Attachment A to Resolution No. R15-XXX

Amendment to the Water Quality Control Plan for the Los Angeles Region to Incorporate Groundwater Quality Management Measures for Salts and Nutrients in the Lower Santa Clara River Basin

Table of Contents

I. Salt and Nutrient Management Plans

II. Basin-Specific Salt and Nutrient Management Plans

B. Lower Santa Clara River Basin

Adopted by the California Regional Water Quality Control Board, Los Angeles Region on [insert date].

Approved by:

The State Water Resources Control Board on [Insert Date].
The Office of Administrative Law on [Insert Date].

The program of implementation[1] 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.

---

[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."

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

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. 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

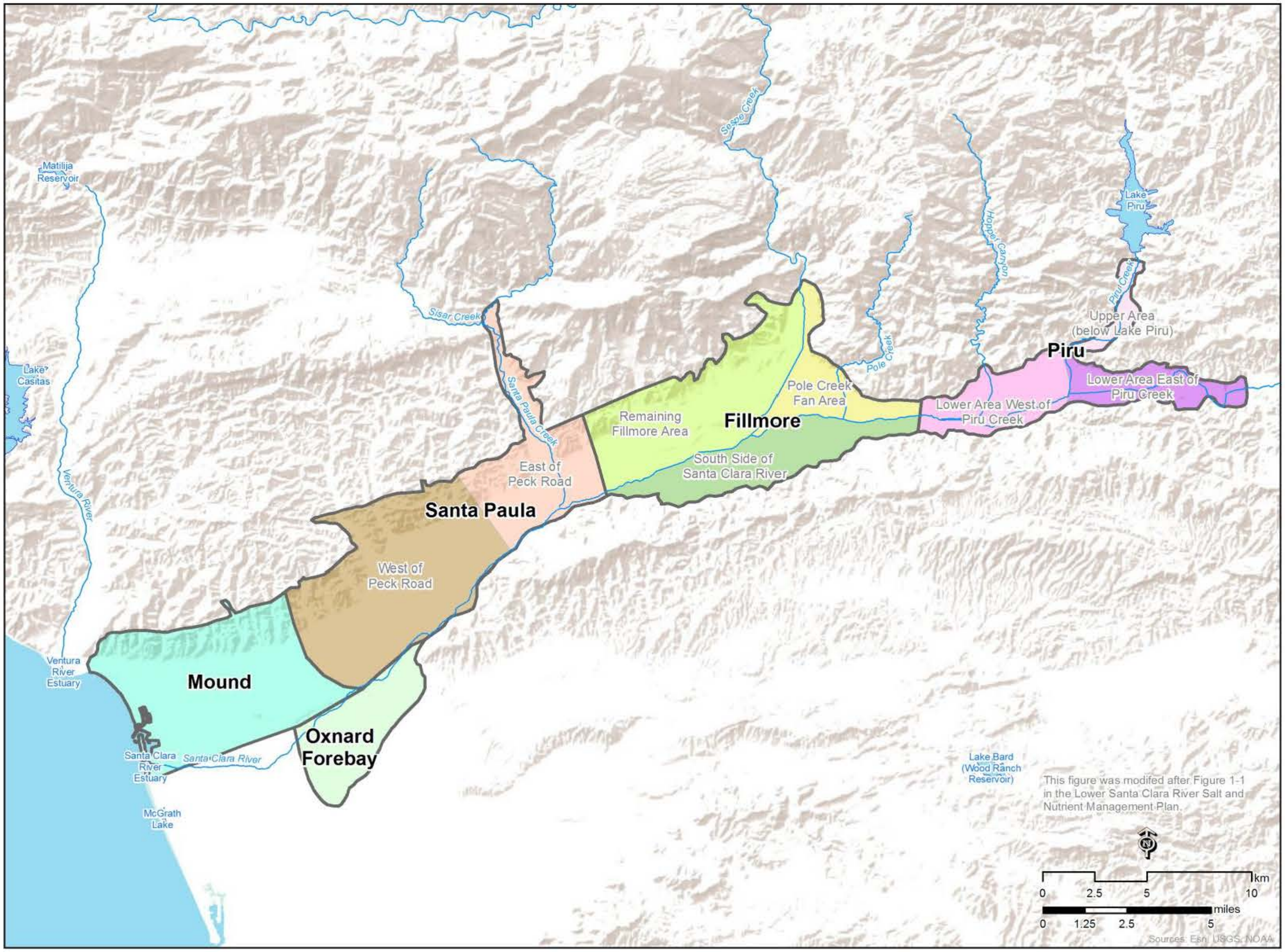

Figure 8.2-1. Lower Santa Clara River Salt and Nutrient Management Plan (SNMP) Area.

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	Piru Creek	Streambed recharge from the SCR 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 92% of groundwater production. <u>Santa Paula Basin</u> uses approximately 20% of its groundwater production for municipal and industrial purposes. Several irrigation companies operate in the

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

Source Water	TDS		Chloride		Nitrate	
Groundwater Production	-57713.8	39.6	-3040.5	39.6	-54.8	7.9
Total Outflow	**-145717.1**	**100.0**	**-7681.4**	**100.0**	**-284.7**	**41.3**
Annual change in mass (tons)	**10830.1**		**1184.1**		**-689.9**	**100.0**

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

Source Water	TDS		Chloride		Nitrate	
	(tons)	%	(tons)	%	(tons)	%
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)	%	(tons)	%	(tons)	%
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)	%	(tons)	%	(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 wastewater.
Wastewater and reclaimed water quality	Source control – salts	City of Ventura – Ordinances on Industrial	Prohibits discharge of saltwater or brine from commercial or industrial activities. Establishes local limits for	Prohibits the additional salt load to wastewater from saltwater or brine from commercial or

Category	Specific Measure	Agency/Action	Description	Effect
		discharges	industrial/commercial facilities. Establishes permit requirements for non-domestic wastewater discharges.	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).
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	Reduces the load of nitrogen that is transported by runoff to surface waters and by infiltration to groundwater.

Category	Specific Measure	Agency/Action	Description	Effect
			on the results of soil fertility measurements.	
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.
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 from the removal of existing water softeners in the SNMP planning area through a rebate program, and, where necessary, from 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.

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

Groundwater Basin	Subarea	Agency	Type of Future Use	Volume of Use	Timing of Use
Piru	reek	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	60 AFY (0.05 mgd)	Unknown – depends on pipeline construction
			Panam Sat Orchard - 20-acre avocado orchard	147 AFY (0.13 mgd)	Unknown – may depend on developing competitive pricing for recycled water
			Baldwin Towne Plaza – 5-acre turf	10 AFY (0.01 mgd)	Unknown – may depend on developing competitive pricing for recycled water
			Agricultural area east of City limits – no defined acreage	Unknown	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

Groundwater Basin	Subarea	Agency	Type of Future Use	Volume of Use	Timing of Use
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 mgd)	2025 Implementation at 9,700 AFY – dependent on outcome of 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). 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 to manage salts and nutrients on a sustainable basis in such cases. (Table 8.2-6c).

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-regenerating water softeners will reduce the

Category	Specific Measure	Agency/ Action	Description	Effect
				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>
<tr><td>Additional Resources</td><td>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.</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>

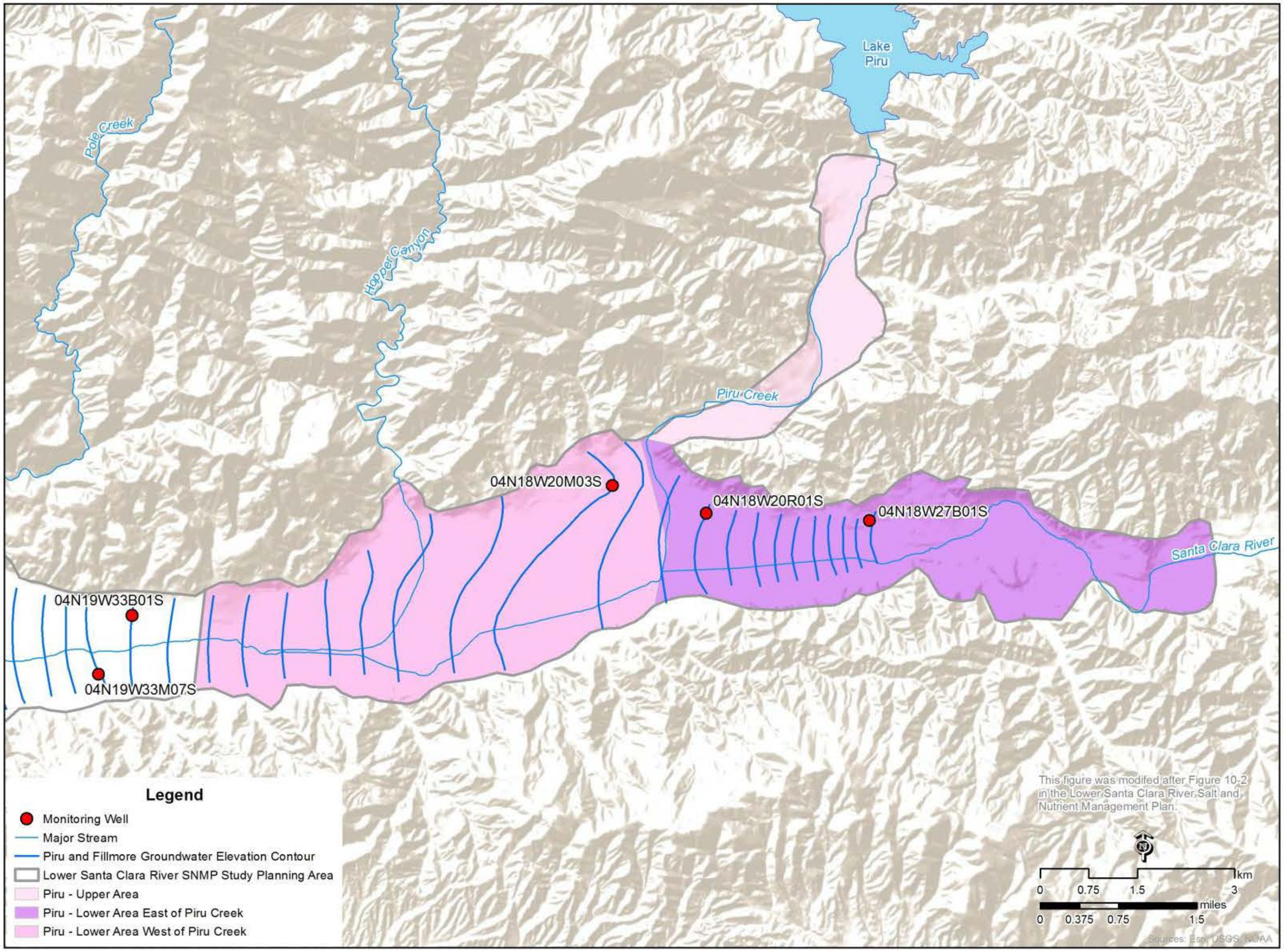

Figure 8.2-2A. Location of SNMP Monitoring Wells in the Piru Basin.

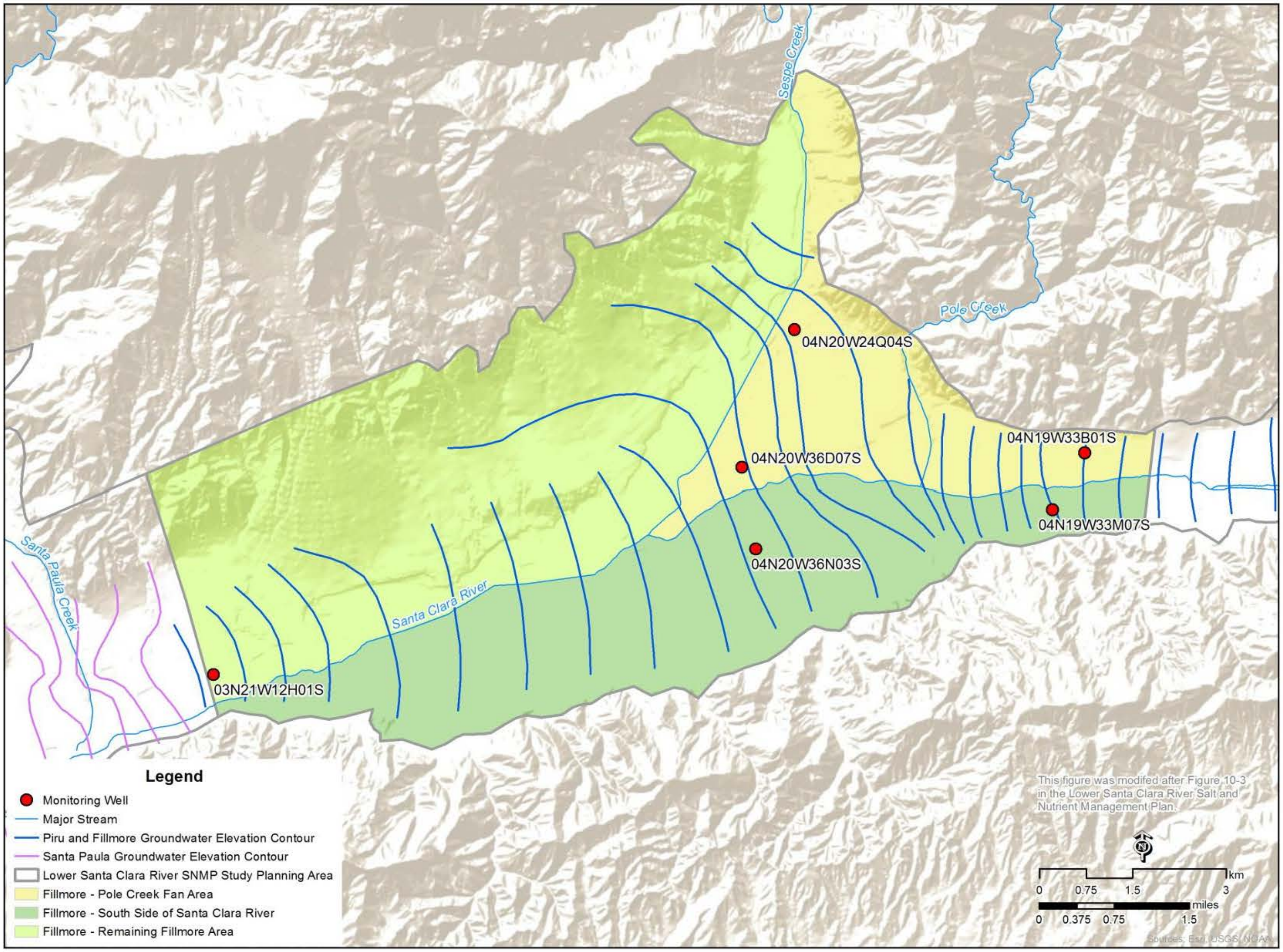

Figure 8.2-2B. Location of SNMP Monitoring Wells in the Fillmore Basin.

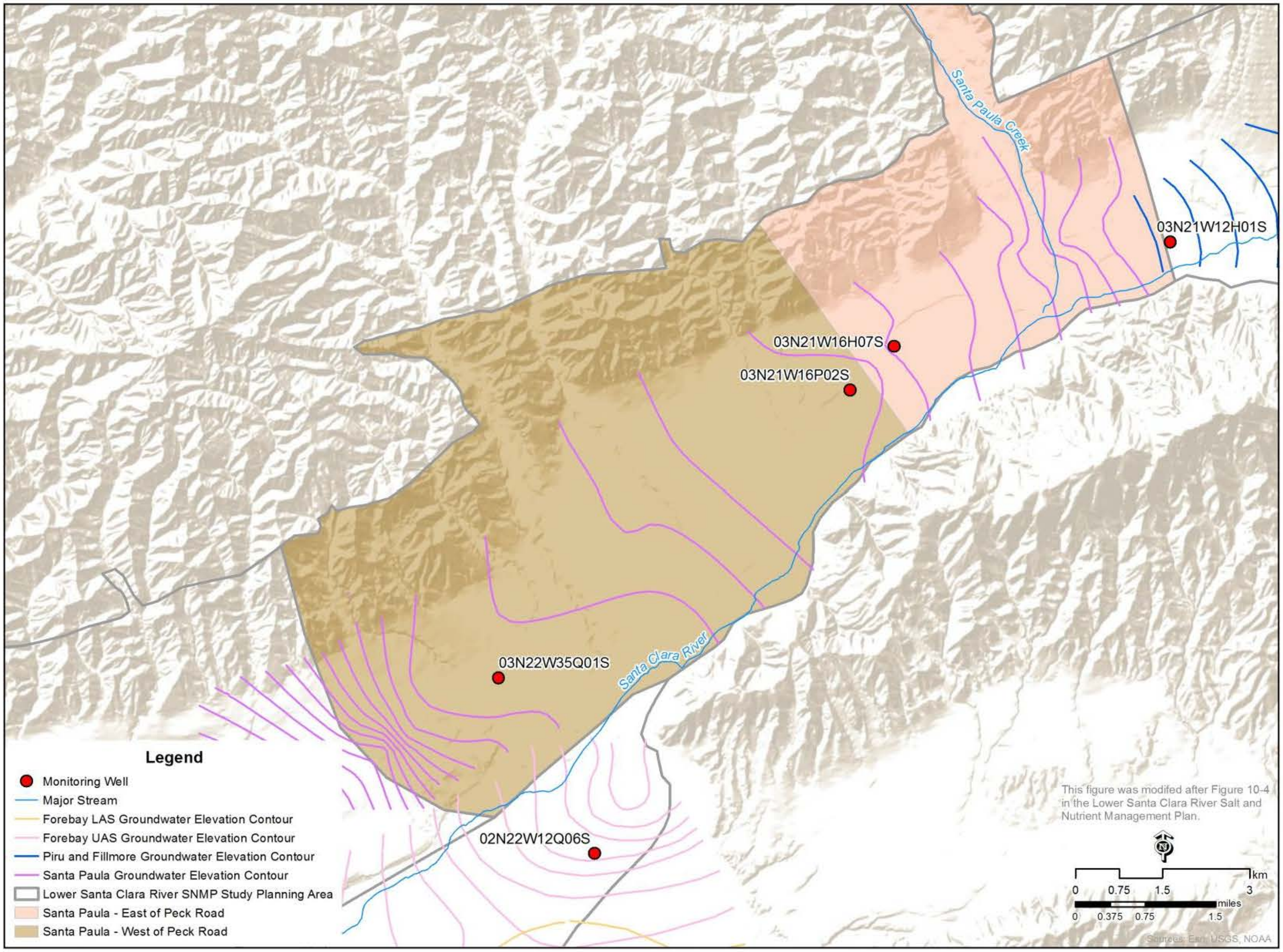

Figure 8.2-2C. Location of SNMP Monitoring Wells in the Santa Paula Basin.

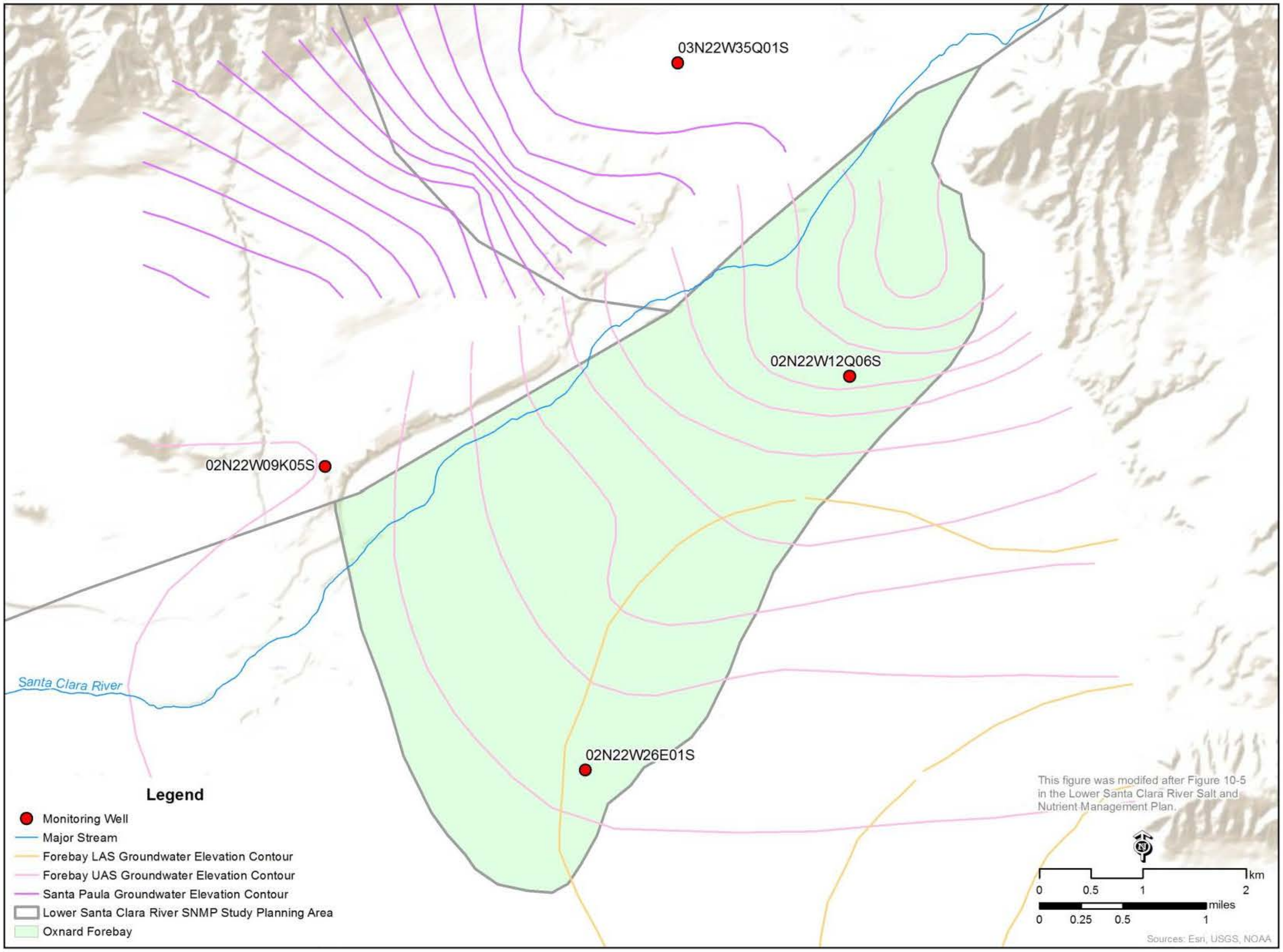

Figure 8.2-2D. Location of SNMP Monitoring Wells in the Oxnard Forebay Basin.

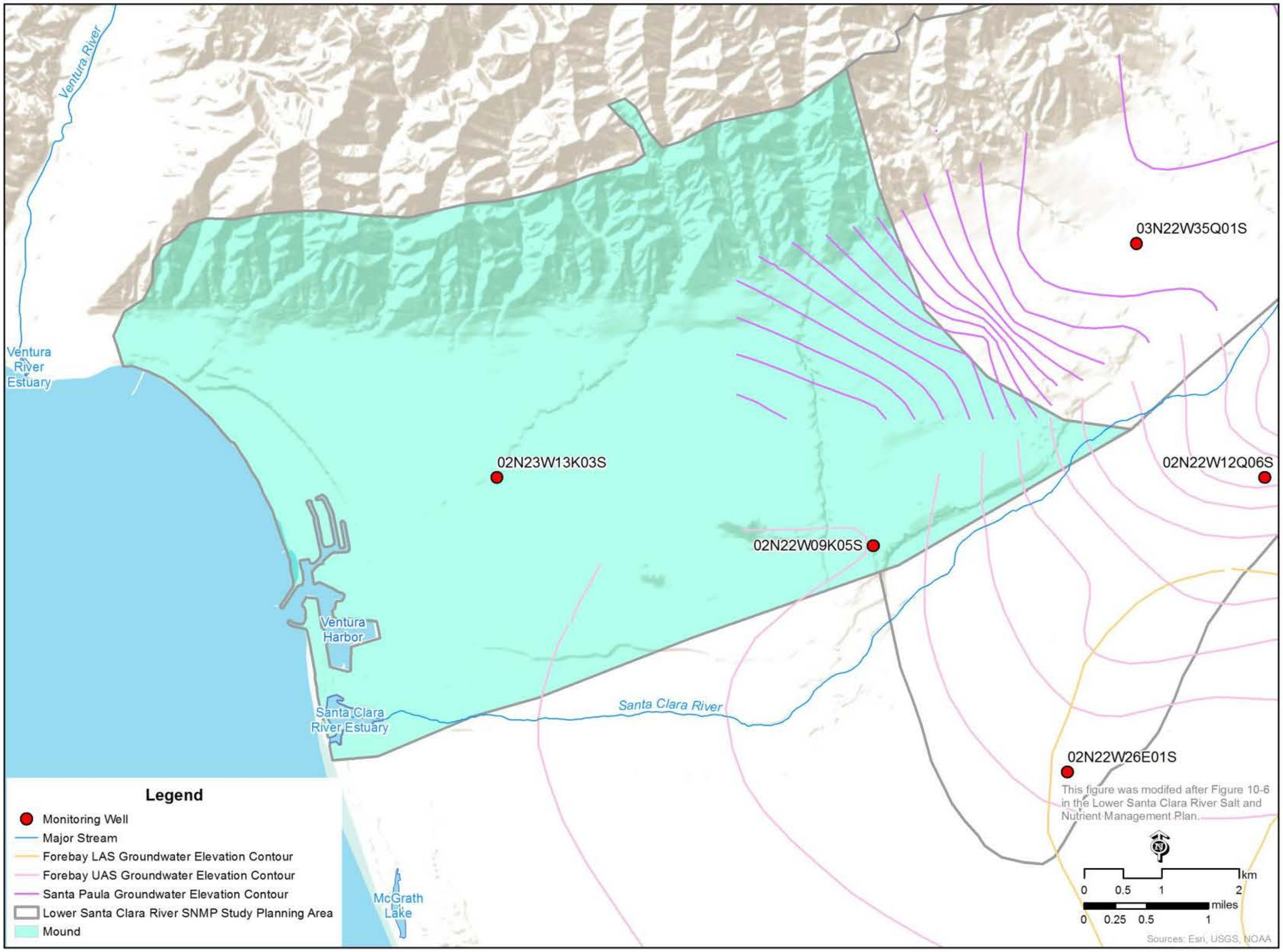

Figure 8.2-2E. Location of SNMP Monitoring Wells in the Mound Basin.

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, 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 Lower Santa Clara River Basin are voluntary measures that are designed to maintain water quality that is protective of beneficial uses and address elevated salt and nutrient concentrations in localized areas. 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.