

## **Appendix G: Supplemental Water Supply Information**

- DWR Groundwater Bulletin 118



BULLETIN 118 · UPDATE 2003

# CALIFORNIA'S GROUNDWATER

## South Lahontan Hydrologic Region

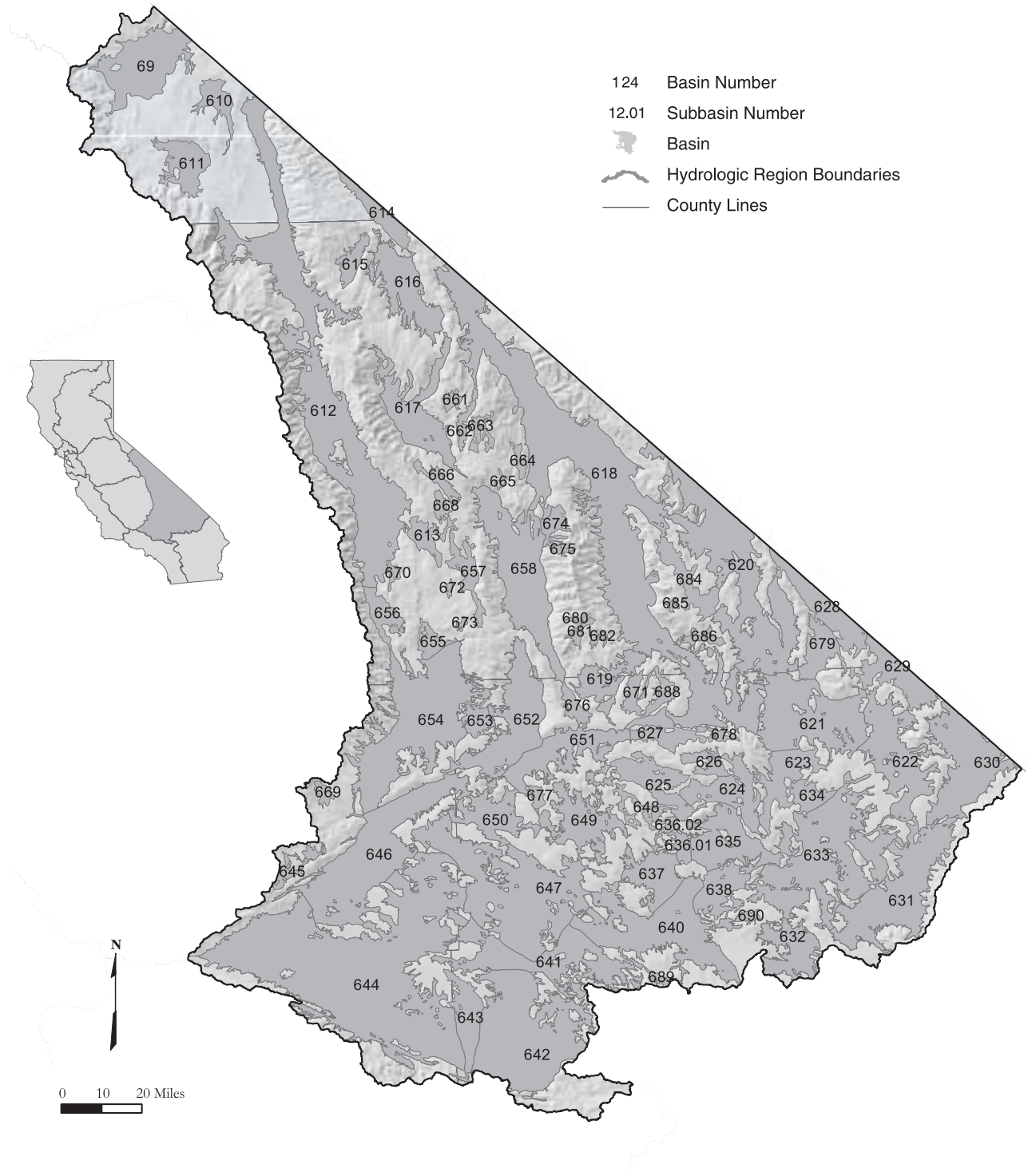


Figure 41 South Lahontan Hydrologic Region

## Basins and Subbasins of the South Lahontan Hydrologic Region

Basin/subbasin	Basin name	Basin/subbasin	Basin name
6-9	Mono Valley	6-51	Pilot Knob Valley
6-10	Adobe Lake Valley	6-52	Searles Valley
6-11	Long Valley	6-53	Salt Wells Valley
6-12	Owens Valley	6-54	Indian Wells Valley
6-13	Black Springs Valley	6-55	Coso Valley
6-14	Fish Lake Valley	6-56	Rose Valley
6-15	Deep Springs Valley	6-57	Darwin Valley
6-16	Eureka Valley	6-58	Panamint Valley
6-17	Saline Valley	6-61	Cameo Area
6-18	Death Valley	6-62	Race Track Valley
6-19	Wingate Valley	6-63	Hidden Valley
6-20	Middle Amargosa Valley	6-64	Marble Canyon Area
6-21	Lower Kingston Valley	6-65	Cottonwood Spring Area
6-22	Upper Kingston Valley	6-66	Lee Flat
6-23	Riggs Valley	6-68	Santa Rosa Flat
6-24	Red Pass Valley	6-69	Kelso Lander Valley
6-25	Bicycle Valley	6-70	Cactus Flat
6-26	Avawatz Valley	6-71	Lost Lake Valley
6-27	Leach Valley	6-72	Coles Flat
6-28	Pahrump Valley	6-73	Wild Horse Mesa Area
6-29	Mesquite Valley	6-74	Harrisburg Flats
6-30	Ivanpah Valley	6-75	Wildrose Canyon
6-31	Kelso Valley	6-76	Brown Mountain Valley
6-32	Broadwell Valley	6-77	Grass Valley
6-33	Soda Lake Valley	6-78	Denning Spring Valley
6-34	Silver Lake Valley	6-79	California Valley
6-35	Cronise Valley	6-80	Middle Park Canyon
6-36	Langford Valley	6-81	Butte Valley
6-36.01	Langford Well Lake	6-82	Spring Canyon Valley
6-36.02	Irwin	6-84	Greenwater Valley
6-37	Coyote Lake Valley	6-85	Gold Valley
6-38	Caves Canyon Valley	6-86	Rhodes Hill Area
6-40	Lower Mojave River Valley	6-88	Owl Lake Valley
6-41	Middle Mojave River Valley	6-89	Kane Wash Area
6-42	Upper Mojave River Valley	6-90	Cady Fault Area
6-43	El Mirage Valley		
6-44	Antelope Valley		
6-45	Tehachapi Valley East		
6-46	Fremont Valley		
6-47	Harper Valley		
6-48	Goldstone Valley		
6-49	Superior Valley		
6-50	Cuddeback Valley		

## Description of the Region

The South Lahontan HR covers approximately 21.2 million acres (33,100 square miles) in eastern California. This region includes about 21 percent of the surface area of California and both the highest (Mount Whitney) and lowest (Death Valley) surface elevations of the contiguous United States. The HR is bounded on the west by the crest of the Sierra Nevada and on the north by the watershed divide between Mono Lake and East Walker River drainages; on the east by Nevada and the south by the crest of the San Gabriel and San Bernardino mountains and the divide between watersheds draining south toward the Colorado River and those draining northward. This HR includes the Owens, Mojave, and Amargosa River systems, the Mono Lake drainage system, and many other internally drained basins. Average annual precipitation is about 7.9 inches, and runoff is about 1.3 maf per year (DWR 1994).

The South Lahontan HR includes Inyo County, much of Mono and San Bernardino counties, and parts of Kern and Los Angeles counties (Figure 41). National forests, national and state parks, military bases and other public lands comprise most of the land in this region. The Los Angeles Department of Water and Power is also a major landowner in the northern part of the HR and controls rights to much of the water draining the eastern Sierra Nevada.

According to 2000 census data, the South Lahontan HR is home to about 530,000 people, or 1.6 percent of the state's population. The major population centers are in the southern part of the HR and include Palmdale, Lancaster, Victorville, Apple Valley, and Hesperia.

## Groundwater Development

In this report, 76 groundwater basins are delineated in the South Lahontan HR, and the Langford Valley Groundwater Basin (6-36) is divided into two subbasins. The groundwater basins underlie about 11.60 million acres (18,100 square miles) or about 55 percent of the HR.

Most of the groundwater production is concentrated, along with the population, in basins in the southern part of this region. Groundwater provides 41 percent of water supply for agriculture and urban uses (DWR 1998). Much of this HR is public land with very low population density, within these areas there has been little groundwater development and little is known about the basins.

In most smaller basins, groundwater is found in unconfined alluvial aquifers; however, in some of the larger basins, or near dry lakes, aquifers may be separated by aquitards that cause confined groundwater conditions. Depths of the basins range from tens or hundreds of feet in smaller basins to thousands of feet in larger basins. The thickness of aquifers varies from tens to hundreds of feet. Well yields vary in this region depending on aquifer characteristics and well location, size, and use.

Conjunctive use of surface water and groundwater is practiced in the more heavily pumped basins. Some water used in the southern part of the HR is imported from Northern California by the State Water Project. Some of this imported water is used to recharge groundwater in the Mojave River Valley basins (6-40, 6-41, and 6-42). Surface water and groundwater are exported from the South Lahontan HR to the South Coast HR by the Los Angeles Department of Water and Power.

## Groundwater Quality

The chemical character of the groundwater varies throughout the region, but most often is calcium or sodium bicarbonate. Near and beneath dry lakes, sodium chloride and sodium sulfate-chloride water is common. In general, groundwater near the edges of valleys contains lower TDS content than water beneath the central part of the valleys or near dry lakes.

Drinking water standards are most often exceeded for TDS, fluoride, and boron content. The EPA lists 13 sites of contamination in this HR. Of these, three military installations in the Antelope Valley and Mojave River Valley groundwater basins are federal Superfund sites because of VOCs and other hazardous contaminants.

*Water Quality in Public Supply Wells*

From 1994 through 2000, 605 public supply water wells were sampled in 19 of the 77 basins and subbasins in the South Lahontan HR. Analyzed samples indicate that 506 wells, or 84 percent, met the state primary MCLs for drinking water. Ninety-nine wells, or 16 percent, have constituents that exceed one or more MCL. Figure 42 shows the percentages of each contaminant group that exceeded MCLs in the 99 wells.

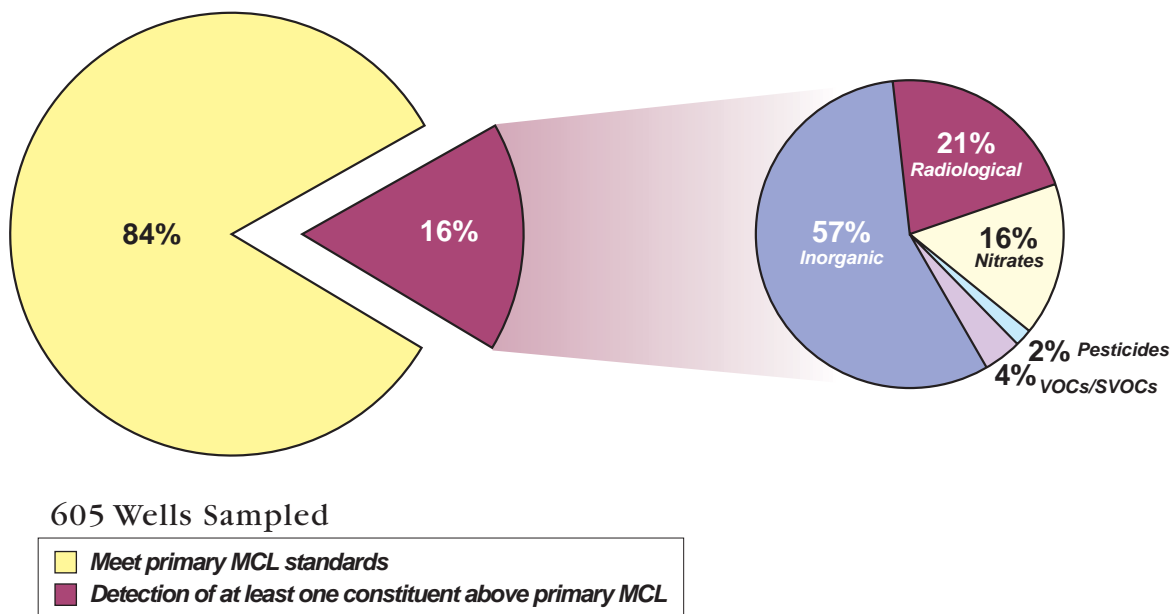


Figure 42 MCL exceedances in public supply wells in the South Lahontan Hydrologic Region

Table 36 lists the three most frequently occurring contaminants in each of the six contaminant groups and shows the number of wells in the HR that exceeded the MCL for those contaminants.

**Table 36 Most frequently occurring contaminants by contaminant group in the South Lahontan Hydrologic Region**

Contaminant group	Contaminant - # of wells	Contaminant - # of wells	Contaminant - # of wells
Inorganics – Primary	Fluoride – 30	Arsenic – 19	Antimony – 5
Inorganics – Secondary	Iron – 82	Manganese – 36	Specific Conductance – 5 TDS – 5
Radiological	Gross Alpha – 18	Uranium – 7	Radium 228 – 2
Dissolved Nitrogen	Nitrate (as NO <sub>3</sub> ) – 12	Nitrate + Nitrite–6	Nitrite (as N) – 4
Pesticides	Di(2-Ethylhexyl)phthalate) – 2		
VOCs/SVOCs	MTBE – 2	TCE – 2	Carbon Tetrachloride – 2

TCE = Trichloroethylene  
 MTBE = Methyltertiarybutylether  
 VOC = Volatile Organic Compound  
 SVOC = Semivolatile Organic Compound

**Changes from Bulletin 118-80**

Several modifications from the groundwater basins presented in Bulletin 118-80 are incorporated in this report (Table 37). Langford Valley Groundwater Basin (6-36) has been divided into two subbasins. Granite Mountain Area (6-59) and Fish Slough Valley (6-60) groundwater basins have been deleted because no information was found concerning wells or groundwater in these basins or because well completion reports indicate that groundwater production is derived from fractured rocks beneath the basin. Furnace Creek Area Groundwater Basin (6-83) has been incorporated into Death Valley Groundwater Basin (6-18), and Butterbread Canyon Valley Groundwater Basin (6-87) has been incorporated into Lost Lake Valley Groundwater Basin (6-71).

**Table 37 Modifications since Bulletin 118-80 of groundwater basins and subbasins in South Lahontan Hydrologic Region**

Basin/subbasin name	New number	Old number
Langford Well Lake	6-36.01	6-36
Irwin	6-36.02	6-36
Troy Valley	Incorporated into 6-40 and 7-14.	6-39
Granite Mountain Area	Deleted	6-59
Fish Slough Valley	Deleted	6-60
Furnace Creek Area	Deleted – incorporated into 6-18	6-83
Butterbread Canyon Valley	Deleted – incorporated into 6-71	6-87



Troy Valley Groundwater Basin (6-39) has been split at the Pisgah fault, which is a groundwater barrier, and has been incorporated into Lower Mojave River Valley (6-40) and Lavié Valley (7-14) groundwater basins. This change incorporates part of the South Lahontan HR into a basin in the Colorado River HR<sup>1</sup>. The Middle Mojave River Valley Groundwater Basin (6-41) has changed boundaries along the north (Harper Valley; 6-47) and east sides (Lower Mojave River Valley; 6-40). The new boundaries are along the Camp Rock-Harper Lake fault zone, Waterman fault, and Helendale fault. Groundwater level elevations indicate that these faults are likely strong barriers to groundwater movement.

The boundary between the Upper Mojave River Valley Groundwater Basin (6-42) and the Lucerne Valley Groundwater Basin (7-19) was changed from the regional surface divide to the southern part of the Helendale fault, which is a groundwater barrier. This change incorporates part of the Colorado Desert HR into a basin in the South Lahontan HR<sup>2</sup>.

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<sup>1</sup> The boundaries of the hydrologic regions are defined by surface drainage patterns. In this case, faults impede groundwater flow causing it to flow beneath the surface drainage divide into the adjacent hydrologic region.

<sup>2</sup> See previous note.

Table 38 South Lahontan Hydrologic Region groundwater data

Basin/Subbasin	Basin Name	Area (acres)	Groundwater Budget Type	Well Yields (gpm)		Types of Monitoring			TDS (mg/L)	
				Maximum	Average	Levels	Quality	Title 22	Average	Range
6-09	MONO VALLEY	173,000	A	800	480	-	-	-	-	2060
6-10	ADOBE LAKE VALLEY	39,800	C	-	-	-	-	-	-	-
6-11	LONG VALLEY	71,800	A	250	90	20	-	5	-	-
6-12	OWENS VALLEY	661,000	A	8,100	1,870	700	7	89	-	300-450,000
6-13	BLACK SPRINGS VALLEY	30,800	C	-	-	-	-	-	-	-
6-14	FISH LAKE VALLEY	48,100	C	-	-	-	-	-	-	-
6-15	DEEP SPRINGS VALLEY	29,900	C	700	390	-	-	-	-	-
6-16	EUREKA VALLEY	129,000	C	-	-	-	-	1	-	-
6-17	SALINE VALLEY	146,000	C	-	-	-	-	-	-	-
6-18	DEATH VALLEY	921,000	C	-	-	28	-	6	-	-
6-19	WINGATE VALLEY	71,400	C	-	-	-	-	-	-	-
6-20	MIDDLE AMARGOSA VALLEY	390,000	C	3,000	2,500	2	-	4	-	-
6-21	LOWER KINGSTON VALLEY	240,000	C	-	-	-	-	-	-	-
6-22	UPPER KINGSTON VALLEY	177,000	C	24	-	-	-	5	-	-
6-23	RIGGS VALLEY	87,700	C	-	-	-	-	-	-	-
6-24	RED PASS VALLEY	96,500	C	-	-	-	-	-	-	-
6-25	BICYCLE VALLEY	89,600	C	710	-	-	12	6	618	508-810
6-26	AVAWATZ VALLEY	27,700	C	-	-	-	-	-	-	-
6-27	LEACH VALLEY	61,300	C	-	-	-	-	-	-	-
6-28	PAHRUMP VALLEY	93,100	C	300	150	-	-	-	-	-
6-29	MESQUITE VALLEY	88,400	C	1,500	1,020	-	-	-	-	-
6-30	IVANPAH VALLEY	199,000	C	600	400	-	-	9	-	-
6-31	KELSO VALLEY	255,000	C	370	290	-	-	-	-	-
6-32	BROADWELL VALLEY	92,100	C	-	-	-	-	1	-	-
6-33	SODA LAKE VALLEY	381,000	C	2,100	1,100	-	-	3	-	-
6-34	SILVER LAKE VALLEY	35,300	C	-	-	-	-	-	-	-
6-35	CRONISE VALLEY	127,000	C	600	340	-	-	-	-	-
6-36	LANGFORD VALLEY	-	-	-	-	-	-	-	-	-
6-36.01	LANGFORD WELL LAKE	19,300	C	1,700	410	11	7	3	498	440-568
6-36.02	IRWIN	10,500	C	550	-	40	-	3	528	496-598
6-37	COYOTE LAKE VALLEY	88,200	A	1,740	660	5	-	-	-	300-1000
6-38	CAVES CANYON VALLEY	73,100	A	300	-	4	1	4	-	300-1000
6-40	LOWER MOJAVE RIVER VALLEY	286,000	A	2,700	770	70	21	52	300	-
6-41	MIDDLE MOJAVE RIVER VALLEY	211,000	A	4,000	1,000	74	3	14	500	-
6-42	UPPER MOJAVE RIVER VALLEY	413,000	A	5,500	1,030	120	22	153	500	1105
6-43	EL MIRAGE VALLEY	75,900	A	1,000	230	50	3	21	-	-
6-44	ANTELOPE VALLEY	1,110,000	A	7,500	286	262	10	248	300	200-800
6-45	TEHACHAPI VALLEY EAST	24,000	C	150	31	31	-	9	361	298-405
6-46	FREMONT VALLEY	2,370,000	C	4,000	500	23	-	13	596	350-100,000
6-47	HARPER VALLEY	410,000	A	3,000	725	11	3	19	-	179-2391
6-48	GOLDSTONE VALLEY	28,100	C	-	-	-	-	-	-	-
6-49	SUPERIOR VALLEY	120,000	C	450	100	-	-	-	-	-

Table 38 South Lahontan Hydrologic Region groundwater data (continued)

Basin/Subbasin	Basin Name	Area (acres)	Groundwater Budget Type	Well Yields (gpm)			Types of Monitoring			TDS (mg/L)	
				Maximum	Average	Levels	Quality	Title 22	Average	Range	
6-50	CUDEBACK VALLEY	94,900	C	500	300	-	-	-	-	-	-
6-51	PILOT KNOB VALLEY	139,000	C	-	-	-	-	I	-	-	-
6-52	SEARLES VALLEY	197,000	C	1,000	300	-	-	-	-	-	-
6-53	SALT WELLS VALLEY	29,500	C	-	-	-	-	-	-	-	-
6-54	INDIAN WELLS VALLEY	382,000	A	3,800	815	116	20	63	312	110-1620	-
6-55	COSO VALLEY	25,600	C	-	-	-	-	-	-	-	-
6-56	ROSE VALLEY	42,500	C	-	-	-	-	I	-	-	-
6-57	DARWIN VALLEY	44,200	C	130	43	-	-	-	-	-	-
6-58	PANAMINT VALLEY	259,000	C	35	30	-	-	-	-	-	-
6-61	CAMEO AREA	9,310	C	-	-	-	-	-	-	-	-
6-62	RACE TRACK VALLEY	14,100	C	-	-	-	-	-	-	-	-
6-63	HIDDEN VALLEY	18,000	C	-	-	-	-	-	-	-	-
6-64	MARBLE CANYON AREA	10,400	C	-	-	-	-	-	-	-	-
6-65	COTTONWOOD SPRING AREA	3,900	C	-	-	-	-	-	-	-	-
6-66	LEE FLAT	20,300	C	-	-	-	-	-	-	-	-
6-68	SANTA ROSA FLAT	312	C	-	-	-	-	-	-	-	-
6-69	KELSO LANDER VALLEY	11,200	C	-	-	-	-	-	-	-	-
6-70	CACTUS FLAT	7,030	C	-	-	-	-	-	-	-	-
6-71	LOST LAKE VALLEY	23,300	C	-	-	-	-	-	-	-	-
6-72	COLES FLAT	2,950	C	-	-	-	-	-	-	-	-
6-73	WILD HORSE MESA AREA	3,320	C	-	-	-	-	-	-	-	-
6-74	HARRISBURG FLATS	24,900	C	-	-	-	-	I	-	-	-
6-75	WILDROSE CANYON	5,160	C	-	-	-	-	-	-	-	-
6-76	BROWN MOUNTAIN VALLEY	21,700	C	-	-	-	-	-	-	-	-
6-77	GRASS VALLEY	9,980	C	-	-	-	-	-	-	-	-
6-78	DENNING SPRING VALLEY	7,240	C	-	-	-	-	-	-	-	-
6-79	CALIFORNIA VALLEY	58,300	C	-	-	-	-	-	-	-	-
6-80	MIDDLE PARK CANYON	1,740	C	-	-	-	-	-	-	-	-
6-81	BUTTE VALLEY	8,810	C	-	-	-	-	-	-	-	-
6-82	ANVIL SPRING CANYON VALLEY	4,810	C	-	-	-	-	-	-	-	-
6-84	GREENWATER VALLEY	59,900	C	-	-	-	-	-	-	-	-
6-85	GOLD VALLEY	3,220	C	-	-	-	-	-	-	-	-
6-86	RHODES HILL AREA	15,600	C	-	-	-	-	-	-	-	-
6-88	OWL LAKE VALLEY	22,300	C	-	-	-	-	-	-	-	-
6-89	KANE WASH AREA	5,960	C	60	-	-	-	-	-	-	-
6-90	CADY FAULT AREA	7,960	C	-	-	-	-	-	-	-	-

gpm - gallons per minute  
 mg/L - milligram per liter  
 TDS -total dissolved solids



## South Coast Hydrologic Region

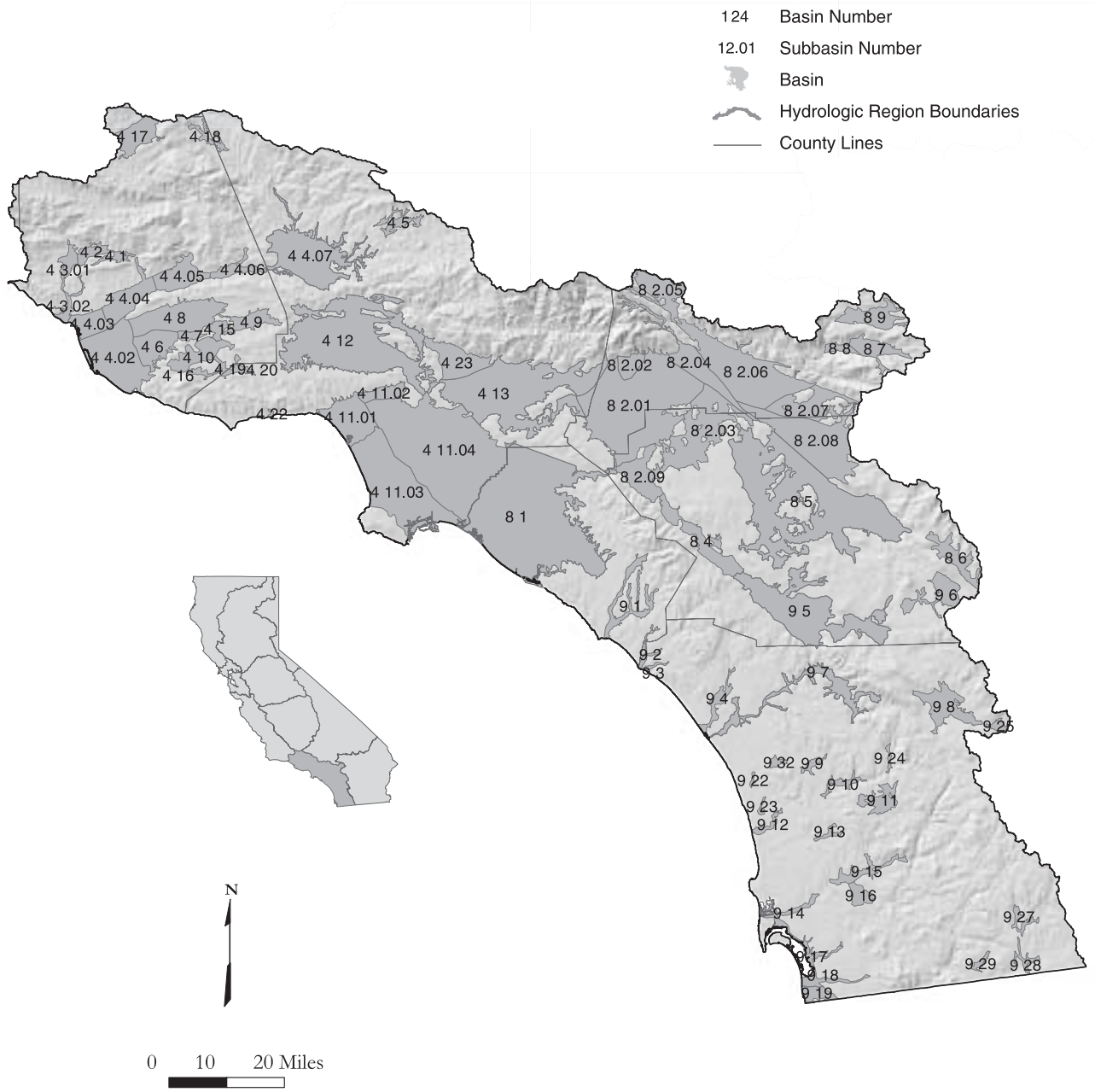


Figure 31 South Coast Hydrologic Region

## Basins and Subbasins of the South Coast Hydrologic Region

Basin/subbasin	Basin name	Basin/subbasin	Basin name
4-1	Upper Ojai Valley	8-4	Elsinore
4-2	Ojai Valley	8-5	San Jacinto
4-3	Ventura River Valley	8-6	Hemet Lake Valley
4-3.01	Upper Ventura River	8-7	Big Meadows Valley
4-3.02	Lower Ventura River	8-8	Seven Oaks Valley
4-4	Santa Clara River Valley	8-9	Bear Valley
4-4.02	Oxnard	9-1	San Juan Valley
4-4.03	Mound	9-2	San Mateo Valley
4-4.04	Santa Paula	9-3	San Onofre Valley
4-4.05	Fillmore	9-4	Santa Margarita Valley
4-4.06	Piru	9-5	Temecula Valley
4-4.07	Santa Clara River Valley East	9-6	Coahuila Valley
4-5	Acton Valley	9-7	San Luis Rey Valley
4-6	Pleasant Valley	9-8	Warner Valley
4-7	Arroyo Santa Rosa Valley	9-9	Escondido Valley
4-8	Las Posas Valley	9-10	San Pasqual Valley
4-9	Simi Valley	9-11	Santa Maria Valley
4-10	Conejo Valley	9-12	San Dieguito Creek
4-11	Coastal Plain of Los Angeles	9-13	Poway Valley
4-11.01	Santa Monica	9-14	Mission Valley
4-11.02	Hollywood	9-15	San Diego River Valley
4-11.03	West Coast	9-16	El Cajon Valley
4-11.04	Central	9-17	Sweetwater Valley
4-12	San Fernando Valley	9-18	Otay Valley
4-13	San Gabriel Valley	9-19	Tijuana Basin
4-15	Tierra Rejada	9-22	Batiquitos Lagoon Valley
4-16	Hidden Valley	9-23	San Elijo Valley
4-17	Lockwood Valley	9-24	Pamo Valley
4-18	Hungry Valley	9-25	Ranchita Town Area
4-19	Thousand Oaks Area	9-27	Cottonwood Valley
4-20	Russell Valley	9-28	Campo Valley
4-22	Malibu Valley	9-29	Potrero Valley
4-23	Raymond	9-32	San Marcos Area
8-1	Coastal Plain of Orange County		
8-2	Upper Santa Ana Valley		
8-2.01	Chino		
8-2.02	Cucamonga		
8-2.03	Riverside-Arlington		
8-2.04	Rialto-Colton		
8-2.05	Cajon		
8-2.06	Bunker Hill		
8-2.07	Yucaipa		
8-2.08	San Timoteo		
8-2.09	Temescal		

## Description of the Region

The South Coast HR covers approximately 6.78 million acres (10,600 square miles) of the southern California watershed that drains to the Pacific Ocean (Figure 31). The HR is bounded on the west by the Pacific Ocean and the watershed divide near the Ventura-Santa Barbara County line. The northern boundary corresponds to the crest of the Transverse Ranges through the San Gabriel and San Bernardino mountains. The eastern boundary lies along the crest of the San Jacinto Mountains and low-lying hills of the Peninsular Range that form a drainage boundary with the Colorado River HR. The southern boundary is the international boundary with the Republic of Mexico. Significant geographic features include the coastal plain, the central Transverse Ranges, the Peninsular Ranges, and the San Fernando, San Gabriel, Santa Ana River, and Santa Clara River valleys.

The South Coast HR includes all of Orange County, most of San Diego and Los Angeles Counties, parts of Riverside, San Bernardino, and Ventura counties, and a small amount of Kern and Santa Barbara Counties. This HR is divided into Los Angeles, Santa Ana and San Diego subregions, RWQCBs 4, 8, and 9 respectively. Groundwater basins are numbered according to these subregions. Basin numbers in the Los Angeles subregion are preceded by a 4, in Santa Ana by an 8, and in San Diego by a 9. The Los Angeles subregion contains the Ventura, Santa Clara, Los Angeles, and San Gabriel River drainages, Santa Ana encompasses the Santa Ana River drainage, and San Diego includes the Santa Maria River, San Luis Rey River and the San Diego River and other drainage systems.

According to 2000 census data, about 17 million people live within the boundaries of the South Coast HR, approximately 50 percent of the population of California. Because this HR amounts to only about 7 percent of the surface area of the State, this has the highest population density of any HR in California (DWR 1998). Major population centers include the metropolitan areas surrounding Ventura, Los Angeles, San Diego, San Bernardino, and Riverside.

The South Coast HR has 56 delineated groundwater basins. Twenty-one basins are in subregion 4 (Los Angeles), eight basins in subregion 8 (Santa Ana), and 27 basins in subregion 9 (San Diego).

The Los Angeles subregion overlies 21 groundwater basins and encompasses most of Ventura and Los Angeles counties. Within this subregion, the Ventura River Valley, Santa Clara River Valley, and Coastal Plain of Los Angeles basins are divided into subbasins. The basins in the Los Angeles subregion underlie 1.01 million acres (1,580 square miles) or about 40 percent of the total surface area of the subregion.

The Santa Ana subregion overlies eight groundwater basins and encompasses most of Orange County and parts of Los Angeles, San Bernardino, and Riverside counties. The Upper Santa Ana Valley Groundwater Basin is divided into nine subbasins. Groundwater basins underlie 979,000 acres (1,520 square miles) or about 54 percent of the Santa Ana subregion.

The San Diego subregion overlies 27 groundwater basins, encompasses most of San Diego County, and includes parts of Orange and Riverside counties. Groundwater basins underlie about 277,000 acres (433 square miles) or about 11 percent of the surface of the San Diego subregion.

Overall, groundwater basins underlie about 2.27 million acres (3,530 square miles) or about 33 percent of the South Coast HR.



## Groundwater Development

Groundwater has been used in the South Coast HR for well over 100 years. High demand and use of groundwater in Southern California has given rise to many disputes over management and pumping rights, with the resolution of these cases playing a large role in the establishment and clarification of water rights law in California. Raymond Groundwater Basin, located in this HR, was the first adjudicated basin in the State. Of the 16 adjudicated basins in California, 11 are in the South Coast HR. Groundwater provides about 23 percent of water demand in normal years and about 29 percent in drought years (DWR 1998).

Groundwater is found in unconfined alluvial aquifers in most of the basins of the San Diego subregion and the inland basins of the Santa Ana and Los Angeles subregions. In some larger basins, typified by those underlying the coastal plain, groundwater occurs in multiple aquifers separated by aquitards that create confined groundwater conditions. Basins range in depth from tens or hundreds of feet in smaller basins, to thousands of feet in larger basins. The thickness of aquifers varies from tens to hundreds of feet. Well yields vary in this HR depending on aquifer characteristics and well location, size, and use. Some aquifers are capable of yielding thousands of gallons per minute to municipal wells.

## Conjunctive Use

Conjunctive use of surface water and groundwater is a long-standing practice in the region. At present, much of the potable water used in Southern California is imported from the Colorado River and from sources in the eastern Sierra and Northern California. Several reservoirs are operated primarily for the purpose of storing surface water for domestic and irrigation use, but groundwater basins are also recharged from the outflow of some reservoirs. The concept is to maintain streamflow over a longer period of time than would occur without regulated flow and thus provide for increased recharge of groundwater basins. Most of the larger basins in this HR are highly managed, with many conjunctive use projects being developed to optimize water supply.

Coastal basins in this HR are prone to intrusion of seawater. Seawater intrusion barriers are maintained along the Los Angeles and Orange County sections of the coastal plain. In Orange County, recycled water is injected into the ground to form a mound of groundwater between the coast and the main groundwater basin. In Los Angeles County, imported and recycled water is injected to maintain a seawater intrusion barrier.

## Groundwater Quality

Groundwater in basins of the Los Angeles subregion is mainly calcium sulfate and calcium bicarbonate in character. Nitrate content is elevated in some parts of the subregion. Volatile organic compounds (VOCs) have created groundwater impairments in some of the industrialized portions of the region. The San Gabriel Valley and San Fernando Valley groundwater basins both have multiple sites of contamination from VOCs. The main constituents in the contamination plumes are trichloroethylene (TCE) and tetrachloroethylene (PCE). Some of the locations have been declared federal Superfund sites. Contamination plumes containing high concentrations of TCE and PCE also occur in the Bunker Hill Subbasin of the Upper Santa Ana Valley Groundwater Basin. Some of these plumes are also designated as Superfund sites. Perchlorate is emerging as an important contaminant in several areas in the South Coast HR.

Groundwater in basins of the Santa Ana subregion is primarily calcium and sodium bicarbonate in character. Local impairments from excess nitrate or VOCs have been recognized. Groundwater and surface water in the Chino Subbasin of the Santa Ana River Valley Groundwater Basin have elevated nitrate concentrations, partly derived from a large dairy industry in that area. In Orange County, water from the Santa Ana River provides a large part of the groundwater replenishment. Wetlands maintained along the Santa Ana River near the boundary of the Upper Santa Ana River and Orange County Groundwater Basins provide effective removal of nitrate from surface water, while maintaining critical habitat for endangered species.

Groundwater in basins of the San Diego subregion has mainly calcium and sodium cations and bicarbonate and sulfate anions. Local impairments by nitrate, sulfate, and TDS are found. Camp Pendleton Marine Base, in the northwestern part of this subregion, is on the EPA National Priorities List for soil and groundwater contamination by many constituents.

*Water Quality in Public Supply Wells*

From 1994 through 2000, 2,342 public supply water wells were sampled in 47 of the 73 basins and subbasins in the South Coast HR. Analyzed samples indicate that 1,360 wells, or 58 percent, met the state primary MCLs for drinking water. Nine-hundred-eighty-two wells, or 42 percent, have constituents that exceed one or more MCL. Figure 32 shows the percentages of each contaminant group that exceeded MCLs in the 982 wells.

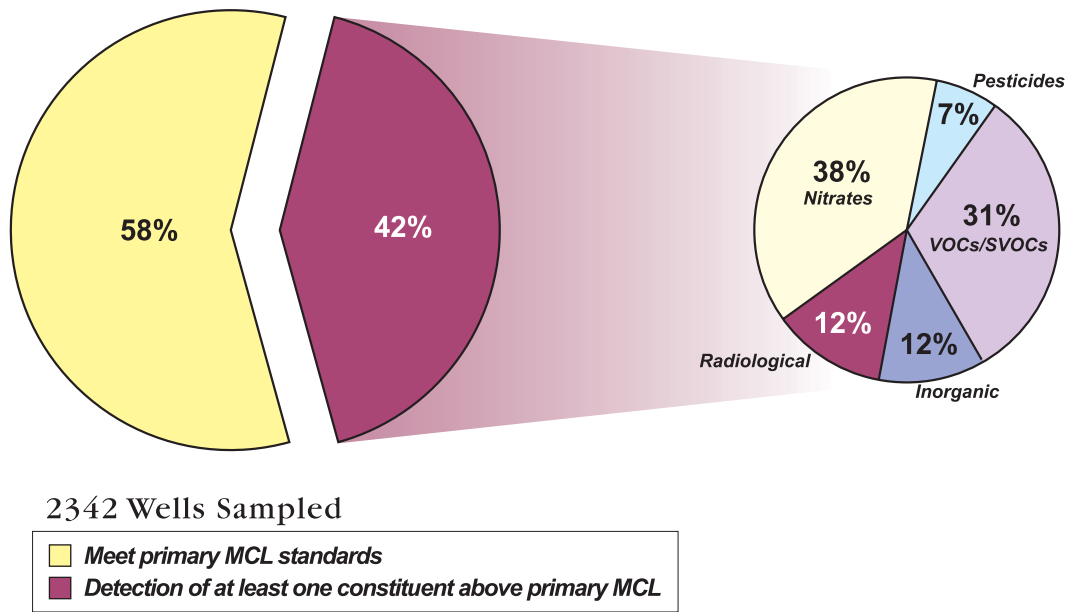


Figure 32 MCL exceedances in public supply wells in the South Coast Hydrologic Region

Table 22 lists the three most frequently occurring contaminants in each of the six contaminant groups and shows the number of wells in the HR that exceeded the MCL for those contaminants.

**Changes from Bulletin 118-80**

Several modifications from the groundwater basins presented in Bulletin 118-80 are incorporated in this report (Table 23). The Cajalco Valley (8-3), Jamul Valley (9-20), Las Pulgas Valley (9-21), Pine Valley (9-26), and Tecate Valley (9-30) Groundwater Basins have been deleted in this report because they have thin deposits of alluvium and well completion reports indicate that groundwater production is from underlying fractured bedrock. The Conejo Tierra Rejada Volcanic (4-21) is a volcanic aquifer and was not assigned a basin number in this bulletin. This is considered to be groundwater source area as discussed in Chapter 6.

**Table 22 Most frequently occurring contaminants by contaminant group in the South Coast Hydrologic Region**

Contaminant group	Contaminant - # of wells	Contaminant - # of wells	Contaminant - # of wells
Inorganics – Primary	Fluoride – 56	Thallium – 13	Aluminum – 12
Inorganics – Secondary	Iron – 337	Manganese – 335	TDS – 36
Radiological	Gross Alpha – 104	Uranium – 40	Radium 226 – 9 Radium 228 – 9
Nitrates	Nitrate (as NO <sub>3</sub> ) – 364	Nitrate + Nitrite – 179	Nitrate Nitrogen (NO <sub>3</sub> -N) – 14
Pesticides	DBCP – 61	Di(2-Ethylhexyl)phthalate – 5	Heptachlor – 2 EDB – 2
VOCs/SVOCs	TCE – 196	PCE – 152	1,2 Dichloroethane – 89

DBCP = Dibromochloropropane  
 EDB = Ethylene Dibromide  
 VOCs = Volatile Organic Compounds  
 SVOCs = Semivolatile Organic Compounds

The Ventura River Valley (4-3), Santa Clara River Valley (4-4), Coastal Plain of Los Angeles (4-11), and Upper Santa Ana Valley (8-2) Groundwater Basins have been divided into subbasins in this report. The extent of the San Jacinto Groundwater Basin (8-5) has been decreased because completion of Diamond Valley Reservoir has inundated the valley. Paloma Valley has been removed because well logs indicate groundwater production is solely from fractured bedrock. The Raymond Groundwater Basin (4-23) is presented as an individual basin instead of being incorporated into the San Gabriel Valley Groundwater Basin (4-13) because it is bounded by physical barriers and has been managed as a separate and individual groundwater basin for many decades. In Bulletin 118-75, groundwater basins in two different subregions were designated the Upper Santa Ana Valley Groundwater Basin (4-14 and 8-2). To alleviate this confusion, basin 4-14 has been divided, with parts of the basin incorporated into the neighboring San Gabriel Valley Groundwater Basin (4-13) and the Chino subbasin of the Upper Santa Ana Valley Groundwater Basin (8-2.01). The San Marcos Area Groundwater Basin (9-32) in central San Diego County is presented as a new basin in this report.

**Table 23 Modifications since Bulletin 118-80 of groundwater basins and subbasins in South Coast Hydrologic Region**

Basin/subbasin name	Number	Old number	Basin/subbasin name	Number	Old number
Upper Ventura River	4-3.01	4-3	Cajon	8-2.05	8-2
Lower Ventura River	4-3.02	4-3	Bunker Hill	8-2.06	8-2
Oxnard	4-4.02	4-4	Yucaipa	8-2.07	8-2
Mound	4-4.03	4-4	San Timoteo	8-2.08	8-2
Santa Paula	4-4.04	4-4	Temescal	8-2.09	8-2
Fillmore	4-4.05	4-4	Cajalco Valley	deleted	8-3
Piru	4-4.06	4-4	Tijuana Basin	9-19	
Santa Clara River Valley East	4-4.07	4-4	Jamul Valley	deleted	9-20
Santa Monica	4-11.01	4-11	Las Pulgas Valley	deleted	9-21
Hollywood	4-11.02	4-11	Batiquitos Lagoon Valley	9-22	
West Coast	4-11.03	4-11	San Elijo Valley	9-23	
Central	4-11.04	4-11	Pamo Valley	9-24	
Upper Santa Ana Valley	Incorporated into 8-2.01 and 4-13	4-14	Ranchita Town Area	9-25	
Conejo-Tierra Rejada Volcanic	deleted	4-21	Pine Valley	deleted	9-26
Raymond	4-23	4-13	Cottonwood Valley	9-27	
Chino	8-2.01	8-2	Campo Valley	9-28	
Cucamonga	8-2.02	8-2	Potrero Valley	9-29	
Riverside-Arlington	8-2.03	8-2	Tecate Valley	deleted	9-30
Rialto-Colton	8-2.04	8-2	San Marcos Area	9-32	Not previously identified

Table 24 South Coast Hydrologic Region groundwater data

Basin/Subbasin	Basin Name	Area (acres)	Groundwater Budget Type	Well Yields (gpm)		Active Monitoring			TDS (mg/L)	
				Maximum	Average	Levels	Quality	Title 22	Average	Range
4-1	UPPER OJAI VALLEY	3,800	A	200	50	4	-	1	707	438-1,249
4-2	OJAI VALLEY	6,830	A	600	383	24	-	22	640	450-1,140
4-3	VENTURA RIVER VALLEY									
4-3.01	UPPER VENTURA RIVER	7,410	C	-	600	17	-	18	706	500-1,240
4-3.02	LOWER VENTURA RIVER	5,300	A	-	20	-	-	2	-	760-3,000
4-4	SANTA CLARA RIVER VALLEY									
4-4.02	OXNARD	58,000	A	1,600	-	127	127	69	1,102	160-1,800
4-4.03	MOUND	14,800	A	-	700	11	11	4	1,644	1,498-1,908
4-4.04	SANTA PAULA	22,800	A	-	700	60	60	10	1,198	470-3,010
4-4.05	FILLMORE	20,800	A	2,100	700	23	-	10	1,100	800-2,400
4-4.06	PIRU	8,900	A	-	800	19	-	3	1,300	608-2,400
4-4.07	SANTA CLARA RIVER VALLEY EAST	66,200	C	-	-	-	-	62	-	-
4-5	ACTON VALLEY	8,270	A	1,000	140	-	-	7	-	-
4-6	PLEASANT VALLEY	21,600	A	-	1,000	9	-	12	1,110	597-3,490
4-7	ARROYO SANTA ROSA VALLEY	3,740	A	1,200	950	6	-	7	1,006	670-1,200
4-8	LAS POSAS VALLEY	42,200	A	750	-	-	-	24	742	338-1,700
4-9	SIMI VALLEY	12,100	A	-	394	13	-	1	-	1,580
4-10	CONEJO VALLEY	28,900	A	1,000	100	-	-	3	631	335-2,064
4-11	COASTAL PLAIN OF LOS ANGELES									
4-11.01	SANTA MONICA	32,100	C	4,700	-	-	-	12	916	729-1,156
4-11.02	HOLLYWOOD	10,500	A	-	-	5	5	1	-	526
4-11.03	WEST COAST	91,300	A	1,300	-	67	58	33	456	-
4-11.04	CENTRAL	177,000	A	11,000	1,730	302	64	294	453	200-2,500
4-12	SAN FERNANDO VALLEY	145,000	A	3,240	1,220	1,398	2,385	126	499	176-1,116
4-13	SAN GABRIEL VALLEY	154,000	A	4,850	1,000	67	296	259	367	90-4,288
4-15	TIERRA REJADA	4,390	A	1,200	172	4	1	-	-	619-930
4-16	HIDDEN VALLEY	2,210	C	-	-	-	-	1	453	289-743
4-17	LOCKWOOD VALLEY	21,800	A	350	25	-	-	1	-	-
4-18	HUNGRY VALLEY	5,310	C	-	28	-	-	-	<350	-
4-19	THOUSAND OAKS AREA	3,110	C	-	39	2	-	-	1,410	1,200-2,300
4-20	RUSSELL VALLEY	3,100	A	-	25	-	-	-	-	-
4-22	MALIBU VALLEY	613	C	1,060	1,030	-	-	-	-	-
4-23	RAYMOND	26,200	A	3,620	1,880	88	-	70	346	138-780
8-1	COASTAL PLAIN OF ORANGE COUNTY	224,000	A	4,500	2,500	521	411	240	475	232-661
8-2	UPPER SANTA ANA VALLEY									
8-2.01	CHINO	154,000	A	1,500	1,000	12	8	187	484	200-600
8-2.02	CUCAMONGA	9,530	C	4,400	2,115	1	1	21	-	-
8-2.03	RIVERSIDE-ARLINGTON	58,600	A	-	-	11	3	43	-	370-756
8-2.04	RIALTO-COLTON	30,100	A	5,000	545	50	5	41	337	-
8-2.05	CAJON	23,200	C	200	60	-	-	5	-	-
8-2.06	BUNKER HILL	89,600	A	5,000	1,245	398	169	204	-	150-550
8-2.07	YUCAIPA	25,300	A	2,800	206	19	3	45	334	-

Table 24 South Coast Hydrologic Region groundwater data (continued)

Basin/Subbasin	Basin Name	Area (acres)	Groundwater Budget Type	Well Yields (gpm)		Active Monitoring			TDS (mg/L)	
				Maximum	Average	Levels	Quality	Title 22	Average	Range
8-2.08	SAN TIMOTEO	73,100	A	-	-	67	12	36	-	-
8-2.09	TEMESCAL	23,500	C	-	-	2	2	20	753	373-950
8-4	EL SINORE	25,700	C	5,400	-	1	1	18	-	-
8-5	SAN JACINTO	188,000	C	-	-	150	115	56	463	160-12,000
8-6	HEMET LAKE VALLEY	16,700	C	820	196	-	-	9	-	-
8-7	BIG MEADOWS VALLEY	14,200	C	120	34	-	-	8	-	-
8-8	SEVEN OAKS VALLEY	4,080	C	-	-	-	-	1	-	-
8-9	BEAR VALLEY	19,600	A	1,000	500	57	57	52	-	-
9-1	SAN JUAN VALLEY	16,700	C	1,000	-	-	-	8	760	430-12,880
9-2	SAN MATEO VALLEY	2,990	A	-	-	-	-	5	586	490-770
9-3	SAN ONOFRE VALLEY	1,250	A	-	-	-	-	2	-	600-1,500
9-4	SANTA MARGARITA VALLEY	626	A	1,980	-	4	-	-	-	337-9,030
9-5	TEMECULA VALLEY	87,800	C	1,750	-	140	4	67	476	220-1,500
9-6	COAHUILA VALLEY	18,200	C	500	-	2	-	1	-	304-969
9-7	SAN LUIS REY VALLEY	37,000	C	2,000	500	-	-	28	1,258	530-7,060
9-8	WARNER VALLEY	24,000	C	1,800	800	-	-	4	-	263
9-9	ESCONDIDO VALLEY	2,890	C	190	50	-	-	1	-	250-5,000
9-10	SAN PASQUAL VALLEY	4,540	C	1,700	1,000	-	-	2	-	500-1,550
9-11	SANTA MARIA VALLEY	12,300	A	500	36	3	-	2	1,000	324-1,680
9-12	SAN DIEGUITO CREEK	3,560	A	1,800	700	-	-	-	-	2,000
9-13	POWAY VALLEY	2,470	C	200	100	-	-	1	-	610-1,500
9-14	MISSION VALLEY	7,350	C	-	1,000	-	-	-	-	-
9-15	SAN DIEGO RIVER VALLEY	9,890	C	2,000	-	-	-	5	-	260-2,870
9-16	EL CAJON VALLEY	7,160	C	300	50	1	-	2,340	-	-
9-17	SWEETWATER VALLEY	5,920	C	1,500	300	7	7	9	2,114	300-50,000
9-18	OTAY VALLEY	6,830	C	1,000	185	-	-	-	-	500->2,000
9-19	TIJUANA BASIN	7,410	A	2,000	350	-	-	-	-	380-3,620
9-22	BATQUITOS LAGOON VALLEY	741	C	-	-	-	-	-	1,280	788-2,362
9-23	SAN ELIJO VALLEY	883	C	1,800	-	-	-	-	-	1,170-5,090
9-24	PAMO VALLEY	1,500	C	-	-	-	-	-	369	279-455
9-25	RANCHITA TOWN AREA	3,130	C	125	22	-	-	-	-	283-305
9-27	COITONWOOD VALLEY	3,850	C	-	-	-	-	1	-	-
9-28	CAMPO VALLEY	3,550	C	-	<40	-	-	4	-	800
9-29	POTRERO VALLEY	2,020	C	-	-	-	-	4	-	-
9-32	SAN MARCOS VALLEY	2,130	C	60	-	-	-	-	-	500-700

gpm - gallons per minute  
 mg/L - milligram per liter  
 TDS - total dissolved solids