Final Task 1 Report For

Santa Clara River Nutrient TMDL Analysis:

Source Identification and Characterization

Prepared for

Santa Clara Nutrient TMDL Steering Committee

On behalf of the
Los Angeles Regional Water Quality Control Board and
Watershed Stakeholder Groups

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I. Introduction

Background

The Los Angeles Regional Water Quality Control Board (LA RWCB) has determined that several segments and tributaries of the Santa Clara River do not meet the water quality criteria for their beneficial uses. As a result, these segments are listed on the 1998 303(d) list of impaired waters. The impairment is caused by excessive ammonia, nitrite/nitrate, organic enrichment, and low dissolved oxygen. Based on consent decree, Total Maximum Daily Loads (TMDLs) must be calculated which will protect the beneficial uses including recreation, wildlife habitat, and municipal, industrial, and agricultural supply. (LA RWCB 2002)

Objective

The Santa Clara River watershed drains an area of 1,618 square miles, with a wide variety of land uses including mountain forest, urbanized areas, and agricultural land. The watershed lies almost entirely in Los Angeles and Ventura Counties, California. The flow is highly seasonal and dominated by winter storm events. Several stream segments within the watershed have been determined to be impaired and need TMDLs calculated for their primary pollutants. This process involves five steps:

1. Assess the sources of pollution loads in the watershed,
2. Link pollution loads to numerical water quality targets for the impaired segments;
3. Determine the TMDLs for the impaired stream segments;
4. Provide technical assistance to the stakeholders group to fulfill their tasks.
5. Prepare a final report

This report summarizes the findings of the first task.

II. Loading Sources

In identifying impaired river segments and loading sources, the Santa Clara River has been divided into reaches. There are two separate designations of reaches: one from the United States Environmental Protection Agency (US EPA) and the other from LA RWQCB, as shown in Tables 1 and 2 (LA RWQCB 2002). ***This report uses the US EPA reach designations***.

Table 1: US EPA Reach designations for the Santa Clara River

Reach	Description
1	Santa Clara Estuary to Highway 101
2	Highway 101 to Freeman diversion dam
3	Freeman diversion dam to above Santa Paula Creek and below Timber Canyon
4	Above Timber Canyon to above Grimes Canyon
5	Above Grimes Canyon to Propane Road
6	Propane Road to Blue Cut gaging station
7	Blue Cut gaging station to west pier Highway 99
8	West pier Highway 99 to Bouquet Canyon Road
9	Bouquet Canyon Road to Lang gaging station
10	Above Lang gaging station

Table 2: LA RWQCB Reach designations for the Santa Clara River

Reach	Description
1	Santa Clara Estuary to Highway 101
2	Highway 101 to Freeman diversion dam
3	Freeman diversion dam to Fillmore “A” Street
4	Fillmore “A” Street to Blue Cut gaging station
5	Blue Cut gaging station to west pier Highway 99
6	West pier Highway 99 to Bouquet Canyon Road
7	Bouquet Canyon Road to Lang gaging station
8	Above Lang gaging station

Figure 1 shows the impaired reaches and tributaries of the Santa Clara River: Mint Canyon Creek (1), Santa Clara River Reach 8 (2), Santa Clara River Reach 7 (3), Santa Clara River Reach 3 (4), Wheeler Canyon / Todd Barranca (5), and Brown Barranca / Long Canyon (6).

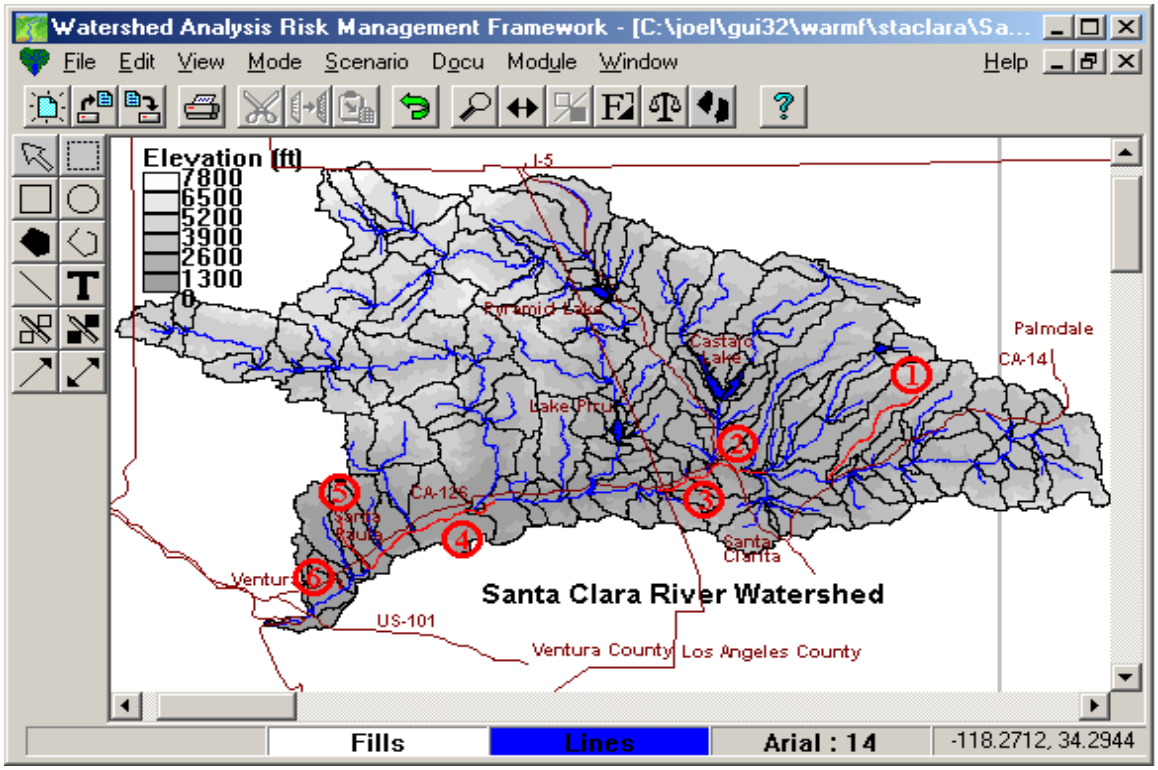

Figure 1: Impaired segments of the Santa Clara River watershed

For purposes of this analysis, the watershed has been broken into the land area which drains to each impaired reach of the Santa Clara River, as shown in Figure 2.

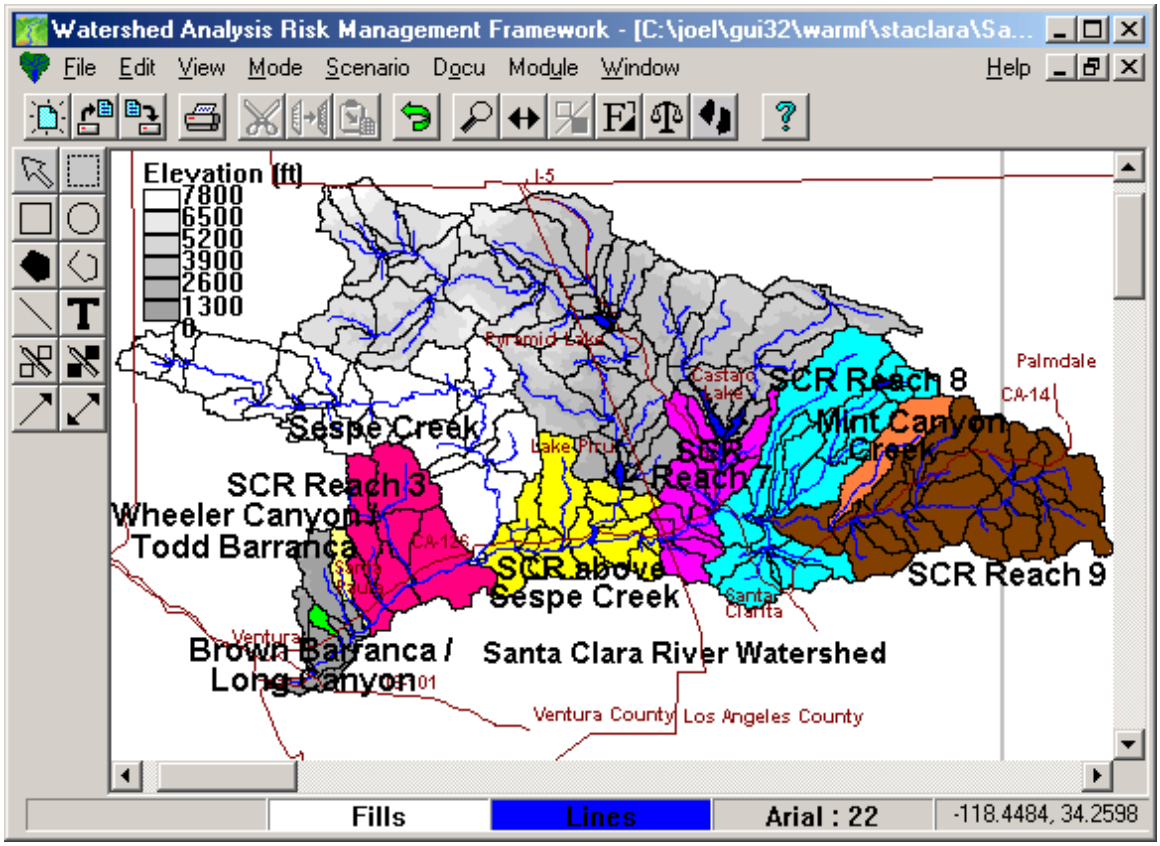

Figure 2 Analysis subregions of the Santa Clara River watershed

The Santa Clara River flows generally from east to west. The Mint Canyon Creek subregion in orange only consists of the land area draining to Mint Canyon Creek. The area draining to impaired Reach 8 has been split into two pieces. The brown area drains to Reach 9, including Reach 10. The turquoise color indicates the area which drains directly to the Santa Clara River, Reach 8. The turquoise area includes Santa Clarita. The magenta subregion drains to Santa Clara River Reach 7. The area draining to the impaired Reach 3 of the Santa Clara River is a large area which has been split into three pieces for this analysis. The yellow area is the Santa Clara River above Sespe Creek, which includes all of Reaches 5 and 6 of the Santa Clara River. In white is Sespe Creek, which drains eastward and then south to its confluence with the Santa Clara River. There is very little human impact within the Sespe Creek drainage. The red area drains to Santa Clara River Reach 3, also including Reach 4. The small yellow area near Santa Paula is Wheeler Canyon, whose drainage is called Todd Barranca near the Santa Clara River. The small green area is Long Canyon, whose drainage is called Brown Barranca.

The gray regions in Figure 2 are not included in this analysis. The watersheds tributary to Lake Piru and Castaic Lake provide flow and loading input to the Santa Clara River through the release from their dams. The gray region near Ventura does not drain to any impaired segment of the Santa Clara River watershed.

The lowlands near the lower Santa Clara River (yellow, white, and red areas) is an agricultural area, producing citrus fruit, avocadoes, and vegetables. Under this region is

an unconfined aquifer. (UWCD 2002) This aquifer and stream diversions provide irrigation water for these crops.

Each catchment (black outlined object in Figure 1) is divided into land uses. The percentage of each land use in each catchment is calculated by overlaying an ArcView shapefile with the catchment boundaries. Three different databases were used for land use / land cover: 1980 data from BASINS (US EPA 2001), 1993 data from Southern California Association of Governments (SCAG) (SCAG 1993), and draft 2000 data from Ventura County (Ventura County 2002). The BASINS database covers the entire watershed and includes separate designations for each type of natural land cover. The SCAG database covers Ventura County and much of Los Angeles County (including the immediate Santa Clarita area) and has separate designations for different agricultural and urban land uses. The Ventura County database has detailed designations of agricultural land uses but is not detailed with regard to residential and commercial land uses. Table 3 shows the total land area of each subregion. Table 4 shows which database was used for each land use type in Ventura and Los Angeles Counties. Where SCAG and BASINS are listed as sources for Los Angeles County, SCAG was used in the area to which it applied and BASINS was used for the remaining (primarily rural) area. Table 5 shows the aggregate land use percentages within each region.

Table 3: Santa Clara River Watershed Subregion Areas

Subregion	Area (km^2)
Mint Canyon Creek	**75**
Santa Clara River Reach 9	**534**
Santa Clara River Reach 8	**438**
Santa Clara River Reach 7	**218**
Santa Clara River above Sespe Creek	**268**
Sespe Creek	**685**
Santa Clara River Reach 3	**284**
Wheeler Canyon / Todd Barranca	**24**
Brown Barranca / Long Canyon	**7**
TOTAL	**2534**

Table 4: Land Use Data Sources

Land Use	Ventura County	Los Angeles County
Deciduous	BASINS	BASINS
Mixed Forest	BASINS	BASINS
Orchard	Ventura County	SCAG/BASINS
Coniferous	BASINS	BASINS
Shrub / Scrub	BASINS	BASINS
Grassland	BASINS	BASINS
Park	Ventura County	SCAG
Golf Course	Ventura County	SCAG
Pasture	Ventura County	SCAG
Cropland	Ventura County	SCAG/BASINS
Marsh	Ventura County	BASINS
Barren	Ventura County	SCAG/BASINS
Water	Ventura County	SCAG/BASINS
Residential	SCAG	SCAG/BASINS
High Density Residential	SCAG	SCAG
Comm./Industrial	SCAG	SCAG/BASINS

Table 5: Land use in each watershed subregion, %

Land Use	Mint Canyon	SCR Reach 9	SCR Reach 8	SCR Reach 7	SCR abv Sespe	Sespe	SCR Reach 3	Wheeler / Todd	Long / Brown	Total
Deciduous	0.00	0.00	0.08	0.84	0.49	0.00	3.31	0.00	0.00	0.51
Mixed Forest	0.00	0.47	1.66	0.00	0.00	1.53	1.05	0.00	0.00	0.92
Orchard	0.00	0.11	0.18	0.33	11.85	2.04	16.62	10.53	24.21	3.92
Coniferous	0.00	5.99	1.24	1.23	8.33	28.71	33.67	44.30	0.00	14.41
Shrub / Scrub	87.75	74.95	62.60	80.72	70.37	66.85	36.33	38.83	56.31	66.30
Grassland	3.46	4.09	0.54	1.26	4.01	0.37	2.38	1.75	2.55	1.98
Park	0.00	0.05	0.24	0.00	0.19	0.01	0.20	0.00	0.82	0.10
Golf Course	0.00	0.05	1.09	0.64	0.16	0.00	0.09	0.00	0.00	0.28
Pasture	0.30	0.43	0.37	0.75	0.05	0.00	0.02	0.00	0.00	0.23
Cropland	0.74	0.21	0.46	1.80	1.13	0.09	1.17	0.89	4.95	0.60
Marsh	0.00	0.00	0.02	1.45	0.05	0.00	0.00	0.00	0.00	0.13
Barren	0.05	0.32	1.03	0.51	0.04	0.01	0.02	0.26	0.00	0.30
Water	0.00	0.00	0.67	0.08	0.01	0.00	0.00	0.00	0.00	0.12
Residential	2.80	6.77	1.52	1.13	0.40	0.19	0.99	2.32	0.00	2.10
High Density Residential	2.03	2.97	20.69	2.63	0.99	0.06	2.07	0.19	0.00	4.84
Comm./Industrial	2.87	3.59	7.61	6.63	1.94	0.12	2.07	0.94	11.16	3.24

This source identification and characterization analysis is focused on those pollutants of primary concern in the Santa Clara River watershed: nitrogen (ammonia, nitrite, nitrate) and phosphorus. Both nitrogen and phosphorus are also present in organic matter. Some data is available for organic nitrogen, but since measurement of ammonia is more

common than measurement of organic or kjeldahl nitrogen, loading sources will be presented here in terms of ammonia. Since the natural reaction to convert nitrite to nitrate is faster than the reaction producing nitrite from ammonia, very little nitrite is normally present in nature. Therefore, the sources of nitrite are exclusively surface and subsurface point source discharges.

The time period used for this source characterization analysis is water years 1990-2000 (10/1/1989 – 9/30/2000). The loading is described seasonally by averaging the loading for each month in the 11 year time frame. Although three significant figures are provided in most cases in this report, that does not mean that any numbers presented are truly that precise. Rather, the significant figures are meant to ensure that the relationships between different loading sources are clear.

This report is intended to be a detailed summary of the current understanding of nutrient pollutant sources in the Santa Clara River watershed. Although every effort has been made to make this report as comprehensive as possible, there are probably other sources of pollutant loading in addition to those presented here. Any apparent omissions or corrections should be brought to the attention of the Santa Clara River Nutrient TMDL Steering Committee and Systech Engineering immediately.

The pollutant sources described in this report are divided into categories which describe how those sources affect water quality. This report does not attempt to link pollutant sources with water quality, however, as the transport and assimilation of pollutants varies according to location, time of year, water management, and the presence of other pollutants.

Direct Sources

Direct sources are those which discharge directly to the surface waters in the affected watershed subregions. Loading from these sources is only attenuated through in-stream processes including sediment adsorption and uptake by periphyton. Loading from these sources, as well as accompanying assimilative capacity, may also be removed by diversion.

Reservoir Releases

The releases from Castaic Lake and Lake Piru are treated in a manner similar to point sources, and no attempt is made to ascertain the ultimate source of pollutants. Flow for these sources is known from USGS gaging stations downstream of the dams (11109800 and 11108134), water quality is estimated from measured values from 1992-2000 from Piru Creek (USGS 11109800 and United Water Conservation District (UWCD) 4N18W03SW2) and extrapolated as necessary. Very little water quality data is available for Castaic Creek (UWCD 04N17W14SW1) and that data shows a similar quality to Piru Creek, so it is assumed that the water quality of Castaic Creek is the same as Piru Creek. Tables 6-8 show the average monthly loading for both these sources. Nitrite loading is assumed to be always zero for both sources.

Table 6: Monthly Reservoir Release Loading of Ammonia Nitrogen, kg/d

Region	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Castaic Lake	0.22	3.94	3.71	1.68	1.54	0.68	0.42	0.28	0.19	0.03	0.07	0.17	1.06
Lake Piru	1.53	2.63	3.34	1.89	3.26	2.39	1.68	4.31	15.21	14.25	7.35	2.4	5.02

Table 7: Monthly Reservoir Release Loading of Nitrate Nitrogen, kg/d

Region	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Castaic Lake	0.38	9.55	11.49	9.51	17.36	4.33	0.63	1.28	0	0.22	0.43	0.89	4.65
Lake Piru	2.68	6.37	10.33	10.68	36.76	15.31	2.52	19.46	0	96.54	43.57	12.2	21.53

Table 8: Monthly Reservoir Release Loading of Phosphorus, kg/d

Region	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Castaic Lake	0.2	3.61	3.41	3.37	1.41	0.62	0.38	0.26	0.07	0.03	0.07	0.16	1.11
Lake Piru	1.4	2.41	3.06	3.78	2.98	2.19	1.54	3.95	5.7	13.06	6.74	2.2	4.09

Direct Point Sources

Direct point sources are those which discharge directly to surface waters such as Santa Clara River and its tributaries. Each of these has a permit from the National Pollution Discharge Elimination System (NPDES). Table 9 shows a list of all the NPDES surface water dischargers, broken down into regions of the watershed, from the US EPA Permit Compliance System. The Fillmore WWTP includes both surface and groundwater discharges. Only the surface discharges are included here.

Table 9: Permitted Surface Water Discharges

NPDES Permit	Name	Average Flow, m^3/s
Total Mint Canyon Creek		**0**
CA0061638	City of Santa Clarita	0.0011
Total Santa Clara River Reach 9		**0.0011**
CA0003271	H R Textron Inc Valencia Facility	0.0003
CA0003352	Six Flags Magic Mountain Inc	0.0044
CA0054313	Saugus WWRP	0.2498
CA0057126	Keysor Century Corp	0.0042
CA0064017	H R Textron Inc Valencia Facility	0
Total Santa Clara River Reach 8		**0.2587**
CA0054216	Valencia WWRP	0.4036
CA0062561	Val Verde County Park Swimming Pool	0.000004
Total Santa Clara River Reach 7		**0.4036**
CA0059021	Fillmore WWTP	0.0078
CA0063240	Texaco Trading and Transportation Inc	0.0020
Total Santa Clara River above Sespe Creek		**0.0098**
Total Sespe Creek		**0**
CA0054224	Santa Paula WWRP	0.0858
Total Santa Clara River Reach 3		**0.0858**
Total Wheeler Canyon / Todd Barranca		**0**
Total Brown Barranca / Long Canyon		**0**
TOTAL WATERSHED		**0.759**

The flow and loading data for each was compiled from Discharge Monitoring Reports and information from the Los Angeles County Sanitation District. Tables 10-14 show the frequency of data used to evaluate point source loading and what assumptions were made to fill in data gaps. The data came from discharge monitoring reports (DMRs), United Water Conservation District water quality monitoring data (UWCD), and Los Angeles County Santitation District data (LACSD),

Table 10: Flow Data Frequency and Availability for Direct Point Source Discharges

NPDES Permit	Data Frequency and Availability
CA0061638	1989-2000: average of 2001 2001: two DMR data points
CA0003271	1989-9/2000: average of 10/2000-2001 10/2000-2001: monthly DMR data
CA0003352	1989-2000: average of 2001 2001: quarterly DMR data
CA0054313	1989-2001: daily LACSD data
CA0057126	1989-2001: one DMR flow value
CA0064017	DMR has zero discharge after 1/2000; assumed zero discharge always
CA0054216	1989-2001: daily LACSD data
CA0062561	1989-2000: copy of 2001 season 2001: two DMR measurements; operates seasonally May-September
CA0059021	1989-9/1998,11/1998,1/1999-4/1999,6/1999-12/1999,5/2001-10/2001: daily DMR data 10/1998,12/1998,5/1999,1/2001-4/2001: monthly or sporadic DMR data 1/2000-12/2000: no data: apparently no flow
CA0063240	1989-11/1993: average of 12/1993-2001 12/1993-2001: monthly DMR data
CA0054224	1989-6/1998: daily data 7/1998-2000: monthly DMR data 2001: daily/monthly DMR data

Table 11: Ammonia Nitrogen Data Frequency and Availability for Direct Point Source Discharges

NPDES Permit	Data Frequency and Availability
CA0061638	No data: zero discharge assumed
CA0003271	No data: zero discharge assumed
CA0003352	No data: assumed 20 mg/l discharge
CA0054313	1989-5/1992: average concentration of 6/1992-2001 6/1992-2001: monthly LACSD data
CA0057126	No data: zero discharge assumed
CA0064017	No data: zero discharge assumed
CA0054216	1989-1992: annual DMR data 1993-2001: monthly or more frequent LACSD data
CA0062561	No data: zero discharge assumed
CA0059021	1989-1/1993: average of 2/1993-8/2001 2/1993-8/2001: monthly DMR data when there was flow
CA0063240	No data: zero discharge assumed
CA0054224	1989-1997: monthly data 1998-2001: monthly DMR data

Table 12: Nitrite Nitrogen Data Frequency and Availability for Direct Point Source Discharges

NPDES Permit	Data Frequency and Availability
CA0061638	No specific data: zero discharge assumed
CA0003271	No specific data: zero discharge assumed
CA0003352	1989-2000: average of 2001 2001: quarterly DMR data
CA0054313	1989-5/1992: average concentration of 6/1992-2001 6/1992-2001: monthly LACSD data
CA0057126	1989-9/2000: average of 10/2000-2001 10/2000-2001: two DMR data points
CA0064017	No data: zero discharge assumed
CA0054216	1989-1992: annual DMR data 1993-2001: monthly LACSD data
CA0062561	1989-2000: copy of 2001 season 2001: two DMR measurements; operates seasonally May-September
CA0059021	1989-1/1993: average of 2/1993-8/2001 2/1993-8/2001: monthly DMR data when there was flow
CA0063240	No specific data: zero discharge assumed
CA0054224	1989-9/1997: monthly data 10/1997-12/1997: UWCD data 1998-2001: monthly DMR data

Table 13: Nitrate Nitrogen Data Frequency and Availability for Direct Point Source Discharges

NPDES Permit	Data Frequency and Availability
CA0061638	1989-2001: one 2001 data point for NO_2+NO_3 used for all years
CA0003271	1989-2000: average of 2001 NO2+NO3 data 2001: quarterly NO2+NO3 DMR data, zero discharge of NO2 assumed
CA0003352	1989-2000: average of 2001 2001: quarterly DMR data
CA0054313	1989-5/1992: average concentration of 6/1992-2001 6/1992-2001: monthly LACSD data
CA0057126	1989-9/2000: average of 10/2000-2001 10/2000-2001: two DMR data points
CA0064017	No data: zero discharge assumed
CA0054216	1989-1992: annual DMR data 1993-2001: monthly LACSD data
CA0062561	1989-2000: copy of 2001 season 2001: two DMR measurements; operates seasonally May-September
CA0059021	1989-1/1993: average of 2/1993-8/2001 2/1993-8/2001: monthly DMR data when there was flow
CA0063240	1989-7/1994,12/1997-1/1999,3/2000-2001: average of periods with data 8/1994-11/1997,2/1999-2/2000: quarterly NO_2+NO_3 DMR data
CA0054224	1989-9/1997: monthly data 10/1997-12/1997: UWCD data 1998-2001: monthly DMR data

Table 14: Phosphorus Data Frequency and Availability for Direct Point Source Discharges

NPDES Permit	Data Frequency and Availability
CA0061638	No data: zero discharge assumed
CA0003271	No data: zero discharge assumed
CA0003352	No data: assumed 6 mg/l discharge
CA0054313	1989: average concentration of 1990-2001 1990-2001: monthly/quarterly LACSD data
CA0057126	No data: zero discharge assumed
CA0064017	No data: zero discharge assumed
CA0054216	1989-2001: approximately monthly LACSD data
CA0062561	No data: zero discharge assumed
CA0059021	No data: assumed 3 mg/l discharge
CA0063240	No data: zero discharge assumed
CA0054224	1989-9/1997: average of 1997-2001 data 10/1997-12/1997: UWCD data 1998-2001: monthly DMR data

When available data is compiled and data gaps filled, there is a complete record of flow and loading for each pollutant over the entire time period for the source characterization

analysis. Using that complete record, the average loading for each month was calculated and averaged for the same month in all years used in the analysis. The result is the monthly distribution of loading shown in Tables 15-18.

Table 15: Average Monthly Surface Discharge of Point Source Ammonia, kg/d as N

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Total Mint Canyon Creek	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
CA0061638	0	0	0	0	0	0	0	0	0	0	0	0	0
Total SCR Reach 9	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
CA0003271	0	0	0	0	0	0	0	0	0	0	0	0	0
CA0003352	7.55	7.55	7.55	7.55	7.55	7.55	7.55	7.55	7.55	7.81	7.41	7.41	7.55
CA0054313	250	230	229	209	243	239	225	237	246	259	260	278	243
CA0057126	0	0	0	0	0	0	0	0	0	0	0	0	0
CA0064017	0	0	0	0	0	0	0	0	0	0	0	0	0
Total SCR Reach 8	**258**	**238**	**237**	**217**	**251**	**247**	**233**	**245**	**254**	**267**	**267**	**285**	**251**
CA0054216	561	520	547	594	579	585	585	540	537	505	551	570	556
CA0062561	0	0	0	0	0	0	0	0	0	0	0	0	0
Total SCR Reach 7	**561**	**520**	**547**	**594**	**579**	**585**	**585**	**540**	**537**	**505**	**551**	**570**	**556**
CA0059021	4.9	1.6	9.8	16.4	7.2	15.8	29.2	12.1	3.7	2.3	2.9	5	9.3
CA0063240	0	0	0	0	0	0	0	0	0	0	0	0	0
Total SCR above Sespe Creek	**4.9**	**1.6**	**9.8**	**16.4**	**7.2**	**15.8**	**29.2**	**12.1**	**3.7**	**2.3**	**2.9**	**5**	**9.3**
Total Sespe Creek	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
CA0054224	146	139	154	134	144	157	139	136	123	120	136	155	140
Total SCR Reach 3	**146**	**139**	**154**	**134**	**144**	**157**	**139**	**136**	**123**	**120**	**136**	**155**	**140**
Total Wheeler Cyn / Todd Barr.	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Total Brown Barr. / Long Cyn	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
TOTAL WATERSHED	**970**	**899**	**948**	**961**	**981**	**1005**	**986**	**933**	**918**	**894**	**957**	**1015**	**956**

Table 16: Average Monthly Surface Discharge of Point Source Nitrite, kg/d as N

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Total Mint Canyon Creek	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
CA0061638	0	0	0	0	0	0	0	0	0	0	0	0	0
Total SCR Reach 9	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
CA0003271	0	0	0	0	0	0	0	0	0	0	0	0	0
CA0003352	0	0	0	0	0	0	0	0	0	0	0	0	0
CA0054313	52.3	42.7	39.9	38.9	41.8	38.3	41.1	40.9	41.6	39.9	43	51	42.7
CA0057126	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52
CA0064017	0	0	0	0	0	0	0	0	0	0	0	0	0
Total SCR Reach 8	**52.8**	**43.2**	**40.4**	**39.4**	**42.3**	**38.8**	**41.6**	**41.4**	**42.1**	**40.4**	**43.5**	**51.5**	**43.2**
CA0054216	46.2	48.6	51.7	46.7	51.2	50.1	52.6	45.3	52.9	47.1	44.2	46.3	48.5
CA0062561	0	0	0	0	0	0	0	0	0	0	0	0	0
Total SCR Reach 7	**46.2**	**48.6**	**51.7**	**46.7**	**51.2**	**50.1**	**52.6**	**45.3**	**52.9**	**47.1**	**44.2**	**46.3**	**48.5**
CA0059021	0.08	0.02	0.22	0.11	0.03	0.25	0.23	0.13	0.11	0.04	0.05	0.08	0.11
CA0063240	0	0	0	0	0	0	0	0	0	0	0	0	0
Total SCR above Sespe Creek	**0.08**	**0.02**	**0.22**	**0.11**	**0.03**	**0.25**	**0.23**	**0.13**	**0.11**	**0.04**	**0.05**	**0.08**	**0.11**
Total Sespe Creek	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
CA0054224	4.03	4.12	4.06	5.09	4.58	4.41	5.69	6.5	8.6	9.19	5.98	3.54	5.5
Total SCR Reach 3	**4.03**	**4.12**	**4.06**	**5.09**	**4.58**	**4.41**	**5.69**	**6.5**	**8.6**	**9.19**	**5.98**	**3.54**	**5.5**
Total Wheeler Cyn / Todd Barr.	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Total Brown Barr. / Long Cyn	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
TOTAL WATERSHED	**103**	**96**	**96**	**91**	**98**	**94**	**100**	**93**	**104**	**97**	**94**	**101**	**97**

Table 17: Average Monthly Surface Discharge of Point Source Nitrate, kg/d as N

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Total Mint Canyon Creek	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
CA0061638	0.89	0.89	0.89	0.89	0.89	0.90	0.90	0.90	0.90	0.89	0.89	0.89	0.89
Total SCR Reach 9	**0.89**	**0.89**	**0.89**	**0.89**	**0.89**	**0.90**	**0.90**	**0.90**	**0.90**	**0.89**	**0.89**	**0.89**	**0.89**
CA0003271	0.18	0.19	0.19	0.19	0.2	0.2	0.21	0.21	0.2	0.19	0.18	0.19	0.19
CA0003352	1.71	1.71	1.71	1.64	1.64	1.64	1.68	1.68	1.68	1.77	1.68	1.68	1.68
CA0054313	28.1	33.8	30.7	35.7	45.6	57.5	43	30.4	37.2	40.5	33.3	29.3	37
CA0057126	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64
CA0064017	0	0	0	0	0	0	0	0	0	0	0	0	0
Total SCR Reach 8	**30.6**	**36.3**	**33.2**	**38.2**	**48.1**	**60.0**	**45.5**	**32.9**	**39.7**	**43.1**	**35.8**	**31.8**	**39.5**
CA0054216	188	189	203	201	175	189	206	194	185	220	228	202	199
CA0062561	0	0	0	0	0	0.006	0.021	0.024	0.004	0	0	0	0.005
Total SCR Reach 7	**188**	**189**	**203**	**201**	**175**	**189**	**206**	**194**	**185**	**220**	**228**	**202**	**199**
CA0059021	0.18	0.27	1.53	2.3	0.71	2.16	2.97	2.97	1.95	2.55	1.49	0.91	1.67
CA0063240	0.004	0.02	0.023	0.017	0.012	0.004	0.004	0.004	0.004	0.005	0.005	0.005	0.009
Total SCR above Sespe Creek	**0.18**	**0.29**	**1.55**	**2.32**	**0.72**	**2.16**	**2.97**	**2.97**	**1.95**	**2.56**	**1.50**	**0.92**	**1.68**

Total Sespe Creek	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
CA0054224	42.5	35	36.5	37.4	34.2	34.5	37.1	38.2	37.5	33.4	36.4	39.9	36.9
Total SCR Reach 3	**42.5**	**35**	**36.5**	**37.4**	**34.2**	**34.5**	**37.1**	**38.2**	**37.5**	**33.4**	**36.4**	**39.9**	**36.9**
Total Wheeler Cyn / Todd Barr	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Total Brown Barr. / Long Cyn	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
TOTAL WATERSHED	**262**	**261**	**275**	**280**	**259**	**287**	**292**	**269**	**265**	**300**	**303**	**276**	**278**

Table 18: Average Monthly Surface Discharge of Point Source Phosphorus, kg/d

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Total Mint Canyon Creek	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
CA0061638	0	0	0	0	0	0	0	0	0	0	0	0	0
Total SCR Reach 9	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
CA0003271	0	0	0	0	0	0	0	0	0	0	0	0	0
CA0003352	2.26	2.26	2.26	2.26	2.26	2.26	2.26	2.26	2.26	2.34	2.22	2.22	2.26
CA0054313	159	164	175	162	168	152	146	144	150	144	141	145	154
CA0057126	0	0	0	0	0	0	0	0	0	0	0	0	0
CA0064017	0	0	0	0	0	0	0	0	0	0	0	0	0
Total SCR Reach 8	**161**	**166**	**177**	**164**	**170**	**154**	**148**	**146**	**152**	**146**	**143**	**147**	**156**
CA0054216	339	337	348	343	287	266	274	266	220	228	251	284	286
CA0062561	0	0	0	0	0	0	0	0	0	0	0	0	0
Total SCR Reach 7	**339**	**337**	**348**	**343**	**287**	**266**	**274**	**266**	**220**	**228**	**251**	**284**	**286**
CA0059021	0.9	0.4	2.28	3.18	1.72	2.95	4.97	3.25	1.01	1.34	0.95	1.1	2.02
CA0063240	0	0	0	0	0	0	0	0	0	0	0	0	0
Total SCR above Sespe Creek	**0.9**	**0.4**	**2.28**	**3.18**	**1.72**	**2.95**	**4.97**	**3.25**	**1.01**	**1.34**	**0.95**	**1.1**	**2.02**
Total Sespe Creek	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
CA0054224	23.1	22.2	33	26.4	24	27.8	27.2	25.7	25.1	21	27.8	30.8	26.2
Total SCR Reach 3	**23.1**	**22.2**	**33**	**26.4**	**24**	**27.8**	**27.2**	**25.7**	**25.1**	**21**	**27.8**	**30.8**	**26.2**
Total Wheeler Cyn / Todd Barr.	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Total Brown Barr. / Long Cyn	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
TOTAL WATERSHED	**524**	**526**	**560**	**537**	**483**	**451**	**454**	**441**	**398**	**396**	**423**	**463**	**470**

Subsurface Discharges

There are many groundwater waste discharges in the Santa Clara River watershed. In each case, there is a mechanism which allows the waste to percolate into the soil. Once

into the soil, the water and its associated pollutants disperse, although they may be assimilated through soil adsorption or uptake by vegetation. These sources are not associated with any particular land use, but are assumed to be dispersed proportionately over all land uses.

Groundwater Discharges

The State of California issues permits for groundwater discharges. Table 19 shows all such dischargers in each subregion of the watershed.

Table 19: Permitted Groundwater Discharges

Name	Average Flow, m^3/s
Truck & RV Sales	0.000009
Veterans of Foreign Wars	0.000009
Total Mint Canyon Creek	**0.000018**
Acton Plaza	0.000088
Acton Rehabilitation Center	0.000964
Building A, Santiago Square, Acton	0.000464
Westar Properties, Acton	0.000088
Crown Valley Building Supply	0.000031
Crown Valley Community Church	0.000074
E Z Take Out, Acton	0.000057
Fire Camp #11, Acton	0.000394
Jack-in-the-Box #3304, Acton	0.000066
McDonald's Resaurant, Acton	0.000526
Mobil SS #11	0.000263
Mobil SS #18	0.000005
Rio Café	0.000066
Shell Oil, Acton	0.000066
Sierra Ranch WWTP	0.002848
Tract 21566, Acton	0.000066
Tract 22190, Acton	0.000066
Tract 22284 Acton	0.000004
Tract 45695, Acton	0.000053
Tract 46404, Acton	0.000832
Tract 46647 Acton	0.000158
Tract 47788, Acton	0.000250
Tract 48391, Acton	0.000044
Tract 48818, Acton	0.000066
Tract 49240, Acton	0.001038
Tract 49240, Acton	0.000355
Tract 49240, Acton	0.000197
Tract 49601, Acton	0.000482
Tract 49601, Acton	0.000066
Tract 49601, Acton	0.000407
Tract 49684, Acton	0.000066
Tract 50385, Acton	0.000066
Tract 52637, Acton	0.000066
Tract 52882, Acton	0.000920
Tract 52883, Acton	0.000066
Trans Technology Corp.	0.009201
Warm Springs Rehabilitation Center	0.000801
Total Santa Clara River Reach 9	**0.021270**
College of the Canyons	0.000040
H.R. Textron Valencia Facility	0.000197
Mobil Oil Newhall Station	0.006572
Total Santa Clara River Reach 8	**0.006809**
Total Santa Clara River Reach 7	**0**
Piru WWTP	0.004596
Fillmore WWTP	0.032716
Total Santa Clara River abv Sespe Ck	**0.037312**
Total Sespe Creek	**0**
Pan American Seed	0.000014
Thomas Aquinas College	0.000498
Total Santa Clara River Reach 3	**0.000512**
Limoneira & Olivelands Sewer Farm	0.000719
Saticoy Food Corp.	0.009201
Todd Road Jail Facility	0.003724
Total Wheeler Canyon / Todd Barranca	**0.013644**
Total Brown Barranca / Long Canyon	**0**
TOTAL WATERSHED	**0.079565**

In most cases, there is no monitoring data available for groundwater discharges. The State of California groundwater discharger database has a baseline flow. This was combined with assumed package sewage treatment plant effluent pollutant concentrations (25 mg/l NH_4-N, 5 mg/l NO_3-N, 6 mg/l P) to estimate load (Lindeburg 1999).

The flow and loading for each discharger with data was compiled from Discharge Monitoring Reports. Tables 20-24 show the frequency of data used to evaluate point source loading for those stations with data and what assumptions were made to fill in data gaps.

Table 20: Flow Data Frequency and Availability for Groundwater Point Source Discharges

Name	Data Frequency and Availability
Mobil SS #18	10/1989-10/2000: average of 10/2000-10/2001 10/2000-10/2001: weekly data
Warm Springs Rehabilitation Center	1989-1999: average of 2000-2001 2000-2001: monthly data
Fillmore WWTP	1989-9/1998,2/1999-12/1999: daily data 10/1998-1/1999,2000-2001: monthly data
Piru WWTP	1989-1992: average of 1993-2001 1993-2001: daily data
Pan American Seed	1989-1999: average of 2000-2001 2000-2001: quarterly data
Thomas Aquinas College	1989: monthly data 1990: daily and monthly data 1991-9/1998: daily data 10/1998-2001: average of 1989-1998
Limoneira & Olivelands Sewer Farm	1989-1992: average of 1993-2001 1993-2001: monthly data

Table 21: Ammonia Nitrogen Data Frequency and Availability for Groundwater Discharges

Name	Data Frequency and Availability
Mobil SS #18	No data: assumed zero discharge
Warm Springs Rehabilitation Center	1989-1999: average of 2000-2001 2000-2001: quarterly data
Fillmore WWTP	1989-7/1998: average of 8/1998-2001 8/1998-2001: monthly/quarterly data
Piru WWTP	1989-1999: average of 2000-2001 2000: monthly data 2001: quarterly data
Pan American Seed	No data: assumed 2 mg/l
Thomas Aquinas College	1989-4/1994: average of 5/1994-9/1998 5/1994–9/1998: quarterly data 10/1998-2001: average of 5/1994-9/1998
Limoneira & Olivelands Sewer Farm	No data: assumed no discharge

Table 22: Nitrite Nitrogen Data Frequency and Availability for Groundwater Discharges

Name	Data Frequency and Availability
Mobil SS #18	No data: assumed zero discharge
Warm Springs Rehabilitation Center	1989-1999: average of 2000-2001 2000-2001: quarterly data
Fillmore WWTP	1989-7/1998: average of 8/1998-2001 8/1998-2001: monthly/quarterly data
Piru WWTP	1989-1999: average of 2000-2001 2000: monthly data 2001: quarterly data
Pan American Seed	No data: assumed zero discharge
Thomas Aquinas College	1989-4/1994: average of 5/1994-9/1998 5/1994–9/1998: quarterly data 10/1998-2001: average of 5/1994-9/1998
Limoneira & Olivelands Sewer Farm	No data: assumed no discharge

Table 23: Nitrate Nitrogen Data Frequency and Availability for Groundwater Discharges

Name	Data Frequency and Availability
Mobil SS #18	No data: assumed zero discharge
Warm Springs Rehabilitation Center	1989-1999: average of 2000-2001 2000-2001: quarterly data
Fillmore WWTP	1989-7/1998: average of 8/1998-2001 8/1998-2001: monthly/quarterly data
Piru WWTP	1989-1999: average of 2000-2001 2000: monthly data 2001: quarterly data
Pan American Seed	No data: assumed 10 mg/l
Thomas Aquinas College	1989-4/1994: average of 5/1994-9/1998 5/1994–9/1998: quarterly data 10/1998-2001: average of 5/1994-9/1998
Limoneira & Olivelands Sewer Farm	1989-1992: average of 1993-2001 1993-2001: quarterly data

Table 24: Phosphorus Data Frequency and Availability for Groundwater Discharges

Name	Data Frequency and Availability
Mobil SS #18	No data: assumed zero discharge
Warm Springs Rehabilitation Center	No data: 3 mg/l assumed
Fillmore WWTP	No data: assumed 3 mg/l
Piru WWTP	1989-1999: average of 2000-2001 2000-2001: quarterly data
Pan American Seed	No data: assumed 2 mg/l
Thomas Aquinas College	No data: assumed 3 mg/l
Limoneira & Olivelands Sewer Farm	No data: assumed no discharge

When available data is compiled and data gaps filled, there is a complete record of flow and loading for each pollutant over the entire time period for the source characterization analysis. Using that complete record, the average loading for each month was calculated and averaged for the same month in all years used in the analysis. For discharges without data, constant flow and loading was assumed. The result is the monthly distribution of loading shown in Tables 25-28.

Table 25: Average Monthly Groundwater Discharge Loading of Ammonia Nitrogen, kg/d as N

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Truck & RV Sales	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019
Veterans of Foreign Wars	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019
Total Mint Canyon Creek	**0.038**	**0.038**	**0.038**	**0.038**	**0.038**	**0.038**	**0.038**	**0.038**	**0.038**	**0.038**	**0.038**	**0.038**	**0.038**
Acton Plaza	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189
Acton Rehabilitation Center	2.08	2.08	2.08	2.08	2.08	2.08	2.08	2.08	2.08	2.08	2.08	2.08	2.08
Building A, Santiago Sq, Acton	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Westar Properties, Acton	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189	0.189
Crown Valley Building Supply	0.066	0.066	0.066	0.066	0.066	0.066	0.066	0.066	0.066	0.066	0.066	0.066	0.066
Crown Valley Comm. Church	0.161	0.161	0.161	0.161	0.161	0.161	0.161	0.161	0.161	0.161	0.161	0.161	0.161
E Z Take Out, Acton	0.123	0.123	0.123	0.123	0.123	0.123	0.123	0.123	0.123	0.123	0.123	0.123	0.123

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Fire Camp #11, Acton	0.852	0.852	0.852	0.852	0.852	0.852	0.852	0.852	0.852	0.852	0.852	0.852	0.852
Jack-in-the-Box #3304, Acton	0.142	0.142	0.142	0.142	0.142	0.142	0.142	0.142	0.142	0.142	0.142	0.142	0.142
McDonald's Resaurant, Acton	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14
Mobil SS #11	0.568	0.568	0.568	0.568	0.568	0.568	0.568	0.568	0.568	0.568	0.568	0.568	0.568
Mobil SS #18	0	0	0	0	0	0	0	0	0	0	0	0	0
Rio Café	0.142	0.142	0.142	0.142	0.142	0.142	0.142	0.142	0.142	0.142	0.142	0.142	0.142
Shell Oil, Acton	0.142	0.142	0.142	0.142	0.142	0.142	0.142	0.142	0.142	0.142	0.142	0.142	0.142
Sierra Ranch WWTP	6.15	6.15	6.15	6.15	6.15	6.15	6.15	6.15	6.15	6.15	6.15	6.15	6.15
Tract 21566, Acton	0.142	0.142	0.142	0.142	0.142	0.142	0.142	0.142	0.142	0.142	0.142	0.142	0.142
Tract 22190, Acton	0.142	0.142	0.142	0.142	0.142	0.142	0.142	0.142	0.142	0.142	0.142	0.142	0.142
Tract 22284 Acton	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009
Tract 45695, Acton	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114
Tract 46404, Acton	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80
Tract 46647 Acton	0.341	0.341	0.341	0.341	0.341	0.341	0.341	0.341	0.341	0.341	0.341	0.341	0.341
Tract 47788, Acton	0.539	0.539	0.539	0.539	0.539	0.539	0.539	0.539	0.539	0.539	0.539	0.539	0.539
Tract 48391, Acton	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095
Tract 48818, Acton	0.142	0.142	0.142	0.142	0.142	0.142	0.142	0.142	0.142	0.142	0.142	0.142	0.142
Tract 49240, Acton	2.24	2.24	2.24	2.24	2.24	2.24	2.24	2.24	2.24	2.24	2.24	2.24	2.24
Tract 49240, Acton	0.767	0.767	0.767	0.767	0.767	0.767	0.767	0.767	0.767	0.767	0.767	0.767	0.767

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Tract 49240, Acton	0.426	0.426	0.426	0.426	0.426	0.426	0.426	0.426	0.426	0.426	0.426	0.426	0.426
Tract 49601, Acton	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Tract 49601, Acton	0.142	0.142	0.142	0.142	0.142	0.142	0.142	0.142	0.142	0.142	0.142	0.142	0.142
Tract 49601, Acton	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Tract 49684, Acton	0.142	0.142	0.142	0.142	0.142	0.142	0.142	0.142	0.142	0.142	0.142	0.142	0.142
Tract 50385, Acton	0.142	0.142	0.142	0.142	0.142	0.142	0.142	0.142	0.142	0.142	0.142	0.142	0.142
Tract 52637, Acton	0.142	0.142	0.142	0.142	0.142	0.142	0.142	0.142	0.142	0.142	0.142	0.142	0.142
Tract 52882, Acton	1.99	1.99	1.99	1.99	1.99	1.99	1.99	1.99	1.99	1.99	1.99	1.99	1.99
Tract 52883, Acton	0.142	0.142	0.142	0.142	0.142	0.142	0.142	0.142	0.142	0.142	0.142	0.142	0.142
Trans Technology Corp.	19.9	19.9	19.9	19.9	19.9	19.9	19.9	19.9	19.9	19.9	19.9	19.9	19.9
Warm Springs Rehab. Center	0.048	0.048	0.052	0.049	0.049	0.052	0.052	0.051	0.051	0.051	0.051	0.05	0.051
Total SCR Reach 9	**44.3**	**44.3**	**44.3**	**44.3**	**44.3**	**44.3**	**44.3**	**44.3**	**44.3**	**44.3**	**44.3**	**44.3**	**44.3**
College of the Canyons	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.08	0.08	0.08	0.085
H.R. Textron Valencia Facility	0.426	0.426	0.426	0.426	0.426	0.426	0.426	0.426	0.426	0.426	0.426	0.426	0.426
Mobil Oil Newhall Station	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2
Total SCR Reach 8	**14.7**	**14.7**	**14.7**	**14.7**	**14.7**	**14.7**	**14.7**	**14.7**	**14.7**	**14.7**	**14.7**	**14.7**	**14.7**
Total SCR Reach 7	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Fillmore WWTP	43.2	50.8	45.4	39.7	43.4	35.8	32	33.7	39.1	36.2	39.1	40	39.8
Piru WWTP	6.44	6.75	7.8	6.57	6.69	6.83	7.84	7.19	7.76	7.24	7.15	6.61	7.07
Total SCR above Sespe Creek	**49.6**	**57.6**	**53.2**	**46.3**	**50.1**	**42.6**	**39.8**	**40.9**	**46.9**	**43.4**	**46.3**	**46.6**	**46.9**
Total Sespe Creek	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Pan American Seed	0	0	0	0	0	0	0	0	0	0	0	0	0
Thomas Aquinas College	0.589	0.814	0.546	0.41	0.41	0.401	0.386	0.383	0.278	0.277	0.49	0.387	0.444

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Total SCR Reach 3	**0.589**	**0.814**	**0.546**	**0.41**	**0.41**	**0.401**	**0.386**	**0.383**	**0.278**	**0.277**	**0.49**	**0.387**	**0.444**
Limoneira & Olivelands Sewer Farm	0	0	0	0	0	0	0	0	0	0	0	0	0
Saticoy Food Corp.	19.9	19.9	19.9	19.9	19.9	19.9	19.9	19.9	19.9	19.9	19.9	19.9	19.9
Todd Road Jail Facility	8.05	8.05	8.05	8.05	8.05	8.05	8.05	8.05	8.05	8.05	8.05	8.05	8.05
Total Wheeler Cyn/Todd Barr	**27.9**	**27.9**	**27.9**	**27.9**	**27.9**	**27.9**	**27.9**	**27.9**	**27.9**	**27.9**	**27.9**	**27.9**	**27.9**
Total Brown Barr. / Long Cyn	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
TOTAL WATERSHED	**137**	**145**	**141**	**134**	**137**	**130**	**127**	**128**	**134**	**131**	**134**	**134**	**134**

Table 26: Average Monthly Groundwater Loading of Nitrite Nitrogen, kg/d as N

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Truck & RV Sales	0	0	0	0	0	0	0	0	0	0	0	0	0
Veterans of Foreign Wars	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Mint Canyon Creek	0	0	0	0	0	0	0	0	0	0	0	0	0
Acton Plaza	0	0	0	0	0	0	0	0	0	0	0	0	0
Acton Rehabilitation Center	0	0	0	0	0	0	0	0	0	0	0	0	0
Building A, Santiago Sq, Acton	0	0	0	0	0	0	0	0	0	0	0	0	0
Westar Properties, Acton	0	0	0	0	0	0	0	0	0	0	0	0	0
Crown Valley Building Supply	0	0	0	0	0	0	0	0	0	0	0	0	0
Crown Valley Comm. Church	0	0	0	0	0	0	0	0	0	0	0	0	0
E Z Take Out, Acton	0	0	0	0	0	0	0	0	0	0	0	0	0
Fire Camp #11, Acton	0	0	0	0	0	0	0	0	0	0	0	0	0
Jack-in-the-Box #3304, Acton	0	0	0	0	0	0	0	0	0	0	0	0	0
McDonald's Resaurant, Acton	0	0	0	0	0	0	0	0	0	0	0	0	0
Mobil SS #11	0	0	0	0	0	0	0	0	0	0	0	0	0
Mobil SS #18	0	0	0	0	0	0	0	0	0	0	0	0	0
Rio Café	0	0	0	0	0	0	0	0	0	0	0	0	0
Shell Oil, Acton	0	0	0	0	0	0	0	0	0	0	0	0	0
Sierra Ranch WWTP	0	0	0	0	0	0	0	0	0	0	0	0	0
Tract 21566, Acton	0	0	0	0	0	0	0	0	0	0	0	0	0
Tract 22190, Acton	0	0	0	0	0	0	0	0	0	0	0	0	0
Tract 22284 Acton	0	0	0	0	0	0	0	0	0	0	0	0	0
Tract 45695, Acton	0	0	0	0	0	0	0	0	0	0	0	0	0
Tract 46404, Acton	0	0	0	0	0	0	0	0	0	0	0	0	0
Tract 46647 Acton	0	0	0	0	0	0	0	0	0	0	0	0	0
Tract 47788, Acton	0	0	0	0	0	0	0	0	0	0	0	0	0
Tract 48391, Acton	0	0	0	0	0	0	0	0	0	0	0	0	0
Tract 48818, Acton	0	0	0	0	0	0	0	0	0	0	0	0	0
Tract 49240, Acton	0	0	0	0	0	0	0	0	0	0	0	0	0
Tract 49240, Acton	0	0	0	0	0	0	0	0	0	0	0	0	0

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Tract 49240, Acton	0	0	0	0	0	0	0	0	0	0	0	0	0
Tract 49601, Acton	0	0	0	0	0	0	0	0	0	0	0	0	0
Tract 49601, Acton	0	0	0	0	0	0	0	0	0	0	0	0	0
Tract 49601, Acton	0	0	0	0	0	0	0	0	0	0	0	0	0
Tract 49684, Acton	0	0	0	0	0	0	0	0	0	0	0	0	0
Tract 50385, Acton	0	0	0	0	0	0	0	0	0	0	0	0	0
Tract 52637, Acton	0	0	0	0	0	0	0	0	0	0	0	0	0
Tract 52882, Acton	0	0	0	0	0	0	0	0	0	0	0	0	0
Tract 52883, Acton	0	0	0	0	0	0	0	0	0	0	0	0	0
Trans Technology Corp.	0	0	0	0	0	0	0	0	0	0	0	0	0
Warm Springs Rehab. Center	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004
Total SCR Reach 9	**0.004**	**0.004**	**0.004**	**0.004**	**0.004**	**0.004**	**0.004**	**0.004**	**0.004**	**0.004**	**0.004**	**0.004**	**0.004**
College of the Canyons	0	0	0	0	0	0	0	0	0	0	0	0	0
H.R. Textron Valencia Facility	0	0	0	0	0	0	0	0	0	0	0	0	0
Mobil Oil Newhall Station	0	0	0	0	0	0	0	0	0	0	0	0	0
Total SCR Reach 8	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Total SCR Reach 7	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Fillmore WWTP	0.646	0.989	0.943	0.853	0.794	0.427	0.408	0.521	0.593	0.579	0.601	0.606	0.661
Piru WWTP	0.144	0.153	0.179	0.147	0.149	0.155	0.18	0.154	0.162	0.152	0.154	0.14	0.156
Total SCR above Sespe Creek	**0.79**	**1.142**	**1.122**	**1**	**0.943**	**0.582**	**0.588**	**0.675**	**0.755**	**0.731**	**0.755**	**0.746**	**0.817**
Total Sespe Creek	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Pan American Seed	0	0	0	0	0	0	0	0	0	0	0	0	0
Thomas Aquinas College	0	0	0	0	0	0	0	0	0	0	0	0	0
Total SCR Reach 3	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Limoneira & Olivelands Sewer Farm	0	0	0	0	0	0	0	0	0	0	0	0	0
Saticoy Food Corp.	0	0	0	0	0	0	0	0	0	0	0	0	0
Todd Road Jail Facility	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Wheeler Cyn/Todd Barr	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Total Brown Barr / Long Cyn	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
TOTAL WATERSHED	**0.794**	**1.146**	**1.126**	**1.004**	**0.947**	**0.586**	**0.592**	**0.679**	**0.759**	**0.735**	**0.759**	**0.75**	**0.821**

Table 27: Average Monthly Groundwater Loading of Nitrate Nitrogen, kg/d as N

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Truck & RV Sales	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004
Veterans of Foreign Wars	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004
Total Mint Canyon Creek	**0.008**	**0.008**	**0.008**	**0.008**	**0.008**	**0.008**	**0.008**	**0.008**	**0.008**	**0.008**	**0.008**	**0.008**	**0.008**
Acton Plaza	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038
Acton Rehabilitation Center	0.416	0.416	0.416	0.416	0.416	0.416	0.416	0.416	0.416	0.416	0.416	0.416	0.416
Building A, Santiago Sq, Acton	0.201	0.201	0.201	0.201	0.201	0.201	0.201	0.201	0.201	0.201	0.201	0.201	0.201
Westar Properties, Acton	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038
Crown Valley Building Supply	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013
Crown Valley Comm. Church	0.032	0.032	0.032	0.032	0.032	0.032	0.032	0.032	0.032	0.032	0.032	0.032	0.032
E Z Take Out, Acton	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025
Fire Camp #11, Acton	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17
Jack-in-the-Box #3304, Acton	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028
McDonald's Resaurant, Acton	0.227	0.227	0.227	0.227	0.227	0.227	0.227	0.227	0.227	0.227	0.227	0.227	0.227
Mobil SS #11	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114
Mobil SS #18	0	0	0	0	0	0	0	0	0	0	0	0	0
Rio Café	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028
Shell Oil, Acton	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028
Sierra Ranch WWTP	1.23	1.23	1.23	1.23	1.23	1.23	1.23	1.23	1.23	1.23	1.23	1.23	1.23
Tract 21566, Acton	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Tract 22190, Acton	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028
Tract 22284 Acton	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
Tract 45695, Acton	0.023	0.023	0.023	0.023	0.023	0.023	0.023	0.023	0.023	0.023	0.023	0.023	0.023
Tract 46404, Acton	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36
Tract 46647 Acton	0.068	0.068	0.068	0.068	0.068	0.068	0.068	0.068	0.068	0.068	0.068	0.068	0.068
Tract 47788, Acton	0.108	0.108	0.108	0.108	0.108	0.108	0.108	0.108	0.108	0.108	0.108	0.108	0.108
Tract 48391, Acton	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019
Tract 48818, Acton	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028
Tract 49240, Acton	0.449	0.449	0.449	0.449	0.449	0.449	0.449	0.449	0.449	0.449	0.449	0.449	0.449
Tract 49240, Acton	0.153	0.153	0.153	0.153	0.153	0.153	0.153	0.153	0.153	0.153	0.153	0.153	0.153
Tract 49240, Acton	0.085	0.085	0.085	0.085	0.085	0.085	0.085	0.085	0.085	0.085	0.085	0.085	0.085
Tract 49601, Acton	0.208	0.208	0.208	0.208	0.208	0.208	0.208	0.208	0.208	0.208	0.208	0.208	0.208
Tract 49601, Acton	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028
Tract 49601, Acton	0.176	0.176	0.176	0.176	0.176	0.176	0.176	0.176	0.176	0.176	0.176	0.176	0.176
Tract 49684, Acton	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028
Tract 50385, Acton	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028
Tract 52637, Acton	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028
Tract 52882, Acton	0.398	0.398	0.398	0.398	0.398	0.398	0.398	0.398	0.398	0.398	0.398	0.398	0.398

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Tract 52883, Acton	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028
Trans Technology Corp.	3.98	3.98	3.98	3.98	3.98	3.98	3.98	3.98	3.98	3.98	3.98	3.98	3.98
Warm Springs Rehab. Center	0.431	0.433	0.435	0.443	0.443	0.426	0.426	0.422	0.42	0.498	0.509	0.414	0.442
Total SCR Reach 8	**9.27**	**9.27**	**9.28**	**9.28**	**9.28**	**9.27**	**9.27**	**9.26**	**9.26**	**9.34**	**9.35**	**9.26**	**9.28**
College of the Canyons	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.016	0.016	0.016	0.017
H.R. Textron Valencia Facility	0.085	0.085	0.085	0.085	0.085	0.085	0.085	0.085	0.085	0.085	0.085	0.085	0.085
Mobil Oil Newhall Station	2.84	2.84	2.84	2.84	2.84	2.84	2.84	2.84	2.84	2.84	2.84	2.84	2.84
Total SCR Reach 8	**2.94**	**2.94**	**2.94**	**2.94**	**2.94**	**2.94**	**2.94**	**2.94**	**2.94**	**2.94**	**2.94**	**2.94**	**2.94**
Total SCR Reach 7	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Fillmore WWTP	6.3	6.66	6.5	6.66	7.25	7.37	6.58	5.42	6.28	6.63	6.12	6.06	6.48
Piru WWTP	0.295	0.311	0.358	0.293	0.297	0.317	0.367	0.347	0.401	0.374	0.315	0.286	0.33
Total SCR above Sespe Creek	**6.6**	**6.97**	**6.86**	**6.95**	**7.55**	**7.69**	**6.95**	**5.77**	**6.68**	**7**	**6.44**	**6.35**	**6.81**
Total Sespe Creek	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Pan American Seed	0	0	0	0	0	0	0	0	0	0	0	0	0
Thomas Aquinas College	0.121	0.384	0.376	0.274	0.172	0.083	0.073	0.102	0.128	0.145	0.148	0.122	0.175
Total SCR Reach 3	**0.121**	**0.384**	**0.376**	**0.274**	**0.172**	**0.083**	**0.073**	**0.102**	**0.128**	**0.145**	**0.148**	**0.122**	**0.175**
Limoneira & Olivelands Sewer Farm	0.008	0.011	0.014	0.014	0.013	0.009	0.006	0.003	0.004	0.005	0.006	0.013	0.009
Saticoy Food Corp.	3.98	3.98	3.98	3.98	3.98	3.98	3.98	3.98	3.98	3.98	3.98	3.98	3.98
Todd Road Jail Facility	1.61	1.61	1.61	1.61	1.61	1.61	1.61	1.61	1.61	1.61	1.61	1.61	1.61
Total Wheeler Cyn/Todd Barr	**5.60**	**5.60**	**5.60**	**5.60**	**5.60**	**5.60**	**5.60**	**5.60**	**5.60**	**5.60**	**5.60**	**5.60**	**5.60**
Total Brown Barr. / Long Cyn	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
TOTAL WATERSHED	**24.5**	**25.2**	**25.1**	**25.1**	**25.6**	**25.6**	**24.8**	**23.7**	**24.6**	**25**	**24.5**	**24.3**	**24.8**

Table 28: Average Monthly Groundwater Loading of Phosphorus, kg/d

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Truck & RV Sales	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Veterans of Foreign Wars	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Total Mint Canyon Creek	**0.010**	**0.010**	**0.010**	**0.010**	**0.010**	**0.010**	**0.010**	**0.010**	**0.010**	**0.010**	**0.010**	**0.010**	**0.010**
Acton Plaza	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045
Acton Rehabilitation Center	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Building A, Santiago Sq, Acton	0.241	0.241	0.241	0.241	0.241	0.241	0.241	0.241	0.241	0.241	0.241	0.241	0.241
Westar Properties, Acton	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045
Crown Valley Building Supply	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Crown Valley Comm. Church	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.039
E Z Take Out, Acton	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Fire Camp #11, Acton	0.204	0.204	0.204	0.204	0.204	0.204	0.204	0.204	0.204	0.204	0.204	0.204	0.204
Jack-in-the-Box #3304, Acton	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034
McDonald's Resaurant, Acton	0.273	0.273	0.273	0.273	0.273	0.273	0.273	0.273	0.273	0.273	0.273	0.273	0.273
Mobil SS #11	0.136	0.136	0.136	0.136	0.136	0.136	0.136	0.136	0.136	0.136	0.136	0.136	0.136
Mobil SS #18	0	0	0	0	0	0	0	0	0	0	0	0	0
Rio Café	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034
Shell Oil, Acton	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034
Sierra Ranch WWTP	1.48	1.48	1.48	1.48	1.48	1.48	1.48	1.48	1.48	1.48	1.48	1.48	1.48

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Tract 21566, Acton	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034
Tract 22190, Acton	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034
Tract 22284 Acton	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
Tract 45695, Acton	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027
Tract 46404, Acton	0.432	0.432	0.432	0.432	0.432	0.432	0.432	0.432	0.432	0.432	0.432	0.432	0.432
Tract 46647 Acton	0.082	0.082	0.082	0.082	0.082	0.082	0.082	0.082	0.082	0.082	0.082	0.082	0.082
Tract 47788, Acton	0.129	0.129	0.129	0.129	0.129	0.129	0.129	0.129	0.129	0.129	0.129	0.129	0.129
Tract 48391, Acton	0.023	0.023	0.023	0.023	0.023	0.023	0.023	0.023	0.023	0.023	0.023	0.023	0.023
Tract 48818, Acton	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034
Tract 49240, Acton	0.538	0.538	0.538	0.538	0.538	0.538	0.538	0.538	0.538	0.538	0.538	0.538	0.538
Tract 49240, Acton	0.184	0.184	0.184	0.184	0.184	0.184	0.184	0.184	0.184	0.184	0.184	0.184	0.184
Tract 49240, Acton	0.102	0.102	0.102	0.102	0.102	0.102	0.102	0.102	0.102	0.102	0.102	0.102	0.102
Tract 49601, Acton	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Tract 49601, Acton	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034
Tract 49601, Acton	0.211	0.211	0.211	0.211	0.211	0.211	0.211	0.211	0.211	0.211	0.211	0.211	0.211
Tract 49684, Acton	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034
Tract 50385, Acton	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034
Tract 52637, Acton	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Tract 52882, Acton	0.477	0.477	0.477	0.477	0.477	0.477	0.477	0.477	0.477	0.477	0.477	0.477	0.477
Tract 52883, Acton	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034
Trans Technology Corp.	4.77	4.77	4.77	4.77	4.77	4.77	4.77	4.77	4.77	4.77	4.77	4.77	4.77
Warm Springs Rehab. Center	0.205	0.205	0.203	0.204	0.204	0.209	0.21	0.211	0.21	0.211	0.212	0.207	0.208
Total SCR Reach 9	**10.8**	**10.8**	**10.8**	**10.8**	**10.8**	**10.8**	**10.8**	**10.8**	**10.8**	**10.8**	**10.8**	**10.8**	**10.8**
College of the Canyons	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.019	0.019	0.019	0.02
H.R. Textron Valencia Facility	0.102	0.102	0.102	0.102	0.102	0.102	0.102	0.102	0.102	0.102	0.102	0.102	0.102
Mobil Oil Newhall Station	3.41	3.41	3.41	3.41	3.41	3.41	3.41	3.41	3.41	3.41	3.41	3.41	3.41
Total SCR Reach 8	**3.53**	**3.53**	**3.53**	**3.53**	**3.53**	**3.53**	**3.53**	**3.53**	**3.53**	**3.53**	**3.53**	**3.53**	**3.53**
Total SCR Reach 7	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Fillmore WWTP	9.08	10.31	8.87	8.07	8.61	7.76	7.33	7.06	8.94	8.67	8.63	8.59	8.48
Piru WWTP	0.462	0.469	0.503	0.419	0.431	0.458	0.525	0.477	0.511	0.477	0.432	0.395	0.463
Total SCR above Sespe Creek	**9.5**	**10.8**	**9.4**	**8.5**	**9**	**8.2**	**7.9**	**7.5**	**9.5**	**9.1**	**9.1**	**9**	**8.9**
Total Sespe Creek	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Pan American Seed	0	0	0	0	0	0	0	0	0	0	0	0	0
Thomas Aquinas College	0.157	0.225	0.17	0.126	0.14	0.11	0.102	0.105	0.086	0.092	0.135	0.113	0.129
Total SCR Reach 3	**0.157**	**0.225**	**0.17**	**0.126**	**0.14**	**0.11**	**0.102**	**0.105**	**0.086**	**0.092**	**0.135**	**0.113**	**0.129**
Limoneira & Olivelands Sewer Farm	0	0	0	0	0	0	0	0	0	0	0	0	0
Saticoy Food Corp.	4.77	4.77	4.77	4.77	4.77	4.77	4.77	4.77	4.77	4.77	4.77	4.77	4.77
Todd Road Jail Facility	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93
Total Wheeler Cyn/Todd Barr	**6.7**	**6.7**	**6.7**	**6.7**	**6.7**	**6.7**	**6.7**	**6.7**	**6.7**	**6.7**	**6.7**	**6.7**	**6.7**
Total Brown Barr. / Long Cyn	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
TOTAL WATERSHED	**30.7**	**32.1**	**30.6**	**29.7**	**30.2**	**29.4**	**29**	**28.6**	**30.6**	**30.2**	**30.3**	**30.2**	**30.1**

Septic Systems

Septic system loading is estimated by multiplying the number of septic systems, the number of people served by each septic system (assumed to be 2.3), and flow and loading per capita. It is assumed that there is no loading of nitrite or nitrate from septic systems, although nitrification of ammonia will indirectly produce these species. It is assumed that the loading is uniform every month of the year and throughout the analysis time period. The per capita loading is assumed to be 75 gallons/capita/day (Wagener 2002) at a concentration of 32 mg/l of ammonia as nitrogen and 6 mg/l of phosphate as P (Maizel et al 1997). Table 29 shows the number of people served by septic systems and average flow from those systems for each subregion in Ventura County. There are an estimated 10,000 people served by septic systems in the Los Angeles County portion of the watershed, and it is assumed that they are distributed in proportion to land area outside the Santa Clarita area (Wagener 2002).

Table 29: Septic Systems, Flow, and Loading

Subregion	People	Flow, m^3/d	NH_4-N, kg/d	PO4-P, kg/d
Mint Canyon Creek	**463**	**131**	**4.21**	**0.79**
Santa Clara River Reach 9	**3062**	**870**	**27.83**	**5.22**
Santa Clara River Reach 8	**1346**	**382**	**12.23**	**2.29**
Santa Clara River Reach 7	**1071**	**304**	**9.73**	**1.82**
Santa Clara River abv Sespe Ck	**526**	**149**	**4.78**	**0.90**
Sespe Creek	**215**	**61**	**1.95**	**0.37**
Santa Clara River Reach 3	**873**	**248**	**7.93**	**1.49**
Wheeler Canyon / Todd Barr.	**67**	**19**	**0.61**	**0.11**
Brown Barranca / Long Canyon	**2**	**0.6**	**0.02**	**0.003**
TOTAL WATERSHED	**7484**	**2166**	**69.30**	**12.99**

Land Application Sources

These sources represent pollutants loaded to the land surface. Some portion is assimilated by soil and vegetation. The remainder may be transported through the soil to surface waters based on natural and irrigation hydrology. These sources are associated with specific land uses.

Diversions for Groundwater Recharge / Irrigation

There are seven locations within the watershed where water is diverted from streams and applied to the land. Table 30 lists each with average flow rate.

Table 30: Diversion Flows, m^3/s

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Total Mint Canyon Creek	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Total SCR Reach 9	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Total SCR Reach 8	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Rancho Camulos	0.000	0.000	0.227	0.227	0.227	0.227	0.227	0.227	0.227	0.227	0.227	0.000	0.170
Isola (Newhall Land)	0.000	0.000	0.015	0.029	0.029	0.029	0.029	0.029	0.029	0.029	0.029	0.029	0.023
Total SCR Reach 7	**0.000**	**0.000**	**0.242**	**0.256**	**0.256**	**0.256**	**0.256**	**0.256**	**0.256**	**0.256**	**0.256**	**0.029**	**0.193**
Piru Mutual	0.023	0.023	0.023	0.066	0.066	0.066	0.066	0.066	0.066	0.042	0.042	0.042	0.049
Piru Creek Diversion	0.086	0.152	0.308	0.578	0.949	0.4	0.198	0.258	0.465	0.253	0.28	0.193	0.343
Total SCR abv Sespe Ck	**0.109**	**0.175**	**0.331**	**0.644**	**1.015**	**0.466**	**0.264**	**0.324**	**0.531**	**0.295**	**0.322**	**0.235**	**0.392**
Fillmore Irrigation Canal	0.004	0.007	0	0.041	0.073	0.071	0.094	0.086	0.084	0.073	0.06	0.054	0.054
Total Sespe Creek	**0.004**	**0.007**	**0**	**0.041**	**0.073**	**0.071**	**0.094**	**0.086**	**0.084**	**0.073**	**0.06**	**0.054**	**0.054**
Farmers Irrigation	0.014	0.014	0.014	0.064	0.064	0.064	0.09	0.09	0.09	0.056	0.056	0.056	0.056
Richardson Diversion	0.001	0.001	0.001	0.003	0.003	0.003	0.019	0.019	0.019	0.017	0.017	0.017	0.01
Total SCR Reach 3	**0.015**	**0.015**	**0.015**	**0.067**	**0.067**	**0.067**	**0.109**	**0.109**	**0.109**	**0.073**	**0.073**	**0.073**	**0.066**
Total Wheeler Cyn/Todd Barr	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Total Brown Barr. / Long Cyn	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
TOTAL WATERSHED	**0.128**	**0.197**	**0.588**	**1.008**	**1.411**	**0.860**	**0.723**	**0.775**	**0.980**	**0.697**	**0.711**	**0.391**	**0.705**

Of these locations, the Piru Creek Diversion recharges groundwater, while the others are used for irrigation. Tables 31-33 show the estimated loading of ammonia, nitrate, and phosphorus to the land surface from these diversions. The loading was calculated from the flow and average monthly concentrations from water quality monitoring near each diversion (LACSD station RE for Rancho Camulos and Isola; UWCD station 4N18W03SW2 for Piru Creek diversions; UWCD station 4N20W26SW1 for Fillmore

Irrigation Canal; UWCD station 3N21W11SW1 for Farmers Irrigation; UWCD station 3N21W22SW1 for Richardson Diversion). The loading was then averaged for each month over the 11 year analysis period. Nitrite loading is assumed to be zero. Note that the amount of loading applied to the land surface is also directly removed from the river.

Table 31: Ammonia loading from diversions, kg/d N

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Total Mint Canyon Creek	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Total SCR Reach 9	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Total SCR Reach 8	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Rancho Camulos	0	0	23.6	81.1	78.2	90.6	103	102.8	46.5	103	76.9	0	58.8
Isola (Newhall Land)	0	0	1.6	10.5	10.1	11.8	13.4	13.4	6.0	13.4	10.0	17.3	9
Total SCR Reach 7	**0.0**	**0.0**	**25.2**	**91.6**	**88.3**	**102.4**	**116.4**	**116.2**	**52.5**	**116.4**	**86.9**	**17.3**	**67.8**
Piru Mutual	0.059	0.059	0.059	0.114	0.171	0.171	0.172	0.172	0.229	0.108	0.108	0.108	0.128
Piru Creek Diversion	0.223	0.395	0.799	0.999	2.46	1.037	0.512	0.669	1.607	0.655	0.727	0.501	0.882
Total SCR abv Sespe Ck	**0.28**	**0.45**	**0.86**	**1.11**	**2.63**	**1.21**	**0.68**	**0.84**	**1.84**	**0.76**	**0.84**	**0.61**	**1.01**
Fillmore Irrigation Canal	0.021	0.038	0.001	0.036	0.236	0.226	0.292	0.255	0.405	0.223	0.18	0.159	0.173
Total Sespe Creek	**0.021**	**0.038**	**0.001**	**0.036**	**0.236**	**0.226**	**0.292**	**0.255**	**0.405**	**0.223**	**0.18**	**0.159**	**0.173**
Farmers Irrigation	0.049	0.049	0.049	0.167	0.222	0.222	0.31	0.31	0.387	0.195	0.195	0.195	0.196
Richardson Diversion	0.003	0.003	0.003	0.007	0.007	0.007	0.049	0.049	0.049	0.045	0.045	0.045	0.026
Total SCR Reach 3	**0.052**	**0.052**	**0.052**	**0.174**	**0.229**	**0.229**	**0.359**	**0.359**	**0.436**	**0.24**	**0.24**	**0.24**	**0.222**
Total Wheeler Cyn/Todd Barr	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Total Brown Barr. / Long Cyn	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
TOTAL WATERSHED	**0**	**1**	**26**	**93**	**91**	**104**	**118**	**118**	**55**	**118**	**88**	**18**	**69**

Table 32: Nitrate loading from diversions, kg/d N

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Total Mint Canyon Creek	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Total SCR Reach 9	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Total SCR Reach 8	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Rancho Camulos	0	0	88	85	81	84	87	89	150	96	122	0	74
Isola (Newhall Land)	0	0	5.9	11	10.5	10.9	11.2	11.6	19.5	12.5	15.8	13.8	10.2
Total SCR Reach 7	**0**	**0**	**94**	**96**	**92**	**95**	**98**	**101**	**170**	**109**	**138**	**14**	**84**
Piru Mutual	0.103	0.143	0.182	0.645	1.934	1.096	0.258	0.775	0	0.732	0.641	0.549	0.588
Piru Creek Diversion	0.59	1.32	3.2	7.64	30.03	7.59	1.24	3.63	0.60	5.04	4.98	3.00	5.74
Total SCR abv Sespe Ck	**0.69**	**1.46**	**3.38**	**8.29**	**32.0**	**8.69**	**1.5**	**4.41**	**0.6**	**5.77**	**5.62**	**3.55**	**6.33**
Fillmore Irrigation Canal	0	0	0	0	0.178	0.51	1.1	0.481	0	0.67	0.136	0.06	0.261
Total Sespe Creek	**0**	**0**	**0**	**0**	**0.178**	**0.51**	**1.1**	**0.481**	**0**	**0.67**	**0.136**	**0.06**	**0.261**
Farmers Irrigation	1.26	0.95	0.64	1.51	1.95	2.1	3.15	54.7	23.42	2.31	1.1	0.27	7.78
Richardson Diversion	0.16	0.17	0.17	0.32	0.3	0.34	2.73	3	2.92	2.6	2.53	1.93	1.43
Total SCR Reach 3	**1.42**	**1.12**	**0.81**	**1.83**	**2.25**	**2.44**	**5.88**	**57.7**	**26.34**	**4.91**	**3.63**	**2.2**	**9.21**
Total Wheeler Cyn/Todd Barr	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Total Brown Barr. / Long Cyn	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
TOTAL WATERSHED	**2**	**3**	**98**	**106**	**126**	**107**	**107**	**163**	**196**	**120**	**147**	**20**	**100**

Table 33: Phosphorus loading from diversions, kg/d P

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Total Mint Canyon Creek	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Total SCR Reach 9	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Total SCR Reach 8	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Rancho Camulos	0	0	74	68	63	71	79	87	117	24	92	0	56
Isola (Newhall Land)	0	0	4.9	8.8	8.1	9.2	10.2	11.3	15.2	3.2	11.9	11.4	7.9
Total SCR Reach 7	**0**	**0**	**79**	**77**	**71**	**80**	**89**	**98**	**132**	**27**	**104**	**11**	**64**
Piru Mutual	0.054	0.054	0.054	0.228	0.157	0.157	0.157	0.157	0.086	0.099	0.099	0.099	0.117
Piru Creek Diversion	0.204	0.362	0.733	1.999	2.255	0.951	0.47	0.614	0.603	0.6	0.666	0.459	0.826
Total SCR abv Sespe Ck	**0.258**	**0.416**	**0.787**	**2.227**	**2.412**	**1.108**	**0.627**	**0.771**	**0.689**	**0.699**	**0.765**	**0.558**	**0.943**
Fillmore Irrigation Canal	0.014	0.025	0.001	0.071	0.157	0.151	0.195	0.17	0.162	0.148	0.12	0.106	0.111
Total Sespe Creek	**0.014**	**0.025**	**0.001**	**0.071**	**0.157**	**0.151**	**0.195**	**0.17**	**0.162**	**0.148**	**0.12**	**0.106**	**0.111**
Farmers Irrigation	0.024	0.024	0.024	0.111	0.111	0.111	0.155	0.155	0.155	0.097	0.097	0.097	0.097
Richardson Diversion	0.002	0	0.003	0.012	0.018	0.087	1.137	1.64	1.608	1.436	1.408	0.053	0.617
Total SCR Reach 3	**0.026**	**0.024**	**0.027**	**0.123**	**0.129**	**0.198**	**1.292**	**1.795**	**1.763**	**1.533**	**1.505**	**0.15**	**0.714**
Total Wheeler Cyn/Todd Barr	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Total Brown Barr. / Long Cyn	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
TOTAL WATERSHED	**0**	**0**	**80**	**79**	**74**	**82**	**91**	**101**	**135**	**30**	**106**	**12**	**66**

Well Pumping Irrigation

Irrigation water pumped from the aquifer contains nitrogen and phosphorus. Agricultural pumping flow was compiled for each region of the watershed in Ventura County (UWCD 2002). Well water quality was also compiled for Ventura County (UWCD 2002). Water quality was averaged to estimate loading.

For the Los Angeles County portion of the watershed, pumping is assumed to provide the irrigation water for crops not otherwise provided for by diversions (Rancho Camulos and Isola). The two diversions provide all the water needed for SCR Region 7. For orchards and row crops, approximately 30 inches of irrigation water is applied each year (Daugovich 2002). The total irrigation water needed is calculated by multiplying 30 inches by the area of orchard and cropland land uses in each region within Los Angeles County. The timing of well pumping irrigation is estimated by using the proportion of irrigation diversion water in each month of the year (all sources except Piru Creek Diversion in Table 30). Well water quality varies greatly with location, but for this analysis, all Los Angeles County pumped irrigation water is assumed to contain 0.1 mg/l ammonia as N, 5 mg/l nitrate as N, and 0.05 mg/l phosphorus. Given these assumptions, Tables 34-37 show the flow and resulting load to each region of the watershed. Nitrite loading is assumed to be negligible.

Table 34: Pumped Irrigation Flow, m^3/s

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Total Mint Canyon Creek	0.002	0.002	0.010	0.015	0.017	0.017	0.020	0.019	0.019	0.016	0.016	0.007	0.013
Total SCR Reach 9	0.005	0.006	0.031	0.048	0.053	0.053	0.060	0.059	0.058	0.051	0.049	0.023	0.041
Total SCR Reach 8	0.008	0.010	0.051	0.078	0.087	0.087	0.099	0.096	0.095	0.083	0.080	0.037	0.068
Total SCR Reach 7	0	0	0	0	0	0	0	0	0	0	0	0	0
Total SCR abv Sespe Ck	1.072	1.072	1.072	1.072	1.072	1.072	1.372	1.372	1.372	1.390	1.390	1.390	1.226
Total Sespe Creek	0.165	0.165	0.165	0.165	0.165	0.165	0.247	0.247	0.247	0.247	0.247	0.247	0.206
Total SCR Reach 3	0.925	0.925	0.925	0.925	0.925	0.925	1.450	1.450	1.450	1.454	1.454	1.454	1.189
Total Wheeler Cyn/Todd Barr	0.020	0.020	0.020	0.020	0.020	0.020	0.017	0.017	0.017	0.019	0.019	0.019	0.019
Total Brown Barr. / Long Cyn	0.004	0.004	0.004	0.004	0.004	0.004	0.005	0.005	0.005	0.004	0.004	0.004	0.004
TOTAL WATERSHED	2.20	2.20	2.28	2.33	2.34	2.34	3.27	3.27	3.26	3.26	3.26	3.18	2.77

Table 35: Estimated well pumping irrigation loading of ammonia, kg/d as N

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Total Mint Canyon Creek	0.01	0.02	0.09	0.13	0.15	0.15	0.17	0.16	0.16	0.14	0.14	0.06	0.12
Total SCR Reach 9	0.04	0.05	0.27	0.41	0.46	0.46	0.52	0.51	0.50	0.44	0.42	0.20	0.36
Total SCR Reach 8	0.07	0.08	0.44	0.68	0.75	0.75	0.85	0.83	0.82	0.72	0.69	0.32	0.58
Total SCR Reach 7	0	0	0	0	0	0	0	0	0	0	0	0	0
Total SCR abv Sespe Ck	9.0	9.0	9.0	9.0	9.0	9.0	11.4	11.4	11.4	11.5	11.5	11.5	10.2
Total Sespe Creek	1.42	1.42	1.42	1.42	1.42	1.42	2.13	2.13	2.13	2.14	2.14	2.14	1.78
Total SCR Reach 3	8.0	8.0	8.0	8.0	8.0	8.0	12.5	12.5	12.5	12.6	12.6	12.6	10.3
Total Wheeler Cyn/Todd Barr	0.62	0.61	0.62	0.62	0.62	0.62	0.53	0.53	0.53	0.59	0.59	0.59	0.59
Total Brown Barr. / Long Cyn	0.03	0.03	0.03	0.03	0.03	0.03	0.04	0.04	0.04	0.04	0.04	0.04	0.04
TOTAL WATERSHED	19.2	19.2	19.9	20.3	20.4	20.4	28.1	28.1	28.1	28.2	28.1	27.5	24.0

Table 36: Estimated well pumping irrigation loading of nitrate, kg/d as N

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Total Mint Canyon Creek	0.7	0.8	4.4	6.7	7.5	7.4	8.5	8.2	8.2	7.1	6.8	3.2	5.8
Total SCR Reach 9	2.2	2.5	13.4	20.6	23.0	22.8	26.1	25.4	25.1	21.9	21.1	9.8	17.8
Total SCR Reach 8	3.6	4.2	22.0	33.8	37.7	37.4	42.7	41.6	41.2	35.9	34.6	16.1	29.2
Total SCR Reach 7	0	0	0	0	0	0	0	0	0	0	0	0	0
Total SCR abv Sespe Ck	317	317	317	317	317	317	425	425	425	429	429	429	372
Total Sespe Creek	76	76	76	76	76	76	113	113	113	114	114	114	94
Total SCR Reach 3	385	385	385	385	385	385	615	615	615	619	619	619	501
Total Wheeler Cyn/Todd Barr	1.3	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.3	1.3	1.3	1.3
Total Brown Barr. / Long Cyn	1.2	1.2	1.2	1.2	1.2	1.2	1.6	1.6	1.6	1.4	1.4	1.4	1.4
TOTAL WATERSHED	787	788	820	842	849	848	1233	1231	1230	1230	1227	1194	1023

Table 37: Estimated well pumping irrigation loading of phosphorus, kg/d

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Total Mint Canyon Creek	0.01	0.01	0.04	0.07	0.07	0.07	0.08	0.08	0.08	0.07	0.07	0.03	0.06
Total SCR Reach 9	0.02	0.03	0.13	0.21	0.23	0.23	0.26	0.25	0.25	0.22	0.21	0.10	0.18
Total SCR Reach 8	0.04	0.04	0.22	0.34	0.38	0.37	0.43	0.42	0.41	0.36	0.35	0.16	0.29
Total SCR Reach 7	0	0	0	0	0	0	0	0	0	0	0	0	0
Total SCR abv Sespe Ck	4.96	4.96	4.96	4.96	4.96	4.96	6.45	6.45	6.45	6.53	6.53	6.53	5.73
Total Sespe Creek	0.71	0.71	0.71	0.71	0.71	0.71	1.07	1.07	1.07	1.07	1.07	1.07	0.89
Total SCR Reach 3	3.67	3.67	3.67	3.67	3.67	3.67	5.69	5.69	5.69	5.70	5.70	5.70	4.68
Total Wheeler Cyn/Todd Barr	0.09	0.09	0.09	0.09	0.09	0.09	0.07	0.07	0.07	0.08	0.08	0.08	0.08
Total Brown Barr. / Long Cyn	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
TOTAL WATERSHED	9.5	9.5	9.8	10.1	10.1	10.1	14.1	14.1	14.0	14.1	14.0	13.7	11.9

Atmospheric Deposition

There are two forms of atmospheric deposition: wet and dry. Wet deposition is from pollutants present in rain. Dry deposition is from gradual accumulation on the ground and leaf surfaces during dry weather. Dry deposition includes particulate matter and uptake of gases including NO_x. NO_x is converted to nitrate upon uptake by vegetation. Atmospheric deposition may be assimilated in the soil and in vegetative uptake, with some portion reaching surface waters through the natural hydrologic cycle. The following equations govern the collection of pollutants through atmospheric deposition (Chen 2001).

Wet deposition to land use j D_{jw} (kg/d) is a function of the amount of precipitation, the concentration of the precipitation, and the land area, as shown in equation 1.

$$D_{jw} = \frac{PC_p A_j}{10^9} \qquad \text{(eq. 1)}$$

where P is the precipitation rate (cm/d), C_p is the precipitation concentration (mg/l), and A_j is the area of land use j (cm^2). The dry deposition to land use j D_{jd} (kg/d) is the sum of the particulate deposition to leaf surfaces D_{jdl}, the particulate deposition to the ground D_{jdg}, and the gaseous uptake by leaves U_{jdl} as shown in equations 2-5.

$$D_{jd} = D_{jdl} + D_{jdg} + U_{jdl} \qquad \text{(eq. 2)}$$

$$D_{jdl} = \frac{e_d V_d C_a L_j A_j}{10^{15}} \quad \text{(eq. 3)}$$

$$D_{jdg} = \frac{V_d C_a A_j}{10^{15}} \quad \text{(eq. 4)}$$

$$U_{jdl} = \frac{e_d U_d C_a L_j A_j}{10^{15}} \quad \text{(eq. 5)}$$

where e_d is the dry collection efficiency (assumed 0.6 from Chen 1983), V_d is the particulate deposition velocity (cm/d), U_d is the gaseous uptake velocity (cm/d) and C_a is the atmospheric concentration ($\mu g/m^3$). Since gaseous uptake means the nitrogen is absorbed to meet the nutrient demand of vegetation, this is not available for watershed loading, and it is omitted from the atmospheric loading in this analysis ($U_d = 0$). Linkage analysis will take this effect into account in determining the uptake needed by vegetation beyond NO_x uptake.

Table 38 shows the monthly particulate deposition rate from Joshua Tree National Park (CASTNET 2001). The Joshua Tree site is the nearest of a national network of monitoring stations. Data for a Santa Monica Bay study has deposition velocities approximately triple that of Joshua Tree with relatively large particle size (UCLA 1994). A study prepared for the California Air Resources Board indicates that particulate deposition velocity of nitrate is approximately 0.182 times the gaseous deposition velocity of HNO_3 (Russell 1990). Russell cites two other studies (Finlayson-Pitts and Pitts 1986; McRae and Russell 1984) which give land use adjusted summer HNO_3 deposition rates ranging from 1.0 to 4.7. WARMF performs its own land use adjustments from a neutral deposition velocity. Adjusting the cited HNO3 deposition rates so that WARMF would approximate the same deposition flux gives a land use neutral HNO_3 deposition rate of approximately 1.2. Using the 0.182 relationship between particulate nitrate and gaseous HNO_3 from Russell, the estimated summer particulate deposition velocity of 0.22 cm/s is within 5% of that from Joshua Tree. Table 39 shows the estimated monthly leaf area index for each land use (Nikolov 1999).

Table 38: Monthly Particulate Deposition Rate, cm/s

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Particulate Deposition	0.11	0.14	0.17	0.21	0.24	0.24	0.22	0.22	0.19	0.15	0.12	0.11

Table 39: Monthly Leaf Area Index for each Land Use

Land Use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Deciduous	0	0	0	0.5	1	2.5	4	4.5	4.5	1	0	0
Mixed Forest	1	1	1	2	2	3	4	4	3	2	1	1
Orchard	4	4	4	4	4	4	4	4	4	4	4	4
Coniferous	2	2	2	3	3	4	4	4	3	3	2	2
Shrub / Scrub	0.5	0.5	0.5	1	1	1	1	1	1	1	0.5	0.5
Grassland	0.5	0.5	0.5	1	1	1	1	1	1	1	0.5	0.5
Park	1	1	1	1	1	1	1	1	1	1	1	1
Golf Course	1	1	1	1	1	1	1	1	1	1	1	1
Pasture	0.5	0.5	0.5	1	1	1	1	1	1	1	0.5	0.5
Cropland	1	1	1	1	1	1	1	1	1	1	1	1
Marsh	1	1	1	1	1	1	1	1	1	1	1	1
Barren	0	0	0	0	0	0	0	0	0	0	0	0
Water	0	0	0	0	0	0	0	0	0	0	0	0
Residential	0	0	0	0.2	0.4	1	1.6	1.8	1.8	0.4	0	0
High Density Residential	0	0	0	0.2	0.4	1	1.6	1.8	1.8	0.4	0	0
Comm./Industrial	0	0	0	0	0	0	0	0	0	0	0	0

Air quality monitoring data is available from several monitoring stations as shown in Figure 3. Tables 40 and 41 list the average monthly particulate concentrations of ammonia and nitrate (CARB 2002). With precipitation data from various meteorological stations (NCDC 2002), rain chemistry from a single station at Tanbark Flat, Los Angeles County (NADP 2002), and land uses within each subregion, one can calculate the total atmospheric deposition, as shown in Tables 42 and 43. Only ammonia and nitrate are deposited from the atmosphere. Loading of phosphorus is assumed to be insignificant.

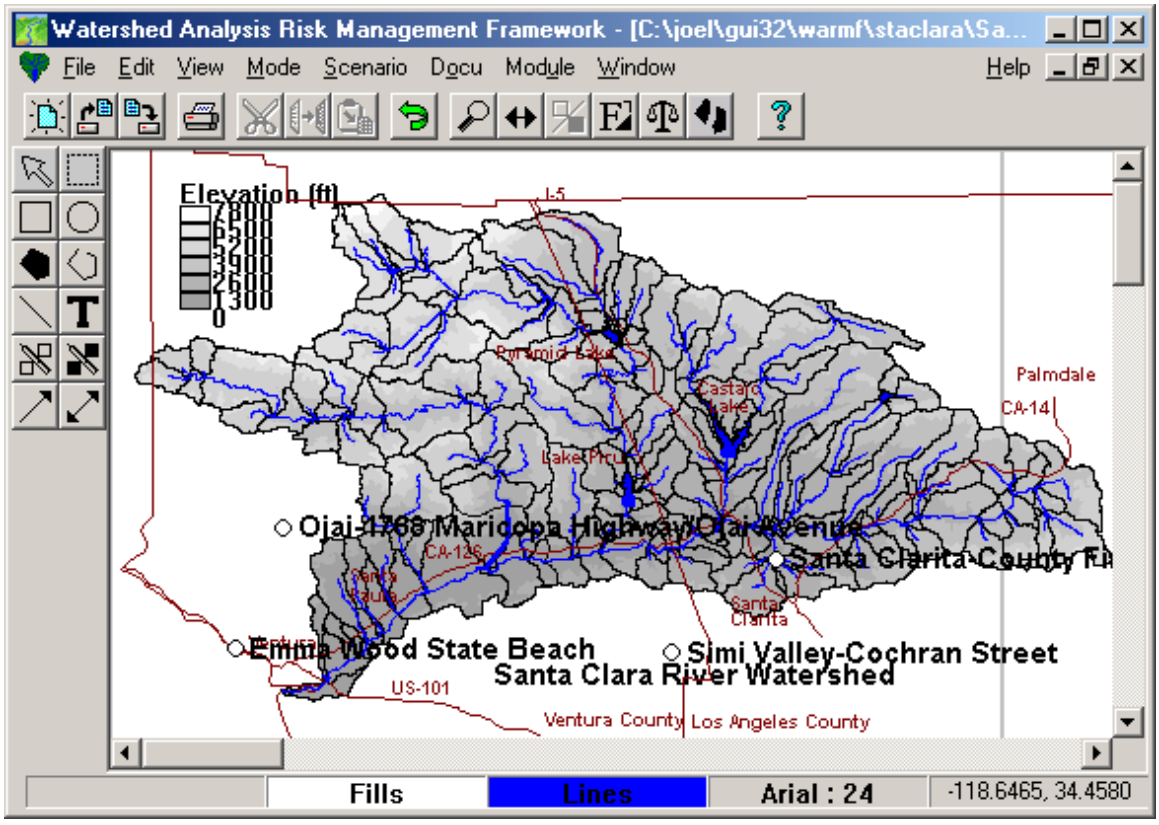

Figure 3: Air quality monitoring stations in the Santa Clara River watershed

Table 40: Average Monthly Atmospheric Concentration of Particulate Ammonia, µg/m^3 as N

Region	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Emma Wood State Beach	0.69	0.98	1.07	0.67	1.02	0.84	0.78	0.67	0.65	0.85	0.84	0.71	0.81
Ojai – 1768 Maricopa Highway	0.87	1.04	0.77	0.90	1.01	0.87	0.82	0.99	0.82	0.58	0.60	0.58	0.82
Santa Clarita – County Fire Stn	0.49	0.46	0.81	0.72	0.93	0.75	0.89	0.97	0.94	1.16	0.96	0.82	0.83
Simi Valley – Cochran Street	0.48	0.60	1.05	0.80	0.84	0.83	1.03	0.83	0.80	1.31	0.93	0.56	0.84

Table 41: Average Monthly Atmospheric Concentration of Particulate Nitrate, µg/m^3 as N

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Emma Wood State Beach	0.71	0.79	0.71	0.63	0.71	0.75	0.73	0.70	0.70	1.02	0.84	0.67	0.75
Ojai – 1768 Maricopa Highway	0.96	0.98	0.82	0.88	0.65	0.55	0.62	0.70	0.85	0.77	0.70	0.72	0.77
Santa Clarita – County Fire Stn	0.48	0.49	0.69	0.62	0.72	0.64	0.55	0.52	0.48	0.75	0.73	0.61	0.61
Simi Valley – Cochran Street	0.63	0.69	1.05	0.92	0.87	0.83	0.65	0.58	0.64	0.89	0.94	0.69	0.78

Table 42: Atmospheric Deposition of Ammonia Nitrogen, kg/d

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Mint Canyon Ck	35	65.2	61.7	53.4	29.3	24.1	24.9	22.6	21	26.7	19.8	27.7	34.3
Santa Clara River Reach 9	187	384	374	293	207	186	201	170	166	202	130	199	225
Santa Clara River Reach 8	179	334	311	231	145	123	137	121	110	134	98	142	172
Santa Clara River Reach 7	110	201	188	141	91	70	76	63	59	79	58	87	102
Santa Clara River abv Sespe Ck	141	234	246	201	128	101	115	86	91	112	78	131	139
Sespe Creek	487	945	796	689	459	339	334	272	257	338	226	386	461
Santa Clara River Reach 3	145	252	281	238	166	135	156	123	121	135	93	146	166
Wheeler Canyon / Todd Barr.	12.4	20.6	23.6	11.7	12.3	10.8	12.2	9.6	7.9	11.1	8.8	10.2	12.6
Brown Barranca / Long Canyon	3.87	6.46	7.01	3.19	3.02	2.6	2.95	2.3	2.16	3.05	2.7	3.19	3.54
TOTAL WATERSHED	1300	2440	2290	1860	1240	990	1060	870	840	1040	710	1130	1310

Table 43: Monthly Atmospheric Deposition of Nitrate Nitrogen, kg/d

Region	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Mint Canyon Ck	36	61.5	64.8	66	27.3	21.1	14.2	17.3	17.8	22.8	20.5	35.6	33.7
Santa Clara River Reach 9	199	356	387	340	184	157	106	107	138	165	143	275	213
Santa Clara River Reach 8	181	311	324	274	131	105	76	84	87	118	100	181	164
Santa Clara River Reach 7	110	189	193	167	82	60	43	40	48	68	61	113	98
Santa Clara River abv Sespe Ck	149	242	264	268	137	107	79	61	86	96	93	185	147
Sespe Creek	490	911	857	952	500	394	223	205	244	311	264	517	489
Santa Clara River Reach 3	156	261	301	319	174	136	100	86	114	106	119	200	173
Wheeler Canyon / Todd Barr.	13.5	20.8	25.1	12.9	13	10.9	7.8	6.8	7	8.8	12.9	14.8	12.9
Brown Barranca / Long Canyon	4.2	6.52	7.47	3.45	3.36	2.64	1.89	1.59	1.92	2.47	3.99	4.62	3.68
TOTAL WATERSHED	1340	2360	2420	2400	1250	990	650	610	740	900	820	1530	1330

Fertilization

Fertilization is applied to the land surface for the purpose of being taken up by orchards and row crops. What is not taken up may be assimilated in the soil or may be transported to surface waters. Since fertilization occurs on land which is irrigated, it has a greater opportunity for transport than atmospheric deposition. Tables 44-46 show fertilization rates per unit area for agricultural land uses (Daugovich 2002) and estimated unit rates for other land uses from animal waste, debris, and other sources. Nitrogen in fertilizer is assumed to be 50% ammonia and 50% nitrate.

Table 44: Monthly Unit Land Application Rate of Ammonia Nitrogen, kg/ha/d

Land Use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Deciduous	0	0	0	0	0	0	0	0	0	0	0	0	0
Mixed Forest	0	0	0	0	0	0	0	0	0	0	0	0	0
Orchard	0.000	0.000	0.000	0.123	0.245	0.245	0.245	0.245	0.245	0.123	0.000	0.000	0.123
Coniferous	0	0	0	0	0	0	0	0	0	0	0	0	0
Shrub / Scrub	0	0	0	0	0	0	0	0	0	0	0	0	0
Grassland	0	0	0	0	0	0	0	0	0	0	0	0	0
Park	0	0	0	0	0	0	0	0	0	0	0	0	0
Golf Course	0.000	0.000	0.000	0.960	0.960	0.960	0.960	0.960	0.960	0.000	0.000	0.000	0.480
Pasture	0.068	0.068	0.068	0.068	0.068	0.068	0.068	0.068	0.068	0.068	0.068	0.068	0.068
Farm[1]	0.000	0.000	0.000	0.577	0.577	0.577	0.577	0.577	0.577	0.000	0.000	0.000	0.288
Farm[2]	0.288	0.288	0.288	0.577	0.577	0.577	0.577	0.577	0.577	0.288	0.288	0.288	0.433
Farm[3]	0.412	0.412	0.824	0.824	0.824	0.824	0.824	0.824	0.824	0.824	0.824	0.412	0.721
Marsh	0	0	0	0	0	0	0	0	0	0	0	0	0
Barren	0	0	0	0	0	0	0	0	0	0	0	0	0
Water	0	0	0	0	0	0	0	0	0	0	0	0	0
Residential	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
High Density Residential	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Comm./Industrial	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001

1. SCR above Sespe Creek, SCR Reaches 7, 8, and 9, Mint Canyon Creek
2. Sespe Creek, SCR Reach 3
3. Wheeler Canyon / Todd Barranca, Long Canyon / Brown Barranca

Table 45: Monthly Unit Land Application Rate of Nitrate Nitrogen, kg/ha/d

Land Use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Deciduous	0	0	0	0	0	0	0	0	0	0	0	0	0
Mixed Forest	0	0	0	0	0	0	0	0	0	0	0	0	0
Orchard	0.000	0.000	0.000	0.123	0.245	0.245	0.245	0.245	0.245	0.123	0.000	0.000	0.123
Coniferous	0	0	0	0	0	0	0	0	0	0	0	0	0
Shrub / Scrub	0	0	0	0	0	0	0	0	0	0	0	0	0
Grassland	0	0	0	0	0	0	0	0	0	0	0	0	0
Park	0	0	0	0	0	0	0	0	0	0	0	0	0
Golf Course	0.000	0.000	0.000	0.960	0.960	0.960	0.960	0.960	0.960	0.000	0.000	0.000	0.480
Pasture	0	0	0	0	0	0	0	0	0	0	0	0	0
Farm[1]	0.000	0.000	0.000	0.577	0.577	0.577	0.577	0.577	0.577	0.000	0.000	0.000	0.288
Farm[2]	0.288	0.288	0.288	0.577	0.577	0.577	0.577	0.577	0.577	0.288	0.288	0.288	0.433
Farm[3]	0.412	0.412	0.824	0.824	0.824	0.824	0.824	0.824	0.824	0.824	0.824	0.412	0.721
Marsh	0	0	0	0	0	0	0	0	0	0	0	0	0
Barren	0	0	0	0	0	0	0	0	0	0	0	0	0
Water	0	0	0	0	0	0	0	0	0	0	0	0	0
Residential	0	0	0	0	0	0	0	0	0	0	0	0	0
High Density Residential	0	0	0	0	0	0	0	0	0	0	0	0	0
Comm./Industrial	0	0	0	0	0	0	0	0	0	0	0	0	0

1. SCR above Sespe Creek, SCR Reaches 7, 8, and 9, Mint Canyon Creek
2. Sespe Creek, SCR Reach 3
3. Wheeler Canyon / Todd Barranca, Long Canyon / Brown Barranca

Table 46: Monthly Unit Land Application Rate of Phosphorus, kg/ha/d

Land Use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Deciduous	0	0	0	0	0	0	0	0	0	0	0	0	0
Mixed Forest	0	0	0	0	0	0	0	0	0	0	0	0	0
Orchard	0.000	0.000	0.000	0.061	0.123	0.123	0.123	0.123	0.123	0.061	0.000	0.000	0.061
Coniferous	0	0	0	0	0	0	0	0	0	0	0	0	0
Shrub / Scrub	0	0	0	0	0	0	0	0	0	0	0	0	0
Grassland	0	0	0	0	0	0	0	0	0	0	0	0	0
Park	0	0	0	0	0	0	0	0	0	0	0	0	0
Golf Course	0	0	0	0	0	0	0	0	0	0	0	0	0
Pasture	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033
Farm[1]	0.000	0.000	0.000	0.399	0.399	0.399	0.399	0.399	0.399	0.000	0.000	0.000	0.200
Farm[2]	0.200	0.200	0.200	0.399	0.399	0.399	0.399	0.399	0.399	0.200	0.200	0.200	0.299
Farm[3]	0.254	0.254	0.509	0.509	0.509	0.509	0.509	0.509	0.509	0.509	0.509	0.254	0.445
Marsh	0	0	0	0	0	0	0	0	0	0	0	0	0
Barren	0	0	0	0	0	0	0	0	0	0	0	0	0
Water	0	0	0	0	0	0	0	0	0	0	0	0	0
Residential	0	0	0	0	0	0	0	0	0	0	0	0	0
High Density Residential	0	0	0	0	0	0	0	0	0	0	0	0	0
Comm./Industrial	0	0	0	0	0	0	0	0	0	0	0	0	0

1. SCR above Sespe Creek, SCR Reaches 7, 8, and 9, Mint Canyon Creek
2. Sespe Creek, SCR Reach 3
3. Wheeler Canyon / Todd Barranca, Long Canyon / Brown Barranca

When these application rates are applied based on the land use area in each subregion, the result is the net loading rate to each subregion as shown in Tables 47-49.

Table 47: Monthly Land Application of Ammonia, kg/d as N

Region	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Mint Canyon Ck	2.1	2.1	2.1	34.1	34.1	34.1	34.1	34.1	34.1	2.1	2.1	2.1	18.1
Santa Clara River Reach 9	23	23	23	120	127	127	127	127	127	30	23	23	75
Santa Clara River Reach 8	24	24	24	608	618	618	618	618	618	34	24	24	321
Santa Clara River Reach 7	13	13	13	383	391	391	391	391	391	22	13	13	202
Santa Clara River abv Sespe Ck	2	2	2	607	997	997	997	997	997	391	2	2	499
Sespe Creek	18	18	18	207	379	379	379	379	379	189	18	18	198
Santa Clara River Reach 3	98	98	98	796	1376	1376	1376	1376	1376	676	98	98	737
Wheeler Canyon / Todd Barr.	8.9	8.9	17.7	48.7	79.7	79.7	79.7	79.7	79.7	48.7	17.7	8.9	46.5
Brown Barranca / Long Canyon	14.4	14.4	28.6	49.4	70.2	70.2	70.2	70.2	70.2	49.4	28.6	14.4	45.9
TOTAL WATERSHED	200	200	230	2850	4070	4070	4070	4070	4070	1440	230	200	2140

Table 48: Monthly Land Application of Nitrate, kg/d as N

Region	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Mint Canyon Ck	0	0	0	32	32	32	32	32	32	0	0	0	16
Santa Clara River Reach 9	0	0	0	98	105	105	105	105	105	7	0	0	52
Santa Clara River Reach 8	0	0	0	584	594	594	594	594	594	10	0	0	297
Santa Clara River Reach 7	0	0	0	369	378	378	378	378	378	9	0	0	189
Santa Clara River abv Sespe Ck	0	0	0	605	995	995	995	995	995	389	0	0	498
Sespe Creek	18	18	18	207	379	379	379	379	379	189	18	18	201
Santa Clara River Reach 3	96	96	96	795	1375	1375	1375	1375	1375	674	96	96	735
Wheeler Canyon / Todd Barr.	8.8	8.8	17.6	48.6	79.6	79.6	79.6	79.6	79.6	48.6	17.6	8.8	46.4
Brown Barranca / Long Canyon	14.3	14.3	28.6	49.3	70.1	70.1	70.1	70.1	70.1	49.3	28.6	14.3	45.8
TOTAL WATERSHED	140	140	160	2790	4010	4010	4010	4010	4010	1380	160	140	2080

Table 49: Monthly Land Application of Phosphorus, kg/d

Region	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Mint Canyon Ck	0.7	0.7	0.7	22.9	22.9	22.9	22.9	22.9	22.9	0.7	0.7	0.7	11.8
Santa Clara River Reach 9	7.6	7.6	7.6	55.9	59.5	59.5	59.5	59.5	59.5	11.2	7.6	7.6	33.6
Santa Clara River Reach 8	5.3	5.3	5.3	90.5	95.4	95.4	95.4	95.4	95.4	10.2	5.3	5.3	50.4
Santa Clara River Reach 7	5	5	5	166	171	171	171	171	171	10	5	5	88
Santa Clara River abv Sespe Ck	0	0	0	315	512	512	512	512	512	194	0	0	256
Sespe Creek	12	12	12	110	196	196	196	196	196	98	12	12	104
Santa Clara River Reach 3	67	67	67	421	713	713	713	713	713	355	67	67	390
Wheeler Canyon / Todd Barr.	5.4	5.4	10.9	26.3	42	42	42	42	42	26.3	10.9	5.4	25
Brown Barranca / Long Canyon	8.8	8.8	17.6	28	38.5	38.5	38.5	38.5	38.5	28	17.6	8.8	25.8
TOTAL WATERSHED	110	110	130	1240	1850	1850	1850	1850	1850	730	130	110	980

III. Loading Balance

The loading to the land and surface waters in the watershed is linked to the water quality within the impaired reaches of the Santa Clara River. Although modeling is required to reliably link loading with water quality, a rough accounting of pollutants can be approximated through a balance of direct loading, and land application loading with in-stream loading. In-stream loading is the product of flow and concentration within the river itself.

Most of the loading to the land surface may be assimilated in the soil and vegetation before it ever reaches the river but direct loading is not assimilated at all before reaching the river. The magnitude of the land surface loading is likely to be disproportionate to its impact upon water quality in the river. Note that in the following tables, the "Subsurface Discharges" and "Land Application Sources" categories have been combined together into "Total Land Surface Loading" to facilitate the analysis of assimilation of nonpoint source loading. Loading in the river may be assimilated by in-stream processes or lost with water that seeps into the river bed. Estimates of in-stream loading include error from incomplete flow measurement and sporadic water quality measurement. In spite of the error in estimating in-stream loading, it provides a check that loading *in* the river is accounted for by loading *to* the river. It can indicate if loading sources are not completely accounted for.

The assimilation of land surface loading can be estimated through an analysis of the loading balance. If the direct loading is subtracted from in-stream loading, the result is

that portion of loading which came from the land surface. That amount can be compared with the tabulated land surface loading to determine the approximate fraction assimilated. Care should be taken in analyzing assimilation of ammonia and nitrate, since nitrification makes ammonia appear to be assimilated but the resulting nitrate may appear as in-stream loading of nitrate.

Mint Canyon Creek

For Mint Canyon Creek, there is currently no water quality monitoring data. Using the most upstream monitoring station on the Santa Clara River, just upstream of the Saugus Wastewater Reclamation Plant, to estimate concentration in Mint Canyon Creek, Tables 50-53 show the loading balance for ammonia, nitrite, nitrate, and phosphorus.

Table 50: Loading balance of ammonia for Mint Canyon Creek, kg/d N

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Upstream Regions	0	0	0	0	0	0	0	0	0	0	0	0	0
Reservoir Releases	0	0	0	0	0	0	0	0	0	0	0	0	0
Direct Point Sources	0	0	0	0	0	0	0	0	0	0	0	0	0
Diversions	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Direct Loading	0	0	0	0	0	0	0	0	0	0	0	0	0
Groundwater Discharges	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038
Septic Systems	4.21	4.21	4.21	4.21	4.21	4.21	4.21	4.21	4.21	4.21	4.21	4.21	4.21
Diversion Recharge/Irrigation	0	0	0	0	0	0	0	0	0	0	0	0	0
Well Pumping Irrigation	0.01	0.02	0.09	0.13	0.15	0.15	0.17	0.16	0.16	0.14	0.14	0.06	0.12
Atmospheric Deposition	35	65.2	61.7	53.4	29.3	24.1	24.9	22.6	21	26.7	19.8	27.7	34.3
Fertilization	2.1	2.1	2.1	34.1	34.1	34.1	34.1	34.1	34.1	2.1	2.1	2.1	18.1
Total Land Surface Loading	41.4	71.6	68.1	91.9	67.8	62.6	63.4	61.1	59.5	33.2	26.3	34.1	56.8
Total Instream Loading	0.134	0.202	0.394	0.009	0	0.012	0.005	0.006	0.004	0.006	0.011	0.008	0.0066

Table 51: Loading balance of nitrite for Mint Canyon Creek, kg/d N

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Upstream Regions	0	0	0	0	0	0	0	0	0	0	0	0	0
Reservoir Releases	0	0	0	0	0	0	0	0	0	0	0	0	0
Direct Point Sources	0	0	0	0	0	0	0	0	0	0	0	0	0
Diversions	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Direct Loading	0	0	0	0	0	0	0	0	0	0	0	0	0
Groundwater Discharges	0	0	0	0	0	0	0	0	0	0	0	0	0
Septic Systems	0	0	0	0	0	0	0	0	0	0	0	0	0
Diversion Recharge/Irrigation	0	0	0	0	0	0	0	0	0	0	0	0	0
Well Pumping Irrigation	0	0	0	0	0	0	0	0	0	0	0	0	0
Atmospheric Deposition	0	0	0	0	0	0	0	0	0	0	0	0	0
Fertilization	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Land Surface Loading	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Instream Loading	0.016	0.024	0	0.001	0.007	0.001	0.001	0.001	0	0.001	0.001	0.001	0.005

Table 52: Loading balance of nitrate for Mint Canyon Creek, kg/d N

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Upstream Regions	0	0	0	0	0	0	0	0	0	0	0	0	0
Reservoir Releases	0	0	0	0	0	0	0	0	0	0	0	0	0
Direct Point Sources	0	0	0	0	0	0	0	0	0	0	0	0	0
Diversions	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Direct Loading	0	0	0	0	0	0	0	0	0	0	0	0	0
Groundwater Discharges	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008
Septic Systems	0	0	0	0	0	0	0	0	0	0	0	0	0
Diversion Recharge/Irrigation	0	0	0	0	0	0	0	0	0	0	0	0	0
Well Pumping Irrigation	0.7	0.8	4.4	6.7	7.5	7.4	8.5	8.2	8.2	7.1	6.8	3.2	5.8
Atmospheric Deposition	36	61.5	64.8	66	27.3	21.1	14.2	17.3	17.8	22.8	20.5	35.6	33.7
Fertilization	0	0	0	32	32	32	32	32	32	0	0	0	16
Total Land Surface Loading	37	62	69	105	67	61	55	58	58	30	27	39	56
Total Instream Loading	16	24	21.2	1.1	3.7	1.5	0.6	0.8	0.4	0.7	1.3	1	6

Table 53: Loading balance of phosphorus for Mint Canyon Creek, kg/d P

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Upstream Regions	0	0	0	0	0	0	0	0	0	0	0	0	0
Reservoir Releases	0	0	0	0	0	0	0	0	0	0	0	0	0
Direct Point Sources	0	0	0	0	0	0	0	0	0	0	0	0	0
Diversions	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Direct Loading	0	0	0	0	0	0	0	0	0	0	0	0	0
Groundwater Discharges	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Septic Systems	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79
Diversion Recharge/Irrigation	0	0	0	0	0	0	0	0	0	0	0	0	0
Well Pumping Irrigation	0.01	0.01	0.04	0.07	0.07	0.07	0.08	0.08	0.08	0.07	0.07	0.03	0.06
Atmospheric Deposition	0	0	0	0	0	0	0	0	0	0	0	0	0
Fertilization	0.7	0.7	0.7	22.9	22.9	22.9	22.9	22.9	22.9	0.7	0.7	0.7	11.8
Total Land Surface Loading	1.5	1.5	1.5	23.8	23.8	23.8	23.8	23.8	23.8	1.6	1.6	1.5	12.7
Total Instream Loading	16.5	24.8	17.7	1.2	4.4	1.5	0.7	0.8	0.5	0.8	1.3	1	5.9

Santa Clara River Reach 9

To calculate the in-stream loading for Santa Clara River Reach 9, the flow was estimated by starting with the gaging station at Old Road Bridge, then subtracting the flow from Saugus WWRF and twice the flow of the Bouquet Canyon Creek gage. Doubling the Bouquet Canyon gaged flow accounts for neighboring San Francisquito Canyon, which has similar characteristics and watershed size. The water quality monitoring was from Los Angeles County Sanitation District (LA CSD) station RA. Data only exists for February, March and May, so the February data was extrapolated to cover the wet season (December-March) and May was extrapolated to all of the dry season (May-November). April was the average of March and May.

Since Mint Canyon Creek is upstream of the Santa Clara River Reach 9 region, its outflow is considered as a direct loading input to Reach 9. Note that most of the in-stream loading occurs in spring with high winter flows.

Table 54: Loading balance of ammonia for Santa Clara River Reach 9, kg/d N

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Mint Canyon Creek	0.134	0.202	0.394	0.009	0	0.012	0.005	0.006	0.004	0.006	0.011	0.008	0.066
Reservoir Releases	0	0	0	0	0	0	0	0	0	0	0	0	0
Direct Point Sources	0	0	0	0	0	0	0	0	0	0	0	0	0
Diversions	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Direct Loading	0.134	0.202	0.394	0.009	0	0.012	0.005	0.006	0.004	0.006	0.011	0.008	0.066
Groundwater Discharges	44.3	44.3	44.3	44.3	44.3	44.3	44.3	44.3	44.3	44.3	44.3	44.3	44.3
Septic Systems	27.83	27.83	27.83	27.83	27.83	27.83	27.83	27.83	27.83	27.83	27.83	27.83	27.83
Diversion Recharge/Irrigation	0	0	0	0	0	0	0	0	0	0	0	0	0
Well Pumping Irrigation	0.04	0.05	0.27	0.41	0.46	0.46	0.52	0.51	0.5	0.44	0.42	0.2	0.36
Atmospheric Deposition	187	384	374	293	207	186	201	170	166	202	130	199	225
Fertilization	23	23	23	120	127	127	127	127	127	30	23	23	75
Total Land Surface Loading	282	479	469	486	407	386	401	370	366	305	226	294	372
Total Instream Loading	2	23	9	53	103	30	11	18	19	16	26	2	26

Table 55: Loading balance of nitrite for Santa Clara River Reach 9, kg/d N

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Mint Canyon Creek	0.016	0.024	0	0.001	0.007	0.001	0.001	0.001	0	0.001	0.001	0.001	0.005
Reservoir Releases	0	0	0	0	0	0	0	0	0	0	0	0	0
Direct Point Sources	0	0	0	0	0	0	0	0	0	0	0	0	0
Diversions	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Direct Loading	0	0	0	0	0	0	0	0	0	0	0	0	0
Groundwater Discharges	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004
Septic Systems	0	0	0	0	0	0	0	0	0	0	0	0	0
Diversion Recharge/Irrigation	0	0	0	0	0	0	0	0	0	0	0	0	0
Well Pumping Irrigation	0	0	0	0	0	0	0	0	0	0	0	0	0
Atmospheric Deposition	0	0	0	0	0	0	0	0	0	0	0	0	0
Fertilization	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Land Surface Loading	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004
Total Instream Loading	0	0	0	1.56	3.17	0.92	0.34	0.54	0.58	0.51	0.8	0	0.7

Table 56: Loading balance of nitrate for Santa Clara River Reach 9, kg/d N

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Mint Canyon Creek	16	24	21.2	1.1	3.7	1.5	0.6	0.8	0.4	0.7	1.3	1	6
Reservoir Releases	0	0	0	0	0	0	0	0	0	0	0	0	0
Direct Point Sources	0.89	0.89	0.89	0.89	0.89	0.9	0.9	0.9	0.9	0.89	0.89	0.89	0.89
Diversions	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Direct Loading	16.89	24.89	22.09	1.99	4.59	2.4	1.5	1.7	1.3	1.59	2.19	1.89	6.89
Groundwater Discharges	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.3	12.3	12.2	12.2
Septic Systems	0	0	0	0	0	0	0	0	0	0	0	0	0
Diversion Recharge/Irrigation	0	0	0	0	0	0	0	0	0	0	0	0	0
Well Pumping Irrigation	2.2	2.5	13.4	20.6	23	22.8	26.1	25.4	25.1	21.9	21.1	9.8	17.8
Atmospheric Deposition	199	356	387	340	184	157	106	107	138	165	143	275	213
Fertilization	0	0	0	98	105	105	105	105	105	7	0	0	52
Total Land Surface Loading	213	371	413	471	324	297	249	250	280	206	176	297	295
Total Instream Loading	54	681	395	164	104	30	11	18	19	17	26	60	132

Table 57: Loading balance of phosphorus for Santa Clara River Reach 9, kg/d P

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Mint Canyon Creek	16.5	24.8	17.7	1.2	4.4	1.5	0.7	0.8	0.5	0.8	1.3	1	5.9
Reservoir Releases	0	0	0	0	0	0	0	0	0	0	0	0	0
Direct Point Sources	0	0	0	0	0	0	0	0	0	0	0	0	0
Diversions	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Direct Loading	17	25	18	1	4	2	1	1	1	1	1	1	6
Groundwater Discharges	14.3	14.3	14.3	14.3	14.3	14.4	14.4	14.4	14.4	14.4	14.4	14.3	14.4
Septic Systems	5.22	5.22	5.22	5.22	5.22	5.22	5.22	5.22	5.22	5.22	5.22	5.22	5.222
Diversion Recharge/Irrigation	0	0	0	0	0	0	0	0	0	0	0	0	0
Well Pumping Irrigation	0.02	0.03	0.13	0.21	0.23	0.23	0.26	0.25	0.25	0.22	0.21	0.1	0.18
Atmospheric Deposition	0	0	0	0	0	0	0	0	0	0	0	0	0
Fertilization	7.6	7.6	7.6	55.9	59.5	59.5	59.5	59.5	59.5	11.2	7.6	7.6	33.6
Total Land Surface Loading	27	27	27	76	79	79	79	79	79	31	27	27	53
Total Instream Loading	4	49	118	93	120	35	13	21	22	19	30	4	44

Santa Clara River Reach 8

To calculate in-stream loading for Santa Clara River Reach 8, the gaging station at Old Road Bridge was used as the flow estimate. The water quality monitoring was from Los Angeles County Sanitation District (LA CSD) stations RB and RB01. Since Santa Clara River Reach 9 is upstream of the Santa Clara River Reach 8 region, its outflow is considered as a direct loading input to Reach 8. Note that during the winter rainy season most of the loading is from non-point sources, but during the dry season there is little nonpoint source loading reaching the Santa Clara River and some attenuation of pollutants loaded directly to the river. Sometimes, the flow from the Saugus WWRF is greater than the flow at the Old Road bridge gage, indicating that some flow and its associated in-stream loading is being lost as water seeps into the river bed.

Table 58: Loading balance of ammonia for Santa Clara River Reach 8, kg/d N

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Santa Clara River Reach 9	2	23	9	53	103	30	11	18	19	16	26	2	26
Reservoir Releases	0	0	0	0	0	0	0	0	0	0	0	0	0
Direct Point Sources	258	238	237	217	251	247	233	245	254	267	267	285	251
Diversions	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Direct Loading	260	261	246	270	354	277	244	263	273	283	293	287	276
Groundwater Discharges	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7
Septic Systems	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2
Diversion Recharge/Irrigation	0	0	0	0	0	0	0	0	0	0	0	0	0
Well Pumping Irrigation	0.07	0.08	0.44	0.68	0.75	0.75	0.85	0.83	0.82	0.72	0.69	0.32	0.58
Atmospheric Deposition	179	334	311	231	145	123	137	121	110	134	98	142	172
Fertilization	24	24	24	608	618	618	618	618	618	34	24	24	321
Total Land Surface Loading	230	385	362	867	791	769	783	767	756	196	150	193	521
Total Instream Loading	434	2427	916	496	670	283	207	215	203	145	228	321	545

Table 59: Loading balance of nitrite for Santa Clara River Reach 8, kg/d N

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Santa Clara River Reach 9	0	0	0	1.56	3.17	0.92	0.34	0.54	0.58	0.51	0.8	0	0.70
Reservoir Releases	0	0	0	0	0	0	0	0	0	0	0	0	0
Direct Point Sources	52.8	43.2	40.4	39.4	42.3	38.8	41.6	41.4	42.1	40.4	43.5	51.5	43.2
Diversions	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Direct Loading	52.8	43.2	40.4	41	45.5	39.7	41.9	41.9	42.7	40.9	44.3	51.5	43.8
Groundwater Discharges	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004
Septic Systems	0	0	0	0	0	0	0	0	0	0	0	0	0
Diversion Recharge/Irrigation	0	0	0	0	0	0	0	0	0	0	0	0	0
Well Pumping Irrigation	0	0	0	0	0	0	0	0	0	0	0	0	0
Atmospheric Deposition	0	0	0	0	0	0	0	0	0	0	0	0	0
Fertilization	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Land Surface Loading	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004
Total Instream Loading	9.2	320	32.9	37.8	57.9	13.5	12.4	26.7	24	0.7	39.3	15.8	49.2

Table 60: Loading balance of nitrate for Santa Clara River Reach 8, kg/d N

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Santa Clara River Reach 9	54	681	395	164	104	30	11	18	19	17	26	60	132
Reservoir Releases	0	0	0	0	0	0	0	0	0	0	0	0	0
Direct Point Sources	30.6	36.3	33.2	38.2	48.1	60	45.5	32.9	39.7	43.1	35.8	31.8	39.5
Diversions	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Direct Loading	84.6	717.3	428.2	202.2	152.1	90	56.5	50.9	58.7	60.1	61.8	91.8	171
Groundwater Discharges	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.3	12.3	12.2	12.2
Septic Systems	0	0	0	0	0	0	0	0	0	0	0	0	0
Diversion Recharge/Irrigation	0	0	0	0	0	0	0	0	0	0	0	0	0
Well Pumping Irrigation	3.6	4.2	22	33.8	37.7	37.4	42.7	41.6	41.2	35.9	34.6	16.1	29.2
Atmospheric Deposition	181	311	324	274	131	105	76	84	87	118	100	181	164
Fertilization	0	0	0	584	594	594	594	594	594	10	0	0	297
Total Land Surface Loading	197	327	358	904	775	749	725	732	734	176	147	209	503
Total Instream Loading	98	735	239	159	168	137	108	46	56	31	63	168	167

Table 61: Loading balance of phosphorus for Santa Clara River Reach 8, kg/d P

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Santa Clara River Reach 9	4	49	118	93	120	35	13	21	22	19	30	4	44
Reservoir Releases	0	0	0	0	0	0	0	0	0	0	0	0	0
Direct Point Sources	161	166	177	164	170	154	148	146	152	146	143	147	156
Diversions	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Direct Loading	165	215	295	257	290	189	161	167	174	165	173	151	200
Groundwater Discharges	14.3	14.3	14.3	14.3	14.3	14.4	14.4	14.4	14.4	14.4	14.4	14.3	14.4
Septic Systems	2.29	2.29	2.29	2.29	2.29	2.29	2.29	2.29	2.29	2.29	2.29	2.29	2.29
Diversion Recharge/Irrigation	0	0	0	0	0	0	0	0	0	0	0	0	0
Well Pumping Irrigation	0.04	0.04	0.22	0.34	0.38	0.37	0.43	0.42	0.41	0.36	0.35	0.16	0.29
Atmospheric Deposition	0	0	0	0	0	0	0	0	0	0	0	0	0
Fertilization	5.3	5.3	5.3	90.5	95.4	95.4	95.4	95.4	95.4	10.2	5.3	5.3	50.4
Total Land Surface Loading	22	22	22	107	112	112	113	113	113	27	22	22	67.3
Total Instream Loading	276	1968	686	580	402	183	109	90	87	10	183	305	407

Santa Clara River Reach 7

For Santa Clara River Reach 7, flow is estimated from the USGS station at the Los Angeles / Ventura county line. Water quality is estimated from USGS and UWCD monitoring data at the same location and LA CSD station RF just downstream. This region includes direct loading from Reach 8 and from Castaic Lake releases. The imbalance between direct loading and in-stream loading of ammonia and an imbalance of nitrate in the opposite direction implies that nitrification is an important process in this reach. Assimilation of additional ammonia and phosphorus is also apparent. The cause could be periphyton growth and/or water seeping into the river bed.

Table 62: Loading balance of ammonia for Santa Clara River Reach 7, kg/d N

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Santa Clara River Reach 8	434	2427	916	496	670	283	207	215	203	145	228	321	545
Reservoir Releases (Castaic)	0.22	3.94	3.71	1.68	1.54	0.68	0.42	0.28	0.19	0.03	0.07	0.17	1.06
Direct Point Sources	561	520	547	594	579	585	585	540	537	505	551	570	556
Diversions	0	0	-25	-92	-88	-102	-116	-116	-53	-116	-87	-17	-68
Total Direct Loading	995	2951	1442	1000	1162	766	676	639	688	534	692	874	1034
Groundwater Discharges	0	0	0	0	0	0	0	0	0	0	0	0	0
Septic Systems	9.73	9.73	9.73	9.73	9.73	9.73	9.73	9.73	9.73	9.73	9.73	9.73	9.73
Diversion Recharge/Irrigation	0	0	25	92	88	102	116	116	53	116	87	17	68
Well Pumping Irrigation	0	0	0	0	0	0	0	0	0	0	0	0	0
Atmospheric Deposition	110	201	188	141	91	70	76	63	59	79	58	87	102
Fertilization	13	13	13	383	391	391	391	391	391	22	13	13	202
Total Land Surface Loading	133	224	236	625	580	573	593	580	512	227	168	127	382
Total Instream Loading	1864	2462	624	92	168	98	37	46	79	679	24	382	546

Table 63: Loading balance of nitrite for Santa Clara River Reach 7, kg/d N

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Santa Clara River Reach 8	9.2	320	32.9	37.8	57.9	13.5	12.4	26.7	24	0.7	39.3	15.8	49.2
Reservoir Releases (Castaic)	0	0	0	0	0	0	0	0	0	0	0	0	0
Direct Point Sources	46.2	48.6	51.7	46.7	51.2	50.1	52.6	45.3	52.9	47.1	44.2	46.3	48.5
Diversions	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Direct Loading	55.4	368.6	84.6	84.5	109.1	63.6	65	72	76.9	47.8	83.5	62.1	97.7
Groundwater Discharges	0	0	0	0	0	0	0	0	0	0	0	0	0
Septic Systems	0	0	0	0	0	0	0	0	0	0	0	0	0
Diversion Recharge/Irrigation	0	0	0	0	0	0	0	0	0	0	0	0	0
Well Pumping Irrigation	0	0	0	0	0	0	0	0	0	0	0	0	0
Atmospheric Deposition	0	0	0	0	0	0	0	0	0	0	0	0	0
Fertilization	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Land Surface Loading	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Instream Loading	169	132	97	86	63	85	47	23	26	70	35	46	73

Table 64: Loading balance of nitrate for Santa Clara River Reach 7, kg/d N

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Santa Clara River Reach 8	98	735	239	159	168	137	108	46	56	31	63	168	167
Reservoir Releases (Castaic)	0.4	9.6	11.5	9.5	17.4	4.3	0.6	1.3	0	0.2	0.4	0.9	4.7
Direct Point Sources	188	189	203	201	175	189	206	194	185	220	228	202	199
Diversions	0	0	-94	-96	-92	-95	-98	-101	-170	-109	-138	-14	-84
Total Direct Loading	286	934	360	274	268	235	217	140	71	142	153	357	287
Groundwater Discharges	0	0	0	0	0	0	0	0	0	0	0	0	0
Septic Systems	0	0	0	0	0	0	0	0	0	0	0	0	0
Diversion Recharge/Irrigation	0	0	94	96	92	95	98	101	170	109	138	14	84
Well Pumping Irrigation	0	0	0	0	0	0	0	0	0	0	0	0	0
Atmospheric Deposition	110	189	193	167	82	60	43	40	48	68	61	113	98
Fertilization	0	0	0	369	378	378	378	378	378	9	0	0	189
Total Land Surface Loading	110	189	287	632	552	533	519	519	596	186	199	127	371
Total Instream Loading	2433	2196	1935	791	533	432	304	407	365	336	392	704	902

Table 65: Loading balance of phosphorus for Santa Clara River Reach 7, kg/d P

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Santa Clara River Reach 8	276	1968	686	580	402	183	109	90	87	10	183	305	407
Reservoir Releases (Castaic)	0.2	3.61	3.41	3.37	1.41	0.62	0.38	0.26	0.07	0.03	0.07	0.16	1.11
Direct Point Sources	339	337	348	343	287	266	274	266	220	228	251	284	286
Diversions	0	0	-79	-77	-71	-80	-89	-98	-132	-27	-104	-11	-64
Total Direct Loading	615	2309	958	849	619	370	294	258	175	211	330	578	630
Groundwater Discharges	0	0	0	0	0	0	0	0	0	0	0	0	0
Septic Systems	1.82	1.82	1.82	1.82	1.82	1.82	1.82	1.82	1.82	1.82	1.82	1.82	1.82
Diversion Recharge/Irrigation	0	0	79	77	71	80	89	98	132	27	104	11	64
Well Pumping Irrigation	0	0	0	0	0	0	0	0	0	0	0	0	0
Atmospheric Deposition	0	0	0	0	0	0	0	0	0	0	0	0	0
Fertilization	5	5	5	166	171	171	171	171	171	10	5	5	88
Total Land Surface Loading	6.8	6.8	85.8	244.8	243.8	252.8	261.8	270.8	304.8	38.8	110.8	17.8	153.8
Total Instream Loading	639	798	576	252	144	98	81	79	79	82	95	148	256

Santa Clara River upstream of Sespe Creek

For the Santa Clara River upstream of Sespe Creek, there is no gaging station which directly measures flow at Sespe Creek. The estimated flow is USGS gage at Saticoy plus the diverted Freeman flow, minus the undiverted flow of Santa Paula and Sespe Creeks, minus the flow from the Santa Paula WRP. Water quality is estimated from the UWCD site downstream of the Fillmore WRP discharge (04N19W33SW1). This region includes direct loading inputs from Reach 7 and from Lake Piru releases. This stretch of river includes the "dry gap", a stretch of river which usually has no flow because of water seeping into the river bed. This assimilation mechanism is clearly a key process in this section of the watershed.

Table 66: Loading balance of ammonia for Santa Clara River above Sespe Creek, kg/d N

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Santa Clara River Reach 7	1864	2462	624	92	168	98	37	46	79	679	24	382	546
Reservoir Releases (Piru)	1.5	2.6	3.3	1.9	3.3	2.4	1.7	4.3	15.2	14.3	7.4	2.4	5
Direct Point Sources	4.9	1.6	9.8	16.4	7.2	15.8	29.2	12.1	3.7	2.3	2.9	5	9.3
Diversions	-0.28	-0.45	-0.86	-1.11	-2.63	-1.21	-0.68	-0.84	-1.84	-0.76	-0.84	-0.61	-1.01
Total Direct Loading	1870	2466	636	109	176	115	67	62	96	695	33	389	559
Groundwater Discharges	49.6	57.6	53.2	46.3	50.1	42.6	39.8	40.9	46.9	43.4	46.3	46.6	46.9
Septic Systems	4.78	4.78	4.78	4.78	4.78	4.78	4.78	4.78	4.78	4.78	4.78	4.78	4.78
Diversion Recharge/Irrigation	0.28	0.45	0.86	1.11	2.63	1.21	0.68	0.84	1.84	0.76	0.84	0.61	1.01
Well Pumping Irrigation	9	9	9	9	9	9	11.4	11.4	11.4	11.5	11.5	11.5	10.2
Atmospheric Deposition	141	234	246	201	128	101	115	86	91	112	78	131	139
Fertilization	2	2	2	607	997	997	997	997	997	391	2	2	499
Total Land Surface Loading	207	308	316	869	1192	1156	1169	1141	1153	563	143	196	701
Total Instream Loading	0	529	424	313	215	64	58	50	100	587	485	397	269

Table 67: Loading balance of nitrite for Santa Clara River above Sespe Creek, kg/d N

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Santa Clara River Reach 7	169	132	97	86	63	85	47	23	26	70	35	46	73
Reservoir Releases (Piru)	0	0	0	0	0	0	0	0	0	0	0	0	0
Direct Point Sources	0.08	0.02	0.22	0.11	0.03	0.25	0.23	0.13	0.11	0.04	0.05	0.08	0.11
Diversions	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Direct Loading	169	132	97	86	63	85	47	23	26	70	35	46	73
Groundwater Discharges	0.79	1.142	1.122	1	0.943	0.582	0.588	0.675	0.755	0.731	0.755	0.746	0.817
Septic Systems	0	0	0	0	0	0	0	0	0	0	0	0	0
Diversion Recharge/Irrigation	0	0	0	0	0	0	0	0	0	0	0	0	0
Well Pumping Irrigation	0	0	0	0	0	0	0	0	0	0	0	0	0
Atmospheric Deposition	0	0	0	0	0	0	0	0	0	0	0	0	0
Fertilization	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Land Surface Loading	0.79	1.142	1.122	1	0.943	0.582	0.588	0.675	0.755	0.731	0.755	0.746	0.817
Total Instream Loading	0	0	0	0	0	22.1	8.5	0	0	0	0	0	2.6

Table 68: Loading balance of nitrate for Santa Clara River above Sespe Creek, kg/d N

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Santa Clara River Reach 7	2433	2196	1935	791	533	432	304	407	365	336	392	704	902
Reservoir Releases (Piru)	3	6	10	11	37	15	3	19	0	97	44	12	22
Direct Point Sources	0.18	0.29	1.553	2.317	0.722	2.164	2.974	2.974	1.954	2.555	1.495	0.915	1.679
Diversions	-0.69	-1.46	-3.38	-8.29	-32	-8.69	-1.5	-4.41	-0.6	-5.77	-5.62	-3.55	-6.33
Total Direct Loading	2435	2201	1943	796	539	440	308	425	366	430	432	713	919
Groundwater Discharges	6.6	6.97	6.86	6.95	7.55	7.69	6.95	5.77	6.68	7	6.44	6.35	6.81
Septic Systems	0	0	0	0	0	0	0	0	0	0	0	0	0
Diversion Recharge/Irrigation	0.69	1.46	3.38	8.29	32	8.69	1.5	4.41	0.6	5.77	5.62	3.55	6.33
Well Pumping Irrigation	317	317	317	317	317	317	425	425	425	429	429	429	372
Atmospheric Deposition	149	242	264	268	137	107	79	61	86	96	93	185	147
Fertilization	0	0	0	605	995	995	995	995	995	389	0	0	498
Total Land Surface Loading	473	567	591	1205	1489	1435	1507	1491	1513	927	534	624	1030
Total Instream Loading	181	2117	1326	612	302	265	156	81	142	718	498	331	561

Table 69: Loading balance of phosphorus for Santa Clara River above Sespe Creek, kg/d P

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Santa Clara River Reach 7	639	798	576	252	144	98	81	79	79	82	95	148	256
Reservoir Releases (Piru)	1.4	2.4	3.1	3.8	3	2.2	1.5	4	5.7	13.1	6.7	2.2	4.1
Direct Point Sources	0.9	0.4	2.28	3.18	1.72	2.95	4.97	3.25	1.01	1.34	0.95	1.1	2.02
Diversions	-0.26	-0.42	-0.79	-2.23	-2.42	-1.11	-0.63	-0.77	-0.69	-0.7	-0.77	-0.56	-0.94
Total Direct Loading	641	800	581	257	146	102	87	85	85	96	102	151	261
Groundwater Discharges	9.5	10.8	9.4	8.5	9	8.2	7.9	7.5	9.5	9.1	9.1	9	8.9
Septic Systems	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Diversion Recharge/Irrigation	0.26	0.42	0.79	2.23	2.42	1.11	0.63	0.77	0.69	0.7	0.77	0.56	0.94
Well Pumping Irrigation	4.96	4.96	4.96	4.96	4.96	4.96	6.45	6.45	6.45	6.53	6.53	6.53	5.73
Atmospheric Deposition	0	0	0	0	0	0	0	0	0	0	0	0	0
Fertilization	0	0	0	315	512	512	512	512	512	194	0	0	256
Total Land Surface Loading	16	17	16	332	529	527	528	528	530	211	17	17	272
Total Instream Loading	0	112	90	64	43	31	12	0	2	27	34	37	38

Sespe Creek

The Sespe Creek in-stream loading was estimated based on the undiverted flow of Sespe Creek (USGS gage flow minus Fillmore Irrigation Canal flow) and water quality monitoring by the USGS (station 11113000) and UWCD (4N20W26SW1). Most of this region is natural landscape, but the area near the mouth of Sespe Creek has some anthropogenic pollutant sources. Note that approximately 99% of nitrogen and 90% of phosphorus loaded to the land surface is assimilated.

Table 70: Loading balance of ammonia for Sespe Creek, kg/d N

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Upstream Regions	0	0	0	0	0	0	0	0	0	0	0	0	0
Reservoir Releases	0	0	0	0	0	0	0	0	0	0	0	0	0
Direct Point Sources	0	0	0	0	0	0	0	0	0	0	0	0	0
Diversions	-0.02	-0.04	0	-0.04	-0.24	-0.23	-0.29	-0.26	-0.41	-0.22	-0.18	-0.16	-0.17
Total Direct Loading	-0.02	-0.04	0	-0.04	-0.24	-0.23	-0.29	-0.26	-0.41	-0.22	-0.18	-0.16	-0.17
Groundwater Discharges	0	0	0	0	0	0	0	0	0	0	0	0	0
Septic Systems	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95
Diversion Recharge/Irrigation	0.02	0.04	0	0.04	0.24	0.23	0.29	0.26	0.41	0.22	0.18	0.16	0.17
Well Pumping Irrigation	1.42	1.42	1.42	1.42	1.42	1.42	2.13	2.13	2.13	2.14	2.14	2.14	1.78
Atmospheric Deposition	487	945	796	689	459	339	334	272	257	338	226	386	461
Fertilization	18	18	18	207	379	379	379	379	379	189	18	18	198
Total Land Surface Loading	508	966	817	899	842	722	717	655	640	531	248	408	663
Total Instream Loading	39.3	64.9	32	4.6	7.1	3.1	1.2	0.5	0.6	0.6	1.1	7.2	13.5

Table 71: Loading balance of nitrite for Sespe Creek, kg/d N

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Upstream Regions	0	0	0	0	0	0	0	0	0	0	0	0	0
Reservoir Releases	0	0	0	0	0	0	0	0	0	0	0	0	0
Direct Point Sources	0	0	0	0	0	0	0	0	0	0	0	0	0
Diversions	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Direct Loading	0	0	0	0	0	0	0	0	0	0	0	0	0
Groundwater Discharges	0	0	0	0	0	0	0	0	0	0	0	0	0
Septic Systems	0	0	0	0	0	0	0	0	0	0	0	0	0
Diversion Recharge/Irrigation	0	0	0	0	0	0	0	0	0	0	0	0	0
Well Pumping Irrigation	0	0	0	0	0	0	0	0	0	0	0	0	0
Atmospheric Deposition	0	0	0	0	0	0	0	0	0	0	0	0	0
Fertilization	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Land Surface Loading	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Instream Loading	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 72: Loading balance of nitrate for Sespe Creek, kg/d N

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Upstream Regions	0	0	0	0	0	0	0	0	0	0	0	0	0
Reservoir Releases	0	0	0	0	0	0	0	0	0	0	0	0	0
Direct Point Sources	0	0	0	0	0	0	0	0	0	0	0	0	0
Diversions	0	0	0	0	-0.18	-0.51	-1.1	-0.48	0	-0.67	-0.14	-0.06	-0.26
Total Direct Loading	0	0	0	0	-0.18	-0.51	-1.1	-0.48	0	-0.67	-0.14	-0.06	-0.26
Groundwater Discharges	0	0	0	0	0	0	0	0	0	0	0	0	0
Septic Systems	0	0	0	0	0	0	0	0	0	0	0	0	0
Diversion Recharge/Irrigation	0	0	0	0	0.18	0.51	1.1	0.48	0	0.67	0.14	0.06	0.26
Well Pumping Irrigation	76	76	76	76	76	76	113	113	113	114	114	114	94
Atmospheric Deposition	490	911	857	952	500	394	223	205	244	311	264	517	489
Fertilization	18	18	18	207	379	379	379	379	379	189	18	18	201
Total Land Surface Loading	584	1005	951	1235	955	850	716	697	736	615	396	649	784
Total Instream Loading	0	0	0	0	5.33	6.97	4.63	1.01	0	1.95	0.84	2.72	1.95

Table 73: Loading balance of phosphorus for Sespe Creek, kg/d P

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Upstream Regions	0	0	0	0	0	0	0	0	0	0	0	0	0
Reservoir Releases	0	0	0	0	0	0	0	0	0	0	0	0	0
Direct Point Sources	0	0	0	0	0	0	0	0	0	0	0	0	0
Diversions	-0.01	-0.03	0	-0.07	-0.16	-0.15	-0.2	-0.17	-0.16	-0.15	-0.12	-0.11	-0.11
Total Direct Loading	-0.01	-0.03	0	-0.07	-0.16	-0.15	-0.2	-0.17	-0.16	-0.15	-0.12	-0.11	-0.11
Groundwater Discharges	0	0	0	0	0	0	0	0	0	0	0	0	0
Septic Systems	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37
Diversion Recharge/Irrigation	0.01	0.03	0	0.07	0.16	0.15	0.2	0.17	0.16	0.15	0.12	0.11	0.11
Well Pumping Irrigation	0.71	0.71	0.71	0.71	0.71	0.71	1.07	1.07	1.07	1.07	1.07	1.07	0.89
Atmospheric Deposition	0	0	0	0	0	0	0	0	0	0	0	0	0
Fertilization	12	12	12	110	196	196	196	196	196	98	12	12	104
Total Land Surface Loading	13.1	13.1	13.1	111.2	197.2	197.2	197.6	197.6	197.6	99.6	13.6	13.6	105.4
Total Instream Loading	26.2	43.3	21.3	9.2	4.7	2.1	0.8	0.4	0.3	0.4	0.7	4.8	9.5

Santa Clara River Reach 3

Flow at the Freeman diversion, calculated as the sum of the gaged flow at Saticoy plus the Freeman diversion flow, was used with water quality data collected by UWCD (3N21W32SW1) at the same location to estimate in-stream loading. The difference between in-stream loading and direct loading indicates that much non-point source load of nitrogen reaches the river in this region.

Table 74: Loading balance of ammonia for Santa Clara River Reach 3, kg/d N

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Sespe Ck & SCR above Sespe	39	594	456	318	222	67	59	51	101	588	486	404	283
Reservoir Releases	0	0	0	0	0	0	0	0	0	0	0	0	0
Direct Point Sources	146	139	154	134	144	157	139	136	123	120	136	155	140
Diversions	-0.05	-0.05	-0.05	-0.17	-0.23	-0.23	-0.36	-0.36	-0.44	-0.24	-0.24	-0.24	-0.22
Total Direct Loading	185	733	610	452	366	224	198	187	224	708	622	559	423
Groundwater Discharges	0.589	0.814	0.546	0.41	0.41	0.401	0.386	0.383	0.278	0.277	0.49	0.387	0.444
Septic Systems	7.93	7.93	7.93	7.93	7.93	7.93	7.93	7.93	7.93	7.93	7.93	7.93	7.93
Diversion Recharge/Irrigation	0.05	0.05	0.05	0.17	0.23	0.23	0.36	0.36	0.44	0.24	0.24	0.24	0.22
Well Pumping Irrigation	8	8	8	8	8	8	12.5	12.5	12.5	12.6	12.6	12.6	10.3
Atmospheric Deposition	145	252	281	238	166	135	156	123	121	135	93	146	166
Fertilization	98	98	98	796	1376	1376	1376	1376	1376	676	98	98	737
Total Land Surface Loading	260	367	396	1051	1559	1528	1553	1520	1518	832	212	265	922
Total Instream Loading	275	1878	1062	581	323	256	225	214	594	4537	4901	248	1258

Table 75: Loading balance of nitrite for Santa Clara River Reach 3, kg/d N

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Sespe Ck & SCR above Sespe	0	0	0	0	0	22.1	8.5	0	0	0	0	0	2.6
Reservoir Releases	0	0	0	0	0	0	0	0	0	0	0	0	0
Direct Point Sources	4.03	4.12	4.06	5.09	4.58	4.41	5.69	6.5	8.6	9.19	5.98	3.54	5.5
Diversions	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Direct Loading	4	4	4	5	5	27	14	7	9	9	6	4	8
Groundwater Discharges	0	0	0	0	0	0	0	0	0	0	0	0	0
Septic Systems	0	0	0	0	0	0	0	0	0	0	0	0	0
Diversion Recharge/Irrigation	0	0	0	0	0	0	0	0	0	0	0	0	0
Well Pumping Irrigation	0	0	0	0	0	0	0	0	0	0	0	0	0
Atmospheric Deposition	0	0	0	0	0	0	0	0	0	0	0	0	0
Fertilization	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Land Surface Loading	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Instream Loading	0	0	0	0	0	0	0	0	0	0	68.7	0	5.7

Table 76: Loading balance of nitrate for Santa Clara River Reach 3, kg/d N

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Sespe Ck & SCR above Sespe	181	2117	1326	612	307	272	161	82	142	720	499	334	563
Reservoir Releases	0	0	0	0	0	0	0	0	0	0	0	0	0
Direct Point Sources	42.5	35	36.5	37.4	34.2	34.5	37.1	38.2	37.5	33.4	36.4	39.9	36.9
Diversions	-1.42	-1.12	-0.81	-1.83	-2.25	-2.44	-5.88	-57.7	-26.3	-4.91	-3.63	-2.2	-9.21
Total Direct Loading	222	2151	1362	648	339	304	192	63	153	748	532	372	591
Groundwater Discharges	0.121	0.384	0.376	0.274	0.172	0.083	0.073	0.102	0.128	0.145	0.148	0.122	0.175
Septic Systems	0	0	0	0	0	0	0	0	0	0	0	0	0
Diversion Recharge/Irrigation	1.42	1.12	0.81	1.83	2.25	2.44	5.88	57.7	26.3	4.91	3.63	2.2	9.21
Well Pumping Irrigation	385	385	385	385	385	385	615	615	615	619	619	619	501
Atmospheric Deposition	156	261	301	319	174	136	100	86	114	106	119	200	173
Fertilization	96	96	96	795	1375	1375	1375	1375	1375	674	96	96	735
Total Land Surface Loading	639	744	783	1501	1936	1899	2096	2134	2130	1404	838	917	1418
Total Instream Loading	519	3198	1319	556	247	150	111	93	167	927	779	537	717

Table 77: Loading balance of phosphorus for Santa Clara River Reach 3, kg/d P

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Sespe Ck & SCR above Sespe	26	155	111	73	48	33	13	0	2	27	35	42	48
Reservoir Releases	0	0	0	0	0	0	0	0	0	0	0	0	0
Direct Point Sources	23.1	22.2	33	26.4	24	27.8	27.2	25.7	25.1	21	27.8	30.8	26.2
Diversions	-0.03	-0.02	-0.03	-0.12	-0.13	-0.2	-1.29	-1.8	-1.76	-1.53	-1.51	-0.15	-0.71
Total Direct Loading	49	177	144	99	72	61	39	24	25	46	61	73	73
Groundwater Discharges	0.157	0.225	0.17	0.126	0.14	0.11	0.102	0.105	0.086	0.092	0.135	0.113	0.129
Septic Systems	1.49	1.49	1.49	1.49	1.49	1.49	1.49	1.49	1.49	1.49	1.49	1.49	1.49
Diversion Recharge/Irrigation	0.03	0.02	0.03	0.12	0.13	0.2	1.29	1.8	1.76	1.53	1.51	0.15	0.71
Well Pumping Irrigation	3.67	3.67	3.67	3.67	3.67	3.67	5.69	5.69	5.69	5.7	5.7	5.7	4.68
Atmospheric Deposition	0	0	0	0	0	0	0	0	0	0	0	0	0
Fertilization	67	67	67	421	713	713	713	713	713	355	67	67	390
Total Land Surface Loading	72	72	72	426	718	718	722	722	722	364	76	74	397
Total Instream Loading	6	0	24	21	15	39	46	51	92	513	433	15	105

Wheeler Canyon / Todd Barranca

For Wheeler Canyon / Todd Barranca there is insufficient flow data available to estimate in-stream loading. There are no direct loading sources, so all loading in the river results from land surface loading.

Table 78: Loading balance of ammonia for Wheeler Canyon / Todd Barranca, kg/d N

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Upstream Regions	0	0	0	0	0	0	0	0	0	0	0	0	0
Reservoir Releases	0	0	0	0	0	0	0	0	0	0	0	0	0
Direct Point Sources	0	0	0	0	0	0	0	0	0	0	0	0	0
Diversions	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Direct Loading	0	0	0	0	0	0	0	0	0	0	0	0	0
Groundwater Discharges	27.9	27.9	27.9	27.9	27.9	27.9	27.9	27.9	27.9	27.9	27.9	27.9	27.9
Septic Systems	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61
Diversion Recharge/Irrigation	0	0	0	0	0	0	0	0	0	0	0	0	0
Well Pumping Irrigation	0.62	0.61	0.62	0.62	0.62	0.62	0.53	0.53	0.53	0.59	0.59	0.59	0.59
Atmospheric Deposition	12.4	20.6	23.6	11.7	12.3	10.8	12.2	9.6	7.9	11.1	8.8	10.2	12.6
Fertilization	8.9	8.9	17.7	48.7	79.7	79.7	79.7	79.7	79.7	48.7	17.7	8.9	46.5
Total Land Surface Loading	50	59	70	90	121	120	121	118	117	89	56	48	88
Total Instream Loading													

Table 79: Loading balance of nitrite for Wheeler Canyon / Todd Barranca, kg/d N

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Upstream Regions	0	0	0	0	0	0	0	0	0	0	0	0	0
Reservoir Releases	0	0	0	0	0	0	0	0	0	0	0	0	0
Direct Point Sources	0	0	0	0	0	0	0	0	0	0	0	0	0
Diversions	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Direct Loading	0	0	0	0	0	0	0	0	0	0	0	0	0
Groundwater Discharges	0	0	0	0	0	0	0	0	0	0	0	0	0
Septic Systems	0	0	0	0	0	0	0	0	0	0	0	0	0
Diversion Recharge/Irrigation	0	0	0	0	0	0	0	0	0	0	0	0	0
Well Pumping Irrigation	0	0	0	0	0	0	0	0	0	0	0	0	0
Atmospheric Deposition	0	0	0	0	0	0	0	0	0	0	0	0	0
Fertilization	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Land Surface Loading	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Instream Loading													

Table 80: Loading balance of nitrate for Wheeler Canyon / Todd Barranca, kg/d N

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Upstream Regions	0	0	0	0	0	0	0	0	0	0	0	0	0
Reservoir Releases	0	0	0	0	0	0	0	0	0	0	0	0	0
Direct Point Sources	0	0	0	0	0	0	0	0	0	0	0	0	0
Diversions	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Direct Loading	0	0	0	0	0	0	0	0	0	0	0	0	0
Groundwater Discharges	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6
Septic Systems	0	0	0	0	0	0	0	0	0	0	0	0	0
Diversion Recharge/Irrigation	0	0	0	0	0	0	0	0	0	0	0	0	0
Well Pumping Irrigation	1.3	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.3	1.3	1.3	1.3
Atmospheric Deposition	13.5	20.8	25.1	12.9	13	10.9	7.8	6.8	7	8.8	12.9	14.8	12.9
Fertilization	8.8	8.8	17.6	48.6	79.6	79.6	79.6	79.6	79.6	48.6	17.6	8.8	46.4
Total Land Surface Loading	29	37	50	68	100	97	94	93	93	64	37	31	66
Total Instream Loading													

Table 81: Loading balance of phosphorus for Wheeler Canyon / Todd Barranca, kg/d P

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Upstream Regions	0	0	0	0	0	0	0	0	0	0	0	0	0
Reservoir Releases	0	0	0	0	0	0	0	0	0	0	0	0	0
Direct Point Sources	0	0	0	0	0	0	0	0	0	0	0	0	0
Diversions	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Direct Loading	0	0	0	0	0	0	0	0	0	0	0	0	0
Groundwater Discharges	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7
Septic Systems	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
Diversion Recharge/Irrigation	0	0	0	0	0	0	0	0	0	0	0	0	0
Well Pumping Irrigation	0.09	0.09	0.09	0.09	0.09	0.09	0.07	0.07	0.07	0.08	0.08	0.08	0.08
Atmospheric Deposition	0	0	0	0	0	0	0	0	0	0	0	0	0
Fertilization	5.4	5.4	10.9	26.3	42	42	42	42	42	26.3	10.9	5.4	25
Total Land Surface Loading	12.3	12.3	17.8	33.2	48.9	48.9	48.9	48.9	48.9	33.2	17.8	12.3	31.9
Total Instream Loading													

Brown Barranca / Long Canyon

For Brown Barranca / Long Canyon there is no flow or water quality data currently available to estimate in-stream loading. There are no direct loading sources, so all loading in the stream comes from land surface loading.

Table 82: Loading balance of ammonia for Brown Barranca / Long Canyon, kg/d N

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Upstream Regions	0	0	0	0	0	0	0	0	0	0	0	0	0
Reservoir Releases	0	0	0	0	0	0	0	0	0	0	0	0	0
Direct Point Sources	0	0	0	0	0	0	0	0	0	0	0	0	0
Diversions	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Direct Loading	0	0	0	0	0	0	0	0	0	0	0	0	0
Groundwater Discharges	0	0	0	0	0	0	0	0	0	0	0	0	0
Septic Systems	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Diversion Recharge/Irrigation	0	0	0	0	0	0	0	0	0	0	0	0	0
Well Pumping Irrigation	0.03	0.03	0.03	0.03	0.03	0.03	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Atmospheric Deposition	3.87	6.46	7.01	3.19	3.02	2.6	2.95	2.3	2.16	3.05	2.7	3.19	3.54
Fertilization	14.4	14.4	28.6	49.4	70.2	70.2	70.2	70.2	70.2	49.4	28.6	14.4	45.9
Total Land Surface Loading	18.32	20.91	35.66	52.64	73.27	72.85	73.21	72.56	72.42	52.51	31.36	17.65	49.5
Total Instream Loading													

Table 83: Loading balance of nitrite for Brown Barranca / Long Canyon, kg/d N

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Upstream Regions	0	0	0	0	0	0	0	0	0	0	0	0	0
Reservoir Releases	0	0	0	0	0	0	0	0	0	0	0	0	0
Direct Point Sources	0	0	0	0	0	0	0	0	0	0	0	0	0
Diversions	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Direct Loading	0	0	0	0	0	0	0	0	0	0	0	0	0
Groundwater Discharges	0	0	0	0	0	0	0	0	0	0	0	0	0
Septic Systems	0	0	0	0	0	0	0	0	0	0	0	0	0
Diversion Recharge/Irrigation	0	0	0	0	0	0	0	0	0	0	0	0	0
Well Pumping Irrigation	0	0	0	0	0	0	0	0	0	0	0	0	0
Atmospheric Deposition	0	0	0	0	0	0	0	0	0	0	0	0	0
Fertilization	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Land Surface Loading	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Instream Loading													

Table 84: Loading balance of nitrate for Brown Barranca / Long Canyon, kg/d N

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Upstream Regions	0	0	0	0	0	0	0	0	0	0	0	0	0
Reservoir Releases	0	0	0	0	0	0	0	0	0	0	0	0	0
Direct Point Sources	0	0	0	0	0	0	0	0	0	0	0	0	0
Diversions	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Direct Loading	0	0	0	0	0	0	0	0	0	0	0	0	0
Groundwater Discharges	0	0	0	0	0	0	0	0	0	0	0	0	0
Septic Systems	0	0	0	0	0	0	0	0	0	0	0	0	0
Diversion Recharge/Irrigation	0	0	0	0	0	0	0	0	0	0	0	0	0
Well Pumping Irrigation	1.2	1.2	1.2	1.2	1.2	1.2	1.6	1.6	1.6	1.4	1.4	1.4	1.4
Atmospheric Deposition	4.2	6.52	7.47	3.45	3.36	2.64	1.89	1.59	1.92	2.47	3.99	4.62	3.68
Fertilization	14.3	14.3	28.6	49.3	70.1	70.1	70.1	70.1	70.1	49.3	28.6	14.3	45.8
Total Land Surface Loading	19.7	22	37.3	54	74.7	73.9	73.6	73.3	73.6	53.2	34	20.3	50.9
Total Instream Loading													

Table 85: Loading balance of phosphorus for Brown Barranca / Long Canyon, kg/d P

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Upstream Regions	0	0	0	0	0	0	0	0	0	0	0	0	0
Reservoir Releases	0	0	0	0	0	0	0	0	0	0	0	0	0
Direct Point Sources	0	0	0	0	0	0	0	0	0	0	0	0	0
Diversions	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Direct Loading	0	0	0	0	0	0	0	0	0	0	0	0	0
Groundwater Discharges	0	0	0	0	0	0	0	0	0	0	0	0	0
Septic Systems	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003
Diversion Recharge/Irrigation	0	0	0	0	0	0	0	0	0	0	0	0	0
Well Pumping Irrigation	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Atmospheric Deposition	0	0	0	0	0	0	0	0	0	0	0	0	0
Fertilization	14.3	14.3	28.6	49.3	70.1	70.1	70.1	70.1	70.1	49.3	28.6	14.3	45.8
Total Land Surface Loading	14.3	14.3	28.6	49.3	70.1	70.1	70.1	70.1	70.1	49.3	28.6	14.3	45.8
Total Instream Loading													

IV. Data Gaps

In any analysis of watershed loading and water quality, there is imperfect data. The data available is used, and gaps in the data are filled in with basic assumptions. A "data gap", for purposes of this report, are those cases where missing data does the most to increase uncertainty and decrease accuracy of a source characterization analysis or linkage analysis (modeling). Based on the information collected, following are the key data gaps.

- There is no water quality data available for Mint Canyon Creek to evaluate the water quality conditions in this impaired reach and to calibrate the water quality model.
- There is no flow or water quality data available for Brown Barranca / Long Canyon. This segment is impaired, but the accuracy of water quality modeling will be unknown without flow and water quality monitoring data. Wheeler Canyon / Todd Barranca, a nearby impaired stream, has data and will be used as a model for the linkage analysis.

V. Uncertainty

It is important to understand the sources of uncertainty and how that uncertainty can propagate through the linkage analysis and TMDL calculation steps of this project. In many ways the water quality is controlled through human interactions with the watershed, including point sources and diversions. These human impacts are well characterized and are not the prime source of uncertainty. The natural processes of the river pose the greatest challenge to understanding the transport and fate of pollutants. This includes loss of river water by seepage into the river bed and exfiltration of groundwater from the local aquifers. The uncertainty can be minimized through the compilation of information and knowledge from those most familiar with the watershed and through rigorous linkage analysis to learn where water is entering and leaving the river. Since different regions of the watershed have significantly different ambient water quality, the available monitoring data will help clarify the paths water takes through the watershed as the linkage analysis is conducted.

VI. Conclusion

The data currently available is in general clearly sufficient to conduct a thorough loading analysis and calibrate a water quality model to demonstrate the linkage between pollutant sources and in-stream water quality. The various modes of land application loading have different transport mechanisms to deliver pollutants to surface waters, but the relative importance of each can be discerned by comparing the loading of each pollutant to each region. The information in this document is an important element in determining how a TMDL should be calculated and what implementation strategies would be most promising.

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