Chapter 8:

Groundwater Quality Management

Sustainability and Basin-specific Protection of Groundwater

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Introduction

Groundwater is a valuable resource in the Los Angeles Region, and is relied upon for a significant portion of municipal and domestic water supply and for agricultural, industrial and process water. The groundwater basins and sub-basins in the Los Angeles Region and their designated beneficial uses are identified in Chapter 2 of this Basin Plan. The water quality objectives to protect each of the beneficial uses are set forth in Chapter 3. The Regional Water Board programs of implementation to achieve the water quality objectives are set forth in Chapter 4.

While the regulation and oversight of the distribution of water, i.e., establishing and regulating groundwater supply, is not within the purview of the Regional Water Board, the growing focus toward promoting sustainable local water supplies further highlights the need for increased oversight to ensure water supplies of sufficient quality to support existing beneficial uses within a basin, as well as the need to protect high quality waters for future use. Thus, groundwater quality regulation and protection is conducted using a basin-wide approach that considers issues pertaining to both water quality and water supply. A leading example of this is the State Water Resources Control Board's (State Water Board's) Policy for water Quality Control For Recycled Water (Recycled Water Policy or Policy) (see Chapter 5), which promotes the increased development of recycled water projects to supplement demand, but also recognizes the potential impact of such activities on groundwater quality. The Recycled Water Policy addresses potential impacts by requiring salt and nutrient management planning.

This chapter focuses on basin/sub-basin groundwater quality management, commencing with salt and nutrient management plans.

I. Salt and Nutrient Management Plans

A. Legal Basis and Authority

The purpose of the Recycled Water Policy is to increase the use of recycled water from municipal wastewater sources that meet the definition in Water Code section 13050(n), in a manner that implements State and federal water quality laws. This policy is consistent with the State Water Board's overarching goal of promoting sustainable water supplies. The policy is also intended to encourage beneficial reuse, rather than solely disposal, of municipal wastewater.

The Policy (which is summarized in Chapter 5) recognizes the potential for increased salt and nutrient loading to groundwater basins as a result of increased recycled water use and, therefore, requires the development of regional or sub-regional salt and nutrient management plans (SNMPs) for each groundwater basin in the State. The Policy also acknowledges that recycled water may not be the sole cause of high concentrations of salts and nutrients in groundwater basins, and therefore regulation of recycled water alone may not always address such conditions. The intent of SNMPs is for salts and nutrients from all sources to be managed on a basin-wide or watershed-wide basis in a manner that ensures the attainment of water quality objectives and protection of beneficial uses.

Per the Policy, these SNMPs are to be directed and funded by local water and wastewater entities, together with local salt/nutrient contributing stakeholders, and developed through a collaborative process open to all stakeholders including the Regional Water Board .

The Policy also directs that within one year of receipt of a Salt and Nutrient Management Plan, the Regional Water Board shall consider it for incorporation into the Basin Plan, revised implementation programs, consistent with Water Code section 13242, for those groundwater basins within its region where water quality objectives for salts or nutrients are being exceeded, or where conditions are such that there is the threat that water quality objectives will be exceeded. The implementation program(s) shall be based on the salt and nutrient management plans required by the Recycled Water Policy.

B. Elements of a Salt and Nutrient Management Plan

The required elements of a SNMP, as specified by the Recycled Water Policy include:

a) Source identification/source loading and assimilative capacity estimates;
b) Implementation measures that integrate water quantity and quality, groundwater and surface water, and recharge area protection in order to maintain a sustainable long-term supply of water where salt and nutrient loadings are managed for multiple beneficial uses;
c) Consideration of water recycling/stormwater recharge/use;
d) Anti-degradation analyses demonstrating that the projects included within the plan will collectively, satisfy the requirements of State Water Board's Resolution No. 68-16, "Statement of Policy with respect to Maintaining High Quality of Waters in California";
e) Development of a basin-wide monitoring plan to provide to provide reasonable, cost-effective means of determining whether groundwater quality objectives for salts, nutrients and other constituents of concern as identified in the SNMP are being achieved.; and
f) Annual monitoring of Constituents of Emerging Concern (CECs) including several types of chemicals that may be classified as (i) persistent organic pollutants, (ii) pharmaceuticals and personal care products, (iii) veterinary medicines, (iv) endocrine disruptors, and (v) others.

C. CEQA Requirements

The Policy requires that salt and nutrient management plans developed for basin/sub-basins comply with the California Environmental Quality Act (CEQA), Cal Pub. Res. Code §§ 21000 et seq. and associated regulations set forth in California Code of Regulations, Title 14 §§ 15000 et seq. CEQA requires state and local agencies to evaluate the potentially significant environmental impacts of proposed projects and identify measures to avoid or mitigate these impacts where feasible. Pursuant to Public Resources Code section 21080.5, the Resources Agency has approved the Regional Boards' basin planning process as a "certified regulatory program" that adequately satisfies the CEQA requirements for preparing environmental documents (14 Cal. Code Regs. § 15251(g); 23 Cal. Code Regs. § 3782). A programmatic substitute environmental document (SED) has been prepared and considered by the Regional Water Board for each of the implementation programs below. SNMP proponents may also be required to comply with other CEQA requirements related to specific projects for salt and nutrient management contained in their plans.

D. Organization of Section

As Salt and Nutrient Management Plans are developed for the different basin/sub-basin groups, this Chapter will be amended to include summaries of the salt and nutrient management measures contained in each SNMP in chronological order of Board approval.

II. Basin-Specific Salt and Nutrient Management Plans

A. Central Basin and West Coast Basin

Adopted by the California Regional Water Quality Control Board, Los Angeles Region on February 12, 2015.

Approved by:

The State Water Resources Control Board on July 21, 2015.
The Office of Administrative Law on April 11, 2016.

The program of implementation[1] described below is based on the Salt and Nutrient Management Plan for the Central Basin and West Coast Basin developed by the Water Replenishment District of Southern California (WRD) and other agencies, including, Los Angeles County Department of Public Works, West Basin Municipal Water District, Los Angeles Department of Water and Power, and the County Sanitation Districts of Los Angeles County. The Salt and Nutrient Management Plan and this program of implementation satisfy the Recycled Water Policy requirements for Salt and Nutrient Management Plans. This program of implementation applies to groundwater basin(s) with the designated beneficial use of municipal and domestic supply (MUN).

The following summarizes essential elements of the Salt and Nutrient Management Plan for the Central Basin and West Coast Basin. Further details may be found in the full document at: http://www.waterboards.ca.gov/losangeles/water_issues/programs/salt_and_nutrient_management/index.shtml

Background

The Central Basin and West Coast Basin are located in the southern portion of Los Angeles County and provide approximately 40 percent of the overall water supply for the nearly four million residents and businesses in the 43 cities overlying the basins. The Central Basin covers approximately 280 square miles and is hydrogeologically divided into four subareas including the Los Angeles Forebay, Montebello Forebay, Whittier Area, and Pressure Area (Figure 8.1-1). The forebays are areas where confining layers are thin or absent and infiltration of precipitation and surface water can recharge deeper potable water supply aquifers. The Montebello Forebay is the most significant area of recharge in the Central Basin. The Central Basin Pressure Area, Fthe largest of the four subareas, is characterized by aquifers that are generally confined by

[1] The Recycled Water Policy refers to "revised implementation plans" for adoption into regional basin plans pursuant to Water Code section 13242. Water Code section 13242 uses the term "program of implementation." Pursuant to Water Code section 13242, "[t]he program of implementation for achieving water quality objectives shall include, but not be limited to:
(a) A description of the nature of actions which are necessary to achieve the objectives, including recommendations for appropriate action by any entity, public or private.
(b) A time schedule for the actions to be taken.
(c) A description of surveillance to be undertaken to determine compliance with objectives."

relatively impermeable clay layers over most of the area, but areas of semi-permeable confining layers allow some interaction between the aquifers (DWR, 1961). The West Coast Basin covers approximately 140 square miles. Aquifers in the West Coast Basin are generally confined and receive the majority of their natural recharge from adjacent groundwater basins or from the Pacific Ocean (seawater intrusion). The Newport-Inglewood Uplift and associated faulting acts as a partial barrier to groundwater flow between the Central Basin and West Coast Basin.

Basin Adjudications and Management

From 1900 through the 1950s, overpumping of the basins caused declines in groundwater levels, seawater intrusion, and other groundwater management problems related to supply and quality. To remedy these problems, the courts adjudicated the two basins in the early 1960s and set a limit on allowable groundwater production. The adjudicated pumping amounts are greater than the natural replenishment of the groundwater aquifers, creating an annual deficit or annual overdraft, under natural recharge conditions. Accordingly, the WRD was established in 1959 to provide the needed supplemental replenishment water to make up the difference between the adjudicated amounts and the natural safe yield. Since then multiple measures have been implemented to manage groundwater supply and quality and prevent seawater intrusion, as described below.

TABLE 8.1-1: HISTORICAL BASIN MANAGEMENT MEASURES

Management Measure	Function
Montebello Forebay Spreading Grounds (MFSG)	To provide artificial groundwater recharge. Water is comprised of stormwater (since 1930s), imported water (since 1950s), and recycled water (since 1960s).
West Coast Basin Seawater Intrusion Barrier (WCBB)	To create a pressure ridge or subsurface water wall to block further seawater intrusion through a series of injection wells constructed by Los Angeles County (LAC) along the western coast of the West Coast Basin in the 1950s
Dominguez Gap Seawater Intrusion Barrier (DGB)	To create a pressure ridge or subsurface water wall to block further seawater intrusion through a series of injection wells constructed by Los Angeles County (LAC) along the southern coast of the West Coast Basin in the 1970s. Currently, treated imported water and advanced treated recycled water are injected.
Alamitos Gap Seawater Intrusion Barrier (AGB)	To create a pressure ridge or subsurface water wall to block further seawater intrusion through a series of injection wells constructed by Los Angeles County (LAC) along the southern coast of the Central Basin in the 1960s. Currently, treated imported water and advanced treated recycled water are injected.

Management Measure	Function
De-salters	For salinity management in the West Coast Basin, the Brewer De-salter and Goldsworthy De-salter began operating in 1993 and 2002, respectively, to pump and treat brackish groundwater for potable supply.

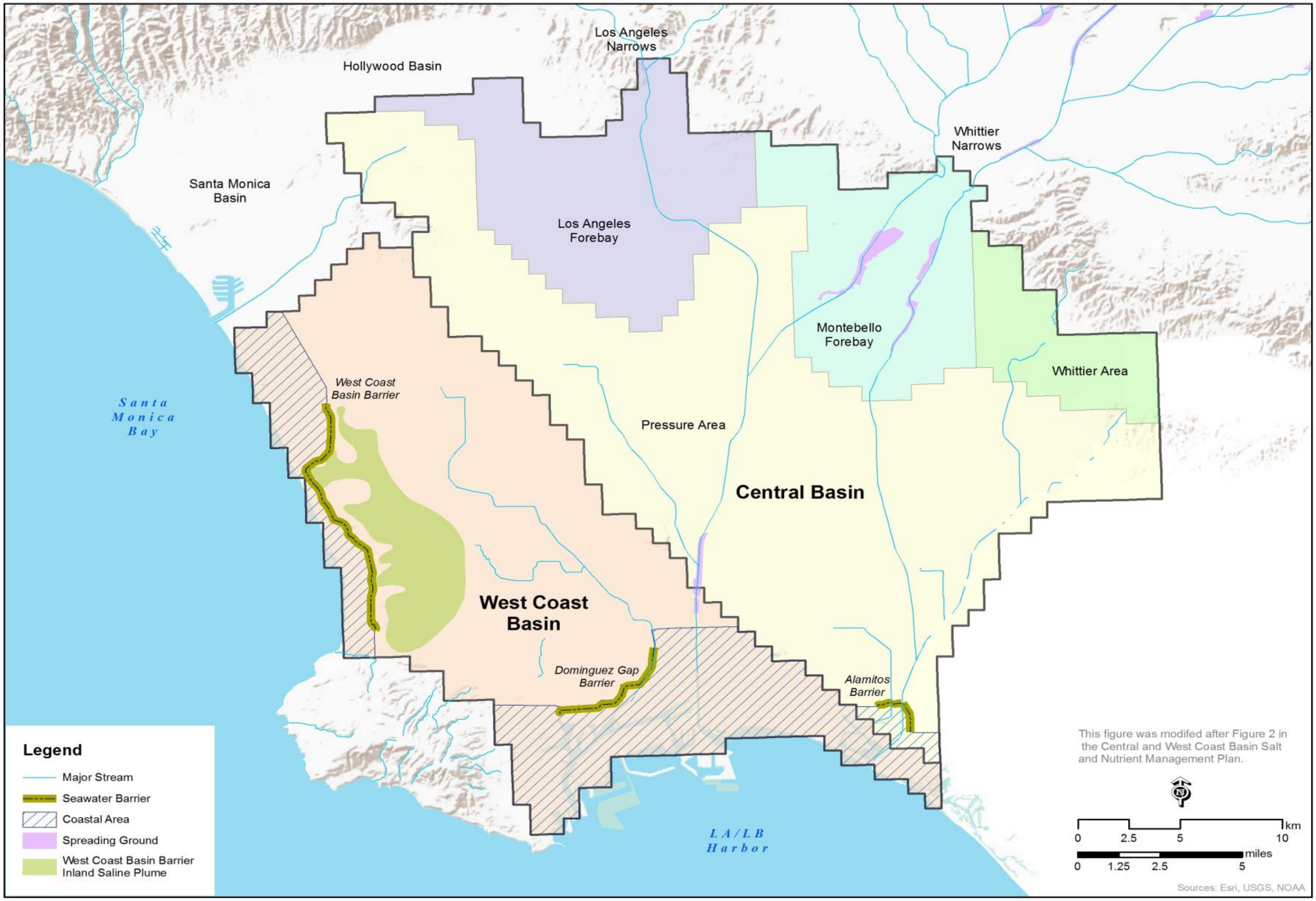

Figure 8.1-1. Central Basin and West Coast Basin Subareas and Coastal Areas (modeled).

Participating Agencies

Stakeholders in the Central Basin and West Coast Basin that participated in the SNMP process and collaborated to develop the SNMP include water and wastewater entities, regulatory agencies, water purveyors, water associations, and environmental groups. The WRD was the lead agency managing and coordinating development of the SNMP. Funding partners for the SNMP consist of WRD, Los Angeles County Department of Public Works, West Basin Municipal Water District, Los Angeles Department of Water and Power, and the County Sanitation Districts of Los Angeles County (CSDLAC).

Sources of Water in the CBWCB

Sources of water for use and recharge in the CBWCB include surface water/stormwater, imported water, groundwater, and recycled water. Other minor potential sources of groundwater recharge include leaking pipes, septic systems, and stream losses (not associated with managed aquifer recharge).

TABLE 8.1-2: CONTRIBUTIONS OF SOURCE WATERS TO THE CENTRAL AND WEST COAST BASINS

TYPE	SOURCE	CONTRIBUTION TO GROUNDWATER
Surface water	Los Angeles River	Negligible - lined throughout most of the overlying area
	Rio Hondo	Negligible - lined throughout the overlying area
	San Gabriel River	In-stream recharge along the San Gabriel River in the Montebello Forebay, and at the Dominguez Gap Spreading Grounds
Storm water	Precipitation from overlying area	Active capture and recharge through replenishment operations the MFSG, as well as stormwater retention basins and LID projects in the area
Imported water	Colorado River (CR) and State Water Project (SWP)	Applied to the Montebello Forebay spreading grounds (Untreated imported water) Injection into the three seawater intrusion barriers (Treated Imported Water)
	Owens Valley-Mono Basin	Water supply in the CBWCB
	Groundwater extracted from the San Gabriel Basin	Water supply in the CBWCB
Groundwater	Extracted from the CBWCB	Water supply and irrigation (small percentage)
	Subsurface flow from adjacent groundwater basins and minor ocean water inflow	Recharge of the CBWCB

Type	Source	Contribution to Groundwater
Recycled Water	Pomona, San Jose Creek, and Whittier Narrows Water Reclamation Plants (WRPs)	Managed Aquifer Recharge in the Montebello Forebay
	Tertiary-treated recycled water from CSDLAC's Long Beach, Los Coyotes, and San Jose Creek WRPs	Irrigation and commercial/industrial applications in the Central Basin
	Advanced Water Treatment (AWT) recycled water produced by the Leo J. Vander Lans Advanced Water Treatment Facility	Injected at the AGB
	Tertiary treated and AWT recycled water from Edward C. Little Water Recycling Facility (WRF) .	Irrigation (tertiary-treated) in the West Coast Basin Injection (AWT) at the WCBB
	AWT recycled water from Terminal Island Water Reclamation Plant/Advanced Water Purification Facility (TIWRP)	Injection at the DGB

Groundwater outflow from the Central Basin and West Coast Basin includes:

- Pumping, including extraction associated with the de-salters,
- Subsurface outflow to adjacent basins and the ocean, and
- Groundwater discharge to surface water.

Salt and Nutrient Loading to the Central Basin and West Coast Basin

The mass balances (inputs and outflows) for total dissolved solids (TDS), chloride, and nitrate-N for a 10-year baseline period (Water Years 2000-01 to 2009-10) are presented below.

TABLE 8.1-3A: SALT AND NUTRIENT BALANCE IN THE CENTRAL BASIN (2000-01 THROUGH 2009-10)

Source Water	TDS		Chloride		Nitrate	
	(tons)	%	(tons)	%	(tons)	%
Spreading Grounds	65,880	48.9	13,125	57.2	307.6	73.4
Seawater Barrier	2,227	1.7	447	1.9	4.8	1.2
Precipitation Infiltration	3,429	2.5	457	2.0	3.8	0.9
Mountain Front Recharge	2,191	1.6	314	1.4	13.6	3.2
Irrigation Return Flows	31,643	23.5	4,601	20.0	4.9	1.2
Subsurface Inflow	29,478	21.9	4,012	17.5	84.2	20.1
Total Inflow	**134,849**	**100**	**22,956**	**100**	**419.0**	**100**
Groundwater Production	-130,042	97.3	-19,787	96.9	-110.3	99.1
Subsurface Outflow	-3,621	2.7	-537	3.1	-0.9	0.8
Total Outflow	**-133,663**	**100**	**-17,323**	**100**	**-111.3**	**100**
Annual Change in Mass	**1,186**	**-**	5,633	**-**	**307.7**	**-**

TABLE 8.1-3B: SALT AND NUTRIENT BALANCE IN THE WEST COAST BASIN (2000-01 THROUGH 2009-10)

Source Water	TDS		Chloride		Nitrate	
	(tons)	%	(tons)	%	(tons)	%
Spreading Grounds	127	0.3	17	0.1	0.8	2.2
Seawater Barriers	8,830	17.6	1,977	10.4	15.3	42.6
Precipitation Infiltration	1,689	3.4	225	1.2	1.9	5.3
Mountain Front Recharge	804	1.6	115	0.6	5.0	13.9
Irrigation Return Flows	12,716	25.4	3,179	16.6	2.2	6.1
Subsurface Inflow*	25,924	51.8	13,586	71.1	10.7	29.8
Total Inflow	**50,090**	**100**	**19,099**	**100**	**35.9**	**100**
Groundwater Production	-57,937	100	-28,999	100	-4.0	100
Subsurface Outflow	0	0	0	0	0.0	0
Total Outflow	**-57,937**	**100**	**-28,999**	**100**	**-4.0**	**100**
Annual Change in Mass	**-7,847**	**-**	**-9,900**	**-**	**31.9**	**-**

Groundwater Quality and Assimilative Capacity in Central Basin and West Coast Basin

Monitoring data from wells in the Central Basin and West Coast Basin, from January 2007 through mid-2012, were used to calculate current groundwater quality. The water quality data set includes semi-annual monitoring of the network of WRD nested wells and other data sets such as the State Water Board's Division of Drinking Water (formerly the California Department of Public Health) well database. For each basin, two average concentrations were calculated: one average includes the coastal areas (i.e., areas seaward of the barriers) and the other average excludes these coastal areas). For the West Coast Basin, a third average groundwater quality estimate was calculated excluding the WCBB-inland saline plume and coastal areas in order to evaluate the impact of this saline plume on overall basin groundwater quality (Figure 8.1-4a).

TABLE 8.1-4A: GROUNDWATER QUALITY IN THE CENTRAL AND WEST COAST BASINS (2007-2012)

	Existing Average Concentration (mg/l)		
Location	**TDS**	**Cl**	**NO3-N**
Central Basin Water Quality Objectives	**700**	**150**	**10**
Los Angeles Forebay	640	81	0.15
Montebello Forebay	534	88	1.13
Whittier Area	1007	121	0.57
Central Basin Pressure Area (including Coastal Area)	485	65	0.10
Central Basin Pressure Area (excluding Coastal Area)	470	55	0.10
Central Basin (including Coastal Area)	538	73	0.28
Central Basin (excluding Coastal Area)	529	67	0.28
West Coast Basin Water Quality Objectives	**800**	**250**	**10**
West Coast Basin (including Coastal Areas)	1424	660	0.04
West Coast Basin (excluding Coastal Areas)	890	306	0.05
West Coast Basin (excluding Coastal Areas and inland saline plume)	747	224	0.05

The average (2007-2012) TDS, chloride, and nitrate-N concentrations for each subarea/layer and for the Central Basin and West Coast Basin both with and without the coastal areas, and the West Coast Basin without the coastal areas and without the WCBB inland saline plume were compared to the applicable basin water quality objectives to determine the existing available assimilative capacity (Table 8-1.4b).

TABLE 8.1-4B: GROUNDWATER ASSIMILATIVE CAPACITY FOR TDS, CHLORIDES AND NITRATES IN THE CENTRAL AND WEST COAST BASINS (2007-2012)

	Assimilative Capacity (mg/l)		
Location	**TDS**	**Cl**	**NO3-N**
Central Basin Water Quality Objectives	**700**	**150**	**10**
Los Angeles Forebay	60	69	9.85

Location	Assimilative Capacity (mg/l)		
	TDS	**Cl**	**NO3-N**
Montebello Forebay	166	62	8.87
Whittier Area	-307	29	9.43
Central Basin Pressure Area (including Coastal Area)	215	85	9.90
Central Basin Pressure Area (excluding Coastal Area)	230	95	9.90
Central Basin (including Coastal Area)	162	77	9.72
Central Basin (excluding Coastal Area)	171	83	9.72
West Coast Basin Water Quality Objectives	**800**	**250**	**10**
West Coast Basin (including Coastal Areas)	-624	-410	9.96
West Coast Basin (excluding Coastal Area)s	-90	-56	9.95
West Coast Basin (excluding Coastal Areas and inland saline plume)	53	26	9.95

Salt and Nutrient Management Measures in the Central and West Coast Basins

Existing salt and nutrient management measures in the Central Basin and West Coast Basin can be broadly categorized into actions that improve source waters to the groundwater basin, improve stormwater capture, and/or increase recycled water use (Table 8.1-5a).

TABLE 8.1-5A: CURRENT SALT AND NUTRIENT MANAGEMENT MEASURES IN THE CENTRAL AND WEST COAST BASINS

Type	Components
Improve Surface Water Quality	Compliance with TMDL requirements, stormwater best management practices, Low Impact Development, water quality monitoring, education & outreach
Improve Imported Water Quality	Salinity Source Water Control Program (Metropolitan Water District of Southern California), Education & Outreach (Southern California Salinity Coalition), water quality monitoring
Improve Recycled Water Quality	Nitrogen treatment, industrial source controls, water quality monitoring, public education on water softeners, compliance with existing permits and regulations
Improve Groundwater Quality	Seawater intrusion barriers, Desalters, LA County First Flush Policy, water quality monitoring, basin adjudication
Improve Surface Water Capture	Montebello Forebay Spreading Grounds (MFSG), Dominguez Gap Spreading Grounds (DGSG), Torrance stormwater retention ponds
Increased Recycled Water Use	Advanced treated recycled water at seawater barriers, recycled water at MFSG, recycled water for irrigation and industrial uses

Planned implementation projects include increased groundwater recharge at the seawater barriers, increased volumes of groundwater treatment by de-salters, and increased stormwater recharge (Table 8.1-5b). These projects are expected to be completed by the 2025.

TABLE 8.1-5B: MAJOR PLANNED (FUTURE) SALT AND NUTRIENT PROJECTS AND MANAGEMENT STRATEGIES

Project Description*	Estimated Date	Lead Agency(s)
Central Basin		
100% Advanced treated (AWT) Recycled Water (RW) at Alamitos Gap Barrier - increased recharge volume, increased injection volumes and replacement of imported water with advanced treated recycled water	2014/15	Water Replenishment District of Southern California
Groundwater Reliability Improvement Program (GRIP) for the Montebello Forebay Spreading Grounds • GRIP RW Project A – Replace recharge of 21,000 AFY of imported water with 11,000 AFY tertiary RW and 10,000 AFY AWT RW • GRIP RW Project B – Replace recharge of 21,000 AFY of imported water with 21,000 AFY tertiary RW	2017/2018 2015	Water Replenishment District of Southern California
Increased RW** for irrigation • Increase the volumes of recycled water for irrigation to reduce reliance on imported water and groundwater supplies	On-going	County Sanitation Districts of Los Angeles County
West Coast Basin		
100% Advanced Treated Recycled Water at West Coast Basin Barrier - increased recharge volume, increased injection volumes and replacement of imported water with advanced treated recycled water	2015	West Basin Municipal Water District
100% Advanced Treated Recycled Water at Dominguez Gap Barrier - increased recharge volume, increased injection volumes and replacement of imported water with advanced treated recycled water	2018/19	City of Los Angeles
Expansion of Goldsworthy De-salter and increased groundwater pumping for treatment by the Goldsworthy De-salter and Brewer De-salter	2015	Water Replenishment District of Southern California
Increased recharge at Dominguez Gap Spreading Grounds	2015	Los Angeles County Department of Public Works
Increased use of recycled water** for irrigation	On-going	County Sanitation Districts of Los Angeles County

***** These projects are expected to be implemented by or before the SNMP 2025 planning horizon.
** Using recycled water quality at Secondary MCLs for TDS and chloride and MCLs for nitrate-N..

Projected Impacts of Future Projects on Water Quality

A salt and nutrient management mixing model was developed to simulate/estimate groundwater quality over the planning period (through 2025). The mixing model was also used to evaluate the effects of planned future projects on overall groundwater quality and use of assimilative capacity in the CBWCB through WY 2024-25. The mixing model was developed in Microsoft Excel™ and consisted of a set of linked spreadsheets used to represent “continuously-stirred” mixing volumes for basins/subareas, and vertical modellayers.

The estimated current groundwater volume (provided by the MODFLOW regional groundwater flow model [USGS, 2003 and CH2MHILL, 2012b]) and associated salt and nutrient mass in storage (estimated from existing average groundwater quality) within the Central and West Coast Basins served as initial inputs into the mixing model. Several scenarios were evaluated. Results of the recommended scenario and the most likely alternative are provided in Table 8.1-6.

TABLE 8.1-6: PROJECTED IMPACT OF SALT AND NUTRIENT MANAGEMENT MEASURES ON BASIN WATER QUALITY

Basin/sub-basin	Impact of Projected Baseline Conditions & Recommended Future Projects (with GRIP A)*			Impact of Projected Baseline Conditions & Recommended Future Projects (with GRIP B)*		
Change (2010 to 2025) (mg/L)	**TDS**	**Cl**	**NO3-N**	**TDS**	**Cl**	**NO3-N**
Los Angeles Forebay	-0.6	1.6	0.15	-0.5	1.6	0.15
Montebello Forebay	-66.1	-0.7	0.16	-47.1	4.0	0.22
Whittier Area	-41.5	-3.1	0.05	-41.5	-3.1	0.05
Central Basin Pressure Area	18.8	8.2	0.13	20.0	8.4	0.14
Central Basin Change (2010 to 2025) (mg/L) Assimilative Capacity Used (2010 to 2025) (%)	**1.1** **0.7%**	**5.6** **6.7%**	**0.14** **1.4%**	**4.7** **2.8%**	**6.5** **7.8%**	**0.15** **1.5%**
West Coast Basin Change (2010 to 2025) (mg/L) Assimilative Capacity Used (2010 to 2025) (%)	**-56.8** **NC**	**-34.1** **NC**	**0.06** **0.6%**	**-56.7** **NC**	**-34.1** **NC**	**0.06** **0.6%**

TDS - total dissolved solids
AWT - advanced water treatment
MCL - maximum contaminant level
Cl - chloride
SMCL - secondary MCL
NO_3-N - nitrate as nitrogen
mg/L - milligrams per liter
NC - No assimilative capacity available
GRIP - Groundwater Reliability Improvement Program
GRIP A – GRIP Recycled Water Project A
GRIP B - GRIP Recycled Water Project B
“Overall Scenario” quantifies the impacts of the indicated future project/scenario in combination with existing projects in the CBWCB, i.e. including average baseline conditions (No Future Projects Scenario) continued through the future planning period
*Values reflect recycled water quality limits at secondary MCLs for TDS and chloride and MCL for nitrate

Salt and Nutrient Load Limits

The Central and West Coast Basins are currently being managed in a manner that addresses existing TDS and chloride impairments in localized areas, and proposes to maintain TDS, chloride and nitrate levels in the other areas of the basin below water quality objectives. Therefore assignment of allocations for salt and nutrient loading is not warranted at this time.

Monitoring Program

The SNMP Monitoring Program was developed based on WRD's Regional Groundwater Monitoring Program. Seventy (70) WRD nested groundwater monitoring wells (referred to as the SNMP monitoring wells) at 13 locations throughout the CBWCB were selected for the purpose of salt and nutrient monitoring and reporting (see Figure 8.1-2). Elements of the program are laid out in Table 8.1-7.

TABLE 8.1-7: MONITORING PROGRAM ELEMENTS

<table>
<tr><th>Element</th><th>Description</th></tr>
<tr><td>Responsible Agency</td><td>Water Replenishment District of Southern California</td></tr>
<tr><td>Program Origin</td><td>Water Replenishment District of Southern California's Regional Groundwater Monitoring Program (RGWMP)</td></tr>
<tr><td>Parameters and Monitoring Frequency</td><td><table><tr><th>Parameter</th><th>Monitoring Frequency</th></tr><tr><td>Total Dissolved Solids</td><td rowspan="3">Semi-Annually</td></tr><tr><td>Chloride</td></tr><tr><td>Nitrate</td></tr></table></td></tr>
<tr><td>Monitoring locations</td><td>70 nested groundwater monitoring wells at 13 locations throughout the Central Basin and West Coast Basin (CBWCB); each nested well is screened in a specific aquifer, allowing the assessment of salts and nutrients in all the major aquifers of the CBWCB. These wells are located throughout the most critical areas of the basins, particularly their proximity to water supply wells and groundwater recharge projects that utilize recycled water, including the seawater intrusion barriers and the MFSG (Figure 8.1-2).</td></tr>
<tr><td>Reporting Requirements</td><td>Monitoring results will be reported annually. WRD will upload TDS, chloride, and nitrate data collected from the SNMP monitoring wells to the State Water Board's online GeoTracker database.</td></tr>
<tr><td>Additional Resources</td><td>WRD's annual Regional Groundwater Monitoring Report (RGWMR), which provides maps depicting chloride, TDS, and nitrate concentrations in all the RGWMP wells and active drinking water wells; chloride and TDS trend graphs for the SNMP monitoring wells; and a discussion of salt and nutrient concentrations and trends in groundwater with respect to water quality objectives established in the Basin Plan to assess overall groundwater quality in the CBWCB. The RGWMR is sent to the CBWCB water purveyors and can be downloaded from the WRD website:
http://www.wrd.org/engineering/groundwater-engineering-reports.php

WRD's online Geographical Information System (GIS) database provides groundwater quality data, well locations, well construction, and water levels for active production wells and all the RGWMP wells:
http://gis.wrd.org/wrdmap/login.asp</td></tr>
<tr><td>Review Period and Re-opener</td><td>TDS, chloride, and nitrate data collected from the SNMP monitoring wells will be reviewed periodically to validate model predictions regarding changes to basin water quality.</td></tr>
</table>

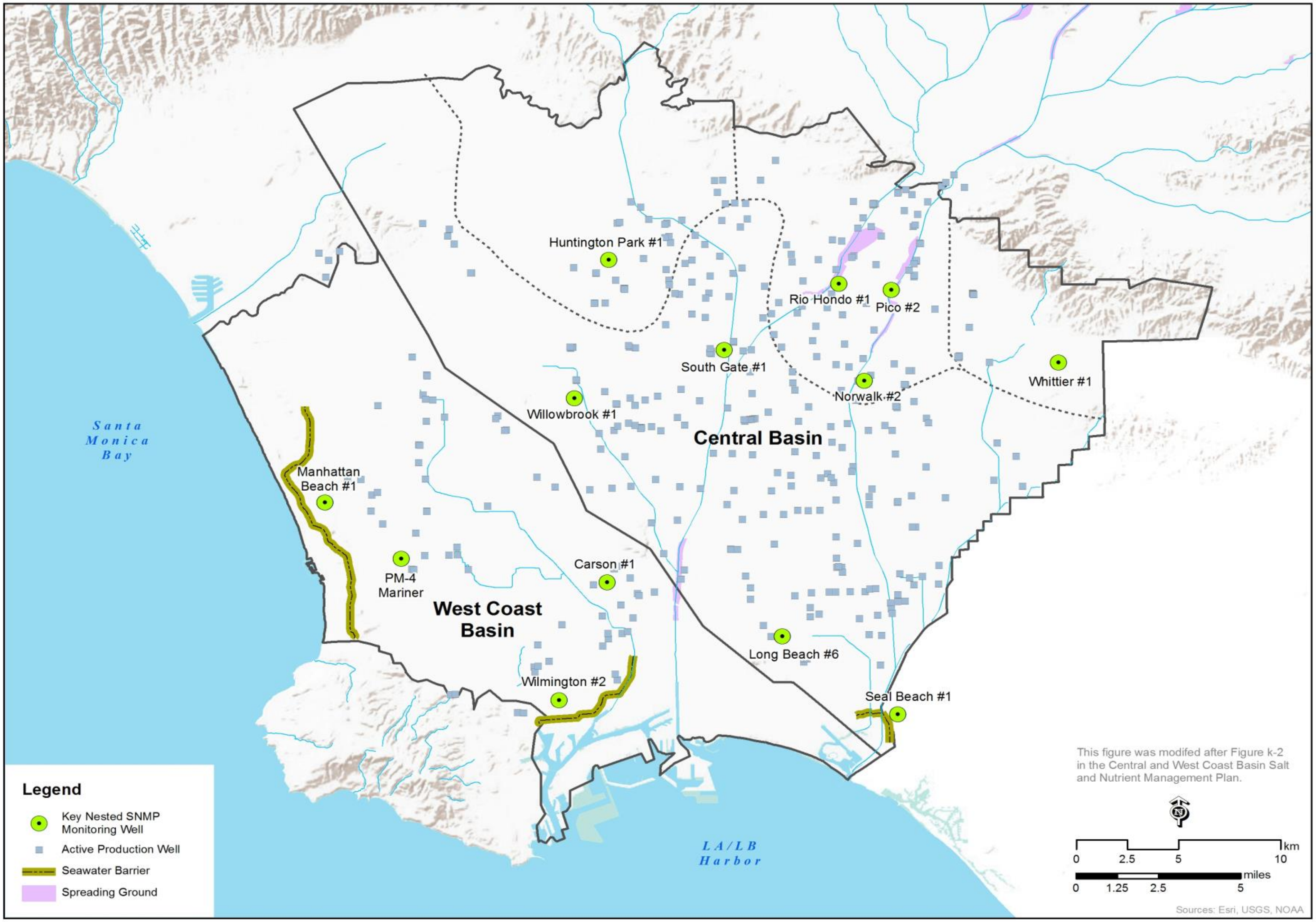

Figure 8.1-2. Location of SNMP Monitoring Wells in the Central Basin and West Coast Basin.

Updates to the Salt and Nutrient Management Measures

Salt and nutrient management measures will be updated (i) as necessary to reflect changing conditions in the CBWCB (i.e. in accordance with actions that have been taken or in response to proposed actions not taken), (ii) where results from the SNMP Monitoring Program indicate that revisions/ modifications are warranted, and/or (iii) at the end of the planning horizon (i.e. 2025).

Regulatory Implications

The salt and nutrient management strategies developed by local water entities in the Central Basin and West Coast Basin are voluntary measures that are designed to maintain water quality that is protective of beneficial uses. Except for the permitting of existing and proposed facilities/projects, further Regional Water Board action pertaining to these implementation measures geared toward controlling salt and nutrient loading to these basins will only be necessary where data and/or other information indicate that the projected water quality conditions are not being met.

B. Lower Santa Clara River Basin

Adopted by the California Regional Water Quality Control Board, Los Angeles Region on July 9, 2015.

Approved by:

The State Water Resources Control Board on December 1, 2015.
The Office of Administrative Law on August 17, 2016.

The program of implementation[2] described below is based on the Salt and Nutrient Management Plan for the Lower Santa Clara River Groundwater Basin developed by the Ventura County Watershed Protection District (VCWPD) and other agencies, including the Cities of Ventura, Santa Paula, and Fillmore; Ventura County Water Works District 16; United Water Conservation District; and the Ventura County Agricultural Irrigated Lands Group. The Salt and Nutrient Management Plan and this program of implementation satisfy the Recycled Water Policy requirements for Salt and Nutrient Management Plans.

The overarching goal of the Lower Santa Clara River Basin (LSCR) Salt and Nutrient Management Plan (SNMP) is to protect, conserve, and augment water supplies and to improve water supply reliability. This goal is supported by objectives of:

- Protecting Agricultural Supply and Municipal and Domestic Supply Beneficial Uses of groundwater;
- Supporting increased recycled water use in the basin;
- Facilitating long-term planning and balancing use of assimilative capacity and management measures across the basin;
- Encouraging groundwater recharge in the Santa Clara River (SCR) valley; and
- Collecting, treating, and infiltrating stormwater runoff in new development and redevelopment projects.

The SNMP has been developed to support these general goals and objectives.
The following summarizes the essential elements of the Salt and Nutrient Management Plan for the LSCR groundwater basin. Further details may be found in the full document at: http://www.waterboards.ca.gov/losangeles/water_issues/programs/salt_and_nutrient_management/index.shtml

Background

[2] The Recycled Water Policy refers to “revised implementation plans” for adoption into regional basin plans pursuant to Water Code section 13242. Water Code section 13242 uses the term “program of implementation.” Pursuant to Water Code section 13242, “[t]he program of implementation for achieving water quality objectives shall include, but not be limited to:
(a) A description of the nature of actions which are necessary to achieve the objectives, including recommendations for appropriate action by any entity, public or private.
(b) A time schedule for the actions to be taken.
(c) A description of surveillance to be undertaken to determine compliance with objectives.”

The Lower Santa Clara River Basin is located in southwestern Ventura County and consists of the Piru, Fillmore, Santa Paula, Mound and Oxnard sub-basins (Figure 8.2-1). These sub-basins are overlain by the cities of Fillmore, Santa Paula and San Buenaventura (Ventura), and small, unincorporated communities in Ventura County. Most of the area is reliant on groundwater for up to 65% of their overall water supply. A description of each sub-basin is provided below.

The Piru Basin is the uppermost sub-basin in the LSCR Basin. Its upstream or eastern extent is just west of the Ventura/Los Angeles County line. The Piru basin is narrower than downstream basins and is confined to the north by the Topatopa Mountains and to the south by the Oak Ridge and Santa Susana Mountains. The Piru basin is approximately 9.8 miles long and 1.8 miles wide at its widest point at the Piru Creek/Santa Clara River confluence, and covers an area of approximately 13.9 square miles. The basin's western extent is marked by an area where the groundwater table intersects the streambed and causes groundwater to discharge into the Santa Clara River channel. The portion of the Santa Clara River above the Piru basin is in direct connection with the underlying aquifer, resulting in groundwater levels that respond rapidly to recharge from streambed percolation and rainfall events.

The Fillmore Basin is immediately downstream of the Piru basin, sharing its eastern boundary with the Piru basin's western boundary. It is confined to the SCR valley by the Topatopa Mountains on the north and Oak Ridge to the south. It is 5.2 miles in width at its widest point. The basin is approximately 9.8 miles long and covers an area of approximately 32.56 square miles. The basin is considered an unconfined aquifer system. Groundwater generally flows from east to west down the axis of the basin, with southwesterly flow occurring in the Sespe Creek area. The streambed percolation from the SCR and Sespe Creek, and underflow from Piru basin are major sources of recharge to the Fillmore basin. Discharge from the basin includes groundwater pumping, rising groundwater that becomes surface water in the SCR, and subsurface outflow to the Santa Paula basin.

The Santa Paula Basin is just west and downstream of the Fillmore basin. The basin is 10.5 miles in length and covers an area approximately 35.78 square miles. It is bounded by the Sulphur Mountain foothills on the north and South Mountain on the south, Mound basin to the west and the Oxnard Forebay basin to the south. A hydraulic connection is believed to exist between Santa Paula basin and the downgradient Mound basin and Oxnard Forebay, but the flow is unquantified. The Santa Paula basin is primarily recharged by percolation of surface water from the SCR and Santa Paula Creek, direct percolation of precipitation on the exposed San Pedro Formation, and underflow from Fillmore basin. Discharge from the Santa Paula basin includes groundwater pumping and outflow to the Mound basin and Oxnard Forebay. Geologically, the Santa Paula basin is comprised of the San Pedro Formation and overlying alluvial sediments deposited by the SCR and its tributaries. An alluvial fan associated with the Santa Paula Creek occurs in the northeast portion of the basin.

The Mound Basin, overlying a low lying alluvial plain, is immediately downstream of the Santa Paula basin and shares its eastern boundary with Santa Paula basin's western boundary

(Figure 8.2-1). The basin's northern boundary is confined to the valley by the Ventura Foothills, north of the City of Ventura. Its southern boundary coincides approximately with the Montalvo anticline, which separates it from the Oxnard Forebay and Oxnard Plain basins to the south. The lowermost portion of the SCR transects the southern boundary of the Mound basin; this is the only part of the SCR that flows through the Mound basin. The Pacific Ocean bounds the basin on the west. The Mound basin is approximately 5.5 miles long by 4 miles wide, with an area of 23.20 square miles. The alluvium and San Pedro formation contain the basin's primary aquifers.   Sources of recharge to the Mound basin include underflow from adjacent basins (Santa Paula, Oxnard Plain, and Oxnard Forebay), mountain front recharge from the Ventura Foothills, irrigation return flow, and direct percolation of precipitation on the San Pedro formation exposed along the basin's northern boundary. Sources of discharge from the Mound basin include groundwater production and outflow to the ocean.

The Oxnard Forebay is bordered by the Santa Paula and Mound basins on its northern boundary and surrounded by the Oxnard Plain basin on its west and south boundary. The nose of the South Mountain occurs at the northeastern extent of the basin. The Oxnard Forebay is delineated as the unconfined portion of the Oxnard Plain basin (UWCD, 2008), and is the main source of recharge to the Oxnard Plain. The Oxnard Forebay is approximately 8.39 square miles, 5.5 miles long, and 2.4 miles wide. As the Oxnard Forebay aquifers are in direct hydraulic connection with the confined aquifer of the Oxnard Plain basin, it is the primary source of recharge to that basin. The Oxnard Forebay is also a source of recharge to other adjacent and regional basins, including the Mound, West Las Posas, and Pleasant Valley basins, but the majority of its groundwater underflow is downgradient to the Oxnard Plain basin (UWCD, 2012b).

Percolation of SCR flows between the UWCD SCR surface water diversion (Freeman Diversion) and the U.S. Highway 101 bridge, managed aquifer recharge, irrigation return flows, and direct percolation of precipitation are major sources of groundwater recharge to the Oxnard Forebay (UWCD, 2012; UWCD, 2013). Groundwater in the basin is discharged by groundwater pumping and outflow to the adjacent Mound and Oxnard Plain basins.

Basin Management

The Lower Santa Clara River sub-basins are actively managed by the United Water Conservation District through groundwater replenishment and the construction and operation of water supply and delivery systems, and by the Ventura County Watershed Protection District through the issuance of permits for water supply and monitoring wells, and the collection and assessment of groundwater quality data.

TABLE 8.2-1: HISTORICAL BASIN MANAGEMENT MEASURES*

Management Measure	Function
Santa Felicia Dam - constructed in 1955	Constructed for the purpose of groundwater recharge
Freeman Diversion - constructed in 1991	Replenishment of groundwater supply with approximately 58,000 AFY of stream flow
Piru, Saticoy and Noble Spreading Grounds	Recharge of groundwater in the Oxnard Forebay using water from the Freeman Diversion Facility
Pumping Trough and Pleasant Valley Pipeline and Reservoirs	Delivery of surface water directly from the Santa Clara River to agriculture in the Oxnard Plain and Pleasant Valley to reduce pumping in the over-drafted lower aquifer system
Oxnard Hueneme Pipeline	Provision of drinking water to the City of Oxnard and a number of water agencies to avoid local pumping near the coast where wells are most vulnerable to saltwater intrusion

*Source: http://www.unitedwater.org/about-us-6/facilities-a-strategies

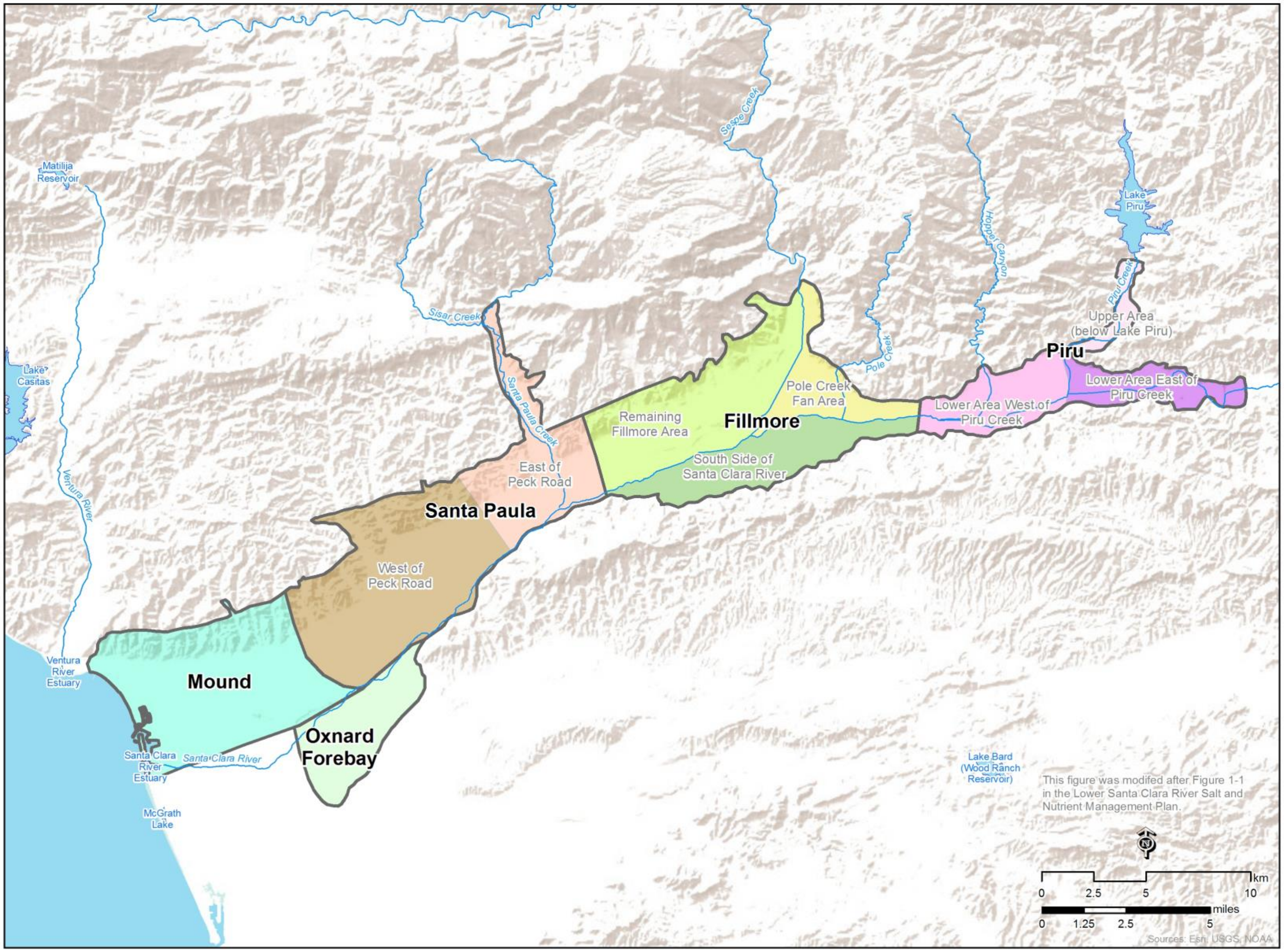

Figure 8.2-1. Lower Santa Clara River Salt and Nutrient Management Plan (SNMP) Area.

Participating Agencies

Using a tiered stakeholder process, which included a Technical Advisory Group (TAG), the Santa Clara River Watershed Committee (SCRWC), and the Los Angeles Water Board, the LSCR Basin SNMP, was developed with broad-based local community involvement.

The TAG consists of the funding agencies and stakeholders responsible for management of salts and nutrients in the watershed with representatives from agriculture, water suppliers, municipalities, including disadvantaged communities, and watershed managers. The following organizations participated in the TAG: Ventura County Public Works Agency Watershed Protection District; Cities of Ventura, Santa Paula, and Fillmore; United Water Conservation District (UWCD); Ventura County Water Works District 16; and the Farm Bureau of Ventura County (administrator of the Ventura County Agricultural Irrigated Lands Program).

Sources of Water in the Lower Santa Clara River Basin

Water purveyors supply water within the LSCR area from a number of sources. Surface water and groundwater have been used and managed conjunctively for many years in the LSCR Basin, both for water supply and managed aquifer recharge operations.

TABLE 8.1-2: CONTRIBUTIONS OF SOURCE WATERS TO THE LOWER SANTA CLARA RIVER BASIN

TYPE	SOURCE	CONTRIBUTION TO GROUNDWATER
Surface water	Santa Clara River, Piru Creek	Streambed recharge from the Santa Clara River and Piru Creek from both natural flows and water released from Santa Felicia Dam are major sources of groundwater recharge. The Piru Diversion diverts water from Piru Creek into the Piru Spreading Grounds for groundwater recharge. Releases from Piru Reservoir at Santa Felicia Dam and natural runoff in the SCR percolates naturally into the Piru, Fillmore, and Santa Paula basins.
	Santa Clara River, Piru Creek, Sespe Creek, and Santa Paula Creek	Several small diversions located on Piru Creek, Sespe Creek, Santa Paula Creek, and the SCR are operated by mutual water companies for agricultural irrigation.
Stormwater	Precipitation from overlying area	Active capture and recharge through low impact development (LID) projects.
Imported water	State Water Project	Groundwater percolation and recharge via releases from Santa Felicia Dam following storage in Pyramid Lake, then Lake Piru. Water supply within the Lower Santa Clara River Basin.
Groundwater	Extracted from LSCR basin for use in Ventura County	<u>Piru Basin</u> - groundwater production is predominantly for agricultural irrigation. In comparison, approximately 4% of groundwater pumped is used for municipal and industrial purposes. <u>Fillmore Basin</u> produces the greatest amount of groundwater of all the study area basins. Consistent with land use, agricultural pumping accounts for over

TYPE	SOURCE	CONTRIBUTION TO GROUNDWATER
		92% of groundwater production. Santa Paula Basin uses approximately 20% of its groundwater production for municipal and industrial purposes. Several irrigation companies operate in the Santa Paula Basin distributing irrigation water to areas that have groundwater of relatively poorer quality. Mound Basin - Fifty-five percent of the basin's groundwater extraction is for agricultural irrigation. The majority of the municipal and industrial production is by the City of Ventura. Oxnard Forebay produces groundwater primarily for municipal and industrial consumption. Agricultural pumping accounts for approximately 30% water pumped from the basin.
	Mountain front recharge from upland areas and from the upstream Eastern Santa Clara River Valley basin	Basin Recharge
Groundwater	Subsurface flow from adjacent Upper Santa Clara River Basin	Basin Recharge
Recycled Water	District 16 WWTP	Discharge to percolation ponds. There are plans to use the recycled water for agricultural irrigation.
	City of Fillmore WWTP	Produces recycled water suitable for irrigation. This recycled water is delivered to nearby recharge basins and subsurface irrigation systems in parks and schools.
	City of Santa Paula water recycling facility	Recharges 13 acres of percolation ponds. Plans for the City of Santa Paula to reuse the water in other ways.
	Saticoy Sanitation District WWTP	Percolates treated wastewater into ponds located on the southern edge of the Santa Paula basin.
	Other small WWTPs such as Limoneira and Olivelands sewer farms, and Todd Road Jail	Percolate treated wastewater into ponds. There are plans for these plants to produce recycled water for irrigation in the future.
	City of Ventura VWRF	Produces tertiary treated municipal wastewater that is used to irrigate Marina Park, on the north side of the Ventura harbor, Ventura Municipal golf course, Olivas Links golf course, and other landscaped areas located in the vicinity of the SCR in the Mound basin.

Groundwater outflow from the Lower Santa Clara River groundwater basin includes subsurface outflow, pumping, and groundwater discharge to surface water.

Salt and Nutrient Loading to the Lower Santa Clara River Basin

The mass balances (inputs and outflows) for total dissolved solids (TDS), chloride, and nitrate-N for a 16-year baseline period (1996-2012) from the various sources of water are presented below for each sub-basin. Loads from the imported water, while not specifically listed, are reflected in the loads from surface water inflow, agricultural irrigation and percolation pond effluent.

TABLE 8.2-3A: SALT AND NUTRIENT BALANCE IN THE PIRU BASIN (1996 THROUGH 2012)

Source Water	TDS		Chloride		Nitrate	
	(tons/yr)	%	(tons/yr)	%	(tons/yr)	%
Subsurface Inflow	17512.7	15.7	1958.2	17.2	52.7	15.8
Surface Water Inflow	75239.3	67.5	7902.3	69.2	140.5	42.0
Managed Recharge	1020.2	0.9	54.8	0.5	0.7	0.2
Precipitation	25.9	0.0	0.2	0.0	0.2	0.1
Mountain Front Recharge	34.7	0.0	0.4	0.0	0.4	0.1
Agricultural Irrigation with Surface Water	4672.0	4.2	472.7	4.1	45.6	13.6
Agricultural Irrigation with Groundwater	12535.9	11.2	965.4	8.5	90.3	27.0
Septic Systems	110.6	0.1	14.4	0.1	3.5	1.0
Wastewater Treatment Percolation Ponds	355.9	0.3	45.6	0.4	0.4	0.1
Total Inflow	**111507.1**	**100.0**	**11413.9**	**100.0**	**334.3**	**100.0**
Subsurface Outflow	-98380.3	86.6	-9152.4	88.7	-310.4	85.4
Seepage to Santa Clara River	-2715.6	2.4	-182.5	1.8	-9.1	2.5
Groundwater Production	**-12508.6**	**11.0**	**-978.2**	**9.5**	**-43.8**	12.1
Total Outflow	**-113604.4**	**100.0**	**-10313.1**	**100.0**	**-363.4**	100.0
Annual change in mass (tons)	**-2097.3**		**1100.8**		**-29.0**	

TABLE 8.2-3B: SALT AND NUTRIENT BALANCE IN THE FILLMORE BASIN (1996 THROUGH 2012)

Source Water	TDS		Chloride		Nitrate	
	(tons/yr)	%	(tons/yr)	%	(tons/yr)	%
Subsurface Inflow	94339.7	60.3	5298.0	59.8	321.2	44.6
Surface Water Inflow	13424.7	8.6	916.2	10.3	23.5	3.3
Precipitation	125.9	0.1	1.1	0.0	1.1	0.2
Mountain Front Recharge	48.0	0.0	0.4	0.0	0.4	0.1
Municipal Irrigation	503.7	0.3	23.7	0.3	1.5	0.2
Agricultural Irrigation with Groundwater	45745.5	29.2	2390.8	27.0	355.9	49.4
Recycled Water	348.6	0.2	67.5	0.8	0.5	0.1
Septic Systems	332.2	0.2	27.4	0.3	10.6	1.5
Wastewater Treatment Percolation Ponds	1679.0	1.1	140.5	1.6	5.5	0.8
Total Inflow	**156547.2**	**100.1**	**8865.5**	**100.0**	**720.1**	**100.0**
Subsurface Outflow	-65966.5	45.3	-3914.6	51.0	--350.4	50.8
Seepage to Santa Clara River	-22036.9	15.1	-726.4	9.5	-54.8-	7.9

Source Water	TDS		Chloride		Nitrate	
Groundwater Production	-57713.8	39.6	-3040.5	39.6	284.7	41.3
Total Outflow	**-145717.1**	**100.0**	**-7681.4**	**100.0**	**689.9**	**100.0**
Annual change in mass (tons)	**10830.1**		**1184.1**		**30.3**	

TABLE 8.2-3C: SALT AND NUTRIENT BALANCE IN THE SANTA PAULA BASIN (1996 THROUGH 2012)

Source Water	TDS		Chloride		Nitrate	
	(tons/yr)	%	(tons/yr)	%	(tons/yr)	%
Subsurface Inflow	46763.8	48.7	2157.2	41.3	277.4	44.0
Surface Water Inflow	1268.4	1.3	56.6	1.1	1.8	0.3
Precipitation	118.6	0.1	1.3	0.0	1.3	0.2
Mountain Front Recharge	47.5	0.0	0.5	0.0	0.5	0.1
Municipal Irrigation	2387.1	2.5	107.7	2.1	9.1	1.4
Agricultural Irrigation with Surface Water	257.3	0.3	12.8	0.2	3.7	0.6
Agricultural Irrigation with Groundwater	40896.4	42.6	2396.2	45.9	306.6	48.6
Septic Systems	301.1	0.3	23.7	0.5	10.2	1.6
Wastewater Treatment Percolation Ponds	3958.4	4.1	465.4	8.9	20.1	3.2
Total Inflow	**95998.7**	**100.0**	**5221.3**	**100.0**	**630.7**	**100.0**
Subsurface Outflow	-53375.8	52.9	-3025.9	51.5	-158.0	57.9
Seepage to Santa Clara River	-6796.3	6.7	-461.7	7.9	-7.3	2.7
Groundwater Production	-40788.8	40.4	-2387.1	40.6	-107.7	39.4
Total Outflow	**-100960.8**	**100.0**	**-5874.7**	**100.0**	**-273.0**	**100.0**
Annual change in mass (tons)	**-4962.2**		**-653.4**		**357.7**	

TABLE 8.2-3D: SALT AND NUTRIENT BALANCE IN THE OXNARD FOREBAY (1996 THROUGH 2012)

Source Water	TDS		Chloride		Nitrate	
	(tons/yr)	%	(tons/yr)	%	(tons/yr)	%
Subsurface Inflow	15873.9	13.2	1071.3	16.1	20.1	11.5
Surface Water Inflow	13797.0	11.5	762.9	11.5	14.6	8.3
Managed Recharge	80210.6	66.7	4281.5	64.3	93.1	53.2
Precipitation	45.6	0.0	0.4	0.0	0.4	0.2
Mountain Front Recharge	27.4	0.0	0.4	0.0	0.4	0.2
Agricultural Irrigation with Groundwater	10183.5	8.5	538.4	8.1	45.6	26.1
Septic Systems	29.2	0.0	2.6	0.0	0.9	0.5
Total Inflow	**120167.1**	**100.0**	**6657.2**	**100.0**	**175.0**	**100.0**
Subsurface Outflow	-109012.7	91.4	-5781.6	91.4	-472.7	91.5
Groundwater Production	-10192.6	8.6	-542.0	8.6	-43.8	8.5
Total Outflow	**-119205.4**	**100.0**	**-6323.6**	**100.0**	**-516.5**	**100.0**
Annual change in mass (tons)	**961.8**		**333.6**		**-341.5**	

TABLE 8.2-3E: SALT AND NUTRIENT BALANCE IN THE MOUND BASIN (1996 THROUGH 2012)

Source Water	TDS		Chloride		Nitrate	
	(tons/yr)	%	(tons/yr)	%	(tons)	%
Subsurface Inflow	31559.7	64.2	1695.4	61.0	143.1	67.2
Precipitation	1.1	0.0	0.0	0.0	0.0	0.0
Mountain Front Recharge	18.3	0.0	0.2	0.0	0.2	0.1
Municipal Irrigation	9168.8	18.7	470.9	16.9	12.8	6.0
Agricultural Irrigation with Groundwater	7696.0	15.7	476.3	17.1	54.8	25.7
Recycled Water	664.3	1.4	129.6	4.7	1.1	0.5
Septic Systems	36.5	0.1	7.3	0.3	0.9	0.4
Total Inflow	**49144.7**	**100.0**	**2779.7**	**100.0**	**212.8**	**100.0**
Subsurface Outflow	-38379.8	85.8	-2374.3	85.9	-124.1	86.1
Groundwater Production	-6332.8	14.2	-390.6	14.1	-20.1	13.9
Total Outflow	**-44712.5**	**100.0**	**-2764.9**	**100.0**	**-144.2**	**100.0**
Annual change in mass (tons)	**4432.2**		**14.8**		**68.6**	

Groundwater Quality and Assimilative Capacity in Lower Santa Clara River Basin

Monitoring data from wells in the Lower Santa Clara River Basin from 1996 through 2012 were used to characterize current groundwater quality. The groundwater and surface water quality data included data on concentrations of nitrate, TDS and chloride. Groundwater and surface water data were compiled for the SNMP from the following sources of data: Geographical Information System (GIS) shapefiles and groundwater data (UWCD and Ventura County); surface water quality data (UWCD); stormwater quality data (Ventura Countywide Stormwater Quality Management Program).

The average (1996-2012) TDS, chloride, and nitrate-N concentrations for each area of the Lower Santa Clara River Basin were compared to the applicable basin water quality objectives to determine the existing available assimilative capacity (Table 8.2-4). Assimilative capacity is estimated as the difference between the water quality objectives and the existing groundwater quality for each basin/subarea.

While there are localized areas with higher salt and nutrient concentrations (particularly in the vicinity of wastewater treatment effluent percolation ponds), the average water quality of most of the sub-basins is below Basin Plan objectives. Therefore, assimilative capacity is available for TDS, chloride and nitrate in all sub-basins within the planning area except for the Mound Basin where the existing concentration of TDS exceeds the water quality objectives.

TABLE 8.2-4: GROUNDWATER QUALITY AND AVAILABLE ASSIMILATIVE CAPACITY IN THE LOWER SANTA CLARA RIVER GROUNDWATER BASINS

Basin	Subarea	TDS (mg/L)			Chloride (mg/L)			Nitrate-N (mg/L)		
		Water Quality Objective	Current Quality	Available Assimilative Capacity	Water Quality Objective	Current Quality	Available Assimilative Capacity	Water Quality Objective	Current Quality	Available Assimilative Capacity
Piru	Upper Area below Lake Piru	1,100	No data	**NA**	200	No data	**NA**	10	No Data	**NA**
	Lower Area East of Piru Creek	2,500	1,000	**1,500**	200	118	**82**	10	2.6	**7.4**
	Lower Area West of Piru Creek	1,200	992	**208**	100	69	**31**	10	3.6	**6.4**
Fillmore	Pole Creek Fan Area	2,000	1,101	**899**	100	59	**41**	10	2.9	**7.1**
	South Side of Santa Clara River	1,500	1,411	**89**	100	74	**26**	10	5.6	**4.4**
	Remaining Fillmore	1,000	846	**154**	50	44	**6**	10	6.7	**3.3**
Santa Paula	East of Peck Road	1,200	953	**247**	100	39	**61**	10	5.0	**5.0**
	West of Peck Road	2,000	1,444	**556**	110	97	**13**	10	2.0	**8.0**
Oxnard Forebay		1,200	1077	**123**	150	57	**93**	10	4.5	**5.5**
Mound		1,200	1,230	**-30**	150	76	**74**	10	4.0	**6.0**

Salt and Nutrient Management Measures in the Lower Santa Clara River Basin

Existing salt and nutrient management measures in the Lower Santa Clara River Basin are categorized by sources and pathways for reducing salt and nutrient contributions to the groundwater. Some management measures prevent loads from entering the basin (e.g., water conservation or water softener bans), others offset loads from another source (e.g., changing the source water for an irrigation project), and others remove loading from the basin (e.g., groundwater treatment). Existing management measures are summarized in Table 8.2-5A. The categories used to describe the management measures are listed below:

- Improve wastewater and reclaimed water quality;
- Improve municipal water quality;
- Reduce septic system leachate and improve quality;
- Manage urban stormwater runoff to support basin water quality;
- Improve non-stormwater discharge control and quality;
- Improve agricultural runoff control and quality;
- Increase recycled water use;
- Increase aquifer recharge with lower concentration water sources;
- Improve urban and agricultural water efficiency/conservation;
- Reduce saltwater intrusion and protect groundwater quality; and
- Manage groundwater pumping and water levels.

TABLE 8.2-5A: EXISTING SALT AND NUTRIENT MANAGEMENT MEASURES IN THE LOWER SANTA CLARA RIVER BASINS

Category	Specific Measure	Agency/Action	Description	Effect
Wastewater and reclaimed water quality	Source control - salts	City of Santa Paula – Water Softener Ban	Prohibits replacement or enlargement of any apparatus for treating the water supply to a property if the apparatus is of a kind that produces any wastewater with a mineral content higher than that of the water supply of the property.	Fewer self-regenerating water softeners (or other treatment devices that produce a high mineral waste) will reduce the salt load in residential wastewater.
Wastewater and reclaimed water quality	Source control – salts	City of Fillmore - Water softener rebate program	Outreach and rebate program aimed at reducing the number of self-regenerating water softeners in the Fillmore community. Approximately 85 rebates completed to date.	Fewer self-regenerating water softeners will reduce the salt load in residential wastewater.
Wastewater and reclaimed water quality	Source control – salts	City of Fillmore	Prohibits self-regenerating water softeners discharging to the sanitary sewer.	Prohibits the additional salt load to wastewater from water softener brine.
Wastewater and reclaimed water quality	Source control – salts	City of Santa Paula – Industrial Discharge Ordinance	Local limits for TDS (2,000 mg/L), chloride (110 mg/L) and ammonia nitrogen (30 mg/L).	Provides an upper limit on the concentration of salts and nutrients in industrial contributions to wastewater.
Wastewater and reclaimed water quality	Source control – salts	City of Ventura – Local Limits	Local limit for TDS (4,270 mg/L).	Provides an upper limit on the concentration of salts in industrial contributions to

Category	Specific Measure	Agency/Action	Description	Effect
				wastewater.
Wastewater and reclaimed water quality	Source control – salts	City of Ventura – Ordinances on Industrial discharges	Prohibits discharge of saltwater or brine from commercial or industrial activities. Establishes local limits for industrial/commercial facilities. Establishes permit requirements for non-domestic wastewater discharges.	Prohibits the additional salt load to wastewater from saltwater or brine from commercial or industrial activities.
Wastewater and reclaimed water quality	Treatment control – nutrients	City of Santa Paula – Upgraded treatment facilities	Construction of wastewater treatment facilities with nutrient removal to replace secondary treatment facility.	Reduction in total nitrogen concentrations in effluent.
Wastewater and reclaimed water quality	Treatment control – nutrients	City of Fillmore – Upgraded treatment facility	Construction of wastewater treatment facilities with nutrient removal to replace secondary treatment facility.	Reduction in total nitrogen concentration in effluent.
Wastewater and reclaimed water quality	Treatment control – nutrients	Ventura County Waterworks District 16 – Upgraded treatment facilities	Construction of wastewater treatment facilities with nutrient removal and subsequent upgrade to tertiary treatment.	Reduction in total nitrogen concentrations in effluent.
Septic system leachate volume and quality	Leachate volume reduction	City of Santa Paula – Septic tank policy	Prohibits installation of new septic tanks in service area and requires tie-in of a septic tank to the sewer if located within 200 feet of a sewer line. County areas adjacent to the service area also are required to tie in.	Reduces the volume of septic system leachate that percolates into shallow groundwater. Tie-in to a treatment plant ultimately leads to a treated waste stream with a lower nutrient load.
Municipal water quality	Provide treatment of a compromised supply	City of Ventura – Water Conditioning Facilities	City of Ventura has two water condition facilities that treat extracted groundwater from the Mound basin before potable use. The conditioning facilities are designed to reduce iron and manganese in the extracted groundwater and help comply with secondary drinking water standards. The City's current (interim) approach to continued use of this supply is to blend the water from the Mound basin with water from the Oxnard Plain prior to delivery to customers.	Reduces salt concentration in municipal water supply.
Stormwater runoff management	Increase stormwater recharge through LID and improve quality through BMPs	Ventura County – MS4 permit	Requires specified New Development and Redevelopment projects to control pollutants, pollutant loads, and runoff volume emanating from impervious surfaces through infiltration, storage for reuse, evapotranspiration, or bioretention/ bioinfiltration by reducing Effective Impervious Area to 5% or less of the total project area.	Promotes infiltration of rainwater (low in salt and nutrients) into the groundwater. Through treatment, reduces pollutant loads to groundwater and surface waters (that may recharge groundwater basins).
Stormwater runoff management	Increase stormwater recharge and improve water quality through BMPs	Ventura County – Green Street Demonstrations	Demonstration projects to illustrate stormwater capture and treatment BMPs.	Promotes infiltration of rainwater (low in salt and nutrients) into the groundwater. Through treatment, reduces pollutant loads to groundwater and surface waters (that may recharge groundwater basins).

Category	Specific Measure	Agency/Action	Description	Effect
Non-stormwater discharge control and quality	Source control of non-stormwater discharges	Ventura County – MS4 permit	Requires discharges of debrominated/ dechlorinated swimming pool water to meet water quality standards for salts.	Provides an upper limit on the concentration of salts in non-stormwater contributions to stormwater.
Agricultural runoff control and quality	Source control through fertilizer BMPs	Source control through fertilizer BMPs	Fertilizers are applied in multiple smaller applications, as opposed to one large application. Fertilizer applications are adjusted to account for other nutrient sources, such as: irrigation water, cover crops, and residuals from previous fertilizations. Fertilization rates are adjusted based on the results of soil fertility measurements.	Reduces the load of nitrogen that is transported by runoff to surface waters and by infiltration to groundwater.
Agricultural runoff control and quality	Source control through salinity/leaching BMPs	VCAILG – Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands within the Los Angeles Region	Leaching is performed only when necessary, as determined by measuring soil solution electrical conductivity. Saline or high selenium wells are decommissioned and other sources of water are used. Fertilizers and amendments with low salt index are used.	Reduces the load of salts to the groundwater from leaching activities.
Wastewater Reuse	Offset supply with reclaimed wastewater	City of Ventura	Urban irrigation of golf courses and landscaping. Recycled water permit establishes nitrate plus nitrite limit of 10mg/L as N	Limits the nitrate concentration in the applied irrigation water.
Wastewater Reuse	Offset supply with reclaimed wastewater	City of Fillmore	Urban irrigation of schools, parks and other locations. Recycled water permit establishes concentration limits for irrigation water, including; 5 mg/L as N for nitrate plus nitrite, 2,000 mg/L for TDS, and 155 mg/L for chloride.	Limits the concentrations of salts and nitrate in irrigation water.
Agricultural Water Conservation	Conservation through efficiency criteria	Fox Canyon Groundwater Management Agency (FCGMA) – Agricultural Pumpers Use Irrigation Efficiency Criteria	Agricultural users may use “Efficiency Criteria” in place of historical groundwater allocations. Must have 20% or less of applied water going to leaching, deep percolation or runoff.	Through conservation, reduces the load of salt associated with irrigation water that is ultimately conveyed in irrigation runoff or in percolation.
Conservation through irrigation management practices	Conservation through irrigation management practices	VCAILG – Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands within the Los Angeles Region	Irrigation is varied to accommodate plant growth stage and weather. Irrigation conducted by personnel who understand and practice irrigation practices related to runoff management. Irrigation is halted if significant runoff occurs.	Through conservation, reduces the load of salt associated with irrigation water that is ultimately conveyed in irrigation runoff or in percolation.

Category	Specific Measure	Agency/Action	Description	Effect
Saline intrusion and groundwater quality	Groundwater quality improvement	City of Fillmore, Piru Basin – Control of saline intrusion and protection of groundwater quality	Current programs to achieve basin management goals include: management of wellhead protection areas, well abandonment and destruction program, overdraft mitigation measures, replenishment of extracted groundwater.	Improvement of groundwater quality protection.

Implementation of the existing management measures has resulted in reductions in the discharges of salts and nutrients to the groundwater basins. Average effluent concentrations from the wastewater treatment plants for chloride, TDS and total nitrogen have decreased as a result of the existing management measures shown in Table 8.2-5A. For Piru, Fillmore, and Santa Paula wastewater treatment facilities, upgrades to treatment facilities have reduced the discharge of total nitrogen into the watershed by over 75%. For salts, bans on new water softeners have reduced TDS and chloride concentrations from the Fillmore and Santa Paula wastewater treatment facilities. The effectiveness of these and other measures is described in detail in the Salt and Nutrient Management Plan for the Lower Santa Clara River Basin. Further reductions in effluent chloride concentrations are expected to occur through future source control efforts, including the removal of existing water softeners in the SNMP planning area through a rebate program, and, where necessary[3], from additional control measures which may include advanced treatment of wastewater effluent by reverse osmosis.

Since management measures already exist for the major sources of salt and nutrient loads to the basin, future projects that may impact loading of these constituents in the basin are primarily recycled water projects. Recycled water projects are to be developed from wastewater effluent currently being discharged to the basins. These projects, most of which are in the early planning stages, are presented in Table 8.2-5B[4].

[3] As determined using the procedures outlined in Section 9 of the Lower Santa Clara River Basin Salt and Nutrient Management Plan.
[4] The projects listed in this table may be modified during implementation, and/or additional projects may be identified. The procedures outline in Section 9 of the Lower Santa Clara River Basin Salt and Nutrient Management Plan will be used to evaluate modified or additional recycled water projects as they are developed.

TABLE 8.2-5B: PLANNED (FUTURE) RECYCLED WATER PROJECTS

Groundwater Basin	Subarea	Agency	Type of Future Use	Volume of Use	Timing of Use
Piru	Lower Area West of Piru Creek	Ventura County Water Works District 16 – Piru Wastewater Treatment Plant	Farm land located to the north, east, and south of the treatment plant	Phased implementation from 225 AFY to 560 AFY (0.2 mgd to 0.5 mgd)	Delivery of 225 AFY (0.2 mgd), current treatment plant flows, will begin in 2016
Fillmore	Pole Creek Fan Area	City of Fillmore – Fillmore Wastewater Reclamation Facility	Heritage Valley Park Development – 20-acre park, 10-acre school sports field Panam Sat Orchard -20-acre avocado orchard Baldwin Towne Plaza – 5-acre turf Agricultural area east of City limits – no defined acreage	60 AFY (0.05 mgd) 147 AFY (0.13 mgd) 10 AFY (0.01 mgd) Unknown	Unknown – depends on pipeline construction Unknown – may depend on developing competitive pricing for recycled water Unknown – may depend on developing competitive pricing for recycled water Unknown
Santa Paula	West of Peck Road	City of Santa Paula – Santa Paula Water Recycling Facility	Landscape Irrigation	Phased Implementation from 400 AFY (0.4 mgd) to 1,622 AFY (1.45 mgd)	Phased Implementation from 2015-2035
	West of Peck Road	City of Ventura – Ventura Water Recycling Facility	Landscape irrigation	Possible upper range of 100 AFY	Not currently permitted, and recycled water demands not well defined
Mound		City of Ventura – Ventura Wastewater Reclamation Facility	Groundwater recharge to Mound Basin for indirect potable reuse	2,200 AFY (2 mgd) to 7,100 AFY (6.3 mgd), Possible upper range of 9,700 AFY (8.7	2025 Implementation at 9,700 AFY – dependent on outcome of

Groundwater Basin	Subarea	Agency	Type of Future Use	Volume of Use	Timing of Use
				mgd)	feasibility studies.
			Landscape irrigation in the City's Recycled Water Focus Area	60 AFY (0.05 mgd)	Already permitted, but timing of implementation unknown
			Landscape irrigation	Possible upper range of 1,500 AFY (1.3 mgd)	Not currently permitted, and recycled water demands not currently well defined
			Agricultural irrigation	Possible upper range of 7,300 AFY (6.5 mgd)	Not currently permitted, and recycled water demands not currently well defined
Oxnard Forebay	Oxnard Forebay	City of Oxnard – Oxnard Advanced Water Purification Facility	Recharge of recycled water in surface spreading basins, and/or direct re-use for agricultural irrigation	Unknown	Unknown

Projected Impacts of Future Projects on Water Quality

A mass balance model was developed to assess the impact of additional (future) loadings on existing assimilative capacity for salt and nutrients in each subarea. The mass balance model is implemented in a series of spreadsheets and treats each hydrostratigraphic unit in each subarea as a single mixing cell. Inputs to the mass balance model are time series of hydrologic/hydrogeologic inflows and outflows for 1996-2012, as well as salt concentrations and loadings. For the purpose of determining the extent of assimilative capacity use by future recycled water projects, four project scenarios were considered (Table 8.2-6A). A number of these projects are currently in the planning stages, and the potential exists for agencies to maximize recycling of all current and future effluent flows up to the design capacities of the treatment plants. These project scenarios were developed to reflect the full range of potential recycled water use, including both planned and potential future projects. Results of this analysis are presented in Table 8.2-6B.

TABLE 8.2-6A SCENARIOS BASED ON PROJECTED RECYCLED WATER VOLUMES

Facility	Sub-area	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Piru	Lower Area West of Piru Creek	225 AFY	560 AFY	560 AFY	not applicable
Fillmore	Pole Creek Fan Area	217 AFY	1040 AFY	2651 AFY	not applicable
Santa Paula	West of Peck Road and/or East of Peck Road	400 AFY	1622 AFY	3,088 AFY	not applicable
Ventura	Mound	60 AFY	1500 AFY	8,800 AFY	7,300 AFY

Scenario 1 represents the *low* estimates of *planned* recycled water project volumes. Scenario 2 represents the *high* estimates of *planned* recycled water project volume, while Scenario 3 represents the *maximum* amount of recycled water that could be used in the SNMP area. Scenario 4 is an additional scenario for the City of Ventura that only considers the use of partially treated recycled water (as opposed to advanced treated wastewater) in the Mound Basin.

TABLE 8.2-6B: PROJECTED ASSIMILATIVE CAPACITY USE (%) BY FUTURE RECYCLED WATER PROJECTS

Parameter	Scenario 1	Scenario 2	Scenario 3	Scenario 4
	Piru Basin – Lower Area West of Piru Creek			
TDS	0.13	2.6	2.6	not applicable
Chloride	0.4	7.9	7.9	
Nitrate	0.0	0.1	0.1	
	Fillmore Basin – Pole Creek Fan Area			
TDS	0.0	0.0	3.1	not applicable
Chloride	0.0	0.0	21	
Nitrate	0.0	0.0	1.5	
	Santa Paula Basin – West of Peck Road			
TDS	0.0	0.0	2.9	not applicable
Chloride	0.0	0.0	6.0	
Nitrate	0.0	0.0		
	Santa Paula Basin - East of Peck Road			
TDS	3.3	13.2	31.0	not applicable
Chloride	3.0	12.1	28.4	
Nitrate	6.7	26.7	62.3	
	Mound Basin*			
TDS	above WQOs	above WQOs	above WQOs	above WQOs
Chloride	0.2	4.0	11.8	7.8
Nitrate	0.1	1.4	4.0	2.6

No assimilative capacity exists for TDS in the Mound Basin.

Projections of assimilative capacity use assist in the identification of those potential projects for which additional analysis and/or additional implementation measures would be required. The LSCR Basins SNMP includes a menu of further management measures that could be implemented, as needed[5], to manage salts and nutrients on a sustainable basis in such cases (Table 8.2-6c).

[5] As determined using the procedures outlined in Section 9 of the Lower Santa Clara River Basin Salt and Nutrient Management Plan

Salt and Nutrient Load Limits

The Lower Santa Clara River Basin is currently being managed to control salt and nutrient inputs through various actions and programs in the area. Existing TDS and chloride impairments in localized areas are being addressed through blending of extracted groundwater. Current management measures are expected to maintain TDS, chloride and nitrate levels in the long term. Continued reductions in the chloride levels in POTW discharges are expected from on-going institutional programs. Assignment of allocations for salt and nutrient loading is not warranted at this time.

TABLE 8.2-6C: OTHER POTENTIAL FUTURE MANAGEMENT MEASURES

Category	Specific Measure	Agency/ Action	Description	Effect
Wastewater and reclaimed water quality	Source control – salts	City of Santa Paula, County of Ventura - Water Softener Outreach and Rebate Program[1]	Consideration of implementation of outreach, removal and incentive program aimed at reducing the number of self-regenerating water softeners in the unincorporated areas of Ventura County within the LSCR Basin SNMP project area.	Fewer self-regenerating water softeners will reduce the salt load in residential wastewater.
Wastewater and reclaimed water quality	Source control – salts	City of Ventura, County of Ventura – Water Softener Ban[1]	Consideration of implementation of a water softener ban in the City of Ventura, and the unincorporated areas of the County that are within the LSCR Basin SNMP project area.	Fewer self-regenerating water softeners will reduce the salt load in residential wastewater.
Wastewater and reclaimed water quality	Source control – industrial control, pretreatment program	Ventura County and Municipalities[1]	Consideration of modified local limits to improve influent wastewater quality.	Limits the pollutant concentrations in influent wastewater.
Wastewater and reclaimed water quality	Advanced treatment of effluent	City of Santa Paula[1]	Consideration of Reverse Osmosis treatment to remove salts from effluent	Advanced treatment reduces salt load in recycled water and effluent discharged to percolation ponds
Septic system leachate	Provide connections to sewer systems	Ventura County and Municipalities	Consideration of a septic system conversion program to reduce the number of septic systems in the basin	Reduces the volume of septic system leachate that percolates into shallow groundwater. Tie-in to a treatment plant ultimately leads to a treated waste stream with a lower nutrient load.
Non-stormwater discharge control and quality	Source control of non-stormwater discharges	Ventura County – MS4 permit	Ordinance banning installation and discharges of debrominated/dechlorinated swimming pool water.	Reduce primary source of salts in non-stormwater discharges.
Municipal Water Quality	Replace/augment compromised groundwater supplies with surface water sources	Ventura County and Municipalities	Consideration of using SWP allocations to replace or augment compromised groundwater supplies.	Through use of an alternative supply, reduces salt load in potable water that is pass through to wastewater. Reduces need for residential water softeners.
Municipal Water Quality	Softening of groundwater supplies	Water Purveyors[1]	Consideration of water softening to reduce hardness.	Reduces need for the self-regenerating residential water softeners. Fewer self-

Category	Specific Measure	Agency/ Action	Description	Effect
				regenerating water softeners will reduce the salt load in residential wastewater.
Municipal Water Quality	Advanced treatment of compromised groundwater supplies	Water Purveyors[1]	Consideration of RO treatment to remove salts from groundwater supplies, with likely participation in development of a regional brine line.	Through treatment, reduces salt load in potable water that is pass through to wastewater. Reduces need for residential water softeners.
Municipal Water Quality	Desalination	Water Purveyors	Consideration of desalination to replace existing groundwater supplies	Through use of an alternative supply, reduces salt load in potable water that is pass through to wastewater. Reduces need for residential water softeners.
Agricultural Supply	Improve agricultural irrigation water quality	Ventura County	Consideration of drilling deeper wells to access water with lower salt concentrations.	Improves irrigation water quality through use of an alternative supply. Reduces the load of salt and nutrients attributed to irrigation water.
Stormwater Recharge	Additional groundwater recharge with stormwater	Ventura County and Municipalities	Consideration of capture and recharge of stormwater, including opportunities identified in TMDL implementation plans and other stormwater resource plans developed for the planning area.	Provides dilution of groundwater through recharge of water with potentially low salt and low nutrient concentrations.
Municipal Water Quality	Improves municipal water quality	Ventura – RO of Mound Groundwater	If other alternatives including groundwater recharge or direct potable reuse are not implemented, then additional treatment, RO, will be provided for water extracted from the Mound basin.	Improves potable water quality through treatment. Reduces salt load in potable water that is pass through to wastewater. Reduces need for residential water softeners.

[1]The Santa Paula, Fillmore and Ventura County Waterworks District 16 wastewater treatment plants have exceeded effluent limitations in their Waste Discharge Requirements for some salts. Implementation of these actions would reduce salts concentration in the effluent and could also support compliance with existing effluent limitations, if needed. Additionally, implementing recycled water projects in accordance with the procedures outline in the SNMP would reduce the loading of salts discharged to the groundwater through the percolation ponds and could support compliance with waste discharge requirements.

Monitoring Program

The goals of the SNMP monitoring program are to assess spatial and temporal changes in salt and nutrient concentrations and characterize groundwater quality, and also assess the impact of future recycled water and groundwater recharge projects on groundwater quality. Monitoring data will also be used to refine the assimilative analysis using updated information. The SNMP Monitoring Program for the Lower Santa Clara River Basin was developed based on existing monitoring programs for regional groundwater resource assessment and management, and compliance with regulatory requirements such as drinking water regulations and waste discharge requirements. Sixteen locations within the five sub-basisns were selected for the purpose of salt and nutrient monitoring and reporting (see Figures 8.2-2A-E). Elements of the program are laid out in Table 8.2-7.

TABLE 8.2-7: MONITORING PROGRAM ELEMENTS

<table>
<tr><th>Element</th><th>Description</th></tr>
<tr><td>Responsible Agency</td><td>Ventura County Watershed Protection District</td></tr>
<tr><td>Program Origin</td><td>Ventura County Groundwater Monitoring Program

United Water Conservation District Water Quality Monitoring Program.</td></tr>
<tr><td>Parameters and Monitoring Frequency</td><td><table>
<tr><th>Parameter</th><th>Monitoring Frequency</th></tr>
<tr><td>Total Dissolved Solids</td><td rowspan="5">Annually</td></tr>
<tr><td>Chloride</td></tr>
<tr><td>Sulfate</td></tr>
<tr><td>Boron</td></tr>
<tr><td>Nitrate</td></tr>
</table></td></tr>
<tr><td>Monitoring locations</td><td>Sixteen (16) monitoring wells located throughout the five Lower Santa Clara River sub-basins. Selected to provide sampling locations that characterize the subareas based on groundwater gradients and flow paths in the sub-basin and subarea. Within each subarea, at least one well is included to characterize the subarea and to provide multiple points for analyzing a sub-basin. In sub-basins not divided into multiple water quality objective areas, at least two wells are included. A well at the upstream portion of the LSCR Basin is included to provide a baseline water quality for groundwater entering the basin from the Upper Santa Clara River Basin.</td></tr>
<tr><td>Reporting Requirements</td><td>Annual report of monitoring results. TDS, chloride, and nitrate data collected from the SNMP monitoring wells will be uploaded to the State Water Board's online GeoTracker database.</td></tr>
</table>

Element	Description
Additional Resources	Existing programs will be used to provide information regarding surface water inputs to the groundwater. These programs include surface water and discharge quality monitored by the Ventura Countywide Stormwater Management Program, VCAILG, City of Ventura, and UWCD.
Review Period	Data collected from the SNMP monitoring wells, and other monitoring programs, will be reviewed periodically to evaluate basin water quality conditions.

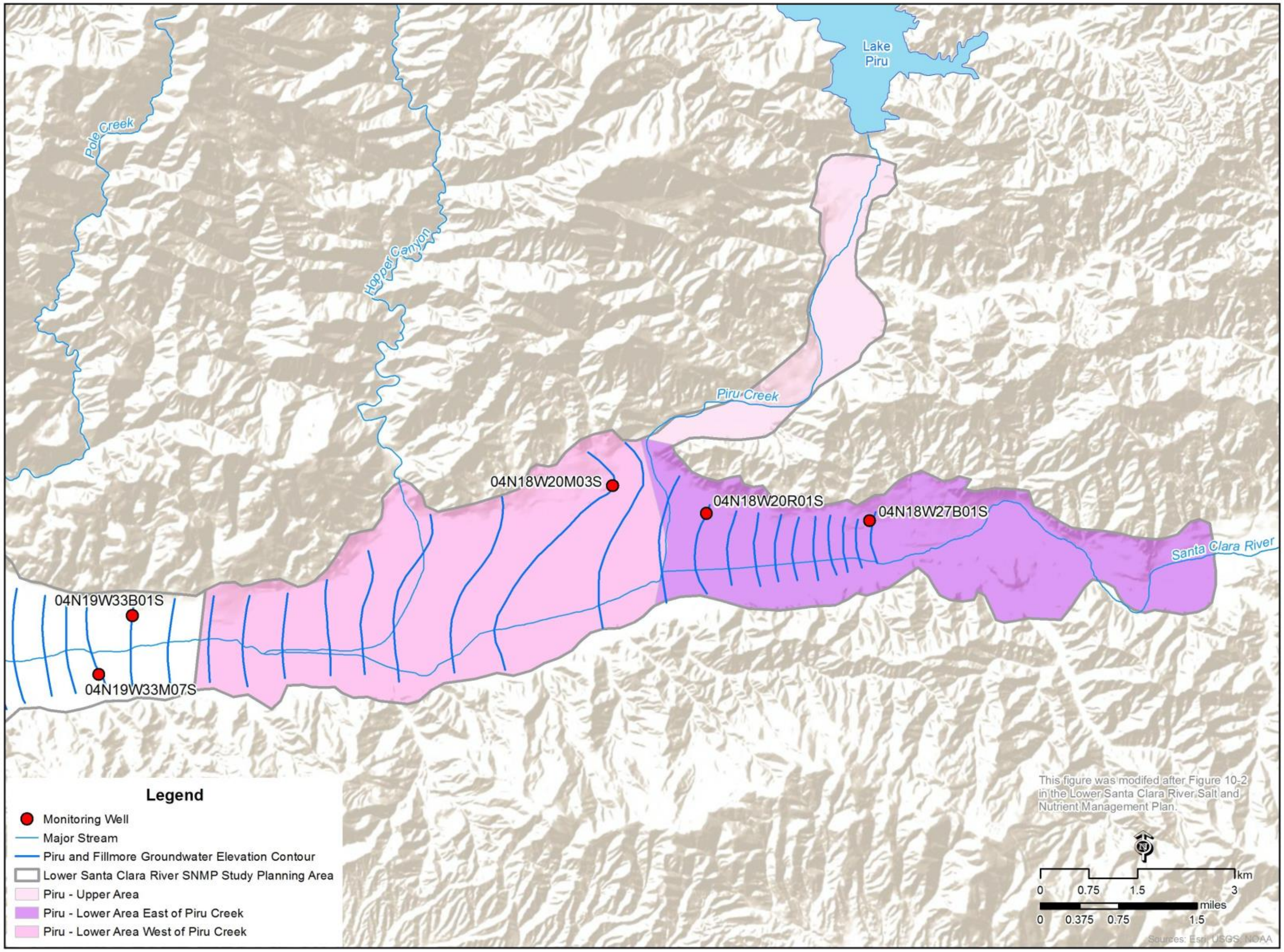

Figure 8.2-2A. Location of SNMP Monitoring Wells in the Piru Basin.

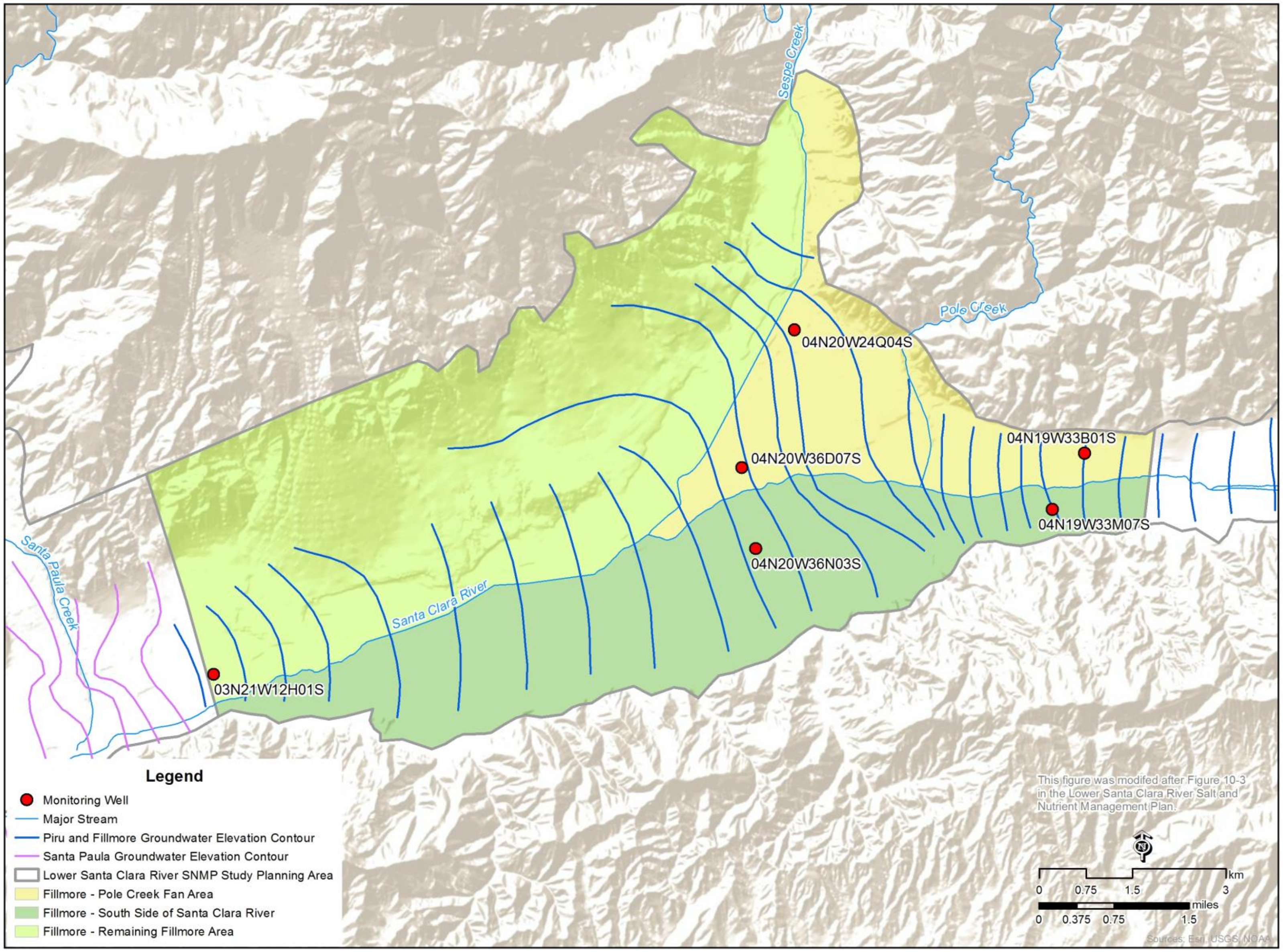

Figure 8.2-2B. Location of SNMP Monitoring Wells in the Fillmore Basin.

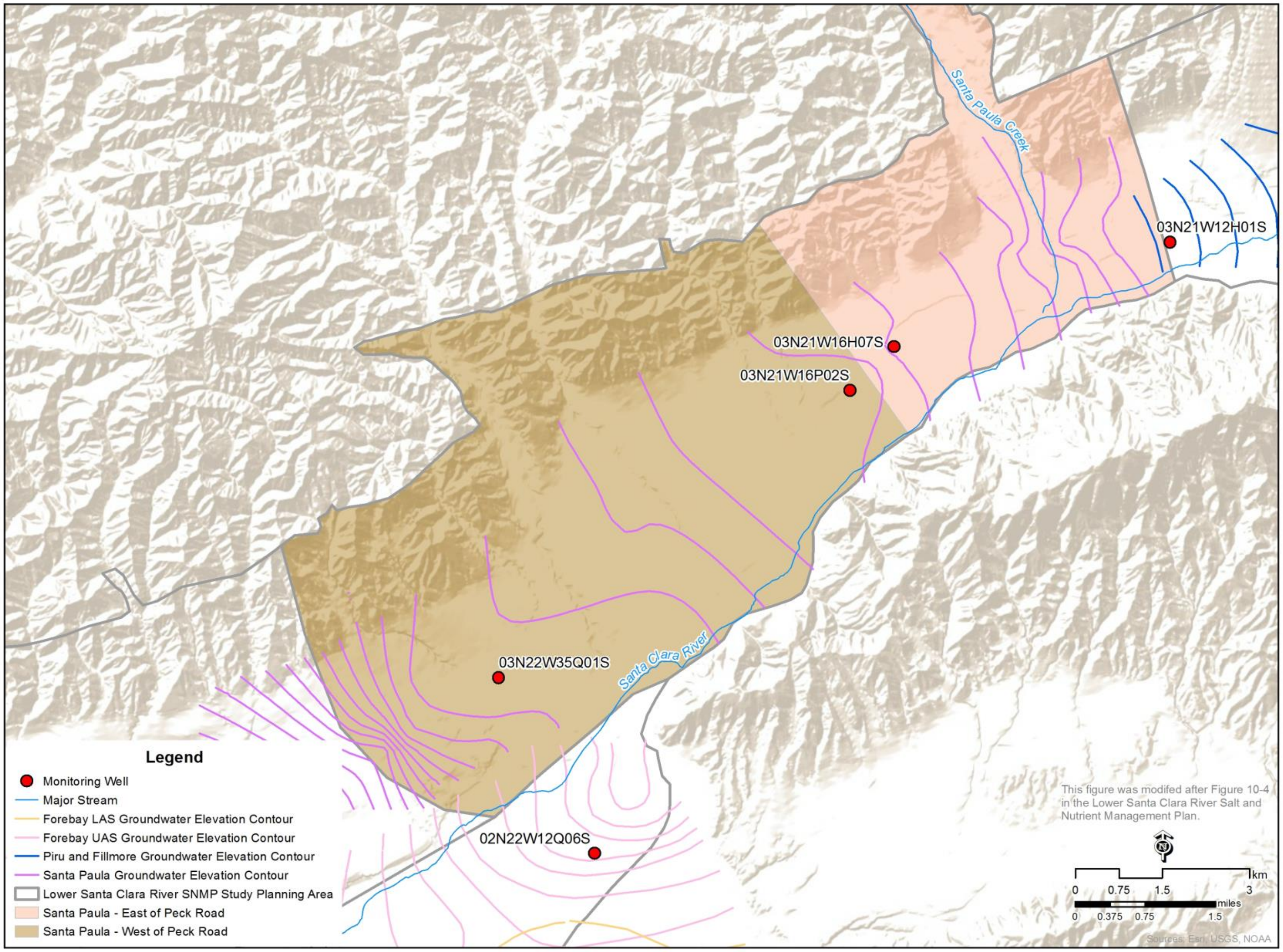

Figure 8.2-2C. Location of SNMP Monitoring Wells in the Santa Paula Basin.

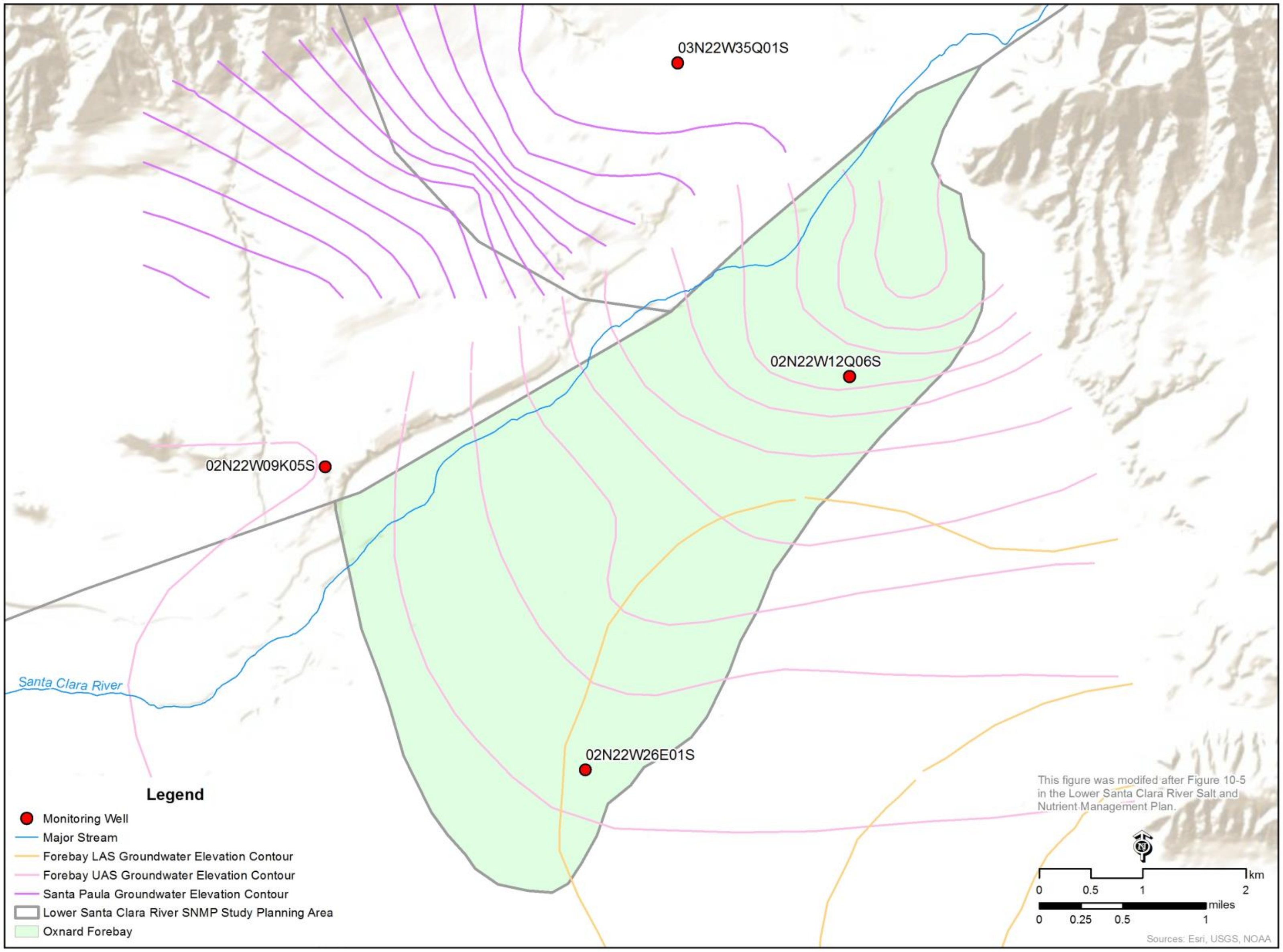

Figure 8.2-2D. Location of SNMP Monitoring Wells in the Oxnard Forebay Basin.

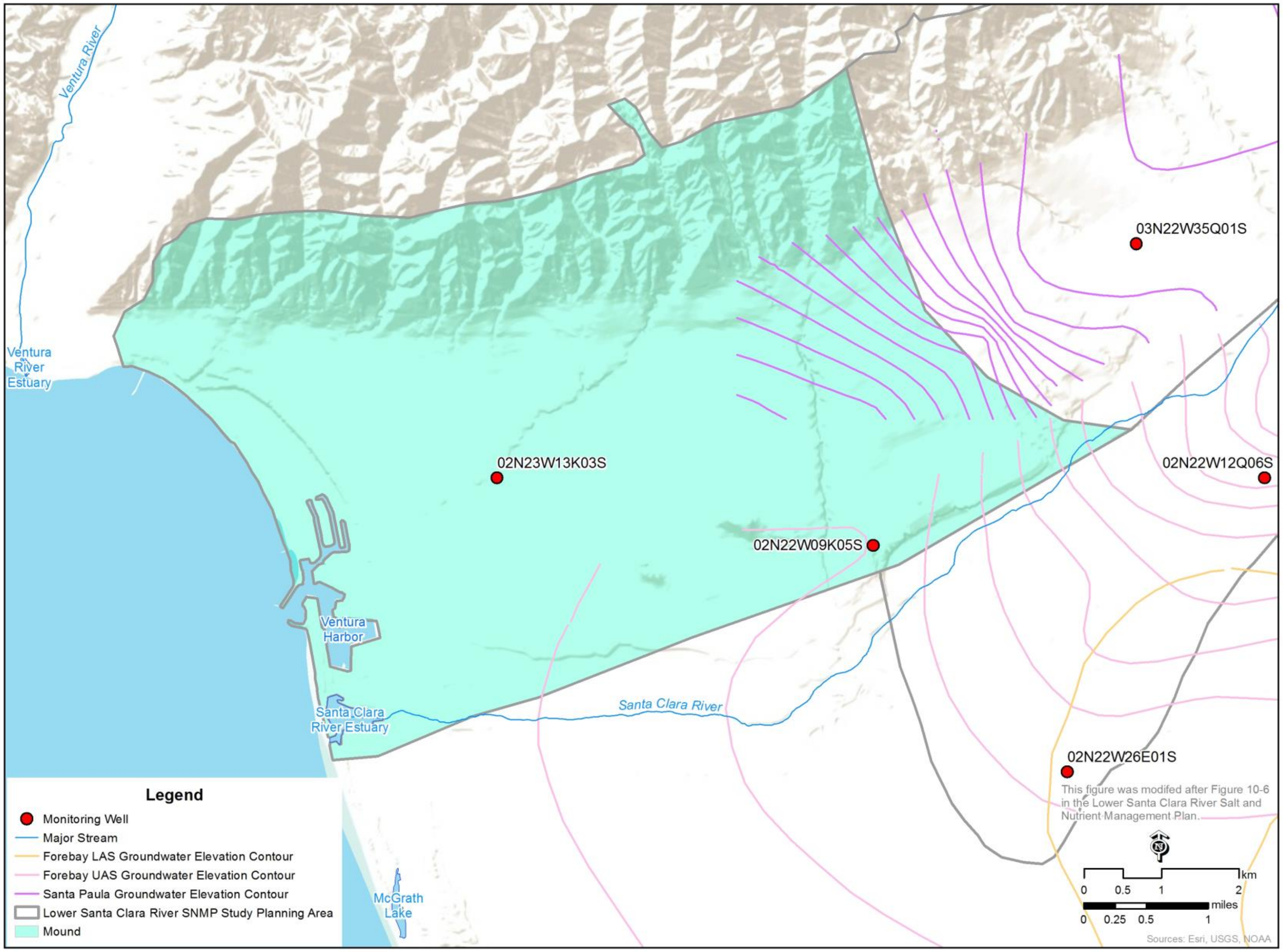

Figure 8.2-2E. Location of SNMP Monitoring Wells in the Mound Basin.

Updates to the Salt and Nutrient Management Measures

Salt and nutrient management measures will be updated (i) as necessary to reflect changing conditions in the LSCR Basin (e.g. drought conditions, changes in current or projected salt and nutrient loads to the basin, and/or changes in land use), (ii) where results from the SNMP Monitoring Program indicate that revisions/modifications are warranted, (iii) if needed to address modified or additional recycled water projects and/or (iv) at the end of the planning horizon (i.e. 2025).

Regulatory Implications

The salt and nutrient management strategies developed by local water entities in the Lower Santa Clara River Basin are voluntary measures that are designed to maintain water quality that is protective of beneficial uses and prevent additional loading in localized areas of elevated salt and nutrient concentrations. In addition to existing and potential management measures, stakeholders have developed a protocol for managing future projects that may impact salt and nutrient loads and have identified additional potential control measures to be implemented should it become necessary.

Where projects have the potential to impact salt and/or nutrient loads to a basin, consideration will be given to water quality conditions and the corresponding assimilative capacity in localized areas during the permitting process or the development of other Regional Board regulatory actions.

Except for the permitting of existing and proposed facilities/projects, further Regional Water Board action pertaining to these implementation measures geared toward controlling salt and nutrient loading to these basins may only be necessary where data and/or other information indicate that the projected water quality impacts are being exceeded.

C. Malibu Valley Basin

Adopted by the California Regional Water Quality Control Board, Los Angeles Region on July 14, 2016.

Approved by:

The State Water Resources Control Board on April 19, 2017.
The Office of Administrative Law on August 9, 2017.

The program of implementation[6] described below is based on the Salt and Nutrient Management Plan for the Malibu Valley Groundwater Basin developed by the City of Malibu in consultation with Los Angeles County Waterworks District 29 and other basin stakeholders. The Salt and Nutrient Management Plan and this program of implementation satisfy the Recycled Water Policy requirements for Salt and Nutrient Management Plans.

The overarching goal of the Malibu Valley Basin Salt and Nutrient Management Plan (SNMP) is to manage, protect and enhance basin groundwater in order to sustain the beneficial uses of this resource. In developing the SNMP, the City of Malibu and the Malibu Valley Basin stakeholders aimed to achieve the following objectives:

- Improve the technical understanding of the groundwater basin's hydrogeology, the implications of the overlying land uses on the underlying groundwater quality, and groundwater-surface water interactions.
- Develop a forum and collaborative process for defining issues and identifying and implementing actions to manage the groundwater resource (both quality and supply).
- Define implementation measures as necessary to ensure the long-term sustainability of the groundwater resource.
- Develop a groundwater monitoring program to coordinate ongoing and future data collection efforts and to facilitate analysis of water quality trends into the future.
- Provide a framework for adaptively managing the groundwater basin and implementing future management actions.
- The Malibu Valley Groundwater Basin SNMP has been developed to support these goals and objectives.

[6] The Recycled Water Policy refers to "revised implementation plans" for adoption into regional basin plans pursuant to Water Code section 13242. Water Code section 13242 uses the term "program of implementation." Pursuant to Water Code section 13242, "[t]he program of implementation for achieving water quality objectives shall include, but not be limited to:
(a) A description of the nature of actions which are necessary to achieve the objectives, including recommendations for appropriate action by any entity, public or private.
(b) A time schedule for the actions to be taken.
(c) A description of surveillance to be undertaken to determine compliance with objectives."

The following summarizes the essential elements of the Salt and Nutrient Management Plan for the Malibu Valley Groundwater Basin. Further details may be found in the full document at: http://www.waterboards.ca.gov/losangeles/water_issues/programs/salt_and_nutrient_management/index.shtml

Background

The Malibu Valley Groundwater Basin is a small alluvial basin located in southwestern Los Angeles County, along the coastline. It is bounded by the Pacific Ocean on the south and by the Santa Monica Mountains on all remaining sides (Figure 8.3-1). The basin covers an area of approximately 613 acres (0.96 square miles) and is flanked on both sides by canyons - the Sweetwater Canyon to the east, and the Winter Canyon to the west. The valley is drained by Malibu Creek to the Pacific Ocean. The Malibu Coast Fault runs across the basin in an east-west direction but does not create a groundwater barrier.[7]

In general, there are four hydrostratigraphic units within the Malibu Valley Groundwater Basin (from shallowest to deepest): shallow alluvium, a low permeability zone that covers most of the groundwater basin, Civic Center Gravels, and bedrock. Bedrock is at or near land surface in the upland areas, and beneath the unconsolidated sediments that are present in the Civic Center Area along Malibu Creek and Lagoon. Groundwater moves south towards the Pacific Ocean.

Infiltration of stream flow is a common source of recharge to the alluvial aquifers. Recharge occurs as streams flow from steep upland areas, which are predominantly bedrock, onto more permeable, relatively flat, alluvial deposits. The rate of recharge is controlled by the difference in head between the stream and the underlying groundwater and the permeability of the streambed and underlying alluvial deposits.

Development overlying the groundwater basin is predominantly urban in nature, and includes a significant amount of residential development and undeveloped land. Historical groundwater use was from the shallow alluvium, which has a hydraulic connection to Malibu Creek and the Pacific Ocean. However, at present, the groundwater basin is not used for local potable water supplies.

Basin Management

The Malibu Valley Basin is actively managed by the City of Malibu, as the approving agency for Coastal Development Permits required by their certified Local Coastal Program, and the Los Angeles County Department of Public Health (LACDPH) Environmental Health Division, Drinking Water Program, as the entity primarily responsible for well construction and destruction permits and the regulation of small community onsite wastewater treatment systems.

[7] California Department of Water Resources (DWR). 1975. *Sea-Water Intrusion in California: Inventory of Coastal Ground Water Basins*. Bulletin 63-5.

The Malibu Valley Basin has been critically over-drafted in the past. Seawater intrusion occurred through the 1950s and 1960s when seawater advanced over a half mile inland.[8] In response to this situation, Los Angeles County Waterworks District 29 (WD29) was established as a special district in 1959 by a public election that authorized the formation of the district.[9] Once established, WD29 constructed water distribution systems in Malibu between 1962 and 1970 and started distribution of imported potable water into the basin. All known private and commercial potable supply wells were subsequently abandoned.

[8] California Department of Water Resources. 2003. *California's Ground Water*. Bulletin 118.
[9] http://dpw.lacounty.gov/wwd/web/About/Overview.aspx

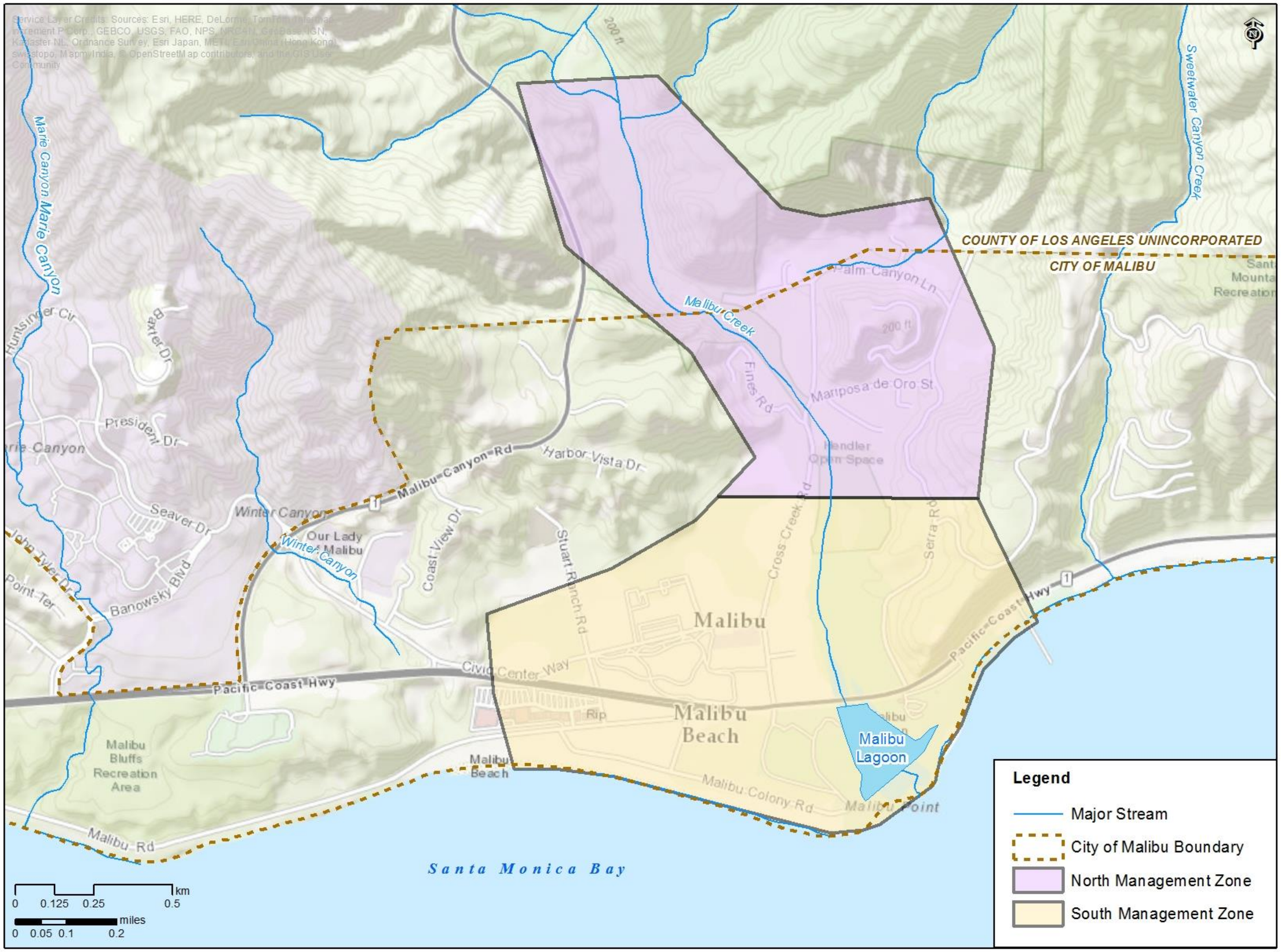

Figure 8.3-1. The Malibu Valley Basin's Salt and Nutrient Management Plan Area.

Participating Agencies

In addition to the City of Malibu as the lead agency, two stakeholder groups participated in the development of the Malibu Valley Basin SNMP. The primary stakeholder group was a Technical Advisory Committee (TAC) that included representatives from the City of Malibu, Los Angeles County Department of Public Works, Heal the Bay, Santa Monica Bay Restoration Commission, Regional and State Water Board staff, and various consultants. The other group was a public stakeholder group that included area residents and businesses, other environmental groups, and representatives of the Planning Commission and local school districts, in addition to the TAC members and other interested entities.

Sources of Water in the Malibu Valley Basin

Water supply within the Malibu area is provided by the Los Angeles County Waterworks District 29 from imported sources. Imported water recharges the basin directly through irrigation, and indirectly through onsite wastewater treatment system discharges in the area. Other sources of basin recharge include stream infiltration, mountain front recharge, and precipitation.

TABLE 8.3-1: CONTRIBUTIONS OF SOURCE WATERS TO THE MALIBU VALLEY BASIN

TYPE	SOURCE	CONTRIBUTION TO GROUNDWATER
Surface water	Upland areas	Recharge from infiltration of Malibu Creek into underlying alluvial deposits, which occurs when surface water flow infiltrates into permeable alluvium in the upper reaches of the creek. Surface water infiltration, which is evident in the western part of the alluvium at the artificial wetland near the intersection of Civic Center Way and Stuart Ranch Road, on what is typically referred to as the Smith Parcel.
Subsurface Municipal Wastewater	Onsite Wastewater Treatment Systems	Subsurface wastewater dispersal, which occurs within the shallow alluvium at each dispersal bed. Dispersal systems in upland areas adjacent to the alluvium can also provide indirect recharge to the basin in the form of groundwater migration into the downgradient basin.
Imported Water	Metropolitan Water District via Los Angeles County Waterworks District 29	Water supply within the Malibu Valley area Groundwater recharge from excess irrigation required to flush root zones for maintenance of turf and other vegetation Recharge to the alluvium via groundwater migration and surface water runoff from irrigation in upland areas.
Groundwater	Mountain front recharge from upland areas	Basin recharge Groundwater migration from upland areas, which recharges alluvial deposits as it flows from the upland areas to the edges of the alluvial deposits on the valley floor.

TYPE	SOURCE	CONTRIBUTION TO GROUNDWATER
Stormwater	Precipitation from overlying areas	Infiltration of precipitation directly into the alluvium where land is not covered with impervious surfaces. Additionally, infiltration of precipitation from upland areas in the form of groundwater recharge at the basin's margins.

Groundwater outflow from the Malibu Valley groundwater basin includes natural discharge to surface waters and the ocean, evapotranspiration from riparian vegetation (where the root zone of vegetation is at or below the water table), and pumping wells used for irrigation or other water uses in the plan area.

Salt and Nutrient Loading to the Malibu Valley Basin

The mass balances (inputs and outflows) for total dissolved solids (TDS), chloride, nitrate-N, and sulfate from the various sources of water are presented below for the Malibu Valley Basin. Loads from the imported water, while not specifically listed, are reflected in the loads from stream seepage, irrigation and onsite wastewater treatment systems effluent.

TABLE 8.3-2A: SALT AND NUTRIENT BALANCE IN THE MALIBU VALLEY BASIN

Source Water	TDS		Nitrate	
	(tons/yr)	%	(tons/yr)	%
Stream Seepage	1574.47	79.70	3.04	28.2
Onsite Wastewater Treatment Systems & Irrigation	229.28	11.60	7.57	70.2
Precipitation	0.00	0.00	0.17	1.6
Ocean Inflow	172.51	8.70	0.01	0.0
Total Inflow	**1975.28**	**100**	**10.79**	**100**
Ocean Outflow	2283.62	58.55	4.80	58.5
Stream Outflow	1616.72	41.45	3.41	41.8
Total Outflow	**3900.34**	**100**	**8.21**	**100**
Annual change in mass (tons)	**-1925.06**		**2.58**	

Groundwater Quality and Assimilative Capacity in Malibu Valley Basin

Available groundwater quality data was limited in terms of quantity and spatial representation. Monitoring data from wells in the Malibu Valley Basin from 2003 through 2011 were used to characterize current groundwater quality with regard to nitrates and TDS concentrations. Water quality data were obtained from GeoTracker—compiled from a variety of sources including monitoring and test wells installed as part of the conceptual feasibility testing for a proposed centralized wastewater treatment facility, monitoring wells at the commercial development commonly referred to as the “Lumber Yard,” wells sampled by the United States Geological Survey (USGS), and wells owned by private parties whose groundwater quality data were publicly available. The median groundwater concentrations for both TDS and nitrate were developed by averaging concentrations from individual wells basin-wide (both shallow and deep wells), and then employing a spatial averaging and interpolation across the entire groundwater basin. Since no recent data for chloride or sulfates were available, water quality assessment was based on historic data from GeoTracker from 1953 to 1969.

For the purpose of groundwater quality assessment and determination of available assimilative capacity and future water quality conditions, the Malibu Valley Basin was divided into two management zones. The Northern Management Zone includes approximately the northern half of the groundwater basin and contains primarily residential properties, while the Southern Management Zone covers the southern half of the basin and contains a combination of seaside residential properties, the Civic Center commercial area, and the proposed treated effluent injection wells of the proposed Civic Center Wastewater Treatment Facility. The line dividing the two management zones was determined based on a combination of groundwater quality data, current and future land use, and the grid elements contained in the MODFLOW groundwater flow model, which provided the water balance data necessary for the analyses.

The average TDS, chloride, sulfate and nitrate-N concentrations for each of the management zones were compared to the applicable basin water quality objectives to determine the existing available assimilative capacity (Table 8.3-3). Assimilative capacity is estimated as the difference between the water quality objectives and the existing groundwater quality for each management zone.

TABLE 8.3-3: GROUNDWATER QUALITY AND AVAILABLE ASSIMILATIVE CAPACITY IN THE MALIBU VALLEY BASIN

BASIN	SUB AREA	Water Quality Objective (mg/l)	Current Quality (mg/l)	Available Assimilative Capacity (mg/l)
		Total Dissolved Solids (TDS)		
Malibu Valley	Northern Zone	2000	2000	0
	Southern Zone		2200	-200
	Basin wide		2100	-100
		Nitrate - N		
Malibu Valley	Northern Zone	10	2.78	7.22
	Southern Zone		3.29	6.71
	Basin wide		3.23	6.77
		Chlorides		
Malibu Valley	Northern Zone	500	170	330
	Southern Zone		244	256
	Basin wide		212	288
		Sulfates		
Malibu Valley	Northern Zone	500	394	106
	Southern Zone		619	-119
	Basin wide		520	-20

Note: An “Available Assimilative Capacity” of 0 or a negative number indicates that there is no assimilative capacity available for the sub area/pollutant.

Available data showed TDS concentrations below the basins’ water quality objective (i.e. less than 2,000 mg/L) throughout most of the basin; however, some areas displayed elevated TDS levels, primarily as a result of either direct connection with ocean waters and/or as a result of historical sea water intrusion. One well in particular, on the east side of the basin, showed elevated TDS concentrations (above 4,000 mg/L) and this resulted in a significant impact on the groundwater basin’s spatial average. Generally, low nitrate concentrations were observed throughout most of the groundwater basin, with higher readings outside of the basin. Also, higher nitrate concentrations were found in the shallow groundwater as compared to the deeper aquifer. On average, chloride concentrations were below water quality objectives, though concentrations tended to be high near the ocean and lagoon. Finally, the water quality data showed areas of relatively low sulfate concentrations and localized areas of high concentrations exceeding 800 mg/L. The higher concentrations tended to occur near the ocean and lagoon – a possible indication of tidal and seawater influences on groundwater quality. In summary, assimilative capacity is available for chloride and nitrate in both management zones within the planning area, and for sulfate in the Northern Management Zone. There is no assimilative capacity for TDS in either zone, and none for sulfate in the Southern Management Zone.

Salt and Nutrient Management Measures in the Malibu Valley Basin

Existing salt and nutrient management measures in the Malibu Valley Basin include actions/programs that manage groundwater quality, protect and enhance groundwater recharge, and promote onsite stormwater capture and retention. These existing management measures are summarized in Table 8.3-4A.

TABLE 8.3-4A: EXISTING SALT AND NUTRIENT MANAGEMENT MEASURES IN THE MALIBU VALLEY BASIN

Category	Program/Project	Description
Groundwater Management and Adaptation	Water Quality Mitigation Plan (WQMP)	For projects that require a Coastal Development Permit and fall into one of 8 pre-defined categories, a WQMP must be prepared to show how treatment control BMPs and/or structural BMPs will be used to minimize or prevent the discharge of polluted runoff after construction.
	Well construction/destruction permits	Los Angeles County Department of Public Health issues permits for groundwater well construction and destruction.
	Total Maximum Daily Loads (TMDLs)	As a result of surface water-groundwater interactions between Malibu Creek/Lagoon and the Malibu Valley Basin, efforts to meet TMDL requirements for Malibu Creek/Lagoon will aid in protecting groundwater quality.
	Groundwater Management Ordinance	Manage groundwater extractions from existing wells and installation and extraction from new wells
Protect/Enhance Groundwater Recharge	Land development approvals	Manage development to protect key basin recharge areas
	Stormwater runoff retention ordinance	New projects are to retain onsite the Storm Water Quality Design Volume (SWQDv) defined as the greater of the 85th percentile, 24-hour storm event or the 0.75 inch, 24-hour storm event.
Saline Water Intrusion Management	Groundwater Management Ordinance	Manage groundwater extractions from existing wells and installation and extraction from new wells
Stormwater Capture and Runoff Management	LID and stormwater BMPs	Promotion of green architecture (including LID techniques) through the City's Green Building Standards Code and implementation of State General Permits
	Stormwater runoff retention ordinance	New projects are to retain onsite the Storm Water Quality Design Volume (SWQDv) defined as the greater of the 85th percentile, 24-hour storm event or the 0.75 inch, 24-hour storm event.
	Stormwater Management Plans (SWMP)	All projects which require a Coastal Development Permit must include a SWMP to mitigate the effect of development on stormwater after construction and must maximize, to the extent practicable, the percentage of permeable surfaces and the retention

Category	Program/Project	Description
		of dry-weather runoff on the site
Public Outreach	Cooperation and coordination between water-related entities	The City currently coordinates with multiple entities in the groundwater basin on water resource-related issues, including, but not limited to, the Los Angeles Water Board, National Park Service, Resource Conservation District of the Santa Monica Mountains, California State Coastal Conservancy, Las Virgenes Municipal Water District, and Malibu Coastal Land Conservancy
Land Use Regulation	Landscape water conservation requirements	M.W.C. Section 9.22, City Ordinance No. 343 requires homeowners to maintain water-efficient landscapes

Planned implementation projects and programs include, among others, the construction of a centralized wastewater treatment facility (the Civic Center Wastewater Treatment Facility or CCWTF) to reduce pollutant loads from onsite wastewater treatment systems and replace imported water for irrigation. Discharge from this centralized treatment system will be injected into the groundwater aquifer to curtail seawater intrusion. Details of such measures are provided in Table 8.3-4B.

TABLE 8.3-4B: PLANNED SALT AND NUTRIENT MANAGEMENT MEASURES IN THE MALIBU VALLEY BASIN

Category	Program/Project	Description
Protect/Enhance Groundwater Recharge	Mapping of basin recharge areas	Recharge zones for the groundwater basin will be mapped and used in consideration of land use approvals
Saline Water Intrusion Management	Recycled water injection as part of CCWTF	Injection will establish a partial recharge barrier against future saline water intrusion
Wastewater Salinity/Nutrient Control	CCWTF construction and operation	Wastewater collection and nitrogen treatment
	Regenerative salt-based water softeners ordinance	Control loading of salts in wastewater to reduce salts in recycled water
Groundwater Monitoring	Groundwater elevation and water quality monitoring program	Groundwater monitoring will be required as part of the Water Reclamation Requirements (WRR)/Waste Discharge Requirements (WDR) for the CCWTF
	SNMP monitoring program	A supplemental monitoring program will be implemented, building on the WDR monitoring program, to provide necessary information for SNMP implementation
	MOU monitoring program	A supplemental monitoring program will be implemented, building on the WDR monitoring program, to provide necessary information for evaluating the impacts of CCWTF implementation on the shallow alluvium per MOU requirements

Projected Impacts of Future Projects on Water Quality

Groundwater quality concentrations for TDS and nitrate were simulated for two scenarios using a spreadsheet-based analytical mixing model. This mixing model was developed in Microsoft Excel and is a set of linked spreadsheets used to represent 'instantaneously mixed' groundwater volumes. This mixing model, combined with the loading analysis, was designed to account for current groundwater volumes and salt/nutrient masses in storage in the Malibu Valley Basin, and to track the loading/unloading of salts and nutrients through various major groundwater sources and sinks under baseline (current) and future land and water use scenarios (based on the City's General Plan for future development through build-out). Concentration estimates were based on water and mass inflows and outflows (balances), mixed with the volume of water in storage in the groundwater basin and the average ambient groundwater quality. The water balance components are based upon a MODFLOW groundwater flow model developed and used to simulate future impacts to the groundwater basin, and are further extrapolated such that the future groundwater quality analysis simulates the period of 2010 to 2039. In the absence of sufficient data on chloride and sulfate, the analysis was limited to TDS and nitrate.

The two scenarios evaluated in this analysis were: (1) a No Project scenario that assumes continued use of o systems in the planning area and projected land use at build-out per the City's General Plan; and (2) implementation of the CCWTF[10] Project. Under this second scenario, once fully implemented, the CCWTF Project will be the only recycled water project in the Malibu Valley Basin and the recycled water produced by the CCWTF will be used for irrigation with any unused recycled water injected into the groundwater basin. Results of this analysis are presented in Tables 8.3-5A and 8.3-5B.

Projected Future Assimilative Capacity Use for Total Dissolved Solids (TDS) and Nitrate

Results from the model indicate that future changes in land use and implementation of the proposed CCWTF Project will not result in significant adverse changes to TDS loading to the groundwater basin. The TDS concentration of recycled water to be injected into the Malibu Valley Basin will be less than existing ambient groundwater concentrations (estimated to be 2,000 mg/L in the Northern Zone and 2,200 mg/L in the Southern Zone). Consequently, the proposed recycled water injection project will result in improvements to groundwater quality with respect to TDS in the injection area, eventually lowering TDS concentrations well below the water quality objective.

Based on the model, nitrate-N concentrations are projected to increase basin-wide by 13% over a 25-year period. However, water quality will still be maintained below the nitrate-N water quality objective of 10 mg/l. The centralized treatment plant is estimated to account for about 7% of the nitrate-N assimilative capacity use, while the balance is projected to be utilized by future land uses, which would occur under either of the two scenarios evaluated (i.e., development of currently vacant lands and changes to existing land uses).

These projections are based on conservative assumptions for the impact analysis (e.g., all nitrogen loading is converted to nitrate-N, there is no in-basin denitrification, no advection, dispersion or

[10] CCWTF Project Scenario – This scenario assumes recycled water irrigation and injection with centralized wastewater treatment/recycled water generation resulting in a total nitrogen concentration of 8 mg/L.

diffusion within the groundwater basin, and no salt is removed from the basin once loading occurs), and may therefore overestimate the actual TDS and nitrate-N loadings to the Malibu Valley Basin and the projected impacts on basin water quality.

TABLE 8.3-5A: PROJECTED IMPACT OF DIFFERENT PROJECT SCENARIOS ON ASSIMILATIVE CAPACITY FOR TDS

MALIBU VALLEY BASIN/SUB AREA	**CURRENT WATER QUALITY**	**NO PROJECT SCENARIO**		**CCWTF PROJECT SCENARIO**	
	2015	**2040**			
	TDS (mg/l)	TDS (mg/l)	Assimilative Capacity created (%)	TDS (mg/l)	Assimilative Capacity created (%)
Northern Management Zone	2000	1097	**+45**	1105	**+45**
Southern Management Zone	2200	1096	**+55**	1115	**+54**
Basin wide	2100	936	**+53**	934	**+53**

TABLE 8.3-5B: PROJECTED IMPACT OF DIFFERENT PROJECT SCENARIOS ON ASSIMILATIVE CAPACITY FOR NITRATE-NITROGEN

MALIBU VALLEY BASIN/SUB AREA	**CURRENT WATER QUALITY**	**NO PROJECT SCENARIO**		**CCWTF PROJECT SCENARIO**	
	2015	**2040**			
	Nitrate-N (mg/l)	Nitrate-N (mg/l)	Assimilative Capacity used (%)	Nitrate-N (mg/l)	Assimilative Capacity used (%)
Northern Management Zone	2.78	4.31	**-21**	3.95	**-16**
Southern Management Zone	3.29	5.85	**-38**	4.91	**-24**
Basin wide	3.23	4.91	**-25**	4.1	**-13**

Salt and Nutrient Load Limits

Salt and nutrient loads to the Malibu Valley Basin will be managed with the existing and planned programs/projects discussed above, in conjunction with other existing water quality protection measures including Total Maximum Daily Loads and the prohibition on onsite wastewater treatment system discharges in the area. These measures are designed to maintain water quality that is protective of beneficial uses, preserve capacity for stormwater recharge, address elevated salt concentrations and curtail impacts from seawater intrusion.

Monitoring Program

Groundwater monitoring for salt and nutrient management plan implementation will utilize a mix of shallow and deeper monitoring wells that are spatially distributed around the Malibu Valley Basin as shown in Figure 8.3-2, and will monitor for potential impacts to the groundwater basin resulting from recycled water irrigation. In addition, the SNMP monitoring program will assess spatial and temporal changes in salt and nutrient concentrations and provide a more complete and current characterization of groundwater quality, particularly for sulfates and chlorides. Monitoring data will also be used to refine the assimilative capacity analysis using updated information. Elements of the program are laid out in Table 8.3-6.

TABLE 8.3-6: MONITORING PROGRAM ELEMENTS

<table>
<tr><th>Element</th><th>Description</th></tr>
<tr><td>Responsible Agency</td><td>City of Malibu</td></tr>
<tr><td>Program Origin</td><td>Waste Discharge Monitoring Requirements for the CCWTF, and other existing monitoring wells.</td></tr>
<tr><td>Parameters and Monitoring Frequency</td><td><table>
<tr><th>Parameter</th><th>Monitoring Frequency</th></tr>
<tr><td>Total Dissolved Solids</td><td rowspan="4">Semi-Annually</td></tr>
<tr><td>Chloride</td></tr>
<tr><td>Sulfate</td></tr>
<tr><td>Nitrate-N</td></tr>
</table></td></tr>
<tr><td>Monitoring locations</td><td>Shallow and deeper monitoring wells spatially distributed around the Malibu Valley Basin (Figure 8.3-2)</td></tr>
<tr><td>Reporting Requirements</td><td>Annual report of monitoring results. TDS, chloride, sulfate and nitrate-N data collected from the SNMP monitoring wells will be uploaded to the State Water Board’s online GeoTracker database.</td></tr>
<tr><td>Review Period</td><td>Data collected from the SNMP monitoring wells, and other monitoring programs, will be reviewed periodically to evaluate basin water quality conditions.</td></tr>
</table>

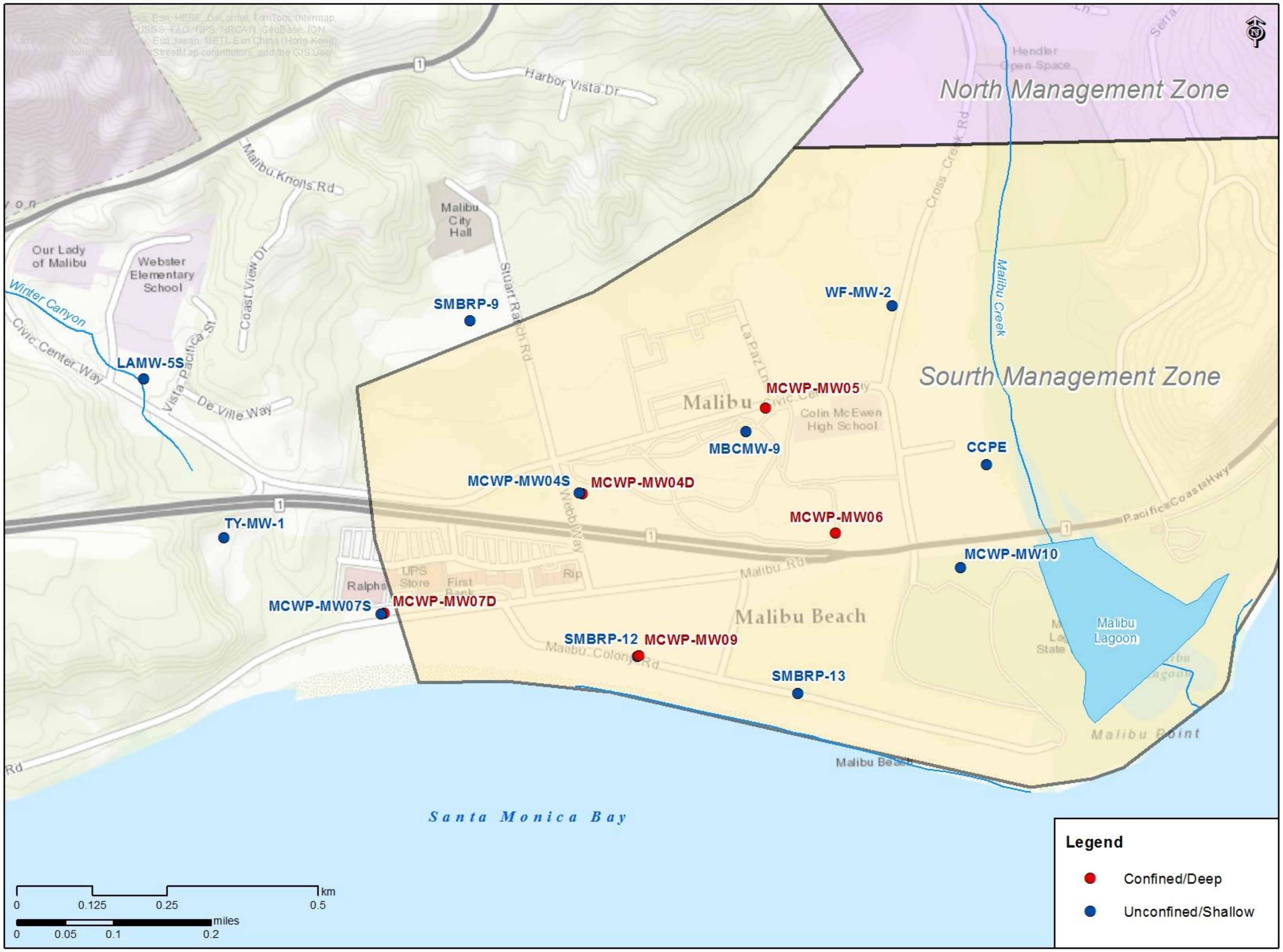

Figure 8.3-2. Location of SNMP Monitoring Wells in the Malibu Valley Basin.

Updates to the Salt and Nutrient Management Measures

Salt and nutrient management measures will be updated (i) as necessary to reflect changing conditions in the Malibu Valley Basin (e.g. drought conditions, changes in current or projected salt and nutrient loads to the basin, and/or changes in land use), (ii) where results from the SNMP Monitoring Program indicate that revisions/modifications are warranted, (iii) if needed to address modified or additional recycled water projects and/or (iv) at the end of a 10-year planning horizon.

Regulatory Implications

The salt and nutrient management strategies developed by the Malibu Valley Basin stakeholders are measures designed to maintain water quality that is protective of beneficial uses, preserve capacity for stormwater recharge, address elevated salt concentrations and curtail impacts from seawater intrusion. These strategies will be applied in conjunction with already existing water quality protection measures in the planning area (e.g. TMDLs and prohibition on onsite wastewater treatment system discharges).

Where additional projects have the potential to impact salt and/or nutrient loads to a basin, consideration will be given to water quality conditions and the corresponding assimilative capacity in localized areas during the permitting process or the development of other Regional Water Board regulatory actions.

Except for the permitting of existing and proposed facilities/projects, further Regional Water Board action pertaining to these implementation measures geared toward controlling salt and nutrient loading to these basins may only be necessary where data and/or other information indicate that the projected water quality impacts are being exceeded.

D. Upper Santa Clara River Basin

Adopted by the California Regional Water Quality Control Board, Los Angeles Region on December 8, 2016.

Approved by:

The State Water Resources Control Board on May 16, 2017.
The Office of Administrative Law on June 19, 2018.

The program of implementation[11] described below is based on the Salt and Nutrient Management Plan (SNMP) for the Upper Santa Clara River Basin (also known as the Eastern Santa Clara Groundwater Basin or East Sub-basin) developed by the Castaic Lake Water Agency (CLWA) and other agencies, including City of Santa Clarita, CLWA Santa Clarita Water Division (SCWD), Los Angeles County Flood Control District (LACFCD), Newhall County Water District (NCWD), San Gabriel & Lower Los Angeles Rivers and Mountains Conservancy, Santa Clarita Valley Sanitation District (SCVSD) and Valencia Water Company (VWC). The Salt and Nutrient Management Plan and this program of implementation satisfy the State Water Resources Control Board's Recycled Water Policy requirements for Salt and Nutrient Management Plans. This program of implementation applies to groundwater basin(s) with the designated beneficial use of municipal and domestic supply (MUN).

The SNMP was developed to provide the framework for water management practices in the East Subbasin, including the use of recycled water, to ensure protection of beneficial uses and allow for the sustainable use of groundwater resources, consistent with the Regional Board's water quality objectives.

The following summarizes essential elements of the SNMP for the Upper Santa Clara River Basin. Further details may be found in the full document at:
http://www.waterboards.ca.gov/losangeles/water_issues/programs/salt_and_nutrient_management/index.shtml

Background

The Upper Santa Clara River Basin (or East Subbasin) is located in northwest Los Angeles County and is part of the larger Santa Clara River Valley Groundwater Basin. The Basin encompasses an area of approximately 103 square miles[12], and comprises two primary aquifers

[11] The Recycled Water Policy refers to "revised implementation plans" for adoption into regional basin plans pursuant to Water Code section 13242. Water Code section 13242 uses the term "program of implementation." Pursuant to Water Code section 13242, "[t]he program of implementation for achieving water quality objectives shall include, but not be limited to:
(a) A description of the nature of actions which are necessary to achieve the objectives, including recommendations for appropriate action by any entity, public or private.
(b) A time schedule for the actions to be taken.
(c) A description of surveillance to be undertaken to determine compliance with objectives."

[12] DWR. 2002. Santa Clara River Valley Groundwater Basin, Santa Clara River Valley East Subbasin. California's Groundwater Bulletin 118. Last Update: January 2006.

that are used for groundwater production, and provide about 50-60% of the water supply for the Santa Clarita Valley residents: a shallow Alluvial Aquifer and an older, underlying geologic unit called the Saugus Formation. The main surface drainage features in the area include the Santa Clara River (which provides most of the annual groundwater recharge to the groundwater system), Bouquet Creek, and Castaic Creek.

The Alluvial Aquifer generally underlies the Santa Clara River and its several tributaries. It is deepest along the center of the river channel, with a maximum depth of about 200 ft, and thins toward the flanks of the adjoining hills and toward the eastern and western boundaries of the basin[13]. The Saugus Formation underlies practically the entire Upper Santa Clara River area, to depths of at least 2,000 ft in the central part of the valley. Groundwater in the subbasin is generally unconfined in the alluvium, but may be confined, semi-confined, or unconfined in the Saugus Formation[2].

For management purposes, the Upper Santa Clara River Basin is subdivided into six subunits/management zones (MZs), which exhibit consistent hydrological, water quality or overlying land use characteristics (Figure 8.4-1). Five of these subunits (Management Zones 1 through 5: Santa Clara-Mint Canyon Subunit, South Fork Subunit, Placerita Canyon Subunit, Santa Clara-Bouquet and San Francisquito Canyon Sunbunit, and Castaic Subunit, respectively) comprise the shallow Alluvial Aquifer, and provide a majority of the groundwater production. The sixth subunit (Management Zone 6) consists of the Saugus Formation, which provides the balance of groundwater production.

Surface water flowing into the subbasin percolates into the highly permeable alluvial sediments, which underlie the Santa Clara River. Groundwater generally moves westward toward the outlet of the Alluvium, which is also the outlet of the Upper Santa Clara River Hydrologic Area. Thus, groundwater movement in the Alluvium beneath the tributaries is toward their confluence with the Santa Clara River and then westward. As the Alluvium thins and narrows towards the outlet of the basin, groundwater is forced to rise, keeping the depth to water at or approaching land surface.

Groundwater in the alluvial units percolates farther downward into the Saugus Formation, which underlies the alluvium. The geologic structure controls the movement of groundwater in the Saugus Formation -- downward in the eastern portion of the subbasin and upwards in the western portion. Groundwater in the Saugus Formation in the western portion of the basin rises into the alluvial portion of the Castaic Subunit, becoming surface water again and flowing westerly out of the East Subbasin. Therefore, percolation of either natural surface water and/or treated wastewater is minimal in the western portion of the subbasin due to rising water.

Basin Management

The Upper Santa Clara River Basin (USCRB) is actively managed through a local Memorandum of Understanding process between the Castaic Lake Water Agency (CLWA), the retail water purveyors, and the United Water Conservation District (which operates downstream of the USCRB in Lower Santa Clara River Basins). These retail water purveyors are the Santa Clarita Water Division of CLWA (SCWD), Newhall County Water District (NCWD), Valencia Water Company (VWC) and Los Angeles County Waterworks District 36 (LACWWD 36). The MOU is

[13] CLWA. 2003. Groundwater Management Plan. Santa Clara River Valley Groundwater Basin, East Subbasin, Los Angeles County, California.

a collaborative and integrated approach to water resource management, integrating database management, monitoring and reporting and groundwater modelling and analysis. The cooperating agencies developed and adopted a Groundwater Management Plan that includes:

- Monitoring of groundwater levels, quality, production and subsidence
- Monitoring and management of surface water flows and quality
- Determination of Basin yield and avoidance of overdraft
- Development of regular and dry-year emergency water supply
- Continuation of conjunctive use operations
- Long-term salinity management
- Integration of recycled water
- Identification and mitigation of soil and groundwater contamination, including involvement with other local agencies in investigation, cleanup and closure
- Development and continuation of local, state and federal agency relationships
- Groundwater management reports
- Continuation of public education and water conservation programs
- Identification and management of recharge areas and wellhead protection areas
- Identification of well construction, abandonment and destruction policies
- Provisions to update the groundwater management plan

The CLWA has a contract with the State of California, through DWR, to acquire and distribute State Water Project (SWP) water to its four local retail water purveyors in the Upper Santa Clara River Basin area: CLWA Santa Clarita Water Division (SCWD), Newhall County Water District (NCWD), Valencia Water Company (VWC) and Los Angeles County Waterworks District No. 36 (LACWWD 36).

Pumping in the groundwater basins is governed by an analysis of local hydrologic conditions for the Alluvium Aquifer, and by the availability of other water supplies, particularly from the SWP. The water supply and water resource management practices applied by the purveyors aim at maximizing the use of the Alluvial Aquifer and imported water during years of normal or above-normal availability of these supplies, while limiting the use of the Saugus Formation. During years when supplemental imported water supplies are significantly reduced due to drought conditions, Saugus Formation pumping will be temporarily increased.

Participating Agencies

The SNMP was developed with broad-based stakeholder involvement. Participants included a Task Force consisting of Castaic Lake Water Agency (CLWA), City of Santa Clarita, Los Angeles County Flood Control District (LACFCD), Newhall County Water District (NCWD), Rivers and Mountains Conservancy (RMC), Santa Clarita Water Division of CLWA (SCWD), Santa Clarita Valley Sanitation District of Los Angeles County (SCVSD), Santa Clarita Valley, and Sanitation District of Los Angeles County (SCVSD). Additional stakeholders represented Municipal and County Government Agencies, Water Suppliers/Wastewater Management/Special Districts, Business Organizations, Recreational and Open Space Entities, Regulatory and Resource Agencies- State and Federal, and Non-Profit Organizations.

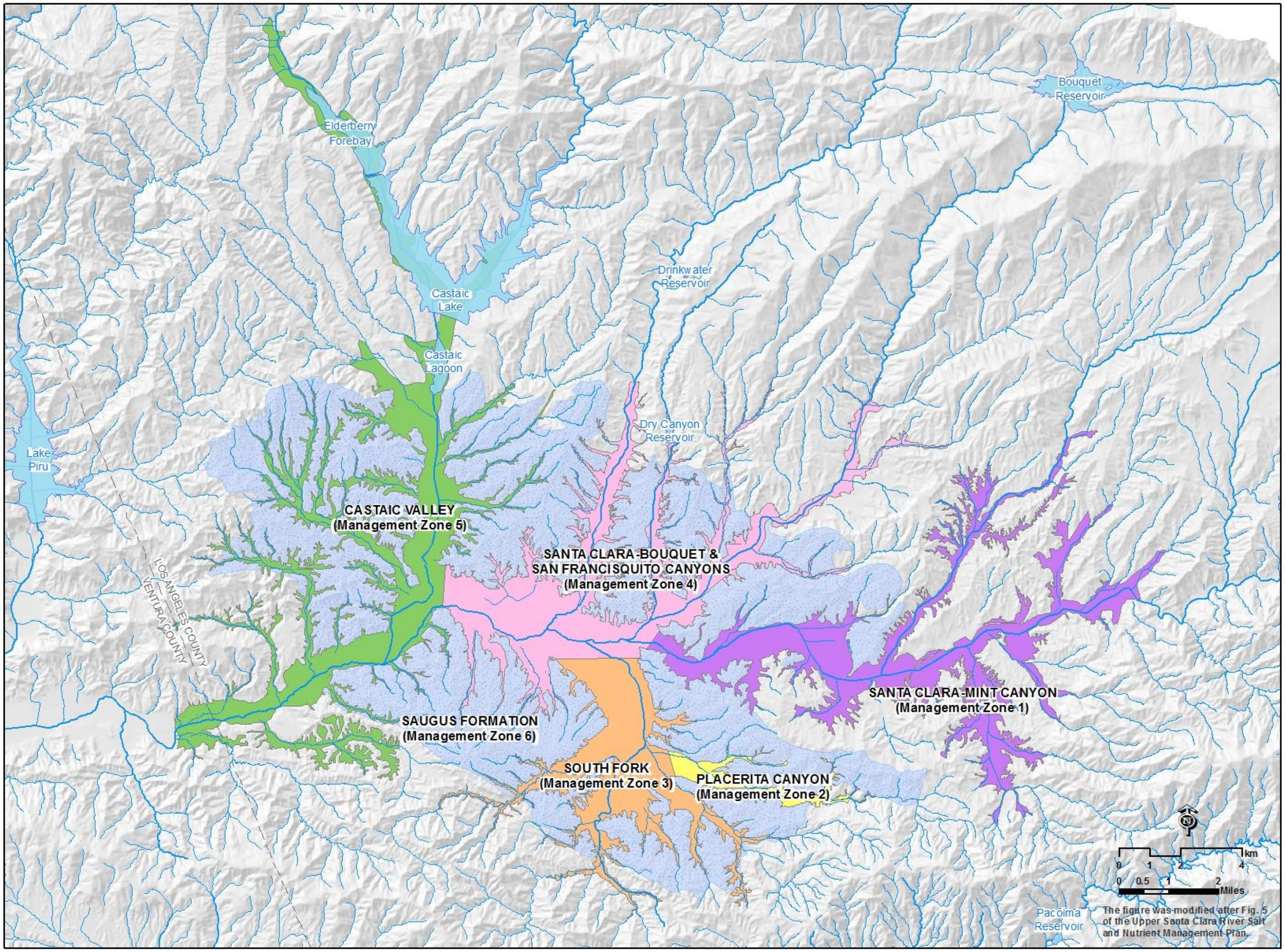

Figure 8.4-1. Upper Santa Clara River Salt and Nutrient Management Plan (SNMP) Area.

Sources of Water in the Upper Santa Clara River Basin

Sources of water for use and recharge in the Upper Santa Clara River Basin include surface water/stormwater, imported water, groundwater, and recycled water. Other minor potential sources of groundwater recharge include leakage from septic systems.

TABLE 8.4-1: CONTRIBUTIONS OF SOURCE WATERS TO THE UPPER SANTA CLARA RIVER BASINS

TYPE	SOURCE	CONTRIBUTION TO GROUNDWATER
Surface water	Santa Clara River and tributaries (Castaic Creek, San Francisquito Canyon, Bouquet Canyon, Mint Canyon, South Fork of the Santa Clara River)	Infiltration of surface waters takes place in unlined tributary channels and in the Santa Clara River bed as a result of natural flows and water releases from Castaic Dam.
Recycled Water	Tertiary-treated recycled water from Valencia and Saugus Water Reclamation Plants (WRPs)	Irrigation of nearby landscapes and discharge to the Santa Clara River
Stormwater	Precipitation from overlying area	Due to the high permeability of the Santa Clara River channel, surface flows percolate quickly into the groundwater system. Stormwater is also recharged naturally at unpaved areas (e.g., parks, golf courses, landscaped areas, dirt lots, residential lawns and gardens, etc.) where the geology promotes deep percolation.
Imported water	State Water Project (SWP), Buena Vista Water Storage District (BVWSD) and Rosedale Rio-Bravo Water Storage District (RRBWSD)	Groundwater percolation and recharge via releases from Castaic Dam following storage in Castaic Lake, as well as leakage beneath the dam. Water supply within the Upper Santa Clara Basin
Groundwater	Extracted from the Upper Santa Clara River Basin	Water supply and irrigation
	Mountain Front recharge from adjacent highland areas	Recharge of the Upper Santa Clara River Basin
	Subsurface flow from adjacent groundwater basins (including inflow from upgradient management zones, upward/downward leakage to/from the Saugus Formation, and underflow from the Acton Basin)	Recharge of the Upper Santa Clara River Basin

Groundwater outflow from the Upper Santa Clara River Basin includes:

- Pumping
- Subsurface outflow to adjacent basins, and
- Groundwater discharge to surface water.

Salt and Nutrient Loading to the Upper Santa Clara River Basin

The mass balances (inputs and outflows) for total dissolved solids (TDS), chloride, nitrate-N and sulfate from the various water sources are presented below for the upper Santa Clara River Basins, in Tables 8.4-2A through 8.4-2F. These values were model-derived based on historical hydrology[14]. Values for Management Zones 1 through 5 represent a 10-year baseline period (2001-2011), while those for Management Zone 6 (Saugus Formation) represent estimates for the 2012 year. Loads from the imported water, while not specifically listed, are reflected in the loads from applied water and stream leakage.

Management Zone 1 (Santa Clara-Mint Canyon subunit) was separated into Zones 1a and 1b (see Tables 8.4-2A and 8.4-2B) to isolate a localized area (approximately 10% of Management Zone 1) of elevated TDS and sulfate concentrations. This area with elevated concentrations was designated Zone 1b, while the rest of Management Zone 1 was designated as Management Zone 1a. The purpose of this separation was to help define the impaired area for any future groundwater quality management efforts.

[14] Discrepancies in underflow values between basins are an artifact of model calibration. More streamlined values will be obtained through future SNMP monitoring.

TABLE 8.4-2A: SALT AND NUTRIENT BALANCE IN MANAGEMENT ZONE 1A (SANTA CLARA-MINT CANYON SUBUNIT) (2001 THROUGH 2011)

Source Water	TDS		Chloride		Nitrate		Sulfate	
	(tons)	%	(tons)	%	(tons)	%	(tons)	%
Percolation from precipitation	384	1.7	153	5.7	7.7	5.6	153	3.2
Percolation from septic systems	968	4.3	141	5.3	13	9.2	154	3.2
Percolation from applied water	3,190	14.0	464	17.3	5.2	3.8	510	10.6
Stream leakage	11,062	48.6	1363	50.8	69	50.5	2138	44.2
Upward leakage from Saugus Basin plus net lateral inflow from adjoining units	4,586	20.1	213	7.9	29	21.0	1490	30.8
Underflow from Acton Basin	2,585	11.4	351	13.1	14	9.9	387	8.0
Total Inflow	**22,775**	**100**	**2,685**	**100**	**137**	**100**	**4,832**	**100**
Groundwater Production	11,480	50.9	1314	51.0	74	50.9	2372	50.8
Underflow to Management Zone 4	8,816	39.1	1008	39.1	57	39.2	1822	39.0
Downward leakage to Saugus Formation	27	0.1	3	0.1	0.2	0.2	6	0.1
Groundwater discharge to streams	2,235	9.9	250	9.7	14	9.8	469	10.0
Total Outflow	**22,558**	**100**	**2,575**	**100**	**146**	**100**	**4,669**	**100**
Annual Change in Mass	**217**	**-**	**110**	**-**	**-9**	**-**	**163**	**-**

*Contributions from the irrigation of nearby landscapes with recycled water and from discharges of recycled water to the Santa Clara River are included in the percolation from applied water and recharge from stream leakage, respectively.

TABLE 8.4-2B: SALT AND NUTRIENT BALANCE IN MANAGEMENT ZONE 1B (SANTA CLARA-MINT CANYON SUBUNIT) (2001 THROUGH 2011)

Source Water	TDS		Chloride		Nitrate		Sulfate	
	(tons)	%	(tons)	%	(tons)	%	(tons)	%
Percolation from precipitation	26	1.7	11	5.9	0.5	4.8	11	3.3
Percolation from septic systems	66	4.2	10	5.4	0.9	9.5	11	3.3
Percolation from applied water	219	14.0	32	17.3	0.5	4.8	35	10.5
Stream leakage	758	48.6	93	50.3	4.7	50.0	147	44.3
Upward leakage from Saugus Basin plus net lateral inflow from adjoining units	314	20.1	15	8.1	2.0	21.4	102	30.7
Underflow from Acton Basin	177	11.3	24	13.0	0.9	9.5	26	7.8
Total Inflow	**1,560**	**100**	**185**	**100**	**9**	**100**	**332**	**100**
Groundwater Production	859	50.9	67	51.1	6.1	51.9	276	50.8
Underflow to Management Zone 4	659	39.1	51	38.9	4.5	38.5	212	39.0
Downward leakage to Saugus Formation	2	0.1	0	0.0	0.0	0.0	1	0.2
Groundwater discharge to streams	167	9.9	13	9.9	1.1	9.6	54	9.9
Total Outflow	**1,687**	**100**	**131**	**100**	**12**	**100**	**543**	**100**
Annual Change in Mass	**-127**	**-**	**54**	**-**	**-2**	**-**	**-211**	**-**

*Contributions from the irrigation of nearby landscapes with recycled water and from discharges of recycled water to the Santa Clara River are included in the percolation from applied water and recharge from stream leakage, respectively.

TABLE 8.4-2C: SALT AND NUTRIENT BALANCE IN MANAGEMENT ZONE 2 (PLACERITA SUBUNIT) (2001 THROUGH 2011)

Source Water	TDS		Chloride		Nitrate		Sulfate	
	(tons)	%	(tons)	%	(tons)	%	(tons)	%
Percolation from precipitation	40	1.9	16	6.9	0.7	4.8	16	3.3
Percolation from septic systems	615	28.7	68	29.2	7.9	55.6	129	26.8
Percolation from applied water	497	23.2	55	23.6	0.9	6.3	105	21.8
Stream leakage	561	26.1	69	29.6	1.6	11.1	108	22.5
Upward leakage from Saugus Basin plus net lateral inflow from adjoining units	433	20.2	25	10.7	3.2	22.2	123	25.6
Underflow from upstream tributaries	0	0.0	0	0.0	0.0	0.0	0	0.0
Total Inflow	**2,146**	**100**	**233**	**100**	**14**	**100**	**481**	**100**
Groundwater Production	0	0.0	0	0.0	0.0	0.0	0	0.0
Underflow to Management Zone 3	549	36.2	60	36.4	3.8	36.2	113	36.1
Downward leakage to Saugus Formation	969	63.8	105	63.6	6.8	63.8	200	63.9
Groundwater discharge to streams	0	0.0	0	0.0	0.0	0.0	0	0.0
Total Outflow	**1,518**	**100**	**165**	**100**	**11**	**100**	**313**	**100**
Annual Change in Mass	**628**	**-**	**68**	**-**	**4**	**-**	**168**	**-**

*Contributions from the irrigation of nearby landscapes with recycled water and from discharges of recycled water to the Santa Clara River are included in the percolation from applied water and recharge from stream leakage, respectively.

TABLE 8.4-2D: SALT AND NUTRIENT BALANCE IN MANAGEMENT ZONE 3 (SOUTH FORK SUBUNIT) (2001 THROUGH 2011)

Source Water	TDS		Chloride		Nitrate		Sulfate	
	(tons)	%	(tons)	%	(tons)	%	(tons)	%
Percolation from precipitation	251	2.2	100	8.3	5.0	9.1	100	3.7
Percolation from septic systems	425	3.7	48	4.0	5.4	10.0	91	3.4
Percolation from applied water	3,449	30.2	395	33.0	5.4	10.0	736	27.6
Stream leakage	3,152	27.6	388	32.4	9.5	17.4	608	22.8
Upward leakage from Saugus Basin plus net lateral inflow from adjoining units	3,565	31.2	206	17.2	25	46.5	1013	38.0
Underflow from Management Zone 2	567	5.0	61	5.1	3.8	7.1	120	4.5
Total Inflow	**11,409**	**100**	**1,198**	**100**	**54**	**100**	**2,668**	**100**
Groundwater Production	0	0.0	0	0.0	0.0	0.0	0	0.0
Underflow to Management Zone 4	4,543	43.9	481	43.9	24	44.1	978	43.7
Downward leakage to Saugus Formation	5,812	56.1	614	56.1	31	55.9	1262	56.3
Groundwater discharge to streams	0	0.0	0	0.0	0.0	0.0	0	0.0
Total Outflow	**10,355**	**100**	**1,095**	**100**	**55**	**100**	**2,240**	**100**
Annual Change in Mass	**1,054**	**-**	**103**	**-**	**-1**	**-**	**428**	**-**

*Contributions from the irrigation of nearby landscapes with recycled water and from discharges of recycled water to the Santa Clara River are included in the percolation from applied water and recharge from stream leakage, respectively.

TABLE 8.4-2E: SALT AND NUTRIENT BALANCE IN MANAGEMENT ZONE 4 (SANTA CLARA – BOUQUET AND SAN FRANCISQUITO CANYON SUBUNIT) (2001 THROUGH 2011)

Source Water	TDS		Chloride		Nitrate		Sulfate	
	(tons)	%	(tons)	%	(tons)	%	(tons)	%
Percolation from precipitation	385	1.3	154	4.0	7.7	4.0	154	2.0
Percolation from septic systems	326	1.1	45	1.2	4.1	2.1	59	0.7
Percolation from applied water	3,393	11.0	472	12.1	5.4	2.8	621	7.9
Stream leakage	9,746	31.7	1830	47.0	66	34.4	2593	32.9
Upward leakage from Saugus Basin plus net lateral inflow from adjoining units	3,918	12.8	157	4.0	25	13.3	1315	16.7
Underflow from Management Zone 1	9,457	30.8	1,092	28.1	60	31.4	1970	25.0
Underflow from Management Zone 3	3,504	11.4	140	3.6	23	11.9	1176	14.9
Total Inflow	**30,729**	**100**	**3,890**	**100**	**190**	**100**	**7,888**	**100**
Groundwater Production	11,082	36.5	1366	36.5	73	36.3	2815	36.5
Underflow to Management Zone 5	7,649	25.2	940	25.1	51	25.2	1941	25.2
Downward leakage to Saugus Formation	1,103	3.6	136	3.6	7.2	3.6	280	3.6
Groundwater discharge to streams	10,547	34.7	1296	34.7	70	34.9	2675	34.7
Total Outflow	**30,381**	**100**	**3,738**	**100**	**201**	**100**	**7,711**	**100**
Annual Change in Mass	**348**	**-**	**152**	**-**	**-11**	**-**	**177**	**-**

*Contributions from the irrigation of nearby landscapes with recycled water and from discharges of recycled water to the Santa Clara River are included in the percolation from applied water and recharge from stream leakage, respectively.

TABLE 8.4-2F: SALT AND NUTRIENT BALANCE IN MANAGEMENT ZONE 5 (CASTAIC SUBUNIT) (2001 THROUGH 2011)

Source Water	TDS		Chloride		Nitrate		Sulfate	
	(tons)	%	(tons)	%	(tons)	%	(tons)	%
Percolation from precipitation	469	1.3	188	4.7	9.3	7.7	188	1.6
Percolation from septic systems	218	0.6	31	0.8	2.7	2.3	42	0.3
Percolation from applied water	6,958	18.9	977	24.5	10	8.7	1324	11.0
Stream leakage	9,634	26.1	1374	34.5	20	16.6	3211	26.8
Upward leakage from Saugus Basin plus net lateral inflow from adjoining units	9,466	25.7	258	6.5	39	32.4	4044	33.7
Underflow from Management Zone 4	9,492	25.7	994	25.0	38	31.3	3076	25.6
Underflow from Castaic Dam	633	1.7	161	4.0	1.4	1.1	118	1.0
Total Inflow	**36,870**	**100**	**3,983**	**100**	**120**	**100**	**12,003**	**100**
Groundwater Production	15,637	44.0	1673	44.0	50	44.0	5103	43.9
Underflow to Blue Cut (County Line)	6,943	19.5	742	19.5	22	19.5	2266	19.5
Downward leakage to Saugus Formation	446	1.3	48	1.3	1.4	1.2	146	1.3
Groundwater discharge to streams	12,550	35.3	1341	35.3	40	35.3	4096	35.3
Total Outflow	**35,576**	**100**	**3,804**	**100**	**115**	**100**	**11,611**	**100**
Annual Change in Mass	**1,294**	**-**	**179**	**-**	**5**	**-**	**392**	**-**

*Contributions from the irrigation of nearby landscapes with recycled water and from discharges of recycled water to the Santa Clara River are included in the percolation from applied water and recharge from stream leakage, respectively.

TABLE 8.4-2G: SALT AND NUTRIENT BALANCE IN MANAGEMENT ZONE 6 (SAUGUS FORMATION) (2012)

Source Water	TDS		Chloride		Nitrate		Sulfate	
	(tons)	%	(tons)	%	(tons)	%	(tons)	%
Percolation from precipitation	3,953	21.8	1,581	46.6	80	61.0	1,581	34.2
Percolation from septic systems	1,340	7.4	179	5.3	16	12.5	256	5.5
Percolation from applied water	8,591	47.3	1,144	33.7	14	10.4	1,641	35.5
Stream leakage	9.1	<0.1	1.2	<0.1	0.0	<0.1	2.4	>0.1
Downward leakage from the Alluvium + net lateral inflow from adjoining units	4,256	23.4	485	14.3	21	16.1	1,137	24.6
Total Inflow	**18,148**	**100**	**3,391**	**100**	**132**	**100**	**4,617**	**100**
Groundwater Production	11,384	82.4	681	82.3	79	82.3	4,714	82.4
Upward leakage to the Alluvium	2,439	17.6	146	17.7	17	17.7	1,010	17.6
Total Outflow	**13,822**	**100**	**827**	**100**	**96**	**100**	**5,724**	**100**
Annual Change in Mass	**4,326**	**-**	**2,564**	**-**	**36**	**-**	**-1,107**	**-**

*Contributions from the irrigation of nearby landscapes with recycled water and from discharges of recycled water to the Santa Clara River are included in the percolation from applied water and recharge from stream leakage, respectively.

Groundwater Quality and Assimilative Capacity in Upper Santa Clara River Basin

Water quality conditions in each of the management zones of the Upper Santa Clara River Basin were evaluated from the period 2001 through 2011, using groundwater quality data obtained from the following sources: California Department of Public Health, the United States Geologic Service Water Information System, the Los Angeles Regional Water Quality Control Board, SCVSD, LACFCD, CLWA Santa Clarita Water Division, City of Santa Clarita Public Works Department, Newhall County Water District, VWC, Newhall Land and Farming, and the Groundwater Surface Water Interaction Model database Hydrodesktop – from the Consortium of Universities for the Advancement of Hydrologic Sciences (CUAHSI) Hydrologic Information System (HIS).

The average (2001-2011) TDS, chloride, and nitrate and sulfate concentrations for each area of the Upper Santa Clara River Basin were compared to the applicable basin water quality objectives (WQO) to determine the existing available assimilative capacity (Table 8.4-3). Assimilative capacity is estimated as the difference between the water quality objectives and the existing groundwater quality for each basin/subarea. Because Management Zone 6 does not have established WQOs for TDS, chloride, nitrate, and sulfate, the most conservative basin objective of the alluvial management zones was used for the calculation of assimilative capacity for TDS, chloride and nitrate. Due to the lack of supporting historical data for sulfate, no decision has been made with regards to the WQO for sulfate in Management Zone 6.

Analysis of salt concentrations in Management Zone 1 (Santa Clara-Mint Canyon subunit) indicated the presence of a localized area (approximately 10% of Management Zone 1) of elevated TDS and sulfate concentrations. Previous analyses by the water purveyors have ruled out historical land use as a source of the elevated TDS and sulfate. The elevated levels of these constituents are thought to be associated with groundwater flow in the native geologic materials. For the purpose of groundwater quality assessment and determination of available assimilative capacity and future water quality conditions, this area was designated as Management Zone 1b, while the rest of Management Zone 1 was designated as Management Zone 1a.

TABLE 8.4-3: GROUNDWATER QUALITY IN THE UPPER SANTA CLARA RIVER BASIN (2001-2011)

Management Zone	Groundwater subunit		TDS (mg/L)	Cl (mg/L)	Nitrate-N(mg/L)	Sulfate (mg/L)
1a	Santa Clara-Mint Canyon	Water Quality Objective	800	150	10	150
		Water Quality	728	89	4.5	138
		Available Assimilative Capacity	**72**	**61**	**5.5**	**12**
1b	Santa Clara-Mint Canyon	Water Quality Objective	800	150	10	150
		Water Quality	833	72	4.7	269
		Available Assimilative Capacity	**-33**	**78**	**5.3**	**-119**
2	Placerita Canyon[1]	Water Quality Objective	700	100	10	150
		Water Quality	NA	NA	NA	NA
		Available Assimilative Capacity	**NA**	**NA**	**NA**	**NA**
3	South Fork[2]	Water Quality Objective	700	100	10	200
		Water Quality	NA	NA	NA	NA
		Available Assimilative Capacity	**NA**	**NA**	**NA**	**NA**
4	Santa Clara-Bouquet and San Francisquito Canyons	Water Quality Objective	700	100	10	250
		Water Quality	710	77	3.6	189
		Available Assimilative Capacity	**-10**	**23**	**6.4**	**61**
5	Castaic Valley	Water Quality Objective	1000	150	10	350
		Water Quality	727	77	1.8	246
		Available Assimilative Capacity	**273**	**73**	**8.2**	**104**
6	Saugus Formation[3]	Water Quality Objective	700	100	10	NA
		Water Quality	636	28	3.2	235
		Available Assimilative Capacity	**64**	**72**	**6.8**	**NA**

[1] No data.

[2] Limited data (1 well).

[3] WQOs have not been established for the Saugus Formation. The most conservative of the alluvial management zone WQOs was used for calculation of assimilative capacity for TDS, chloride and nitrate.

Salt and Nutrient Management Measures in the Upper Santa Clara River Basin

The region has long been concerned about salinity and nutrient discharges in order to, among other things, allow for the use of recycled water. In particular, high levels of chloride in the sewage system originate from potable water supply, self-regenerating water softeners (SRWSs), treatment plant disinfection using chlorine, and other miscellaneous residential, commercial and industrial sources. Table 8.4-4A provides a summary of historic and existing activities conducted to reduce salt and nutrient loads in the Upper Santa Clara River Basin, broadly categorized into stormwater/runoff management, wastewater salinity/nutrient source control, source water salinity control, institutional measures, regulatory/non-regulatory measures, land use regulation, conservation measures and TMDLs.

TABLE 8.4-4A: CURRENT SALT AND NUTRIENT MANAGEMENT MEASURES IN THE UPPER SANTA CLARA RIVER BASIN

Category	Specific Measure	Description
Stormwater/Runoff Management	MS4 Permitting Program	Regulates stormwater discharges from municipal separate storm sewer systems (MS4s) through permits issued by the Regional Board. NPDES stormwater permits have been adopted for medium (serving between 100,000 and 250,000 people) and large (serving 250,000 people) municipalities that require the discharger to develop and implement a Storm Water Management Plan/Program. In the current Los Angeles County MS4 Permit (Order No. R4-2012-0175) Permittees are implementing their SWMP through an Enhanced Watershed Management Program (EWMP) that emphasizes implementation of regional stormwater retention and infiltration projects. In addition, per the provisions of this permit, new development and significant redevelopment must retain on-site the stormwater runoff volume associated with the 85^{th} percentile, 24-hour storm. Alternatively, off-site mitigation through another stormwater retention project must be implemented, while also providing on-site treatment of volume associated with the 85^{th} percentile, 24 hour event.
Wastewater Salinity/Nutrient Source Control	Treatment Process Upgrade at the Valencia and Saugus WRPs	Upgrades include nitrification/denitrification. As a result, nutrient concentrations in the effluent have decreased.
	Industrial Wastewater Source Control Programs	Ongoing source control programs that allow WRPs to achieve NPDES permit compliance.
	SCVSD Automatic Water Softener Rebate Program	Public Education/Outreach program that provides reimbursement to SRWS owners for their removal. Phase I of the program commenced in November, 2005 and resulted in the removal of 431 units. Phase II commenced in May, 2007.
Source Water Salinity Control	LACDPW Stormwater "First Flush" Policy	Low Impact Development Guide that lists requirements for infiltration and other stormwater quality.
Institutional	1999 SCVSD Ordinance Prohibiting Installation of New Residential SRWSs	Ordinance that took effect in March 2003 and prohibits the installation of new SRWSs.
	SCVSD Measure S	Measure on the November, 2008 ballot that requires the removal and disposal of all remaining active SRWSs connected to SCVSD's sewage system. Responsible for the

Category	Specific Measure	Description
		removal of approximately 8,000 SRWSs.
	SCVSD Commercial and Industrial Sector Regulations	Program added to the source control program for NPDES permit compliance. Enforces the SRWS ban and implementation of chloride discharge limits of 100 mg/L, or performance-based chloride limits that reflect the implementation of chloride reduction practices.
Regulatory/Non-Regulatory	Wastewater, Recycled Water, Surface Water/Stormwater, Imported Water and Groundwater Monitoring	Compliance with requirements of SB7x-6 and the Sustainable Groundwater Management Act.
	State Regulations for Groundwater Replenishment Using Recycled Water	Facilitation of artificial recharge for purposes of groundwater recovery to supplement Eastside wells.
	Regional Board Permits for Groundwater Recharge	Facilitation of artificial recharge for purposes of groundwater recovery.
	Recycled Water Non-Potable Reuse Regulations, Guidelines and Permits	Facilitation of non-potable reuse by defining limits of human contact and streamlining permitting for projects.
	California Statewide Groundwater Elevation Monitoring (CASGEM) Monitoring	Enhanced monitoring and reporting ensures compliance with requirements of SB7x-6 and coordinates groundwater level monitoring among all of the users in the subbasin.
Land Use Regulation	City/County Model Water Efficient Landscape Ordinance	Ordinances requiring new development to minimize exterior water use are required to be implemented by land use planning agencies and local water retailers.
Conservation	Water Conservation Act of 2009 (Senate Bill X7-7)	Requires all water providers above a minimum size to increase water use efficiency by demonstrating a 10% reduction in potable water demand by 2015 and 20% reduction by 2020. The bill also requires, among other things, that DWR, in consultation with other state agencies, develop a single standardized water use reporting form, which would be used by both urban and agricultural water agencies.
	Emergency Drought Mandates	Emergency measures to reduce water use and minimize drought impacts on customers while conforming to statewide drought mandates. Includes a list of prohibited activities.
TMDLs	TMDLs for Chloride, Bacteria and Nitrogen	Requires the management of all sources of pollutants in a watershed to attain applicable water quality standards.

Other methods of salt reduction have included a pilot water softening treatment for drinking water for the VWC service area. This system precipitates out ions of magnesium and other salts. The objective of the program is to encourage individual homeowners to not install, or to remove existing SRWSs.

In addition, imported water is normally blended with groundwater supplies to reduce hardness. The relatively low TDS, chloride and nitrate concentrations in the imported water, particularly during wet years, results in lower salts and nutrient concentrations in supplied water than would occur if only local sources were used.

Planned Salt and Nutrient Management Measures in the Upper Santa Clara River Basin
Planned implementation projects include increased groundwater recharge and wastewater salinity/nutrient source control (Table 8.4-4B). These projects are expected to be completed by 2035.

TABLE 8.4-4B: MAJOR PLANNED (FUTURE) SALT AND NUTRIENT PROJECTS AND MANAGEMENT STRATEGIES

Category	Specific Measure	Estimated Dates	Description
Groundwater Recharge	Vista Canyon WRP	2014/2019	Project will generate 439 acre-ft/yr of treated wastewater that will be used for landscape irrigation. Any excess treated effluent not being recycled will be conveyed to the downstream facilities of the Santa Clarita Valley Sanitation District (SCVSD).
Wastewater Salinity/Nutrient Source Control	Newhall Ranch WRP	2023/2033	WRP to service development in the Newhall Ranch Specific Plan and Westside communities, thereby also serving as a Wastewater Salinity/Nutrient Source Control program. It will also provide water for landscape irrigation.
	SCVSD Wastewater Treatment Plant Chloride Compliance Program	2015/2019	Reverse Osmosis treatment and blending of treated wastewater to produce a combined discharge of chloride from the Saugus and Valencia WRPs equal to 100 mg/L as a three-month average.
Source Water Salinity Control (and Conservation)	SCV Water Use Efficiency Programs	2012/2015	Suite of water conservation programs/projects to be implemented from the updated Santa Clarita Valley Water Use Efficiency Plan.
	SCWD Water Use Efficiency Programs	2014/2020	Ten (10) programs designed to conserve water and reduce residential and urban use, runoff and sewage flows.
Conservation	CLWA Recycled Water Master Plan	2014/2035	Plans to incorporate additional recycled water for use in landscape irrigation

Projected Impacts of Future Projects on Water Quality

Groundwater quality over the planning period (2012-2035) was estimated using a spreadsheet model. This mixing model was developed in Microsoft Excel and is a set of linked spreadsheets used to represent ‘instantaneously mixed’ groundwater volumes. Salt and nutrient loadings were quantified by determining the potential volume of water coming from each source and applying an appropriate loading factor based on water quality sampling data and the distribution of potential salt loads by land use. The water balance for all inflow and outflow terms was quantified using a groundwater model that took into account the various hydrologic variables that affect the water resources within the Upper Santa Clara River Basin. The salt and nutrient loads were then applied to the annual water balances for each management zone to evaluate the annual and overall changes in salt and nutrient concentrations for the study period.

Eight scenarios were considered to evaluate the effects of planned future projects on overall groundwater quality and use of assimilative capacity:

(1) No project implemented, with existing conditions projected into the future, taking into account future changes in land use and associated water use;

(2-7) Each of the proposed projects implemented individually, taking into account future changes in land use and associated water use;

(8) All projects implemented, taking into account future changes in land use and associated water use.

Results of the no project and all project scenarios are provided in Tables 8.4-5A-D.

The results indicate that in some cases, some of the assimilative capacity of the USCRB will be used under existing conditions, due to projected land use changes (no project scenario). With the exception of sulfate in Zone 1b, and TDS in Zone 4, the concentrations of all salts would remain under the water quality objectives. The completion of all proposed projects would have varying, but generally beneficial, effects by decreasing the amount of assimilative capacity used, compared to the no project scenario.

TABLE 8.4-5A: PROJECTED IMPACT OF DIFFERENT PROJECT SCENARIOS ON ASSIMILATIVE CAPACITY FOR TDS

Management Zone	Groundwater subunit	Current Water Quality	No Project Scenario		All Projects Scenario	
		2011	2035			
		TDS (mg/L)	TDS (mg/L)	Assimilative Capacity created (%)*	TDS (mg/L)	Assimilative Capacity created (%)*
1a	Santa Clara-Mint Canyon	728	739	**-15**	717	**14**
1b	Santa Clara-Mint Canyon	833	790	**129**	786	**143**
2	Placerita Canyon	NA	NA	**NA**	NA	**NA**
3	South Fork	NA	NA	**NA**	NA	**NA**
4	Santa Clara-Bouquet and San Francisquito Canyons	710	709	**12**	703	**70**
5	Castaic Valley	727	728	**0**	719	**3**
6	Saugus Formation	636	636	**-1**	636	**-1**

*Negative values indicate assimilative capacity used

TABLE 8.4-5B: PROJECTED IMPACT OF DIFFERENT PROJECT SCENARIOS ON ASSIMILATIVE CAPACITY FOR CHLORIDE

Management Zone	Groundwater subunit	Current Water Quality	No Project Scenario		All Projects Scenario*	
		2011	2035			
		Chloride (mg/L)	Chloride (mg/L)	Assimilative Capacity created (%)*	Chloride (mg/L)	Assimilative Capacity created (%)*
1a	Santa Clara-Mint Canyon	89	89	**0**	85	**6**
1b	Santa Clara-Mint Canyon	72	72	**0**	71	**1**
2	Placerita Canyon	NA	NA	**NA**	NA	**NA**
3	South Fork	NA	NA	**NA**	NA	**NA**
4	Santa Clara-Bouquet and San Francisquito Canyons	77	93	**-71**	88	**-49**
5	Castaic Valley	77	79	**-3**	75	**3**
6	Saugus Formation	28	46	**-24**	46	**-25**

*Negative values indicate assimilative capacity used
**An additional “All Project” management scenario, using recycled water with higher chloride concentrations for irrigation, results in a projected chloride concentration of 89 mg/l and a 52% use of assimilative capacity in Management Zone 4.

TABLE 8.4-5C: PROJECTED IMPACT OF DIFFERENT PROJECT SCENARIOS ON ASSIMILATIVE CAPACITY FOR NITRATE

Management Zone	Groundwater subunit	Current Water Quality	No Project Scenario		All Projects Scenario	
		2011	2035			
		Nitrate-N (mg/L)	Nitrate-N (mg/L)	Assimilative Capacity created (%)*	Nitrate-N (mg/L)	Assimilative Capacity created (%)*
1a	Santa Clara-Mint Canyon	4.5	4.3	**3**	4.3	**2**
1b	Santa Clara-Mint Canyon	4.7	5.2	**-9**	5.2	**-9**
2	Placerita Canyon	NA	NA	**NA**	NA	**NA**
3	South Fork	NA	NA	**NA**	NA	**NA**
4	Santa Clara-Bouquet and San Francisquito Canyons	3.6	4.3	**-10**	4.3	**-11**
5	Castaic Valley	1.8	2.5	**-8**	2.5	**-8**
6	Saugus Formation	3.2	4.3	**-17**	4.3	**-17**

*Negative values indicate assimilative capacity used

TABLE 8.4-5D: PROJECTED IMPACT OF DIFFERENT PROJECT SCENARIOS ON ASSIMILATIVE CAPACITY FOR SULFATE

Management Zone	Groundwater subunit	Current Water Quality	No Project Scenario		All Projects Scenario	
		2011	2035			
		Sulfate(mg/L)	Sulfate (mg/L)	Assimilative Capacity created (%)*	Sulfate (mg/L)	Assimilative Capacity created (%)*
1a	Santa Clara-Mint Canyon	138	150	**-102**	147	**-76**
1b	Santa Clara-Mint Canyon	269	225	**37**	225	**37**
2	Placerita Canyon	NA	NA	**NA**	NA	**NA**
3	South Fork	NA	NA	**NA**	NA	**NA**
4	Santa Clara-Bouquet and San Francisquito Canyons	189	166	**39**	164	**41**
5	Castaic Valley	246	248	**-2**	248	**-2**
6	Saugus Formation	235	251	-	251	-

*Negative values indicate assimilative capacity used

Salt and Nutrient Load Limits

Salt and nutrient loads to the Upper Santa Clara River Basin will be managed with the existing and planned programs/projects discussed above, in conjunction with other existing water quality protection measures described in Table 8.4-6. Additional conceptual implementation measures include groundwater recharge in the Saugus Formation using State Water Project water during wet years with recovery during dry years, and a proposed brine line in the lower sections of the Santa Clara River Valley that could be extended to Los Angeles County. These measures are expected to maintain water quality that is protective of beneficial uses. Existing TDS and sulfate impairments in localized areas are being addressed through blending of extracted groundwater. Assignment of allocations for salt and nutrient loading is not warranted at this time

TABLE 8.4-6: OTHER PLANNED FUTURE MANAGEMENT MEASURES

Category	Specific Measure	Description
Stormwater/Runoff Management	Low Impact Development (LID) and Stormwater Best Management Practices (BMPs)	The main goals of LID and stormwater BMPs are to increase groundwater recharge and improve stormwater quality. On April 7, 2015 the City of Santa Clarita adopted Resolution No. P15-02, approving the Unified Development Code Amendment 15-001, the Low Impact Development Ordinance. LID projects/practices decrease salt and nutrient loading and concentrations in groundwater.
Groundwater Recharge	Projects from Recon Study	Includes possible rubber dams and moving up to 10,000 acre-ft/yr of SWRP and VWRP water to discharge points in the eastern part of the subbasin for groundwater recharge.
	City/County MS4 Stormwater Infiltration Basins	In December 2012, the Regional Board adopted a new Los Angeles County MS4 Permit (Order No. R4-2012-0175), replacing the 2001 Los Angeles County MS4 Permit. The 2012 MS4 Permit encourages permittees to infiltrate stormwater as a fundamental aspect of permit implementation. Compliance with this permit will decrease salt and nutrient loading and concentrations in groundwater.
	Enhanced Watershed Management Program	The Upper Santa Clara Watershed Management Group prepared an Enhanced Watershed Management Plan (EWMP) to implement the requirements of the Los Angeles County MS4 Permit, described above. The EWMP allows Permittees to comprehensively evaluate opportunities, within the participating Permittees' collective jurisdictional area, for collaboration among Permittees and other partners on multi-benefit regional EWMP projects that, wherever feasible, retain (i) all non-storm water runoff and (ii) all storm water runoff from the 85th percentile, 24-hour storm event for the drainage areas tributary to the projects, while also achieving other benefits including flood control and water supply. The approved USCR EWMP applies to the Permittees within the Integrated Regional Watershed Management Group, and describes how the IRWMG intends to implement a program that will address water quality issues within the geographical scope of their EWMP area.
Regulatory / Non-Regulatory	SNMP Monitoring	Increased groundwater level and water quality monitoring. The monitoring program data will allow preparation of updated ambient water quality for the management zones every three years.
	Sustainable Groundwater Management Act Plan/Programs	Long term planning and monitoring to ensure sustainable yield of the subbasin by all of the groundwater stakeholders.

Monitoring Program

While, historically, there have been some monitoring programs in an effort to develop a database for the Upper Santa Clara River area, there has been no unified monitoring system for groundwater levels and groundwater quality. Groundwater levels and groundwater quality sampling and analysis are currently conducted by various agencies. The SNMP monitoring program will allow consistent on-going collection of data to monitor the actual effects of land use changes and groundwater management measures on groundwater quality in the Upper Santa Clara River Basin. The Program will collect samples from a set of thirty six monitoring wells and eight surface water sites in the subbasins, as well as incorporate data from existing sampling programs. Elements of the program are laid out in Table 8.4-7.

TABLE 8.4-7: MONITORING PROGRAM ELEMENTS

<table>
<tr><th>Element</th><th>Description</th></tr>
<tr><td>Responsible Agency</td><td>Castaic Lake Water Agency</td></tr>
<tr><td>Program Origin</td><td>State Water Board’s Groundwater Ambient Monitoring and Assessment Program
California Statewide Groundwater Elevation Monitoring Plan (CASGEM)
Ventura County Watershed Protection District Comprehensive Water Quality Monitoring Plan for the Santa Clara River Watershed
Santa Clarita Valley Sanitation District of Los Angeles County – Santa Clara River Watershed- Wide Monitoring Program and Implementation Plan</td></tr>
<tr><td>Parameters and Monitoring Frequency</td><td><table>
<tr><th>Parameter</th><th>Monitoring Frequency</th></tr>
<tr><td>Total Dissolved Solids</td><td rowspan="4">Annually</td></tr>
<tr><td>Chloride</td></tr>
<tr><td>Nitrate</td></tr>
<tr><td>Sulfate</td></tr>
<tr><td>Groundwater level</td><td>Monthly</td></tr>
</table></td></tr>
<tr><td>Monitoring locations</td><td>Groundwater quality monitoring will be accomplished using thirty six (36) monitoring wells located throughout the Alluvial Aquifer and the Saugus Formation. The wells were selected to: (1) provide a sampling location downgradient of potential salt and nutrient contributors such as treated effluent discharge locations, stormwater outfalls, septic tank areas, and land use areas with planned long-term application of recycled water, and (2) allow evaluation of the contribution to groundwater quality from individual subunits downgradient of the confluence of the subbasins moving to the western end of the Upper Santa Clara River Basin.
In addition to groundwater, eight (8) surface water monitoring stations located along the Santa Clara River will be used to evaluate the impacts of surface water trends on groundwater conditions.</td></tr>
</table>

Element	Description
Reporting Requirements	Monitoring results will be reported at least every three years. All data collected from the SNMP monitoring wells will be uploaded to the State Water Board's online GeoTracker database.
Additional Resources	Existing programs will be used to provide additional information. These programs include surface water, groundwater and effluent discharge quality monitoring by the Santa Clarita Valley Sanitation District of Los Angeles County, and stormwater quality monitoring conducted by Los Angeles County Department of Public Works (LACDPW) and the City of Santa Clarita.
Review Period and Re-opener	Data collected from the SNMP monitoring wells and other monitoring programs will be reviewed periodically to validate model predictions regarding changes to basin water quality.

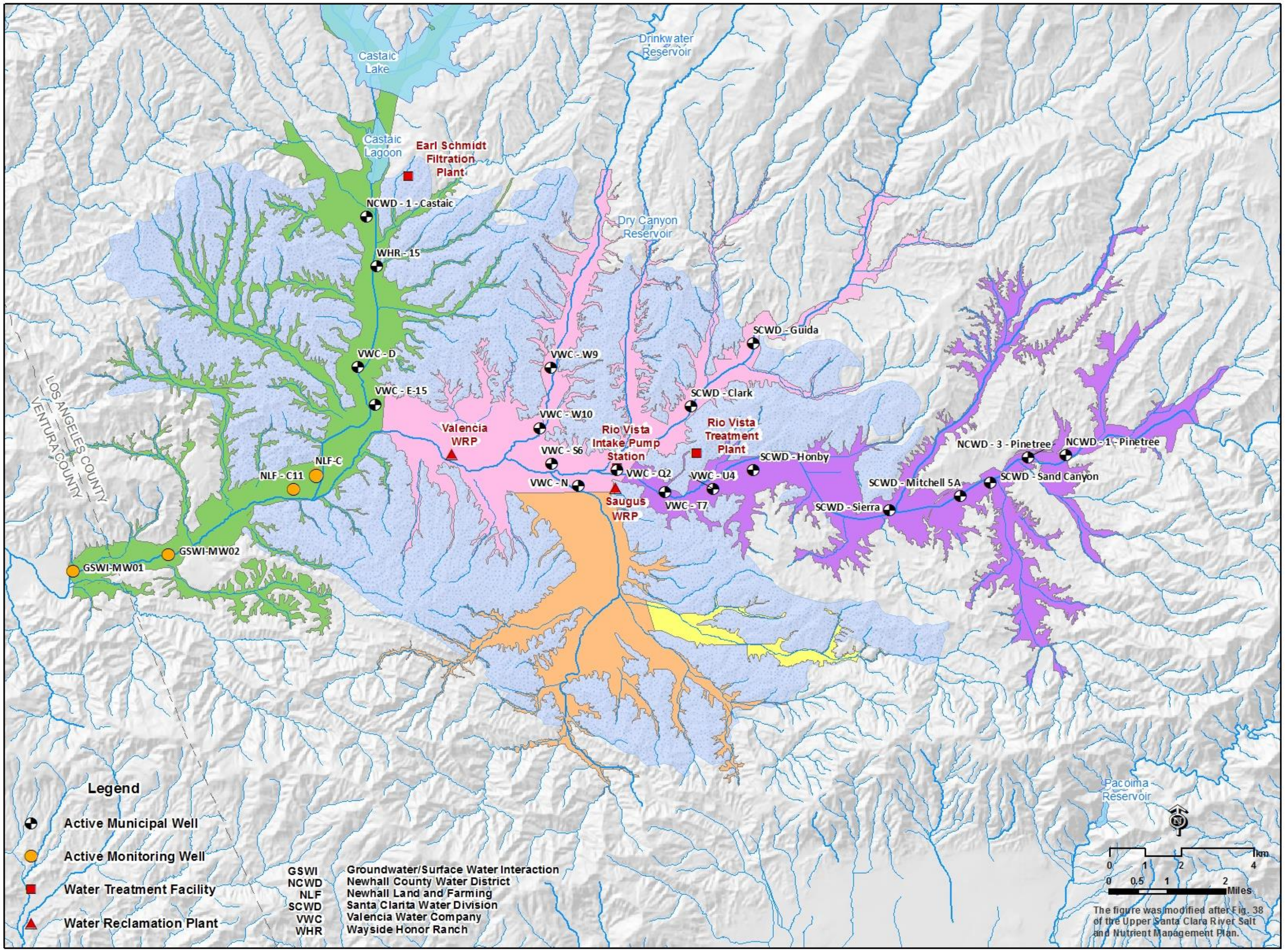

Figure 8.4-2. Location of SNMP Monitoring Wells in the Alluvial Aquifer of the Upper Santa Clara River Basin.

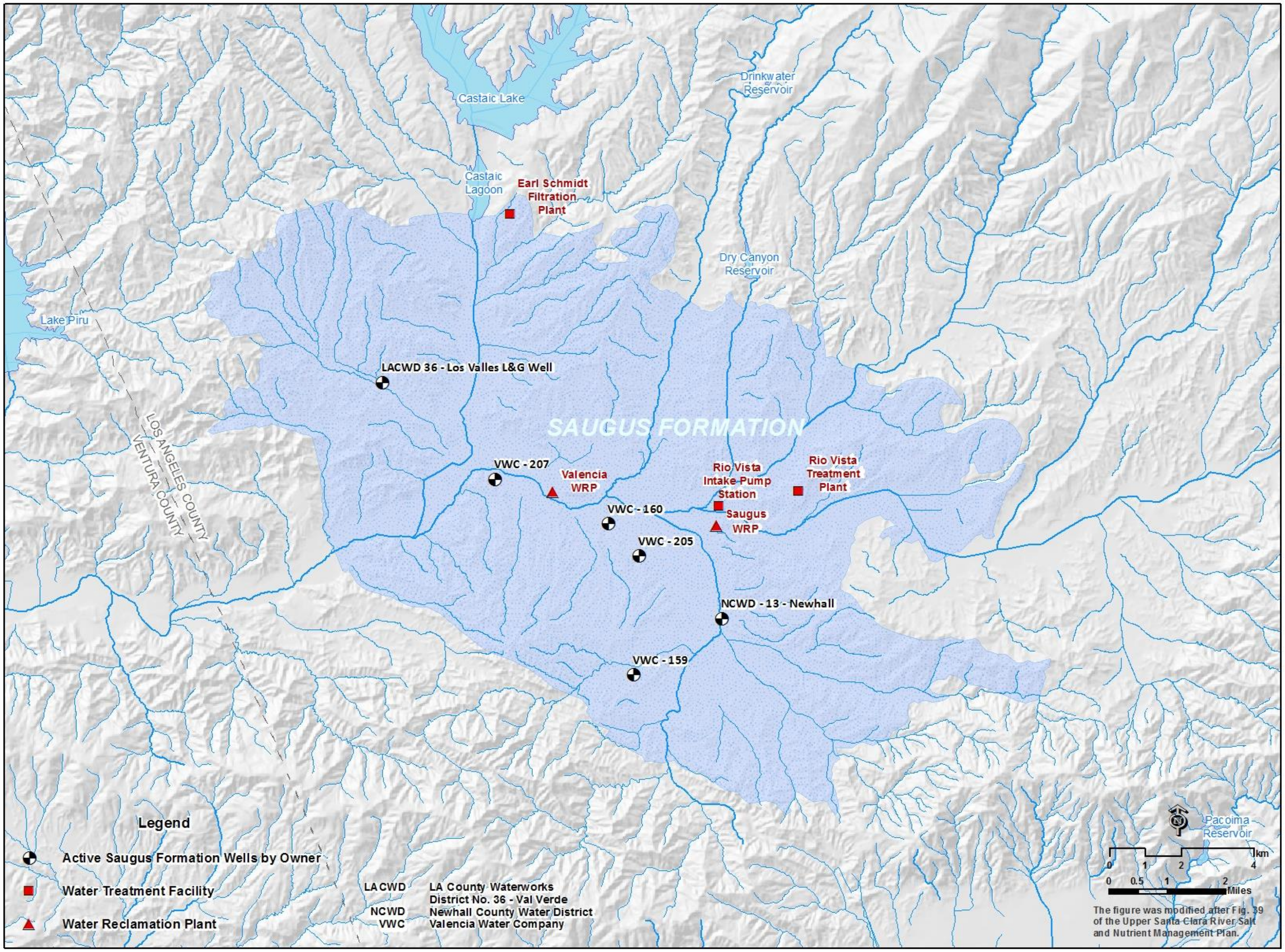

Figure 8.4-3. Location of SNMP Monitoring Wells in the Saugus Formation of the Upper Santa Clara River Basin.

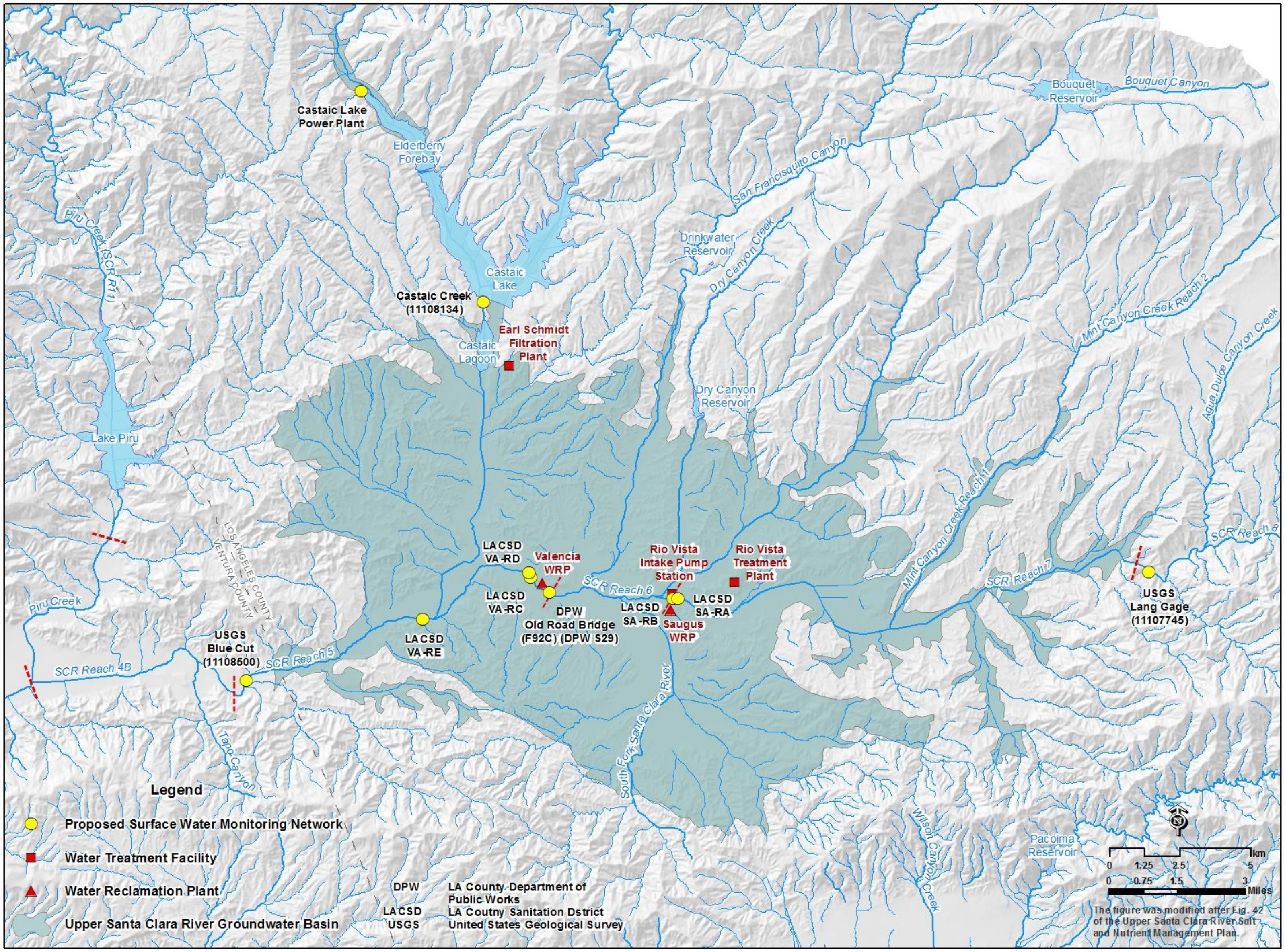

Figure 8.4-4. Location of SNMP Surface Water Monitoring Stations in the Upper Santa Clara River Basin.

Updates to the Salt and Nutrient Management Measures

Salt and nutrient management measures will be updated (i) as necessary to reflect changing conditions in the Upper Santa Clara River Basin (i.e. in accordance with actions that have been taken or in response to proposed actions not taken), (ii) where results from the SNMP Monitoring Program indicate that revisions/modifications are warranted, and/or (iii) at the end of a 10-year planning horizon (i.e. 2025).

Regulatory Implications

The salt and nutrient management strategies developed by local water entities in the Upper Santa Clara River Basin are voluntary measures that are designed to maintain water quality that is protective of beneficial uses, while increasing recycled water use and allowing for the sustainable use of groundwater. These strategies will be applied in conjunction with already existing water quality protection measures in the planning area (e.g. TMDLs).

Where projects have the potential to impact salt and/or nutrient loads to a basin, consideration will be given to water quality conditions and the corresponding assimilative capacity in localized areas during the permitting process or the development of other Regional Board regulatory actions. Except for the permitting of existing and proposed facilities/projects, further Regional Board action pertaining to these implementation measures geared toward controlling salt and nutrient loading to these basins will only be necessary where data and/or other information indicate that the projected water quality conditions are not being met.

E. Raymond Basin

Adopted by the California Regional Water Quality Control Board, Los Angeles Region on December 8, 2016.

Approved by:

The State Water Resources Control Board on May 16, 2017.
The Office of Administrative Law on December 19, 2018.

The program of implementation[15] described below is based on the Salt and Nutrient Management Plan for the Raymond Groundwater Basin developed by the Raymond Basin Management Board in consultation with the Metropolitan Water District of Southern California, the Los Angeles County Sanitation Districts, the Los Angeles County Department of Public Works, and other basin stakeholders. The Salt and Nutrient Management Plan and this program of implementation satisfy the Recycled Water Policy requirements for Salt and Nutrient Management Plans.

The following summarizes the essential elements of the Salt and Nutrient Management Plan for the Raymond Groundwater Basin. Further details may be found in the full document at: http://www.waterboards.ca.gov/losangeles/water_issues/programs/salt_and_nutrient_management/index.shtml

Background

The Raymond Groundwater Basin underlies the north westerly portion of the San Gabriel Valley in Los Angeles County. It is bounded on the north by the San Gabriel Mountains, on the west by the San Rafael Hills and on the southeast by the Raymond Fault which separates the basin from the Main San Gabriel Basin which is down-gradient. Raymond Basin has a surface area of approximately 40.9 square miles and consists of three sub-units: (i) the Monk Hill Subarea which underlies the City of La Canada Flintridge and the northwestern portion of the City of Pasadena, (ii) the Pasadena Subarea which underlies most of the City of Pasadena and the unincorporated county area of Altadena, and (iii) the Santa Anita Subarea which underlies the Cities of Arcadia and Sierra Madre (Figure 8.5-1). The land area overlying the Raymond Basin is largely urbanized with little agricultural lands.

[15] The Recycled Water Policy refers to "revised implementation plans" for adoption into regional basin plans pursuant to Water Code section 13242. Water Code section 13242 uses the term "program of implementation." Pursuant to Water Code section 13242, "[t]he program of implementation for achieving water quality objectives shall include, but not be limited to:
(a) A description of the nature of actions which are necessary to achieve the objectives, including recommendations for appropriate action by any entity, public or private.
(b) A time schedule for the actions to be taken.
(c) A description of surveillance to be undertaken to determine compliance with objectives."

The principal streams overlying the basin are (i) the Arroyo Seco, which drains the Monk Hill Subarea and part of the Pasadena Subarea to the Los Angeles River, (ii) Eaton Wash which drains the Pasadena Subarea and flows to the Rio Hondo, and (iii) Santa Anita Wash which drains the Santa Anita Subarea and flows into the Rio Hondo.

The Raymond Basin is a structural basin filled with permeable alluvial deposits, which is underlain and surrounded by relatively impermeable rock. The Basin aquifer is stratified in some areas by confining or semi-confining layers consisting of impermeable or less-permeable materials such as clay or silt. The Basin aquifer is generally classified as an unconfined to semi-confined aquifer system because the semi-confining or confining layers are not continuous across the Basin. The base of the water bearing zones is considered bedrock with elevations ranging from approximately 500 feet below sea level to 2,000 feet above mean sea level. Depth to bedrock ranges from 450 to 750 feet below ground surface (bgs) in the Monk Hill and Santa Anita subareas to more than 1,200 feet bgs in the Pasadena subarea. Groundwater generally flows southeast from the Monk Hill Subarea in the northwest to the Raymond fault in the southeast

Natural recharge to the basin consists of direct rainfall, percolation of streamflow from the northern and western sides, underflow from the Verdugo Basin and mountain front recharge. Artificial recharge of the Raymond Basin occurs via infiltration of stormwater runoff in all three subareas and, to a lesser degree, injection of treated imported water in the Monk Hill and Pasadena subareas.

Groundwater provides fifty percent of the potable water demands for water suppliers in the basin. The balance of the demand has historically been met through the purchase of treated imported water from the Metropolitan Water District's Weymouth Treatment Plant (along with a groundwater impaction/withdrawal program historically conducted by the Valley Water Company in the Monk Hill Subarea).

Basin Management

From 1913 through the 1930s, over-pumping of the Raymond Basin caused significant groundwater level declines. To remedy the problem, the courts adjudicated the basin in 1943 and set a limit on allowable groundwater production. At the time, the State Department of Water Resources was appointed as the Watermaster. However, in 1984 the judgement was amended to form the Raymond Basin Management Board (RBMB) which now serves as Watermaster. The Management Board consists of ten representatives appointed by the water purveyors within the basin. The RBMB is presently composed of members from the City of Pasadena, the Lincoln Avenue Water Company, Rubio Canon Land and Water, the City of Alhambra, the City of Arcadia, California-American Water, Kinneloa Irrigation District, San Gabriel County Water District, City of Sierra Madre and Sunny Slope Water Company. The RBMB is charged with the powers and responsibilities of managing the Raymond Basin and protecting the long-term quantity and quality of the groundwater supply.

Basin management measures that the RBMB is involved with include:

- Management and control the withdrawal and replenishment of water supplies in the Basin.
- Implementation of the annual Operating Safe Yield (the amount of groundwater that can safely be extracted) for the succeeding fiscal year, and notification of the pumpers regarding production totals on a monthly basis.
- Coordination of spreading and storage activities.
- Coordination of local involvement in efforts to preserve and restore the quality of groundwater in the Basin.
- Assistance with enforcement of water quality regulations affecting the Basin.
- Collection of production, water quality, and other relevant data from producers.
- Preparation of an annual report of Watermaster activities, including financial activities, and summary reports of pumping and diversion.
- Participation on the Greater Los Angeles County Integrated Water Resource Management Leadership Committee, as Groundwater Representative.

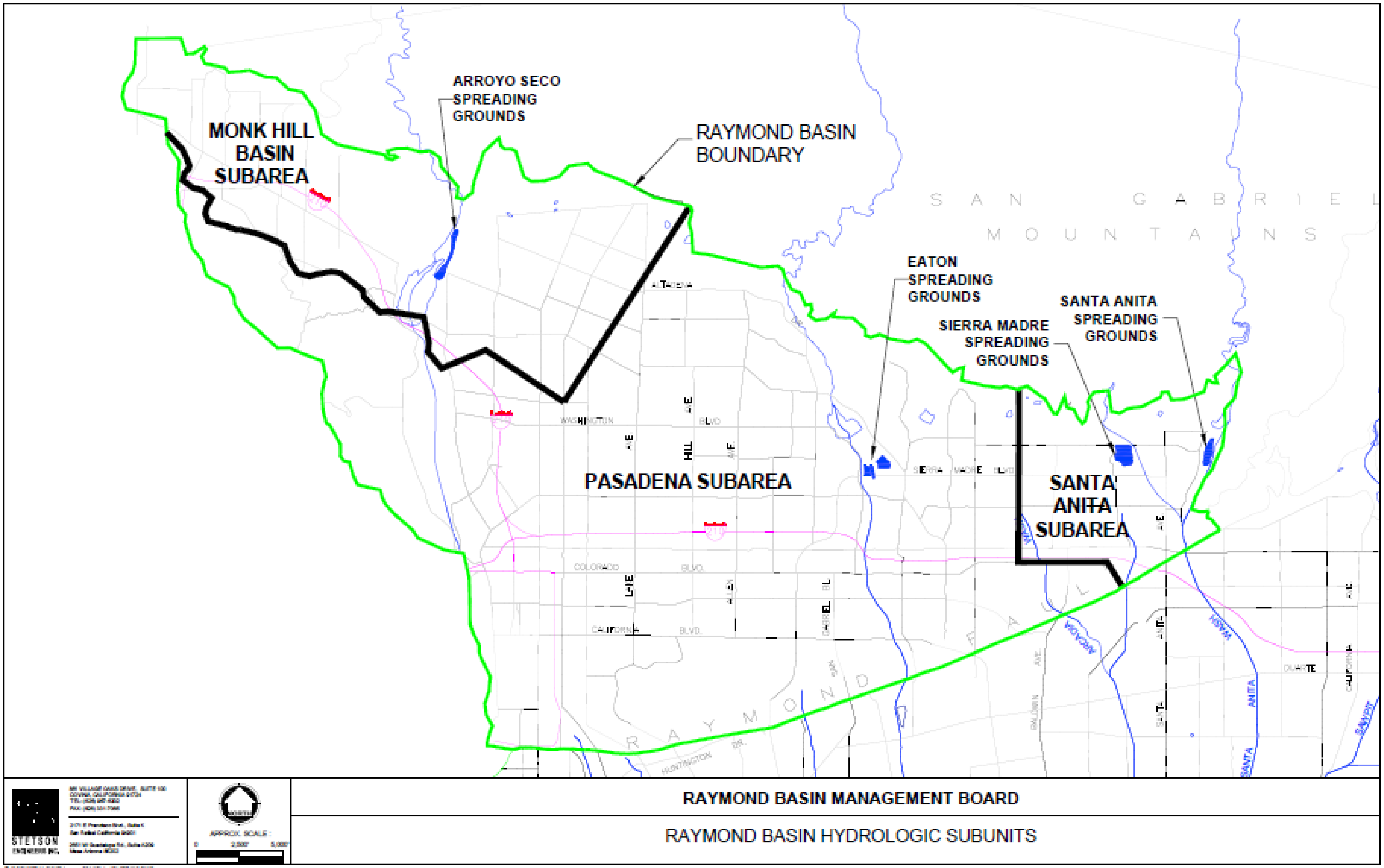

Figure 8.5-1: Raymond Basin's Salt and Nutrient Management Plan Area

Participating Agencies

The Raymond Basin Management Board (RBMB) is the lead agency for the development of the SNMP for the Basin (Raymond Basin SNMP) in conjunction with local salt/nutrient contributing stakeholders - the Los Angeles County Sanitation Districts (LACSD), the County of Los Angeles Department of Public Works (LACDPW), who is responsible for stormwater recharge; and the Metropolitan Water District of Southern California (MWD) who is responsible for the delivery of imported water in the Raymond Basin. RBMB held a number of SNMP development meetings with the "local salt/nutrient contributing stakeholders". In addition, RBMB staff regularly kept the Basin groundwater producers up to date with the planning process during Pumping and Storage Committee meetings. Regional Water Board staff actively participated in the Raymond Basin SNMP development process.

Sources of Water in the Raymond Basin

Sources of water supply in the Raymond Basin area include local groundwater, and treated imported water from the Weymouth Treatment Planted operated by MWD. Return flow from these sources recharges the Raymond Basin. Other major sources of basin recharge include precipitation and mountain front recharge.

TABLE 8.5-1: CONTRIBUTIONS OF SOURCE WATERS TO THE RAYMOND BASIN

TYPE	SOURCE	CONTRIBUTION TO GROUNDWATER
Surface water	Arroyo Seco	Diverted to spreading grounds for basin recharge
Imported Water	Metropolitan Water District – blend of State Water Project and Colorado River Water	Water supply within the Raymond Basin area Storage and extraction in the Monk Hill Subarea
Groundwater	Extracted from the Raymond Basin	Water supply in the Raymond Basin area
	Subsurface flow from the Verdugo Basin	Recharge of the Raymond Basin
Stormwater	Precipitation from overlying areas	Active capture and recharge through stormwater retention and spreading basins Infiltration of precipitation directly into the alluvium where land is not covered with impervious surfaces. Additionally, infiltration of precipitation from upland areas in the form of groundwater recharge at the basin's margins.

Groundwater outflow from the Raymond Basin includes pumping and subsurface outflow to other basins.

Salt and Nutrient Loading to the Raymond Basin

The mass balances (inputs and outflows) for total dissolved solids (TDS), chloride, nitrate-N, and sulfate from the various sources of water are presented below for the Raymond Basin. These values represent a baseline period from Water Years 2002-03 to 2012-13. Loads from the imported water, while not specifically listed, are reflected in the loads from return flow

TABLE 8.5-2A: SALT AND NUTRIENT BALANCE IN MONK HILL SUBAREA (2002/03 THROUGH 2011/12)

Source Water	TDS		Chloride		Nitrate		Sulfate	
	(tons)	%	(tons)	%	(tons)	%	(tons)	%
Precipitation	31.3	30.2	179	22.1	31.3	30.2	269.5	29.6
Return Flow	24.7	23.9	161	19.9	24.7	23.9	311.0	19.4
Direct Spreading and Injection	25.5	24.6	291.5	36.0	25.5	24.6	491.0	29.1
Underflow from Verdugo Basin	22.1	21.4	179	28.7	22.1	21.4	282	27.3
Total Inflow	**103.6**	**100**	**810.5**	**100**	**103.6**	**100**	**1353.5**	**100**
Groundwater Production	42.6	44.5	250	44.2	42.6	44.5	433.5	44.5
Underflow to Pasadena Subarea	53.2	55.5	310	55.8	53.2	55.5	547.5	55.5
Total Outflow	**95.8**	**100.0**	**560**	**100**	**95.8**	**100**	**981**	**100**
Annual Change in Mass	7.8		250		7.8		372.5	

TABLE 8.5-2B: SALT AND NUTRIENT BALANCE IN THE PASADENA SUBAREA (2002/03 THROUGH 2011/12)

Source Water	TDS		Chloride		Nitrate		Sulfate	
	(tons)	%	(tons)	%	(tons)	%	(tons)	%
Precipitation	471.5	7.9	115.0	12.7	15.5	13.4	165.0	10.2
Return Flow	3479.5	58.4	308.0	34.1	53.1	45.8	544.5	33.5
Direct Spreading and Injection	1544.5	25.9	380.0	42.1	33.3	28.8	747.0	46.0
Underflow from Monk Hill Subarea	461.5	9.5	99.0	11.0	14.0	12.1	167.5	17.6
Total Inflow	**5957.0**	**100**	**902.0**	**100**	**115.9**	**100**	**1623.5**	**100**
Groundwater Production	2603.0	53.3	271.0	54.0	56.0	53.4	508.0	53.3
Underflow to Santa Anita Subarea and Main San Gabriel Basin	2277.0	46.7	230.5	46.0	48.7	46.4	445.5	46.7
Total Outflow	**4880.0**	**100**	**501.5**	**100**	**104.8**	**100**	**953.5**	**100**
Annual Change in Mass	1077.5		400.5		11.2	13.4	670.0	

TABLE 8.5-2C: SALT AND NUTRIENT BALANCE IN THE SANTA ANITA SUBAREA (2002/03 THROUGH 2011/12)

Source Water	TDS		Chloride		Nitrate		Sulfate	
	(tons)	%	(tons)	%	(tons)	%	(tons)	%
Precipitation	772.0	34.4	28.0	25.5	9.8	30.5	101.5	32.4
Return Flow	424.5	18.9	41.0	37.3	9.0	28.1	83.0	26.5
Direct Spreading	371.5	16.5	17.0	15.5	4.4	13.7	39.0	12.5
Underflow from Pasadena Subarea	678.0	26.0	24.0	21.8	8.9	27.7	89.5	29.9
Total Inflow	**2245.5**	**100**	**110.0**	**100**	**32.2**	**100**	**313.0**	**100**
Groundwater Production	2385.0	91.3	132.5	91.4	35.7	90.8	268.0	89.5
Underflow to Main San Gabriel Basin	227.5	8.7	12.0	8.3	3.6	9.2	31.0	10.4
Total Outflow	**2612.0**	**100**	**145.0**	**100**	**39.3**	**100**	**299.5**	**100**
Annual Change in Mass	-366.5		-35.0		-7.1		13.5	

Groundwater Quality and Assimilative Capacity in the Raymond Basin

Groundwater quality data was available from the existing State Department of Drinking Water's Title 22 monitoring program which requires "General Mineral" compliance sampling that includes Nitrate, Chloride, Sulfate, and Total Dissolved Solids (TDS). Sampling for TDS, chloride and sulfate is conducted every three years, while sampling for nitrate is conducted annually._A data set of water quality sampling from 2002 through 20011was used to assess current water quality conditions. Mean annual constituent concentrations were calculated as the arithmetic average concentration of all available water quality data at the production wells within each subarea. The average TDS, chloride, sulfate and nitrate-N concentrations for each of the subareas were compared to the applicable basin water quality objectives to determine the existing available assimilative capacity (Table 8.5-3). Assimilative capacity is estimated as the difference between the water quality objectives and the existing groundwater quality for each subarea.

TABLE 8.5-3: GROUNDWATER QUALITY AND AVAILABLE ASSIMILATIVE CAPACITY IN RAYMOND BASIN

Raymond Basin Subarea	Water Quality Objective (mg/l)	Current Water Quality (mg/l)	Available Assimilative Capacity (mg/l)
Total Dissolved Solids (TDS)			
Monk Hill	450	411.0	39.0
Pasadena		363.0	87.0
Santa Anita		268.0	182
Nitrate - N			
Monk Hill	10	8.1	1.9
Pasadena		7.5	2.5
Santa Anita		4.1	5.9
Chlorides			
Monk Hill	100	43.0	**57.0**
Pasadena		**34.0**	**66.0**
Santa Anita		**15.0**	**85.0**
Sulfates			
Monk Hill	100	**66.0**	**34.0**
Pasadena		**73.0**	**27.0**
Santa Anita		**35.0**	**65.0**

On average, groundwater quality in each subarea is currently below Basin Plan objectives for TDS, chlorides, sulfates, and nitrate, and assimilative capacity is available for all constituents. However, review of available data suggests an increasing trend for TDS chloride and sulfate concentrations in the Monk Hill and Pasadena subareas. Also, there is considerable annual variation in water quality for each constituent. Generally, water quality concentrations vary with many environmental factors, including the volume of groundwater in storage. The water quality concentrations in the Raymond Basin appear to be inversely related to groundwater in storage, increasing as groundwater levels decrease, and vice versa.

Salt and Nutrient Management Measures in the Raymond Basin

Existing salt and nutrient management measures in the Raymond Basin include: actions/programs that are intended to sustain groundwater recharge, monitor water quality conditions, and control salinity in waters imported into the basin. Potential management measures include increasing groundwater recharge and promoting onsite stormwater capture and retention. These management measures are summarized in Table 8.5-4.

TABLE 8.5-4: EXISTING AND POTENTIAL SALT AND NUTRIENT MANAGEMENT MEASURES IN THE RAYMOND BASIN

Category	Program/Project	Description
Groundwater Management and Adaptation	Basin Adjudication (Existing)	Focus on protecting the long-term quantity and quality of the groundwater supply.
Water Quality Monitoring/Management	Title 22 Water Quality Monitoring Program (Existing)	Title 22 Monitoring requirements to track mineral water quality (along with other parameters). Monitoring results dictate actions to be taken (e.g. groundwater treatment facilities, water quality blending plans) to maintain production from wells.
	SNMP Monitoring Program (Planned)	RBMB will implement a proposed monitoring plan as required by the Recycled Water Policy Water quality data will be reported to the LAWRWQCB at least every three years. The sampling frequency for salts and nutrients will be periodically evaluated and adjusted accordingly as necessary.
Groundwater Replenishment	Maintain Existing Spreading grounds	LACDPW maintains a complex system of dams, retention basins, storm channels and off-stream spreading grounds to control stormwater runoff and to maximize replenishment of the stormwater flow. The existing spreading grounds are operated to enable stormwater run-off to be replenished into each of the subareas in an efficient and effective manner. A lesser source of replenishment is injection of treated imported water into the Monk Hill subarea. Local stormwater replenished in these facilities typically has the lowest concentrations of TDS, Nitrate, Sulfate, and Chloride of the various sources contributing to loading. Artificial recharge of stormwater runoff occurs in off-stream spreading grounds located off the Arroyo Seco, Eaton Wash, and Santa Anita Wash. The stormwater augments naturally occurring groundwater replenishment from

Category	Program/Project	Description
		precipitation. Replenishment of high quality stormwater contributes to the long-term enhancement of groundwater quality.
	Develop new spreading facilities (Potential)	The RBMB and LACDPW continually investigate opportunities to expand the network of spreading grounds. Potential new sites include debris basins.
Improve Imported Water Quality	Regional Salinity Control (Existing) Imported Water Regional Salinity Control	The MWD is responsible for all treated imported water used in the Raymond Basin and that water is from the Weymouth Treatment Plant. MWD has a goal to maintain the TDS concentrations at or below 500 mg/l. This is done through blending SWP water with Colorado River water.
Stormwater Capture and Runoff Management	Reduce Stormwater Runoff (Planned)	Cities within the Raymond Basin are co-permittees for the new MS4 permit. As such, cities are directed to take proactive steps, both individually and collectively, to implement stormwater Best Management Practices (BMPs) to reduce or eliminate stormwater runoff from facilities and consequently reduce flow in storm channels. These practices may result in increased stormwater replenishment.

Projected Impacts of Future Projects on Water Quality (Assimilative Capacity Use)

A mass balance spreadsheet model was developed as an assimilative capacity assessment tool to calculate the impacts of additional future salt and nutrient loadings on existing assimilative capacity in the basin. In the absence of actual planned recycled water projects, a hypothetical groundwater replenishment project with water quality similar to other local recycled water projects was evaluated. The analysis determined the maximum annual recharge of water from this project that could occur in each subarea (Monk Hill, Pasadena, and Santa Anita) of the Raymond Basin, before exceeding 10 percent of the assimilative capacity Results of this analysis are presented in Table8.5-5.

TABLE 8.5-5: PROJECTED ASSIMILATIVE CAPACITY USE (%) BY FUTURE RECYCLED WATER PROJECTS (Hypothetical Scenario)

Time Period	TDS	Chloride	Sulfate	Nitrate
Percent Utilization of Assimilative Capacity (%)				
Monk Hill ***max: 225 acre-feet per year***				
20 years	7.6	2.8	5.9	0.0
Equilibrium	10	3.6	7.7	0.0
Pasadena ***max: 405 acre-feet per year***				
20 years	3.9	2.8	5.3	-1.0
Equilibrium	7.5	4.5	10.0	-1.8
Santa Anita ***max: 245 acre-feet per year***				
20 years	8.0	5.6	8.3	0.7
Equilibrium	9.7	6.8	10.0	0.8

The assimilative capacity assessment tool provides a valuable management tool that could be employed in decisions concerning use of new water for aquifer recharge. It could also identify the mineral constituents in the water that will most limit the volume of new water that can be used for recharge without passing a defined assimilative capacity threshold, e.g., 10 percent (as in this scenario), as well as evaluate the effects of groundwater replenishment with water with different water quality characteristics.

Salt and Nutrient Load Limits

Salt and nutrient loads to the Raymond Basin will be managed with the existing and potential programs/projects discussed above. These measures are designed to protect long-term quantity and quality of the groundwater supply. Assignment of waste load allocations is not warranted at this time.

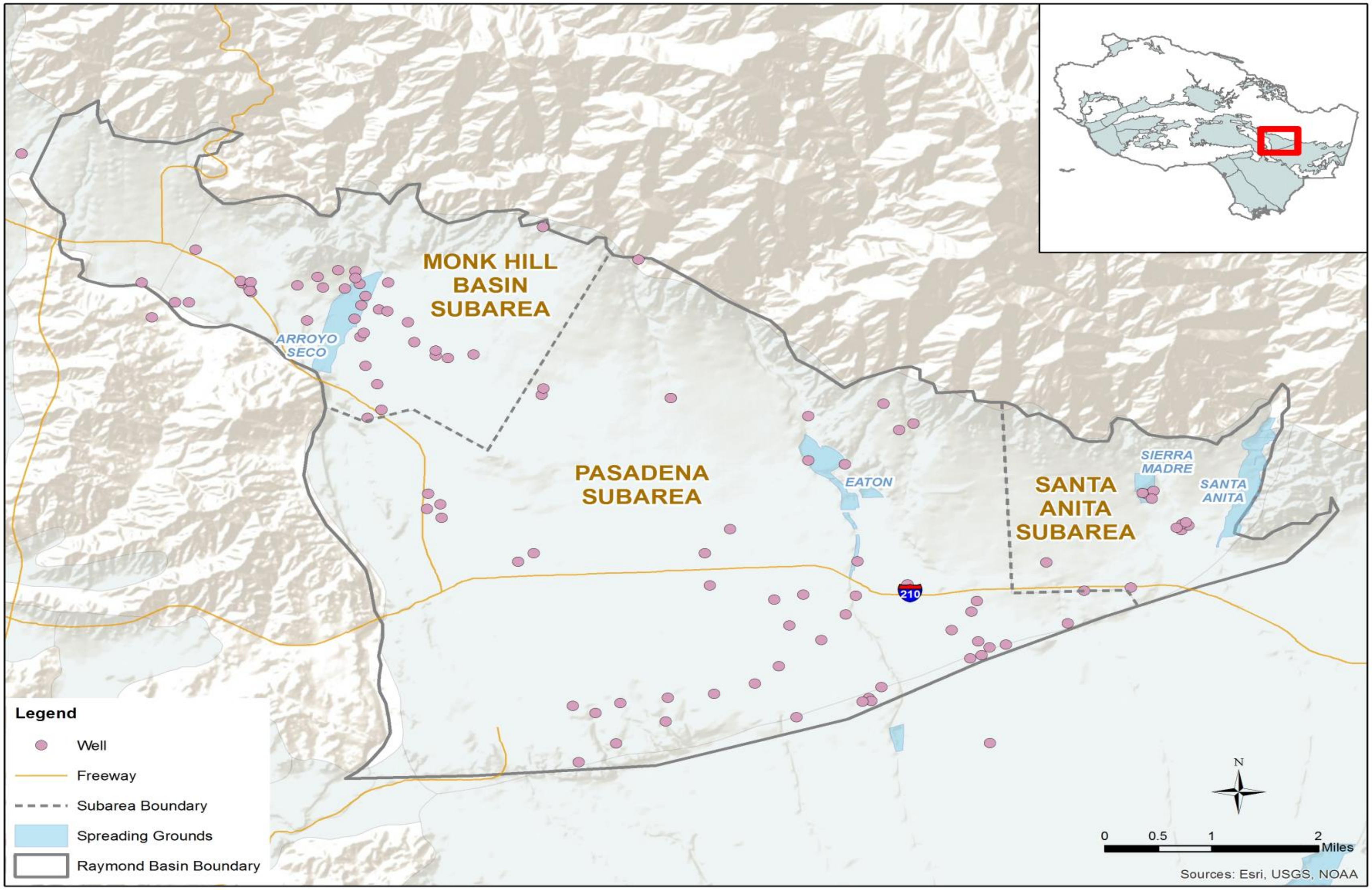

Figure 8.5-2: Location of Wells for SNMP Monitoring in the Raymond Basin

Monitoring Program

Groundwater monitoring for salt and nutrient management plan implementation will rely on water quality monitoring conducted as part of the State Department of Drinking Water's Title 22 Water Quality Monitoring Program, for which water samples are collected from potable supply wells throughout the basin and analyzed for a variety of parameters including TDS, chloride, sulfate and nitrate-N. This sampling monitors groundwater quality within the basins and can be used to assess spatial and temporal changes in salt and nutrient concentrations. This monitoring may also help confirm the source/cause of increasing concentrations in the Pasadena and Monk Hill subareas and assist with identifying potential management measures to address them. Elements of the program are laid out in Table 8.5-6.

TABLE 8.5-6: MONITORING PROGRAM ELEMENTS

<table>
<tr><th>Element</th><th>Description</th></tr>
<tr><td>Responsible Agency</td><td>Raymond Basin Management Board</td></tr>
<tr><td>Program Origin</td><td>Title 22 Water Quality Monitoring Program.</td></tr>
<tr><td>Parameters and Monitoring Frequency</td><td>
<table>
<tr><th>Parameter</th><th>Monitoring Frequency</th></tr>
<tr><td>Nitrate-N</td><td>Annually</td></tr>
<tr><td>Total Dissolved Solids</td><td rowspan="3">Triennially*</td></tr>
<tr><td>Chloride</td></tr>
<tr><td>Sulfate</td></tr>
</table>
</td></tr>
<tr><td>Monitoring locations</td><td>Potable water supply wells spatially distributed around the Raymond Basin</td></tr>
<tr><td>Reporting Requirements</td><td>Triennial report of monitoring results. TDS, chloride, sulfate and nitrate-N data collected from the Title 22 Water Quality Monitoring Program will be uploaded to the State Water Board's online GeoTracker database.</td></tr>
<tr><td>Review Period</td><td>Data collected from the monitoring program will be reviewed periodically to evaluate basin water quality conditions.</td></tr>
</table>

*In response to the increasing TDS concentrations trends in the Monk Hill and Pasadena subareas, the RBMB will increase the frequency of monitoring of TDS in production wells to at least once annually to gather more annual data to evaluate future trends.

Updates to the Salt and Nutrient Management Measures

Salt and nutrient management measures will be updated (i) as necessary to reflect changing conditions in the Raymond Basin (e.g. drought conditions, changes in current or projected salt and nutrient loads to the basin, and/or changes in land use), (ii) where results from the SNMP Monitoring Program indicate that revisions/modifications are warranted, (iii) if needed to address modified or additional recycled water projects and/or (iv) at the end of a 10-year planning horizon.

Regulatory Implications

The salt and nutrient management strategies developed by the Raymond Basin stakeholders are measures designed to provide a framework for the long-term management of salts and nutrients in the Raymond Basin, while supporting increased use of recycled water. These strategies will be applied in conjunction with already existing groundwater quality protection measures in the planning area (e.g. cleanup operations)

Where additional projects have the potential to impact salt and/or nutrient loads to the basin, consideration will be given to water quality conditions and the corresponding assimilative capacity in localized areas during the permitting process or the development of other Regional Water Board regulatory actions.

F. Main San Gabriel Valley Basin

Adopted by the California Regional Water Quality Control Board, Los Angeles Region on December 8, 2016.

Approved by:

The State Water Resources Control Board on May 16, 2017.
The Office of Administrative Law on December 19, 2018.

The program of implementation[16] described below is based on the Salt and Nutrient Management Plan (SNMP) for the Main San Gabriel Valley Basin[17] developed by the Main San Gabriel Basin Watermaster (Basin Watermaster) in conjunction with other agencies, including the Upper San Gabriel Valley Municipal Water District (Upper District), San Gabriel Valley Municipal Water District (San Gabriel District), Three Valley's Municipal Water District (Three Valley's District), the County of Los Angeles Department of Public Works (LACDPW), Metropolitan Water District of Southern California (MWD), and the Sanitation Districts of Los Angeles County (LACSD). The Salt and Nutrient Management Plan and this program of implementation satisfy the State Water Resources Control Board's Recycled Water Policy requirements for Salt and Nutrient Management Plans. This program of implementation applies to groundwater basin(s) with the designated beneficial use of municipal and domestic supply (MUN).

The SNMP was developed to provide the framework for water management practices in the San Gabriel Valley Basin, including the use of recycled water, to ensure protection of beneficial uses and allow for the sustainable use of groundwater resources, consistent with the Regional Board's water quality objectives.

The following summarizes essential elements of the SNMP for the San Gabriel Basin. Further details may be found in the full document at:
http://www.waterboards.ca.gov/losangeles/water_issues/programs/salt_and_nutrient_management/index.shtml

[16] The Recycled Water Policy refers to "revised implementation plans" for adoption into regional basin plans pursuant to Water Code section 13242. Water Code section 13242 uses the term "program of implementation." Pursuant to Water Code section 13242, "[t]he program of implementation for achieving water quality objectives shall include, but not be limited to:
(a) A description of the nature of actions which are necessary to achieve the objectives, including recommendations for appropriate action by any entity, public or private.
(b) A time schedule for the actions to be taken.
(c) A description of surveillance to be undertaken to determine compliance with objectives."

[17] The Main San Gabriel Valley basin SNMP does not include the Puente Basin or the Six Basins both of which are subjects of separate court adjudications.

Background

The Main San Gabriel basin underlies the San Gabriel Valley located in southeastern Los Angeles County, and serves as the major source of water supply to about 1.4 million residents in the 19 cities overlying the basin. The basin covers a surface area of approximately 167 square miles. It is bounded by the San Gabriel Mountains on the north, the Raymond fault on the northeast, a system of low rolling hills (Repetto, Merced, Puente, and San Jose Hills) on the west and south, and by the bedrock high between San Dimas and La Verne on the east. The Whittier Narrows, a 1.5-mile gap between the Merced and Puente Hills, forms the only exit for the Basin surface water and groundwater. The Basin Plan identifies two subareas in the Main San Gabriel Basin: the Western Area, and the Eastern Area which are demarcated by a series of streams (Walnut Creek, Big Dalton Wash and Little Dalton Wash) in the overlying land area (Figure 8.6-1).

The Basin is filled with permeable alluvial deposits (water-bearing formations) and underlain and surrounded by relatively impermeable rocks (nonwater-bearing formations). It also contains many geological features and faults that may influence groundwater movement into, through, or within the Basin. The water-bearing formations extend to a maximum depth of more than 4,000 feet, and consist primarily of (i) the older alluvium, which constitutes the main valley fill material and is exposed around the margins of the entire Basin, (ii) the recent alluvium, which blankets the center of the valley floor, and (iii) the transition zone deposits, which lie along San Dimas Wash in the eastern part of the Basin.

The older alluvium deposits consist of unsorted yellowish to reddish-brown, angular to sub-rounded continental debris, derived from the surrounding mountains. These deposits vary from silt to boulders more than two feet in diameter. The thickness of the older alluvium deposits ranges from approximately 300 feet in the northern part of the Basin in the vicinity of the mouth of the San Gabriel River to approximately 4,100 feet in the vicinity of Whittier Narrows. Clay is also present in the older alluvium, likely due to the weathering process after the sediments were deposited. Clay layers of various thicknesses are embedded within the old alluvium at varying depths. These clay layers act as aquitards, i.e. semi-confining or confining layers, stratifying the water-bearing formations, i.e. aquifers, and restricting hydraulic communication between these aquifers. The presence and significance of these clay layers are dominant in the southern and western portions of the Basin – which coincides with the Western Area delineated in the Basin Plan.

The Recent alluvium deposits overlie the older alluvium along the front of the San Gabriel Mountains and in the central part of the Basin. These deposits consist of predominantly coarse boulders, gravels, and sands, ranging in thickness from a few inches to roughly 100 feet in Whittier Narrows. The thickest portions are found along the San Gabriel River channel and its adjacent floodplains. The transition zone deposits are limited in a zone of approximately two miles wide along San Dimas Wash from San Dimas to Baldwin Park. These deposits contain gravels found in both the older and recent alluvium. These deposits are thin (less than 30 feet thick) and lie above the water table.

The Basin ground surface slopes downward from approximately 1,200 feet above mean sea level (msl) in the San Dimas area, 850 feet msl in the Pomona area on the east, and 600 feet msl in the Alhambra area on the west to approximately 200 feet msl in the Whittier Narrows area on the southwest. The direction of groundwater movement in some areas of the Basin remains the same as that during earlier periods. In other portions of the Basin, the direction of groundwater movement is affected naturally by hydrologic conditions and geological features and artificially by groundwater resources management measures such as extraction and/or groundwater recharge. Prior to development, “the general direction of ground water movement across all of the San Gabriel Valley was from the perimeter of the valley toward Whittier Narrows. However, due to groundwater extraction for early development, a groundwater low was formed in the vicinity of the City of Alhambra, causing groundwater in the northwestern portion of the valley to flow towards this groundwater low (also known as the Alhambra pumping hole) rather than towards Whittier Narrows.

The Basin surface water system consists of two major streams: the San Gabriel River and the Rio Hondo. The San Gabriel River and its tributaries (Fish Canyon, Rogers Canyon, Big Dalton, Little Dalton, San Dimas, Walnut, and San Jose Creeks) drain the Eastern portion of the San Gabriel River watershed, and the Rio Hondo (which is a distributary of the San Gabriel River) and its tributaries (Alhambra, Rubio, Eaton, Arcadia, Santa Anita, and Sawpit Washes) drain the western portion of the San Gabriel River watershed. Surface water in the San Gabriel River and Rio Hondo exits the Basin at Whittier Narrows, a narrow gap between the Merced and Puente Hills. Surface water has been significantly modified by flood control reservoirs, dams, and channels (Cogswell, San Gabriel, Morris, Big Dalton, Eaton, and Puddingstone Reservoirs; Santa Fe Dam and Whittier Narrows Dam). Most stream channels have concrete-lined bottom and sides. However the San Gabriel River between Santa Fe Dam and Whittier Narrows Dam, and the San Jose Creek west of Elsah Avenue, have pervious bottoms allowing surface water percolation for groundwater recharge.

Local groundwater constitutes about 85 percent of the water demand for the basin. An additional 10 percent comes from treated imported water and 5 percent from other local supplies (recycled water and local surface water diversions). In addition, an average of about 40,000 acre-feet per year of untreated imported water is delivered for basin replenishment[18]. Land use in the Basin is approximately 84 percent urban, 16 percent open space and 1 percent agricultural.

[18] Annual Report 2014-2015. Main San Gabriel Basin Watermaster. http://media.wix.com/ugd/af1ff8_1d30b7f8d78e4e74878789c229b343e9.pdf

Basin Management

The Main San Gabriel Basin has been adjudicated and management of the local water resources within the Basin is based on Watermaster services under two Court Judgments: San Gabriel River Watermaster (River Watermaster)[19] and Main San Gabriel Basin Watermaster (Basin Watermaster)[20]. The Main Basin Watermaster was created in 1973 to resolve water issues that had arisen among water users in the San Gabriel Valley. The Watermaster is headed by a nine members board: six of those members are nominated by water producers (producer members) and three members (public members) are nominated by the Upper San Gabriel Valley Municipal Water District (Upper District) and the San Gabriel Valley Municipal Water District (SGVMWD), which overlie most of the Basin.

Initially, the Main Basin Watermaster's mission was to generally manage the water supply of the Main Basin. However, during the late 1970s and early 1980s, significant groundwater contamination was discovered in the Main Basin. The contamination was caused in part by past practices of local industries that had improperly disposed of industrial solvents referred to as Volatile Organic Compounds (VOCs) as well as by agricultural operations that infiltrated nitrates into the groundwater.

Therefore, in1989, local water agencies adopted a joint resolution regarding water quality issues that stated Main Basin Watermaster should coordinate local activities aimed at preserving and restoring the quality of groundwater in the Main Basin. The joint resolution also called for a cleanup plan. In 1991, the Court granted the Main Basin Watermaster the authority to control pumping for water quality purposes. The new responsibilities included development of a Five-Year Water Quality and Supply Plan, to be updated annually, submitted to the LARWQCB, and made available for public review by November 1 of each year.

The objective of the Five-Year Water Quality and Supply Plan is to coordinate groundwater-related activities so that both water supply and water quality in the Main Basin are protected and improved. Issues detailed in the Five-Year Plan include how Main Basin Watermaster plans to:

- Monitor groundwater supply and quality;
- Develop projections of future groundwater supply and quality;
- Review and cooperate on cleanup projects, and provide technical assistance to other agencies;
- Assure that pumping does not lead to further degradation of water quality in the Basin;
- Address Perchlorate, N-nitrosodimethylamine (NDMA), and other emerging contaminants in the Basin;
- Develop a cleanup and water supply program consistent with the U.S. Environmental Protection Agency (USEPA) plans for its San Gabriel Basin Superfund sites; and
- Coordinate and manage the design, permitting, construction, and performance evaluation of the Baldwin Park Operable Unit (BPOU) cleanup and water supply plan.

[19] Board of Water Commissioners of the City of Long Beach, et al., v. San Gabriel Valley Water Company, et al., Los Angeles County Case No. 722647, Judgment entered September 24, 1965.
[20] Upper San Gabriel Valley Municipal Water District v. City of Alhambra, et al., Los Angeles County Case No. 924128, Judgment entered January 4, 1973.

The Watermaster coordinates efforts with the Upper District, San Gabriel District, Three Valleys District, MWD, LACSD, and LACDPW to replenish the groundwater supplies to the basin with the greatest amount of high quality water as possible. In addition, the Main Basin Watermaster, in coordination with the Upper District, works with local water companies and state and federal regulatory agencies to clean up contaminated water supplies.

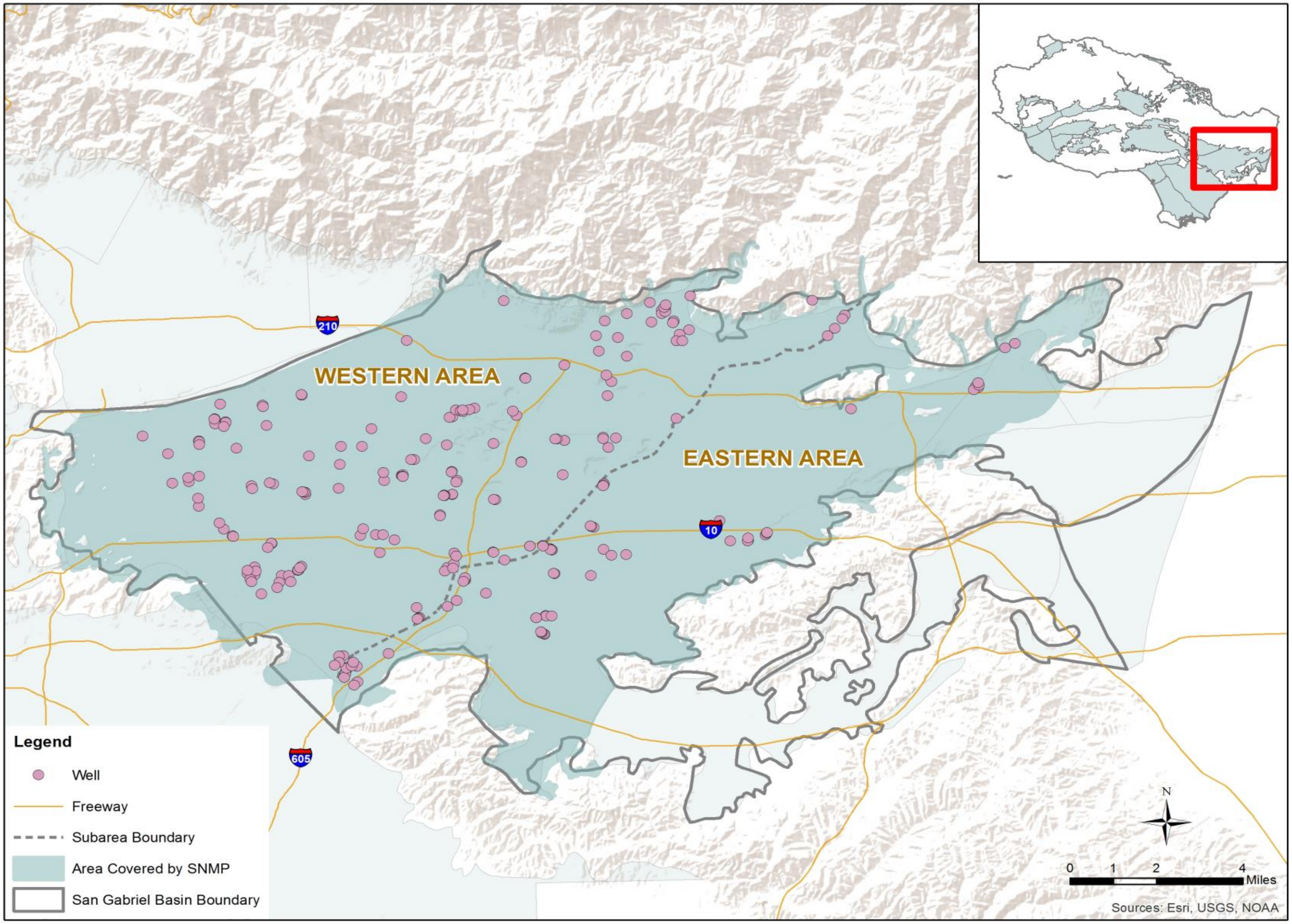

Figure 8.6-1: Main San Gabriel Basin Salt and Nutrient Management Planning Area

Participating Agencies

The Main San Gabriel Basin Watermaster (Watermaster) was the lead agency for the development of the SNMP for the San Gabriel Valley Groundwater Basin. Other major stakeholders included the Upper San Gabriel Valley Municipal Water District (Upper District), San Gabriel Valley Municipal Water District (San Gabriel District), Three Valley's Municipal Water District (Three Valley's District), the County of Los Angeles Department of Public Works (LACDPW) which is responsible for stormwater recharge; and Metropolitan Water District of Southern California (MWD) which collectively are responsible for the delivery and recharge of imported water in the Basin; and the Sanitation Districts of Los Angeles County (LACSD) which is responsible for the release of recycled water in the Basin. In addition, Watermaster staff regularly kept the Basin groundwater producers up to date with the planning process during Basin Water Management Committee meetings. Regional Water Board staff actively participated in the Main San Gabriel Basin SNMP development process.

Sources of Water in the San Gabriel Basin

Sources of water for use and recharge in the San Gabriel Basin include precipitation on the valley floor, percolation of water applied for irrigation (groundwater, local surface water, treated imported water, and recycled water), artificial recharge with local stormwater and untreated imported water, percolation of recycled water discharged from LACSD water reclamation plants to unlined portions of the San Gabriel River, San Jose Creek and Rio Hondo, and subsurface inflow.

TABLE 8.6-1: CONTRIBUTIONS OF SOURCE WATERS TO THE MAIN SAN GABRIEL BASINS

TYPE	SOURCE	CONTRIBUTION TO GROUNDWATER
Surface water	San Gabriel River, San Jose Creek and Rio Hondo	Infiltration of surface waters in unlined portions of the San Gabriel River, San Jose Creek and Rio Hondo.
Recycled Water	Tertiary-treated recycled water from Los Angeles County Sanitation District (LACSD) water reclamation plants.	Percolation to the groundwater basin from surface uses, such as irrigation. Incidental percolation of water discharged into the unlined portions of the San Gabriel River and San Jose Creek as recycled water from the San Jose Creek Wastewater Reclamation Plant and Pomona Wastewater Reclamation Plant comingles with local stormwater in the River.
Stormwater	Precipitation from overlying area	Percolation of precipitation on the Valley floor and percolation of runoff from surrounding watersheds. Artificial recharge of groundwater by direct spreading of local runoff to spreading grounds.

TYPE	SOURCE	CONTRIBUTION TO GROUNDWATER
Imported water	State Water Project (SWP)	Surface water from the State Water Project is imported by the Upper District, the San Gabriel Valley Municipal Water District (San Gabriel District), and Three Valleys Municipal Water District (Three Valleys District) for artificial groundwater recharge through spreading grounds.
	Upper District and Three Valleys Municipal Water District (Three Valleys District)	Water supply in the Main San Gabriel Basin area
Groundwater	Imported from the Raymond Basin	Water supply and irrigation in the Main San Gabriel Basin area
	Puente Basin	Subsurface inflow from adjacent Puente Basin
	Raymond Basin	Subsurface inflow from the Raymond Basin
	San Gabriel Mountains	Subsurface inflow from the San Gabriel Mountains on the north, as a result of stored water moving out of fractures in the Basement Complex into the alluvial fill
	Hills south of the basin	A negligible quantity of water may enter the valley from the hills on the south

Groundwater outflow from the San Gabriel Valley Basin includes:

- Pumping, and
- Subsurface outflow to the Central Basin through Whittier Narrows.

Salt and Nutrient Loading to the Upper Santa Clara River Basin

The primary sources of salt loading are from stormwater recharge, untreated imported water replenished in the Basin in response to annual production which may exceed water rights, and incidental recharge of recycled water which is discharged into the San Gabriel River, Rio Hondo, and San Jose Creek by the LACSD. The mass balances (inputs and outflows) for total dissolved solids (TDS), chloride, nitrate-N and sulfate from the various water sources are presented below for the upper San Gabriel Valley Basin. These values were derived using a spreadsheet groundwater balance model that included components for recharge and discharge within the basin.

TABLE 8.6-2: SALT AND NUTRIENT BALANCE IN THE SAN GABRIEL RIVER BASIN (2001-02 THROUGH 2010-11)

Source Water	Nitrate		Chloride		Sulfate		TDS	
	(tons)	%	(tons)	%	(tons)	%	(tons)	%
Percolation from precipitation	1,134	17%	1,678	14%	2,903	27%	26,127	17%
Incidental streambed percolation	454	7%	1,451	12%	1,134	11%	8,074	5%
Irrigation return flow	998	15%	1,089	9%	3,175	30%	13,517	9%
Direct spreading	4,264	62%	7,394	63%	3,175	30%	101,741	68%
Underflow from Puente Basin	14	0%	45	0%	181	2%	635	0%
Total Inflow	**6,863**	**100%**	**11,657**	**100%**	**10,569**	**100%**	**150,094**	**100%**
Groundwater Production	6,713	96%	9,662	81%	16,103	81%	107,955	89%
Underflow to Central Basin	268	4%	2,277	19%	3,750	19%	13,616	11%
Total Outflow	**6,981**	**100%**	**11,938**	**100%**	**19,853**	**100%**	**121,571**	**100%**
Annual Change in Mass	**-118**		**-281**		**-9,284**		**28,523**	

Groundwater Quality and Assimilative Capacity in San Gabriel Valley Basin

Water quality conditions in each of the San Gabriel Valley Basin were evaluated from the period 2001-2002 through 2011-12, using groundwater quality data obtained from the Watermaster, the Los Angeles Regional Water Board and the US Environmental Protection Agency. Mean annual constituent concentrations were calculated as the arithmetic average concentration of all available water quality data at the production wells within each subarea as well as within the entire basin. Elevated concentrations of nitrate-N, chloride and sulfate were generally found in shallow wells, while low concentrations were found in wells adjacent to streams or spreading grounds. The average TDS, chloride, sulfate and nitrate-N concentrations for each of the subareas and the basin were compared to the applicable basin water quality objectives to determine the existing available assimilative capacity (Table 8.6-3). Assimilative capacity is estimated as the difference between the water quality objectives and the existing groundwater quality for each subarea.

TABLE 8.6-3: GROUNDWATER QUALITY IN THE SAN GABRIEL VALLEY BASIN (2001-2002 THROUGH 2011-12)

Parameter	Water Quality Objective (mg/L)	Water Quality (mg/L)	Assimilative Capacity (mg/L)
Western Area			
Nitrate-N	10	4.5	5.5
Chloride	100	27	73
Sulfate	100	45	55
TDS	450	330	120
Eastern Area			
Nitrate-N	10	5.4	4.6
Chloride	100	46	54
Sulfate	100	81	19
TDS	600	456	146
Basin wide			
Nitrate-N	10	4.8	5.2
Chloride	100	31	69
Sulfate	100	53	47
TDS	450*	357	93

* The water quality objective for TDS is 450 mg/L for the westerly portion of the San Gabriel Basin, and 600mg/L for the easterly portion of the San Gabriel Basin. However, as no geologic barrier exists between the eastern and western basin subarea, the more conservative value (450 mg/l) was used in determining the assimilative capacity and in completing the anti-degradation analysis.

In general, concentrations of nitrate, chloride, sulfate and TDS are all below the water quality objectives, and assimilative capacity is available for all constituents (Table 8-6-3). A review of available water quality data indicate a decreasing trend for nitrate concentrations within the basin, and increasing trends for trends for chloride, sulfate, and TDS. The water quality concentrations in the San Gabriel Basin appear to be inversely related to groundwater in storage, increasing as groundwater levels decrease, and vice versa.

Salt and Nutrient Management Measures in the San Gabriel Valley Basin

Existing programs to manage salts and nutrients in the Main San Gabriel Basin are broadly categorized into groundwater replenishment, recycled water treatment upgrades, imported water management, and institutional and regulatory measures (Table 9.6-4A)

TABLE 8.6-4A: CURRENT SALT AND NUTRIENT MANAGEMENT MEASURES IN THE SAN GABRIEL VALLEY BASIN

Category	Specific Measure	Description
Groundwater replenishment	Maintain Spreading Facilities	LACDPW maintains a complex system of dams, retention basins, storm channels and off-stream spreading grounds to control stormwater runoff and to maximize replenishment of the stormwater flow. The existing spreading grounds are conjunctively operated to enable both stormwater run-off and untreated imported water to be replenished into the Basin in an efficient and effective manner. The TDS, chloride, nitrate, and sulfate concentrations in local stormwater and SWP water (which historically have been used to replenish the water supplies of the Basin) are lower than the concentrations found in the groundwater extracted. Consequently, the quality of the Basin will be maintained over time assuming replenishment is greater than or equal to extractions. During drought conditions with little stormwater runoff, this may not be the case.
	Maintain Unlined Portions of Rivers and Streams	The San Gabriel River is unlined from Morris Dam to Whittier Narrows Dam, along with portions of the Rio Hondo, Walnut Creek, and San Jose Creek. Stormwater is released under a controlled manner into these unlined water bodies to augment groundwater replenishment that occurs in off-stream spreading grounds. Replenishment of high quality stormwater contributes to the long-term enhancement of groundwater quality.
	Groundwater Replenishment Coordinating Group	Representatives from the Watermaster, LACDPW, LACSD, and MWD meet approximately every two months to coordinate the planned replenishment of local and untreated imported water with the availability of the sources of supply and the availability of groundwater replenishment facilities. As the highest quality source of water, stormwater run-off is typically given the highest priority for replenishment activities.
	Optimize Delivery of SWP Water	SWP water typically contains the lowest concentration of TDS. Consequently, the Watermaster and MWD have endeavored to maximize delivery of untreated SWP water to replenish the Basin in conjunction with groundwater basin management practices.

Category	Specific Measure	Description
Recycled Water Treatment Upgrades	Nitrogen Treatment	Although recycled water is not a significant component of nitrate loading in the Basin, historical loading occurred from the discharge of recycled water into the San Jose Creek, San Gabriel River, and Rio Hondo, and the subsequent infiltration of a portion of that discharge. The LACSD has taken steps to reduce the nitrate (nitrogen) concentration in the recycled water through treatment process upgrades.
Imported Water Management	Control of State Water Project salt concentrations	Historically the Basin has used SWP water almost exclusively to replenish the groundwater supplies as the result of groundwater production in excess of water rights. This practice ensures reliable groundwater supplies and that the groundwater levels are operated within a historical range of about 100 feet. MWD has taken proactive steps in conjunction with the California Department of Water Resources (DWR) to ensure the TDS concentrations of the SWP water are maintained. Long-term replenishment of the Basin with high quality water will tend to improve Basin water quality over time
Institutional Measures	Main San Gabriel Basin Judgment	The Basin Watermaster was created by the court in 1973 to manage both the water quantity and quality of the Basin. These activities include the annual establishment of the Operating Safe Yield which limits the amount of groundwater that can be pumped from the groundwater basin without having to purchase untreated imported water from the SWP. Watermaster coordinates with the LACFCD and MWD to ensure available water supplies are replenished in an efficient manner. Watermaster maintains records of all groundwater produced for the Basin, maintains a database of groundwater quality from all municipal water supply wells, and keeps track of all water entering and leaving the Basin. In addition, the Watermaster also adopted the "Criteria for Delivery of Supplemental Water" (Criteria) by Resolution No.4-96-138. The Criteria sets forth procedures the Watermaster follows to ensure the highest quality untreated imported water is replenished in the Basin.
Regulatory Measures	Title 22 Water Quality Monitoring	All municipal water suppliers are required to adhere to the provisions of Title 22 regarding water quality monitoring of municipal water supply wells. In general TDS, chloride, and sulfate samples are collected once every three years and nitrate samples are collected annually. Based on water quality results, municipal water suppliers may need to construct groundwater treatment facilities and/or develop water quality blending plans to maintain production from wells. In those situations, DDW may require more frequent

Category	Specific Measure	Description
		water quality monitoring than those noted above. Water quality data from Title 22 water quality sampling will be incorporated into the Basin-wide Salt and Nutrient Monitoring Program.
Voluntary Measure	Supplemental Monitoring	Since fiscal year 1994-95, Watermaster has also implemented its Basinwide Groundwater Quality Monitoring Program (BGWQMP) to sample all production wells (both potable and non-potable) in the Basin at least once a year for VOCs, TDS, and nitrate (NO3), and once every three years for chloride and sulfate.

Planned implementation projects and programs include, development of new spreading facilities, development of an Indirect Reuse Replenishment Project (IRRP), and promotion of onsite stormwater capture and retention. Details of such measures are provided in Table 8.6-4B.

TABLE 8.6-4B: POTENTIAL FUTURE MANAGEMENT MEASURES

Category	Specific Measure	Description
Groundwater Recharge	Develop New Spreading Facilities	The Watermaster and LACDPW continually investigate opportunities to expand the network of spreading grounds. Potential new sites include sand and gravel pits.
	Develop an Indirect Reuse Replenishment Project	The Upper San Gabriel Valley Water District (Upper District) is developing an Indirect Reuse Replenishment Project (IRRP) which would provide up to 10,000 ac-ft/yr of recycled water from the San Jose Creek West Water Reclamation Plant (SJCWRP) for groundwater replenishment in the Main Basin. This will replace approximately 10,000 ac-ft/yr of untreated imported water previously used for groundwater replenishment.
Stormwater/Runoff Management	Reduce Stormwater Runoff	Cities within the Raymond Basin are co-permittees for the new MS4 permit. As such, cities are directed to take proactive steps, both individually and collectively, to implement stormwater Best Management Practices (BMPs) to reduce or eliminate stormwater runoff from facilities and consequently reduce flow in storm channels. These practices may result in increased stormwater replenishment.
Regulatory Measures	SNMP Monitoring	Watermaster will implement a proposed monitoring plan as required by the Recycled Water Policy.

Projected Impacts of Future Project on Water Quality

The impact of the Indirect Reuse Replenishment Project (IRRP) on water quality in the Main Basin was evaluated using a spreadsheet mixing model. The potential utilization of the assimilative capacity resulting from long term recharge of recycled water was analyzed. The constituent concentrations in the groundwater are predicted to eventually reach equilibrium after which there will be no further increases despite continued recharge of recycled water. The TDS concentration in the groundwater is estimated to reach equilibrium after more than 100 years of recycled water recharge under the same quality assumptions. Once equilibrium is reached, the TDS concentration in the groundwater will be 364 mg/L, an increase of 7 mg/L, which represents approximately 7.2 percent utilization of the available assimilative capacity. The IRRP utilizes a smaller percentage of the available assimilative capacity of the other constituents analyzed once equilibrium is reached. The detailed results of the analysis are presented in Table 8.6-5.

In addition to this analysis, three hypothetical scenarios presenting varied replenishment water quality for nitrate, chloride, sulfate, and TDS were evaluated to determine the maximum volume of new replenishment water under varied quality conditions that could be recharged annually without cumulatively exceeding 10 percent of the assimilative capacity.

The water quality selected for analysis in the hypothetical scenarios is representative of water quality from likely replenishment water sources. Historical supply sources for replenishment water have been primarily stormwater runoff and SWP, with Colorado River water and recycled water contributing to groundwater replenishment to a lesser extent.

Scenario 1 represents the likely water quality of potential replenishment water from the Colorado River with a high sulfate concentration.
Scenario 2 represents likely water quality of potential replenishment water from the State Water Project experiencing salt water intrusion with a high chloride concentration.
Scenario 3 represents likely water quality of potential replenishment water with a high sulfate concentration along with a lower nitrate concentration.

For all three scenarios, TDS is the most limiting of the constituents, reaching approximately 10 percent of the assimilative capacity with replenishment and subsequent production of 5,700, 5,300 and 5,800 acre feet of recycled water annually for scenario 1, 2 and 3, respectively (Table 8.6-5).

TABLE 8.6-5: PROJECTED IMPACT OF THE IRRP ON ASSIMILATIVE CAPACITY FOR VARIOUS SCENARIOS

	Assimilative Capacity Used (%)			
	TDS	**Chloride**	**Nitrate**	**Sulfate**
Current Conditions *Replenishment water : primarily stormwater runoff and* State Water Project *Volume of replenishment water: 10000 AF*				
after 5yr	1.4	0.9	0.2	0.5
after 10yr	2.6	1.6	0.4	1
after 20yr	4.2	2.7	0.7	1.6
after reaching equilibrium	7.2	4.6	1.2	2.7
Scenario 1 *Replenishment water : Colorado River (high sulfate concentration)* *Volume of replenishment water: 5700 AF*				
after 5yr	2	0.1	0	1.9
after 10yr	3.5	0.2	0	3.4
after 20yr	5.8	0.4	0.1	5.6
after reaching equilibrium	10	0.6	0.1	9.6
Scenario 2 *Replenishment water : State Water Project with salt water intrusion (high chloride concentration)* *Volume of replenishment water: 5300 AF*				
after 5yr	2	1.3	-0.3	0.1
after 10yr	3.5	2.4	-0.5	0.1
after 20yr	5.8	4	-0.9	0.2
after reaching equilibrium	10.1	6.8	-1.5	0.3
Scenario 3 *Replenishment water : high sulfate concentration and lower nitrate concentration* *Volume of replenishment water: 5800 AF*				
after 5yr	2	0.2	-0.3	1.9
after 10yr	3.6	0.4	-0.6	3.5
after 20yr	5.9	0.6	-0.9	5.7
after reaching equilibrium	10.1	1	-1.5	9.8

These scenarios only evaluated the impacts resulting from direct spreading of replenishment water; therefore, indirect use of replenishment water (such as would be likely with recycled water reuse) would allow recharge of a significantly greater volume of replenishment water before resulting in an equivalent utilization of the assimilative capacity.

No Project Scenario

An evaluation of the compiled historical water data for the period 1973-74 to 2010-11 was conducted to project future groundwater quality assuming no hypothetical scenarios or additional recycled water projects are implemented. First, the linear interpolation of the annual mean extraction well quality was determined for each subarea over the long term time period (1973-74 through 2010-11) to determine the historical trend. Next, the linear interpolation was extrapolated from 2011-12 to 2030-31 to plot the future predictive trends without taking into consideration any additional projects, future implementation measures, or changes in hydrology. The results of the trend analyses indicated that nitrate concentration trends will gradually decreasing. Chloride, sulfate, and TDS concentrations will gradually increasing but would remain below the water quality objectives through the year 2030.

Salt and Nutrient Load Limits

Salt and nutrient loads to the Main San Gabriel Basin will be managed with the existing and planned programs/projects discussed above, in conjunction with other potential water quality management measures described in Table 8.6-4. These measures are expected to maintain water quality that is protective of beneficial uses. Assignment of allocations for salt and nutrient loading is not warranted at this time.

Monitoring Program

Groundwater monitoring for salt and nutrient management plan implementation will rely on water quality monitoring conducted as part of (i) the State Department of Drinking Water's Title 22 Water Quality Monitoring Program, (for which water samples are collected from potable supply wells throughout the basin and analyzed for a variety of parameters including TDS, chloride, sulfate and nitrate-N), and (ii) the Basinwide Groundwater Elevation Monitoring Program (BGWEMP) which supplements the Title 22 monitoring program with increased frequency of TDS monitoring as well as TDS and nitrate monitoring for non-potable supply wells that are not covered under Title 22 requirements. There are about 200 potable water supply wells in the Main San Gabriel Basin, and about 50 non-potable (irrigation and industrial) supply wells. The SNMP monitoring program will take advantage of water quality data collected from these wells. Elements of the program are laid out in Table 8.6-6.

TABLE 8.6-6: MONITORING PROGRAM ELEMENTS

<table>
<tr><th>Element</th><th>Description</th></tr>
<tr><td>Responsible Agency</td><td>Main San Gabriel Basin Watermaster</td></tr>
<tr><td>Program Origin</td><td>Title 22 water quality monitoring program</td></tr>
<tr><td>Parameters and Monitoring Frequency</td><td>
<table>
<tr><th>Parameter</th><th>Monitoring Frequency</th></tr>
<tr><td>Nitrate</td><td rowspan="2">Annually</td></tr>
<tr><td>Total Dissolved Solids</td></tr>
<tr><td>Chloride</td><td rowspan="2">Triennially</td></tr>
<tr><td>Sulfate</td></tr>
</table>
</td></tr>
<tr><td>Monitoring locations</td><td>Water quality sampling for TDS and nitrate will be conducted annually for nitrate and TDS, and at least once every three years for sulfate and chloride at all production wells.</td></tr>
<tr><td>Reporting Requirements</td><td>Monitoring results will be reported at least every three years. All data collected from the SNMP monitoring wells will be uploaded to the State Water Board's online GeoTracker database.</td></tr>
<tr><td>Additional Resources</td><td>Watermaster prepares a "Five-year Water Quality and Supply Plan" pursuant to Section 28 of Watermaster's Rules and Regulations. The Five-year Plan identifies existing and planned activities to enhance water quality through the Basin, including a summary of cleanup programs to remove contaminants from the Basin. Although these cleanup programs do not contribute or remove salts and nutrients, they are included as added information in the SNMP.</td></tr>
<tr><td>Review Period and Re-opener</td><td>Data collected from the SNMP monitoring wells and other monitoring programs will be reviewed periodically to validate model predictions regarding changes to basin water quality.</td></tr>
</table>

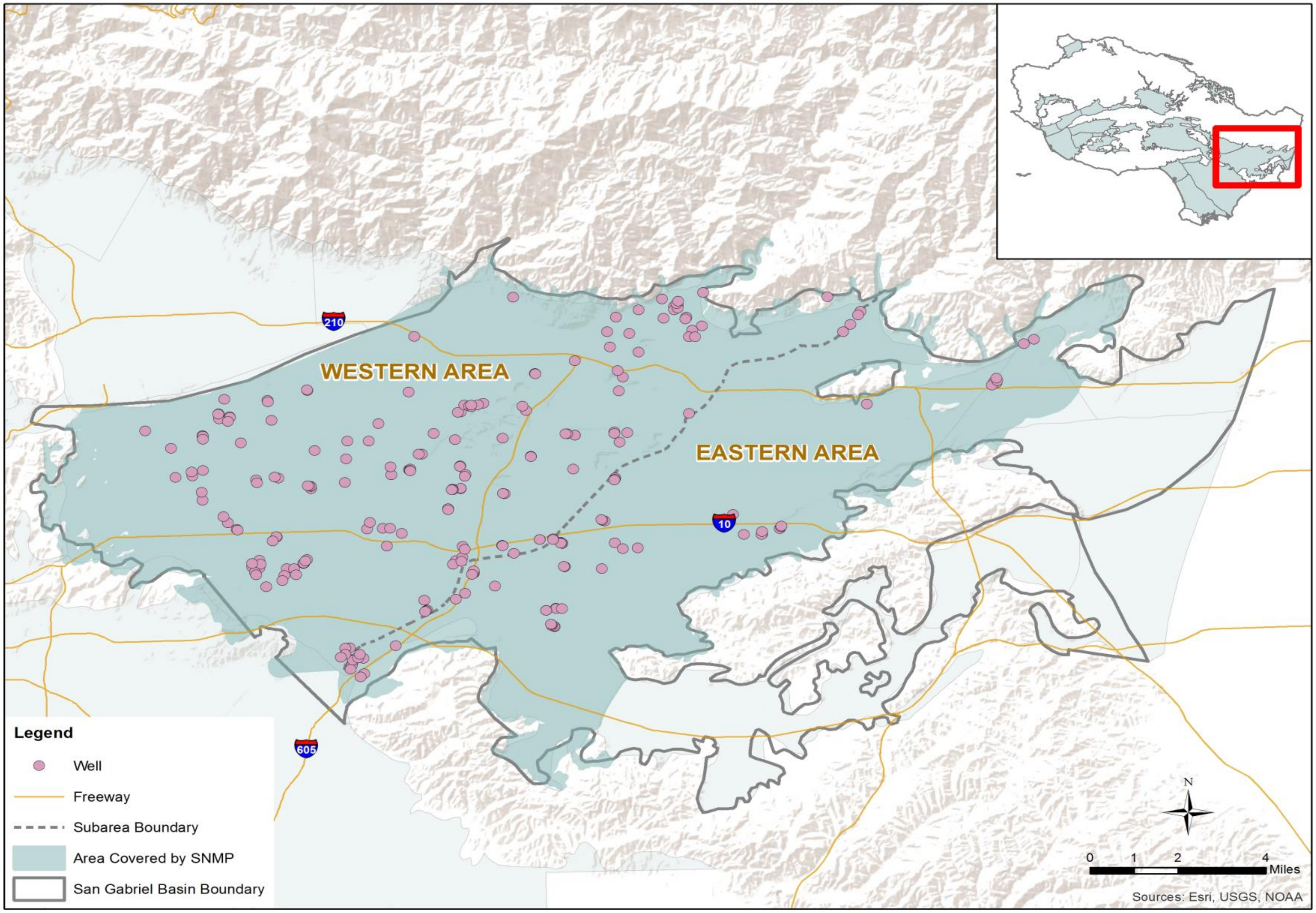

Figure 8.6-2. Location of production wells for SNMP Monitoring in the Main San Gabriel Basin.

Updates to the Salt and Nutrient Management Measures

Salt and nutrient management measures will be updated (i) as necessary to reflect changing conditions in the San Gabriel Valley Basin (i.e. in accordance with actions that have been taken or in response to proposed actions not taken), (ii) where results from the SNMP Monitoring Program indicate that revisions/modifications are warranted, and/or (iii) at the end of a 10-year planning horizon.

Regulatory Implications

The salt and nutrient management strategies developed by local water entities in the San Gabriel Valley Basin are voluntary measures that are designed to maintain water quality that is protective of beneficial uses, while increasing recycled water use and supporting the sustainable use of groundwater. These strategies will be applied in conjunction with already existing water quality protection measures in the planning area (e.g. cleanup operations).

Where projects have the potential to impact salt and/or nutrient loads to a basin, consideration will be given to water quality conditions and the corresponding assimilative capacity in localized areas during the permitting process or the development of other Regional Water Board regulatory actions.