Water Resources
Report on the Santa Clara River

Prepared by United Water Conservation District
Castaic Lake Water Agency

April 1996

Acknowledgments

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Introduction

This document presents an overview of the geologic and hydrologic conditions of the Santa Clara River Watershed (see Figure 1). The Santa Clara River is the principal river draining the area. The river originates in the San Gabriel Mountains and flows westward more than 80 miles to the Pacific Ocean. Part of the upper portion of the watershed lies within the Castaic Lake Water Agency (CLWA) study area. as shown on Figure 2. The lower portion, approximately the Ventura County portion of the watershed, lies mostly within the boundary of the United Water Conservation District (UWCD) as shown on Figure 3.

This report is an amalgamation of sections written by Kennedy/Jenks Consultants and Richard C. Slade and Associates, on behalf of CLWA, for the Los Angeles County reach of the river and by the UWCD for the Ventura County portion of the river. The report includes information on the Santa Clara River within the 500-year flood plain up to the year 1992 due to the availability of current information at the time data was being collected for the report. Information on the river includes the following: climatology, geology, hydrology, quantity, quality, water rights, and institutional conditions for the groundwater basins and the surface waters of the river. Goals, objectives, and recommendations for the water resources of the Santa Clara River are also included in this report.

Climatology

Upper Santa Clara River

The CLWA study area exhibits a semi-arid, Mediterranean-type climate that is characterized by long, dry summers and relatively short, wet winters. Typical temperatures in the valley range from highs of approximately 100° F in the summer to lows of 30° F in the winter. Mean monthly temperatures range between 77° F in summer to 48° F in winter. Approximately 80 percent of the average annual precipitation in the valley occurs between November and March.

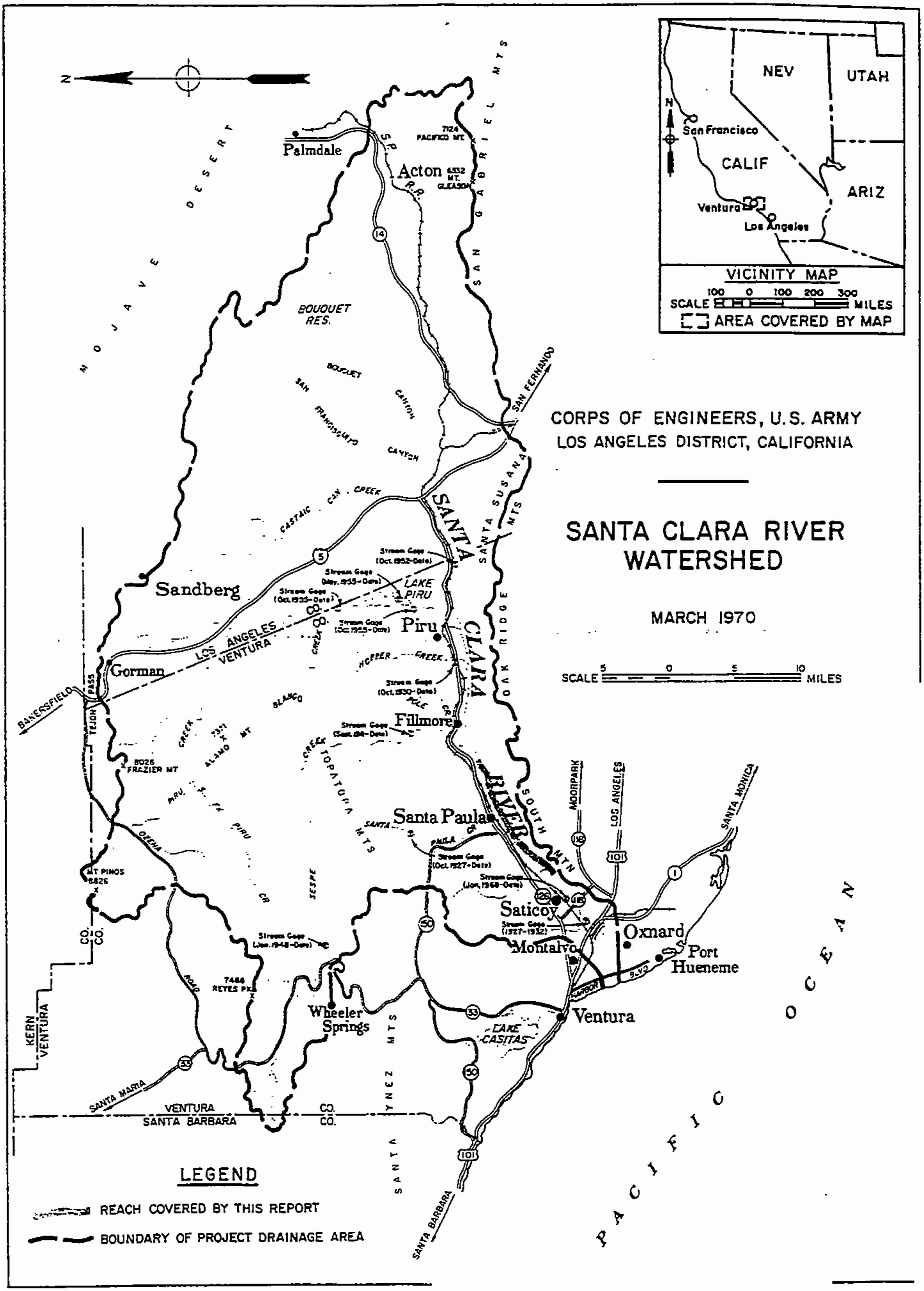
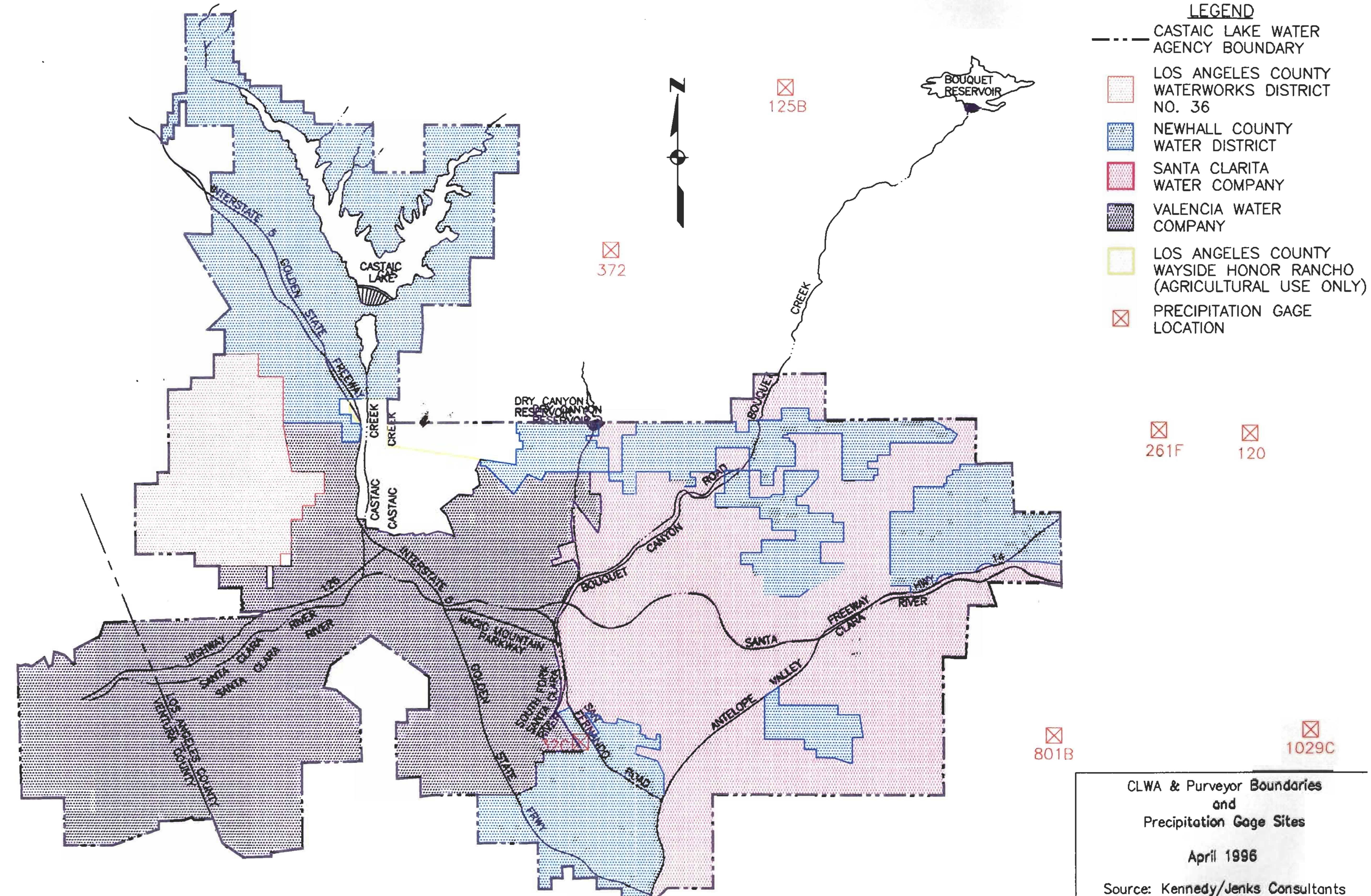

CORPS OF ENGINEERS, U.S. ARMY
LOS ANGELES DISTRICT, CALIFORNIA
SANTA CLARA RIVER WATERSHED
MARCH 1970
SCALE 5 0 5 10 MILES
VICINITY MAP
SCALE 100 0 100 200 300 MILES
AREA COVERED BY MAP
NEV
UTAH
CALIF
ARIZ
San Francisco
Ventura
Los Angeles
LEGEND
REACH COVERED BY THIS REPORT
BOUNDARY OF PROJECT DRAINAGE AREA
MOJAVE DESERT
SAN GABRIEL MTS
Palmdale
Acton
7124 PACIFICO MT
6532 MT. GLEASON
S.P. R.R.
BOUQUET RES.
BOUQUET CANYON
SAN FRANCISQUITO CANYON
SAN FERNANDO
CASTAIC CAN. CREEK
SANTA SUSANA MTS
SANTA CLARA RIVER
Sandberg
LAKE PIRU
Piru
LOS ANGELES
VENTURA
Gorman
TEJON PASS
BAKERSFIELD
HOPPER CREEK
OAK RIDGE
POLE CR
Fillmore
BLANCO
ALAMO MT
7371
8026 FRAZIER MT
PIRU S. FK
PIRU CR
TOPATOPA MTS
SANTA PAULA
Santa Paula
SOUTH MTN
MOORPARK
LOS ANGELES
SANTA MONICA
MT PINOS 8826
OZENA
SESPE CR
Saticoy
Montalvo
Oxnard
Port Hueneme
HARBOR BLVD
7486 REYES PK
Wheeler Springs
Ventura
LAKE CASITAS
SANTA YNEZ MTS
SANTA MARIA
VENTURA CO.
SANTA BARBARA CO.
KERN VENTURA
SANTA BARBARA
PACIFIC OCEAN
Stream Gage (Oct. 1952-Date)
Stream Gage (May 1955-Date)
Stream Gage (Oct. 1955-Date)
Stream Gage (Oct. 1955-Date)
Stream Gage (Oct. 1930-Date)
Stream Gage (Sept. 1911-Date)
Stream Gage (Oct. 1927-Date)
Stream Gage (Jan. 1968-Date)
Stream Gage (1927-1932)
Stream Gage (Jan. 1948-Date)
14
5
126
118
101
1
150
33

Figure 1



CLWA & Purveyor Boundaries and Precipitation Gage Sites

April 1996

Source: Kennedy/Jenks Consultants

Figure 2

FOOTNOTE: BOUNDARIES ARE APPROXIMATELY ONLY.

United Water Conservation District Boundary

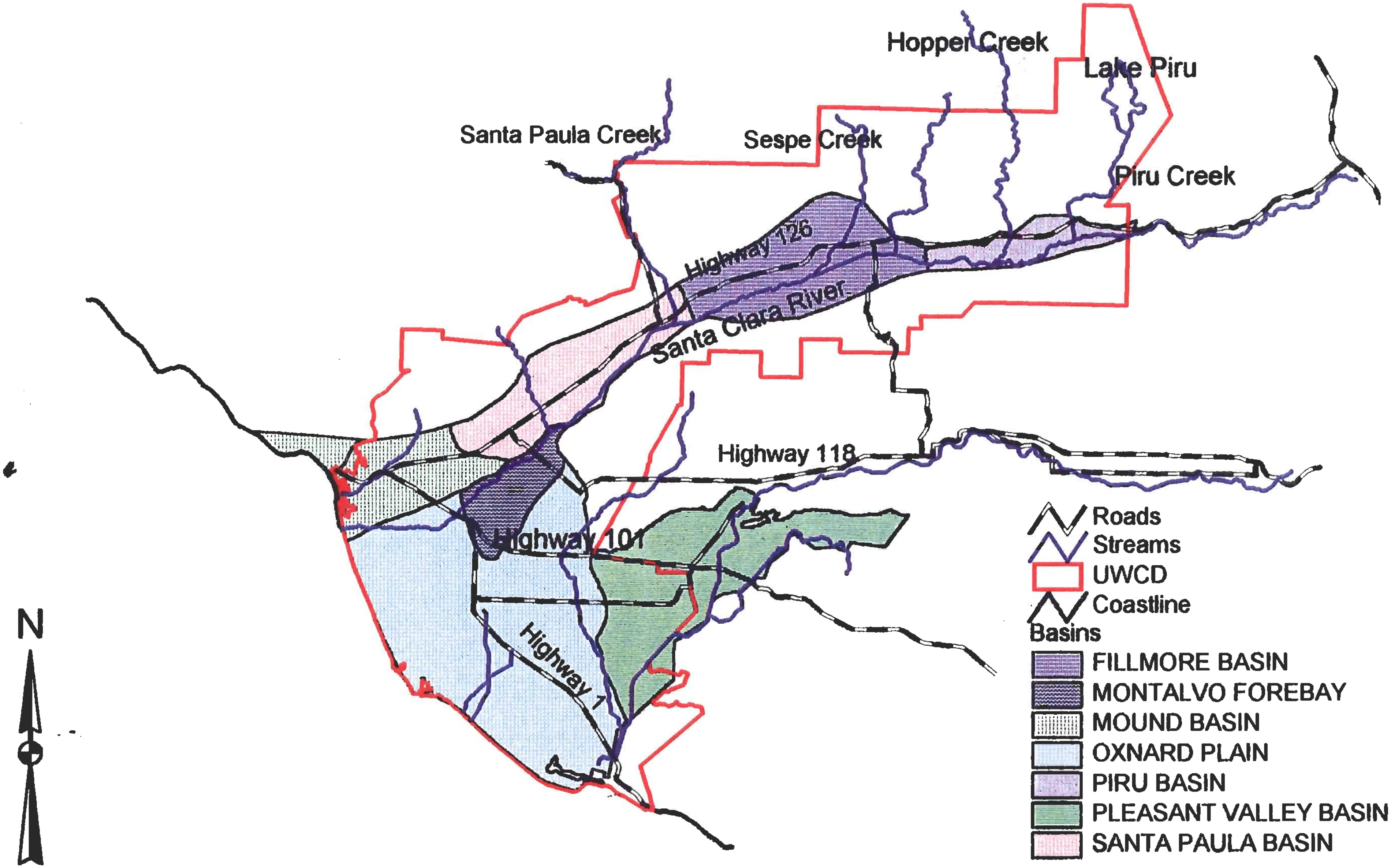
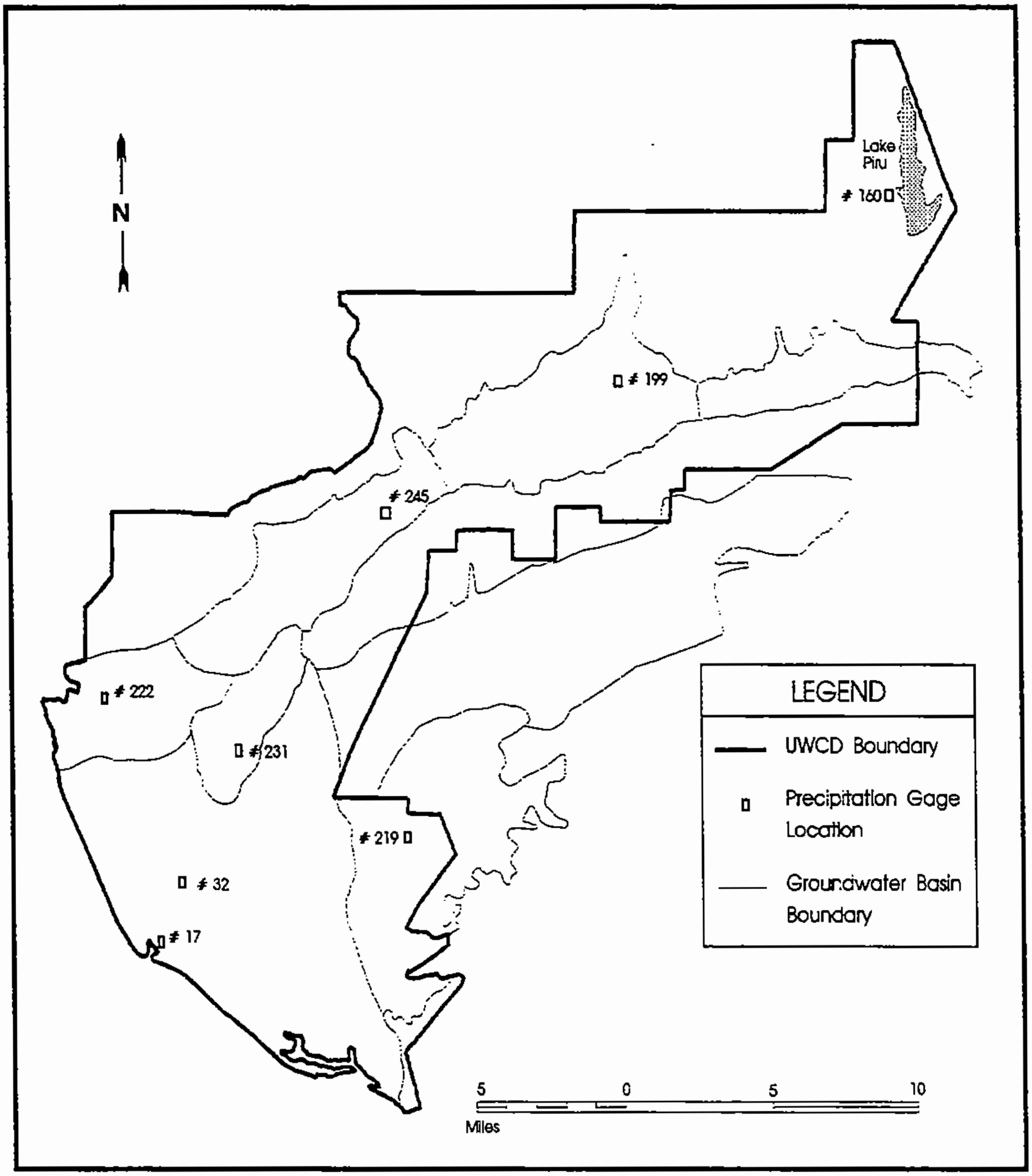


Figure 3

UWCD Boundary and Precipitation Gage Sites



Source: United Water Conservation District

Figure 3

Los Angeles County Department of Public Works, Hydraulic/Water Conservation Division-Records indicate that 1992 was an extremely wet water year. Rainfall totals were nearly double the annual normal rainfall. As shown in Table 1 the total rainfall for 1992 ranged from 15.74 inches at the Vincent Patrol Station Gage to 41.7 inches at the Magic Mountain Gage. Figure 2 shows the locations of the precipitation gages summarized in Table 1. The 100-year normal rainfall for these gages were 8.35 to 21.8 inches, respectively. According to the Los Angeles County Department of Public Works, Hydraulic/Water Conservation Division, the annual normal rainfall is a statistically-derived average using historical precipitation records.

The Department of Water Resources of Southern California report titled "Investigation of Water Quality and Beneficial Uses Upper Santa Clara River Hydrologic Area" provided precipitation records for the Acton and Saugus gage stations. The historical high for the Acton station was 25.80 inches in water year 1983, and the historical low was 2.54 inches in water year 1898. The historical high for the Saugus station was 43.73 inches in water year 1983, and the historical low was 8.01 inches in water year 1961. The long-term mean seasonal precipitation of 10.20 inches for the Acton station contrasts with the 18.45 inches for the Saugus station.

Graphs showing the seasonal precipitation and the cumulative departure for the Acton and Saugus stations are provided in Appendix A. Overall, the annual mean precipitation has increased from 16.3 inches (20 years prior to 1972) to 20.2 inches (1972 through 1988).

Lower Santa Clara River

Ventura County Department of Public Works Records indicate that 1992 was an extremely wet water year. The overall climate within the UWCD is a Mediterranean-type climate consisting of long, dry summers and short, comparatively wet winters. Almost all of the precipitation occurs during the period between December and March. The average annual temperatures within UWCD range from about 69°F near the coast to about 61°F inland. Historic average precipitation within Ventura County is shown in Table 2.

TABLE 1

PRECIPITATION GAGES WITHIN LOS ANGELES COUNTY

Station No.	Station Name	Latitude	Longitude	Total Rainfall for 1992 Jan-Dec (inches)	100-Year Normal Rainfall (inches)
1029C	Mill Creek Summit Ranger Station	N34:23:22	W118:04:48	37.33	17.52
120	Vincent Patrol Station	N34:29:17	W118:08:27	15.74	8.35
261F	Acton-Escondido Canyon	N34:29:42	W118:16:22	18.19	9.79
801B	Magic Mountain	N34:23:18	W118:19:27	41.7	21.8
125B	San Francisquito Canyon Power House #1 (Saugus)	N34:35:25	W118:27:15	31.98	17.9
372	San Francisquito Power House #2	N34:32:02	W118:31:27	31.83	16.1
32C	Newhall-Soledad	N34:23:07	W118:31:54	32.06	17.56

Note: The 100-year normal rainfall is derived from historical precipitation data for the precipitation gages listed above as well as extrapolated data from adjacent precipitation gages. The 100-year normal is approximately equivalent to the 100-year average.

Reference: Los Angeles County Department of Public Works, Hydraulic/Water Conservation Division-Records.

Table 2 Precipitation Gages Within Ventura County		
Station Location	Gage Number	Average Annual Rainfall (inches)
Camarillo	219	15.72
East Ventura	222	15.72
El Rio	231	15.46
Fillmore	199	18.73
Lake Piru	160	19.81
Oxnard	32	14.29
Port Hueneme	17	13.76
Santa Paula	245	17.41

Source: Ventura County Flood Control District
Note: Average Annual Rainfall is from 1950-1992.

Figure 3 shows the locations of the precipitation gages summarized in Table 2.

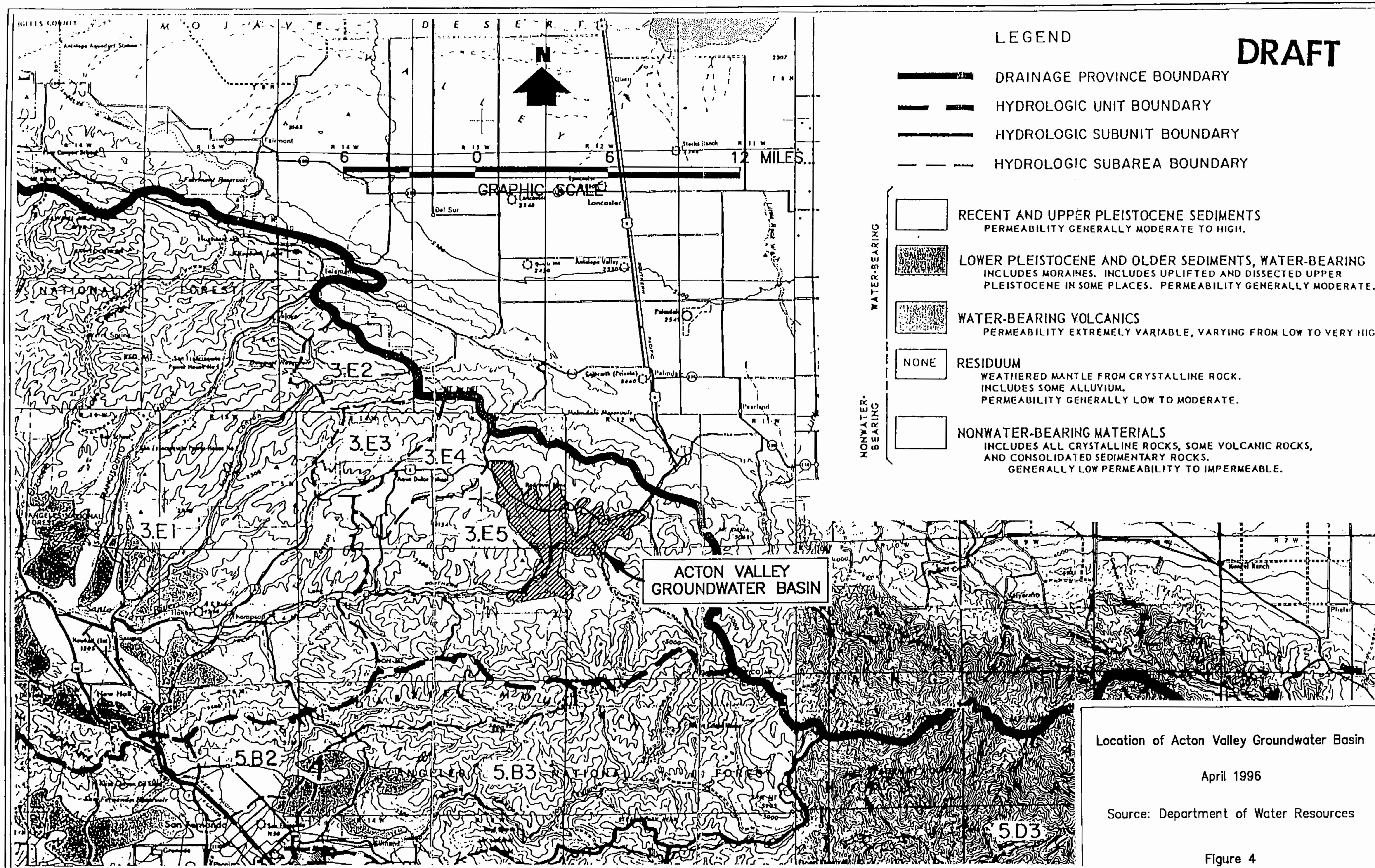
Santa Clara River Groundwater Basins

Acton Valley Groundwater Basin

Geology of the Acton Valley Groundwater Basin

Framework

The Acton Valley Groundwater Basin is an alluvial basin of limited extent encompassing an area of approximately 17 square miles (see Figure 4). The basin generally consists of two water-bearing units; Quaternary terrace deposits (Qt) and recent undifferentiated valley alluvium (Qal). The Qt occurs largely in the northern portion of the basin, north of Acton. The Qal occurs largely in and around the vicinity of the town of Acton and along upper Soledad Canyon, beginning just southwest of Soledad Pass. Maximum depth of Qal in the vicinity of Acton may be on the order of 225 ft. This Qal thins to zero thickness on the margins of the basin and where it comes into contact with Qt.



Location of Acton Valley Groundwater Basin

April 1996

Source: Department of Water Resources

Figure 4

Both Qt and Qal form a relatively thin veneer of unconsolidated sediments that unconformably overlie non-water bearing, geologically older, basement complex rock (BC). This BC consists largely of the following lithology: Precambrian anorthosite, schist, gabbro, syenite, and gneiss; Mesozoic granite and granodiorite and Tertiary Vasquez Formation sandstone and volcanic rocks.

The Acton Valley Groundwater Basin is transected by a number of faults in the northeast portion of the basin, at Soledad Pass, and in the southern portion of the basin just south of Acton. In the vicinity and south of Acton, three of the largest faults occur, namely the Kashmere Valley, Acton, and Soledad faults. The Kashmere Valley and Acton faults are southeast trending faults whereas the Soledad fault is a southwest to west trending fault.

The Kashmere Valley fault forms the southwestern margin of the basin and passes through the east flank of Parker Mountain continuing south through Soledad Canyon. The Acton fault appears to splay from the Kashmere Valley fault and trends southeasterly across the Acton Valley Groundwater Basin, south of Acton and north of Acton Camp. The Soledad fault trends westward along Soledad Canyon, southwest of Acton Valley Groundwater Basin.

These three fault systems clearly offset the basement complex rocks. These faults have not been shown to offset valley alluvium or terrace deposits. It is not known whether or not investigations have been conducted on these faults to determine their historic seismic activity. It is not known if any of these faults form a barrier to groundwater flow in the BC. They likely do not form barriers to groundwater movement in Qal or Qt because the faults do not apparently break these units. However, groundwater level data are wholly lacking from shallow water-supply wells in the alluvium near where these faults cross the alluvial and/or terrace deposits.

Hydraulics

The regional direction of groundwater flow within the Acton Valley Groundwater Basin is in a southwestward direction toward Soledad Canyon. This canyon forms the only outlet for groundwater underflow, as well as for surface water outflow from the basin. Average gradients of groundwater in the basin have been found to range from 64 to 91 ft per mile. As in the Eastern Groundwater Basin, these gradients are ultimately dependent upon either hydrologically dry or wet conditions, with the lowest gradients occurring during dry seasons and the highest gradients occurring during wet seasons.

Soledad Pass, at the northeastern extremity of the region, forms a groundwater divide and is also the watershed boundary; groundwater north of the town of Vincent drains into the Lancaster/Palmdale area. South of this divide groundwater flows from the surrounding highland area, originating largely from rainfall runoff, and percolates into the basin thereby replenishing it.

Replenishment Areas

Groundwater in the Acton Valley Groundwater Basin is replenished largely by deep percolation of direct rainfall and by infiltration of surface water runoff. Lesser amounts of replenishment are provided by deep percolation of excessive irrigation of lawns and agricultural areas and by deep percolation from private onsite septic tank and leachfield systems. The relative magnitudes of each form of recharge to the basin are not known.

Another replenishment area is at the western extremity of the basin, west of Acton. There, groundwater also originates largely as rainfall runoff and deep percolation and recharges the basin on the west. However, the most significant recharge area, possibly in terms of volume of flows and upland watershed areas, occurs on the southern and eastern sides of the Acton Valley. There, rugged and mountainous terrain capture a majority of the rainfall moving in from the west, due to higher peak elevations.

Fluvial Geomorphology

One large ephemeral river, the Upper Santa Clara River, exists within and traverses across the Acton Valley Groundwater Basin. The fluvial geomorphology of the Upper Santa Clara River is similar to that discussed in the Eastern Groundwater Basin. Indeed, this area comprises the headwaters for the Santa Clara River system. The river in this region has typical braided stream deposits and a relatively wide floodplain area. Such streams result from stormwater flows originating in highland areas and due to storms of short duration but of great intensity in rainfall. Particle sizes of sediment in the stream bed generally range from coarse sand sizes to gravel (pebble, cobble, and boulder size).

In the area where the river system exits Aliso Canyon and Soledad Pass on the eastern edge of the basin, the morphology of the river is broad and flat. In Aliso Canyon, the main drainageway for the channel, width of the channel ranges from 400 to 600 ft across and drains to the north. As the channel exits Aliso Canyon, it abruptly turns to the west and attains a width ranging from 1,000 to 1,500 ft across. The channel continues westward broadening slightly to a width of approximately 2,000 ft near Acton. At Acton, the stream channel abruptly turns south and the channel narrows downward in width ranging between 600 and 800 ft across, as it enters Soledad Canyon southwest of Acton Camp.

Groundwater Hydrology of the Acton Valley Groundwater Basin

Groundwater Quantity

Historically, the quantity of groundwater in storage in the Acton Valley Groundwater Basin, within both the alluvial and terrace deposits, ranges from 14,883 acre-feet (AF) for a relatively dry hydrologic period (1965), to 34,395 AF for a comparatively wet hydrologic period (1945). The estimated groundwater storage capacity within both the alluvial and terrace deposits is approximately 45,000 AF.

Geraghty & Miller (G&M) in Brockmeier, 1990, has also calculated total volume of groundwater in storage in the Acton Valley Groundwater Basin. In their calculations, G&M arrive at a total value of 108,000 AF for groundwater in storage within the alluvial sediments and terrace deposits, although the lateral extent and vertical depth of these materials, as used by G&M, are not the same as those used by Slade.

Historical groundwater elevations within the main alluvial channel of the upper Santa Clara River (from Slade, 1990 and excluding tributary drainages) have ranged from 2570 ft above sea level (asl), at Acton Camp in the southern portion of the basin, to 2997 ft asl in the northern portion of the basin during a relatively dry hydrologic period (1964-1965). During a relatively wet hydrologic period (1984-1985), water level elevations have ranged from 2616 ft asl, at Acton Camp, to 3085 ft asl at the Vincent Fire Station.

There are several water-supply wells that extract groundwater from the alluvial deposits at rates greater than 100 gallons per minute (gpm); and numerous, small-volume domestic water-supply wells scattered throughout the valley region. Most of these individual domestic wells extract groundwater ranging at rates from 2 to 5 gpm.

Some of the major water purveyors in the area are the Los Angeles County Water Works District, Acton Camp, a trailer park, and a few large private water-supply wells located within the southern portion of the groundwater basin. These purveyors have higher-capacity water-production wells.

Groundwater Quality

Generally, based on quality data from selected water-supply wells in the Acton area (Slade, 1990), groundwater quality in the majority of wells in the basin exhibit a calcium-magnesium-bicarbonate character. However, a few wells exhibit calcium-magnesium-sulfate character; these wells are located north of Acton. Nitrate (as NO_3) concentrations in the selected well samples ranged from 3.9 to 24.7 milligrams per liter (mg/l), total dissolved solids concentrations (TDS) ranged from 279 to 480 mg/l, and total hardness concentrations ranged from 172 to 271 mg/l. Based on these data, it appears that groundwater quality is largely influenced by deep percolation of rainfall runoff. Indeed, concentration graphs of TDS versus time compared to hydrographs in the region seem to indicate that as rainfall declines, TDS increases, and vice-versa.

The Department of Water Resources data set for the Acton subarea consists of 314 mostly complete analyses from 75 wells measured during a period of record from 1946 through 1989. A statistical summarization of all the quality data in the database is presented in Table 3. Distribution maps of the 1989 concentrations of TDS, sulfate, chloride, nitrate and boron found in water wells are shown in Appendix B. Several figures and hydrographs showing groundwater quality data for the Acton Valley Groundwater Basin are also included in Appendix B.

Adjudication and Rights

Currently, there is no adjudication of the groundwater basin but individual water rights have been established within the basin through various uses but not set by the courts.

Rising and Sinking Water Areas

Rising groundwater is present at the mouth of Soledad Canyon, just southwest of Arrastre Canyon. This rising groundwater may be caused by buried bedrock highs in the alluvium in this stretch of the river. Sinking, or disappearing, water occurs in Arrastre Canyon at its confluence with Soledad Canyon. Here, surface water flows emanating from Arrastre Canyon were observed (Slade, 1990) to disappear into the stream alluvium of Soledad Canyon. This may generally be the case where all the tributaries meet the valley alluvium.

TABLE 3

STATISTICAL SUMMARY OF QUALITY CONSTITUENTS IN GROUND WATERS ACTON HYDROLOGIC SUBAREA

In mg/L, unless otherwise noted

	1989 Data						1946-88 Data		
Constituent	n[a]	Maximum Value	Minimum Value	Median Value	75th Percentile	25th Percentile	N[d]	Maximum Value	Minimum Value
Calcium	43	140	6	68	78	55	264	252	12
Magnesium	43	55	2	17	23	15	264	54	3
Sodium	43	132	23	44	63	36	264	106	5
Potassium	43	6.0	0.3	2.0	2.0	1.4	263	11.0	0
Alkalinity	34	382	86	179	247	139	222	344	80
Sulfate	43	315	30	72	78	53	264	213	17
Chloride	43	270	10	44	55	31	271	406	5
Nitrate	43	62.0	ND	11.2	19.0	2.0	263	151	0
Fluoride	42	1.3	0.1	0.4	0.4	0.3	221	1.4	0
Boron	43	2.00	ND	ND	0.08	ND	221	1.60	0
TDS	43	893	275	411	474	355	222	1,800	228
Total Hardness	31	500	22	232	275	200	265	853	73
pH[b]	42	8.5	7.3	7.95	8.1	7.7	270	8.6	6.2
Electrical Conductivity[c]	31	1,300	400	600	700	500	268	2,110	342
Total Iron	34	0.10	ND	ND	ND	ND	158	1.57	0
Manganese	34	0.10	ND	ND	ND	ND	153	0.14	0

[a] n is the number of measurements from 41 wells; two wells were measured twice.
[b] In standard unit
[c] In μmhos/cm
[d] N is the number of measurements from 43 wells; 20 wells had recurrent sampling and 23 had been sampled one time only.
ND = none detected

Source: Investigation of Water Quality and Beneficial Uses Upper Santa Clara River Hydrologic Area by DWR dated 1993.

Soledad Canyon Alluvial Channel

The Soledad Canyon Alluvial Channel is approximately 9 miles in length and is bordered by the Eastern Groundwater Basin on the west. Figure 5 shows the location of the Soledad Canyon Alluvial Channel.

The Soledad Canyon Alluvial Channel is not a Department of Water Resources designated basin. However, groundwater is extracted via 21 private wells located throughout the channel. Figure 5 shows the approximate locations of the wells. Groundwater extraction data, groundwater storage, and basin yields are not currently available.

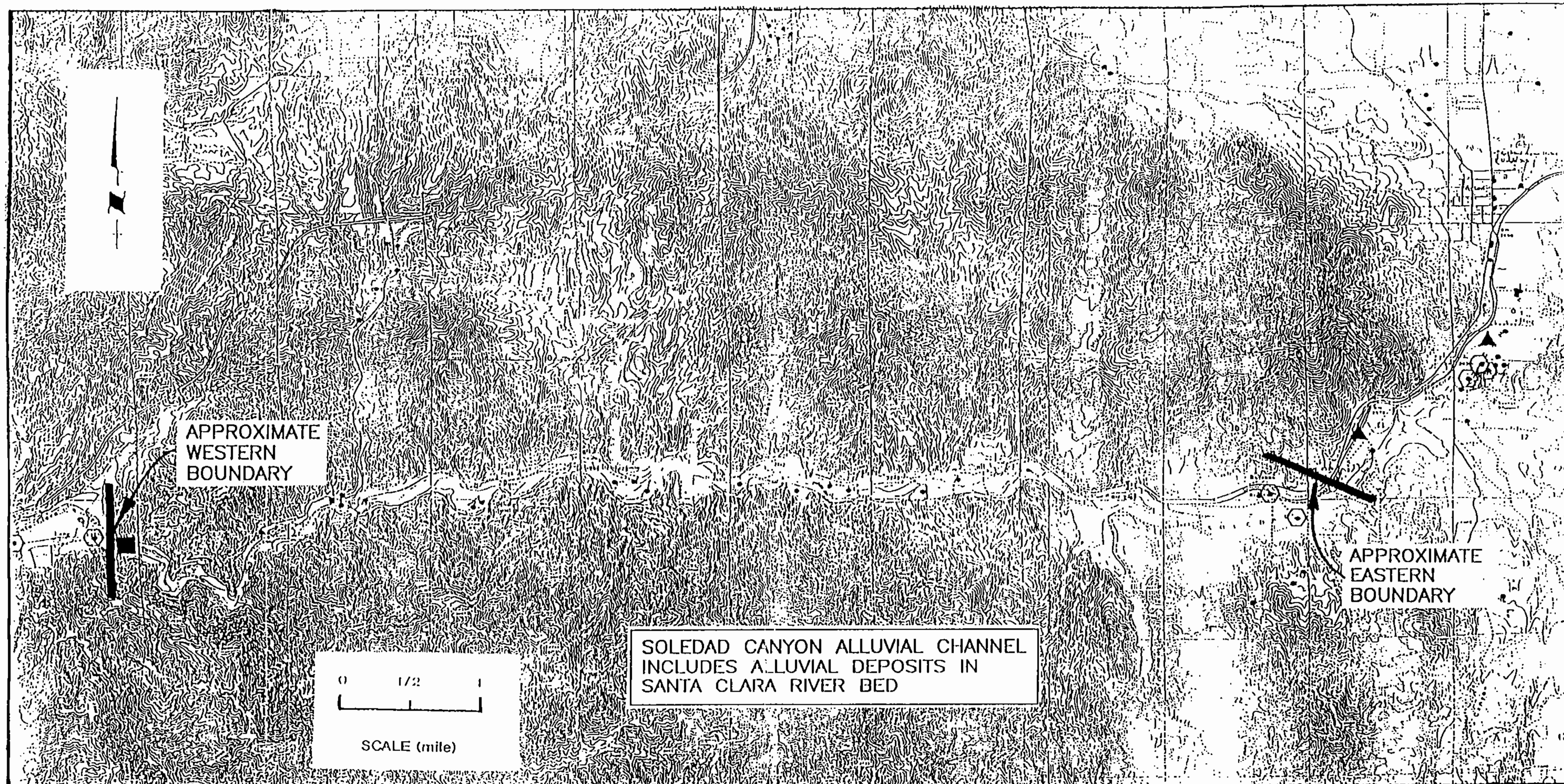
Eastern Groundwater Basin

The Eastern Groundwater Basin encompasses the upper Santa Clara River Valley and is shown on Figure 6. Much of the following information on this basin, presented in this report, has been. summarized and condensed from Slade, 1986, "Hydrogeologic Investigation for Perennial Yield and Artificial Recharge Potential of the Alluvial Sediments in the Santa Clarita Valley of Los Angeles County, California", and from Slade, 1988, "Hydrogeologic Assessment of the Saugus Formation in the Santa Clara Valley of Los Angeles County, California"

Geology of the Eastern Groundwater Basin

Framework

Geologic units in the Santa Clara River Valley, in descending stratigraphic order, are as follows: Quaternary alluvium and terrace deposits; the Saugus Formation of Pliocene-Pleistocene geologic age; and the Pico, Castaic, Towsley, and Mint Canyon formations of Miocene geologic



- Well Location
- Well Location for Hydrograph Data
- Rainfall Gage Data
- Stream Gage Data

Location of Soledad Canyon Alluvial Channel

April 1996

Source: Kennedy/Jenks Consultants

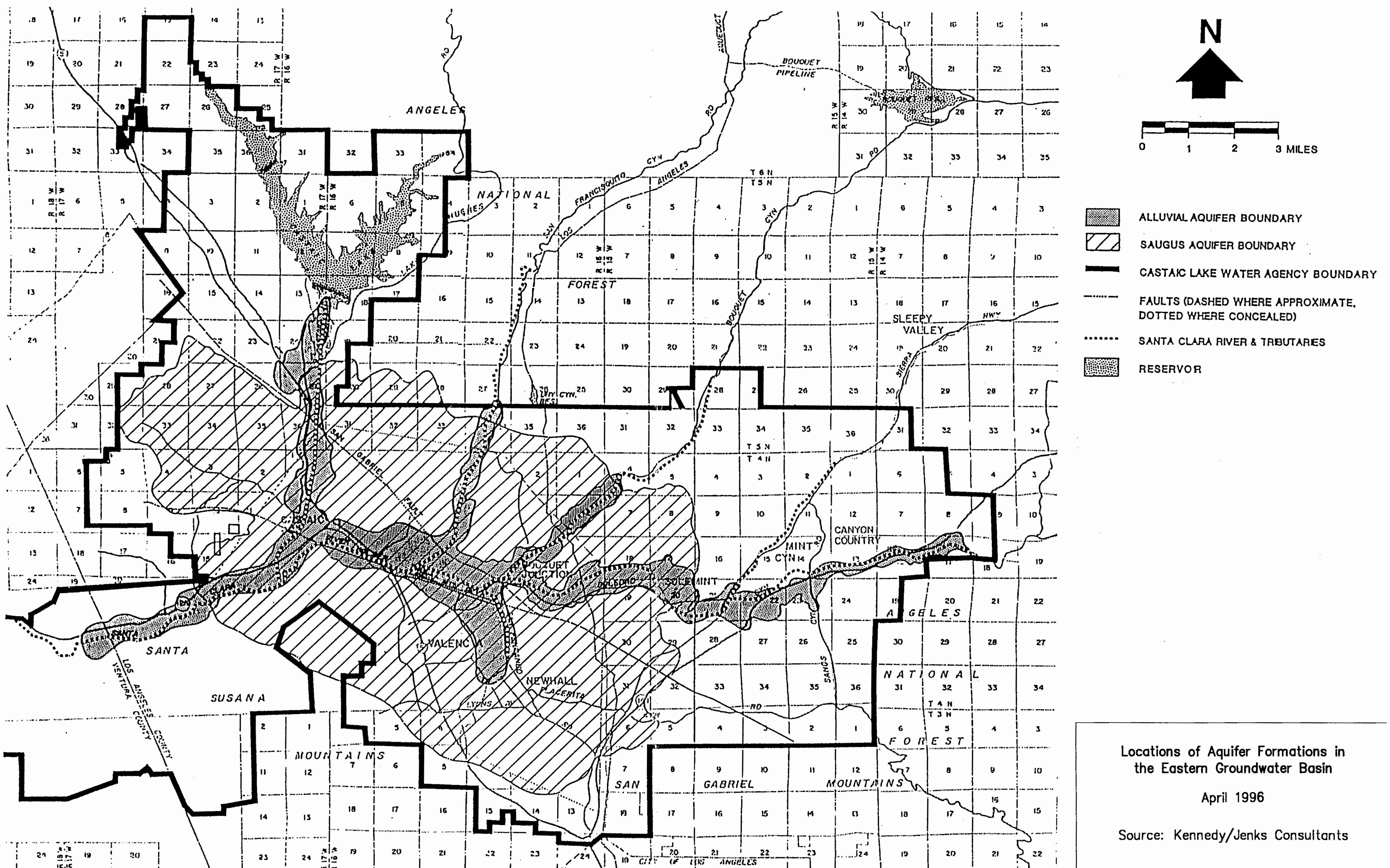
Figure 5

age. Much of the subsurface structural geology and lithology of the listed formations has been extensively documented and studied from published literature and from data from the numerous oil wells in the region.

Geologically much older basement complex rocks, consisting largely of Precambrian granite, schist, and gneiss and Mesozoic granite and granodiorite, are exposed in the mountainous terrain of the San Gabriel Mountains, to the south of the river valley, and in the mountains in the Angeles National Forest, to the north of the valley. The older geologic units lying beneath the Saugus Formation are considered to be nonwater-bearing units whereas the Saugus Formation and overlying alluvial and terrace deposits are considered to be potentially water-bearing units. Within the Saugus Formation, however, the lower part of the formation is not considered to contain usable groundwater. This is largely caused by changes in water quality and water quantity at deeper depths within the formation.

The alluvium and the Saugus Formation comprise the main water-producing units (aquifers) in the Eastern Groundwater Basin and are shown on Figure 6. The Alluvial aquifer consists of unconsolidated Recent (Holocene geologic age) stream deposits of clay, silt, sand, and gravel. The Saugus aquifer system is composed largely of claystone, siltstone, and sandstone originally deposited in a non-marine environment; these strata are of late Pliocene to early Pleistocene geologic age. Generally, the alluvium forms a relatively thin veneer of sediments that directly overlies the Saugus Formation along the Santa Clara River within the local groundwater basin.

Traversing the valley are two large fault systems: the San Gabriel and Holser faults. The San Gabriel fault system is considered to be a steeply northeast-dipping, possibly right-lateral strike-slip fault. The San Gabriel fault trends northwestward originating in the San Gabriel Mountains on the south, and transecting the region through the communities of Saugus and Castaic, continuing onward west of Interstate Highway 5, crossing that highway south of Sulphur Springs.



Locations of Aquifer Formations in the Eastern Groundwater Basin

April 1996

Source: Kennedy/Jenks Consultants

Figure 6

The Holser fault may be a splay from the San Gabriel fault with which it intersects near the community of Saugus. The Holser fault is considered to be a south-dipping left-lateral reverse fault that also trends northwestward through Castaic Junction continuing onward north of and along the Santa Clara River Valley, west of Castaic Junction.

The San Gabriel and Holser faults appear to rupture the Saugus and older underlying formations. Study of the San Gabriel fault by various investigators (sited in Slade, 1988) has yielded information that the fault may have experienced movement within Holocene time (in the past 10,000 years). Activity along the Holser fault is not known.

The San Gabriel fault may form a partial barrier to groundwater flow. In areas where alluvium of the Santa Clara River overlies the fault, groundwater underflow may flow across the zone, possibly even in those areas where the fault offsets drainage. This fault is considered to form at least a partial barrier to groundwater flow in the alluvium where it crosses the river near Bouquet Junction. There are inadequate water level data from alluvial wells in Castaic Creek to ascertain whether or not the fault is a groundwater barrier in that area. At depth, however, the San Gabriel fault may form an effective barrier, especially in those areas where fault gouge may be well-developed within the Saugus Formation.

The Holser fault appears to form a barrier to groundwater movement at depth in the Saugus Formation in the western portion of the basin, where Saugus Formation material has come into fault contact with Pico Formation material. However, in the eastern portion of the basin the Holser fault may not form a barrier to groundwater at depth, where Saugus Formation material is in fault contact with similar Saugus Formation material. In the alluvium, the Holser fault does not appear to form a barrier to groundwater movement.

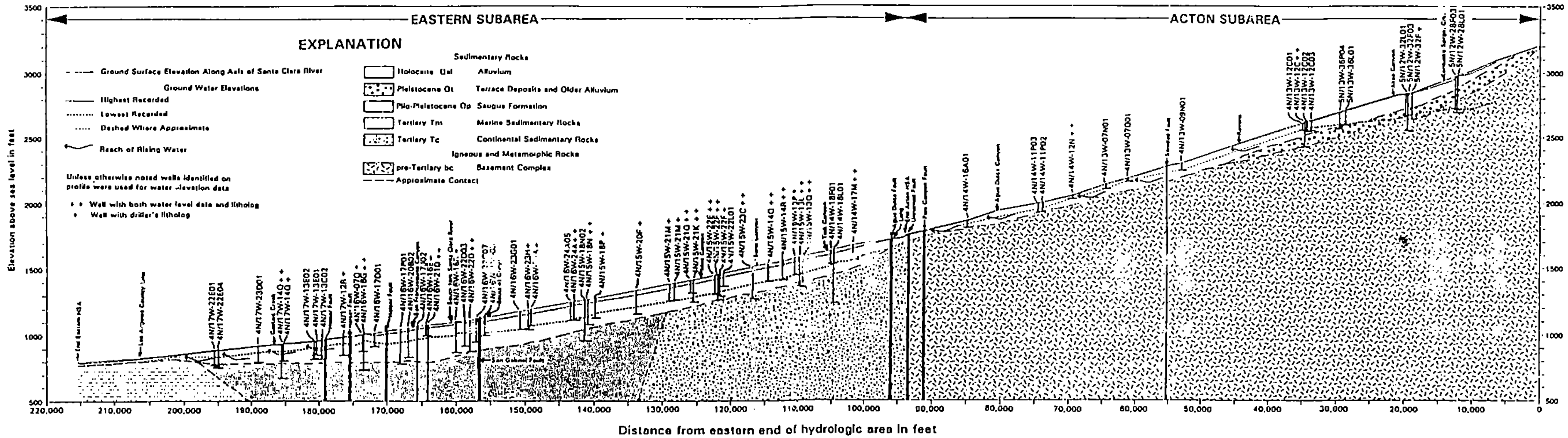
Hydraulics

Alluvial Aquifer. Groundwater flow directions in the Alluvial aquifer of the Santa Clarita Valley generally trend westward, following the trend of surface water flows in the Santa Clara River. However, flow directions in tributary stream drainages north of the river are generally to the south-southwest, while those south of the river are generally to the north-northwest. Average gradient of groundwater in alluvium of the basin is approximately 46 ft/mile (based on 1985 water level data and encompassing the river from the Lang Gage to the Los Angeles-Ventura County Line). However, the general groundwater gradient may typically range anywhere from 25 to 55 feet/mile. These gradients can vary locally along the Santa Clara River and in the tributary drainages and are ultimately dependent upon either hydrologically dry or wet conditions and extraction practices, with the lowest gradients occurring during dry seasons and the highest gradients occurring during wet seasons.

Saugus Aquifer. For wells screened entirely within the Saugus Formation, groundwater flow directions generally trend north-northwestward in the Santa Clara River-South Fork area. Data on groundwater elevations in the Saugus Formation exposed in the hills to the north and south of the Santa Clara River are lacking and, thus, groundwater flow directions in these outlying areas cannot be ascertained. However, it is likely that groundwater flow directions in the Saugus aquifer outside of the alluvial valley may be largely controlled by extraction practices (pumping), fractures, joints, and/or bedding planes. This may especially be the case where the sediments of the Saugus aquifer are relatively consolidated, thereby decreasing the space for the storage of groundwater.

Figure 7 from the Department of Water Resources shows the Aquifer Stream Hydraulic Interrelation Along the Santa Clara River within Los Angeles County.

FIGURE 7 AQUIFER - STREAM HYDRAULIC INTERRELATION ALONG SANTA CLARA RIVER



Source: Investigation of Water Quality and Beneficial Uses, Upper Santa Clara River Hydrologic Area by DWR Dated 1993.

Aquifer–Stream Hydraulic Interrelation Along Santa Clara River

April 1996

Figure 7

Replenishment Areas

Alluvial Aquifer. Replenishment of groundwater to the Alluvial aquifer occurs primarily from infiltration of surface water runoff within the Santa Clara River and from deep percolation of precipitation on the exposures of alluvium along the stream canyons. These replenishment areas are largely comprised by canyon tributaries located north of the basin, such as the Bouquet, Dry, and San Francisquito Canyons, and by those located south of the basin such as Placerita, Whitney, Gavin, and Pico Canyons. On the eastern extremity of the basin, Iron, Oak Spring, Bee, Tick, and Mint Canyons comprise the replenishment areas for the alluvial.

The major contributing source of groundwater replenishment to the Alluvial aquifer occurs along the entire length of the Santa Clara River. Surface water flows, emanating from the above listed canyons, percolate into and through the coarse-grained deposits of sand and gravel along the entire native river channel.

Saugus Aquifer. Replenishment to the groundwater in the Saugus aquifer system occurs via two main methods: as direct precipitation and deep percolation of rainfall on outcrops in the highland areas surrounding the basin, and through infiltration of groundwater from the saturated sections of the overlying Alluvial aquifer within the river valley itself. Thus, the replenishment area for the Saugus aquifer comprises a large area of the Eastern Groundwater Basin, outside of the alluvial valley itself. However, there is evidence that the greater amounts of groundwater replenishment to the Saugus aquifer occur directly from the Alluvial aquifer; those areas located external to the Alluvial aquifer contribute much less replenishment of groundwater, largely through joints, fractures, and bedding planes in the Saugus aquifer.

Fluvial Geomorphology

The Santa Clara River exists within and traverses across the Eastern Groundwater Basin. This river, along its entire course, consists of typical braided stream geomorphological characteristics such as point bar deposits, gravelly stream bottoms, and broad, wide washes. Geologically, such characteristics manifest themselves in cut and fill structures, and intertonguing silt, sand, and gravel lenses in sedimentary section. It addition, a relatively wide floodplain area forms the surrounding flat-lying areas of the river. In these areas, relatively finer-grained material comprise the dominant sediment size.

The Santa Clara River has been formed largely by stormwater flows emanating from highland areas caused by storms of short duration but of great rainfall intensity. Particle sizes of sediment in the stream bed generally range from coarse sand sizes to gravel (pebble, cobble, and boulder size). Generally, the channel of the Santa Clara River, upstream from Bouquet Junction, is dry except following storms. Downstream from Bouquet Junction, the combination of shallow bedrock, a reduced cross-sectional flow area, and wastewater discharge to the streambed from two water reclamation plants creates a perennial flow condition in the river westward from the Saugus Water Reclamation Plant past the Los Angeles-Ventura County Line.

The river enters the groundwater basin on the east near State Highway 14. Here, the channel and floodplain area is shallow and has a width of approximately 2000 ft. From this point the river continues westward to Bouquet Junction, generally maintaining its width. At Bouquet Junction, the river enters the main Santa Clarita Valley and a number of tributary stream drainages, of similar morphology, join the river at that point.

The river passes through this valley in a west-northwestward direction, abruptly narrowing, before reaching Interstate Highway 5, to a channel width of approximately 500 ft across. A topographic high point on the north side of the river underlain by Saugus Formation sediments. acts to confine the channel in this area. The river continues onward and slightly increases in width after passing the bedrock topographic high point.

South of Castaic Junction, the river turns southwestward and is joined in this area by Castaic Creek, entering the valley on the north. Southwest of Castaic Junction, past the point where the two streams merge, the Santa Clara River channel and floodplain increases in width ranging from

500 to 2,000 ft. The river generally maintains that width until it exits the Eastern Groundwater Basin at the Los Angeles-Ventura County Line.

Groundwater Hydrology of the Eastern Groundwater Basin

Groundwater Quantity

Alluvial Aquifer. Historically, the quantity of groundwater in storage in the Alluvial aquifer ranges from 107,000 acre-feet (AF) in a relatively dry hydrologic period (1965), to 201,000 AF in a relatively wet hydrologic period (1945). The estimated groundwater storage capacity of the basin is approximately 239,900 AF. Historical groundwater elevations in the Santa Clara Valley have ranged from 1635 feet (ft) above sea level (asl), on the east side of the basin, to 825 ft asl, on the west side of the basin, during a relatively dry hydrologic period (1965). During a relatively wet hydrologic period (1985), groundwater elevations have ranged from 1696 ft asl, on the east, to 885 ft asl, on the west.

A number of water purveyors, such as the Santa Clarita Water Company, the Valencia Water Company, the Newhall County Water District, and Wayside Honor Rancho (through Los Angeles County Waterworks District No. 36) have historically extracted groundwater from the basin for water-supply purposes. Each of the water companies/water districts produces groundwater for municipal-supply purposes. For the years 1987 to 1994, total groundwater extractions by these purveyors from the Alluvial aquifer range between approximately 12,000 to 21,000 AF (these quantities do not include total agriculture and other local pumping).

Saugus Aquifer. It has been recently estimated that the total quantity of usable groundwater in storage in the Saugus aquifer is approximately 1,413,000 AF. This calculation as presented in Slade 1988 represents the volume of usable groundwater in storage as measured down to the base of fresh water or a depth of 2,500 feet within the Saugus Formation. The 2,500-foot depth was considered the maximum depth to which water wells would reasonably be drilled. However, the historical range of groundwater in storage has not been estimated.

Data from water-supply wells in the Saugus aquifer have shown that groundwater elevations have ranged from 1,101 ft asl, in the southern portion of the basin, to 947 ft asl, in the western portion of the basin, for a relatively dry hydrologic period (1967, prior to the heavy rains at that time). For a relatively wetter hydrologic period (1987), groundwater elevations ranged from 1,293 ft asl, in the southern portion of the basin, to 1,055 ft asl, in the western portion of the basin.

The previously listed water-purveyors in the basin that extract groundwater from the Alluvial aquifer also extract groundwater from the Saugus aquifer. However, the amounts of extraction from the Saugus aquifer are approximately 18 to 20 percent that of the extractions from the Alluvial aquifer. For the years 1987 to 1994, total groundwater extractions by these purveyors, from the Saugus aquifer ranged from approximately 8,000 to 14,500 AF.

Groundwater Quality

Alluvial Aquifer. Based on quality data from selected water-supply wells in the Eastern Groundwater Basin, Slade found that groundwater quality in the majority of wells in the basin exhibit a range in character from calcium-magnesium-bicarbonate to calcium-magnesium-sulfate. Nitrate (as NO_3) concentrations in selected well samples ranged from non-detectable to 35 milligrams per liter (mg/l), with one well showing a concentration of 57 mg/l (above the State Maximum Contaminant Level (MCL) of 45 mg/l). Total dissolved solids concentrations (TDS) ranged from 376 to 750 mg/l and total hardness concentrations (TH) ranged from 236 to 504 mg/l.

Saugus Aquifer. Based on quality data from selected water-supply wells screened in the Saugus aquifer, Slade found that groundwater quality in the majority of wells in the basin exhibit primarily a calcium-magnesium-sulfate character. However a few wells show calcium-magnesium-bicarbonate character and a few others show sodium-chloride-sulfate character. Nitrate (as NO_3) concentrations in selected well samples ranged from non-detectable to 34 milligrams per liter (mg/l), with one well showing a concentration of 57 mg/l (above the State MCL of 45 mg/l). However, it is very likely that this lone Saugus aquifer well does not have an adequate sanitary seal. TDS concentrations ranged from 410 to 1,800 mg/l and TH concentrations ranged from 153 to 919 mg/l.

Hydrographs and TDS graphs from Slade for several wells in the Alluvial and Saugus aquifers are provided in Appendix C.

Eastern Groundwater Basin

The Department of Water Resources (DWR) compiled groundwater quality data for the Eastern Hydrologic Subarea for a period of approximately 50 years. Their current basin plan has the Eastern Subarea divided into five subdivisions, in which each has a set of water quality data. The five subdivisions are as follows: (1) Above Bouquet Canyon; (2) Above Castaic Creek to Bouquet Canyon; (3) Placerita Canyon Area; (4) South Fork of Santa Clara River Area; and (5) Castaic Creek to Blue Cut. A statistical summarization of the quality data for the subdivisions is presented in Tables 4 through 8. Several figures and hydrographs from DWR showing groundwater quality data for the Eastern Groundwater Basin are included in Appendix D.

Adjudication and Rights

Currently, there is no adjudication of the groundwater basin but individual water rights have been established within the basin through various uses but not set by the courts. However, small users and a few large water purveyors, such as the Santa Clarita Water Company, the Valencia

TABLE 4

STATISTICAL SUMMARY OF QUALITY CONSTITUENTS IN GROUND WATERS EASTERN HYDROLOGIC SUBAREA, ABOVE BOUQUET CANYON SUBDIVISION

In mg/L, unless otherwise noted

	1989-90 Data						1945-88 Data		
Constituent	n[a/]	Maximum Value	Minimum Value	Median Value	75th Percentile	25th Percentile	N[d/]	Maximum Value	Minimum Value
Calcium	34	227	5	100	114	55	427	344	0
Magnesium	34	58	0	24	28	6	426	129	0
Sodium	34	768	46	79	186	61	416	660	0
Potassium	34	7.0	0.1	3.0	4.0	1.6	360	16.0	0
Alkalinity	27	362	44	269	293	233	407	463	28
Sulfate	34	651	4	112	150	82	439	1,660	7
Chloride	34	1,568	20	73	118	55	456	975	6
Nitrate	34	49	ND	6.9	24.0	2.4	405	109.5	0
Fluoride	34	12.0	0.3	0.5	1.0	0.4	294	10.0	<0.06
Boron	34	6.60	ND	1.00	2.00	0.47	286	20.5	0
TDS	34	2,872	337	619	686	522	353	2,896	217
Total Hardness	34	615	16	358	416	200	426	1,390	0
pH[b/]	34	8.7	7.4	8.1	8.2	7.9	431	9.2	6.1
Electrical Conductivity[c/]	33	4,800	500	956	1,102	848	388	4,110	152
Total Iron	26	0.40	ND	ND	0.01	ND	190	4.61	0
Manganese	26	0.03	0	ND	ND	ND	190	0.38	0

[a/] n is the number of measurements from 33 wells; one well was measured twice
[b/] In standard unit
[c/] In μmhos/cm
[d/] N is the number of measurements from 89 wells; 60 wells had recurrent sampling, and 29 had been sampled one time only.
ND = none detected

Source: Investigation of Water Quality and Beneficial Uses Tables 5-9 Upper Santa Clara River Hydrologic Area by DWR dated 1993.

TABLE 5

STATISTICAL SUMMARY OF QUALITY CONSTITUENTS IN GROUND WATERS EASTERN HYDROLOGIC SUBAREA, ABOVE CASTAIC CREEK TO BOUQUET CANYON SUBDIVISION

In mg/L, unless otherwise noted

	1989 Data						1939-88 Data		
Constituent	n[a]	Maximum Value	Minimum Value	Median Value	75th Percentile	25th Percentile	N[d]	Maximum Value	Minimum Value
Calcium	35	139	9	67	86	55	348	336	12
Magnesium	35	63	3	26	35	23	348	272	2.9
Sodium	35	383	22	60	69	46	340	261	0
Potassium	35	4.3	1.0	2.0	3	1.8	266	10.0	0
Alkalinity	29	376	161	244	267	225	349	520	46
Sulfate	35	410	32	96	127	42	359	3,167	37
Chloride	35	156	17	39	50	25	389	264	14
Nitrate	35	38.0	ND	5.0	14.6	1.0	330	106.0	0
Fluoride	35	3.5	0.3	0.7	0.8	0.6	255	5.0	0.1
Boron	34	1.50	ND	0.40	0.65	0.05	227	1.25	0
TDS	35	1,120	312	492	587	362	299	5,150	330
Total Hardness	35	540	35	277	355	230	351	1,226	46
pH[b]	34	8.6	7.0	8	8.2	7.7	353	8.7	6.5
Electrical Conductivity[c]	35	1,650	500	736	900	600	322	2,296	380
Total Iron	29	0.05	ND	ND	ND	ND	185	1.89	<0.01
Manganese	29	0.15	ND	ND	ND	ND	173	0.09	0

[a] n is the number of measurements from 31 wells; four well were measured twice
[b] In standard unit
[c] In μmhos/cm
[d] N is the number of measurements from 56 wells; 36 wells had recurrent sampling and 20 had been sampled one time only.
ND = none detected

Source: Investigation of Water Quality and Beneficial Uses Upper Santa Clara River Hydrologic Area by DWR dated 1993.

TABLE 6

STATISTICAL SUMMARY OF QUALITY CONSTITUENTS IN GROUND WATERS EASTERN HYDROLOGIC SUBAREA, PLACERITA CANYON AREA SUBDIVISION

In mg/L, unless otherwise noted

	1989 Data			1948-88 Data		
Constituent	n[a]	Maximum Value	Minimum Value	N[d]	Maximum Value	Minimum Value
Calcium	6	127	64	99	360	0
Magnesium	6	43	17	98	72	3
Sodium	6	501	26	74	88	0
Potassium	6	4.4	2.0	63	8.0	0
Alkalinity	4	328	217	106	431	123
Sulfate	6	160	42	104	765	1
Chloride	6	810	35	116	695	4
Nitrate	6	35.0	ND	90	38.4	0
Fluoride	5	0.5	0.4	52	1.1	0.1
Boron	6	5.00	0.08	55	2.90	0
TDS	6	1,768	356	78	1,309	270
Total Hardness	6	455	247	99	1,076	159
pH[b]	6	8.3	7.5	107	8.7	5.7
Electrical Conductivity[c]	6	2,900	582	68	1,886	389
Total Iron	4	ND	ND	37	2.10	<0 01
Manganese	4	ND	ND	37	0.10	0

[a] n is the number of measurements; one well was measured twice.
[b] In standard unit
[c] In µmhos/cm
[d] N is the number of measurements from 34 wells; 14 wells had recurrent sampling, and 20 had been sampled one time only.
ND = none detected

Source: Investigation of Water Quality and Beneficial Uses Upper Santa Clara River Hydrologic Area by DWR dated 1993.

TABLE 7

STATISTICAL SUMMARY OF QUALITY CONSTITUENTS IN GROUND WATERS EASTERN HYDROLOGIC SUBAREA, SOUTH FORK OF SANTA CLARA RIVER SUBDIVISION

In mg/L, unless otherwise noted

	1989 Data			1940-88 Data		
Constituent	n[a]	Maximum Value	Minimum Value	N[d]	Maximum Value	Minimum Value
Calcium	9	122	76	285	690	1
Magnesium	9	32	15	285	315	1
Sodium	9	83	31	260	1,060	0
Potassium	9	5.6	1.9	174	28.0	1.0
Alkalinity	5	205	145	287	599	31
Sulfate	9	257	80	290	2,636	0
Chloride	9	60	21	314	2,632	8
Nitrate	9	32.9	ND	232	60.0	0
Fluoride	8	0.5	0.3	182	1.5	0
Boron	9	0.20	ND	158	1.80	0
TDS	9	600	455	245	5,354	298
Total Hardness	9	434	254	284	2,575	11
pH[b]	8	8.3	7.1	275	9.7	6.1
Electrical Conductivity[c]	9	936	700	204	3,000	429
Total Iron	5	ND	ND	109	2.25	ND
Manganese	5	0.70	ND	106	1.08	0

[a] n is the number of measurements; three wells were measured twice in 1989.
[b] In standard unit
[c] In µmbos/cm
[d] N is the number of measurements from 71 wells; 36 wells had recurrent sampling and 35 wells had been sampled one time only.
ND = none detected

Source: Investigation of Water Quality and Beneficial Uses Upper Santa Clara River Hydrologic Area by DWR dated 1993.

TABLE 8

STATISTICAL SUMMARY OF QUALITY CONSTITUENTS IN GROUND WATERS EASTERN HYDROLOGIC SUBAREA, CASTAIC CREEK TO BLUE CUT SUBDIVISION

In mg/L, unless otherwise noted

	1989-90 Data						1939-88 Data		
Constituent	n[a/]	Maximum Value	Minimum Value	Median Value	75th Percentile	25th Percentile	N[d/]	Maximum Value	Minimum Value
Calcium	31	506	15	78	106	43	288	525	3
Magnesium	31	377	3	25	39	19	288	555	1
Sodium	31	968	16	53	98	31	277	1,082	70
Potassium	31	13.0	1.0	3.0	4.0	2.0	216	18.0	0
Alkalinity	31	346	112	246	269	195	286	1,787	0
Sulfate	31	4,313	12	70	255	44	297	4,930	0
Chloride	31	160	9	32	70	18	309	630	7
Nitrate	31	39.0	ND	5.0	13.0	2.0	278	72.0	0
Fluoride	31	6.6	0.2	0.8	1.0	0.6	188	6.3	0.2
Boron	31	2.57	ND	ND	0.40	ND	210	8.90	0
TDS	31	6,978	216	457	767	344	248	7,430	202
Total Hardness	31	2,880	58	281	435	215	288	3,492	20
pH[b/]	31	8.5	7.0	8.0	8.2	7.7	290	9.2	6.2
Electrical Conductivity.[c/]	31	10,000	300	700	1,100	600	248	7,540	327
Total Iron	31	0.50	ND	ND	ND	ND	54	9.40	<0.01
Manganese	31	0.05	ND	ND	ND	ND	54	0.26	<0.01

[a/] n is the number of measurements from 29 wells; two wells were measured twice.
[b/] In standard unit
[c/] In µmhos/cm
[d/] N is the number of measurements from 83 wells; 42 wells had recurrent sampling and 41 had been sampled one time only.
ND = none detected

Source: Investigation of Water Quality and Beneficial Uses Upper Santa Clara River Hydrologic Area by DWR dated 1993.

Water Company, the Newhall County Water District, and Los Angeles County Water Works District No. 36 have historically extracted groundwater for water-supply purposes. In 1995 Newhall County Water District passed a resolution of intent to form a groundwater management plan under AB 3030.

Rising and Sinking Water Areas

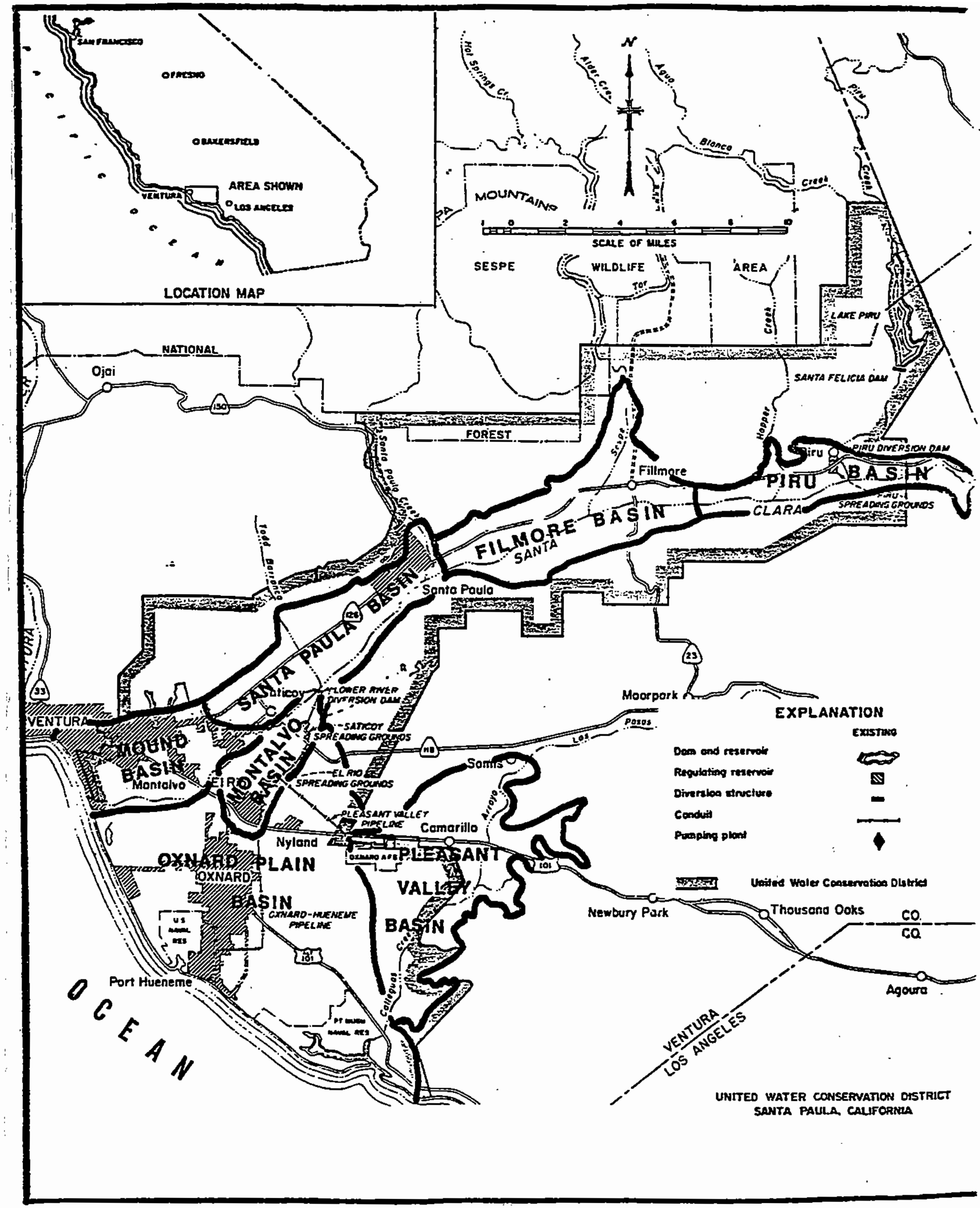
Most flow that enters the basin from tributary streams generally remain as overland flow, especially during periods of high rainfall. It is possible that rising water areas may exist locally and in the basin. The majority of these rising/sinking water areas will be observed in the tributary canyons. Also, one area where rising water occurs is in the main Santa Clara River channel where it abruptly narrows and is confined on the north by a bedrock topographic high, before reaching Interstate Highway 5.

Piru Groundwater Basin

Geology of the Piru Groundwater Basin

Framework

The eastern boundary of the Piru Groundwater Basin is located 0.7 stream miles below the Blue Cut gaging station at a point were the alluvium is thin and underlain by non-water bearing rocks (see Figure 8). The western boundary of the Piru Groundwater Basin is in the vicinity of the Fillmore Fish Hatchery, just east of the City of Fillmore at a reach of periodic rising water. The Piru Groundwater Basin consists of recent and older alluvium underlain by San Pedro Formation. The recent and older alluvium is made up of coarse sands and gravels that exist basin wide to a depth of approximately 60 - 80 feet. The San Pedro Formation, also known as the Saugus Formation in the Eastern Groundwater Basin, consists of permeable sands and gravels and extends to a depth of approximately 8,000 feet. Two faults are found within the Piru



Source: UWCD QMP Report, Mar., 1974

Figure 8

Groundwater Basins - Plan View

Groundwater Basin, the Oakridge fault to the south and the San Cayetano fault to the north. Refer to Reference 1 in the UWCD bibliography for more information regarding the faults (A Plan for Ground Water Management, Mann).

Hydraulics

The flow gradient of groundwater in the alluvium of the Piru Groundwater Basin tends to be westerly parallel to the river channel. Similarly, the flow gradient in the San Pedro Formation is westerly with a small north/south component as the groundwater moves parallel with the axis of the syncline.

Replenishment Areas

The Piru Groundwater Basin is recharged by percolation of surface flows along the Santa Clara River channel and its tributaries and small amounts of underflow at the upper end of the basin. Additionally, the basin is replenished by rainfall penetration and by irrigation returns, along with the natural recharge of the Piru Groundwater Basin, artificial recharge through spreading grounds and water conservation releases by UWCD. The Piru spreading grounds are located adjacent to Piru Creek just upstream of the confluence of Piru Creek and the Santa Clara River. During UWCD's water conservation releases from Lake Piru, which usually occur in the fall, surface flows are percolated into the alluvium of Piru Creek and the Santa Clara River as well as into recharge basins located near Piru, Saticoy and El Rio. A portion of the annual water conservation release is diverted, via a small diversion and pipeline, out of Piru Creek near the Piru recharge facility and delivered to the recharge grounds at Piru to be used for direct percolation into the Piru basin alluvium. The average annual spreading at the Piru grounds amounts to 6,600 acre-feet per year.

Fluvial Geomorphology

The Santa Clara River within the Piru Groundwater Basin displays typical braided stream geomorphological characteristics which include point bar deposits, gravelly stream bottoms, and broad, wide washes, and a relatively wide floodplain area. The Santa Clara River flows are typically of short duration and can be of high intensity following prolonged storm events. Particle sizes of sediment in the stream bed generally range from coarse sand sizes to gravel (pebble, cobble, and boulder size). The floodplain is approximately 1,000 feet wide at the eastern boundary of the Piru basin, then widens to approximately 2,000 to 3,000 feet along the length of the basin. The Santa Clara River watershed is asymmetric, resulting in the major sources of alluvium from the north facing the floodplain to the south against the escarpment of the Oakridge and other faults.

Groundwater Hydrology of the Piru Groundwater Basin

Groundwater Quantity

The Piru Groundwater Basin recharges rapidly from the Santa Clara River flows in the winter and water conservation releases from Lake Piru in the fall. Groundwater levels reach a high in the spring after winter rains and are at their lowest in the fall before winter rains begin. Fluctuations of water levels in the Piru Groundwater Basin, as seen in Well 04N/18W-29M02, are summarized in the table below:

Table 9

Well 04N/18W-29M02 - Water Level Fluctuations

Date	Elevation (feet)	Feet below Ground Surface Elevation
1941 (high)	630.80	5.96
1931 (low)	508.00	128.76
Spring 1992	573.56	63.20
Spring 1994	594.76	42.00

Source: United Water Conservation District

Figure 9 shows the locations of UWCD monitoring wells showing historic groundwater levels. Figure 10 shows the historic groundwater elevations at Well 04N/18W-29M02. Figure 11 shows groundwater elevation fluctuations along the Piru Groundwater Basin.

The maximum storage depletion in the Piru Groundwater Basin and the average, maximum, and minimum annual extractions in the Piru Groundwater Basin since 1980 are summarized in the tables below:

Table 10

Maximum Storage Depletion in the Piru Groundwater Basin

Year	Storage Depletion (Acre-Feet)
1931	74,334
1991	73,680

Source: United Water Conservation District

Table 11

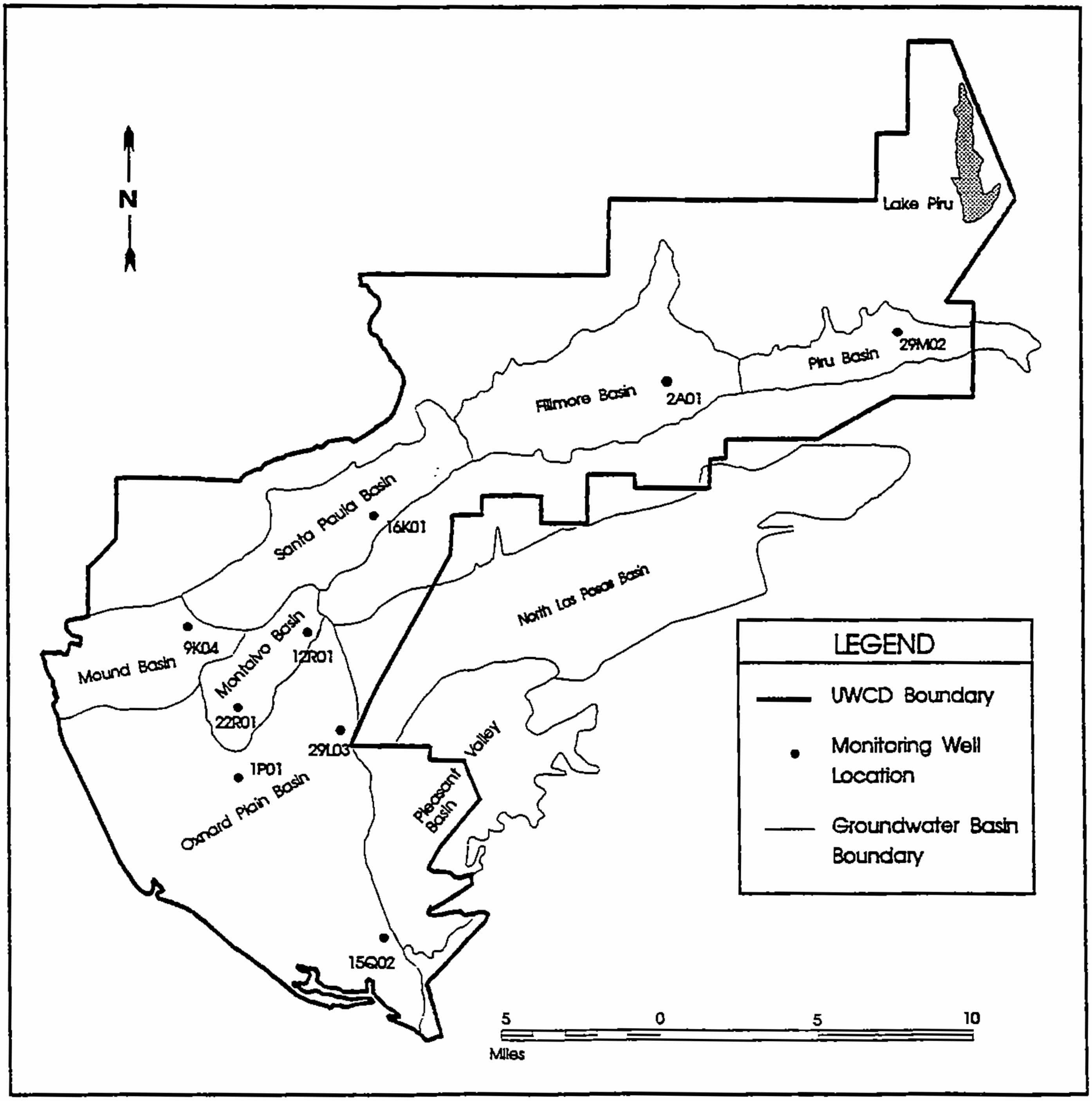
Piru Groundwater Basin Extractions

Year		Extraction (Acre-Feet)
	Average	11,106
1983	Minimum	6,335
1990	Maximum	15,128

Source: United Water Conservation District

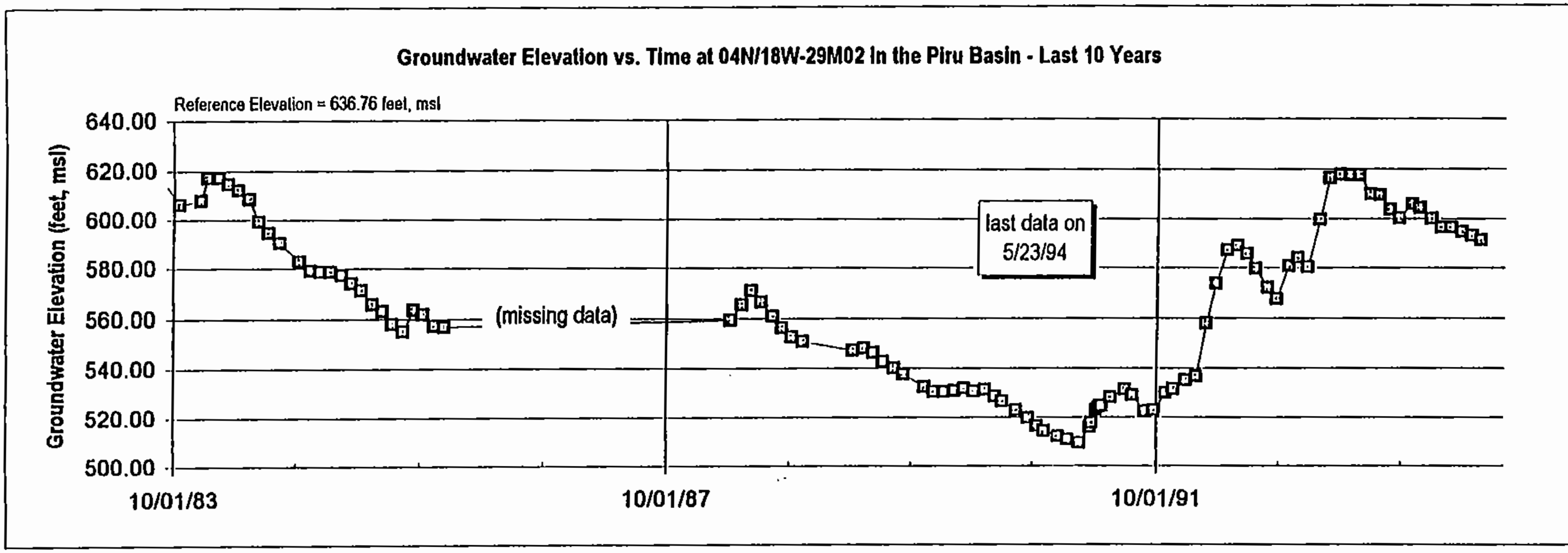
An important note about the Piru Groundwater Basin is the "topping off" of the basin's groundwater elevations as seen in the graph depicting water level elevations of Well 04N/18W-29M02, which is included as Figure 10. The water level elevations reach a certain maximum elevation and then hold this elevation until the groundwater levels drop. This is assumed to mean the groundwater basin is "full" and additional recharge to the basin results in a like discharge from the western (lower) end of the basin. This "topping off" of the basin has occurred several times in the last fifty years.

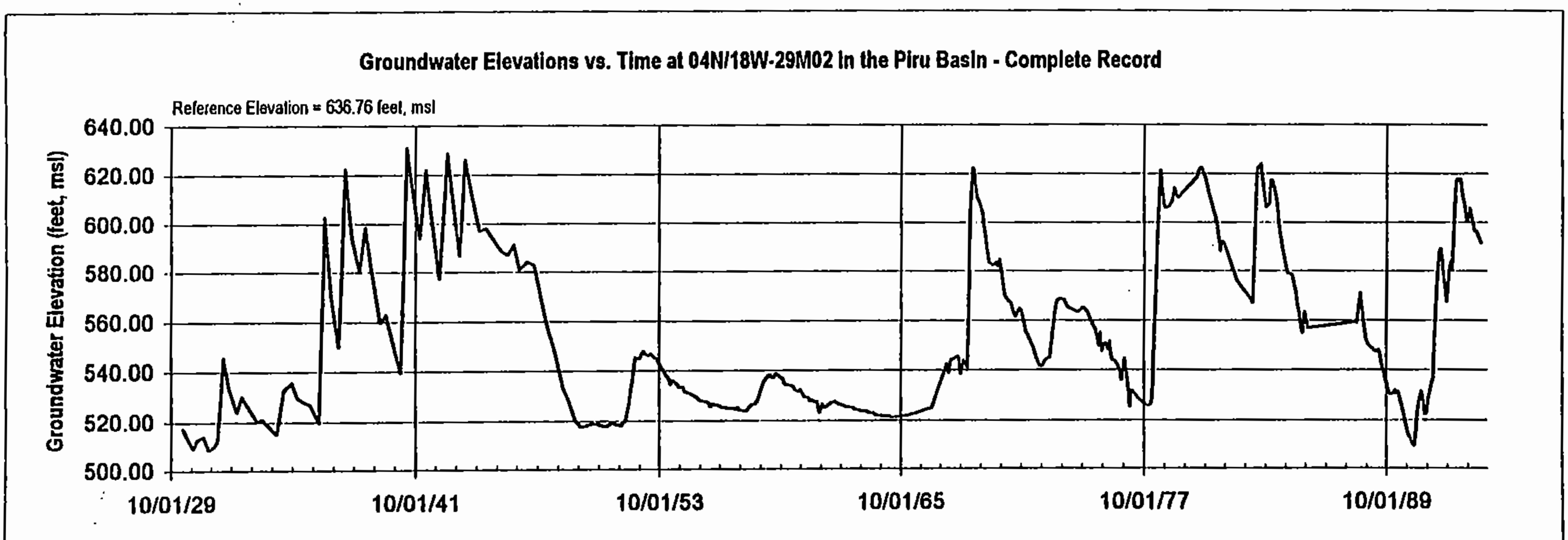
Locations of Wells Showing Historic Groundwater Levels



Source: United Water Conservation District

Figure 9

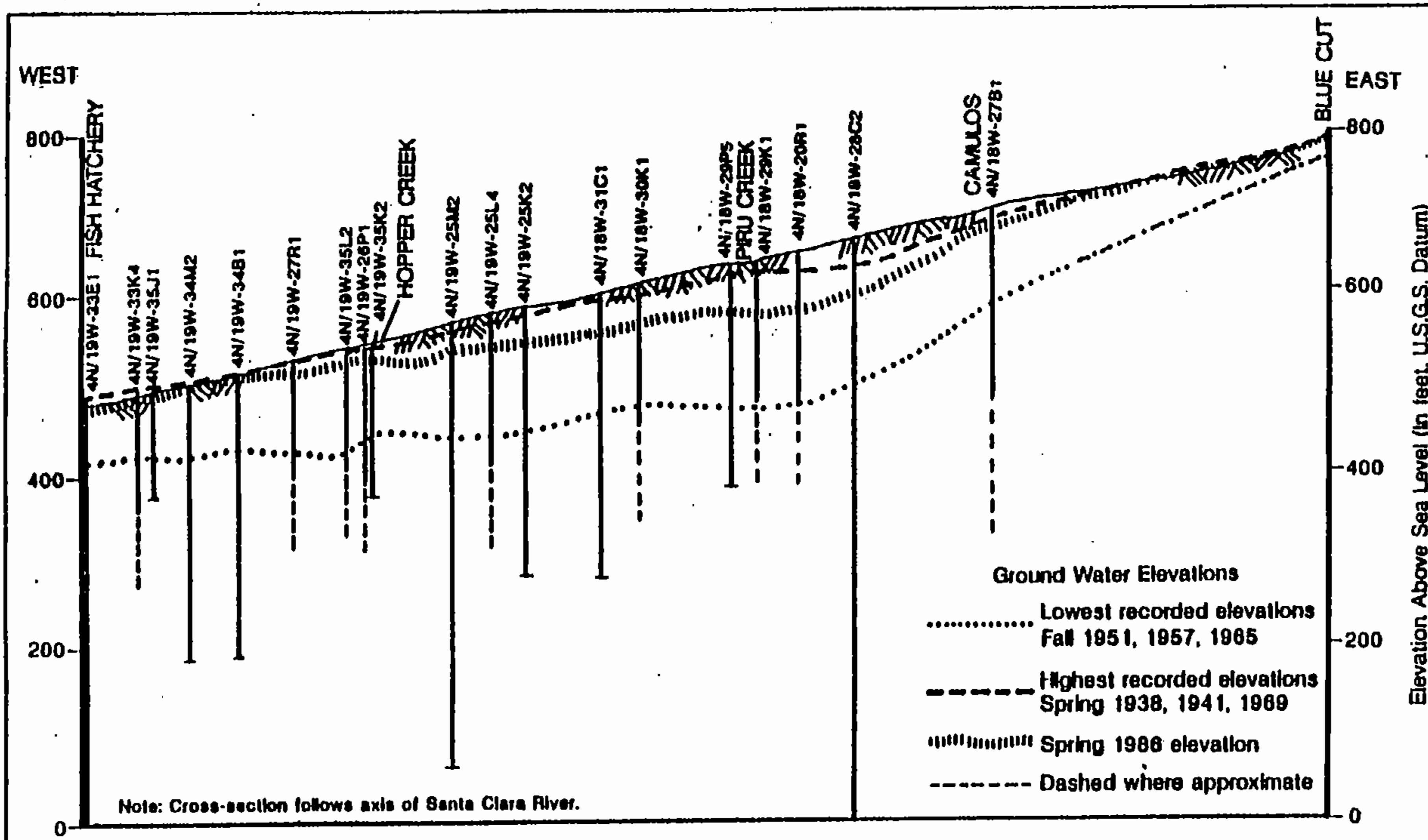




Source: United Water Conservation District

Figure 10

Figure 10



PROFILE OF STREAM - AQUIFER HYDRAULIC INTERCONNECTION
ALONG THE SANTA CLARA RIVER, SANTA FELICIA HYDROLOGIC SUBAREA (PIRU)

Figure 11

Source: Department of Water Resources, Update of Basin Plan, 1989

Figure 11

UWCD currently monitors water levels in four wells in the Piru Groundwater Basin on a monthly to bi-monthly basis. UWCD has water level records on wells in the Piru Groundwater Basin that were historically monitored. In addition, United Water Conservation District and the United States Geological Survey installed a "cluster" monitoring well in Spring 1994 for continuous monitoring of water levels at different aquifer depths within the Piru Groundwater Basin.

Groundwater Quality

Groundwater quality is sampled on a yearly basis from selected wells in the Piru Groundwater Basin. Groundwaters found in the Piru Basin generally tend to be calcium sulfate waters with the total dissolved solids (TDS) averaging around 1,300 mg/l. The range of TDS values have been recorded in UWCD records from a low of 800 mg/l to a high of 2,400 mg/l.

Table 12 provides well water quality from the Update of Basin Plan for Piru, Sespe, and Santa Paula Hydrologic Areas by DWR dated June 1989.

Adjudication and Rights

Currently, there is no adjudication of the groundwater basin but individual water rights have been established within the basin through various uses but not set by the courts.

Rising and Sinking Water Areas

Two areas of rising groundwater are present in the Piru Groundwater Basin. Rising groundwater refers to an area where groundwater is forced to the surface by some type of flow barrier and thus becomes surface water flow. The first area of rising water is located just west of the Los Angeles/Ventura County line, which is also the site of a United States Geological Survey stream flow gaging station. This area of rising water is considered the eastern-most extent of the Piru

Table 12

MEDIAN AND RANGE OF CONCENTRATIONS OF SELECTED PARAMETERS IN WELL WATERS, 1975-88: SANTA FELICIA SUBAREA

In mg/L, unless otherwise noted

Parameter	Median Concentration	Range of Concentrations
Calcium	150	106-474
Magnesium	57	39-256
Sodium	102	71-294
Potassium	6.0	2.9-11.0
Sulfate	479	325-2,260
Chloride	60	35-177
Nitrate	16	0-65
Fluoride	0.9	0.6-2.0
Boron	0.9	0.2-1.9
Total dissolved solids	1,183	660-4,120
Electrical conductivity (umhos/cm)	1,535	939-4,060
Hydrogen ion concentration (pH)	7.8	7.3-8.2
Iron	0	0-2.4
Manganese	0	0-0.11

Source: Update of Basin Plan for Piru, Sespe, and Santa Paula Hydrologic Areas by DWR dated June 1989.

Groundwater Basin. The second area of rising water is located just east of the City of Fillmore, at the Fillmore Fish Hatchery, and is considered to be the boundary between the Piru Groundwater Basin to the east and the Fillmore Groundwater Basin to the west.

Fillmore Groundwater Basin

Geology of the Fillmore Groundwater Basin

Framework

The eastern boundary of the Fillmore Groundwater Basin is located approximately one mile upstream of the City of Fillmore at the topographic narrows at the Fillmore Fish Hatchery (see Figure 8). The basin boundary up Sespe Creek extends approximately to the location of the gaging station. The western boundary of the Fillmore Groundwater Basin extends to Willard Road, which is located just east of the City of Santa Paula and is distinguished by an area of rising water. The area of the Fillmore Groundwater Basin is 18,580 acres.

The basin can be divided into two parts. The larger portion (southern and eastern parts of the basin) is covered by the latest sands and gravels of the Santa Clara River and Sespe Creek. The north central portion of the basin can be termed the Sespe uplands, which is characterized by predominantly steep southward sloping alluvial fan material. The recent sands and gravels of the Santa Clara River near the fish hatchery extend to a depth of 60 feet and the older alluvial materials are found between depths of 60 and 100 feet. In the Bardsdale area, the alluvial fill is as much as 120 feet thick, whereas the downstream basin boundary is close to 80 feet thick. West of the City of Fillmore, the alluvium of Sespe Creek is close to 80 feet thick.

The Sespe uplands are characterized as complex terrace deposits, older alluvial fan deposits, and recent alluvial fan deposits resting on an erosional surface cut on the San Pedro Formation.

The San Pedro Formation, formed into an east-west syncline, underlies almost all of the Fillmore basin. Along the main axis of the syncline, the San Pedro Formation reaches a depth of 8,430 feet. Fairly fresh waters can be found at a depth of as much as 7,000 feet. At the western basin boundary, the San Pedro Formation extends to a depth of 5,000 to 6,000 feet.

The San Cayetano thrust fault does not appear to cut the basin, although outcrops of the fault scarp are visible near the City of Fillmore.

Hydraulics

The flow gradient in the Fillmore Groundwater Basin is generally westerly, causing an east to west movement of water through the alluvium. Sespe Creek alluvium waters move from northeast to southwest and join the Santa Clara River alluvial waters. In the San Pedro Formation, the movement of water is southerly in the downdip direction and westerly near the axis of the syncline.

Replenishment Areas

Recharge in the Fillmore Groundwater Basin is primarily caused by percolation of surface flows from the Santa Clara River and Sespe Creek and from UWCD Water Conservation Releases from Lake Piru. The Sespe uplands are recharged by surface flows from Timber Creek and Boulder Creek. The Fillmore Groundwater Basin alluvium, in addition to surface flow percolation, receives a portion of recharge from rainfall penetration and from irrigation returns. In addition to the preceding, underflow from the Piru Groundwater Basin is a source of recharge to the basin and occurs all year long. Lastly, effluent from sewage treatment plants provides a source of recharge waters for the Fillmore Groundwater Basin.

Fluvial Geomorphology

The geomorphological characteristics of the Fillmore Groundwater Basin tend to be generally the same as the characterization of the Piru Groundwater Basin until the Santa Clara River reaches the western boundary of the Fillmore Groundwater Basin. At this point, the floodplain constricts to approximately 1,000 feet wide.

Groundwater Hydrology of the Fillmore Groundwater Basin

Groundwater Quantity

The Fillmore Groundwater Basin recharges rapidly when the Santa Clara River and the Sespe Creek flow during winter storms. Groundwater levels reach their highest elevations in the spring after winter rains and are at the lowest in the fall. Fluctuations of water levels in the Fillmore Groundwater Basin, as seen in Well 03N/20W-02A01, are summarized in the following table:

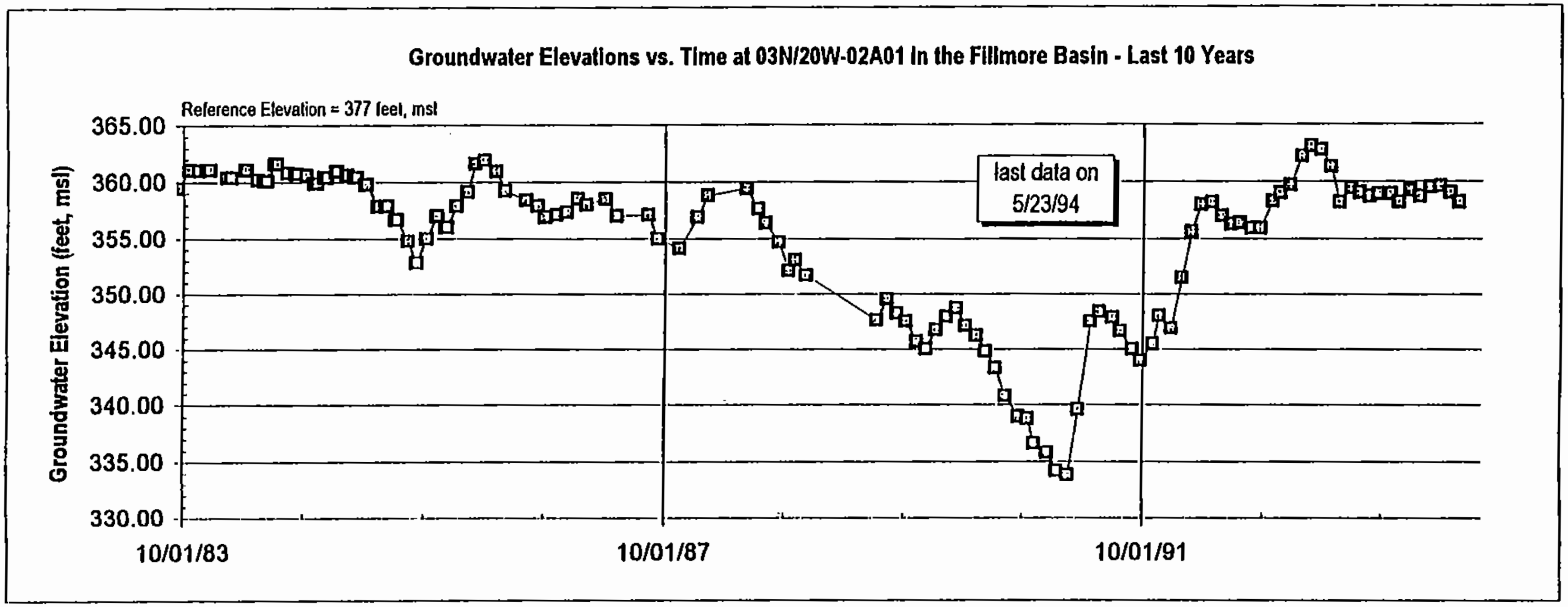
Table 13

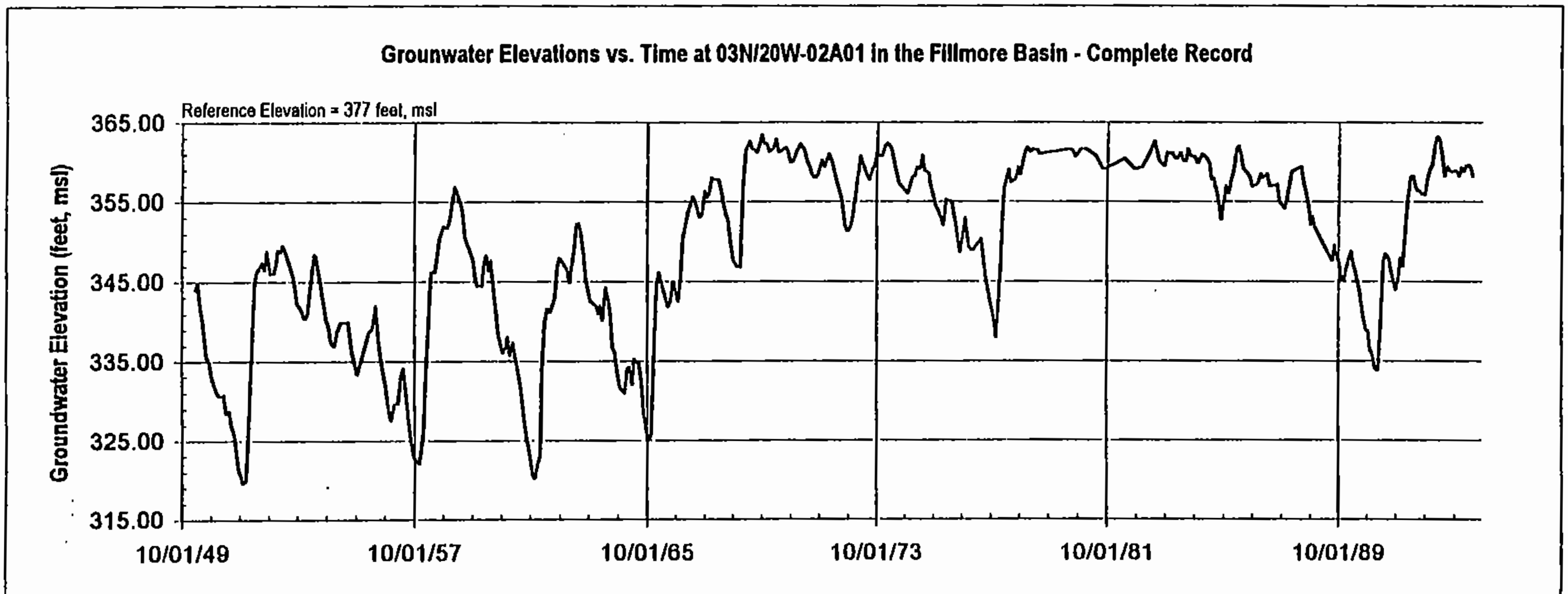
Well 03N/20W-02A01 - Water Level Fluctuations

Date	Elevation (feet)	Feet below Ground Surface Elevation
1969 (Maximum)	363.00	14.00
1951 (Minimum)	319.00	58.00
Spring 1992	358.00	19.00
Spring 1994	359.60	17.40

Source: United Water Conservation District

Figure 12 shows historic groundwater elevations at Well 03N/20W-02A01. Figure 13 shows groundwater elevation fluctuations along the Fillmore Groundwater Basin.

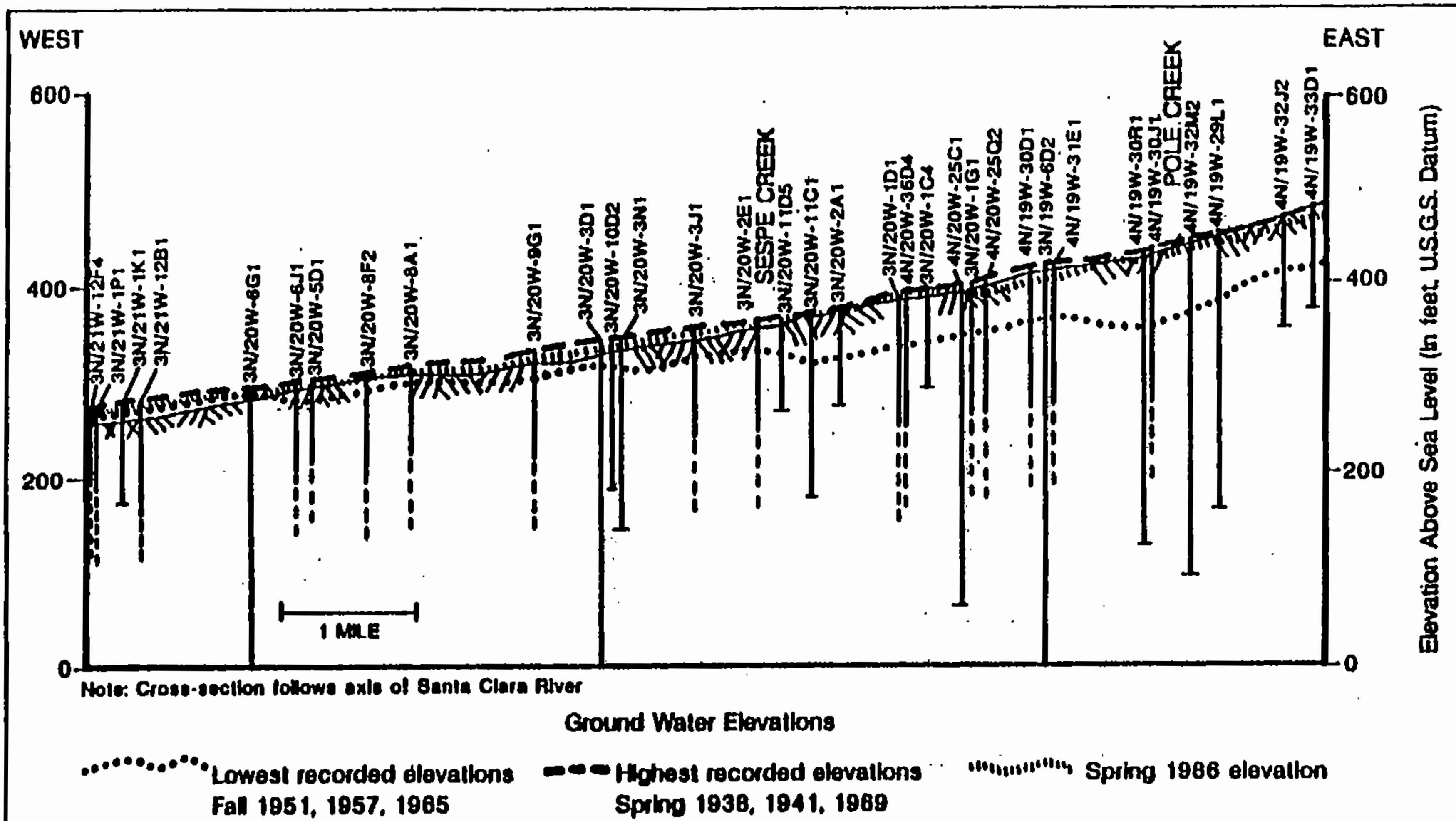




Source: United Water Conservation District

Figure 12

Figure 12



PROFILE OF STREAM - AQUIFER HYDRAULIC INTERCONNECTION
ALONG THE SANTA CLARA RIVER, FILLMORE HYDROLOGIC SUBAREA

Figure 13

Source: Department of Water Resources, Update of Basin Plan, 1989

Figure 13

The maximum storage depletion in the Fillmore Groundwater Basin and the average, maximum, and minimum annual extractions in the Fillmore Groundwater Basin since 1980 are summarized in the tables below:

Table 14

Maximum Storage Depletion in the Fillmore Groundwater Basin

Year	Storage Depletion (Acre-Feet)
1951	80,571
1956	79,619

Source: United Water Conservation District

Table 15

Fillmore Groundwater Basin Extractions

Year		Extraction (Acre-Feet)
	Average	48,447
1983	Minimum	31,896
1989	Maximum	61,804

Source: United Water Conservation District

As is the case in the Piru Groundwater Basin, the Fillmore Groundwater Basin elevation hydrograph for Well 03N/20W-02A01 depicts a "topping off" of the groundwater basin. This, again, is assumed to mean that the basin is "full" or that the underground aquifers are filled. This "topping off" of the basin has occurred several times historically as depicted in the graph included as an exhibit later in this report.

The UWCD currently monitors water levels in six wells in the Fillmore Groundwater Basin on a monthly to bi-monthly basis. UWCD has water level records on wells in the Fillmore basin that were historically monitored.

Groundwater Quality

Groundwater quality is sampled on a yearly basis from selected wells in the Fillmore Groundwater Basin. Groundwaters found in the Fillmore Groundwater Basin generally tend to be Calcium Sulfate waters with the total dissolved solids (TDS) averaging around 1,100 mg/l. The range of TDS values have been recorded in UWCD records from a low of 800 mg/l to a high of 2,400 mg/l. Two areas within the Fillmore Groundwater Basin have been identified to contain high nitrate concentrations within the groundwater. The two areas are the Bardsdale area near Fillmore and an area west of Fillmore on the west side of Sespe Creek.

Table 16 provides well water quality from the Update of Basin Plan for Piru, Sespe, and Santa Paula Hydrologic Areas by DWR dated June 1989.

Adjudication and Rights

Currently, there is no adjudication of the groundwater basin but individual water rights have been established within the basin through various uses but not set by the courts.

Rising and Sinking Water Areas

Two areas of rising groundwater are present in the Fillmore Groundwater Basin. The first area of rising water is located just east of the City of Fillmore at the location of the Fillmore Fish Hatchery. This location signifies the western most boundary of the Piru Groundwater Basin and the eastern most extent of the Fillmore Groundwater Basin. The second area of rising groundwater in the Fillmore Groundwater Basin is located just east of the City of Santa Paula in the vicinity of Willard Road. This area designates the western most extent of the Fillmore Groundwater Basin .

Table 16

MEDIAN AND RANGE OF CONCENTRATIONS OF SELECTED PARAMETERS IN WELL WATERS, 1975-88: FILLMORE SUBAREA

In mg/L, unless otherwise noted

Parameter	Median Concentration	Range of Concentrations
Calcium	150	80-360
Magnesium	46	7-144
Sodium	86	30-252
Potassium	4.0	0.2-15.0
Sulfate	412	170-1,330
Chloride	46	8-202
Nitrate	22	0-117
Fluoride	0.8	0.3-1.2
Boron	0.8	0.2-1.5
Total dissolved solids	1,023	468-2,715
Electrical conductivity (umhos/cm)	1,363	737-3,190
Hydrogen ion concentration (pH)	--	7.2-8.2
Iron	--	0-0.7
Manganese	--	0-0.22

Source: Update of Basin Plan for Piru, Sespe, and Santa Paula Hydrologic Areas by DWR dated June 1989.

Santa Paula Groundwater Basin

Geology of the Santa Paula Groundwater Basin

Framework

The Santa Paula Groundwater Basin is located along the Santa Clara River, between Saticoy and the City of Santa Paula. The basin is formed between the Sulphur Mountain foothills on the north and South Mountain on the south. The basin is elongate in a northeast-southwest dimension and measures 10 miles by 3.5 miles. The surface area of the basin is approximately 13,700 acres, and ranges in elevation from 270 feet above sea level near Santa Paula to about 130 feet above sea level near Saticoy. On-going uplift along the Oak Ridge and other faults has created a deep basin, with Plio-Pleistocene deposits reaching in excess of 10,000 feet thick in the basin.

The principal fresh water-bearing strata of the Santa Paula Groundwater Basin are the Pleistocene San Pedro Formation, overlying Pleistocene river deposits of the ancient Santa Clara River, alluvial fan deposits shed from the uplifted mountain blocks, and recent river and stream sediments deposited locally along the Santa Clara River and its tributaries. These water-bearing sediments are underlain by relatively impermeable Pliocene and older units. The sediments of the basin have been warped into a syncline that is oriented in a northeast-southwest direction along the center of the basin.

To the east, the Santa Paula Groundwater Basin is considered to be in hydraulic connection with the Fillmore Groundwater Basin. To the south, the Oak Ridge fault forms a barrier to groundwater movement. On the north, the San Pedro Formation is exposed along the foothills, and rain falling on the surface exposures or streams crossing the sediments may provide some groundwater recharge to the basin.

The Santa Paula Groundwater Basin borders the Montalvo and Mound Groundwater Basins on the west. The San Pedro Formation is uplifted along this western flank of the Santa Paula basin and geologic structures such as the Country Club fault are present. It is not known whether this western boundary is a groundwater barrier or is a partial hydraulic connection to the adjoining basins. Groundwater pumped from the eastern and central portions of the Santa Paula basin has been considered to come primarily from unconfined aquifers; however, monitoring wells drilled in 1994 indicate that aquifers in the upper 100 ft of the basin are unconfined, but deeper aquifers are confined. A combination of overlying fine-grained alluvial-fan sediments and interlayering of sediments in the San Pedro Formation form confining conditions in the western portion of the basin. During high rainfall years, wells in this western portion may flow under artesian conditions and rising water is common in the Santa Clara River at the western edge of the basin.

Hydraulics

The movement of groundwater in the Santa Paula Groundwater Basin is primarily east to west in the alluvium. In the San Pedro formation underflow to the Montalvo Groundwater Basin is restricted by the Oak Ridge Fault. Faults and near-vertical bedding also limit the underflow to the Mound Groundwater Basin. Water does leave the western boundary of the basin as rising groundwater into the Santa Clara River near Saticoy.

Replenishment Areas

The primary recharge to the Santa Paula Groundwater Basin is by percolation from the Santa Clara River, Santa Paula Creek, and other tributaries, and by underflow from the Fillmore Groundwater Basin. The Santa Clara River southwest of Santa Paula has incised the bedrock of the Oakridge Fault scarp resulting in the river alluvium overlying bedrock west of Peck Road, thereby limiting vertical percolation of river flows into the Saugus Aquifer. Agricultural returns are also a source of recharge for the Santa Paula Groundwater Basin.

Fluvial Geomorphology

The geomorphological characteristics of the Santa Paula Groundwater Basin tend to be the same as the characterization of the Piru Groundwater Basin. The river near Peck Road is forced to the south side of the valley by the Oak Ridge Fault and the alluvium is underlain by bedrock. From this point downstream to the western basin boundary the floodplain is approximately 1,000 feet wide. Extractions of gravel combined with extreme flood flows along the Santa Clara River has lowered the river tens of feet across the Santa Paula Groundwater Basin. Construction of the Freeman Diversion has stabilized this river entrenchment.

Groundwater Hydrology of the Santa Paula Groundwater Basin

Groundwater Quantity

Water level fluctuations in the Santa Paula Groundwater Basin follow the pattern of other wells in the UWCD with elevation highs in the spring and lows in the fall. Within the Santa Paula Groundwater Basin, most notably in the Saticoy area, there are localized lenses of clay. These confining beds cause local wells to flow following periods of rainfall. Additionally, the Oak Ridge fault, County Club fault, Saticoy fault and other subsurface geologic anomalies cause artesian conditions to occur more or less continuously. These flowing conditions are not found in the eastern part of the basin. Groundwater fluctuations as seen in Well 03N/21W-16K01 are summarized in the table below.

Table 17 Well 03N/21W-16K01 - Water Level Fluctuations		
Date	Elevation (feet)	Feet below Ground Surface Elevation
1942 (maximum)	218.00	17.70
1991 (minimum)	172.00	63.70
Spring 1992	197.70	36.20
Spring 1994	192.20	43.50

Source: United Water Conservation District

Figure 14 shows historic groundwater elevations at Well 03N/21W-16K01.

Figure 15 shows groundwater elevation fluctuations along the Santa Paula Groundwater Basin.

The maximum storage depletion in the Santa Paula Groundwater Basin and the average, maximum, and minimum annual extractions in the Santa Paula Groundwater Basin since 1980 are summarized in the tables below:

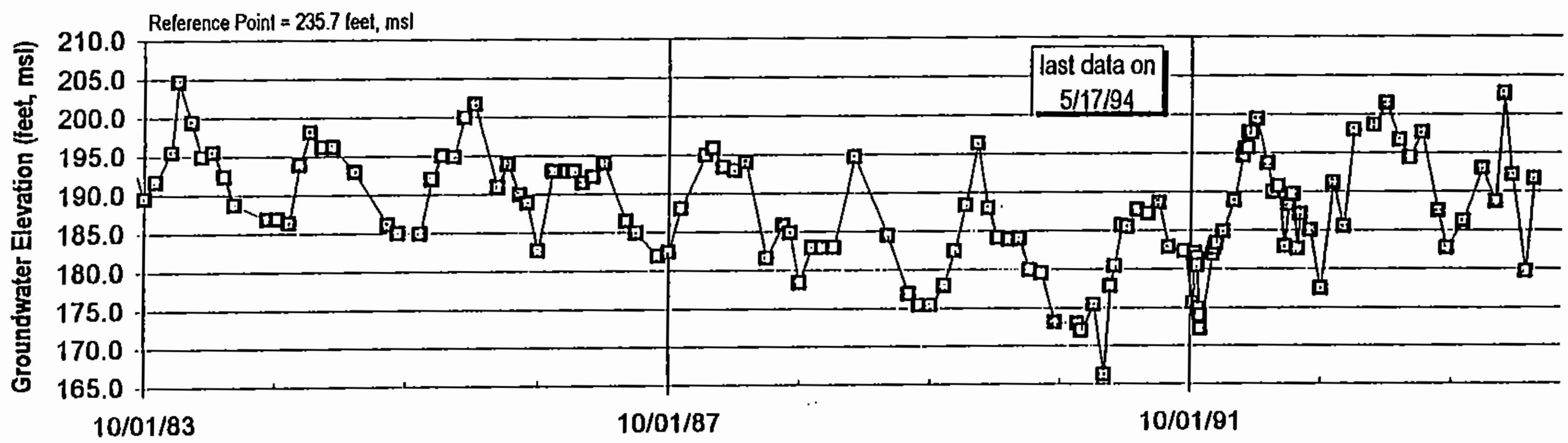
Table 18 Maximum Storage Depletion in the Santa Paula Groundwater Basin	
Year	Storage Depletion (Acre-Feet)
1991	30,545

Source: United Water Conservation District

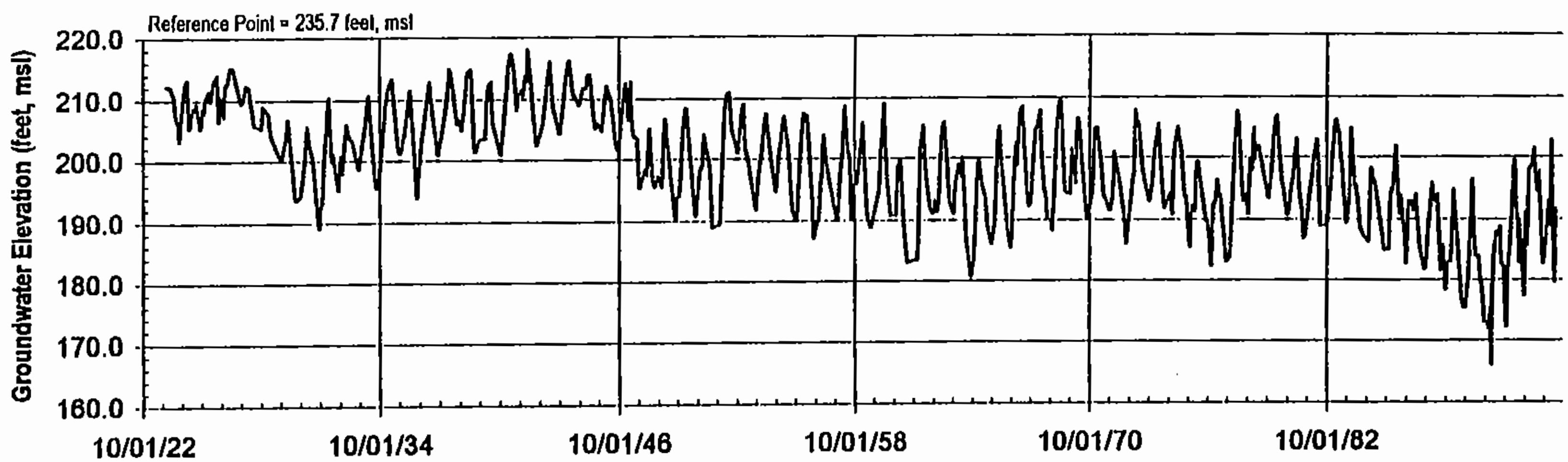
Table 19 Santa Paula Groundwater Basin Extractions		
Year		Extraction (Acre-Feet)
	Average	23,339
1983	Minimum	15,708
1990	Maximum	29,799

Source: United Water Conservation District

Groundwater Elevations vs. Time at 03N/21W-16K01 in the Santa Paula Basin - Last 10 Years



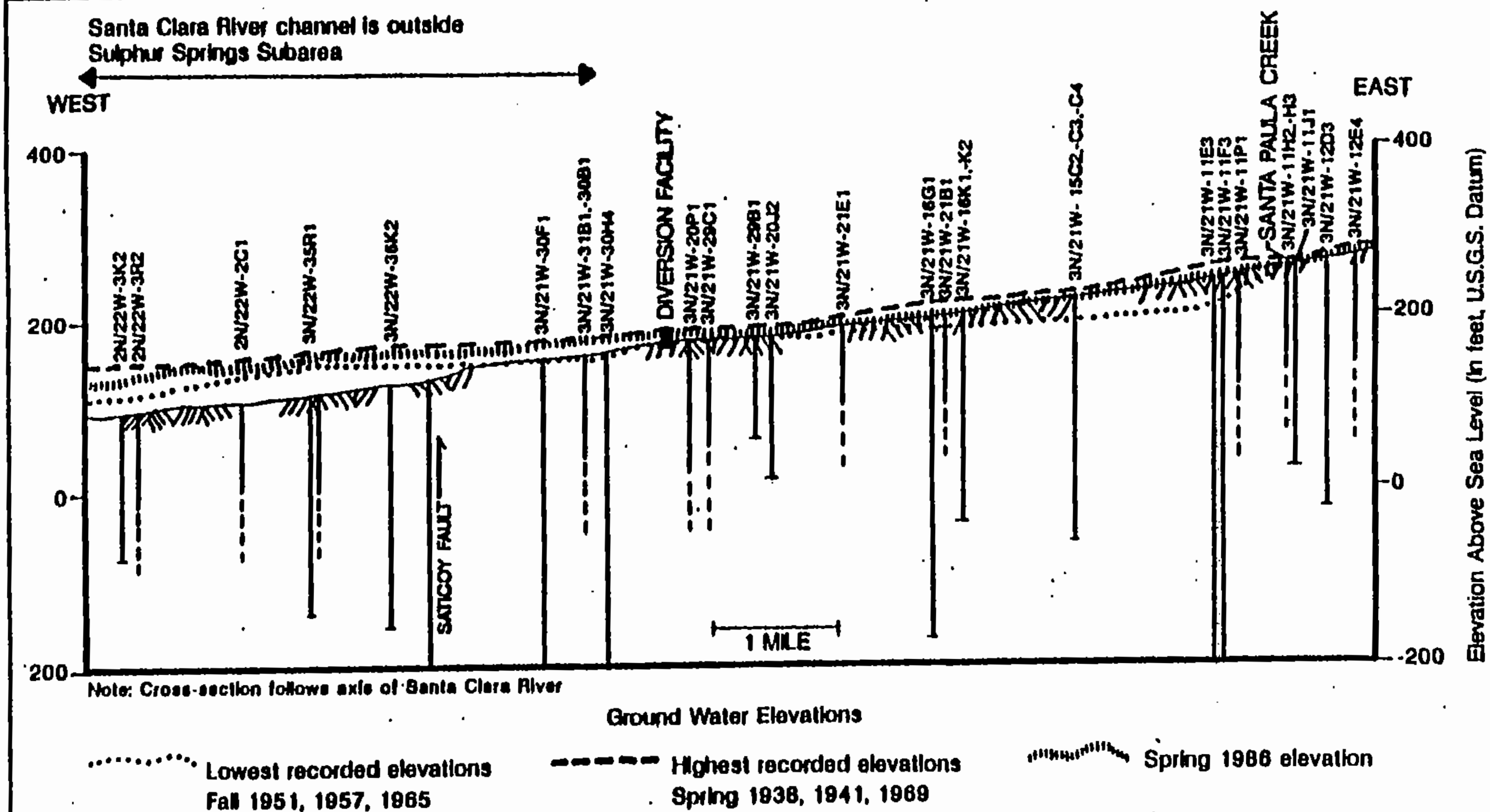
Groundwater Elevations vs. Time at 03N/21W-16K01 in the Santa Paula Basin - Complete Record



Source: United Water Conservation District

Figure 14

Figure 14



PROFILE OF STREAM - AQUIFER HYDRAULIC INTERCONNECTION
ALONG THE SANTA CLARA RIVER, SULPHUR SPRINGS HYDROLOGIC SUBAREA (SANTA PAULA)

Figure 15

Source: Department of Water Resources, Update of Basin Plan, 1989

UWCD has measured groundwater elevations within the Santa Paula Groundwater Basin since the early part of the century. UWCD measures water elevations from upwards of 20 wells on a monthly, bi-monthly, and quarterly basis. In addition, UWCD and the United States Geological Survey installed two "cluster" monitoring well sites in the basin in Spring 1994. Water levels at several aquifer depths will be monitored continuously in these wells.

Groundwater Quality

Groundwater quality is sampled on a yearly basis from selected wells in the Santa Paula Groundwater Basin. Groundwaters found in the Santa Paula Groundwater Basin generally tend to be Calcium Sulfate waters with the total dissolved solids (TDS) averaging around 1300 mg/l. The range of TDS values have been recorded in UWCD records from a low of 700 mg/l to a high of 2000 mg/l. Table 20 provides well water quality from the Update of Basin Plan for Piru, Sespe, and Santa Paula Hydrologic area by DWR dated June 1989.

Adjudication and Rights

Currently, there is no adjudication of the groundwater basin but individual water rights have been established within the basin through various uses but not set by the courts.

Rising and Sinking Water Areas

Two areas of rising water are present in the Santa Paula Groundwater Basin. The first area of rising water is located just east of the City of Santa Paula in the vicinity of Willard Road, which corresponds to the eastern most extent of the Santa Paula Groundwater Basin. The second area of rising water is located east of the unincorporated area of Saticoy near the toe of South Mountain.

Table 20

MEDIAN AND RANGE OF CONCENTRATIONS OF SELECTED PARAMETERS IN WELL WATERS, 1975-88: SULPHUR SPRINGS SUBAREA

In mg/L, unless otherwise noted

Parameter	Median Concentration	Range of Concentrations
Calcium	210	68-346
Magnesium	67	14-137
Sodium	138	23-460
Potassium	6.0	2.6-12.0
Sulfate	630	151-1,230
Chloride	80	10-339
Nitrate	4.0	0-76.8
Fluoride	0.7	0.3-1.4
Boron	0.7	0.2-1.4
Total dissolved solids	1,416	378-2,840
Electrical conductivity (umhos/cm)	1,770	1,100-3,119
Hydrogen ion concentration (pH)	---	7.5-8.2
Iron	---	0-0.5
Manganese	---	0-0.69

Source: Update of Basin Plan for Piru, Sespe, and Santa Paula Hydrologic Areas by DWR dated June 1989.

This area of rising water is near the location of the UWCD's Vern Freeman Diversion Dam. Santa Clara River water (maximum rate not to exceed 375 cfs) is diverted for direct recharge through recharge basins near Saticoy and El Rio or agricultural irrigation waters delivered via pipelines.

Montalvo Groundwater Basin

Geology of the Montalvo Groundwater Basin

Framework

The Montalvo Groundwater Basin, also referred to as the Oxnard Forebay Basin, comprises 6,400 acres and includes the free-water table area of the Oxnard Plain. The basin serves as the primary recharge area for the Oxnard Plain. The eastern boundary of the Montalvo Groundwater Basin is located near the toe of South Mountain where there exists a sharp line between recent alluvium and the end of the mountain. At this eastern basin boundary is the site of United Water Conservation District's Vern Freeman Diversion Dam. The north-western boundary is in part the Oak Ridge fault and in part the break between the recent alluvium and the clayey terrace deposits of the Mound Groundwater Basin. The southeast and southwest basin boundaries coincide with the approximate position of a gradational change from water-table conditions to confined conditions as clays become more abundant. The main water bearing deposits of the Montalvo Groundwater Basin consist of course alluvial materials of recent and upper Pleistocene age overlying a sequence of pre-middle Pleistocene deposits. This zone is referred to as the Oxnard aquifer and can be found up to depths of 150 feet. The San Pedro Formation is directly beneath the middle Pleistocene unconformity. The Fox Canyon aquifer, which consists of the course permeable basal layers of the San Pedro Formation, is upturned directly under the alluvial deposits beneath the Saticoy spreading grounds. At the end of South Mountain, the Santa Clara River has eroded the deposits comprising the Fox Canyon aquifer and, therefore, the alluvium rests directly on the non-water bearing Santa Barbara Formation.

Hydraulics

The flow gradient of groundwater in the alluvium of the Montalvo Groundwater Basin tends to be from the northeast to southwest in the alluvium, whereas the flow gradient in the Fox Canyon aquifer is westerly towards the ocean and southerly toward the heavily pumped areas in Pleasant Valley.

Replenishment Areas

The Montalvo Groundwater Basin is replenished by numerous processes. The primary recharge is provided by UWCD's spreading grounds at Saticoy and El Rio. Here, Santa Clara River water that is diverted at the Freeman Diversion is percolated in a series of ponds. The average annual spreading at the Saticoy and El Rio facilities combined amounts to 44,000 acre-feet per year. The combined spreading at the Saticoy and El Rio facilities during water year 1992-1993 amounted to 105,095 acre-feet. There is also replenishment to the basin through percolation of Santa Clara River flows into the river alluvium. The Montalvo Groundwater Basin may also be replenished by a small underflow component from the Santa Paula Groundwater Basin. The underflow occurs through the alluvium and probably not in the San Pedro Formation, where faulting is a barrier to flow. The basin also receives recharge through direct rainfall penetration and irrigation returns. During times of extremely low water levels, groundwater moves westerly from the West Las Posas basin up through a sub-alluvial outcrop into the overlying alluvial deposits of the Montalvo Groundwater Basin. Water leaves the Montalvo Groundwater Basin as underflow moving seaward through the Oxnard aquifer, Fox Canyon aquifer water moving westerly towards Pleasant Valley, small amounts of underflow through the Upper Pleistocene gravels to the Mound Groundwater Basin, or in times of high water levels, water moves seaward above the clay cap.

Fluvial Geomorphology

The river geomorphological characteristics of the Montalvo Groundwater Basin tend to be the same as the characteristics of the Piru Groundwater Basin. The width of the floodway in the Montalvo Groundwater Basin tends to broaden to approximately 2,000 to 3,000 feet due to the rivers exit from the Santa Clara River Valley and its emergence onto the Oxnard Plain, which is a large delta formed by the river. Extractions of gravels along the Santa Clara River has lowered the river tens of feet across the Montalvo Groundwater Basin.

Groundwater Hydrology of the Montalvo Groundwater Basin

Groundwater Quantity

The Montalvo Groundwater Basin receives recharge when the Santa Clara River flows during winter storms. However, the major recharge comes from the United Water Conservation District's two spreading facilities located in Saticoy and El Rio. This artificial recharge occurs during the winter and spring as diversions of storm runoff and during the summer and fall as diversions of conservation releases from Lake Piru. Groundwater levels reach their highest elevations in the spring after winter rains and artificial recharge of storm runoff and are at the lowest in the fall. Fluctuations of water levels in the Montalvo Groundwater Basin, as seen in Wells 02N/22W-12R01 and 02N/22W-22R01 are summarized in the following tables:

Table 21

Well 02N/22W-12R01 - Water Level Fluctuations

Date	Elevation (feet)	Feet below Ground Surface Elevation
1980 (high)	64.90	28.70
1990 (low)	-35.10	128.70
Spring 1992	11.94	81.66
Spring 1994	53.10	40.50

Source: United Water Conservation District

Table 22 Well 02N/22W-22R01 - Water Level Fluctuations		
Date	Elevation (feet)	Feet below Ground Surface Elevation
1983 (high)	114.20	21.90
1965 (low)	9.10	127.00
Spring 1992	78.92	57.18
Spring 1994	98.72	37.38

Source: United Water Conservation District

Figures 16 and 17 show the historic groundwater elevations at Wells 02N/22W-12R01 and 02N/22W-22R01.

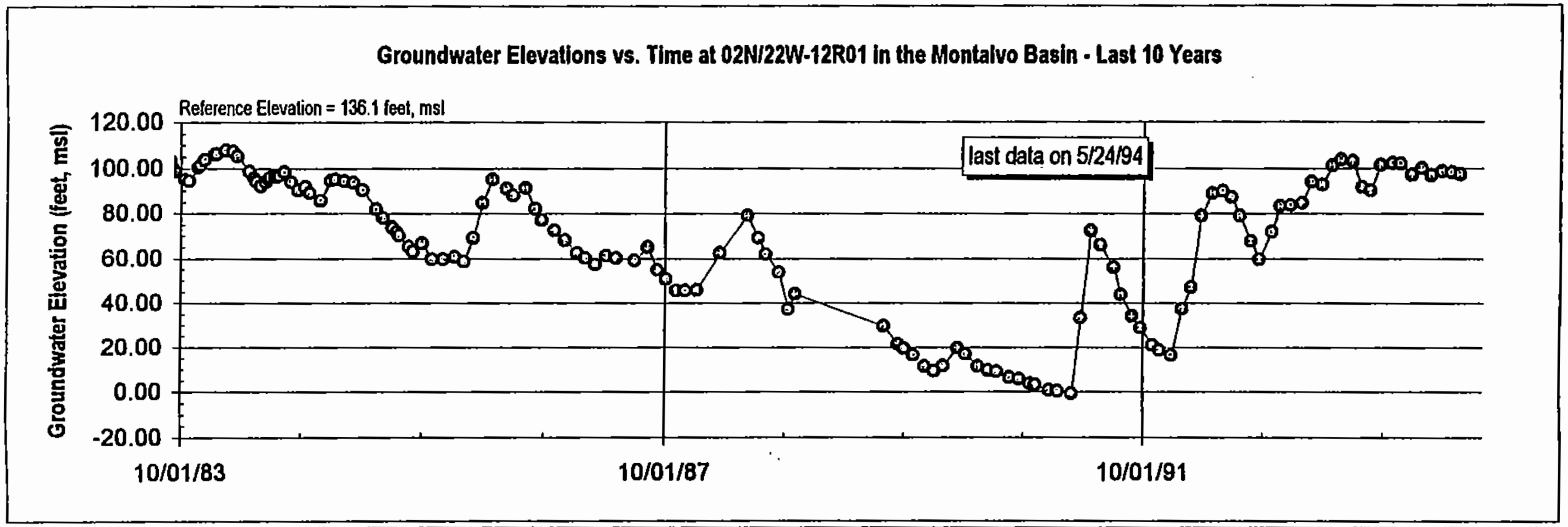
The maximum storage depletion in the Montalvo Groundwater Basin and the average, maximum, and minimum annual extractions in the Montalvo Groundwater Basin since 1980 are summarized in the tables below:

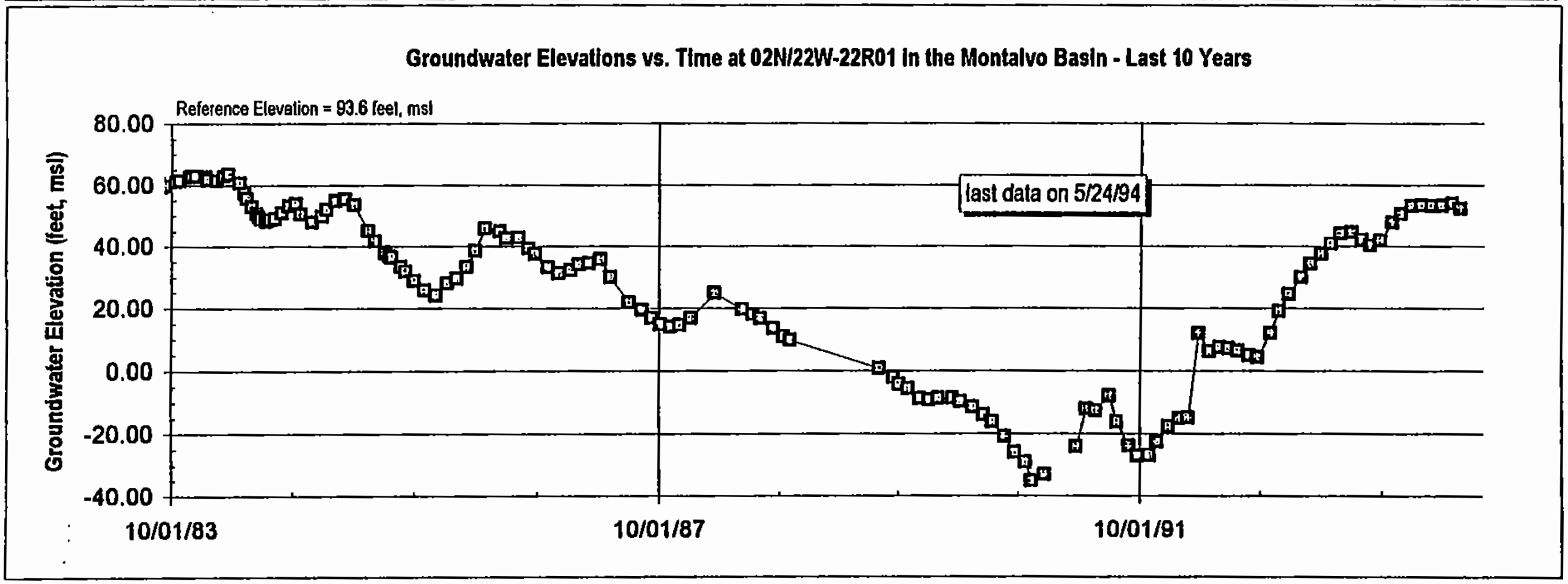
Table 23 Maximum Storage Depletion in the Montalvo Groundwater Basin	
Year	Storage Depletion (Acre-Feet)
1990	121,000

Source: United Water Conservation District

Table 24 Montalvo Groundwater Basin Extractions		
Year		Extraction (Acre-Feet)
	Average	25,586
1980	Minimum	22,830
1989	Maximum	27,837

Source: United Water Conservation District



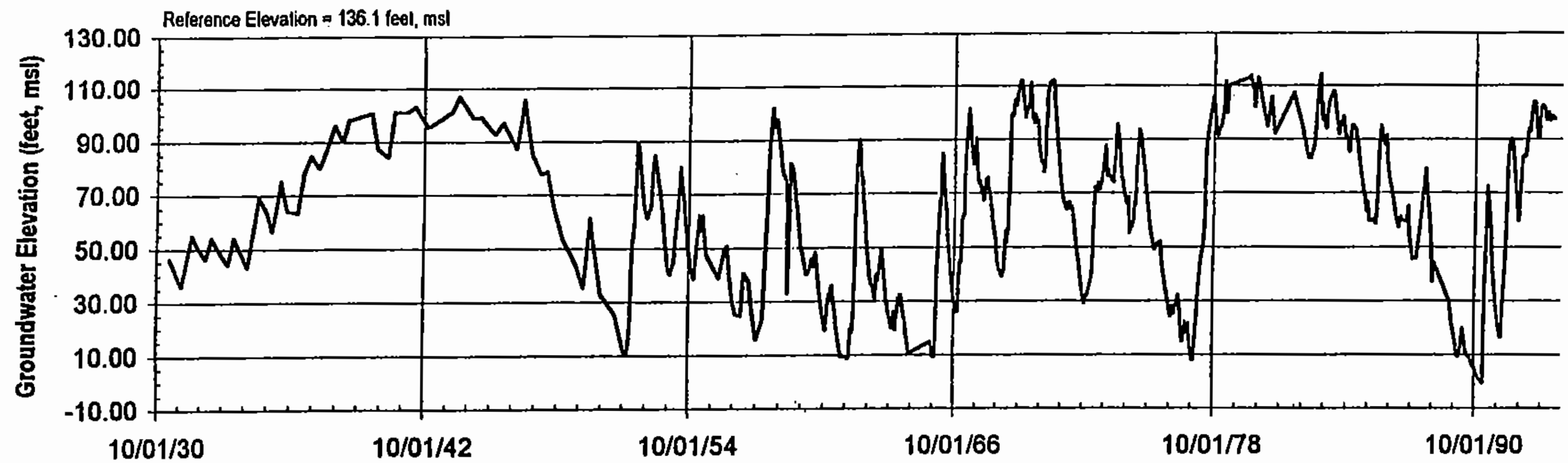


Source: United Water Conservation District

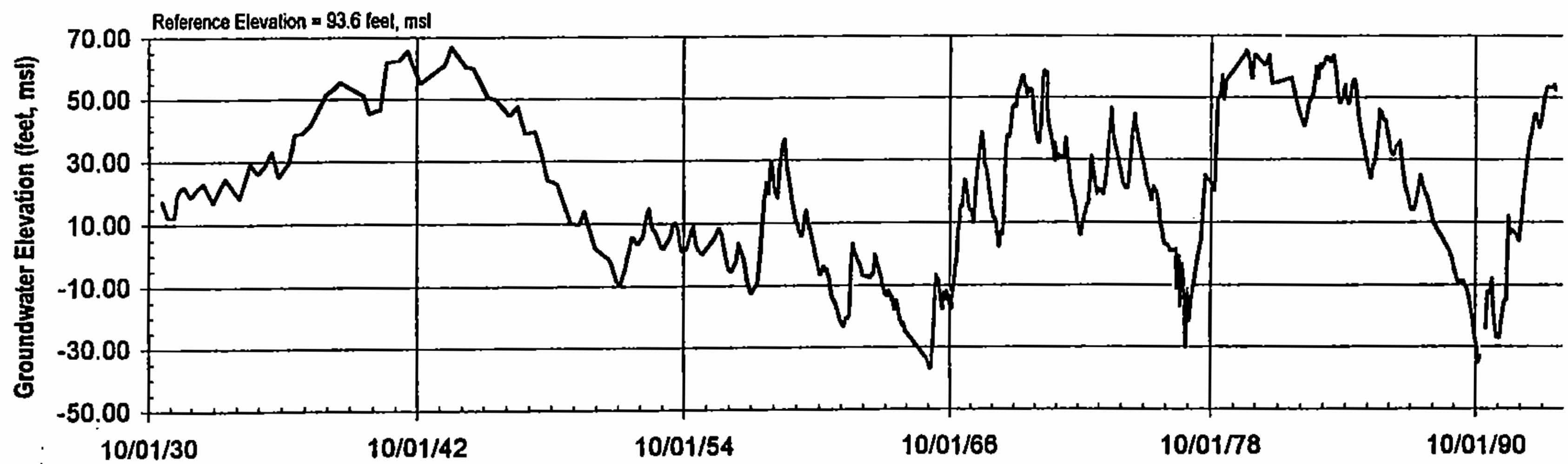
Figure 16

Figure 16

Groundwater Elevations vs. Time at 02N/22W-12R01 in the Montalvo Basin - Complete Record



Groundwater Elevations vs. Time at 02N/22W-22R01 in the Montalvo Basin - Complete Record



Source: United Water Conservation District

Figure 17

Figure 17

UWCD currently monitors water levels in approximately 23 wells in the Montalvo Groundwater Basin on a monthly to bi-monthly basis. UWCD has water level records on wells in the Montalvo Groundwater Basin that were historically monitored.

Groundwater Quality

Groundwater quality is sampled on a weekly, quarterly, and yearly basis from selected wells in the Montalvo Groundwater Basin. Groundwaters found in the Montalvo Forebay generally tend to be Calcium Sulfate waters with the total dissolved solids (TDS) averaging around 1,200 mg/l. The range of TDS values have been recorded in UWCD records from a low of 700 mg/l to a high of 1,600 mg/l. High nitrate levels in the groundwater are a concern in the El Rio area. On occasion, nitrate concentrations coincident have at times been observed to exceed the state drinking water standard of 45 mg/l.

Adjudication and Rights

Currently, there is no adjudication of the groundwater basin but individual water rights have been established within the basin through various uses but not set by the courts.

Rising and Sinking Water Areas

One area of rising water is present in the Montalvo Groundwater Basin and is located at the eastern boundary of the near the toe of South Mountain where there exists a sharp line between recent alluvium and the end of the mountain. At this eastern basin boundary is the site of UWCD's Vern Freeman Diversion Dam. At this point, groundwater from the Santa Paula Groundwater Basin alluvium is forced to the surface and enters the Montalvo Groundwater Basin as surface flow. As the river flows westward from the Freeman Diversion, water infiltrates rapidly into the Montalvo Groundwater Basin reducing river flows substantially

Oxnard Plain Groundwater Basin

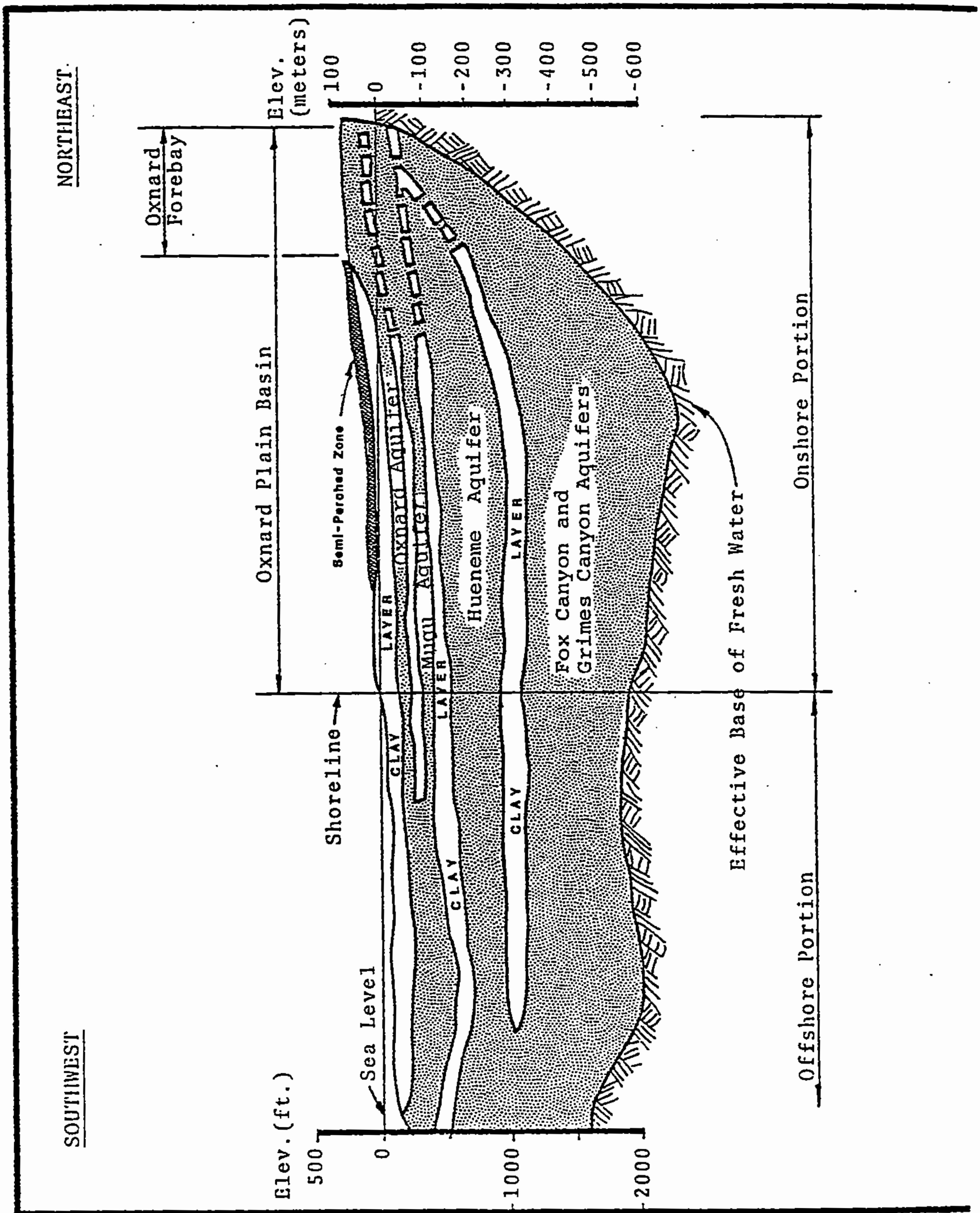
Geology of the Oxnard Plain Groundwater Basin

Framework

The Oxnard Plain Groundwater Basin coincides with the confined portions of the Oxnard Aquifer. The boundary between the Montalvo Groundwater Basin and the Oxnard Groundwater Plain aquifer approximates the limits of the clay cap, which exists in the Oxnard Plain Groundwater Basin. The southern boundary extends from South Mountain to the tip of the Camarillo Hills to Point Mugu, which is the edge of the Oxnard Aquifer. The northern boundary coincides with the Santa Clara River.

The Oxnard Plain Groundwater Basin covers 130 square miles and is underlain by a complex system of five aquifers, which are divided into an upper and a lower system. The upper system, which consists of the Oxnard and the Mugu aquifers, of Holocene and Late Pleistocene ages respectively, is characterized by flat lying alluvial deposits and is up to 400 feet thick. The lower system consists of the Hueneme and Fox Canyon aquifers of Early Pleistocene age and the Grimes Canyon aquifer of Pliocene/Pleistocene age. The aquifers in the lower system consist of continental deposits and marine deposits which are more than 1,000 feet thick. The continental deposits are characterized by alternating layers of sands and clays about 5 to 50 feet thick whereas the marine deposits consist of fine grained sand and silt layers more than 100 feet thick separated by layers of silt and clay as much as 50 feet thick.

The Oxnard Aquifer is confined by the basin-wide clay cap which consists of many silty and clayey layers with interbedded lenses of sands and minor gravels. This clay cap is a barrier to vertical movements between the Oxnard Aquifer and the semi-perched zone, which exists above the clay cap. Figure 18 shows a cross section of the upper and lower aquifer systems of the Oxnard Plain Groundwater Basin.



Source: Oxnard Plain Groundwater Study, SWRCB, March, 1979

Figure 18

Oxnard Plain - Cross-Section of Upper and Lower Aquifers

Hydraulics

Historical gradients on the Oxnard Plain caused movement of groundwater from recharge areas near the Santa Clara River to discharge areas near the coast. Groundwater discharged by underflow through offshore outcrops, as baseflow to streams near the coast, and by evapotranspiration in lowlands along the coast. Groundwater pumping caused groundwater levels to decline below sea level in parts of the upper system. Because of the lowered groundwater levels, sea water entered the freshwater aquifers through outcrop areas in the Hueneme and the Mugu submarine canyons near the coast. Increased historical water extractions from the upper system caused a pumping trough to form near the center of the basin. Thus, present water gradients cause groundwater to flow from outlying areas towards the pumping trough. In the lower system, the water gradient is presently a trend towards the coast. Recent studies of the Oxnard Plain have brought to light the movement of poor quality semi-perched zone waters down to the Oxnard aquifer through failed well casings. This is also a source of water movement between the upper and lower aquifer systems. The problems in the Oxnard Plain spurred the formation of the Fox Canyon Groundwater Management Agency, which administers a Groundwater Management Plan on the Oxnard Plain.

Replenishment Areas

Recharge to the upper system of the Oxnard Plain Groundwater Basin is primarily from UWCD's recharge ponds in the Montalvo Groundwater Basin. From there, groundwater moves to the Oxnard Plain through underflow from the Montalvo Groundwater Basin. When water gradients are favorable, poor quality waters from the perched zone move downwards through failed well casings. The lower system, much like the upper system, is recharged primarily through underflow from the Montalvo Groundwater Basin as well as small volumes of underflow from the West Las Posas Basin. The perched zone receives recharge from Santa Clara River streambed percolation, rainfall penetration and irrigation returns.

Fluvial Geomorphology

The geomorphological characteristics of the river within the Oxnard Plain Groundwater Basin tend to be the same` as the characteristics of the Piru Groundwater Basin with the floodway widths being approximately 2,000 to 3,000 feet. At the western boundary of the Oxnard Plain, the Santa Clara River flows meet the Pacific Ocean at which point a delta has been formed.

Groundwater Hydrology of the Oxnard Plain Groundwater Basin

Groundwater Quantity

The Oxnard Plain Groundwater Basin receives recharge primarily through underflow from the Montalvo Groundwater Basin. Groundwater levels reach their highest elevations in the spring after winter rains and the winter-spring UWCD artificial recharge cycle, and are at the lowest in the fall. Fluctuations of water levels in the Oxnard Plain Groundwater Basin, as seen in Wells 02N/22W-01P01 and 02N/21W-29L03 are summarized in the following tables:

Table 25

Well 02N/22W-01P01 - Water Level Fluctuations in the Upper System

Date	Elevation (feet)	Feet below Ground Surface Elevation
1994 (high)	7.82	43.88
1964 (low)	-36.70	80.40
Spring 1992	-5.42	57.12
Spring 1994	7.82	43.88

Source: United Water Conservation District

Table 26		
Well 02N/21W-29L03 - Water Level Fluctuations in the Lower System		
Date	Elevation (feet)	Feet below Ground Surface Elevation
1948 (high)	18.8	58.50
1989 (low)	-60.60	137.90
Spring 1992	-25.9	103.20
Spring 1994	-8.90	86.20

Source: United Water Conservation District

Figures 19 and 20 show the historic groundwater elevations in the upper and lower systems at three key well sites monitored by UWCD.

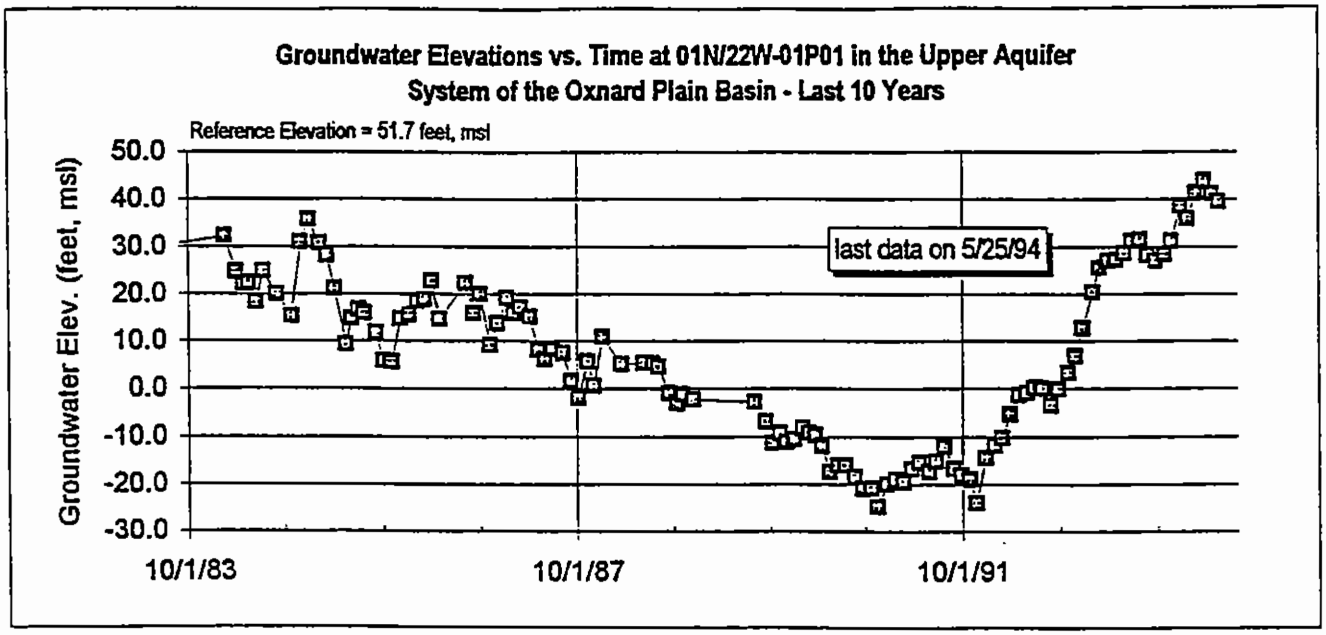
The storage in the Oxnard Plain Groundwater Basin's upper and lower aquifer systems and the average, maximum, and minimum annual extractions in the Oxnard Plain Groundwater Basin are summarized in the table below:

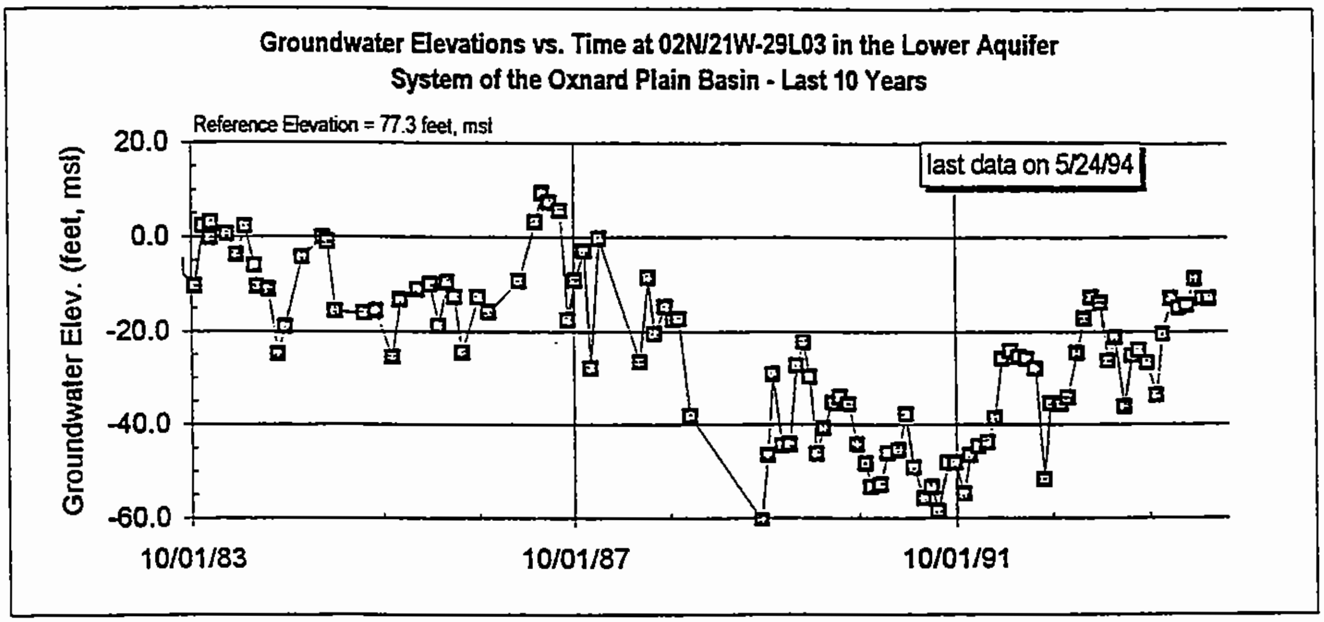
Table 27		
Storage in the Oxnard Plain Groundwater Basin		
Aquifer System	Onshore Storage (Acre-Feet)	Offshore Storage (Acre-Feet)
Lower System	6,000,000	1,500,000
Upper System	1,200,000	1,100,000

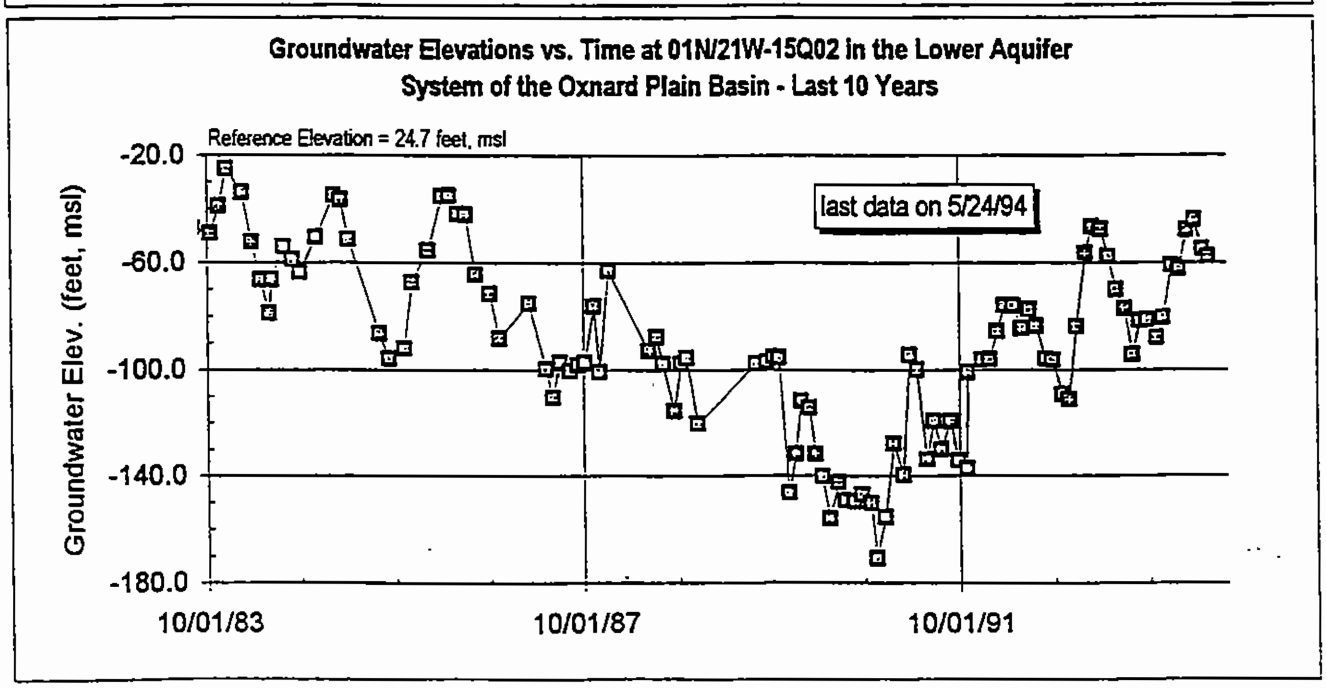
Source: United Water Conservation District

Table 28		
Oxnard Plain Groundwater Basin Extractions		
Year		Extraction (Acre-Feet)
	Average	67,195
1992	Minimum	46,938
1990	Maximum	81,467

Source: United Water Conservation District



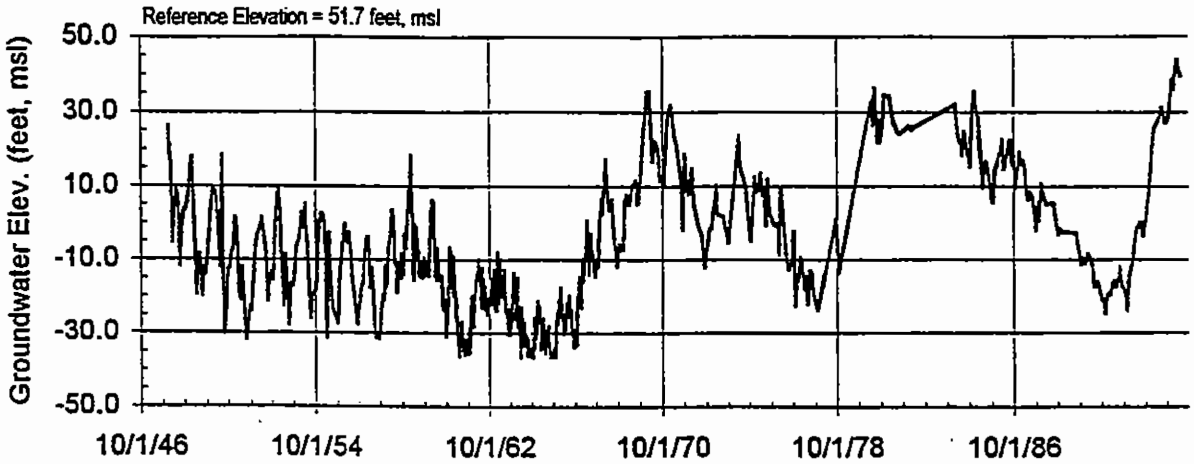




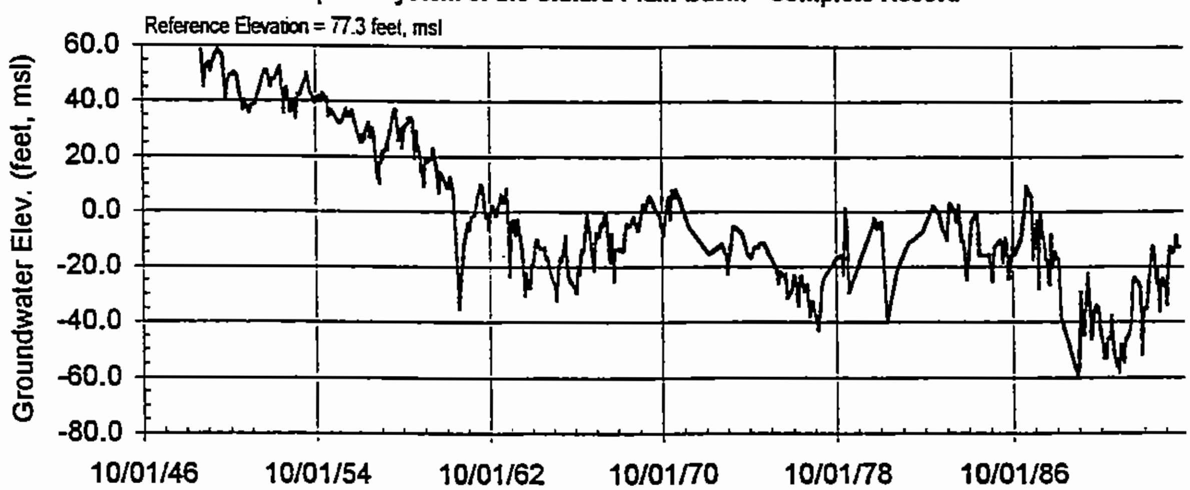
Source: United Water Conservation District

Figure 19

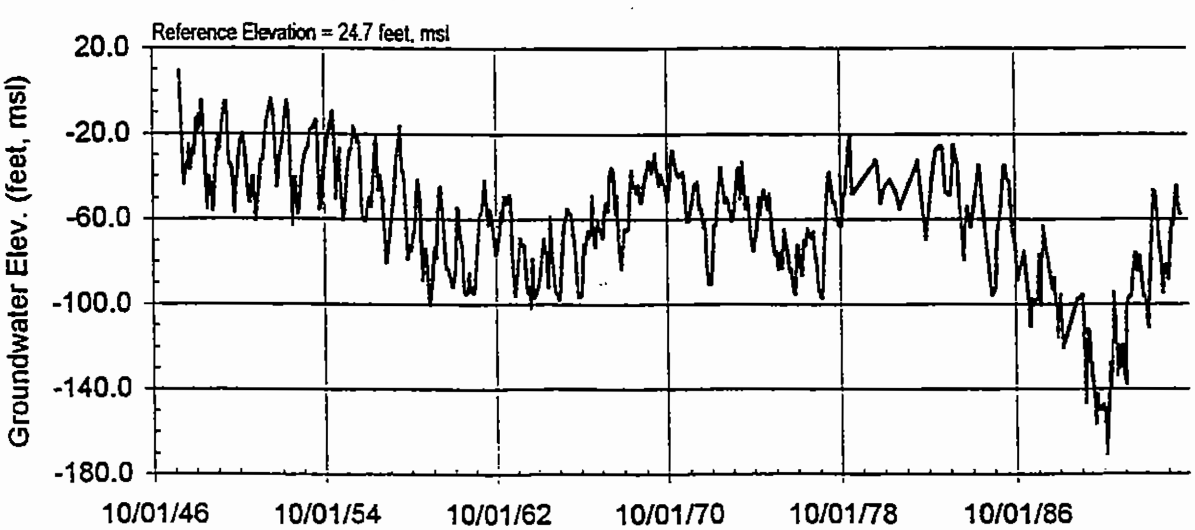
Grounwater Elevations vs. Time at 01N/22W-01P01 in the Upper Aquifer System of the Oxnard Plain Basin - Complete Record



Groundwater Elevations vs. Time at 02N/21W-29L03 in the Lower Aquifer System of the Oxnard Plain Basin - Complete Record



Groundwater Elevations vs. Time at 01N/21W-15Q02 in the Lower Aquifer System of the Oxnard Plain Basin - Complete Record



Source: United Water Conservation District

Figure 20

The UWCD currently monitors water levels in approximately 35 wells in the Oxnard Plain Groundwater Basin on a monthly to bi-monthly basis. UWCD has water level records on wells in the Oxnard Plain Groundwater Basin that were historically monitored.

Groundwater Quality

Groundwater quality is sampled on a weekly, quarterly, and yearly basis from selected wells in the Oxnard Plain Groundwater Basin Groundwaters found in the Oxnard Plain Groundwater Basin generally tend to be Calcium Sulfate waters with the total dissolved solids (TDS) averaging around 900 mg/l. The range of TDS values have been recorded in UWCD records from a low of 300 mg/l to a high of 1,100 mg/l.

One area of the Oxnard Plain that tends to be of different quality is along the coast between Port Hueneme and Point Mugu. In these areas high chloride levels were first detected in the early 1930's and became a serious concern in the 1950's. Early monitoring programs only used existing and abandoned wells as monitoring points; sampling of these wells indicated that there was a widespread area of elevated chloride levels in the Hueneme to Mugu areas. As part of a joint UWCD/U.S. Geological Survey study, Regional Aquifer Systems Analysis (RASA), a series of 17 nested wellsites, with three or more wells within each site, were drilled and have been monitored since July 1991.

Results from the monitoring of these cluster wells indicates that the cause of the elevated chloride levels varies on the Oxnard Plain. Four major types of chloride degradation have been documented. These include: 1) lateral seawater intrusion; 2) cross contamination of freshwater supplies through failed wellbores; 3) dewatering of salt-laden marine clays caused by regional pumping stress; 4) lateral movement of saline water along fault planes.

Adjudication and Rights

Currently, there is no adjudication of the groundwater basin but individual water rights have been established within the basin through various uses but not set by the courts.

Surface Waters of the Santa Clara River

The Santa Clara River is the largest river system in Southern California that remains in a relatively natural state. Beginning in the San Gabriel Mountains east of Santa Clarita, the Santa Clara River flows approximately 84 miles westward to the Pacific Ocean.

Surface water resources of the Santa Clara River include surface flow diversions, storage reservoirs, and wastewater treatment plants.

There are a number of gaging stations that monitor the flow of the river and its tributaries as well as several sampling stations where surface water quality data is collected along the river and its tributaries.

High and Low Flow Extremes Within the Upper Santa Clara River

Principal tributaries to the upper Santa Clara River include Mint Canyon, Bouquet Canyon, San Francisquito Canyon, Castaic Creek Canyon, Oak Spring Canyon, Sand Canyon and Potrero Canyon (Richard C. Slade, December 1986). The principal tributaries of the South Fork of the Santa Clara River, which drains in a northerly direction towards its confluence with the main course of the Santa Clara River, include Placerita Creek Canyon, Newhall Creek Canyon, and Pico Canyon.

Water flow in the stream canyons is considered to be ephemeral and diminishes rapidly after most rainfall events. The river's surface flow typically occurs during the rainy season or snow-melt season; however, portions of the river have surface flow year round. Natural "rising water," reclaimed water, agricultural runoff, and other miscellaneous flows contribute to this year-round flow.

A total of twelve stream gaging stations are within the CLWA study area, of which three are used to monitor the Santa Clara River and nine to monitor its tributaries. Stream gage name, number, and period of record are summarized in Table 29. Figure 21 shows the locations of the stream gaging stations.

Daily flow records were collected and evaluated for each of the twelve stream gages for the available period of record and computed into average monthly flows, as shown in Table 30. The highest average monthly flows occurred between January and March, while the lowest average monthly flows occurred between July and October. Daily flows were used to compile flow duration curves for each stream gage station. Flow duration analyses quantifies the percentage of daily measurements which exceed average daily flows. Results of the flow duration analyses produced flow duration curves which plot percent of time average flows are exceeded (x axis) and average daily flow (y axis). (See Appendix E)

The annual mean outflow at the County Line gaging station has increased from 25,700 acre feet in 1972 (mean for 20 years) to 35,360 acre feet in 1988 (mean for 36 years).

Figure 22 shows a water balance within Los Angeles County. The water balance depicts in flows and out flows on the Upper Santa Clara River Watershed. The average volume at inflows from stream gages are shown as well as inflows from water reclamation plants and outflows from surface diversions.

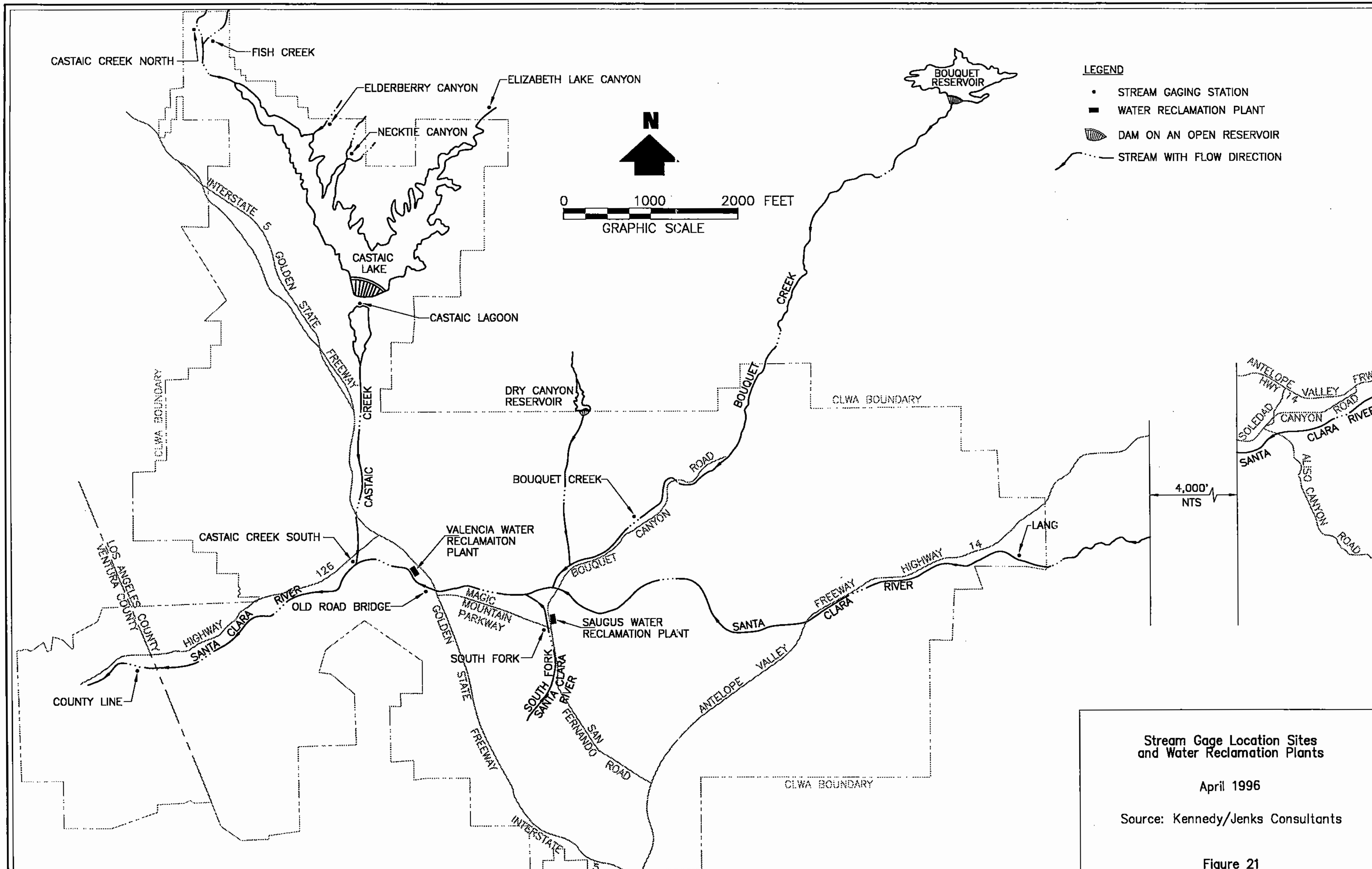
TABLE 29

SUMMARY OF STREAM GAGE INFORMATION WITHIN LOS ANGELES COUNTY

GAGE NAME	GAGE NUMBER	AGENCY	LONGITUDE	LATITUDE	PERIOD OF RECORD*	BEGIN/END OF RECORD
LANG	11107745	USGS/LAC	W118-21'-07"	N34-25'-45"	36	10/49-9/89
BOUQUET C REEK	11107860	USGS	W118-30'-22"	N34-25'-56"	6	10/70-9/77
SOUTH FORK	1117922	USGS	W118-32'-34"	N34-26'-55"	2	10/75-9/77
OLD ROAD BRIDGE	11108000	USGS/LAC	W118-35'-10"	N34-24'-34"	42	10/29-9/93
CASTAIC C REEK - NORTH	11108075	USGS	W118-39'-51"	N34-25'-23"	5	10/76-9/91
FISH CREEK	11108080	USGS	W118-39'-43"	N34-36'-09"	5	10/76-9/91
ELDERBERRY CANYON	1118090	USGS	W118-37'-28"	N34-36'-20"	4	10/78-9/91
NECKTIE CANYON	11108095	USGS	W118-36'-51"	N34-34'-38"	5	10/76-9/91
ELIZABETH LAKE CANYON	11108130	USGS	W118-33'-22"	N34-34'-34"	5	10/76-9/91
CASTAIC LAGOON	11108135	USGS	W118-36'-28"	N34-30'-37"	5	10/76-9/94
CASTAIC CREEK-SOUTH	11108145	USGS	W118-37'-40"	N34-25'-42"	30	10/46-9/77
COUNTY LINE	11108500	USGS	W118-42'-14"	N34-23'-59"	40	10/52-1/92

* The period of record represents the number of yeas that data has been collected, potential for data gaps.

Note: Data was collected from USGS and Los Angeles County



Stream Gage Location Sites and Water Reclamation Plants

April 1996

Source: Kennedy/Jenks Consultants

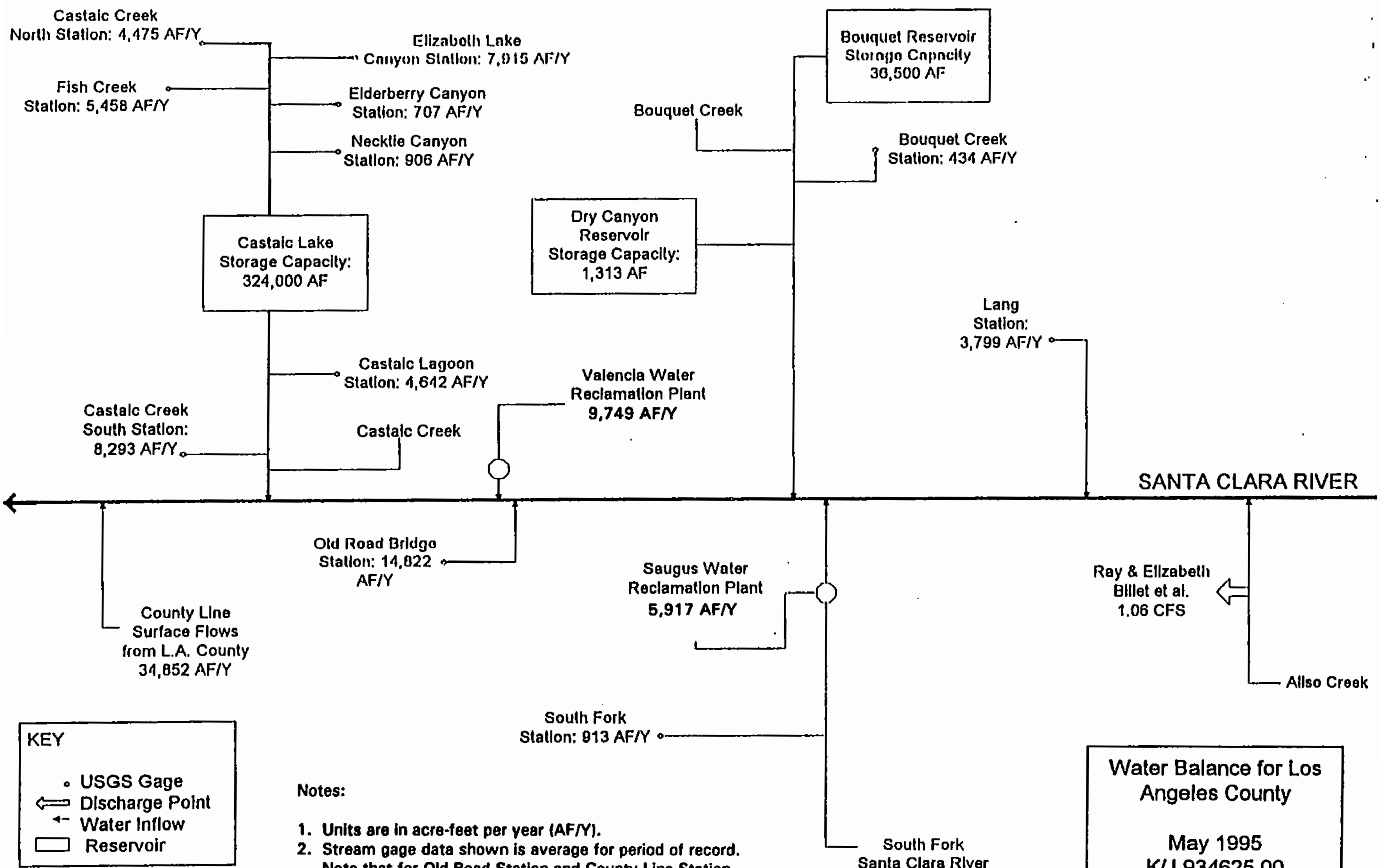
Figure 21

TABLE 30

SEASONAL FLOWS WITHIN LOS ANGELES COUNTY

	Average Monthly Flow (AF/MO)												Average Annual (AF/YR)
Gage Name	**Oct.**	**Nov.**	**Dec.**	**Jan.**	**Feb.**	**Mar.**	**Apr.**	**May**	**June**	**July**	**Aug.**	**Sept**	
Lang	483.21	342.32	513.24	512.15	323.18	704.49	207.18	156.97	87.96	72.47	147.97	247.96	3799.10
Bouquet Creek	24.71	36.68	90.36	67.80	98.55	46.78	0.06	0.00	0.95	5.90	31.90	27.31	434.00
South Fork	1.60	43.61	5.53	321.55	200.54	30.37	0.00	175.50	0.00	4.36	73.27	56.34	912.67
Old Road Bridge	220.91	268.10	725.46	2774.63	3439.37	4794.42	1011.77	570.10	327.76	245.35	233.66	210.72	14822.25
Castaic Creek-North	1.54	1.25	55.88	239.00	1495.79	2046.58	370.74	158.41	53.90	23.67	14.26	13.80	4474.79
Fish Creek	0.00	0.00	13.71	336.98	1668.32	2505.64	570.93	239.55	90.19	31.29	1.29	0.00	5457.90
Elderberry Canyon	0.00	0.00	0.89	73.59	254.07	332.60	42.77	2.20	0.76	0.00	0.00	0.00	706.80
Necktie Canyon	0.00	0.00	5.59	124.94	309.15	399.62	55.37	9.09	2.24	0.00	0.00	0.00	906.00
Elizabeth Lake Canyon	5.70	10.02	66.07	433.47	1982.10	3559.13	1067.49	437.04	176.28	92.23	38.10	46.93	7914.56
Castaic Lagoon	0.00	0.00	0.00	0.00	0.00	0.00	218.57	894.27	2080.96	1158.46	99.58	189.89	4641.73
Castaic Creek-South	42.90	270.91	477.62	1467.84	2725.74	1517.95	1178.50	310.53	171.86	58.64	34.77	35.98	8293.04
County Line	891.99	1913.20	2709.47	5031.81	8668.21	7016.98	3315.26	1766.91	1277.49	861.26	673.16	706.92	34852.36

Notes: The average annual flow is an average of all monthly flows during the period of record (shown in Table 29); derived from individual daily flows.
Period of record for individual gages may have data gaps.
Data provided by USGS and Los Angeles County.



Notes:

1. Units are in acre-feet per year (AF/Y).
2. Stream gage data shown is average for period of record. Note that for Old Road Station and County Line Station averages include Water Reclamation Plant's annual average effluent flows; no attempt was made to disaggregate flows.
3. Not shown are local runoff, groundwater, recharge, and evaporation.

Water Balance for Los Angeles County

May 1995
K/J 934625.00
Source: Kennedy/Jenks Consultants
Figure 22

Table 31

Summary of Stream Gage Information Within Ventura County

Gage Name	Gage Number	Agency	Latitude	Longitude	Period of Record
Piru Creek above Lake Piru	11109600	USGS	W118-45'-22"	N34-31'-23"	10/55-9/92
Piru Creek Below Lake Piru	11109800	USGS	W118-45'-04"	N34-27'-37"	10/55-9/92
Hopper Creek	11110500	VCFCD	W118-49'-32"	N34-24'-03"	10/30-9/92
Sespe Creek	11113001	VCFCD	W118-55'-30"	N34-27'-03"	9/11-9/92
Santa Paula Creek	11113500	USGS	W119-04'-53"	N34-24'-48"	10/27-9/92
Santa Clara River at Montalvo	11114000	USGS	W119-11'-21"	N34-14'-31"	10/27-10/92

Source: United States Geological Survey

High and Low Flow Extremes Within the Lower Santa Clara River

A total of six stream gages are within the UWCD; one of the gages is on the Santa Clara River and the remaining five gages are on tributaries. Figure 23 tabulates the stream gage locations. Stream gage name, number, and period of record are summarized in Table 31.

Daily flow records including UWCD diversions have been collected for the available period of record and computed into average yearly flows and average monthly flows for the stream gages as shown in the following tables. Daily flows were also used to compile flow duration curves for the stream gages, summarizing the percentage of time that the average daily flow is exceeded (See Appendix F). Summer and Fall river flows below the confluence of the Santa Clara River and Piru Creek are partially controlled by water conservation releases of captured winter flood waters at Lake Piru.

Table 32

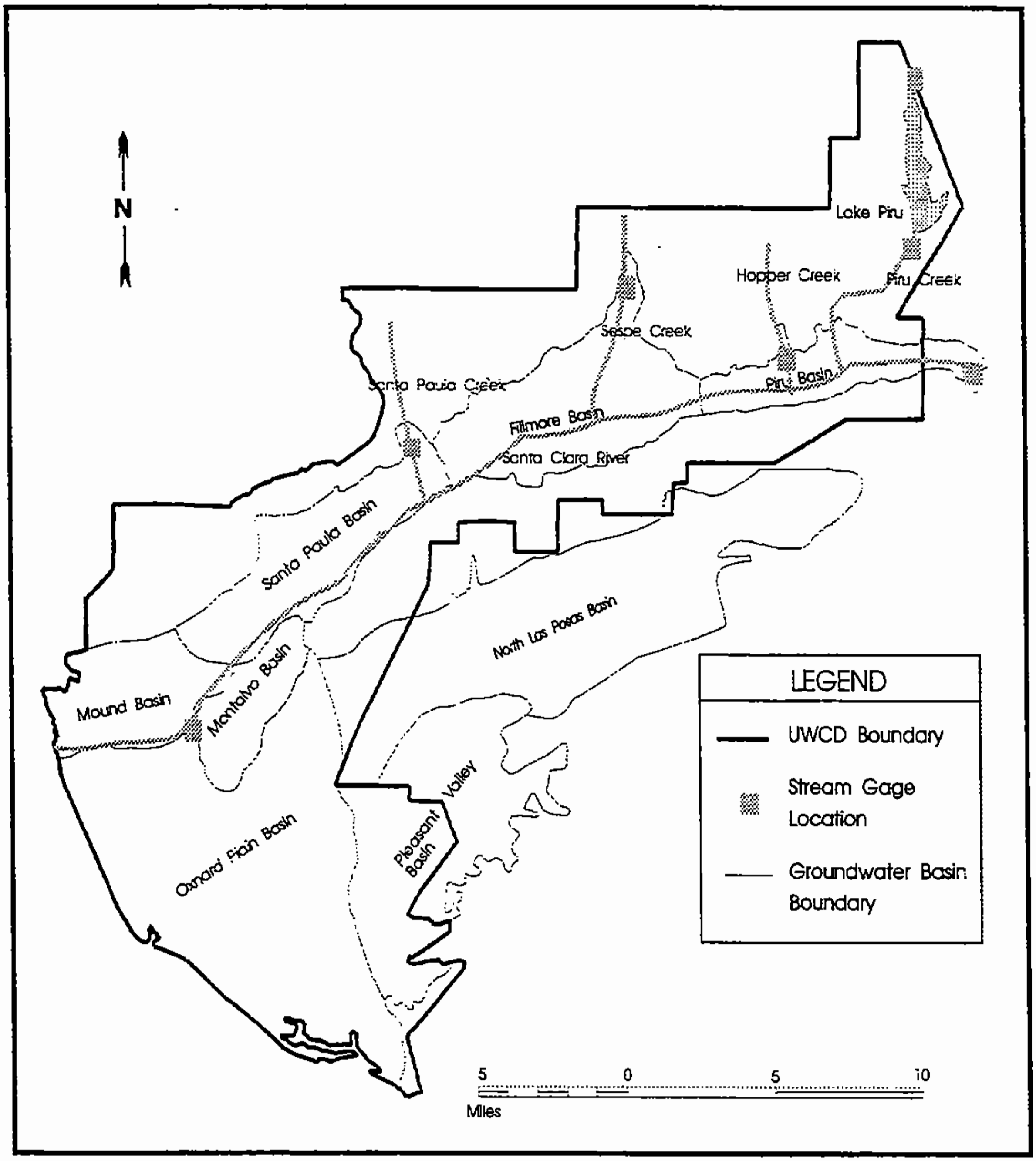
Average Yearly Flows Pre-1972 (AFY) Within Ventura County

Location	Inflows AFY	Diversions AFY	Period
Piru Creek Above Lake Piru	41,470		1956-1971
Piru Creek Below Lake Piru	29,540		1956-1968
Piru Diversion		6,397	1955-1985
Hopper Creek	4,040		1930-1971
Sespe Creek	76,070		1927-1971
Santa Paula Creek	15,650		1927-1971
Freeman Diversion		53,636	1955-1985
Santa Clara River at Montalvo Bridge	82,590		1949-1971

Note: Flow below Lake Piru controlled by Santa Felicia Dam.
Flows over Santa Felicia Dam spillway bypass the stream gage below Lake Piru; therefore, the average yearly flows are lower.
Pre-1972 is before Pyramid Reservoir was constructed and operational.

Source: United States Geological Survey

Stream Gage Location Sites



Source: United Water Conservation District

Figure 23

Table 33

Average Yearly Flows 1972-1992 (AFY) Within Ventura County

Location	Inflows AFY	Diversions AFY	Period
Piru Creek Above Lake Piru	42,920		1972-1992
Piru Creek Below Lake Piru	31,190		1972-1992
Hopper Creek	4,040		1930-1971
Sespe Creek	84,160		1912-1992
Santa Paula Creek	16,540		1928-1992
Freeman and Piru Diversion		73,157	1979-1992
Santa Clara River at Montalvo Bridge	144,590		1972-1992

Note: Flow below Lake Piru controlled by Santa Felicia Dam.
Flows over Santa Felicia Dam spillway bypass the stream gage below Lake Piru; therefore, the average yearly flows are lower.
Pyramid Reservoir was operational in 1972.

Source: United States Geological Survey

Table 34

Average Monthly Mean (cfs) Within Ventura County

	Piru Creek above Lake Piru (1972-1992)	Piru Creek Below Lake Piru (1972-1992)	Hopper Creek	Sespe Creek	Santa Paula Creek	Santa Clara River at Montalvo
Oct	10.5	11.0	0.13	4.4	2.86	1.15
Nov	14.0	13.9	5.4	42.8	8.27	57.1
Dec	35.3	33.1	7.79	95.5	15.6	90.1
Jan	62.0	10.4	17.62	205.0	37.9	270.0
Feb	197.0	14.2	33.06	459.0	80.3	709.0
Mar	199.0	25.3	22.37	365.0	66.1	520.0
Apr	79.4	49.7	6.96	166.0	34.5	173.0
May	50.4	46.0	2.42	49.2	13.7	22.5
June	28.1	56.8	1.05	16.6	7.75	2.56
July	17.5	94.4	0.45	6.44	4.69	1.3
Aug	14.2	88.0	0.28	3.35	3.07	0.24
Sept	12.6	44.3	0.33	3.35	3.02	1.19

Source: United States Geological Survey

Figure 24 shows a water balance within Ventura County. The water balance depicts inflows and outflows on the lower Santa Clara River Watershed. The average volumes of inflows and outflows are included , where known, as well as the average stream flows as recorded by the USGS. UWCD's Freeman Diversion and subsequent breakdown of the diverted river water is also depicted.

Figure 25 shows riverbed profiles for the Santa Clara River in the Santa Paula basin.

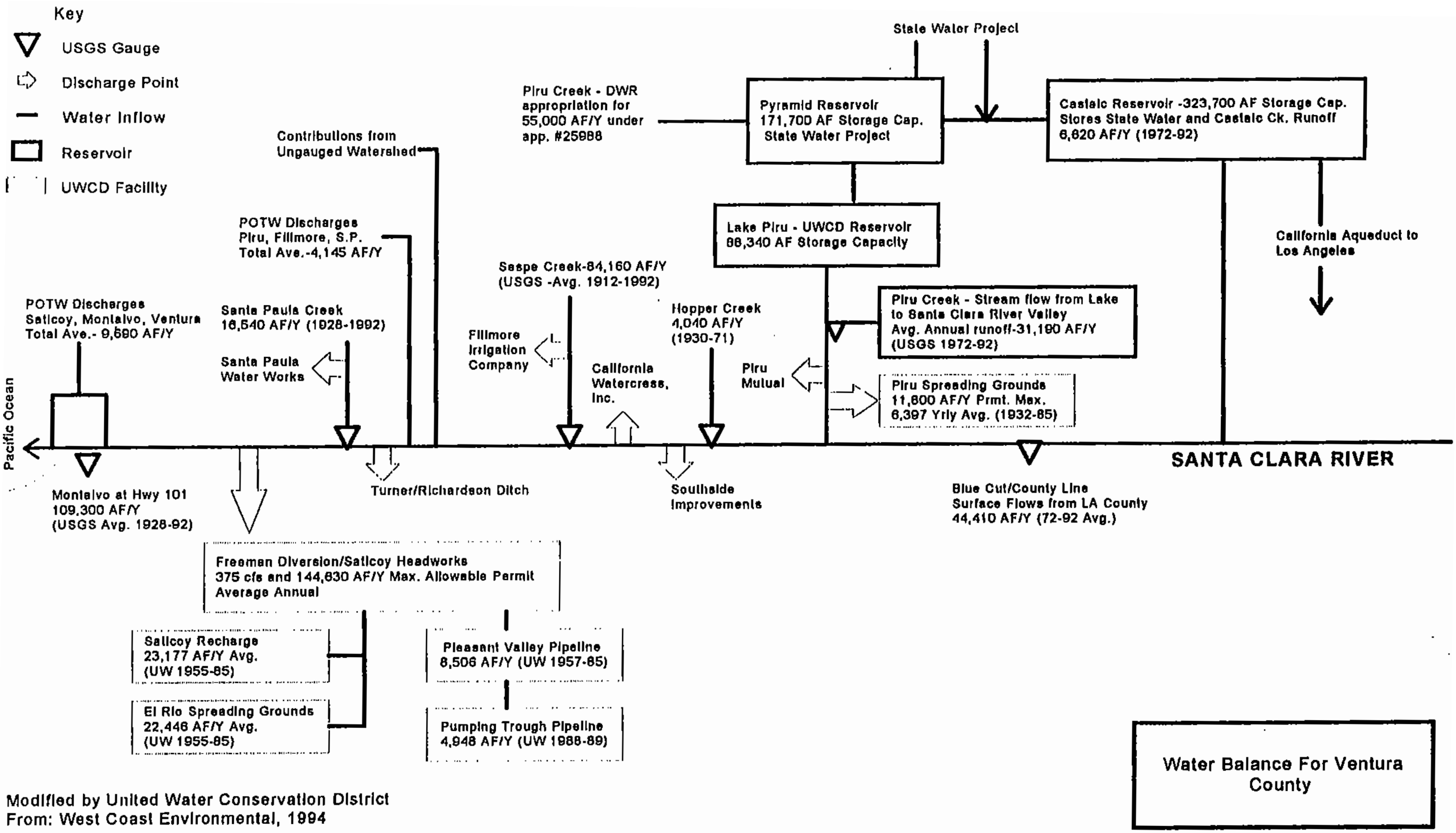
Surface Water Quality Within the Santa Clara River

Upper Santa Clara River

Surface water quality data was taken from "Investigation of Water Quality and Beneficial Uses Upper Santa Clara River Hydrologic Area," prepared by the Department of Water Resources (DWR), dated 1993. The surface water quality data base compiled for the DWR study consisted mainly of data from the files of the U.S. Geological Survey, State Water Resources Control Board, the Department, and City of Los Angeles Department of Water and Power and 13 samples collected by the Regional Board mainly in August and September 1990.

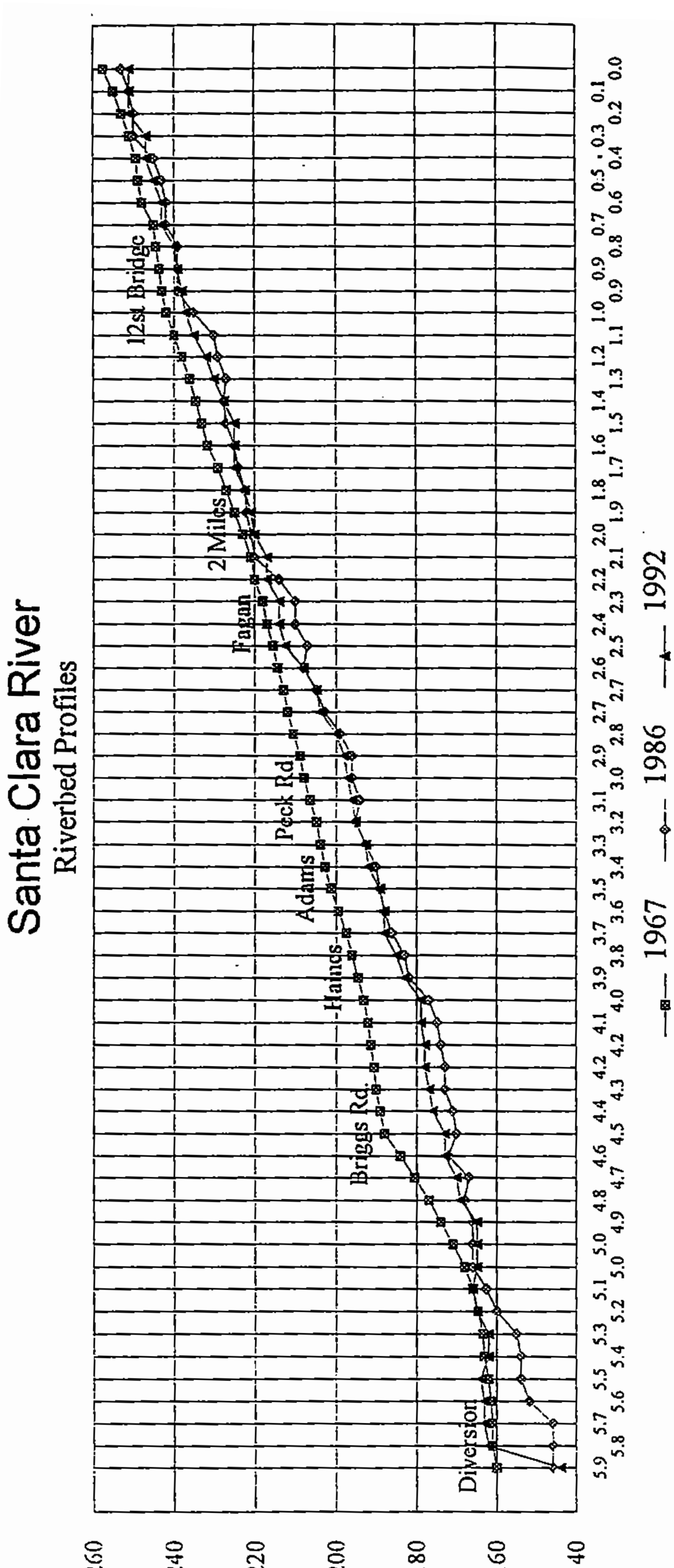
Table 35 summarizes surface water quality data of the Upper Santa Clara River and several tributaries. Hydrologic conditions of the watershed have changed since the surface water quality measurements in Table 35 were made. The Santa Clarita Valley has undergone significant urbanization and the effect on the surface water quality from these changes is not known due to lack of current data.

Surface water quality data for the Upper Santa Clara River and its tributaries vary from the fairly long continuous records at two gaging stations to mostly historical records for some stream waters. Data collected hydrographs as shown in Appendix G were prepared from data collected at the Old Highway Bridge and the County Line gaging stations.



Water Balance For Ventura County

Figure 24



August 23, 1993
Source, UWCD & Co. Flood Control

Figure 25

The data from the Old Highway Bridge gaging station show that the TDS concentrations at this location have been more than three times that at the upstream Lang gaging station and the sulfate concentrations more than five times of that at Lang. The data from the County Line gaging station show the maximum TDS and sulfate concentrations are about three times the maximum concentration measurements at the Old Highway Bridge gaging station and about ten times the maximum concentration measurements at Lang.

There appears to be a trend of decreasing TDS and sulfate concentrations over time (see Appendix E). The range of TDS concentrations during the 1950s and early 1970s was as much as 1,800 mg/l, and the sulfate concentrations were as much as 900 mg/l. The ranges during the 1980s are only about 900 mg/l for TDS and 350 mg/l for sulfate concentrations. Several physical changes such as the regulation of Castaic Creek and impoundment of imported water in Castaic Lake, increased use of imported water, urbanization of the Santa Clarita Valley, increased discharges of treated wastewater, and increased outflow from the hydrologic area have influenced the quality of the surface flows. In general, the quality of surface flows has become less variable since 1972.

Storage Reservoirs

The following water quality information was obtained from "Investigation of Water Quality and Beneficial Uses Upper Santa Clara River Hydrologic Area," prepared by the DWR, dated 1993.

Bouquet Canyon and Dry Canyon Reservoirs

The quality of surface waters in these reservoirs reflects that of the imported waters from the Los Angeles Department of Water and Power Aqueduct System (Mono-Owen water) they impound. The TDS concentrations in Bouquet Canyon Reservoir ranged from 150 to 250 mg/l in 1965 to 1982, with a chemical character of sodium-calcium bicarbonate.

Castaic Lake and Lagoon

These reservoirs store State Water Project water and local runoff. Since 1972, annual average concentrations in Castaic Lake have ranged from approximately 210 to 460 mg/l for TDS, 40 to 165 mg/l for sulfate, and 25 to 90 mg/l for chloride. Occasionally, recreational activities in the Lagoon have been closed due to high bacteria counts which may be associated with human contact in the water.

Water Reclamation Plants

There are two Water Reclamation Plants (WRPs) in the CLWA's study area: the Saugus and the Valencia Water Reclamation Plants. Their locations are shown on Figure 21. The effluent from the Saugus and Valencia WRPs has consistently been in compliance with the reclaimed water requirements specified in the reclamation permits. Additionally, the tertiary-treated wastewater is "disinfected, oxidized, coagulated, clarified, and filtered," as required for use of reclaimed water in nonrestricted recreational impoundments, the use subject to the most stringent requirements in state regulations governing water reclamation (H&S Code, Title 22).

The effluent from the WRPs is also required to comply with the National Pollutant Discharge Elimination System (NPDES) discharge requirements. The discharge requirements are set at levels protective of aquatic life and habitats on the Santa Clara River and potential downstream uses. Average concentrations of effluent constituents measured in 1992 for each plant are listed in Table 36. During 1992, the BOD measured was approximately 7 mg/l for Saugus WRP and less than 6 mg/l for Valencia WRP. Suspended solids concentration in the effluent averaged less than 2 mg/l for each plant, and residual chlorine concentration remained less than the effluent limitation of 0.1 mg/l.

TABLE 35
SUMMARY OF QUALITY CONSTITUENTS IN SURFACE WATERS
UPPER SANTA CLARA RIVER HYDROLOGIC AREA
(Continued)

In mg/L, unless otherwise noted

Constituent	Sand Canyon 1958-1962		Placenta Creek 1952-1962		Pico Creek 1952-1962		South Fork of Santa Clara River 1952-1978		Castaic Creek 1952-1975		San Martinez Grande Canyon 1952-1963		Potrero Canyon 1951-1963	
	n[a]	Range	n[a]	Range	n[a]	Range	n[a]	Range	n[a]	Range	n[a]	Range	n[a]	Range
Calcium	5	64-50	8	102-.38	7	452-344	6	241-78	12	133-35	21	726-210	18	491-238
Magnesium	5	18-12	8	5-19	7	418-166	6	135-24	12	33-13	21	766-147	18	639-329
Sodium	5	16-9	8	66-17	7	662-359	6	146-28	12	85-26	21	1,120-207	18	1,700-715
Potassium	5	8.0-5.9	7	9.0-0.8	5	12.4-6.3	5	9.0-3.6	10	9.4-3.0	20	17.1-2.4	17	202.0-6.0
Bicarbonate	5	162-130	8	295-66	7	540-31	6	242-114	6	294-126	21	605-139	19	650-274
Sulfate	5	115-56	8	267-51	7	3,557-2,140	6	1,127-215	12	291-88	21	3,930-990	18	6,290-3,540
Chloride	5	12-4	8	34-20	7	349-45	6	133-17	12	67-14	21	617-104	19	373-136
Nitrate	5	32.0-2.0	8	14.0-1.2	7	67.0-1.2	6	15.0-1.8	12	18.0-0.9	21	3.7-0	18	70.0-0
Fluoride	5	0.6-0	5	0.7-0.1	6	2.1-1.2	4	1.0-0.8	9	1.0-0	14	3.3-0.2	15	4.2.-0.4
Boron	5	0.13-0	8	0.55-0	7	1.85-0.80	6	0.95-0.05	12	0.43-0.17	20	3.95-0.5	18	5.4-0.8
TDS	5	395-264	8	782-240	7	5,920-3,295	7	1,645-510	8	978-317	19	6,784-2,457	18	9,940-4,272
Total Hardness	5	235-174	3	211-160	6	2,670-2,088	3	715-503	11	631-140	9	2,646-2,414	19	3,780-2,224
pH[b]	5	7.3-7.1	8	8.5-7.3	7	8.3-7.6	7	8.2-7.1	11	9.0-6.0	21	8.3-7.3	19	8.2-7.5
Electrical Conductivity[c]	5	535-388	8	971-345	7	5,817-4,040	9	2,372-684	12	1,260-502	21	7,270-2,247	19	9,660-5,700
Iron	-	-	-	-	-	-	-	-	6	0.49-0.08	-	-	-	-
Manganese	-	-	-	-	-	-	-	-	6	0.03-<0.01	-	-	-	-
Discharge[d]	5	150-6	7	100-1.5	7	3.0-0.01	7	100-1.5	10	500-0.2	18	40-0.01	14	1-0.05

[a] N is the number of measurements
[b] In standard unit
[c] In μmhos/cm
[d] In cubic feet per second
Values are as alkalinity ($CaCO_3$)

Source: Update of Basin Plan for Piru, Sespe, and Santa Paula Hydrologic Areas by DWR dated June 1989.

TABLE 35

SUMMARY OF QUALITY CONSTITUENTS IN SURFACE WATERS
UPPER SANTA CLARA RIVER HYDROLOGIC AREA

In mg/L, unless otherwise noted

Constituent	Santa Clara River LA-Ventura Co. Line 1951-1988		Santa Clara River Old Highway Bridge 1951-1990		Santa Clara River near Lang 1951-1978		Santa Clara River near Ravenna 1951-1976		Mint Canyon Creek 1958-1978		Bouquet Canyon Creek 1958-1992		San Francisquito Creek 1958-1992	
	n[a]	Range	n[a]	Range	n[a]	Range	n[a]	Range	n[a]	Range	n[a]	Range	n[a]	Range
Calcium	263	419-53	256	268-12	42	121-36	20	98-26	2	33-26	6	61-28	3	88-42
Magnesium	261	352-20	256	124-3	42	30-12	20	45-0	2	5-4	6	20-6	3	47-13
Sodium	308	1,081-38	256	228-5	42	79-17	20	59-23	2	27-25	6	137-24	3	52-12
Potassium	220	18.0-0	256	29.4-0.8	39	5.0-0.3	19	5.6-1.0	2	4.7-3.0	6	61-3.5	3	4.0-2.6
Bicarbonate	385	438-89.[c]	144	454-11	34	381-162	22	342-156	2	146-110	6	409-134	3	405-139
Sulfate	325	3,368-128	270	989-20	42	177-23	20	121-0.5	2	33-19	6	69-13	3	170-42
Chloride	445	585-14	269	200-5	42	60-15	22	55-2	2	14-13	6	148-15	3	33-4
Nitrate	175	42.0-0	202	63.0-0	34	14-0	20	32.2-0.7	2	9.0-0.5	7	7.4-0	4	14.0-ND
Fluoride	252	2.2-0.2	132	1.5-0	33	0.8-0	16	0.6-0.2	2	0.7-0.3	6	0.8-0.3	3	0.9-0.3
Boron	309	3.20-0	116	2.4-0	42	0.70-0.08	20	0.66-0	2	0.36-0.32	6	0.90-0.16	3	0.20-0.12
TDS	318	5,986-387	241	1,939-134	44	650-213	28	552-183	2	232-215	7	750-227	3	621-238
Total Hardness	148	1,160-42	253	1,180-43	42	403-147	18	328-88	2	102.88	6	235-95	3	440-157
pH[b]	410	8.6-7.0	270	8.6-6.8	43	8.4-7.0	28	8.4-7.1	3	7.8-7.7	8	8.3-7.4	3	7.9-7.4
Electrical Conductivity[c]	438	7,620-668	271	2,450-101	47	1,030-334	30	850-267	4	460-270	8	1,240-362	3	880-357
Iron	31	39.00-0.240	115	117.00-0	8	1.000-0.030	-	-	-	-	2	58.00-0.10	1	ND
Manganese	31	0.71-0.030	118	4.75-0	8	0.040-0	-	-	-	-	2	1.00-0.030	1	0.20
Discharge[d]	448	13,500-0	73	2,000-2	43	400-0	28	100-0.1	3	100-0.2	7	400-0.25	3	300-0.25

Source: Update of Basin Plan for Piru, Sespe, and Santa Paula Hydrologic Areas by DWR dated June 1989.

TABLE 36

EFFLUENT QUALITY AND WATER RECLAMATION REQUIREMENTS
SAUGUS AND VALENCIA WRPs

CONSTITUENT (UNITS)	AVERAGE EFFLUENT QUALITY [1] FOR 1992		MAXIMUM LIMITATIONS [2]
	SAUGUS WRP	VALENCIA WRP	
Total Dissolved Solids (mg/L)	686	772	1,000
Chloride (mg/L)	126	148	100[3]
Sulfate (mg/L)	137	167	450-550
Coliform Group (MPN/100 ml)	<1.0	<1.0	2.2
Nitrate + Nitrate (mg/L)	3.28	7.19	10
Turbidity (NTU)	1.4	1.4	2
pH (pH units)	7.10	7.04	6.0-8.5
Arsenic (mg/L)	.002	.002	0.05
Barium (mg/L)	<.02	<0.02	1.0
Cadmium (mg/L)	<.009	<.009	0.010
Total Chromium (mg/L)	<.02	<.02	0.05
Copper(mg/L)	<.02	<.02	1.0
Lead (mg/L)	<.04	<.04	0.05
Mercury (mg/L)	<.0001	<.0004	0.002
Selenium (mg/L)	<.001	<.001	0.01
Silver (mg/L)	<.005	<.005	0.05
Zinc (mg/L)	.04	.10	5.0
Fluoride (mg/L)	.38	.38	1.6
Radioactivity (pCi/L) (gross alph + gross beta)	<10.4	<13.53	65
Total Identifiable Chlorinated Hydrocarbons (ug/L)	.02	.02	NS
Phenols (mg/L)	004	.005	NS

(1) Arithmetic mean effluent analytical data (CSDLAC, Annual Monitoring Report for 1992, 15 march 1993.)

(2) Reclaimed water limitations specified in RWQCB-LA Order No. 89-129 (Valencia WRP) and RWWCB-LA Order No. 89-130 (Saugus WRP). Trace constituent concentration limits obtained from California Department of Health Services, California Administrative Code, Title 22, Division 4, Chapter 15, "Domestic Water Quality and Monitoring" (1989).

(3) Pursuant to Los Angeles County Regional Water Quality Control Board Resolution No. 90-004, readopted on February 3, 1995 for two years, during this period the effluent limitation for chloride will not be considered to be violated unless the effluent concentrations exceed 250 mg/L or water supply concentrations plus 85 mg/L, whichever is less.

NS: Not Specified.
mg/L: milligrams per liter.
MPN/100 ml: Most probable number per 100 milliliters.
NTU: Nephelometric turbidity units.
pCi/L: picouries per liter.
µg/L: micrograms per liter

The effluent outfall from the Saugus WRP is located approximately 400 feet downstream from Bouquet Canyon Road. Effluent from the Valencia WRP is discharged at a point approximately 2,000 feet downstream from "The Old Road" Bridge.

Lower Santa Clara River

The quality of the waters in the Santa Clara River is typically characterized as a flow dilution system. Water quality varies inversely to the rate of discharge. Higher quality waters are present with higher flows and lower quality waters are associated with lower flow rates.

Since 1971, Piru Creek has shown improvements in quality due to operational releases of State Water Project water form Pyramid Reservoir. Piru Creek below Lake Piru has also shown improvements in water quality since 1971.

Not unlike the Santa Clara River, Sespe Creek also exhibits flow dilution characteristics. The higher the flow rate the better the water quality and the lower the flow rate the lower the water quality. The Sespe Creek has a lower overall TDS, therefore, it is a good source of higher quality water for mixing with Santa Clara River flows and recharging basin groundwater.

As with the Santa Clara River and Sespe Creek, Santa Paula Creek also exhibits flow dilution characteristics. The higher quality waters are present with higher flows and lower quality waters with lower flows.

UWCD collects surface water quality data at four locations on the Santa Clara River on a quarterly basis. The sites sampled are located at the Los Angeles/Ventura County line, 1/4 mile downstream of the Fillmore Fish Hatchery, Willard Road, and at the Vern Freeman Diversion facility. A summary of selected 1992 water quality parameters follows:

Table 37 Santa Clara River Surface Water Quality - 1992			
Sample Location	Water Type (major cation and anion)	Average TDS (mg/l)	Average pH
County Line	Calcium-Sulfate	1081	8.23
Fillmore Fish Hatchery	Calcium-Sulfate	1092	8.06
Willard Road	Calcium-Sulfate	1022	8.04
Freeman Diversion	Calcium-Sulfate	1027	8.06

Source: United Water Conservation District

Potential sources of water quality problems in the lower Santa Clara River could result from the one or more of the following: natural oil seeps in the Santa Paula area, impacts from urbanization, impacts from agriculture, and effects of imported and reclaimed water.

Water quality issues associated with the Santa Clara River estuary are as follows:

- Water Level Management. An interim plan is currently in place which allows for mechanical breaching of the sandbar at the lagoon mouth when the water level in the estuary reaches nine (9) feet above mean sea level. Questions remain concerning whether natural breaching is sufficient to avoid water quality problems at other times.
- Mosquito Abatement. High numbers of mosquitoes have been found in the vicinity of the estuary during the late summer months, when low tides and low river flows result in infrequent natural breaching of the sandbar at the mouth of the lagoon. This could cause a human health result of encephalitis, which is transmitted by some mosquitoes.
- Eutrophication. High nutrient levels entering the estuary from point source and non-point source discharges could cause algal blooms and lead to eutrophication of the lagoon. Although high nitrate levels have been recorded in the discharge from the wastewater

treatment plant, there is no clear indication of a problem in the receiving waters. However, this issue probably requires additional study.

- Coliform Bacteria. Bacteria levels exceeding recreational standards have been recorded at receiving stations in the estuary and nearby ocean monitoring stations. These high levels appear to be associated with non-point sources perhaps the large flocks of birds attracted to the landfill.
- Pesticides. Agricultural activities in the watershed may result in contamination of sediments in the lagoon or the river. Additional monitoring would be required to investigate this potential problem.

Tables 38 through 40 summarizes surface water quality data from the Update of Basin Plans for Piru, Sespe, and Santa Paula Hydrologic Areas by DWR , dated June 1989.

Storage Reservoirs

Lake Piru

The following information was taken from the Update of Basin Plan for Piru, Sespe, and Santa Paula Hydrologic Areas by DWR dated June 1989.

Beginning in 1971, the quality of water in Lake Piru has shown improvement because of operational releases of SWP water from Pyramid Reservoir to Piru Creek. Previous to the releases of SWP waters, the TDS, sulfate, and boron concentrations in Lake Piru were 400 to 1,300 mg/l, 300 to 700 mg/l, and 0.5 to 2.3 mg/l, respectively. With the inflows of SWP water, the concentrations of these constituents decreased to 400 to 800 mg/l for TDS content, 250 to 400 mg/l for sulfate content, and 0.2 to 1.1 mg/l for boron content. The chemical character of Lake Piru's water has remained calcium-sodium-magnesium sulfate.

TABLE 38
SURFACE WATER QUALITY, SANTA FELICIA SUBAREA

In mg/L, unless otherwise noted*

Parameter	Piru Creek Near Piru*	Hopper Creek**	Tapo Canyon Creek***	Santa Clara River: At LA-Ventura Co. Line+ (4N/17W-30K)	Santa Clara River: West of Blue Cut++ (4N/18W-25F)	Santa Clara River: Near Fish hatchery++ (4N/19W-34F)
Calcium	69-283	110-168	118	139	131	157
Magnesium	26-86	56-118	191	50	41	58
Sodium	42-180	51-243	755	142	141	94
Potassium	1.9-7.8	3.0-9.0	11	6.6	5.5	4.8
Bicarbonate	148-222	219-483	1,087	--	325	296
Sulfate	211-924	610-871	1,200	152-1,370	350	481
Chloride	22-80	12-51	448	65-182	91	48
Nitrate	0-2.8	0-0.3	5.0	21.6	19	9.6
Fluoride	0.6-1.3	0.4-0.8	1.2	0.9	1.0	1.0
Boron	0.24-1.07	0.3-0.6	--	0.8	0.8	0.9
Total dissolved solids	548-1,610	1,098-1,720	3,328	603-2,800	982	1,075
Electrical conductivity (umhos/cm)	786-1970	1,370-2,050	4,300	916-3,330	1,450	1,175
Hydrogen ion concentration (pH)	7.3-9.1	8.0-8.2	7.8	7.2-11.5	7.9	7.6
Iron	0-1	0	ND	0.1	ND	ND
Manganese	ND	0	ND	--	ND	ND
Nitrite	--	--	--	--	0.5	0.1
Total phosphate (as P)	0.43	0.04	0.17	--	--	0.07
Discharge (cubic feet per second)	0.8-526	0.5-5.0	0.33	2-150	--	--

ND=not detected

*Data represent 34 analyses from 4N/18W-15N in 1975-86, one analysis from 4N/18W-20C in September 1987, and two from 4N/18W-200 one in September 1987 and one in May 1988.

**Data represent 4 analyses from 1977-88.

***Board sampled 4N/18W-36C in March 1988.

+ Data represent 42 partial analyses from 1975-86 and 1 complete analysis from November 1981.

++Board sampled Fall 1987.

Source: United Water Conservation District

TABLE 39
SURFACE WATER QUALITY, FILLMORE SUBAREA

In mg/L, unless otherwise noted

Parameter	Pole Creek*	Sespe Creek**	Near Santa Paula*** (3N/21W-12P)	Santa Clara River: At Atmore Rd+ (3N/20W-3A)	Santa Clara River: At Chambersburg RD++ (4N/19W-31E)	Santa Clara River: Near fish hatchery+++ (4N/19W-34F)
Calcium	152-186	82-139	92-207	106	134	157
Magnesium	83-98	22-53	33-81	32	53	58
Sodium	78-138	50-97	52-150	56	85	94
Potassium	3.4-7.0	2.0-5.0	1.9-6.8	2.3	4.5	4.8
Bicarbonate	216-384	143-249	227-325	215	245	296
Sulfate	648-780	190-449	276-759	280	431	481
Chloride	15-18	11-123	25-67	26	40	48
Nitrate	0-1.4	0-8.6	1.7-24.0	2.0	6.0	9.6
Fluoride	0.7-1.9	0.8-1.3	0.6-1.5	0.9	0.9	1.0
Boron	0.5-1.0	0.5-2.6	0.4-2.3	--	--	0.9
Total dissolved solids	719-1,430	260-968	598-1,549	649	938	1,075
Electrical conductivity (umhos/cm)	1,080-1,700	370-1,260	867-2,059	900	1,200	1,175
Hydrogen ion concentration (pH)	8.0-8.3	7.5-8.2	7.4-8.5	8.2	8.0	7.6
Iron	0-1.0	0-0.1	--	ND	ND	ND
Manganese	0	0	--	ND	ND	ND
Nitrite	ND	ND	--	--	--	0.1
Total phosphate (as P)	0.4	--	--	0.03	0.07	0.07
Discharge (cubic feet per second)	0.4-30.0	0.3-1,480	6.5-750	20	1	--

ND=not detected
*Data represent 1 partial and 3 complete analyses from 4N/19W-30J and -19R for 1977-87.
**Data represent 59 partial analyses and 6 complete analyses from three sites for 1975-88.
***Data represent 22 complete analyses and 7 analyses complete except for bicarbonate for 1976-87.
+Board sampled May 1988.
++Board sampled March 1988.
+ ++Board sampled November 1987.

Source: United Water Conservation District

TABLE 40
SURFACE WATER QUALITY, SULPHUR SPRINGS SUBAREA

In mg/L, unless otherwise noted

Parameter	Santa Paula Creek*	Wheeler Cyn Creek** (3N/22W-13L)	Barrancas***	Santa Clara River: Near Santa Paula+ (3N/21W-12P)	Santa Clara River: Above Santa Paula WR Plant** (3N/21W-15P)	Santa Clara River: Near Saticoy** (2N/22W-01K)
Calcium	83-95	141	279-338	92-207	195	176
Magnesium	19-30	96	114-260	33-81	76	61
Sodium	16-72	242	210-1,005	52-150	140	176
Potassium	0.6-2.0	6.4	10-25	1.9-6.8	5.7	8.5
Bicarbonate	167-228	384	503-536	218-325	325	360
Sulfate	133-265	730	1,000-3,300	276-750	700	583
Chloride	4-73	100	125-255	25-67	65	102
Nitrate	0.5-2.0	3.9	44-115	1.7-24.0	12	1.6
Fluoride	0.3-0.5	0.8	0.7-1.2	0.6-1.5	0.8	0.7
Boron	0.2-0.4	0.9	--	0.4-2.3	0.6	0.9
Total dissolved solids	197-1,110	1,546	2,144-5,772	598-1,549	1,400	1,318
Electrical conductivity (umhos/cm)	291-1,480	1,700	--	867-2,059	1,702	1,492
Hydrogen ion concentration (pH)	7.7-8.8	8.2	7.4-8.1	7.4-8.5	8.1	7.7
Iron	0-0.04	0.1	ND-0.3	--	ND	0.3
Manganese	ND	ND	ND-0.08	--	ND	0.09
Nitrite	ND	0.1		--	ND	0.1
Total phosphate (as P)	0.02-0.12	0.09		--	0.03	2.7
Discharge (cubic feet per second)	2-855	--	0.33-2.0	6.5-750	--	--

ND=not detected
*Data represent 6 complete plus 18 partial analyses, 1975-88 from three sites.
**Board sampled November 1987.
***Board sampled Ellsworth, Todd, and Brown Barrancas in January 1988.
+Data represent 23 complete analyses and 6 analyses complete except for bicarbonate for 1976-87.

Source: United Water Conservation District

TABLE 41

SURFACE WATER DIVERSIONS WITHIN LOS ANGELES COUNTY

I.D. NUMBER	OWNER NAME	STREAM	LOCATION OF DIVERSION				USE	MAXIMUM DIRECT DIVERSION (CFS)	MAXIMUM ANNUAL USE (ACRE/FEET)	COMMENTS
			TOWNSHIP	RANGE	SECTION	1/4 1/4 SECTION				
000518	Ray & Elizabeth Billet et al	Aliso Creek	04N	12W	16	NW NE	Domestic	1.06	None	
029898*	Santa Clarita Water Company	Santa Clara River Underflow	04N	15W	23	NE NW	Municipal	7		3 diversion points at this location
			04N	15W	22	SE NE		1.5		
			04N	15W	21	NW SE		3.4		
			04N	15W	21	SW SW		7.6		
			04N	15W	18	SE SW		2.7		
			04N	16W	23	SW NE		2.2		3 diversion points at this location
			04N	15W	6	SE SW		2.2		
		Bouquet Canyon Underflow	04N	16W	12	SW SW		1.1		
			04N	16W	14	SW NW		2.7		
								30.4	15000	
029967*	Transit Mixed Concrete Co.	Santa Clara River	04N	14W	16	NW SE	Mining	0.95	322	3 diversion points at this location
030174*	Rio Dulce Ranch Limited Partnership	Agua Dulce Cyn Underflow	04N	14W	3	SE NE	Domestic	1.5	505	

Source: State Water Resources Control Board Division of Water Rights Automated Water Right Information System data base.
Note: Only diversions with maximum direct diversions greater than or approximately equal to 1 cfs are included.
* Unverified claims of the owners on file with the State Water Resources Control Board.

Water Reclamation Plants

There are six water reclamation plants within Ventura County that are described later in the text. Tables 50 through 55 indicate average TDS values for the plants.

Surface Water Diversions Within the Upper Santa Clara River

Table 41, Surface Water Diversions Within Los Angeles County, summarizes the surface water diversions within the Upper Santa Clara River. There is currently one approved application and four applications that have not yet been approved.

Surface Water Diversions Within the Lower Santa Clara River

UWCD is currently permitted to divert surface flows from the Santa Clara River at the Freeman Diversion at a rate of up to 375 cubic feet per second (cfs) (maximum annual diversion of 144,630 AF) to recharge underground aquifers and to provide water to agricultural and municipal/industrial users in the Oxnard Plain. UWCD stores storm water runoff in Lake Piru for controlled releases to recharge groundwater basins within the Santa Clara River bed and through diversions to spreading grounds. UWCD also is permitted to divert up to 80 cfs from Piru Creek for underground storage in the Piru basin. Table 42 summarizes UWCD's diversions.

Table 42

UWCD Surface Water Permitted Diversions (Piru and Freeman)

Permit or License No. (Application)	Diversion to Piru Recharge for UG Storage	Diversion to Saticoy & El Rio for UG Storage	Direct Diversion at Freeman for Ag Use	Total Amount of Permitted Diversion at Freeman (Cols. 3 +4)
L-10173 (12092A)	11,800 AF/Y (80 cfs max)	89,000 AF/Y	15,630 AF/Y (38 cfs permit) (375 cfs max.)	104,630 AF/Y 375 cfs Max.
P-18908 (26434)	NA	30,000 AF/Y	10,000 AF/Y to Direct Diversion (37 cfs)	40,000 AF/Y
Totals	11,800 AFY	119,000 AFY	25,630 AFY	144,630 AFY

Source: United Water Conservation District
Note: Unverified claims of the owners on file with the State Water Resources Control Board.

Other surface water diversions in the UWCD are:

1.) Piru Mutual
2.) Camulos Ranch
3.) Fillmore Irrigation
4.) Southside Improvement
5.) Turner/Richard Ditch
6.) Santa Paula Water Works
7.) California Water Cress
8.) Newhall Land and Farming Company Diversion at Blue Cut
9.) Newhall Land and Farming Company Isola Diversion

Table 43 summarizes smaller diversions which are on file with the State Water Resources Control Board.

Table 43

Surface Water Rights of Record with the State Water Resources Control Board Within the UWCD-Excluding the UWCD

Name	Lic, Per, Appl #	Stream	Date Filed	Water Right
The Nature Conservancy	L # 004995	Hopper Creek	4/15/1926	4,000 gpd (0.01 cfs)
Cal Dept of Fish and Game	L # 010313	Santa Clara River	11/03/1941	4.8 cfs
Pajaro Partners, Inc	L # 024111	Santa Paula Creek	7/7/1972	0.33 cfs
Pajaro Partners, Inc	L # 025297	Santa Paula Creek	3/15/1977	0.33 cfs
Flying A Ranch, A Partnership	P # 026411	Pole Creek	6/10/1980	0.307 cfs
Santa Clara Water And Irr. District	001146	Santa Clara River	1/1/1967	4.01 cfs
Steven A.& Robin Wigley Smith	008038	Santa Paula Creek	1/1/1972	31 AF/yr
Alfred A. and Francis L. Martinez	008909	Pole Creek	8/9/1976	43,200 gpd (0.07 cfs)
Robert Asimow	013360	Hopper Creek	1/5/1989	0.04 cfs
Sanford I. Drucker	013544	Sespe Creek	10/26/1990	0.089 cfs
Sanford I. Drucker	013545	Sespe Creek	10/26/1990	0.089 cfs
Sanford I. Drucker	013546	Sespe Creek	10/26/1990	0.089 cfs
Sanford I. Drucker	013547	Sespe Creek	10/26/1990	0.089 cfs
Sanford I. Drucker	013548	Sespe Creek	10/26/1990	0.089 cfs
Central Coast Production Credit Assn.	013876	Santa Clara River	10/15/1992	1.0 cfs

Source: State Water Resources Control Board
Note: The last ten listed are unverified claims of the owners on file with the State Water Resources Control Board.

Storage Reservoirs Within the Upper Santa Clara River

There are four storage reservoirs in the upper river's study area. The storage reservoirs include Bouquet Canyon Reservoir, Dry Canyon Reservoir, Castaic Lake, and Castaic Lagoon as shown on Figure 21 and described below.

Bouquet Canyon Reservoir

Bouquet Canyon Reservoir is located approximately one mile west of the junction of Bouquet Canyon Road and Spunky Canyon Road, covering 628 acres. The reservoir was completed in March of 1934 and was designed for a storage capacity of 36,500 AF at the spillway elevation of 2995.4 feet. The reservoir is currently owned and operated by the Department of Water and Power (DWP) and is used for water storage.

Dry Canyon Reservoir

Dry Canyon Reservoir is a 1,313 AF storage facility located in Dry Canyon between San Francisquito and Bouquet Canyon, five miles north of Saugus. The reservoir was originally placed in service in 1913 to provide Aqueduct storage and to regulate flows in the First Los Angeles Aqueduct below the San Francisquito Power Plants. Dry Canyon Reservoir was taken out of service in January of 1966 due to unsuccessful attempts to control seepage problems. Currently, Dry Canyon only impounds water during storms.

Castaic Lake

Castaic Lake is a 324,000 acre-foot storage facility created by an earthfill dam across Castaic Creek, it also serves as the terminus of the West Branch of the California Aqueduct. Castaic Lake provides regulation of deliveries to water contractors at varying rates in accordance with their demand schedules to the extent physically and contractually possible. Castaic Lake also provides a reserve of water for use during emergencies (such as interruptions which might occur from a major earthquake on the San Andreas Fault) and is also the site of a major recreational development. Deliveries made from Castaic Lake to CLWA and to the Metropolitan Water District of Southern California (MET) are used in Metropolitan's service area.

Castaic Lagoon

Castaic Lagoon is located directly south of the Castaic Dam. The lagoon was created by DWR to provide more recreation opportunities for visitors. The lagoon has a surface area of 197 acres, 3 miles of shoreline, a maximum depth of 72 feet and a gross capacity of 5,701 acre-feet of water.

Facilities at the lagoon were built and are operated by the Los Angeles County Department of Parks and Recreation, which also operates recreation at Castaic Lake.

Storage Reservoirs Within the Lower Santa Clara River

Pyramid Lake

Pyramid Lake operates as an inflow/outflow reservoir per the 1967 agreement mentioned above. All natural inflow is to be released at the same time and at the rates (as close a possible) that it flowed into the reservoir.

If Lake Piru, located downstream of Pyramid Lake on Piru Creek is spilling and there is continuity of flow to the Pacific Ocean, the Department of Water Resources appropriatively right is exercised and the natural inflow becomes property of the State. At such time as the flow over the Lake Piru spillway ceases and natural inflow can again be stored in Lake Piru, the DWR will again release natural inflow at the time and rate it entered Pyramid Lake.

Lake Piru

Lake Piru is a 88,340 acre-feet storage facility created by a 200 foot high rolled earthfilled embankment (Santa Felicia Dam) across Piru Creek. It was completed on December 5, 1955. When full, Lake Piru covers a surface area of 1,200 acres. Lake Piru provides storage of flood waters used for groundwater replenishment in the Piru, Saticoy and El Rio recharge grounds as well as water for direct uses for agricultural and M&I use on the Oxnard Plain. Lake Piru also has outstanding recreational facilities which include fishing, boating, water skiing, picnicking, and camping opportunities.

Natural inflows are stored and released during the summer and fall with all releases being diverted at UWCD's Freeman Diversion located near Saticoy. The diverted waters are then used for groundwater recharge or for direct delivery via pipelines for agricultural users on the Oxnard Plain.

Imported Water Within the Upper Santa Clara River

CLWA and Antelope Valley-East Kern Water Agency (AVEK) currently import water from the State Water Project (SWP). The long-term water service contracts between the Department of Water Resources (DWR), CLWA and AVEK for water service from the SWP are basic to its construction and operation. In return for water service, the agencies contractually agree to repay a proportional share of SWP's capital and operating costs. Annual entitlements to SWP are subject to availability and should not be considered an indication of how much water a contractor shall or will receive.

Since the original contracts were signed by DWR and local agencies, many have been amended to incorporate mutually desired changes. The amendments may be categorized as follows:

1. Revision of annual Entitlements

2. Enlargement of East Branch of California Aqueduct
3. Purchase of excess capacity
4. Provision to carry over entitlement water
5. Surplus water provisions
6. Unscheduled water provisions
7. Wet-weather provisions

Table 44 gives a brief description of the seven categories listed above. Amendments have been made to CLWA's 30 June 1992 Water Supply Contract in areas 1, 4, and 5. Amendments have been made to AVEK's contract in areas 1 through 5.

CLWA has been importing State Water to the area, since 1980, and has averaged approximately 17,000 acre-feet (AF) annually. Table 45 summarizes annual delivery of State Project Water from 1986 to 1992. Annual entitlements to Project Water for CLWA in 1992 was 54,200 AF. AVEK began importing State Water in 1990 to the Acton area. Total water delivered to Acton in 1990, 1991 and 1992 was 17 AF, 200 AF, and 632 AF respectively. Table 46 summarizes the annual delivery of State Project Water to Acton from 1990 to 1992. Total annual entitlements to imported State Water for AVEK in 1992 was 138,400 AF.

Imported Water Within the Lower Santa Clara River

The Ventura County Flood Control District is the long-term State Water Project (SWP) supply contractor for up to 20,000 acre-feet (AF) of water annually, and administers SWP entitlements for the United Water Conservation District, Casitas Municipal Water District, and the City of Ventura. United Water Conservation District has an entitlement of 5,000 AF of SWP water; the Casitas Municipal Water District has an annual entitlement of 5,000 AF; and the City of Ventura has an annual entitlement of 10,000 AF. United Water Conservation District is the only agency that has taken delivery SWP entitlement water. A total of 4,836 AF in 1990 and 988 AF in 1991 was delivered to Lake Piru via Piru Creek through releases from Pyramid Lake, a SWP reservoir

TABLE 44

AMENDMENTS TO WATER SUPPLY CONTRACTS BY CATEGORY

Category	Description
1. Revision of annual entitlements	Amendments to Table A, "Annual Entitlements," of water supply contracts resulting in changes in amounts of entitlement water
2. Enlargement of East Branch of California Aqueduct	Amendments for allocating (1) costs of the enlargement of the East Branch of the California Aqueduct to contractors in Southern California; and (2) benefits of increased conveyance capacity
3. Purchase of excess capacity	Amendments to allow contractors to purchase extra water service capacity from the California Aqueduct
4. Provisions to carry over entitlement water	Amendments to allow contractors to carry over entitlement water from one year for delivery in the next year, providing certain conditions are met
5. Surplus water provisions	Amendments to allow contractors to take delivery of surplus water; that is, water in excess of that required to meet all demands for entitlement water-water to be stored in reservoirs or to meet other SWP requirements
6. Unscheduled water provisions	Amendments to allow contractors to take delivery of unscheduled water; that is water available for a very short period of time when excess water and SWP pumping capacity are available in the Delta
7. Wet-weather provisions	Amendments to allow contractors to take, under certain conditions, delivery of entitlement water in subsequent years if favorable local weather conditions result in adequate local water supplies

All data was taken from DWR Bulletin 132-92, Table 5-1 page 52

TABLE 45 ANNUAL DELIVERY OF STATE PROJECT WATER BY CASTAIC LAKE WATER AGENCY (1)	
Year	Annual Delivery (AF/YR)
1986	14,719.68
1987	16,285.98
1988	19,032.83
1989	21,618.96
1990	21,733.57
1991	10,440.94
1992	15,447.02
Total	119,278.98

(1) All data is from Castaic Lake Water Production and Connection Fee Reports.

TABLE 46 ANNUAL DELIVERY OF STATE PROJECT WATER TO ACTON BY ANTELOPE VALLEY EAST KERN WATER AGENCY (1)	
Year	Annual Delivery (AF/YR)
1990	17
1991	200
1992	632
Total	849

(1) All data is from AVEK Water Agency records for SWP deliveries.

owned and operated by the California State Department of Water Resources. At no other time has the SWP entitlement been ordered and delivered by the above agencies. Other imports into UWCD are: Calleguas Municipal Water District which imports to the City of Oxnard and the City of Ventura which imports Ventura River Water and Casitas Lake Water to East Ventura.

Institutional Conditions Within the Upper Santa Clara River

In-Stream Flow Requirements

There are no in-stream flow requirements established for the upper Santa Clara River.

Effluent from the Saugus and Valencia WRPs comprise a majority of the total flow in the upper. Santa Clara River during summer months. An analysis based on 40 years of stream data for stream Gage F92-R from the County of Los Angeles and effluent flow data for the Saugus and Valencia WRPs indicated that effluent accounted for about 40 percent of total stream flow during the wet season and approximately 90 percent of total flow during the dry season. The proposed Phase I of the CLWA's reclaimed water project will use approximately 5-15 percent of the total stream flow depending on the season.

Key Surface Water Rights Agreements

Following are summaries of the key surface water rights agreements impacting the Santa Clara River within the area of interest to CLWA's study.

Four key agreements exist on Castaic Creek:

1. Agreement between Department of Water Resources (DWR) and the Newhall Land and Farming Company (Newhall) (1966)

2. Agreement between DWR and United Water Conservation District (United) (1967)

3. Agreement between DWR and County of Los Angeles (County), Newhall, Newhall County Water District (District), and United (1978)

4. Agreement between County, Newhall, District, and United (1978)

The first three agreements provide for collection and release of storm water from the Castaic Creek watershed above Castaic Dam to the downstream users. The second agreement includes the collection and release of storm water from Pyramid Lake. The third agreement supersedes the first two agreements with respect to Castaic Lake operators. The objective of the third agreement is to "conserve local flood waters originating in the watershed above Castaic Dam that would otherwise waste to the Pacific Ocean because they are in excess of the flow rate below which all flows are readily percolated or otherwise beneficially used". To achieve this objective the following requirements have been established:

- If storm water inflow to Castaic Lake is 0 to 100 cubic feet per second (cfs), release approximately equals inflow (plus any releases of stored water requested by the downstream users).
- If storm water inflow to Castaic Lake exceeds 100 cfs, release equals zero if storage capability exists. Water is stored until downstream users request release of the water.
- If downstream users have not requested release of stored water (from storms occurring from October 1 through May 1) by May 1, the water becomes property of DWR.
- Flood flows occurring between May 1 and September 30 will be stored only at the option of DWR and can be requested for release by downstream users within 30 days after storage commenced.
- Downstream users can specify desired flow rate for release of stored water.

- Downstream users are required to pay storage charges for water stored.

The fourth agreement provides for allocation of storm water from Castaic Creek watershed above Castaic Creek Dam to the downstream users. Allocations are listed below:

Entity	***Allocation***
District	2.883%
United	48.00%
County	4.843%
Newhall	44.274%

One agreement address releases from Bouquet Canyon Reservoir. The original agreement, dated 27 April 1932, is between Los Angeles Department of Water and Power, the owner of the reservoir, and United Water Conservation District, successor in interest to Santa Clara Water Conservation District. The agreement, as amended in 1978, provides for the following releases:

- 1 cfs continuously for 6 months during the winter
- 5 cfs continuously for 6 months during the summer

Future Projects on the Upper Santa Clara River

Newhall Ranch

The following future projects described in this section may not be a complete representation of what is currently planned for the upper Santa Clara River. Information on these future projects were provided from either Draft Environmental Impact Reports, brochures, or verbal contact with project representatives.

The Newhall Ranch Company, a division of The Newhall Land and Farming Company is proposing the development of a new town, Newhall Ranch. Newhall Ranch is envisioned as a community of approximately 70,000 people residing in approximately 25,000 homes, within 12,000 acres (nearly 19 square miles). Newhall Ranch is bordered by the L.A./Ventura County line on the west, and Interstate 5 and Route 126 to the east and north. Newhall Ranch is anticipated to include shops, schools, community services, recreation, apartment homes for first time buyers, executive homes, estates and a new wastewater treatment facility.

The proposed wastewater treatment plant will produce high-quality reclaimed water which will be used to irrigate the golf course, parks, and other landscaped areas. The EIR, and a specific plan draft are slated for completion in Fall, 1995.

Tesoro del Valle

Tesoro del Valle, is a proposed master planned development of approximately 3,000 units to be situated on a 1,795-acre site. The development would include various sized single-family homes, as well as multi-family units. A 5-acre commercial site, tow elementary schools, 40 acres of active parks, a firestation, and a swimming and tennis club are also proposed for the project site to support residential uses.

The proposed project location is in the unincorporated portion of Los Angeles County north of the City of Santa Clarita and south of the Angeles National Forest. Castaic Lake is located to the northwest of the site.

Project water consumption will result from urban water usage, irrigation of landscaping, and the onsite water quality lakes. Total consumption would be approximately 2,800 AF per year. The project site would require annexation to both the CLWA and the Valencia Water Company

(VWC), the local retail provider. Based on DMS calculations, this represents 15 percent of the available supply of the VWC and does not exceed its DMS stated supply.

The Chiquita Canyon Landfill Expansion

The proposed project consists of the expansion and ultimate closure of the Chiquita Canyon Landfill located in northwestern Los Angeles County near the City of Santa Clarita, just west of the Interstate 5 (I-5) and State Route 126 (SR-126) junction. The existing landfill is a Class III (municipal solid waste) facility and consists of five currently permitted canons (or waste management units) totaling 154 acres in landfill area. The Chiquita Canyon Landfill is on land owned by the Newhall Land and Farming Company. Laidlaw is the third largest provider of solid waste management services in the nation. The current landfill operation is permitted by the County of Los Angeles under a Conditional Use Permit (CUP No 1809-5) issued on November 24, 1982; existing CUP will expire in November 1997.

The proposed CUP would allow for: a vertical expansion over 85.3 acres of the existing permitted landfill and a 183-acre horizontal expansion of landfill area within the 592 acre lease boundaries to a total of 337± landfill acres, and an increase in daily refuse tonnage from the currently permitted volume of 5,000 tons per day (tpd) to a maximum of 10,000 tpd. Laidlaw has also proposed several resource recovery facilities, in conjunction with the landfill expansion at Chiquita Canyon. These facilities include composting operations, a materials recovery facility and recyclable household hazardous waste drop-off facility and would receive up to 1,060 tpds of recyclable waste for procession and disposal and varying quantities of recyclable household waste. The proposed project would expand the capacity of the existing landfill by 43,588,000 cubic yards (24,422,000 tons) and the landfill life by a minimum of eight years at the proposed maximum daily tonnage of 10,000 tpd.

The Chiquita Canyon Landfill does not have sewage or water provided by a public utility system. Sanitary facilities at the landfill office use a 1,500-gallon septic tank. Portable toilets are provided for other areas of the site. In the future, Laidlaw would either continue its existing practice of using a septic tank for the landfill offices or connect to a public sewer system. The MRF would connect to a public sewer system for 1,000 to 3,000 gallons per day of domestic wastewater disposal. Portable toilets would continue to be used for other areas of the site. The Valencia Wastewater Treatment Plant has a future planned capacity that could accommodate the project's sewage after expansion.

Bottled water is provided to the landfill office for drinking. Water for other purposes, such as construction, fire suppression, and dust control, is obtained from offsite wells owned by the Newhall Land and Farming Company and pumped to the site. These wells supply one 10,000-gallon tank and one 4,000-gallon tank located near the office, on 12,000-gallon tank located near the maintenance shop for shop use and fire suppression, and two 50,000-gallon tanks and one 10,000-gallon water tank used for dust control and landscape irrigation. Increased storage capacity to hold 160,000 gallons of water onsite for dust control and fire suppression would be constructed upon approval of the proposed expansion. Laidlaw proposes to either continue using bottled water for drinking and well water for nonpotable uses or connect to a public water supply. Bottled water would continue to be provided for other for other areas of the site. Well water would continue to be used for nonpotable requirements. Water would also be needed by the proposed MRF for domestic, irrigation, and fire-suppression purposes. Laidlaw has obtained a commitment from the existing lines near the USPS facility to the entrance of the MRF site.

Environmental Controls and Monitoring

In addition to the development features proposed under the landfill expansion plans, the design of the expanded facility would contain specific control and monitoring elements required by Title 14 and Chapter 15, applicable RWQCB order(s), and California regulations implementing Subtitle D criteria for landfill design. In addition, Laidlaw has proposed certain operational procedures to prevent potential environmental effects. These measures are intended to allow for safe operating procedures and protection of public health at both the landfill and the resource recovery facilities. A listing of these features is presented below:

- Groundwater protection system
- Landfill gas recovery and monitoring system
- Drainage and erosion control
- Site observation and maintenance
- Load-screening procedures
- Dust and odor control
- Noise, litter, and vector control
- Emergency response plan

CLWA Reclaimed Water System

A Reclaimed Water System Master Plan was completed for the CLWA's proposed reclaimed water system in September of 1993. There are eight phases to be implemented in the master plan. The phases are prioritized based on the status of the users, the anticipated construction schedule of future users, and the proximity of the users to the Valencia and Saugus Water Reclamation Plants (WRP).

Phase I of CLWA's reclaimed water system will distribute up to 1,700 acre-feet per year of reclaimed water to potential users in the Santa Clarita Valley. The system will be supplied tertiary effluent from the existing Valencia Water Reclamation Plant, which is owned and operated by the Los Angeles County Sanitation Districts. Currently, most of the treated effluent is being discharged into the Santa Clara River.

Potential users of reclaimed water to be served by the system include Six Flags Magic Mountain Amusement Park, golf courses, and miscellaneous irrigation uses. Reclaimed water for the Park will be used for landscape irrigation and hosedown of their rides, patios and walkways. The golf course will use reclaimed water for irrigation purposes.

The master plan for the proposed reclaimed water system will deliver approximately 9,100 acre-feet of water per year for the following uses:

- 3,700 acre-feet for eight golf courses.
- 1,300 acre-feet for parks.
- 1,000 acre-feet for schools.
- 1,100 acre-feet for residential landscaping.
- 500 acre-feet for commercial/industrial landscaping.
- 700 acre-feet for use at a cogeneration plant.
- 500 acre-feet for use at Six Flags Magic Mountain Amusement Park.
- 300 acre-feet for other uses which include cemetery landscaping, freeway landscaping, and Christmas tree farms.

Newhall County Water District Proposed Reclaimed Water Service Concept

NCWD's proposed reclaimed water service concept involves both direct use, primarily for irrigation uses, and discharge to Castaic Lagoon from which downstream groundwater recharge basins would be served. The identified reclaimed water demands are 5,200 AFY of which 2,200 would be for indirect uses, presumably groundwater recharge.

Institutional Conditions Within the Lower Santa Clara River

In-Stream Flow Requirements

A minimum 5 cubic feet per second (cfs) release, or equal to inflow if the inflow is less than 5 cfs, from Santa Felicia Dam (Lake Piru) is required for fish enhancement per State Water Resources Control Board License 10173.

Also, the fish ladder of the Vern Freeman Diversion must meet the following flow requirements as provided by the Army Corps of Engineer 404 permit for the Vern Freeman Diversion. Flows shall be provided to facilitate passage of steelhead smelts moving downstream. The flow release schedule is such that during the period February 15 to May 15, after each time river flow recedes to 415 cfs, a 40 cfs bypass flow through the fish ladder shall be maintained for a 48-hour period. The amount by which this reduces the full diversion capacity of 375 cfs shall not exceed on the average 500 AF/yr using a 10-year base. Variations on this release schedule to facilitate fish passage are permitted only if the Corps of Engineers approves the variation, after consultation with the District and the involved resource agencies, and that the volume of 500 AF/yr on a 10-year average is not exceeded.

Key Surface Water Rights Agreements

United Water Conservation District's key surface water rights agreements are summarized in Table 42 (see page 1-53).

Management Issues

Fox Canyon Groundwater Management Agency. As early as the 1950's upper system wells on the Oxnard Plain were experiencing high chloride levels. By the 1970's the State Board threatened adjudication of the Oxnard Plain. Ventura County and the UWCD proposed physical solutions to the problems on the plain in the form of the Freeman Diversion for additional yield and the Pumping Trough Pipeline for in-lieu deliveries.

California Department of Water Resources, through a groundwater model, determined that the physical solutions were not enough to solve the problems stated above and recommend shifting the pumping from the upper aquifer system to the lower aquifer system, which is determined to have 100 years of supply.

The State Board approved the proposed physical solutions and grants $8 million in the late 1970's for the construction of the certain physical facilities. Also included are granted conditions that allow for the formation of the Fox Canyon Groundwater Management Agency (GMA).

Chapter 1023 of 1982 statutes, which was sought by Ventura County and the United Water Conservation District, was passed by the State Legislature which allowed for the creation of the Fox Canyon GMA. Board members for the newly created GMA are represented by all areas of interest which include: M&I, Agriculture, Ventura County, UWCD, and an at-large seat. The GMA carries out staff functions by either contracting with Ventura County, UWCD, or consultants. The functions of the GMA are to do studies and reports, control extractions in the upper aquifer system (UAS) by the year 2000 and to follow with a plan to control the lower aquifer system (LAS).

The actions of the GMA to date are: a moratorium on new UAS wells, installing meters on wells, implementing rolling cutbacks in low/cost pumpage by 25% over 20 years, and establishing waivers or credits for cutbacks. The cutbacks started in the early 1990's and they go in 5%

increments every five years. Therefore, if pumpage exceeds the cutback amount, there is a tiered penalty structure up to $600/AF.

Future Projects on the Lower Santa Clara River

The following future projects described in this section may not be a complete representation of what is currently planned for the upper Santa Clara River. Information on these future projects were provided from either Draft Environmental Impact Reports, brochures, or verbal contact with project representatives.

S.P Milling - Sycamore Ranch Mining and Reclamation Plant (CUP 4837)

The proposed project involves mining and reclamation of a site new Fillmore known as Sycamore Ranch. The project would help enable continued operations of S.P. Milling's processing plant facility in El Rio. Studies of the Sycamore Ranch site indicate sufficient aggregate reserves (an estimated 16 million tons) to meet anticipated demand for approximately 30 years, subject to the variability of market demand over the life of the project. S.P. Milling estimates that a maximum of 685,000 tons of raw materials would be mined annually at the Sycamore Ranch site. The proposed Mining and Reclamation Plan for Sycamore Ranch (CUP 4837) proposes simultaneous agricultural, mining, and reclamation activities on the project site.

The project site located north of the Santa Clara River at its confluence with Sespe Creek. The site is bounded on the north by Sycamore Road and on the southeast by State Route (SR) 126 (Telegraph Road). Boulder Creek flows through the western portion of the site in northwest-southeast direction; Hardison Ditch (also referred to as the East Fort of Lords Creek) is located on the eastern portion of the site.

Ventura Regional Sanitation District - Toland Road Landfill Expansion

Toland is an existing Class III municipal solid waster landfill permitted to receive 135 tons per day (tpd) of waste. It has a current permitted capacity of 6 million cubic yards or approximately 2.5 million tons of solid waste. VRSD is proposing a vertical and lateral expansion of Toland and an increase in the daily permitted tonnage limit. The proposed project would have the capacity for a maximum 30 million cubic yards or a maximum of 15 million tons of solid waste, and would be permitted to receive a maximum tonnage of 1,500 tpd. Toland would provide 31 years of capacity under the proposed project.

Toland is owned and operated by VRSD. The landfill is located at 3500 North Toland Road in a rural, unincorporated area of Ventura County, California, between the cities of Santa Paula and Fillmore. Access to the site is via State Highway 126 and Toland Road. Toland currently serves the Santa Clara Valley, which includes the cities of Santa Paula and Fillmore, the community of Piru, and other unincorporated areas of the Valley.

The objectives of the proposed project include continued service to the Santa Clara Valley, and to make service available to the cities of Oxnard, Port Hueneme, Ventura, Camarillo, and Ojai, and surrounding unincorporated areas.

Continuation of aggregate mining by CalMat Co., El Rio, California (CUP 4843)

The project proposed by CalMat consists of deepening three existing excavation areas to provide aggregate (sand and gravel) to an existing plant site consisting of a processing plant as well as concrete and asphalt batch plants. The project is located along Vineyard, Los Angeles and Rose Avenues in the El Rio/Del Norte area of Ventura County. All activities would occur outside the Santa Clara River on previously mined farm land, in an existing water storage basin, or on the existing plant site.

The few of the components of the proposed project are as follows:

- Revise excavation depths of the three excavation areas as follows: Rose Avenue excavation area - from 20 feet below the original ground level; Noble excavation area - from 25 feet currently to 60 feet below ground level; Ferro excavation area - from 25 feet currently to 100 feet below ground level.
- Extend the project site life from 1995 to the year 2045.
- Make permit boundary adjustments to the plant site to delete 403.5 acres of land within the Santa Clara River, and add 7.2 acres of the land in the northwest corner of Los Angeles Avenue and Vineyard Avenue for additional stockpile areas.

Groundwater Recharge

In order to further enhance groundwater recharge the UWCD is examining the feasibility of using an existing gravel basin southwest of the Freeman Diversion to store an additional 10,000-15,000 acre-feet per year to be used for groundwater percolation or delivered via pipelines to meet increasing demands. A pilot project, the Fox Canyon Seawater Intrusion Abatement Pilot project, consisting of the conversion of one gravel pit (the Noble Pit) is under construction, and should be operational in early 1995. The pilot project will help UWCD answer questions about the feasibility of a larger project.

One future project, which is being discussed by UWCD, is the addition of recharge basins in the Santa Paula Groundwater Basin. If work were to commence, it would be in the near future.

Santa Paula Basin Litigation

The Santa Paula Groundwater Basin has been in litigation since 1991 over an overdraft issue. The litigation parties are the City of Ventura and the Santa Paula Basin Pumpers Association. Settlement discussions are being facilitated by the UWCD. The litigation in the Santa Paula

Groundwater Basin will ultimately result in a Groundwater Management Plan for the basin. The details of such an effort are still pending and will be determined in the near future.

Groundwater Management Plans

In 1993, Governor Pete Wilson signed a bill into law allowing for local water agencies to develop a plan to preserve and protect their groundwater resources at a local level. The bill, AB 3030, which became Chapter 947 of the 1992 statutes, took effect on January 1, 1993 and is incorporated into the California Water Code under section 10750 et seq.

The City of Fillmore, the Upper Santa Clara River Pumpers Association and the UWCD have proposed a Groundwater Management Plan for the Piru and Fillmore Groundwater Basins. A meeting was held in full at 1994 with the Piru and Fillmore basin pumpers in which a vote to continue with the AB 3030 process was unanimously approved by all in attendance.

In November 1994, UWCD has passed a Resolution of Intention to prepare a Groundwater Management Plan (Resolution 94-18). The Groundwater Management Plan is to be prepared by a working group representing the various interests in the basins. After the groundwater management plan is prepared, copies of that draft plan will be made available to all pumpers and other interested parties for comment, and the UWCD will hold a second hearing to determine whether to adopt the plan. The law requires the final plan be adopted within two years from passage of the Resolution of Intention.

Water Reclamation Plants Within the Upper Santa Clara River

The County Sanitation Districts of Los Angeles County (CSDLAC) owns and operates two wastewater reclamation plants (WRPs) within the CLWA study area: the Saugus WRP and the Valencia WRP. The Saugus WRP has a rated capacity of 6.5 million gallons per day (mgd). The Stage IV Expansion of the Valencia WRP was recently implemented which increased the rated design capacity of the plant to 11 mgd. An additional sedimentation tank is currently under construction. Upon their completion anticipated in late 1995, the rated capacity of the plant will be 12.6 mgd. The water at both plants is treated to tertiary standards and discharged to the Santa Clara River.

To accommodate anticipated growth in the Santa Clarita Valley and to ensure compliance with discharge requirements of the California Regional Water Quality Control Board, Los Angeles Region (RWQCB-LA), CSDLAC is planning to further expand the Valencia WRP. The ultimate capacity of the plant is planned to be 22 mgd bringing the total capacity for both plants to 28.5 mgd. Construction will occur in phased increments. No expansion of the Saugus WRP is planned in the future; increased flows will be treated at the Valencia WRP.

Average daily flow rates for the Saugus WRP during the period from 1984 through 1992 are summarized in Table 47. Monthly average daily flow rates in 1992 ranged from 4.91 mgd in November to 5.69 mgd in February.

Average daily flow rates at the Valencia WRP have been steadily increasing over the past several years (see Table 48). Monthly average daily flow rates in 1992 ranged from 8.16 mgd in January to 9.14 mgd in August.

Combined flows from both the Saugus and the Valencia WRPs averaged 13.98 mgd in 1992. Monthly average daily flows from 1989 to 1992 for both plants combined are listed on Table 49 and depicted on Figure 26.

The projected combined flows of the Valencia and Saugus WRP's to the year 2010 are depicted on Figure 27. Projected growth is based on population projections contained in the Growth Management Plan and Air Quality Management Plan, both prepared by Southern California Association of Governments. Flows are projected to increase by approximately 100 percent by the year 2010. The total combined flow from the Saugus WRP and the Valencia WRP is predicted to be approximately 25 mgd by the year 2010, a portion of which will be diverted for water reclamation purposes.

TABLE 47

SUMMARY OF AVERAGE DAILY FLOW RATES AND TDS
SAUGUS WATER RECLAMATION PLANT

YEAR	AVERAGE DAILY FLOW [1] (MGD)	ANNUAL AVERAGES TDS (MG/L)
1984	5.16	629
1985	5.08	588
1986	5.38	606
1987	4.7	598
1988	4.71	621
1989	4.87	639
1990	5.21	665
1991	5.21	720
1992	5.28	686

(1) Arithmetic mean of monthly average daily flows (n=12). Monthly average daily flow represents the mean of daily total plant effluent flows.

TABLE 48

SUMMARY OF AVERAGE DAILY FLOW RATES AND TDS
VALENCIA WATER RECLAMATION PLANT

YEAR	AVERAGE DAILY FLOW [1] (MGD)	ANNUAL AVERAGES TDS (MG/L)
1984	3.31	679
1985	3.58	655
1986	4.28	662
1987	4.8	661
1988	6.29	698
1989	7.23	758
1990	7.4	794
1991	7.39	830
1992	8.7	772

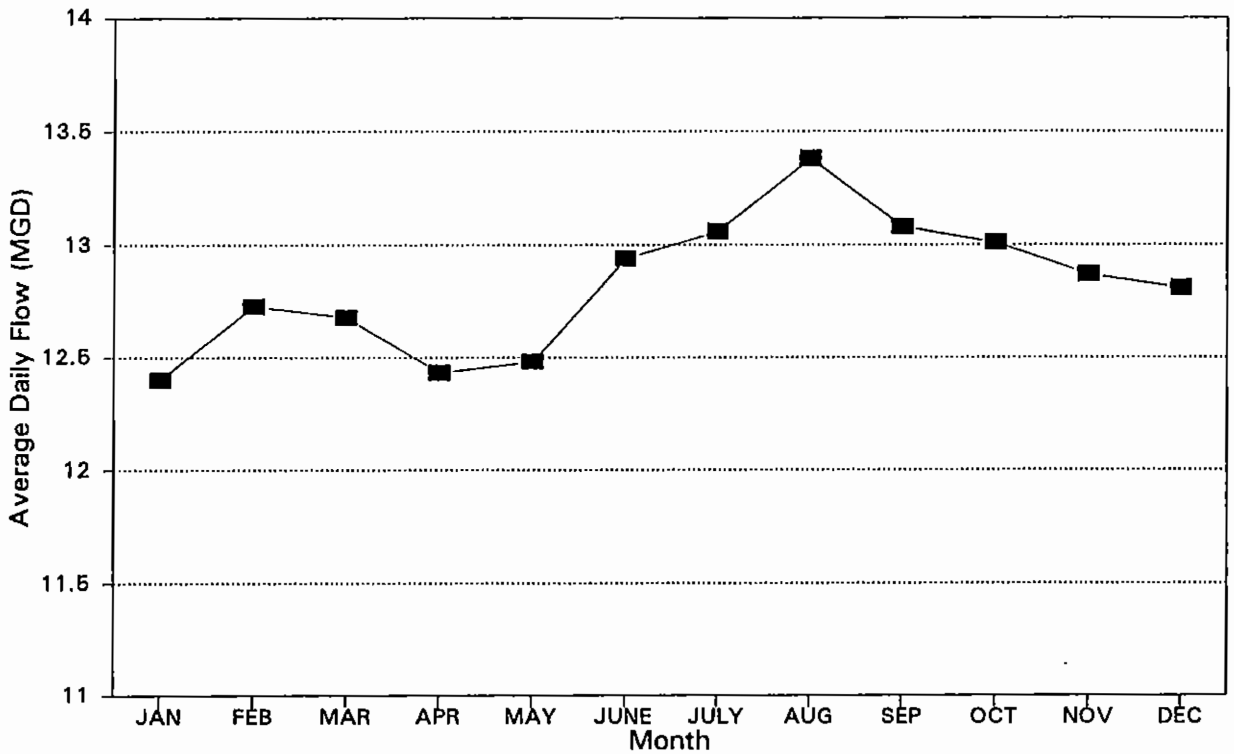
(1) Arithmetic mean of monthly average daily flows (n=12). Monthly average daily flow represents the mean of daily total plant effluent flows.

TABLE 49

VALENCIA WRP & SAUGUS WRP
MONTHLY AVERAGE DAILY FLOW (MGD)

MONTH	1989	1990	1991	1992	AVERAGE
January	11.39	12.21	12.71	13.28	12.40
February	11.67	12.19	12.63	14.42	12.73
March	11.94	12.16	12.42	14.18	12.68
April	12.11	12.18	11.45	13.96	12.43
May	11.84	12.08	12.18	13.80	12.48
June	12.43	12.87	12.62	13.85	12.94
July	12.52	12.92	12.65	14.14	13.06
August	12.72	13.42	12.78	14.61	13.38
September	12.28	12.82	12.98	14.22	13.08
October	12.08	13.21	12.79	13.94	13.01
November	12.21	12.67	12.89	13.72	12.87
December	12.01	12.53	13.04	13.66	12.81
AVERAGE	12.10	12.61	12.60	13.98	12.82

Combined Average Daily Flows for Saugus and Valencia WRPs (1989-1992)

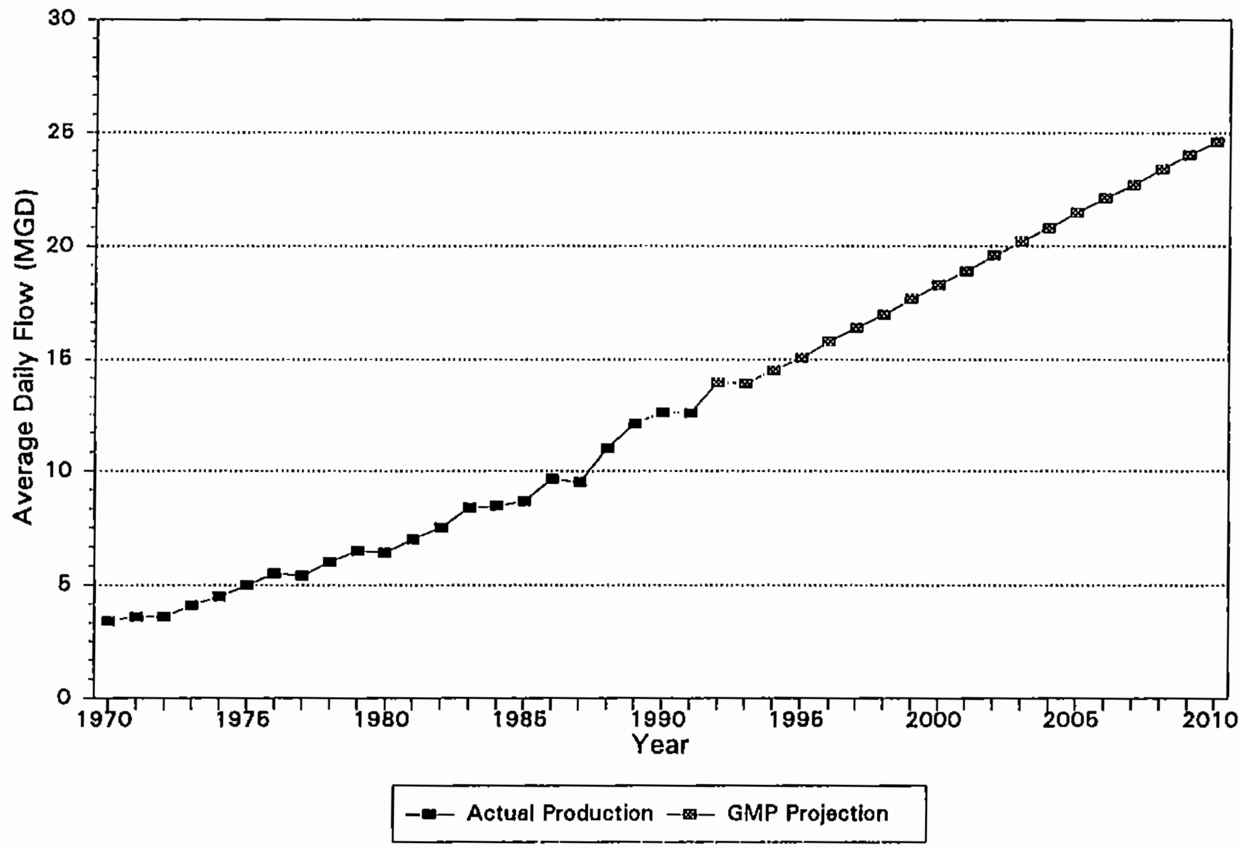


Source: Kennedy/Jenks Consultants

Figure 26

Figure 26

Production of the Valencia and Saugus Water Reclamation Plants



Source: Kennedy/Jenks Consultants

Figure 27

Figure 27

ERRATA SHEET FOR PAGE 1-74 THIRD PARAGRAPH

The Santa Paula WRP discharges secondary treated effluent directly to the Santa Clara River. Treatment consists of primary sedimentation, primary and secondary/biofiltration, secondary clarification, sand filtration, chlorination and dechlorination.

Water Reclamation Plants Within the Lower Santa Clara River

The County Sanitation District of Ventura County (CSDVC) owns and operates six water reclamation plants (WRPs) within the United Water Conservation District: the Piru, Fillmore, Santa Paula, Saticoy, Montalvo, and Ventura WRPs.

The WRP's at Piru, Fillmore, and Montalvo percolate secondary treated effluent into the ground near the Santa Clara River bed. The Saticoy Sanitary District percolates primary treated effluent from what is essentially a community septic tank. In all cases the water receives additional treatment as it percolates through the ground.

The Santa Paula WRP discharges tertiary treated water directly to the Santa Clara River. At some point in the growth of the Santa Paula plant it was determined to be less expensive to perform the additional treatment with additional facilities instead of purchasing land and percolating the water.

At all the treatment plants the water is potentially available for reuse downstream. Essentially, the aquifer is used for both additional treatment and blending and distribution system. Direct reuse for irrigation would require a dual piping system plus either blending or some mechanism for reducing the salt concentration. Currently, the expense of reclaiming the water is too great relative to the cost of using groundwater. For this reason, there are no plans to directly reclaim wastewater from the treatment plants along the lower reaches of the Santa Clara River.
Average yearly flow and average yearly total dissolved solids (TDS) are summarized in Tables 50-55.

Table 50

Effluent from Piru Water Treatment Plant

Year	avg. mgd	Total AF	avg. TDS (mg\L)
1980	0.090*	101*	1300*
1981	0.091*	102*	1300*
1982	0.093*	104*	1300*
1983	0.094*	105*	1300*
1984	0.095*	106*	1300*
1985	0.096*	108*	1300*
1986	0.098*	110*	1300*
1987	0.099*	110*	1300*
1988	0.100*	112*	1300*
1989	0.101	113	1273
1990	0.111	124	1462
1991	0.106	119	1506
1992	0.123	138	1445

Source: County Sanitation District of Ventura County *estimated by CSDVC

Table 51

Effluent from Fillmore Water Treatment Plant

Year	avg. mgd	Total AF	avg. TDS (mg\L)
1980	0.750*	840*	1200*
1981	0.756*	847*	1200*
1982	0.762*	854*	1200*
1983	0.768*	861*	1200*
1984	0.774*	867*	1200*
1985	0.780*	874*	1200*
1986	0.786*	881*	1200*
1987	0.792*	888*	1200*
1988	0.798*	894*	1200*
1989	0.800*	896*	1200*
1990	0.843	945	1306
1991	0.794	890	1255
1992	0.890	997	1143

Source: County Sanitation District of Ventura County *estimated by CSDVC

Table 52

Effluent from Santa Paula Water Treatment Plant

Year	avg. mgd	Total AF	avg. TDS (mg\L)
1980	2.03	2274	1300*
1981	1.88	2110	1300*
1982	2.00	2237	1300*
1983	2.01	2254	1300*
1984	2.03	2272	1300*
1985	2.10	2357	1300*
1986	2.25	2517	1300*
1987	2.09	2346	1300*
1988	2.14	2399	1300*
1989	2.14	2394	1300*
1990	2.05	2294	1300*
1991	2.05*	2297*	1300*
1992	2.03	2272	1353

Source: County Sanitation District of Ventura County *estimated by CSDVC

Table 53

Effluent from Saticoy Water Treatment Plant

Year	avg. mgd	Total AF	avg. TDS (mg\L)
1980	0.120*	135*	1800*
1981	0.120*	135*	1800*
1982	0.120*	135*	1800*
1983	0.120*	135*	1800*
1984	0.120*	135*	1800*
1985	0.120*	135*	1800*
1986	0.120*	135*	1800*
1987	0.120*	135*	1800*
1988	0.124	139	1973
1989	0.126	141	1824
1990	0.113	127	1743
1991	0.086	96	1666
1992	0.116	130	1978

Source: County Sanitation District of Ventura County *estimated by CSDVC

Table 54

Effluent from Montalvo Wastewater Treatment Plant

Year	avg. mgd	Total AF	avg. TDS (mg\L)
1980	0.230*	258*	1700*
1981	0.230*	258*	1700*
1982	0.230*	258*	1700*
1983	0.230*	258*	1700*
1984	0.230*	258*	1700*
1985	0.230*	258*	1700*
1986	0.230*	258*	1700*
1987	0.230*	258*	1700*
1988	0.232	260	1883
1989	0.243	272	1703
1990	0.215	241	1683
1991	0.196	220	1759
1992	0.206	231	1884

Source: County Sanitation District of Ventura County *estimated by CSDVC

Table 55

Effluent from Ventura Wastewater Treatment Plant

Year	avg. mgd	Total AF	avg. TDS (mg\L)
1980	7.34	8,225	1451
1981	8.12	9,099	1330
1982	6.99	7,833	1452
1983	8.24	9,233	1367
1984	8.70	9,749	1398
1985	9.40	10,533	1380
1986	8.64	9,682	1411
1987	9.07	10,163	1309
1988	8.42	9,435	1457
1989	8.45*	9,469*	1424
1990	8.50	9,525	1561
1991	8.50	9,525	1583
1992	7.60	8,516	1569

Source: County Sanitation District of Ventura County *estimated by CSDVC

Water Resources Issues Within the Upper Santa Clara River

Within the upper river, the following water resources issues have been identified: localized areas with high nitrate in groundwater, impacts of rapid urban development (increased runoff and quality of runoff), loss of natural stream characteristics and habitat with development and resultant channelization.

Water Resources Issues Within the Lower Santa Clara River

Within the lower river, three water resources problems have been identified and are either under study or have been studied in an effort to better the management practices to minimize or eradicate the problems. The three problems that have been identified are overdrafting, seawater intrusion, and areas of nitrates in excess of the State drinking water standard of 45 mg/l.

Overdrafting can be loosely defined as the withdrawal of groundwater in excess of recharge. Currently, many of the groundwater basins within the lower river are threatened with the potential of being overdrafted. Special concern has been given to the Santa Paula Basin, currently in litigation over an overdrafting issue, and the Oxnard Plain. The Fox Canyon Groundwater Management Agency (GMA) was formed in part to manage and reverse the overdraft on the Oxnard Plain as well as minimize the seawater intrusion that has been occurring on the plain.

Seawater intrusion is a major concern on the Oxnard Plain in the upper groundwater aquifer system. Intrusion is currently occurring in the Oxnard Aquifer in the vicinities of the United States Naval Construction Battalion Center at Port Hueneme and in the vicinity of the United States Naval Air Station Point Mugu. The two naval bases are located near submarine canyons which are structures that allow the Oxnard aquifer to be in direct connection with freshwater inland and seawater offshore. As historic pumping onshore reduced groundwater levels below sea level, the seawater was able to move onshore through (intrude) the Oxnard aquifer.

High nitrate levels have been identified in several locations within the United Water Conservation District. The areas of concern are in the El Rio area, the Bardsdale area near Fillmore, and an area west of Fillmore on the west side of the Sespe Creek. The areas of concern have nitrate levels which at times exceed the state drinking water standard of 45 mg/l. The sources of nitrate can be from sources such as wastewater collection systems and agricultural practices within the area. The collection systems being used consist of septic tanks and leach lines.

Upper River Findings and Conclusions

Findings

1) The Santa Clara River flows intermittently with the larger flows occurring during and up to several days after precipitation events. The winter runoff is largely natural runoff. During the dry season, low flows in the river are augmented by water releases from Castaic Lake and discharges of treated wastewater from wastewater treatment plants.

2) The Santa Clara River is the major source of recharge for the Acton Valley and Eastern groundwater basins within the 500 year floodplain. Much of this recharge occurs as a result of deep percolation of direct rainfall and by infiltration of surface water runoff along the river bottom and tributaries.

3) Total dissolved solids in the Acton Valley and Eastern groundwater basins average in the range of under 300 mg/L to 1,800 mg/L. Nitrate levels are generally well below drinking water standards in both basins except in localized areas.

4) Currently, there is no adjudication of the groundwater basins located in the Los Angeles County study area. However, individual rights have been established within the basin through historical use.

5.) Groundwater and surface water quality data were found to be minimal and not consistent within Ventura and Los Angles Counties, resulting in data gaps. Consequently, an adequate analysis of water quality is difficult to attain.

Conclusions

1) The Santa Clara River is an important water resource in the region. Groundwater basins within the 500 year floodplain are largely dependent upon continuing recharge from the Santa Clara River.

2) Conjunctive use of surface water and groundwater, such as containment of winter flows in Castaic Lake and subsequent release during the dry season, is an important tool in groundwater management within the flood plain by replenishing groundwater in the basins.

3) The quality of the Santa Clara River water largely controls the quality of the groundwater within the groundwater basins. Thus, protection of Santa Clara River quality is essential for healthy groundwater basins.

4) Continued efforts by agencies are needed to control activities and events in the Santa Clara River Valley through a combination of policy, procedures, and surveillance. This requires continual review of the various new projects occurring in the Santa Clara River Valley that may potentially impact the water resources of the Santa Clara River. Also, coordination among groundwater management agencies and surface water management agencies should be implemented.

Upper River Recommendations

Activities which will preserve and enhance the ability to recharge groundwater supplies within the Santa Clara Valley should be promoted.

Alterations of the river which will significantly adversely impact the natural recharge of underlying aquifers from the river channel should be discourages.

Existing water rights, licenses, and permits for use of Santa Clara River water resources should be fully recognized and respected.

The preservation and enhancement of beneficial uses of water in the Santa Clara River including instream uses, riparian uses, as well as the ability of existing diverters to appropriate surface waters should be promoted.

Activities which serve to preserve the existing river channel and protect existing, adjacent land uses should be promoted.

Activities which serve to preserve the existing river channel and protect existing and future adjacent land uses should be promoted.

A single source permitting system which will streamline and shorten the permitting process for maintenance of both instream and flood protection facilities should be established.

The appropriate treatment of wastewater discharges to maintain beneficial uses should be encouraged.

Activities within the 500 year flood plain that will lead to the degradation of water quality should be discouraged.

Lower River Findings and Conclusions

Findings

1) The Santa Clara River flows intermittently with the larger flows occurring during the winter and lasting up to several days after precipitation events. The winter runoff is largely natural runoff. During the dry season, low flows in the river are augmented by water conservation releases from Lake Piru, and discharges of highly treated wastewater from wastewater treatment plants.

2) The Santa Clara River is the major source of recharge for all the groundwater basins within the 500 year floodplain. Much of this recharge occurs as percolation along the river bottom and tributaries.

3) Groundwater levels are lower during drought cycles and are higher during wet cycles. The Piru and Fillmore groundwater basins normally return to full groundwater levels during extended wet cycles. The Santa Paula Basin recovers more gradually than the Fillmore and Piru Basins. The Montalvo Groundwater Basin returns to full groundwater levels during extended wet cycles but is largely influenced by diversions on the Santa Clara River and artificial recharge. The Oxnard Plain, which is separated from surface recharge by a clay cap, is recharged largely from groundwater underflow from the Montalvo Forebay. Therefore, water levels on the Oxnard Plain generally reflect water levels in the Montalvo Forebay.

4) Natural surface runoff is of higher quality than most groundwater basins and is very low in nitrates. Total dissolved solids in the Piru, Fillmore, Santa Paula, Montalvo, and Oxnard Plain groundwater basins average in the range of under 1,000 mg/L to 1,300 mg/L. Nitrate levels are generally well below drinking water standards in all basins except in localized areas. Sea water intrusion has occurred in the Oxnard Plain in the areas of Port Hueneme and Point Mugu. Artificial recharge in the Montalvo Forebay and pipeline deliveries of Santa Clara River water to farmers are the major projects designed to prevent further sea water intrusion.

5) The Ventura County groundwater basins are managed under a variety of groundwater management authorities. The Piru and Fillmore basins are managed under an AB 3030 Groundwater Management Plan. The Santa Paula Basin is an adjudicated basin. The Montalvo Forebay and the Oxnard Plain are part of the Fox Canyon Ground Water Management Agency. United is the only agency with authority to replenish the groundwater from Santa Clara River flows.

6) Groundwater and surface water quality data were found to be minimal and not consistent within Ventura and Los Angeles Counties resulting in data gaps. Consequently, an adequate analysis of water quality is difficult to attain.

Conclusions

1) The Santa Clara River is the most important water resource in the region. Groundwater basins within the study area are largely dependent upon continuing recharge from the Santa Clara River.

2) Conjunctive use of surface water and groundwater, such as storage of winter flows in Lake Piru and subsequent release during the dry season, is an essential tool in groundwater management within the flood plain by replenishing groundwater in the basins and preventing further degradation of the Oxnard Plain Basin by seawater.

3) The quality of the Santa Clara River water largely controls the quality of the groundwater within the groundwater basins. Thus, protection of the higher quality Santa Clara River flows is essential for continuing healthy groundwater basins.

4) Continued efforts by agencies are needed to control water resource activities and events in the Santa Clara River Valley through a combination of policy, procedures, and surveillance. This requires continual review of the various new projects occurring in the Santa Clara River Valley that may potentially impact the water resources of the Santa Clara River. Also, coordination

among groundwater management agencies and surface water management agencies should be continued.

Lower River Recommendations

Activities which will preserve and enhance the ability to recharge groundwater supplies within the Santa Clara Valley as well as the Oxnard Coastal Plain should be promoted.

Alterations of the river which will significantly adversely impact the natural recharge of underlying aquifers from the river channel should be discouraged.

Existing water rights, licenses, and permits for use of Santa Clara River water resources should be fully recognized and respected.

Use of the river channel to transport supplemental water from various sources for recharge of the Oxnard Plain Aquifers should be given highest priority in the event of conflicting uses.

The preservation and enhancement of beneficial uses of water in the Santa Clara River including instream uses, riparian uses, as well as the ability of existing diverters to appropriate surface waters should be promoted.

Activities which serve to preserve the river channel, within the 25-year protection and encroachment limits set by the Flood Control Subcommittee Report, and protect existing, adjacent land uses should be promoted.

A single source permitting system which will streamline and shorten the permitting process for maintenance of both instream and flood protection facilities should be established.

The appropriate treatment of wastewater discharges to maintain beneficial uses should be encouraged.

Activities within the 500 year flood plain that will lead to the degradation of water quality should be discouraged if actions to prevent degradation of water quality are not implemented or if actions to prevent water quality degradation are not achievable.

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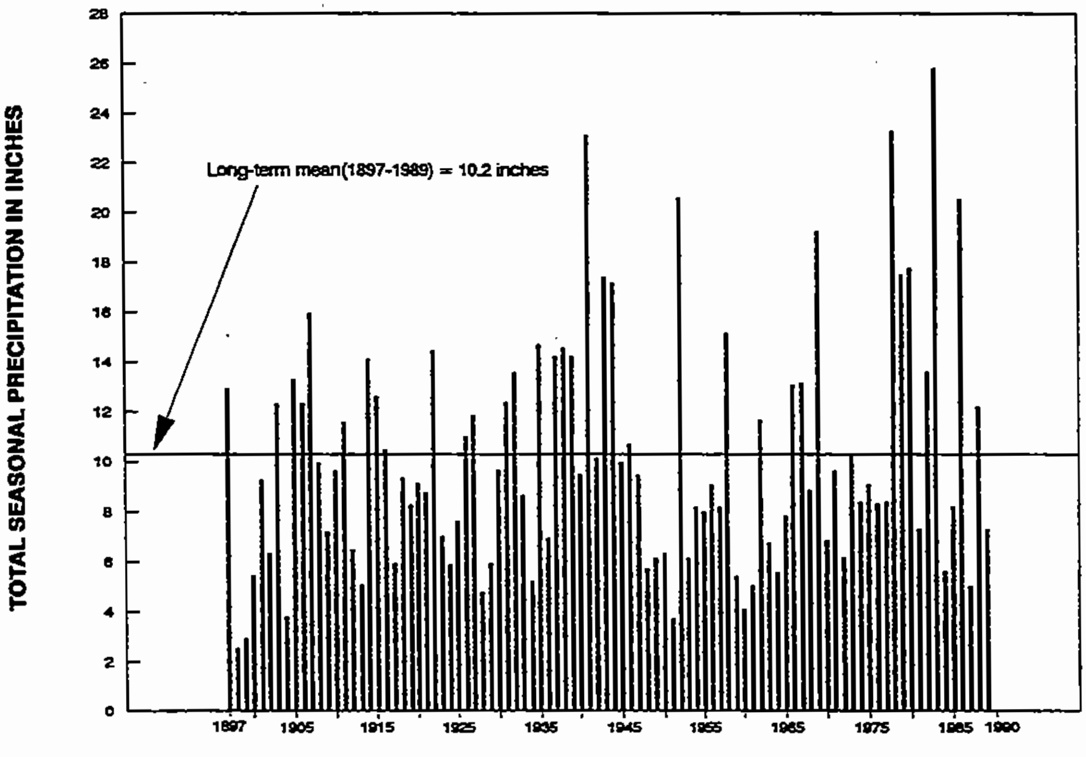
APPENDIX A

Precipitation Information for the Upper Santa Clara River

FIGURE 1 -SEASONAL PRECIPITATION

AT ACTON

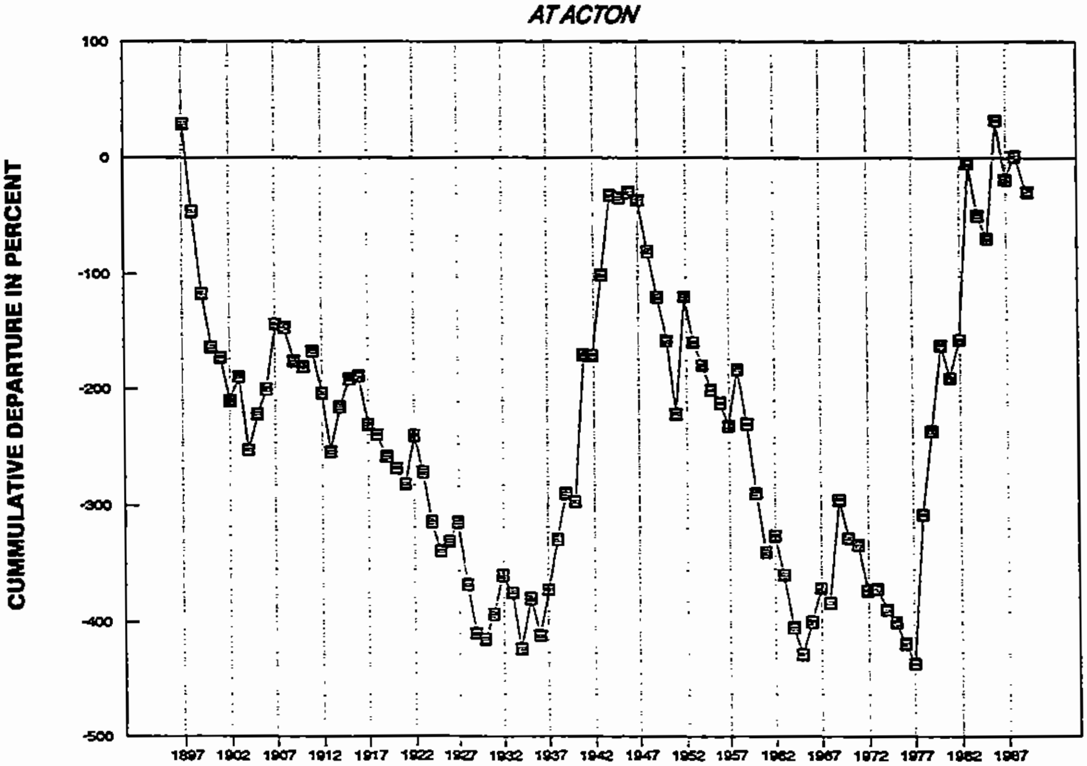


Station: Acton - Escondido Canyon

Elevation: 2,960 feet

FIGURE 2 -CUMULATIVE DEPARTURE

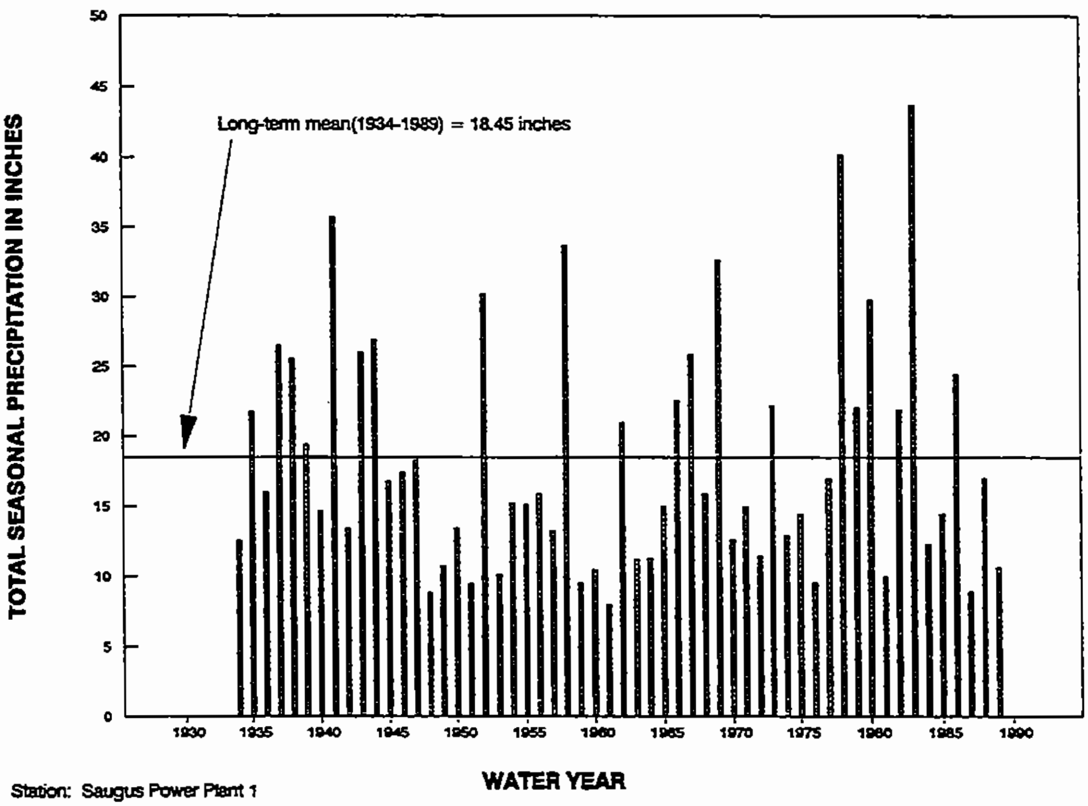
AT ACTON



Source: Investigation of Water Quality and Beneficial Uses, Upper Santa Clara River Hydrologic Area by DWR Dated 1993.

FIGURE 3 -SEASONAL PRECIPITATION

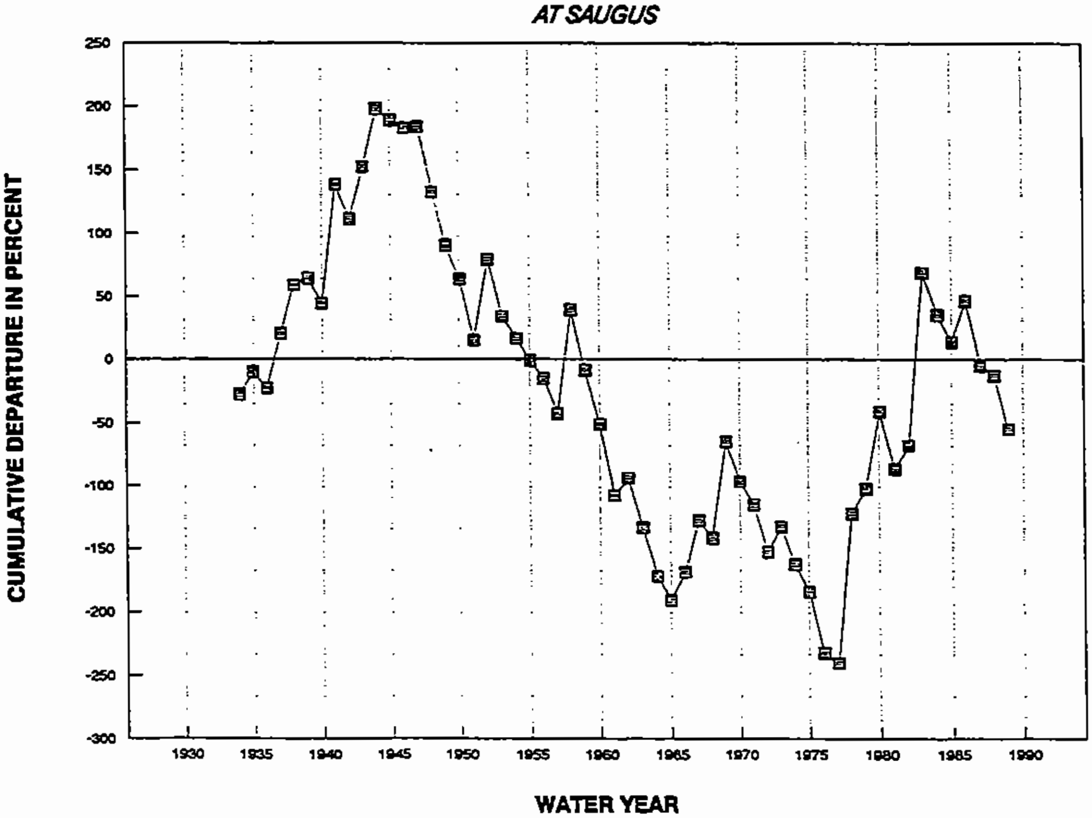
AT SAUGUS



Station: Saugus Power Plant 1
Elevation: 2,105 feet

FIGURE 4 -CUMULATIVE DEPARTURE

AT SAUGUS

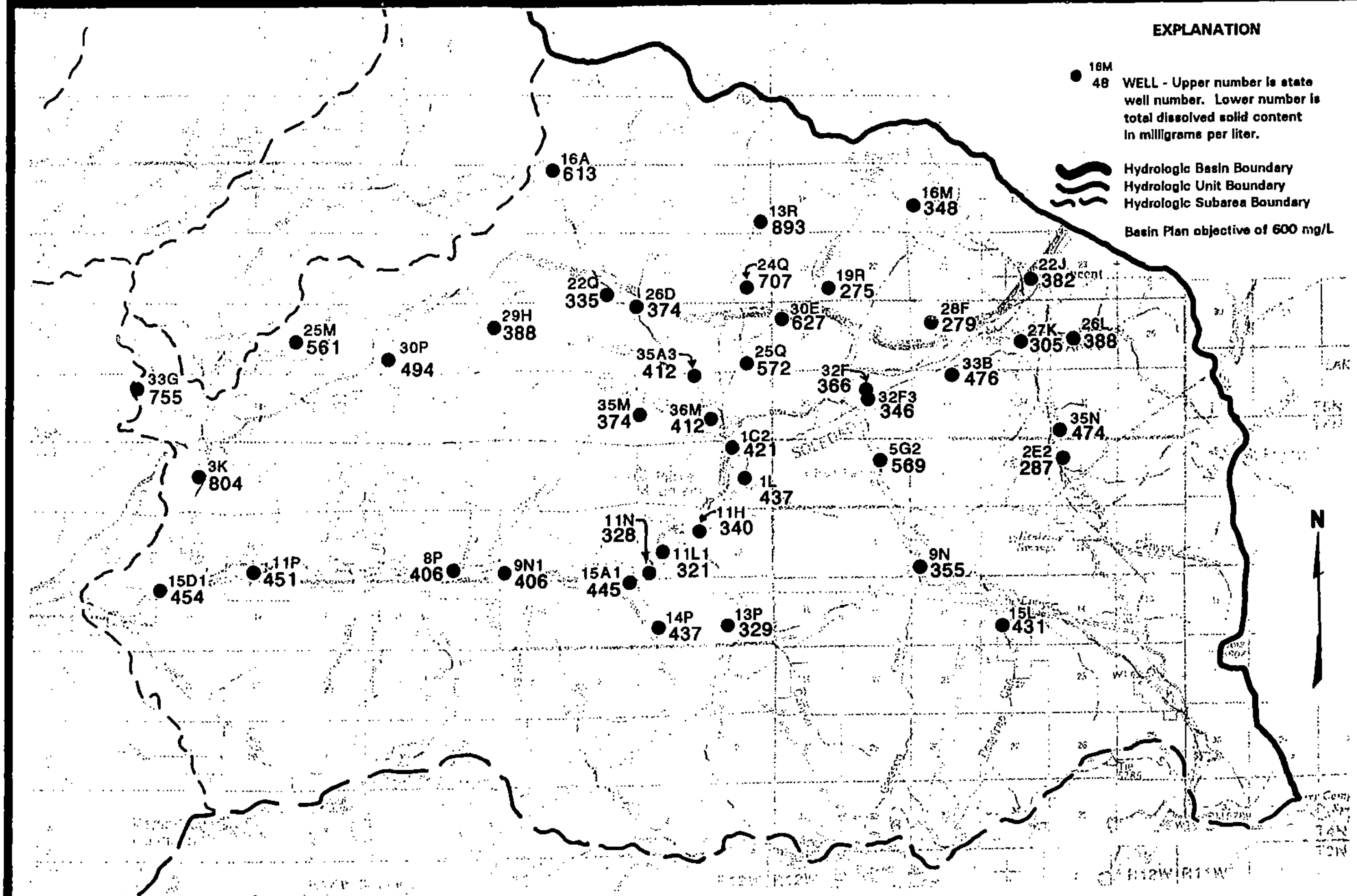


Source: Investigation of Water Quality and Beneficial Uses, Upper Santa Clara River Hydrologic Area by DWR Dated 1993.

APPENDIX B

Well Water Quality Information for the Acton Groundwater Basin

FIGURE 5 - CONCENTRATIONS OF TOTAL DISSOLVED SOLIDS IN WELL WATERS, 1989
ACTON SUBAREA



Department of Water Resources, Southern District

FIGURE 6 - CONCENTRATIONS OF SULFATE IN WELL WATERS, 1989
ACTON SUBAREA

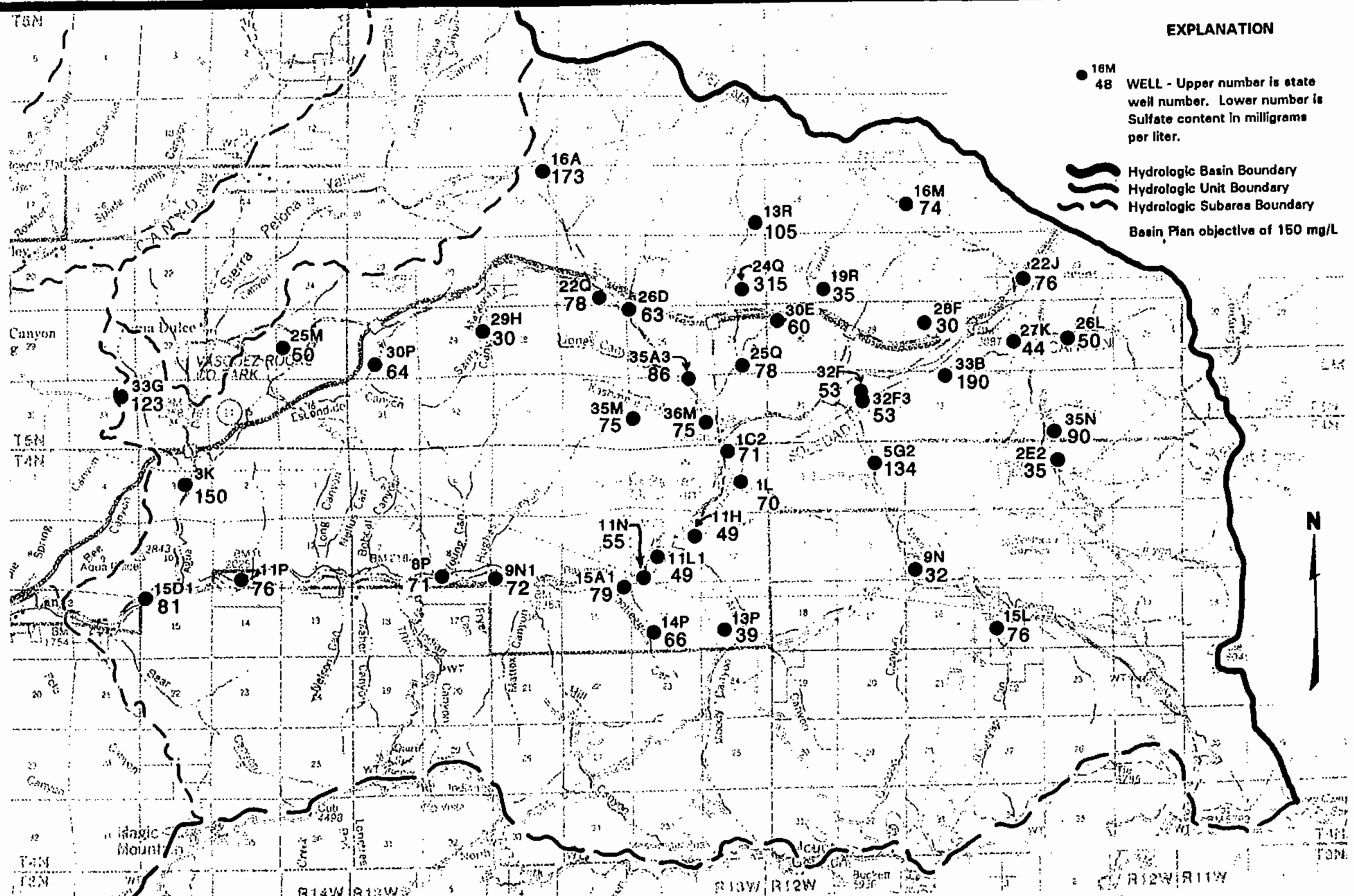
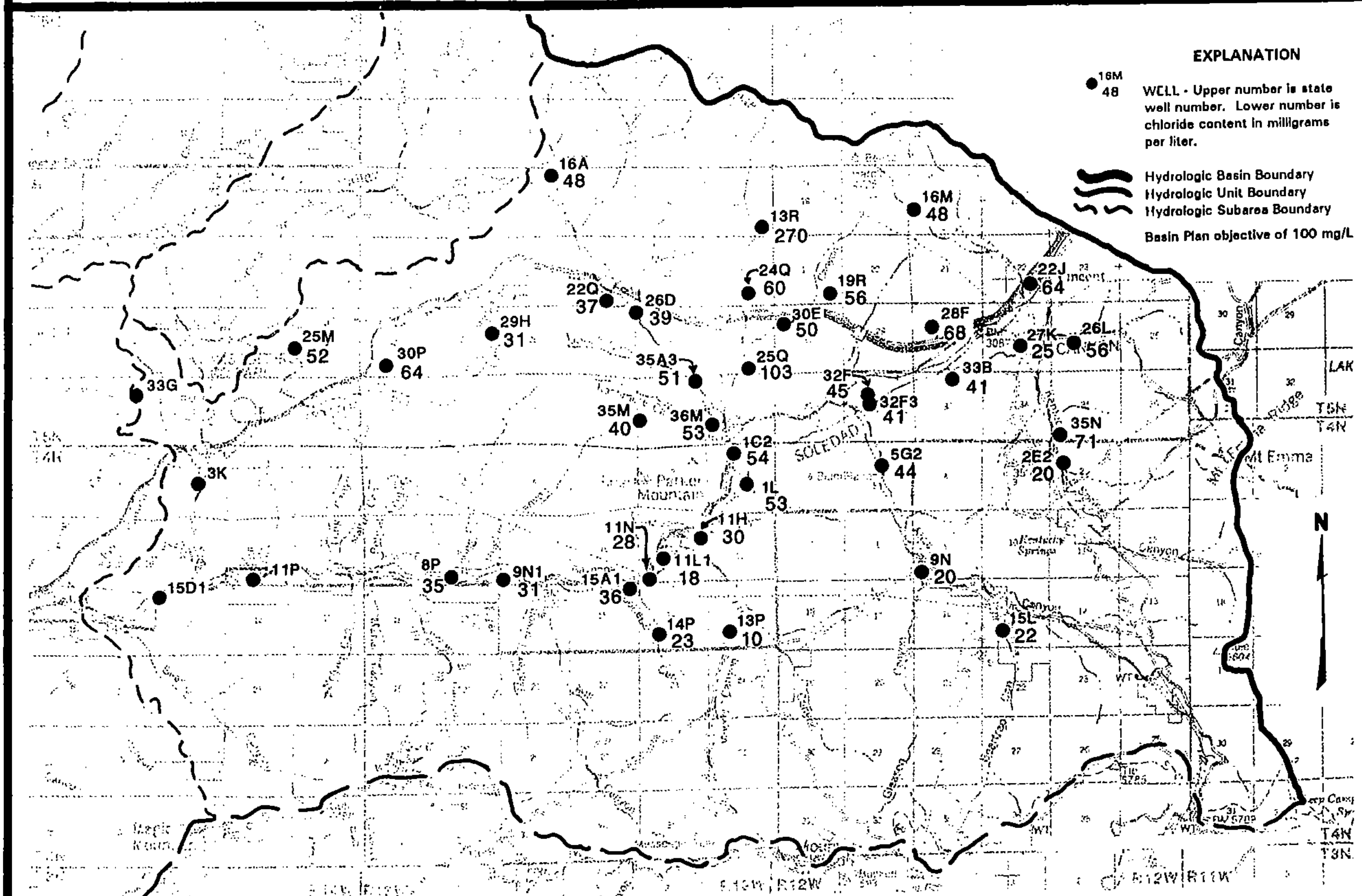


FIGURE 7 - CONCENTRATIONS OF CHLORIDE IN WELL WATERS, 1989
ACTON SUBAREA



Department of Water Resources, Southern District

FIGURE 8 - CONCENTRATIONS OF NITRATE IN WELL WATERS, 1989
ACTON SUBAREA

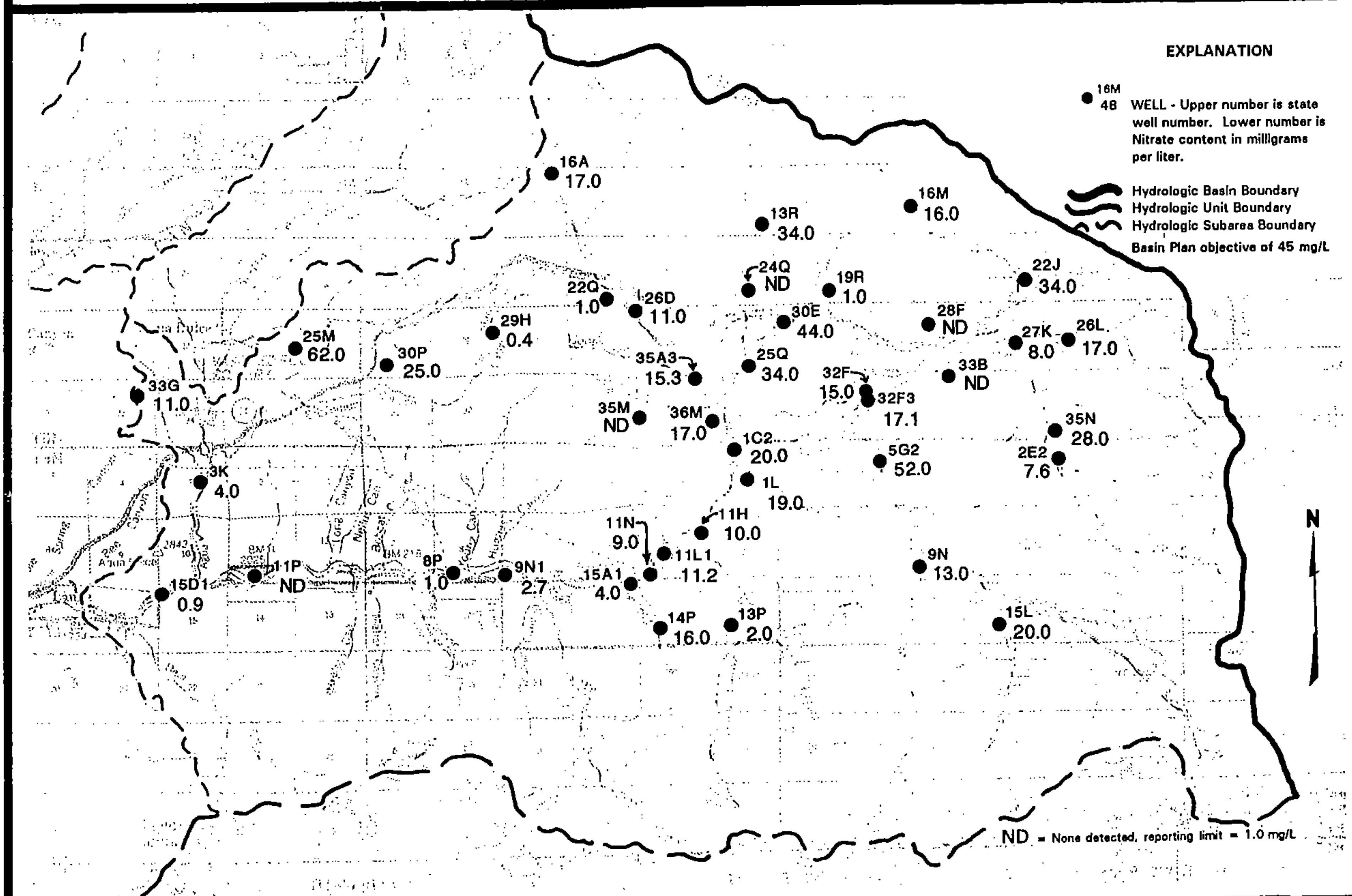
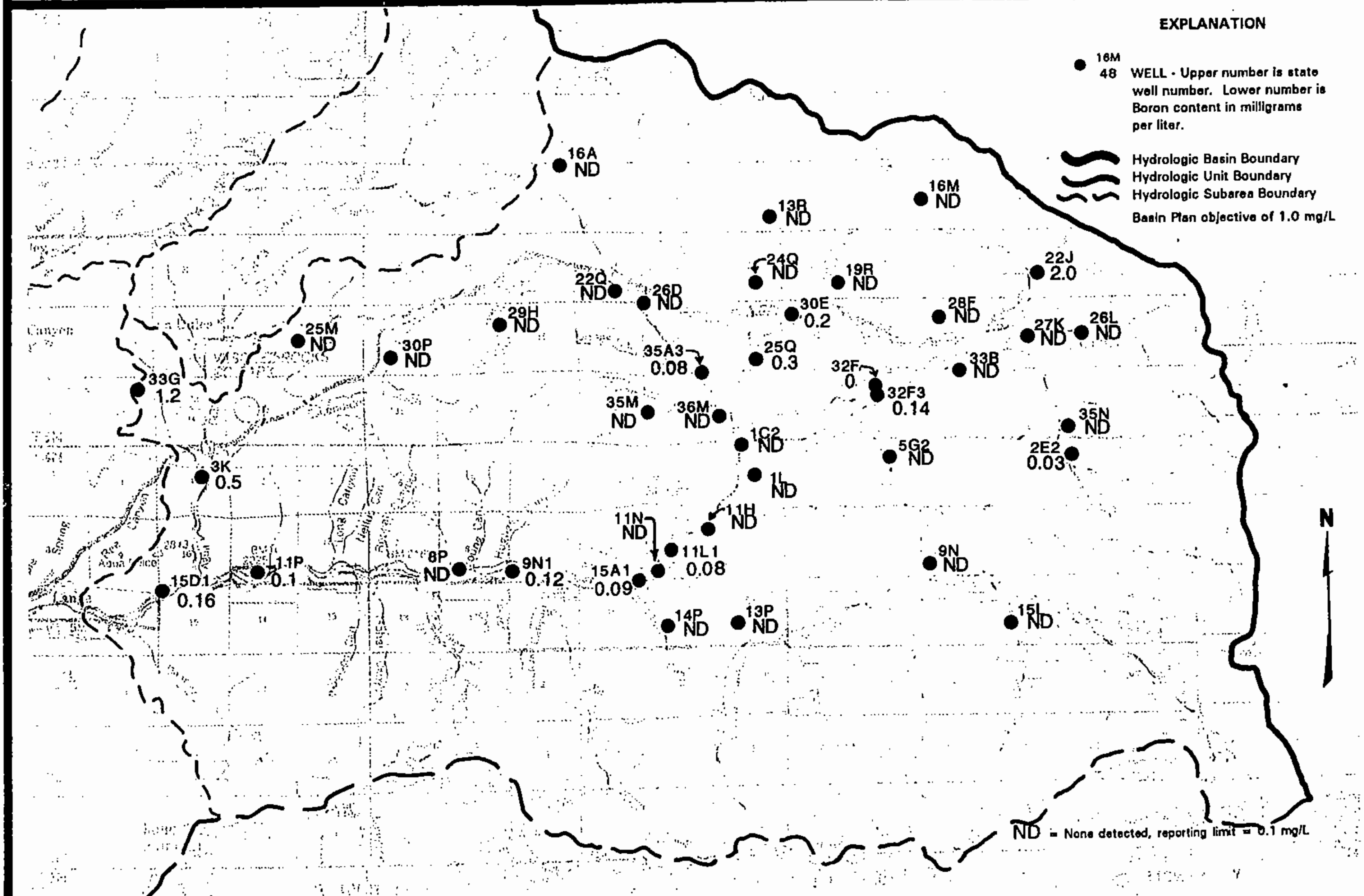
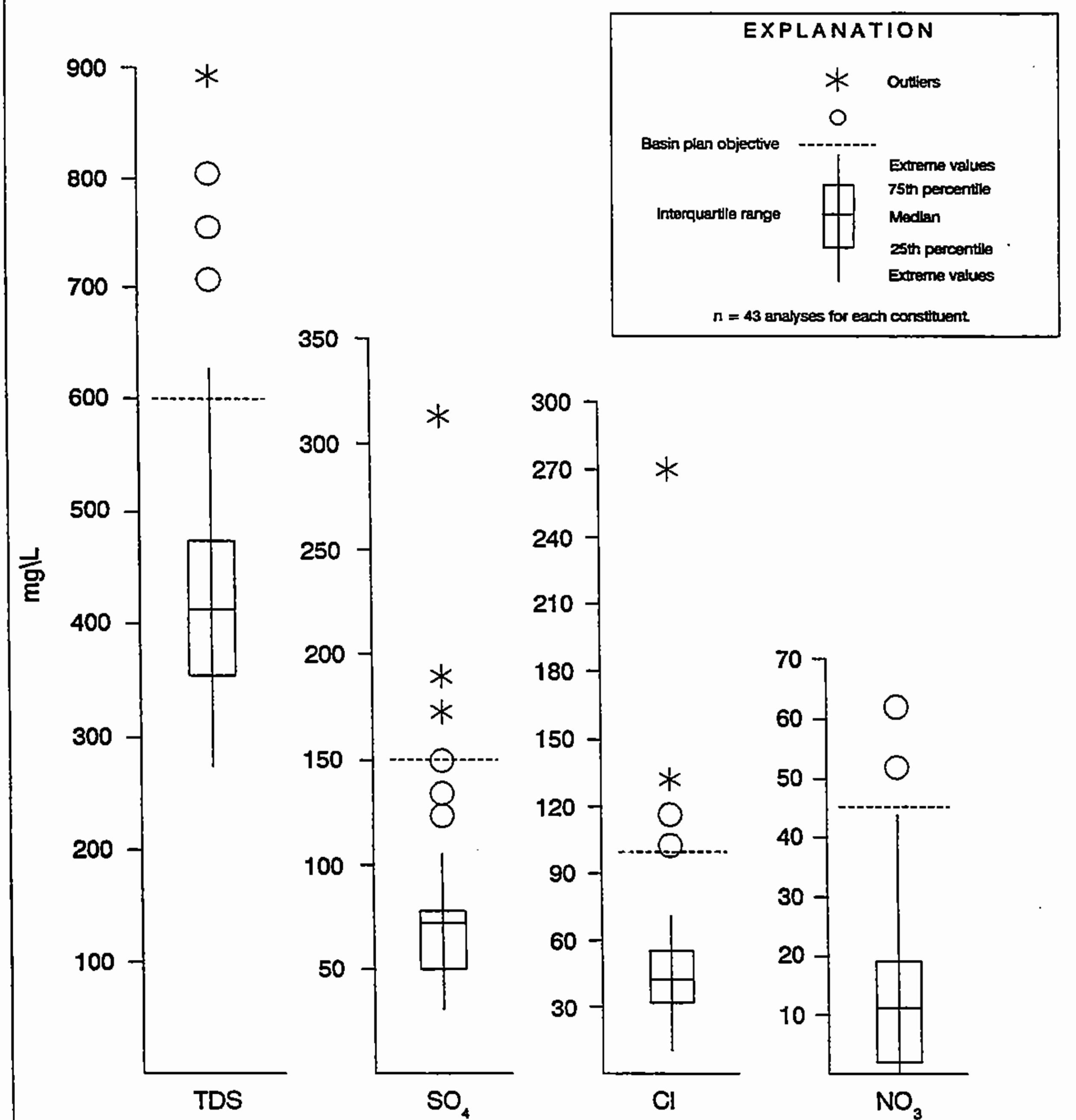


FIGURE 9 - CONCENTRATIONS OF BORON IN WELL WATERS, 1989
ACTON SUBAREA



Department of Water Resources, Southern District

FIGURE 11 - Schematic Box Plots of Total Dissolved Solids, Sulfate, Chloride, and Nitrate Concentrations in Well Waters in Acton Subarea, 1989 Data

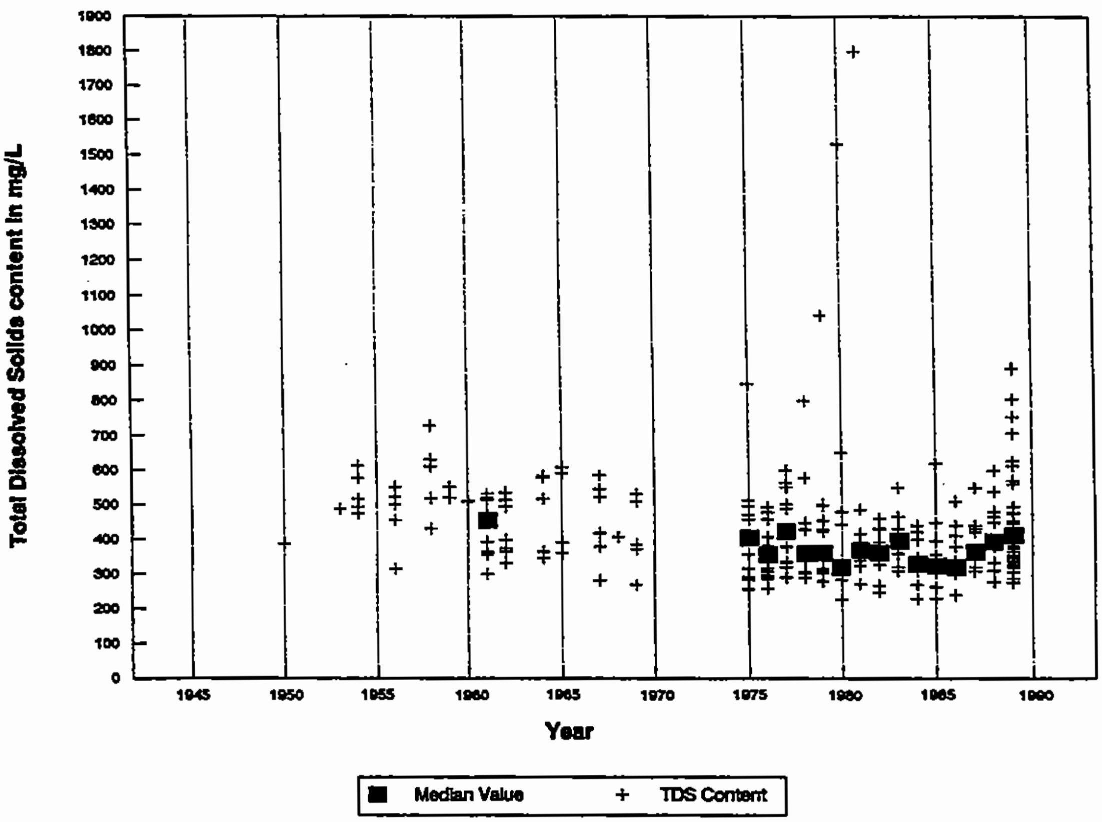


Vertical lines extend to extreme values within 1.5 times the interquartile range. Outliers are shown as ○ when within 1.5 to 3.0 times the interquartile range and as ✳ for values greater than 3 times the interquartile range. (Kleiner & Graedel, 1980).

Source: Investigation of Water Quality and Beneficial Uses, Upper Santa Clara River Hydrologic Area by DWR Dated 1993.

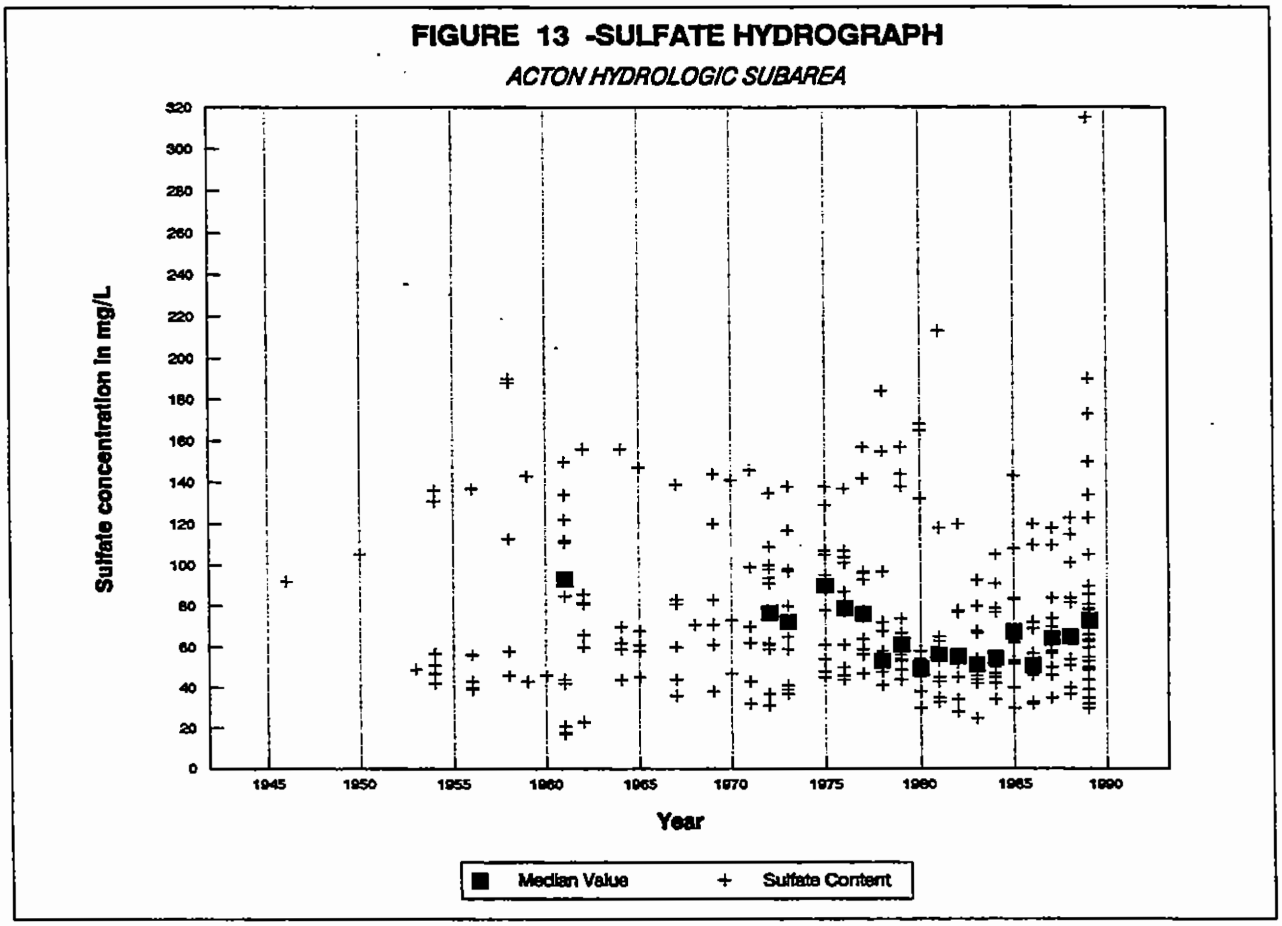
FIGURE 12 -TDS HYDROGRAPH

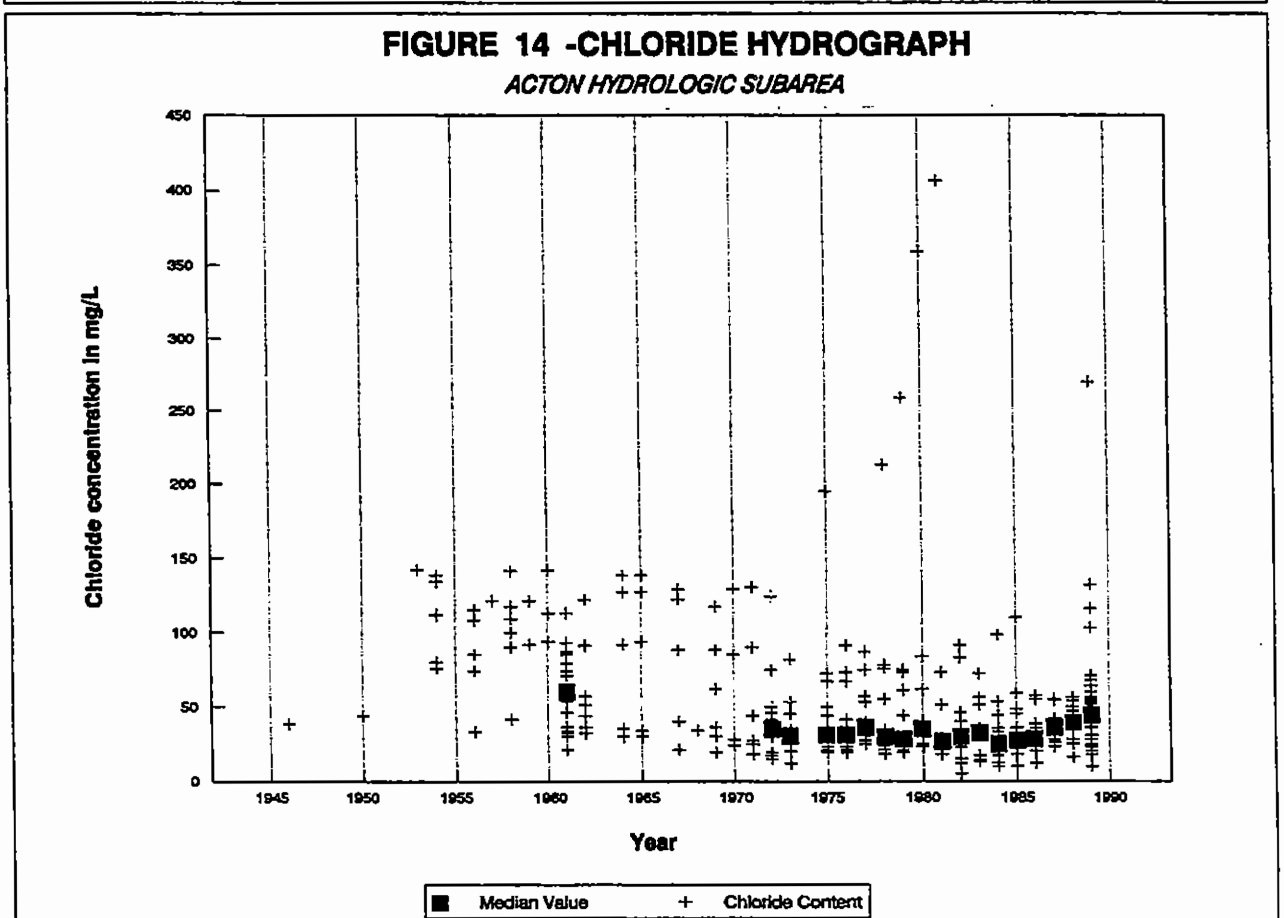
ACTON HYDROLOGIC SUBAREA



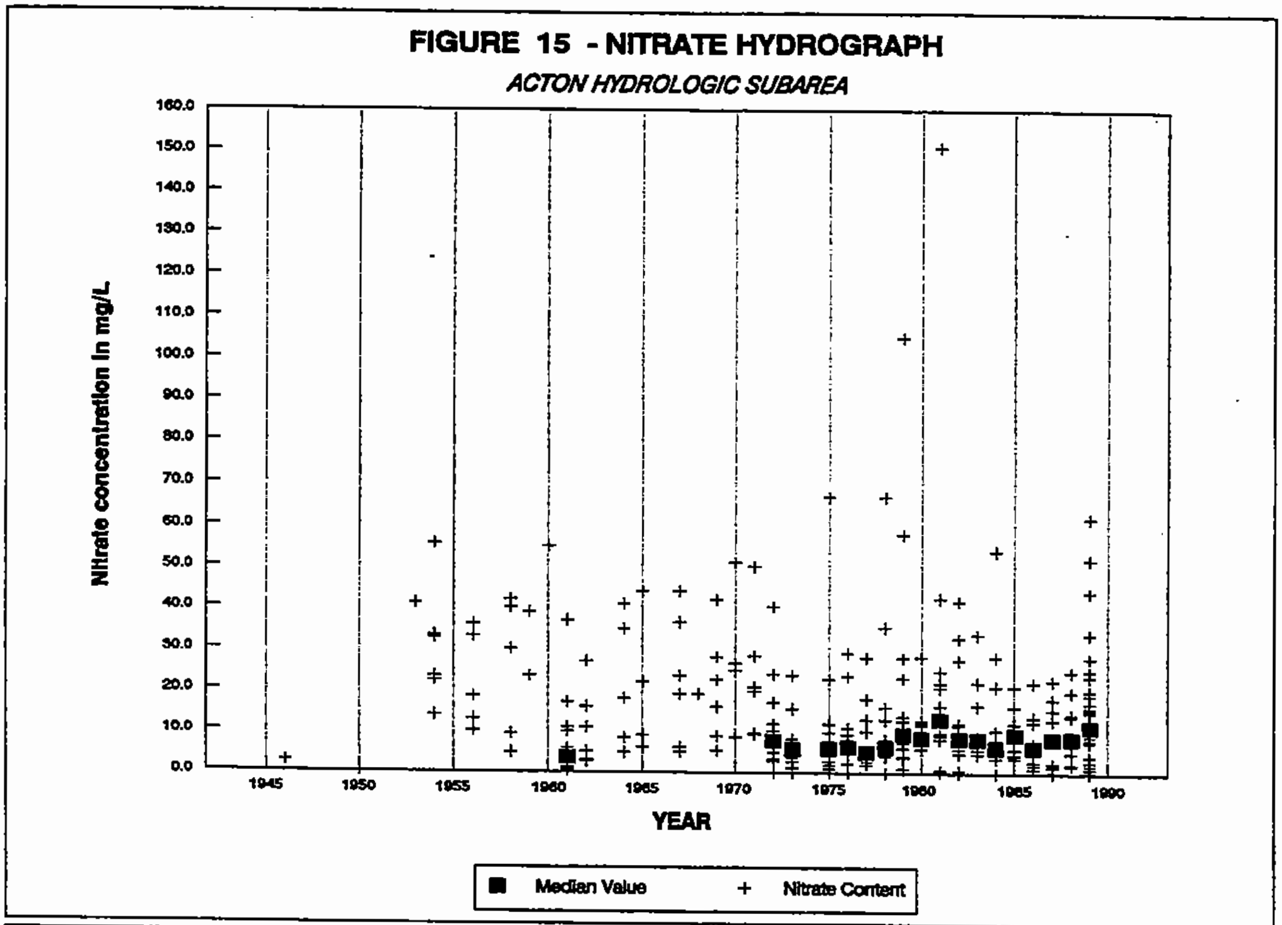
Source: Investigation of Water Quality and Beneficial Uses, Upper Santa Clara River Hydrologic Area by DWR Dated 1993.

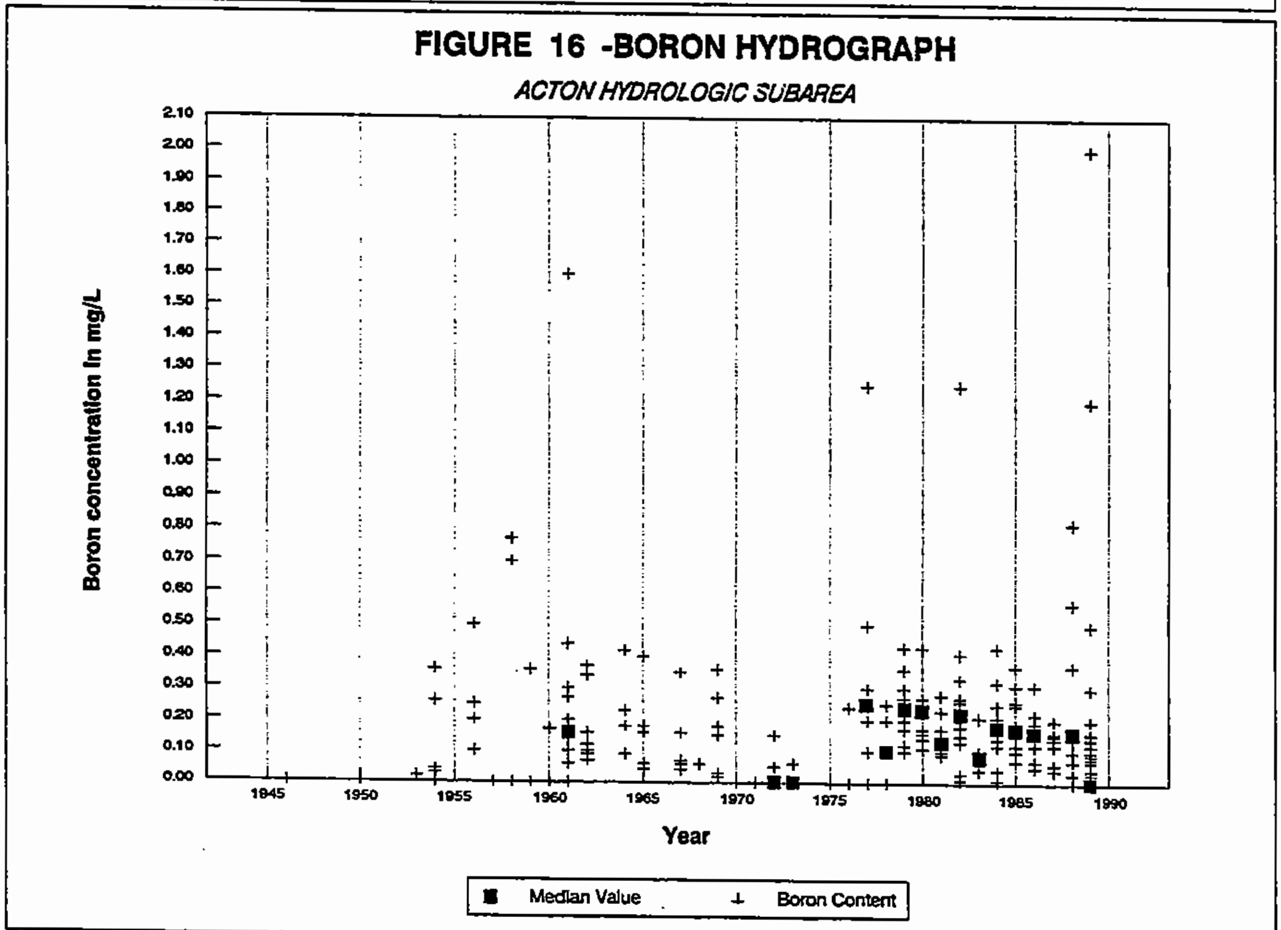
Appendix B



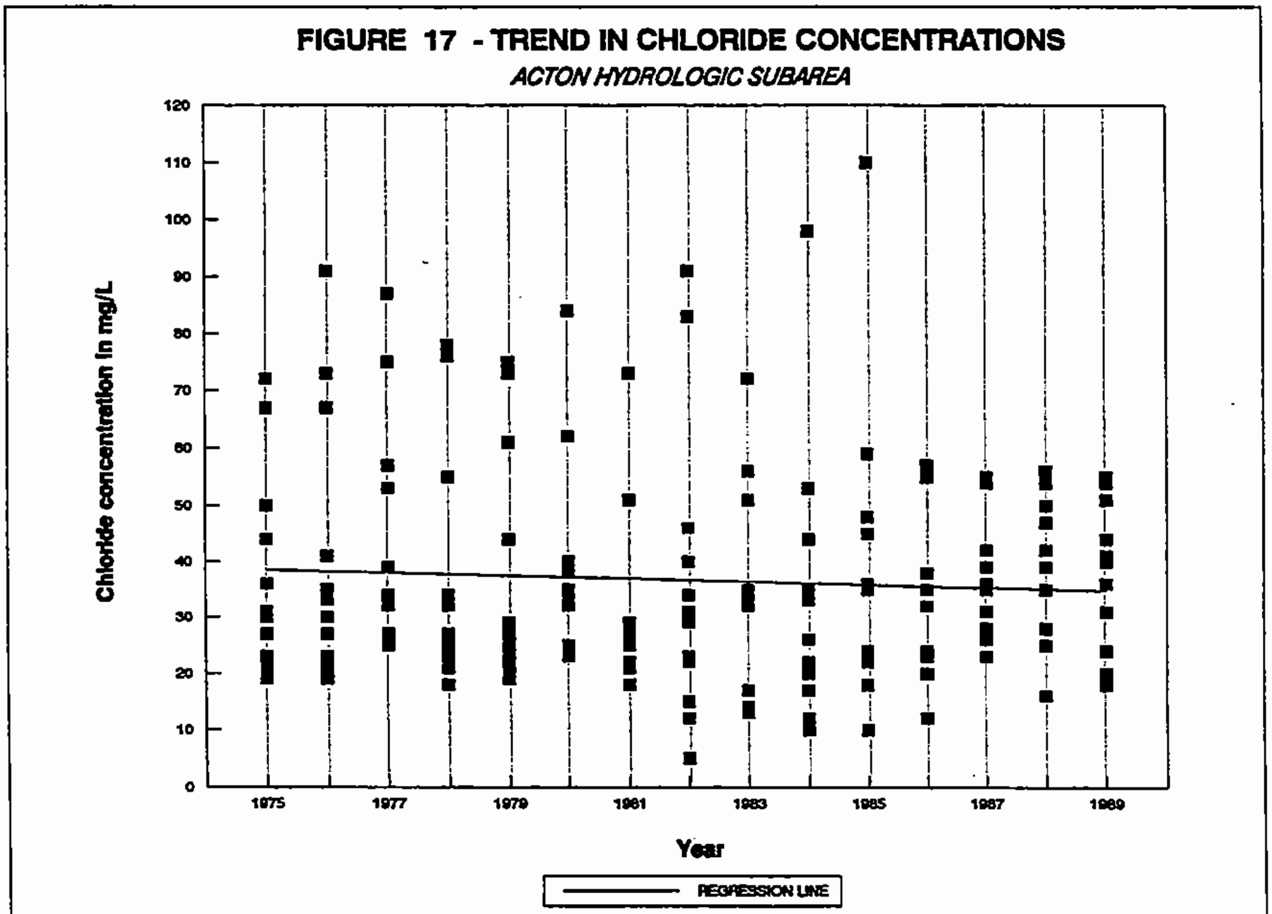


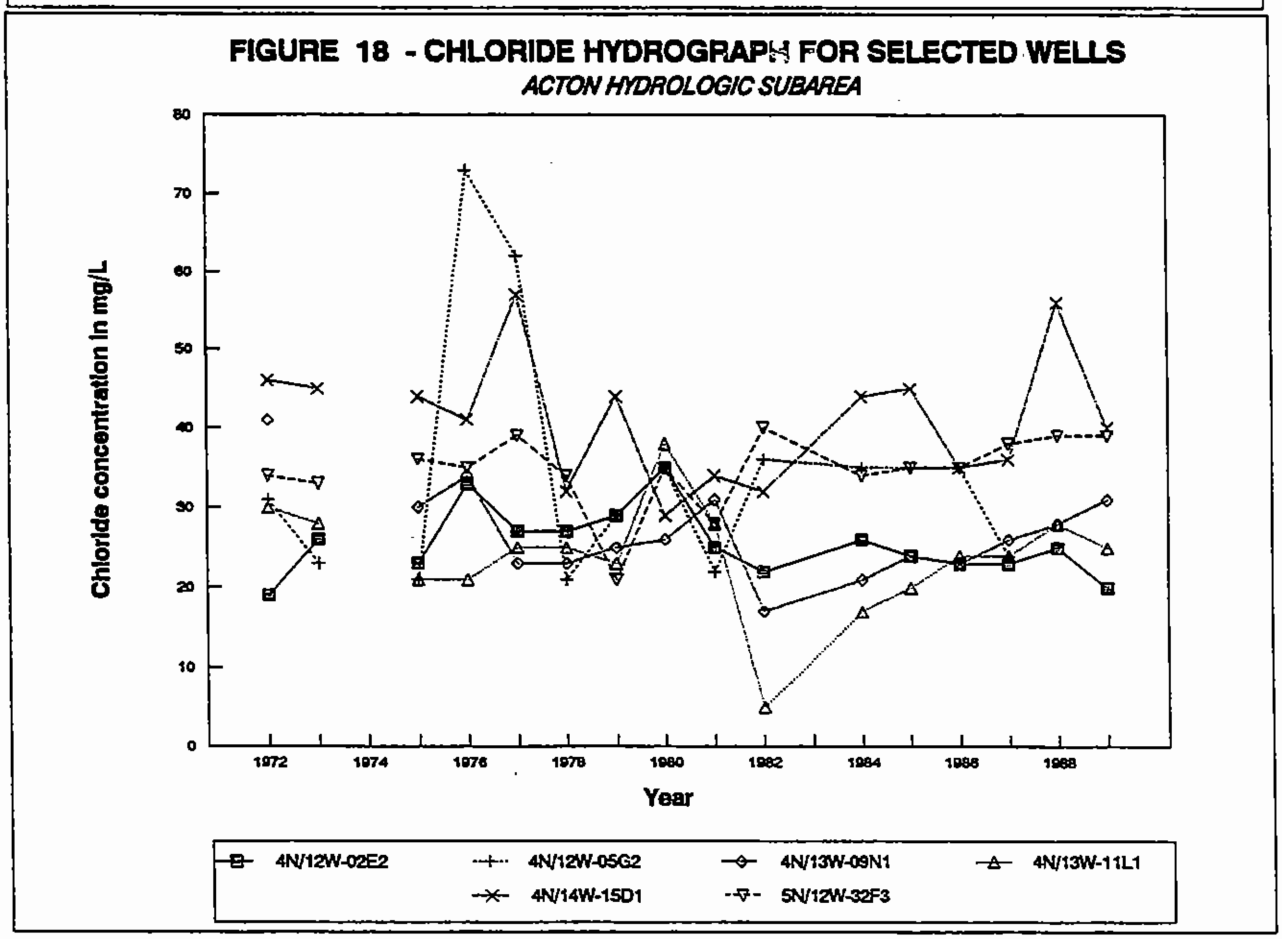
Source: Investigation of Water Quality and Beneficial Uses, Upper Santa Clara River Hydrologic Area by DWR Dated 1993.





Source: Investigation of Water Quality and Beneficial Uses, Upper Santa Clara River Hydrologic Area by DWR Dated 1993.



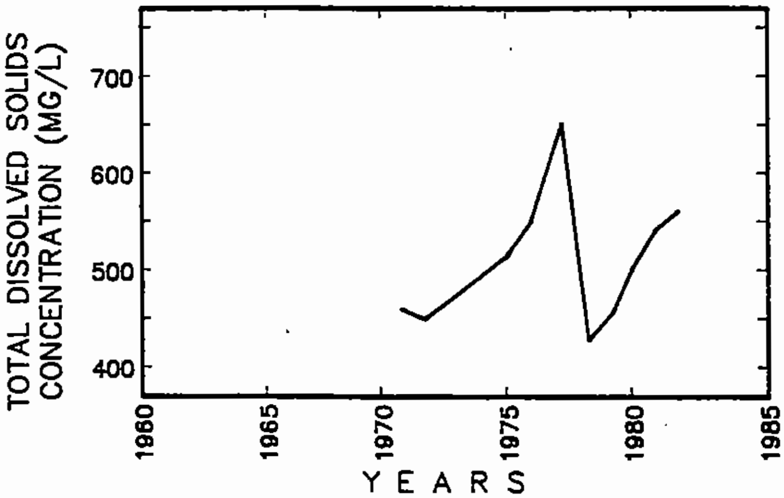


Source: Investigation of Water Quality and Beneficial Uses, Upper Santa Clara River Hydrologic Area by DWR Dated 1993.

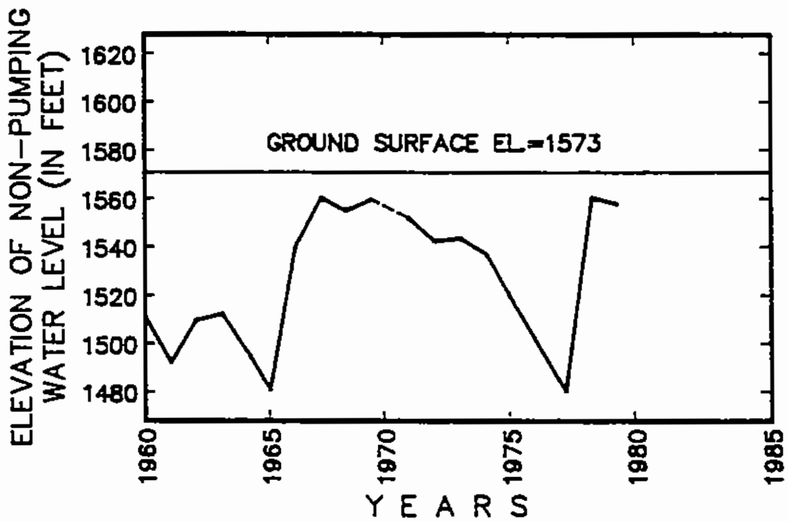
APPENDIX C

Hydrographs/TDS Graphs for Wells in the Alluvial and Saugus Aquifers of the Eastern Groundwater Basin

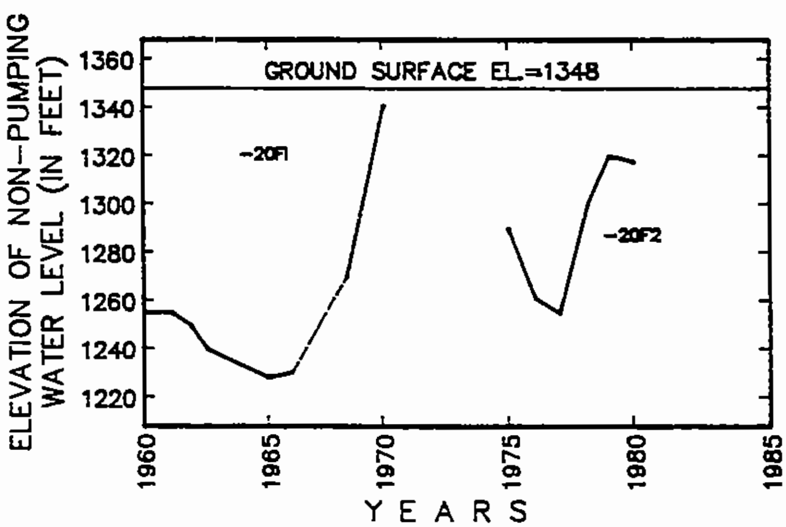
LOCATION: UPPER REACH, SANTA CLARA RIVER



WELL NO. 4N/15W-14J1 (ALLUVIUM)
DEPTH = 117 FT.
PERFORATIONS = UNKNOWN



WELL NO. 4N/15W-13P1 (ALLUVIUM)
DEPTH = 150 FT.
PERFORATIONS = UNKNOWN



WELL NOS. 4N/20F1, -20F2 (ALLUVIUM)
DEPTH = 175 FT.
PERFORATIONS = 160-170(?) FT.

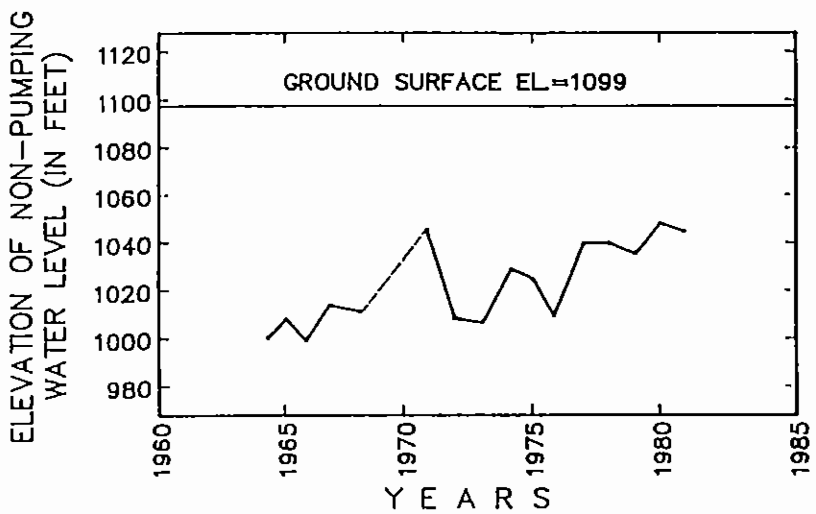
RICHARD C. SLADE
CONSULTING GROUNDWATER GEOLOGIST

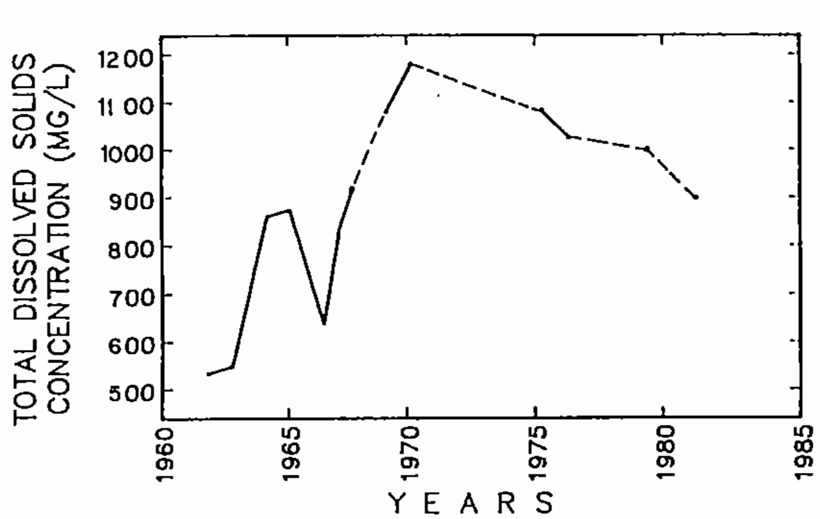
HYDROGRAPHS AND TDS GRAPHS

JOB NO. S8605 JULY 1986 PLATE 6.1

LOCATION: MIDDLE REACH, SANTA CLARA RIVER

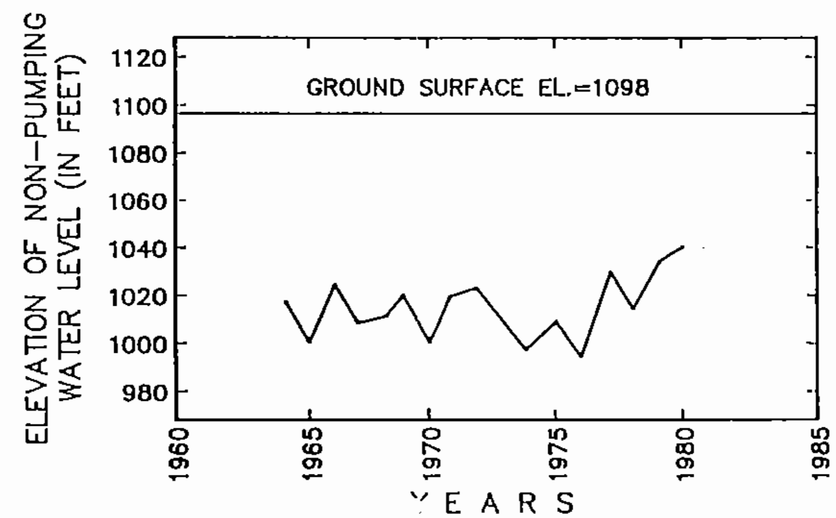
VALENCIA WATER CO.
WELL NO. 158 (SAUGUS FM)
4N/16W-17J1
DEPTH = 1608 FT.
PERFORATION = 740-1600 FT.

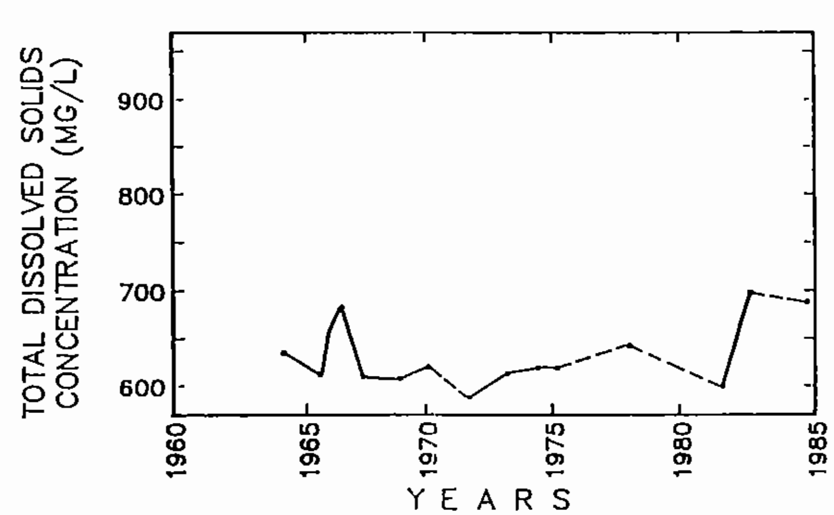




LOCATION: MIDDLE REACH, SANTA CLARA RIVER

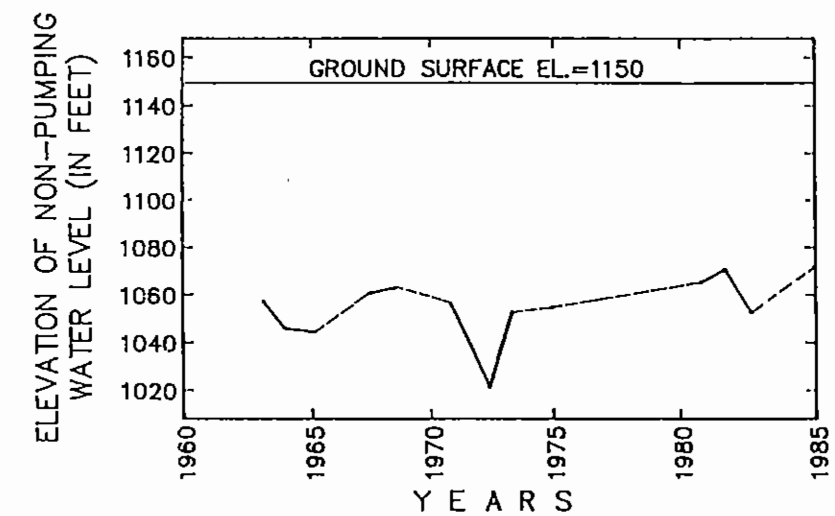
VALENCIA WATER CO.
WELL NO. 160 (SAUGUS FM)
4N/16W-21D1
DEPTH = 2000 FT.
PERFORATION = 950-2000 FT.

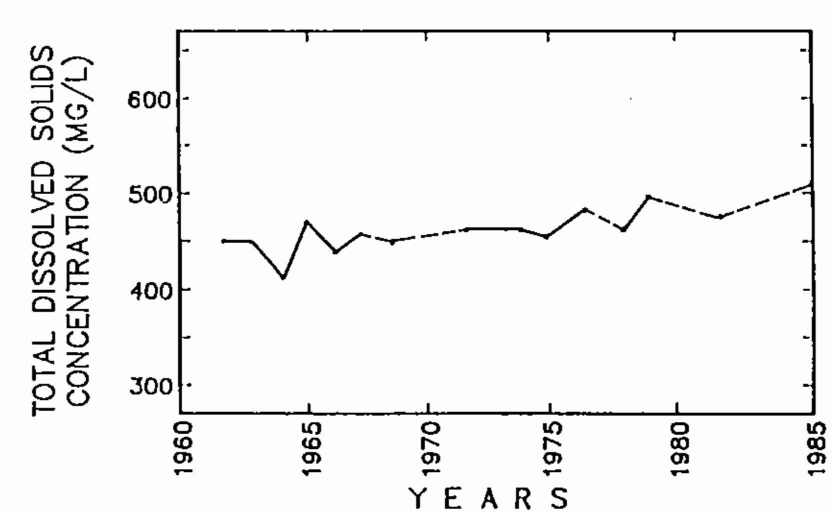




LOCATION: MIDDLE REACH, SANTA CLARA RIVER

VALENCIA WATER CO.
WELL NO. 157 (SAUGUS FM)
4N/16W-22MI
DEPTH = 2014 FT.
PERFORATION = 593-2014 FT.





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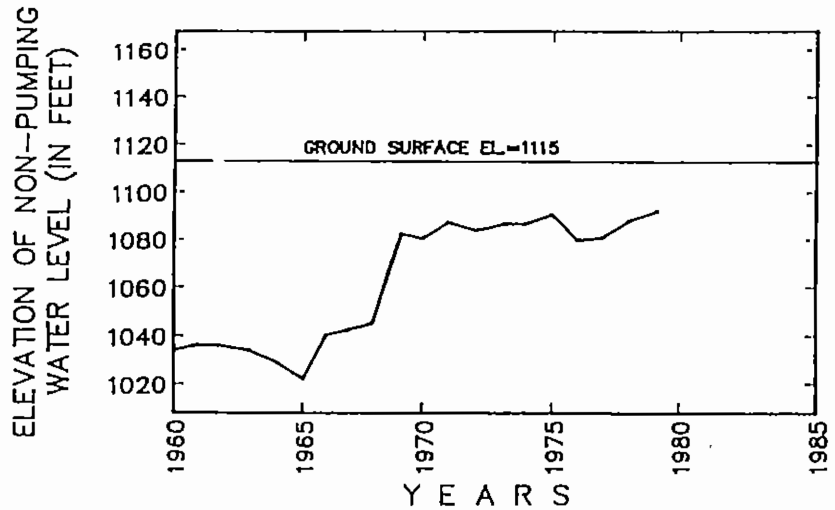
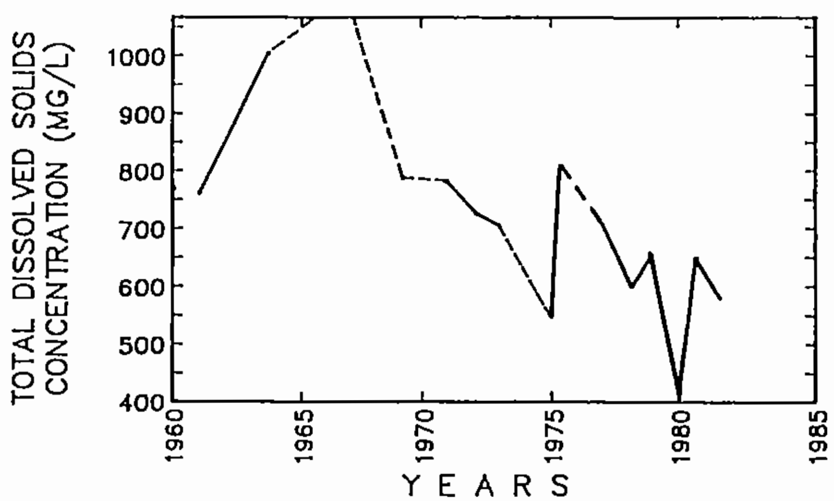
HYDROGRAPHS AND TDS GRAPHS

JOB NO. S8605 | JULY 1986 | PLATE 6.2

LOCATION: MIDDLE REACH, SANTA CLARA RIVER

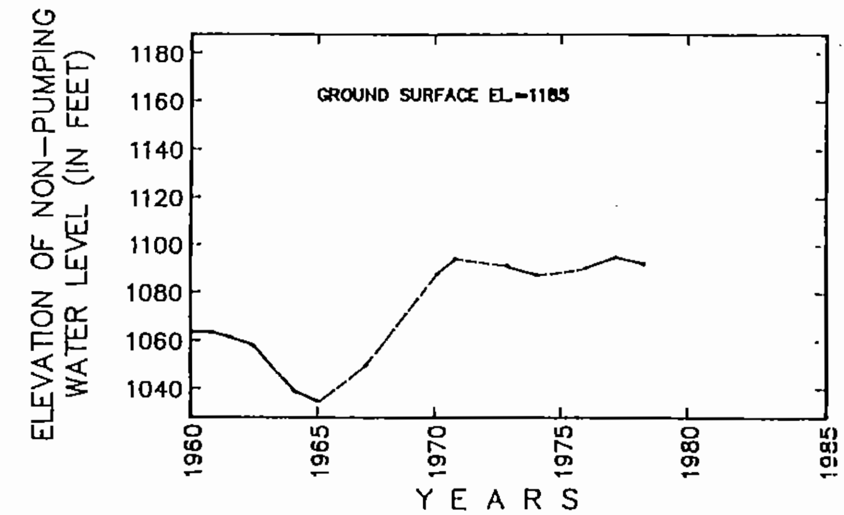


NL&F CO.
WELL NO. S & S-2 (ALLUVIUM)
4N/16W-16QI AND -16Q3
DEPTH = 230 AND 212 FT.
PERFORATIONS = 60-220 FT. & 50-202 FT.

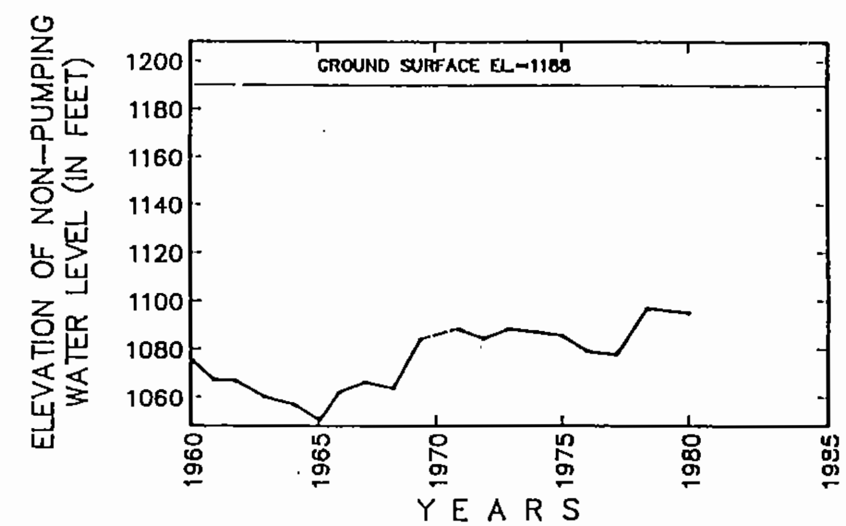


NL&F CO.
WELL NO. R2-94 (ALLUVIUM)
4N/16W-14E2
DEPTH = 130 FT.
PERFORATION = 40-128 FT.

LOCATION: SOUTH FORK, SANTA CLARA RIVER



NL&F CO.
WELL NO. 154 (ALLUVIUM & SAUGUS FM)
4N/16W-27H5
DEPTH = 1137 FT.
PERFORATIONS = 45-1016 FT.



WELL NO. 4N/16W-27JI
(ALLUVIUM & POSSIBLE SAUGUS FM)
DEPTH = 380 FT.
PERFORATION = UNKNOWN

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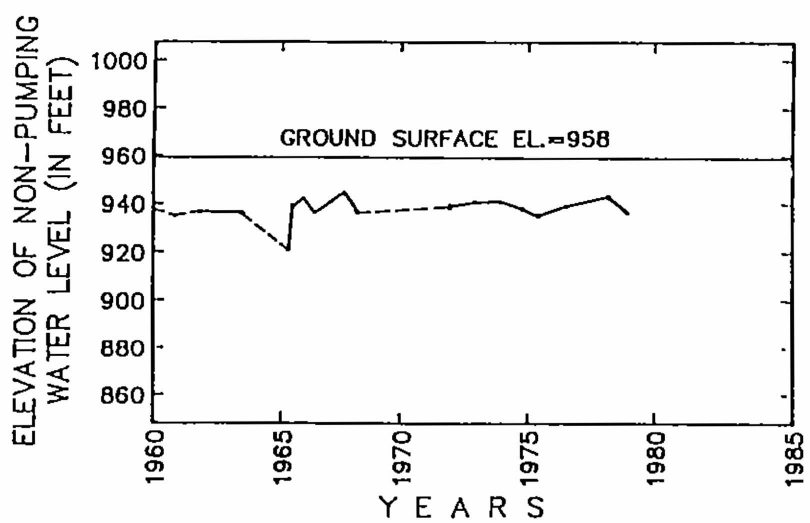
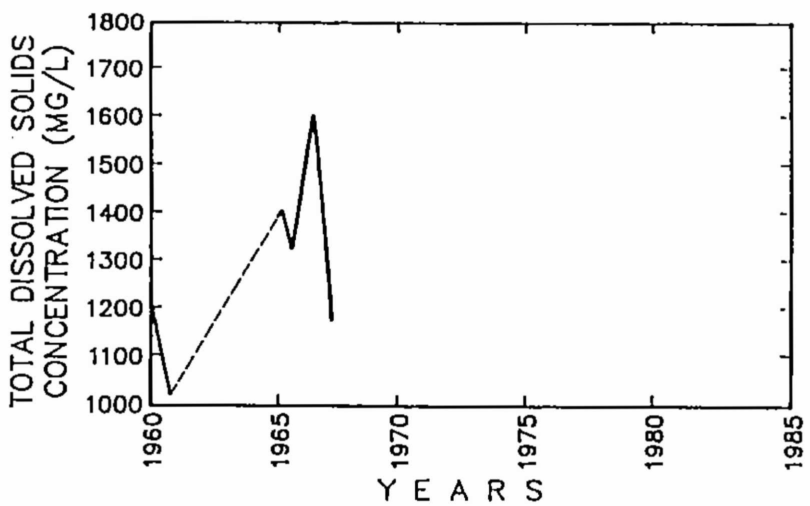
HYDROGRAPHS AND TDS GRAPHS

JOB NO. S8605 JULY 1986 PLATE 6.3

LOCATION: LOWER REACH, SANTA CLARA RIVER

NL&F CO.
WELL NO. C (ALLUVIUM)
4N/17W-14Q2
DEPTH = 140 FT.
PERFORATION = 80–135 FT.

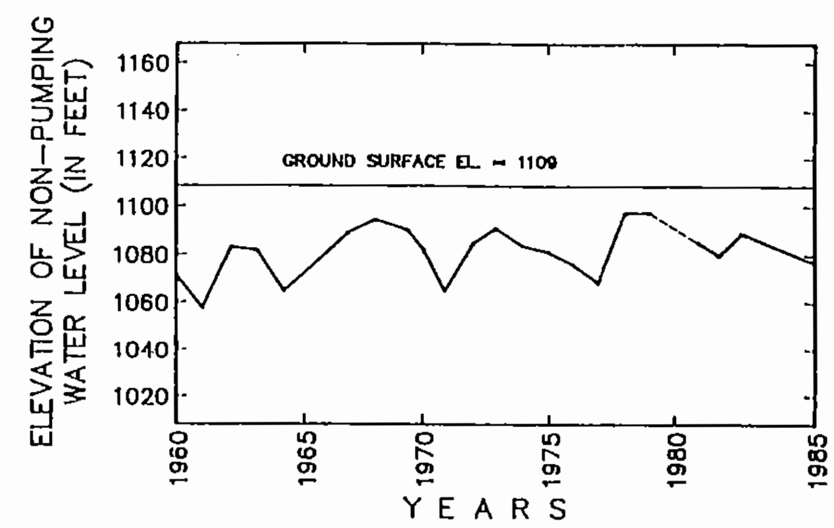


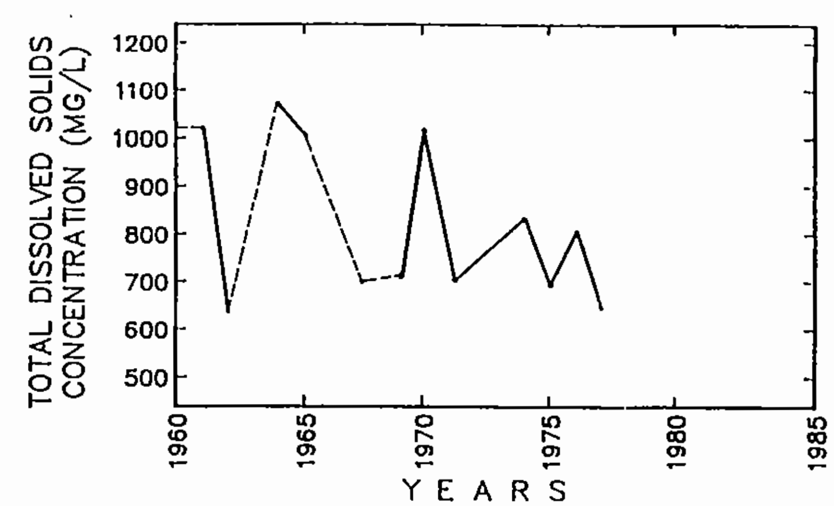


ALLUVIAL WELL
NL&F CO. WELL C-2
4N/17W-14Q1
DEPTH = 135 FT.
PERFORATION = ?

LOCATION: CASTAIC CREEK

WAYSIDE HONOR RANCHO
WELL NO. 14 (ALLUVIUM), 5N/17W-36A3
DEPTH = 126 FT.
PERFORATION = 66–106 FT.





ALLUVIAL WELL
4N/17W-1J1
WAYSIDE NO. 11
DEPTH = 100 FT.
PERFORATION = 50–100 FT.

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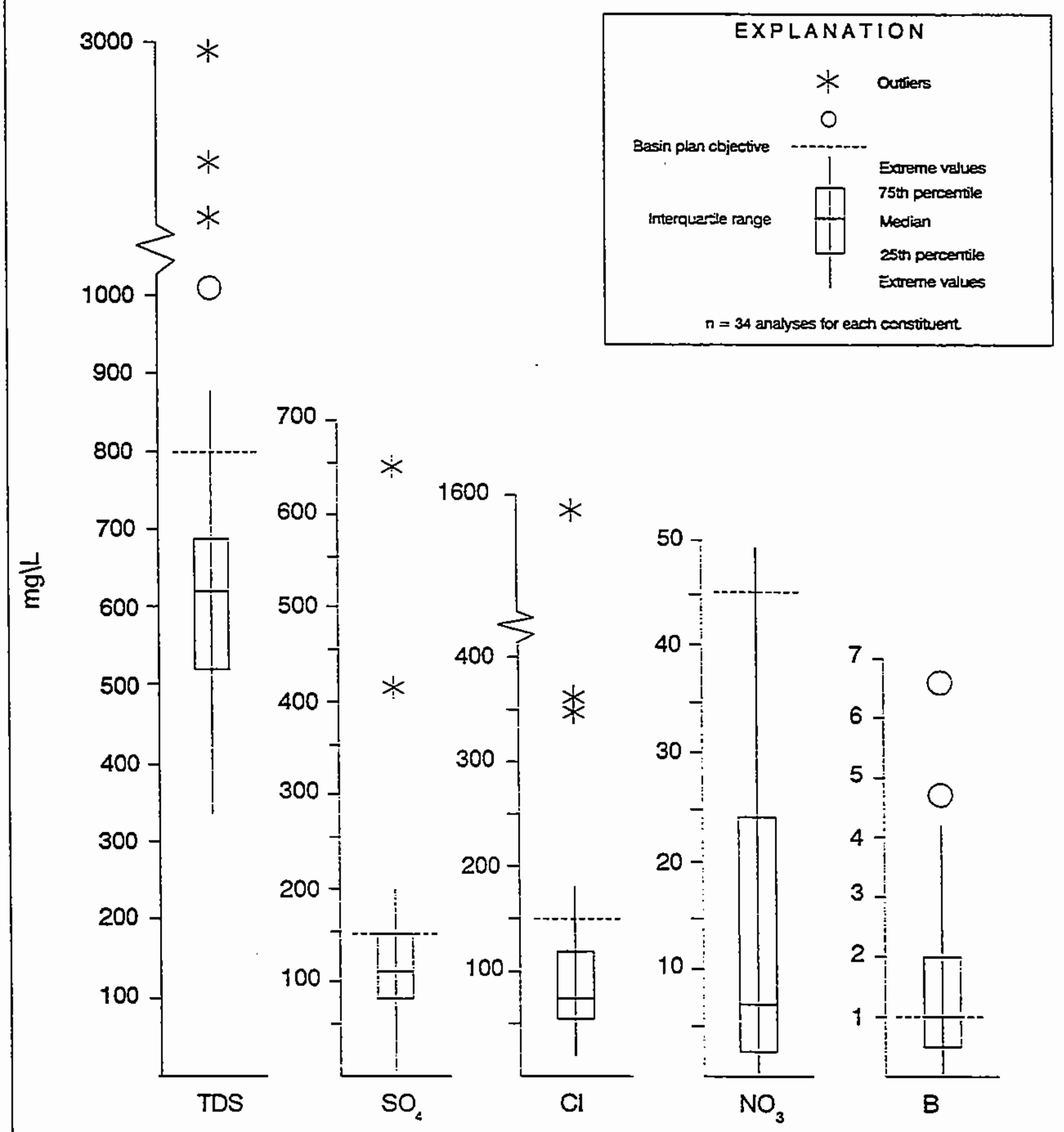
HYDROGRAPHS AND TDS GRAPHS

JOB NO. S8605 JULY 1986 PLATE 6.4

APPENDIX D

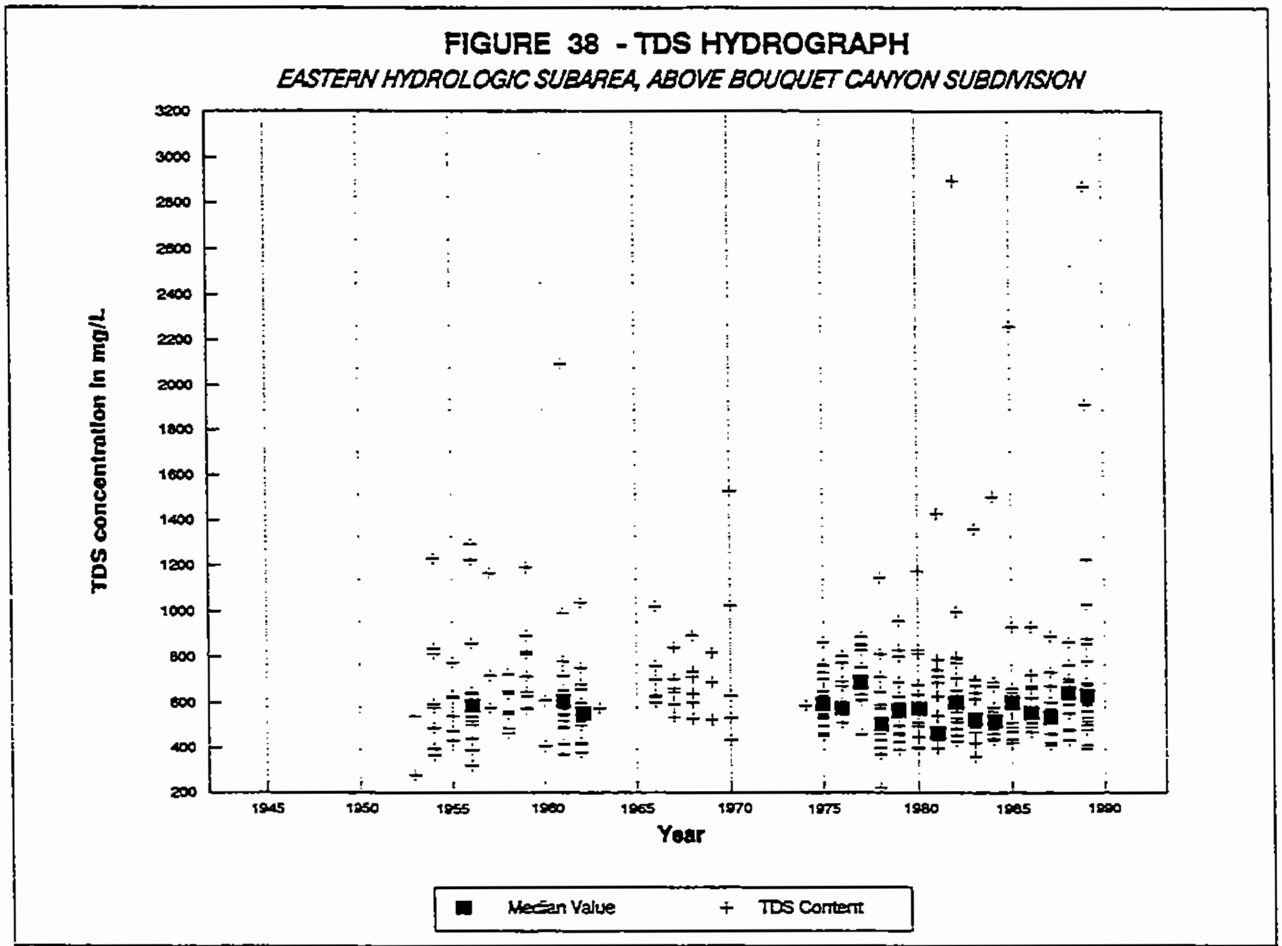
Well Water Quality Information for the Eastern Groundwater Basin

FIGURE 37 - Schematic Box Plots of Total Dissolved Solids, Sulfate, Chloride, Nitrate and Boron Concentrations in Well Waters in Eastern Subarea, Above Bouquet Canyon Subdivision, 1989-1990 Data



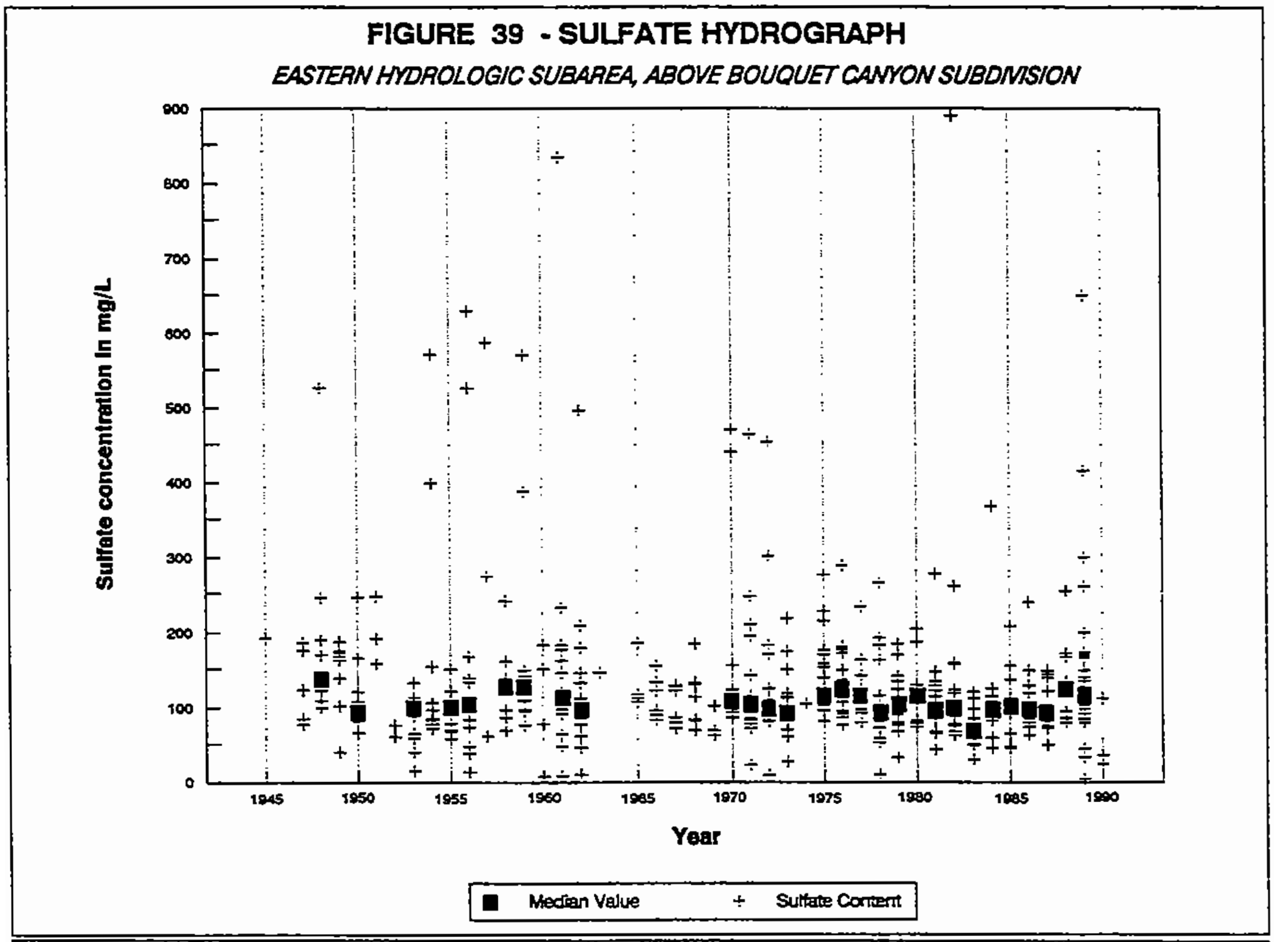
Vertical lines extend to extreme values within 1.5 times the interquartile range. Outliers are shown as ○ when within 1.5 to 3.0 times the interquartile range and as ✳ for values greater than 3 times the interquartile range. (Kleiner & Graedel, 1980).

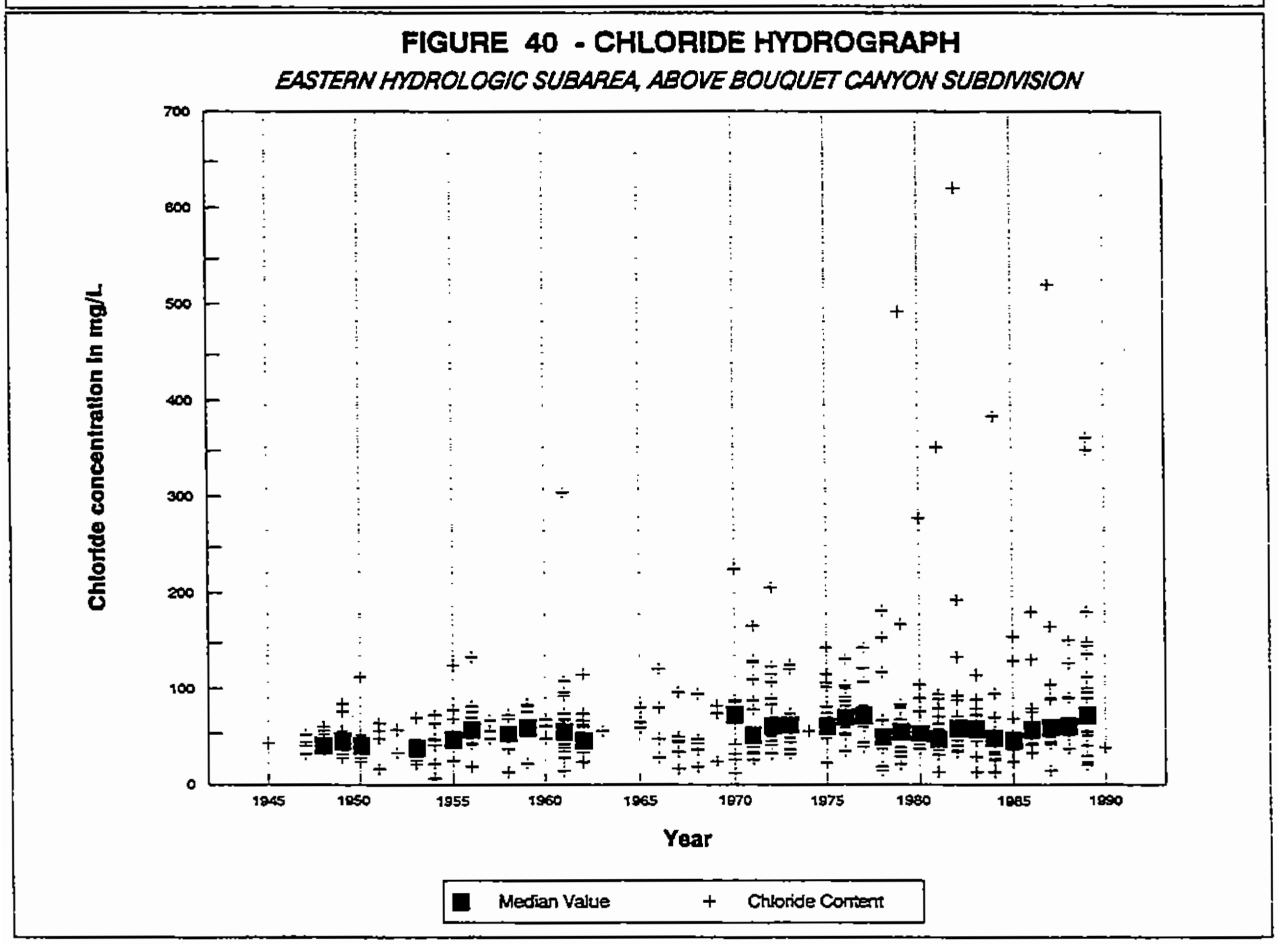
Source: Investigation of Water Quality and Beneficial Uses, Upper Santa Clara River Hydrologic Area by DWR Dated 1993.



Source: Investigation of Water Quality and Beneficial Uses, Upper Santa Clara River Hydrologic Area by DWR Dated 1993.

Appendix D





Source: Investigation of Water Quality and Beneficial Uses, Upper Santa Clara River Hydrologic Area by DWR Dated 1993.

FIGURE 41 - NITRATE HYDROGRAPH

EASTERN HYDROLOGIC SUBAREA, ABOVE BOUQUET CANYON SUBDIVISION

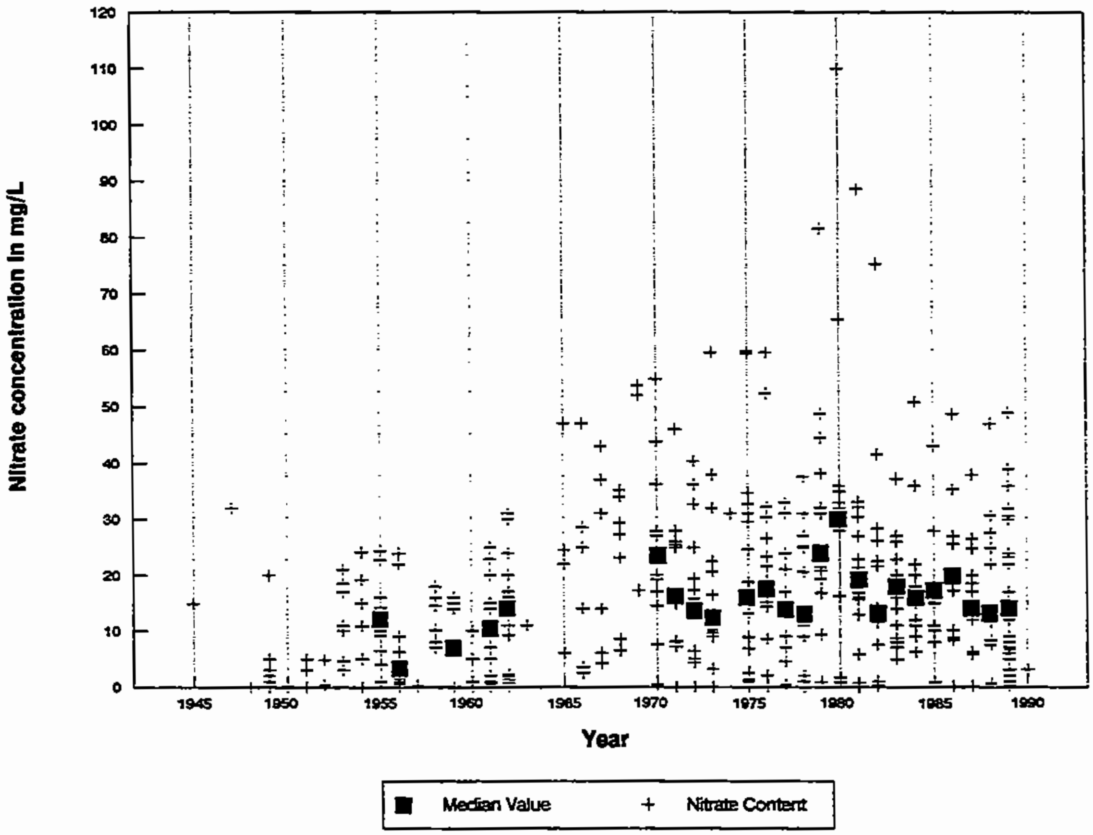
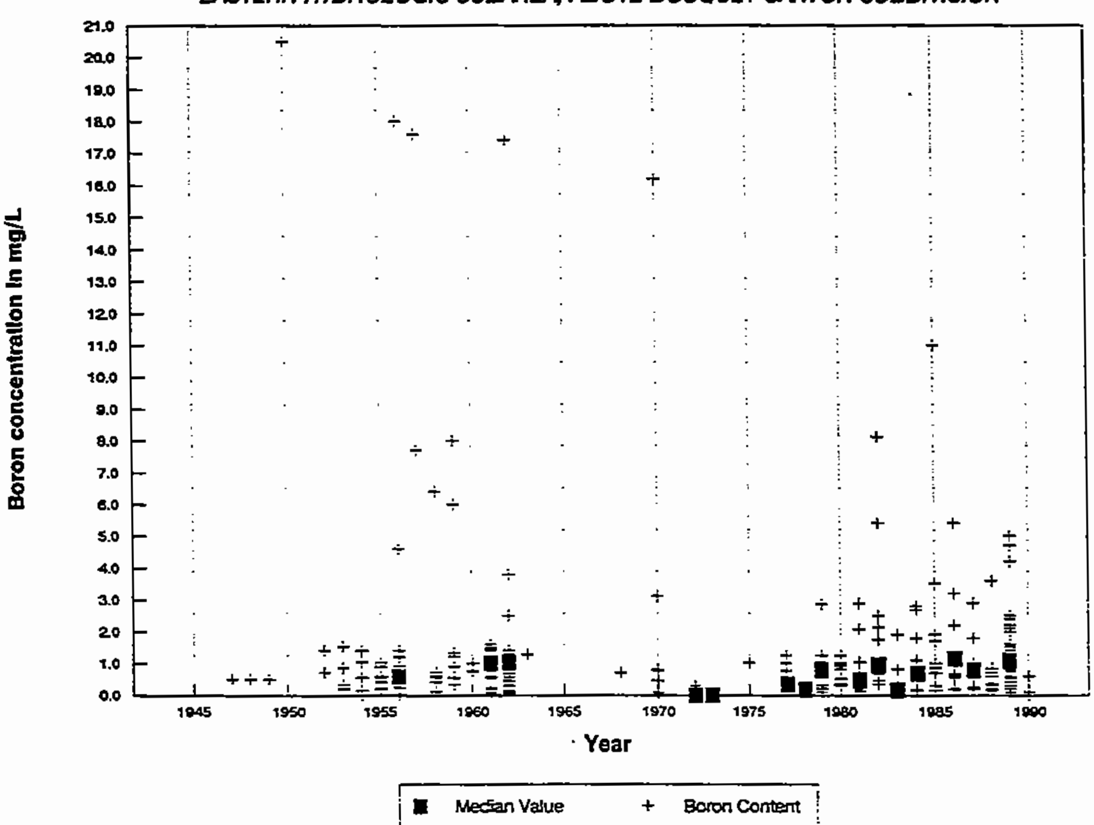


FIGURE 42 - BORON HYDROGRAPH

EASTERN HYDROLOGIC SUBAREA, ABOVE BOUQUET CANYON SUBDIVISION



Source: Investigation of Water Quality and Beneficial Uses, Upper Santa Clara River Hydrologic Area by DWR Dated 1993.

FIGURE 43 - TRENDS IN CHLORIDE CONCENTRATIONS

EASTERN HYDROLOGIC SUBAREA, ABOVE BOUQUET CANYON SUBDIVISION

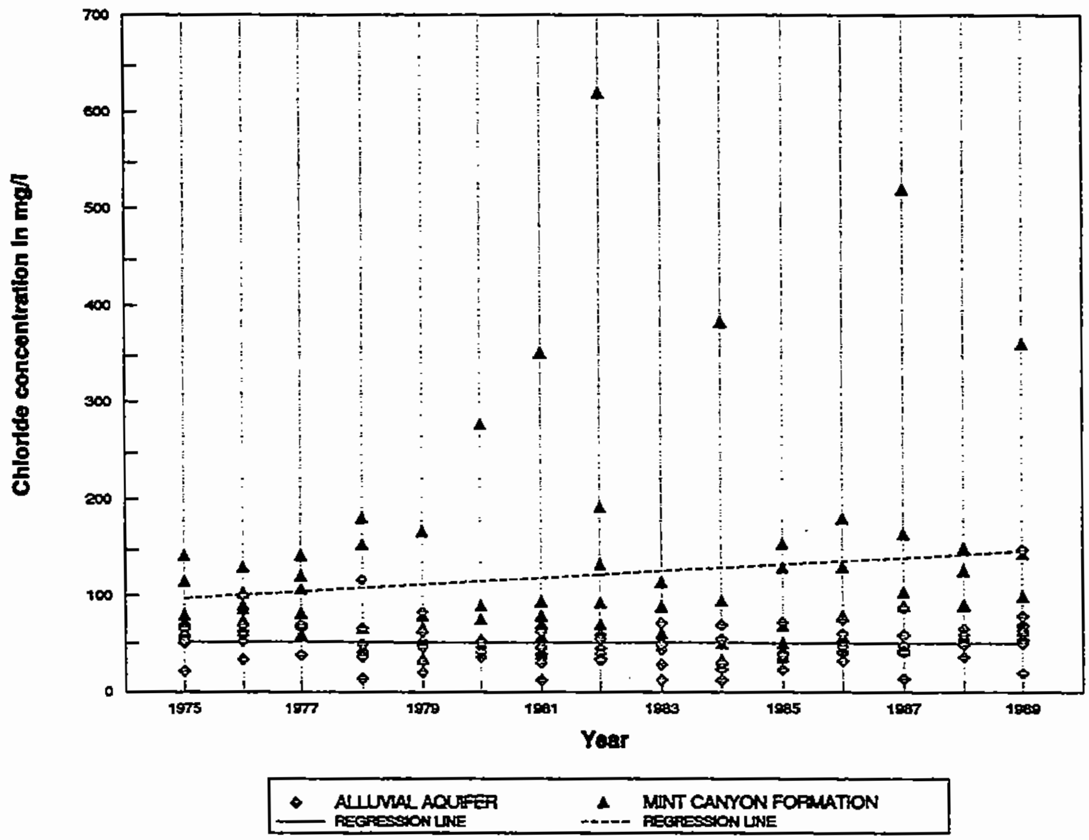
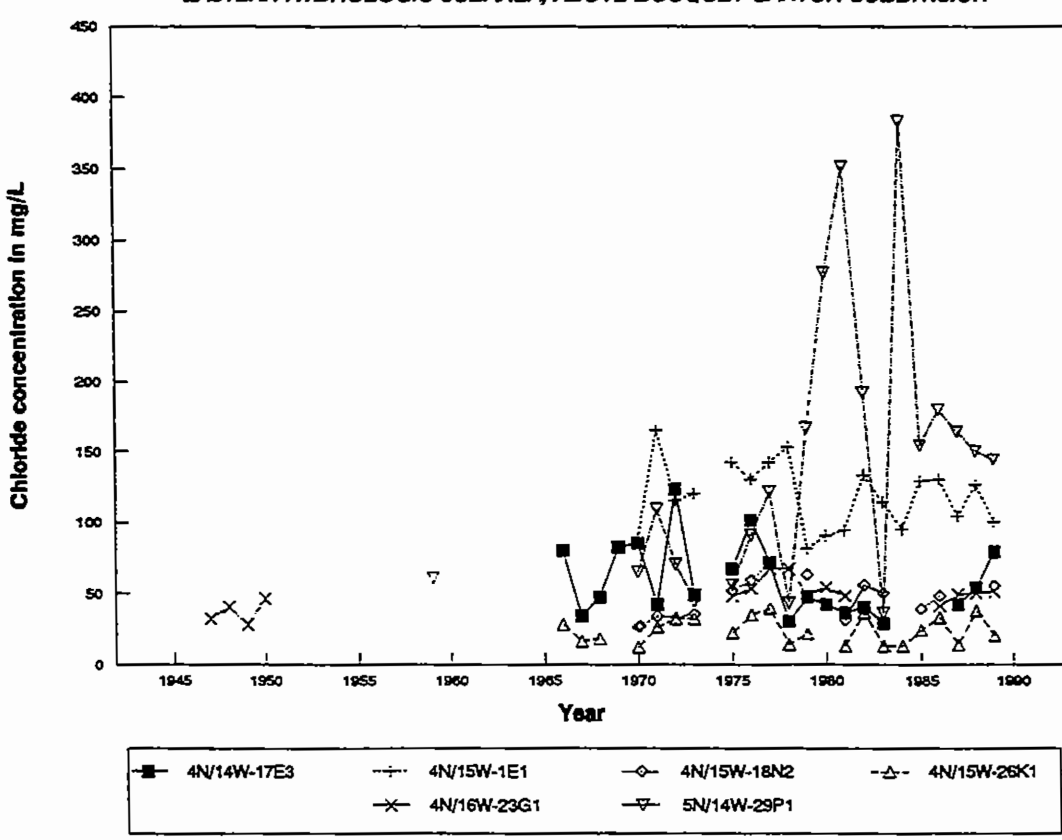


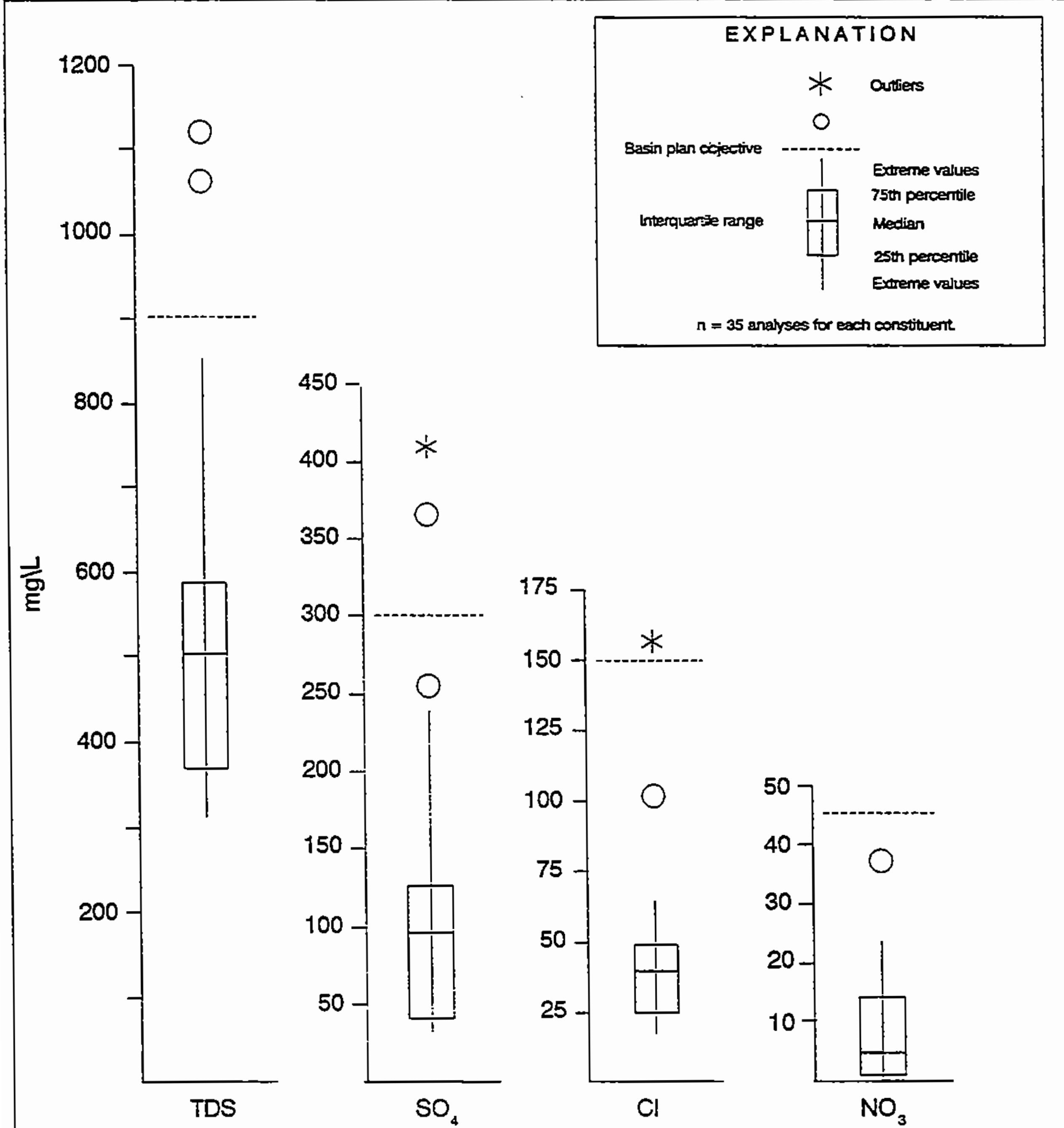
FIGURE 44 - CHLORIDE HYDROGRAPH FOR SELECTED WELLS

EASTERN HYDROLOGIC SUBAREA, ABOVE BOUQUET CANYON SUBDIVISION



Source: Investigation of Water Quality and Beneficial Uses, Upper Santa Clara River Hydrologic Area by DWR Dated 1993.

FIGURE 45 - Schematic Box Plots of Total Dissolved Solids, Sulfate, Chloride, and Nitrate Concentrations in Well Waters in Eastern Subarea, Above Castaic Creek to Bouquet Canyon Subdivision, 1989-90 Data



Vertical lines extend to extreme values within 1.5 times the interquartile range. Outliers are shown as ○ when within 1.5 to 3.0 times the interquartile range and as ✳ for values greater than 3 times the interquartile range. (Kleiner & Graedel, 1980).

Source: Investigation of Water Quality and Beneficial Uses, Upper Santa Clara River Hydrologic Area by DWR Dated 1993.

FIGURE 46 - TDS HYDROGRAPH

EASTERN HYDROLOGIC SUBAREA, ABOVE CASTAIC CREEK TO BOUQUET CANYON SUBDIVISION

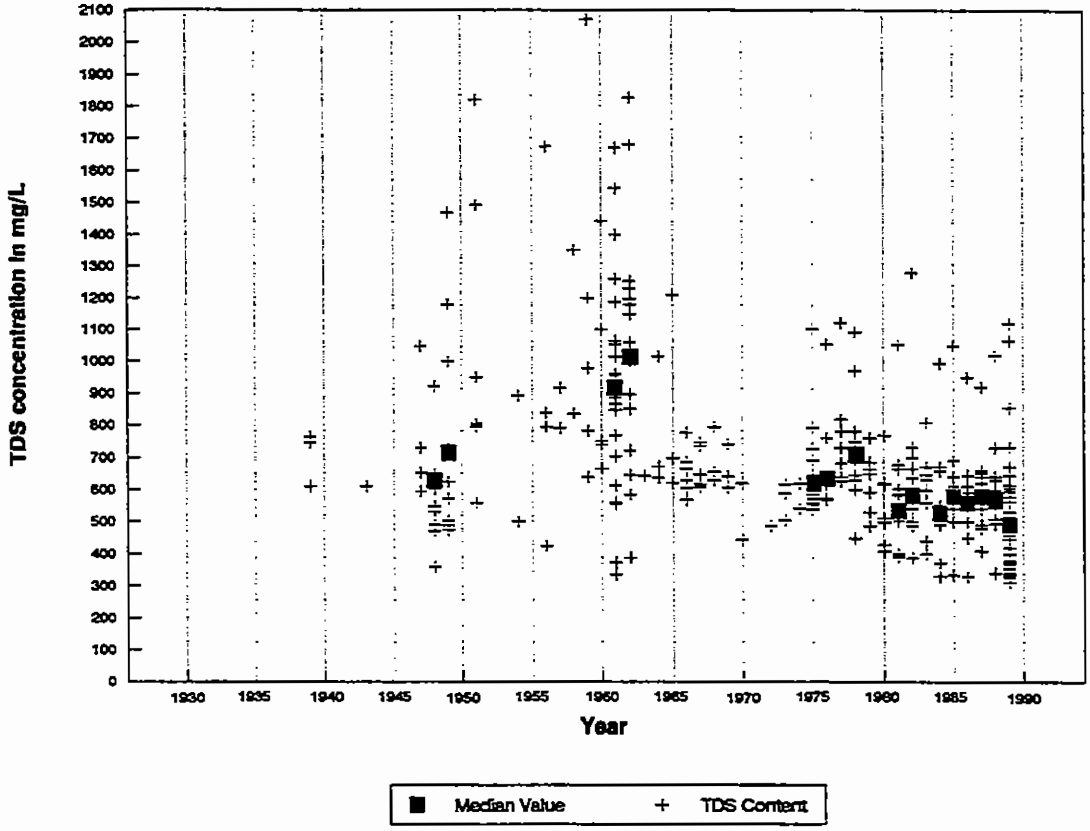
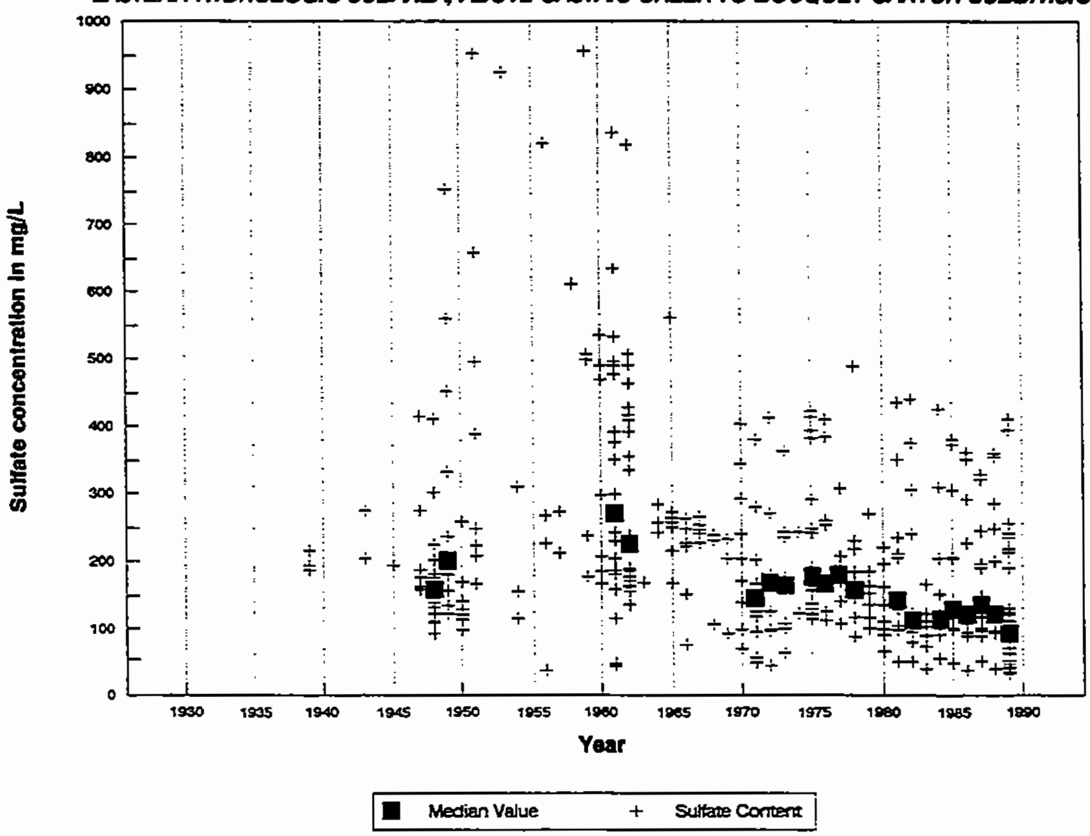


FIGURE 47 - SULFATE HYDROGRAPH

EASTERN HYDROLOGIC SUBAREA, ABOVE CASTAIC CREEK TO BOUQUET CANYON SUBDIVISION



Source: Investigation of Water Quality and Beneficial Uses, Upper Santa Clara River Hydrologic Area by DWR Dated 1993.

FIGURE 48 - CHLORIDE HYDROGRAPH

EASTERN HYDROLOGIC SUBAREA, ABOVE CASTAIC CREEK TO BOUQUET CANYON SUBDIVISION

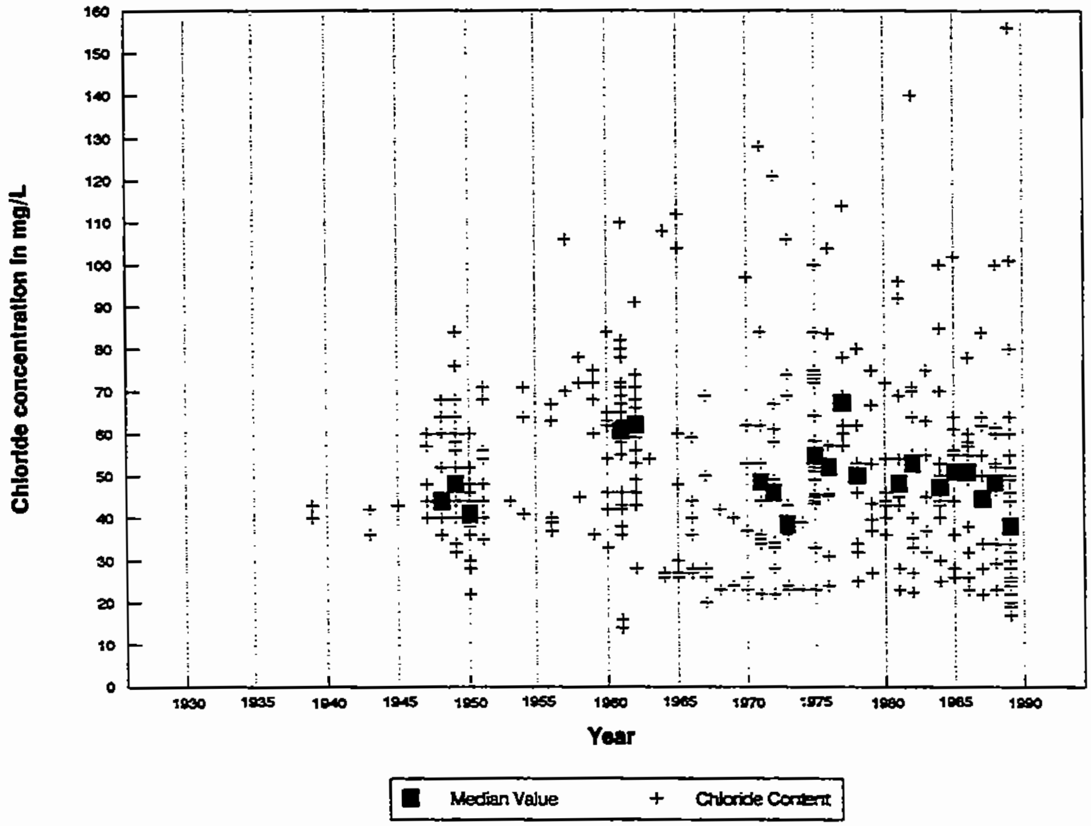
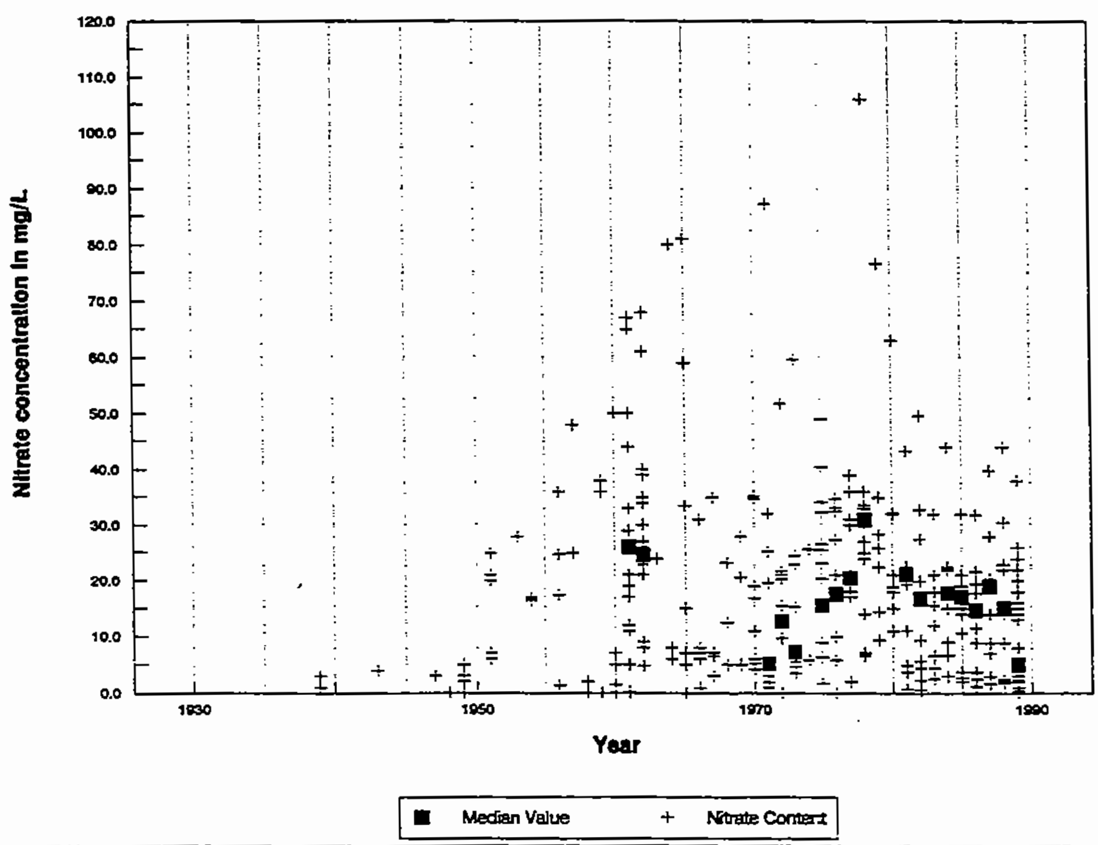


FIGURE 49 - NITRATE HYDROGRAPH

EASTERN HYDROLOGIC SUBAREA, ABOVE CASTAIC CREEK TO BOUQUET CANYON SUBDIVISION



Source: Investigation of Water Quality and Beneficial Uses, Upper Santa Clara River Hydrologic Area by DWR Dated 1993.

FIGURE 50 - BORON HYDROGRAPH

EASTERN HYDROLOGIC SUBAREA, ABOVE CASTAIC CREEK TO BOUQUET CANYON SUBDIVISION

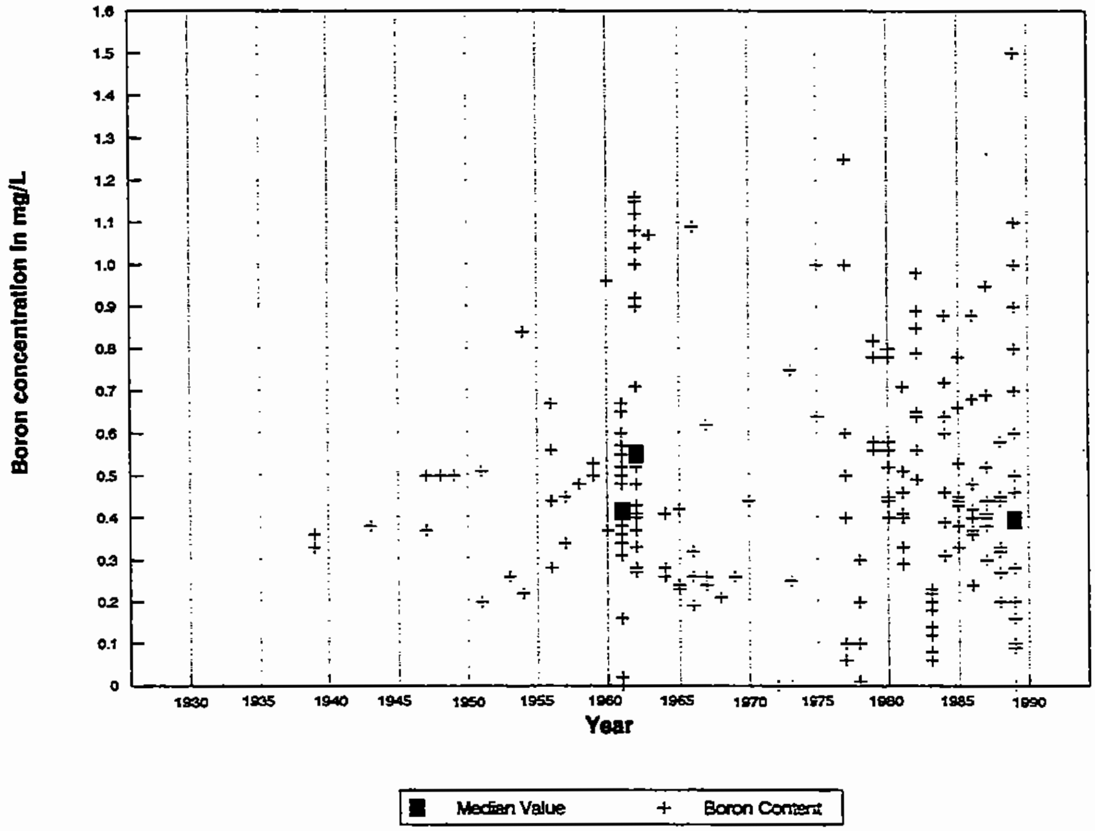
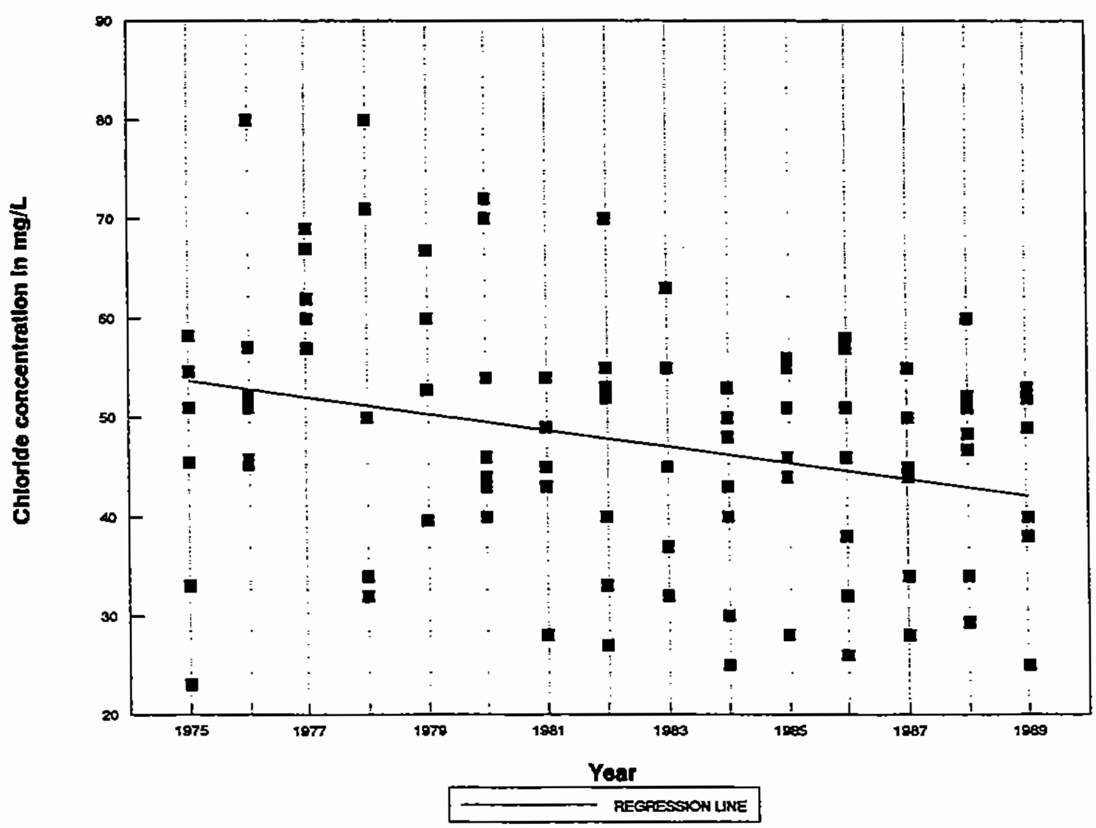


FIGURE 51 - TREND IN CHLORIDE CONCENTRATIONS

EASTERN HYDROLOGIC SUBAREA, ABOVE CASTAIC CREEK TO BOUQUET CANYON SUBDIVISION



Source: Investigation of Water Quality and Beneficial Uses, Upper Santa Clara River Hydrologic Area by DWR Dated 1993.

FIGURE 54 - SULFATE HYDROGRAPH

EASTERN HYDROLOGIC SUBAREA, PLACERITA CANYON AREA SUBDIVISION

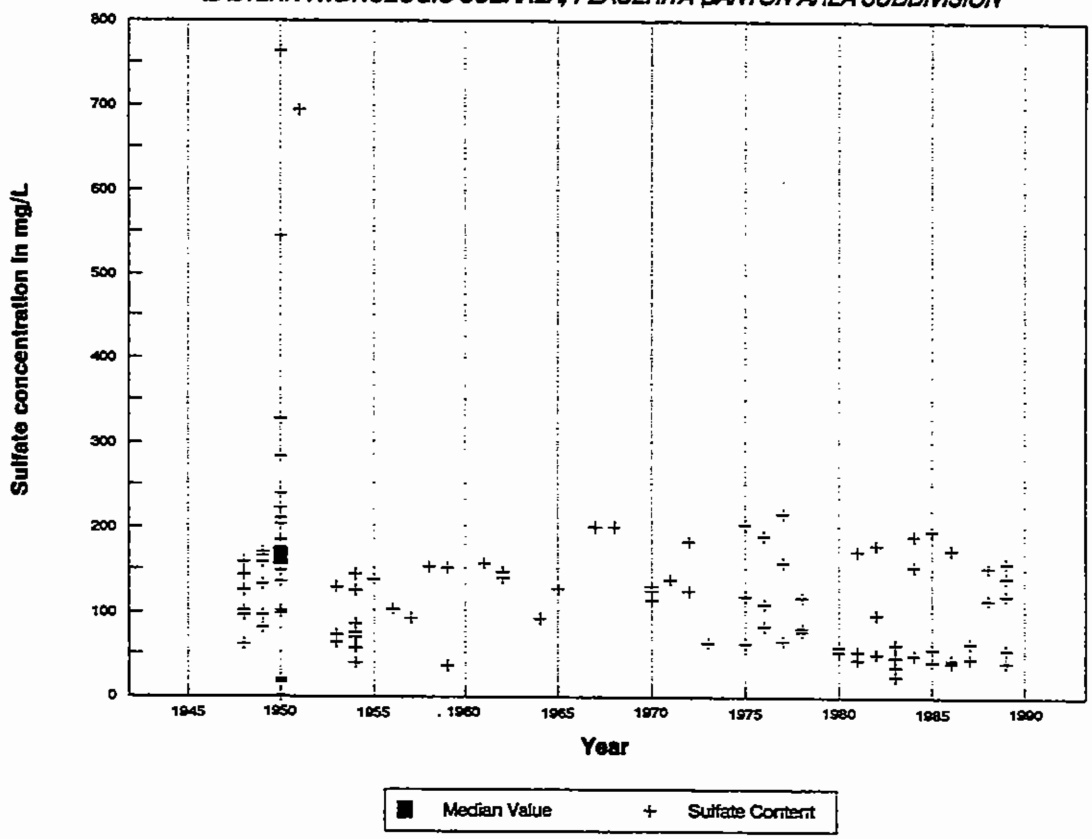
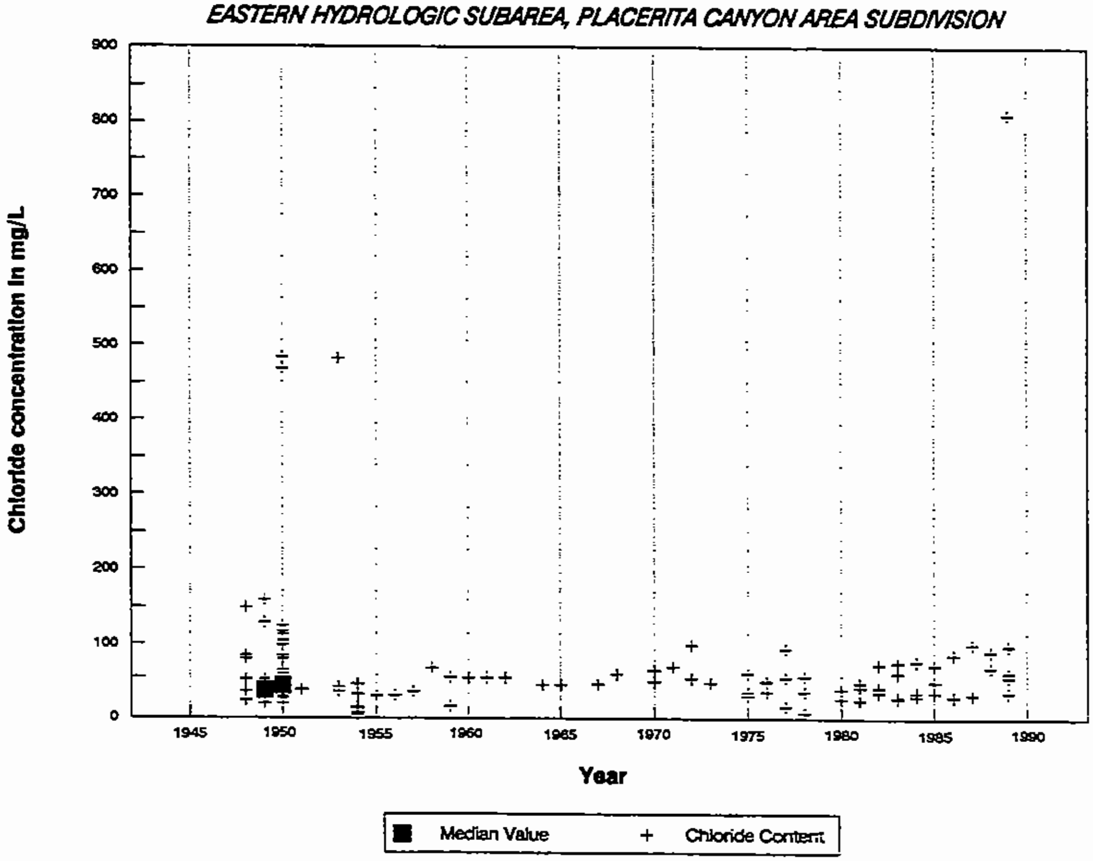


FIGURE 55 - CHLORIDE HYDROGRAPH

EASTERN HYDROLOGIC SUBAREA, PLACERITA CANYON AREA SUBDIVISION



Source: Investigation of Water Quality and Beneficial Uses, Upper Santa Clara River Hydrologic Area by DWR Dated 1993.

FIGURE 56 - NITRATE HYDROGRAPH

EASTERN HYDROLOGIC SUBAREA, PLACERITA CANYON AREA SUBDIVISION

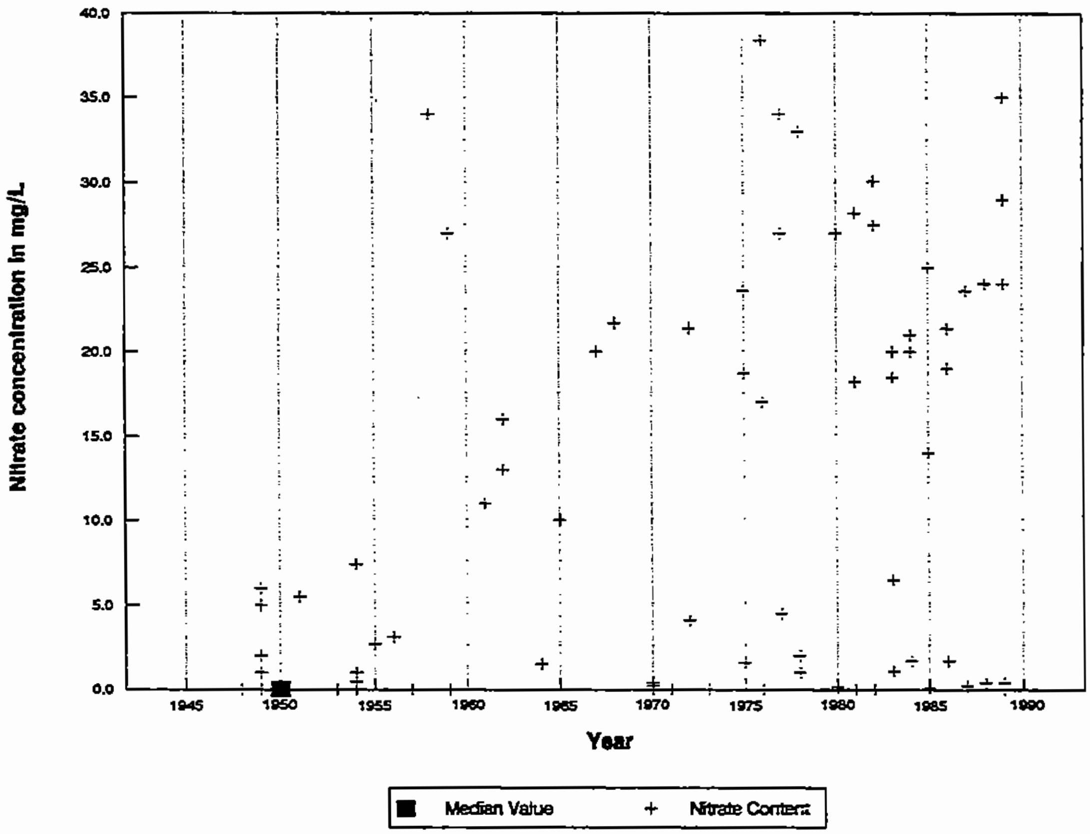
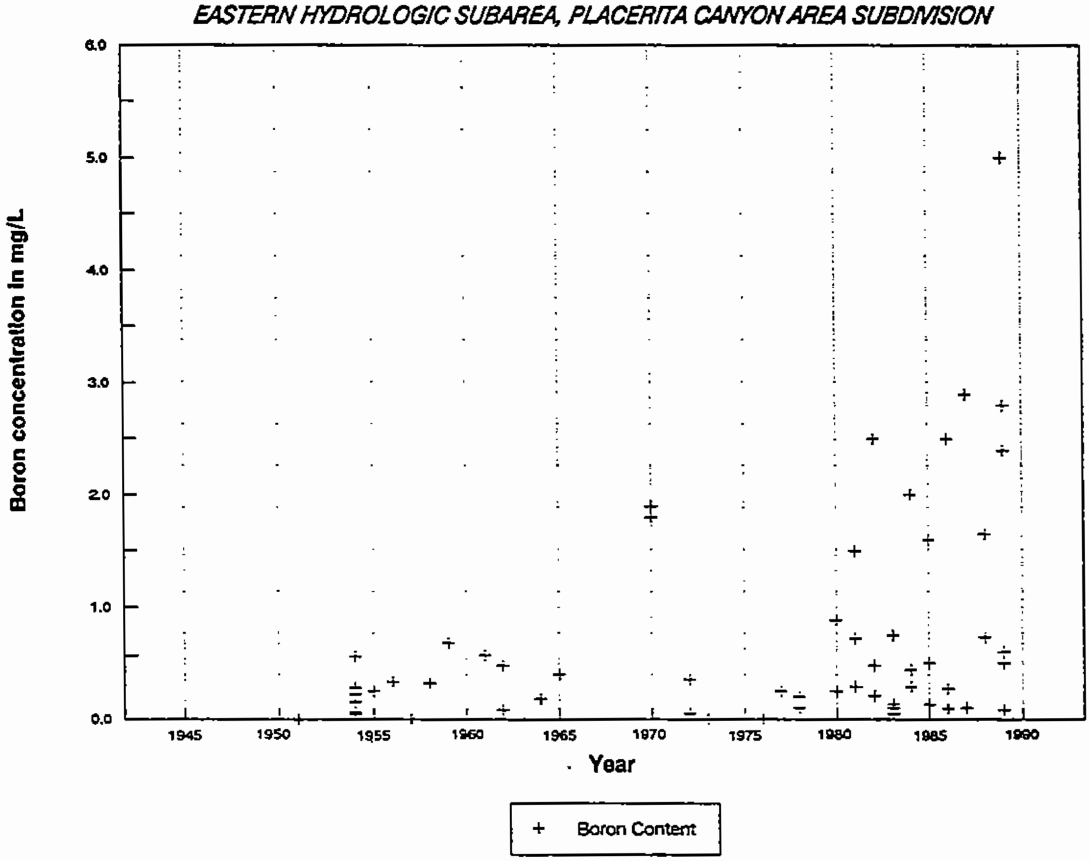


FIGURE 57 - BORON HYDROGRAPH

EASTERN HYDROLOGIC SUBAREA, PLACERITA CANYON AREA SUBDIVISION



Source: Investigation of Water Quality and Beneficial Uses, Upper Santa Clara River Hydrologic Area by DWR Dated 1993.

FIGURE 58 - TREND IN CHLORIDE CONCENTRATIONS

EASTERN HYDROLOGIC SUBAREA, PLACERITA CANYON AREA SUBDIVISION

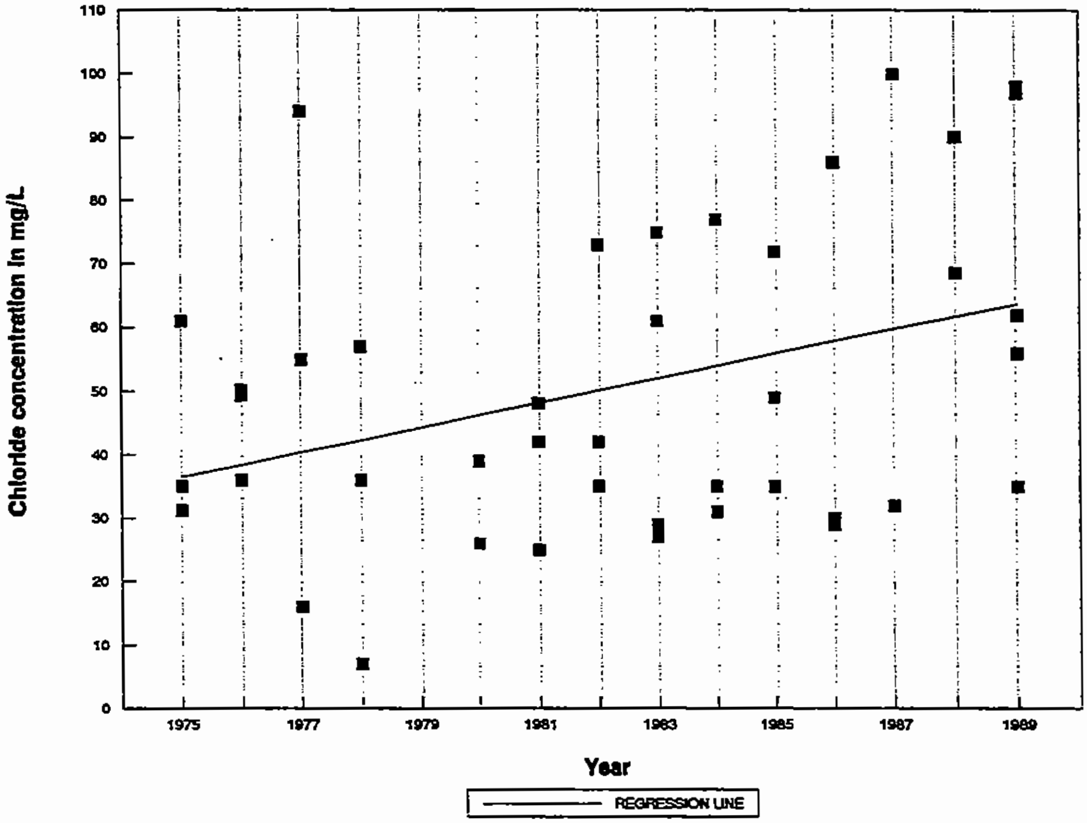
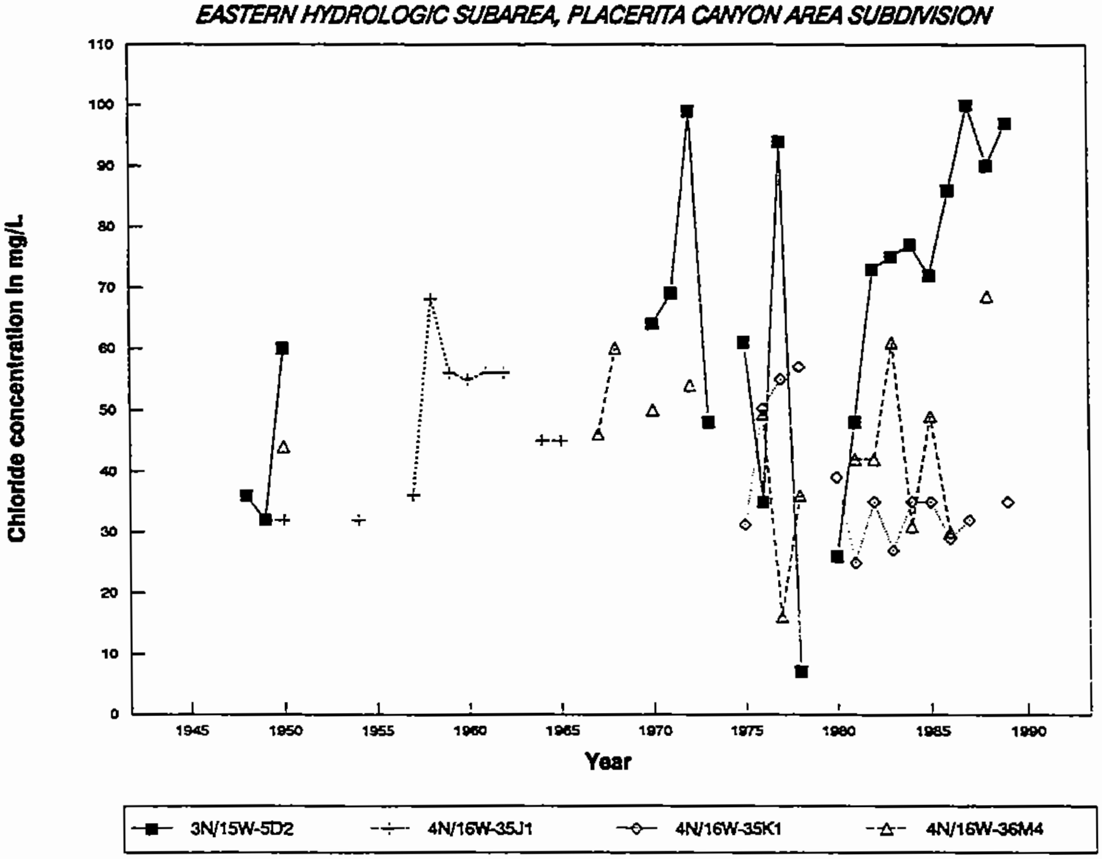


FIGURE 59 - CHLORIDE HYDROGRAPH FOR SELECTED WELLS

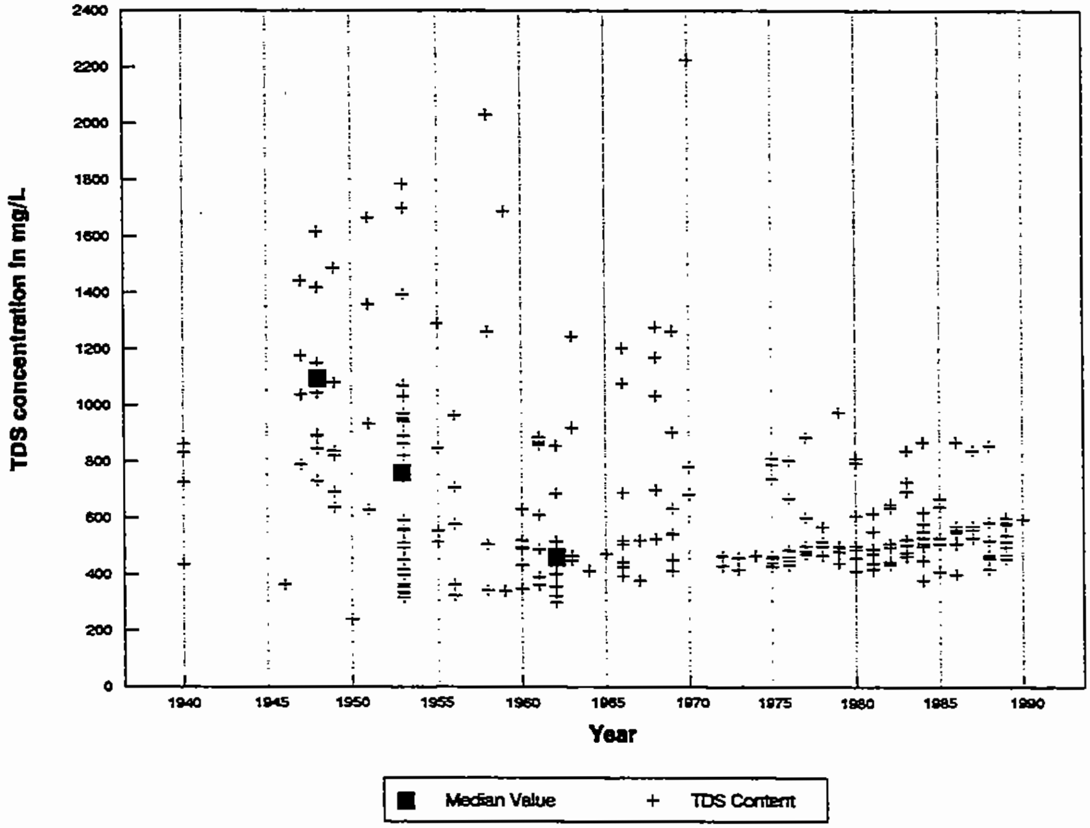
EASTERN HYDROLOGIC SUBAREA, PLACERITA CANYON AREA SUBDIVISION



Source: Investigation of Water Quality and Beneficial Uses, Upper Santa Clara River Hydrologic Area by DWR Dated 1993.

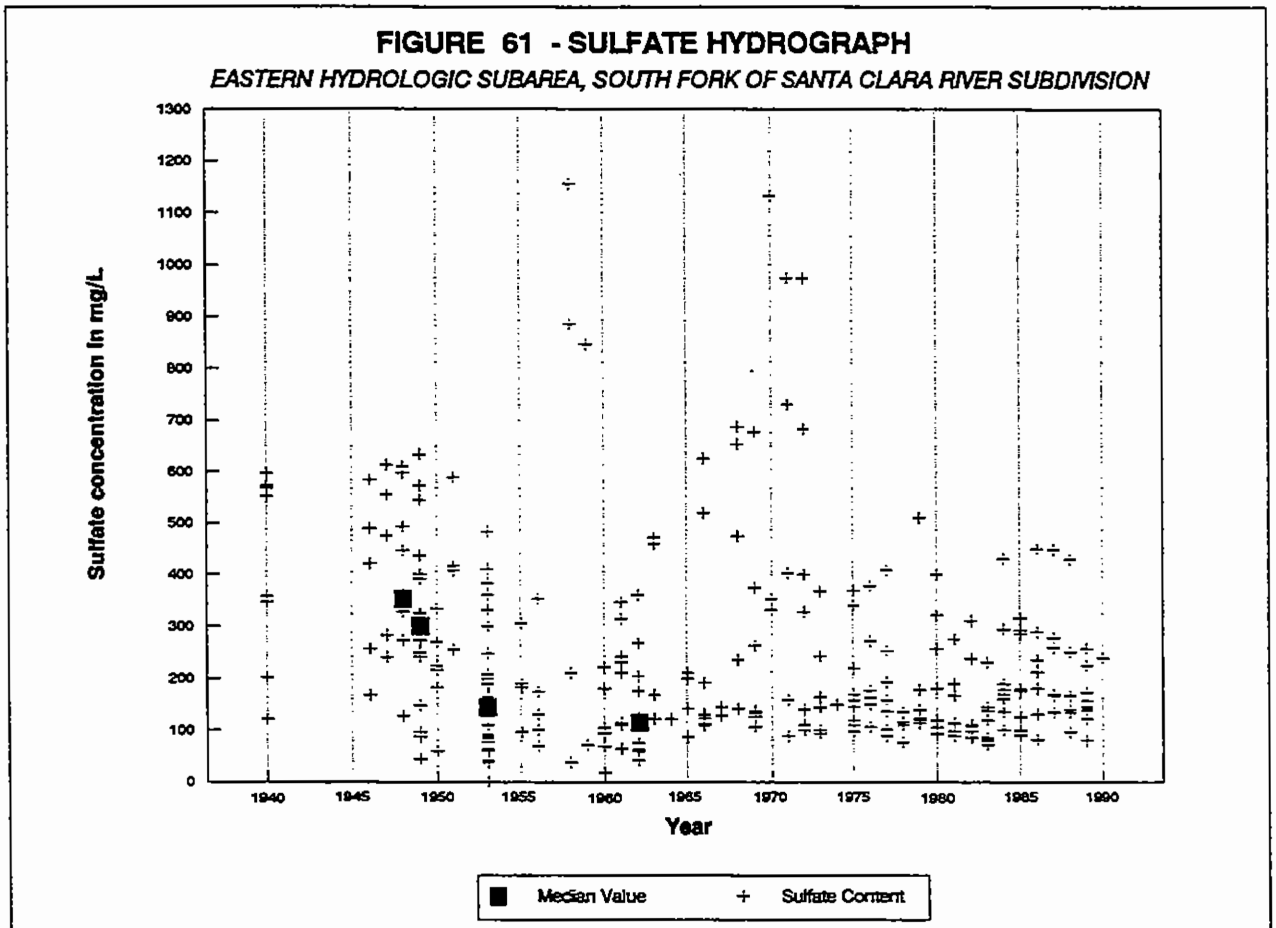
FIGURE 60 - TDS HYDROGRAPH

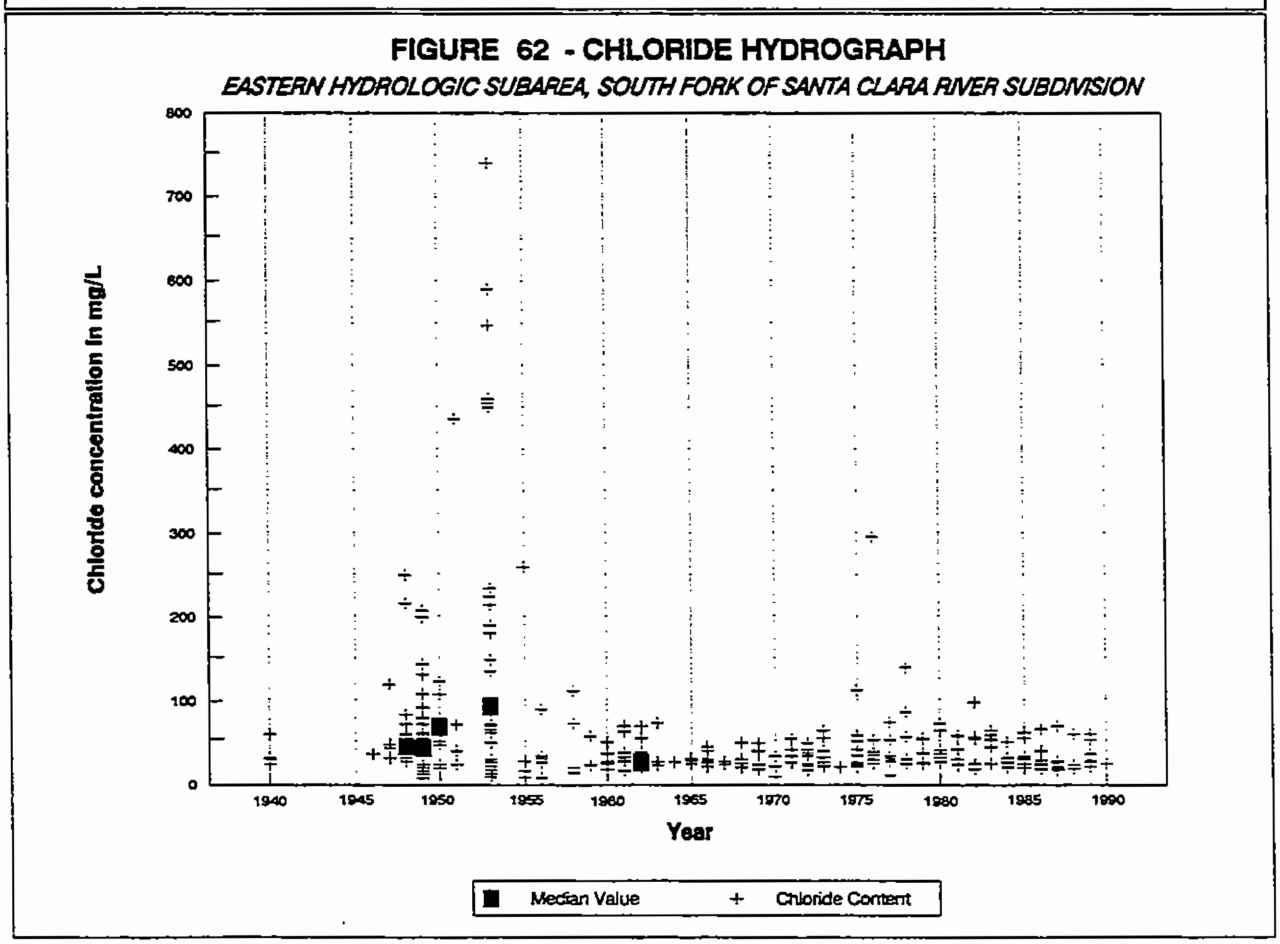
EASTERN HYDROLOGIC SUBAREA, SOUTH FORK OF SANTA CLARA RIVER SUBDIVISION



Source: Investigation of Water Quality and Beneficial Uses, Upper Santa Clara River Hydrologic Area by DWR Dated 1993.

Appendix D





Source: Investigation of Water Quality and Beneficial Uses, Upper Santa Clara River Hydrologic Area by DWR Dated 1993.

FIGURE 63 - NITRATE HYDROGRAPH

EASTERN HYDROLOGIC SUBAREA, SOUTH FORK OF SANTA CLARA RIVER SUBDIVISION

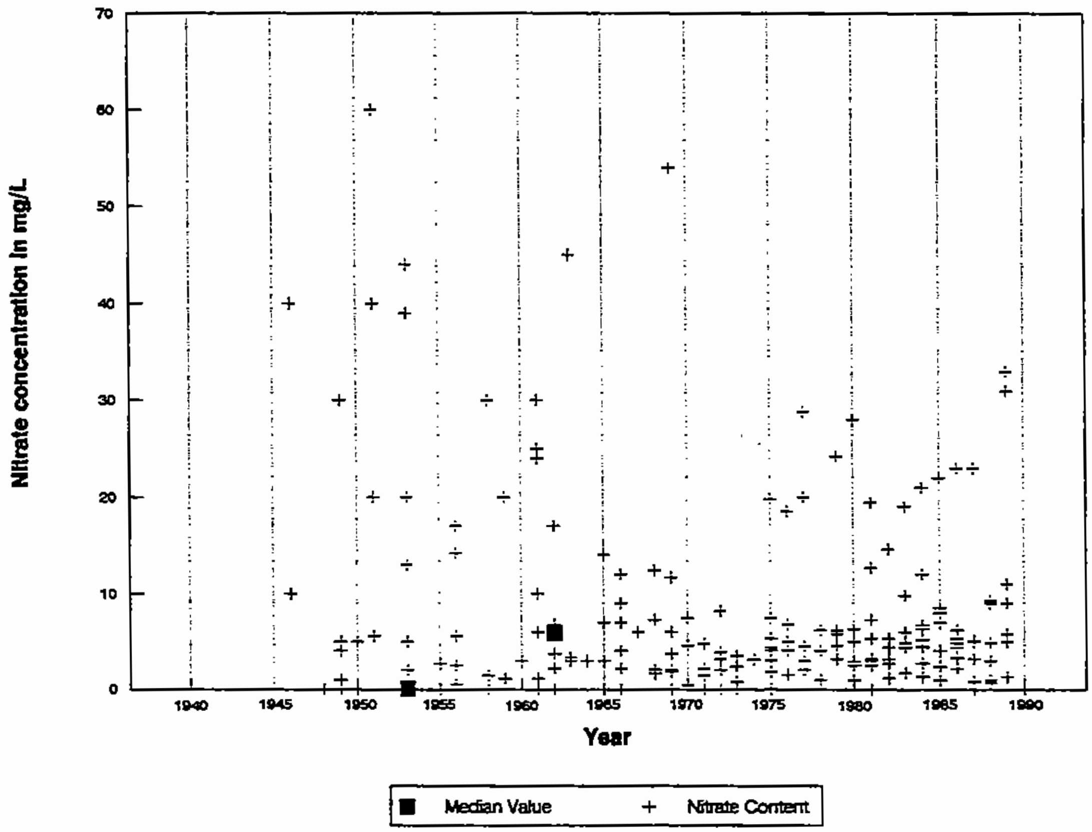
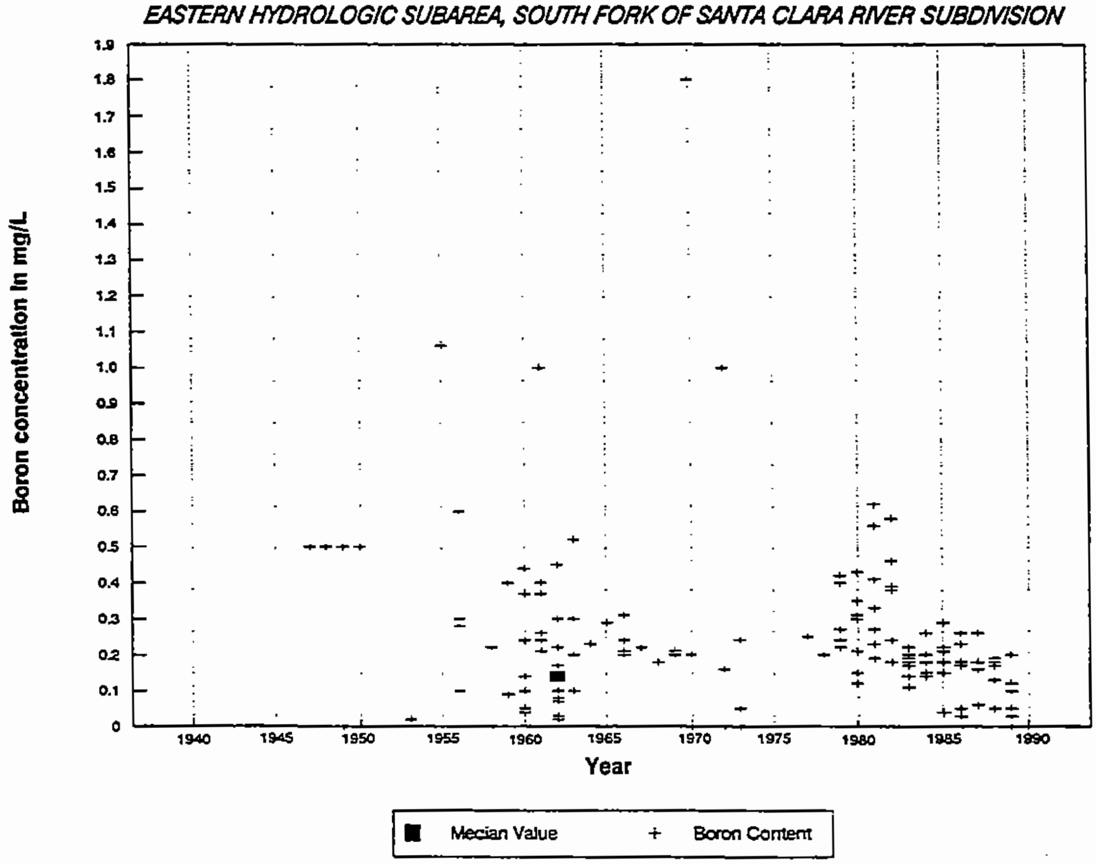


FIGURE 64 - BORON HYDROGRAPH

EASTERN HYDROLOGIC SUBAREA, SOUTH FORK OF SANTA CLARA RIVER SUBDIVISION



Source: Investigation of Water Quality and Beneficial Uses, Upper Santa Clara River Hydrologic Area by DWR Dated 1993.

FIGURE 65 - TREND IN CHLORIDE CONCENTRATIONS

EASTERN HYDROLOGIC SUBAREA, SOUTH FORK OF THE SANTA CLARA RIVER SUBDIVISION

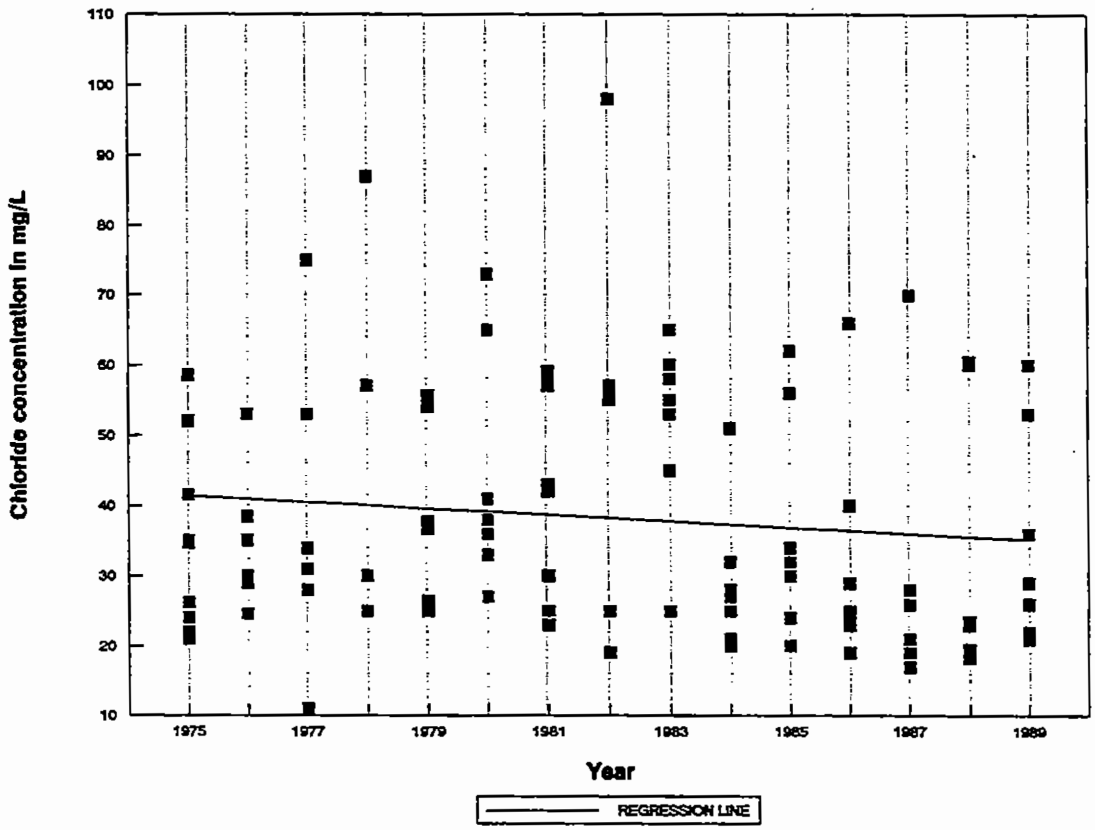
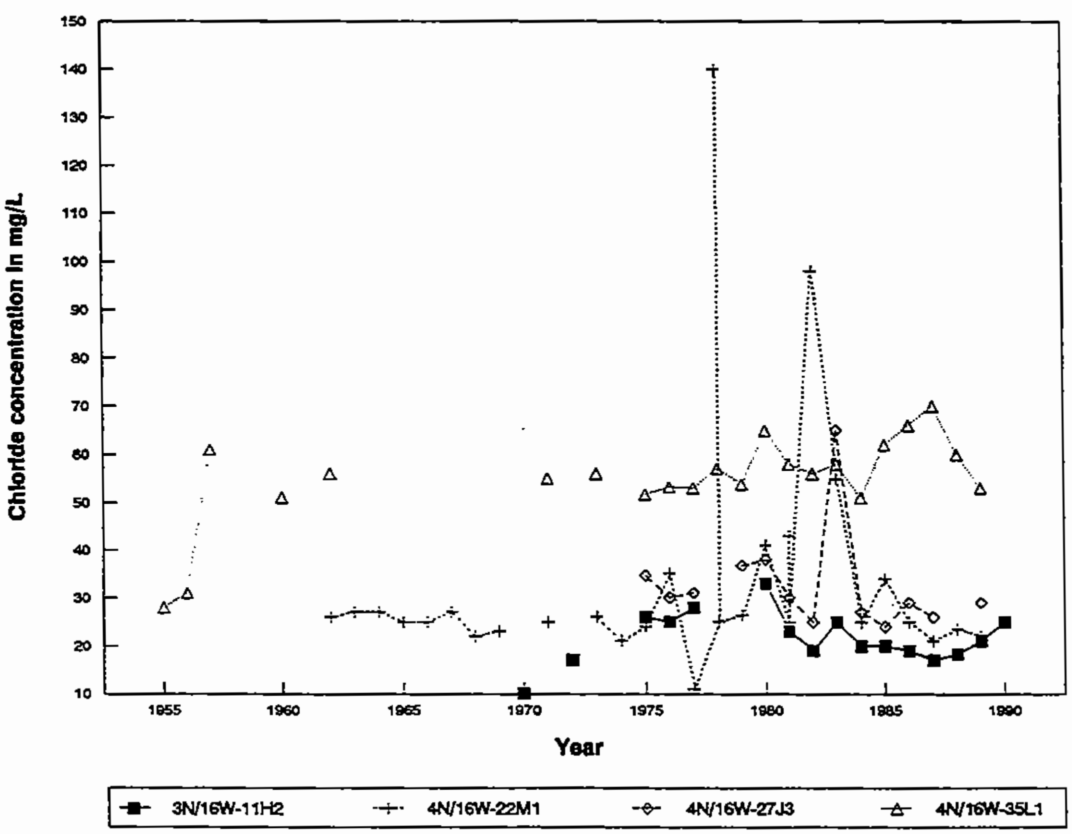


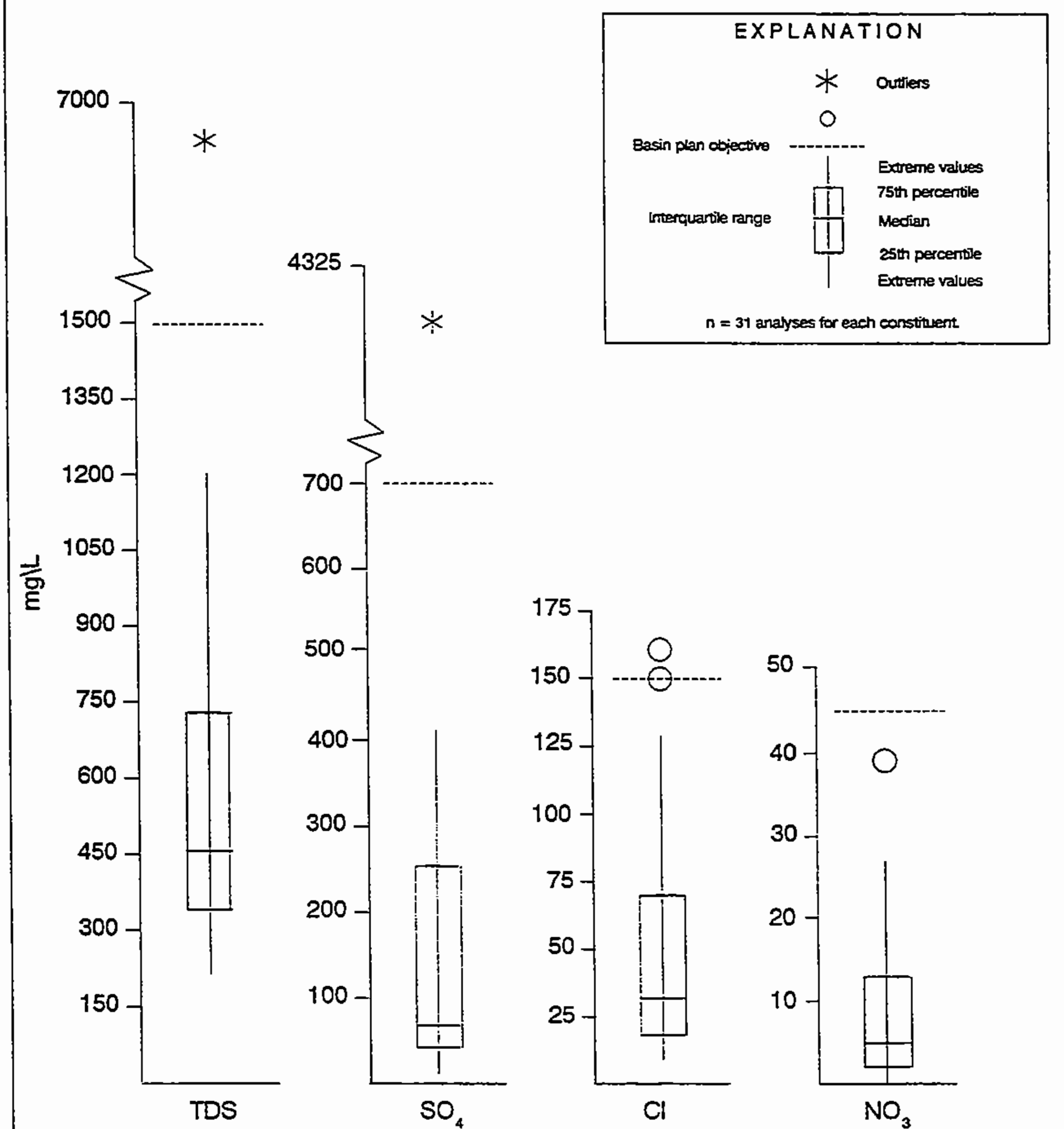
FIGURE 66 - CHLORIDE HYDROGRAPH FOR SELECTED WELLS

EASTERN HYDROLOGIC SUBAREA, SOUTH FORK OF SANTA CLARA RIVER SUBDIVISION



Source: Investigation of Water Quality and Beneficial Uses, Upper Santa Clara River Hydrologic Area by DWR Dated 1993.

FIGURE 67 - Schematic Box Plots of Total Dissolved Solids, Sulfate, Chloride, and Nitrate Concentrations in Well Waters in Eastern Subarea Castaic Creek to Blue Cut Subdivision, 1989-90 Data



Vertical lines extend to extreme values within 1.5 times the interquartile range. Outliers are shown as ○ when within 1.5 to 3.0 times the interquartile range and as ⚹ for values greater than 3 times the interquartile range. (Kleiner & Graedel, 1980).

Source: Investigation of Water Quality and Beneficial Uses, Upper Santa Clara River Hydrologic Area by DWR Dated 1993.

FIGURE 68 - TDS HYDROGRAPH

EASTERN HYDROLOGIC SUBAREA, CASTAIC CREEK TO BLUE CUT SUBDIVISION

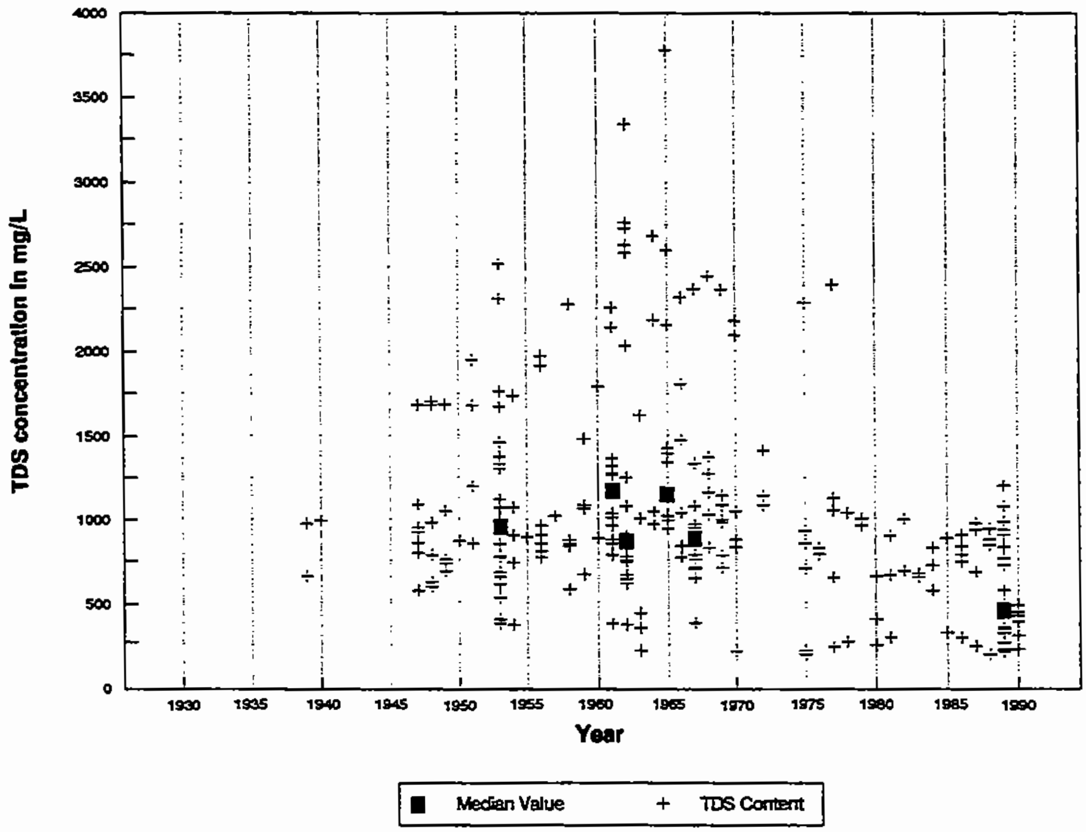
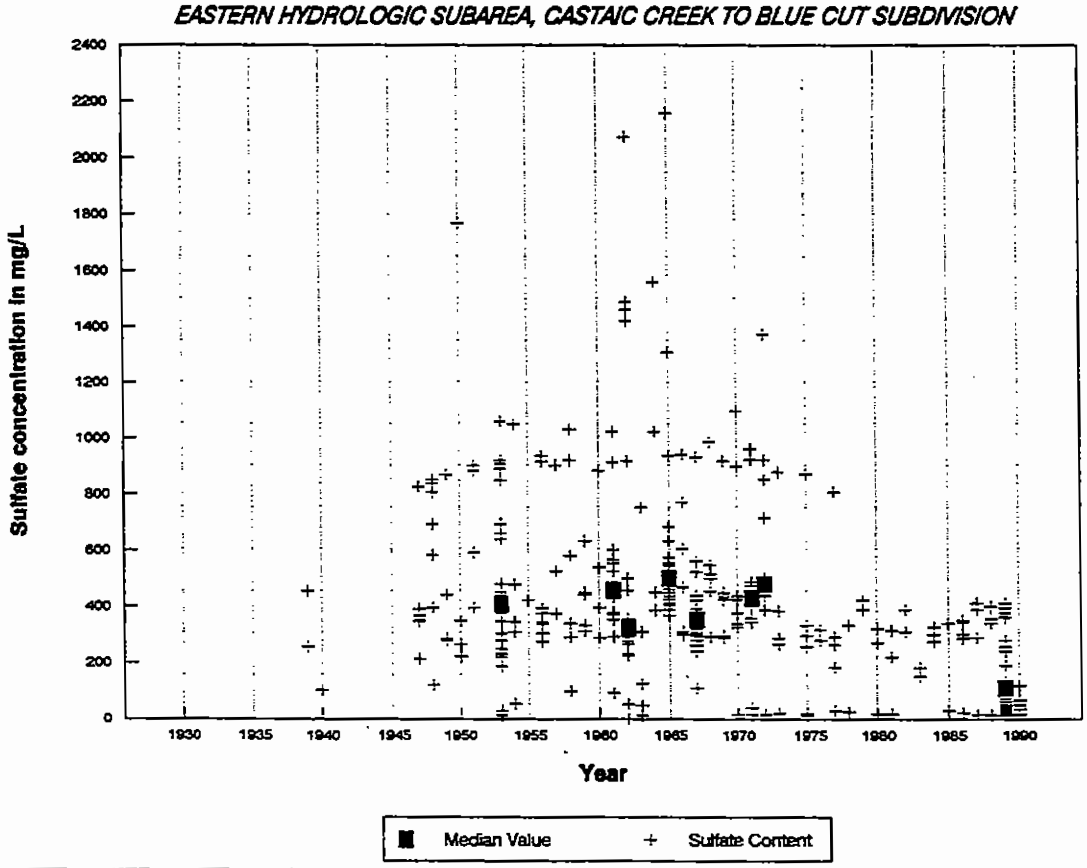


FIGURE 69 - SULFATE HYDROGRAPH

EASTERN HYDROLOGIC SUBAREA, CASTAIC CREEK TO BLUE CUT SUBDIVISION



Source: Investigation of Water Quality and Beneficial Uses, Upper Santa Clara River Hydrologic Area by DWR Dated 1993.

FIGURE 70 - CHLORIDE HYDROGRAPH

EASTERN HYDROLOGIC SUBAREA, CASTAIC CREEK TO BLUE CUT SUBDIVISION

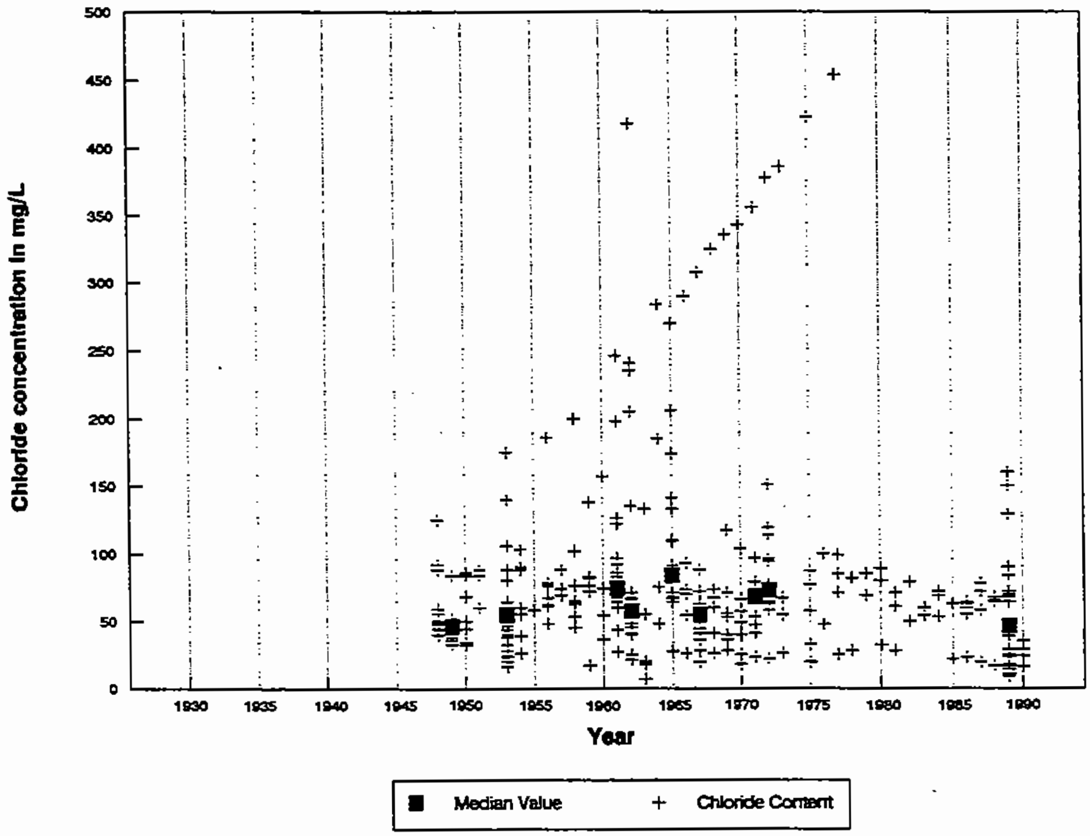
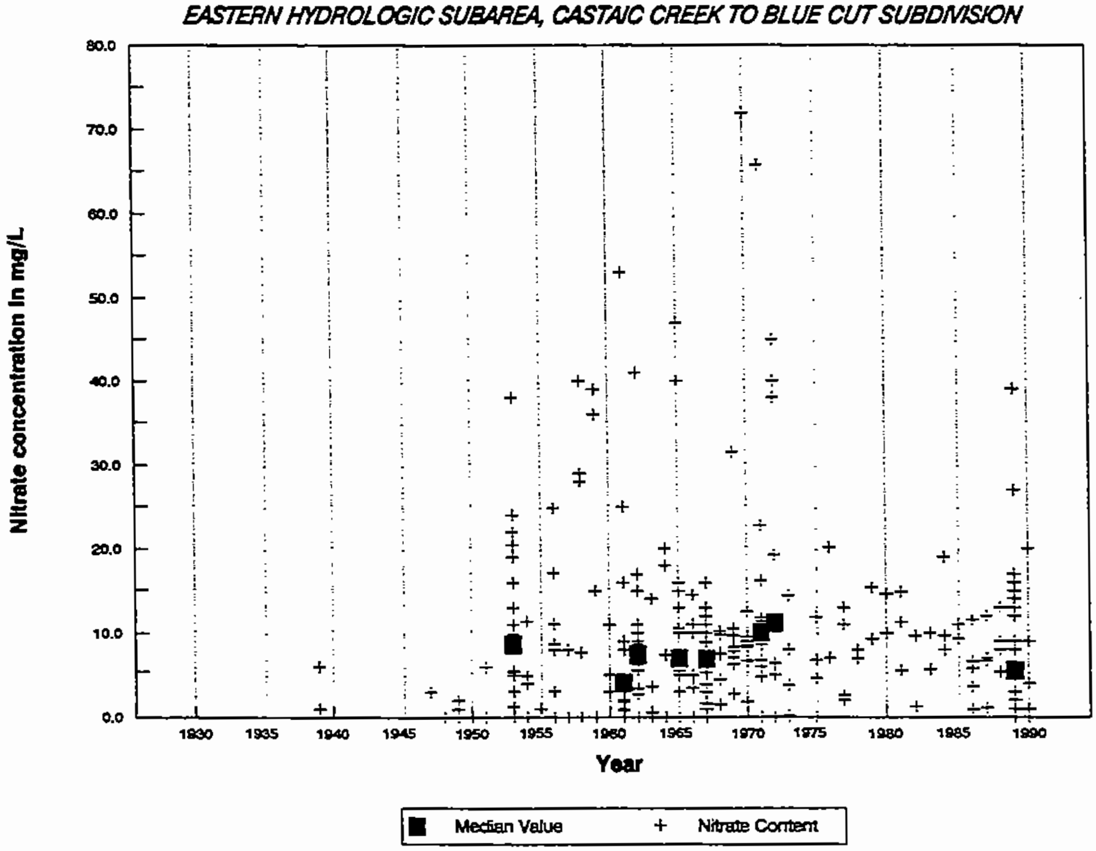
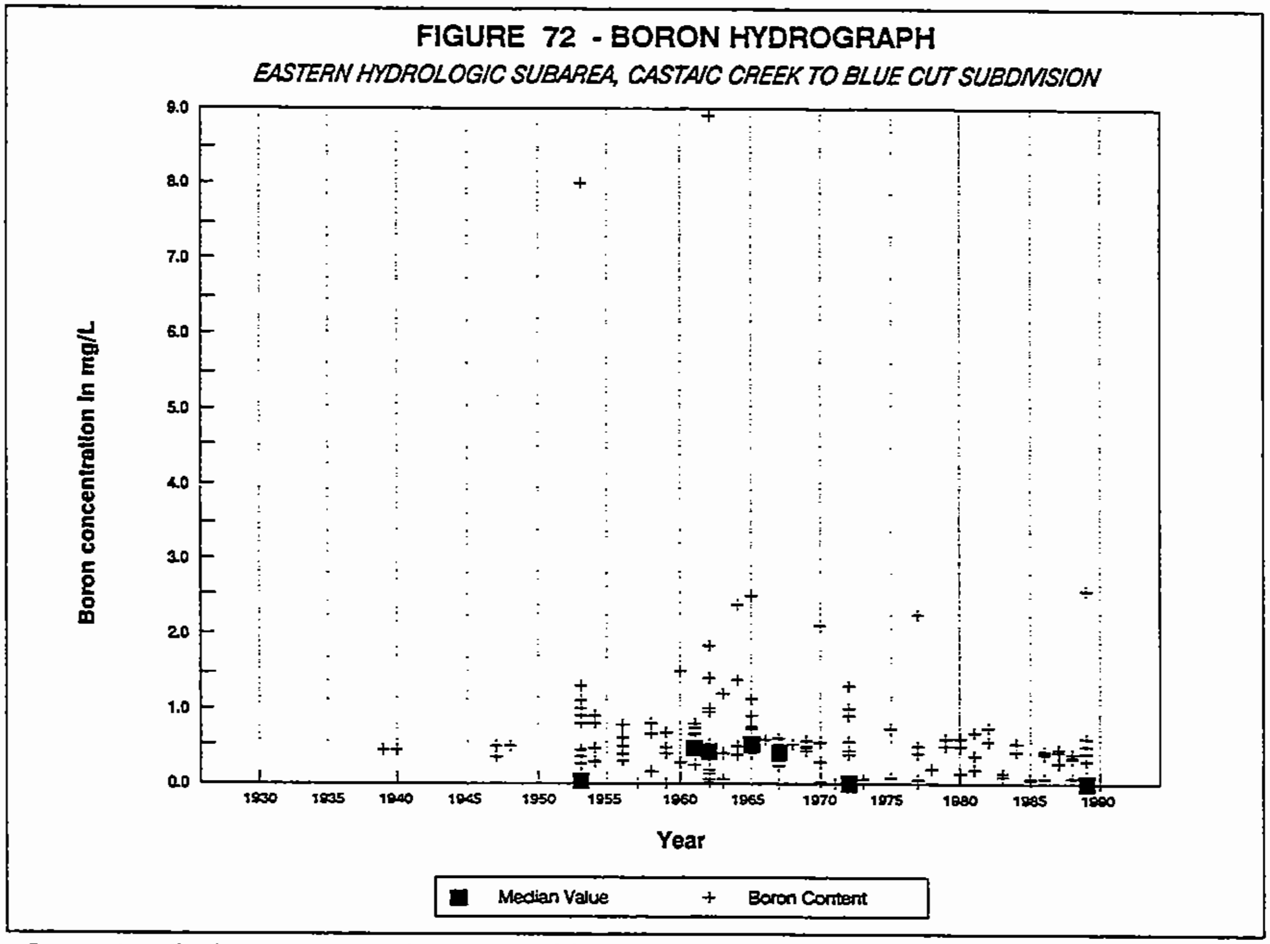


FIGURE 71 - NITRATE HYDROGRAPH

EASTERN HYDROLOGIC SUBAREA, CASTAIC CREEK TO BLUE CUT SUBDIVISION

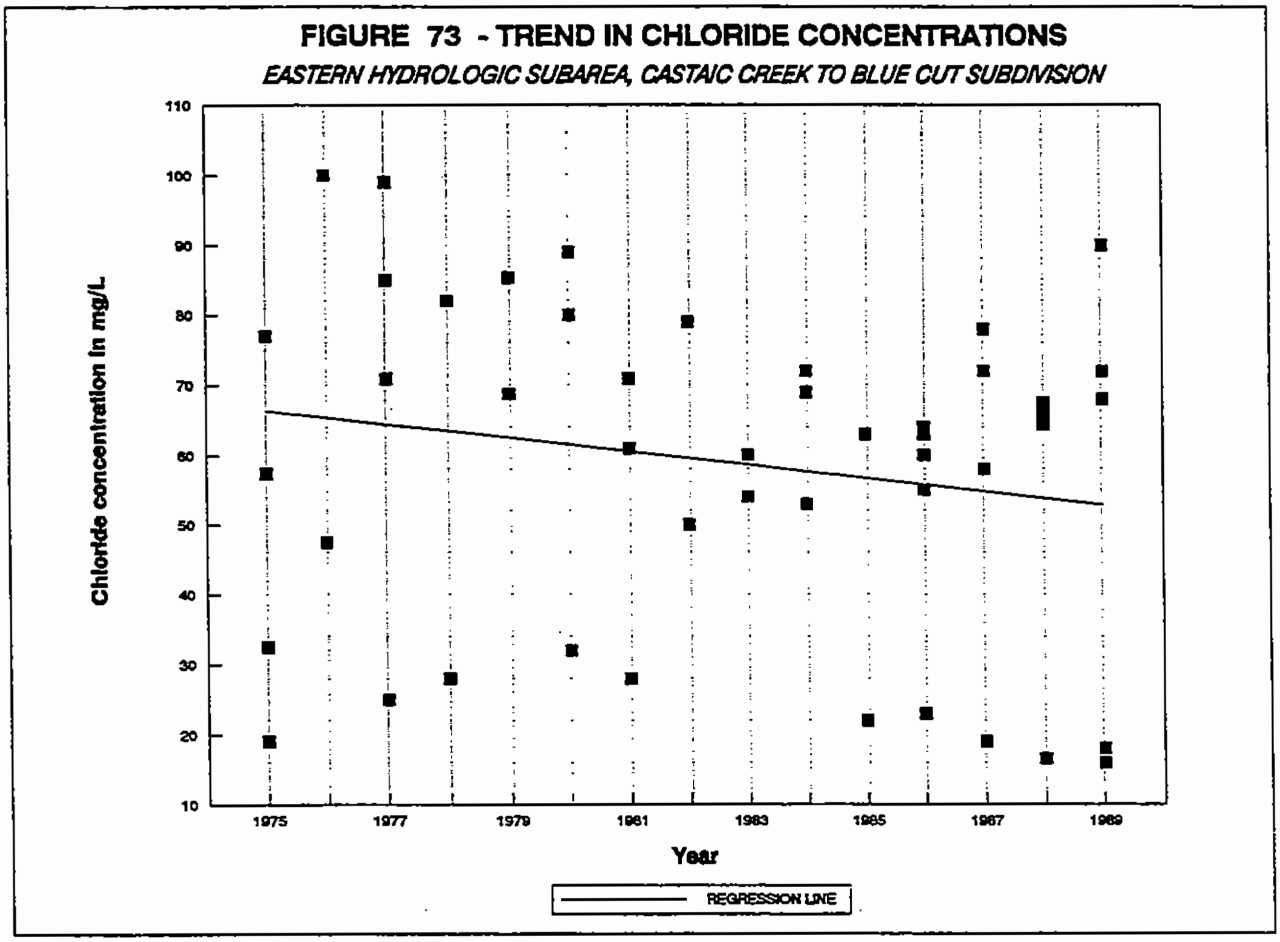


Source: Investigation of Water Quality and Beneficial Uses, Upper Santa Clara River Hydrologic Area by DWR Dated 1993.



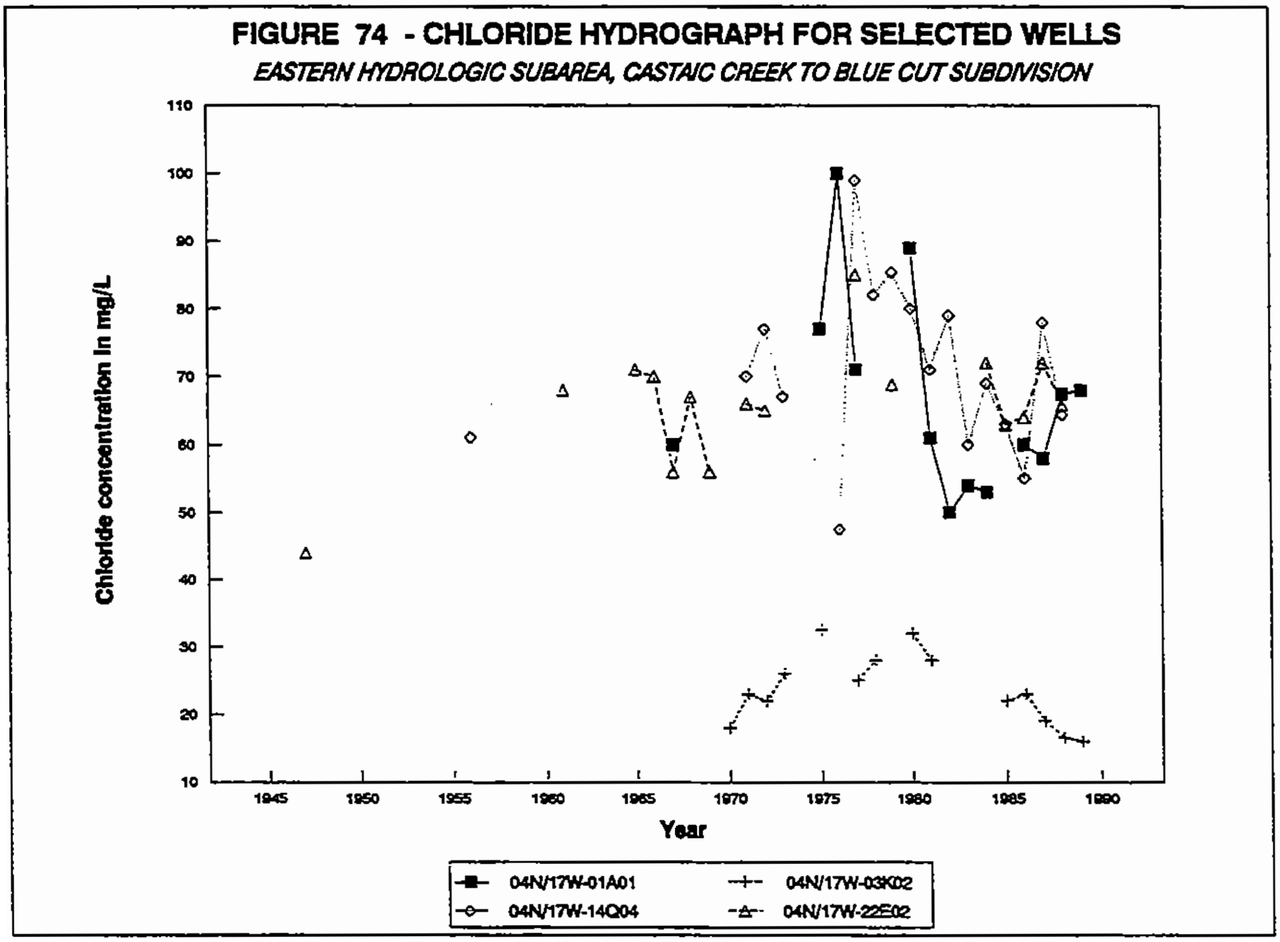
Source: Investigation of Water Quality and Beneficial Uses, Upper Santa Clara River Hydrologic Area by DWR Dated 1993.

Appendix D



Source: Investigation of Water Quality and Beneficial Uses, Upper Santa Clara River Hydrologic Area by DWR Dated 1993.

Appendix D



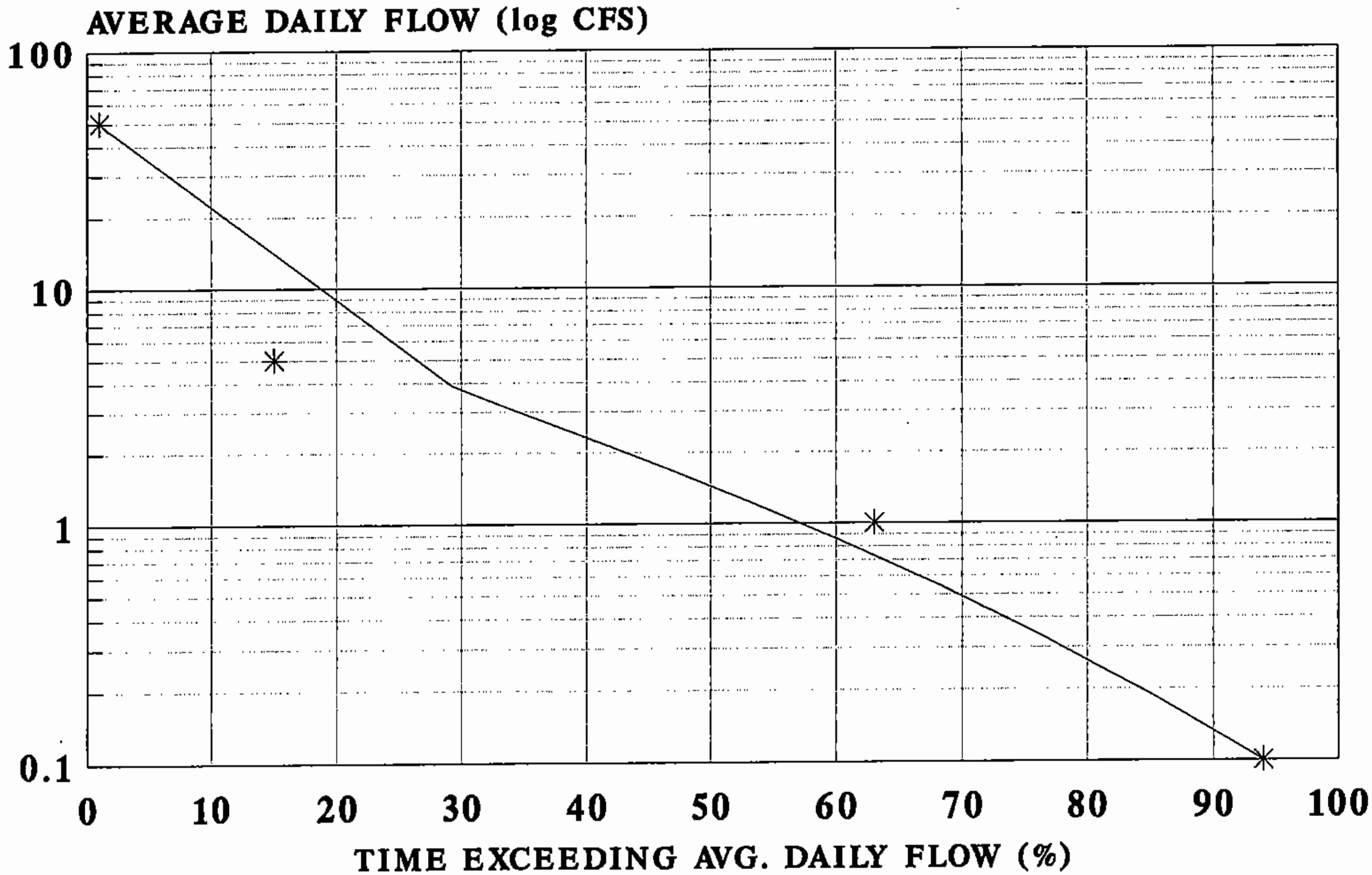
Source: Investigation of Water Quality and Beneficial Uses, Upper Santa Clara River Hydrologic Area by DWR Dated 1993.

Appendix D

APPENDIX E

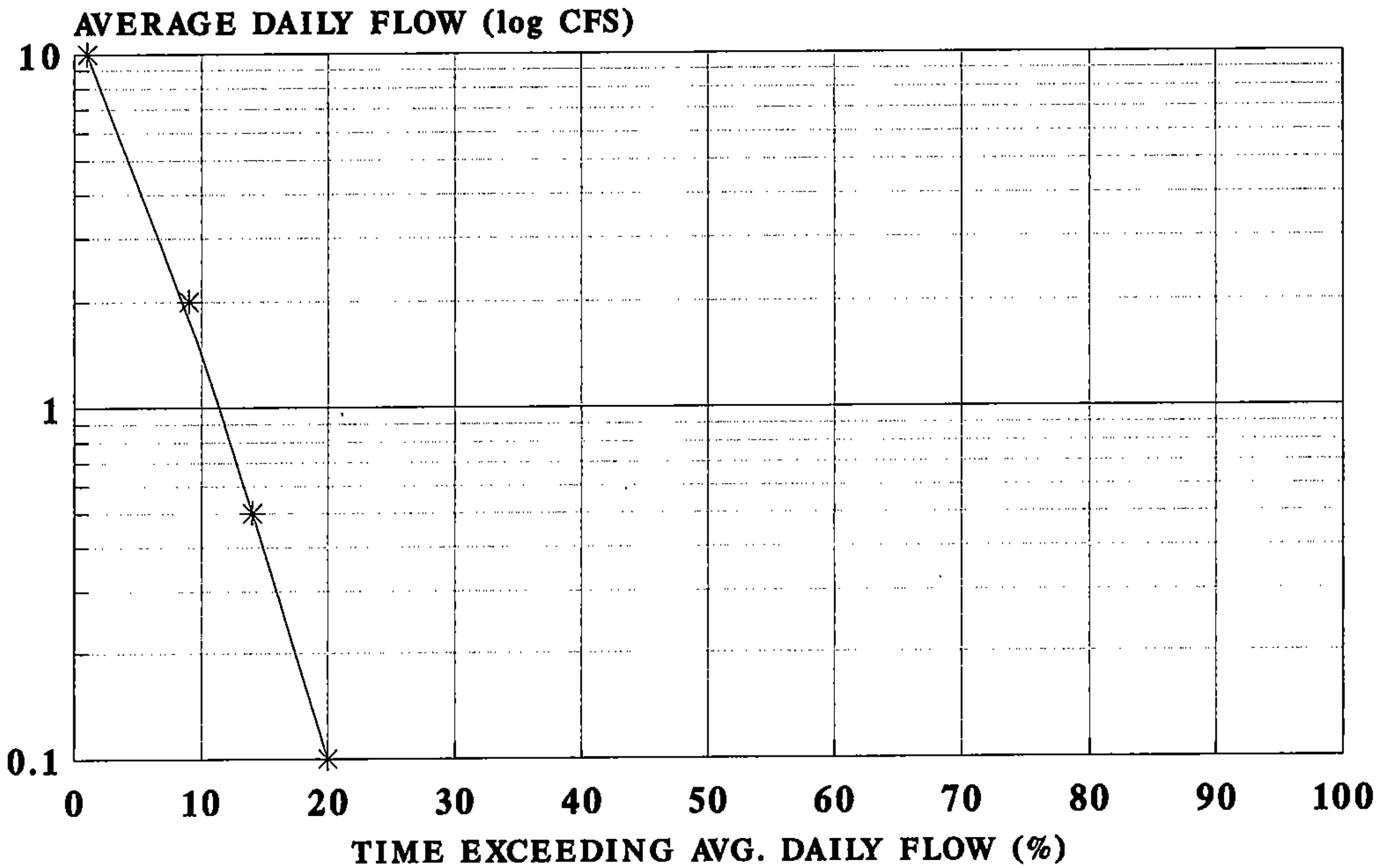
Flow Duration Curves for the Upper Santa Clara River

LANG STATION
FLOW DURATION ANALYSIS



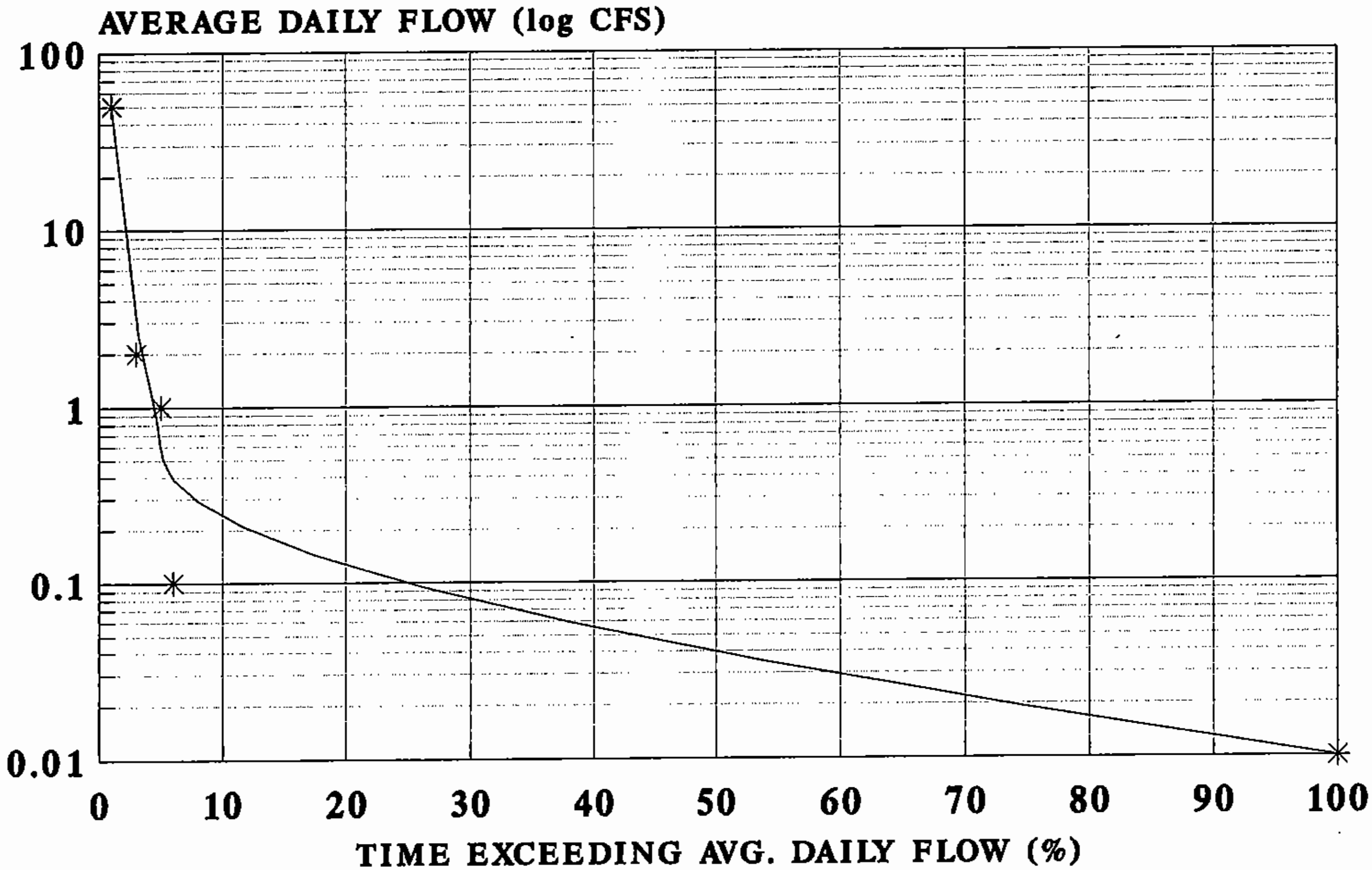
Source: Duration Curve Prepared by Kennedy/Jenks Consultants (USGS Records for Oct. 1949 to Sept. 1989)

BOUQUET CREEK STATION
FLOW DURATION ANALYSIS



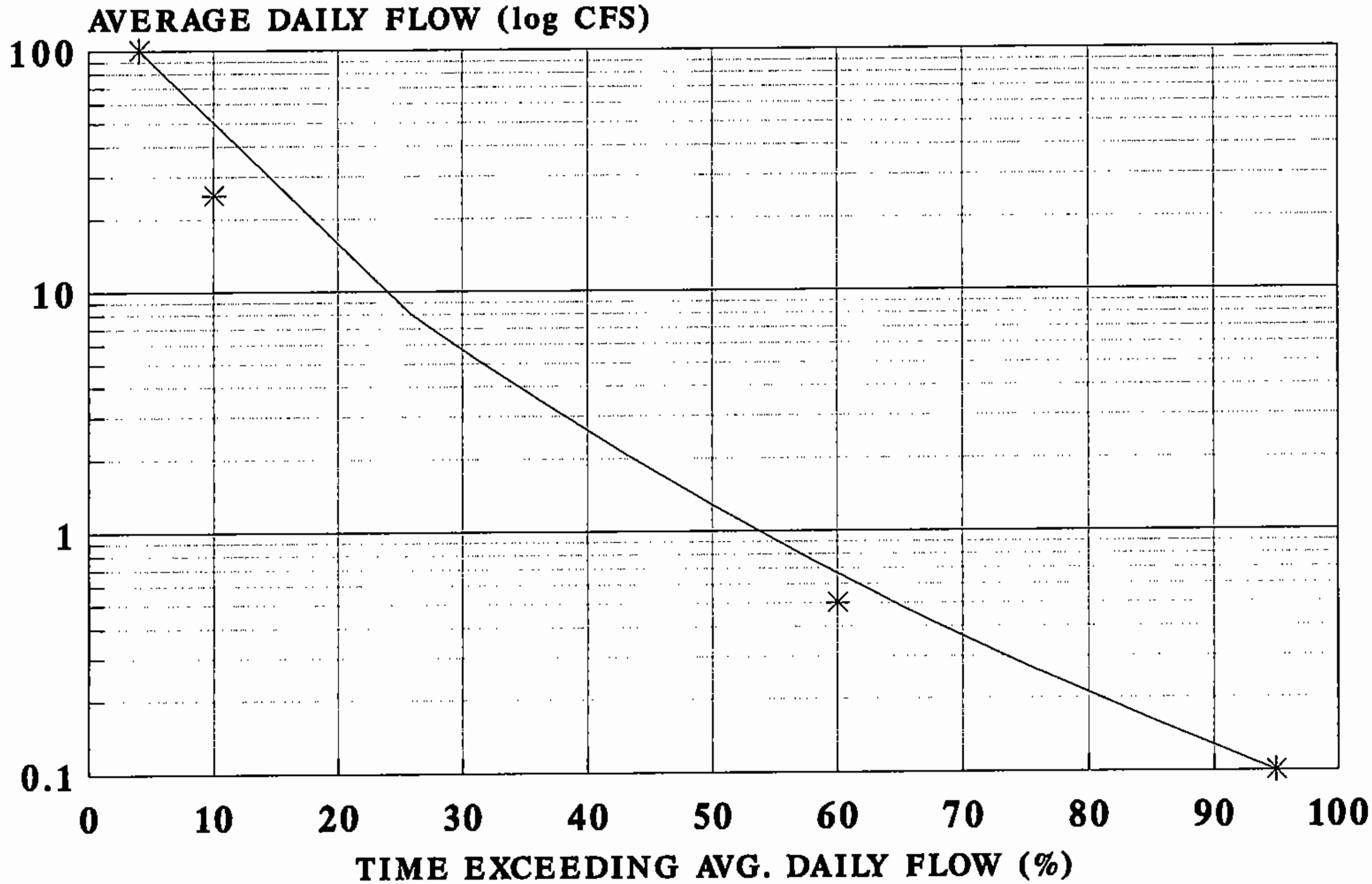
Source: Duration Curve Prepared by Kennedy/Jenks Consultants (USGS Records for Oct. 1970 to Sept. 1977)

SOUTH FORK STATION
FLOW DURATION ANALYSIS



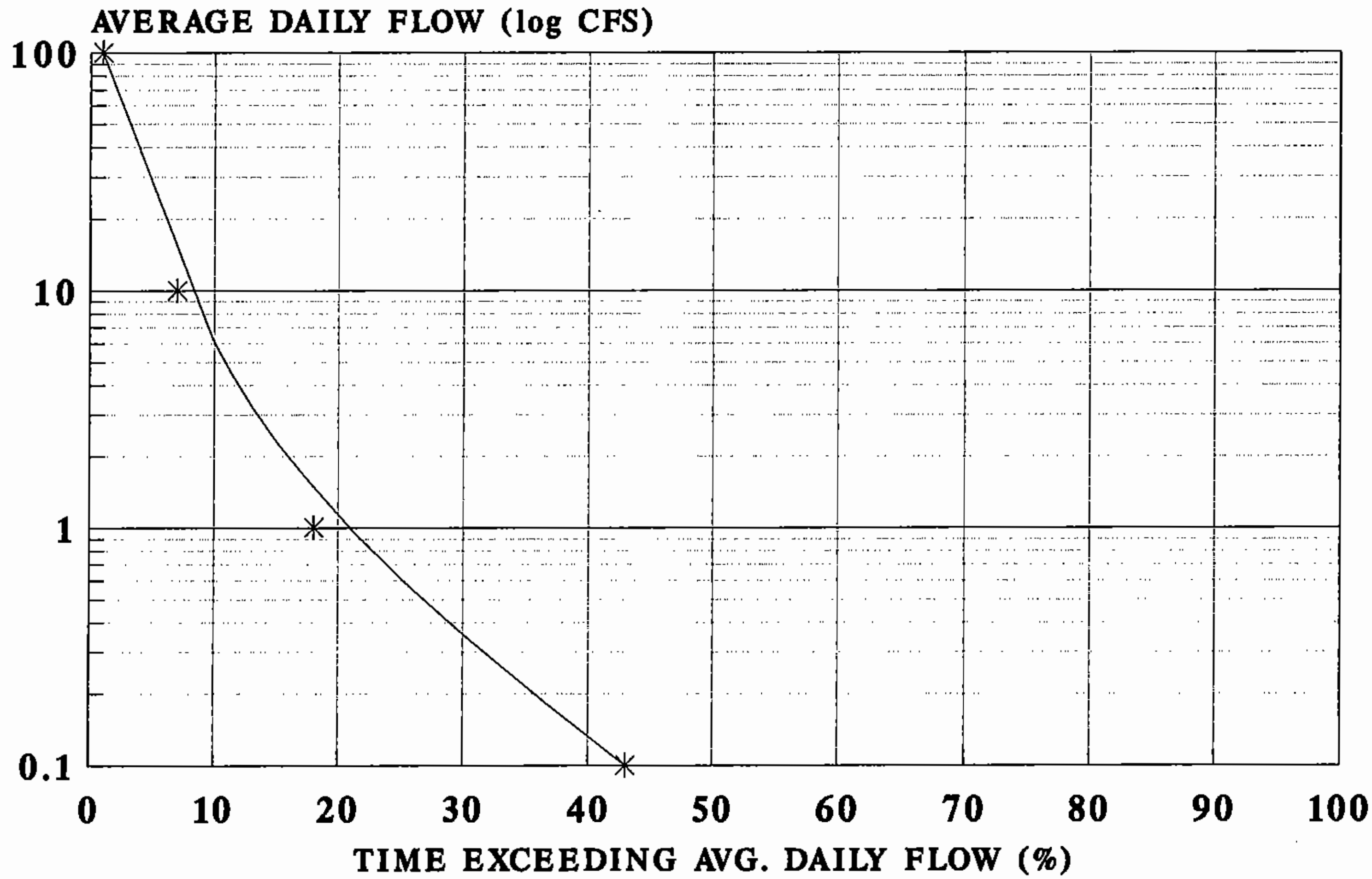
Source: Duration Curve Prepared by Kennedy/Jenks Consultants (USGS Records for Oct. 1975 to Sept. 1977)

OLD ROAD BRIDGE STATION
FLOW DURATION ANALYSIS



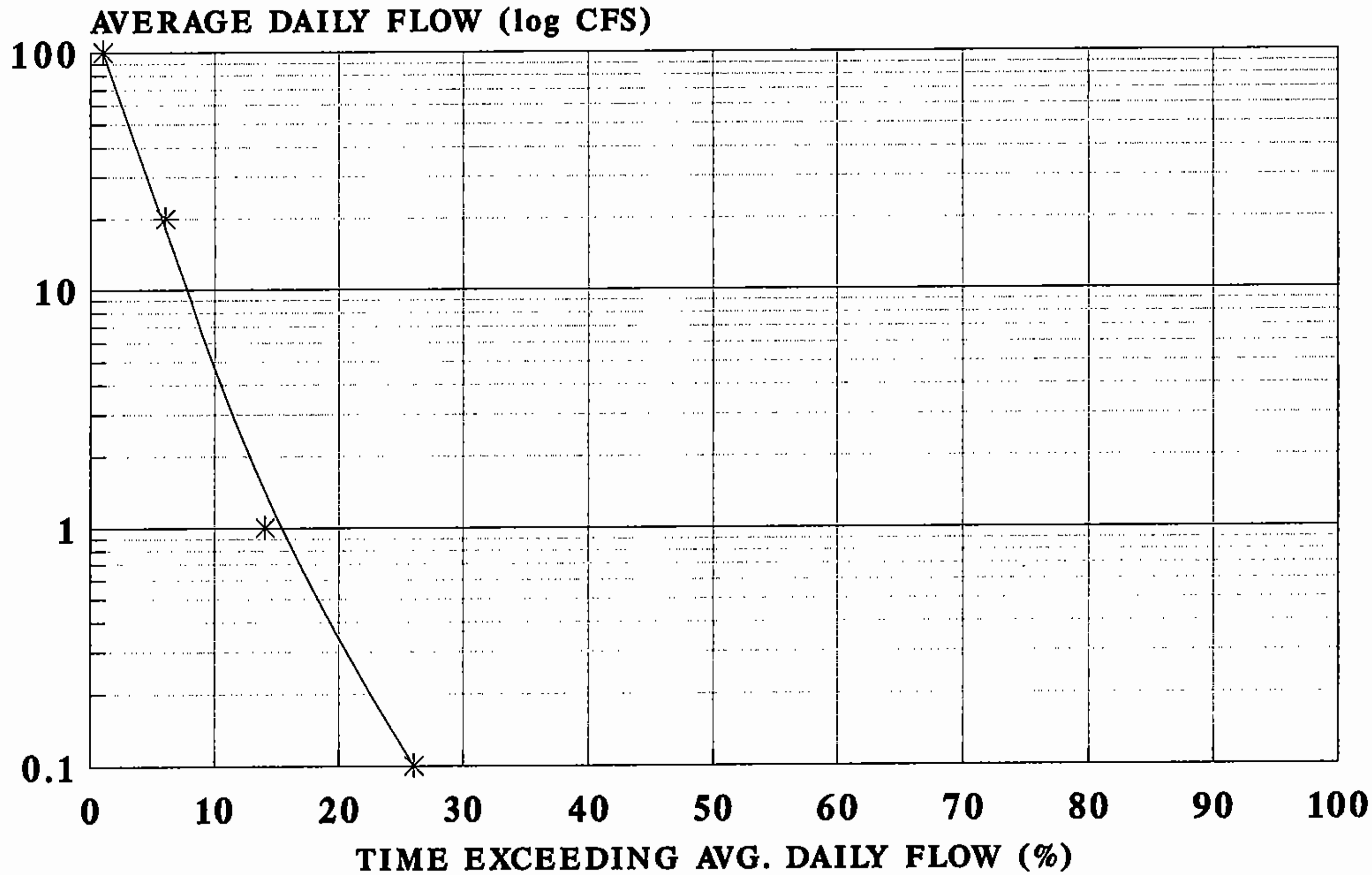
Source: Duration Curve Prepared by Kennedy/Jenks Consultants (USGS Records for Oct. 1929 to Sept. 1993)

CASTAIC CREEK-NORTH STATION
FLOW DURATION ANALYSIS



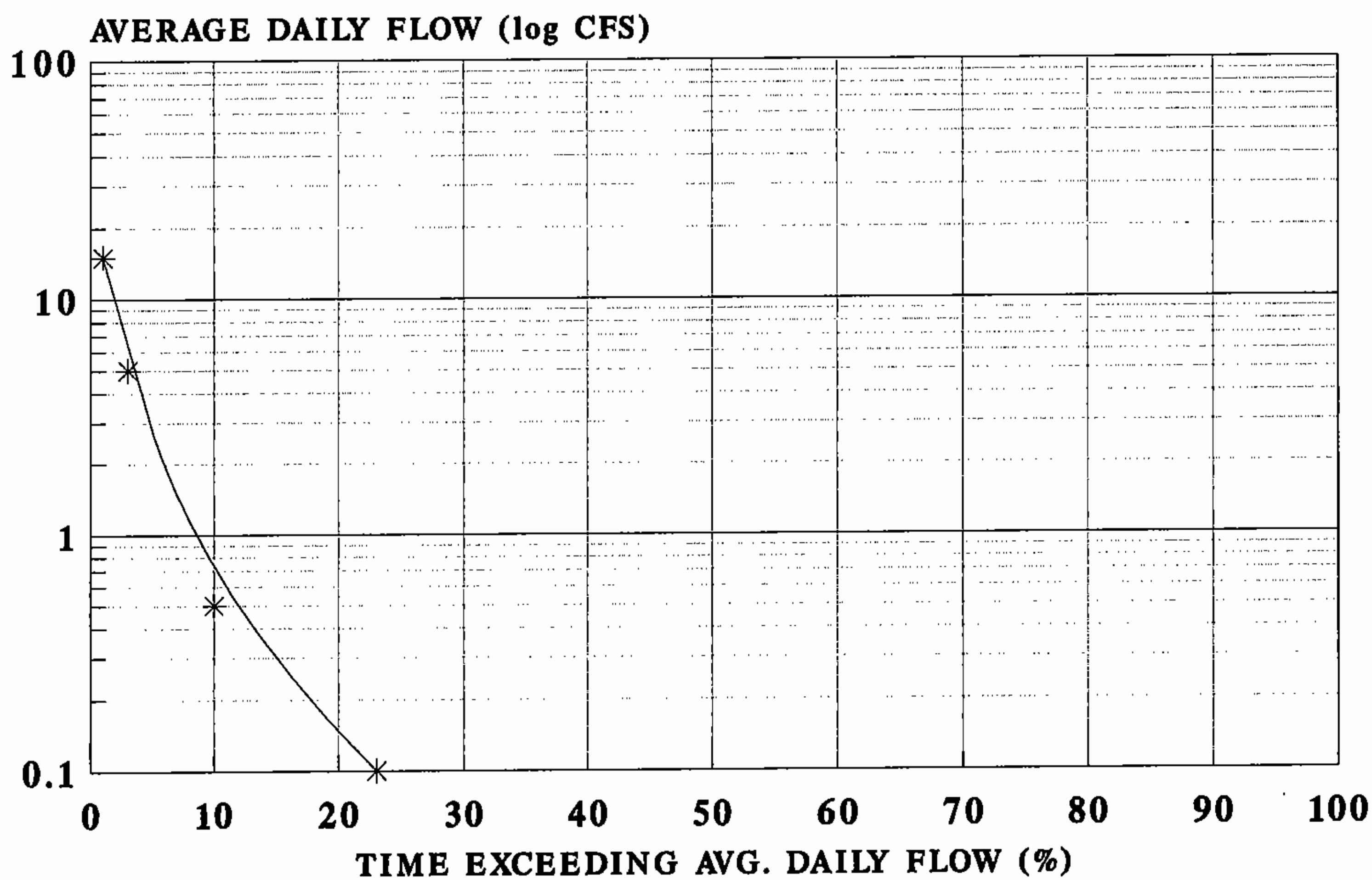
Source: Duration Curve Prepared by Kennedy/Jenks Consultants (USGS Records for Oct. 1976 to Sept. 1991)

FISH CREEK STATION
FLOW DURATION ANALYSIS



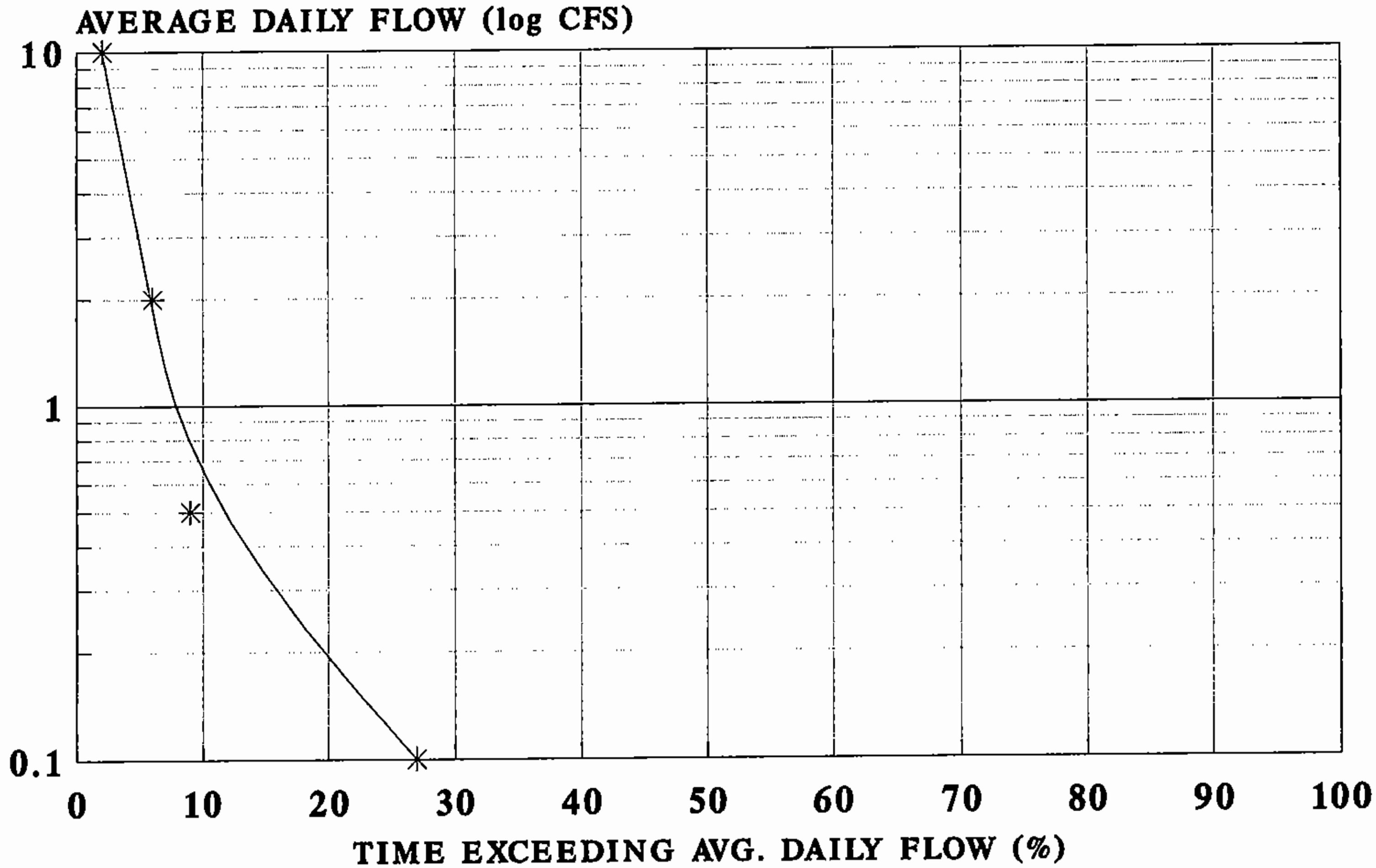
Source: Duration Curve Prepared by Kennedy/Jenks Consultants (USGS Records for Oct. 1976 to Sept. 1991)

ELDERBERRY CANYON STATION
FLOW DURATION ANALYSIS



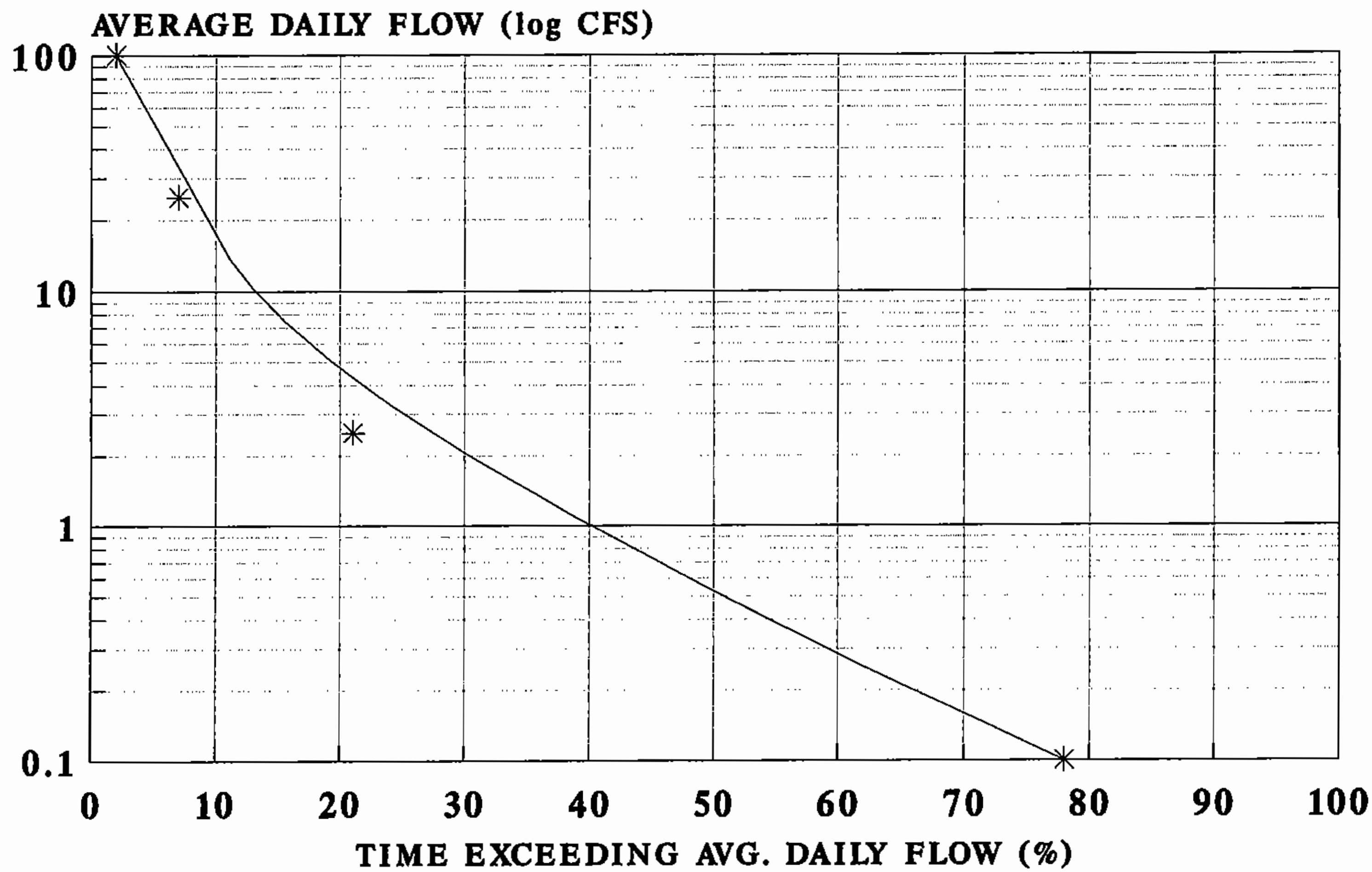
Source: Duration Curve Prepared by Kennedy/Jenks Consultants (USGS Records for Oct. 1978 to Sept. 1991)

NECKTIE CANYON STATION
FLOW DURATION ANALYSIS



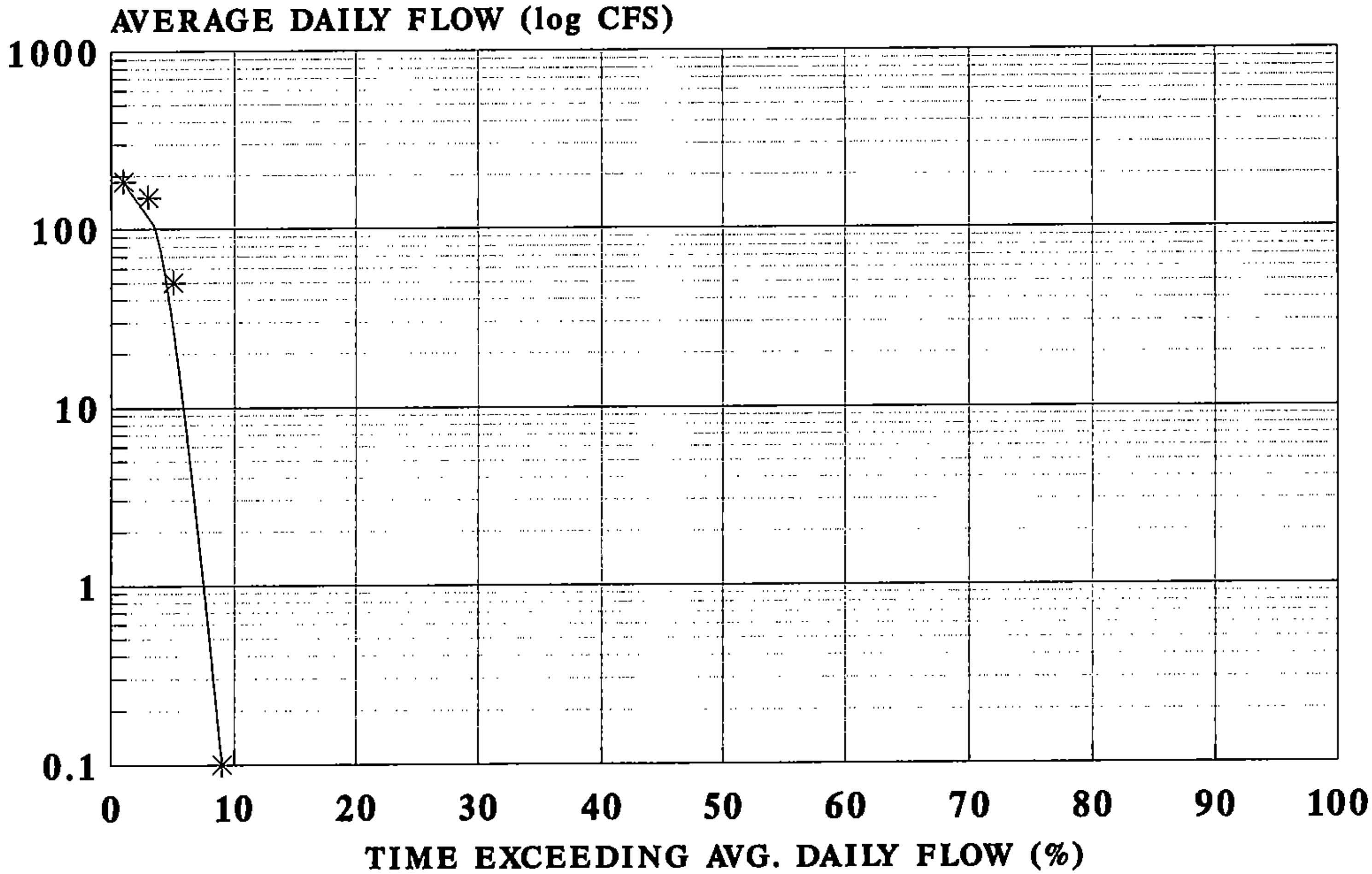
Source: Duration Curves Prepared by Kennedy/Jenks Consultants (USGS Records for Oct. 1976 to Sept. 1991)

ELIZABETH LAKE CANYON STATION
FLOW DURATION ANALYSIS



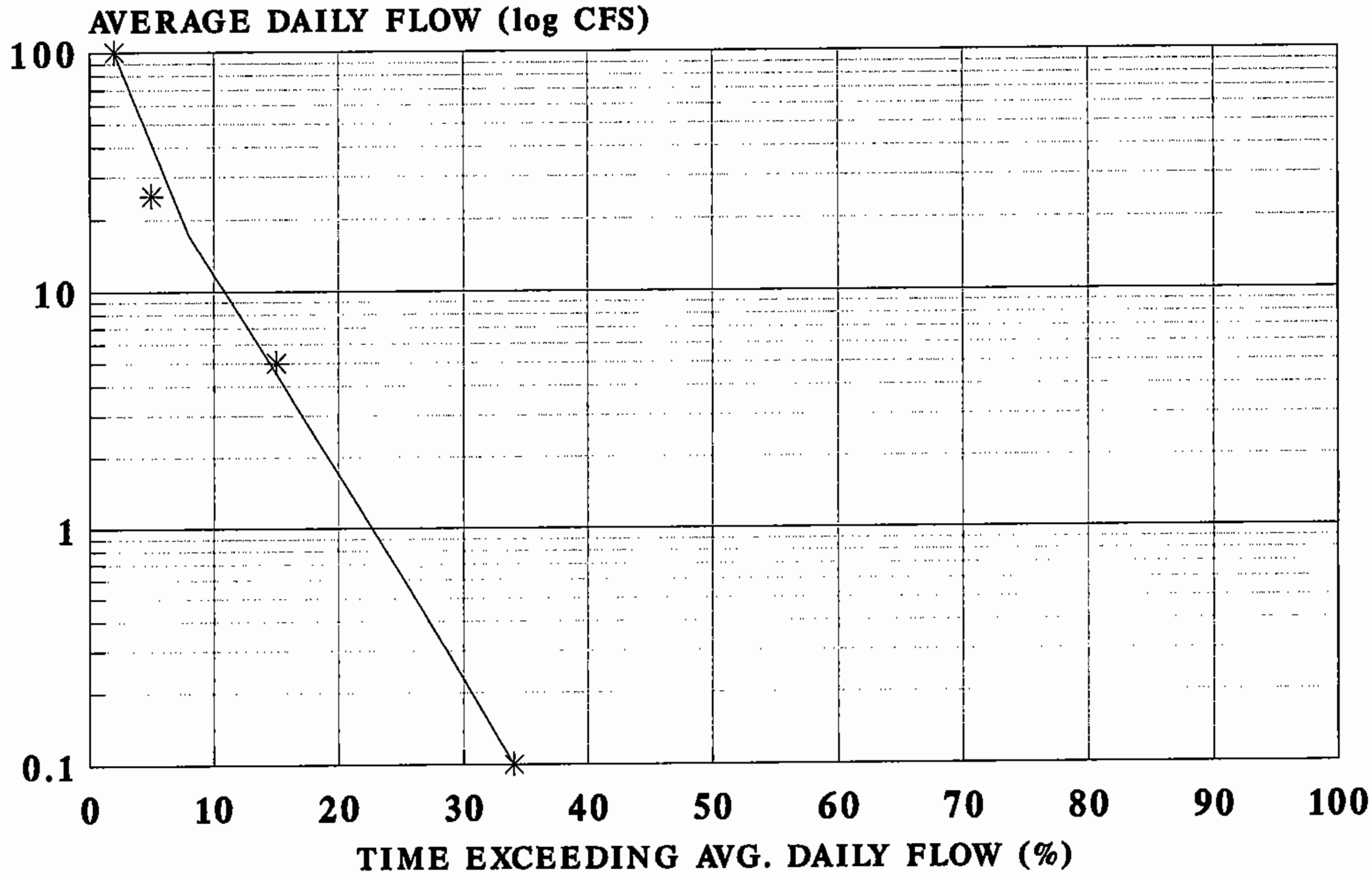
Source: Duration Curve Prepared by Kennedy/Jenks Consultants (USGS Records for Oct. 1976 to Sept. 1991)

CASTAIC LAGOON STATION
FLOW DURATION ANALYSIS



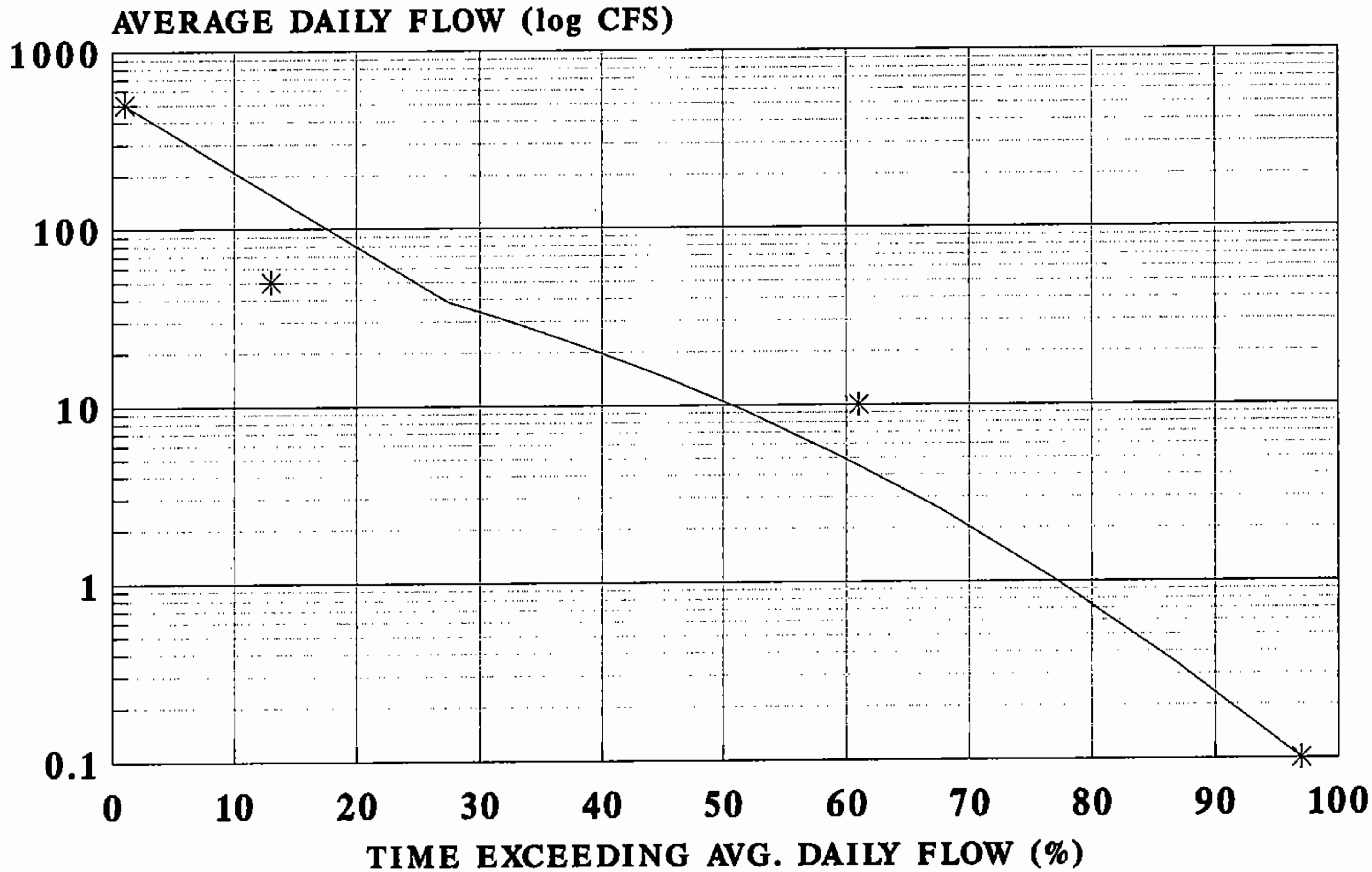
Source: Duration Curve Prepared by Kennedy/Jenks Consultants (USGS Records for Oct. 1976 to Sept. 1994)

CASTAIC CREEK-SOUTH STATION
FLOW DURATION ANALYSIS



Source: Duration Curve Prepared by Kennedy/Jenks Consultants (USGS Records for Oct. 1946 to Sept. 1977)

COUNTY LINE STATION
FLOW DURATION ANALYSIS

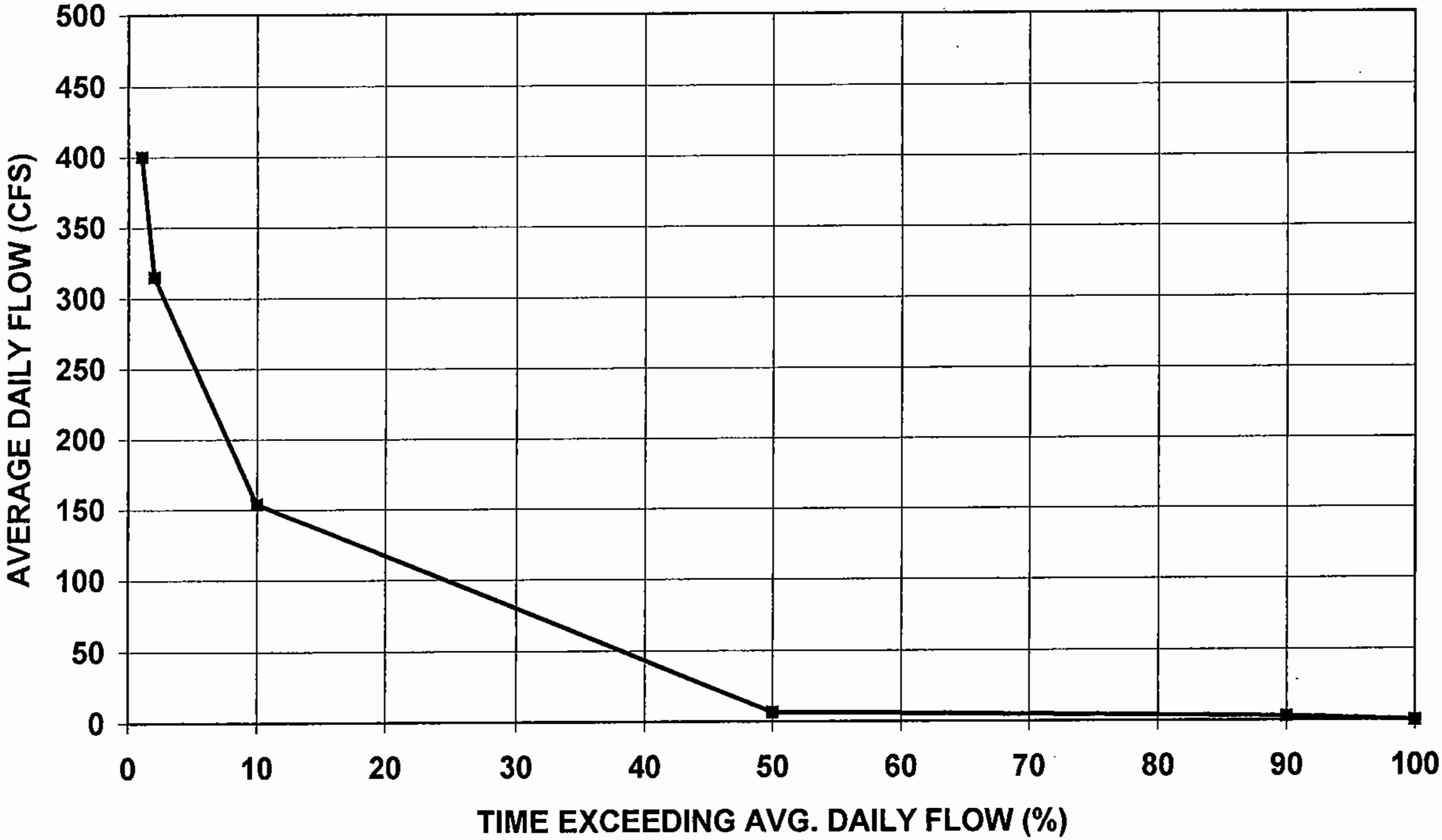


Source: Duration Curve Prepared by Kennedy/Jenks Consultants (USGS Records for Oct. 1952 to Jan. 1992)

APPENDIX F

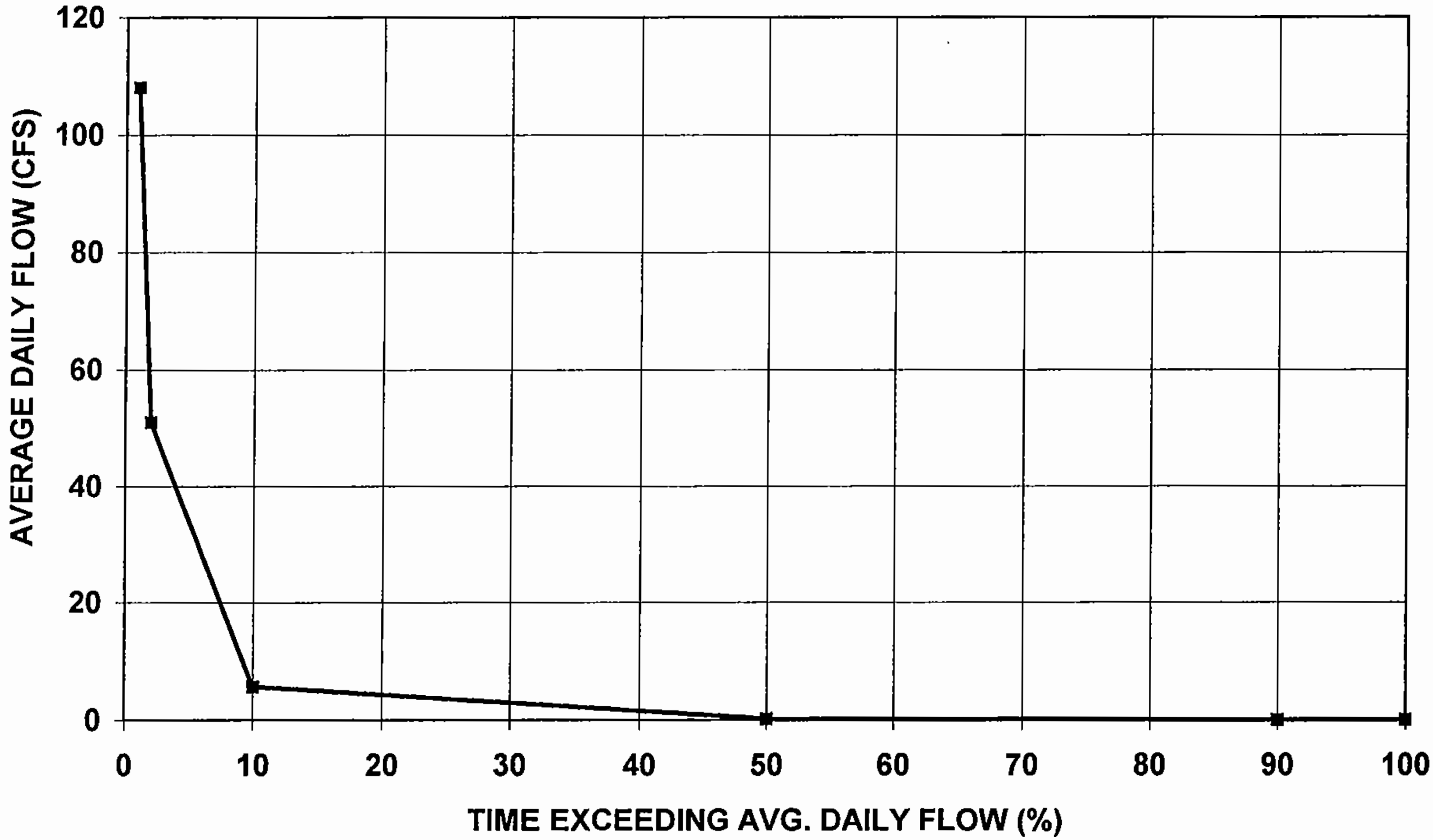
Flow Duration Curves for the Lower Santa Clara River

PIRU CREEK BELOW SANTA FELICIA DAM
FLOW DURATION ANALYSIS



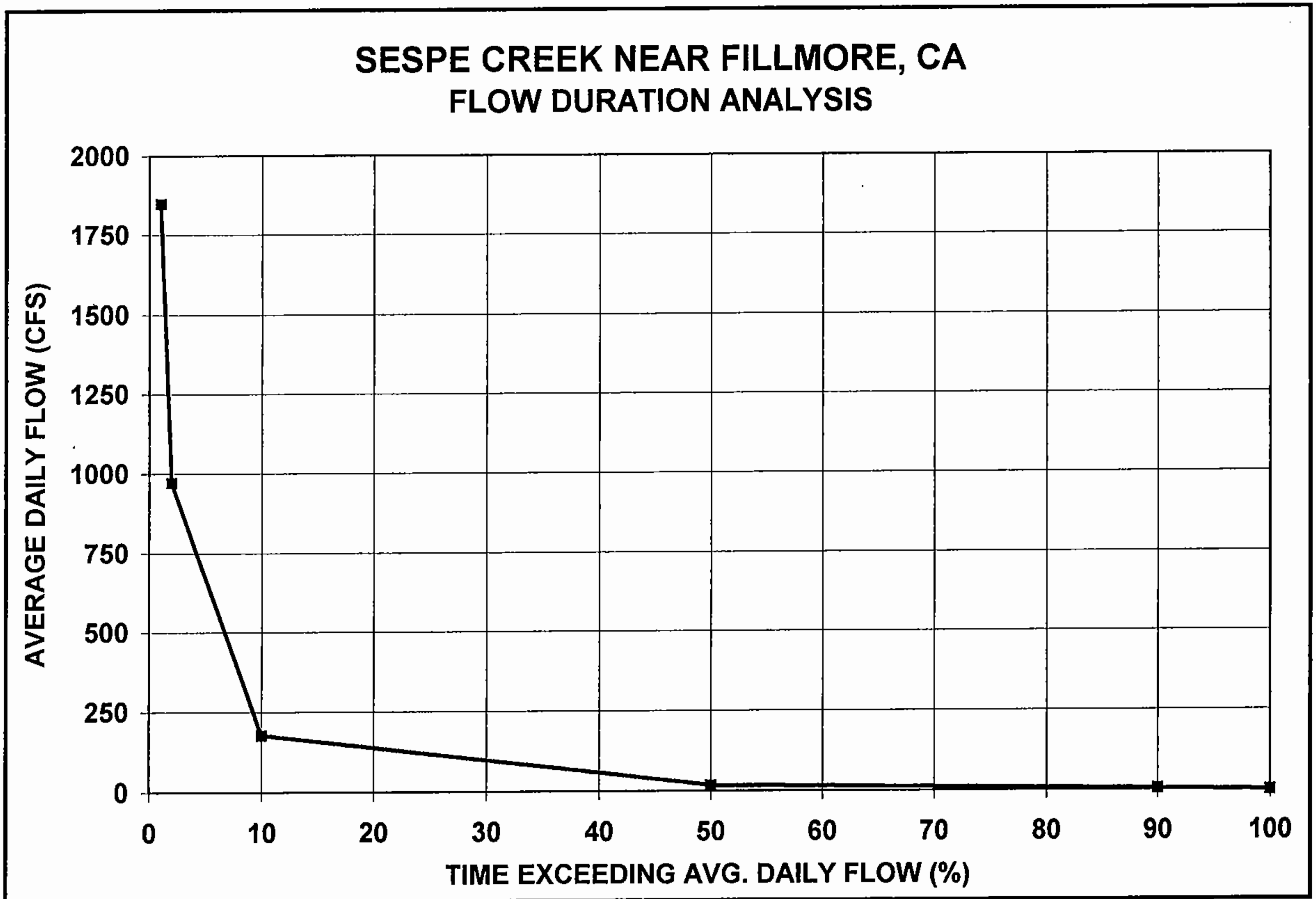
Source: Duration Curve Prepared by
United Water Conservation District (USGS Records
for 1956-1993)

HOPPER CREEK NEAR PIRU, CA
FLOW DURATION ANALYSIS



Source: Duration Curve Prepared by United Water Conservation District (USGS Records for 1931-1983)

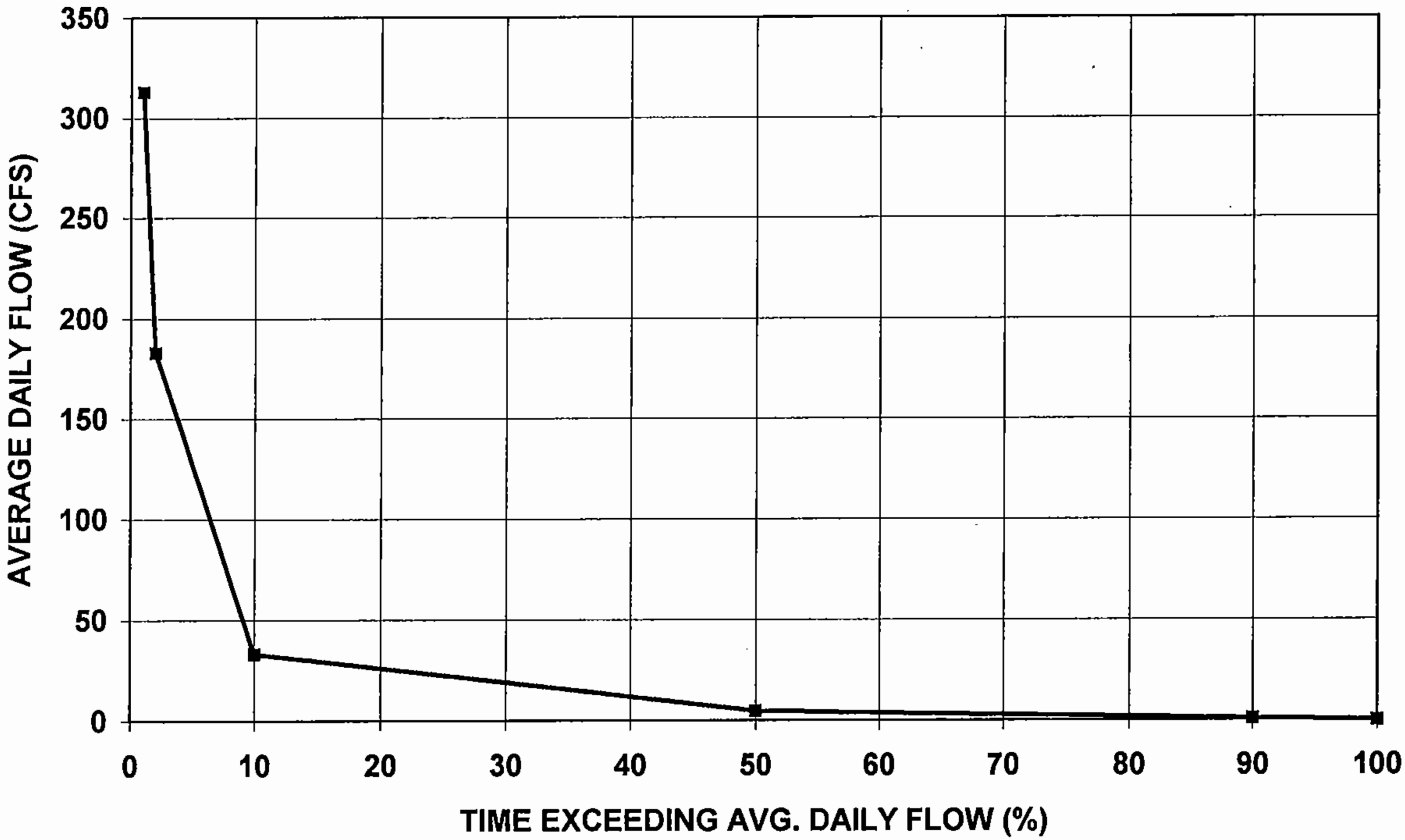
Appendix F



Appendix F

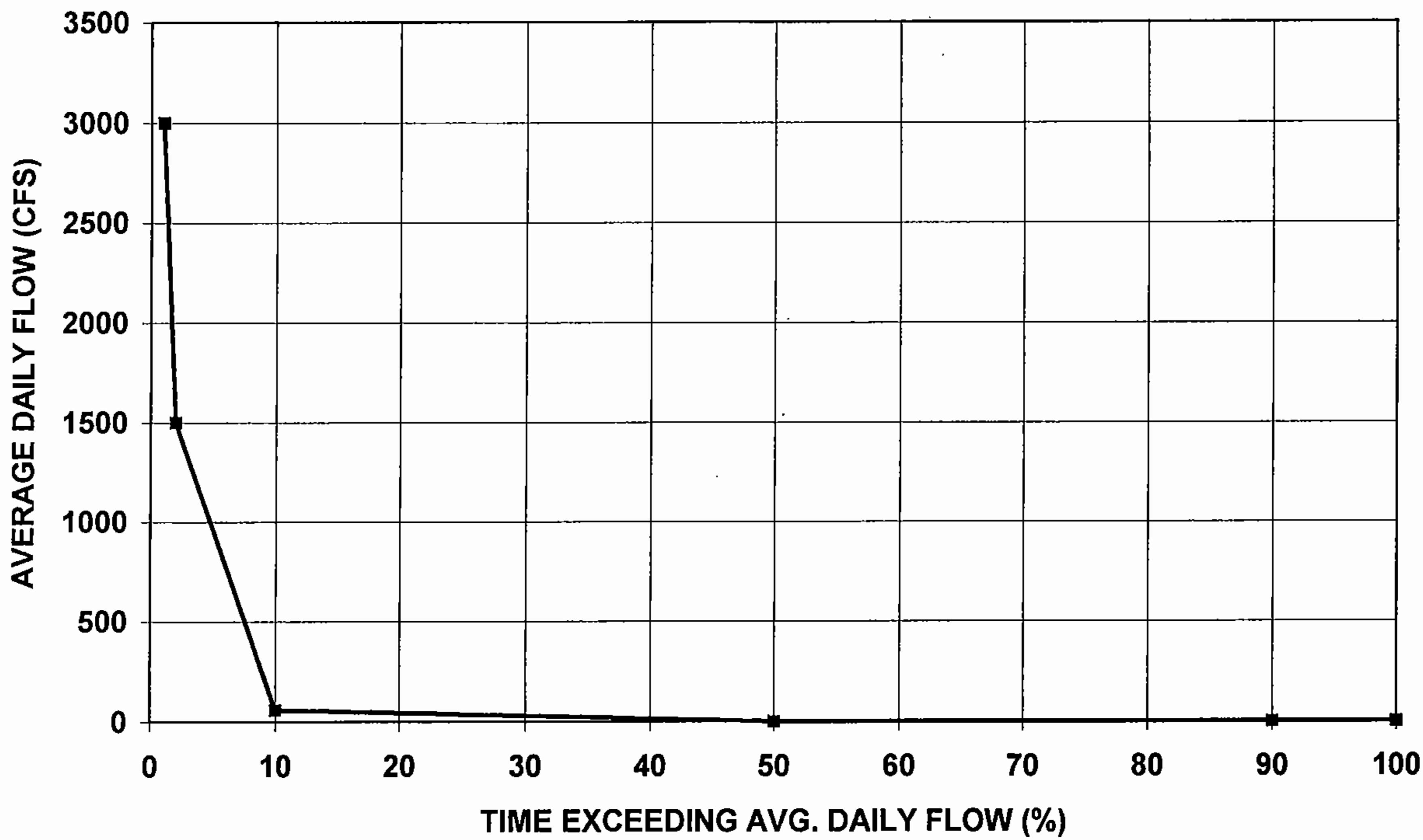
Source: Duration Curve Prepared by
United Water Conservation District (USGS Records
for 1912-1993)

SANTA PAULA CREEK NEAR SANTA PAULA, CA
FLOW DURATION ANALYSIS



Source: Duration Curve Prepared by United Water Conservation District (USGS Records for 1928-1993)

SANTA CLARA RIVER AT MONTALVO, CA
FLOW DURATION ANALYSIS



Source: Duration Curve Prepared by
United Water Conservation District (USGS Records
for 1928-1993)

APPENDIX G

Surface Water Quality for the Upper Santa Clara River

FIGURE 77 - ANNUAL AVERAGE WEIGHTED TDS CONCENTRATIONS SANTA CLARA RIVER AT OLD HIGHWAY BRIDGE

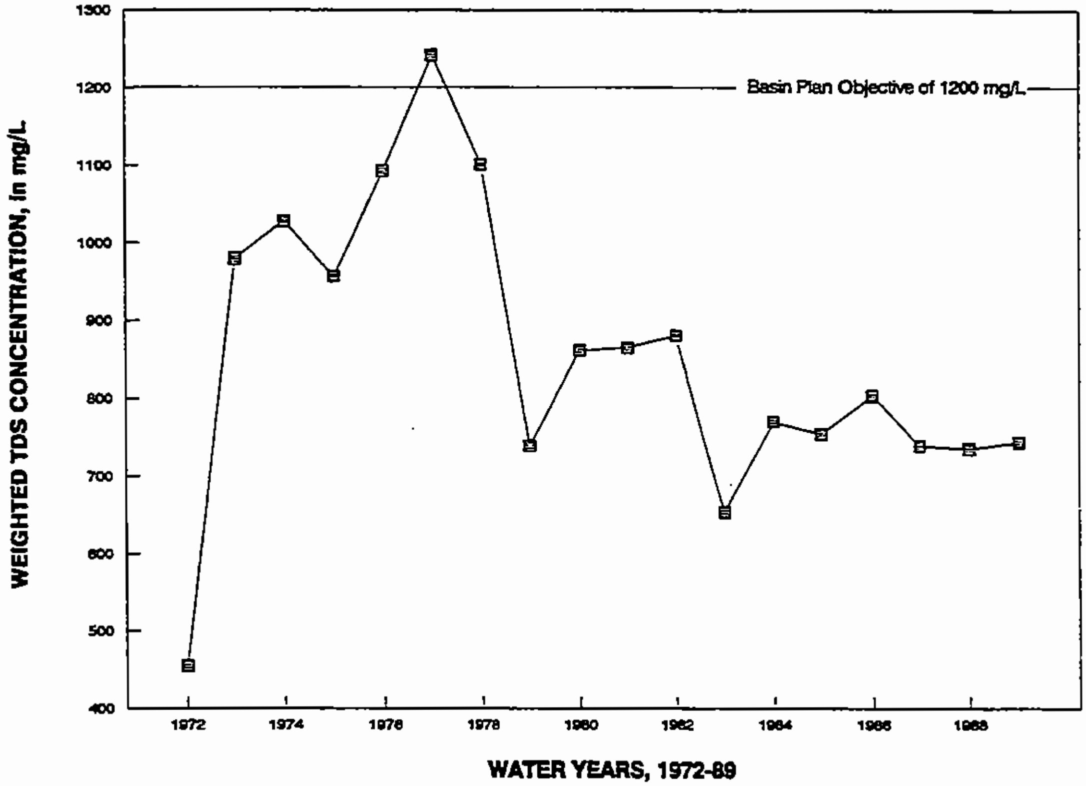
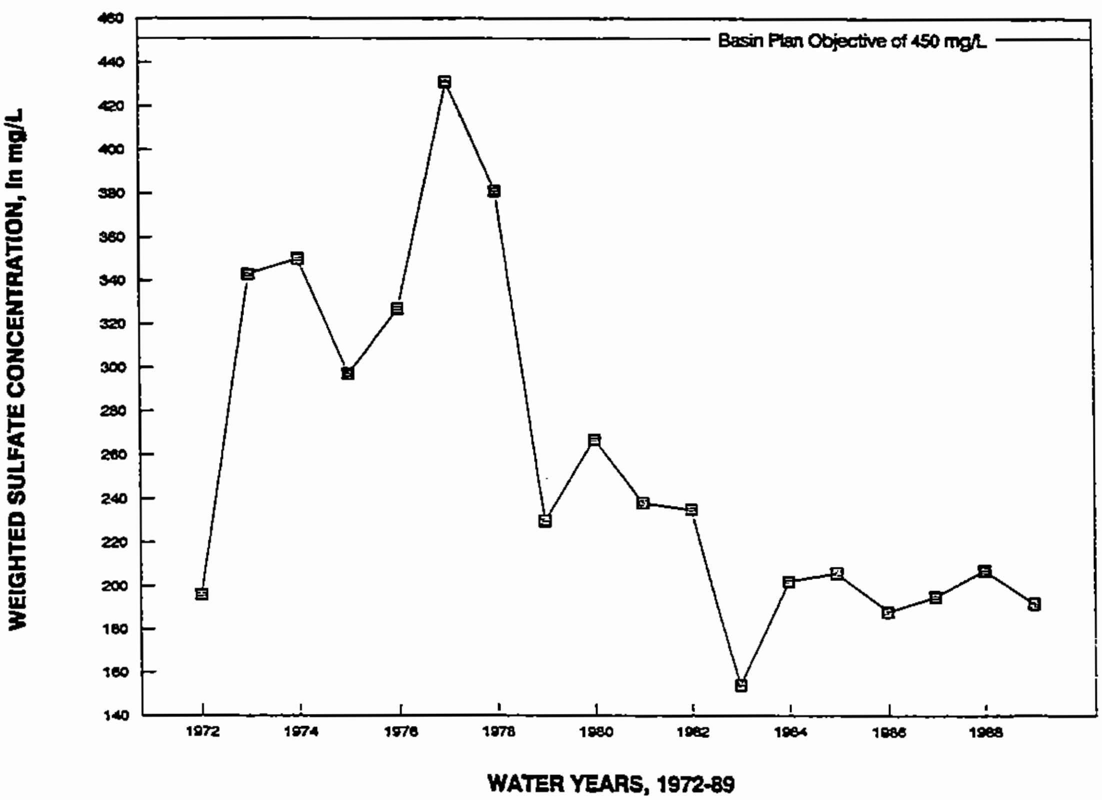


FIGURE 78 - ANNUAL AVERAGE WEIGHTED SULFATE CONCENTRATIONS SANTA CLARA RIVER AT OLD HIGHWAY BRIDGE



Source: Investigation of Water Quality and Beneficial Uses, Upper Santa Clara River Hydrologic Area by DWR Dated 1993.

FIGURE 79 - ANNUAL AVERAGE WEIGHTED CHLORIDE CONCENTRATIONS SANTA CLARA RIVER AT OLD HIGHWAY BRIDGE

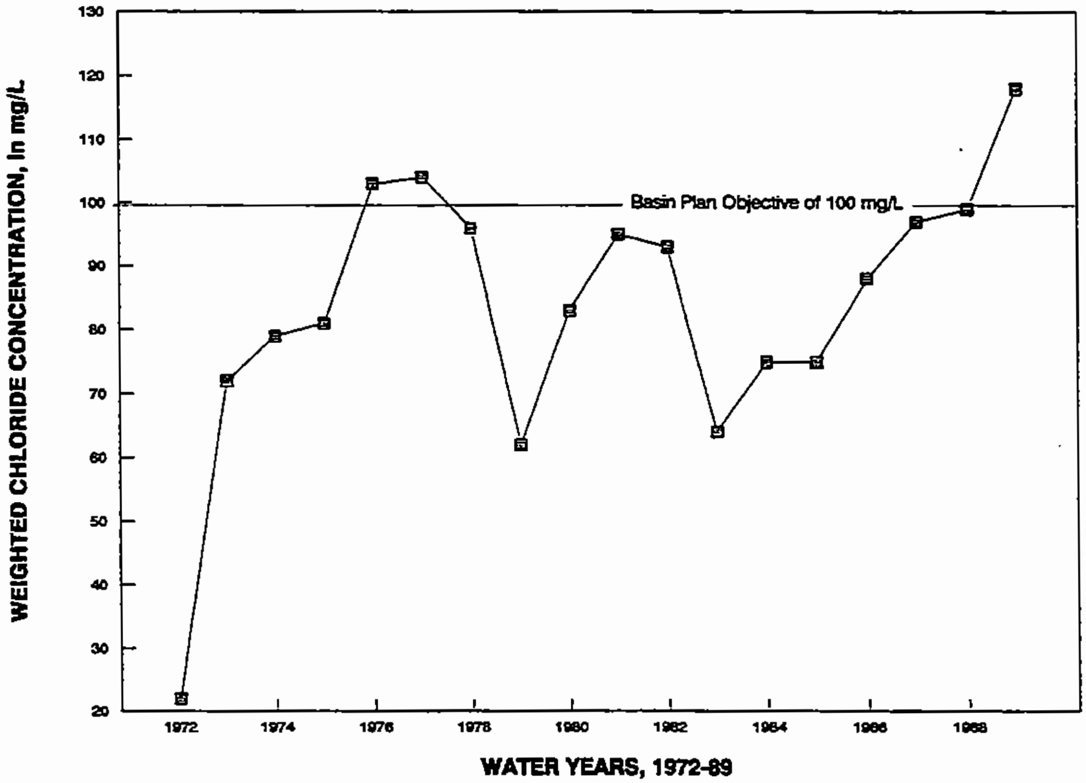
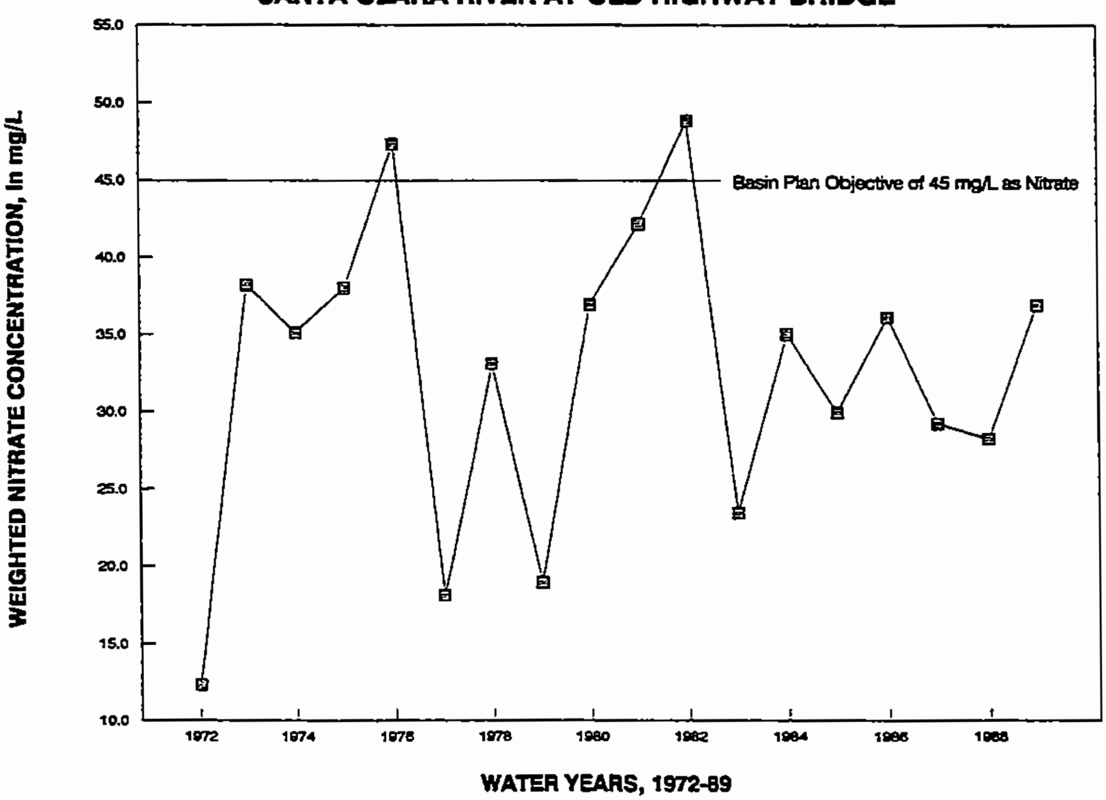
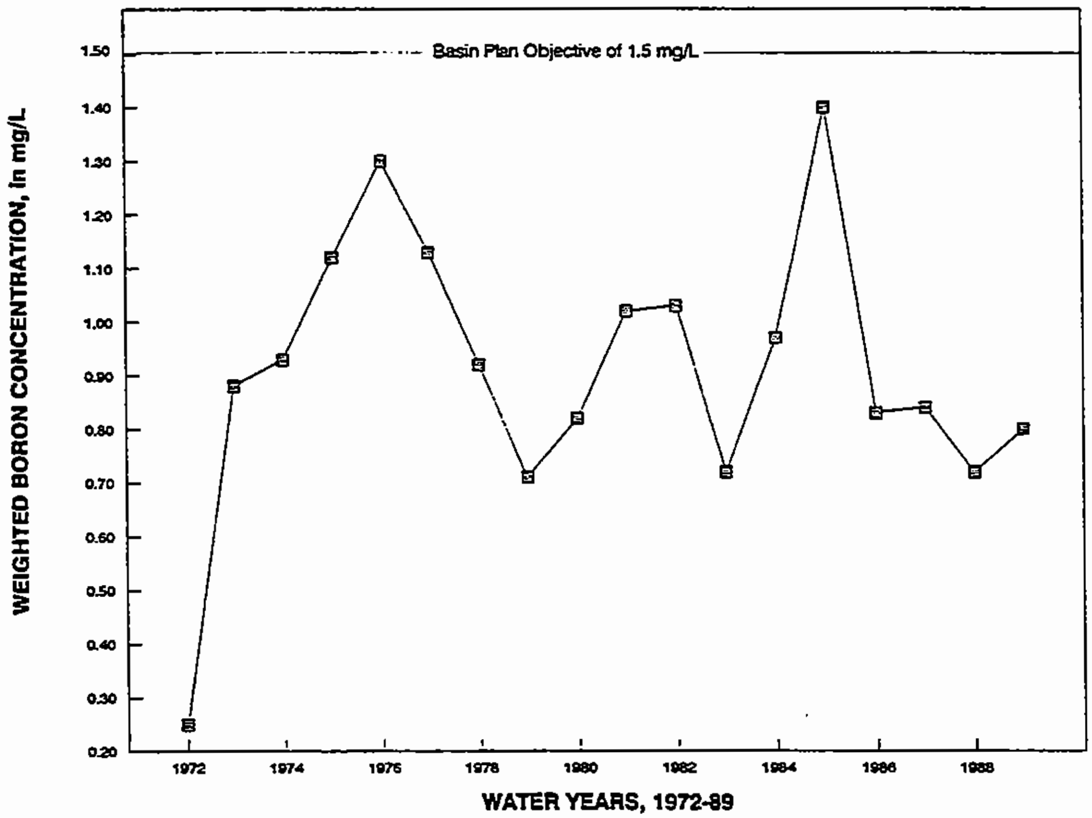


FIGURE 80 - ANNUAL AVERAGE WEIGHTED NITRATE CONCENTRATIONS SANTA CLARA RIVER AT OLD HIGHWAY BRIDGE



Source: Investigation of Water Quality and Beneficial Uses, Upper Santa Clara River Hydrologic Area by DWR Dated 1993.

FIGURE 81 - ANNUAL AVERAGE WEIGHTED BORON CONCENTRATIONS SANTA CLARA RIVER AT OLD HIGHWAY BRIDGE



Source: Investigation of Water Quality and Beneficial Uses, Upper Santa Clara River Hydrologic Area by DWR Dated 1993.

Appendix G

FIGURE 82 - ANNUAL AVERAGE DISCHARGE - FREQUENCY WEIGHTED TDS CONCENTRATIONS, SANTA CLARA RIVER, LOS ANGELES - VENTURA COUNTY LINE

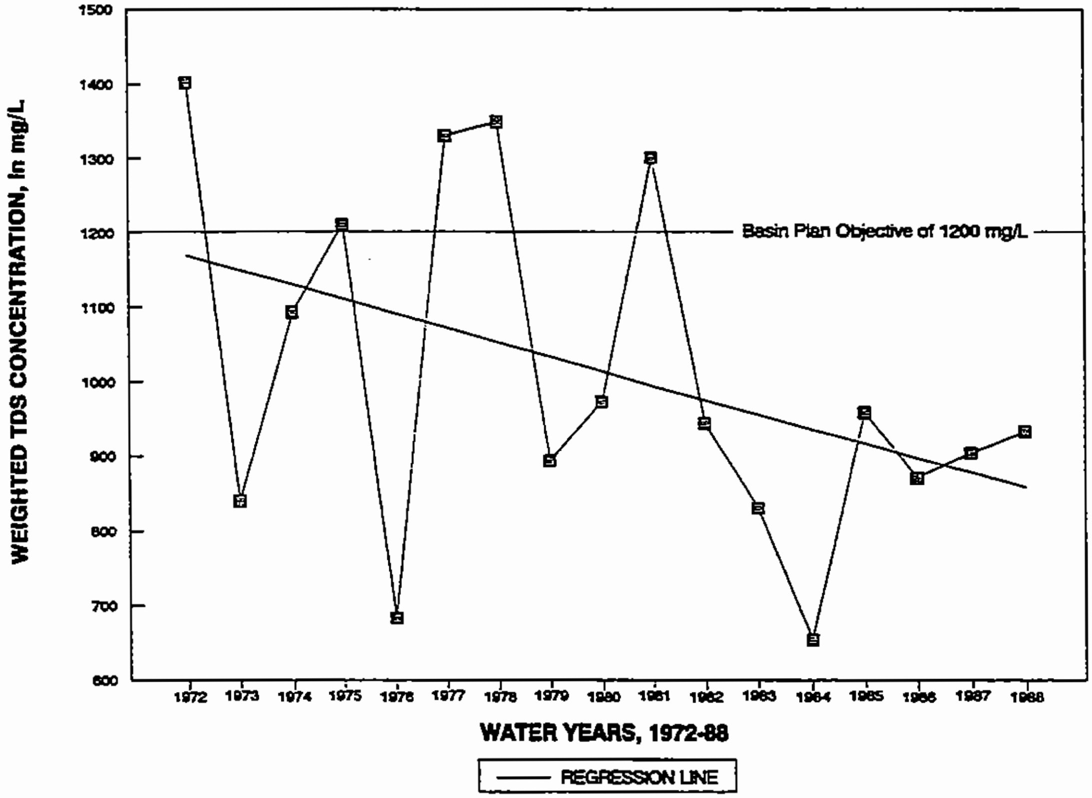
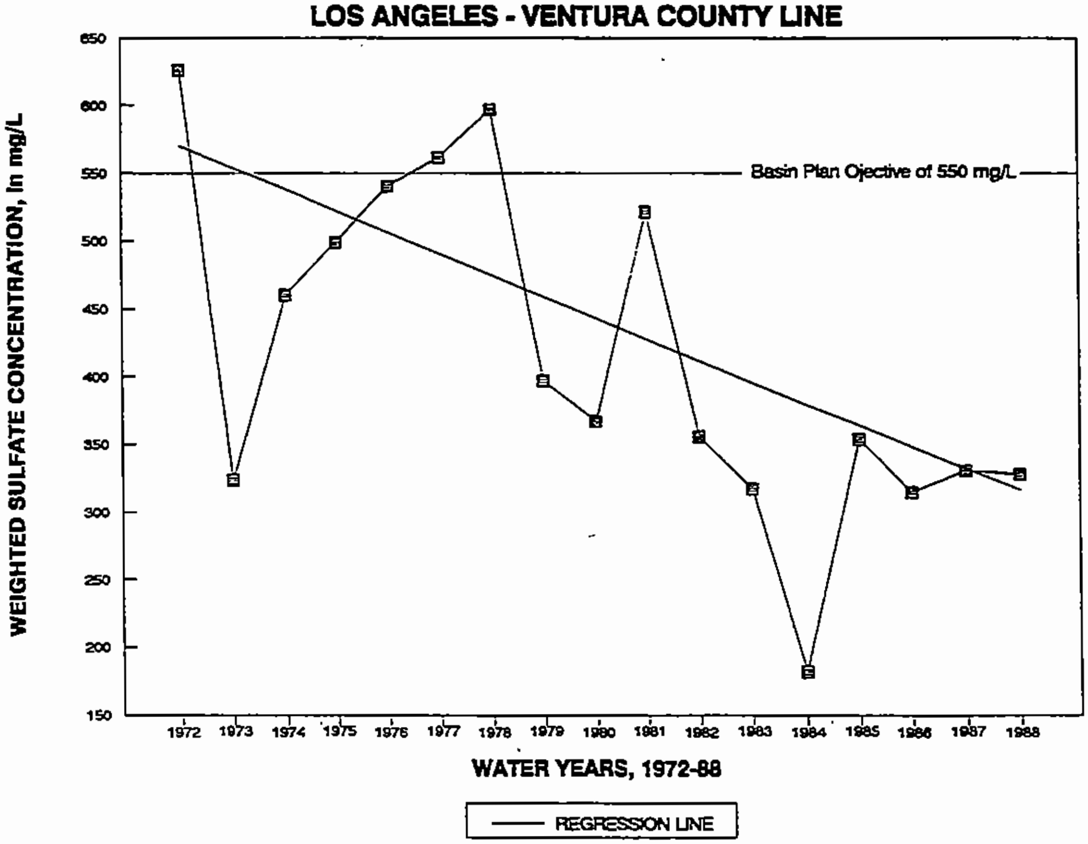


FIGURE 83 - ANNUAL AVERAGE DISCHARGE - FREQUENCY WEIGHTED SULFATE CONCENTRATIONS, SANTA CLARA RIVER, LOS ANGELES - VENTURA COUNTY LINE



Source: Investigation of Water Quality and Beneficial Uses, Upper Santa Clara River Hydrologic Area by DWR Dated 1993.

FIGURE 84 - ANNUAL AVERAGE DISCHARGE - FREQUENCY WEIGHTED CHLORIDE CONCENTRATIONS, SANTA CLARA RIVER, LOS ANGELES - VENTURA COUNTY LINE

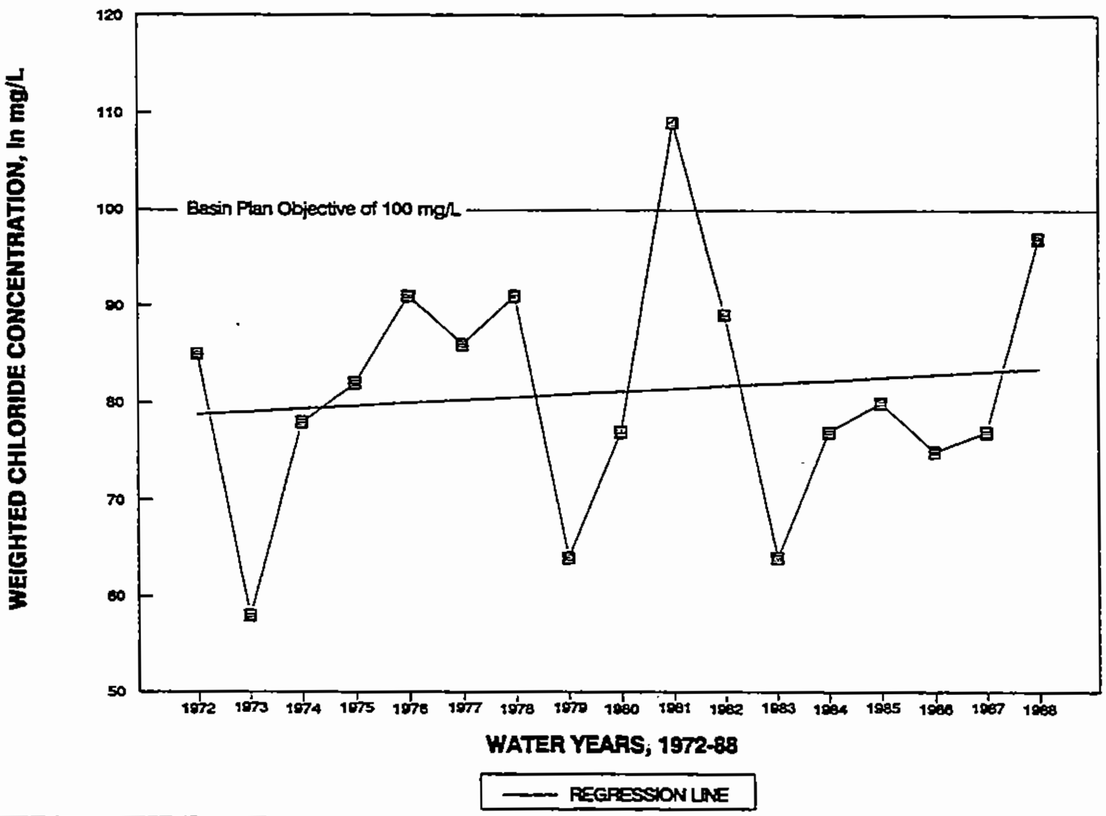
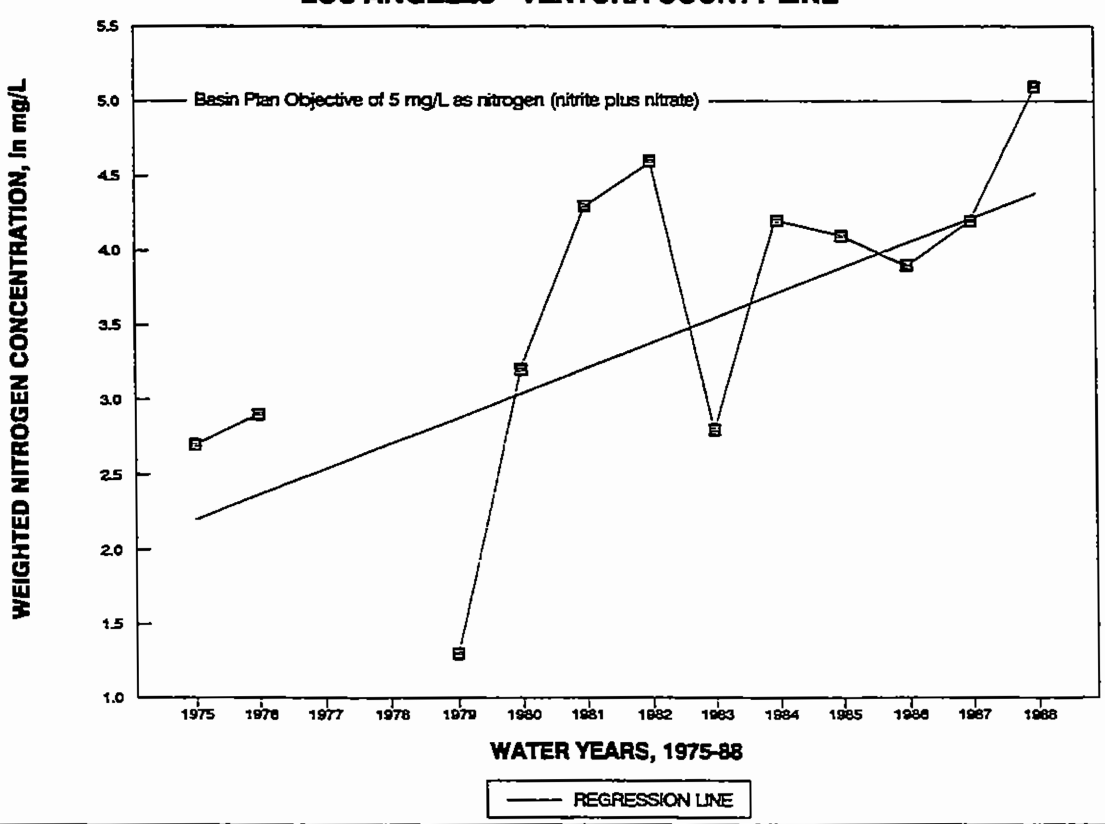
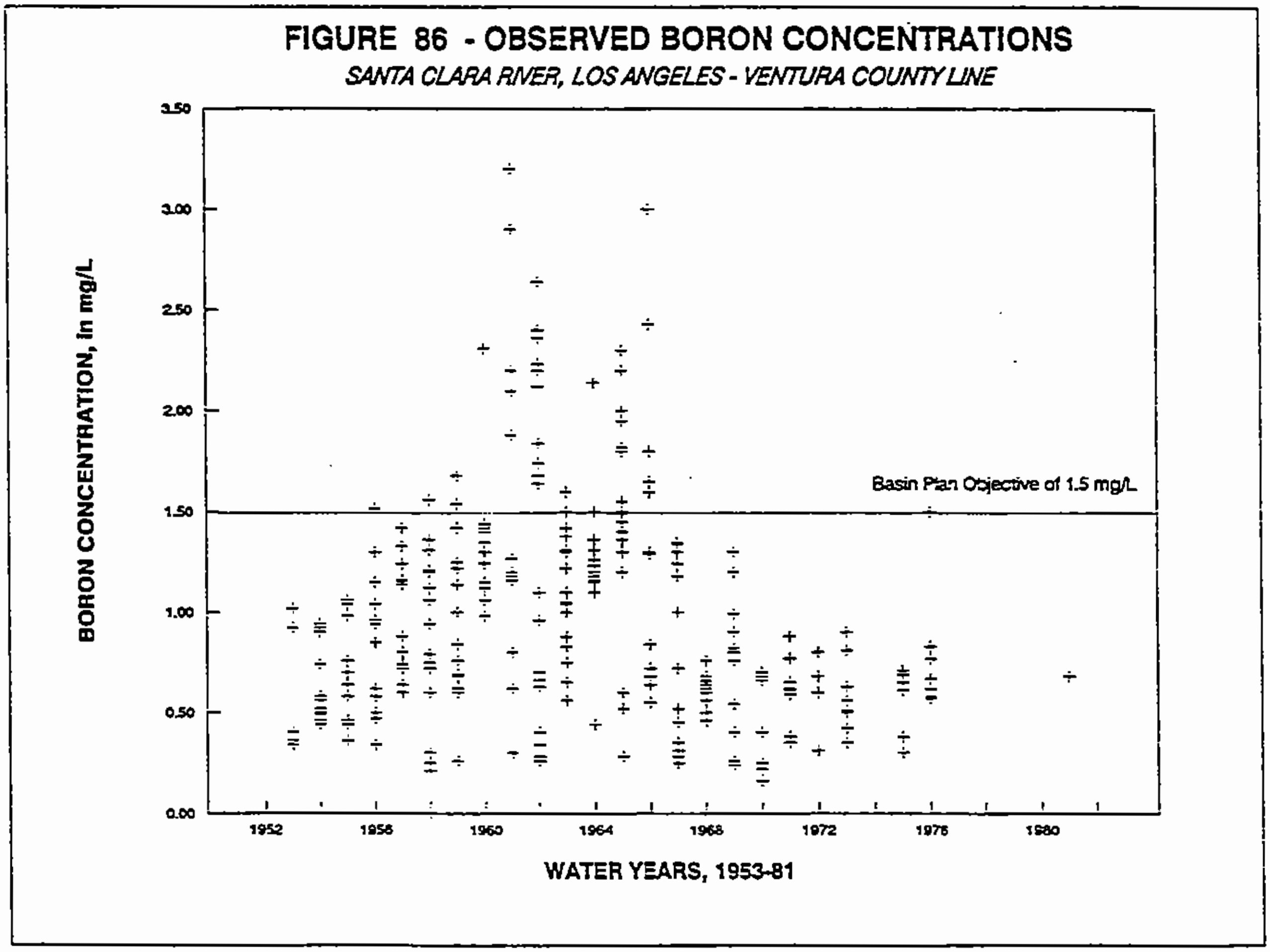


FIGURE 85 - ANNUAL AVERAGE DISCHARGE - FREQUENCY WEIGHTED NITROGEN CONCENTRATIONS, SANTA CLARA RIVER, LOS ANGELES - VENTURA COUNTY LINE



Source: Investigation of Water Quality and Beneficial Uses, Upper Santa Clara River Hydrologic Area by DWR Dated 1993.



Source: Investigation of Water Quality and Beneficial Uses, Upper Santa Clara River Hydrologic Area by DWR Dated 1993.

Appendix G

APPENDIX H

Responses to Agency Comments

A

FACSIMILE

ACTON TOWN COUNCIL

KATHLEEN M. HOWALD, VICE PRESIDENT
PHONE (805) 269-0133 / FAX (805) 269-2505

Date: November 13, 1995

To: Frank Royer, Water Resources Subcommittee Chair

Subject: Santa Clara River Enhancement and Management Plan, First Draft Subcommittee Reports

Message:

We have reviewed the Water Resources first draft report and although the report is substantive it is of limited use because there are no findings and conclusions and no recommendations for the upper Santa Clarita River Valley.

We would expect the final report to be inclusive of the these findings and recommendations
A1 therefore we are quite anxious to have the opportunity to review this information as soon as possible.

We would also request that future copies of this report along with any additions or changes also be sent to District 37, attention Dave Howard, for review.

Thank you for your time in preparing this report.

Sincerely,

K. M. Howald

TOTAL NUMBER OF PAGES IN TRANSMISSION 1

A1. The recommendations for the upper Santa Clara River Valley as well as the findings and conclusions have been included in the final draft.

MEMORANDUM

B

County Sanitation Districts of Los Angeles County

May 26, 1995

TO: Jayme Laber,
United Water Conservation District
Fax (805)525-2661

FROM: Michelle Weber

SUBJECT: **Comments - Water Resources Draft Report**

Following are preliminary comments on the 5/1/95 version of the Water Resources Draft Report:

B1 (1) Figure 22 - It is unclear what the current and future flows (AF/Y) shown for Valencia and Saugus WRPs represent. It appears that the values should represent the effluent flows being discharged from the respective treatment facilities into the Santa Clara River. If that is the case, the values shown are incorrect. Otherwise, please clarify what the flows are representing.

B2 (2) Page 1-65, the last sentence of the second paragraph: "Currently, ~~100 percent~~ most of the treated effluent is being discharged into the Santa Clara River."

B3 (3) Page 1-70, the first paragraph: "The County Sanitation Districts of Los Angeles County (CSDLAC) own and operate two water reclamation plants (WRPs) within the upper river's study area: the Saugus WRP and the Valencia WRP. ~~Current combined treatment capacity of the two plants is 16.6 million gallons per day (mgd).~~ The Saugus WRP ~~operates above its design~~ has a rated capacity ~~at a 1994 average flow of 6.98 mgd~~ of 6.5 million gallons per day (mgd). The Stage IV Expansion of the Valencia WRP was recently implemented which increased the rated ~~design~~ capacity of the plant to 11 mgd. An additional final sedimentation tank and aeration tank are currently under construction. Upon their completion anticipated in late 1995, the ~~design~~ rated capacity of the plant will be ~~12.5~~ 12.6 mgd. The water at both plants is treated to tertiary standards and discharged to the Santa Clara River."

Page 1-70, the second paragraph: "...bringing the total capacity for both plants to ~~27.6~~ 28.5 mgd."

B4 (4) Tables 47 and 48 - Average Daily TDS should be Average Monthly TDS.

B5 (5) Page 1-71, the last sentence of the first paragraph: "The total combined flow from the Saugus WRP and the Valencia WRP is predicted to be approximately 25 mgd by the year 2010, a portion of which will be diverted for water reclamation purposes."

B1. The annual averages for the total plant effluent contained in Figure 22 have been revised. The annual average effluent for 1992 for Valencia and Saugus Water Reclamation Plants was 9,749 and 5,971 AF/Y, respectively.

B2. Page 1-65, the last sentence of the second paragraph has been changed to read as follows: "Currently, most of the treated effluent is being discharged into the Santa Clara River."

B3. Page 1-70 the first and second paragraphs: all comments have been incorporated.

B4. The third column heading of Tables 47 & 48 have been changed from "AVERAGE DAILY TDS (mg/l)" to "ANNUAL AVERAGE TDS (mg/l)"

B5. Page 1-71, the last sentence of the first paragraph has been changed to read as follows: "The total combined flow from the Saugus WRP and the Valencia WRP is predicted to be approximately 25 mgd by the year 2010, a portion of which will be directed for water reclamation purposes."

NEWHALL LAND

AUG 28 1995

C

August 24, 1995

Mr. Frederick J. Glentke
General Manager
United Water Conservation District
P O Box 432
Santa Paula CA 93061

Mr. Robert Sagehorn
General Manager
Castaic Lakes Water Agency
P O Box 368
Castaic CA 91310

Dear Fred and Bob:

We would like to thank United Water and CLWA for the opportunity to review and comment on the May, 1995 "Water Resources Draft Report on the Santa Clara River", which is intended to be a part of the Santa Clara River Enhancement and Management Plan. We would also like to thank you for incorporating most of the changes we previously suggested.

We have the following suggested changes to the May, 1995 draft.

C1 Page 1-9 and Figure 5: Should reference to the Soledad Canyon Alluvial Channel be "aquifer" rather than "channel"?

C2 Page 1-14, last paragraph: The sentence "Generally, the channel of the Santa Clara River, upstream from Castaic Junction..." should read "...upstream of Bouquet Junction..."

C3 Page 1-15, third paragraph: Floodplain width should be changed to "500 to 2,000 feet", per our March 8 letter.

C4 Page 1-16, second paragraph: The Newhall Land and Farming Company should be deleted as a water purveyor; it is not. Also, it should be clarified that the quantities extracted do not include agriculture and other local pumping.

C5 Page 1-18, second paragraph: "Placenta" should read "Placerita".

C6 Page 1-52 Castaic Lake and Lagoon: Monitoring at Castaic Lake probably began after 1978 when the dam was completed (not 1972).

C7 Page 1-55: Only approved diversions should be shown in the report. Listed in Table 41 are the four <u>applications</u> that are pending before the SWRCB on the Upper Santa Clara River. This information should be consistent with Tables 42 and 43 showing approved surface water diversions within the Lower Santa Clara River

C1. The name of the section and the figure only refers to the geomorphic description of Soledad Canyon between the Acton and Eastern Groundwater Basins. In addition, Soledad Canyon itself is not considered as a viable aquifer capable of supplying groundwater for municipal purposes. Accordingly, no change was made.

C2. Page 1-14, last paragraph: "Castaic Junction" was changed to "Bouquet Junction."

C3. Page 1-15, third paragraph: the floodplain width was changed from "2,000 ft to 3,000 ft" to "500 ft to 2,000 ft."

C4. Page 1-16, second paragraph: Newhall Land and Farming Company has been deleted from the list of purveyors. The following note was added to the last sentence to clarify quantifies of water extracted: "(these quantities do no include total agriculture and other local pumping)."

C5. Page 1-18, second paragraph, comment was incorporated.

C6. Page 1-52, Castaic lake and Lagoon: the date and the concentration data was obtained from a report titled "Investigation of Water Quality and Beneficial Uses Upper Santa Clara River." Comment was not incorporated.

C7. Page 1-55: Information in tables was not changed. However, footnotes for tables 41,42 and 43 were made to be consistent.

Mr. Frederick J. Glentke
Mr. Robert Sagehorn

23 August, 1995

C8 Page 1-56: The Newhall Land and Farming Company's historic diversion at Blue Cut and the NLF Isola diversion should be included in the list of diversions.

Page 1-64: There are numerous other future projects along the Santa Clara River and its tributaries other than the only one listed (Newhall Ranch). Others include: Porta
C9 Bella (Northholme), The Colony (G. H. Palmer Associates), Valencia (NLF), and Tesoro del Valle (Clougherty).

Page 1-77 Recommendations: Second recommendation: Insert the word "significantly" between "will" and "adversely". Fourth recommendation: It is not clear that this is appropriate. There are legal rights to water within the river and diversions, among other issues. Sixth recommendation: Insert the words "and future" after the work "existing". Ninth recommendation: NPDES invokes controls which protect against water quality
C10 degradation. This recommendation is too general in that there are actions which can be taken to prevent water quality degradation. Perhaps an alternative recommendation would be that activities within the floodplain that potentially could cause water quality degradation should implement actions to prevent degradation.

Again, thank you for the opportunity to comment. If we can answer any questions or assist in any way, please feel free to call.

Sincerely,

James M. Harter
Senior Vice President
Newhall Ranch Division

JMH:mn

cc: Mr. Carl Blum
Mr. Alex Sheydai
Mr. Reed Holderman
Ms. Cat Brown

C8. Page 1-56: The Newhall Land and Farming Company's historic diversion at Blue Cut and the NLF Isola diversion have been added to the list of diversions.

C9. Page 1-64: Additional project descriptions were added as well as the following sentences:

> "The following future projects described in this section may not be a complete representation of what is currently planned for the upper Santa Clara River. Information of these future projects were provided from either Draft Environmental Impact Reports, brochures, or verbal contact with project representatives."

C10. The word "significantly' was added to recommendation 2.

- The fourth recommendation was not changed.
- The words "and future" was added to recommendation six.
- The ninth recommendation was changed to read "Activities within the 500 year floodplain that will lead to the degradation of water quality should be discourage if actions to prevent degradation of water quality are not implemented or if actions to prevent water quality degradation are not achievable."

NOV 13 1995

Friends of the Santa Clara River

660 Randy Drive Newbury Park, California 91320 (805) 498-4323

D

November 12, 1995

Mr. Alex Sheydayi, Co-Chair
SCREMP Project Steering Committee
800 South Victoria Avenue
Ventura, CA 93009

Dear Alex,

Friends of the Santa Clara River offers the attached comments on the Draft Water Resources Report for the Santa Clara River Enhancement and Management Plan. Please provide our comments to the Committee Chair.

Sincerely,

Ron Bottorff

Ron Bottorff, Chair

COMMENTS ON "WATER RESOURCES DRAFT REPORT "

Thank you for incorporating many of our previous comments in the new draft. We would like to make the following additional comments.

SPECIFIC COMMENTS

D1 Figure 2. It should be noted that boundaries indicated on this map are not exact.

D2 Pg. 1-13: Paragraph labeled *Alluvial Aquifer*. Elsmere Canyon and Newhall Creek should be listed, along with Whitney and Placerita Canyons, as replenishment located south of the basin. They are indicated in the most recent version of the Water Quality Control Board Basin Plan and serve as recharge to several Newhall County Water District wells.

D3 Pg. 1-16: No estimate of extractions by Newhall Land & Farming in Paragraph 2. An approximate figure should be obtained or estimated. Estimates of agricultural water use are available in several of the cited reports.

D4 Paragraph labeled *Saugus Aquifer*: First, there is a typographical error in the second to last line. "Reasonable" should be "reasonably". Next, it is inaccurate to call the estimated quantity of potable water in the Saugus Aquifer "usable". The amount which is usable is only the amount which can be pumped without causing overdraft. This is probably equal to the annual rate of replenishment and is most definitely *not* 1,413,000 AF. Exceeding replenishment rates causes subsidence and loss of storage capacity. It may lead to structural damage of buildings in affected areas for which water companies are legally responsible. The wording of this paragraph should be changed to avoid the suggestion that this amount is available for use.

D5 Pg. 1-18: *Adjudication and Rights*. It might be pertinent to note that Newhall County Water District passed a resolution of intent to form a ground water management plan under AB3030 earlier this year.

D6 Pg. 1-44: *Adjudication and Rights*. It might be pertinent to note that United Water has completed a ground water management plan under AB3030 for regions including the Oxnard Plain.

D7 Figure 22: *Water Balance for Los Agneles County*. The indicated acre feet of water generated from the two noted reclamation plants is incorrect and grossly understated. Please refer to charts listed in the *Water Reclamation* section. Quantities there are quoted in MGD, but can be converted to AF.

D1. Figure 2, comment was incorporated.

D2. Page 1-13: Based upon our review of the cited Water Quality Control Board Basin Report, Elsmere Canyon and Newhall Creek are not specifically listed as replenishment areas on the south side of the groundwater basin; only Placerita Canyon is. The larger replenishment areas were included. The list is not inclusive of all the smaller drainages.

D3. Page 1-16, second paragraph, Newhall Land and Farming Company has been deleted from the list of purveyors. The following note was added to the last sentence clarify quantities of water extracted: "(these quantities do not include total agriculture and other local pumping)." Reliable estimates for agricultural pumping are unavailable.

D4. Page 1-16, third paragraph, this paragraph has remained unchanged. The term "usable water" was used in the context to identify the amount of water of adequate quality for municipal purposes that can be obtained under normal pumping conditions (only that amount obtained by specific yield). It can not be assumed that subsidence will occur in the Santa Clarita Valley due to withdrawal of groundwater exceeding the "replenishment" of groundwater.

D5. Page 1-18, The following will be included under the heading Adjudication and Right: In 1995 Newhall County Water District passed a resolution of intent to form a groundwater management plan under AB 3030.

D6. Page 1-44, comment was not incorporated. Information regarding the Fillmore-Piru Basin AB 3030 Groundwater Management Plan has been included elsewhere in the report.

D7. Figure 22 Water Balance, the annual averages for the total plant effluent contained in Figure 22 have been revised. The annual average effluent for 1992 for Valencia and Saugus Water Reclamation Plants was 9,749 and 5,971 AF/Y, respectively.

D8 Table 41: The application for riparian rights by Ecco Water Company was recently denied by the State Water Resources Board and should be deleted.

D9 Pg. 1-60: *Imported Water*. We are not quite sure why a discussion of imported water is included in an assessment of the Santa Clara River. If it is included to indicate that this much less water is extracted from the river system because of its availability, this should be so stated. If it is included because it adds to the amount of water being returned to the river, this should be stated. It should also be noted that CLWA's entitlement is *not* an indication of how much water it receives or will receive. State water is subject to availability. Contractual agreements currently supply about 50% of the water 80% of the time, which should be noted.

D10 Pg. 1-61: *In-stream Flow Requirements*. It is stated in the last paragraph that effluent from reclamation plants is responsible for 90% of summer surface flow and 40% of winter flow. We believe this to be incorrect. Historical photographs and written descriptions of the river indicate a much greater surface flow than currently exists. It must be remembered that *all* effluent discharged to the river, except that originating from the State Water Project, was originally pumped from the river's alluvial soils. Had it not been pumped, it would very likely have formed the same surface flow generated by the reclamation plants.

D11 Pg. 1-64: *Future Projects on the Upper Santa Clara River*. This section is should include not only Newhall Ranch but the 3,700 condos to be built by NLF on the Santa Clara River and San Francisquito Creek, along with the 3,000 units in Tresoro del Valle and all additional projects in the tributaries and alluvial areas from Acton to Ventura. The estimate of ground water needed for these projects should also be included, along with the effects on the river of supplying this water and the effects on water quality. The estimated water need for Newhall Ranch is 19,000 acre feet, the entire amount CLWA normally receives, which should be stated.

D12 Pg. 1-65: *CLWA Reclaimed Water System*. Newhall County Water District also has a reclaimed water proposal which will supply residential and industrial uses as well as recharge the ground water in the Castaic area. They have formally declared their intent to become a lead agency for reclaimed water. Their proposal would utilize approximately 4 million GPD. This project should be included in any discussion of reclaimed water.

D13 Pg. 1-76: It should be noted that high levels of nitrates also occur from agricultural fertilizers. Location of high nitrate levels would indicate agricultural involvement. This source should be noted.

D14 Pg. 1-77: *Recommendations*. We agree with and support most recommendations listed in this section. However, we feel it would be beneficial. and probably necessary, to define exactly what is

D8. Table 41. comment was incorporated.

D9. Page 1-60, A discussion of imported water was added for general informational purposes. The following sentence was added to the end of the first paragraph for clarification: "Annual entitlements to SWP are subject to availability and should not be considered an indication of how much water a contractor shall or will receive."

D10. Page 1-61. The following was added for clarification to the beginning of the second sentence of the second paragraph under in-stream flow requirements: An analysis based on 40 years of stream flow data for Stream Gauge F92-R from the County of Los Angeles and effluent flow data for the Saugus and Valencia WRPs indicated that...

D11. Page 1-64, Additional project descriptions were added as well as the following sentences:

> "The following future projects described in this section may not be a complete representation of what is currently planned for the upper Santa Clara River. Information on these future projects were provided from either Draft Environmental Impact Reports, brochures, or verbal contact with project representatives."

Estimates of groundwater needed to support these projects and analysis of the effect of the proposed projects on the river is beyond the scope of this study.

D12. Page 1-65, The following will be added to the report following the Castaic Lake Water Agency Reclaimed Water System information:

Newhall County Water District Proposed Reclaimed Water Service Concept

NCWD's proposed reclaimed water service concept involves both direct use, primarily for irrigation uses, and discharge to Castaic Lagoon from which downstream groundwater recharge basins would be served. The identified reclaimed water demands are 5,200 AFY of which 2,200 would be for indirect uses, presumably groundwater recharge.

D13. The following sentence was added: "The sources of nitrate can be from sources such as waste water collection systems and agricultural practices within the area."

meant by "channel" in recommendation #6 - i.e. whether we are talking of the floodplain or banks or what. Also, it would seem in order to clarify the meaning of "a single source permitting system" in recommendation #7. We would support a "one-stop" permit location for all required permits provided that all affected agencies perform their normal permitting functions.

D15 *Appendix C*: Why is data limited to NLF and Valencia Water Company wells? There is considerable data available from other purveyors which ought to be included.

D16 *Appendix D*: Test well locations should be indicated more finitely. This could be accomplished by providing a map indicating well numbers and then labeling the data accordingly.

D17 *Appendix E - Flow duration curves for the Upper Santa Clara River*: The charts should indicate the year or years when the data was collected and the time of year or period of time during which it was collected.

GENERAL COMMENTS

D18 All water quality charts should contain a column indicating current potable water requirements for listed constituents. We realize these charts were probably extracted, as is, from the Basin Plan reports. However, the extra column would be easy to add and be invaluable for comparison purposes. Also, the most recent Water Quality Control Basin Plan for the Upper Santa Clara area was finalized in July 1995 and is now available. All charts should be extracted from this most recent version.

D19 The interaction between the surface flow of the river and ground water recharge to the alluvial and deep aquifers should be noted as a water quality issue throughout the document. Poor surface water quality *will* result in poor ground water quality and potential loss of potable water sources. This connection should be made more strongly. Additionally, the report should contain a discussion of water quality issues such as agricultural runoff and treatment plant effluent on ocean water quality and shoreline activities.

D20 We are extremely concerned that safe yield data (or ranges) have not been included in this report. The lack of these data leaves a gaping hole in information that decision-makers are entitled to in their efforts to define appropriate uses along the river. Safe yield ranges for the Upper Santa Clara Alluvial System and the Saugus Aquifer are available in the Slade Reports and the USGS Studies. Estimates are also available from data on well levels during drought and wet years kept by individual water purveyors. Such data should also exist for the United Water Conservation District and for the Acton area. We believe these data *must* be included in the final version of the report.

D14. The following was added for clarification to recommendation 6: "within the 25 year protection and encroachment limits set by the Flood Control Subcommittee Report..." Did not incorporate the recommended change to recommendation 7.

D15. Appendix C - Page 1-18, first sentence indicates that Appendix C includes information from Slade's 1986 report only. Collection of data from other purveyors is too costly to collect at this time.

D16. Appendix D - The information contained in the referenced report did not include a map showing this information. Adding a map at this time is a very costly procedure.

D17. Appendix E - comment has been incorporated.

D18. Adding the additional column would be too costly and time consuming to accomplish at this time. All data is current as of 1992 as agreed upon by the water resources subcommittee and the SCREMP steering committee.

D19. Additional water quality text was added to cover areas such as the estuary. This information was provided by the Regional Water Quality Control Board.

D20. Safe yield data must address recharge and extractions from the aquifers wholly outside the 500 year floodplain and is beyond the scope to this report.

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(PWA Ref. # 929-2)

November 13, 1995

E

Reed Holderman
State Coastal Conservancy
1330 Broadway, Suite 1100
Oakland, CA 94612

Dear Reed,

I have reviewed the Water Resources Draft Report on the Santa Clara River prepared by the United Water Conservation District Castaic Lake Water Agency (May, 1995), as you requested. I have also reviewed the scope of work intended in the Request for Proposals (RFP) for the Santa Clara River Enhancement and Management Plan, and compared it to the scope of the draft report. The RFP indicates that the work product by the in-kind provider will include information on existing subsurface and subsurface water flows, groundwater, geologic data, water quality, low flow, and return flow conditions. Eleven deliverables are listed:

1. Discussion of the low-flow regime of the river in different reaches, using flow duration curves or low-flow frequency analysis.

2. Identification of reaches of the river with historical perennial flow on a topographic map.

3. Description of the agreements governing water release operations from Bouquet Reservoir, Castaic Lake, Pyramid Lake, and Piru Lake.

4. Summary of past discharge records and projected future discharge levels from treatment plants, and estimates of the volume of return flows from all sources.

5. Summary of all water rights in the river.

6. Identification of additional constituents or location for which water quality sampling is needed. Review analysis and summary of water quality (stormwater and ambient) data for the river.

7. Conduct selected water quality sampling as needed.

8. Identification of how reuse of treated waste-water is likely to influence discharges to the river.

9. Review, analysis, and summarize groundwater data. Identification of areas where groundwater pumping is reducing the flow of the river and over draft rates.

10. Review and analysis of applicable STORET water quality information available from the EPA.

11. Assessment of geologic features in the study area, and identification of any significant geologic properties that may affect management or enhancement of the river, watershed or floodplain.

The draft report describes the groundwater aquifers that are associated with the Santa Clara River in detail. However, other components of the hydrologic environment relevant to the enhancement and management plan are not discussed. Understanding the physical constraints posed by the groundwater and surface water characteristics is critical in developing an enhancement and management plan. This report contains a lot of information, however, is not summarized or analyzed in a way that leads to identification of the critical watershed problems or potential enhancement projects. The following suggestions are intended to aid in evaluating the usefulness of the data reported, and to provide guidance toward developing a final draft that can be used to develop a comprehensive plan for the Santa Clara River.

- The RFP calls for a discussion of the low flow regime in the different river reaches using flow duration curves. The draft indicates that most of the tributaries to the Santa Clara are ephemeral, and reports average monthly and annual flows at 12 gages. These average data do not describe low flow conditions. The report includes only two flow duration curves (Piru Creek and Hooper Creek) in Appendix F. Additional data needed include: Flow duration curves for all the gages on the Santa Clara River and a discussion
E1 of how low flow (or no flow) conditions affect resources such as riparian and aquatic habitat important for the enhancement and management plan. A discussion of how and why low flows in the river have changed over time is also needed. For example, how would reuse of wastewater effect low flow characteristics in the river? In addition, a description of how flow diversions and groundwater pumping have altered flow characteristics in the river at various locations, should be included. The report does not include a topographic map showing reaches with historical perennial flow.

- A description of the agreement governing water release operations from
E2 Castaic Dam is included in the draft report. However, release operations from Bouquet Reservoir, pyramid Lake and Piru Lake are not present. The draft report should summarize these release operations and describe the

E1. To the extent possible a discussion of low flow regimes was included. To expand the discussion further would require a large time and monetary expenditure.

All flow duration curves have been incorporated into Appendix E.

Discussions of how and why low flows have historically changed over time, how diversions and groundwater pumping have altered flow characteristics, and providing a topographic map showing the reaches and historic perennial flow were not covered because this information is outside the scope of the report.

E2. A discussion of Pyramid Lake and Lake Piru release operations have been added.

constraints they pose for future enhancement and management of the Santa Clara River.

- E3 The discussion of water rights within each groundwater basin states that "Currently, there is no adjudication of the groundwater basin but individual water rights have been established within the basin through various uses but not set by the courts." The report should summarize what these uses are, the magnitude of these uses, and what likely effect the existing status of the water rights would have on an enhancement and management plan for the Santa Clara River.

E4 The section on surface water rights consists of two tables (Table 42 and 43). The tables should be edited so that units (cfs, gpd, acre-feet/yr) that quantify the rate of permitted withdrawals are consistent. Additional text should be included to summarize the total volume of permitted diversions and their likely effect on future management or enhancement activities.

- E5 Groundwater and surface water quality is presented in detail in the draft report. A discussion on the rationale for the placement of sampling sites relative to the current land uses in the basis is needed. For example, how were the sampling locations chosen to monitor the effects of existing or future land use activities such as urbanization, landfills, and agriculture?

- E6 The report contains a general description of the fluvial geomorphology in each reach of the Santa Clara River as part of the assessment of geological properties. An understanding of the dominant geomorphic processes responsible for creating the characteristic morphology is critical in developing a management plan for the river. In the report, the river is described as wide and braided. The report implies that the morphology results from "stormwater flows originating in highland areas due to storms of short duration but of great intensity in rainfall." While it is true that storms in southern California often are of short duration, this does not explain the dominant morphology of the Santa Clara River. The report should include flood frequency curves, and describe morphologic change that occurred during historic floods.

A section on the fluvial geomorphology of the fluvial system (rather than of reaches corresponding to the groundwater basins) should be expanded to include:

E3. The information requested is not readily available. Discussions of basin-wide water rights issues is beyond the scope of this report.

E4. Tables 42 and 43 summarize the water rights as either a volume per year or a rate. The water right volumes were made consistent as well as the water right rates. The rates and volumes were reported consistent with the State Water Resources Control Board files which were used for the two tables.

E5. The majority of the water quality data was obtained from DWR reports. The sampling sites were chosen for the purposes of their studies but the reasoning behind their location could not be readily ascertained. The lower Santa Clara River surface water sampling sites correspond with areas of rising water.

E6. Not incorporated. Beyond the scope of the Water Resources Report but are evaluated in more detail in the Flood Control Report.

- a description of the episodic nature of flows in a semi-arid environment;
- natural sediment sources from the erosive terrain such as hillslope erosion following fire and debris flows, and sources of sediment accelerated due to human activities;
- E7 a description of how sediment moves through the fluvial system, where it is deposited, and where it is eroded;
- a description of bank erosion, and the interaction between riparian vegetation and channel bank stability;
- a description of the relation between geomorphic characteristics such as width, depth, slope, and channel pattern, as well as a description of how land use activities such as gravel extraction can affect channel pattern.

Please let me know if you have any questions or comments.

Sincerely,

Joan C Florsheim

Joan Florsheim, Ph.D.
Senior Associate

E7. Not incorporated. Sediment transport analysis is beyond the scope of the Water Resources Report and might be better discussed as a function of high flow regimes.

STATE OF CALIFORNIA—ENVIRONMENTAL PROTECTION AGENCY

PETE WILSON, Governor

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
LOS ANGELES REGION
101 CENTRE PLAZA DRIVE
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F

March 11, 1996

Frank Royer
United Water Conservation District
106 N. 8th Street
Santa Paula, CA 93061

RE: REVIEW OF DRAFT REPORT - WATER RESOURCES ON THE SANTA CLARA RIVER

Dear Frank:

I appreciated the opportunity to review this second draft of the Water Resources Report for the Santa Clara River as part of the development of a Watershed Management Plan for the River.

While the report presents a good overview of the geology and hydrologic conditions of surface and ground waters associated with the river corridor and presents a lot of information which will be useful for the development of the plan, it falls short of the necessary data compilation and analysis that will be necessary to resolve many of the water resource issues for this watershed.

Outlined below are some key elements that must be addressed in order for the report to be able to support watershed decision-making and the development of a plan over the next few years. More detailed comments follow.

- F1 Page 1-1 states that goals, objectives, and recommendations for the water resources of the river are included in this report. We were unable to find any statements of water resource goals or objectives, either for this report or for the process in general. This is a key element which is needed to evaluate whether this report met both the shorter-term report preparation goals and objectives and the longer term objectives of the larger watershed planning effort. These goals and objectives (if available) should be presented at the beginning of the report. If not available, these should be developed by the subcommittee.

- F2 There is no mention of existing water quality standards (beneficial uses and water quality objectives) for the Santa Clara River and tributaries. There should be both a general introduction to these concepts and inclusion of the beneficial uses in discussions of water quality for each surface water reach and ground water basin.

F1. Recommendations, findings, and conclusions will be included. Goals and objectives were not developed for the water resources report. To fully comply with this comment the report must be restructured which would be time consuming and too costly.

F2. Existing water quality standards were not added. The data was requested from RWQCB but was not received. The consultant may be able to add this information at a later date.

- For the most part, the only water quality data which are presented are general mineral analyses (mainly a summary of the DWR reports that were done for our agency). These data really don't tell the reader a whole lot about the overall quality of these waterbodies. I know that data are limited for this river, but there are some data available for other parameters. We will be glad to provide you with any data that you may not have as yet. Do you monitor surface waters before spreading during your operations? If so, these might be useful data. There also may be more information available from permittees who discharger into surface or groundwaters of the system. F3

- In terms of the analysis of the data, one would expect the report to point out data gaps (either geographic areas with no data or specific kinds of data that are needed, but not available) and a summary of water quality problems (which stations occasionally or routinely exceed standards?) or threats in the watershed. It would be useful to have a map showing surface water stations or wells with marginal or poor water quality. We can provide a copy of our most recent Water Quality Assessment which will help with these issues. F4

- There is not much discussion of known or potential sources of water quality problems with the exception of a few references to improperly sealed wells. There are a lot of issues to discuss for this watershed -- like the impact of natural oil seeps in the Santa Paula area, impacts from urbanization, impacts from agriculture, effects of imported and reclaimed water, etc. These should at least be mentioned as issues in the report. F5

- The report states that there are no water resource issues in the upper Santa Clara River area. This is not the case. Here are a few: localized areas with high nitrate in groundwater, impacts of rapid urban development (increased runoff and quality of runoff), loss of natural stream characteristics and habitat with development and resultant channelization. F6

- We would suggest that you also add the information from the USGS RASA study to the section (pages 1-75 and 1-76) on water resource issues in the lower river. Other issues include water quality issues in the estuary (not even mentioned in the report), surface water/groundwater use conflicts in the lower river, and flooding issues in mid-reaches of the river. F7

- F8 The Findings and Conclusions Section is blank.

F3. All data that was available at the time of the report was included. Data was requested from RWQCB but was not received before the final draft was to be completed. United Water Conservation District does monitor surface waters before spreading and this information was included to the extent possible.

F4. Did not receive the requested data from RWQCB to include in the final draft. If the data is forthcoming the consultant may be able to add it at a later date.

F5. The issues listed in your comment letter were added as issues in the final draft.

F6. The water resources issues mentioned have been incorporated for the upper Santa Clara River area.

F7. Water quality issues within the estuary were added. USGS RASA data were not included because the RASA study is outside the study area and scope of the water resources report. The flooding issues are more appropriately addressed in the flood control report. Surface water/groundwater use conflict in the lower river were not addressed because it is outside the scope of this 500 year floodplain report.

F8. Recommendations for the upper river have been included. Findings and conclusions were also added.

- F9 There are no draft recommendations for the upper river. Perhaps "Issues" should be substituted for "Recommendations" if not enough information exists to make recommendations. Issues include the impacts of rapid development in the upper area (increase in runoff and downstream effects, water quality impacts from urban land uses), decreased recharge, loss of, and encroachment on, aquatic habitats. Other issues to explore are potential impacts (positive and negative) from imported and reclaimed waters.

- F10a As was mentioned above for the upper river, the recommendations for the lower river may be better presented at this stage in the planning process as "Issues" rather than as "recommendations". Recommendations should be more broad in terms of the need to protect all water resources of the system and in proposing how "we" (the committee and others) may want to begin resolving issues resulting from conflicts between uses. Many of the recommendations in this report seem to be from a single perspective rather than from an overall water resource perspective. For example, unilateral decisions on what the highest priority use of river water should be, should be deferred and replaced with discussions of real or potential conflicts between this and other uses of river water with a recommendation to work to balance these interests. Priorities may be established on a case by case basis rather than by an all inclusive statement. Our Board designates a variety of beneficial uses for each waterbody (surface and ground) in our Basin Plan; however, we do not assign priorities to these uses.

  F10b Other issues include impacts of various land uses along the river (urban areas, agriculture, mining and others), impacts from imported and reclaimed waters, surface water/ground water tradeoffs, impacts from hydromodifications, abandoned wells, and seawater intrusion.

  I would also think that this report may want to recommend further studies in areas that were deficient (e.g., data gaps) in preparing this report.

- F11 The issues, findings, conclusions, and recommendations should be the real "meat" of this report, yet are still blank or very sketchy. Perhaps a sub-committee meeting could be held in order to come up with some group ideas on how to flesh out these sections before this report is released to the public.

F9. Recommendations for the upper Santa Clara River have been added.

F10a. See comment for F9 above.

F10b. Other issues were not addressed because they are largely outside the scope of the study area.

F11. It is too late in the process of the final draft to accommodate this request. This may be done in conjunction with the consultant in a future draft of the comprehensive SCREMP report.

Other more specific comments:

- F12 While this report only considered water quality data collected up to 1992 (due to availability at that time), the subcommittee should continue to collect data from 1992 to present so that we have more recent data for use in decision-making as the watershed process continues to unfold. Perhaps we should explore the idea of putting together a database for the watershed.

- F13 Maps: Many of the maps are hard to interpret for a variety of reasons (lack of geographic features for reference, old xeroxes, lack of labels, orientation). A larger map (or series of maps at the same scale) showing the entire river corridor and groundwater basins would be useful. We may be able to help out with this. We can print some of these types of maps from our GIS. Which maps (if any) are in the project GIS? Can the consultants do some overlays?

- F14 Page 1-18: The report references DWR's Basin Plan. I believe this reference is for our Basin Plan.

- F15 Page 1-43: The report mentions the availability of weekly data from selected wells in the Oxnard Plain. This sounds like very useful data and should be presented in the report.

- F16 Page 1-2: Castaic Lagoon. There are some water quality issues (related to swimming uses) which should be included in this section.

- F17 There are statements in the report made about changes in water quality over the years without any explanation as to why. Many may have simple explanations (increased use of imported waters, etc.).

- F18 Page 1-56: Please provide more information about the seven surface water diversions listed on this page.

- F19 Storage Reservoirs: It would be very useful to describe the various uses (swimming boating, fishing, etc.) allowed at each of the reservoirs described in the report. This was done to some degree for Lake Piru, but not the others.

- F20 Since Lakes Piru and Castaic are included in this report, a section on Lake Pyramid should also be included.

F12. Additional data beyond 1992 was not added due to the cost of revisions.

F13. Comment noted. Standardization of mapping is expected as part of the consultants scope of work.

F14. Reference was checked and appeared to be correct.

F15. Some data is available but is outside the scope of the report (500 year floodplain) and was not included.

F16. Additional text was added to address the swimming concerns.

F17. Time constraints for report production did not allow for additional complex analysis at this time.

F18. Information was not available to expand the section as requested.

F19. Additional information for Pyramid Lake and Castaic Lake was added. the recreation subcommittee will most likely address storage reservoir recreational uses.

F20. See comment F19 above.

- F21 Page 1-60: Specifically, which areas in the upper watershed are supplied with imported waters and which still rely solely on groundwater for their drinking water supply?

- F22 Page 1-64: A map of the proposed project would be useful to the reader. There are other smaller (but significant) projects which should also be discussed in this section.

- F23 Citations: Where data are mentioned throughout the text, a source for these data should be included (in parentheses).

- F24 <u>Bibliography;</u> The two separate bibliographies should now be merged. Please also note that our Basin Plan is now final (adopted by our Board on June 13, 1994) and should be referenced as *California Regional Water Quality Control Board, Los Angeles Region, 1994. Water Quality Control Plan - Los Angeles Region. Basin Plan for the Coastal Watersheds of Los Angeles and Ventura Counties.*

In summary, this report is a good start, but still needs a lot more information and analysis. We will be glad to help where we can in filling in gaps, identifying issues, and developing recommendations. As was pointed out earlier, it may be appropriate to convene the sub-committee (or subsets thereof) to help resolve some of these issues.

Thanks for all of your hard work on this report!

Please call me at (213) 266-7549 should you have any questions regarding our comments.

Sincerely,

Deborah J. Smith, Chief
Regional Programs

cc: ✓Jayme Laber, United Water Conservation District
Susan Rungren, Kennedy/Jenks Consultants

F21. This request is beyond the scope of the report.

F22. Out of scope of in-kind services. Information about additional future projects has been added.

F23. Too time intensive to do at such a late juncture in the reports progress. All sources are listed in the three page bibliography at the end of the report.

F24. The two bibliographies have been merged.

General Comment:

Requests for expansion of data to a watershed wide perspective are largely outside the scope of the SCREMP study area which has been specifically limited to the 500 year floodplain.