	$ 118,219
6) Description of all other outreach programs	Description is too large for text area. Data will be stored in the BMP Reporting database when online.	Description is too large for text area. Data will be stored in the BMP Reporting database when online.
	On Track for 6 Actions	**On Track for 6 Actions**

All 6 action types implemented and reported to CUWCC to be 'On Track')

CUWCC BMP RETAIL COVERAGE REPORT 2009-2010

Foundation Best Management Practices for Urban Water Efficiency

2.2 School Education Programs Implemented and Reported to CUWCC

	2009	2010	
Does a wholesale agency implement School Education Programs for this unility's benefit?	Yes	Yes	
Name of Wholesale Supplier?	Santa Barbara County Water Agency	Santa Barbara County Water Agency	
1) Curriculum materials developed and/or provided by agency	The materials we distribute include water conservation coloring books, posters, and worksheets as well as water resources and water conservation information on our website.	The materials we distribute include water conservation bookmarks, coloring books, posters, and worksheets as well as water resources and water conservation information on our website.	Yes/ No
2) Materials meet state education framework requirements and are grade-level appropriate?	Yes	Yes	All 5 actions types implemented and reported to CUWCC to be 'On Track'
3) Materials Distributed to K-6?	Yes	Yes	
Describe K-6 Materials	The City of Santa Barbara provides water conservation coloring books, pencils, posters, stickers, and worksheets to K-6 students	The City of Santa Barbara provides water conservation bookmarks, coloring books, pencils, posters, stickers, and worksheets to K-6 students	Describe materials to meet minimum requirements
Materials distributed to 7-12 students?	Yes	Yes	Info Only
4) Annual budget for school education program.	$ 4,000	$ 4,000	
5) Description of all other water supplier education programs	The City provides water education presentations and materials to local schools and summer camps. Tours of the City's water treatment facilities with free bus transportation are provided. The City participates in the annual Water Awareness High School Vide	The City provides water education presentations and materials to local schools and summer camps. Tours of the City's water treatment facilities with free bus transportation are provided. The City participates in the annual Water Awareness High School Vide	
	See Wholesale Report 0 **On Track**	**See Wholesale Report** 0 **On Track**	

CUWCC BMP COVERAGE REPORT BMP 3 RESIDENTIAL

Agency: City of Santa Barbara **District Name:** City of Santa Barbara, PWD **CUWCC Unit #:** 88

Date: April 18, 2011

Primary Contact Alison Jordan **Email** ajordan@SantaBarbaraCA.gov

Compliance Option Chosen By Reporting Agency: Traditional **Initial 10 year period completed:** Y **If "Yes"credit for past BMP Implementation?** Y

Historic Re 1965

Completed Accounts SF Surveys: 3145 **MF Surveys:** 1852

15% of Accounts **SF** 2531 **MF** 910

Date 2009 Data Downloaded from PDF June 1, 2011

Date 2019 Data Downloaded from PDF June 1, 2011

BMP 3 C 1) Residential Assistance

	2009 Single Family Accounts	2009 SF Target	2009 Multi Family Units	2009 MF Targets	2010 Single Family Accounts	2010 SF Target	2010 Multi Family Units	2010 MF Targets
Total Number of Customers	16,873		6,069		16,920		6126	
Total Participants during Reporting Period	333		79		365		95	
Number of Leak Detection Surveys or Assistance on Customer Property	200	127	79	46	202	127	95	46
Number of Faucet Aerators Distributed	0		0		200		45	
Number of WSS Showerheads Distributed	1		10		0		4	
		On Track		On Track		On Track		On Track

"On Track" if annual number of surveys/assistance >= 1.5% of SF accounts and MF units; or >0.75% if historical credit is

Agency: City of Santa Barbara **District Name:** City of Santa Barbara, PWD **CUWCC Unit #:** 88

BMP 3 C2) Landscape Water Surveys	2009		2010		
	SF		SF		
Number of SF account landscape water surveys completed	133	127	163	127	
Surveys as Percent of SF Accounts	0.79%		0.96%		
	On Track		On Track		

greater than 15%

"On Track" if annual number of landscape surveys >= 1.5% of SF accounts

BMP 3 C3) High Efficiency Clothes Washers	2009		2010	
Number Financial Incentives Provided to Customers	182	152	101	169
Percent	1.69%		0.60%	
	On Track		On Track	

Historic HECW Program? Y

Credit for Historic HECW 103

Credit =124 x 5/6

"On Track" if number of incentives for HECW (WF,=5.0) => 0.9% SF accounts in 2009 and 1.0 % in 2010

Credit = Total number of HECW

BMP 3 C4) Water Sense Specification Toilets	2009		2010	
Retrofit 'On Resale' Ordinance exists	No		No	
75% Market Penetration Achieved				
If 'Yes' is documentation provided?	Yes	On Track	Yes	On Track

Ordinance must require replacement of toilets => 3.5 gpf when property is sold
On Track if ordinance exists

On Track if 75% penetration achieved and documentation provided

	SF	MF Units	SF	MF Units
Five year average Resale Rate	4%	9%	4%	9%
Number Toilets per Household	2	1	2	1
Number WSS Toilets Installed	22	10	17	4
Ave Resale Rate X Toilets /residence	675	273	677	276

On Track If number of toilets installed => average resale rate X number toilets per residence (from Base Year Data)

Agency: City of Santa Barbara | District Name: City of Santa Barbara, PWD | CUWCC Unit #: 88

BMP 3 C5) WSS for New Residential Development

	2009 SF	2009 MF	2010 SF	2010 MF	
Does an Ordinance Exists Requiring WSS Fixtures and Appliances in new SF and MF	No	No	No	No	On Track if ordinance exists requiring WSS in new residential units and documentation is provided
If 'Yes' is documentation provided?					
Incentives					
Number of new SF & MF units built	3	59	5	241	If no ordinance, to be On Track, provide incentives and describe, Including:

On Track

List Incentive Types, $ amounts, number of WSS fixtures installed; and number of participating SF & MF homes

2009 New Residential Development Incentives and Results

Types of Incentives	Incentive Value SF	Number WSS Fixtures Installed	Number SF Participants	Number MF Participants	Measured SF Water Savings AF	Measured MF Water Savings AF
Built Green Fast	$ 100	14	3	8		

2010 New Residential Development Incentives and Results

Types of Incentives	Incentive Value SF	Number WSS Fixtures Installed	Number SF Participants	Number MF Participants	Measured SF Water Savings AF	Measured MF Water Savings AF
Built Green Fast	$ 100	9	3	3		

CUWCC BMP COVERAGE REPORT

Traditional BMP 4 - Comercial Industrial Institutional

Agency: City of Santa Barbara
District Name: City of Santa Barbara
CUWCC Unit #: 88
Primary Contact Alison Jordan
Email: ajordan@santabarbaraca.gov
Report Date: June 30, 2011
Compliance Option Chosen By Reporting Agency: Traditional
Date Agency Signed MOU: 1/28/1992
Initial 10 year period completed: Y
If "Yes" , 50% credit for past BMP 9 Implementation? Y
Water Savings Credit (AF) 8.8

CII Baseline Water Use (AF): 2,550.0
Target CII Water Use Reduction (AF) 255.0
2 year Target (AF) 12.8

Target Reduction is 10% of Baseline CII water use over 10 years.

Water Efficiency Measures	2009 Quantity Installed	2009 Water Savings AF	2010 Quantity Installed	2010 Water Savings AF	Type of Program	Other type of Program
1 High Efficiency Toilets (1.2 GPF or less)	72	3.0	1	0.0	Incentive	
2 High Efficiency Urinals (0.5 GPF or less)	6	0.4	0	0.0	Incentive	
3 Ultra Low Flow Urinals	6	0.5	0	0.0	Incentive	
4 Zero Consumption Urinals	6	0.6	0	0.0	Incentive	
5 Commercial High Efficiency Single Load Clothes Washers	2	0.2	0	0.0	Incentive	
6 Cooling Tower Conductivity Controllers	0	0.0	0	0.0		
7 Cooling Tower pH Controllers	0	0.0	0	0.0		
8 Connectionless Food Steamers	0	0.0	0	0.0		
9 Medical Equipment Steam Sterilizers	0	0.0	0	0.0		
10 Water Efficient Ice Machines	0	0.0	0	0.0		
11 Pressurized Water Brooms	8	1.2	0	0.0	Incentive	
12 Dry Vacuum Pumps	0	0.0	0	0.0		
Total Water Savings		5.9		0.0		

Guideline: 'On Track' if estimated savings as percent of baseline:
0.5% by the end of first reporting perio
2.4% by end of yr 4,
6.4% by end of year 8
9 % by end of yr 10

CII List of Efficiency Measures from MOU Compliance Policies Tier 3, page 5, dated 10-06-09

On Track

CUWCC BMP COVERAGE REPORT

Traditional BMP 5 - Landscape

Agency: City of Santa Barbara
District Name: City of Santa Barbara
CUWCC Unit #: 88
Primary Contact Alison Jordan
Email: ajordan@santabarbara.gov
Report Date: June 30, 2011
Compliance Option Chosen By Reporting Agency: Traditional
Date Agency Signed MOU: 1/28/1992
Initial 10 year period completed: Y
If "Yes" , 50% credit for past BMP 9 Implementation? Y
50% of Completed Accounts: 30

Required Documentation

	2009	2010
Number of dedicated irrigation meter accounts	729	712
Number of dedicated irrigation meter accounts with water budgets.	729	712
Percent of dedicated irrigation meters with water budgets	100.0%	100.0%
Target Rate for Year 1	9%	Target Rate for Year 2 18% On Track
Aggregate water use for dedicated non-recreational landscape accounts with budgets	**443.71**	**379.47**

ETo-based water use budgets developed for 90% of CII accounts with dedicated irrigation meters at an average rate of 9% per year over 10 years

Aggregate acreage assigned water budgets and average ET for dedicated non-recreational landscape accounts with budgets.

2009 Acres	2009 Average ET	2010 Acres	2010 Average ET
672.31		656.2	

Offer site-specific technical assistance annually to all accounts that are 20% over budget within six years of the date implementation was to commence.

2009 Accounts ≥20% over-budget			2010 Accounts ≥20% over-budget		
Number of Accounts	Offered Technical Assistance	Accepting Technical Assistance	Number of Accounts	Offered Technical Assistance	Accepting Technical Assistance
85			61	20	5

Aggregate acreage of recreational areas assigned water budgets and average ET for dedicated recreational landscape accounts with budgets.

2009 Acres	2009 Average ET	2010 Acres	2010 Average ET

Agency: City of Santa Barbara **District Name:** City of Santa Barbara **CUWCC Unit #:** 88

CII Accounts without Meters or with Mixed-Use Meters

	2009	2010
Number of mixed use and un-metered accounts.	2289	2289

Incentive Type	2009 Incentives and Responses			2010 Incentives and Responses			
	Incentive Value $	Number offered to Customers	Number accepted by Customers	Incentive Value $	Number offered to Customers	Number accepted by Customers	
Smart Irrigation controllers	4653		12	22168		45	Agency will implement and maintain a customer incentive program(s) for irrigation equipment retrofits.

	2009 Surveys		2010 Surveys		
	Number offered.	Number accepted	Number offered.	Number accepted	
Landscape Irrigation Surveys	150	17	200	29	Complete irrigation water use surveys for not less than 15% of CII accounts with mixed-use meters and un-metered accounts within 10 years of the date implementation is to commence. (Note: CII surveys that include both indoor and outdoor components can be credited against coverage requirements for both the Landscape and CII BMPs.)
Agregate acreage for Mixed Use and un-metered accounts					On Track if the percent of CII accounts with mixed-use meters receiving a landscape water use survey equals or exceeds the following: 1.5% by the end of the first reporting period (year two) following the date implementation is to commence; 3.6% by the end of year four; 6.3% by the end of year six; 9.6% by the end of
Percent Surveys Complete				3.3%	
				On Track	

	2009 Savings AF	2010 Savings AF
Estimated annual water savings by customers receiving surveys and implementing recommendations.	5483	

No Methodology Spreadsheet was uploaded

(This page intentionally left blank.)

The fields in red are required.

Agency name: City of Santa Barbara

Reporting unit name (District name): City of Santa Barbara, PWD

Reporting unit number: 88

Primary contact:

First name: Alison

Last name: Jordan

Email: ajordan@santabarbaraca.gov

You must enter the reporting unit number that we have on record for your agency. Click here to open a table to obtain this number.

Base Year Data

Link to FAQs

Reporting Unit Base Year

What is your reporting period? Fiscal

Base Year 2008

BMP 1.3 Metering

Number of unmetered accounts in Base Year 0

BMP 3.1 & BMP 3.2 & BMP 3.3 Residential Programs

Number of Single Family Customers in Base Year 43,760

Number of Multi Family Units in Base Year 20,805

BMP 3.4 WaterSense Specification (WSS) Toilets

Number of Single Family Housing Units constructed prior to 1992

Number of Multi Family Units prior to 1992

Average number of toilets per single family household 2.2

Average number of toilets per multi family household 1.2

Five year average resale rate of single family households 5%

Five-year average resale rate of multi family households 5%

Average number of persons per single family household 2.59

Average number of persons per multi family household 6.8

BMP 4.0 & BMP 5.0 CII & Landscape

Total water use (in Acre Feet) by CII accounts 2550

Number of accounts with dedicated irrigation meters 759

Number of CII accounts without meters or with Mixed Use Meters 2,289

Number of CII accounts 2,517

Comments:

The fields in red are required.

Agency name: City of Santa Barbara

Division name (Reporting unit): City of Santa Barbara, PWD

Reporting unit number: 88

Primary contact:

First name: Alison

Last name: Jordan

Email: ajordan@santabarbaraca.gov

Water Uses 2009

Potable Water Billed

Make sure to enter numbers in AF/Year.

Customer Type	Meter Accounts	Metered Water Delivered	Un-metered Accounts	Un-metered Water Delivered	Description
Single-Family	16,873.00	6,260.00			
Multi-Family	6,069.00	3,033.00			
Commercial	2,462.00	2,160.00			
Industrial	55.00	283.00			
Dedicated Irrigation	759.00	778.00			
Other					
Other					
Other					
Other					
Other					
Other					
Other					
Other					

Potable Water Un-Billed

Customer Type	Meter Accounts	Metered Water Delivered	Un-metered Accounts	Un-metered Water Delivered	Description
Other					
Other					
Other					
Other					
Other					
Other					
Other					
Other					
Other					
Other					
Other					
Other					
Other					

The fields in red are required.

Agency name: City of Santa Barbara

Division name (Reporting unit): City of Santa Barbara, PWD

Reporting unit number: 88

Primary contact:

First name: Alison

Last name: Jordan

Email: ajordan@santabarbaraca.gov

Water Uses

2009

Non-Potable Billed

Customer Type	Meter Accounts	Metered Water Delivered	Un-metered Accounts	Un-metered Water Delivered	Description
Dedicated Irrigation	79.00	728.00			
Other					
Other					
Other					
Other					
Other					
Other					
Other					
Other					
Other					
Other					
Other					
Other					

Non-Potable Un-Billed

Customer Type	Meter Accounts	Metered Water Delivered	Un-metered Accounts	Un-metered Water Delivered	Description
Other					
Other					
Other					
Other					
Other					
Other					
Other					
Other					
Other					
Other					
Other					
Other					
Other					

The fields in red are required.

Agency name: City of Santa Barbara

Division name (Reporting unit): City of Santa Barbara, PWD

Reporting unit number: 88

Primary contact:

First name: Alison

Last name: Jordan

Email: ajordan@santabarbaraca.gov

WATER SOURCES

2009

Service Area Population: 93017

Potable Water

Own Supply Source Name	AF/YEAR	Water Supply Type	Water Supply Description
Cachuma Lake	8,236.00	Surface	
Gibraltar Reservoir	2,569.00	Surface	
Mission Tunnel	1,142.00	Groundwater	
Devil's Canyon	76.00	Surface	
Groundwater	1,112.00	Groundwater	
Desalination	0.00	Other	Ocean
		Other	
		Other	
		Other	
		Other	
		Other	

Imported Supply Source Name	AF/YEAR	Water Supply Type	Water Supply Description
State Water Project (SWP)	496.00	Surface	
SWP for LCMWC Conveyance	902.00	Surface	
Net imports from GWD	225.00	Surface	Water owed by the City by Goleta W
		Other	
		Other	
		Other	
		Other	
		Other	
		Other	
		Other	
		Other	

Exported Water Name	AF/YEAR	Where Exported?
Conveyance to LCMWC	902.00	State Water conveyed via City distribution system to La Cumbre M
Groundwater Injection	141.00	City groundwater basins for long-term storage

The fields in red are required.

Agency name: City of Santa Barbara

Division name (Reporting unit): City of Santa Barbara, PWD

Reporting unit number: 88

Primary contact:

First name: Alison

Last name: Jordan

Email: ajordan@santabarbaraca.gov

2009

Service Area Population: 93017

Non- Potable Water

If you select Other for type, enter

Own Supply Source Name	AF/YEAR	Water Supply Type	Water Supply Description
El Estero WWTP	729.00	Recycled Non Potable	
		Select a water type.	
		Select a water type.	
		Select a water type.	
		Select a water type.	
		Select a water type.	
		Select a water type.	
		Select a water type.	
		Select a water type.	
		Select a water type.	
		Select a water type.	

Imported Supply Source Name	AF/YEAR	Water Supply Type	Water Supply Description
		Select a water type.	
		Select a water type.	
		Select a water type.	
		Select a water type.	
		Select a water type.	
		Select a water type.	
		Select a water type.	
		Select a water type.	
		Select a water type.	
		Select a water type.	
		Select a water type.	

Exported Water Name	AF/YEAR	Where Exported? such as groundwater recharge, retail, e

(This page intentionally left blank.)

The fields in red are required.

Agency name: City of Santa Barbara

Reporting unit name (District name): City of Santa Barbara, PWD

Reporting unit number: 88

Primary contact:

First name: Alison

Last name: Jordan

Email: ajordan@santabarbaraca.gov

You must enter the reporting unit number that we have on record for your agency. Click here to open a table to obtain this number.

Link to FAQs

2009

BMP 1.1 Operations Practices

Comments:

See the complete MOU: View MOU

See the coverage requirements for this BMP:

Conservation Coordinator

Conservation Coordinator ◯ Yes ◯ No

Contact Information

First Name	Alison
Last Name	Jordan
Title	Water Conservation Coordinator
Phone	805 564-5574
Email	ajordan@SantaBarbaraCA.gov

Note that the contact information may be the same as the primary contact information at the top of the page. If this is your case, excuse the inconvenience but please enter the information again.

Water Waste Prevention

Water Agency shall do one or more of the following:

a. Enact and enforce an ordinance or establish terms of service that prohibit water waste
b. Enact and enforce an ordinance or establish terms of service for water efficient design in new development
c. Support legislation or regulations that prohibit water waste
d. Enact an ordinance or establish terms of service to facilitate implementation of water shortage response measures
e. Support local ordinances that prohibit water waste
f. Support local ordinances that establish permits requirements for water efficient design in new

To document this BMP, provide the following:

a. A description of, or electronic link to, any ordinances or terms of service
b. A description of, or electronic link to, any ordinances or requirements adopted by local jurisdictions or regulatory agencies with the water agency's service area.
c. A description of any water agency efforts to cooperate with other entities in the adoption or enforcement of local requirement
d. description of agency support positions with respect to adoption of legislation or regulations

You can show your documentation by providing files, links (web addresses), and/or entering a description.

File name(s): Email files to natalie@cuwcc.org

SBMC TITLE 14 Water and Sewers,Waste of Water Enforcement Policy, Landscape Design Standards A

Web address(s) URL: comma-separated list

Enter a description:

Waste of Water Enforcement Policy, per City Ordinance No. 4558, adopted on February 1989, prohibits the waste of water defined as gutter flooding and failure to repair leaks in a timely manner.
On August 12, 2008, the City Council adopted the revised Landscape Design Standards for Water Conservation, Resolution No. 08-083. The Landscape Design Standards were originally adopted by

The fields in red are required.

Agency name: City of Santa Barbara

Reporting unit name (District name): City of Santa Barbara, PWD

Reporting unit number: 88

Primary contact:

First name: Alison

Last name: Jordan

Email: ajordan@santabarbaraca.gov

You must enter the reporting unit number that we have on record for your agency. Click here to open a table to obtain this number.

Link to FAQs

View MOU

2009 BMP 1.2 Water Loss Control

Did your agency complete a pre-screening system audit in 2009? Yes ○ No ◉

If yes, answer the following:

Determine metered sales in AF:

Definition: other accountable uses not included in metered sales, such as unbilled water use, fire suppression, etc.

Determine system verifiable uses AF:

Determine total supply into the system in AF:

Does your agency keep necessary data on file to verify the answers above? Yes ○ No ○

Did your agency complete a full-scale system water audit during 2009? Yes ○ No ◉

Does your agency maintain in-house records of audit results or the completed AWWA worksheet for the completed audit which could be forwarded to CUWCC? Yes ◉ No ○

Did your agency operate a system leak detection program? Yes ○ No ◉

Comments:

The fields in red are required.

Agency name: City of Santa Barbara

Reporting unit name (District name): City of Santa Barbara, PWD

Reporting unit number: 88

Primary contact:

First name: Alison

Last name: Jordan

Email: ajordan@santabarbaraca.gov

You must enter the reporting unit number that we have on record for your agency. Click here to open a table to obtain this number.

Link to FAQs

2009 BMP 1.2 Water Loss Control

View MOU

AWWA Water Audit

Agency to complete a Water Audit & Balance Using The AWWA Software ○ Yes ○ No

Email to natalie@cuwcc.org - Worksheets (AWWA Water Audit). Enter the name of the file below:

Water Audit Validity Score from AWWA spreadsheet

Agency Completed Training In The AWWA Water Audit Method ○ Yes ○ No

Agency Completed Training In The Component Analysis Process ○ Yes ○ No

Completed/Updated the Component Analysis (at least every 4 years)? ○ Yes ○ No

Component Analysis Completed/Updated Date

Water Loss Performance

Agency Repaired All Reported Leaks & Breaks To The Extent Cost Effective ○ Yes ○ No

Recording Keeping Requirements:

Date/Time Leak Reported	Leak Location
Type of Leaking Pipe Segment or Fitting	Leak Running Time From Report to Repair
Leak Volume Estimate	Cost of Repair

Agency Located and Repaired Unreported Leaks to the Extent Cost Effective ○ Yes ○ No

Type of Program Activities Used to Detect Unreported Leaks

Active water main replacement program.

Annual Summary Information

Complete the following table with annual summary information (required for reporting years 2-5 only)

Total Leaks Repaired	Economic Value Of Real Loss	Economic Value Of Apparent Loss	Miles Of System Surveyed For Leaks	Pressure Reduction Undertaken for loss reduction	Cost Of Interventions	Water Saved (AF/Year)

Comments:

The fields in red are required.

Agency name: City of Santa Barbara

Reporting unit name (District name): City of Santa Barbara, PWD

Reporting unit number: 88

Primary contact:

First name: Alison

Last name: Jordan

Email: ajordan@santabarbaraca.gov

You must enter the reporting unit number that we have on record for your agency. Click here to open a table to obtain this number.

BMP 1.3 Metering with Commodity

Link to FAQs

See the complete MOU: View MOU

See the coverage requirements for this BMP:

Implementation

Does your agency have any unmetered service connections? Yes No

If YES, has your agency completed a meter retrofit plan? Yes No

Enter the number of previously unmetered accounts fitted with meters during reporting year:

Are all new service connections being metered? Yes No

Are all new service connections being billed volumetrically? Yes No

Has your agency completed and submitted electronically to the Council a written plan, policy or program to test, repair and replace meters? Yes No

Please Fill Out The Following Matrix

Account Type	# Metered Accounts	# Metered Accounts Read	# Metered Accounts Billed by Volume	Billing Frequency Per Year	# of estimated bills/yr
Single-Family	16,873	16,873	16,873	Monthly	12
Multi-Family	6,069	6,069	6,069	Monthly	12
Commericial	2,462	2,462	2,462	Monthly	12
Industrial	55	55	55	Monthly	12
Dedicated Irrigatic	704	704	704	Monthly	12
Agricultural	55	55	55	Monthly	12
Other				Other	
Other				Other	
Other				Other	
Other				Other	

Number of CII Accounts with Mixed-use Meters: 2,289

Number of CII Accounts with Mixed-use Meters Retrofitted with Dedicated Irrigation Meters during Reporting Period: 0

Feasibility Study

Has your agency conducted a feasibility study to assess the merits of a program to provide incentives to switch mixed-use accounts to dedicated landscape meters? Yes No

If YES, please fill in the following information:

A. When was the Feasiblity Study conducted

B. Email or provide a link to the feasibility study (or description of):

File name(s): Email files to natalie@cuwcc.org Enter the file name here e.g. WaterWastePreventionOrdinan

Web address(s) URL: comma-separated list Enter the URL to your documentation.

General Comments about BMP 1.3:

The fields in red are required.

Agency name: City of Santa Barbara

Reporting unit name (District name): City of Santa Barbara, PWD

Reporting unit number: 88

Primary contact:

First name: Alison

Last name: Jordan

Email: ajordan@santabarbaraca.gov

You must enter the reporting unit number that we have on record for your agency. Click here to open a table to obtain this number.

Link to FAQs

View MOU

BMP 1.4 Retail Conservation Pricing

2009

If you are reporting more rate structures than this form allows, add the structures to a spreadsheet and send the file to natalie@cuwcc.org.

Implementation (Water Rate Structure)

Enter the Water Rate Structures that are assigned to the majority of your customers, by customer class

Rate Structure	Customer Class	Total Revenue Commodity Charges	Total Revenue Customer Meter/Service (Fixed Charges)
Increasing Block		10,370,435.00	3,253,067.00
Increasing Block		5,355,212.00	1,506,727.00
Increasing Block		5,147,973.00	1,062,128.00
Increasing Block		838,042.00	71,447.00
Allocation Based		924,561.00	380,056.00
Uniform		640,557.00	119,178.00
Select a Rate Struc			

Implementation Option (Conservation Pricing Option)

- ○ Use Annual Revenue As Reported
- ○ Use Canadian Water & Wastewater Association Rate Design Model

If CWWA is select, enter the file name and email the spreadsheet to natalie@cuwcc.org

Retail Waste Water (Sewer) Rate Structure by Customer Class

Agency Provide Sewer Service ○ Yes ○ No

Select the Retail Waste Water(Sewer) Rate Structure assigned to the majority of your customers within a specific customer class.

Rate Structure	Customer Class	Total Revenue Commodity Charges	Total Revenue Customer Meter/Service (Fixed Charges)
Uniform		2,188,021.00	3,032,344.00
Uniform		2,837,678.00	2,457,934.00
Uniform		114,371.00	2,173,049.00
Uniform		19,708.00	374,443.00
Select a Rate Struc			
Select a Rate Struc			
Select a Rate Struc			

Comments:

The fields in red are required.

Agency name: City of Santa Barbara

Reporting unit name (District name): City of Santa Barbara, PWD

Reporting unit number: 88

Primary contact:

First name: Alison

Last name: Jordan

Email: ajordan@santabarbaraca.gov

Click here to open a table that displays your agency name reporting unit name and reporting unit number. Please ensure that you enter the correct information.

Link to FAQs

2009

BMP 2.1 Public Outreach - Retail Reporting

View MOU

Is a Wholesale Agency Performing Public Outreach?

Are there one or more wholesale agencies performing public outreach which can be counted to help your agency comply with the BMP? ○ Yes ○ No

Enter the name(s) of the wholesale agency (comma delimited): Santa Barbara County Water Agency

Is your agency performing public outreach?

Report a minimum of 4 water conservation related contacts your agency had with the public during the year.

Public Information Programs List

Did at least one contact take place during each quarter of the reporting year? ✓

Number of Public Contacts	Public Information Programs
6	Newsletter articles on conservation
1,662	Flyers and/or brochures (total copies), bill stuffers, messages printed on bill, information packets
1,367	Landscape water conservation media campaigns
266	General water conservation information
24	Website

Contact with the Media

Are there one or more wholesale agencies performing media outreach which can be counted to help your agency comply with the BMP? ○ Yes ○ No

Enter the name(s) of the wholesale agency (comma delimited): Santa Barbara County Water Agency

OR Retail Agency (Contacts with the Media)

Media Contacts List

Did at least one contact take place during each quarter of the reporting year? ✓

Number of Media Contacts	Media Contact Types
7	Articles or stories resulting from outreach
4	News releases
21	Newspaper contacts
664	Radio contacts
687	Television contacts
	Select a type of media contact

Is a Wholesale Agency Performing Website Updates?

Did one or more CUWCC wholesale agencies agree to assume your agency's responsibility for meeting the requirements of and for CUWCC reporting of this BMP? ○Yes ○No

Enter the name(s) of the wholesale agency (comma delimited)

Santa Barbara County Water Agency

Is Your Agency Performing Website Updates?

Enter your agency's URL (website address): www.savewatersb.org

Describe a minimum of four water conservation related updates to your agency's website that took place during the year:

1) Added information on the Smart Landscape Rebate Program.
2) In partnership with the County Water Agency we launched a "Water Wise Gardening in Santa Barbara County" interactive gardening website with local garden tours, garden gallery, and water wise plant list.
3) We added information and links to EPAs WaterSense program
4) We included more print material on the website that is translated into Spanish

Did at least one Website Update take place during each quarter of the reporting year? ○Yes ○No

Public Outreach Annual Budget

Enter budget for public outreach programs. You may enter total budget in a single line or brake the budget into discrete categories by entering many rows. Please indicate if personnel costs are included in the entry.

Category	Amount		Personnel Costs Included? If yes, check the box.	Comments	
Total Budget	$88,551				

Comments:

Public Information Programs Water Conservation Hotline. The Hotline handles the incoming calls for the Water Conservation Program. Hotline staff schedule wat

City of Santa Barbara
Long-Term Water Supply Plan
2011

Prepared by Water Resources Division,
Public Works Department

Adopted by the Santa Barbara City Council on June 14, 2011,
as Agenda Item No. 15

City Council:

Helene Schneider, Mayor
Grant House, Councilmember
Dale Francisco, Councilmember
Frank Hotchkiss, Councilmember
Michael Kathleen Self, Councilmember
Harwood “Bendy” White, Councilmember
Randy Rowse, Councilmember

Board of Water Commissioners:

Landon Neustadt, Chair
Barry Keller, Vice-Chair
Russell Ruiz, Commissioner
James Smith, Commissioner
Bill Thomas, Commissioner

(This page intentionally left blank)

City of Santa Barbara

Long-Term Water Supply Plan
2011

Introduction

The City of Santa Barbara provides water service to most properties within the City limits, as well as several unincorporated areas, including Mission Canyon and the Barker Pass. The service area is approximately 20 square miles with a population of approximately 91,416. The water utility is administered by the Water Resources Division of the Public Works Department. The City's potable water supply sources include surface water from Gibraltar Reservoir, Devils Canyon Creek, and Lake Cachuma; groundwater from City production wells and Mission Tunnel infiltration; State Water; and desalination. A separate recycled water system supplies treated wastewater, primarily for irrigation, to offset the need to use potable water. In addition, water conservation is a key component of water supply management due to its role in offsetting the need to develop new water supplies and reducing the demand on existing water supplies. The Water Fund budget for FY 2011 includes an Operating Budget of $31,301,242 and a Capital Program of $3,349,702, for a total budget of $34,650,944.

For the past 17 years, the water supply has been managed under the 1994 Long-Term Water Supply Program (1994 LTWSP). Important events at the time of the program's adoption included the recent end of the severe drought of 1987 to 1991, an extensive inventory and analysis of water supply alternatives, and the addition of recycled water, State Water, and desalination to the City's water supply portfolio. The program incorporated water demand estimates derived from the City's 1988 General Plan Update process and water conservation savings anticipated from a rapidly developing City Water Conservation Program. During the two decades since the drought, the City's normal year water system demand (including potable and recycled water demand) has dropped from a pre-drought amount of 16,300 AFY to 14,000 AFY, despite a population increase of approximately 5%. This is a significant consideration in the development of this updated plan and is discussed in detail in later sections.

The fundamental challenge for the City's water supply continues to be the ability to provide adequate water during an extended drought. However, the water supply situation may also be affected by potential climate change impacts on hydrology and sea level, new constraints on deliveries of State Water through the Sacramento-San Joaquin Delta, a statewide water supply deficit with an accompanying legislative mandate for water use reduction, new technologies and practices for conserving water, and increasing costs for water supply and operation of the water system.

The City has recently certified an Environmental Impact Report (EIR) for the *Plan Santa Barbara* process to update the City's General Plan. The document included an analysis

of the City's water supply, which was developed in conjunction with the City's Water Commission in preparation for a recommendation to update the 1994 LTWSP. On June 14, 2011, the City Council adopted this Long-Term Water Supply Plan as Agenda Item No. 15.

Terms and Concepts

A number of key terms and concepts play a role in water supply planning and are discussed below:

Planning Period: The period covered by this plan is from 2011 through 2030, intended to roughly correspond with the term of the anticipated General Plan update.

Water Production: Production is the amount of water treated and put into the City distribution system in order to serve City water customers, net of deductions for water that leaves the distribution system as transfers for other purposes. As such, production is a measure of the amount of water supply needed to serve City customers. Production is tracked separately for the potable and recycled distribution systems. The sum of these two is referred to as "system production."

Metered Sales: The City maintains 26,513 retail water meters that measure the water used from the distribution system by City water customers. The sum of usage on these meters is referred to as "metered sales." Due to system losses, distribution system flushing, and normal meter inaccuracy, this number is generally about 90% to 92% of the production amount.

Cloud Seeding: Clouds can be seeded with certain compounds that enhance the amount of precipitation generated. The City participates, with other Santa Barbara County agencies, in an annual cloud seeding program to augment precipitation and runoff into local reservoirs.

Marginal Cost: To evaluate the economic benefits of ordering more water from one supply over another, only those costs that vary with the amount of water delivered are considered. These are called the "marginal" costs, also referred to as "variable" costs. Fixed or "sunk" costs are not included since they are the same regardless of whether more water is taken from a given source. For example, State Water has substantial costs for debt service and fixed operation and maintenance, but it is only the variable costs for chemicals and electricity that influence the economics of ordering additional State Water.

Avoided Cost: The cost effectiveness of a water conservation measure is evaluated by comparing the cost of the measure to the marginal cost that is avoided as a result of implementing the conservation measure and reducing the amount of water supply required.

Critical Drought Period: A water supply is evaluated by how well it performs in meeting the target level of demand during the expected worst case water supply situation. For the Santa Barbara area, this worst case is an extended drought, characterized by multiple years of below average rainfall, resulting in minimal inflow to Lake Cachuma and declining reservoir levels. The historical critical drought period for Santa Barbara is the 5-year period of 1947 to 1951. The most recent drought of 1987-1991 was somewhat less severe. Importantly, any year following the filling and spilling of Lake Cachuma could be the first year of a critical drought period, but this generally doesn't become apparent until about the third year.

Conservation: The City's Water Conservation Program promotes ongoing efforts to improve water efficiency and reduce waste in ways that don't require lifestyle sacrifices on the part of customers. Examples include using a high efficiency clothes washer to do the job with less water, fixing leaks, replacing a conventional irrigation controller with a smart irrigation controller, and replacing lawn with water wise plants. This type of conservation can be counted on for long-term reduction in demand, which avoids the need to procure more water supplies with high marginal cost. For water supply planning, it is important to distinguish between these ongoing efforts, and planned short-term extraordinary demand reductions employed during an extended severe drought or other catastrophic water supply interruption.

Safety Margin: In addition to quantifiable estimates of water supply yield and projected water demand, there is the potential for unplanned and unquantifiable shortages in supply or increases in demand. The approach used in this plan is to make reasoned estimates of supply and demand for the planning period and then add a safety margin on top of the projected demand target to recognize that unexpected events will occur.

Planned Demand Reductions During Severe Drought: A water supply can be planned for 100% reliability (i.e., able to meet full demand under all circumstances). However, meeting this reliability standard can result in significant additional cost. Because there is short-term flexibility in water demand during extraordinary conditions, it is reasonable to count on such short-term reductions to some extent to reduce the cost of operating the water system. During the most recent severe drought of 1987-1991, it became necessary to seek extraordinary reductions of up to 50%, which came at some considerable expense to the community. This level of planned reduction was deemed excessive during the development of the 1994 LTWSP and an amount equal to 10% of target demand was adopted at that time. This percentage was referred to as the "acceptable shortage" in the 1994 LTWSP.

Water Supply Performance: A water supply plan is evaluated by whether it meets the established technical and policy goals during the planning period. Performance of the water supply is based on assumptions for anticipated deliveries from the various sources. For the City's plan, much of this information comes from the Santa Ynez River Hydrology Model (SYRHM), a computer model developed by the Santa Barbara County Water Agency. The model covers a 76-year period from 1918 to 1993. It uses historical weather and river flow data, along with current water supply facilities and

operational strategies, to simulate the long-term yield of the river in its current state. The purpose is to illustrate how our current water supply portfolio might perform over a future period that is similar to the past. This explains why, for example, the model results include yield from Lake Cachuma in years before the reservoir actually existed.

A second important element of the performance analysis is to evaluate the relative costs of various options for meeting the supply goals. The focus is on marginal costs for the supplies that are part of the various alternatives evaluated.

Current Water Supply Portfolio

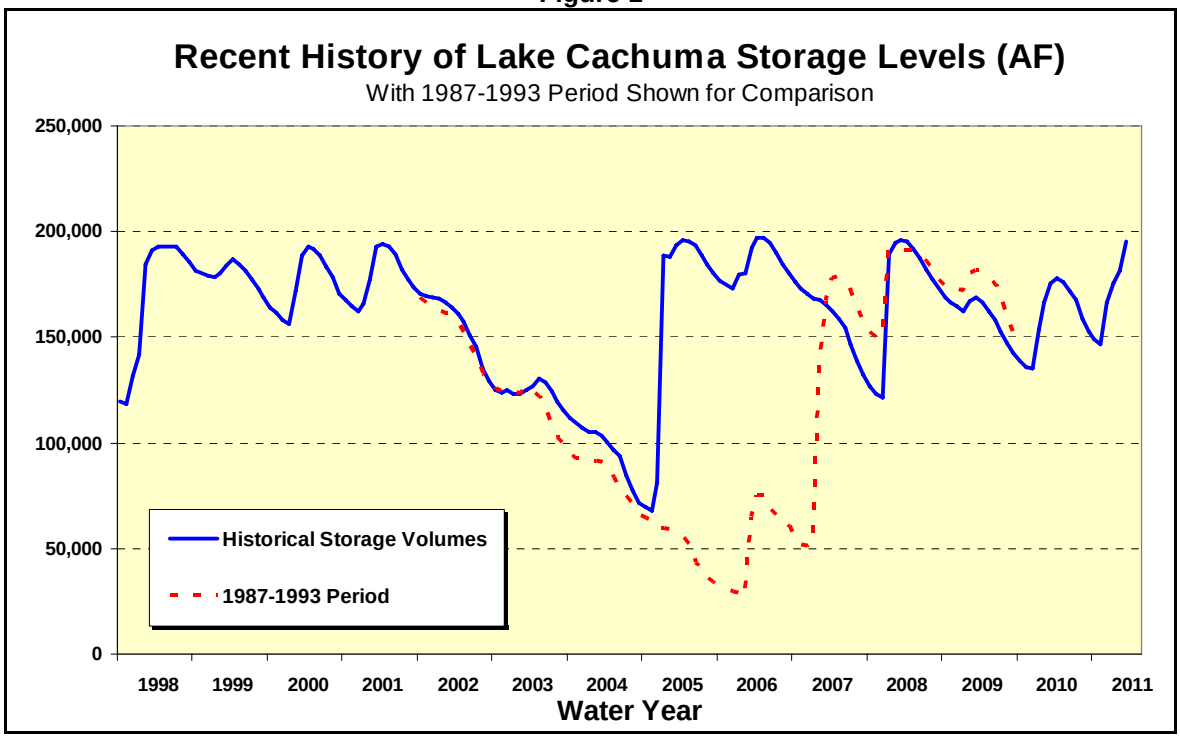
The City operates a diverse water supply. The various supply sources are summarized below. Additional discussion is included in the Final EIR for the *Plan Santa Barbara* process to update the City's General Plan.

Lake Cachuma

The federally-owned Cachuma Project on the Santa Ynez River supplies water to the City and four other member agencies. The most recent capacity survey (2008) estimated the storage capacity at 186,636 AF. The reservoir is currently operated to supply a total yield of 25,714 AFY to the five member agencies in most years. The City's current share of this annual yield is 8,277 AFY. In later years of extended dry periods (characterized by consecutive years of below average rainfall), storage typically drops below 100,000 AF and deliveries to member agencies are reduced. Historically the reservoir has filled and spilled an average of once every three years, but there occasionally are longer dry periods, the longest of which defines the critical drought period for planning purposes. Lake Cachuma is the City's primary water supply and the multi-year storage capacity provides an important buffer against dry periods. Figure 1 illustrates the recent history of storage levels at Lake Cachuma.

The lake is operated by the U.S. Bureau of Reclamation pursuant to orders of the State Water Resources Control Board (SWRCB) and in compliance with a Biological Opinion issued by the U.S. Fish and Wildlife Service (USFWS) for protection of steelhead trout, which were designated as endangered in the Lower Santa Ynez River in 2003. SWRCB is considering Lake Cachuma and Santa Ynez River water rights following a major hearing on the Cachuma Project conducted in November 2003. This was a continuation of SWRCB's long-standing review of the Cachuma Project in terms of its effects on downstream water users and on Public Trust resources (i.e., steelhead trout). The SWRCB ruling has been delayed pending completion of the necessary environmental documents.

Figure 1



For estimating future deliveries from Lake Cachuma during the planning period, the following assumptions were used:

- Alternative 3-C of the 2003 Cachuma Water Rights hearing Draft EIR, as modeled by the SYRHM was assumed. This includes a reservoir surcharge of 3-foot elevation (now in place) to provide additional water for fish releases and operation of the reservoir in compliance with the above mentioned Biological Opinion.

- Siltation has historically averaged about 332 AFY from the time of dam construction in 1953 until the most recent reservoir survey in 2008. Though options to control such siltation will be important, it should be assumed that this rate of siltation will continue, and would result in a 5% reduction in the reservoir capacity, and a roughly similar reduction in yield, by the end of the planning period. As a result, it could be estimated that normal year deliveries would be reduced from the current amount of 8,277 AFY to 7,863 AFY by the year 2030.

- Deliveries of Cachuma water during surplus (spill) conditions are not deducted from member agency annual entitlements, meaning that spill years usually result in some accumulation of water in excess of entitlement. The excess becomes "carryover" water that continues to be available until lost to spill or evaporation. This provides increased flexibility for members, but can not necessarily be expected to increase project yield above the amount modeled. Therefore, delivery estimates do not assume increased yield as a result of the carryover accounting of water accumulated during a spill condition.

Gibraltar Reservoir

In 1920, the City completed construction of Gibraltar Dam on the Santa Ynez River upstream of where Lake Cachuma was subsequently constructed. The dam formed Gibraltar Lake, with an initial storage capacity of 15,793 AF. Water is conveyed from Gibraltar Reservoir to the City through Mission Tunnel. From the beginning, siltation has been an issue, particularly following wildfires. In 1948, siltation had reduced the volume by about half and the dam was raised 23 feet to its current height of 1,400 feet above sea level. Prior to the 2007 Zaca Fire, which burned 60 percent of the Gibraltar watershed, the volume was 6,786 AF. Erosion since the fire, particularly the heavy rainfall of January 2008, has reduced the reservoir volume to 5,251 AF as of the June 2010 lake survey.

Since before the completion of Gibraltar Dam, the City has also diverted water from Devils Canyon Creek just downstream of the dam, with long-term average annual diversions of approximately 100 AFY. The City counts Devils Canyon diversions as part of its total allowable Gibraltar diversions.

As a result of the sale of the Juncal Dam site upstream of Gibraltar Reservoir and associated water rights in the early 1900's, the City receives an annual transfer of 300 AFY from the Montecito Water District. The water is transferred to the City's account at Lake Cachuma.

Current Gibraltar Reservoir operations are based on the 1989 Upper Santa Ynez River Operations Agreement (also known as the "Pass Through Agreement") by which the City agreed to defer a second enlargement of the reservoir in exchange for the right to receive a portion of its Gibraltar water through Lake Cachuma. The intent of this arrangement was to allow the City to stabilize the yield of Gibraltar so it would be consistent with the 1988 reservoir volume, while recognizing the interests of the Cachuma Project and other downstream users.

The City and other signatories to the Pass Through Agreement are currently working to implement the Pass Through mode of the agreement, which tracks the yield of a hypothetical "Base Reservoir" that is equal to the 1988 storage capacity of 8,567 AF, and operated under the procedures defined in the Pass Through Agreement. The Pass Through mode allows Gibraltar Reservoir diversions (including diversions to Mission Tunnel and the portion taken through Cachuma) up to the amount that could have been diverted under the "Base Reservoir" operations. Modeling done in 1989 indicated that long-term average yield of the Base Reservoir would be 5,160 AFY. Yield under the actual Pass Through operations can be expected to be somewhat less on average, due to potential losses associated with conveyance of water between Gibraltar and Cachuma, and spill and evaporation of Pass Through water at Cachuma.

Mission Tunnel

Mission Tunnel conveys water from Gibraltar Reservoir through the Santa Ynez Mountains to the City and was completed in 1910. Infiltration into the tunnel from watersheds on both sides of the mountains contributes to the City's water supply. Water supplies from infiltration to Mission Tunnel have varied from a low of 500 AFY in 1951 to a high of 2,375 AFY, with an average annual yield of 1,125 AFY based on analysis in the DEIR for the Cachuma Project water rights hearings.

State Water Project

The City is a participant in the State Water Project (SWP). Deliveries to Santa Barbara County participants are administered by the Central Coast Water Authority (CCWA). Project water is delivered into Lake Cachuma through the Coastal Branch of the State Aqueduct and two locally-operated pipeline extensions. The SWP contract defines the maximum amount each project contractor is entitled to request each year, which is referred to as the "Table A" amount, referring to the table of that name in the contract. The City's SWP Table A amount is 3,300 AFY and the City has a share of pipeline capacity to deliver that amount. However, deliveries of Table A amounts are subject to availability and delivery constraints.

The California Department of Water Resources produces the State Water Delivery Reliability Report every two years to assist project participants in estimating anticipated deliveries. The 2009 version (published August 2010) is the most recent. The report is based on analysis using the CALSIM II computer model developed by DWR and USBR to simulate Delta flows and predict available deliveries.

Deliveries are estimated for "current conditions" (2009) and "future conditions" (2029). Projections for this plan are based on the "future" conditions, but it is important to note that "future" conditions do not assume improvements in the ability to deliver water through the Delta. Key assumptions are listed below:

- Despite substantial efforts being made to address Delta delivery constraints, DWR's modeling assumes no improvements to the current conveyance system through the Delta. For example, there is no assumption that a Peripheral Canal or other form of "isolated facility" to convey water around or under the Delta will be in place.

- The beneficial effects of planned increases in SWP reservoir capacity are not assumed as a part of the analysis.

- Current constraints on exports, including federal biological opinions of December 2008 (Delta smelt) and June 2009 (salmon, steelhead, green sturgeon, and killer whale) are assumed to remain in place.

- The model does not assume any easing of delivery constraints associated with potential habitat improvements related to the ongoing development of the Delta Habitat Conservation and Conveyance Program, which targets the co-equal goals of ecosystem restoration and water supply conveyance.

- The model has been modified to include the projected future hydrological effects of climate change. The most important of these effects are the assumed continuation of sea level rise and a reduction in the amount of precipitation that falls as snow. The latter reduces the "storage" effect provided by snowpack and results in more concentrated runoff during winter and early spring, versus late spring and summer, which has the effect of reducing the amount of water available for delivery to SWP contractors.

Based on the above assumptions for future conditions, the 2009 report projects 6-year average annual dry period deliveries of 32% to 36% of Table A amount, median deliveries of 63%, and long-term average annual deliveries of 60%. The estimated long-term average continues a downward trend in DWR's previous biennial reports, as shown in Figure 2, reflecting the restrictions of the biological opinions and the projected effects of climate change. Given the number of variables associated with State Water Project deliveries, staff analysis for this plan assumes annual deliveries would be limited in all years to no more than 50% of Table A amounts, reflecting experience during 2008 and 2009. This results in an average annual predicted delivery of 46% of Table A amount (also shown in Figure 2).

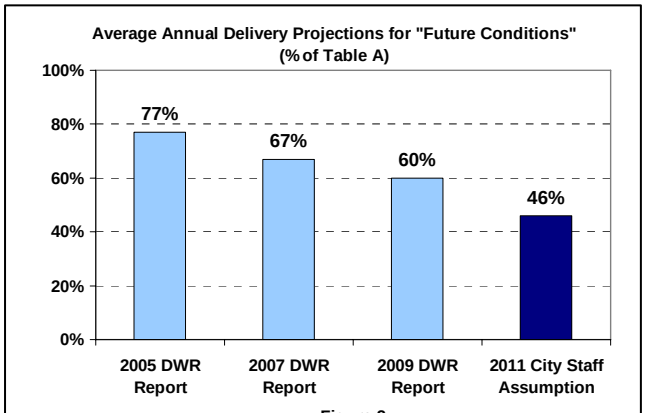


Figure 2

For comparison purposes, actual Table A availability for the past 5 years is shown in Figure 3. This period of 2005 to 2010 includes the recent statewide drought. Three of the five years were classified as "dry" or "critically dry." The period also includes significant new restrictions in SWP deliveries due to environmental and endangered species issues. The 57% average delivery amount for this period suggests that the assumption of 46% average annual deliveries is reasonably conservative.

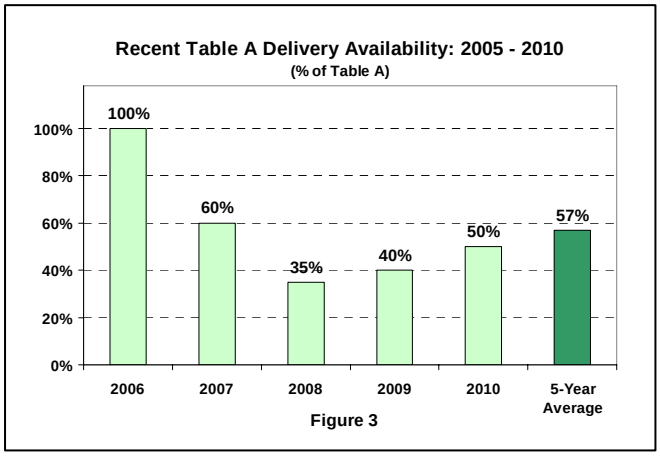


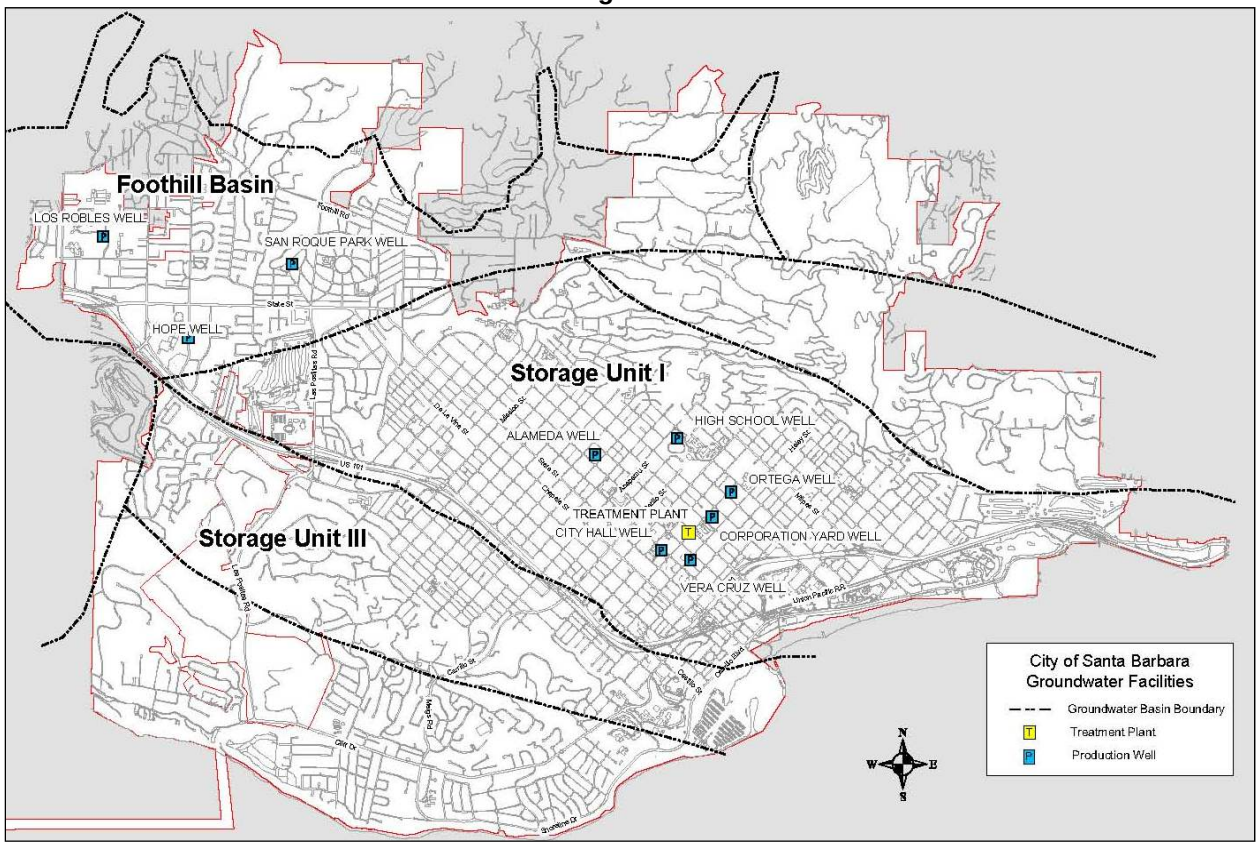
Figure 3

An additional important consideration is the ability of the SWP pipeline to convey non-project water to augment drought year supplies. These potential supplemental water supplies include the State's Dry Weather Water Purchase Program, purchase of unused Table A water available through San Luis Obispo County, or other open market water purchases, such as purchase of agricultural water.

Groundwater

City groundwater supplies are produced from two basins: Storage Unit No. 1 (downtown area) and the Foothill Basin (outer State Street area) as shown in Figure 4. The City conjunctively manages groundwater supplies, withdrawing water when needed and allowing recharge to occur following drought periods. A primary goal of this program is to attempt to utilize the perennial yield of the groundwater basins, while also managing the basins to maximize available storage to act as a back-up supply during drought periods.

Figure 4



The estimated long-term safe yield of these two basins is approximately 1,800 AFY. Extraction by private pumpers is estimated at 500 AFY. The City has six production wells in Storage Unit No. 1 and three in the Foothill Basin, though the wells are in need of varying degrees of maintenance or replacement. While the estimated total pumping capacity is approximately 4,500 AFY, a capacity of 4,150 AFY is assumed for planning

purposes. The total usable storage capacity of these two basins is estimated at 16,000 AF of City pumping. A third basin (Storage Unit No. 3 in the Las Positas Valley area) provides additional safe yield of approximately 100 AFY, but water quality is inferior and is not planned for use.

Seawater intrusion into Storage Unit No. 1 is a key issue because the groundwater basin is in contact with seawater that can flow into the basin during periods of heavy pumping. Under normal periods of little or no pumping, the groundwater flow is toward the ocean, which stops intrusion and pushes the seawater interface seaward. The City's Multiple Objective Optimization Model (developed by USGS) was used to estimate pumping levels that represent a compromise between maximizing production and minimizing seawater intrusion. The model results in total pumping of up to about 17,800 AF during the drought period, allowing some intrusion for the last portion of the drought. It should be noted that this modeling was based on one additional well in each basin, which may have implications for future capital program needs. In Storage Unit No. 1, the assumption was that new wells would be placed further inland to minimize intrusion.

Recycled Water

Recycled water is used in the City to irrigate over 400 acres of landscaped areas (including schools, parks, the zoo, and golf courses) and for toilet flushing in some public restrooms. The City system as currently configured has the capacity to treat and deliver approximately 1,400 acre-feet per year (AFY) of recycled water. Current connected recycled water demand is approximately 800 AFY, plus approximately 300 AFY process water used at the wastewater treatment plant, leaving about 300 AFY of additional capacity.

To meet a City goal of no more than 300 mg/L of chloride during irrigation season, approximately 300 AFY of potable water has historically been blended into the recycled water. This is because blending is the least costly solution and potable water is currently available for this use. A ten-year history of blend amounts is shown in Figure 5.

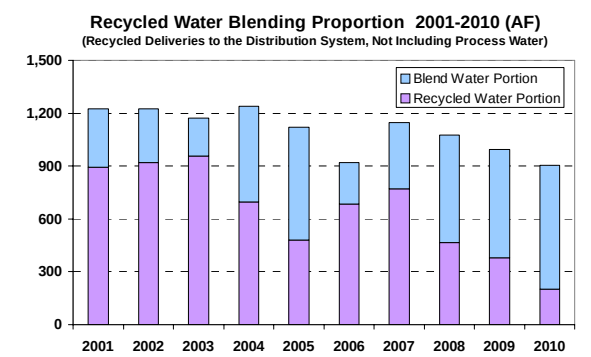


Figure 5

Secondary Process Issues: Beginning in 2004, due to challenges with the secondary treatment process, blending has increased recently to approximately 700 AFY to meet regulatory requirements. Improvements to the secondary process are being evaluated to address this recent increased use of potable water for blending. Once the secondary process is resolved, it is expected that the blend water component can be reduced.

Further Mineral Reduction: Mineral content suitable for irrigation purposes is an important part of fully utilizing the City's recycled water capacity and a standard other than the 300 mg/L chloride limit has been considered. Carollo Engineers identified an Environmental Protection Agency guideline of 1,000 mg/L of total dissolved solids (TDS) as a possible updated standard. A Carollo Engineers study on the recycled water filter rehabilitation project identified a conceptual project to meet this target without the need for blending. For a production rate of 1,910 AFY, the demineralization component was estimated to have a capital cost of $4.6 million. Annualized costs were estimated at approximately $652,000 (including the capital component) resulting in added unit cost of $341/AF of produced recycled distribution water. A blending alternative to meet the same standard is estimated to resulting in added unit cost of about $180/AF of produced water, assuming a cost of $600/AF for potable blend water. A modified blending alternative could involve blending only during the primary irrigation season, as is currently conducted to meet the chloride standard.

The recycled water system provides an important component of the City water supply, even with a partial potable water component for blending. In addition, the fact that users are signed up and connected to the separate recycled water system provides increased flexibility in how the City balances the economic and water supply aspects of this source of water.

Desalination

The Charles Meyer Desalination Facility was built in 1991 at an original capacity of 7,500 AFY and has a maximum hydraulic capacity of 10,000 AFY. Sale of a portion of this facility reduced current production capacity to a maximum of 3,125 AFY, which is also the capacity identified in the environmental analysis and permitting to convert the facility to permanent status in 1996. Due to reduced demand and relatively wet weather since 1992, the facility has been kept in long-term storage mode. However, the facility is permitted as a permanent part of the City water supply under a Coastal Development Permit approved by the City and the Coastal Commission. The City's current Regional Water Quality Control Board National Pollutant Discharge Elimination System (NPDES) permit for discharge from the City's wastewater treatment plant includes provisions for discharge of brine when the desalination facility is in operation.

The construction and operation of the Desalination Facility was approved by City voters in an advisory election held in 1991. No major technical barriers have been identified that would prevent reactivation of this facility to produce 3,125 AFY if needed. Although permit requirements would be subject to review by various regulatory agencies, the City has approval of all major permits required to operate this facility.

Reactivation of the facility at a capacity of 3,125 AFY was estimated by Carollo Engineers to cost $17.7 million. (An additional $2.5 million in distribution system improvements that would be required to operate the facility are already planned for construction due to their value in improving overall distribution of water throughout the

system). Operating costs are estimated to be $1,470 per AF, compared to variable costs of about $100 to $700 for other City water supplies. It should be noted that desalinated water includes a substantial energy component, estimated at 4,615 kilowatt-hours (kWh) per AF of produced water. This is lower than the original facility's energy use of 6,600 kWh per AF, but still well in excess of the energy requirements for other City water supplies. Should the need arise, reactivation is estimated to require about 16 months from the time of approval of any required permits.

Demand Management

Demand management (i.e., water conservation), provides a viable alternative to the high marginal costs of procuring new water supplies or increased deliveries from the more expensive existing supplies. Projected water demand is a key input assumption of the water supply planning process. Balancing the assumptions of projected water demand with the projected water conservation savings is necessary to develop an accurate water demand forecast. This section reviews the history of the City's water demand, summarizes current water conservation efforts, and discusses recent analysis and regulations that are relevant to the anticipated level of demand during the planning period.

Current Status

The total water system production is used to track the demand for water, since water is produced and put into the distribution system to match customer demand. The history of water demand from 1986 to present is shown in Figure 6 as a moving 12-month average.

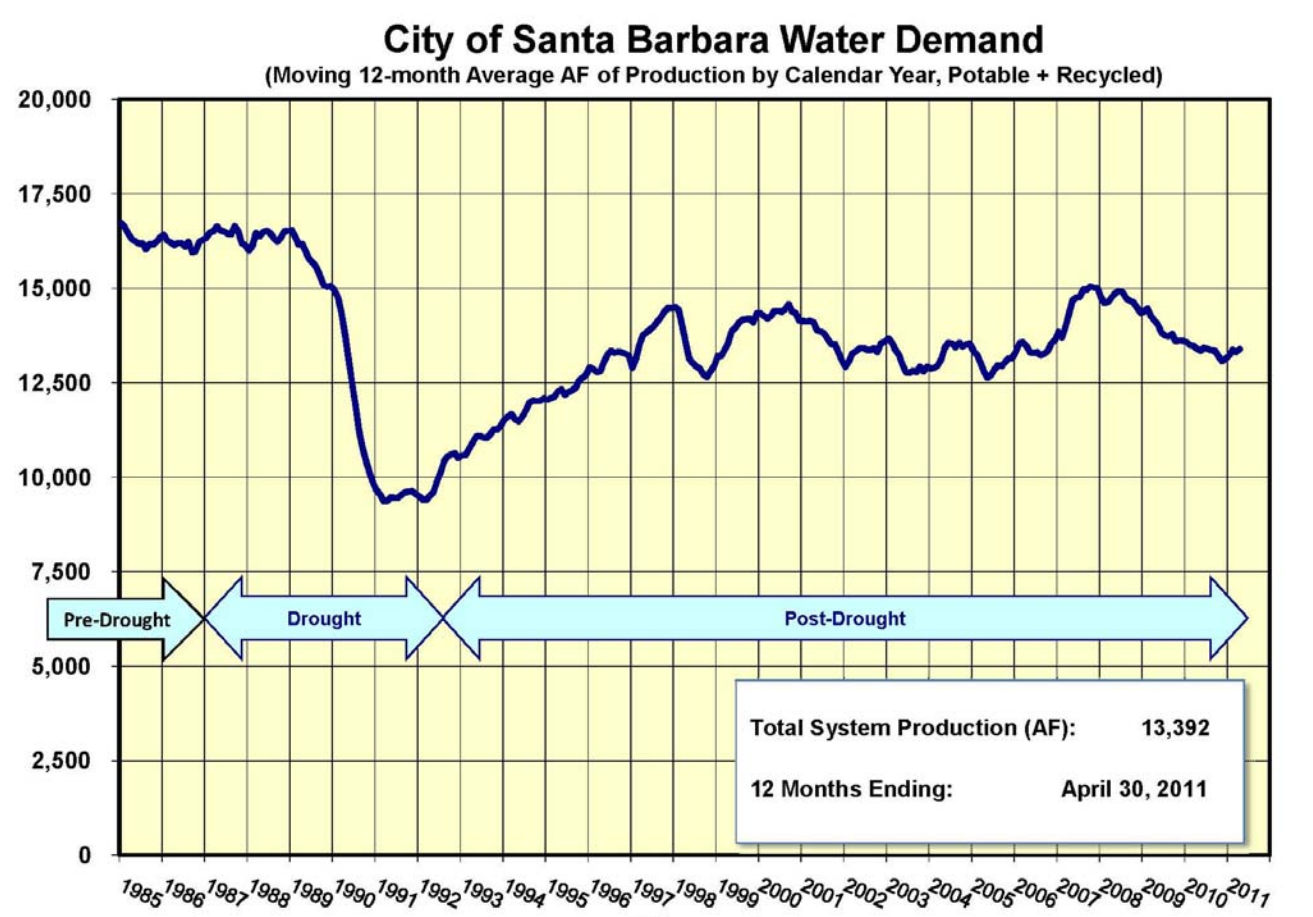


Figure 6

Moderate cutbacks in response to a Stage 1 Drought are evident during 1989 and response to the Drought Emergency is reflected in significant reductions during 1990. From 1992 to 1998, a steady post-drought recovery occurred, followed by a period of generally flat demand, but with significant fluctuations from year to year. To analyze this period of fluctuations, staff began tracking demand in relation to rainfall and evapotranspiration (ETo) data, as shown in Figure 7.

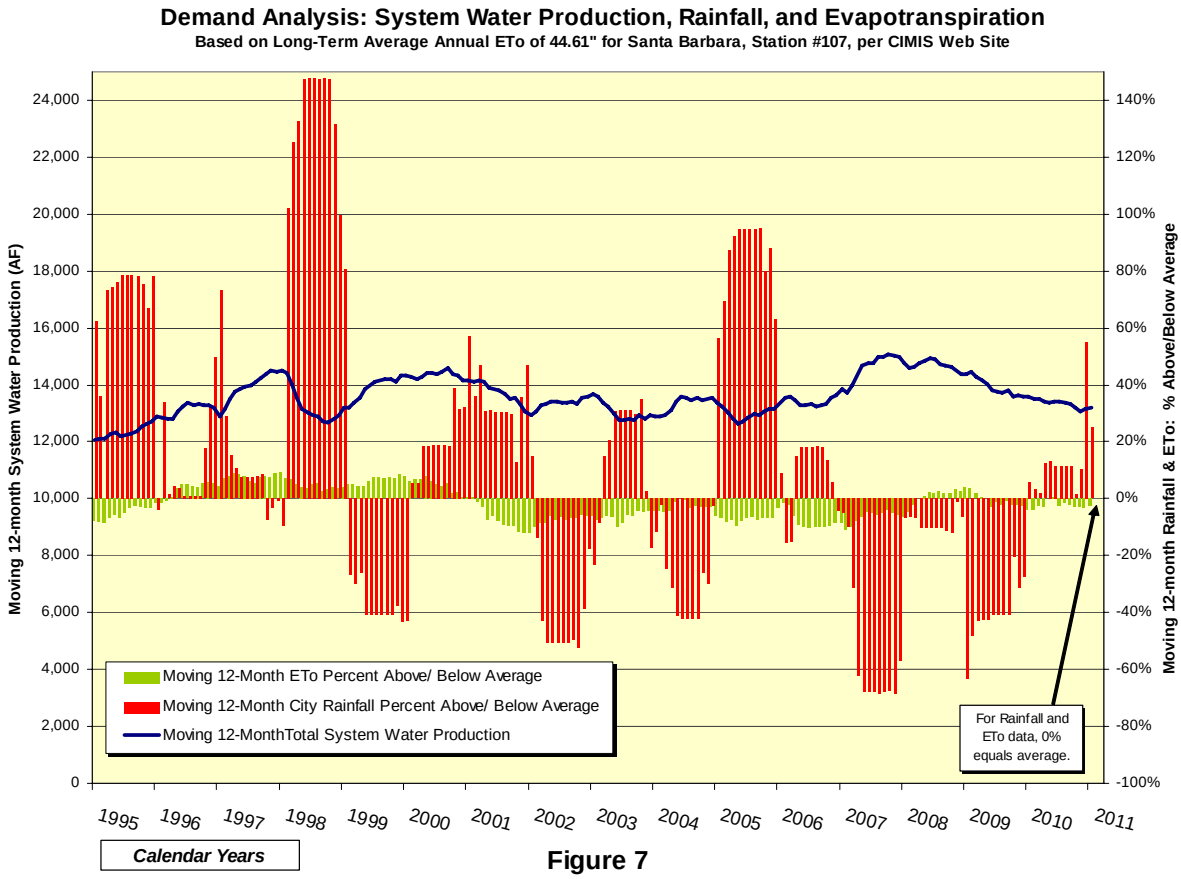


Figure 7

This information suggests that weather based fluctuations are the predominant effect on water demand. It is used to help estimate the "normal year" demand (i.e., approximately average rainfall), as the basis for planning water supply and estimating revenues.

Under the 1994 LTWSP, the City's water supply was planned to meet a total water system demand of 18,200 AFY. This number was derived as 17,900 AFY of demand projected during the 1989 update of the City's General Plan, plus a 10% safety margin, for a total of 19,700 AFY, minus an assumed "supply" of 1,500 AFY from new water conservation (some rounding included). Demand without safety margin for the end of the period was projected to be 16,400 AFY, including the assumed effects of water conservation. As the 1994 LTWSP planning period comes to an end, the normal year

demand is approximately 14,000 AFY, about 2,400 AFY less than projected. Demand for the 2010 water year, with rainfall about 12% above average, was 13,347 AFY.

The significant reduction in current demand compared to pre-drought levels can be attributed to a number of factors:

- An aggressive water conservation program;
- Less actual development than was projected;
- The cumulative effects of stricter plumbing codes and appliance standards on both new and existing development, and
- The relatively high cost of water, accentuated by the block rate pricing structure that charges a higher unit rate for higher levels of water usage.

The City's Water Conservation Program has developed into a comprehensive demand management effort. An important focus of the water conservation program has been to comply with, and to help shape, the Best Management Practices for Urban Water Conservation (BMPs) administered by the California Urban Water Conservation Council (CUWCC). These BMPs constitute the officially recognized standard for urban water conservation. Implementing the BMPs satisfies contractual requirements associated with the Cachuma Project. The BMPs have become a requirement for water utilities to remain eligible for state and federal loans and grants and Urban Water Management Plan acceptance. The City has been a signatory to the CUWCC Memorandum of Understanding Regarding Urban Water Conservation since 1992 and has worked with CUWCC to insure that the BMPs are practical and effective in achieving cost effective conservation savings.

Highlights of the water conservation program include:

- A broad selection of up-to-date print and on-line information on indoor and outdoor water conservation for both homes and businesses, including water wise plant selection, on-line irrigation scheduling tools, sustainable landscaping, high efficiency appliances, and water use awareness;

- Rebates for installation of water wise plants, smart irrigation controllers, and efficient irrigation systems, as well as high efficiency toilets, urinals, and clothes washers;

- A youth education program for elementary and secondary students, including classroom presentations, curriculum, treatment plant tours, and assemblies;

- The Green Gardener program, which trains landscape maintenance professionals in resource efficient and pollution prevention landscape maintenance practices;

- Practical guidelines and ordinances that reflect current technology for water conservation, including the City's Landscape Design Standards for Water Conservation;

- Targeted billing system analysis to reach customers with particularly high water usage, with an emphasis on providing site-specific landscape water budgets and real-time irrigation demand information; and

- A residential and commercial customer assistance program, providing free water check-ups to evaluate all water uses on the property and make recommendations for improved indoor efficiency, water wise plant selections, and irrigation system upgrades.

The current program is outlined in more detail in Appendix A (Water Conservation Program Summary).

City General Plan Growth Policies

Growth policies and projections analyzed for the City's General Plan update process (*Plan Santa Barbara*) were used as the basis for projecting water demand through the end of the planning period. Under proposed General Plan policies, development of up to 2,795 new dwelling units (DU) and 2.0 million square feet of new non-residential development are projected to occur within the City limits by the year 2030. Water demand for these projections is estimated as follows, based on recently updated aggregate demand factors for applicable customer classes:

Single Family Residential:	13% of 2,795 DU = 363 DU X .40 AFY/DU =	145 AFY
Multi-Family Residential:	87% of 2,795 DU = 2,432 DU X .16 AFY/DU =	389 AFY
Non-Residential:	2,000,000 ft^2 X .13 AFY per 1,000 ft^2 =	260 AFY

When 100 AFY of demand from projected added demand outside the current City limits is included (e.g. for annexations to the City), the result is a projected new demand of about 895 AFY. It is important to note that using current aggregate demand factors to project future demand can be expected to overestimate demand for new development. This is because new development will be subject to new codes and standards, while aggregate demand includes a significant portion of the building stock constructed under older standards.

State and Federal Requirements

A number of factors at the State and Federal levels will affect water demand in the future:

CUWCC BMP's: As noted above, the City's ongoing implementation of the BMP's can be expected to continue to exert a downward pressure on water use.

State & Federal Plumbing Codes: Currently, Federal plumbing and appliance efficiency standards require 1.6 gpf toilets, 1.0 gpf urinals, and 2.5 gpm showerheads. Effective 2014, all toilets and urinals sold in California will need to meet the new standards of 1.28 gallons per flush for toilets and 0.5 gallons per flush for urinals. This change will affect demand from new development, as well as demand from existing development as older fixtures are gradually replaced with models meeting the new standards. As required by the legislation, compliant models are already on sale in California at major retail and wholesale outlets. In addition, the California Green Building Standards have recently become effective and now essentially mandate the above standards for new construction. Additionally, after July 1, 2011, the 2010 California Plumbing code will require installations of 1.28 gpf toilets and .5 gpf urinals for all residential occupancy remodels. These include single family residential, dorms, hotels, apartments and basically any structure where overnight sleeping takes place.

S.B. 407 Fixture Replacement: Recent State legislation requires that new building owners be notified if the property does not have high efficiency fixtures. Implementation requirements are still unclear, but this can be expected to further the pace of conversion to high efficiency plumbing fixtures.

California's 20 X 2020 Requirement: In 2008, the Governor initiated a goal of 20% reduction in per capita urban water use by 2020. In 2009, the legislature adopted this goal into law by passing the Water Conservation Act of 2009 (SBx7-7). The penalty for non-compliance is ineligibility for State grants and loans. The focus is on public potable water distribution systems only. As such, the use of recycled water helps toward meeting the requirement. Targets were established by hydrologic regions, with several options for defining the baseline and the eventual 2020 target of per capita water use. The most suitable option for the City is "Method #3" in the legislation. This results in a baseline of 154 gallons per capita per day (GPCD) and a 2020 target of 117 GPCD. The 2009 potable per capita demand for the City was 130 GPCD, as calculated in compliance with the legislation.

Water Conservation Technical Evaluation

In preparing this plan, it was important to evaluate all of the above factors and determine to what extent additional water conservation could be relied upon during the planning period. This is in the context of meeting the State requirements of 20 X 2020

for per capita water use, meeting the CUWCC BMP requirements, and for properly identifying a cost effective role for water conservation in avoiding water supply costs.

Maddaus Water Management (MWM) is an engineering firm that is widely recognized as expert in estimating the costs and benefits of water conservation measures. MWM was hired to analyze the City's existing conservation program and use its proprietary Demand Management Decision Support System (DSS) to model current and potential conservation measures. The DSS also quantified the demand reduction effects of these measures along with the effects of plumbing codes and appliance standards. The process evaluated 92 potential measures which were screened for several factors to identify 23 that are most appropriate for Santa Barbara water customers. These 23 measures were inserted into the model, along with detailed information about the City's customer base and demand history. The project is described in more detail in the Executive Summary of the project report included as Appendix B (Water Conservation Technical Evaluation – Executive Summary). Key findings, including the effect of assumed development consistent with the Plan Santa Barbara process, are as follow:

- The 2030 demand would be expected to increase by 1,202 AFY (compared to the 2006 model reference point of 13,623 AFY) to 14,825 AFY, if the effects of already adopted plumbing codes and appliance standards were <u>not</u> considered. (It should be noted that this is not a projection that will actually occur, but it is a useful reference point to illustrate the ongoing effect of stricter codes and standards on both new and existing development.)

- The effects of the plumbing code and appliance standards are estimated to reduce 2030 demand by 919 AFY, to 13,906 AFY, not including the effects of conservation program activities and measures.

- Conservation Program B, which includes current conservation program measures along with those that together meet a utility benefit-cost ratio of 1.0, is estimated to reduce demand by an additional 498 AFY, to 13,408 AFY.

The benefit-cost ratio was calculated on the basis of an avoided cost of $600 per AF, which is an average of the variable costs associated with State Water Project Table A deliveries, groundwater produced from the Ortega Groundwater Treatment Plant, and deliveries of purchased water through the State Water Project during non-critical drought periods.

Figure 8

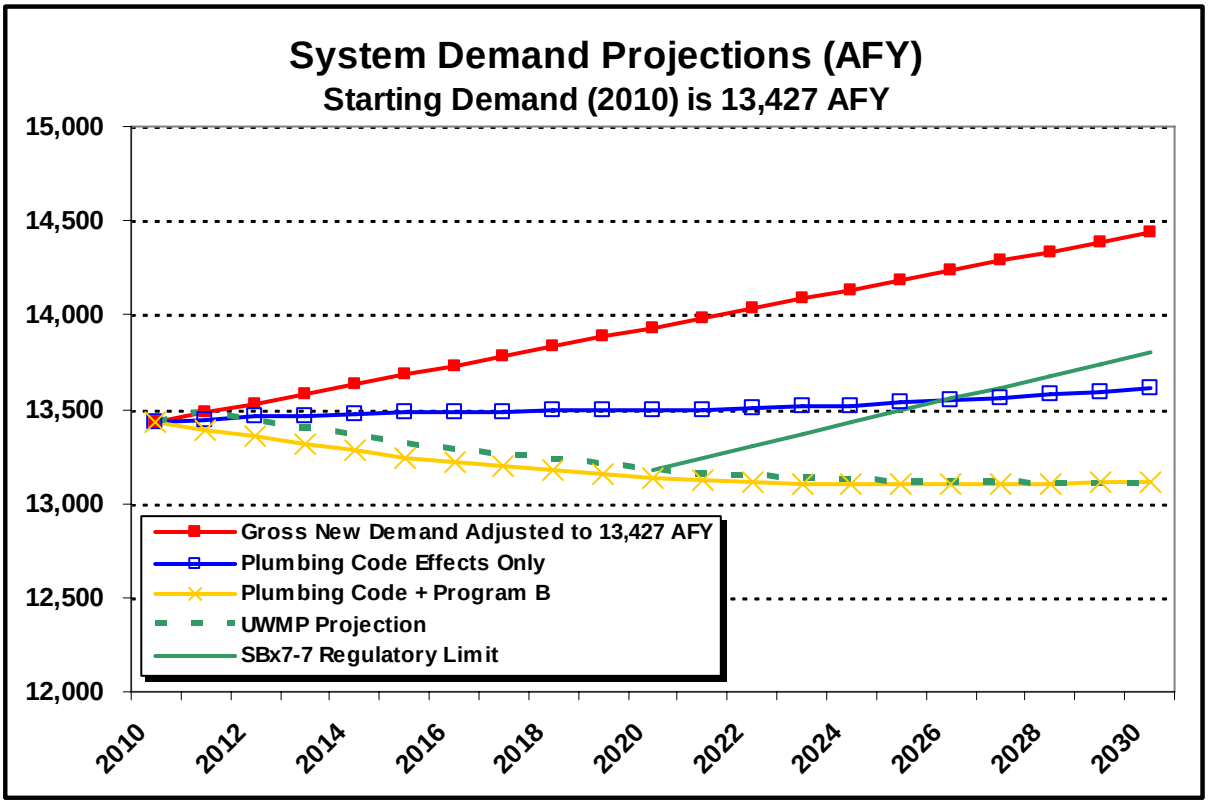


Figure 8 shows demand projections reflecting the various factors that will influence the City's actual water demand over the course of the planning period. These are based on the modeling results from the Maddaus report, adjusted to a reference point equal to the Fiscal Year 2010 total system demand of 13,427 AFY.

Primary Planning Issues

Given the water supply as described above, there are several key issues that shaped the water supply policies contained in this plan, as discussed below.

Planned Duration of Critical Drought Period

The critical drought period for the City's water supply occurs when there are multiple consecutive years of below average rainfall. This is due to the particular hydrology of the Santa Ynez River, where little or no inflow to Lake Cachuma typically occurs until at least average rainfall has occurred. When this condition of average or less rainfall continues for multiple years in succession, the storage level of Lake Cachuma drops and shortages in deliveries occur. Based on historical data, the critical drought period has had a duration of five years.

Climate change has the potential to impact the water supply, though it is still unclear whether this will have a significant effect during the planning period. To the extent information is available for the local area, overall rainfall amounts would be expected to be similar to recent history, but an increasing frequency of extreme rainfall events can be expected. This has the potential to result in an extended irrigation season with some associated increase in demand. From a water supply perspective, more concentrated rainfall events may have the benefit of increased inflow to Lake Cachuma. Guidance from the State planning agencies is that California can expect a 20% increase in both the frequency and the duration of dry periods. For the City's water supply this would suggest a critical drought period frequency of perhaps once every 30 years, instead of 40 years, and a duration of 6 years, instead of 5 years. Even though climate change impact information is incomplete and still undergoing critical review, the six-year drought period is a reasonable test and staff has used it for critical drought period analysis of the water supply.

Role of Desalination

The City's desalination facility is a vital resource as a back-up for potential prolonged drought and unforeseen interruptions of the water supply and would help mitigate the economic impact of such situations. It is also a reliable source of water, once in operation. However, as noted above, reactivation of the facility will result in significant costs, if only for the planning and design work that would be needed to start the process. In recent years, a dry period of only three years has been enough to trigger the start of planning to reactivate the facility in case of continuing dry weather. In 2004, after three years of drought, the storage level at Lake Cachuma had been reduced to about 70,000 AF out of 190,000 AF (37% of capacity) and the City was beginning this process of planning for reactivation.

As a result of discussion of this issue between staff and the Water Commission, the water supply has been modeled to stretch available Cachuma supplies over a potential 6-year drought period, with the goal of deferring the reactivation process, i.e. to plan for operation in the sixth year of a critical drought period instead of the fifth year. This would reduce the frequency of the planning and design effort, as well as reducing the likelihood that the substantial expense of actually reactivating the facility would be needed. This is another basis for the six-year critical drought period used in performance modeling.

Sedimentation Management at Reservoirs

Reservoirs on the Santa Ynez River are vulnerable to loss of storage capacity due to siltation, as are reservoirs throughout the west. Reduced storage capacity reduces the yield of a reservoir. At Gibraltar Reservoir, efforts to maintain storage capacity by dredging have had marginal impact and high cost. There has been some interest on the part of federal agencies to cooperate in vegetation management using controlled burns, but budget issues have made this unlikely to occur. Implementation of the Pass

Through provisions of the Upper Santa Ynez River Operations Agreement will essentially stabilize Gibraltar deliveries at a level close to historical amounts, despite continuing sedimentation. Still, an updated analysis of potential alternatives for managing sediment will be useful.

Efforts to control sedimentation at Lake Cachuma will require a joint effort among the Cachuma Project members, the downstream water users, and the various state and federal agencies that would have responsibility for permitting and/or implementing measures to address siltation. Issues related to such efforts are likely to be shared with numerous other reservoirs throughout the state, meaning that a coordinated statewide effort may be appropriate.

Groundwater Management

The City has initiated a three-year USGS study to update the groundwater flow and water quality models to allow more accurate management of groundwater. Better indicators of basin fullness are expected to be developed. More importantly, the modeling of seawater intrusion effects in Storage Unit No. 1 is expected to be made more accurate. This will guide placement of new wells in the basin, assist with scheduling well operation to minimize intrusion, and provide the ability to estimate the benefits of groundwater recharge for basin replenishment and creating barriers to seawater intrusion. In addition, the City should formalize its groundwater management role by developing a Groundwater Management Plan in accordance with State regulations.

Recycled Water Expansion

Recycled water is a relatively expensive source of water, but it is a reliable way to extend potable water supplies, thereby deferring the expense of procuring additional potable supplies. Additionally, increased recycled water connections will allow flexibility in meeting regulatory demand management requirements, such as the statewide requirement to reduce gross daily per capita water consumption. Current recycled water system capacity is 1,400 AFY, and current demand includes 800 AFY of retail demand and about 300 AFY of process water at EEWTP, for a total of 1,100 AFY. Carollo Engineers identified about 300 AFY of potential new users of recycled water, some adjacent to the existing system and some that could be served with extensions of the distribution system. These opportunities are being evaluated for their potential to cost effectively improve the reliability of the City's water supply and aid in meeting the state mandate on per capita water use. A caveat is that such expanded use will be more difficult to achieve if the mineral content is not reduced below that of the raw wastewater that feeds the recycled water system.

Water Supply Performance

The charts included as Appendix C are based on a worksheet developed by staff to simulate the City's water supply using the long-term model results from the Santa Ynez River Hydrology Model and other delivery assumptions as described above. An additional hypothetical year was added at the end of the 1947-1951 drought to simulate the 6-year critical drought period. For this sixth year, deliveries from Gibraltar, Mission Tunnel, and SWP are assumed to be the average of the preceding five years of drought. Cachuma is assumed to have negligible inflow during year six and the 5-year modeled yield is stretched out over the 6-year period. The charts illustrate how the City's water supplies would be used in the most cost effective manner to meet the projected demand during varying water supply conditions, ranging from very wet to very dry. The worksheet was used to explore the potential to defer the use of desalination at least until the sixth year of a drought. Three conditions are represented:

- The first represents "Current Conditions", with Cachuma entitlement of 8,277 AFY and no use of the safety margin.
- The second represents the near-term condition with Cachuma entitlement also at 8,277, but with a 10% safety margin included.
- The third represents 2030 conditions, with projected future Cachuma entitlement at 7,863 AFY and 10% safety margin included.

Planned demand reductions during the critical drought period are set at 10% in year 4, 15% in year 5, and 15% in year 6.

The worksheet uses a projected system demand of 14,000 AFY (plus safety margin as specified above), based on the combined effects of new development during the planning period, reductions in water use due to updated plumbing codes and appliance standards, the effects of the City's water conservation program, and the statutory requirement to meet a reduction in per capita daily water use by 2020.

A category called "Drought Supplies" is used to indicate water that would be used defer the use of desalination, either from unused State Water that is banked for use during dry periods or from the purchase of water during the critical drought period. The worksheet estimates that approximately 4,400 AF of unused State Water would be available for banking if contractual arrangements could be made to store the water for future use. Assuming a 50% deduction for the service of banking the water, about 2,200 AF of water would be available to meet the need for drought supplies. Water purchases would be pursued if additional water were needed. The desalination facility is proposed to remain a part of the City's water supply and would be used, if needed, to address shortages remaining after the use of banked water and purchased water.

The worksheet uses supplies as needed to meet the target demand according to the following sequence of priorities:

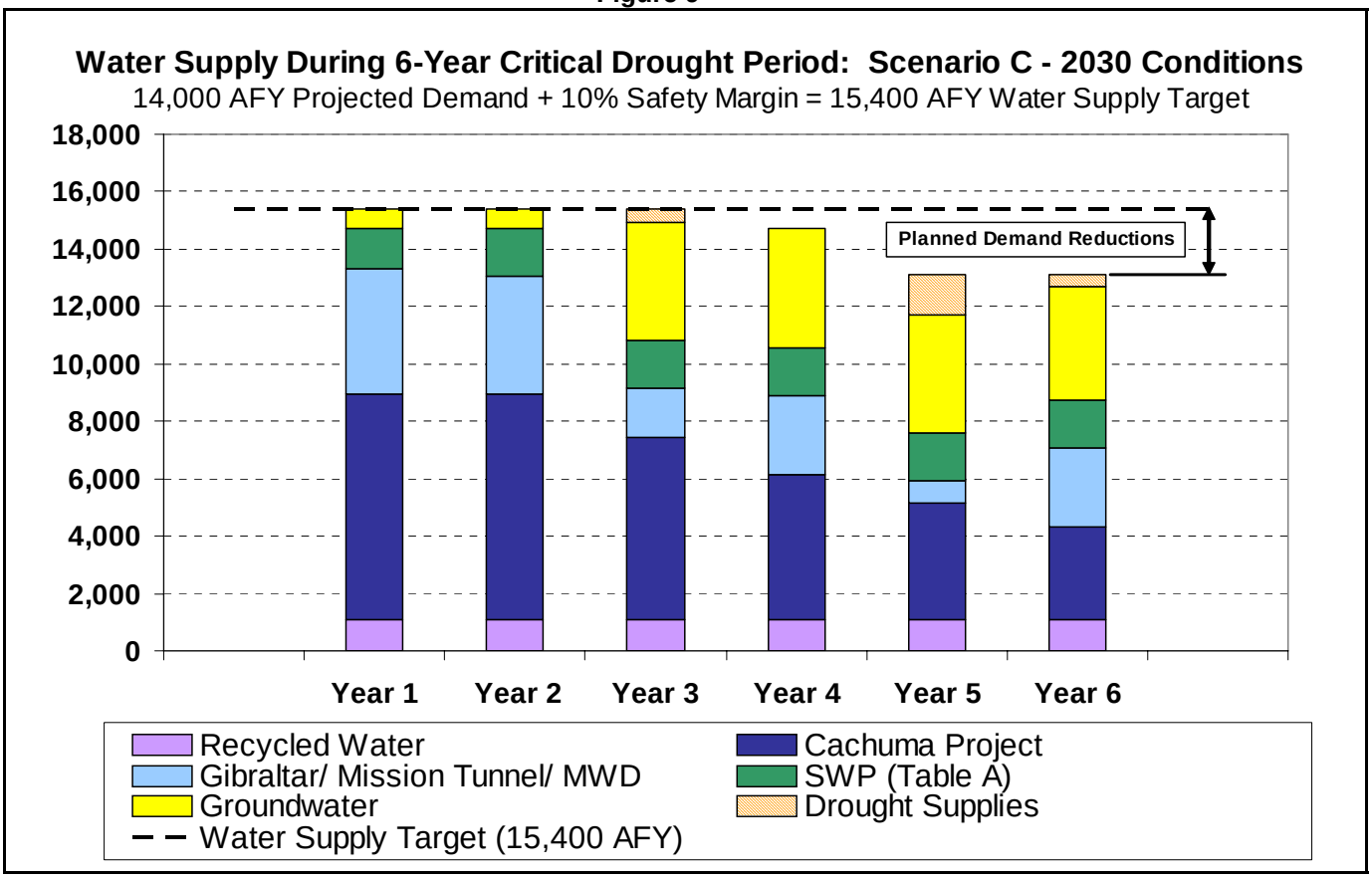
1. All available water from Gibraltar, Mission Tunnel and the Montecito Water District transfer, plus the 1,100 AFY of recycled water;
2. Minimum groundwater usage of 700 AFY;
3. The City's "exchange water" obligation of SWP Table A water (600 AFY);
4. Available Cachuma entitlement (except that remaining SWP Table A water is taken in year 2 and later to preserve available Cachuma water);
5. Remaining available SWP Table A water;
6. Added groundwater pumping up to the maximum amount of 4,150 AFY, subject to a cumulative pumping limit to minimize seawater intrusion;
7. Deliveries of "Drought Supplies" (banked water or purchased water to the extent available) through SWP facilities; and
8. Desalination (if necessary).

The worksheet is set up to take Planned Demand Reductions in years 4, 5, and 6 prior to taking delivery of Drought Supplies. The cumulative drawdown of available groundwater is tracked.

The water supply charts illustrate that the City's water supply can be met in most years with limited groundwater pumping, an average of only about 75% of available State Water, no drought supplies (banked water, purchased water, or desalination), and no need for extraordinary demand reductions. The real test of the water supply is the six-year critical drought period, beginning with model year 1947. Note that the sixth year is a hypothetical year that extends the historical 5-year drought to a 6-year drought. The 6-year critical drought period for 2030 Conditions (Scenario C) is highlighted in Figure 9. Key points illustrated include:

- Years 1 & 2: much like any non-drought year (mostly surface water, plus limited groundwater pumping);
- Year 3: Cachuma deliveries reduced to stretch remaining supplies; maximum groundwater pumping begins; small amount of Drought Supplies required;
- Year 4: First year of Planned Demand Reductions (4% of allowed 10%); further reduction at Cachuma is offset by some increased inflow at Gibraltar; no Drought Supplies required;
- Year 5: 15% Planned Demand Reductions; 1,364 AF of Drought Supplies taken; zero water delivered from Gibraltar; and
- Year 6: 15% Planned Demand Reductions; maximum pumping constrained slightly by the cumulative limit; some Drought Supplies required as a result; rainfall provides water from Gibraltar, but not enough to increase Cachuma deliveries.

Figure 9


Water Supply During 6-Year Critical Drought Period: Scenario C - 2030 Conditions
14,000 AFY Projected Demand + 10% Safety Margin = 15,400 AFY Water Supply Target
18,000
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
Planned Demand Reductions
Year 1
Year 2
Year 3
Year 4
Year 5
Year 6
Recycled Water
Gibraltar/ Mission Tunnel/ MWD
Groundwater
Water Supply Target (15,400 AFY)
Cachuma Project
SWP (Table A)
Drought Supplies

Water Supply Policies

This plan has been developed to evaluate the adequacy and reliability of the City's water supply and provide a long-term view of how the City's water supplies will be managed. It is based on the best currently available projections and assumptions, and is to be considered a plan, not a prescription. New information or conditions may necessitate adjustments or new policy direction. Based on the information contained and referenced herein, the City's water supply management program will be guided by the following policies:

1. Safety Margin: A safety margin of 10% above projected demand will be used for planning purposes to accommodate unplanned increases in demand or decreases in available supply.

2. Demand Reductions During Drought: Planned short-term reductions of up to 15% in customer demand will be a part of the City's response during a critical drought period. Such reductions will be in addition to the ongoing promotion of long-term water use efficiency and will be achieved by measures such as restrictions on landscape irrigation and other water uses, a modified water rate structure, and intensive public information efforts to promote the community goal of reduced water use. This policy of planned cutbacks is established in recognition of short-term elasticity in customer demand that can be tapped during rare emergency conditions to avoid the cost of 100% reliability of the water supply.

3. Recycled Water: State and City regulations requiring use of recycled water where available will be implemented. Capacity in the City's recycled water system will be utilized to continue to serve existing connected demand plus an additional 300 AFY of expanded use, for a total of approximately 1,100 AFY, in addition to recycled water used for process water. The use of potable water for blending will be tracked and reported annually. A contingency plan for eliminating the need for blending will be developed for implementation based on economic, regulatory or water supply requirements. The City's goal is to be able to deliver recycled water to its customers, without blending, by the end of the planning period. Status of this goal will be reported at five-year intervals as a part of the City's Urban Water Management Plan updates.

4. Water Conservation: The City will operate a water conservation program aimed at minimizing the use of potable water supplies, meeting the requirements of the California Urban Water Conservation Council Best Management Practices, and achieving compliance with 20 X 2020 per capita water use limitations. Conservation measures will be evaluated for cost effectiveness based on avoided cost of additional water supplies.

5. Groundwater Management: Groundwater production capacity of at least 4,125 AFY will be maintained in Storage Unit No. 1 and the Foothill Basin to augment

depleted surface water supplies during a severe drought. Ongoing modeling will assess strategies for groundwater management, including optimal use of available recharge, injection of potable water for artificial recharge, and injection of recycled water as a barrier to sea water intrusion. Sites for new or replacement production wells will be evaluated with the goal of minimizing sea water intrusion. The City will develop a Groundwater Management Plan, consistent with state law, to provide for the orderly and responsible use of the City's groundwater resources.

6. Gibraltar Pass Through Operations: Pass Through operations will be implemented for storage of Gibraltar water in Lake Cachuma, pursuant to the 1989 Upper Santa Ynez Rive Operations Agreement. An updated analysis of sedimentation management will be conducted to assess whether efforts to arrest or reverse the sedimentation process at Gibraltar Reservoir are feasible.

7. Sedimentation Management at Lake Cachuma: To address ongoing reduction in capacity at Lake Cachuma due to sedimentation, the City will promote development of a long-term strategy to minimize sedimentation in conjunction with Cachuma Project Member Units and other appropriate parties and agencies, including state and federal agencies.

8. Water Banking: The City will investigate opportunities to bank unused State Water, with the goal of using this water to reduce the amount of drought water purchases that may be needed during a critical drought period, and deferring the potential need for production from the desalination facility at least until the sixth year of a critical drought period.

9. Desalination Facility: The City's desalination facility is an important component of the City's water supply, despite the significant cost of activating and operating the plant. The desalination facility will be retained as an official part of the City's water supply for use as may be needed during extended drought.

10. Water Supply Reliability: The City will adequately fund the maintenance, rehabilitation, and replacement of the water conveyance and distribution infrastructure to provide reliable delivery of the City's water supplies and prevent increased costs from deferred maintenance. In addition to planning for periodic droughts, the City will develop an emergency water supply plan to address catastrophic interruption of water supplies due to earthquake, South Coast Conduit failure, or other disaster that could interrupt the City's ability to convey water from the Santa Ynez River for a substantial period of time. The groundwater production capacity identified for drought response will also be maintained for response on short notice to such catastrophic interruptions.

11. Management of Water Fund Assets: Land and equipment assets purchased with Water Fund resources will be managed for the purpose of optimizing the economic and sustainable operation of the water system.

12. Monitoring and Reporting: Ongoing monitoring and reporting of the City's water supply status will be conducted, including annual reports to City Council on the near-term drought outlook, preparation of 5-year updates of the City's Urban Water Management Plan, and an update of this plan in approximately 2030, or sooner as may be appropriate.

Finding

Based on implementation of the above policies, the City's water supply is determined to be adequate to serve anticipated demand for the duration of the planning period.

(This page intentionally left blank)

Appendix A:

City of Santa Barbara
Water Conservation Program

Program Summary

(This page intentionally left blank)

City of Santa Barbara Public Works Department
Water Resources Division

WATER CONSERVATION PROGRAM SUMMARY
February 2011

The City of Santa Barbara is a long-term leader in water conservation. The City's Water Conservation Program began as a response to the drought in the late 1970's. In 1988, the Water Conservation Program was increased as a result of the recommendations from the City's Five-Year Water Policy Action Plan. As a result of the 1986-1991 California Drought, the City accelerated implementation of the Water Conservation Program.

The City's current Water Conservation Program is a combination of the City's commitment to carrying out the California Urban Water Conservation Council's (CUWCC) Best Management Practices and the City's dedication to water conservation as a element of the City's water supply plan. The City joined the CUWCC in January 1992 as a result of signing the Memorandum of Understanding Regarding Urban Water Conservation. Since that time, the City has been actively carrying out the Best Management Practices. Below is a description of the City's Water Conservation Program.

Foundational BMPs

BMP 1. Utility Operations Programs

BMP 1.1 Utility Operations Practices

1. Conservation Coordinator

The City's Water Conservation Program staff includes the FTE of one Water Resources Specialist, administrative support from one Senior Office Specialist, and 10 hours per week from a temporary Water Resources Technician.

2. Water Waste Prevention

City Ordinance No. 4558, adopted on February 1989, prohibits the waste of water defined as gutter flooding and failure to repair leaks in a timely manner.

BMP 1.2 Water Loss Control

Annually City completes the standard water audit and balance using the AWWA Water Loss software. The City's system unaccounted loss is ~1%. The City implements an annual water main replacement program. Age, material, and break history of water mains are tracked to determine overall condition of main in order to determine the priority of mains to be replaced. The City replaces three miles per year of the 275 miles of main in the distribution system.

BMP 1.3 Metering with Commodity Rates for All New Connections and Retrofit of Existing Connections

City meters all customers and has an inclining block rate structure.

BMP 1.4 Retail Conservation Pricing

City has an inclining block rate structure.

BMP 2. Education Programs

BMP 2.1 Public Information Programs

Water Conservation Hotline. The Hotline handles the incoming calls for the Water Conservation Program. Hotline staff schedule water checkups and provides administrative assistance to the Conservation Program.

Website. The City's Water Conservation Programs website is www.savewatersb.org. Additionally the City promotes the regional water conservation program website, www.sbwater.org.

Water Conservation Brochures and Handouts. Brochures and handouts are distributed both hard copy and via the website on indoor water conservation, efficient irrigation and sustainable landscaping.

Video Loan. Videos on sustainable landscaping, water conservation, efficient irrigation, and water supply are available to the public to loan.

Media Campaign. An annual media campaign is implemented in conjunction with the Santa Barbara County Water Agency and funding from water purveyors countywide.

Water Bill Message. A monthly water conservation message is printed directly on the water bill.

Demonstration Gardens. The Water Conservation Program has two low-water using demonstration gardens, at Alice Keck Park Memorial Garden in conjunction with the Parks Department and the Firescape Garden in conjunction with the Fire Department.

Garden Wise Guys. Garden Wise Guys a thirty-minute television show about designing & maintaining a sustainable landscape. The quarterly show is produced by City TV and funded by the Santa Barbara County Water Agency, the City of Santa Barbara Public Works Department, and the Goleta Water District. It is hosted by two local landscape architects: Owen Dell and Billy Goodnick. With a unique sense of humor, the Garden Wise Guys will give viewers the basic information they need to start making changes in their own yard.

Water Wise Gardening for Santa Barbara County CD and Website.
A free "tool" for water wise gardening —a compact disc and website of gardening information tailored to our climate and our need for water conservation, titled "Water Wise Gardening in SB County". Available on CD or online at www.savewatersb.org or www.sbwater.org, it includes: extensive database with searchable information on over 1,000 water wise plants; more than 300 photos grouped into garden tours and garden galleries, all from local gardens Countywide; helpful facts, resources, and guidance on gardening design and practices; and links to other useful sustainable gardening sites.

BMP 2.2 School Education Programs
Water education presentations are given in approximately 90 classes and summer camps per year. Water education materials are provided to schools. Tours of the City's water treatment facilities with free bus transportation are provided. The City participates in the Annual Water Awareness High School Video Contest.

Programmatic BMPS

BMP 3. Residential

Residential Assistance Program
The City's Water Resources Specialist conducts residential water surveys (water checkups) upon request by water customers. A water checkup includes evaluating all water uses on the property including, and providing recommendations to the customer for improved efficiency including both indoor usage, evaluating irrigation system, and specific recommendations on improvements and upgrades.

Landscape Water Survey
As an element of the water checkups staff performs site-specific landscape water surveys that include checking the irrigation system for maintenance and repairs, reviewing the irrigation schedule and making recommendations for adjusting program of irrigation controller, providing customer with evaluation results and water savings recommendations.

The City has conducted an average of 400 water checkups per year for a total of 9,290 surveys since June 1990 (this includes both residential and commercial water checkups.) Savings for this program is projected to be 400 AFY for the 20 year period as projected in the LTWSP.

Smart Rebates Program
The Smart Rebates Program is co-funded through Proposition 50 grant received by the California Urban Water Conservation Council (CUWCC) and participating water suppliers throughout California. The Program provides rebates for water users to improve their efficiency through appliance and equipment retrofits and replacements. The City is participating with water broom (high efficiency pavement washers) rebates at $50 each, high efficiency clothes washer rebates at $150 for residential customers, and $400 for commercial customers: high efficiency toilet rebates at $100 for residential customers and $200 for commercial customers; and waterless or high efficiency urinal rebates at $300 for commercial customers.

The City's Toilet Rebate Program was in place from August 1988 through June 1995. An $80 rebate was issued per toilet retrofitted to a 1.6 gallon or less per flush toilet. The rebate was reduced to $40 for the period July 1994 to June 1995. The total number of residential rebates that were issued is 18,842.

BMP 4. Commercial, Industrial and Institutional

Commercial Water Checkups
As mentioned in the Residential BMP section, water checkups are offered for both commercial, industrial, and residential customers.

CII Toilet Rebates. 2,995 toilets at commercial sector sites were retrofitted during the City's Toilet Rebate Program from August 1988 through June 1995.

Save Water, Save a Buck CII Rebate Program. This rebate program offered rebates for the installation of water efficient fixtures for CII water customers and was coordinated by the Santa Barbara County Water Agency. Rebates issued through this program: toilets (1.28 gpf) = 80, (1.6 gpf) = 25, urinals =21, and clothes washers = 32.

Smart Rebates Program
Currently commercial high efficiency toilets, waterless and high efficiency urinals, high efficiency clothes washers, and waterbroom. See information on Smart Rebates Program in Residential BMP section.

Rinse and Save Pre-rinse Spray Valve Program. Through *Rinse & Save*, an innovative door-to-door installation program, restaurants in the City received a free 1.6 gpm pre-rinse spray valve. 199 spray valves were installed in the City in 2003, and 104 from January to September 2005, for a total of 303. Each replaced valve will save approximately one acre foot (326,000 gallons) of water over five years. *Rinse & Save* Program is administered by the CUWCC and funded by a grant from the California Public Utilities Commission and the participating agencies.

Lodging Industry Water Conservation Program consists of table tents and door hangers encouraging patrons to conserve water for lodging industry as well as educational videos for lodging industry staff.

Restaurant Table Cards are provided which inform restaurant customers that water will be served upon request.

BMP 5. Landscape

Smart Landscape Rebate Program

The Smart Landscape Rebate Program offers rebates to increase water efficiency in both the commercial and residential landscapes. Rebates on approved irrigation equipment and landscape materials will be up to 50% of material costs. Rebates are available for up to $1,000 for single family homes and up to $2,000 per account serving irrigated area ($4,000 per site) for commercial, multi-family, and HOAs. Rebate will cover: drip irrigation parts, sprinkler system efficiency retrofits and rotating sprinkler nozzles; water-wise plants and mulch; and smart irrigation controller. The process is 3 steps: a pre-inspection, a 60 day window to complete the approved projects and then a post-inspection. Since the program began in April 2009, there have been 146 participants, with 86 properties completing the rebate process to date.

California Landscape Budgets Program (CLBP)

This program provides monthly water use reports via www.landscapebudgets.com for the properties served by dedicated irrigation meters and compares the usage to a weather-based water allocation calculation. The goal is to provide education to the customers, as well as monthly reporting, identifying ways to help customers irrigate more efficiently. Currently, all City dedicated landscape irrigation meters billing is based on a water budget calculated from historical evaportranspiration data.

Green Gardener Program

The City of Santa Barbara and the Santa Barbara County Water Agency began in March 2000 the Green Gardener Program (GGP) along with eleven other partnering agencies and organizations. The GGP trains gardeners in resource efficiency and pollution prevention landscape maintenance practices. In order to be a Green Gardener, gardeners attend a fifteen-week training session (two and half hour class per week) taught in both English and Spanish covering topics including water efficiency, non-point source pollution reduction, fertilizing, integrated pest management, and reduction of air pollution emissions and green waste. A test covering training material is required for Green Gardener status plus annual ongoing educational requirements. This program includes promotion of the Green Gardeners through advertising and a list of gardeners distributed by partnering agencies and on www.greengardener.org. So far, the GGP countywide has trained 1,000 gardeners.

California Irrigation Management Information System (CIMIS)

Two CIMIS weather stations are owned by the California Department of Water Resources (DWR) are located on the City's Golf Course and the Vic Trace Reservoir. City staff assists in maintenance of the stations. CIMIS is a network of weather stations that automatically read and collect information on wind speed and run, average vapor pressure, air temperature, relative humidity, dew point, solar radiation, soil temperature, and precipitation. The information is transmitted to a central computer data base in Sacramento which gives daily evapotranspiration rates that can be accessed on DWR's website.

Smart Irrigation Controller Distribution Program

In May 2002, the Santa Barbara County Water Agency, City of Santa Barbara, and Goleta Water District began implementing the Smart Irrigation Controller Distribution Program. The program involves distribution and installation of Weather TRAK ET irrigation controllers at no cost to residential customers with significant landscape water usage. The Weather TRAK ET Controller automatically calculates a scientifically-based irrigation schedule based on several factors, including plant and soil type. It then adjusts the irrigation schedule as local weather changes. To date, 180 irrigation controllers have been installed in the City.

Watering Index and Landscape Watering Calculator

Landscape Watering Calculator: This is an easy-to-use web-based tool that helps estimate the right amount of water to give a landscape. The calculator has been designed to give a weekly irrigation schedule. Information needed is zip code of the site, the type of plants watered by a particular station on the irrigation system, the soil type, and the sprinkler type. Available at www.SantaBarbaraCA.gov/water.

Watering Index: On many irrigation controllers there is a feature called "water budget", or seasonal adjust, which one can easily adjust the watering schedule as the weather changes. Set the water budget to the weekly watering index (W.I.) which represents the recommended percentage setting for the water budget feature. The W.I. is normally 100% for much of July and August. Over the course of the year, the W.I. changes to reflect the landscape's changing need for water as climatic conditions change. As new W.I. values are published weekly, the controller's water budget feature should be changed to match to current W.I. value. For the weekly watering index, visit www.SantaBarbaraCA.gov/water.

Free Rain Sensor Program

Free rain sensors are now available from the City of Santa Barbara and Goleta Water District. Rain sensors automatically shut off the sprinkler timer during and immediately after it rains, thus saving tremendous amounts of otherwise wasted water. There are two options to receive a rain sensor: 1. receive a voucher of up to $50 and purchase a rain sensor from approved list, or 2. receive a free rain sensor with a brief training on how to install it. They goal of the rain sensor rebate program is to reduce the amount of water wasted by automatically shutting off irrigation controllers during rain events. Since April 2008, 416 rain sensors have been distributed to City water customers.

Graywater

The City provides outreach on the use of graywater with handouts, fact sheet, sample plan sheet, workshops and information on the City's website. City promotes use of graywater in accordance with the California Plumbing Code Chapter 16A.

Landscape Design Standards. On August 12, 2008, the City Council adopted the revised Landscape Design Standards for Water Conservation, Resolution No. 08-083. The Landscape Design Standards were originally adopted by resolution of the City Council on June 27, 1989. There has been much progress in irrigation technology and sustainable landscaping practices in the last 19 years; therefore, it was time to bring the standards up to date. Chapters 14.23 and 22.80 of the Santa Barbara Municipal Code require projects that are subject to design review to comply with Landscape Design Standards.

Additional Programs

Regional Cooperative Programs
The City participates in many regional water conservation programs with neighboring water purveyors. The Santa Barbara County Water Agency's regional water conservation program administers these programs.

City Facilities Water Conservation Retrofit Program. City facilities are equipped with the latest in water-saving devices, including waterless urinals, low-flow toilets and showerheads. Many City facilities and parks are landscaped with water-wise plants. City facility and parks irrigation systems continue to upgrade with smart irrigation controllers, rain sensors and state-of-the-art irrigation equipment. To date, 145 low-flow showerheads, 317 low-flow toilets, and 22 waterless urinals are installed in City facilities. Eight City public restrooms are plumbed with recycled water for toilet flushing. In one City facility retrofitted two years ago with four waterless urinals, the building's water use has decreased by 45%.

City Facility Requirements for New Construction and Renovations at City Facilities. Require state-of-the-art water conservation technology for landscape, irrigation and plumbing for new construction and renovations at City Facilities. Approved by Resolution No. 08-008 on February 5, 2008.

(This page intentionally left blank.)

Appendix B:

Executive Summary:
Water Conservation Technical Evaluation

Maddaus Water Management

(This page intentionally left blank)

EXECUTIVE SUMMARY

Introduction

This conservation technical analysis was conducted by Maddaus Water Management (MWM) for the City of Santa Barbara (City). The purpose of the analysis is to:

1. Evaluate current conservation measures and identify new conservation measures that will reduce future water demand.
2. Estimate the costs and water savings of these measures.
3. Combine the measures into increasingly more aggressive programs and evaluate the costs and water savings of these programs.

Long-Term Conservation Program Analysis

A list of 92 potential conservation measures was developed from known water saving technologies and services. Twenty-three conservation measures, selected by the City and local stakeholders during an evaluation workshop, were further analyzed by the Least Cost Planning Decision Support System Model (DSS Model). The DSS Model is a planning tool that assists water planners with evaluating alternative water conservation programs. The model itself is an end use model that calculates water savings, costs and benefits from individual measures, and programs of a number of measures. Projections of future water demand with and without water conservation programs are made for the City water service area. Calculations are made for every year in the 30-year analysis period. In addition, twenty one measures, both current and potential future measures, were put into a "Tool Kit" for further qualitative evaluation.

Based on analysis by the model, conservation measures were grouped into alternative programs of increasingly higher water savings and implementation costs (Table ES-1). Conservation Program A consists of 10 measures that are part of the existing City water conservation program. Conservation Program B includes all of Program A, plus those additional measures that have an individual benefit-cost ratio of 0.9 or greater, for a total of 17 measures. Conservation Program C includes all measures evaluated, except for Measure 5 which is replaced with the enhanced Measure 6. The measures included in Conservation Programs A, B, and C are identified in Table ES-1 in the columns at the right. Figure ES-1 shows the projected demand without the effects of the plumbing code, with the plumbing code effects, and with the plumbing code and three conservation program alternates. Water savings were evaluated and benefit-cost ratios computed for 20–year period of 2011 to 2030, coinciding with the City's water supply planning period. Savings were then calculated to the year 2030 for each of these programs (see Table ES-2).

Table ES-3 shows the relative demand reductions in the year 2030, conservation program costs for the utility, present value economic information, and the utility cost of water saved for each of the alternate programs. Demand reduction by 2030 is measured from the 14,825 AFY projected 2030 demand without the effects of the plumbing code. Additional resources and customer contacts as embodied in the conservation programs identified in this memorandum, are required to reach higher levels of potential water savings. Utility costs include the cost to the City to run the program, including staff time, rebates, any contracted services, expense, etc. While utility cost is the primary consideration, this memorandum also considers customer costs and community costs to some extent, as described in the body of the memorandum. The plumbing code is included as passive baseline savings in addition to the long-term conservation program in Programs A-C. Most of the future program water savings consist of outdoor landscape improvements.

A Benefit-Cost ratio, which is the ratio of the present value of benefits to the present value of costs, is the most accurate indicator of cost-effectiveness. When the ratio of the Present Value of the benefits to the Present Value of the costs is greater than 1.0 for a particular program of measures, that program can be said to be cost-effective. Benefits for the utility can also be expressed as the value to the utility of the saved water. For the City, the value of the saved water is the cost savings from not producing the water that is saved. This could range from not treating pumped groundwater to not buying water from the State Water Project. An

assessment was made by the City and the value of the saved water was determined to be $600 per acre-foot. This value is hereafter referred to as the City's "Avoided Costs".

Program A reflects estimated water savings derived from the plumbing code and continuing the current program. The additional measures that create programs B and C produce increasing incremental water savings and costs. Figure ES-2 illustrates there are apparent diminishing returns when measures are added beyond Program B. Demand reductions for year 2030 range from 920 to 1,919 AF/Yr. As the plumbing code water savings do not cost the City any money, the graph starts at the plumbing code water savings in 2030.

Table ES-1
Conservation Measures Selected for Programs

No.	Measure Name (ND = Requirements for New Development)	Program A	Program B	Program C
1	Promote Water Efficiency in Green Buildings		✓	✓
2	ND Require High Efficiency Toilets		✓	✓
3	ND Require High Efficiency Faucets and Showerheads		✓	✓
4	Fixture Replacement SB 407		✓	✓
5	Financial Incentives for Irrigation and Landscape Upgrades (Current)	✓	✓	
6	Financial Incentives for Irrigation and Landscape Upgrades			✓
7	Washer Rebates	✓	✓	✓
8	Washer Rebates for High Efficiency Machines			✓
9	High Efficiency Toilet (HET) Rebates	✓	✓	✓
10	Single Family Water Check Up	✓	✓	✓
11	Multifamily Water Check Up	✓	✓	✓
12	Existing Commercial Washer Rebate	✓	✓	✓
13	Cisterns/Rain Catchments			✓
14	Gray water Retrofit SF			✓
15	Current High Efficiency Urinal Rebate (<0.25 gallon)	✓	✓	✓
16	ND Require 0.5 gal/flush or less urinals in new buildings		✓	✓
17	School Building Retrofit		✓	✓
18	Irrigation (Landscape) Water Budgets	✓	✓	✓
19	Irrigation Water Surveys	✓	✓	✓
20	Mulch Program			✓
21	CII Water Check Up Level 1	✓	✓	✓
22	CII Water Check Up Level 2		✓	✓
23	Customized CII Incentive Program			✓
	Total Measures in each Program	10	17	22

Figure ES-1

Long Term Demands with Conservation Programs
(Demand is measured by total water system production, including potable and recycled water)

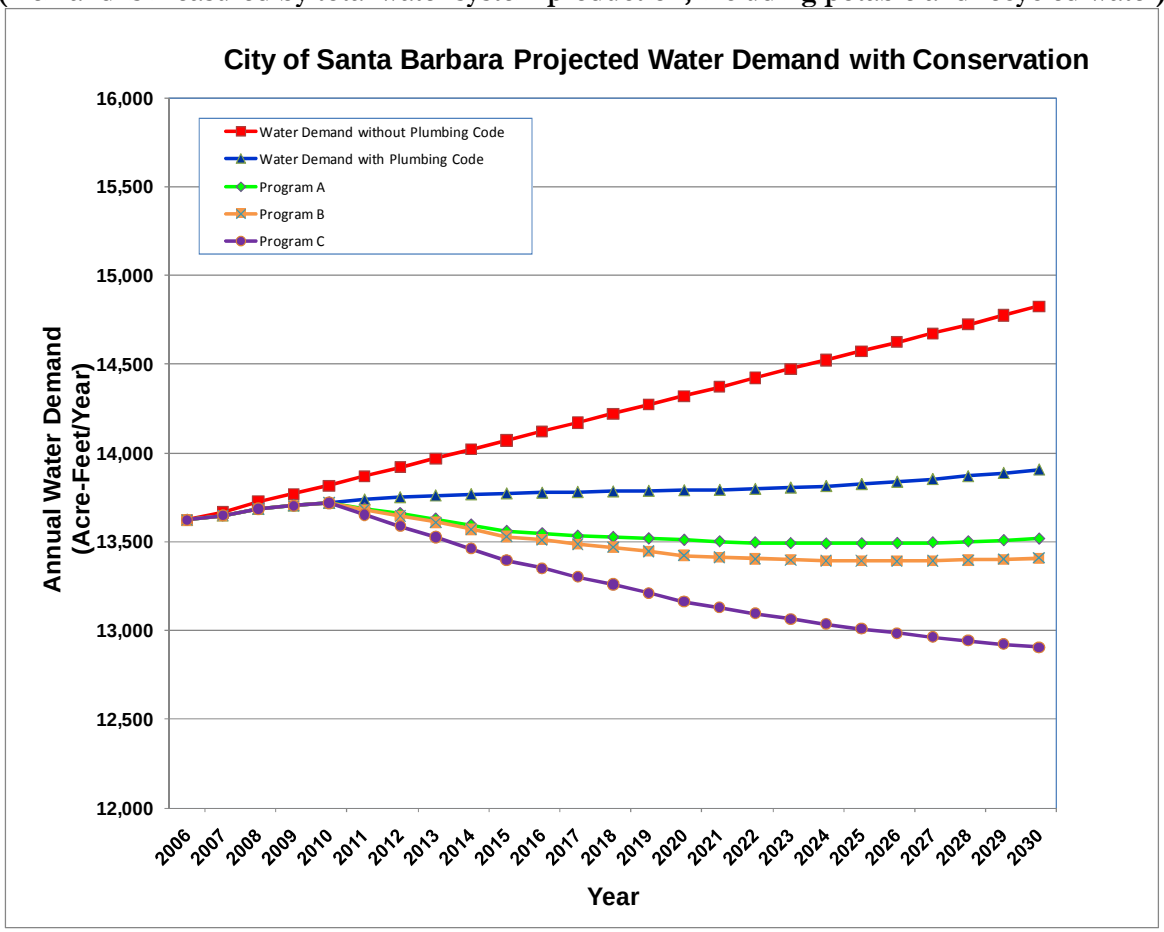


Table ES-2

Conservation Program Description and Future Water Savings

Conservation Program	Description	2030 Demand Reduction (AF/Yr)
-	No Conservation Programs, Plumbing Code Only	919
A	Continue Current Conservation Program (10 measures) and Plumbing Code	1,308
B	Add 7 Cost-Effective Measures to Current Program A and Plumbing Code	1,417
C	Add 5 More Measures to Program B and Plumbing Code	1,919

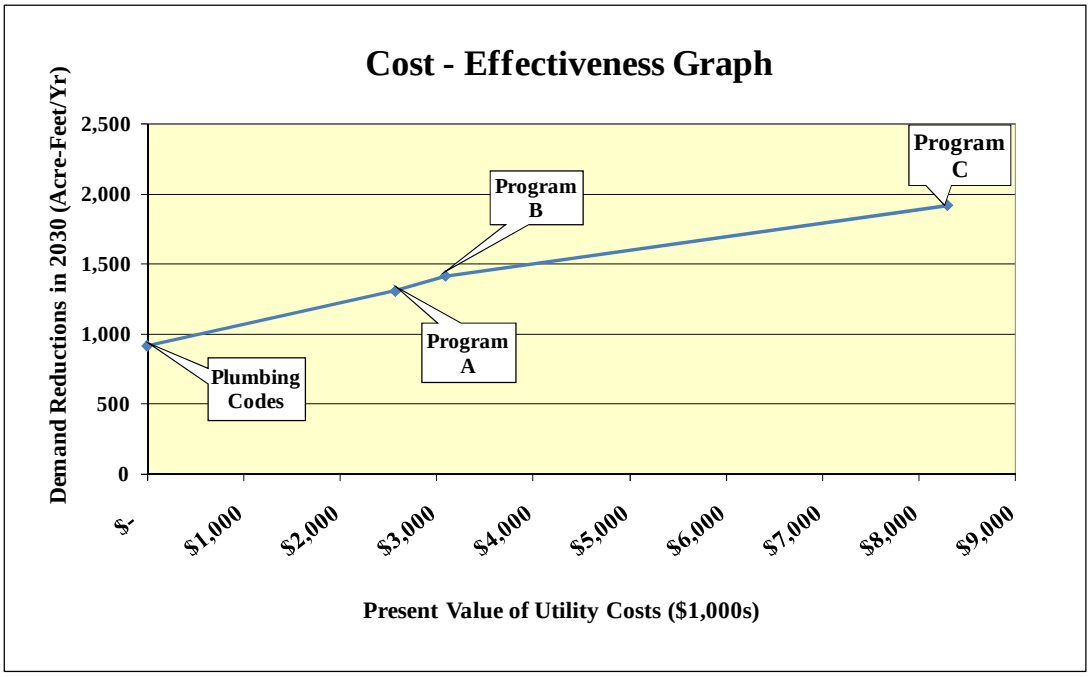
Table ES-3
Economic Summary of Long-Term Conservation Programs
(Excluding Tool Kit Measures)

Conservation Program	Demand Reduction by 2030 (AFY)	Total 20-Year Conservation Program Water Savings (AF)	Average Annual Program Cost to Utility ($)	Present Value of Utility Benefits ($)	Present Value of Utility Costs ($)	Utility Benefit - Cost Ratio	Utility Cost of Water Saved ($/AF)
Plumbing Code Only	919	11,085	NA	NA	NA	NA	NA
Program A + Plumbing Code	1,308	16,419	$194,000	$2,455,000	$2,570,000	0.96	$482
Program B + Plumbing Code	1,417	17,801	$233,200	$3,131,000	$3,089,000	1.01	$460
Program C + Plumbing Code	1,919	23,193	$629,400	$5,867,000	$8,287,000	0.71	$684

Notes:
1. The DSS model is a 30-year model. It was run for 2006 to 2036 to include the base year of 2006 and the 20-year conservation program period of 2011 to 2030.
2. Demand Reduction by 2030 is measured from the 14,825 AFY projected 2030 demand without the effects of the Plumbing Code.
3. Average Annual Program Cost excludes any potential costs for the 21 measures in the Tool Kit
4. Utility Cost of Water Saved somewhat undervalues the cost of savings because program costs are discounted to present value and the water benefit is not. Utility Benefit-Cost ratio is the most accurate measure of cost effectiveness, because it accounts for the time value of money.

Figure ES- 2

Present Value of Utility Costs versus Cumulative (Total) Water Saved



Appendix C:

Long-Term Water Supply Performance Charts

(This page intentionally left blank)

Water Supply Performance: Scenario A - Current Conditions

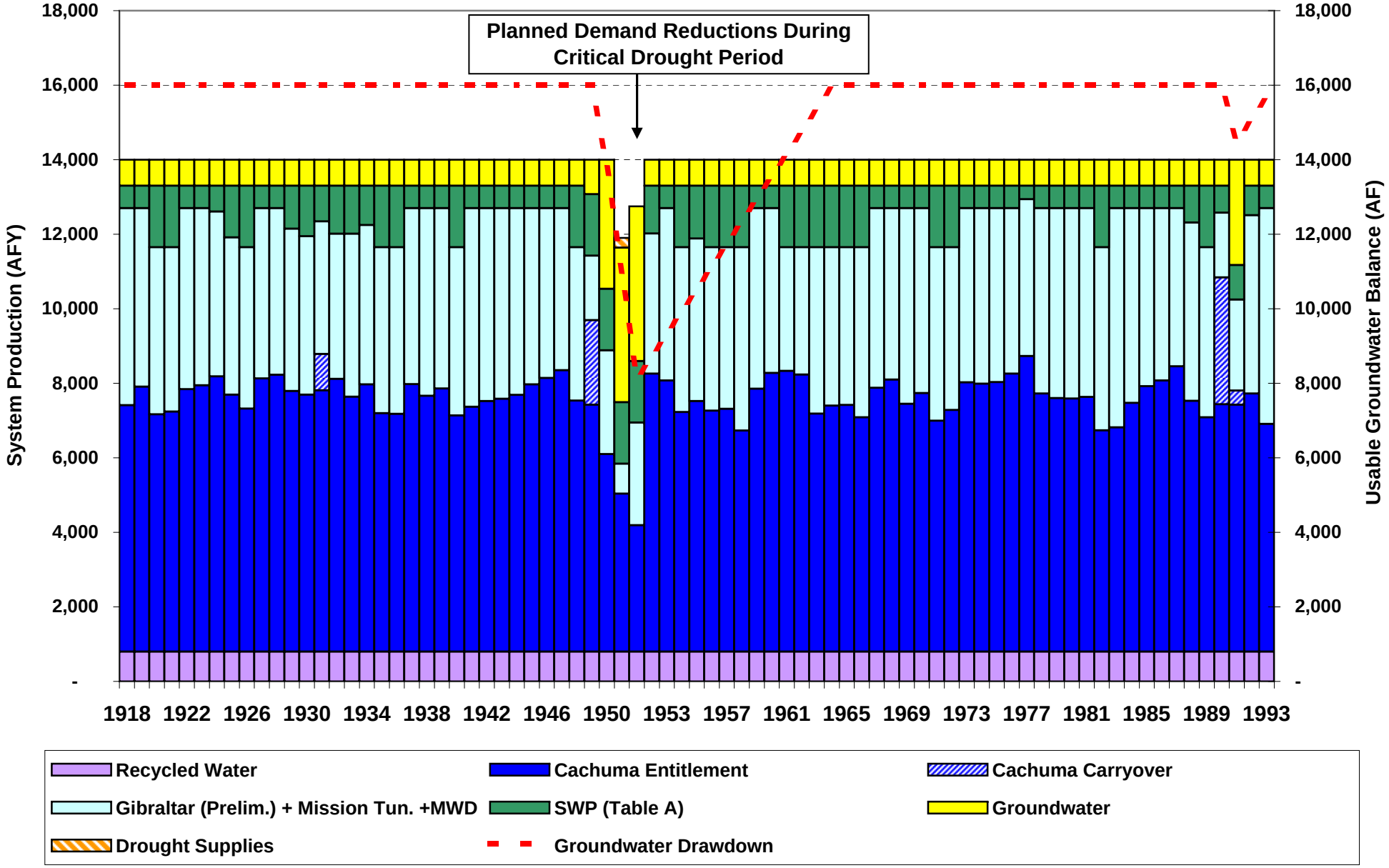
Projected System Demand (AFY): **14,000**

Cachuma Yield Assumption: **Current Entitlement**

Total Critical Period Drought Supplies Required (AF): **262**

Water Supply Target (including Safety Margin): **14,000**

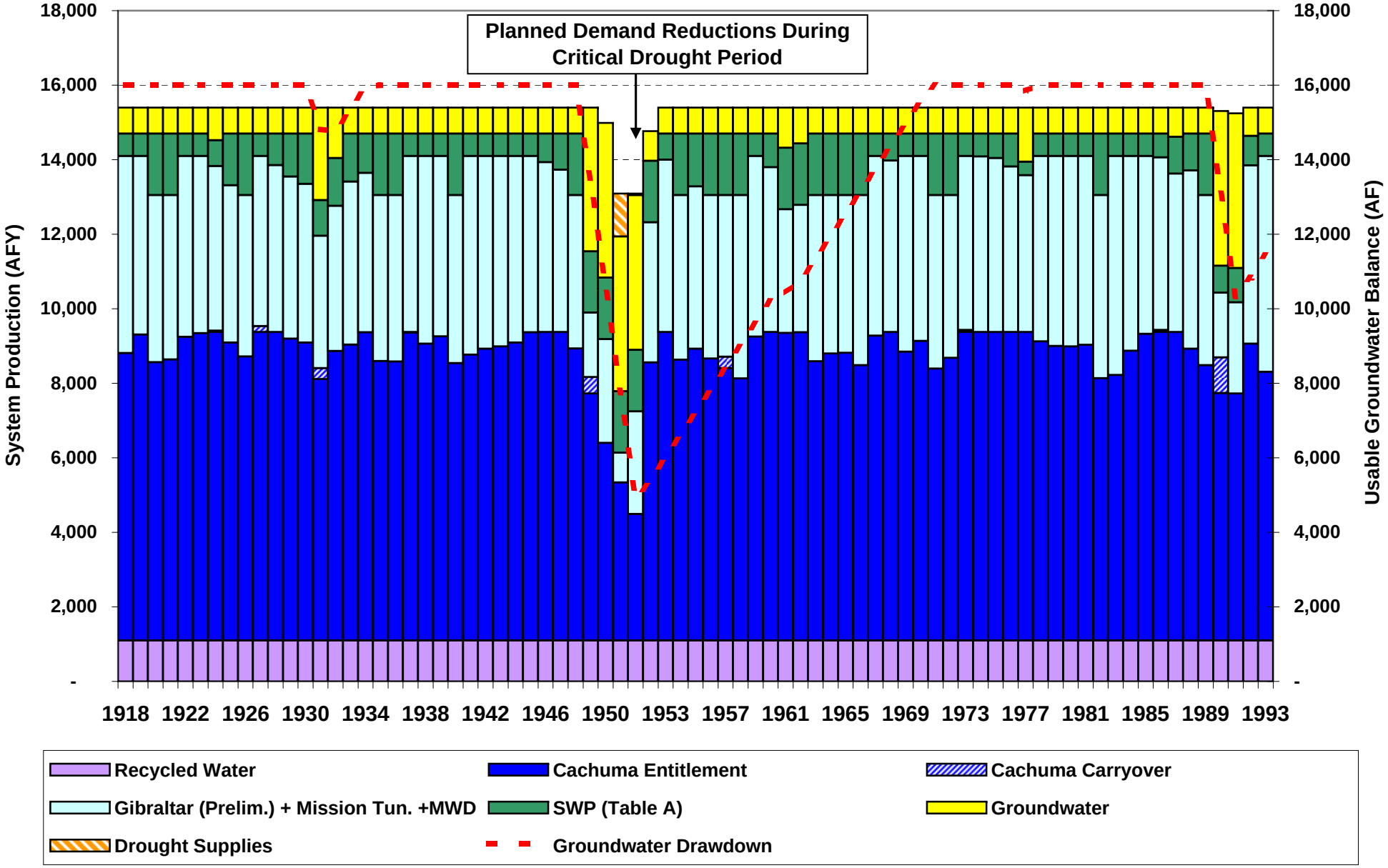
Planned Demand Reductions:	Stage 1	Stage 2	Stage 3
	10%	**15%**	**15%**



(This page intentionally left blank.)

Water Supply Performance: Scenario B - Near Term

Projected System Demand (AFY):	**14,000**	Water Supply Target (including Safety Margin):	**15,400**		
Cachuma Yield Assumption:	**Current Entitlement**	Planned Demand Reductions:	Stage 1	Stage 2	Stage 3
Total Critical Period Drought Supplies Required (AF):	**1,195**		**10%**	**15%**	**15%**



(This page intentionally left blank.)

Water Supply Performance: Scenario C - 2030 Conditions

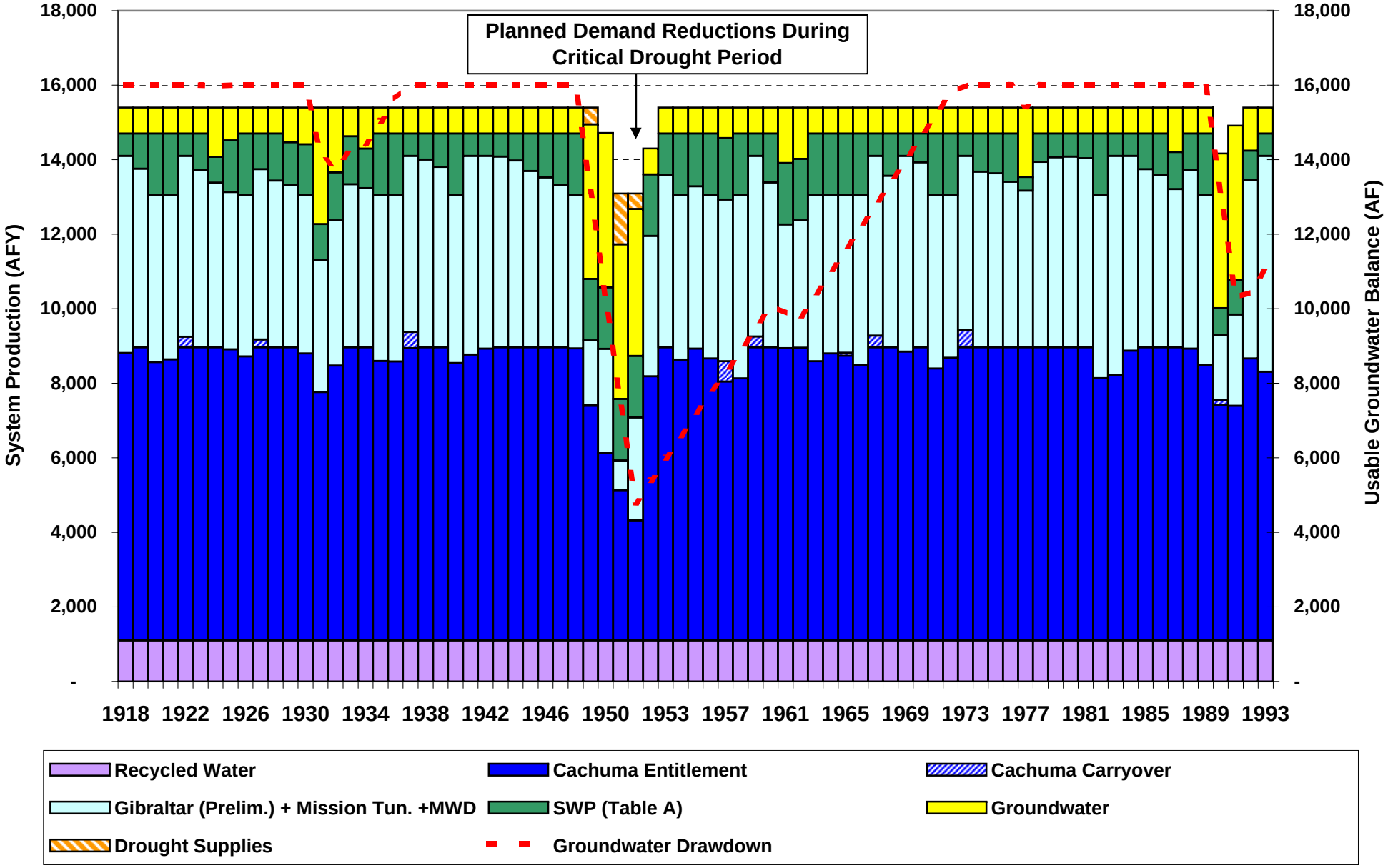
Projected System Demand (AFY): **14,000**

Water Supply Target (including Safety Margin): **15,400**

Cachuma Yield Assumption: **Projected Entitlement**

Planned Demand Reductions: Stage 1 **10%** Stage 2 **15%** Stage 3 **15%**

Total Critical Period Drought Supplies Required (AF): **2,228**



Santa Maria Valley

Groundwater Assessment

Santa Barbara County, California

Submitted to:
Salt and Nutrient Planning Workgroup
Santa Barbara County IRWM Plan 2013

Date: February 12, 2013
Project No: 118210

Robert B. Almy, P.G.
Project Director

GEI Consultants, Inc.

Groundwater Assessment
for the
Salt & Nutrient Planning Workgroup
February 2013

This report was prepared by the staff of GEI Consultants, Inc. under the supervision of professionals whose signatures appear hereon. The findings or professional opinions were prepared in accordance with generally accepted professional engineering and geologic practice.

PROFESSIONAL GEOLOGIST
ROBERT
ALMY
No. 3802
STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER
SAMUEL W. SCHAEFER
C 66337
EXP 6-30-2014
CIVIL
STATE OF CALIFORNIA

Robert Almy, PG
Project Directo

Samuel W. Schaefer, PE
Senior Engineer

Table of Contents

Abbreviations and Acronyms v

1 Introduction 1

1.1 Regulatory Requirements Pertaining to Water Quality in the Santa Maria Valley 2
1.1.1 Basin Plan and Beneficial Uses 2
1.1.2 Total Maximum Daily Loads 3
1.1.3 Point Source Waste Discharge Requirements 3
1.1.4 Nonpoint Source Discharge Requirements 4
1.1.5 Condition Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands: Order No. R3-2012-0011(Agricultural Order) 4
1.1.6 Stormwater Regulations 5
1.1.7 Recycled Water Policy 5
1.1.8 Groundwater Basin Adjudication 5
1.2 Working Group Collaboration Process 6
1.2.1 IRWM Planning Framework 6
1.2.2 Guided by Local Stakeholder Interests 6
1.2.3 Water Users and Dischargers 6
1.2.4 Collaborative and Non-Regulatory 7
1.2.5 Regular Meetings Open to the Public 7
1.3 Agency Coordination 7
1.4 Purpose of the Groundwater Assessment 8
1.5 Approach of the Groundwater Assessment 9
1.5.1 Conceptual Model Discussion 9
1.5.2 Hydrology 9
1.5.3 Inputs-Sources of Salt and Nutrient 10
1.5.4 Transport Mechanism 10
1.5.5 Fate 10
1.5.6 Water and Nutrient Management 11
1.6 Existing Water Management and Institutional Framework 11
1.7 Stakeholder Roles and Responsibilities 11
1.8 Organization of This Report 12

2 Existing Monitoring and Uses of Data 21

2.1 Existing Monitoring Programs and the Current Use of Data 21
2.1.1 Geological Survey Monitoring 21
2.1.2 CCRWQCB Monitoring 22
2.1.3 City of Santa Maria 22
2.1.4 Golden State Water Company 22
2.1.5 City of Guadalupe 22

2.1.6 Central Coast Water Authority 22
2.1.7 County of Santa Barbara Public Works Department 23
2.1.8 Waste Water Treatment Plants 23
2.1.9 Central Coast Water Quality Preservation, Inc. 23
2.2 Sources, Nature and Applicability of Data to this Assessment 23

3 Description of Basin 29
3.1 Past Studies and Sources of Information 29
3.2 Geography and Surface Hydrology 29
3.3 Geology, Geologic History and Hydrogeology 30
3.4 Development of Water Resources 31
3.4.1 Groundwater and Wells 32
3.4.2 Twitchell Reservoir 32
3.5 Agricultural Water Supply and Demand 33
3.5.1 Agriculture Water Requirements 33
3.5.2 Agriculture Water Demand – Pumped Groundwater 35
3.5.3 Agriculture Return Flow 36
3.5.4 Orcutt-Solomon Creek at Sand Plant (312ORC) 38
3.5.5 Oso Flaco Creek 38
3.6 Urban Water Supply and Demand 38
3.7 Urban Return Flow 39
3.7.1 City of Santa Maria WWTP 39
3.7.2 City of Guadalupe WWTP 40
3.7.3 Laguna County Sanitation District (Orcutt) WWTP 40
3.8 Existing Water Management 40
3.8.1 Regional 40
3.8.2 System Operators 41
3.9 Management of Salt and Nutrients 41

4 Sources, Transport and Fate of Water, TDS, Sodium, Chloride and Nitrogen (Conceptual Model) 44
4.1 Relationship between hydrology and transport of salt and nutrient 44
4.2 Source, Transport, Fate Cycle Conceptual Model 45
4.2.1 Basin Balance Estimates 50
4.2.2 Evidence in Support of Transport Model 50

5 Evaluation of Existing Monitoring 59
5.1 Existing monitoring programs 59
5.1.1 Measurement of Recharge and Sources of TDS, Cl^- and NO_3 60
5.1.2 Groundwater measurements and movement of TDS, Cl^- and NO_3 61
5.1.3 Measurements of TDS, Cl^- and NO_3 Discharge 62
5.2 Applicability of Existing Data 63
5.3 Gaps Analysis and Uncertainties 65
5.3.1 Well Location, Construction and Hydrogeologic Characteristics 66
5.3.2 Areal Distribution of Ground Water Measurements 66
5.3.3 Characteristics of Subsurface Discharge to the Ocean 67

5.3.4 Vertical Stratification of TDS and NO_3 in the Subsurface 67
5.3.5 Surface Water Measurements 67
5.4 Conclusions 68
5.4.1 Salt and Nutrient Input Data 68
5.4.2 Salt and Nutrient Output Data 69
5.5 Monitoring Recommendations 69

6 Summary and Conclusions 71
6.1 Monitoring 71
6.2 Sources, Transport and Fate of Salt and Nutrient 71
6.3 Water Quality Trends 71

References and Other Resources 1

Tables

Table 3.5. Irrigated Crop Acres, Unit Applied Water, and Calculated Applied Water by Crop Category 34
Table 4.2-1. Estimated Annual Chloride and TDS Load Balance, Santa Maria Valley, 1990 52
Table 4.2-2. Estimated Annual Nitrate Load Balance, Santa Maria Valley, 1990 53
Table 4.2-3. Estimated Annual Chloride and TDS Load Balance, Santa Maria Valley, 2000 54
Table 4.2-4. Estimated Annual Nitrate Load Balance, Santa Maria Valley, 2000 55
Table 4.2-5. Estimated Annual Chloride and TDS Load Balance, Santa Maria Valley 2010 56
Table 4.2-6. Estimated Annual Nitrate Load Balance, Santa Maria Valley, 2010 57

Figures

Figure 1. Location of Assessment Area: Santa Maria Groundwater Management Area 14
Figure 1.2a. TDS Balance Diagram, Eastern Santa Maria Valley 15
Figure 1.2b. TDS Balance Diagram, Western Santa Maria Valley 16
Figure 1.2c. Chloride (Cl^-) Balance Diagram, Eastern Santa Maria Valley 17
Figure 1.2d. Chloride (Cl^-) Balance Diagram, Western Santa Maria Valley 18
Figure 1.2e. Nitrate (NO_3) Balance Diagram, Eastern Santa Maria Valley 19
Figure 1.2f. Nitrate (NO_3) Balance Diagram, Western Santa Maria Valley 20
Figure 2.1a. Well Network for Monitoring Shallow Groundwater 25
Figure 2.1b. Well Network for Monitoring Deep Groundwater 26
Figure 2.1c. Surface Water and Climatic Monitoring Network 27
Figure 2.1d. Central Coast Ambient Monitoring Program Sampling Sites 28

Figure 4.2. Nitrogen in Root Zone Balance 46
Figure 4.2.1. TDS, CL, and Nitrate Concentrations within Santa Maria Valley Management Area 58

Appendices

A Scope of Work
B Suggested Elements of a Salt and Nutrient Management Plan
C Salt and Nutrient Planning Working Group
D Fact sheet for Order R3-2012-0011 ("2012 Ag Order")
E Preliminary TDS, Cl^-, and NO_3 Balance Calculation

Abbreviations and Acronyms

CCAMP	Central Coast Ambient Monitoring program
CCRWQCB	Central Coast Regional Water Quality Control Board
CCWA	Central Coast Water Authority
CIMIS	California Irrigation Management Information System
CMP	Cooperative Monitoring Program
IRWM	Integrated Regional Water Management
NPDES	National Pollution Discharge Elimination System
POTW	Publically-Owned Treatment Works
SMVWMA	Santa Maria Valley Water Management Authority
SMVWCD	Santa Maria Valley Water Conservation District
TDS	total dissolved solids
TMA	Twitchell Management Authority
TMDL	total maximum daily load
USBR	United State Bureau of Reclamation
USGS	Unites States Geological Society
WRCB	Water Rescources Control Board
WDRs	Water Discharge Requirements

1 Introduction

This Assessment has been prepared to evaluate sources, transport and fate of "salts" and "nutrients" (Nitrate and other forms of nitrogen) in surface water and groundwater within the Santa Maria Valley. Specifically, the Santa Maria Valley Groundwater Management Area as defined by The Superior Court (2008) was the focus of this Assessment (Figure 1). The assessment is a part of the update to the Santa Barbara County Integrated Regional Water Management (IRWM) Plan 2013 under development by local interests. Funding has been provided by the California State Department of Water Resources (DWR) as part of a Proposition 84 IRWM Planning Grant to the Santa Barbara County Region. This assessment is intended to support the development of a Salt and Nutrient Management Plan pursuant to State Water Resources Board Policy (Policy 2009-0011).

Over time, salts and nutrients may increase in groundwater basins due to a number of influences. As use and reuse of water has increased in California, understanding these influences and developing strategies to assure sustainable water resources has become more important. Santa Maria Valley water users, through a Salt and Nutrient Planning Working Group (Group), have prepared this assessment in order to better understand both existing water quality and the effectiveness of ongoing water resource management efforts. The Group has been responsible for guiding collaboration with local organizations and public agencies, as well as the public. The goals of this assessment are to identify regulatory requirements, gather and evaluate data, summarize key issues, and provide recommendations to support future development of a Salt and Nutrient Management Plan by individual stakeholders within the Santa Maria Valley. This report does not discuss climate change since it is a specific topic addressed in the IRWM Plan update.

This assessment is based on existing hydrologic information and water quality data available through the Working Group and public agencies. Funding is provided through an IRWM Planning Grant for consultant services to assist in development of the report.

The scope of work for this assessment was developed by the Working Group and approved by DWR in conjunction with the grant (Appendix A). This assessment contains several sections:

- Purpose of the Assessment
- Overview of regulatory requirements pertaining to water quality in the Santa Maria Valley
- Working Group collaborative process
- Conceptual model of sources, transport, and fate of salt and nutrient
- Data acquisition, management, and analysis

- Description of the groundwater basin
- Overview of salt and nutrient management in the Santa Maria Valley

In addition to this assessment, the Working Group formulated a process to discuss goals and objectives in a separate Technical Memorandum. This process is based on the review of existing data (Section 2 of this Assessment), the development of a shared understanding of salt and nutrient transport and fate (Section 3), and the conclusions of the Groundwater Assessment Report (Section 6). The Working Group addressed both institutional and quantitative goals and objectives.

1.1 Regulatory Requirements Pertaining to Water Quality in the Santa Maria Valley

Quality of surface and groundwater is generally regulated by two agencies, the State Water Resources Control Board (State Board) and the Central Coast Regional Water Quality Control Board (Central Coast Board). These boards have a number of regulatory programs that pertain to the Santa Maria Valley. They include:

- Water quality planning programs (adoption, review, and amendment of state-wide and basin water quality control plans and policies), including development and adoption of Total Maximum Daily Loads (TMDLs) and implementation plans
- Regulatory programs, including permitting and control of discharges through National Pollutant Discharge Elimination System (NPDES) and Waste Discharge Requirement (WDR) permits, discharge to land (California Code of Regulations Chapter 15), and storm water and storage tank programs
- Monitoring and quality assurance programs
- Nonpoint source management programs, including the "Watershed Management Initiative"
- Funding assistance programs, including grants and loans

1.1.1 Basin Plan and Beneficial Uses

The Central Coast Board relies on its adopted "Water Quality Control Plan for the Central Coast Basin Plan" (Basin Plan) to describe the actions necessary to:

- Achieve water quality objectives
- Establish a time schedule for complying with them
- Describe necessary surveillance and monitoring activities

The nature of actions to be taken to meet water quality objectives include, but are not limited to, issuance of WDRs (non-water body discharges) and NPDES permits (for surface water body discharges) for point discharges, establishment of water-quality based effluent limitations, prohibitions of discharge, and the review and establishment of TMDLs.

The Basin Plan also establishes beneficial uses used to guide development of water quality objectives in each surface water body. Each water body is designated for one or more beneficial uses such as domestic, municipal, agricultural, and industrial supply; power generation; recreation; aesthetic enjoyment; navigation; and preservation and enhancement of fish, wildlife, and other aquatic resources. Generally speaking the municipal use and environmental designations carry the strictest water quality standards. Monitoring activities to determine compliance with water quality objectives include discharger self-monitoring required under WDRs and NPDES permits, and monitoring undertaken by the Central Coast Board through its Central Coast Ambient Monitoring Program (CCAMP) program.

1.1.2 Total Maximum Daily Loads

Consistent with Section 303(d) of the Clean Water Act, the State has identified surface water bodies that do not meet water quality standards and considers them "impaired." In order to improve water quality in the impaired surface water bodies in the Santa Maria Valley, the Central Coast Board has implemented the regulatory process of TMDLs. The TMDL process involves determining the quantity of one or more pollutants that can be allowed in each surface water body without exceeding water quality objectives, and allocating responsibility for managing those pollutants. The role of groundwater in developing a TMDL has not been determined by CCRWQCB.

Although the abbreviation stands for Total Maximum Daily Load, the limitations contained in a TMDL may be other than daily load limits. There can also be multiple TMDLs on a particular surface water body, or there can be one TMDL that addresses numerous pollutants. California's Porter-Cologne Water Quality Control Act (Section 13242) requires that any TMDL implementation program be adopted as a Basin Plan amendment. The CCRWQCB has initiated a TMDL regulatory process for Total Dissolved Solids (TDS or "salt") and nutrients in the Santa Maria Valley. In support of the TMDL process, the CCRWQCB is developing a numerical model of elements on the hydrologic system of the Santa Maria Valley that affect sources, transport and fate of TDS in surface and groundwater. The model is intended to guide decisions by the CCRWQCB in its regulatory process. The model was not used in the analysis presented in this report.

1.1.3 Point Source Waste Discharge Requirements

NPDES permits are required by all dischargers—municipal, industrial, and others that discharge pollutants from any point source (such as "end of pipe" systems) into waters of the United States—and are intended to ensure that discharges do not adversely affect the quality and beneficial uses of surface waters. All permit requirements must also comply with the Central Coast Board Basin Plan and any statewide water quality control plans. Permits include requirements for effluent limitations. Permits for discharges to water bodies that do not yet meet water quality objectives may require effluent limitations consistent with a waste load allocation to ensure that the discharge will allow achievement of applicable water

quality objectives. An appropriate monitoring and reporting program is included in all permits.

WDRs are issued under State law pursuant to Section 13263 of the Water Code and apply to dischargers that discharge waste to land or to percolation ponds. The disposal method may be by agricultural or non-agricultural irrigation or to ponds, landfills, or leach fields. Similar to NPDES requirements, all WDRs contain effluent limitations, provisions for maintaining an administrative record, and monitoring and reporting requirements. The City of Guadalupe, the City of Santa Maria and the Laguna County Sanitation District discharge wastewater under separate WDRs.

1.1.4 Nonpoint Source Discharge Requirements

The State Boards Nonpoint Source (NPS) Pollution Control Program is responsible for statewide NPS program management, and for providing administrative and technical support for the program to the State and Regional Boards. Nonpoint source is defined to mean any source of water pollution that does not meet the legal definition of "point source" in CWA 502(14). Typically, nonpoint source pollution is transported by rainfall or runoff and may reach surface water or groundwater. Atmospheric deposition and hydrologic modification of surface characteristics (leading to sediment runoff or increased peak runoff, etc.) are also considered nonpoint sources of pollution. The State has several programs to control nonpoint source pollution. They are discussed below.

1.1.5 Condition Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands: Order No. R3-2012-0011(Agricultural Order)

The Central Coast Board employs a regulatory process called a Conditional Waiver of Waste Discharge Requirements to control discharges from irrigated agricultural lands to protect surface water and groundwater quality. This permit applies to owners and operators of irrigated land used for commercial crop production; it is intended to control pollution from pesticides, nutrients, and sediments. Each grower in the Central Coast Region must submit a Notice of Intent to comply with the Order.

On March 15, 2012, the Central Coast Board adopted an updated Conditional Waiver of Waste Discharge Requirements (Agricultural Order No. RB3-2012-0011). The waiver expands the ongoing monitoring and reporting program and places farms in one of three tiers based on risk to water quality. Specifically, the Order includes water quality monitoring of surface and groundwater as well as implementing nutrient management practices pursuant to a plan developed specifically for each farming operation. A fact sheet outlining the requirements of the Order is contained in Appendix D; at this time and during the writing of this report, full implementation of the Order is pending legal challenges.

1.1.6 Stormwater Regulations

The 1987 amendments to the Clean Water Act added Section 402(p) and established initial regulation of municipal and industrial storm water discharges under the NPDES program. In 1990, EPA established application requirements for storm water permits. The regulations require that storm water associated with industrial activities that discharge either directly to surface waters or indirectly through separate municipal storm sewers must be regulated by an NPDES permit. In California a separate statewide general permit has also been issued for construction activity. Currently the City of Santa Maria and the community of Orcutt are subject to municipal stormwater permits focusing on their storm drain systems, which require six types of pollution control activity: public education, pollution source identification and abatement, water quality monitoring, land use regulations, construction site regulation and control of municipal operations.

The State Board issued a general permit regulating all dischargers where construction activity disturbs five or more acres. The intentions of this permit were to eliminate or reduce non-storm water discharges to storm sewer systems and other waters, and to implement and perform inspections of Best Management Practices (BMPs). State agencies such as CALTRANS, municipal agencies and private construction activities are subject to this permit.

1.1.7 Recycled Water Policy

The State of California encourages recycling of water to increase availability and reliability of existing supplies. In order to address long term water quality issues raised by water reuse, the State Board adopted a Recycled Water Policy in February 2009. The purpose of the policy was to protect long term water quality pursuant to existing laws.

The Recycled Water Policy states that Salt and Nutrient Management Plans need to be completed by 2014 to facilitate basin-wide management of salt and nutrient from all sources in a manner that optimizes recycled water use while ensuring protection of groundwater supply and beneficial uses, agricultural beneficial uses, and human health. The Central Coast Board, through its regulation of discharges, now requires operators of publically owned treatment works (POTW) to develop implementation plans to meet the objectives of the Recycled Water Policy, including preparation of Salt and Nutrient Management Plans. The plans will then be adopted by the Central Coast Board as amendments to the region's Basin Plan. The proposed outline for plans developed by the WRCB is contained in Appendix B.

1.1.8 Groundwater Basin Adjudication

The Santa Maria Groundwater Basin was subject to litigation that was partially settled in a June 30, 2005, Stipulation entered by the Superior Court of the State of California, County of Santa Clara (Superior Court, 2008). The Stipulation divided the overall Santa Maria Valley Groundwater Basin into three management areas, the largest of which overlies the main Santa Maria Valley (the Santa Maria Valley Management Area, or SMVMA) which is

subject to annual reporting by the Twitchell Management Authority. The other two management areas, the Nipomo Mesa Management Area (NMMA) and the Northern Cities Management Area, are addressed in separate annual reports prepared by separate entities. Most water users, including the public purveyors of water, are subject to the Stipulation. Upon final settlement of the adjudication, all water users in the Valley will be subject to the stipulation.

The Stipulation specifies that monitoring will occur to determine groundwater conditions, land and water uses, sources of water supply, and the disposition of all water supplies in the Valley. Annual Reports by the TMA on the SMVMA to the Court summarize the results of the monitoring and include an analysis of the relationship between projected water demand and supply. Some discussion of water quality is included. Currently the SMVMA annual report is prepared by Luhdorff and Scalmanini Engineers.

1.2 Working Group Collaboration Process

The Santa Maria Valley Groundwater study is a new evaluation focusing on salt and nutrient issues that was developed through a collaborative process involving stakeholders within the Santa Maria Valley, as further described below (Appendix C).

1.2.1 IRWM Planning Framework

The development of this report was guided by a Working Group comprising water users, local and state agencies, non-governmental organizations and other interested parties (Appendix C). The Working Group was formed within the framework of the Santa Barbara county IRWM Plan update to focus specifically on salt and nutrient issues in the Santa Maria Valley. The group was open to all interested parties and worked under mutually agreed upon ground rules relating to meeting protocol and decision making. Participation by a diverse group of stakeholders and the public was actively solicited and project development was reported through the County of Santa Barbara IRWM website.

1.2.2 Guided by Local Stakeholder Interests

Local stakeholder in-basin interests provided much of the data used to prepare this report and provided review to assure the report accurately reflects issues related to salt and nutrient planning in the Santa Maria Valley. From the outset, the local stakeholder interests sought a report that could help all users to provide sustainable, local water sources to meet all local needs as well as recognizing the sustainable practices already implemented by stakeholders.

1.2.3 Water Users and Dischargers

Two types of operations are essential to characterizing Santa Maria Valley water quality: 1) production and use by municipal and agriculture interests and 2) water discharge by WWTP operators and agriculture (Figures 1.2a, 1.2b, 1.2c, 1.2d, 1.2e, and 1.2f are a set of six conceptual transport and fate diagrams, which are the same diagrams referred to later in this

report in several places). Water user groups are well represented in the Working Group. Water users included urban water suppliers, agricultural water users, and environmental demands. In the Santa Maria Valley, urban water suppliers rely on both groundwater and imported deliveries from the State Water Project (SWP). Agricultural water users rely predominately on groundwater extractions. (Some minor sprinkler irrigation relies on treated WWTP effluent.)

Dischargers include WWTPs, municipal storm drains, and agricultural drainage. As described in subsequent sections, discharges within the Santa Maria Valley have been adequately monitored to allow general characterization.

1.2.4 Collaborative and Non-Regulatory

Like all other elements of the IRWM Planning process, the Working Group is non-regulatory and collaborative. The group structured its meetings, adopted ground rules, hired a technical consultant, and modified the scope of work during the initial stages of the process. The scope of work and structure of the work products were deliberately crafted to avoid the appearance of complying with a particular regulatory process, while developing information each of the individual dischargers may use as a basis for meeting State mandates to prepare a Salt and Nutrient Management Plan.

1.2.5 Regular Meetings Open to the Public

Regular monthly meetings were held in the Santa Maria Valley among Working Group members, the technical consultant, and members of the IRWM Planning team. These meetings were used to share information, review interim work products, and provide direction to the technical consultant.

1.3 Agency Coordination

This report was prepared under the auspices of the Santa Barbara County Integrated Regional Water Management Plan. The IRWM Planning process includes 28 agencies including the following members of the working group that guided preparation of this report:

- Santa Barbara County Water Agency (CWA)
- Twitchell Management Authority (TMA)
- Santa Maria Valley Water Conservation District (SMVWCD)
- City of Santa Maria and City of Guadalupe
- Golden State Water Company (GSWC)
- Laguna County Sanitation District (LCSD)
- Central Coast Regional Water Quality Control Board (CCRWQCB)

These agencies collaborate in a number of areas on an ongoing basis. They each participated as active members of the working group and provided data as well as comments on the

direction of the assessment. These agencies will continue to collaborate and provide direction through the IRWM Planning process.

1.4 Purpose of the Groundwater Assessment

This groundwater assessment was conceived and scoped based on water users' interest to assure sustainability of water supplies as well as addressing concerns about regulatory requirements, specifically future development of Salt and Nutrient Management Plans that are required by the regulations discussed in a prior section.

The goals of this assessment are to identify regulatory requirements, gather data, summarize key issues, and provide recommendations to support future development of Salt and Nutrient Management Plans that are required by regulation for all groundwater basins and sub-basins in California. To reach those goals this report:

- Provides a regulatory overview including identification of current beneficial uses
- Generally describes institutional responsibilities and roles among water users
- Generally describes transport and fate mechanisms
- Estimates salt and nutrient balance in the Santa Maria Valley
- Describes ongoing management activities

The identification of current uses and water quality trends in the assessment are based on existing reports and input from the Working Group focusing on:

- Urban Water Supply
- Agricultural Water Supply
- Habitat support

Excessive salts or nutrients in water may threaten both human health and agricultural viability (Center for Watershed Sciences, 2012). Currently the principal source of supply in the Santa Maria Valley is groundwater. Ongoing monitoring suggests that both salt (TDS) and Nutrients, specifically nitrate (NO_3), are increasing in some areas of the Valley. NO_3 is a component of "salts" and is included in the measurement of TDS. However, due to the nature of its potential effects on human health and environmental resources, NO_3 is generally considered separately from other chemical species comprising TDS.

In the past decades development of supplemental supplies and new management practices have changed the manner in which salts and nutrients are introduced to the local hydrologic system. At the same time, regulatory agencies may seek to limit discharge of excess salt and nutrients from the Valley through regulation of discharges. Since existing monitoring practices may not provide a comprehensive picture of the benefits of existing and future management practices, conflicts may arise between narrow regulatory objectives and implementation of feasible management practices.

This assessment establishes an information base upon which to plan for the sustainability of water resources for all users. It is intended to be a first step in understanding the sources and transport of salts and nutrients within the Santa Maria Valley as well as their fate. This is key to modifying the current monitoring program so that future monitoring may demonstrate how effectively management measures control or reduce salt and nutrient levels in ground- and surface water within the basin.

1.5 Approach of the Groundwater Assessment

In order to put available data in a straightforward framework and evaluate changes in conditions with time, the assessment focuses on typical conditions in three years: 1990, 2000 and 2010. Based on a conceptual model of salt and nutrient sources and movement in the basin the following factors were evaluated:

- Sources and chemical quality of water sources
- Nature, amount, and use of water produced
- Transport of water
- Changes in water quality
- Changes in water and nutrient management

1.5.1 Conceptual Model Discussion

The Working Group based its development of a working conceptual model (included as Figures 1.2a through 1.2f) of Santa Maria Valley hydrology on previous work (such as Gibbs 2012 and Luhdorff and Scalmanini, 2011). The conceptual model shows the basic elements of sources, transport, and fate of salt and nutrient. These essential elements are represented numerically in the evaluation section. The calculation of flow volume and salt and nutrient concentration allows estimates of total transport and balance (salt/nutrient transported into and out of the valley) as discussed in Section 3.

1.5.2 Hydrology

For the purposes of understanding salt and nutrients in the Santa Maria Valley, there are three essential hydrologic factors that control transport and fate. They are:

- **Elements of Recharge:** rainfall, stream flow, importation of state water substituted for pumping, waste water treatment ponds, and deep percolation (return flow) from agriculture and other irrigation.
- **Elements of Discharge:** flow to surface water bodies that discharge into the ocean, groundwater flow to ocean, and in the case of nutrient, transformation to other forms (such as N_2) that have no water quality implications.
- **Sinks:** salt and nutrient accumulation that may occur without deleterious effects.

1.5.3 Inputs-Sources of Salt and Nutrient

The evaluation of salt and nutrient requires data on water quality as well as the volume of water moving into and through the elements of the hydrologic system. For this report, data on sources of salt and nutrient were obtained from water quality sample results posted on the Central Coast Board and USGS websites as well as limited data in other publications (Luhdorff and Scalmanini, 2011). In addition, data were provided by water purveyors including the City of Guadalupe, City of Santa Maria, and Golden State Water Company. Discharge data were obtained from operators of POTWs and the Central Coast Board. Data on nutrient use by agriculture was based on nutrient application guidelines for crops published by the University of California Cooperative Extension Service. These guidelines provide an order of magnitude estimate of nutrient use. Refined estimates could be developed from use of alternative data sources (e.g. Center for Watershed Sciences, 2012), however, professional judgment discussed among the Working Group members indicates a key conclusion of Section 4 (that NO_3 loading has decreased with time) would likely not change.

1.5.4 Transport Mechanism

Transport mechanism refers to the manner and means that salt and nutrient move through the Valley's hydrologic cycle. Salt transport generally follows flow of surface water and groundwater. The transport of nutrients, specifically nitrate (NO_3), is more complex as a result of plant uptake and chemical transformations that occur in soil.

1.5.5 Fate

Generally speaking salt and nutrients are removed from the hydrologic system through surface or subsurface flow or disposal (by Laguna Sanitation District). Specific to nitrogen, natural processes may convert nitrate (NO_3) into N_2 (a gas) or other forms that are less detrimental from a management standpoint. The movement of both salt and nitrates may be attenuated during movement through unsaturated soils above the water table known as the vadose zone. This attenuation may be a factor in understanding the accumulation of salt and nitrate in that zone. The fate of salt is somewhat less complex since the evapotranspiration of water from the root zone by plants does not remove salts. As a result the majority of salt is concentrated by evapotranspiration and remains available for transport by water movement.

Nitrogen, on the other hand, is added to the root zone in any of several forms to support plant growth to meet target yields and extracted with the plant material when it is harvested; keeping track of the fate of nitrogen requires several components: 1) short-term decisions regarding nitrogen management during a crop growing season, 2) annual and multi-year, long-term root zone budgeting for available nutrients, and 3) a basin wide long-term budget to understand the fate of nitrate that leaches past the root zone and into the groundwater basin. The third component, the groundwater basin, is a large-scale system in comparison to the management of each crop growing in a field-scale.

1.5.6 Water and Nutrient Management

Water and nutrient management, practiced by water management agencies (discussed below) and water users, is influenced by changes in annual precipitation, regulations, and pricing. In particular, changes in cost and availability of water and cost of nutrients are considered in this report as a function of time focusing on three points in time, ten years apart, specifically 1990, 2000 and 2010. The operation of Twitchell Reservoir, importation of relatively expensive supplies from the State Water Project, increasing power costs (which increase the cost of pumping and conveying water) and increased fertilizer costs have led to increased management of salt and nutrients.

1.6 Existing Water Management and Institutional Framework

Extraction, use and discharge of water are subject to a complex management and institutional framework. Generally speaking, groundwater extraction is subject to court jurisdiction pursuant to adjudication (Superior Court, 2008; Luhdorff and Scalmanini, 2011). The adjudication provides certainty as to allocation of groundwater and requires ongoing monitoring to be summarized in annual reports (Superior Court, 2008). In addition, the court established the Twitchell Management Authority to oversee preparation of the annual report for the SMVMA and provide for long term maintenance of the Twitchell Reservoir. Data for the annual report is developed by local agencies and the U. S. Geologic Survey (USGS). Water imported to the valley from the State Water Project on behalf of municipal users is managed by the Central Coast Water Authority, a joint exercise of powers agency comprising local agencies including the three municipal system operators in the valley.

Surface water is managed through the operation of Twitchell Reservoir and maintenance of the Santa Maria River levee system. Twitchell Reservoir is operated by the Santa Maria Valley Water Conservation District to provide enhanced groundwater recharge and regulate flood flows in the Cuyama and Santa Maria Rivers. The Sisquoc River, the other main tributary to the Santa Maria River, is unregulated.

1.7 Stakeholder Roles and Responsibilities

A wide range of interests were represented during scoping and preparation of this report. These interests, or stakeholders, formed a working group (Appendix C) to provide the following:

- Guide development of Groundwater Assessment Report
- Provide information, analysis reports and management program overviews
- Accept Groundwater Assessment Report
- Discuss process to Develop Salt/Nutrient Management Plan(s)

The development of this report is part of a broader process to update the Santa Barbara County Integrated Regional Water Management Plan. The Working Group is a subset of the

group performing that update and provided regular updates to the IRWM Steering Committee. This assessment will be incorporated into the revised IRWM Plan.

1.8 Organization of This Report

This assessment is based on a scope of work developed by the Working Group and approved by the DWR in conjunction with the grant (Appendix A). This assessment contains several sections:

1 Introduction
2 Existing Monitoring and Uses of Data
3 Description of Valley Hydrology and Hydrogeology
4 Sources, Transport and Fate of Sodium, Chloride and Nitrogen
5 Evaluation of Existing Monitoring
6 Summary and Conclusions

In addition to this assessment, the Working Group will formulate a process to develop goals and objectives as a separate Technical Memorandum. This process will be based on the review of existing data (Section 2 of this assessment) and development of shared understanding of salt and nutrient transport and fate (Section 3) and the conclusions of the Groundwater Assessment Report (Section 6). The working group is expected to address both institutional and quantitative goals and objectives.

Section 2 of this report includes a discussion of the source of existing monitoring programs and uses of data collected. The purpose of each major data acquisition program is described along with a summary of data acquisition, management, and availably. Other data acquisition efforts that contributed to this report are described as well.

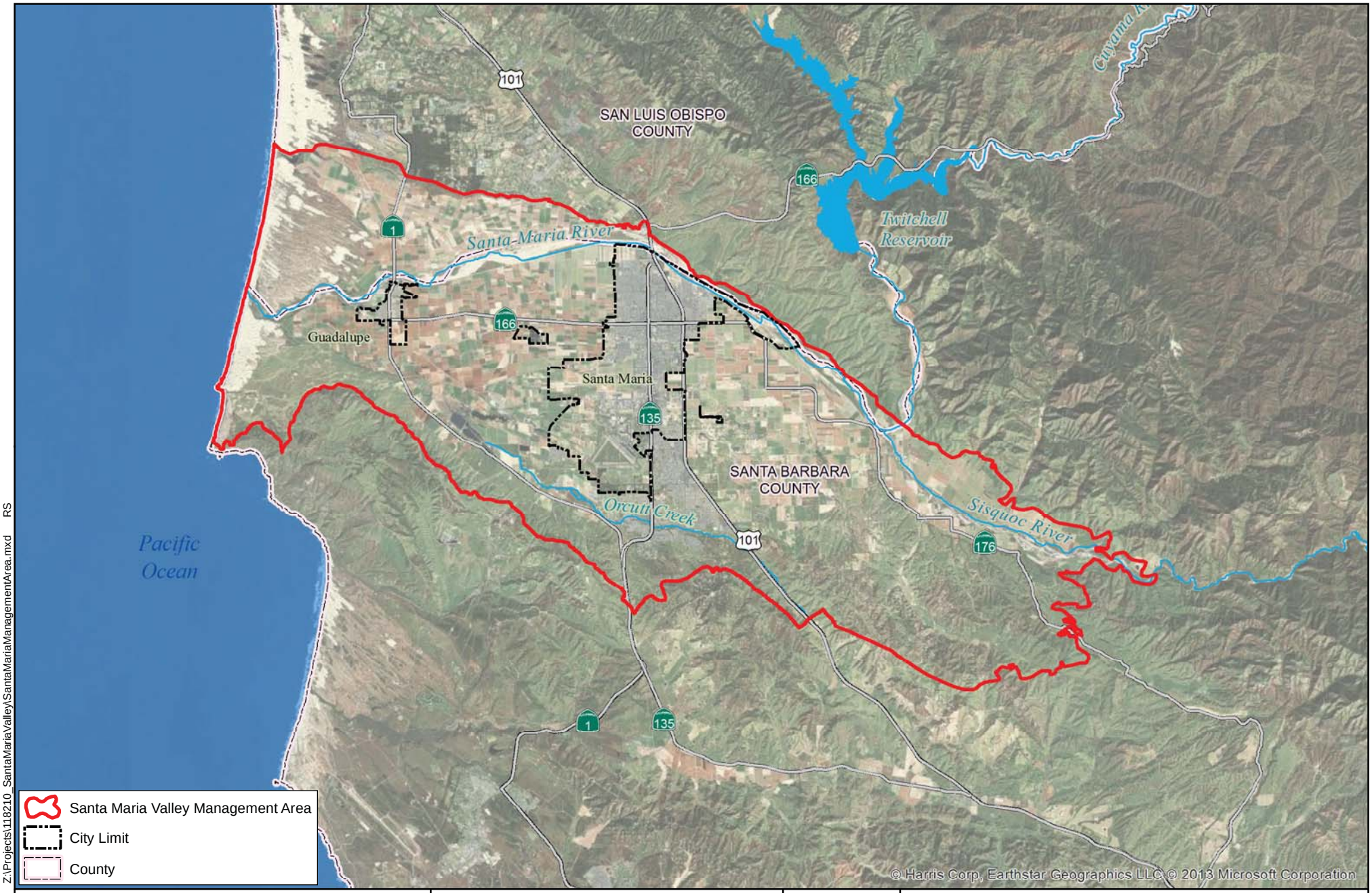
Section 3 of the report includes a description of water resources and use in the valley. In particular, hydrology and hydrogeology of the valley are discussed as they pertain to transport and fate of salt and nutrient. This description of the valley's water resources is based on past studies and reports. The information, including current water management, is structured to support development of a conceptual model of the basin.

Section 4 of the report describes the sources, transport, and fate of TDS, chloride and nitrogen. The working group developed a conceptual model of the basin focusing on sources of salt and nitrogen, and mechanism of transport. Three points in time are discussed (1990, 2000, and 2010) in order to capture changes in management that may be reflected in water quality data. Notable changes in nutrient management practices that may reduce nitrogen loading are discussed along with measures to reduce salt levels in urban water supplies and recycled water. The model was used to organize available data in tables showing estimated inputs and outputs of TDS, Cl, and NO_3 in the years 1990, 2000, and 2010. These tables show the estimated "balance" of these dissolved species within the hydrologic system for each of the three years.

Section 5 of the report evaluates the existing data used to estimate various elements of the conceptual model (groundwater, surface water, wastewater, etc.). Existing monitoring efforts include:

- Measurement of groundwater extraction
- Measurement of the volume of SWP water imported to the valley
- Measurement of discharge from waste water treatment plants and tail water systems
- Measurement of water table fluctuation
- Measurement of surface and subsurface discharge to the ocean
- Measurement of surface water quality
- Measurement of extracted groundwater quality
- Measurement of return flow quality (to groundwater)

Because existing monitoring programs were not developed to document salt and nutrient issues, this report discusses data collection programs in the context of their applicability to the estimates developed in the report. The conclusions and recommendations resulting from the evaluation of monitoring programs are incorporated into the conclusions and recommendation of this report.



4 2 0 4
Miles

Salt and Nutrient Planning Workgroup
Santa Barbara County IRWM Plan 2013

Santa Maria Groundwater Management Area

GEI Consultants
Bookman-Edmonston Division

LOCATION OF ASSESSMENT AREA: SANTA MARIA VALLEY GROUNDWATER MANAGEMENT AREA

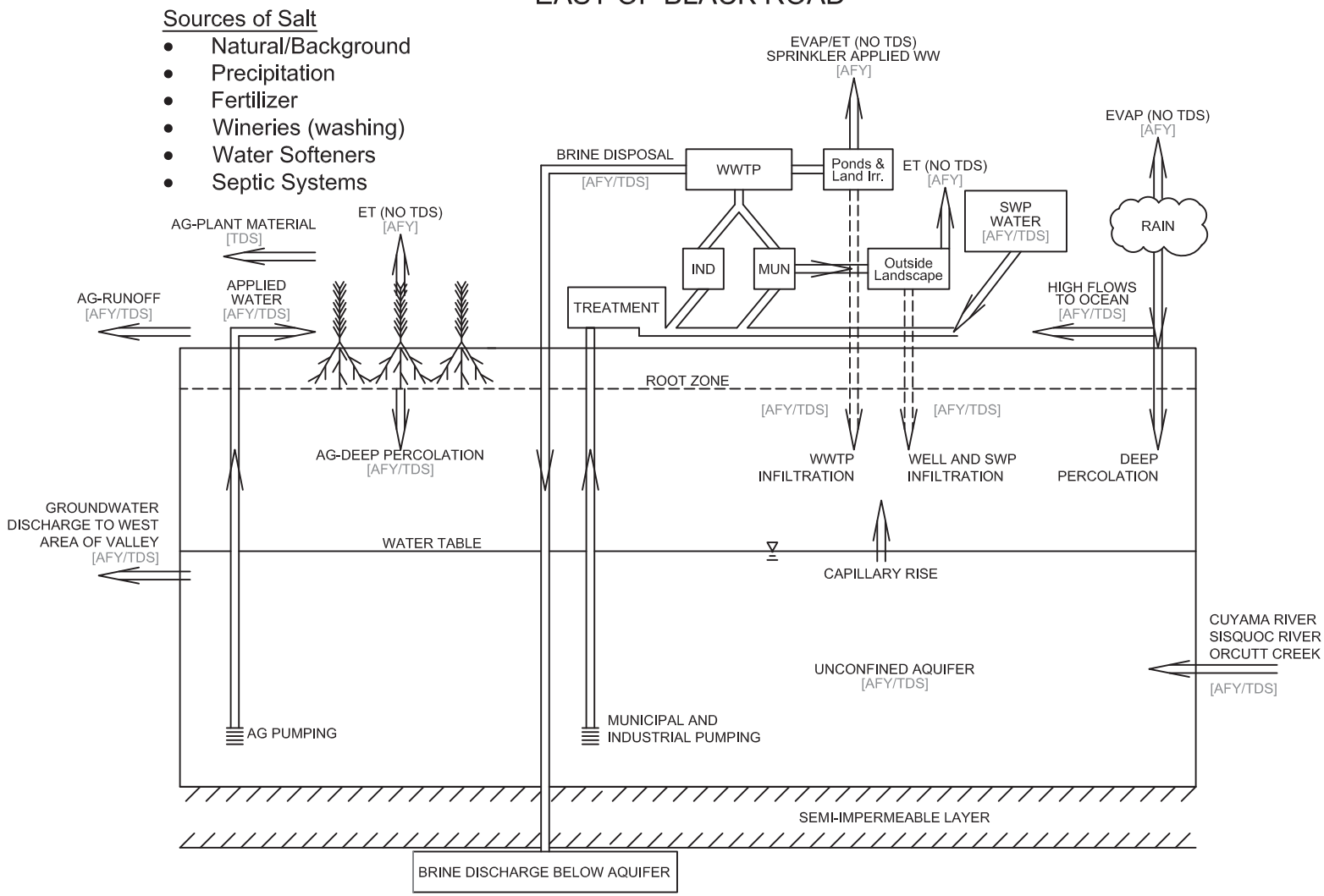
FEBRUARY 2013

FIGURE 1

Z:\Projects\118210_SantaMariaValley\SantaMariaManagementArea.mxd RS

12-Feb-2013

FIGURE 1.2a TDS BALANCE DIAGRAM
EASTERN SANTA MARIA VALLEY
EAST OF BLACK ROAD

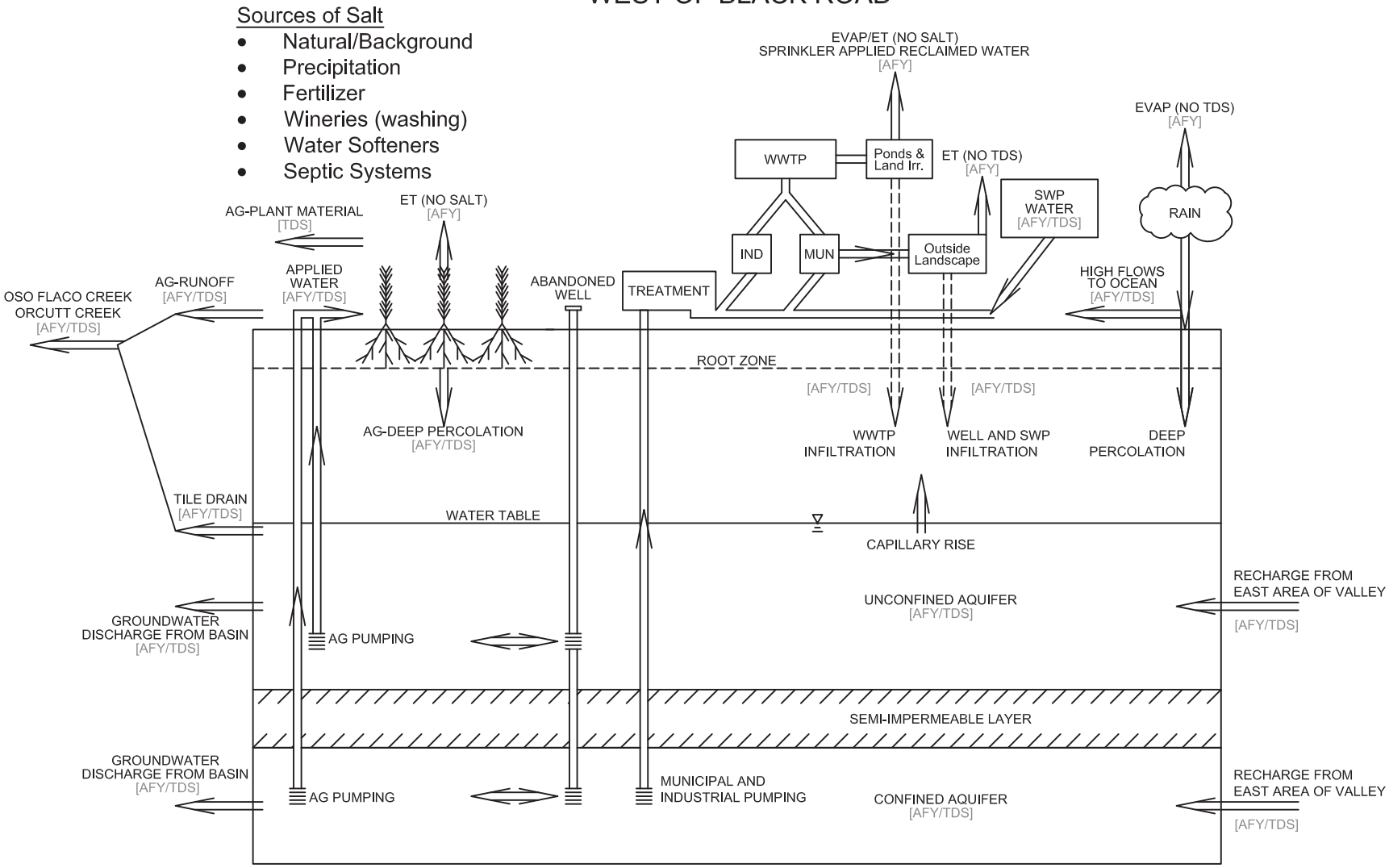


For TDS Balance: TDS In = TDS Out + ΔTDS
Calculated using: Volume x Concentration = Mass

Loading of components in diagram: [AFY/TDS]
- AFY - Volume of water in/out of the system
- TDS - Total Weight of Total Dissolved Solids
- Units are [Acre-feet per year/Pounds]

Salt and Nutrient Planning Workgroup Santa Barbara County IRWM Plan 2013	GEI Consultants Bookman-Edmonston Division	TDS Balance Diagram, Eastern Santa Maria Valley
Santa Maria Groundwater Management Area		February 2013 — Figure 1.2a

FIGURE 1.2b TDS BALANCE DIAGRAM
WESTERN SANTA MARIA VALLEY
WEST OF BLACK ROAD



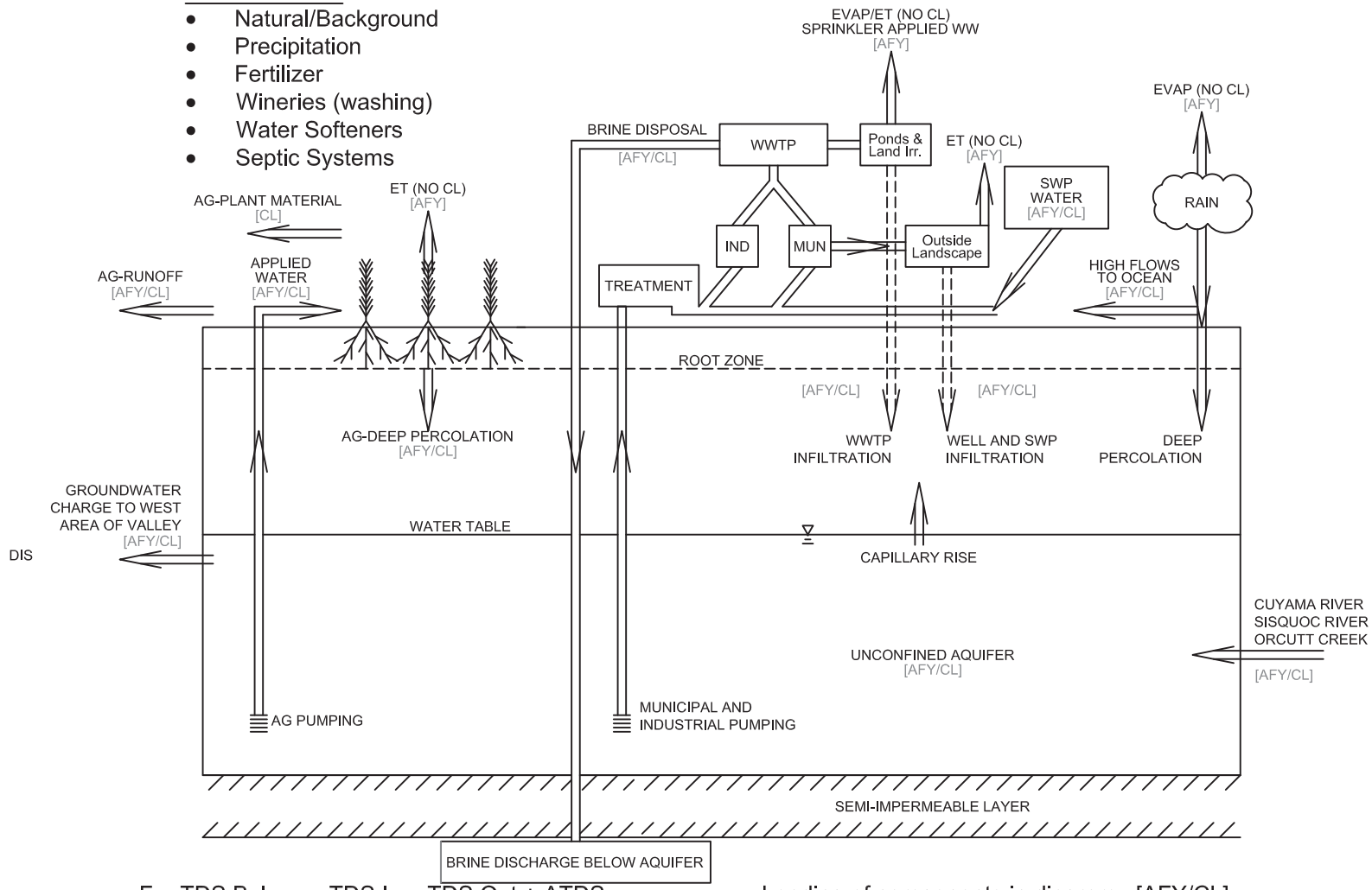
For TDS Balance: TDS In = TDS Out + ΔTDS
Calculated using: Volume x Concentration = Mass

Loading of components in diagram: [AFY/TDS]
- AFY - Volume of water in/out of the system
- TDS - Total Weight of Total Dissolved Solids
- Units are [Acre-feet per year/Pounds]

Salt and Nutrient Planning Workgroup Santa Barbara County IRWM Plan 2013	GEI Consultants Bookman-Edmonston Division	TDS Balance Diagram, Western Santa Maria Valley
Santa Maria Groundwater Management Area		February 2013 — Figure 1.2b

FIGURE 1.2c CHLORIDE BALANCE DIAGRAM
EASTERN SANTA MARIA VALLEY
EAST OF BLACK ROAD

Sources of Salt
- Natural/Background
- Precipitation
- Fertilizer
- Wineries (washing)
- Water Softeners
- Septic Systems

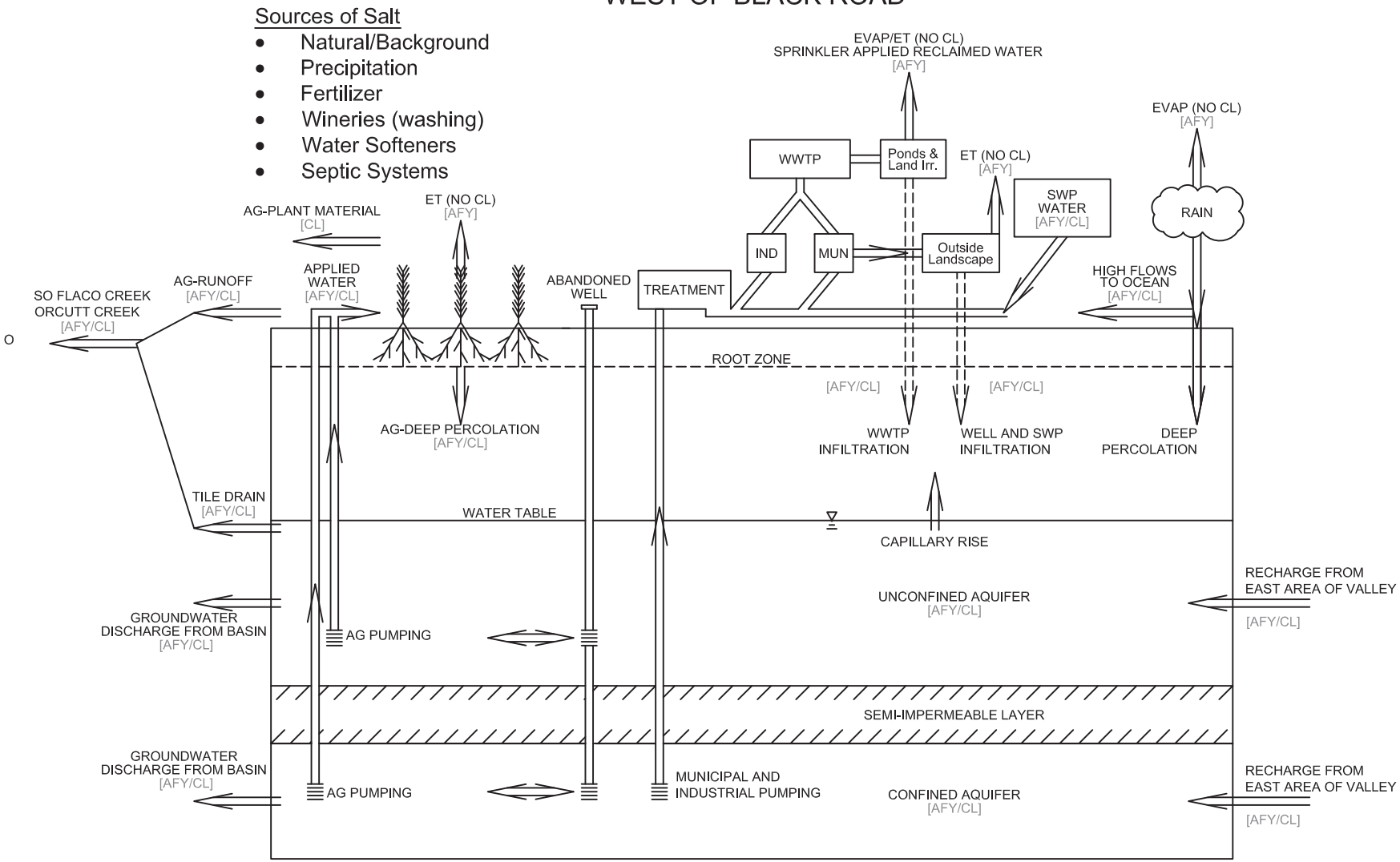


For TDS Balance: TDS In = TDS Out + ΔTDS
Calculated using: Volume x Concentration = Mass

Loading of components in diagram: [AFY/CL]
- AFY - Volume of water in/out of the system
- CL - Total Weight of Chloride
- Units are [Acre-feet per year/Pounds]

Salt and Nutrient Planning Workgroup Santa Barbara County IRWM Plan 2013	GEI Consultants Bookman-Edmonston Division	Chloride (Cl-) Balance Diagram, Eastern Santa Maria Valley
Santa Maria Groundwater Management Area		February 2013 — Figure 1.2c

FIGURE 1.2d CHLORIDE BALANCE DIAGRAM
WESTERN SANTA MARIA VALLEY
WEST OF BLACK ROAD

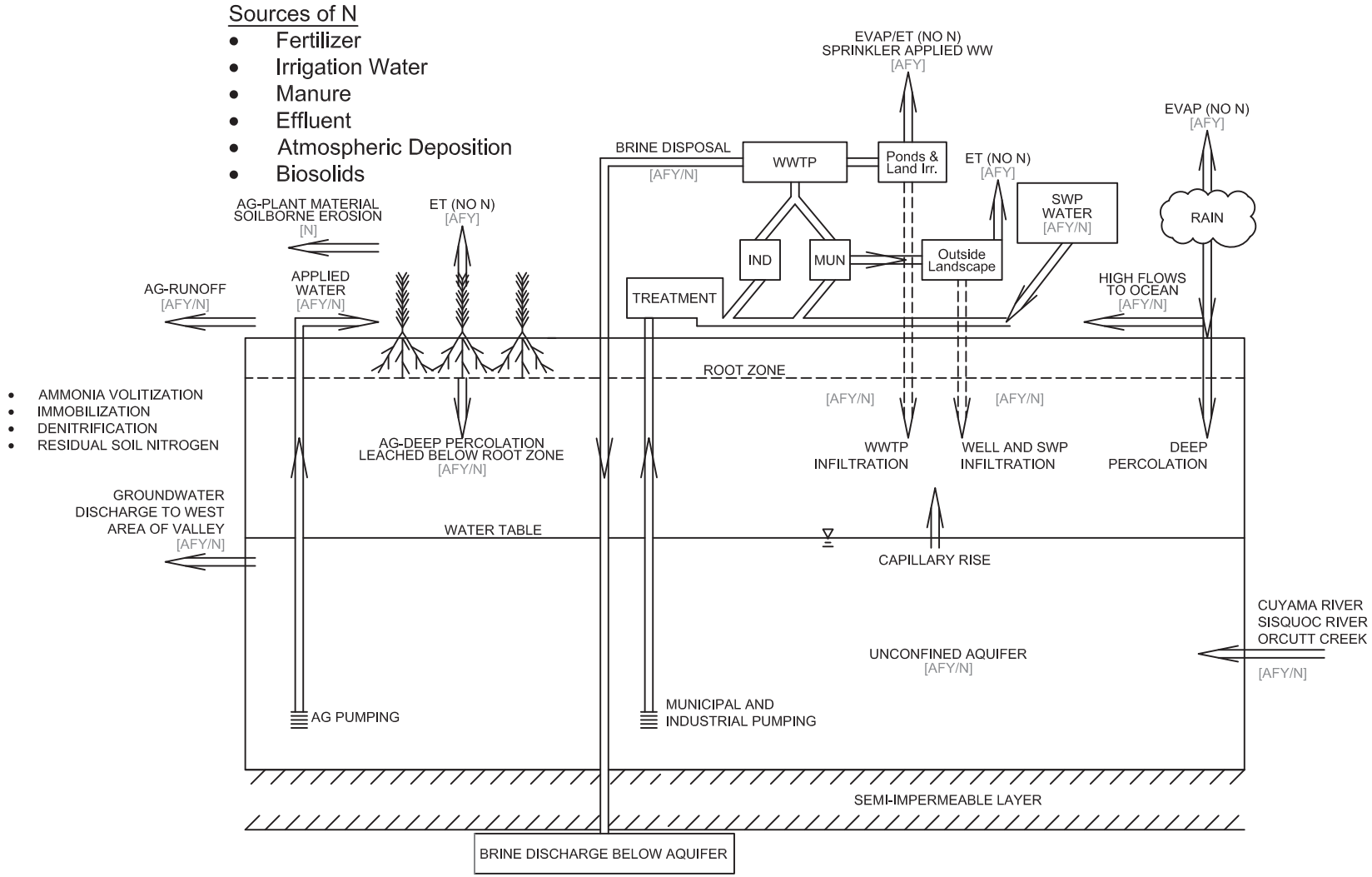


For TDS Balance: TDS In = TDS Out + ΔTDS
Calculated using: Volume x Concentration = Mass

Loading of components in diagram: [AFY/CL]
- AFY - Volume of water in/out of the system
- CL - Total Weight of Chloride
- Units are [Acre-feet per year/Pounds]

Salt and Nutrient Planning Workgroup Santa Barbara County IRWM Plan 2013	GEI Consultants Bookman-Edmonston Division	Chloride (Cl-) Balance Diagram, Western Santa Maria Valley
Santa Maria Groundwater Management Area		February 2013 — Figure 1.2d

FIGURE 1.2e NITRATE/NO3 BALANCE DIAGRAM
EASTERN SANTA MARIA VALLEY
EAST OF BLACK ROAD

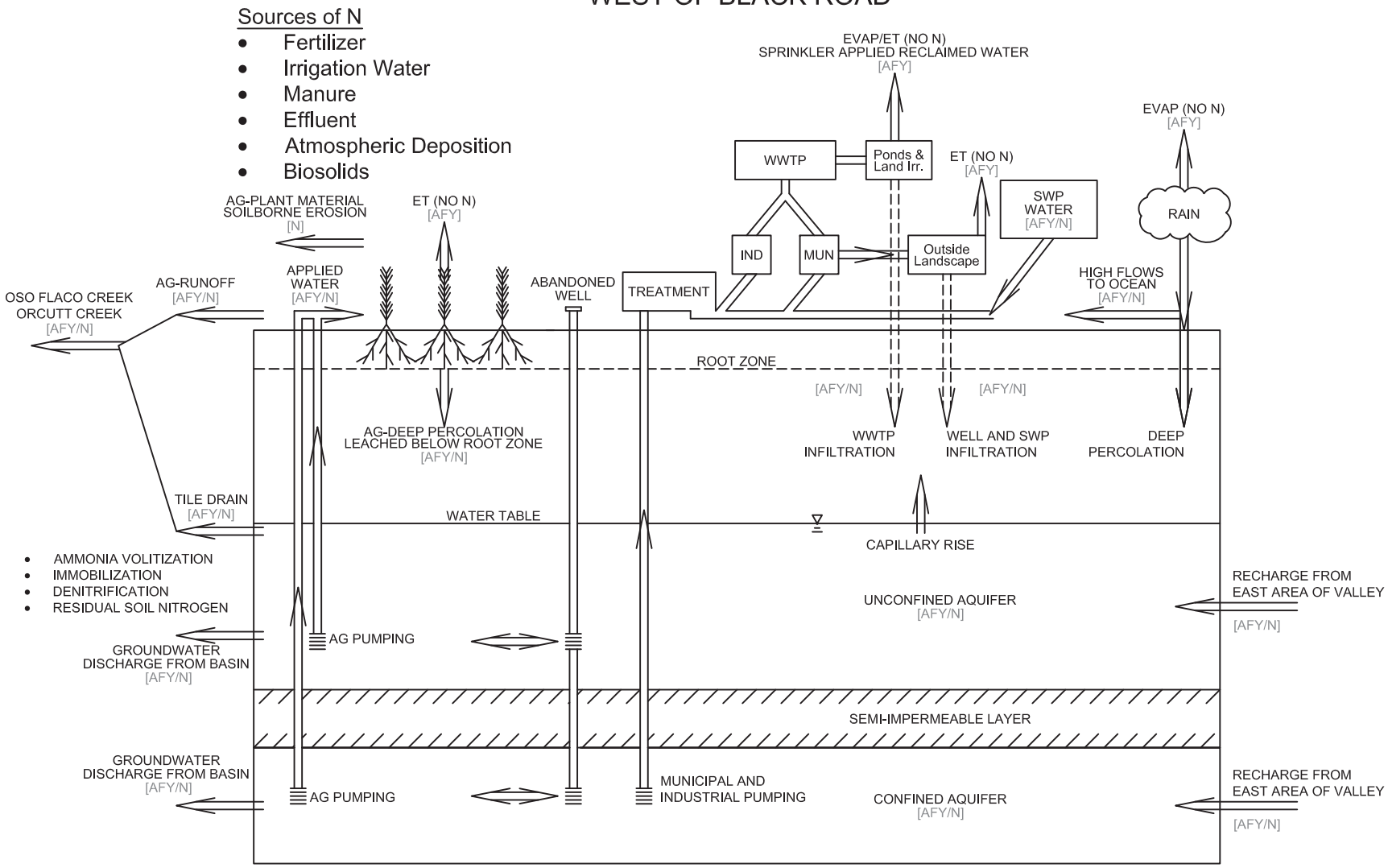


For Nitrogen Balance: N In = N Out + ΔN
Calculated using: Volume x Concentration = Mass

Loading of components in diagram: [AFY/N]
- AFY - Volume of water in/out of the system
- N - Total Weight of Nitrogen [NO3-N]
- Units are [Acre-feet per year, Pounds]
- 10 ppm NO3-N ≈ 44.27 mg/L NO3

Salt and Nutrient Planning Workgroup Santa Barbara County IRWM Plan 2013	GEI Consultants Bookman-Edmonston Division	Nitrate (NO_3) Balance Diagram, Eastern Santa Maria Valley
Santa Maria Groundwater Management Area		February 2013 — Figure 1.2e

FIGURE 1.2f NITRATE/NO3 BALANCE DIAGRAM
WESTERN SANTA MARIA VALLEY
WEST OF BLACK ROAD



For Nitrogen Balance: N In = N Out + ΔN
Calculated using: Volume x Concentration = Mass

Loading of components in diagram: [AFY/N]
- AFY - Volume of water in/out of the system
- N - Total Weight of Nitrogen [NO3-N]
- Units are [Acre-feet per year, Pounds]
- 10 ppm NO3-N ≈ 44.27 mg/L NO3

Salt and Nutrient Planning Workgroup Santa Barbara County IRWM Plan 2013	GEI Consultants Bookman-Edmonston Division	Nitrate (NO_3) Balance Diagram, Western Santa Maria Valley
Santa Maria Groundwater Management Area		February 2013 — Figure 1.2f

2 Existing Monitoring and Uses of Data

Several types of data were utilized for this assessment. When available, firsthand water use information was obtained from city, county, and private agencies; such as the City of Santa Maria, the City of Guadalupe, the Central Coast Water Authority, and Golden State Water Company. The data provided from these agencies often included water quality information including:

- Time series data on water levels, water quality, water use and water discharge.
- Spatial data including crop types and variation in aquifer characteristics, and
- Guidelines for water and fertilizer use and management.

In other cases, data was developed from University of California, Division of Agricultural and Natural Resources and the Natural Resources Conservation Service information relating to general practices in effect during the time period evaluated.

Information was available from a number of sources listed in the bibliography including agency websites, published reports and agency files. Although data acquisition and analysis focused on the years 1990, 2000, and 2010, all data made available was reviewed for relevance and applicability.

2.1 Existing Monitoring Programs and the Current Use of Data

Extensive monitoring of water resources in the Santa Maria Valley has occurred for decades. Measurements of stream flow, groundwater levels and surface- and groundwater quality have been made in support of water resources management. The location and nature of measurements has changed as the perceived need for data collection has changed. This section describes existing water resources monitoring.

2.1.1 Geological Survey Monitoring

Groundwater levels are measured in the spring and a subset of these wells is measured in the fall. Water levels and water quality are measured at multiple completion wells at two locations along the coast to monitor for sea water intrusion. Annual water quality measurements are made in shallow and deep wells indicated in Figures 2.1a and 2.1b. In cooperation with local agencies the United States Geological Survey (USGS) measures stream flow, groundwater elevation and water quality in locations throughout the valley indicated in Figure 2.1c. Continuous stream flow monitoring occurs at two stations, on the Sisquoc River near Garey and the other on the Santa Maria River at the Bonita School Road crossing between the Cities of Santa Maria and Guadalupe. In addition, releases from Twitchell Reservoir are monitored by the U.S. Army Corps of Engineers.

2.1.2 CCRWQCB Monitoring

In 1998 the CCRWQCB established its Central Coast Ambient Monitoring Program (CCAMP) which includes 37 surface water sites in the Santa Maria Valley. Sites in the valley include natural stream flow and agricultural tail water discharges. The CCAMP monitoring is done in sites throughout the Central Coast region on a 5-year cycle. Data are used to identify long-term trends in surface water quality, particularly water bodies that may be affected by point or non-point discharges. The monitoring strategy calls for dividing the Central Coast into five watershed rotation areas and conducting sampling each year in one of the areas. Monitoring sites are placed at the lower ends of tributaries and along the main stem of major rivers. In the Santa Maria Valley the monitoring sites are located on the Santa Maria, Sisquoc and Cuyama Rivers as well as Orcutt Creek, Oso Flaco Creek and the Bradley Ditch. The Santa Maria Valley area was last sampled in 2011.

2.1.3 City of Santa Maria

The City of Santa Maria measures water quality and volume of pumped groundwater from each of their production wells. The purpose of these measurements is to comply with water quality regulations and efficiently manage its resources. Due to elevated levels of nitrate in some of the production wells, the City utilizes a blending program whereby lower-quality water is blended with higher-quality water from other wells, or with treated SWP surface water, to meet potable water quality requirements.

2.1.4 Golden State Water Company

Golden State Water Company, which supplies the unincorporated community of Orcutt and other smaller nearby communities with potable water, also measures water quality and the volume of pumped groundwater from each of their production wells. The water quality of most of GSWCs production wells is generally good. As such, a formal blending program has not been implemented.

2.1.5 City of Guadalupe

The City of Guadalupe has two available groundwater production wells and SWP water with which to meet its urban water demand. Water quality measurements are taken regularly to ensure the pumped groundwater that is blended with treated SWP water meets all state water quality regulations. In 2011 and 2012 the City of Guadalupe blended SWP surface water with one of their groundwater production wells to meet their urban water demands.

2.1.6 Central Coast Water Authority

The Central Coast Water Authority performs water quality tests on SWP water delivered to each SWP contractor. Water quality tests and volume measurements are performed at the point of delivery to each contractor. The water volume data is collected for the obvious reason of ensuring that SWP contractors receive their water allotments.

2.1.7 County of Santa Barbara Public Works Department

The County of Santa Barbara Public Works Department, Water Resources Division operates a number of rainfall gauges throughout the Santa Maria Valley, including two Primary Rainfall Stations; the Santa Maria City and Sisquoc Fire Station gauges. These gauges collect daily, monthly, and yearly rainfall data, as well as rainfall intensity data. These data sets are used to develop historical rainfall graphs, trend graphs, rainfall contour maps, and frequency-duration curves.

2.1.8 Waste Water Treatment Plants

Each of the wastewater treatment plants (Santa Maria WWTP, Guadalupe WWTP, and Laguna County Sanitation District WWTP) monitors the flow volume and water quality of their treated effluent. The city of Santa Maria WWTP discharges at its effluent to infiltration/evaporation ponds. Laguna County Sanitation District and the City of Guadalupe use their effluent for landscape irrigation purposes. Laguna County Sanitation District also provides further treatment (reverse osmosis) to a portion of its waste stream which creates concentrated brine that is discharged to a (brine) well, the discharge of which is located far below the Santa Maria Valley Groundwater Basin (specifically, below the underground source of drinking and irrigation water).

2.1.9 Central Coast Water Quality Preservation, Inc.

Preservation, Inc. is a grower-directed non-profit that manages the Cooperative Monitoring Program (CMP) to fulfill water quality monitoring required in the Ag Waiver. Preservation Inc. is not a regulatory agency and does not enforce regulations. The CMP consists of monthly monitoring of conventional parameters (i.e. nutrients and general chemical/physical parameters) at roughly 50 sites in agricultural watersheds throughout the Central Coast, including 10 sites in the Santa Maria and Oso Flaco watersheds as shown in Figure 2.1d. All sites exhibited water quality impairment (i.e. 303d-listed) prior to selection for the program. Sites are also monitored for aquatic toxicity to invertebrates, fish, and algae in water (four times per year) and to invertebrates in sediment (once per year). Testing for pesticides, herbicides, and other potential toxicants is performed occasionally during special projects.

2.2 Sources, Nature and Applicability of Data to this Assessment

USGS – The USGS collects groundwater samples from various wells in the Santa Maria Valley. As groundwater hydrology is an interpretive science, known points of data are used to interpolate and extrapolate information regarding a given groundwater basin. In general, water level measurements are the principal source of information about the hydrologic stresses acting on an aquifer, and how these stresses affect groundwater recharge, storage, and discharge. Additionally, water quality measurements are used to determine the relative health of the aquifer, and to identify degradation or contamination of the aquifer. The goal of the water level and water quality monitoring is to obtain the groundwater data needed for operating, administering, managing, researching, and planning water resources programs.

The water quality information from the USGS is invaluable to the salt and nutrient analysis. The data provides a snapshot of the composition of water in the basin. When combined with flow and quality data from other sources (surface water, M&I pumping, WWTPs, etc.) a clearer picture of the interaction between the various water sources begins to develop. USGS data is used in developing the SMVMA Annual Reports.

CCAMP – As indicated in the previous section, CCAMP collects stream flow and water quality measurements on tributaries, main-stems, and water-bodies of special concern. Salt and nutrient loading on surface water within the Santa Maria Valley are seasonally dependent, and highly variable. The yearlong monitoring provided by CCAMP captures this variability and allows for a one-year "snapshot" of salt and nutrient levels in surface waters and discharge from certain areas of the groundwater basin.

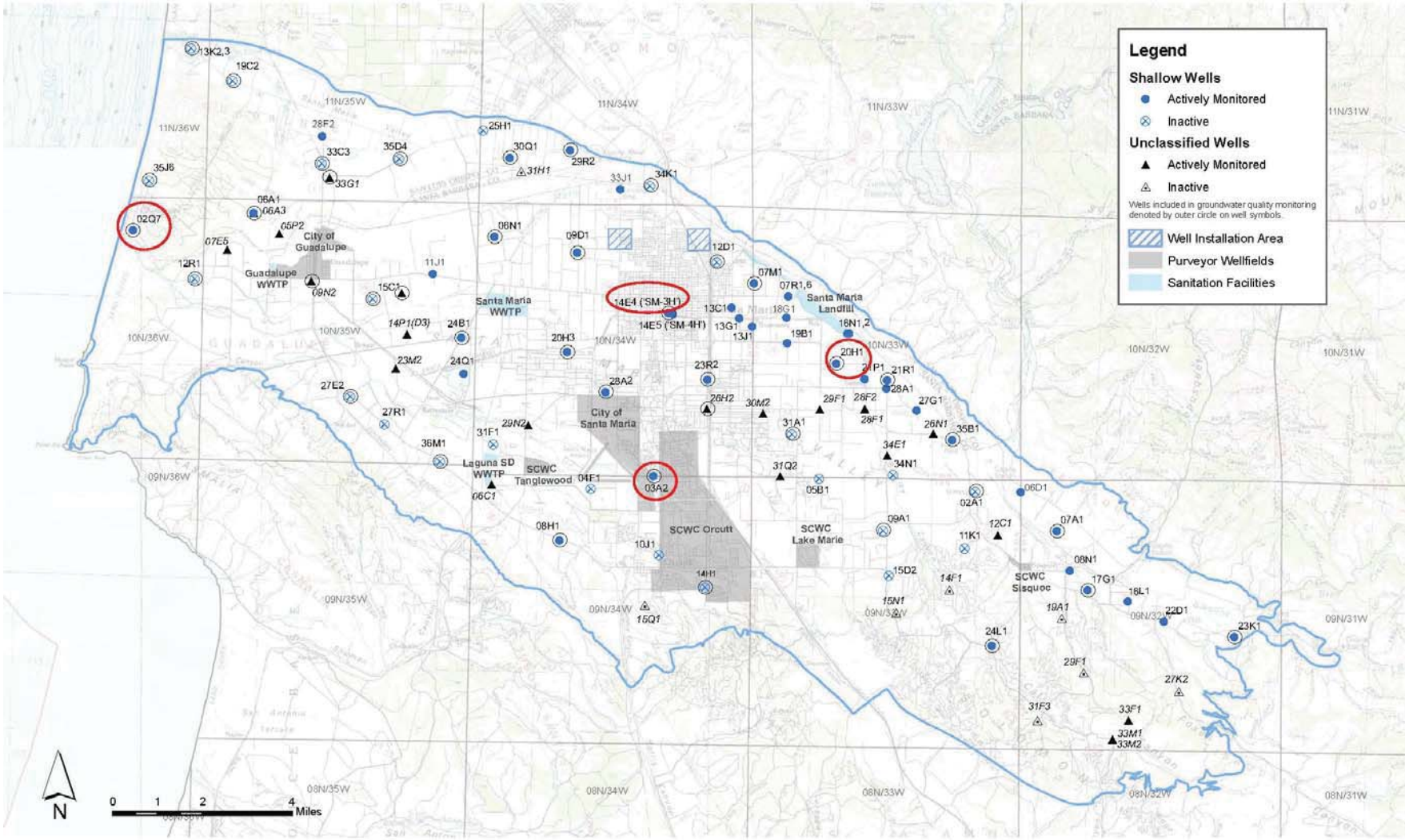
SMVMA Reports – The Santa Maria Valley Management Area Reports compile the volume and water quality data for each purveyor into a single source (for example see Luhdorff and Scalmanini 2012). When water data from the various sources was not provided, the SMVMA Reports were used to supplement water use, water quality and discharge estimates.

Water Purveyors – The water volume and quality data collected by each water purveyor was utilized to develop the water, salt, and nutrient balance estimates in this report.

WWTP Operators – In similar fashion to the water purveyors, the volume and quality data collected by the WWTP operators was used to develop the water, salt, and nutrient balance estimates used in this report.

County Agricultural Commissioner– Crop land use information, and crop water use was provided to estimate the agricultural applied water demand.

Central Coast Water Quality Preservation, Inc. – Surface water sampling has been conducted on behalf of the growers since 2004. The volume and quality data was used to develop the water, salt, and nutrient balance estimates used in this report.



Salt and Nutrient Planning Workgroup
Santa Barbara County IRWM Plan 2013

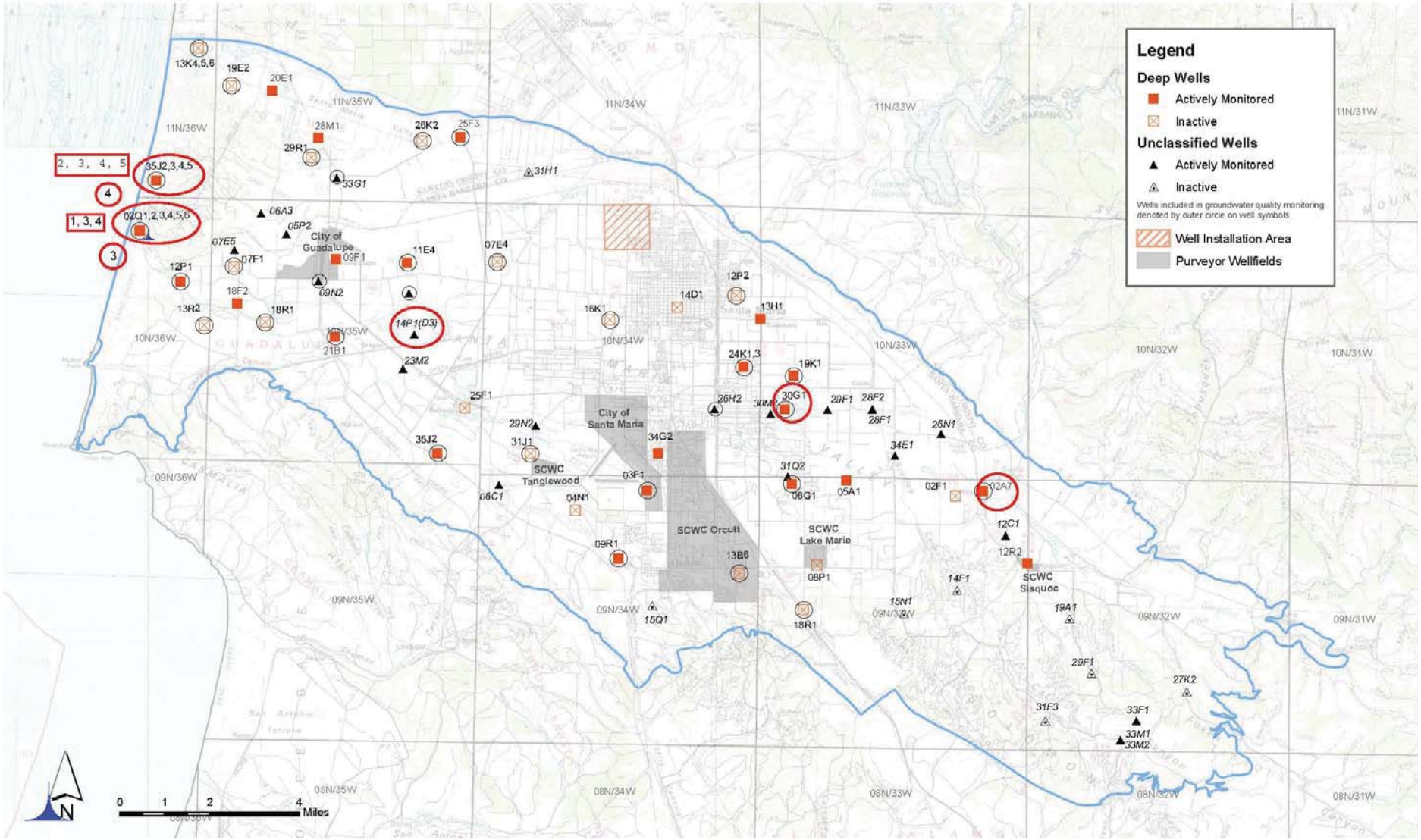
Well Network for Monitoring Shallow Groundwater

Santa Maria Groundwater Management Area

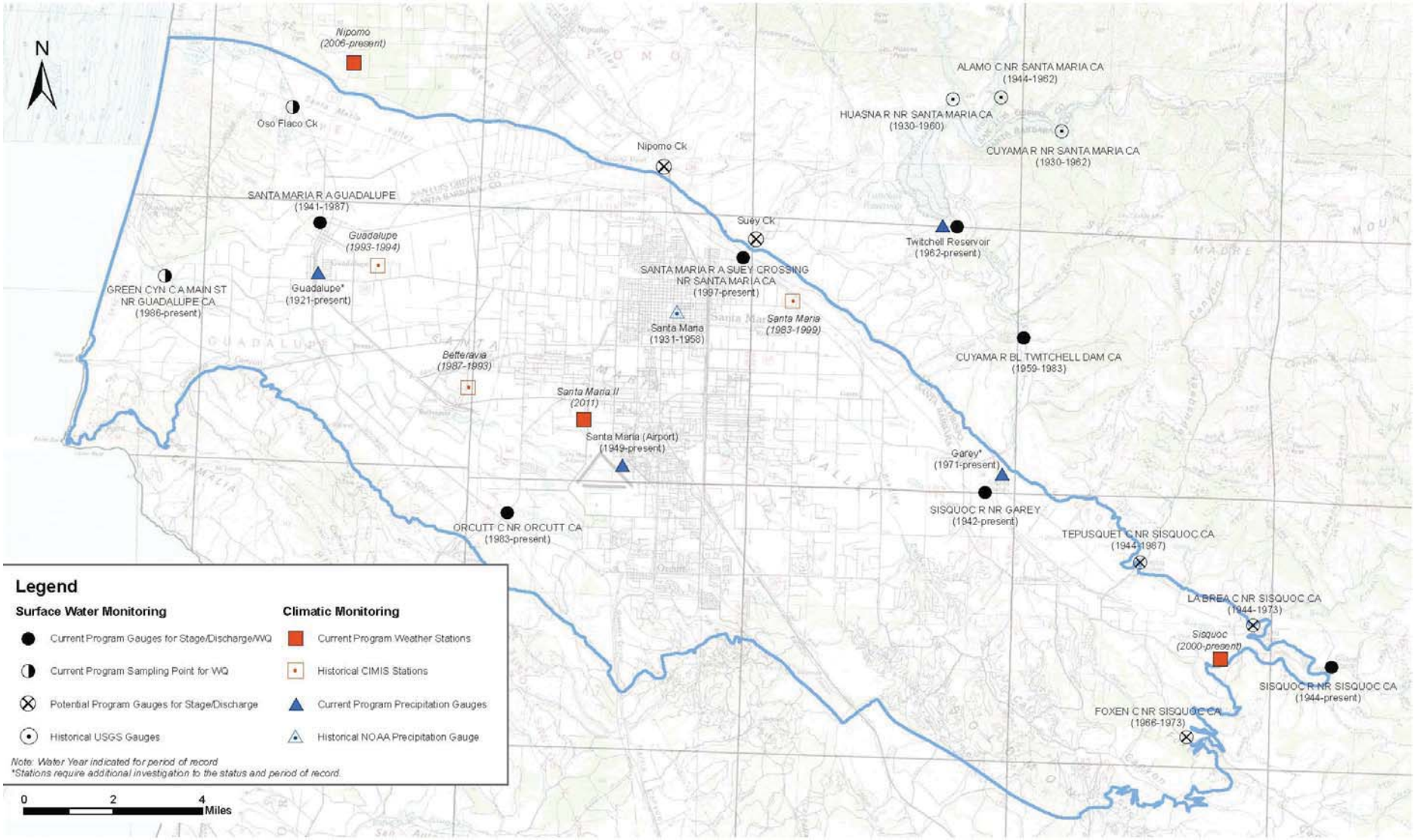
GEI Consultants
Bookman-Edmonston Division

February 2013

Figure 2.1a



Salt and Nutrient Planning Workgroup Santa Barbara County IRWM Plan 2013	GEI Consultants Bookman-Edmonston Division	Well Network for Monitoring Deep Groundwater
Santa Maria Groundwater Management Area		February 2013 — Figure 2.1b



Salt and Nutrient Planning Workgroup Santa Barbara County IRWM Plan 2013	GEI Consultants Bookman-Edmonston Division	Surface Water and Climatic Monitoring Network
Santa Maria Groundwater Management Area		February 2013 — Figure 2.1c

3 Description of Basin

This section discusses the hydrology, hydrogeology and development of water resources of the Santa Maria Valley as it pertains to transport and fate of TDS, Cl^- and NO_3. The importance of water to the valley's economy has resulted in numerous studies of water resources and ongoing monitoring of water supplies and water quality. The discussion below is a summary; more detailed discussions are provided in the references listed in the Section References, particularly USGS Professional Paper 1000 (Worts, 1951), annual reports prepared by the Twitchell Project Authority (Luhdorff and Scalmanini, 2008, 2009, 2010, 2011 and 2012) and the County's Triennial Groundwater report (Gibbs 2012).

3.1 Past Studies and Sources of Information

This report relies on a wide range of sources of information including but not limited to the major sources mentioned below. Studies developed to describe and evaluate water resources are listed in the references section of this report. Key evaluations of water resources by Lippincott and the United States Bureau of Reclamation described surface hydrology of the Santa Maria River and its tributaries and led to development of the Santa Maria Project (Twitchell Reservoir) to provide flood protection and enhanced groundwater recharge.

Detailed studies by the US Geological Survey have described surface and groundwater resources including elements of recharge and discharge as well as water quality. The US Geological Survey established ground and surface water monitoring which has continued as a cooperative program with the County Water Resources Division and the Santa Maria Valley Water Conservation District. In addition, the Twitchell Management Authority prepares an annual report pursuant to the recent adjudication (Luhdorff and Scalmanini, 2012) and the RWQCB periodically samples water quality at a number of surface water locations (CCAMP). Finally, water purveyors make regular tests of supplies and waste water treatment plant operators make measurements of discharges.

3.2 Geography and Surface Hydrology

Santa Maria Valley is a broad alluvial plain generally considered to include the lower portion of the Sisquoc River and the Santa Maria River. Low hills drained by smaller streams occur along the southern margin. The Valley is bounded by the Solomon hills in the South, the Nipomo Mesa to the north, the Sierra Madre Mountains to the northeast and east and the Pacific Ocean to the west. This assessment focuses on the lower portion of the basin which encompasses approximately 260 square miles including areas of both agriculture and urban and suburban development.

Figure 1 contains rivers, urban areas, and surface water features (including Twitchell Reservoir). Location and depth of monitoring wells, rainfall and stream flow gages, and location of CIMIS stations are found in Section 2 of this report and available from the Annual Report of Hydrological Conditions, Water Requirement, Supplies, and Disposition (Luhdorff and Scalmanini, 2012).

The Santa Maria Valley is traversed by the Santa Maria River along its northern margin and lower reaches of its tributaries, the Sisquoc and Cuyama Rivers, to the east. Although the Santa Maria River and its tributaries are ephemeral, surface flow is responsible for a majority of groundwater recharge. But due to extreme variation in flow, surface water is not used directly (diverted) as a water supply. However, significant recharge does occur during and after storm events thus recharge from the larger tributaries affects groundwater quality.

Twitchell Reservoir was designed to capture intermittent storm runoff in order to provide increased groundwater recharge and flood protection. The reservoir has demonstrated effective management over the lower Cuyama River, but inflow is highly variable. For example inflow reached a peak of 190,000 Acre-feet in 1983 but the reservoir has received little or no inflow for up to three years at a time. Since 1965 (when the reservoir was placed in operation) reservoir storage has exceeded 100,000 AF only 8 times.

Other significant surface water recharge occurs as a result of infiltration of treated waste-water and from surface streams such as the Orcutt/Solomon Creek system and Bradley Ditch. Generally speaking, surface recharge that occurs east of Black Road percolates to the deeper elements of the aquifer system. Treated sewage effluent from the City of Santa Maria is recharged to the groundwater system from percolation ponds in the vicinity of Black road. The majority of this recharge is believed to percolate to the deeper elements of the Aquifer and recharge the lower (confined/semi-confined) zone underlying the western most portion of the valley. Tertiary treated sewage effluent from the Laguna County Sanitation District (serving Orcutt and unincorporated Santa Maria) is used for irrigation. The City of Guadalupe discharges treated water through sprinkler irrigation on an area of grasses to the north and east of the City. Any recharge to the groundwater from the City of Guadalupe discharge is mostly confined to the uppermost aquifer zone in an area west of most groundwater development.

Two surface discharge points that discharge out of the SMMA towards the ocean exist; 1) Orcutt Creek that discharges to SM River prior to the ocean outlet and 2) Oso Flaco Creek [detailed descriptions are found in the CMP 2008 summary report Follow-up Monitoring Report, WQ Results from Upstream Monitoring, 2008]

3.3 Geology, Geologic History and Hydrogeology

The materials underlying the Santa Maria Valley comprise extensive deposits of water bearing alluvium and semi-consolidated sedimentary materials of Plio-Pleistocene to Recent age. These materials have accumulated in a broad asymmetrical syncline or trough formed

by downward warping of underlying bedrock. The water-bearing materials are as much as 1,200 feet thick beneath the central portion of the valley and extend beneath the ocean to the west. The older (and deeper) water-bearing materials include the Careaga Sand and overlying Paso Robles Formation. Quaternary age alluvium overlies the Paso Robles Formation. Dune sand and bedrock occur along the margins of the basin but are not widely developed as sources of water. (The occurrence of these materials is described in several reports including Worts, 1951, Gibbs, 2012 and Luhdorff and Scalmanini, 2012).

In general the alluvial materials and the Paso Robles Formation become progressively less coarse grained from east to west (Luhdorff and Scalmanini, 2012). In the westernmost portion of the Valley, the alluvium appears crudely stratified with a confining or semi-confining horizon dividing the aquifer into at least two zones west of the Bonita School Road. Both the upper and lower zones of the aquifer are described as extending to the west beneath the ocean for as much as several miles (Worts, 1951).

The aquifer is unconfined in most of the basin (east of Black Road) and stream flow, rainfall, and return flows all contribute significant recharge. The westernmost portion of the aquifer includes two zones separated by an impermeable (confining) zone. Agricultural return flows and rainfall are the main sources of recharge to the upper (unconfined) zone. The lower zone is confined and receives most of its recharge from where it is unconfined east of Black Road and may receive some recharge from interzonal flow in wells that are completed in both zones. Local water level elevations suggest that both aquifer zones discharge to the Pacific Ocean to the west. No evidence of sea water intrusion has been found in monitoring wells located along the westernmost edge of the basin.

3.4 Development of Water Resources

The majority of water available to the Santa Maria Valley has historically derived from stream flow in the Santa Maria River originating from the Cuyama and Sisquoc rivers. This stream flow is not developed directly as a supply, but rather is the main source of groundwater recharge in the area. Releases from Twitchell Reservoir are used exclusively to augment natural recharge to the groundwater basin. Thus, quality in aquifers underlying much of the Santa Maria Valley has historically reflected the water quality of stream flow in the Cuyama and Sisquoc rivers.

Urban supplies are developed from both groundwater and imported (surface) sources. Typical deliveries of water to urban users are about 23,000 AFY, with a peak historical demand of 25,600 AF in 2007. Agricultural users are supported entirely by wells and water use ranges from 80,000 to 130,000 AFY on roughly 50,000 acres of irrigated crops. In the Santa Maria Valley habitat is supported by surface flows and in some areas shallow groundwater. Water supported habitat includes willows and wetlands along the lower Santa Maria River and Green Canyon and the lagoon at the mouth of the Santa Maria River. No estimates of water needed to support these habitats are available.

Groundwater storage within the basin varies as a function of annual rainfall, and to a lesser extent, importation of State Water Project supplies. Groundwater storage has been estimated to be about 2.5 million AF (MAF) in 1984 and 1.97 MAF in 1991 (Ahlroth, 2002). Substantial fluctuations in water levels are caused by variations in annual rainfall and are documented by the County Water Agency in regular reports (Gibbs 2012).

Until 1996 groundwater was the source of supply for all users in the Valley; in that year urban water users began importing water from the State Water Project. Currently the Santa Maria Valley relies on groundwater to meet all agricultural and some urban needs and with imported water being used extensively in the City of Santa Maria and to some extent in the City of Guadalupe and the community of Orcutt.

Water is imported to the Santa Maria Valley through the Coastal Branch of the State Water Project for municipal use. Municipal supplies are delivered directly to the cities of Santa Maria and Guadalupe and the Tanglewood community serviced by the Golden State Water Company (GSWC, formerly Southern California Water Company). The GSWC serves both groundwater and SWP supplies to the community of Orcutt and its immediate area. GSWC makes its SWP deliveries to the community of Orcutt through interconnections with the City of Santa Maria. (The GSWC provides solely groundwater to the small towns of Sisquoc and Garey.)

3.4.1 Groundwater and Wells

Groundwater development began in the early 1900's and rapidly became the principle source of water for all uses. For decades until the importation of State Water supplies, groundwater was the sole source of supply. Roughly 80 percent or more of the water used in any given year is developed from wells. Wells are generally completed in alluvium or the Paso Robles formation with some being completed in the deeper Careaga Sand.

3.4.2 Twitchell Reservoir

Twitchell Reservoir was constructed as a dual purpose reservoir, built by USBR under contract with SBCWA to provide both flood protection and groundwater recharge. The dam was completed on and put into service in 1966. The reservoir provides no direct deliveries for supply; its releases are controlled to provide infiltration to alluvium in the Santa Maria River.

As discussed by Luhdorff and Scalmanini, inflow and storage in the reservoir vary greatly; this variation results in significant variation in recharge to the groundwater basin (see Figure 2.3-1a and Table 2.3-1 of Luhdorff and Scalmanini, 2011). The average annual recharge is estimated to be 32,000 AFY. The principle area of recharge is dictated by geologic conditions and is in the Santa Maria River from the confluence of the Cuyama and Sisquoc Rivers to Bonita School Road crossing.

Analysis by Luhdorff and Scalmanini suggests that operation of the Reservoir has changed the nature of recharge to the groundwater basin from the Cuyama River. Prior to construction of the reservoir, much of the storm runoff from the Cuyama drainage passed to the ocean immediately during and after high flow events. During operation of the reservoir, storm runoff is captured for later recharge to the groundwater basin. Low flow from the Cuyama River tends to have higher TDS than storm runoff. Thus the reservoir captures higher quality water for recharge and increases the percentage and amount of higher quality water recharging the groundwater basin (Luhdorff and Scalmanini, 2012). Water quality trends in groundwater, particularly in the zones affected by Twitchell recharge, supports their interpretation. The Operation of Twitchell Reservoir has been estimated to provide an average of 32,000 AFY (Luhdorff and Scalmanini, 2012) of recharge to the groundwater basin.

3.5 Agricultural Water Supply and Demand

For the purpose of this report, an agriculture water supply and demand estimate for three ten-year periods 1981-1990, 1991-2000, and 2001-2010 was utilized, as shown in Table 3.5. All agricultural water demand in the Santa Maria Valley Management Area (SMVMA) is supplied by local groundwater, with the exception of some wastewater effluent.

3.5.1 Agriculture Water Requirements

The estimated agricultural water requirement for each time period was based on crop acreage and estimated groundwater pumping to meet crop water requirements found in the 2011 Annual Report of Hydrogeologic Conditions, Water Requirements, Supplies and Disposition, Santa Maria Valley Management Area, (Luhdorff and Scalmanini, 2012). The report contains an estimate for applied water required for crops, groundwater pumping by year, back to 1945. However, the total applied water for each crop type (calculated as crop acres multiplied by applied water per acre) is only shown in Annual Reports since 2008, and not shown for the years prior to 2008. Available data from the Annual Reports included annual acres by crop and total annual pumpage (Table 3.5, below); estimates of annual pumping was available and plotted in Figure 3.1-1c of the Annual Report (Luhdorff and Scalmanini, 2012).

The average water requirements (in terms of groundwater pumping requirements) were used to represent applied water required for the three periods; years 1981-1990, 1991-200, and 2001-2010. Dividing the average pumping by the average acres within each crop allowed for a comparison of unit water use by crop category. Observation of the applied crop water duties in comparison to a 5-year average of crop water duties from the Annual Report combined with professional judgment was used to assign pumping by crop type in each of the three time periods used for this study.

Infiltration of rainfall, an important mechanism, is known to vary significantly in correlation with the wet, normal, and dry years. Thus change to climate may affect the sources and transport of salts and nutrients; however, climate change was not a focus of this study.

Table 3.5. Irrigated Crop Acres, Unit Applied Water, and Calculated Applied Water by Crop Category

	(1981-1990) 10-Yr Average			(1991-2000) 10-Yr Average			(2001-2010) 10-Yr Average		
Crop Categories	**Acres (A)**	**(AF/A)[1,2]**	**Applied Water (AF)**	**Acres (AF)**	**(AF/A)[1,2]**	**Applied Water (AF)**	**Acres (AF)**	**(AF/A)[1]**	**Applied Water (AF)**
Rotational Vegetables or [Truck Crops]	31,300	2.50	78,249	38,296	2.35	89,996	36,597	2.35	86,002
Strawberries or [Truck Crops]	-		-	976	1.40	1,367	6,782	1.40	9,495
Vineyard	5,145	1.20	6,174	5,662	1.10	6,228	4,662	1.10	5,129
Total Pasture	4,292	3.50	15,021	1,387	3.50	4,856	515	3.50	1,803
Field	5,245	2.50	13,113	-	2.30	-	-		-
Grain	595	0.30	178	717	0.30	215	750	0.30	225
Nursery	-		-	82	2.02	166	228	2.02	460
Total Orchard	710	2.70	1,918	908	2.70	2,452	30	2.70	80
10-Year Average Irrigated Acres (A)[3]	**47,286**			**48,906**			**49,564**		
Adjusted Weighted Avg Unit AW (AF/A)		**2.4**			**2.2**			**2.1**	
Calculated Applied Water (AF)			**114,653**			**105,280**			**103,194**
10-Year Average Annual Pumping (AF)[4]			**116,600**			**107,200**			**105,700**
10-Year Weighted Average Unit AW (AF/A)[5]		**2.5**			**2.2**			**2.1**	

[1] In the 2001-2012 10-Year Period, the Unit Applied Water (AF/A) was assigned for each irrigated crop category based on the available applied water information for recent years (2006-2010) from the Luhdorff and Scalmanini, 2011 report; the unit applied water (AF/A) was modified upward to reflect less efficient irrigation practices for Rotational Vegetables, Strawberries, and Vineyard in the 1991-2000 and 1981-1990 periods to match calculated pumping with the 10-Year average annual pumping

[2] Unit Applied Water (AF/A) for each irrigated crop category was needed to assign Applied Water for use in Nutrient loading; Unit Applied Water was modified for Rotational Vegetables, Field Crops, and Vineyard in each 10-yr period to allow calculated AW to closely match the 10-Year Average Annual Pumping, which is based on Annual Pumping shown in Figure 3.1-1c of Luhdorff and Scalmanini, 2011

[3] 10-Year Period, Average Irrigated Acres is based on DWR Crop Survey data and Crop Assessments; both sources are available information from the Luhdorff and Scalmanini, 2011 report.

[4] 10-Year Average Annual Pumping is based on the available estimated pumping to meet agricultural water requirement as shown in Luhdorff and Scalmanini, 2011 report, Figure 3.1-1c.

[5] 10-Year Weighted Average, Unit Applied Water is calculated for observation purposes; Weighted Average Unit Applied Water (AF/A) = Annual Average Pumping / Average Irrigated Acres; calculated for observation of long-term trend of irrigation applied water

The Historical Distribution of Irrigated Acres, Table 3.1-1b of the Annual Report, provided information on the land use changes over time for the crop categories: Rotational Vegetables, Strawberries, Vineyard, Pasture, and Other. Rotational Vegetables consists of lettuce, celery, broccoli, and cauliflower crops. During the three time periods the SMVMA has experienced an increase in truck crop type acreage. Over these time periods, rotational vegetables became the largest crop category, strawberry acreage increased significantly in last decade, vineyard acres remained fairly consistent, and pasture (including alfalfa), field, and orchard acreages have declined.

The following description of the agriculture land use is from Luhdorff and Scalmanini, (2011):

> "In 2010, approximately 50,650 acres in the Santa Maria Valley were irrigated cropland, with the predominant majority (87 percent) in truck crops, specifically Rotational Vegetables (33,850 acres) and Strawberries (10,000 acres). Vineyard comprised the next largest category (4,700 acres), with Grain, Pasture, Nursery, and Orchard in descending order of acreage (990, 320, 215, 20 and 34 acres, respectively). Fallow cropland was estimated to be just over 500 acres. Cropland occupies large portions of the Santa Maria Valley floor, Orcutt Upland, Oso Flaco area, and Sisquoc plain and terraces.
>
> Total irrigated acreage of about 50,650 acres in 2010 is near the upper end of the range over the last 15 years, and within the reported historical range between roughly 34,000 acres in 1945 and 53,000 acres in 1995, as shown in Table 3.1-1b (USGS, Worts, G.F., 1951; California DWR, 1959, 1968, 1977, 1985, and 1995; LSCE, 2000 and 2009). The 2010 irrigated acreage is consistent with those of the last decade, during which total acreages gradually increased from 48,200 acres in 1998. The 2010 cropland locations continue the historical trend of agricultural expansion onto portions of the Orcutt Upland and Sisquoc Valley as urban land use expands into former cropland near the central portions of the Santa Maria Valley and Orcutt Upland."

3.5.2 Agriculture Water Demand – Pumped Groundwater

Agriculture is the dominant local industry within the SMVMA and principle water user. All agricultural applied water relies solely on groundwater pumping. The total acres irrigated has remained relatively constant since 1981 with the annual agricultural water demand varying between wet, normal, and dry precipitation years as much as 50,000 AFY, ranging from below 80,000 AFY to over 130,000 AFY.

Agricultural water demand is indirectly calculated using crop water requirements multiplied by the number of acres of each crop type. For this report, the estimate of annual pumped groundwater to meet total agricultural water requirement for all crops was utilized from the SMVMA Annual Report (Luhdorff and Scalmanini, 2011) (L&S 2011). Applied crop water

requirements (AW) vary by each crop type and vary substantially for a wet, normal, and dry precipitation year. For the purpose of this assessment, the AW for each of the crop type categories in each of the three periods was estimated based on available information. The estimated annual pumping was averaged for the 10-year periods then divided by the average crop acres by crop categories; a comparison of unit water use for each crop category required some professional judgment in assigning the unit water use in order to match the total average pumping with the sum of each crop category pumping. Unit crop water use is based on Crop ET, Effective Precipitation, and Irrigation System Distribution Uniformity factors.

During the period of 1981 to 2010 the total irrigated area of about 50,000 acres have remained fairly constant with some of the crops acres changing from one crop type to another reflecting growers' crop selection as market conditions change over time. Annual groundwater pumping to meet crop water requirements varies substantially by the type of rainfall that happens in a given growing season. The main reason for this is the effect that effective precipitation has on crop water requirements for wet years versus dry years in this coastal climate. Improvements to irrigation methods over time have increased the distribution uniformity and increased the effectiveness of applied water over the basin; irrigation method improvements are a positive improvement regarding the basin water management and noteworthy in conjunction with the effect of precipitation on agricultural water requirements.

The variation in total crop water requirements (ETc) and AW (ETaw) to meet the crops' annual needs are influenced by the coastal climate. The primary factors that influence this variability between years are the total Evapotranspiration (ETc) and the amount of precipitation utilized by each crop type to meet the ETc, known as the Effective Precipitation (Pe). During the time period of 1981 to 2010, the California Irrigation Management Information System (CIMIS) has improved irrigation scheduling and on-farm irrigation efficiency for applied water has improved as irrigation methods have changed over to micro-irrigation systems. An indication of this improvement is shown in the decrease over time of the annual unit applied water, in AF/A for the basin's crops. The improvements to irrigation methods provide a positive effect in both reduced groundwater pumping and help to reduce water movement past the root zone, therefore, helping to contain nutrients in the active root zone where plants can uptake the available nitrate (NO_3). However reduced movement of water through and past the root zone may cause levels of salts in root zone soils to rise.

3.5.3 Agriculture Return Flow

A description of the agriculture return flow component is contained in Chapter 4 of the Luhdorff and Scalmanini, 2011 and included in this assessment. The annual report provides an estimate of return flow for the basin due to irrigation; however, this estimate accounts for effective precipitation, but, does not include the amount of precipitation that moves through the root zone. Therefore, it is possible a more detailed site-specific assessment of the water

quality monitoring by drainage areas is necessary to understand the salt and nutrient characteristics by drainage area.

> "For the range of crops and irrigation systems in the SMVMA, most crops are considered to consumptively use about 80 to 85 percent of the water applied to them, resulting in an estimated 15 to 20 percent of applied water exceeding crop consumption and deep percolating as return flow to the underlying aquifer system (the one exception to the preceding ranges is wine grapes, where 95% of applied water is estimated to be consumptively used, resulting in return flow of only 5% of applied water).
>
> For the full range of crop categories in the SMVMA, return flow rates in 2010 are estimated to range from less than 0.1 af/ac for Vineyard, to about 0.4 af/ac for the predominant Rotational Vegetables in the Valley, to a maximum of about 0.7 af/ac for Pasture. The respective estimated agricultural return flow rates are detailed in Appendix E. When combined with their respective individual crop acreages, it is estimated that just under 17,000 af of applied agricultural irrigation deep percolated to groundwater as return flows in the SMVMA in 2010." (Luhdorff & Scalmanini, 2010)

AW in excess of crop water requirement is considered deep percolation once beyond the crop root depth. Deep percolation either returns to the groundwater source or is intercepted by the subsurface tile drains that collect into a surface drain, or it can also be intercepted directly by the surface drain. In either case, the surface drain eventually discharges through an outlet to a surface drainage. Tile drainage discharges in two main locations west of Black Road: Oso Flaco Creek and Orcutt Creek. Some additional tile drainage flows into the lower Santa Maria River.

Since the Agricultural Waiver program changes occurred in 2004, the Central Coast Water Quality Preservation, Inc. has collected surface water samples from the two main drainages that outlet the SMMA. They have also collected samples from the minor drainages that collect to the main drainages. The characteristics of the two drainage outlets as measured during a wet period when the drainage flows were fairly consistent year round are as follows: [The descriptions below are from the 2008 Upstream Monitoring Report, provided to the Grower Groups and RWQCB through the efforts of Preservation Inc.]

Orcutt Creek drainage is locally regarded as having two components: Orcutt Creek upstream of Guadalupe Lake and Solomon Canyon Creek downstream of Guadalupe Lake. The upstream portion of Orcutt-Solomon Creek collects surface water that recharges into the basin; the upstream and downstream reaches of Orcutt-Solomon Creek remain connected with a small portion of surface flow during periods of the year. The surface flow from the upper reach dissipates into subsurface, and appears to contribute to the subsurface flow that emerges in Orcutt Creek further downstream.

3.5.4 Orcutt-Solomon Creek at Sand Plant (312ORC)

Flows at core CMP site 312ORC were moderate and fairly consistent during 2008, averaging 7.9 CFS. Flows from each of the two contributing channels (Orcutt-Solomon Creek further upstream – 312ORI, and the north fork Solomon Creek – 312ORN) were lower and comparable, with each appearing to contribute about half of the flows aggregated at 312ORC, with 312ORI slightly higher. All sites in the watershed had measurable flows during all 2008 monitoring events.

Nitrate concentrations at 312ORC and in both of the contributing creek channels (312ORN and 312ORI) were consistently high throughout 2008. At 312ORC, concentrations ranged from 19.0 to 72.6 mg/L as N, with a median of 40.3 mg/L. On the basis of median values, 312ORN contributions were somewhat lower and 312ORI somewhat higher, however 312ORN had a maximum nitrate concentration of 380 mg/L.

Nitrate Loads were around 60 lbs. N/hr on a median basis at 312ORC. Contributing loads from 312ORI were typically a bit higher than those from 312ORN, with some exceptions.

3.5.5 Oso Flaco Creek

Flows were present at measurable levels at all Oso Flaco watershed sites during at least ten of the twelve 2008 monitoring events. Flows were highest at the core CMP site (312OFC), with a median value of 2.14 CFS. Flows were lowest at the Bonita School Rd/Division St intersection (312BSR) and where Oso Flaco Creek crosses Highway 1 (312OSR), with median values of 0.19 and 0.33 CFS respectively.

Nitrate concentrations were very high throughout the Oso Flaco watershed, with average values near or above 30 mg/L as N at all sites. Concentrations were lower during the January winter storm event, with values below 10 mg/L at all sites except for the core CMP site (312OFC), which had a concentration of 11.5 mg/L. The highest concentrations on the watershed in 2008 were at the more upstream sites, 312OSR and 312BSR, which had maximum concentrations of 95.6 and 125.0 mg/L, respectively.

Nitrate Loads were highest at the core CMP site (312OFC), following patterns in flow. Median loads at the upstream monitoring sites were roughly three to six times lower, at 2.5 to 5.2 lbs. N/hr.

3.6 Urban Water Supply and Demand

The three main public water system operators serving urban users currently deliver approximately 17 percent of the water used in the Valley. Development of most groundwater for municipal purposes is from numerous water supply wells located in the vicinity of the Santa Maria Airport and the town of Orcutt. The City of Guadalupe and the communities of Sisquoc and Garey are served by wells within each community. Historic demand in urban

areas of Guadalupe, Santa Maria and Orcutt is tied to population water use by the urban suppliers (GEI 2012).

Water supply and water quality concerns led to importation of SWP supplies in the 1990s. Prior to the late 1990s, all municipal and agricultural water requirements in the Santa Maria Valley were met by local pumping. Since the beginning of SWP availability in 1997, deliveries of SWP water have replaced some of the local pumping for municipal supply. In particular, the City of Santa Maria and Golden State Water Company have reduced pumping in the vicinity of the Santa Maria Airport. The reduction since 1997 has been estimated to be 50-percent on an average annual basis.

Santa Maria relies on the SWP for its principle supply while relying on groundwater for backup. Currently the City of Guadalupe relies on a blend of groundwater and SWP supplies. The Golden State Water Company supplies up to 20-percent of its deliveries from the SWP due to limitations in its allocation from that source. Due to their remote location, the small communities of Garey and Sisquoc are supplied by wells. The importation of SWP supplies has improved the quality of water delivered to customers in the Cities of Santa Maria and Guadalupe, and the TDS of treated wastewater recharged to the groundwater basin at their waste water treatment facilities. However, SWP importation does result in importation of salts to the basin.

3.7 Urban Return Flow

Urban return flow is primarily effluent from three publicly owned and operated wastewater treatment plants. A much smaller amount percolates from excess irrigation applied to urban landscaping. The three publically owned WWTPs serve the City of Santa Maria, the City of Guadalupe and the community of Orcutt and unincorporated Santa Maria area. Effluent concentrations of TDS, NO_3 and Cl- as well as contributions to groundwater are shown in Appendix E. The nature and discharge of return for each WWTP is summarized below.

3.7.1 City of Santa Maria WWTP

The City of Santa Maria operates a WWTP located on Black Road west of the City. The City's treated wastewater is percolated to the groundwater pursuant to a Waste Discharge Requirement issued by the CCRWQCB. The volume and quality of the effluent stream are monitored pursuant to that permit and form the basis for estimates used in Appendix E. The importation and use of SWP water and concurrent reduction in regenerative water softener use have lowered the TDS level of the water entering the aquifer from the percolation ponds.

A lesser volume of water, not related to the WWTP, is returned to the groundwater from infiltration of flow from Blosser Channel, Bradley Channel, and Main St. Ditch. During periods of high runoff, these surface drainages flow to the Santa Maria River but during periods of lower flow, most flow seeps into the ground.

3.7.2 City of Guadalupe WWTP

The City of Guadalupe operates a WWTP located at the northwest edge of its incorporation boundary. The City's treated wastewater is spray irrigated to pasture land pursuant to a Waste Discharge Requirement issued by the CCRWQCB. The volume and quality of the effluent stream are monitored pursuant to that permit and form the basis for estimates used in Appendix E. The importation and use of SWP water has lowered the TDS level of the water discharged.

3.7.3 Laguna County Sanitation District (Orcutt) WWTP

The Laguna County Sanitation District operates a WWTP located northwest of the community of Orcutt and surrounding unincorporated Santa Maria which it serves. Tertiary treated wastewater is treated and discharged pursuant to a Waste Discharge Requirement issued by the CCRWQCB. A portion of the effluent stream is treated by reverse osmosis to reduce TDS. The effluent is discharged as recycled water by irrigation and some industrial uses. Brine resulting from the reverse osmosis is injected into a deep disposal well below the aquifer zones and is permitted by the EPA. The volume and quality of each element of the effluent stream are monitored pursuant to that permit and form the basis for estimates used in Appendix E.

3.8 Existing Water Management

Several public agencies are responsible for various aspects of water management in the Santa Maria Valley. However no single agency is responsible for all aspects of water supply or water quality.

3.8.1 Regional

SMVMA - Santa Maria Valley Water Conservation District. SMVWCD was established as a Special District in 1937. The SMVWCD has a contract with SBCWA to pay capital costs and operation of Twitchell Reservoir. The district encompasses an area generally thought to benefit from recharge from Twitchell Reservoir.

TMA – Twitchell Management Authority. The TMA was established pursuant to the settlement of the adjudication and comprises representatives of urban and agricultural interests. The TMA prepares an annual report to court and addresses long term maintenance of Twitchell Reservoir associated with protecting reservoir yield.

CCRWCB - Central Coast Regional Water Quality Control Board. The CCRWQCB is a regulatory agency responsible for oversight of discharges to surface water and implementing water recycling policy.

RCD – Cachuma Resource Conservation District. The RCD provides technical support to growers for improved water and nutrient management.

3.8.2 System Operators

City Santa Maria (water, sewer) – The City of Santa Maria water provides water and sewer service to customers within its service area. The City balances its water resources to fully utilize its State Water supply in the most cost effective manner while meeting both drinking water and wastewater effluent quality requirements.

City of Guadalupe (water, sewer) – The City of Guadalupe serves customers throughout its boundaries and utilizes a single well for urban water demands. Connected to the Coastal Branch, the City receives deliveries of state water and blends with one groundwater well prior to distribution. The City operates a WWTP and discharges its effluent through spray irrigation.

Golden State Water Company (water purveyor) – Golden State Water Company delivers water to urban users in the community of Orcutt. GSWC utilizes a number of groundwater production wells (of varying water quality) and SWP water as their source. As some of the production wells are of marginal quality, GSWC blends water from its various sources to assure drinking water standards are met.

3.9 Management of Salt and Nutrients

Management of salts and nutrients associated with agricultural, urban, and environmental water uses within the Santa Maria Groundwater Basin has evolved over time. The reasons include various social, technical, economical, and environmental factors such as cost of fertilizer and energy as well as regulatory mandates. The following outline shows the agricultural and urban changes in management of salts and nutrients that were identified during preparation of this assessment. Because many practices were implemented incrementally, the management changes are described, in general, as occurring during a sequence of three time periods, 1990, 2000, and 2010.

In the context of implementing policy or regulatory changes in the Santa Maria Valley, it is also important to recognize that significant management practices have already been established within the basin. Therefore, any future regulatory actions need to be taken in a way to maximize the benefit of continued cooperative programs. Otherwise, there is a risk that regulatory actions inhibit management measures intended to improve the salt and nutrient management of the basin. For example, strict limitations of discharges of NO_3 from farmlands may cause increased development of low NO_3 groundwater zones rather than encourage the use of NO_3 containing water as a source of fertilizer.

The Salt and Nitrate management practices that are being implemented over time by agricultural and urban water users within the Santa Maria Valley relate to several concepts of salt and nutrient management including; 1) reducing deep percolation past the root zone, 2) utilizing a higher percentage of the nitrates applied in the root zone, 3) introduction of higher

quality water sources, and 4) increased removal of salt and nutrient through water treatment or use techniques.

In many instances economics were a main driver of management practices for agricultural and urban interests. In other situations regulatory pressures strongly influenced urban interests, and in recent times, agricultural interests. Because urban and agricultural uses rely on a common groundwater resource and a shared economic dependence on this resource, several management practices have been instituted as joint efforts among various stakeholders. As a result, some practices are listed below are not identified with a particular water user group.

Prior to 1990, Management Practices that notably changed included:

- All municipal needs met by local groundwater, however, in the 1960s both urban and agriculture water users invested in Twitchell Reservoir, the operations of which increased the recharge of lower TDS water.
- Agricultural irrigation mainly used furrow irrigation method; sprinklers were used for soil pre-irrigation and preparing the field for planting; once a crop germinated, sprinklers were removed (this increased transport of salt and nutrient below the root zone)
- Dairies were operating in the area, which produced a source of animal manure (a source of salts and nitrogen)
- A large poultry farm operated in the area, which produced a source of animal manure (a source of salts and nitrogen)Main crops grown were potatoes, sugar beets, and carrots (Nitrogen uptake of typical crops was near 50-percent)

During the 1990's, Management Practices that notably changed included:

- Dairies and feed lots stopped operations in the area during this decade; thus decreasing sources of animal manure (a source of salts and nitrogen)
- Vegetables were well established by this time in the area; acres increased from over 35,000 acres in 1990 to around 38,000 acres in 2000 (L&S 2010 Annual Report)
- Strawberry acreage started in the area, which increased to around 3,000 acres planted by 2000
- Drip irrigation technology and field application of drip irrigation methods advanced
- Municipal users approved importation of State Water Project water to offset sole reliance on groundwater for urban uses. (Significant deliveries began in 1997.)

During the 2000's, Management Practices that notably changed included:

- The Municipal water users received delivery of State Water Project water which offset groundwater pumping and imported lower TDS and nutrient supply
- The poultry farm in the area ended operation; thus, decreasing a source of animal manure

- Crop acres were predominately strawberries and vegetable row crops; strawberries increased to about 10,000 acres by 2010, while vegetables decreased slightly to 34,000 acres
- Cost of fertilizers fluctuated in price 20 to 30 percent which increased uncertainty, which encouraged more conservative fertilizer practices, including development of new management techniques
- Split application, or methods for improving the timing of fertilizer applications with a crop needs became common practice
- Slow release fertilizers introduced Use of transplant seedlings lowered the number of days between planting and harvest and reduced water and nutrient use on a per-crop basis
- Drip irrigation systems were more widely installed, resulting in better distribution uniformity and fertilizer application
- Sprinkler irrigation method remains necessary during the early stages of crops for salt management in the root zone
- Agricultural Waiver regulations adopted in 2004 required additional water quality monitoring
- Municipal disposal of brine collected from urban water users

Since 2010, Management Practices that notably changed include:

- Municipal use of higher nitrate production wells for a portion of urban landscape irrigation
- Cost of fertilizers increased 2 to 3 times in comparison to prices prior to 1990 (based on USDA information)
- Fertilizer application methods continue to improve as costs of fertilizer rises and growers implement improved practices, such as, transplanting seedlings to establish a crop and use of techniques to control release of NO_3 from fertilizer materials
- Slow release fertilizers widely utilized
- Agricultural Waiver adopted in 2012 requires additional management practices through development of on-farm nutrient plan
- City of Guadalupe is blending imported SWP water with well water to deliver to urban water users
- Laguna County Sanitation District implemented an ordinance that prohibits the use of salt load regenerating water softeners in construction after January 1, 2012.

4 Sources, Transport and Fate of Water, TDS, Sodium, Chloride and Nitrogen (Conceptual Model)

In order to understand and quantify the sources of transport and fate of salt and nutrient in the Santa Maria Valley, the Working Group developed a working conceptual model (Figures 1.2a through 1.2f) of Santa Maria Valley hydrology based on previous work (such as Gibbs 2012 and Luhdorff and Scalmanini, 2011). The conceptual model shows the basic elements of sources, transport, and fate of salt and nutrients. These essential elements are represented numerically in the evaluation section. The calculation of flow volume and salt and nutrient concentration allows estimates of total transport and balance (salt/nutrient transported into and out of the valley) as discussed below.

For the purposes of this report, three water quality factors are considered: total dissolved Solids (TDS), Chloride (Cl^-) and Nitrate (NO_3). Each factor was selected based on availability of data, and potential limitations increasing levels place on use of water resource in the valley.

4.1 Relationship between hydrology and transport of salt and nutrient

Since both Salts and Nutrients are soluble in water, elements of surface and groundwater flow comprise the transport medium and are responsible for their distribution. The materials through which groundwater moves may attenuate the flow of certain dissolved constituents through adsorption on geologic media.

The quantity and quality of sources dictate the volume of salts and nutrients introduced into the valley; other factors increase/concentrate salts and nutrients. Water entering the valley by natural flow or due to importation (SWP) carries dissolved solids and nitrates. The salts and nutrients may be concentrated or diluted by various mechanisms during use and transport of surface and groundwater. Those factors include evapotranspiration, leaching or adsorption in the vadose zone etc.

This assessment focuses on specific chemical species that have been identified as important to water users in the Valley. Although many chemical species may be of concern in a particular area, water users in the Valley have identified TDS (as an indicator of salt), Chloride (Cl^-) and Nitrate (NO_3) as the constituents of concern for the following reason:

- TDS: may limit crops and is a drinking water standard
- Cl^-: may affect soil characteristics to reduce crop yield

- NO_3: has been identified as a potential health threat, the State Department of Public Health has established a drinking water standard of 45 parts per million as nitrate.

Although conditions may change in the future, the trends of these constituents are highest priority to the working Group and are incorporated into the conceptual model. The conceptual model was developed to provide a simplified description of hydrogeology, flow mechanisms and sources of TDS, Cl^- and NO_3 in the Valley. The model was a basis for estimating the balance between inputs and discharge of salts and nutrients in the basin.

4.2 Source, Transport, Fate Cycle Conceptual Model

The Working Group developed a conceptual model as a basis for a simplified calculation of source, transport and fate of TDS, chloride, and nitrate. The conceptual model was represented in diagrams showing sources, flow, discharge and potential areas of accumulation of TDS, Chloride and NO_3. Due to differences in subsurface conditions, the western and eastern portions of the valley were represented in separate diagrams; resulting in a total of six diagrams (two each for TDS, Cl^- and NO_3) see figures 1.2a through 1.2f. The diagrams were kept generic so as to be able to encompass changes in management practices discussed in Section 3.

There are numerous elements of the Conceptual Model, but these elements generally fall in to one of three "systems": the agricultural extraction and return flow "system", the urban supply and return flow "system" and the remaining element of the model representing the surface and groundwater hydrology. The elements of the conceptual model are discussed in these three categories below.

Some features of the conceptual model (such as ET and plant root zone) were placed in the agricultural system for convenience. Both the agricultural and urban systems share elements with the groundwater system; however the specific operations of each have differing impacts on the basin. There are also elements of the groundwater system that occur independent of the agricultural and urban systems.

In addition, a Source, Transport, and Fate Cycle of nitrate as "N" (NO_3–N) for the basin and root zone was developed since it requires two types of accounting or budgets to understand and manage: a root-zone budget to determine Nitrate efficiency use, and a groundwater basin balance to estimate whether accumulation of N in the form of NO_3 (nitrate) is taking place. Nitrogen is added to the soil root zone in various forms of pounds of N expressed as equivalent NO_3-N. Nitrate, NO_3, is the form of Nitrogen available and used by plants as uptake that leads to Nitrogen removal at harvest. Nitrate, NO_3, is also the form of Nitrogen that may leach to groundwater or may or may not get reapplied to the root zone or discharged to drain outlet, possibly outside of the basin boundary and eventually reaching the ocean. For the purpose of calculating the estimated amount of N, the terms in the mass balance equations are expressed as pounds of N as NO_3-N. The conceptual diagram for nitrogen in the root zone is shown in Figure 4.2.

TESTING

- Soil test at start of season
- Quick Nitrate (NO3-N) soil test during growing season
- Soil test prior to side dressing
- Plant tissue sampling

APPLICATION METHODS

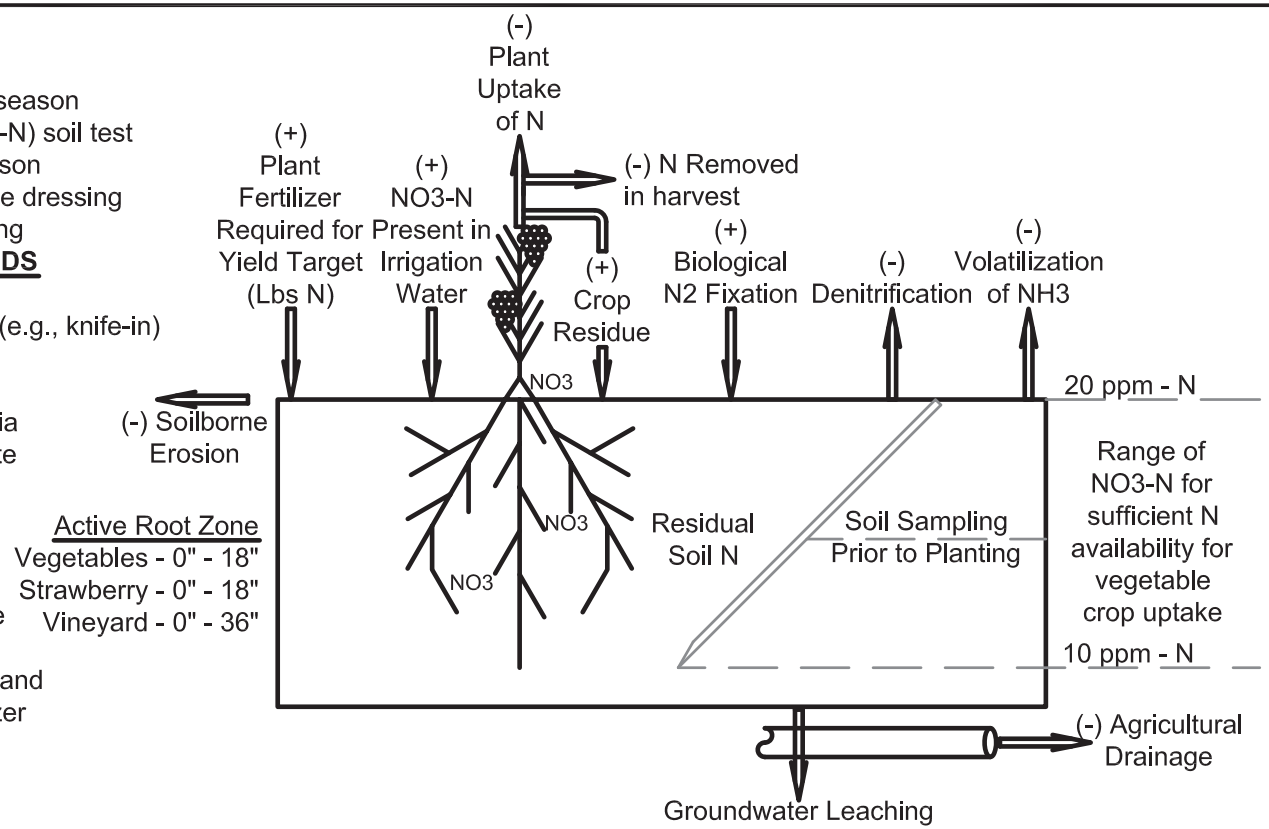
- Broadcast fertilizer
- Precision insertion (e.g., knife-in)
- Fertigation

TYPE OF FERTILIZER

- Anhydrous ammonia
- Ammonium sulphate
- Urea
- Ammonium nitrate
- Calcium nitrate
- Sodium nitrate
- Calcium cyanamide

TIMING/METHOD

- As needed/on-demand
- Slow release fertilizer



NOTES:

- **Soils with a modest level of N (≥10ppm) can support immediate needs of vegetable crop uptake.**
- **Soils may need higher level of 20ppm N to maintain maximum growth rates for several weeks or longer.**
- **10ppm NO3-N ≈ 45 mg/L of NO3**
- **1ppm of NO3-N ≈ 2lb/Ac in 0"- 8" Active Root Zone**
- **Pounds of N/Acre = 0.23 x ppm NO3-N in irrigation water x inches of water.**
- **Pounds of N/Acre = 0.051 x ppm NO3 x inches of water.**

NITROGEN BALANCE EQUATION:

N*Groundwater* = **N***Fertilizer* + **N***Applied Water* - **N***Harvest* + **N***Fixation* - **N***Denit/Volat* - **N***Drainage* - **N***Erosion*

N*Harvest* = **N***Uptake* - **N***Residue*

Salt and Nutrient Planning Workgroup Santa Barbara County IRWM Plan 2013	GEI Consultants Bookman-Edmonston Division	Nitrogen in Rootzone Balance
Santa Maria Groundwater Management Area		February, 2013 — Fig. 4-2

The components shown in the "nitrate in rootzone" balance can be used in a mass balance equation to estimate nitrogen loading to the groundwater based on the following equation:

$$N_{Groundwater} = N_{Fertilizer} + N_{AW} - N_{Harvest} + N_{Residue} + N_{Fixation} - N_{Denit/Volat} - N_{Drainage} - N_{Erosion}$$

- $\mathbf{N_{Groundwater}}$ – Pounds of N leached below the root zone
- $\mathbf{N_{Fertilizer}}$ – Pounds of N added to meet target yield
- $\mathbf{N_{AW}}$ – Pounds of N added based on source water concentration
- $\mathbf{N_{Harvest}}$ – Pounds of N removed at harvest from crop uptake
- $\mathbf{N_{Residue}}$ – Pounds of N returned or added to root zone as crop residue from crop uptake
- $\mathbf{N_{Fixation}}$ – Pounds of N added to the root zone
- $\mathbf{N_{Denit/Volat}}$ – Pounds of N removed from the root zone
- $\mathbf{N_{Drainage}}$ - Pounds of N removed by drainage to outside of groundwater boundary
- $\mathbf{N_{Erosion}}$ - Pounds of N transported by soil erosion outside groundwater boundary

Two important factors that affect nitrogen loading and movement to the groundwater include: the amount of nitrate in the root zone and the crops' applied water. Management of N added as fertilizer and the efficiency of the type of N, and the amount of and timing of water applied for irrigation are the factors that have effected improvements over time. A factor that is not easily controlled by the grower's management is the timing of rainfall, which can transport the available nitrate in the root zone. It is important to recognize the root zone balance is an estimate of potential to transport NO_3 to the groundwater since it can only be transported to the groundwater when leaching of water occurs below a root zone and the leaching path connects it to the groundwater.

From this evaluation, estimating the pounds of N loading to groundwater was based on available UCCE information. In general logic, if the amount of NO_3 contained in the soil profile and the source water applied for irrigation are accounted for, then the $N_{Fertilizer}$ applied to meet the crop yield target can be more effectively managed to reduce the potential loading to the groundwater.

The Agricultural System, as its name suggests, consists of the elements of the Conceptual Model related to agricultural production in the Santa Maria Valley. Groundwater pumping for the purpose of crop irrigation makes up the most significant portion of salt and nutrient movement out of the aquifer. Likewise, deep percolation of applied water makes up a significant portion of salt and nutrient movement back into the groundwater basin. The elements of the Conceptual Model, as they relate to the Agricultural System are as follows:

- **Agricultural Deep Percolation –** The drainage of agricultural applied water which moves below the effective depth of the root zone and is not captured in tile drains or as tailwater, but is stored in subsurface strata. Deep percolation of agricultural water carries salts and nutrients that have leached out of the root zone, into the groundwater basin. There are indications that microbial activity plays a role in GW leaching.

- **ET –** Evapotranspiration is the combined loss of water from a given area by evaporation from the land and transpiration from plants.
- **Ag Plant Material –** Some of the salts, nutrients, and water present in the crops are removed from the groundwater basin once those crops are harvested. However, plant material remaining after harvest is worked back into the ground and may become available to the next crop or may be leached below the root zone.
- **Ag Pumping –** Groundwater pumping for agricultural purposes occurs from both the confined and unconfined aquifers. Groundwater is the sole source of applied water for agriculture users in the Santa Maria Groundwater Basin.
- **Ag Runoff and Tailwater –** Excess water applied for agricultural uses may result in surface runoff from agricultural lands, or may be captured below the root zone in tile drains, or is leached as deep percolation.
- **Root Zone –** The root zone depth is the zone in which water and nutrients can be utilized by the crop, varies from crop type to crop type.
- **Applied Water –** Applied water for agricultural uses is the amount of water pumped from the groundwater basin for agricultural uses. The applied water volume takes into account the evapotranspiration rate for the specific crop in the climate of the area, irrigation efficiency, and crop-specific water requirements that may include salt leaching.

The Urban System consists of elements of the Conceptual Model related to municipal and industrial water production and water importation into the Santa Maria Valley. While the urban water use is significantly less than the agricultural water use, elements of the Urban System still have an impact on the groundwater basin.

- **Brine Disposal –** Effluent from a wastewater treatment plant that has been processed with reverse osmosis, or other salt-removal equipment, results in two wastewater streams; a highly concentrated solution of salts and other dissolved solids; and high quality recycled water. While the high quality recycled water may be infiltrated into the groundwater basin, or used for irrigation, the highly concentrated brine must be properly disposed of. In the case of Laguna County Sanitation District, the brine is injected into a deep well below the underground source of drinking water (USDW) aquifer, which is protected by a packer between the tubing and casing, a cemented exterior casing, and injection below the Sisquoc confining layer.
- **Deep Percolation, Municipal/Industrial –** The drainage of municipal/industrial water that is not evaporated or utilized by landscaping, may move downward by gravity below the maximum effective depth of the root zone toward storage in subsurface strata. Deep percolation of municipal/industrial water may carry contaminants into the groundwater basin.
- **Municipal and Industrial Pumping –** Groundwater pumping occurs from both the confined and unconfined aquifers. Groundwater, in conjunction with imported SWP water, provides the municipalities and agencies with potable water for their urban users.

- **SWP –** Water within the Santa Maria Valley groundwater basin received from the State Water Project, originating outside the basin that adds to recharge of the basin.
- **Well and SWP Infiltration –** Infiltration of groundwater and State Water from over-application of landscape irrigation.
- **WWTP Infiltration –** Effluent from a wastewater treatment plant treated to appropriate level can be used for landscape irrigation, as well as agricultural, industrial, and other beneficial uses. Effluent may also be placed in ponds to evaporate and/or percolate into the groundwater basin.

The Groundwater elements of the Conceptual Model relate to the movement of groundwater into, out of, and within the groundwater basin that aren't directly related to the Agricultural and Urban extraction and recharge.

- **Abandoned Well –** There are a number of abandoned wells in the Santa Maria Valley which once drew from either the confined or unconfined aquifer, or both. Groundwater from the deeper confined aquifer is generally of better quality than groundwater from the shallower unconfined aquifer. Abandoned wells that once drew from both aquifers that have not been properly destroyed allow for the movement of groundwater from one aquifer to another, which results in the degradation of the water quality of the confined aquifer; .improperly constructed or maintained well heads may allow contaminants to enter groundwater.
- **Groundwater Discharge to Ocean –**The Santa Maria Valley groundwater basin gradient is generally sloped toward the ocean. Infiltration from rivers, rainwater, and other activities maintains sufficient gradient that some groundwater flows out into the ocean. Once groundwater is discharged to the ocean, it cannot be recovered.
- **High Flows to Ocean –** In high-flow years when the Santa Maria River, Sisquoc River, and Cuyama River are transporting more water than can be used or infiltrated into the groundwater basin, surface water is discharged to the ocean. Once surface water is discharged to the ocean, it cannot be recovered.
- **Recharge from East Area of Valley –** Groundwater from the unconfined aquifer in the East Area of the Santa Maria Valley flows west due to the gradient of the groundwater basin. As it moves west, a horizontal layer of semi-impermeable soil divides the aquifer into unconfined (upper) and confined (lower) portions. The flow remaining above the layer continues to move through the unconfined aquifer in the west area of the valley, while a portion of the groundwater moves below the semi-impermeable layer and recharges the confined aquifer.
- **Recharge from Cuyama River –** Releases from Twitchell Reservoir are designed to more effectively recharge the groundwater basin by infiltration through the riverbed.
- **Recharge from Orcutt Creek –** A portion of the surface water that flows down Orcutt Creek recharges the groundwater basin by infiltration through the riverbed.
- **Recharge from Sisquoc River –** A portion of the surface water that flows down the Sisquoc River recharges the groundwater basin by infiltration through the riverbed.

- **Semi-Impermeable Layer –** A layer of impermeable or semi-impermeable material that separates the shallow unconfined aquifer from the deep confined aquifer.
- **Unconfined Aquifer –** A condition in which the water in an aquifer forms a free surface under atmospheric pressure.
- **Water Table –** The upper surface of the zone of saturation on which the water pressure in the porous medium equals atmospheric pressure.

Due the nature of data available for this analysis, estimates of basin balance and accumulation of TDS, NO_3 and Cl^- contain significant uncertainty. Recommendations for changes in various monitoring efforts to reduce this uncertainty are provided in Section 5.

4.2.1 Basin Balance Estimates

Existing data were obtained and applied to elements of the conceptual model to estimate the volume of TDS, Cl^- and NO_3 entering, moving through and leaving the basin. The analysis was based on a simple accounting balance approach and represents an "order of magnitude" calculation of the "balance" of TDS and NO_3 in the Valley for the years of 2010, 2000, and 1990 and is shown in Tables 4.2-1 through 4.2-6 (see also Appendix E).

This analysis shows evidence that the degree of loading of TDS and NO_3 to the Valley is decreasing with time. This trend would be expected given the management activities discussed in Section 4. In addition, the loading of TDS to groundwater in the basin may have decreased to a level where groundwater quality is stable as reflected in monitoring results in some areas (Figure 4.2.1). This analysis focuses on general trends thus does not include consideration of rare and catastrophic events such as large wildfires that may introduce

The amount of Nitrate loading has decreased substantially, but water quality samples in some areas continue to show elevated levels of NO_3 even with the substantial management techniques in place. This is consistent with the loading estimates for 2010 which suggest levels of NO_3 entering the Valley hydrologic system continue to exceed the amounts discharged. Since there is a great level of uncertainty in the balance estimates, more research may be useful to understand Nitrogen losses from the various elements that store and transport NO3 within the system. That additional research is beyond the scope of this report and the regulatory processes discussed in Section 1.

4.2.2 Evidence in Support of Transport Model

Coastal monitoring wells are the most down-gradient measurements of water quality in the basin. Although originally installed to monitor for potential sea water intrusion, regular measurements of water quality in these well show several important features. First, while shallow groundwater has experienced increasing specific conductance (an indication of TDS concentrations) over the last 30 years, the intermediate and deep zones do not show a similar trend (Luhdorff and Scalmanini, 2011), particularly in the southern installation of wells. Water in the intermediate and lowermost zones indicates lower specific conductance and less increase

over time. These data presented in the Annual Report support the interpretation by Luhdorff and Scalmanini that increased recharge of stormwater to the basin from Twitchell Reservoir has generally stabilized water quality in the zone influenced by recharge from the Santa Maria River east of Bonita School Road crossing. Shallow groundwater west of Bonita School Road is more influenced by returnflow than recharge from the river and in that area the shallow groundwater has experienced increasing Specific Conductance (or TDS).

Two lines of evidence suggest the mechanism by which Nitrate is transported in the groundwater basin: water quality trends in coastal wells and the difference in water quality between shallow and deeper zones east of the Bonita School road. Luhdorff and Scalmanini observes that nitrate in coastal wells in shallow and intermediate zones in the northerly monitoring well cluster began increasing in the 1980s while Nitrate levels in deep zones has remained low. Nitrate levels in shallow groundwater throughout the valley have increased while deeper zones remain relatively low. This trend is shown in monitoring wells and in the isolation tests performed by the City of Santa Maria on their well # 9 (e-mail correspondence, City of Santa Maria).

These data are consistent with the conceptual model which describes downward movement of TDS and NO_3 during periods of above average rainfall. A higher concentration of TDS and NO_3 is not expected to migrate rapidly through the saturated zone to the deep zone, but rather migrate to the west along the regional groundwater gradient toward the coast.

The shallowest zones west of Bonita School Road may be intercepted by drains or discharge naturally to surface water bodies. This is consistent with the higher levels of TDS and NO_3 measured in surface water in this area.

Table 4.2-1. Estimated Annual Chloride and TDS Load Balance, Santa Maria Valley, 1990

Agency/Location	Source of Water	In		Out		Balance	
		Chloride	TDS	Chloride	TDS	Chloride	TDS
	Imported/SWP, Wells	Lb	Lb	Lb	Lb	Lb	Lb
City of Santa Maria - SWP Outside Landscape Infiltration	SWP	-	-			-	-
City of Santa Maria - WWTP Infiltration	SWP/Wells	-	-			-	-
City of Santa Maria - Municipal and Industrial Pumping	Wells			-	27,868,388	-	(27,868,388)
City of Santa Maria - Well Outside Landscape Infiltration	Wells	-	5,573,953			-	5,573,953
City of Guadalupe - WWTP Infiltration	Wells	-	-			-	-
City of Guadalupe - Municipal and Industrial Pumping	Wells			-	-	-	-
City of Guadalupe - Well Outside Landscape Infiltration	Wells	-	-			-	-
Golden State Water Co. - SWP Outside Landscape Infiltration	SWP	-	-			-	-
Golden State Water Co. - Municipal and Industrial Pumping	Wells			484,959	8,283,254	(484,959)	(8,283,254)
Golden State Water Co. - Well Outside Landscape Infiltration	Wells	9,757	166,654			9,757	166,654
Laguna Sanitation District - WWTP Infiltration	SWP/Wells	2,173,076	7,303,956			2,173,076	7,303,956
Laguna Sanitation District - Brine Disposal				-	-	-	-
Agriculture - Pumped	Wells			23,227,822	309,600,359	(23,227,822)	(309,600,359)
Agriculture - Deep Percolation (74.5%)	Wells	17,304,727	230,652,268			17,304,727	230,652,268
Santa Maria River	N/A					-	-
Cuyama River	N/A	9,191,438	169,688,095	-	-	9,191,438	169,688,095
Sisquoc River	N/A	870,195	43,509,768	679,840	33,992,006	190,355	9,517,762
Orcutt Creek	N/A	-	1,134,756	-	8,170,243	-	(7,035,487)
Oso Flaco Creek	N/A			-	11,435,284	-	(11,435,284)
Groundwater Discharge From Basin	N/A			3,051,893	29,211,824	(3,051,893)	(29,211,824)
High flows directly to Ocean	N/A	-	-	-	-	-	-
	Totals	**29,549,194**	**458,029,450**	**27,444,514**	**428,561,359**	**2,104,680**	**29,468,091**

Notes:

Estimated - 25% of the Agriculture-Pumped water and associated salts, are lost to surface runoff.

Estimated - 0.5% of the Agriculture-Pumped water and associated salts, are lost to crop harvest.

Estimated - 74.5% of the Agriculture-Pumped water and assiciated salts are assumed to return to the basin as Agriculture-Deep Percolation.

Positive values in the Balance columns indicate a general inflow of chloride/TDS into the basin.

Negative values (values in parentheses) in the Balance columns indicate a general removal of chloride/TDS from the basin.

Table 4.2-2. Estimated Annual Nitrate Load Balance, Santa Maria Valley, 1990

Agency/Location	Source of Water	In Nitrate	Out Nitrate	Balance Nitrate	Balance NO3-N Equivalent
	Imported/SWP, Wells	Lb	Lb	Lb	Lb
City of Santa Maria - SWP Outside Landscape Infiltration	SWP	-		-	-
City of Santa Maria - WWTP Infiltration	SWP/Wells	-		-	-
City of Santa Maria - Municipal and Industrial Pumping	Wells		114,752	(114,752)	(25,903)
City of Santa Maria - Well Outside Landscape Infiltration	Wells	22,952		22,952	5,181
City of Guadalupe - WWTP Infiltration	Wells	-		-	-
City of Guadalupe - Municipal and Industrial Pumping	Wells		-	-	-
City of Guadalupe - Well Outside Landscape Infiltration	Wells	-		-	-
Golden State Water Co. - SWP Outside Landscape Infiltration	SWP	-		-	-
Golden State Water Co. - Municipal and Industrial Pumping	Wells		92,872	(92,872)	(20,964)
Golden State Water Co. - Well Outside Landscape Infiltration	Wells	1,869		1,869	422
Laguna Sanitation District - WWTP Infiltration	SWP/Wells	138,749		138,749	31,320
Laguna Sanitation District - Brine Disposal			-	-	-
Agriculture - Pumped	Wells		1,381,198	(1,381,198)	(311,783)
Agriculture - Deep Percolation	Wells	19,225,814		19,225,814	4,339,913
Santa Maria River	N/A			-	-
Cuyama River	N/A	3,535	-	3,535	798
Sisquoc River	N/A	23,785	18,582	5,203	1,175
Orcutt Creek	N/A	20,156	145,122	(124,967)	(28,209)
Oso Flaco Creek	N/A	-	306,860	(306,860)	(69,269)
Groundwater Discharge From Basin	N/A		417,381	(417,381)	(94,217)
High flows directly to Ocean	N/A	-	-	-	-
	Totals	**19,436,860**	**2,476,768**	**16,960,092**	**3,828,463**

Notes:

Positive values in the Balance columns indicate a general inflow of nitrate into the basin
Negative values (values in parentheses) in the Balance columns indicate a general removal of nitrate from the basin.

4.2-3. Estimated Annual Chloride and TDS Load Balance, Santa Maria Valley, 2000

Agency/Location	Source of Water	In		Out		Balance	
		Chloride	TDS	Chloride	TDS	Chloride	TDS
	Imported/SWP, Wells	Lb	Lb	Lb	Lb	Lb	Lb
City of Santa Maria - SWP Outside Landscape Infiltration	SWP	13,104	2,051,892			13,104	2,051,892
City of Santa Maria - WWTP Infiltration	SWP/Wells	123,560	507,810			123,560	507,810
City of Santa Maria - Municipal and Industrial Pumping	Wells			42,208	1,031,141	(42,208)	(1,031,141)
City of Santa Maria - Well Outside Landscape Infiltration	Wells	8,442	206,228			8,442	206,228
City of Guadalupe - WWTP Infiltration	Wells	19,113	743,781			19,113	743,781
City of Guadalupe - Municipal and Industrial Pumping	Wells			28,159	948,513	(28,159)	(948,513)
City of Guadalupe - Well Outside Landscape Infiltration	Wells	5,881	228,856			5,881	228,856
Golden State Water Co. - SWP Outside Landscape Infiltration	SWP	167,224	2,550,814			167,224	2,550,814
Golden State Water Co. - Municipal and Industrial Pumping	Wells			973,406	14,330,283	(973,406)	(14,330,283)
Golden State Water Co. - Well Outside Landscape Infiltration	Wells	19,584	288,316			19,584	288,316
Laguna Sanitation District - WWTP Infiltration	SWP/Wells	2,261,115	8,306,442			2,261,115	8,306,442
Laguna Sanitation District - Brine Disposal				-	-	-	-
Agriculture - Pumped	Wells			21,161,464	271,078,913	(21,161,464)	(271,078,913)
Agriculture - Deep Percolation (74.5%)	Wells	15,765,291	201,953,790			15,765,291	201,953,790
Santa Maria River	N/A					-	-
Cuyama River	N/A	7,777,371	155,547,421	-	-	7,777,371	155,547,421
Sisquoc River	N/A	1,160,260	44,960,094	906,453	35,125,073	253,807	9,835,020
Orcutt Creek	N/A	-	1,167,004	-	8,402,426	-	(7,235,422)
Oso Flaco Creek	N/A			-	11,435,284	-	(11,435,284)
Groundwater Discharge From Basin	N/A			3,051,893	29,211,824	(3,051,893)	(29,211,824)
High flows directly to Ocean	N/A	-	-	-	-	-	-
	Totals	**27,320,945**	**418,512,447**	**26,163,584**	**371,563,457**	**1,157,361**	**46,948,989**

Notes:

Estimated - 25% of the Agriculture-Pumped water and associated salts, are lost to surface runoff.

Estimated - 0.5% of the Agriculture-Pumped water and associated salts, are lost to crop harvest.

Estimated - 74.5% of the Agriculture-Pumped water and assiciated salts are assumed to return to the basin as Agriculture-Deep Percolation.

Positive values in the Balance columns indicate a general inflow of chloride/TDS into the basin.

Negative values (values in parentheses) in the Balance columns indicate a general removal of chloride/TDS from the basin.

4.2-4. Estimated Annual Nitrate Load Balance, Santa Maria Valley, 2000

Agency/Location	Source of Water	In Nitrate	Out Nitrate	Balance Nitrate	Balance NO3-N Equivalent
	Imported/SWP, Wells	Lb	Lb	Lb	Lb
City of Santa Maria - SWP Outside Landscape Infiltration	SWP	21,340	-	21,340	4,817
City of Santa Maria - WWTP Infiltration	SWP/Wells	-	-	-	-
City of Santa Maria - Municipal and Industrial Pumping	Wells		16,499	(16,499)	(3,724)
City of Santa Maria - Well Outside Landscape Infiltration	Wells	3,300		3,300	745
City of Guadalupe - WWTP Infiltration	Wells	2,190	-	2,190	494
City of Guadalupe - Municipal and Industrial Pumping	Wells		2,964	(2,964)	(669)
City of Guadalupe - Well Outside Landscape Infiltration	Wells	674		674	152
Golden State Water Co. - SWP Outside Landscape Infiltration	SWP	44,538	-	44,538	10,054
Golden State Water Co. - Municipal and Industrial Pumping	Wells		12,937	(12,937)	(2,920)
Golden State Water Co. - Well Outside Landscape Infiltration	Wells	4,830		4,830	1,090
Laguna Sanitation District - WWTP Infiltration	SWP/Wells	191,683		191,683	43,269
Laguna Sanitation District - Brine Disposal			-	-	-
Agriculture - Pumped	Wells		5,045,643	(5,045,643)	(1,138,971)
Agriculture - Deep Percolation	Wells	18,036,632		18,036,632	4,071,474
Santa Maria River	N/A			-	-
Cuyama River	N/A	125,191	-	125,191	28,260
Sisquoc River	N/A	51,361	40,125	11,235	2,536
Orcutt Creek	N/A	80,982	583,073	(502,091)	(113,339)
Oso Flaco Creek	N/A	-	306,860	(306,860)	(69,269)
Groundwater Discharge From Basin	N/A		417,381	(417,381)	(94,217)
High flows directly to Ocean	N/A	-	-	-	-
	Totals	**18,562,721**	**6,425,483**	**12,137,238**	**2,739,783**

Notes:

Positive values in the Balance columns indicate a general inflow of nitrate into the basin
Negative values (values in parentheses) in the Balance columns indicate a general removal of nitrate from the basin.

Table 4.2-5. Estimated Annual Chloride and TDS Load Balance, Santa Maria Valley, 2010

Agency/Location	Source of Water	In		Out		Balance	
		Chloride	TDS	Chloride	TDS	Chloride	TDS
	Imported/SWP, Wells	Lb	Lb	Lb	Lb	Lb	Lb
City of Santa Maria - SWP Outside Landscape Infiltration	SWP	11,064	1,732,496			11,064	1,732,496
City of Santa Maria - WWTP Infiltration	SWP/Wells	3,856,294	17,670,758			3,856,294	17,670,758
City of Santa Maria - Municipal and Industrial Pumping	Wells			382,168	7,170,695	(382,168)	(7,170,695)
City of Santa Maria - Well Outside Landscape Infiltration	Wells	76,434	1,434,139			76,434	1,434,139
City of Guadalupe - WWTP Infiltration	Wells	168,168	1,606,135			168,168	1,606,135
City of Guadalupe - Municipal and Industrial Pumping	Wells			45,496	1,532,483	(45,496)	(1,532,483)
City of Guadalupe - Well Outside Landscape Infiltration	Wells	9,099	306,497			9,099	306,497
Golden State Water Co. - SWP Outside Landscape Infiltration	SWP	264	41,548			264	41,548
Golden State Water Co. - Municipal and Industrial Pumping	Wells			751,362	13,002,573	(751,362)	(13,002,573)
Golden State Water Co. - Well Outside Landscape Infiltration	Wells	15,117	261,603			15,117	261,603
Laguna Sanitation District - WWTP Infiltration	SWP/Wells	1,085,028	4,492,873			1,085,028	4,492,873
Laguna Sanitation District - Brine Disposal				992,798	2,244,480	(992,798)	(2,244,480)
Agriculture - Pumped	Wells			23,238,282	279,779,822	(23,238,282)	(279,779,822)
Agriculture - Deep Percolation	Wells	17,312,520	208,435,968			17,312,520	208,435,968
Santa Maria River	N/A					-	-
Cuyama River	N/A	7,777,371	155,547,421	-	-	7,777,371	155,547,421
Sisquoc River	N/A	1,160,260	44,960,094	906,453	35,125,073	253,807	9,835,020
Orcutt Creek	N/A	-	1,167,004	-	8,402,426	-	(7,235,422)
Oso Flaco Creek	N/A			-	11,435,284	-	(11,435,284)
Groundwater Discharge From Basin	N/A			3,530,591	29,562,168	(3,530,591)	(29,562,168)
High flows directly to Ocean	N/A	-	-	1,892,784	26,655,444	(1,892,784)	(26,655,444)
	Totals	**31,471,618**	**437,656,534**	**31,739,935**	**414,910,448**	**(268,316)**	**22,746,085**

Notes:

Estimated - 25% of the Agriculture-Pumped water and associated salts, are lost to surface runoff.

Estimated - 0.5% of the Agriculture-Pumped water and associated salts, are lost to crop harvest.

Estimated - 74.5% of the Agriculture-Pumped water and assiciated salts are assumed to return to the basin as Agriculture-Deep Percolation.

Positive values in the Balance columns indicate a general inflow of Chloride/TDS into the basin.

Negative values (values in parentheses) in the Balance columns indicate a general removal of Chloride/TDS from the basin.

High flows directly to Ocean include flow from Blosser Creek, Bradley Channel, Greene Valley Creek, and Main Street Canal.

Table 4.2-6. Estimated Annual Nitrate Load Balance, Santa Maria Valley, 2010

Agency/Location	Source of Water	In Nitrate	Out Nitrate	Balance Nitrate	Balance NO3-N Equivalent
	Imported/SWP, Wells	Lb	Lb	Lb	Lb
City of Santa Maria - SWP Outside Landscape Infiltration	SWP	18,018	-	18,018	4,067
City of Santa Maria - WWTP Infiltration	SWP/Wells	406,242	-	406,242	91,703
City of Santa Maria - Municipal and Industrial Pumping	Wells		224,576	(224,576)	(50,694)
City of Santa Maria - Well Outside Landscape Infiltration	Wells	44,915		44,915	10,139
City of Guadalupe - WWTP Infiltration	Wells	44,065	-	44,065	9,947
City of Guadalupe - Municipal and Industrial Pumping	Wells		4,789	(4,789)	(1,081)
City of Guadalupe - Well Outside Landscape Infiltration	Wells	958		958	216
Golden State Water Co. - SWP Outside Landscape Infiltration	SWP	85	-	85	19
Golden State Water Co. - Municipal and Industrial Pumping	Wells		14,571	(14,571)	(3,289)
Golden State Water Co. - Well Outside Landscape Infiltration	Wells	5,035		5,035	1,137
Laguna Sanitation District - WWTP Infiltration	SWP/Wells	178,719		178,719	40,343
Laguna Sanitation District - Brine Disposal			79,714	(79,714)	(17,994)
Agriculture - Pumped	Wells		7,692,851	(7,692,851)	(1,736,535)
Agriculture - Deep Percolation	Wells	14,536,848		14,536,848	3,281,456
Santa Maria River	N/A			-	-
Cuyama River	N/A	125,191	-	125,191	28,260
Sisquoc River	N/A	51,361	40,125	11,235	2,536
Orcutt Creek	N/A	80,982	583,073	(502,091)	(113,339)
Oso Flaco Creek	N/A	-	306,860	(306,860)	(69,269)
Groundwater Discharge From Basin	N/A		794,529	(794,529)	(179,352)
High flows directly to Ocean	N/A	-	646,066	(646,066)	(145,839)
	Totals	**15,492,421**	**10,387,155**	**5,105,266**	**1,152,430**

Notes:

Estimated - 25% of the Agriculture-Pumped water and associated salts, are lost to surface runoff.

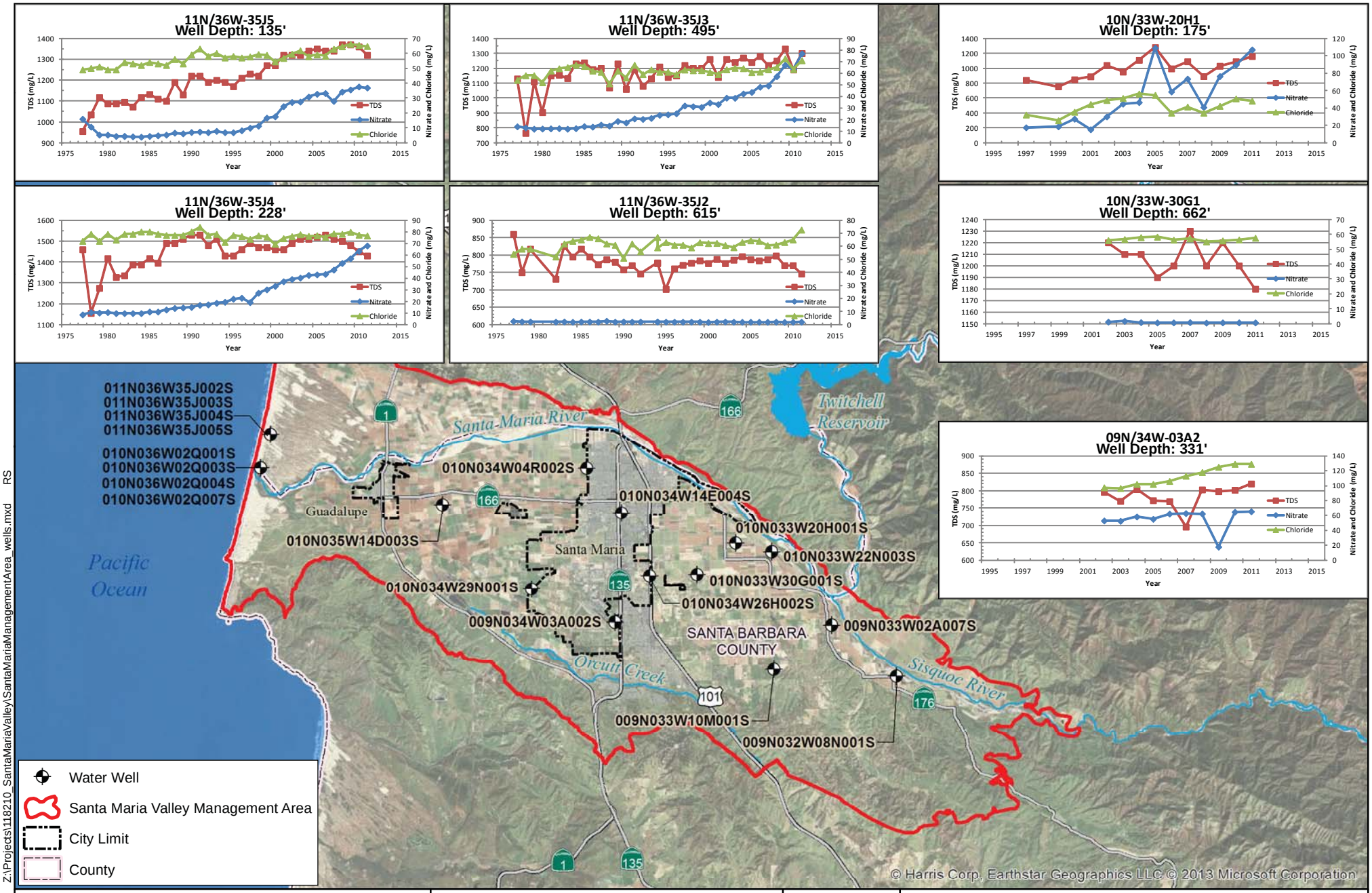
Estimated - 0.5% of the Agriculture-Pumped water and associated salts, are lost to crop harvest.

Estimated - 74.5% of the Agriculture-Pumped water and assiciated salts are assumed to return to the basin as Agriculture-Deep Percolation.

Positive values in the Balance columns indicate a general inflow of nitrate into the basin

Negative values (values in parentheses) in the Balance columns indicate a general removal of nitrate from the basin.

High flows directly to Ocean include flow from Blosser Creek, Bradley Channel, Greene Valley Creek, and Main Street Canal.



Z:\Projects\118210_SantaMariaValley\SantaMariaManagementArea_wells.mxd RS

22-Aug-2012

4 2 0 4

Miles

Salt and Nutrient Planning Workgroup
Santa Barbara County IRWM Plan 2013

Santa Maria Groundwater Management Area

GEI Consultants
Bookman-Edmonston Division

TDS, CHLORIDE AND NITRATE CONCENTRATIONS WITHIN SANTA MARIA VALLEY ASSESSMENT AREA

FEBRUARY 2013

FIGURE 4.2.1

5 Evaluation of Existing Monitoring

A significant amount of the data used in this report has been extracted from the annual reports prepared for the TMA which rely on both existing monitoring programs and other data collected from water and wastewater system operators. In addition, the USGS, CCWQP and CCRWQCB collect stream flow and water quality data. This section discusses the data and its utility for this report.

5.1 Existing monitoring programs

Existing monitoring programs and the data collected in the Santa Maria Valley (Valley) are described in Section 2 of this report. This section evaluates the applicability of the existing monitoring to the salt and nutrient transport and fate analysis in Section 3 and identifies gaps in the data that have constrained the evaluation of past and present salt and nutrient management measures. While each monitoring program reviewed was set up to meet certain objectives, none of the programs were established to support this specific evaluation. This discussion does not evaluate data collection programs themselves or whether the data collected meets other objectives.

Existing data collection provides information on:

- Salt and nutrient inputs
- Climate conditions
- Surface flow (volume and quality)
- Water table gradient and fluctuation
- Ground water quality in the saturated zone,
- Water quality variation of drainage and other shallow groundwater discharges

The existing monitoring provides measurement of salts (TDS), Chloride Cl^- and Nitrogen (NO_3) at certain locations on a regular basis; however, measurements of TDS, Cl^- and NO_3 in other areas within in the Valley are not adequate to define all parameters represented in Figures 1.2a to 1.2f. As a result the current monitoring programs provided a sufficient basis for only a very general estimate of loading, transport and discharge as related to each parameter in the diagram.

As discussed in this section, data available for salt and nutrient assessment is of variable quality. In general public agency data collection is of good to excellent quality for the periods collected. Water production and discharge information from water purveyors and water treatment plants is detailed and complete for the period evaluated. Stream flow data is not consistently available due to a number of factors including cost and practicality. Private

well production and nutrient use data were not available and were estimated from published cropping and best practices information.

5.1.1 Measurement of Recharge and Sources of TDS, Cl^- and NO_3

Recharge to the basin both replenishes water supplies and introduces TDS, Cl^- and NO_3 into the hydraulic system. Recharge to the hydrologic system occurs from three sources:

- Rainfall
- Surface recharge (from streams flowing into the valley)
- Imported water

In addition, TDS, Cl^- and NO_3 are added as water softener discharge and as a result of fertilizer use. TDS, Cl^- and NO_3 are concentrated as water is used for urban, industrial and agricultural purposes.

Rainfall has been measured at two locations in the valley since 1900. Rainfall records are on file with the Santa Barbara County Flood Control and Water Conservation District (SBCFCD) and have been evaluated by that agency as a basis for drainage facility designs. Rainfall records are complete and provide daily measurements.

Surface water flows are derived from runoff and flow into the valley from surrounding watersheds including the Cuyama and Sisquoc rivers. The movement of water through the Valley hydrologic system is currently measured by stream gages in four locations. These are important measurements as there is significant variation in rainfall, which causes extreme ranges of stream flow. Surface flow measurements are used to describe elements of surface hydrology in Luhdorff and Scalmanini, 2012. In addition, two gages on the Santa Maria River and gages on five tributary streams are no longer operated, but past records provides insight regarding stream flow during non-measurement periods. This data was also used to predict runoff from drainages with no gage data but similar land uses.

Data from gaging has been used to estimate the recharge form certain streams. Stream gage information has been collected by the USGS, the SBCFCD and through occasional estimates by RWQCB and Central Coast Water Quality Preservation, Inc. (CCWQP). Stream gage data collected on the Cuyama River (as releases from Twitchell Reservoir), Sisquoc River, and Santa Maria River provide the basis for estimating the volume of recharge from unregulated flow and from releases from Twitchell Reservoir. These data have been collected for many years and are reliable. Gaging is the basis for estimates of annual recharge from surface flow. However, water quality data for these sources of recharge has been collected intermittently. Data collected indicates a range of TDS, Cl^- and NO_3 depending on season and level of flow. Data used in the analysis relied on averages of reported water quality and applied to annual flow.

Water quality data on smaller streams flowing in the Valley is contained in studies by the USGS and has been collected by CCWQP and RWQCB. No systematic measurements of flow in smaller streams are available, but the SBCFCD has measured depth of flow in discharge from the Green Canyon Watershed since 2006. From this limited data, rough estimates of annual flow were made. This data relates to discharge since recharge in smaller watersheds is generally due to direct infiltration of precipitation.

In the most northwesterly portion of the valley, several locations along Oso Flaco Creek and Orcutt-Solomon Creek are monitored for water quality monthly by the CCWQP. Flow velocity is estimated when water quality samples are collected, but the stream channel conditions are not generally conducive to accurate calculations of flow volume. In addition, this flow is generally discharged from shallow groundwater and does not contribute to recharge by surface streams.

5.1.2 Groundwater measurements and movement of TDS, Cl^- and NO_3

Groundwater levels and water quality are measured regularly at a number of points throughout the Valley (Luhdorff and Scalmanini, 2012). As many as 149 potential monitoring wells exist in the Valley; water quality information is currently measured in 14 wells. Existing groundwater monitoring wells that are included in the Annual Report for the Santa Maria Basin (Luhdorff and Scalmanini, 2012) are separated into two well networks; wells to monitor shallow groundwater and wells to monitor deep groundwater. Figures showing the shallow and deep well networks are included in Section 2 as Figures 2a and 2b (figures 2a and 2b in this assessment are the same as Figures 2a and 2b of the Annual Report prepared by Luhdorff and Scalmanini, 2012). At this time, four shallow wells and 10 deep wells are actively monitored for water quality.

With the exception of wells along the coast that were installed to monitor potential sea water intrusion and wells for water quality monitoring at the land fill and WWTPs, the other wells for which data were available were not constructed specifically for data collection. These wells serve other purposes such as agricultural and municipal production. However, water level, production, and water quality measurement data from municipal supply wells has been detailed enabling the calculation of the amount of TDS, Cl^- and NO_3 produced for urban use.

The data collected from irrigation production wells can be used only for estimates of water quality due to lack of available pumping records and only intermittent water quality testing. In addition, these wells typically are not equipped to allow sampling of individual aquifer zones. In the analysis reported in Section 3, values of water quality were averaged from wells of known depth and used with estimates of applied water as a basis for calculating volumes of TDS, Cl^- and NO_3 removed from the groundwater by agricultural pumping. Applied water was estimated from published crop data and surveys of land use which identify crop types and acreages. Applied water estimates were used to develop volumes of water pumped for agricultural use.

Spot measurements of agricultural drain flows made during water quality sampling by CCWQP and the CCRWQCB were used to estimate volumes of TDS, Cl^- and NO_3 discharged from shallow groundwater. Variation in water table elevation during wet periods will cause changes in drainage volume and subsurface transport so that salt and nutrients are discharged from shallow groundwater into surface drainages at varying rates. Since this flow is discharged from shallow groundwater, it was considered to contribute to recharge by surface streams.

Existing drain and surface water flow measurements and water quality measurements provide an estimate of load discharging out of the groundwater basin. However, these measurements do not extend throughout the 10-year analysis periods and therefore do not capture changes that may have occurred due to changes in management practices.

5.1.3 Measurements of TDS, Cl^- and NO_3 Discharge

Discharge of water from the basin is an essential mechanism for removing salt and nutrient from the basin. Discharge of water occurs through four basic mechanisms:

- Subsurface discharge through aquifer zones that extend beneath the ocean
- Surface flow from collection systems that receive agricultural drain water and surface runoff
- Natural surface flow (including runoff from urban and agricultural lands) in streams and the Santa Maria River
- Discharge through the Laguna County Sanitation District deep injection well.

Subsurface discharge to the ocean has been estimated from well data by the USGS and California Department of Water Resources (DWR) and is based on a groundwater gradient and a hypothetical cross-section of the Santa Maria Groundwater basin aquifer at the shoreline through the USGS coastal wells (Miller and Evanson 1966; DWR 2002). The accuracy of these estimates is constrained by a limited understanding of hydraulic characteristics of subsurface materials used in calculation of subsurface discharge. Water quality samples from these wells at various depths allow estimation of transport of TDS, Cl^-, and NO_3 from the groundwater basin as underflow and discharge to the ocean.

Surface flow from discharge of agricultural drains is discussed in the previous section. Other shallow discharges in the Valley vary as a function of rainfall and location. Estimates used in the analysis are based on occasional measurements of surface flow made during water quality sampling. Therefore, the variation of flow is not well documented. Since 2005, some monthly sampling of drainages has occurred through the Cooperative Management Program operated by CCWQP. Measurements made in high flow conditions provide some support for estimates of wet condition discharge. Flow and water quality measurements were combined to estimate average annual discharge of water as well as TDS, Cl^- and NO_3 from the drains. Discharge from drains was assumed to be transported from the basin.

In addition to the flow measurements made by CCWQP, stage measurements made in Green Canyon by the SBCFCD were converted into flow measurements using standard formulas for concrete structures of similar profile. This flow was prorated for two other, similar, watersheds (Bradley and Blosser drainages). Flows over 1 cfs in each drainage were considered to flow from the basin transporting TDS, Cl^- and NO_3. Volume of flow over 1 cfs and average water quality was used to estimate the volume of TDS, Cl^- and NO_3 discharged by this mechanism.

Surface flow is actively measured at Twitchell Reservoir (as reservoir releases) and four other stream gages in the basin by the USGS and FCD; two inactive gages are planned to be reestablished. Measurements in locations with good control are within typical accuracy for surface flow measurements. Other locations, such as the lower Santa Maria River have poorly defined channel geometry and thus flow is not presently gaged.

Discharge to the lower Cuyama River from Twitchell Reservoir is measured by the operator, the SMVWCD. During periods when releases are made, virtually all flow in the lower Cuyama River is from the reservoir. Measurement of releases has been standard operating procedure since the Reservoir was completed in 1958. Water quality measurements from reservoir discharges of Cuyama River flow have been taken only in the last few years. The available data were combined with measurements of releases for groundwater recharge to estimate TDS, Cl^- and NO_3 loading to the ground water basin.

Discharge of brine to the deep injection well by the LCSD is measured as a condition of operation of the WWTP. The data from those measurements are complete and provide an accurate measure of salt discharged from the basin through deep injection since 2003.

TDS, Cl^- and NO_3 in the groundwater are measured by several interests including public water suppliers and the USGS. The data summarized as part of the Annual Report (Luhdorff and Scalmanini, 2012); TDS and NO_3 measurements are reported from 10 deep wells and 4 shallow wells. Samples at each sample point are from a single zone; no data are available to show vertical variation.

No unsaturated (vadose) zone measurements are reported in the Annual Report. Estimates of TDS, Cl^- and NO_3 in the vadose zone were utilized in the evaluation discussed in Section 3.

5.2 Applicability of Existing Data

This section discusses the adequacy of existing data as a basis to estimate the salt and nutrient balance in the Santa Maria Valley discussed in Section 3.

Volume measurements for sources

- Imported water (SWP supplies) is directly monitored and high-quality volumetric and water quality data collected, which allows for the accurate characterization of salt and nutrient inflow.

- Urban groundwater extractions for municipal use are directly monitored and high-quality volumetric and water quality data collected, which allows for the characterization of the salt and nutrient value in water extracted for municipal use.
- For agricultural groundwater extractions, only indirect estimates of volume, and no direct data on water quality, are available. A limited number of USGS sampling points were used to estimate quality of water produced for agricultural uses, but information on the zones developed was limited. Use of estimates and uncertain data introduces significant uncertainty into the analysis.
- Vadose zone conditions between the root zone and the top of the water table were not considered in the evaluation.
- The analysis in Section 3 was based on static conditions; no estimates of attenuation during transport were developed.

Water Quality Measurements for Sources

- Rainfall: No water quality measurements are presently made of precipitation. Generally speaking NO_3 and TDS levels of precipitation are low and may be considered negligible compared to other sources. Therefore, the lack of water quality measurement for rainfall does not significantly affect the analysis.
- Stream Flow: Most stream infiltration occurs during high flows in the Sisquoc River or releases from Twitchell Reservoir. Water quality samples are taken from lower Cuyama River twice a year (when flowing); few water quality measurements are taken of other stream flows on a regular basis. Thus, the existing data are not sufficient to fully characterize water quality of stream flow as a source of ground water recharge. Thus the stream flow infiltration estimates reflected in the analysis introduced uncertainty in sources of TDS and NO_3 from surface flow.
- Groundwater Extractions: Complete high-quality water quality data extracted for municipal use allows characterization of salt and nutrient in water extracted. No direct data on quality of water extracted in agricultural areas is readily available except at a limited number of USGS sampling points which introduces significant uncertainty in estimating the volume of TDS, Cl^- and NO_3 in groundwater being pumped and applied for irrigation purposes. Since agricultural pumping is the largest source of extraction and water use in the valley, the uncertainty in the water quality information is directly reflected in uncertainty in the overall estimates in the analysis.
- Imported Water (SWP supplies): Complete, high-quality water quality data allows characterization of salt and nutrient imported through SWP deliveries.

Transport Mechanism

- Groundwater Movement: The volumes of TDS, Cl^- and NO_3 in transport within aquifers were not used in the analysis and no estimates were developed. Information on thickness and gradient is available in previous reports at a regional scale. However, no data are available with which to characterize changes in TDS, Cl- and NO_3 at depth and therefore data are not adequate for detailed estimates needed to

calculate amount of salt and nutrient being transported within the groundwater basin. Since volumes in transport were not a factor in the analysis, any lack of information did not significantly affect the analysis..

Sinks and Fates

- Discharge to Deep Wells: The discharge of brine to a deep injection well by LCSD is well documented through reports to permitting agencies. Thus estimates of discharge of TDS through brine discharge used in the analysis are considered reliable.
- Subsurface Groundwater Flow: The migration of groundwater beneath the coastal area may be estimated by local gradient calculations and the volume of salt and nutrient transported from the basin may be estimated based on water quality measurements from the coastal piezometers. Seasonal variation in water quality in the piezometers appears adequately documented through biannual measurements. However, variation along the shoreline is not well documented given there are only two piezometer clusters and there appears to be variation in nutrient level measured at the two locations.
- Surface Discharge from Field Drains: Some monthly measurements, conducted by CCWQP through the Cooperative Monitoring Program, may represent a composite sample of surface discharge of field drainage and subsurface drainage collected by surface drains.

Assimilative Capacity

- No estimates of assimilative capacity were made as part of the analysis in Section 3.

5.3 Gaps Analysis and Uncertainties

In this section, the existing monitoring system is evaluated, focusing on its ability to define sources, fate and changes of salts and nutrients in the analysis of the hydrologic system discussed in Section 3. Several important points underlie this gaps analysis. Previous sections have described a westward groundwater gradient and significant subsurface discharge to the ocean. Groundwater flow rates have been estimated by the USGS to be less than a few hundred feet per year. In addition, this report (Section 3, Figure 3-2) and others (Luhdorff and Scalmanini, 2012) note increases in NO_3 in monitoring wells in several areas of the Valley, particularly the western portions.

Other sections of this report outline changes in management techniques that reduce loading of nutrients to the basin. However, the existing monitoring shown in Figure 3-2 indicates continued increase or no reduction in NO_3 in all groundwater measured within the study area. This suggests that benefits from reduced NO_3 loading require many years to manifest themselves at existing measurement points.

5.3.1 Well Location, Construction and Hydrogeologic Characteristics

Vertical and horizontal locational information of all monitoring wells is good. Well head location and elevation of all monitoring wells has been established by GPS and/or surveying. However, 29 of the monitoring wells are "unclassified" as to depth of production zone. They are therefore not assigned to the shallow or deep monitoring well network due to inadequate documentation of production zones or vertical extent of filter pack material. In addition, some wells sampled may be completed in both confined and unconfined horizons. Because the water level elevation in confined and unconfined zones may be at different levels, water level data from multiple completion wells is not easily interpreted and water quality data from the well cannot be ascribed to a particular level in the aquifer system.

The location of existing monitoring wells provides uneven and sparse coverage of key areas in the eastern basin. In particular, effects of NO_3 in that area is not well documented. In addition, recharge along the Santa Maria River is not well documented.

Documentation of geologic materials encountered during well construction is inconsistent. The records of the coastal piezometers detail variation in geologic materials and the relationship to screened intervals. In most other wells used for monitoring, little or no reliable information on subsurface materials is available.

5.3.2 Areal Distribution of Ground Water Measurements

The areal distribution of groundwater measurements was sufficient to generally define the regional water table and surface gradients. However, existing measurements were not adequate to define the vertical and horizontal distribution of salt and nutrients within the basin. Currently, water level elevation is measured in 91 wells on an annual or semiannual basis while in a subset of those wells, 26 wells, water levels are made quarterly or semi-annually. Spring measurements are in March or April (before the irrigation season). Additional measurements are made in the fall, after the end of the most intense irrigation season. Some wells, such as those in or near the municipal well fields, are measured more frequently.

Of the 149 potential water level monitoring wells in the basin, 79 wells could be locations for monitoring water quality (37 shallow, 38 deep, and four unclassified). Water quality information was available from 14 wells, four of which are reported as shallow wells.

The location of existing monitoring wells provides uneven and sparse coverage of key areas in the eastern basin. In particular, lack of monitoring wells means that ground water quality in that area is not well documented.

A significant number of unused wells in the western portion of the Valley may be completed in both the upper and lower zones of the aquifer. These wells may allow flow between the upper and lower aquifer zones. The effect of these wells on water level and migration of NO_3 is not understood. Although data from shallow or deep wells was assumed to represent

only the designated level, this distinction may or may not be important throughout westernmost portions of the Valley.

5.3.3 Characteristics of Subsurface Discharge to the Ocean

Variation of the horizontal extent and permeability of the zone discharging to the ocean is not well defined. Simplifying assumptions underlie the indirect methods used to estimate rate of discharge. In addition, horizontal variation of nutrient and salt levels along the shoreline is documented but not well defined. Only two piezometer clusters are monitored and there appears to be vertical variation in nutrient level at each location and variation between the two locations. The Annual Report (Luhdorff and Scalmanini, 2012), points out that the deep aquifer zone at the northerly monitoring well has shown gradually increasing levels of nitrate up to the present. In contrast, in all aquifer zones near the southerly monitoring well set, the groundwater has consistently shown very low concentrations of nitrates through the present. These variations suggest uncertainty in estimates of discharge of TDS, Cl^- and NO_3 from the basin through the discharge path to the ocean developed in the analysis in Section 3.

5.3.4 Vertical Stratification of TDS and NO_3 in the Subsurface

Wells currently sampled for water quality are characterized as "deep," "shallow" or "unknown." However, these wells are spaced a considerable distance apart, thus only a coarse characterization of vertical groundwater quality, in the most general sense, is possible at the present time. Information is not readily available in the agricultural areas to characterize vertical variation of water quality within the aquifer zones developed as water sources. However, preliminary data provided from the City of Santa Maria suggests that in some areas NO_3 levels in ground-water may be significantly higher in the upper levels of the aquifer compared to lower zones. If this is the case, wells may be constructed and operated to take advantage of high or low NO_3 levels to meet water user preferences and needs.

5.3.5 Surface Water Measurements

Measurement of flow and water quality in surface streams in the Santa Maria Valley is a challenge due to the extremes of rainfall and streambed characteristics. The costs associated with surmounting these challenges and installing effective monitoring have resulted in-stream monitoring focused on the needs of the entity performing the monitoring. Specific challenges in surface water monitoring include:

1. Variation in surface flow due to seasonal/annual variation in rainfall
2. Variation in flow along stream courses due to infiltration
3. Lack of gaging station control (cross section)
4. Gages in need of being reestablished
5. Interpretation of surface drainage sampling to represent groundwater discharge.

Both substantial uncertainties and significant gaps exist in flow and water quality measurements used in the analysis in Section 3. As a result, the analysis and any conclusions drawn from it should be regarded as general in nature.

5.4 Conclusions

5.4.1 Salt and Nutrient Input Data

Inputs are sources of salt and nutrient that contribute to the hydrologic system including rainfall, recharge from Twitchell Reservoir, importation of water from the SWP, and applied fertilizer. The inputs include infiltration from other surface streams and applied irrigation water.

1. Inflow of water to the basin from sources including rainfall, Twitchell Reservoir releases and SWP deliveries is well documented for the analysis period. The data available for calculation of inputs to the conceptual model balance estimates are well defined and detailed.
2. Salt (TDS) loading data for imported SWP water and infiltration of treated sewage effluent is well documented for the analysis period. (This includes sources such as water softeners.) The data available for calculation of inputs to the conceptual model balance estimates are well defined and detailed.
3. Nitrogen (NO_3) loading data for imported SWP water and infiltration of treated sewage effluent is well documented for the analysis period. The data available for calculation of inputs to the conceptual model balance estimates are well defined and detailed.
4. Water quality data from Twitchell Reservoir releases is sparse for the analysis period. TDS and NO_3 data available for calculation of inputs from Twitchell Reservoir to the conceptual model balance estimates lack precision.
5. Streamflow and infiltration data from natural streamflow has been collected intermittently at several sites for the analysis period and generally lacks precision due to the physical characteristics of the measuring points and lack of continuity. TDS and NO_3 data available for calculation of inputs to the conceptual model balance estimates lack precision.
6. Water quality data from natural stream flow has been collected intermittently at several sites for the analysis period and generally lacks precision due to lack of time series data. TDS and NO_3 data available for calculation of inputs to the conceptual model balance estimates lack precision.
7. Irrigation production data for the analysis period were obtained from the Annual Report Luhdorff and Scalmanini (2012). The data were based on cropping information and not actual pumping or electrical use records. These estimates have some basis but there has been no evaluation of their precision.
8. Water quality data for water used for irrigation was not available for the analysis period; water quality was estimated from groundwater quality measurements made at existing monitoring wells. Source zones (aquifer zones sampled) for approximately

30% of the wells are not known. The correspondence between agricultural production zones and the zones represented by monitoring wells is not well documented. TDS and Nitrogen (NO_3) data available for calculation of irrigation water inputs to the conceptual model balance estimates lack precision.

9. Nitrogen application for the analysis period is estimated from NRCS and UCCE guidance materials and anecdotal evidence regarding management practices; no direct data on fertilizer use is available for this analysis. Transformation of the various forms of N to NO_3 was estimated based on academic research. Nitrogen (NO_3) data available for calculation of applied fertilizer inputs to the conceptual model balance estimates lack precision.

5.4.2 Salt and Nutrient Output Data

Outputs are elements of the hydrologic system and other mechanisms that remove salt and nutrient from the Santa Maria Valley. They include stream flow to the ocean, groundwater flow (underflow) to the west beneath the coast, crop material removed at harvest.

10. Streamflow and discharge to streams has been collected intermittently at several sites and generally lacks precision due to the physical characteristics of the measuring points. TDS and Nitrogen (NO_3) data available for calculation of values used in the conceptual model balance estimates lack precision.
11. Subsurface discharge of water is estimated from gradient data developed from 6 deep wells and 3 shallow wells in the western portion of the valley. Other data (permeability and depth of the aquifer) are based on two piezometer clusters near the ocean spaced 1.5 miles apart. Estimates of subsurface discharge have some basis but there has been no evaluation of their accuracy.
12. Subsurface discharge of TDS, Cl^- and NO_3 are estimated from water quality data collected intermittently at two piezometer clusters near the ocean spaced 1.5 miles apart. Estimates of subsurface water quality have some basis. Volume of discharge of TDS, Cl^- and Nitrogen (NO_3) data available as inputs to the conceptual model balance estimates have some basis but there has been no evaluation of their accuracy.
13. TDS, Cl^- and NO_3 in plant material removed at harvest are estimated from agricultural land use, simplifying assumptions for each crop type, NRCS and UCCE guidance materials, and anecdotal evidence regarding soil management practices; no direct data on TDS, Cl^- and NO_3 in plant material removed at harvest was readily available for this analysis.

5.5 Monitoring Recommendations

As discussed in Section 2 of this report, several entities monitor one or more of the following: surface flow, groundwater levels and water quality. These entities include the USGS, the RWQCB, the County of Santa Barbara, Twitchell Management Authority (TMA), and other parties (such as CCWQP). In accordance with the terms of the Settlement

Agreement and Order, the TMA manages a hydrologic monitoring program in the Santa Maria Valley. The original monitoring program has been recently expanded to include a CIMIS station (detailed climate conditions) at the Santa Maria Airport, biannual water quality measurements in the Cuyama River and expanded water level measurement in existing monitoring wells. Additional monitoring will be considered by the Twitchell Management Authority as part of development of their annual budget. This additional data collection is focused on the ongoing requirements of the Court and may or may not pertain to salt and nutrient management.

Recommendation 1: Continue to collect data under existing and newly expanded monitoring programs so that groundwater basin water quality and levels conditions can be reassessed in the future.

Recommendation 2: Periodic samples should be taken to document water quality of Twitchell Reservoir releases. The water quality benefits of releases from Twitchell Reservoir for groundwater recharge are not well documented. These releases appear to improve water quality in areas between the confluence of the Sisquoc and Cuyama Rivers and the Bonita School Road crossing west of the City of Santa Maria. This data will be used along with ground water monitoring to confirm the benefits.

Recommendation 3: Install transducers on northern perimeter wells. Groundwater movement at the boundaries of the study area is a key component to understanding the transport of salts and nutrients and the volume of water in the basin. Transducers provide regular level data to better understand seasonal trends.

Recommendation 4: An additional monitoring well is recommended to be installed in the northern portion of the City of Santa Maria in order to have a more comprehensive understanding of water level and quality in the northern portion of the aquifer Depending on the water quality and geologic materials encountered during drilling, consideration should be given to installation of piezometers rather that completion of the well at a single level.

Recommendation 5: The Green Canyon watershed gage should be rated (for depth vs. flow) and storm water samples collected. Information gathered should be used to evaluate the utility of using the watershed as a basis for estimating salt and nutrient movement from tributary watersheds.

Implementation of these recommendations and any other monitoring should be based on a clear understanding of the purpose and utility of data collected. Data collected should rely on proven and cost effective techniques and applied in defensible and meaningful ways.

6 Summary and Conclusions

This report addresses Total Dissolved Solids (TDS), Chloride (Cl^-) and Nitrate (NO_3) as indicators of salt and nutrient conditions in the Santa Maria Valley. The evaluation focused on conceptual model "snapshots" of 1990, 2000 and 2010 and was based on available information. The main conclusions are listed below.

6.1 Monitoring

- Available existing data provides basis for coarse estimates TDS, Cl^- and NO_3 balance in the Santa Maria Valley area.
- Current monitoring was established to address water management issues and water quality issues in relation to beneficial uses in the basin.
- Existing monitoring characterizes quantity and quality of imported (SWP) supplies and discharged waste water treatment throughout the analysis period.
- Monitoring of the smaller steams and agricultural drains improved during the analysis period.
- The available data are not temporally and spatially sufficient to document effectiveness of past and ongoing salt and nutrient management.
- Salt and nutrients discharged to the basin surface and groundwater by agricultural uses may be better understood in the future by monitoring under the proposed Ag Waiver.

6.2 Sources, Transport and Fate of Salt and Nutrient

- TDS and Cl^- sources include surface water, imported (SWP) water, water softeners, and naturally occurring geologic contributions
- NO_3 sources include municipal waste streams and fertilizer use (for both agriculture and landscaping)
- Significant reduction in NO_3 loading has occurred in the past 20 years due to improved nutrient management.
- Salt and Cl^- loading appears to have decreased in since 2000
- Salts and nutrients are transported by both surface- and groundwater.
- Salts and nutrients are transported from the valley by both surface and subsurface flow.

6.3 Water Quality Trends

- TDS and Cl^- have increased only modestly in monitoring wells along the coast.

- NO_3 levels have increased substantially in shallow wells, particularly in the western portion of the Valley.
- NO_3 levels began increasing in coastal monitoring wells in the mid to late 1980's, suggesting slow response to fertilizer use that has occurred for decades.
- Water quality trends in monitoring wells at the coast do not yet reflect reductions in NO_3 loading that appear to have begun in the 1990's.

References and Other Resources

Geology and Hydrology References and Resources

Ahlroth, J., 1992. *Santa Maria Ground Water Budget Status,* Santa Barbara County Water Agency memorandum, August 26, 1992.

Arnold and Anderson, 1907. *Geology and Oil Resources of the Santa Maria Oil District, Santa Barbara County, California*, U.S. Geological Survey Bulletin 322.

Brown and Caldwell, 1976. *Development of a Nonpoint Source Pollution Control Program for the Santa Maria Valley.*

California Department of Water Resources, Southern District, 2002. *Water Resources of the Arroyo Grande – Nipomo Mesa Area.*

California Regional Water Quality Control Board, 1995. *Assessment of Nitrate Contamination in Ground Water Basins of the Central Coast Region Preliminary Working Draft, Central Coast Region.*

Hopkins, Curtis, 2000. *Hydrogeological Review of the Santa Maria Valley Groundwater Basin Water Budget Models*, Memo to the Santa Barbara County Water Agency, Santa Barbara County, California.

Hughes, Jerry L., 1977. *Evaluation of Ground Water Quality in the Santa Maria Valley, California*, U.S. Geological Survey, Water-Resources Investigation 76-128.

Lippincott, J.B., 1931. *Report on Water Conservation and Flood Control of the Santa Maria River in Santa Barbara and San Luis Obispo Counties.*

Luhdorff and Scalmanini Engineers, 2008. *Monitoring Program for the Santa Maria Valley Management Area*, prepared for Superior Court of California, County of Santa Clara, and Twitchell Management Authority.

Luhdorff & Scalmanini Engineers, 2009. *2008 Annual Report of Hydrogeologic Conditions, Water Requirements, Supplies and Disposition, Santa Maria Valley Management Area.* Prepared for Superior Court of California, County of Santa Clara, and Twitchell Management Authority.

Luhdorff & Scalmanini Engineers, 2010. *2009 Annual Report of Hydrogeologic Conditions, Water Requirements, Supplies and Disposition, Santa Maria Valley*. Prepared for Superior Court of California, County of Santa Clara, and Twitchell Management Authority.

Luhdorff & Scalmanini Engineers, 2011. *2010 Annual Report of Hydrogeologic Conditions, Water Requirements, Supplies and Disposition, Santa Maria Valley*. Prepared for Superior Court of California, County of Santa Clara, and Twitchell Management Authority.

Luhdorff & Scalmanini Engineers, 2012. *2011 Annual Report of Hydrogeologic Conditions, Water Requirements, Supplies and Disposition, Santa Maria Valley*. Prepared for Superior Court of California, County of Santa Clara, and Twitchell Management Authority.

Luhdorff & Scalmanini Engineers, 2000. *Development of a Numerical Ground-Water Flow Model and Assessment of Ground–Water Basin Yield, Santa Maria Valley Ground-Water Basin*, March 2000.

Miller and Evanson, 1966. *Utilization of Groundwater in the Santa Maria Valley Area, California*, USGS Water Supply Paper 1819-A.

Morro Group, The, 1990. *Review of Groundwater Conditions in the Northern Santa Maria Basin and Scenarios for the Evaluation of Impacts of Development on the Water Resources of Nipomo Mesa*, Appendix A.

Santa Barbara County Resource Management Department, Orcutt Community Plan Update Proposed Final Environmental Impact Report (95 EIR-01), 1995.

Santa Barbara County Water Agency, 1994. *Santa Maria Valley Water Resources Report*.

Superior Court of California, County of Santa Clara, *Judgment after Trial*, entered January 25, 2008 incorporating 2005 *Settlement Stipulation for the Santa Maria groundwater basin adjudication*.

Toups Corporation, 1976. *Santa Maria Valley Water Resources Study.*

Water Agency, Santa Barbara County. 1998. *Santa Maria Groundwater Basin*. Water Agency Summary Report.

Woodring and Bramlette, 1950. *Geologic Map of the Santa Maria District, Santa Barbara County, California.*

Worts, G.F., 1951. *Geology and Groundwater Resources of the Santa Maria Valley Area, California*, U.S. Geological Survey Water Supply Paper 1000.

General (Regional) References and Resources

California Department of Fish and Game. 1945. *Report on the Relation to maintenance of Fish Resource of Proposed Dams and Diversions in Santa Barbara County, CA*. Administrative Report 45-25: 1-11.

California Department of Water Resources. 1995. *Compilation of Federal and State Drinking Water Standards and Criteria*, Quality Assurance Technical Document 3.

California Natural Resources Agency. 2009. *California Water Plan Update 2009*. Vol. 4, Reference Guide, 2009 California Climate Adaptation Strategy.

California Regional Water Quality Control Board. 1995. *Assessment of Nitrate Contamination in Ground Water Basins of the Central Coast Region Preliminary Working Draft*, Central Coast Region.

Cosby, P .G and J. A. Ahlroth. 1991. *Santa Barbara County Growth Inducement Potential of State Water Importation*, Santa Barbara County Water Agency.

Cosby, P .G and J. A. Ahlroth. 2003. *Santa Barbara County Water Supply and Demand Update*, Santa Barbara County Water Agency.

Dames & Moore. 1993. *Santa Barbara County Comprehensive Plan, Final Program EIR*. Groundwater Section Conservation Element.

Gibbs, Dennis. 2009. *2008 Santa Barbara County Groundwater Report.* Santa Barbara County Public Works Department, Water Resources Division, Water Agency.

Gibbs, Dennis. 2012. *2011 Santa Barbara County Groundwater Report*. Santa Barbara County Public Works Department, Water Resources Division, Water Agency.

National Marine Fisheries Service (NMFS). 2005. *Endangered and Threatened Species; Designation of Critical Habitat for Seven Evolutionarily Significant Units of Pacific Salmon and Steelhead in California*; Final Rule. 50 CFR Part 226. September 2, 2005.

National Marine Fisheries Service (NMFS). 2009. *Southern California steelhead recovery plan*. Public Review Draft Version. Southwest Regional Office, Long Beach, California.

Pierotti, B. and R. 1998, *Evaluation of Groundwater Overdraft in the Southern Central Coast Region*.

Santa Barbara County Flood Control. 1996. *1996 Precipitation Report*.

Santa Barbara County Planning & Development Department. 1994. *Santa Barbara County Comprehensive Plan, Conservation Element, Groundwater Resources Section*.

Santa Barbara County Planning and Development Department. 1995. *Environmental Thresholds and Guidelines Manual*.

Santa Barbara County Water Agency. 1977. *Adequacy of the Groundwater Basins of Santa Barbara County*.

Santa Barbara County water Agency. May 2007. *Countywide Integrated Regional Water Management Plan*.

Solak, Mark, et al. 1996. *Precipitation Augmentation Potential from Convection Band Seeding in Santa Barbara County*.

U.S. Forest Service. 2005. *Land Management Plan Part 2 Los Padres National Forest Strategy*. Pacific Southwest Region. R5-MB-078.

US Fish and Wildlife Service. *Climate Change in the Pacific Region*, http://www.fws.gov/pacific /Climatechange/challenges.html.

Turner, K.M. 1992. *Reliability of Storage Schemes, Tree Rings, and Hurst Phenomena*. California Department of Water Resources.

Recycled Water and Salt/Nutrient Regulatory References and Resources

California Department of Health Services. 2001. *California Health Laws Related to Recycled Water—June 2001 Update*, p. 51–57. California Department of Health Services, Sacramento, CA.

California Department of Water Resources. 2003. *Recycled Municipal Water, Section 14, Chapter 5, Resource Management Strategies. In California Water Plan Update 2003, vol. I.* California Department of Water Resources, Sacramento, CA.

California Department of Water Resources. 2004. *The California Water Plan, vol. 2. Resource Management Strategies*. Bulletin 160, 2004 Draft. California Department of Water Resources, Sacramento, CA.

California Recycled Water Task Force. 2003. *Final Report: Water Recycling 2030. Recommendations of the California Recycled Water Task Force, June 2003*. California Department of Water Resources, Sacramento, CA.

California State Water Resources Control Board Office of Water Recycling. 2002. *Survey of Recycled Water Use in California*. California State Water Resources Control Board Office of Water Recycling, Sacramento, CA.

Crook, J., and R. Y. Surampalli. 1996. *Water reclamation and reuse criteria in the U.S.* Wat. Sci. Technol. 33:451–462.

State of California. 2000. *PorterCologne Water Quality Control Act.* California Administrative Code, Division 7. State Water Resources Control Board, Sacramento, CA.

State of California. 1978. *Wastewater reclamation criteria, p. 1557–1609*. California Administrative Code. Title 22, Division 4. California Department of Health Services, Berkeley, CA.

Tchobanoglous, G., F. L. Burton, and H. D. Stensil. 2003. *Wastewater Engineering, Treatment, and Reuse.* 4th ed. McGrawHill, New York, NY.

Water Use, Water Quality and Nitrate, Technical and Management References and Resources

Bianchi, M., D. Mountjoy, and A. Jones. 2009. *The Farm Water Quality Plan*. Oakland: University of California Division of Agriculture and Natural Resources, Publication 8332.

Bolda, M., M. Gaskell, J. Fallon, M. Sanchez, T. Bottoms and T. Hartz. May 2012. *Strawberry plant nutrient sufficiency levels revised, Tim Hartz (speaker).* Strawberry Field Day, Friday, May 11, 2012. Manzanita Berry Farms, 1891 West Main, Santa Maria, CA 93458.

Burt, C.M., A. J. Clemmens, T. S. Streldoff, K. H. Solomon, R. D. Bliesner, L. A. Hardy, T. A. Howell, and D. E. Eisenhouer. 1997. *Irrigation Performance Measures: Efficiency and Uniformity.* Journal of Irrigation and Drainage Engineering, November/December 1997. Paper No. 11971.

Cachuma Resources Conservation District and the Dunes Center. August 2004. *Final Nitrate and Sediment Assessment, Oso Flaco Watershed, San Luis Obispo County, CA and Appendix A: Example Farm Plan*. Prepared for: California Regional Water Quality Control Board, Central Coast Region.

Cahn, Michael. 2012. *Irrigation Management of Strawberries (PowerPoint)*. Presentation by Irrigation and Water Resources Advisor, UCCE, Monterey County. 2012.

Cahn, Michael. 2012. *Tools for Improved Irrigation Management (PowerPoint); 2012 Irrigation and Nutrient Management and Water Quality Field Day.* Cooperative Extension Monterey County.

California Department of Water Resources. 2004. *Central Coast Hydrologic Region, Santa Maria River Valley Groundwater Basin.* California's Groundwater Bulletin 118.

California Regional Water Quality Control Board, Central Coast Region. 2012. *Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands.*

California State Water Resources Control Board. 2012. Addressing Nitrate in California's *Drinking Water. Technical Report 2: Nitrogen Sources and Loading to Groundwater*. Center for Watershed Sciences, University of California, Davis. http://groundwaternitrate.uscdavis.com

Callado, Rodolfo. May, 2012. *Fertilizer and nutrient applications 2011; informational discussion.* Mesa Vineyard Management Inc., 2570 Prell Road, Santa Maria, CA 93456.

Central Coast Vineyard Team. 2012. *Sustainability in Practice (SIP) Program for Certified Sustainable Vineyards*. http://www.vineyardteam.org/. List of SIP Certified Vineyards is found at www.sipthegoodlife.org

Central Coast Water Board Staff. November, 2010. *Appendix F, Draft Technical Memorandum: Cost Considerations Concerning Conditional Waiver of Wast Discharge Requirement for Discharges from Irrigated Lands (Draft Agricultural Order No. R3-2020-0006).* California Regional Water Quality Control Board, Central Coast Region.

Dzurella, Kristin N. et al. February, 2012. *Nitrate Source Reduction to Protect Groundwater Quality, Technical Report 3, Addressing Nitrate in California's Drinking Water with a Focus on Tulare Lake Basin and Salinas Valley Groundwater*. Report for the State Water Resources Control Board Report to the Legislature; prepared by Center for Watershed Sciences, University of California, Davis, California Nitrate Project, Implementation of Senate Bill X2 1, Tulare Lake Basin and Salinas Valley Pilot Studies for California State Water Resources Control Board.

Fine, L. O., C. G. Carlson, and J. H. Bischoff. 1988. *Irrigation: Your Water, Your Soil, and Their Compatibility*. Water Resources Institute, South Dakota State University, Brookings South Dakota.

Fry, Bob. 2010. *AWEP Lettuce Nitrogen Management Program for the Salinas Valley (PowerPoint); 2010 Irrigation and Nutrient Management and Cover Crop and Water Quality Field Day.* USDA/NRCS, Davis, CA.

GEI Consultants. 2012. *Santa Barbara County Water Supply and Demand Current Uses and Future Estimates*. Prepared for Santa Barbara County Water Agency.

Greene, Sarah. November 18th, 2011. *Update on Cooperative Monitoring: Water Quality Results for Santa Barbara Co. (PowerPoint)*. Presentation by Central Coast Water Quality Preservation, Inc., at AWQC Meeting, Buellton.

Hartz, Tim. 2012. *Nitrogen Management Project @ Dole Veg Corp (PowerPoint); 2012 Irrigation and Nutrient Management and Water Quality Field Day.* Cooperative Extension Monterey County. http://cemonterey.ucdavis.edu/Custom_Program567/Presentations/

Heinrich, Aaron. and Richard Smith, UCCE, Monterey. 2012. *Nutrient Uptake by Spinach (PowerPoint); 2012 Irrigation and Nutrient Management and Water Quality Field Day.* Cooperative Extension Monterey County.

Hoffman, Georges and Oswald Van Cleemput. September, 2004. *Soil and Plant Nitrogen.* International Fertilizer Industry Association, Paris.

Hughes, Jerry L. July 1977. *Evaluation of Ground-water Quality in the Santa Maria Valley, California.* U.S. Geological Survey Water-Resources Investigations 76-128 prepared in cooperation with the CA State Water Resources Control Board and the CA Regional Water Quality Control Board, Central Coast Region.

Jones, Kenneth R. May 1985. *Water Quality Objectives for the Santa Maria Ground Water Basin Staff Report (Revised)*. California Regional Water Quality Control Board, Central Coast Region.

Levine, A. D. and T. Asano. 2004. *Recovering sustainable water from wastewater.* Environ. Sci. Technol. 38:202A–208A.

Maan, Asif A. June 11, 2012. *Nitrogen Management Efforts (PowerPoint).* CA Department of Food and Agriculture, Fertilizer Research and Education Program.

Monterey County Water Resources Agency. 1999. *Fact Sheet 4: Using the Nitrate Present in Soil and Water in Your Fertilizer Calculations*.

Natural Resources Conservation Service. May 2011. *Conservation Practice Standard: Irrigation Water Management (Ac.)*. Publication CODE 449.

Natural Resources Conservation Service. August 2006. *Conservation Practice Standard: Nutrient Management (Ac.)*. Publication CODE 590.

Pettygrove, G. S., T. K. Hartz, R. Smith, T. R. Lockhart, B. R. Hanson, L. E. Jackson, and S. R. Grattan. 1998. *Management Goals and Management Practices: Nutrient Management Goals and Management Practices for Cool-Season Vegetables*. Oakland: University of California Division of Agriculture and Natural Resources, Publication 8097.

Pettygrove, G. S., T. K. Hartz, B. R. Hanson, L. E. Jackson, R. Smith, T. R. Lockhart, and S. R. Grattan. 1998. *Reference: Nutrient Management in Cool-Season Vegetables.* Oakland: University of California Division of Agriculture and Natural Resources, Publication 8098.

Robins, Paul. 2012. *Regional Irrigation Efficiency Program (PowerPoint); 2012 Irrigation and Nutrient Management and Water Quality Field Day.* Cooperative Extension Monterey County. At: http://cemonterey.ucdavis.edu/Vegetable_Crops/2011_Irrigation_and_Nutrient_Management Meeting_and_Cover_Crop_a/

Schmidt, Kirk and Sarah Greene. September, 2010. *Central Coast Region Conditional Waiver Cooperative Monitoring Program, Follow-Up Monitoring Report: Water Quality Results from Upstream Monitoring 2008.* Central Coast Water Quality Preservation, Inc.

Schmidt, Kirk and Sarah Green. Feb 19, 2008. *Cooperative Monitoring Program (PowerPoint); (Helping Central Coast Growers Comply with the Ag Waiver).* Central Coast Water Quality Preservation, Inc., Irrigation and Nutrient Meeting, Salinas, CA.

Sheikh, B., E. Rosenblum, S. Kasower, and E. Hartling. 1998. *Accounting for all the benefits of water recycling.* In Proceedings, Water Reuse ’98.

Smith, Richard, Michael Cahn, Aaron Heinrich, and Barry Farrara. 2012. *Fertilization Trials on Spinach and Nitrogen Fertilizer Technology Update (PowerPoint); 2012 Irrigation and Nutrient Management and Water Quality Field Day.* Cooperative Extension Monterey County.

Smith, Richard. 2012. *Nitrogen Management of Lettuce: Field Scale Studies (PowerPoint); 2012 Irrigation and Nutrient Management and Water Quality Field Day.* Cooperative Extension Monterey County.

Smith, Richard. 2010. *Practical Soil Nitrate Testing and Fertilizer Management (PowerPoint); 2010 Irrigation and Nutrient Management and Cover Crop and Water Quality Field Day.* Cooperative Extension Monterey County.

Styles, Stuart, Lynn Groundwater, and Curtis Lutje. 2011. *Strawberries: Effects of Modifying Irrigation Methods for Transplant Establishment.* ITRC Paper No. P 11-002. www.itrc.org/papers/strawberries.htm

Styles, Stuart, and Chuck Bates. 2011. *Strawberry Transplants: Modifying Irrigation Methods for Establishment.* ITRC Paper No. P 11-003. www.itrc.org/papers/strawberriesia.htm

UCCE, Monterey. 2011. *Nitrogen Management strategies to comply with water quality regulation (PowerPoint); 2011 Irrigation and Nutrient Management Meeting and Cover Crop and Water Quality Field Day Presentations.* Monterey County, Cooperative Extension Monterey County, 1432 Abbott Street, Salinas, CA 93901.

Appendix A

Scope of Work

03/02/2012

Scope of Work

Various water uses within the Santa Maria Valley have an interest in groundwater quality. These interests have formed a Working Group to guide development of a ground water assessment report to support a Salt Nutrient Plan. The Working Group may form a technical advisory committee (TAC). A consultant will assist in development of the report. In addition, the group will be responsible for guiding collaboration with local organizations and public agencies, as well as the public. The report will be based on existing hydrologic information and water quality data available through the working group and public agencies. A budget of $130,000 has been established for consultant services to assist in the work.

Task 1 Establish Collaborative Process

Task 1.1 Develop a Collaborative Process for Discussion

The outcome of this task will be the establishment of a Working Group for guiding the development of the ground water assessment. The working Group will be within the framework on the Santa Barbara County Integrated Regional Water Management Planning process. The consultant will maintain the contact list for working group, the technical committee, and other stakeholders in the watershed and will coordinate all workshops and distribution of meeting notifications and deliverables. If the Working Group establishes sub-groups or a TAC (based on working knowledge and expertise) to focus on specific issues, the consultant will work with that sub-group or TAC within this scope of work.

The Consultant will attend all Working Group meetings and will facilitate communication between the Working Group, the technical advisory committee, and the Consultant.

Task 1.2 Conduct Salt/Nutrient Meetings for Working Group

Under this task, two initial working group meetings will be conducted. The goal of the meetings will be to discuss the following:

- Organization and Function of the Working Group
- Defining and gaining consensus on the water quality problems and issues to be addressed
- Goals of the Groundwater Assessment Report
- Approach and the process for the development Groundwater Assessment Report
- Agency Coordination
- Data needs and data sources (including TMA, CCRWQCB, USGS, DHS)
- Access to data sources

- Process to assure consistency with emerging Regional Water Quality Control Board (RWQCB) guidelines
- Elements of the Groundwater Assessment
- Finalize the Scope of Work to develop the Groundwater Assessment Report

Deliverables:
One working group meeting covering: the purpose of the assessment, the process, and stakeholders roles and responsibilities. Written deliverables include a written summary of the Working Group meeting, final Scope of Work and a draft Word document covering the Introduction section of the Groundwater Assessment Report and a working outline of the report, due one month after the working group meeting required under this task.

Task 2 Gather Data and Develop Data Management Tool

Data regarding the occurrence, use, and quality of local water supplies are extensive. For example, recent efforts by the Twitchell Management Authority (TMA) have resulted in collection of relevant water supply information throughout the basin and development of a spatially oriented database management system (geographic information system or GIS). This Scope of Work assumes the specially oriented data base developed by TMA will be made available as a platform for evaluating ground water hydrology as adding water quality data. In addition, the Central Coast Regional Water Quality Control Board (CCRWQCB) has developed monitoring data and conceptual elements of dissolved solids transport within the basin. Development of the Groundwater Assessment Report will rely on these and other readily available existing data. The following sub-tasks will be conducted under this task:

Task 2.1 Conceptual Model Discussion

Under this task, one working group meeting will be conducted. The goal of the working group meeting is to discuss the following:

- Consensus by the stakeholders on the identity of inputs (sources) and outputs (transport and fate) of water, sodium, chloride, and nitrogen to the groundwater basin on a global (basin wide) basis.

Task 2.2 Review/summarize RWQCB Regulations

A review existing regulations and summary of past and ongoing evaluations of salt and nutrient sources and transport by CCRWQCB will be prepared.

Task 2.3 Identify Constituents and other Data Needs

For purposes of this scope, three constituents (sodium, chloride, and nitrate) will be considered. Data necessary to describe inputs and outputs will be identified.

Task 2.4 Gather Data

Consolidate data from sources identified in Task 1.2 `and identify data needs for analysis identified in Tasks 1.2 and 2.1. Data needed to fill gaps will be identified and requests for additional data made of potential sources. Where available, complete chemical data plotted in Stiff diagrams or trilinear plots or will be reviewed to identify long term changes in water chemistry.

Task 2.5 Data Management Protocol and Develop GIS Themes

Data from Tasks 2.3 and 2.4 will be compared to the data base used by TMA for development of Annual Reports for potential incorporation into existing GIS "themes" or layers for the groundwater basin. Base GIS map layers, templates and themes will be provided by TMA. The use of an existing GIS framework for its utility as a basis for development of the Ground Water Assessment Report will be explored. Example data maps and visualizations produced from other studies will be reviewed with cooperation of the work group. As appropriate, the GIS will be augmented with additional themes (information layers) of readily available and appropriately formatted data provided by TMA. The resulting body of information will be evaluated in Task 2.6 and later in conjunction with Task 3, to identify any gaps in gathered data that would be necessary to complete the Groundwater Assessment Report.

Task 2.6 Summarize and Evaluate Data, and Identify Gaps (in conjunction with Task 3)

The gathered data and information will be summarized in a draft section of the Assessment Report addressing data and data management. This will be an inventory and presentation of the existing and known data and data sources presenting where data is or has been collected (spatial) and when and for what periods the data is available (temporal). The documentation of publicly available data is an important step. The study will use all data made available to provide the basis for subsequent analysis. The inventory of available data will be circulated to the Work Group and ensure all the data is used for purposes of the study. The draft section will be further refined in conjunction with Task 3, in which any needs for additional data in support of development of the Groundwater Assessment Report will be outlined.

Deliverable: A draft Word document covering the current monitoring and data collection section of the Groundwater Assessment Report, due one month after the working group meeting required under this task.

Task 3 Assess Elements of the Ground Water Basin

Extensive evaluation of the Santa Maria groundwater basin has occurred by both public agencies and private interests. Elements of the groundwater basin will be assessed based on those previous evaluations made available through the working group and public agencies.

Task 3.1 Describe Basin Characteristics

Data gathered in the previous task will be used to describe the basin characteristics. The characterization will include the following:

- Climate
- Geology
- Hydrogeology/hydrology (e.g., flow characteristics, aquifer characteristics)
- Existing/background groundwater and surface water quality and quantity conditions
- Land cover and land use evaluation/mapping
- Beneficial uses
- Recharge areas
- Range of groundwater storage conditions.

The characterization will rely on existing information readily available from sources identified by the Working Group and public agencies.

Task 3.2 Describe Current Management

This task will include the following components:

- Facility locations (including NPDES permitted discharges)
- An initial overview of the irrigation, stormwater control, and other land use practices in the watershed.
    - This task may be expanded in the next phases of the Plan. Information presented in the Santa Maria Groundwater Basin Report (2008 SMVMA Annual Report) will be used for developing a preliminary assessment of the watershed.

Task 3.3 Conduct Preliminary Basin Analysis

The Santa Maria Groundwater Basin has been subject to extensive evaluation by various interests for water supply and water quality management. Based on this previous work and available data, an assessment of the basin and its hydrologic function will be developed. The following tasks will be accomplished:

- Preliminary water balance based on TMA evaluations
- Identification of sources of sodium, chloride, and nitrate
- Storage/available storage volume
    - Changes/range in recharge
    - Minimum and maximum storage

- Change in losses (migration from the basin)

The groundwater assessment will address the following:

- Development of a shared understanding of the local hydrologic conditions including the mechanisms for salt/nutrient transport.
- Testing of adequacy of existing data to support a complete description of the local hydrologic system
- Identification of gaps in existing information that inhibit understanding of basin functioning for salt and nutrient transport and assimilation.
- An informational foundation for eventual numeric modeling of alternative management strategies.

The ground water assessment will be developed in stages and will be subject to public review. Two meetings will be conducted to review the water and sodium, chloride, and nitrate balance. The results of the Task 3 evaluation will be incorporated into the Groundwater Assessment Report

The monitoring section of the groundwater assessment report prepared under Task 2 will be updated to identify data gaps and needs identified during the evaluation process from this task.

Task 3.4 Review by Working Group (and TAC)

The Working Group will be provided with 4 weeks to review the draft descriptions of Elements of the Ground Water Basin and its management. Based on the review of the working Group, the draft Elements will be revised for inclusion in the Groundwater Assessment Report prepared in Task 4.

Task 3.5 Update data gaps and needs

Data available for preparation of the draft Elements of the groundwater Assessment Report will be reviewed for relevance and to the extent that data gaps are identified, a discussion of data needs and potential methods to meet those needs will be prepared as a revised monitoring section of the groundwater assessment report prepared under Task 2.

Deliverables:
Results of these tasks will be discussed in one working group meeting scheduled at least three weeks after the draft Elements are available to the working Group. The documents will be provided as Word documents covering the basin characteristics, groundwater inventory, basin water quality and basin evaluation portions of the Assessment Report. In addition, a revised Monitoring Section summarizing data gaps and ways to address the data needs will be prepared.

Task 4 Develop Groundwater Assessment Report

Task 4.1 Develop Groundwater Assessment Report

Based on the results of Tasks 2 through 3, a report will be prepared to summarize the characteristics of the basin, including salt/nutrient inputs and outputs (sources, transport and fate), present the draft goals and objectives, make recommendations to augment ongoing monitoring, and outline the next steps for development and implementation of a Salt Nutrient Plan. The draft report will be sent for stakeholder review. One meeting will be held to review the draft report. Comments from the committees and stakeholder will be addressed, and the report will be revised.

Deliverable:
One meeting will be conducted on the draft Groundwater Assessment Report. A revised report will be prepared based on input from the stakeholders. The revised report will be submitted in a Word file format. The working Group will be provided one set of conformed and non-conflicting comments. Changes to the draft report will be made based on agreed upon responses to comments to produce the final Groundwater Assessment Report.

Task 5 Develop a Technical Memorandum with Potential Goals and Objectives

The Working Group will formulate a process to develop goals and objectives as a separate Technical Memorandum to the Working Group. This process will be based on the review of existing data (Task 2) and development of shared understanding of salt and nutrient transport and fate (Task 3) and the conclusions of the Groundwater Assessment Report (Task 4). It is expected that the working group will address both institutional and quantitative goals and objectives. Examples of issues the working group may choose to address are listed in Tasks 3.1, 3.2 and 3.3.

Task 5.1 Develop Institutional Goals and Local Objectives

The overall goal of this task is to develop institutional goals and local objectives for a Salt Nutrient Plan based on input from the local stakeholders. Topics to be addressed in this task may include:

- Institutional controls and decision making
- Management practices
- Water quality monitoring

Task 5.2 Develop Quantitative Goals and Local Objectives

The purpose of this task is to facilitate discussions among local agencies to develop broad goals and quantitative local objectives for the Technical Memorandum. The local objectives are established to support the region in measuring and tracking progress towards meeting the broader goals. Topics that may be considered for this task include:

- Means of addressing local objectives for water quality
- Groundwater elevation limits
- Groundwater storage objectives (use, volume)
- Control of sub-surface discharge to the ocean
- Limitations on banked water withdrawal rate and storage

Deliverable:
One meeting with the working group to review conclusions of the groundwater basin assessment focusing on whether it is getting better or worse in terms of individual constituents. At that meeting the working group will finalize the draft goals and objectives to be incorporated into the Task 5 Technical Memorandum

Task 6 Project Management

Monthly progress reports and invoices will be prepared. In addition, up to four phone calls will be held with the IRWM Steering Committee to review progress and provide input and coordination for the project.

Appendix B

Suggested Elements of a Salt and Nutrient Management Plan

DRAFT
SALT/NUTRIENT MANAGEMENT PLANS
— SUGGESTED ELEMENTS —

I. BACKGROUND

- Purpose
  - Protection of Beneficial Use
  - Sustainability of Water Resources
  - Problem Statement
- Salt/Nutrient Management Objectives
- Regulatory Framework
- Groundwater Beneficial Uses
- ***Stakeholder Roles and Responsibilities***
- Process to Develop Salt/Nutrient Management Plan

II. GROUNDWATER BASIN CHARATERISTICS

1. GROUNDWATER BASIN OVERVIEW

- Physiographic Description
- Groundwater Basin and/or Sub-Basin Boundaries
- Watershed Boundaries
- Geology
- Hydrogeology/Hydrology
- Aquifers
- Recharge Areas
- Hydrologic Areas Tributary to the Groundwater Basin
- Climate
- Land Cover and Land Use
- Water Sources

2. GROUNDWATER INVENTORY

- Groundwater Levels
  - Historical, Existing, Regional Changes
- Groundwater Storage
  - Historical, Existing, Changes
- Groundwater Production
  - Historical, Existing, Spatial and Temporal Changes, Safe Yield
- Groundwater Mixing and Movement
  - Subsurface Inflow/Outflow
  - Horizontal and Vertical Movement and Mixing

3. ***BASIN WATER QUALITY***

- ***Groundwater Quality***
  - Background, Historical, Existing
  - Water Quality Objectives
- Surface Water Quality
- Delivered Water Quality
- Imported Water Quality
- Recycled Water Quality

Bold = Required by the Recycled Water Policy

III. BASIN EVALUATION
1. WATER BALANCE
• Conceptual Model • Basin Inflow/Outflow • Groundwater, Surface Water, Imported Water, Water Transfers, Recycled Water Irrigation, Waste Water Discharges, Agricultural Runoff, Stormwater Runoff (Urban, Agriculture, Open Space), Precipitation • Infiltration, Evaporation, Evapotranspiration, Recharge, Surface Water and Groundwater Connectivity
2. ***SALT AND NUTRIENT BALANCE***
• Conceptual Model • ***Salt and Nutrient Source Identification*** • ***Salt and Nutrient Loading Estimates***   • Historical, Existing, Projected • Import/Export • ***Basin/Sub-Basin Assimilative Capacity for Salt and Nutrients*** • ***Fate and Transport of Salt and Nutrients***
3. ***CONSTITUENTS OF EMERGING CONCERNS (CECs)****
* - Requirements for monitoring CECs will be determined following State Water Board review of the CEC Advisory Panel's report due in June 2010. • Constituents • CEC Source Identification
4. PROJECTED WATER QUALITY
IV. SALT AND NUTRIENT MANAGEMENT STRATEGIES

• Load Reduction Goals
• Future Land Development and Use
• Salt/Nutrient Management Options
• Salt/Nutrient Management Strategies and Modeling
  • Management Strategy Model Results
  • Feasibility
  • Cost

V. BASIN MANAGEMENT PLAN ELEMENTS
1. GROUNDWATER MANAGEMENT GOALS
• Groundwater Management Goals • ***Recycled Water and Stormwater Use/Recharge Goals and Objectives***
2. ***BASIN MONITORING PROGRAMS***
• ***Identify Responsible Stakeholder(s) Implementing the Monitoring*** • Monitoring Program Goals • Sampling Locations • ***Water Quality Parameters*** • ***Sampling Frequency*** • Quality Assurance/Quality Control • Database Management

Bold = Required by the Recycled Water Policy

• Data Analysis and Reporting
• Groundwater Level Monitoring
• ***Basin Water Quality Monitoring***
• ***Groundwater Quality Monitoring***
  • ***Areas of Surface Water and Groundwater Connectivity***
  • ***Areas of Large Recycled Water Projects***
  • ***Recycled Water Recharge Areas***
• Surface Water Quality Monitoring
• Stormwater Monitoring
• Wastewater Discharge Monitoring
• Recycled Water Quality Monitoring
• Salt and Nutrient Source Loading Monitoring
• Other Constituents of Concern
• Water Balance Monitoring
  • Climatological Monitoring
  • Surface Water Flow Monitoring
  • Groundwater Production Monitoring

3. SALT AND NUTRIENT LOAD ALLOCATIONS
VI. ***CEQA ANALYSIS***
VII. ***ANTIDEGRADATION ANALYSIS***
VIII. PLAN IMPLEMENTATION
1. ***SALT AND NUTRIENT MANAGEMENT PROGRAM***

• Organizational Structure
• ***Stakeholder Responsibilities***
• ***Implementation Measures to Manage Salt and Nutrient Loading***
• Salt/Nutrient Management
  • Water Supply Quality
  • Regulations of Salt/Nutrients
  • Load Allocations
  • Salt and Nutrient Source Control
  • CEC Source Control
  • Site Specific Requirements
• Groundwater Resource Protection
• Additional Studies

2. PERIODIC REVIEW OF SALT/NUTRIENT MANAGEMENT PLAN
• Adaptive Management Plan • Performance Measures • Performance Evaluation
3. COST ANALYSIS • CWC § 13141, "…prior to implementation of any agricultural water quality control program, an estimate of the total cost of such a program, together with an identification of potential sources of funding, shall be indicated in any regional water quality control plan."
4. IMPLEMENTATION SCHEDULE

Bold = Required by the Recycled Water Policy

5. PUBLIC HEARING AND ADOPTION

Bold = Required by the Recycled Water Policy

Appendix C

Salt and Nutrient Planning Working Group

Appendix C: Santa Barbara IRWM Plan 2013
Salt and Nutrient Planning Workgroup Planning Participants

#	Name	Agency/Organization
1	Bruce Wales	SYRWCD
2	Martin Wilder	County of SB - Laguna County Sanitation District
3	Julie Fallon	Cachuma Resource Conservation District
4	Claire Wineman	V.P, Grower-Shipper Association of SB & SCO Cos.
5	Richard Quant	Grower-Shipper Association of SB & SCO Cos.
6	Steve Kahn	City of Santa Maria
7	Lisa Long	City of Santa Maria
8	Ellen Pritchett	City of Santa Maria
9	Michael LeBrun	Nipomo CSD
10	Patrick Vowell	Golden State Water Company
11	Kenneth Petersen	Golden State Water Company
12	Kevin Peterson	RCD - Santa Barbara
13	Dennis Delzeit	City of Guadalupe, Contract Engineer
14	Shannon Sweeney	City of Santa Maria
15	Randy Sharer	Stakeholder/TMA (stipulated property owners rep)
16	Peter Meertens	RWQCB, Central Coast
17	Brad Newton	Consultant (Nipomo CSD)(SLO side)
18	Tom Gibbons	Santa Maria Valley WCD
19	Kevin Merrill	Santa Barbara County Farm Bureau (Mesa Vineyard Management)
20	Mike Weil	DWR Regional Service Rep
21	Ann Coats	Cachuma Resource Conservation District
22	Kathy Caldwell	RMC Water and Environment
23	Jane Gray	Dudek
24	Bret Stewart	County Water Agency
25	Matt Naftaly	County Water Agency
26	Rob Almy	GEI
27	Sam Schaefer	GEI
28	Aaron McWilliams	GEI

Appendix D

Fact sheet for Order R3-2012-0011 ("2012 Ag Order")

Fact Sheet

Frequently Asked Questions:

What is the Agricultural Order?

- The Agricultural Order (Order) is a Conditional Waiver of Waste Discharge Requirements for discharges from irrigated lands in the Central Coast Region. The Order number is R3-2012-0011.
- The Order is authorized by the California Porter-Cologne Water Quality Control Act and was adopted by the Central Coast Water Board on March 15, 2012. The Order is in effect for five-years unless modified by the Central Coast Water Board before it expires on March 15, 2017.
- The Order replaces a previous order which had been in effect since 2004.

Who is regulated by the Order?

- Similar to the previous order, the Order regulates both landowners and operators of irrigated lands where water is applied for producing commercial crops, from which runoff could affect water quality. Examples are land planted to row, vineyard, field and tree crops, commercial nurseries, nursery stock production, and some greenhouse operations.

How are growers regulated by the Order?

- Growers must enroll in the Order and pay fees. The fees are based on acres of irrigated agriculture.
- The Order is effective immediately but some conditions have completion or reporting dates months or years into the future.
- Growers are categorized in tiers, based on the risk their farm poses to ground and surface water. They must implement the conditions in the Order, according to the tier that applies to their farm. The conditions in the Order are listed after the words, “It is hereby ordered that:” on page 13 of the Order.
- Growers must implement the monitoring and reporting requirements in the Monitoring and Reporting Program, according to the tier that applies to their farm.
- Growers may indicate that their information is proprietary so the Water Board does not release that information to the public. The Water Code and other laws protect trade secrets from public disclosure.
- The Order scales the requirements based on threat to water quality, placing farms in one of three tiers. Farms that are lower threat are in either Tier 1 or Tier 2 (approximately 97% of all farms in the region) and have fewer requirements.

- Farms that are the highest risk to water quality and drinking water sources are in Tier 3, (approximately 3% of all farms) and have more requirements.
- The Order gives growers flexibility in choosing how to comply, and provides many alternatives to meet requirements. It encourages and provides incentives for cooperative water quality improvement efforts to reduce costs and maximize effectiveness.
- Growers who do not comply with the requirements of the Order may be subject to enforcement, consistent with the State's Enforcement Policy. The Water Board will use progressive enforcement, ranging from notices of violations or requests for information to financial penalties, as appropriate. Growers who meet reporting deadlines and implement management practices that reduce pollution loading will generally be in compliance.
- Summaries of requirements for each tier are included at the end of this Fact Sheet: Tier 1 (p.3), Tier 2 (p.4-5), and Tier 3 (p.6-8).

How does a grower enroll in the Order?

- Growers must enroll in the Order by submitting an electronic-Notice of Intent (eNOI), unless they have already done so. The eNOI and instructions are available on the Water Board's website at: http://www.waterboards.ca.gov/centralcoast/water_issues/programs/ag_waivers/noi_submittal.shtml

How does a grower know what tier their farm is in?

- Water Board staff have updated the eNOI so enrolled growers can see which tier their farms/ranches are in when they access their eNOI information on the Water Board's GeoTracker website using their username and password.
- **By May 15, 2012,** Water Board staff will notify enrolled growers of their tier by mail.

How can a grower and other stakeholders learn about the Order?

- **By May 15, 2012,** Water Board staff will distribute written information to growers, including a copy of the Order, a list of requirements for each tier, a five-year compliance calendar, a list of Water Board contacts, and a list of resources available to growers.
- **In May – July 2012,** Water Board staff will conduct workshops to inform growers of the new requirements.
- More detailed information about the requirements is available at: http://www.waterboards.ca.gov/centralcoast/water_issues/programs/ag_waivers/index.shtml
- For questions or to reach Water Board staff directly, individuals can contact the Water Board office at (805) 549-3147.

What do Tier 1 growers have to do to comply with the Order?

- **By May 15, 2012,** all Tier 1 growers that irrigate land to produce commercial crops must enroll in the Order by submitting an eNOI.
- **By October 1, 2012,** all Tier 1 growers that apply fertilizers, pesticides, fumigants or other chemicals through an irrigation system must have back flow prevention devices.
- **By October 1, 2012,** all Tier 1 growers must develop, implement and keep up to date a Farm Water Quality Management Plan (Farm Plan) that includes management practices, treatment or control measures related to irrigation efficiency, pesticide management, salinity management, nutrient management, sediment and erosion control and aquatic habitat protection.
- All Tier 1 growers must implement management practices to treat or control discharges and protect water quality.
- All Tier 1 growers must minimize bare dirt and prevent erosion.
- All Tier 1 growers must protect existing aquatic habitat next to their farms.
- Monitoring and Reporting-
    - **By September 15, 2012,** all Tier 1 growers must monitor the creeks and estuaries that may receive farm runoff. Growers can choose to participate in the existing Cooperative Monitoring Program (CMP) implemented by Central Coast Water Quality Preservation, Inc., or they can choose to monitor individually. Samples must be collected and analyzed for sediment and nutrients monthly, and pesticides, toxicity and metals quarterly. Results must be reported by January 1, 2013.
    - **By March 15, 2013,** all Tier 1 growers must sample the groundwater from the primary irrigation well and any drinking water well on their farm twice (in Sept/Oct 2012 and March 2013). Groundwater samples must be analyzed for nitrate and general minerals. Growers can also comply by submitting existing groundwater data and can also work with neighboring growers on cooperative groundwater monitoring. Results must be reported by October 1, 2013.
- Tier 1 Growers must comply with the above and all other Tier 1 conditions in the Order (pages 13-27) and the Tier 1 Monitoring and Reporting Program R3-2012-0011-01.
    - The Order is available on the Water Board's website at http://www.waterboards.ca.gov/centralcoast/water_issues/programs/ag_waivers/docs/ag_order/final_agorder_atta_032612.pdf
    - The Tier 1 Monitoring and Reporting Program R3-2012-0011-01 is available on the Water Board's website at http://www.waterboards.ca.gov/centralcoast/water_issues/programs/ag_waivers/docs/ag_order/final_mrp_tier1_032612.pdf

What do Tier 2 growers have to do to comply with the Order?

- **By May 15, 2012,** all Tier 2 growers that irrigate land to produce commercial crops must enroll in the Order by submitting an eNOI.
- **By October 1, 2012,** all Tier 2 growers that apply fertilizers, pesticides, fumigants or other chemicals through an irrigation system must have back flow prevention devices.
- **By October 1, 2012,** all Tier 2 growers must develop, implement and keep up to date a Farm Water Quality Management Plan (Farm Plan) that includes management practices, treatment or control measures related to irrigation efficiency, pesticide management, salinity management, nutrient management, sediment and erosion control and aquatic habitat protection.
- All Tier 2 growers must implement management practices to treat or control discharges and protect water quality.
- All Tier 2 growers must minimize bare dirt and prevent erosion.
- All Tier 2 growers must protect existing aquatic habitat next to their farms.
- **By October 1, 2012,** all Tier 2 growers must calculate their risk of loading nitrate to groundwater from their farm (using specified methodology).
- **By October 1, 2012,** Tier 2 growers must take photos to document the existing condition of adjacent streams or wetlands, if those waters are impaired by sediment, turbidity or temperature (a list is in the Order on page 33).
- **By October 1, 2014,** Tier 2 growers must record and report total nitrogen applied, if the farm/ranch has a high nitrate loading risk.
- Monitoring and Reporting-
    - **By September 15, 2012,** all Tier 2 growers must monitor the creeks and estuaries that may receive farm runoff. Growers can choose to participate in the existing Cooperative Monitoring Program (CMP) implemented by Central Coast Water Quality Preservation, Inc., or they can choose to monitor individually. Samples must be collected and analyzed for sediment and nutrients monthly, and pesticides, toxicity and metals quarterly. Results must be reported by January 1, 2013.
    - **By October 1, 2012,** and annually thereafter, all Tier 2 growers must submit annual compliance information, such as verification of Farm Plan, information about discharge, identification of completed farm water quality management practices and nitrate loading risk. All information must be submitted electronically through an on-line annual compliance form, similar to the eNOI.
    - **By March 15, 2013,** all Tier 2 growers must sample the groundwater from the primary irrigation well and any drinking water well on their farm twice (in Sept/Oct 2012 and March 2013). Groundwater samples must be analyzed for nitrate and

general minerals. Growers can also comply by submitting existing groundwater data and can also work with neighboring growers on cooperative groundwater monitoring. Results must be reported by October 1, 2013.

- Tier 2 Growers must comply with the above and all other Tier 2 conditions in the Order (pages 13-28) and the Tier 2 Monitoring and Reporting Program R3-2012-0011-02.
    - The Order is available on the Water Board's website at http://www.waterboards.ca.gov/centralcoast/water_issues/programs/ag_waivers/docs/ag_order/final_agorder_atta_032612.pdf
    - The Tier 2 Monitoring and Reporting Program R3-2012-0011-02 is available on the Water Board's website at http://www.waterboards.ca.gov/centralcoast/water_issues/programs/ag_waivers/docs/ag_order/final_mrp_tier2_032912.pdf

What do Tier 3 growers have to do to comply with the Order?

- **By May 15, 2012,** all Tier 3 growers that irrigate land to produce commercial crops must enroll in the Order by submitting an eNOI.
- **By October 1, 2012,** all Tier 3 growers that apply fertilizers, pesticides, fumigants or other chemicals through an irrigation system must have back flow prevention devices.
- **By October 1, 2012,** all Tier 3 growers must develop, implement and keep up to date a Farm Water Quality Management Plan (Farm Plan) that includes management practices, treatment or control measures related to irrigation efficiency, pesticide management, salinity management, nutrient management, sediment and erosion control and aquatic habitat protection.
- All Tier 3 growers must implement management practices to treat or control discharges and protect water quality.
- All Tier 3 growers must minimize bare dirt and prevent erosion.
- All Tier 3 growers must protect existing aquatic habitat next to their farms.
- **By October 1, 2012,** all Tier 3 growers must calculate their risk of loading nitrate to groundwater from their farm (using specified methodology).
- **By October 1, 2012,** Tier 3 growers must take photos to document the existing condition of adjacent streams or wetlands, if those waters are impaired by sediment, turbidity or temperature (a list is in the Order on page 33).
- **By October 1, 2014,** Tier 3 growers must record and report total nitrogen applied, if the farm/ranch has a high nitrate loading risk.
- Irrigation and Nutrient Management
    - Tier 3 farms must prepare an Irrigation and Nutrient Management Plan if the farm/ranch has a high nitrate loading risk.
    - The purpose of the Irrigation and Nutrient Management Plan is to protect groundwater and surface water, especially drinking water sources, from nitrate contamination, by preventing the excessive application of water and nutrients.
    - The Irrigation and Nutrient Management Plan includes nutrient budgeting information such as crop nitrogen uptake values, amount of nitrogen applied, nutrient balance ratio, and an estimate of nitrate loading to groundwater and reductions achieved.
    - The Order includes nutrient balance ratio milestones as indicators of pollution reduction. The ratio compares the amount of nitrogen applied to the amount of nitrogen needed to produce a crop. The Order does not require 100 percent crop efficiency. Existing data demonstrate that, in many cases, growers are already achieving the milestones.

- Water Quality Buffer Plan
    - Tier 3 growers must prepare a Water Quality Buffer Plan if the farm/ranch is adjacent to a creek or wetland impaired by sediment, turbidity or temperature (a list is in the Order on page 33).
    - The purpose of the Water Quality Buffer Plan is to protect adjacent streams from erosion and sediment loading or other waste discharges. Growers can prepare an alternative plan if it is similarly protective.
- Monitoring and Reporting-
    - **By September 15, 2012,** all Tier 3 growers must monitor the creeks and estuaries that may receive farm runoff. Growers can choose to participate in the existing Cooperative Monitoring Program (CMP) implemented by Central Coast Water Quality Preservation, Inc., or they can choose to monitor individually. Samples must be collected and analyzed for sediment and nutrients monthly, and pesticides, toxicity and metals quarterly. Results must be reported by January 1, 2013.
    - **By October 1, 2012,** and annually thereafter, all Tier 3 growers must submit annual compliance information, such as verification of Farm Plan, information about discharge, identification of completed farm water quality management practices and nitrate loading risk. All information must be submitted electronically through an on-line annual compliance form, similar to the eNOI.
    - **By March 15, 2013,** all Tier 3 growers must sample the groundwater from the primary irrigation well and any drinking water well on their farm twice in the first year of the Order (in Sept/Oct 2012 and March 2013), and once annually thereafter. Groundwater samples must be analyzed for nitrate and general minerals. Growers can also comply by submitting existing groundwater data and can also work with neighboring growers on cooperative groundwater monitoring. First year results must be reported by October 1, 2013.
    - **By October 1, 2013,** all Tier 3 growers must start individual surface water discharge monitoring. Results must be reported by March 15, 2014, October 1, 2014, and annually thereafter.
    - **By October 1, 2015,** Tier 3 growers whose farm/ranch has a high nitrate loading risk must submit elements of their Irrigation and Nutrient Management Plan and report on progress towards meeting specified nutrient balance ratio targets.
    - **By October 1, 2016,** these same high nitrate risk Tier 3 growers must submit their Irrigation and Nutrient Management Plan Effectiveness Report.

- **By October 1, 2016,** Tier 3 growers whose farm/ranch is adjacent to a creek or wetland impaired by sediment, turbidity or temperature (a list is in the Order on page 33) must submit their Water Quality Buffer Plan.

- Tier 3 growers must comply with the above and all other Tier 3 conditions in the Order (pages 13-32) and the Tier 3 Monitoring and Reporting Program R3-2012-0011-03.
  - The Order is available on the Water Board's website at http://www.waterboards.ca.gov/centralcoast/water_issues/programs/ag_waivers/docs/ag_order/final_agorder_atta_032612.pdf
  - The Tier 3 Monitoring and Reporting Program R3-2012-0011-03 is available on the Water Board's website at http://www.waterboards.ca.gov/centralcoast/water_issues/programs/ag_waivers/docs/ag_order/final_mrp_tier3_032912.pdf

Appendix E

Preliminary TDS, Cl^-, and NO_3 Balance Calculations

Salt and Nutrient Loading from Source Water, Santa Maria Valley, 2010

Santa Maria Source Water Salt/Nutrient Loading

Source	Flow	Flow	Chloride	Nitrate	TDS	Chloride	Nitrate	TDS
	AF	MG	mg/L	mg/L	mg/L	Lb	Lb	Lb
Well 9S	0.0	0.0	64	77.7	1000	-	-	-
Well 10S	26.0	8.5	56	52.6	720	3,959	3,715	50,906
Well 11S	1085.0	353.5	30	4.9	730	88,515	14,384	2,153,869
Well 12S	801.0	261.0	52	18.3	860	113,267	39,770	1,873,259
Well 13S	565.0	184.1	48	37.4	935	73,749	57,450	1,436,570
Well 14S	609.0	198.4	62	66.0	1000	102,678	109,257	1,656,091
State Water	10279.0	3349.4	1.98	0.64	310	55,319	18,018	8,662,478
Total	**13365.0**	**4355.0**				**437,487**	**242,595**	**15,833,173**

Source of Data

Well flow data obtained from the City of Santa Maria (TMA Data 2010_LS)

Well chloride conc. obtained from the City of Santa Maria (TMA Data 2011)

Well 11S Cl conc. is a historical average

Well nitrate conc. was obtained from the City of Santa Maria (TMA Data 2010_LS)

Well TDS conc. was obtained from the City of Santa Maria (TMA Data 2011)

Well 11S TDS conc. is a historical average

State Water flow and conc. obtained from CCWA (Process Control Benchsheets)

Cl, N, and TDS conc. are weighted averages.

Subsequent Use of Data

Well data represent salt and nutrient removed from the basin ("Out" in Balance).

State Water data represent salt and nutrient brought in to the basin ("In" in Balance).

Salt and Nutrient Loading from Source Water, Santa Maria Valley, 2010

Golden State Water Company - Orcutt System Source Water Salt/Nutrient Loading

Source	Flow	Flow	Chloride	Nitrate	TDS	Chloride	Nitrate	TDS
	AF	MG	mg/L	mg/L	mg/L	Lb	Lb	Lb
Kenneth #1	1398.3	455.6	38	17	650	144,494	64,642	2,471,613
Mira Flores #1	252.9	82.4	98	53.67	810	67,397	36,910	557,058
Mira Flores #2	680.8	221.8	27	5.9	640	49,986	10,923	1,184,858
Mira Flores #4	750.8	244.6	38	8.7	620	77,584	17,763	1,265,851
Mira Flores #5	370.5	120.7	31	5.2	660	31,233	5,239	664,965
Mira Flores #6	360.4	117.4	38	4.3	1100	37,242	4,214	1,078,063
Mira Flores #7	840.7	273.9	35	9.8	610	80,016	22,404	1,394,561
Oak Plant #1	700.7	228.3	22	3.7	650	41,920	7,050	1,238,546
Orcutt #1	389.8	127.0	76	14	510	80,561	14,840	540,603
Woodmere #1	650.6	212.0	36	20	650	63,692	35,384	1,149,990
Woodmere #2	811.5	264.4	35	14	660	77,237	30,895	1,456,462
State Water	248.0	80.8	1.95	0.63	308	1,318	427	207,739
Total	**7455.0**	**2429.2**				**752,680**	**250,693**	**13,210,312**

Source of Data

Well flow data obtained from GSWC (Orcutt System_2010 Monthly Groundwater)

Well chloride conc. obtained from GSWC (Orcutt_WQ_Data)

Results taken from latest year for which data was available - 2008

Well nitrate conc. obtained from GSWC (Orcutt_WQ_Data)

Mira Flores Well #1 concentration is the 2010 average

Well TDS conc. was obtained from GSWC (Orcutt_WQ_Data)

Results taken from latest year for which data was available - 2008

State Water flow and conc. obtained from CCWA (Process Control Benchsheets)

Cl, N, and TDS concentrations are weighted averages.

Subsequent Use of Data

Well data represent salt and nutrient removed from the basin ("Out" in Balance).

State Water data represent salt and nutrient brought in to the basin ("In" in Balance).

Salt and Nutrient Loading from Source Water,
Santa Maria Valley, 2010

Guadalupe Source Water Salt/Nutrient Loading

Source	Flow	Flow	Chloride	Nitrate	TDS	Chloride	Nitrate	TDS
	AF	MG	mg/L	mg/L	mg/L	Lb	Lb	Lb
Obispo Well	880.5	286.9	19	2	640	45,496	4,789	1,532,483
State Water	0.0	0.0	N/A	N/A	N/A	-	-	-
Total	**880.5**	**286.9**				**45,496**	**4,789**	**1,532,483**

Source of Data

Well flow data from the City of Guadalupe (2010 Guadalupe - Water Production)
Well chloride conc. obtained from the City of Guadalupe (Lab Results - 2011)
Well nitrate conc. obtained from the City of Guadalupe (Lab Results - 2010)
Well TDS conc. obtained from the City of Guadalupe (Lab Results - 2011)
The City of Guadalupe received no State Water in 2010.

Subsequent Use of Data

Well data represent salt and nutrient removed from the basin ("Out" in Balance).

Salt and Nutrient Loading from Source Water, Santa Maria Valley, 2010

Agriculture - Source Water Salt/Nutrient Loading and N Balance

			Ave. Concentration			Pumped			Nitrate Balance			Returned		
Source	**Flow**	**Flow**	**Chloride**	**Nitrate**	**TDS**	**Chloride**	**Nitrate**	**TDS**	**Irrigated Acres**	**Applied Nitrogen lb/A**	**Root Zone Efficiency**	**Chloride**	**Nitrate**	**TDS**
	AF	MG	mg/L	mg/L	mg/L	Lb	Lb	Lb				Lb	Lb	Lb
Rotational Vegetables	86002	28024	82.81	30	997	19,366,811	7,016,113	233,168,830	36597	205	0.55	19,366,811	12,286,932	233,168,830
Strawberries	9495	3094	82.81	20	997	2,138,181	516,407	25,742,867	6782	174	0.55	2,138,181	2,152,912	25,742,867
Vineyard	5129	1671	82.81	7.66	997	1,155,001	106,839	13,905,757	4662	40	0.95	1,155,001	36,230	13,905,757
Total Pasture	1803	588	82.81	7.66	997	406,018	37,557	4,888,298	515	15	0.85	406,018	345	4,888,298
Field	0	0	82.81	7.66	997	-	-	-	0	-	-	-	-	-
Grain	225	73	82.81	7.66	997	50,668	4,687	610,021	750	90	0.85	50,668	44,256	610,021
Nursery	460	150	82.81	7.66	997	103,588	9,582	1,247,153	228	100	0.85	103,588	13,929	1,247,153
Total Orchard	80	26	82.81	7.66	997	18,015	1,666	216,896	30	100	0.85	18,015	2,243	216,896
Total	103194	33626				23,238,282	7,692,851	279,779,822				23,238,282	14,536,848	279,779,822

Source of Data

Groundwater Chloride, Nitrate, and TDS conc. obtained from Ludhorf & Scalmanini (SMVMA_HistGWQ_LSCE)

Wells Used for determining average groundwater concentration:	009N034W03A002S	009N033W10M001S	010N036W02Q004S
	010N033W20H001S	010N034W14E004S	010N036W02Q007S
	010N034W04R002S	010N034W29N001S	011N036W35J002S
	010N035W14D003S	010N033W30G001S	011N036W35J003S
	009N033W02A007S	010N036W02Q001S	011N036W35J004S
	010N033W22N003S	010N036W02Q003S	011N036W35J005S

The average concentrations of Cl, Nitrate, and TDS used in the table above were calculated based on the 18 wells (listed to the left) that were sampled in 2010.

Subsequent Use of Data

The "Pumped" values represent salt and nutrient removed from the basin ("Out" in Balance).

The "Returned" values represent salt and nutrient that are reintroduced to the basin ("In" in Balance).

Nitrate concentration of irrigation source water is increased for Rotational Vegetables and Stawberries (in comparison to previous two decades) which reduces applied nitrogen in recognition of improved management; the inclusion of the management practices is based on grower information obatained at stakeholder meetings.

Root Zone Efficiency increased by 5-percent in each crop category in comparison to previous decade to represent improved nutrient and water mangement practices; root zone efficiency for N is related to applied water distribution uniformity for Vineyard, Pasture, Field, Grain, Nursery, and Orchard categories.

Salt and Nutrient Loading from Wastewater, Santa Maria Valley, 2010

Laguna Sanitation District WWTP - Effluent Salt/Nutrient Loading*

Month	Flow	Chloride	Nitrate	TDS	Chloride	Nitrate	TDS
	MG	mg/L	mg/L	mg/L	Lb	Lb	Lb
Jan	58.28	140	31.4	615	68,092	15,286	299,117
Feb	53.20	180	31.4	752	79,916	13,954	333,869
Mar	66.03	167	31.4	733	92,025	17,319	403,917
Apr	63.30	163	17.7	759	86,107	9,354	400,952
May	65.41	233	17.7	750	127,188	9,666	409,404
Jun	62.70	184	17.7	714	96,279	9,265	373,605
Jul	64.17	150	14.2	591	80,329	7,586	316,495
Aug	65.10	150	14.2	676	81,493	7,696	367,261
Sep	63.00	160	14.2	762	84,122	7,448	400,629
Oct	65.10	190	48.7	675	103,224	26,454	366,718
Nov	63.60	150	48.7	724	79,615	25,845	384,276
Dec	70.99	180	48.7	737	106,639	28,848	436,628
Total	760.88				1,085,028	178,719	4,492,873

*Reflects use of reverse osmosis and injection well to reduce TDS and Cl in LCSD effluent.

Source of Data

WWTP Flow and WQ data obtained from LCSD (LCSD Annual POTW Report - 2010)

Nitrate conc. based on quarterly sampling.

Subsequent Use of Data

WWTP data represents salt/nutrient reintroduced to the basin ("In" in Balance)

Salt and Nutrient Loading from Wastewater, Santa Maria Valley, 2010

Laguna Sanitation District Brine Injection Program - Brine Salt/Nutrient Loading

Month	Flow	Chloride	Nitrate	TDS	Chloride	Nitrate	TDS
	MG	mg/L	mg/L	mg/L	Lb	Lb	Lb
Jan	2.33	4900	220.0	22460	95,254	4,277	436,613
Feb	2.05	4900	220.0	10105	83,981	3,771	173,189
Mar	2.19	4900	220.0	11235	89,623	4,024	205,492
Apr	2.19	4280	247.0	10210	78,386	4,524	186,990
May	2.26	4280	247.0	7086	80,668	4,655	133,555
Jun	2.24	4280	247.0	11735	79,836	4,607	218,896
Jul	2.78	2400	810.0	6580	55,684	18,793	152,667
Aug	2.72	2400	810.0	4141	54,533	18,405	94,092
Sep	2.37	2400	810.0	1702	47,519	16,038	33,699
Oct	2.31	5800	11.0	14850	111,695	212	285,977
Nov	2.29	5800	11.0	8510	111,043	211	162,927
Dec	2.16	5800	11.0	8895	104,577	198	160,381
Total	27.901				992,798	79,714	2,244,480

Source of Data

Brine Injection flow and WQ data obtained from LCSD's 2010 EPA Brine Discharge Permit

Cl, Nitrate, and TDS conc. values based on qtrly sampling, unless more detailed data available
August TDS conc. not recorded; Value based on average between Jul/Sep

Subsequent Use of Data

Brine Injection Program data represents salt/nutrient removed from the basin ("Out" in Balance)

Salt and Nutrient Loading from Wastewater, Santa Maria Valley, 2010

Santa Maria WWTP - Effluent Salt/Nutrient Loading

Month	Flow	Flow	Chloride	Nitrate	TDS	Chloride	Nitrate	TDS
	AF	MG	mg/L	mg/L	mg/L	Lb	Lb	Lb
Jan	652	212	169	33.2	783	299,641	58,864	1,388,277
Feb	564	184	175	33.2	747	268,401	50,919	1,145,688
Mar	629	205	185.5	33.2	802	317,294	56,788	1,371,803
Apr	616	201	196	8.0	857	328,325	13,347	1,435,583
May	641	209	193	8.0	857	336,420	13,889	1,493,845
Jun	637	208	183	8.0	857	316,999	13,802	1,484,523
Jul	677	221	164	26.6	857	301,925	48,897	1,577,743
Aug	728	237	167	26.6	857	330,609	52,580	1,696,598
Sep	715	233	190	26.6	857	369,425	51,641	1,666,302
Oct	724	236	212	8.4	815	417,389	16,559	1,604,586
Nov	621	202	164	8.4	815	276,951	14,203	1,376,309
Dec	645	210	167	8.4	815	292,916	14,752	1,429,500
Total	7849	2558				3,856,294	406,242	17,670,758

Source of Data

WWTP Flow data obtained from the City of Santa Maria (CSM WWTP Flows)

Chloride conc. obtained from the City of Santa Maria (WWTP Salt Data to GEI)

March conc. is an average between February and April

Nitrate conc. obtained from the City of Santa Maria (WWTP Nitrogen data to GEI)

Jan-2011 conc. used for Jan, Feb, Mar 2010

Based on Qtly. Sampling.

TDS conc. obtained from the City of Santa Maria (WWTP Salt Data to GEI)

March conc. is an average between February and April

Based on qtrly sampling, unless more detailed data available

Subsequent Use of Data

WWTP effluent data represents salt/nutrient reintroduced to the basin ("In" in Balance)

Salt and Nutrient Loading from Wastewater,
Santa Maria Valley, 2010

Guadalupe WWTP - Effluent Salt/Nutrient Loading

Month	Flow	Flow	Chloride	Nitrate	TDS	Chloride	Nitrate	TDS
	AF	MG	mg/L	mg/L	mg/L	Lb	Lb	Lb
Jan	-	18.693	93.5	24.5	893	14,586	3,822	139,309
Feb	-	15.548	93.5	24.5	893	12,132	3,179	115,871
Mar	-	17.516	93.5	24.5	893	13,668	3,581	130,537
Apr	-	17.579	93.5	24.5	893	13,717	3,594	131,006
May	-	17.986	93.5	24.5	893	14,034	3,677	134,040
Jun	-	17.696	93.5	24.5	893	13,808	3,618	131,878
Jul	-	18.544	93.5	24.5	893	14,470	3,792	138,198
Aug	-	18.772	93.5	24.5	893	14,648	3,838	139,897
Sep	-	18.640	93.5	24.5	893	14,545	3,811	138,914
Oct	-	19.982	93.5	24.5	893	15,592	4,086	148,915
Nov	-	17.608	93.5	24.5	893	13,739	3,600	131,223
Dec	-	16.954	93.5	24.5	893	13,229	3,466	126,349
Total	572.35	186.501				168,168	44,065	1,606,135

Source of Data

WWTP effluent data obtained from the City of Guadalupe

Chloride, Nitrate, and TDS conc. based on semi-annual monitoring and is calculated as the average of the April and October measurements.

Subsequent Use of Data

WWTP effluent data represents salt/nutrient reintroduced to the basin ("In" in Balance)

Salt and Nutrient Loading from Wastewater,
Santa Maria Valley, 2010

Groundwater Movement - Salt/Nutrient Loading

Well	Flow	Flow	Chloride	Nitrate	TDS	Chloride	Nitrate	TDS
	AFY	MG/Yr	mg/L	mg/L	mg/L	Lb/Yr	Lb/Yr	Lb/Yr
10N36W02Q007S	7000	2281	509	0.08	1380	3,402,600	783,217	25,602,779
11N36W35J003S			63.3	63.6	1190			
11N36W35J004S			77.3	63.3	1450			
11N36W35J005S			65.4	37.6	1360			
10N36W02Q001S	2000	652	22.9	2.07	702	127,991	11,313	3,959,389
10N36W02Q003S			21.6	2.17	712			
11N36W35J002S			26.1	2	770			
Total	9000	2933				3,530,591	794,529	29,562,168

Source of Data

Total average annual groundwater flow obtained from Luhdorff & Scalmanini

Groundwater flow from deep and shallow aquifers was estimated.

Water Quality data obtained from Historical TDS and N - Graphs See fig 4.2

WQ info from Wells 10/36 2Q1 and 2Q3, and 11/36 35J1 were used to represent the deep aquifer. No WQ info for 10/36 2Q2.

WQ info from Wells 10/36 2Q7 and 11/36 35J3, 35J4, and 35J5 were used to represent the shallow aquifer. No depth info for 10/36 2Q4.

The average Cl, Nitrate, and TDS conc. were calculated individually for the deep aquifer and shallow aquifer based on the representative wells.

Subsequent Use of Data

This table represents the movement of groundwater out of the basin, thus the data represents salt/nutrient removed from the basin ("Out" in Balance)

Salt and Nutrient Loading from Wastewater, Santa Maria Valley, 2010

Surface Water Discharge to Groundwater basin/Ocean

			Ave. Concentration			Total			To Ocean				To Groundwater			
Water Body	Flow	Flow	Chloride	Nitrate	TDS	Chloride	Nitrate	TDS	Flow	Chloride	Nitrate	TDS	Flow	Chloride	Nitrate	TDS
	AFY	MG/Yr	mg/L	mg/L	mg/L	Lb/Yr	Lb/Yr	Lb/Yr	MG/Yr	Lb/Yr	Lb/Yr	Lb/Yr	MG/Yr	Lb/Yr	Lb/Yr	Lb/Yr
Cuyama River	52000	16944	55	0.8853	1100	7,777,371	125,191	155,547,421	0	-	-	-	16944	7,777,371	125,191	155,547,421
Sisquoc River	38000	12382	20	0.8853	775	2,066,714	91,486	80,085,167	5431	906,453	40,125	35,125,073	6951	1,160,260	51,361	44,960,094
Orcutt Creek	1700	554		143.64	2070	-	664,056	9,569,430	486	-	583,073	8,402,426	68	-	80,982	1,167,004
Santa Maria River Total	39700	29881				9,844,085	880,733	245,202,017	5917	906,453	623,199	43,527,499	23963	8,937,632	257,534	201,674,518
Oso Flaco Creek	2900	945		38.91	1450	-	306,850	11,434,911	945	-	306,860	11,435,284	0	-	-	-
Blosser Creek	820	267	48	6	725	107,034	13,379	1,616,660	267	107,034	13,379	1,616,660	0	-	-	-
Bradley Channel	3440	1121	47	32	1200	439,666	299,347	11,225,520	1121	439,666	299,347	11,225,520	0	-	-	-
reene Valley Creek	1260	411	225	58	1960	770,939	198,731	6,715,733	411	770,939	198,731	6,715,733	0	-	-	-
Main Street Canal	2250	733	94	22	1160	575,145	134,608	7,097,531	733	575,145	134,608	7,097,531	0	-	-	-

Source of Data

Flow data for each of the water bodies is the average annual flow, based on Luhdorff & Scalmanini and the CCAMP website

Cuyama River is a losing river; meaning that flows do not discharge to the ocean except in high-flow situations

Cuyama River Nitrate and TDS data obtained from CCAMP (Website; Data from 2007)

Cuyama River Cl obtained from Luhdorff & Scalmanini (Cl conc. not available from CCAMP)

Sisquoc River Nirtate and TDS data obtained from CCAMP (Website; Data from 2007)

Sisquoc River Cl obtained from Luhdorff & Scalmanini (Cl conc. not available from CCAMP)

Orcutt Creek Nitrate and TDS data obtained from CCAMP (Website; Data from 2007)

Orcutt Creek Cl data not available from CCAMP or Luhdorff & Scalmanini

Oso Flaco Creek Nitrate and TDS data obtained from CCAMP (Website; Data from 2007)

Oso Flaco Creek Cl data not available from CCAMP or Luhdorff & Scalmanini

Blosser Creek Flow, Cl, Nitrate, and TDS data obtained from CCAMP (Data Request)

Data from CCAMP used to develop Average Flow and Average CL, Nitrate, and TDS concentrations. Average values shown above

Bradley Channel Flow, Cl, Nitrate and TDS data obtained from CCAMP (Data Request)

Data from CCAMP used to develop Average Flow and Average CL, Nitrate, and TDS concentrations. Average values shown above

Greene Valley Creek Flow, Cl, Nitrate and TDS data obtained from CCAMP (Data Request)

Data from CCAMP used to develop Average Flow and Average CL, Nitrate, and TDS concentrations. Average values shown above

Main Street Canal Flow, Cl, Nitrate and TDS data obtained from CCAMP (Data Request)

Data from CCAMP used to develop Average Flow and Average CL, Nitrate, and TDS concentrations. Average values shown above

Subsequent Use of Data

The "To Ocean" values represent salt and nutrient removed from the basin ("Out" in Balance).

The "To Groundwater" values represent salt and nutrient that are brought into the basin ("In" in Balance).

Estimated Annual Chloride and TDS Load Balance, Santa Maria Valley, 2010

Agency/Location	Source of Water	In		Out		Balance	
		Chloride	TDS	Chloride	TDS	Chloride	TDS
	Imported/SWP, Wells	Lb	Lb	Lb	Lb	Lb	Lb
City of Santa Maria - SWP Outside Landscape Infiltration	SWP	11,064	1,732,496			11,064	1,732,496
City of Santa Maria - WWTP Infiltration	SWP/Wells	3,856,294	17,670,758			3,856,294	17,670,758
City of Santa Maria - Municipal and Industrial Pumping	Wells			382,168	7,170,695	(382,168)	(7,170,695)
City of Santa Maria - Well Outside Landscape Infiltration	Wells	76,434	1,434,139			76,434	1,434,139
City of Guadalupe - WWTP Infiltration	Wells	168,168	1,606,135			168,168	1,606,135
City of Guadalupe - Municipal and Industrial Pumping	Wells			45,496	1,532,483	(45,496)	(1,532,483)
City of Guadalupe - Well Outside Landscape Infiltration	Wells	9,099	306,497			9,099	306,497
Golden State Water Co. - SWP Outside Landscape Infiltration	SWP	264	41,548			264	41,548
Golden State Water Co. - Municipal and Industrial Pumping	Wells			751,362	13,002,573	(751,362)	(13,002,573)
Golden State Water Co. - Well Outside Landscape Infiltration	Wells	15,117	261,603			15,117	261,603
Laguna Sanitation District - WWTP Infiltration	SWP/Wells	1,085,028	4,492,873			1,085,028	4,492,873
Laguna Sanitation District - Brine Disposal				992,798	2,244,480	(992,798)	(2,244,480)
Agriculture - Pumped	Wells			23,238,282	279,779,822	(23,238,282)	(279,779,822)
Agriculture - Deep Percolation	Wells	17,312,520	208,435,968			17,312,520	208,435,968
Santa Maria River	N/A					-	-
Cuyama River	N/A	7,777,371	155,547,421	-	-	7,777,371	155,547,421
Sisquoc River	N/A	1,160,260	44,960,094	906,453	35,125,073	253,807	9,835,020
Orcutt Creek	N/A	-	1,167,004	-	8,402,426	-	(7,235,422)
Oso Flaco Creek	N/A			-	11,435,284	-	(11,435,284)
Groundwater Discharge From Basin	N/A			3,530,591	29,562,168	(3,530,591)	(29,562,168)
High flows directly to Ocean	N/A	-	-	1,892,784	26,655,444	(1,892,784)	(26,655,444)
	Totals	**31,471,618**	**437,656,534**	**31,739,935**	**414,910,448**	**(268,316)**	**22,746,085**

Notes:

Estimated - 25% of the Agriculture-Pumped water and associated salts, are lost to surface runoff.

Estimated - 0.5% of the Agriculture-Pumped water and associated salts, are lost to crop harvest.

Estimated - 74.5% of the Agriculture-Pumped water and assiciated salts are assumed to return to the basin as Agriculture-Deep Percolation.

Positive values in the Balance columns indicate a general inflow of Chloride/TDS into the basin.

Negative values (values in parentheses) in the Balance columns indicate a general removal of Chloride/TDS from the basin.

High flows directly to Ocean include flow from Blosser Creek, Bradley Channel, Greene Valley Creek, and Main Street Canal.

Estimated Annual Nitrate Load Balance, Santa Maria Valley, 2010

Agency/Location	Source of Water	In Nitrate	Out Nitrate	Balance Nitrate	Balance NO3-N Equivalent
	Imported/SWP, Wells	Lb	Lb	Lb	Lb
City of Santa Maria - SWP Outside Landscape Infiltration	SWP	18,018	-	18,018	4,067
City of Santa Maria - WWTP Infiltration	SWP/Wells	406,242	-	406,242	91,703
City of Santa Maria - Municipal and Industrial Pumping	Wells		224,576	(224,576)	(50,694)
City of Santa Maria - Well Outside Landscape Infiltration	Wells	44,915		44,915	10,139
City of Guadalupe - WWTP Infiltration	Wells	44,065	-	44,065	9,947
City of Guadalupe - Municipal and Industrial Pumping	Wells		4,789	(4,789)	(1,081)
City of Guadalupe - Well Outside Landscape Infiltration	Wells	958		958	216
Golden State Water Co. - SWP Outside Landscape Infiltration	SWP	85	-	85	19
Golden State Water Co. - Municipal and Industrial Pumping	Wells		14,571	(14,571)	(3,289)
Golden State Water Co. - Well Outside Landscape Infiltration	Wells	5,035		5,035	1,137
Laguna Sanitation District - WWTP Infiltration	SWP/Wells	178,719		178,719	40,343
Laguna Sanitation District - Brine Disposal			79,714	(79,714)	(17,994)
Agriculture - Pumped	Wells		7,692,851	(7,692,851)	(1,736,535)
Agriculture - Deep Percolation	Wells	14,536,848		14,536,848	3,281,456
Santa Maria River	N/A			-	-
Cuyama River	N/A	125,191	-	125,191	28,260
Sisquoc River	N/A	51,361	40,125	11,235	2,536
Orcutt Creek	N/A	80,982	583,073	(502,091)	(113,339)
Oso Flaco Creek	N/A	-	306,860	(306,860)	(69,269)
Groundwater Discharge From Basin	N/A		794,529	(794,529)	(179,352)
High flows directly to Ocean	N/A	-	646,066	(646,066)	(145,839)
	Totals	**15,492,421**	**10,387,155**	**5,105,266**	**1,152,430**

Notes:

Estimated - 25% of the Agriculture-Pumped water and associated salts, are lost to surface runoff.

Estimated - 0.5% of the Agriculture-Pumped water and associated salts, are lost to crop harvest.

Estimated - 74.5% of the Agriculture-Pumped water and assiciated salts are assumed to return to the basin as Agriculture-Deep Percolation.

Positive values in the Balance columns indicate a general inflow of nitrate into the basin

Negative values (values in parentheses) in the Balance columns indicate a general removal of nitrate from the basin.

High flows directly to Ocean include flow from Blosser Creek, Bradley Channel, Greene Valley Creek, and Main Street Canal.

Salt and Nutrient Loading from Source Water, Santa Maria Valley, 2000

Santa Maria Source Water Salt/Nutrient Loading

Source	Flow	Flow	Chloride	Nitrate	TDS	Chloride	Nitrate	TDS
	AF	MG	mg/L	mg/L	mg/L	Lb	Lb	Lb
Well 5S*	0.14	0.05	51	19.7	600	20	8	235
Well 7S*	0.02	0.01	42	30.1	710	2	1	30
Well 8S	0.13	0.04	62	42.0	1100	22	15	395
Well 9S	53.99	17.59	55	42.2	1000	8,075	6,195	146,812
Well 10S	109.16	35.57	42	18.6	840	12,467	5,521	249,344
Well 11S*	0.03	0.01	31	3.3	720	3	0	60
Well 12S	61.46	20.03	29	9.4	680	4,847	1,571	113,656
Well 13S	6.32	2.06	21	4.5	640	361	77	10,997
Well 14S	317.63	103.50	19	3.6	590	16,411	3,109	509,612
State Water	12174.0	3966.9	1.98	0.64	310	65,518	21,340	10,259,462
Total		**4145.7**				**107,681**	**37,815**	**11,289,943**

Source of Data

Well flow data obtained from the City of Santa Maria (TMA Data 2010_LS)

Well chloride conc. obtained from the City of Santa Maria (TMA Data 2008)

2001 measurements used unless otherwise indicated

*2002 measurements used

Well nitrate conc. was obtained from the City of Santa Maria (CCR Nitrate)

Well TDS conc. was obtained from the City of Santa Maria (TMA Data 2008)

2001 measurements used unless otherwise indicated

*2002 measurements used

State Water flow data obtained from Luhdorff & Scalmanini

State Water conc. based on 2010 State Water conc.

Subsequent Use of Data

Well data represent salt and nutrient removed from the basin ("Out" in Balance).

State Water data represent salt and nutrient brought in to the basin ("In" in Balance).

Salt and Nutrient Loading from Source Water,
Santa Maria Valley, 2000

Golden State Water Company - Orcutt System Source Water Salt/Nutrient Loading

Source	Flow	Flow	Chloride	Nitrate	TDS	Chloride	Nitrate	TDS
	AF	MG	mg/L	mg/L	mg/L	Lb	Lb	Lb
Crescent #1	1169.9	381.2	43.6	5.6	566	138,712	17,816	1,800,705
Kenneth #1	1059.3	345.2	30.1	9.75	579	86,709	28,087	1,667,925
Mira Flores #1	1216.4	396.4	89.1	33.43	701	294,728	110,581	2,318,794
Mira Flores #2	491.7	160.2	25	5.08	574	33,425	6,792	767,431
Mira Flores #3	700.3	228.2	36.3	8.14	593	69,128	15,501	1,129,280
Mira Flores #4	188.7	61.5	27.2	5.56	577	13,955	2,853	296,034
Mira Flores #5	998.3	325.3	31	4.9	580	84,155	13,302	1,574,521
Mira Flores #6	503.4	164.0	68.6	4.6	658	93,916	6,298	900,827
Mira Flores #7	-					-	-	-
Oak Plant #1	438.8	143.0	18.7	2.81	578	22,315	3,353	689,726
Orcutt #1	313.9	102.3	18.5	2.76	589	15,791	2,356	502,750
Sunrise #1	35.8	11.7	36.3	8.14	593	3,537	793	57,780
Woodmere #1	187.1	61.0	21.5	8.2	553	10,941	4,173	281,425
Woodmere #2	1506.3	490.8	25.9	6.87	572	106,094	28,142	2,343,085
State Water	268.0	87.3	1.95	0.63	308	1,424	462	224,492
Total	**7908.1**	**2576.9**				**836,119**	**222,692**	**12,754,070**

Source of Data

Well flow data obtained from GSWC (Orcutt_Monthly Groundwater 1990-2010)

Well chloride conc. obtained from GSWC (Orcutt_WQ_Data)

Results taken from latest year for which data was available - 1999

Well nitrate conc. obtained from GSWC (Orcut_WQ_Data)

Results taken from latest year for which data was available - 1999

Well TDS conc. was obtained from GSWC (Orcutt_WQ_Data)

Results taken from latest year for which data was available - 1999

State Water flow data obtained from Luhdorff & Scalmanini

State Water conc. based on 2010 State Water conc.

Subsequent Use of Data

Well data represent salt and nutrient removed from the basin ("Out" in Balance).

State Water data represent salt and nutrient brought in to the basin ("In" in Balance).

Salt and Nutrient Loading from Source Water,
Santa Maria Valley, 2000

Guadalupe Source Water Salt/Nutrient Loading

Source	Flow	Flow	Chloride	Nitrate	TDS	Chloride	Nitrate	TDS
	AF	MG	mg/L	mg/L	mg/L	Lb	Lb	Lb
Obispo Well	545.0	177.6	19	2	640	28,159	2,964	948,513
State Water	233.0	75.9	1.97	0.64	308.97	1,246	405	195,766
Total	**778.0**	**253.5**				**29,405**	**3,369**	**1,144,279**

Source of Data

Well flow data from Luhdorff & Scalmanini
Well chloride conc. based on 2010 chloride conc.
Well nitrate conc. based on 2010 nitrate conc.
Well TDS conc. based on 2010 TDS conc.
State Water flow data obtained from Luhdorff & Scalmanini
State Water conc. based on average of SM and GSWC 2000 State Water conc.

Subsequent Use of Data

Well data represent salt and nutrient removed from the basin ("Out" in Balance).
State Water data represent salt and nutrient brought in to the basin ("In" in Balance).

Salt and Nutrient Loading from Source Water, Santa Maria Valley, 2000

Agriculture - Source Water Salt/Nutrient Loading and N Balance

			Ave. Concentration			Pumped			Nitrate Balance			Returned		
Source	**Flow**	**Flow**	**Chloride**	**Nitrate**	**TDS**	**Chloride**	**Nitrate**	**TDS**	**Irrigated Acres (Ac)**	**Applied Nitrogen lb/Ac**	**Root Zone Efficiency**	**Chloride**	**Nitrate**	**TDS**
	AF	MG	mg/L	mg/L	mg/L	Lb	Lb	Lb				Lb	Lb	Lb
Rotational Vegetables	89996	29325	75.8	20	971	18,550,653	4,894,631	237,634,352	38296	228	0.5	18,550,653	17,382,393	237,634,352
Strawberries	1367	445	75.8	15	971	281,776	55,760	3,609,562	976	183	0.5	281,776	373,313	3,609,562
Vineyard	6228	2029	75.8	3.1	971	1,283,762	52,502	16,445,028	5662	40	0.9	1,283,762	95,605	16,445,028
Total Pasture	4856	1582	75.8	3.1	971	1,000,955	40,936	12,822,263	1387	15	0.8	1,000,955	11,883	12,822,263
Field	0	0	75.8	3.1	971	-	-	-	877	150	0.8	-	116,553	-
Grain	215	70	75.8	3.1	971	44,317	1,812	567,707	717	90	0.8	44,317	56,884	567,707
Nursery	166	54	75.8	3.1	971	34,217	1,399	438,323	82	100	0.8	34,217	7,041	438,323
Total Orchard	2452	799	75.8	3.1	971	505,425	20,670	6,474,504	908	100	0.8	505,425	77,142	6,474,504
Total	102662	33453				21,161,464	5,045,643	271,078,913				21,161,464	18,036,632	271,078,913

Source of Data

Groundwater Chloride, Nitrate, and TDS conc. obtained from Luhdorff & Scalmanini (SMVMA_HistGWQ_LSCE)

Wells Used for determining average groundwater concentration:

010N033W20H001S
010N034W29N001S
011N036W35J003S
011N036W35J004S
011N036W35J005S
011N036W35J002S
010N036W02Q001S
010N036W02Q003S
010N036W02Q004S
010N036W02Q007S

The average concentrations of Cl, Nitrate, and TDS used in the table above were calculated based on the 10 wells (listed to the left) that were sampled in 2000.

Subsequent Use of Data

The "Pumped" values represent salt and nutrient removed from the basin ("Out" in Balance).

The "Returned" values represent salt and nutrient that are reintroduced to the basin ("In" in Balance).

Nitrate concentration of irrigation source water is increased for Rotational Vegetables and Stawberries (in comparison to previous decade) which reduces applied nitrogen in recognition of improved management; the inclusion of the management practices is based on grower information obatained at stakeholder meetings.

Root Zone Efficiency increased by 5-percent in each crop category in comparison to previous decade to represent improved nutrient and water mangement practices; root zone efficiency for N is related to applied water distribution uniformity for Vineyard, Pasture, Field, Grain, Nursery, and Orchard categories.

Salt and Nutrient Loading from Wastewater, Santa Maria Valley, 2000

Laguna Sanitation District WWTP - Effluent Salt/Nutrient Loading

Month	Flow	Chloride	Nitrate	TDS	Chloride	Nitrate	TDS
	MG	mg/L	mg/L	mg/L	Lb	Lb	Lb
Jan	76.57	300	26.7	1100	191,702	17,071	702,908
Feb	70.28	301	26.7	1060	176,541	15,668	621,706
Mar	76.26	270	26.7	1000	171,833	17,002	636,420
Apr	77.70	310	19.9	1100	201,016	12,874	713,281
May	81.84	310	19.9	1100	211,726	13,560	751,286
Jun	74.40	286	19.9	1110	177,577	12,327	689,197
Jul	75.95	300	18.1	1100	190,150	11,461	697,216
Aug	74.71	300	18.1	1100	187,045	11,274	685,833
Sep	75.00	286	18.1	1080	179,009	11,318	675,977
Oct	79.05	290	35.3	1100	191,314	23,318	725,674
Nov	74.70	291	35.3	1070	181,410	22,035	667,039
Dec	80.60	300	35.3	1100	201,792	23,775	739,903
Total	917				2,261,115	191,683	8,306,442

Source of Data

WWTP Flow and WQ data obtained from LCSD (LCSD Annual POTW Report - 2000)

Nitrate conc. is an average of 1990 and 2010 conc.

Subsequent Use of Data

WWTP data represents salt/nutrient reintroduced to the basin ("In" in Balance)

Laguna Sanitation District - Brine Injection (Program initiated in 2006)

Month	Flow	Chloride	Nitrate	TDS	Chloride	Nitrate	TDS
	MG	mg/L	mg/L	mg/L	Lb	Lb	Lb
Jan	-	-	-	-	-	-	-
Feb	-	-	-	-	-	-	-
Mar	-	-	-	-	-	-	-
Apr	-	-	-	-	-	-	-
May	-	-	-	-	-	-	-
Jun	-	-	-	-	-	-	-
Jul	-	-	-	-	-	-	-
Aug	-	-	-	-	-	-	-
Sep	-	-	-	-	-	-	-
Oct	-	-	-	-	-	-	-
Nov	-	-	-	-	-	-	-
Dec	-	-	-	-	-	-	-
Total	-				0	0	0

Salt and Nutrient Loading from Wastewater, Santa Maria Valley, 2000

Santa Maria WWTP - Effluent Salt/Nutrient Loading

Month	Flow	Flow	Chloride	Nitrate	TDS	Chloride	Nitrate	TDS
	MG	Gal	mg/L	mg/L	mg/L	Lb	Lb	Lb
Jan	6.73	6730000	207		711	11,626	-	39,933
Feb	7.05	7050000	182		670	10,708	-	39,419
Mar	6.97	6970000	141		632	8,202	-	36,762
Apr	7.20	7200000	149		630	8,953	-	37,855
May	7.61	7610000	164		677	10,415	-	42,995
Jun	7.87	7870000	162		683	10,640	-	44,858
Jul	7.80	7800000	151		636	9,829	-	41,400
Aug	8.09	8090000	149		623	10,060	-	42,061
Sep	7.79	7790000	144		592	9,362	-	38,486
Oct	8.03	8030000	161		759	10,789	-	50,863
Nov	7.30	7300000	190		692	11,575	-	42,158
Dec	6.90	6900000	198		886	11,401	-	51,019
Total	89.34	89340000				123,560	-	507,810

Source of Data

WWTP Flow data obtained from the City of Santa Maria (CSM WWTP Flows)

Chloride conc. obtained from the City of Santa Maria (WWTP Salt Data to GEI)

Nitrate conc. unavailable

TDS conc. obtained from the City of Santa Maria (WWTP Salt Data to GEI)

Subsequent Use of Data

WWTP effluent data represents salt/nutrient reintroduced to the basin ("In" in Balance)

Salt and Nutrient Loading from Wastewater,
Santa Maria Valley, 2000

Guadalupe WWTP - Effluent Salt/Nutrient Loading

Month	Flow	Flow	Chloride	Nitrate	TDS	Chloride	Nitrate	TDS
	AF	MG	mg/L	mg/L	mg/L	Lb	Lb	Lb
Jan						0	0	0
Feb						0	0	0
Mar						0	0	0
Apr						0	0	0
May						0	0	0
Jun						0	0	0
Jul						0	0	0
Aug						0	0	0
Sep						0	0	0
Oct						0	0	0
Nov						0	0	0
Dec						0	0	0
Total	778	254				19,113	2,190	743,781

Source of Data

Monthly WWTP effluent data not available.

Effluent Flow and salt/nutrient loading calculated asssuming 65% of source water (and associated salt/nutrient loading) returns to the groundwater basin.

Subsequent Use of Data

WWTP effluent data represents salt/nutrient reintroduced to the basin ("In" in Balance)

Salt and Nutrient Loading from Wastewater, Santa Maria Valley, 2000

Groundwater Movement - Salt/Nutrient Loading

Well	Flow	Flow	Chloride	Nitrate	TDS	Chloride	Nitrate	TDS
	AFY	MG/Yr	mg/L	mg/L	mg/L	Lb/Yr	Lb/Yr	Lb/Yr
10N36W02Q007S	7000	2281	430	0.22	1300	2,924,808	406,884	25,174,480
11N36W35J003S			60.8	34.48	1260			
11N36W35J004S			69.4	33.2	1460			
11N36W35J005S			54.4	17.6	1270			
10N36W02Q001S	2000	652	22.5	1.99	729	127,085	10,497	4,037,344
10N36W02Q003S			20.9	1.99	722			
11N36W35J002S			26.7	1.81	776			
Total	9000	2933				3,051,893	417,381	29,211,824

Source of Data

Total average annual groundwater flow obtained from Luhdorff & Scalmanini

Groundwater flow from deep and shallow aquifers was estimated.

Water Quality data obtained from Historical TDS and N - Graphs See fig 4.2

WQ info from Wells 10/36 2Q1 and 2Q3, and 11/36 35J1 were used to represent the deep aquifer. No WQ info for 10/36 2Q2.

WQ info from Wells 10/36 2Q7 and 11/36 35J3, 35J4, and 35J5 were used to represent the shallow aquifer. No depth info for 10/36 2Q4.

The average Cl, Nitrate, and TDS conc. were calculated individually for the deep aquifer and shallow aquifer based on the representative wells.

Subsequent Use of Data

This table represents the movement of groundwater out of the basin, thus the data represents salt/nutrient removed from the basin ("Out" in Balance)

Salt and Nutrient Loading from Wastewater, Santa Maria Valley, 2000

Surface Water Discharge to Groundwater basin/Ocean

			Ave. Concentration			Total			To Ocean				To Groundwater			
Water Body	Flow	Flow	**Chloride**	**Nitrate**	**TDS**	**Chloride**	**Nitrate**	**TDS**	**Flow**	**Chloride**	**Nitrate**	**TDS**	**Flow**	**Chloride**	**Nitrate**	**TDS**
	AFY	MG/Yr	mg/L	mg/L	mg/L	Lb/Yr	Lb/Yr	Lb/Yr	MG/Yr	Lb/Yr	Lb/Yr	Lb/Yr	MG/Yr	Lb/Yr	Lb/Yr	Lb/Yr
Cuyama River	52000	16944	55	0.8853	1100	7,777,371	125,191	155,547,421	-	-	-	-	16,944	7,777,371	125,191	155,547,421
Sisquoc River	38000	12382	20	0.8853	775	2,066,714	91,486	80,085,167	5,431	906,453	40,125	35,125,073	6,951	1,160,260	51,361	44,960,094
Orcutt Creek	1700	554		143.64	2070	-	664,056	9,569,430	486	-	583,073	8,402,426	68	-	80,982	1,167,004
Santa Maria River Total	91700	29881				9,844,085	880,733	245,202,017	5,917	906,453	623,199	43,527,499	23,963	8,937,632	257,534	201,674,518
Oso Flaco Creek	2900	945		38.91	1450	-	306,850	11,434,911	945	-	306,860	11,435,284	-	-	-	-

Source of Data

Flow data for each of the water bodies is the average annual flow, based on Luhdorff & Scalmanini and the CCAMP website
Cuyama River is a losing river; meaning that flows do not discharge to the ocean except in high-flow situations
Cuyama River Nitrate and TDS data obtained from CCAMP (Website; Data from 2007)
Cuyama River Cl obtained from Luhdorff & Scalmanini (Cl conc. not available from CCAMP)
Sisquoc River Nirtate and TDS data obtained from CCAMP (Website; Data from 2007)
Sisquoc River Cl obtained from Luhdorff & Scalmanini (Cl conc. not available from CCAMP)
Orcutt Creek Nitrate and TDS data obtained from CCAMP (Website; Mean Data used)
Orcutt Creek Cl data not available from CCAMP or Luhdorff & Scalmanini
Oso Flaco Creek Nitrate and TDS data obtained from CCAMP (Website; Mean Data used)
Oso Flaco Creek Cl data not available from CCAMP or Luhdorff & Scalmanini

Subsequent Use of Data

The "To Ocean" values represent salt and nutrient removed from the basin ("Out" in Balance).
The "To Groundwater" values represent salt and nutrient that are brought into the basin ("In" in Balance).

Estimated Annual Chloride and TDS Load Balance, Santa Maria Valley, 2000

Agency/Location	Source of Water	In		Out		Balance	
		Chloride	TDS	Chloride	TDS	Chloride	TDS
	Imported/SWP, Wells	Lb	Lb	Lb	Lb	Lb	Lb
City of Santa Maria - SWP Outside Landscape Infiltration	SWP	13,104	2,051,892			13,104	2,051,892
City of Santa Maria - WWTP Infiltration	SWP/Wells	123,560	507,810			123,560	507,810
City of Santa Maria - Municipal and Industrial Pumping	Wells			42,208	1,031,141	(42,208)	(1,031,141)
City of Santa Maria - Well Outside Landscape Infiltration	Wells	8,442	206,228			8,442	206,228
City of Guadalupe - WWTP Infiltration	Wells	19,113	743,781			19,113	743,781
City of Guadalupe - Municipal and Industrial Pumping	Wells			28,159	948,513	(28,159)	(948,513)
City of Guadalupe - Well Outside Landscape Infiltration	Wells	5,881	228,856			5,881	228,856
Golden State Water Co. - SWP Outside Landscape Infiltration	SWP	167,224	2,550,814			167,224	2,550,814
Golden State Water Co. - Municipal and Industrial Pumping	Wells			973,406	14,330,283	(973,406)	(14,330,283)
Golden State Water Co. - Well Outside Landscape Infiltration	Wells	19,584	288,316			19,584	288,316
Laguna Sanitation District - WWTP Infiltration	SWP/Wells	2,261,115	8,306,442			2,261,115	8,306,442
Laguna Sanitation District - Brine Disposal				-	-	-	-
Agriculture - Pumped	Wells			21,161,464	271,078,913	(21,161,464)	(271,078,913)
Agriculture - Deep Percolation (74.5%)	Wells	15,765,291	201,953,790			15,765,291	201,953,790
Santa Maria River	N/A					-	-
Cuyama River	N/A	7,777,371	155,547,421	-	-	7,777,371	155,547,421
Sisquoc River	N/A	1,160,260	44,960,094	906,453	35,125,073	253,807	9,835,020
Orcutt Creek	N/A	-	1,167,004	-	8,402,426	-	(7,235,422)
Oso Flaco Creek	N/A			-	11,435,284	-	(11,435,284)
Groundwater Discharge From Basin	N/A			3,051,893	29,211,824	(3,051,893)	(29,211,824)
High flows directly to Ocean	N/A	-	-	-	-	-	-
	Totals	**27,320,945**	**418,512,447**	**26,163,584**	**371,563,457**	**1,157,361**	**46,948,989**

Notes:

Estimated - 25% of the Agriculture-Pumped water and associated salts, are lost to surface runoff.

Estimated - 0.5% of the Agriculture-Pumped water and associated salts, are lost to crop harvest.

Estimated - 74.5% of the Agriculture-Pumped water and assiciated salts are assumed to return to the basin as Agriculture-Deep Percolation.

Positive values in the Balance columns indicate a general inflow of chloride/TDS into the basin.

Negative values (values in parentheses) in the Balance columns indicate a general removal of chloride/TDS from the basin.

Estimated Annual Nitrate Load Balance, Santa Maria Valley, 2000

Agency/Location	Source of Water	In Nitrate	Out Nitrate	Balance Nitrate	Balance NO3-N Equivalent
	Imported/SWP, Wells	Lb	Lb	Lb	Lb
City of Santa Maria - SWP Outside Landscape Infiltration	SWP	21,340	-	21,340	4,817
City of Santa Maria - WWTP Infiltration	SWP/Wells	-	-	-	-
City of Santa Maria - Municipal and Industrial Pumping	Wells		16,499	(16,499)	(3,724)
City of Santa Maria - Well Outside Landscape Infiltration	Wells	3,300		3,300	745
City of Guadalupe - WWTP Infiltration	Wells	2,190	-	2,190	494
City of Guadalupe - Municipal and Industrial Pumping	Wells		2,964	(2,964)	(669)
City of Guadalupe - Well Outside Landscape Infiltration	Wells	674		674	152
Golden State Water Co. - SWP Outside Landscape Infiltration	SWP	44,538	-	44,538	10,054
Golden State Water Co. - Municipal and Industrial Pumping	Wells		12,937	(12,937)	(2,920)
Golden State Water Co. - Well Outside Landscape Infiltration	Wells	4,830		4,830	1,090
Laguna Sanitation District - WWTP Infiltration	SWP/Wells	191,683		191,683	43,269
Laguna Sanitation District - Brine Disposal			-	-	-
Agriculture - Pumped	Wells		5,045,643	(5,045,643)	(1,138,971)
Agriculture - Deep Percolation	Wells	18,036,632		18,036,632	4,071,474
Santa Maria River	N/A			-	-
Cuyama River	N/A	125,191	-	125,191	28,260
Sisquoc River	N/A	51,361	40,125	11,235	2,536
Orcutt Creek	N/A	80,982	583,073	(502,091)	(113,339)
Oso Flaco Creek	N/A	-	306,860	(306,860)	(69,269)
Groundwater Discharge From Basin	N/A		417,381	(417,381)	(94,217)
High flows directly to Ocean	N/A	-	-	-	-
	Totals	**18,562,721**	**6,425,483**	**12,137,238**	**2,739,783**

Notes:

Positive values in the Balance columns indicate a general inflow of nitrate into the basin
Negative values (values in parentheses) in the Balance columns indicate a general removal of nitrate from the basin.

Salt and Nutrient Loading from Source Water, Santa Maria Valley, 1990

Santa Maria Source Water Salt/Nutrient Loading

Source	Flow	Chloride	Nitrate	TDS	Chloride	Nitrate	TDS
	MG	mg/L	mg/L	mg/L	Lb	Lb	Lb
Well 3S	0.15		3.5	850	-	4	1,029
Well 4S	0.05		3.5	850	-	1	348
Well 5S	40.12		3.5	850	-	1,172	284,595
Well 6S	135.99		3.5	850	-	3,972	964,671
Well 7S	913.24		3.5	850	-	26,675	6,478,143
Well 8S	951.95		3.5	850	-	27,805	6,752,764
Well 9S	696.49		3.5	850	-	20,344	4,940,636
Well 10S	455.88		3.5	850	-	13,316	3,233,840
Well 11S	734.99		3.5	850	-	21,468	5,213,739
Well 12S	0.00		3.5	850	-	-	-
Well 13S	0.00		3.5	850	-	-	-
Well 14S	0.00		3.5	850	-	-	-
State Water					-	-	-
Total	**3928.9**				**-**	**55,128**	**13,388,215**

Source of Data

Well flow data obtained from the City of Santa Maria (Production Data to GEI)

Well chloride conc. not available

Well nitrate conc. obtained from City of Santa Maria

Only available for Well 11S (SM Well 11S_wl and wq data 78-93) - used for all wells

Well TDS conc. obtained from the City of Santa Maria

Only available for Well 11S (SM Well 11S_wl and wq data 78-93) - used for all wells

State Water flow and conc. not available.

Subsequent Use of Data

Well data represent salt and nutrient removed from the basin ("Out" in Balance).

State Water data represent salt and nutrient brought in to the basin ("In" in Balance).

Salt and Nutrient Loading from Source Water, Santa Maria Valley, 1990

Golden State Water Company - Orcutt System Source Water Salt/Nutrient Loading

Source	Flow	Flow	Chloride	Nitrate	TDS	Chloride	Nitrate	TDS
	AF	MG	mg/L	mg/L	mg/L	Lb	Lb	Lb
Crescent #1	1050.9	342.4	39.7	5.3	564.3	113,455	15,146	1,612,657
Evergreen #1	133.2	43.4						
Evergreen #2	992.2	323.3						
Kenneth #1	1078.0	351.3	32.5	8.5	581.4	95,275	24,918	1,704,401
Mira Flores #1	301.3	98.2	51.1	15.5	513	41,863	12,698	420,268
Mira Flores #2	450.0	146.6	25.8	4.2	570	31,569	5,139	697,452
Mira Flores #3	621.5	202.5				-	-	-
Mira Flores #4	335.0	109.1	34.5	5.5	539.4	31,426	5,010	491,332
Mira Flores #5	611.0	199.1	33.4	4.8	612	55,495	7,975	1,016,857
Mira Flores #6	301.7	98.3	34	4.8	574.2	27,899	3,939	471,161
Mira Flores #7	0.0	0.0				-	-	-
Oak Plant #1	102.1	33.3				-	-	-
Orcutt #1	489.3	159.4				-	-	-
Sunrise #1	495.7	161.5				-	-	-
Woodmere #1	1185.1	386.2	27.3	5.6	580	87,978	18,047	1,869,125
Woodmere #2		0.0				-	-	-
State Water		0.0				-	-	-
Total	**5970.7**	**1945.5**				**371,504**	**77,726**	**6,670,597**

Source of Data

Well flow data obtained from GSWC (Orcutt_Monthly Groundwater 1990-2010)
Well chloride conc. obtained from GSWC (1990 GW TDS_NO3_Cl)
Well nitrate conc. obtained from GSWC (1990 GW TDS_NO3_Cl)
Well TDS conc. obtained from GSWC (1990 GW TDS_NO3_Cl)
State Water flow and conc. not available

Subsequent Use of Data

Well data represent salt and nutrient removed from the basin ("Out" in Balance).
State Water data represent salt and nutrient brought in to the basin ("In" in Balance).

Salt and Nutrient Loading from Source Water,
Santa Maria Valley, 1990

Guadalupe Source Water Salt/Nutrient Loading

Source	Flow	Flow	Chloride	Nitrate	TDS	Chloride	Nitrate	TDS
	AF	MG	mg/L	mg/L	mg/L	Lb	Lb	Lb
Obispo Well		0.0				0	0	0
State Water		0.0				0	0	0
Total	**0.0**	**0.0**				**0**	**0**	**0**

Source of Data

Well flow and conc. data not available

State Water flow and conc. not available

Subsequent Use of Data

Well data represent salt and nutrient removed from the basin ("Out" in Balance).

State Water data represent salt and nutrient brought in to the basin ("In" in Balance).

Salt and Nutrient Loading from Source Water, Santa Maria Valley, 1990

Agriculture - Source Water Salt/Nutrient Loading and N Balance

			Ave. Concentration			Pumped			Nitrate Balance			Returned		
Source	**Flow**	**Flow**	**Chloride**	**Nitrate**	**TDS**	**Chloride**	**Nitrate**	**TDS**	**Irrigated Acres (Ac)**	**Applied Nitrogen lb/Ac**	**Root Zone Efficiency**	**Chloride**	**Nitrate**	**TDS**
	AF	MG	mg/L	mg/L	mg/L	Lb	Lb	Lb				Lb	Lb	Lb
Rotational Vegetables	78249	25498	74.5	4.43	993	15,852,649	942,647	211,297,729	31300	228	0.45	15,852,649	17,906,295	211,297,729
Strawberries	0	0	74.5	4.43	993	-	-	-	0	183	0.5	-	-	-
Vineyard	6174	2012	74.5	4.43	993	1,250,805	74,377	16,671,806	5145	40	0.85	1,250,805	147,911	16,671,806
Total Pasture	15021	4895	74.5	4.43	993	3,043,140	180,954	40,561,581	4292	15	0.75	3,043,140	116,539	40,561,581
Field	13113	4273	74.5	4.43	993	2,656,594	157,969	35,409,361	5245	150	0.75	2,656,594	910,818	35,409,361
Grain	178	58	74.5	4.43	993	36,061	2,144	480,658	595	90	0.75	36,061	59,843	480,658
Nursery	0	0	74.5	4.43	993	-	-	-	0	100	0.75	-	-	-
Total Orchard	1918	625	74.5	4.43	993	388,572	23,106	5,179,223	710	100	0.75	388,572	84,409	5,179,223
Total	114653	37360				23,227,822	1,381,198	309,600,359				23,227,822	19,225,814	309,600,359

Source of Data

Groundwater Chloride, Nitrate, and TDS conc. obtained from Ludhorf & Scalmanini (SMVMA_HistGWQ_LSCE)

Wells Used for determining average groundwater concentration:	009N032W08N001S	010N036W02Q001S	011N036W35J003S
	010N034W26H002S	010N036W02Q003S	011N036W35J004S
	010N034W29N001S	010N036W02Q004S	011N036W35J005S
	010N035W14D003S	010N036W02Q007S	011N036W35J002S

The average concentrations of Cl, Nitrate, and TDS used in the table above were calculated based on the 12 wells (listed to the left) that were sampled in 1990.

Subsequent Use of Data

The "Pumped" values represent salt and nutrient removed from the basin ("Out" in Balance).

The "Returned" values represent salt and nutrient that are reintroduced to the basin ("In" in Balance).

Nitrate concentration of irrigation source water is not recognized as available N, therefore, nitrates in the source water are added to the Applied Nitrogen which increases applied nitrogen in recognition of no improved management; no inclusion of management practices for this decade is based on grower information obatained at stakeholder meetings.

A reasonable nutrient efficieny for the Rotational Vegetables and Strawberries was found in the UC Davis Report and calculated based on UCCE publications; root zone efficiency for N is related to applied water distribution uniformity for Vineyard, Pasture, Field, Grain, Nursery, and Orchard categories as a simplifying assumption in this relative analysis and was started at lower level of irrigation distribution efficiency to represent lower level of water and nutrient management practices implemented in the 1980's.

Salt and Nutrient Loading from Wastewater, Santa Maria Valley, 1990

Laguna Sanitation District WWTP - Effluent Salt/Nutrient Loading

Month	Flow	Chloride	Nitrate	TDS	Chloride	Nitrate	TDS
	MG	mg/L	mg/L	mg/L	Lb	Lb	Lb
Jan	66.42	310	22	1100	171,825	12,194	609,701
Feb	59.79	360	22	1200	179,643	10,978	598,811
Mar	63.61	340	22	1200	180,497	11,679	637,047
Apr	60.65	360	22	1100	182,198	11,134	556,717
May	63.46	480	22	1200	254,212	11,651	635,531
Jun	60.72	390	22	1200	197,620	11,148	608,062
Jul	62.75	320	22	1100	167,573	11,521	576,031
Aug	63.11	340	22	1200	179,075	11,587	632,031
Sep	62.30	300	22	1100	155,983	11,439	571,938
Oct	64.46	320	22	1100	172,141	11,835	591,734
Nov	63.01	310	22	1200	163,023	11,569	631,058
Dec	65.43	310	22	1200	169,284	12,014	655,295
Total	755.72				2,173,076	138,749	7,303,956

Source of Data

WWTP Flow and WQ data obtained from LCSD (LCSD Monitoring Data - 1990)

Conc. values based on monthly reporting.

Subsequent Use of Data

WWTP data represents salt/nutrient reintroduced to the basin ("In" in Balance)

Laguna Sanitation District - Brine Injection (Program initiated in 2006)

Month	Flow	Chloride	Nitrate	TDS	Chloride	Nitrate	TDS
	MG	mg/L	mg/L	mg/L	Lb	Lb	Lb
Jan	-	-	-	-	-	-	-
Feb	-	-	-	-	-	-	-
Mar	-	-	-	-	-	-	-
Apr	-	-	-	-	-	-	-
May	-	-	-	-	-	-	-
Jun	-	-	-	-	-	-	-
Jul	-	-	-	-	-	-	-
Aug	-	-	-	-	-	-	-
Sep	-	-	-	-	-	-	-
Oct	-	-	-	-	-	-	-
Nov	-	-	-	-	-	-	-
Dec	-	-	-	-	-	-	-
Total	-				0	0	0

Salt and Nutrient Loading from Wastewater,
Santa Maria Valley, 1990

Santa Maria WWTP - Effluent Salt/Nutrient Loading

Month	Flow	Flow	Chloride	Nitrate	TDS	Chloride	Nitrate	TDS
	MG	Gal	mg/L	mg/L	mg/L	Lb	Lb	Lb
Jan			396		1454	0	0	0
Feb			372		1415	0	0	0
Mar			370		1473	0	0	0
Apr			387		1495	0	0	0
May			387		1495	0	0	0
Jun			391		1477	0	0	0
Jul			393		1509	0	0	0
Aug			386		1531	0	0	0
Sep			372		1503	0	0	0
Oct			365		1508	0	0	0
Nov			388		1507	0	0	0
Dec			386		1526	0	0	0
Total	0.00	0				0	0	0

Source of Data

WWTP Flow data not available

Chloride conc. obtained from the City of Santa Maria (WWTP Salt Data to GEI)

Nitrate conc. not available

TDS conc. obtained from the City of Santa Maria (WWTP Salt Data to GEI)

Subsequent Use of Data

WWTP effluent data represents salt/nutrient reintroduced to the basin ("In" in Balance)

Salt and Nutrient Loading from Wastewater, Santa Maria Valley, 1990

Guadalupe WWTP - Effluent

Month	Flow	Flow	Chloride	Nitrate	TDS	Chloride	Nitrate	TDS
	AF	MG	mg/L	mg/L	mg/L	Lb	Lb	Lb
Jan						0	0	0
Feb						0	0	0
Mar						0	0	0
Apr						0	0	0
May						0	0	0
Jun						0	0	0
Jul						0	0	0
Aug						0	0	0
Sep						0	0	0
Oct						0	0	0
Nov						0	0	0
Dec						0	0	0
Total	0	0				0	0	0

Source of Data

Monthly WWTP effluent data not available.

Effluent Flow and salt/nutrient loading calculated asssuming 65% of source water (and associated salt/nutrient loading) returns to the groundwater basin.

Production data is not available, thus effluent data cannot be calculated.

Subsequent Use of Data

WWTP effluent data represents salt/nutrient reintroduced to the basin ("In" in Balance)

Salt and Nutrient Loading from Wastewater,
Santa Maria Valley, 1990

Groundwater Movement - Salt/Nutrient Loading

Well	Flow	Flow	Chloride	Nitrate	TDS	Chloride	Nitrate	TDS
	AFY	MG/Yr	mg/L	mg/L	mg/L	Lb/Yr	Lb/Yr	Lb/Yr
10N36W02Q007S	7000	2281	430	0.22	1300	2,924,808	406,884	25,174,480
11N36W35J003S			60.8	34.48	1260			
11N36W35J004S			69.4	33.2	1460			
11N36W35J005S			54.4	17.6	1270			
10N36W02Q001S	2000	652	22.5	1.99	729	127,085	10,497	4,037,344
10N36W02Q003S			20.9	1.99	722			
11N36W35J002S			26.7	1.81	776			
Total	9000	2933				3,051,893	417,381	29,211,824

Source of Data

Total average annual groundwater flow obtained from Luhdorff & Scalmanini

Groundwater flow from deep and shallow aquifers was estimated.

Water Quality data obtained from Historical TDS and N - Graphs See fig 4.2

WQ info from Wells 10/36 2Q1 and 2Q3, and 11/36 35J1 were used to represent the deep aquifer. No WQ info for 10/36 2Q2.

WQ info from Wells 10/36 2Q7 and 11/36 35J3, 35J4, and 35J5 were used to represent the shallow aquifer. No depth info for 10/36 2Q4.

The average Cl, Nitrate, and TDS conc. were calculated individually for the deep aquifer and shallow aquifer based on the representative wells.

Subsequent Use of Data

This table represents the movement of groundwater out of the basin, thus the data represents salt/nutrient removed from the basin ("Out" in Balance)

Salt and Nutrient Loading from Wastewater,
Santa Maria Valley, 1990

Surface Water Discharge to Groundwater basin/Ocean

			Ave. Concentration			Total			To Ocean				To Groundwater			
Water Body	Flow	Flow	**Chloride**	**Nitrate**	**TDS**	**Chloride**	**Nitrate**	**TDS**	**Flow**	**Chloride**	**Nitrate**	**TDS**	**Flow**	**Chloride**	**Nitrate**	**TDS**
	AFY	MG/Yr	mg/L	mg/L	mg/L	Lb/Yr	Lb/Yr	Lb/Yr	MG/Yr	Lb/Yr	Lb/Yr	Lb/Yr	Gal/Yr	Lb/Yr	Lb/Yr	Lb/Yr
Cuyama River	52000	16944	65	0.025	1200	9,191,438	3,535	169,688,095	-	-	-	-	16,944	9,191,438	3,535	169,688,095
Sisquoc River	38000	12382	15	0.41	750	1,550,035	42,368	77,501,774	5,431	679,840	18,582	33,992,006	6,951	870,195	23,785	43,509,768
Orcutt Creek	1700	554		35.752	2012.8	-	165,278	9,304,999	486	-	145,122	8,170,243	68	-	20,156	1,134,756
Santa Maria River Total	91700	29881				10,741,474	211,181	256,494,868	5,917	679,840	163,705	42,162,249	23,963	10,061,634	47,476	214,332,619
Oso Flaco Creek	2900	945		38.91	1450	-	306,850	11,434,911	945	-	306,860	11,435,284	-	-	-	-

Source of Data

Flow data for each of the water bodies is the average annual flow, based on Luhdorff & Scalmanini and the CCAMP website
Cuyama River is a losing river; meaning that flows do not discharge to the ocean except in high-flow situations
Cuyama River Nitrate and TDS data obtained from CCAMP (Website; Data from 2007)
Cuyama River Cl obtained from Luhdorff & Scalmanini (Cl conc. not available from CCAMP)
Sisquoc River Nirtate and TDS data obtained from CCAMP (Website; Data from 2007)
Sisquoc River Cl obtained from Luhdorff & Scalmanini (Cl conc. not available from CCAMP)
Orcutt Creek Nitrate and TDS data obtained from CCAMP (Website; Mean Data used)
Orcutt Creek Cl data not available from CCAMP or Luhdorff & Scalmanini
Oso Flaco Creek Nitrate and TDS data obtained from CCAMP (Website; Mean Data used)
Oso Flaco Creek Cl data not available from CCAMP or Luhdorff & Scalmanini

Subsequent Use of Data

The "To Ocean" values represent salt and nutrient removed from the basin ("Out" in Balance).
The "To Groundwater" values represent salt and nutrient that are brought into the basin ("In" in Balance).

Estimated Chloride and TDS Load, Santa Maria Valley, 1990

Agency/Location	Source of Water	In		Out		Balance	
		Chloride	TDS	Chloride	TDS	Chloride	TDS
	Imported/SWP, Wells	Lb	Lb	Lb	Lb	Lb	Lb
City of Santa Maria - SWP Outside Landscape Infiltration	SWP	-	-			-	-
City of Santa Maria - WWTP Infiltration	SWP/Wells	-	-			-	-
City of Santa Maria - Municipal and Industrial Pumping	Wells			-	27,868,388	-	(27,868,388)
City of Santa Maria - Well Outside Landscape Infiltration	Wells	-	5,573,953			-	5,573,953
City of Guadalupe - WWTP Infiltration	Wells	-	-			-	-
City of Guadalupe - Municipal and Industrial Pumping	Wells			-	-	-	-
City of Guadalupe - Well Outside Landscape Infiltration	Wells	-	-			-	-
Golden State Water Co. - SWP Outside Landscape Infiltration	SWP	-	-			-	-
Golden State Water Co. - Municipal and Industrial Pumping	Wells			484,959	8,283,254	(484,959)	(8,283,254)
Golden State Water Co. - Well Outside Landscape Infiltration	Wells	9,757	166,654			9,757	166,654
Laguna Sanitation District - WWTP Infiltration	SWP/Wells	2,173,076	7,303,956			2,173,076	7,303,956
Laguna Sanitation District - Brine Disposal				-	-	-	-
Agriculture - Pumped	Wells			23,227,822	309,600,359	(23,227,822)	(309,600,359)
Agriculture - Deep Percolation (74.5%)	Wells	17,304,727	230,652,268			17,304,727	230,652,268
Santa Maria River	N/A					-	-
Cuyama River	N/A	9,191,438	169,688,095	-	-	9,191,438	169,688,095
Sisquoc River	N/A	870,195	43,509,768	679,840	33,992,006	190,355	9,517,762
Orcutt Creek	N/A	-	1,134,756	-	8,170,243	-	(7,035,487)
Oso Flaco Creek	N/A			-	11,435,284	-	(11,435,284)
Groundwater Discharge From Basin	N/A			3,051,893	29,211,824	(3,051,893)	(29,211,824)
High flows directly to Ocean	N/A	-	-	-	-	-	-
	Totals	**29,549,194**	**458,029,450**	**27,444,514**	**428,561,359**	**2,104,680**	**29,468,091**

Notes:

Estimated - 25% of the Agriculture-Pumped water and associated salts, are lost to surface runoff.

Estimated - 0.5% of the Agriculture-Pumped water and associated salts, are lost to crop harvest.

Estimated - 74.5% of the Agriculture-Pumped water and assiciated salts are assumed to return to the basin as Agriculture-Deep Percolation.

Positive values in the Balance columns indicate a general inflow of chloride/TDS into the basin.

Negative values (values in parentheses) in the Balance columns indicate a general removal of chloride/TDS from the basin.

Estimated Annual Nitrate Load, Santa Maria Valley, 1990

Agency/Location	Source of Water	In Nitrate	Out Nitrate	Balance Nitrate	Balance NO3-N Equivalent
	Imported/SWP, Wells	Lb	Lb	Lb	Lb
City of Santa Maria - SWP Outside Landscape Infiltration	SWP	-		-	-
City of Santa Maria - WWTP Infiltration	SWP/Wells	-		-	-
City of Santa Maria - Municipal and Industrial Pumping	Wells		114,752	(114,752)	(25,903)
City of Santa Maria - Well Outside Landscape Infiltration	Wells	22,952		22,952	5,181
City of Guadalupe - WWTP Infiltration	Wells	-		-	-
City of Guadalupe - Municipal and Industrial Pumping	Wells		-	-	-
City of Guadalupe - Well Outside Landscape Infiltration	Wells	-		-	-
Golden State Water Co. - SWP Outside Landscape Infiltration	SWP	-		-	-
Golden State Water Co. - Municipal and Industrial Pumping	Wells		92,872	(92,872)	(20,964)
Golden State Water Co. - Well Outside Landscape Infiltration	Wells	1,869		1,869	422
Laguna Sanitation District - WWTP Infiltration	SWP/Wells	138,749		138,749	31,320
Laguna Sanitation District - Brine Disposal			-	-	-
Agriculture - Pumped	Wells		1,381,198	(1,381,198)	(311,783)
Agriculture - Deep Percolation	Wells	19,225,814		19,225,814	4,339,913
Santa Maria River	N/A			-	-
Cuyama River	N/A	3,535	-	3,535	798
Sisquoc River	N/A	23,785	18,582	5,203	1,175
Orcutt Creek	N/A	20,156	145,122	(124,967)	(28,209)
Oso Flaco Creek	N/A	-	306,860	(306,860)	(69,269)
Groundwater Discharge From Basin	N/A		417,381	(417,381)	(94,217)
High flows directly to Ocean	N/A	-	-	-	-
	Totals	**19,436,860**	**2,476,768**	**16,960,092**	**3,828,463**

Notes:

Positive values in the Balance columns indicate a general inflow of nitrate into the basin
Negative values (values in parentheses) in the Balance columns indicate a general removal of nitrate from the basin.