UPPER LOS ANGELES RIVER AREA WATERMASTER

CITY OF LOS ANGELES VS. CITY OF SAN FERNANDO, ET AL
CASE NO. 650079 - COUNTY OF LOS ANGELES

WATERMASTER SERVICE
IN THE
UPPER LOS ANGELES RIVER AREA
LOS ANGELES COUNTY

1996-97 WATER YEAR
OCTOBER 1, 1996 - SEPTEMBER 30, 1997

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MAY 1998

FOREWORD

As Watermaster for the Upper Los Angeles River Area (ULARA), I am pleased to submit this report of the water supply in accordance with the provisions of the Final Judgment signed by the Los Angeles Superior Court on January 26, 1979.

This report describes the water rights in each basin, lists the allowable pumping for the 1996-97 Water Year, and indicates the water in storage to the credit of each party as of October 1, 1997. In addition, this report includes background information on the history of the San Fernando Case, information as to each basin and the ULARA, with respect to water supply, groundwater extractions, groundwater levels, quantities of imported water use, recharge operations, water quality conditions, and other pertinent information occurring during the 1996-97 Water Year pursuant to the provisions of the Judgment.

Updates on the development of "Significant Event" through April 1998 are discussed in Section 1.5. These include the status of the Headworks Well Field Remediation Project, the progress of the East Valley Water Recyling Project, and the status of the Pollock Wells Treatment Plant Project. Other significant events include the Pacoima Area Groundwater Investigation, and the Burbank and Glendale Operable Units.

Other matters that are under investigation are CalMat's continued operations in the San Fernando Basin, illegal pumping of groundwater by the Monteria Lake Association and the Middle Ranch property, and a continued evaluation of companies in the San Fernando Basin dealing with high groundwater levels (dewaterers). Other action items to be evaluated include the rising groundwater outflow, water rights and improving the process for water rights notification, and various lawsuits in progress (Appendix L).

To provide more extensive groundwater quality management for the ULARA basins, the ULARA Watermaster and Administrative Committee met on a near monthly basis during 1996-97. As provided in Section 5.4 of the ULARA Policies and Procedures, the third ULARA Groundwater Pumping and Spreading Plan was completed and filed with the court on July 1997. In addition the new ULARA Policies and Procedures – dated February 1998 was filed with the Los Angeles Superior Court on March 23, 1998.

On a sad note, this past March 9, 1998 our friend and colleague Dr. John Mann died. Dr. Mann provided over 40 years of invaluable insight to our groundwater management activities. His career with my office began at the onset of the San Fernando litigation in 1955 when he was invited by the Los Angeles Department of Water and Power to join the water rights team which included then Special Counsel George Grover. John Mann will be long remembered for his outstanding contributions to the groundwater world.

I also wish to acknowledge and express appreciation to all the parties who have provided information and data which were essential to the completion of this report.

M L Blevins

MELVIN L. BLEVINS
ULARA Watermaster

In memory of John Mann Jr. (1921-1998) and Judge George Grover (died 1997)

Melvin Blevins, Judge George Grover, Dr. John Mann, Jr.
The "Water Rights Team" of the historic case City of Los Angeles vs. City of San Fernando
This photograph was taken in 1990 at the time of Judge Grover's retirement.

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I. INTRODUCTION

1. INTRODUCTION

1.1 Background

The Upper Los Angeles River Area (ULARA) encompasses all the watershed of the Los Angeles River and its tributaries above a point in the river designated as Los Angeles County Department of Public Works (LACDPW) Gaging Station F-57C-R, near the junction of the Los Angeles River and the Arroyo Seco (Plates 1 and 5). ULARA encompasses 328,500 acres, composed of 122,800 acres of valley fill, referred to as the groundwater basins, and 205,700 acres of hills and mountains. ULARA is bounded on the north and northwest by the Santa Susana Mountains; on the north and northeast by the San Gabriel Mountains; on the east by the San Rafael Hills, which separate it from the San Gabriel Basin; on the south by the Santa Monica Mountains, which separate it from the Los Angeles Coastal Plain; and on the west by the Simi Hills.

ULARA has four distinct groundwater basins. The water supplies of these basins are separate and are replenished by deep percolation from rainfall, surface runoff and from a portion of the water that is delivered for use within these basins. The four groundwater basins in ULARA are the San Fernando, Sylmar, Verdugo, and Eagle Rock Basins.

THE SAN FERNANDO BASIN (SFB), the largest of the four basins, consists of 112,000 acres and comprises 91.2 percent of the total valley fill. It is bounded on the east and northeast by the San Rafael Hills, Verdugo Mountains, and San Gabriel Mountains; on the north by the San Gabriel Mountains and the eroded south limb of the Little Tujunga Syncline which separates it from the Sylmar Basin; on the northwest and west by the Santa Susana Mountains and Simi Hills; and on the south by the Santa Monica Mountains.

THE SYLMAR BASIN, in the northerly part of ULARA, consists of 5,600 acres and comprises 4.6 percent of the total valley fill. It is bounded on the north and east by the San Gabriel Mountains; on the west by a topographic divide in the valley fill between the Mission Hills and the San Gabriel Mountains; on the southwest by the Mission Hills; on the east by the Saugus formation along the east bank of the Pacoima Wash; and on the south by the eroded south limb of the Little Tujunga Syncline, which separates it from the SFB.

THE VERDUGO BASIN, north and east of the Verdugo Mountains, consists of 4,400 acres and comprises 3.6 percent of the total valley fill. It is bounded on the north by the San Gabriel Mountains; on the east by a groundwater divide separating it from the Monk Hill Subarea of the

Raymond Basin; on the southeast by the San Rafael Hills; and on the south and southwest by the Verdugo Mountains.

THE EAGLE ROCK BASIN, the smallest of the four basins, is in the extreme southeast corner of ULARA. It comprises 800 acres and consists of 0.6 percent of the total valley fill.

1.2 History of Adjudication

The water rights in ULARA were established by the JUDGMENT AFTER TRIAL BY COURT in Superior Court Case No. 650079, entitled The City of Los Angeles, a Municipal Corporation, Plaintiff, vs. City of San Fernando, et al., Defendants, signed March 14, 1968, by the Honorable Edmund M. Moor, Judge of the Superior Court. Numerous pretrial conferences were held subsequent to the filing of the action by the City of Los Angeles in 1955 and before the trial commenced on March 1, 1966.

On March 19, 1958, an Interim Order of Reference was entered by the Court directing the State Water Rights Board, now known as the State Water Resources Control Board (SWRCB), to study the availability of all public and private records, documents, reports, and data relating to a proposed order of reference in the case. The Court subsequently entered an "Order of Reference to State Water Rights Board to Investigate and Report upon the Physical Facts (Section 2001, Water Code)" on June 11, 1958.

A final Report of Referee was approved on July 27, 1962 and filed with the Court. The Report of Referee made a complete study of the geology, insofar as it affects the occurrence and movement of groundwater and the surface and groundwater hydrology of the area. In addition, investigations were made of the history of channels of the Los Angeles River and its tributaries; the areas, limits, and directions of flow of all groundwater within the area; the historic extractions of groundwater in the basin and their quality; and all sources of water, whether they be diverted, extracted, imported, etc. The Report of Referee served as the principal basis for geological and hydrological facts for the original Trial Court Judgment in 1968, the Decision of the Supreme Court in 1975 (14 Cal 3d 199, 123 Cal Rept 1), and the Trial Court Final Judgment on remand on January 26, 1979.

The City of Los Angeles filed an appeal from the Judgment of the Trial Court with the Court of Appeal, which held a hearing on November 9, 1972, and issued its opinion on November 22, 1972. The opinion, prepared by Judge Compton and concurred in by Judges Roth and

Fleming, reversed, with direction, the original judgment handed down by Judge Moor. In essence, the City of Los Angeles was given rights to all water in ULARA, including the use of the underground basins. The defendants, however, were given the right to capture "return water", which is water purchased from the Metropolitan Water District of Southern California (MWD) that percolates into the basin.

A petition for rehearing was filed on December 7, 1972, but was denied by the Court of Appeal. On January 2, 1973, the defendants filed a petition for hearing with the State Supreme Court. The Court on March 2, 1973 advised the parties it would hear the case. The hearing was held on January 14, 1975.

On May 12, 1975, the California Supreme Court filed its opinion on the 20-year San Fernando Valley water litigation. This opinion, which became final on August 1, 1975, upheld the Pueblo Water Rights of the City of Los Angeles to all groundwater in the SFB derived from precipitation within ULARA. The City of Los Angeles' Pueblo Water Rights were not allowed to extend to the groundwaters of the Sylmar and Verdugo Basins.

The City of Los Angeles was also given rights to all SFB groundwater derived from water imported by it from outside ULARA and either spread or delivered within ULARA. The Cities of Glendale and Burbank were also given rights to all SFB groundwater derived from water that each imports from outside ULARA and delivered within ULARA. San Fernando was not a member of MWD until the end of 1971, and had never prior thereto imported any water from outside ULARA. However, San Fernando has no return flow rights based on a mutual agreement between Los Angeles and San Fernando in the March 22, 1984 amendment to the Final Judgment.

The Supreme Court reversed the principal judgment of the Trial Court and remanded the case back to the Superior Court for further proceedings consistent with the Supreme Court's opinion. On remand the case was assigned to the Honorable Harry L. Hupp, Judge of the Superior Court of Los Angeles County.

The Final Judgment (Judgment), signed by the Honorable Harry L. Hupp, was entered on January 26, 1979. Copies of the Judgment are available from the ULARA Watermaster's (Watermaster) office. The water rights set forth in the Judgment are consistent with the opinion of the Supreme Court described above. In addition, the Judgment includes provisions and stipulations regarding water rights, the calculation of imported return water credit, storage of water, stored water credit, and arrangements for physical solution water for certain parties as

suggested by the Supreme Court. A separate stipulation was filed in Superior Court on January 25, 1979 appointing Melvin L. Blevins to act as Watermaster under the Judgment in this case.

On August 26, 1983, the Watermaster reported to the Court pursuant to Section 10.2 of the Judgment that the Sylmar Basin was in a condition of overdraft. In response to the Watermaster's letter and a Minute Order of this Court, the Cities of Los Angeles and San Fernando responded by letter to the Court, agreeing with the Watermaster's report on overdraft. On March 22, 1984, Judge Harry L. Hupp signed a stipulation ordering, effective October 1, 1984, that the Cities of Los Angeles and San Fernando would be limited in their pumping to bring the total pumping within the safe yield of the basin, including any rights exercised by private parties.

The following table lists the judges who have succeeded Judge Hupp as Judge of Record for the San Fernando Judgment.

TABLE 1-1: JUDGES OF RECORD

Judge	Date Appointed
Ricardo A. Torres	January 1, 1993
Gary Klausner	December 9, 1991
Jerold A. Krieger	April 16, 1991
Sally Disco	May 25, 1990
Miriam Vogel	January 16, 1990
Vernon G. Foster	April 30, 1985

1.3 Extraction Rights

The extraction rights under the Judgment and Sylmar Basin Stipulation are as follows:

San Fernando Basin

Native Water

Los Angeles has an exclusive right to extract and utilize all the native safe yield water which is evaluated to be 43,660 acre-feet per year.

Import Return Water

Los Angeles, Glendale, and Burbank each has a right to extract the following amount:

Los Angeles: 20.8 percent of all delivered water, including reclaimed water, to valley fill lands of the SFB.

Burbank: 20.0 percent of all delivered water, including reclaimed water, to the SFB and its tributary hill and mountain areas.

Glendale: 20.0 percent of all delivered water, including reclaimed water, to the SFB and its tributary hill and mountain areas (i.e., total delivered water less 105 percent of total sales by Glendale in the Verdugo Basin and its tributary hills).

Physical Solution Water

Several parties are granted limited rights to extract water chargeable to the rights of others upon payment of specified charges. The following table lists the parties and their maximum physical solution quantities.

TABLE 1-2: PHYSICAL SOLUTION PARTIES

Chargeable Party	Pumping Party	Allowable Pumping (acre-feet)
City of Los Angeles	City of Glendale	5,500
	City of Burbank	4,200
	Van de Kamp[1]	120
	Toluca Lake	100
	Sportsmen's Lodge	25
City of Glendale	Forest Lawn	400
	Angelica Healthcare[1]	75
City of Burbank	Valhalla	300
	Lockheed	25

1. Abandoned 12/97.

Stored Water

Los Angeles, Glendale, and Burbank each has a right to store water and the right to extract equivalent amounts.

Sylmar Basin

Native and Import Return Water

As of October 1, 1984, Los Angeles and San Fernando were assigned equal rights to the safe yield of the basin. The Administrative Committee on July 16, 1996 approved increasing the safe yield in the Sylmar Basin on a trial basis by 300 acre-feet to 6,510 acre-feet per year. The only potentially active private party with overlying rights is Santiago Estates. As a successor to Meurer Engineering, Santiago Estates as of October 1995 was owned by Ellenberg Capital, which is pumping for landscaping irrigation. Santiago Estates pumping is deducted from the safe yield and the two cities divide the remainder. Santiago Estates did not pump during the 1996-97 Water Year.

Stored Water

Los Angeles and San Fernando each has a right to store water and the right to extract equivalent amounts.

Verdugo Basin

Native and Import Return Water

Glendale and the Crescenta Valley Water District (CVWD) own prescriptive rights to extract 3,856 and 3,294 acre-feet per year, respectively. Glendale is not currently pumping its full prescriptive right. CVWD has requested and been given approval by the Watermaster and Administrative Committee to once again pump an adjusted amount above its prescriptive amount for the 1997-98 Water Year (Appendix G). CVWD pumped 400 acre-feet above its prescriptive right during the 1996-97 Water Year.

Eagle Rock Basin

Native Water

The Eagle Rock Basin has no significant native safe yield.

Imported Return Water

Los Angeles delivers imported water to lands overlying the basin, and return flow from this delivered water constitutes the entire safe yield of the basin (approximately 500 acre-feet per year). Los Angeles has the right to extract or cause to be extracted the safe yield of the basin.

Physical Solution Water

McKesson Water Products (successor to Sparkletts) and Deep Rock each have physical solution rights to extract water pursuant to a stipulation with the City of Los Angeles, and as provided in Section 9.2.1 of the Judgment.

1.4 Watermaster Service and Administrative Committee

In preparing the annual Watermaster Report, the Watermaster collected and reported all information affecting and relating to the water supply, water use and disposal, groundwater levels, water quality, and ownership and location of new wells within ULARA. Groundwater pumpers report their extractions monthly to the Watermaster. This makes it possible to update the Watermaster Water Production Accounts on a monthly basis and determine the allowable pumping for the remainder of the year.

Section 8, Paragraph 8.3 of the Judgment established an Administrative Committee for the purpose of advising the Watermaster in the administration of his duties. The duly appointed members of the Committee, as of May 1, 1998, are:

BURBANK, CITY OF
Fred Lantz (President)
Peter Frankel (Alternate)

GLENDALE, CITY OF
Donald Froelich (Vice-President)
Wil Wilson (Alternate)

SAN FERNANDO, CITY OF
Michael Drake
Harold Tighe (Alternate)

LOS ANGELES, CITY OF
Gerald Gewe
Ernest Wong (Alternate)

CRESCENTA VALLEY WATER DISTRICT
Michael Sovich
David Gould (Alternate)

The Watermaster may convene the Administrative Committee at any time in order to seek its advice. Each year the Committee is responsible for reviewing and approving with the Watermaster the proposed annual report. The Committee approved the 1996-97 Watermaster Report on April 14, 1998.

1.5 Significant Events through April 1998

Headworks Well Field Remediation Project

Until the early 1980s, the Headworks wells were the most productive wells in the Los Angeles Department of Water and Power (DWP) water system, each well pumping between 2,500 - 4,000 gpm. However, the well field was taken out of service when it was discovered that the groundwater was contaminated with industrial solvents, primarily TCE and PCE. The project goal is to reactivate the well field by using some form of groundwater treatment process. The preliminary concept is to pump approximately 13,000 gpm from four wells, convey the groundwater to a central treatment facility located at the Headworks Spreading Grounds, remove the contaminants, and finally pump the supply back into the River Supply Conduit distribution system. An alternative study was undertaken in 1997 to evaluate an advanced oxidation process system. This process may be applicable for the Headworks project.

East Valley Water Recycling Project

The East Valley Water Recycling Project (EVWRP) is the cornerstone of the City of Los Angeles' water recycling efforts and will ultimately fulfill nearly half the goal of reusing about 40 percent of the city's wastewater by 2010. This project will ultimately utilize up to 35,000 acre-feet per year of reclaimed water from the Tillman Water Reclamation Plant, primarily for groundwater recharge in the Sun Valley area of the San Fernando Valley. Other incidental uses will be for irrigation and industrial applications. The 10 miles of pipeline and the Balboa Pumping Station are scheduled to be completed by December 1998. The installation of twelve monitoring wells was completed in 1997, and quarterly background sampling events are progressing. Phase I of the EVWRP is a three-year demonstration project that features 10,000 acre-feet per year of water spread at the Hansen Spreading Grounds beginning in December 1998. Groundwater quality will be evaluated over this three-year period with the goal of increasing the spreading up to 35,000 acre-feet per year.

Pollock Wells Treatment Plant

The Pollock Well Field, which is located in the Los Angeles River Narrows area, was removed from service in the late 1980s because the water quality was significantly degraded with

industrial solvents. The DWP is proceeding to construct the Pollock Wells Treatment Plant, a 3,000 gpm facility to restore two of the existing Pollock production wells to operation by treating the groundwater with Liquid-Phase Granular Activated Carbon (GAC) to remove the volatile organic compounds (VOCs), then blending with imported supplies for nitrate reduction. Another significant purpose of the Pollock project is to reduce the rising groundwater discharges from the Los Angeles River Narrows area. The Pollock plant will also provide increased flexibility in utilizing the basin. The plant is anticipated to begin operation in July 1998.

Pacoima Area Groundwater Investigation

A significant groundwater contaminant plume exists in the Pacoima area near the intersection of the Simi Valley Freeway and San Fernando Road (Plate 7). As the lead agency, the Department of Toxic Substances Control (DTSC) of the California Environmental Protection Agency (Cal-EPA) is working with the Los Angeles Regional Water Quality Control Board (RWQCB) and the Watermaster's Office to develop strategies to further investigate the extent and nature of the contaminant plume. The DWP has installed two downgradient monitoring wells to provide a better understanding of the extent of contamination and to provide an early warning detection system for the Tujunga Well Field. In addition to continued groundwater monitoring, interim remediation actions are under consideration including a soil vapor extraction and air-sparging system.

Burbank Operable Unit (BOU)

Phase II of the United States Environmental Protection Agency (EPA) Consent Decree project (BOU) will be completed in 1998. The Second Consent Decree specifies the obligations of operation and maintenance on the treatment facility for the next 18 years. Lockheed began delivering water to the Burbank distribution system in January 1996. In mid-December 1997, the facility was closed to rehabilitate Burbank Well No. 10, improve filtration of the backwash, and re-configure the Liquid-Phase GAC to a downward flow system. The average pumping rate at the facility will be about 9,000 gpm.

Glendale Operable Unit

The City of Glendale and the DreamWorks Studios SKG entered into an agreement during 1995 permitting DreamWorks to develop a studio on the Crystal Springs well site which had been previously selected as the site for the treatment plant of the operable unit (OU). DreamWorks animation studio was completed in December 1997. The EPA signed the Unilateral Administrative Order (UAO) and sent it to the Glendale Respondents Group in October 1997. The UAO provides for the construction, operation and maintenance of remedial

facilities in accordance with the work schedule. The project goal is to pump and treat up to 5,000 gpm from the Glendale North and South OU Well Fields. The City of Glendale, EPA, and the Glendale Respondents Group have held lengthy discussions with DHS concerning the permit process for the facility, the future operator of the facility, and use of the treated groundwater.

Glendale-Verdugo Park Water Treatment Plant

The City of Glendale completed construction of the Verdugo Park Water Treatment Plant, however, the facility is running at 400 gpm instead of the expected 700 gpm. Methods to increase the efficiency of Glendale's wells are being investigated.

Glenwood Nitrate Removal Plant

CVWD completed a rehabilitation of the ion exchange system at the Glenwood Nitrate Removal Plant. The replacement resin should last about eight years. The system produces approximately 50 - 60,000 gallons of brine water from the 1.5 million gallons processed daily.

CalMat

Under the Judgment, CalMat (successor to Conrock, defendant No. 18) was assigned rights to pump groundwater to be used for processing sands and gravel in their mining operations. The Judgment established that the pumped groundwater would be for a non-consumptive or minimal consumptive use (10 percent). The intent was to recharge the aquifer with the remaining 90 percent of the same processed groundwater. The Watermaster is in the process of resolving such issues as evaporative losses at the desilting ponds of the Trout-Switzer and Sun Valley pits, an exposed water table at the Sheldon Pond, and the possibility of mining at the Boulevard Pit which could expose the water table. During 1997, the Watermaster, working with CalMat and the City of Los Angeles, identified critical factors that could be used to measure compliance with the Judgment. An issue of particular concern for the City of Los Angeles is the planned depth of excavation at the Boulevard Pit. This excavation can cause a direct exposure of the groundwater table in the SFB within 0.3 miles of the Tujunga Well Field during periods of high recharge and low extractions.

Monteria Lake

Under the Judgment, the Monteria Lake Association was declared a Defaulting Party, that is, a party specifically not assigned any water rights. During 1996, the Watermaster investigated and confirmed the installation of illegal wells and tanks, as well as encroachment on DWP

easements. The wells were abandoned in December 1997 by order of the Court in accordance with Los Angeles County guidelines.

Tegatz/Pankow (formerly DeMille)

Watermaster investigations included the DeMille Estate, a Disclaiming Party, which gave up any water rights during the San Fernando litigation. Most of this property was purchased by the Pankow Family Trust on December 31,1986 and is known as Middle Ranch. The Watermaster has discovered numerous active wells used for agricultural, irrigation, and incidental domestic use throughout the Middle Ranch. The Watermaster has met several times with the property owner to provide information and an explanation of groundwater rights in the SFB. The Watermaster will continue to work with the property owner to ensure that the water rights of the City of Los Angeles are protected. The property also has a water supply from the City of Los Angeles. A hearing on this matter is scheduled for May 12, 1998.

North Little Tujunga Canyon

The Watermaster is conducting an investigation of the North Little Tujunga Canyon area to gather hydrogeologic information related to groundwater pumping. This geographic area is included under the Judgment, and the water rights belong to the City of Los Angeles. Most of the properties are in unincorporated Los Angeles County surrounded by national forest and are provided services by the County. The Watermaster is examining the rights and responsibilities of all the parties and government agencies.

Dewaterers

The groundwater table in parts of the SFB is near the ground surface. This circumstance in some instances requires continuous dewatering to maintain subsurface structures. A process for notifying the Watermaster was re-instituted with the Department of Building and Safety in 1996 (Appendix F, 1995-96 ULARA Watermaster Report). As permits are requested in the SFB, the Watermaster's Office is notified and plans are submitted for review. If the property has the potential for short or long-term dewatering, instructions are provided. If not, the party is released from any further responsibilities.

Policies and Procedures

In February 1998 a revised edition of the ULARA Watermaster Policies and Procedures was published. This document sets forth the specific provisions for the Watermaster to administer the Judgment addressing the following areas: a summary of water rights as established in the Judgment and its amendments; accounting procedures for groundwater extractions and

storage; management of groundwater quality; establishment of the ULARA Administrative Committee; and reporting requirements and procedures.

1.6 Summary of Water Supply, Operations, and Hydrologic Conditions

Highlights of operations for the 1995-96 and 1996-97 Water Years are summarized in Table 1-3. Details of the 1996-97 Water Year operations and hydrologic conditions are given in Section 2. Locations of the groundwater basins, water service areas of the parties and individual producers, and other pertinent hydrologic facilities are shown on Plates 2 through 9.

Average Rainfall

Precipitation on the valley fill floor area during 1996-97 was 15.17 inches, 92 percent of the calculated 100-year mean (16.48 inches); precipitation in the mountain areas was 20.27 inches, 93 percent of the calculated 100-year mean (21.62 inches).

Spreading Operations

A total of 23,171 acre-feet of water was spread, a slight increase from the 21,239 acre-feet spread during the rainy 1995-96 Water Year. Average annual spreading for the 1968-1997 period was 34,884 acre-feet.

Extractions

Total extractions amounted to 118,183 acre-feet. This is an increase of 23,524 acre-feet from 1995-96 and approximately 123 percent of the 1968-97 average of 95,960 acre-feet. Of the total for the 1996-97 Water Year, 2,286 acre-feet were for non-consumptive use. This increase was related to concentrated rainfall in the month of January, with a long dry period from February through September 1997, which created a demand for increased groundwater pumping. Appendix A contains a summary of groundwater extractions for the 1996-97 Water Year.

Imports

Gross imports (including pass-through water) totaled 533,855 acre-feet, an increase of 5 percent from 1995-96. Net imports used within ULARA amounted to 316,123 acre-feet, a 6,430 acre-feet increase.

Exports

A total of 304,304 acre-feet of water was exported from ULARA, an increase of 35,167 acre-feet from the previous year. Of the 304,304 acre-feet exported, 86,572 acre-feet were from groundwater extractions, and 217,732 acre-feet were from imported supplies (pass-through).

Treated Wastewater

A total of 103,240 acre-feet of wastewater was treated in ULARA. The majority of the treated water was discharged to the Los Angeles River, a small amount was delivered to the Hyperion Treatment Plant, and approximately nine percent was used as reclaimed water.

Recycled Water

Total recycled water used in ULARA was 9,651 acre-feet, a 1,891 acre-feet increase from last year. The recycled water is used for landscape irrigation, in-plant use, power plant use (i.e. cooling), and other industrial uses.

Sewage Export

Sewage export was estimated at 118,050 acre-feet; this was the amount of sewage delivered by pipeline to the Hyperion Treatment Plant. The estimate does not include treated wastewater discharged to the Los Angeles River that leaves ULARA as surface flow.

Groundwater Storage

Groundwater storage in the SFB during 1996-97 decreased by 35,842 acre-feet; the total cumulative increase in groundwater storage since October 1, 1968 is 226,144 acre-feet. The 1996-97 decrease is due to a combination of minimal increase in spreading activities by the LACDPW, about average rainfall, and above average groundwater pumping. The change in groundwater storage for the Sylmar, Verdugo, and Eagle Rock Basins was +338, -2,136, and +113 acre-feet, respectively. The total change in groundwater storage in ULARA was -37,421 acre-feet.

Wells

During the 1996-97 Water Year, 16 monitoring wells for the EVWRP and the Pacoima Investigation were installed within ULARA, and two illegal wells in the Monteria Lake Estates were destroyed.

TABLE 1-3: SUMMARY OF OPERATIONS IN ULARA

Item	Water Year 1995-96	Water Year 1996-97
Active Pumpers (party and nonparties)	29	26
Inactive Pumpers (parties within valley fill)[1]	3	4
Valley Rainfall, in inches		
Valley Floor	12.03	15.17
Mountain Area	16.02	20.27
Spreading Operations, in acre-feet	21,239	23,171
Extractions, in acre-feet		
Used in ULARA	24,098	27,479
Exported from ULARA	68,714	86,770
Nonconsumptive Use	1,007	2,286
Basin Account/Testing[2]	113	1,095
Clean-up/Dewaterers	612	553
Total	**94,544**	**118,183**
Gross Imports, in acre-feet		
Los Angeles Aqueduct Water	450,917	451,048
MWD Water	59,199	82,807
Total	**510,116**	**533,855**
Exports, in acre-feet		
Los Angeles Aqueduct Water	198,779	203,909
MWD Water	1,644	13,823
Groundwater	68,714	86,572
Total	**269,137**	**304,304**
Net Imports Used in ULARA, in acre-feet	309,693	316,123
Reclaimed Water Use, in acre-feet	7,877	9,651
Total Water Use in ULARA, in acre-feet[3]	341,668	353,253
Treated Wastewater, in acre-feet[4]	99,524	103,240
Sewage Export to Hyperion, in acre-feet[5]	119,233	118,050

1) The four inactive pumpers are Hinkle-Schmidt (Deep Rock), Van de Kamp, Disney, and Angelica.
2) Water accounted for under a testing situation or treatment facility water used for backwash.
3) Extractions used in ULARA plus Net Imports and Reclaimed.
4) Most treated wastewater flows to LAR, a portion to Hyperion (see T2-7), and for reclaimed water.
5) Sewage outflow includes estimates of outflow from each of the four basins, and discharges to Hyperion from the Tillman and Los Angeles-Glendale Reclamation Plants.

1.7 Allowable Pumping for the 1997-98 Water Year

Table 1-4 shows a summary of extraction rights for the 1997-98 Water Year and stored water credit as of October 1, 1997, for the Cities of Los Angeles, Burbank, Glendale, San Fernando, and the CVWD. The calculation of these values is shown in more detail in Section 2.

TABLE 1-4: ALLOWABLE PUMPING 1997-98 WATER YEAR

(acre-feet)

	Native Safe Yield Credit[1]	Import Return Credit[2]	Total Native+Import	Stored Water Credit (as of Oct. 1, 1997)	Allowable Pumping 1997-98 Water Year
San Fernando Basin					
City of Los Angeles	43,660	44,586	88,246	296,630	384,876
City of Burbank	—	4,977	4,977	56,297	61,274
City of Glendale	—	5,508	5,508	59,776	65,284
Total	**43,660**	**55,071**	**98,731**	**412,731**	**511,434**
Sylmar Basin					
City of Los Angeles	3,255	—	3,255	4,758	8,013
City of San Fernando	3,255	—	3,255	2,308	5,563
Total	**6,510**	**—**	**6,510**	**7,066**	**13,576**
Verdugo Basin[3]					
CVWD	3,294	—	3,294	—	3,294
City of Glendale	3,856	—	3,856	—	3,856
Total	**7,150**	**—**	**7,150**	**—**	**7,150**

1) Native Safe Yield extraction right per Judgment, page 11.
2) Import Return extraction right per Judgment, page 17.
3) There is no Stored Credit assigned in the Verdugo Basin.

2. WATER SUPPLY, OPERATIONS, AND HYDROLOGIC CONDITIONS

2. WATER SUPPLY, OPERATIONS, AND HYDROLOGIC CONDITIONS

2.1 Precipitation

Precipitation varies considerably throughout ULARA depending on topography and elevation. Mean seasonal precipitation ranges from about 14 inches at the western end of the San Fernando Valley to 35 inches in the San Gabriel Mountains. Approximately 80 percent of the annual rainfall occurs from December through March.

The 1996-97 Water Year experienced slightly below average rainfall. The valley floor received 15.17 inches of rain (92 percent of the 100-year mean), while the mountain area received 20.27 inches (93 percent of the 100-year mean). Figure 2.1 shows monthly valley floor and mountain area rainfall in ULARA. The weighted average of both valley and mountain areas was 17.65 inches (90 percent of the 100-year mean). Table 2-1 shows a record of rainfall at the valley and mountain precipitation stations, and Plate 5 shows their locations.

FIGURE 2.1: MONTHLY RAINFALL

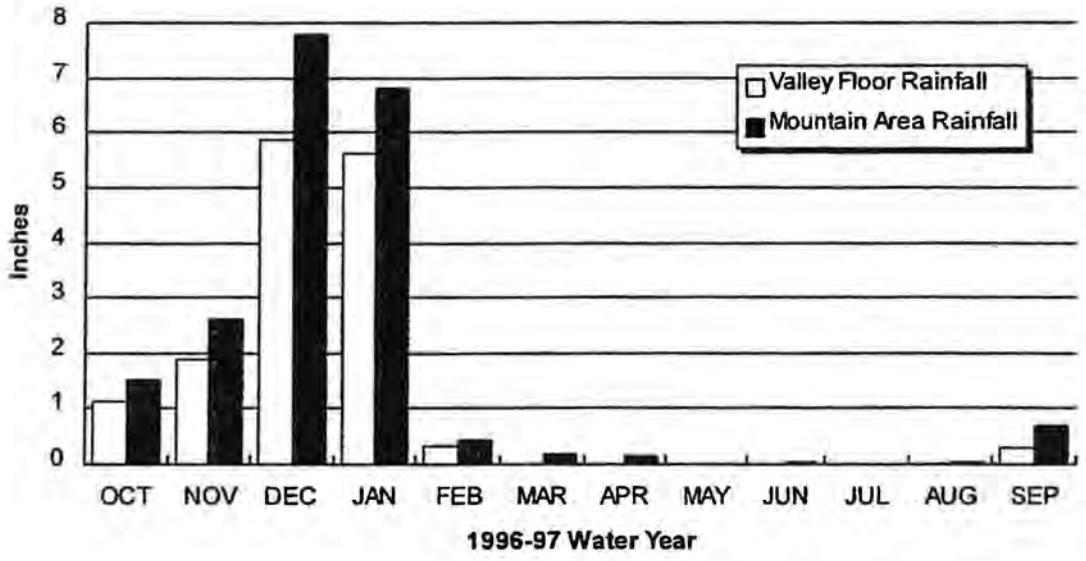


TABLE 2-1: 1996-97 PRECIPITATION

(inches)

LACDPW Rain Gage Stations No.	Name	1996-97 Precipitation	100-Year Mean (1881-1981)	Percent of 100-Year Mean
	Valley Stations			
13C	North Hollywood-Lakeside	15.54	16.63	93%
1107D	La Tuna Canyon	8.76	14.98	58%
465C	Sepulveda Dam	14.56	15.30	95%
21B	Woodland Hills	13.61	14.60	93%
23B	Chatsworth Reservoir	15.96	15.19	105%
25C	Northridge-LADWP	15.02	15.16	99%
251C	La Crescenta	20.99	23.31	90%
293B	Los Angeles Reservoir	18.76	17.32	108%
	Weighted Average[1]	**15.17**	**16.48**	**92%**
	Mountain Stations			
11D	Upper Franklin Canyon Reservoir	15.59	18.50	84%
17	Sepulveda Canyon at Mulholland	22.57	16.84	134%
33A	Pacoima Dam	19.17	19.64	98%
47D	Clear Creek - City School	25.92	33.01	79%
1076B	Monte Cristo Ranger Station	18.62	29.04	64%
54C	Loomis Ranch-Alder Creek	11.32	18.62	61%
210C	Brand Parks	12.72	19.97	64%
797	DeSoto Reservoir[2]	19.86	17.52	113%
	Weighted Average[1]	**20.27**	**21.76**	**93%**
	Weighted Average Valley/Mountain Areas[1]	**17.65**	**19.64**	**90%**

1. Weighted Average calculations performed according to Report of Referee-7/62.
2. Station 797 replaced Station 259 which has been discontinued.

2.2 Runoff and Outflow from ULARA

The drainage area of ULARA contains 328,500 acres, of which 205,700 acres are hills and mountains. The drainage system is made up of the Los Angeles River and its tributaries. Surface flow originates as storm runoff from the hills and mountains, storm runoff from the impervious areas of the valley, industrial and sanitary waste discharges, and rising groundwater.

A number of stream-gaging stations are maintained throughout ULARA, either by the LACDPW or the United States Geological Survey (USGS). The Watermaster has selected six key gaging

stations which record runoff from the main hydrologic areas in ULARA (Plate 5 shows the location of the stations). The six gage stations are as follows:

1. Station F-57C-R registers all surface outflow from ULARA.

2. Station F-252-R registers flow from Verdugo Canyon which includes flows from Dunsmore and Pickens Canyons.

3. Station E-285-R registers flow from the westerly slopes of the Verdugo Mountains and some flow from east of Lankershim Boulevard. It also records any releases of reclaimed wastewater discharged by the City of Burbank.

4. Station F-300-R registers all flow east of Lankershim Boulevard plus the portion of outflow from Hansen Dam which is not spread. These records also include flow through the Sepulveda Dam, which may include extractions from the Reseda wells.

5. Station F-168-R registers all releases from Big Tujunga Dam, which collects runoff from the watershed to the northeast. Runoff below this point flows to Hansen Dam.

6. Station F-118B-R registers all releases from Pacoima Dam. Runoff below this point flows to the Los Angeles River through lined channels, or can be diverted to the Lopez and Pacoima spreading grounds. This station, severely damaged in January 1994 during the Northridge Earthquake, began reporting again in November 1996.

Table 2-2 summarizes the 1995-96 and 1996-97 monthly runoff for these stations. The higher runoff in 1996-97 is related to higher rainfall in 1996-97 than in 1995-96. The mean daily discharge rates for these six stations during 1996-97 are summarized in Appendix B.

TABLE 2-2: MONTHLY RUNOFF AT SELECTED GAGING STATIONS

(acre-feet)

Station	Water Year	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
F-57C-R	1995-96	8,386	7,685	13,079	14,652	31,590	13,516	8,886	7,972	8,625	11,327	13,931	11,507	**151,156**
L.A. River	1996-97	12,950	15,320	34,460	33,280	8,230	6,880	6,750	7,340	7,420	8,540	5,860	8,260	**155,290**
Arroyo Seco														
F-252-R	1995-96	152	149	505	1,315	5,746	4,832	220	185	103	143	89	83	**13,522**
Verdugo Wash	1996-97	675	1,580	6,120	4,510	691	665	592	606	556	200	271	398	**16,864**
E-285-R	1995-96	785	762	802	1,004	7,740	1,247	629	624	552	620	581	603	**15,949**
Burbank	1996-97	956	1,120	1,840	2,000	618	550	470	464	537	548	607	600	**10,310**
Storm Drain														
F-300-R	1995-96	4,628	4,979	8,709	9,211	18,450	8,804	6,140	4,882	4,597	4,892	4,642	4,690	**84,624**
L.A. River	1996-97	7,970	9,500	25,490	24,950	6,360	5,560	5,320	5,490	5,300	5,410	5,370	5,970	**112,690**
Tujunga Ave.														
F-168-R	1995-96	191	208	240	121	2,104	2,412	983	926	337	271	178	135	**8,106**
Big Tujunga	1996-97	0	0	1,390	2,800	1,830	906	614	331	142	7	0	2	**8,023**
Dam														
F-118B-R	1995-96	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pacoima Dam	1996-97	61	59	581	2,170	1,440	497	337	37	143	37	37	37	**36**

1. F-252R Recorder inoperative, record based on Corps station 3388 for October through January.
2. F118B-R has been out of service since 1994 earthquake. Proper gage height not set in recorder: flows estimated from Dam records (October through March).

2.3 Components of Surface Flow

The surface flow of the Los Angeles River at Gaging Station F-57C-R consists of:

1. Storm flows;
2. Reclaimed wastewater from the Tillman, Burbank, and Los Angeles-Glendale Water Reclamation Plants;
3. Industrial discharges; and,
4. Rising groundwater.

In the Report of Referee (Volume II, Appendix O), procedures were developed for the calculation of rising groundwater for the period 1928-1958. Some of the important factors of that study are no longer significant - releases of Owens River water, operation of the Chatsworth Reservoir, and (temporarily, at least) operation of the Headworks Spreading Grounds. As shown on Figure O-2 of the Report of Referee, rising groundwater was considered to have fallen to zero by the late 1950s. The January 1993 report by Brown and Caldwell, "Potential Infiltration of Chlorides from the Los Angeles River into the Groundwater Aquifer" studied groundwater levels along the course of the Los Angeles River. Figure 2-4 of that report is especially informative. As of the end of the drought period in 1977, groundwater levels in the Los Angeles Narrows were very low, with very little potential for rising groundwater.

Heavy runoff occurred during the 1978-83 period, which, combined with reduced pumping in the Crystal Springs, Grandview, and Pollock Well Fields, caused large recoveries of groundwater levels in the Los Angeles Narrows.

An even greater factor affecting hydrologic conditions in the Los Angeles Narrows has been the increasing releases of reclaimed waters. Releases from the Los Angeles-Glendale Plant were started in 1976-77 and from the Tillman Plant in 1985-86. These large year-round releases tend to keep the alluvium of the Los Angeles River Narrows full, even in dry years. There is opportunity for continuing percolation in the unlined reach, both upstream and downstream of the paved section near the confluence of the Verdugo Wash and the Los Angeles River. Water percolating in the unlined reach is believed to circulate through shallow zones and re-appear as rising groundwater downstream from Los Feliz Boulevard. Also, there is up to 3,000 acre-feet of recharge from delivered water within the Los Angeles Narrows-Pollock Well Field area that adds to the rising groundwater conditions.

Rising groundwater also occurs above the Verdugo Narrows, and in the reach upgradient from Gage F-57C-R. During dry periods, conditions in the unlined reach are stabilized with regard to percolation and rising water by releases of treated water. In wet periods, rising groundwater above gage F-57C-R has been considered to be related to the increase of rising water above the Verdugo Narrows. From 1991-92 (Table 2-3) to the very wet year of 1992-93 there was an increase of rising water at Gage F-252-R of about 1,900 acre-feet. From 1995-96 to 1996-97, flows of rising water at gage F-252-R was estimated at 3,000 AF. For 1996-97 the rising groundwater flow at gage F-57C-R was estimated at 3,000 acre-feet.

TABLE 2-3: ESTIMATED SEPRATION OF SURFACE FLOW AT STATIONS F-57C-R & F-252-R

(acre-feet)

Water Year	F-57C-R Rising Groundwater	F-57C-R Waste Discharge	F-57C-R Storm Runoff	F-57C-R Total Outflow	F-252-R Rising Groundwater	F-252-R Storm Runoff	F-252-R Total Outflow
1996-97	3,000	75,827	76,485	155,312	3,000	13,860	16,860
1995-96	3,841	86,127	61,188	151,156	2,577	10,946	13,523
1994-95	4,900	66,209	367,458	438,567	4,809	28,881	33,696
1993-94	2,952	60,594	73,149	136,695	1,387	6,156	7,543
1992-93	4,900	77,000	478,123	560,023	3,335	20,185	23,520
1991-92	3,000	120,789	197,040	320,829	1,412	13,209	14,621
1990-91	3,203	75,647	117,779	196,629	1,157	6,865	8,022
1989-90	3,000	76,789	55,811	167,639	1,182	2,938	4,120
1988-89	3,000	80,020	56,535	136,843	1,995	4,453	6,448
1987-88	3,000	81,920	74,074	156,204	3,548	10,493	14,041
1986-87	3,000	64,125	19,060	83,295	2,100	1,690	3,790
1985-86	3,880	48,370	102,840	155,090	2,470	6,270	8,740
1984-85	3,260	21,600	46,300	71,160	2,710	3,970	6,680
1983-84	3,000	17,780	49,090	69,870	4,000	n/a	n/a
1982-83	3,460	17,610	384,620	405,690	5,330	21,384	26,714
1981-82	1,280	18,180	80,000	99,460	3,710	5,367	9,077
1980-81	4,710	19,580	51,940	76,230	5,780	2,917	8,697
1979-80	5,500	16,500	n/a	n/a	5,150	7,752	12,902
1978-79	2,840	16,450	119,810	139,100	2,470	n/a	n/a
1977-78	1,331	7,449	357,883	366,663	1,168	23,571	24,739
1976-77	839	7,128	58,046	66,013	1,683	2,635	4,318
1975-76	261	6,741	32,723	39,725	2,170	2,380	4,550
1974-75	427	7,318	56,396	64,141	1,333	4,255	5,588
1973-74	2,694	6,366	79,587	88,878	1,772	5,613	7,385
1972-73	4,596	8,776	100,587	113,959	1,706	7,702	9,408
1971-72	—	—	—	—	2,050	2,513	4,563

2.4 Groundwater Recharge

Precipitation has a marked influence on groundwater recharge and, with some delay, groundwater storage. Urban development in ULARA has resulted in approximately 20 percent of the rainfall being collected and routed into paved channels which discharge into the Los Angeles River. To partially offset the increased runoff due to urbanization, Pacoima and Hansen Dams, originally built for flood control, are utilized to regulate storm flows and allow recapture of the flow in downstream spreading basins operated by the LACDPW and the City of Los Angeles.

The LACDPW operates the Branford, Hansen, Lopez, and Pacoima Spreading Grounds; the City of Los Angeles operates the Headworks Spreading Grounds, however, it is currently inactive. The LACDPW, in cooperation with the City of Los Angeles, operates the Tujunga Spreading Grounds. The spreading grounds operated by the LACDPW are utilized for spreading native water and imported water under agreements. Table 2-4 summarizes the spreading operations for the 1996-97 Water Year, and Plate 6 shows the locations of the spreading basins.

TABLE 2-4: 1996-97 SPREADING OPERATIONS IN THE SAN FERNANDO BASIN
(acre-feet)

Agency	Spreading Facility	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
LACDPW														
	Branford	26	71	85	89	35	10	9	12	11	12	13	42	415
	Hansen	0	291	1,650	3,180	2,430	629	421	535	296	81	17	278	9,808
	Lopez	1	1	10	4	393	158	131	0	26	0	0	0	724
	Pacoima	0	335	1,600	3,050	782	0	0	0	0	0	0	1	5,768
	Tujunga	238	70	611	2,750	666	863	580	0	155	295	178	0	6,406
	Total	265	768	3,956	9,073	4,306	1,660	1,141	547	488	388	208	321	23,121
City of Los Angeles														
	Tujunga	0	0	0	0	14	12	7	0	8	2	0	8	50
	Headworks	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hansen	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	0	0	0	0	14	12	7	0	8	2	0	8	50
City of Burbank														
	Pacoima	0	0	0	0	0	0	0	0	0	0	0	0	0
Basin Total		265	768	3,956	9,073	4,320	1,672	1,148	547	496	390	208	329	23,171

2.5 Groundwater Extractions

The original trial court adjudication of groundwater rights in ULARA restricted all groundwater extractions, effective October 1, 1968. On that date, extractions were restricted to approximately 104,000 acre-feet per water year. This amounted to a reduction of approximately 50,000 acre-feet from the previous six-year average. The State Supreme Court's opinion, as implemented on remand in the Judgment entered on January 26, 1979, provides a similar restriction in groundwater pumping.

McKesson Water Products (formerly Sparkletts Drinking Water Corporation) and Deep Rock Water Company are the only parties which have rights to extract water from the Eagle Rock Basin. These parties pay the City of Los Angeles for pumped groundwater pursuant to the Judgment.

Figure 2.2 illustrates the annual groundwater extractions and imported water used in ULARA, beginning with the 1954-55 Water Year. It can be noted that for the 14 years prior to pumping restrictions (1954-55 to 1967-68), imports exceeded extractions by 50,000 to 90,000 acre-feet per year, in contrast to the past 29 years (1968-69 to 1996-97) where imports have exceeded extractions by 110,000 to 250,000 acre-feet per year (Refer to Figure 2.3 - Monthly Extractions and Imports).

A total of 118,183 acre-feet was pumped from ULARA during the 1996-97 Water Year- 105,899 acre-feet from the SFB, 5,741 acre-feet from the Sylmar Basin, 6,345 acre-feet from the Verdugo Basin, and 198 acre-feet from the Eagle Rock Basin. The respective safe yield values for the 1996-97 Water Year are 111,070 acre-feet (Native Safe Yield of 43,660 and an import return of 53,750 acre-feet) for the SFB, 6,510 acre-feet for the Sylmar Basin, and 7,150 acre-feet for the Verdugo Basin. Appendix A contains a summary of groundwater extractions for the 1996-97 Water Year, Plate 9 shows the locations of the well fields, and Plate 10 describes the pattern of groundwater extractions.

Of the total amount pumped in the SFB (105,899 acre-feet), 100,945 acre-feet constitutes extraction rights by Parties to the Judgment, 2,285 acre-feet constitutes nonconsumptive use, and 2,752 acre-feet was by physical solution parties, groundwater cleanup, testing/well development, and dewatering parties (Appendix E). Table 2-5 summarizes 1996-97 private party pumping in the SFB, and Plate 3 shows the locations of the individual producers.

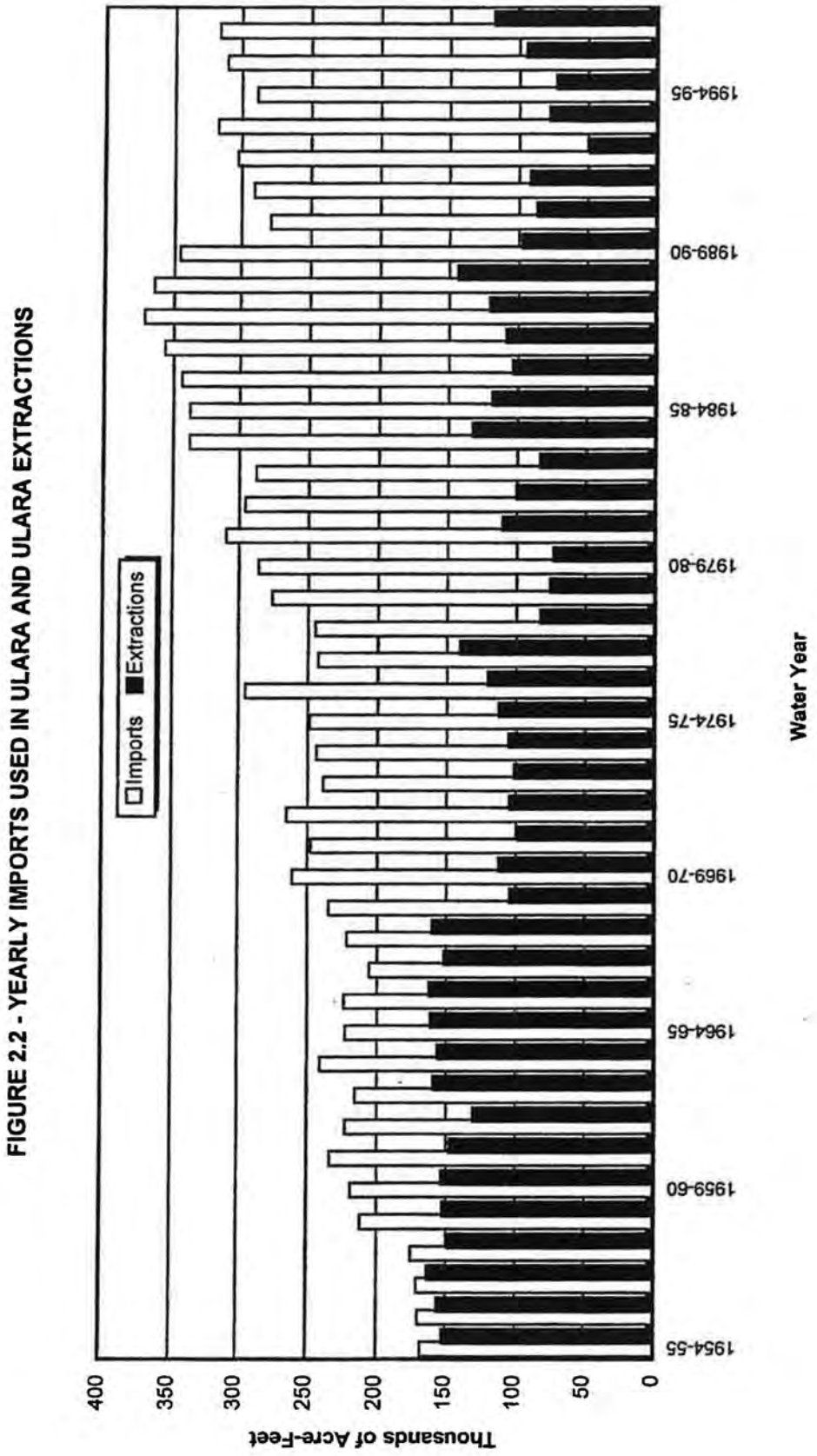


FIGURE 2.2 - YEARLY IMPORTS USED IN ULARA AND ULARA EXTRACTIONS

TABLE 2-5: 1996-97 PRIVATE PARTY PUMPING - SAN FERNANDO BASIN

(acre-feet)

Nonconsumptive Use or Minimal Consumption		Groundwater Dewatering	
CalMat	2,048	Auto Stiegler	33
(Gravel washing)		(Charged to Los Angeles' water rights)	
Sears, Roebuck and Company	224	First Financial Plaza Site	24
(Air Conditioning)		(Charged to Los Angeles' water rights)	
Sportsmen's Lodge	0	Trillium Corporation	20
		(Charged to Los Angeles' water rights)	
Toluca Lake Property Owners Ass'n	13	Metropolitan Transportation Agency	769
(Lake overflows to LA River)		(Charged to Basin Account)	
Walt Disney Productions	0	Metropolitan Water District (MWD)	174
		(Charged to Los Angeles' water rights)	
Total	**2,285**	**Total**	**1,020**
Groundwater Cleanup		**Physical Solution**	
Burbank GAC	55	Angelica Healthcare Services	0
(GAC restart to Basin Account)		(Various uses)	
Lockheed-Burbank Operable Unit	271	CalMat	227
(Well Development to Basin Account)		(10% applied to evaporative loss)	
Greeff Fabrics	16	Forest Lawn Cemetery Assn.	420
(Recharged to groundwater)		(Charged to Glendale's water rights)	
Hughes	6	Sportsmen's Lodge	0
(Charged to Los Angeles' water rights)		(Charged to Los Angeles' water rights)	
Mobil Oil Corporation	1	Toluca Lake Property Owners Ass'n	30
(Charged to Los Angeles' water rights)		((Charged to Los Angeles' water rights)	
Philips Components	68	Valhalla Memorial Park	343
(Recharged to groundwater)		(Charged to Burbank's water rights)	
Rockwell International	280		
3M-Pharmaceutical	15		
(Recycled for on-site use)			
Total	**712**	**Total**	**1,020**
Total Extractions	**5,037**		

2.6 Imports and Exports of Water

Residential, commercial, and industrial expansions in ULARA have required the importation of additional water supplies to supplement that provided by the groundwater basins.

The imported supplies to ULARA are from the Los Angeles Aqueducts and the MWD. Los Angeles Aqueduct water consists of runoff from the Eastern Sierra Nevada and groundwater from Owens Valley. The MWD supplies consist of State Water Project and Colorado River Aqueduct waters.

Exports from ULARA include imported Los Angeles Aqueduct and MWD water (pass-through), and groundwater from the SFB. Exports of wastewater are by pipeline to Hyperion Treatment Plant.

Table 2-6 summarizes the nontributary imports and exports from ULARA during the 1995-96 and 1996-97 Water Years, and Figure 2.3 shows the monthly extractions and imports.

FIGURE 2.3 - TOTAL MONTHLY EXTRACTIONS AND GROSS IMPORTS

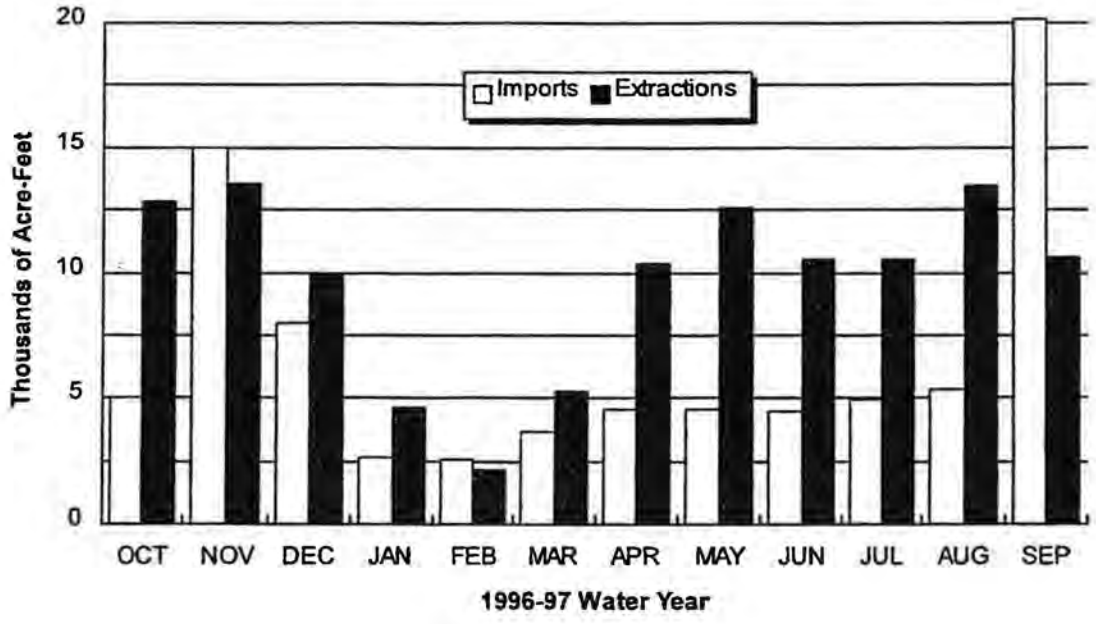


TABLE 2-6: ULARA NONTRIBUTARY WATER IMPORTS AND EXPORTS

(acre-feet)

Source and Agency	Water Year 1995-96	Water Year 1996-97
Gross Imported Water		
Los Angeles Aqueduct		
City of Los Angeles	450,917	451,048
MWD Water		
City of Burbank	12,937	10,525
Crescenta Valley Water District	1,644	1,811
City of Glendale	27,961	28,061
City of Los Angeles[1]	8,459	34,297
La Canada Irrigation District[1]	1,121	1,173
Las Virgenes Municipal Water District[1]	6,463	6,624
City of San Fernando	615	316
Total	**59,200**	**82,807**
Grand Total	**510,117**	**533,855**
Exported Water (Pass-Through)		
Los Angeles Aqueduct		
City of Los Angeles	198,779	203,909
MWD water		
City of Los Angeles	1,644	13,823
Total	**200,423**	**217,732**
Net Imported Water	**309,694**	**316,123**

1. Deliveries to those portions of these Districts that are within ULARA.

2.7 Water Recycling

Water recycling presently provides a source of water for irrigation, industrial, and recreational uses. In the future, water recycling will provide water for groundwater recharge within the Hansen, Headworks and Pacoima spreading basins. Six wastewater reclamation plants are in operation in ULARA. The Las Virgenes Municipal Water District operates a water recycling facility outside ULARA but uses part of the treated water in ULARA. The goal of the East Valley Water Recycling Project is to use up to 35,000 acre-feet/year of reclaimed water from the Donald C. Tillman Reclamation Plant for groundwater recharge. Table 2-7 summarizes the 1996-97 reclamation plant operations, and Plate 6 shows their location.

TABLE 2-7: WASTEWATER RECYLCING OPERATIONS
(acre-feet)

Plant/Agency	Treated Water	Water Discharged to L.A. River	Water Discharged to Hyperion	Recycled Water
City of Burbank	9,224	6,134	5,349	3,120 [1]
Los Angeles-Glendale	22,563	16,424	2,347	4,219 [2]
Donald C. Tillman	71,366	61,650	9,100	616 [3]
Indian Hills Mobile Homes	—	—	—	20 [4]
The Independent Order of Foresters	87	0	0	87 [4]
Rocketdyne (Canoga Park)	N/A	N/A	N/A	N/A [5]
Las Virgenes MWD	—	0	0	1,265 [6]
Total	**103,240**	**84,208**	**16,796**	**9,327**

1. Of the total recycled water (3,120 AF), 2,576 AF was delivered to the Burbank power plant. Of that, 515 AF is for cooling and 2,061 AF is for discharge to the Los Angeles River. Half of the water for cooling is also included in the "river discharges" column. 544 AF was used by CalTrans, DeBell Golf Course and other landscape irrigation.
2. Of the total recycled water (4,219 AF), 1,246 AF was delivered to Glendale for use in Glendale's Phosphate Plant and for irrigation water for CalTrans, Forest Lawn and Brand Park; 751 AF was for in plant use; 1,284 AF was delivered to Griffith Park by Los Angeles for irrigation; and 1,054 AF was used by CalTrans, Lake Side, Sinai Memorial Park, Forest Lawn 2, and Universal City MCA for irrigation.
3. Recycled water was for in plant use and then discharged to the Los Angeles River.
4. Recycled water is used for irrigation.
5. Rocketdyne: Treated water is reused within the facility.
6. Portion of recycled water is used within ULARA for irrigation.

2.8 Water Level Elevations

The 1998 Watermaster Report uses computer simulated groundwater contours for the Spring (April) and the Fall (September) of 1997. Up until 1994-95, the groundwater contour maps were developed by using actual water level data to interpolate the contours, and manually plotting the interpolations. The 1997 contours were produced by using the SFB Groundwater Flow Model. The SFB model was initially developed during the RI study of groundwater contamination in the San Fernando Valley. The RI study was funded through the EPA's Superfund program.

The model is comprised of up to four layers, in the deepest portion of the eastern SFB, and includes 22,016 cells, ranging in size from 1,000 by 1,000 feet to 3,000 by 3,000 feet. The model parameters were calibrated by matching the simulated hydraulic-head fluctuations with the historical water level fluctuations measured at selected key monitoring wells for a 10-year period. The 1997 contours were simulated by incorporating the estimated monthly recharge (e.g. spread water, precipitation, etc.) and discharge (groundwater extractions, rising water, etc.) values for the 1996-97 water year. The model was then run for twelve consecutive stress periods beginning October 1996 through September 1997. The simulated head values at the end of the April and September stress periods were then plotted by utilizing a groundwater contour software package.

The simulated Spring and Fall 1997 Groundwater Contour Maps are shown as Plates 11 and 12. These contours are intended to depict the general trend of groundwater flow for April and September of 1997. Up-to-date groundwater elevations for specific locations can be obtained by contacting the Watermaster's Office at (213) 367-0921.

Plate 13 exhibits the change in groundwater elevation from the Fall of 1996 to the Fall of 1997. The 20 to 30 foot depression in groundwater levels as shown near the Tujunga, Rinaldi-Toluca, North Hollywood and Burbank well field areas are attributed to slightly below normal precipitation (90 percent of normal) and increased groundwater extractions. Overall SFB extractions increased 22 percent from 1995-96 to 1996-97 (82,861 acre-feet to 105,900 acre-feet). More specifically the increase in extractions were (by well field): Tujunga: 2,500 acre-feet, Rinaldi-Touca: 10,400 acre-feet, North Hollywood: 6,000 acre-feet, and Burbank/Lockheed: 3,500 acre-feet. Plate 14 exhibits groundwater flow directions and estimated groundwater velocities in ULARA. Figure 2.4 shows historic well hydrographs of wells throughout ULARA and their locations.

2.9 Groundwater Storage

San Fernando Basin

The total groundwater storage capacity of the SFB was estimated in the Report of Referee to be approximately 3,200,000 acre-feet, of which a regulatory storage capacity of 360,000 acre-feet is required by the Judgment.

The estimated change in groundwater storage for 1996-97 is –35,737 acre-feet (Table 2-8). From the start of safe yield operation in the Fall of 1968 through Fall of 1997, the amount of groundwater in storage has increased by +226,249 acre-feet. However, during the 1968-97 period there has been an accumulation of 412,703 acre-feet of stored water credit through spreading and in-lieu activities of the parties. Such groundwater can be extracted at any time by the credited parties in excess of normal pumping rights. If this water were to be removed, the cumulative change in storage since 1969 would be –186,504 acre-feet.

An annual comparison is made between the hydrologic conditions of the water year and change in storage. Table 2-8 summarizes the annual precipitation and change in storage from 1968-69 through 1996-97. Plate 15 shows the cumulative change in storage from Fall 1928 to the present.

Sylmar Basin

The groundwater storage capacity of the Sylmar Basin is approximately 310,000 acre-feet. The estimated change in storage for 1996-97 is +338 acre-feet, and the cumulative change in storage from 1968-69 through 1996-97 is +1,142 acre-feet (The correct change in storage for 1968-69 through 1996-97 was +804 acre-feet instead of the +304 acre-feet shown in the 1997 report).

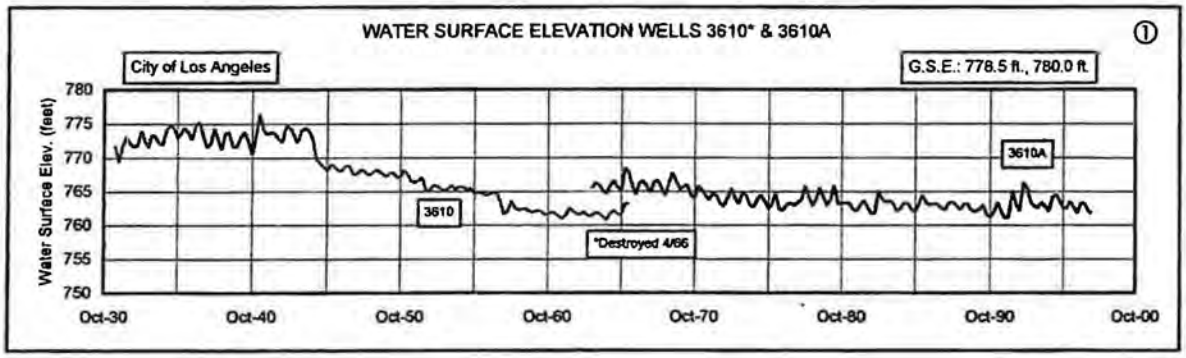
Verdugo Basin

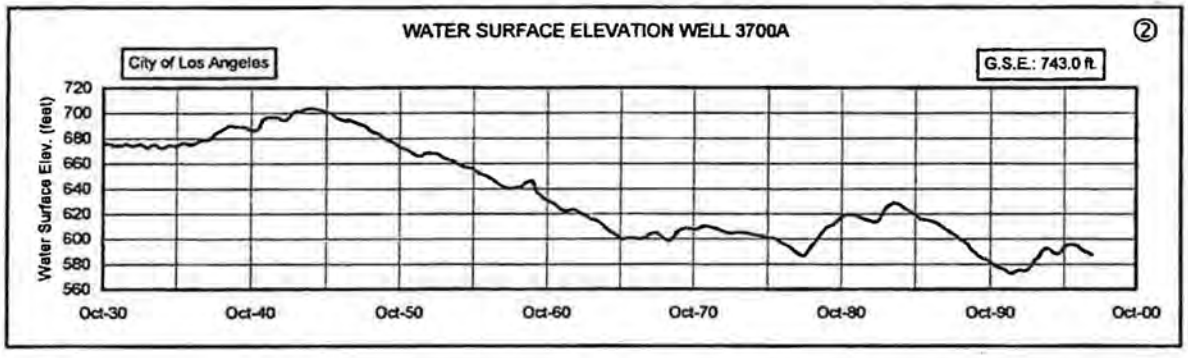
The groundwater storage capacity of the Verdugo Basin is approximately 160,000 acre-feet. The estimated change in storage for 1996-97 is –2,136 acre-feet, and the cumulative change in storage from 1968-69 through 1996-97 is –7,326 acre-feet.

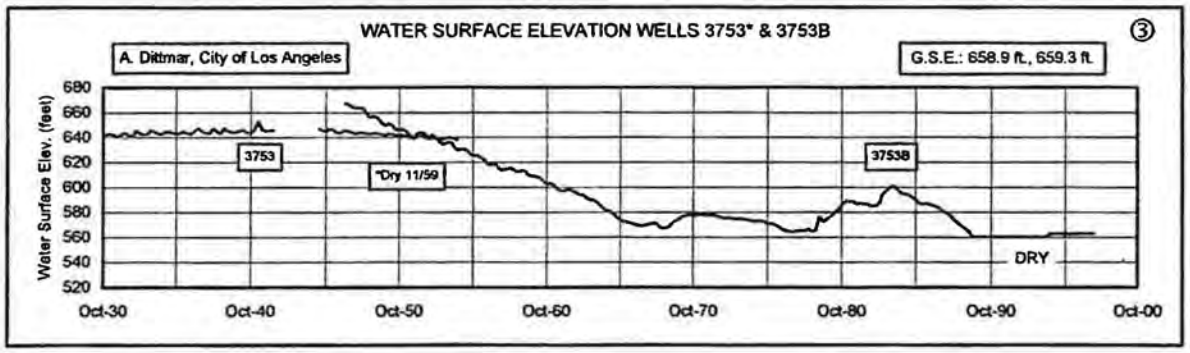
Eagle Rock Basin

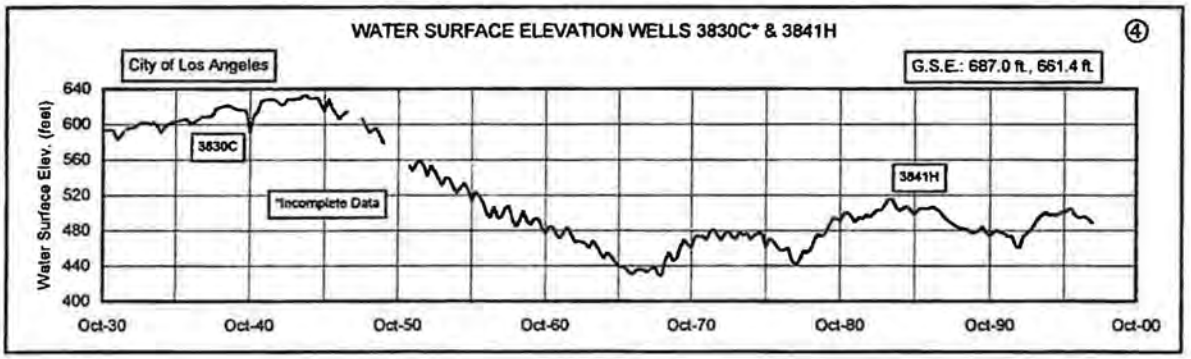
The estimated change in storage is +113 acre-feet.

SAN FERNANDO BASIN

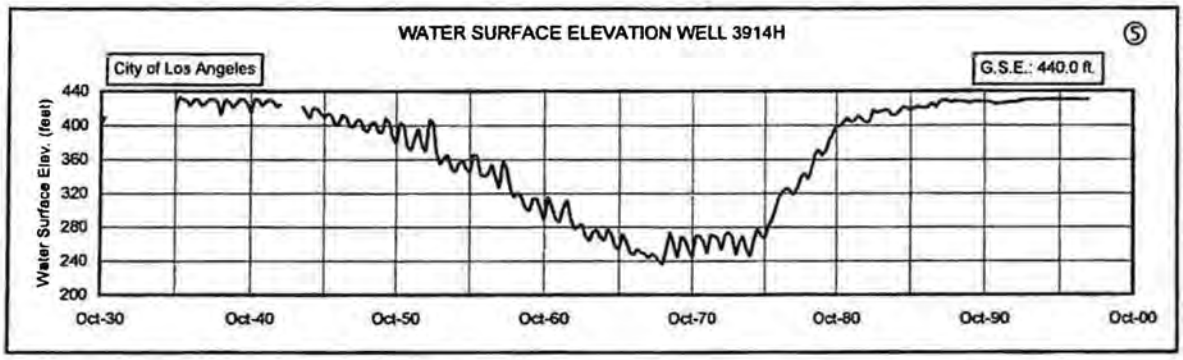


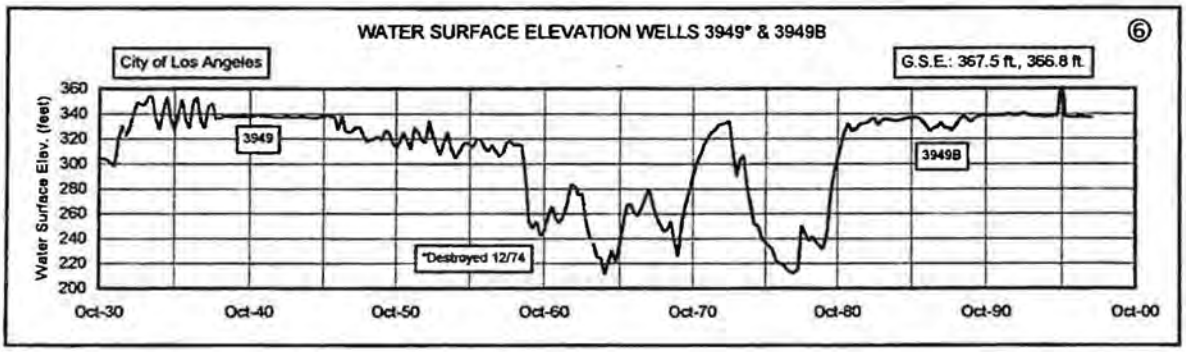


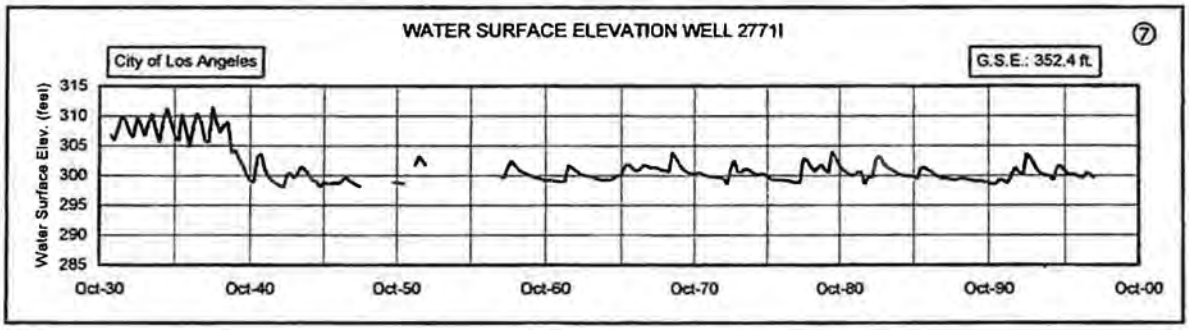




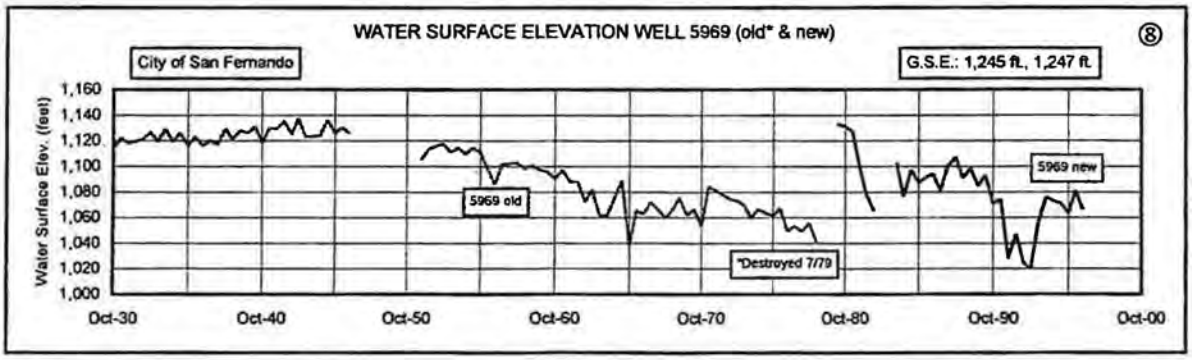
SAN FERNANDO BASIN



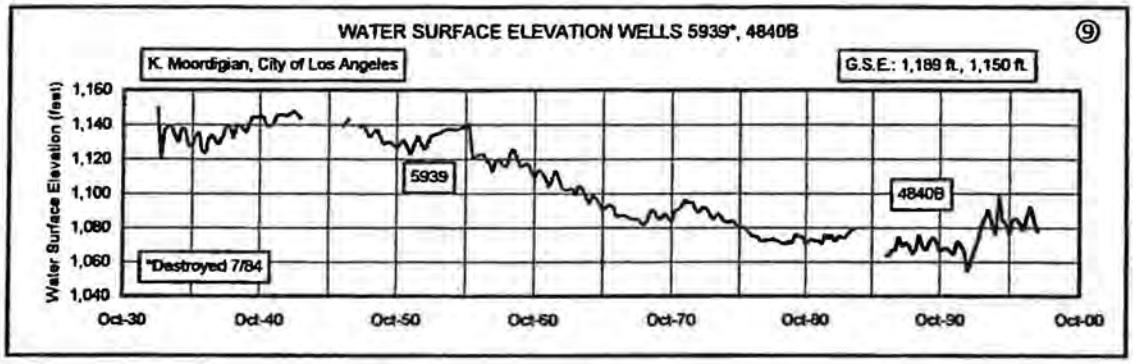




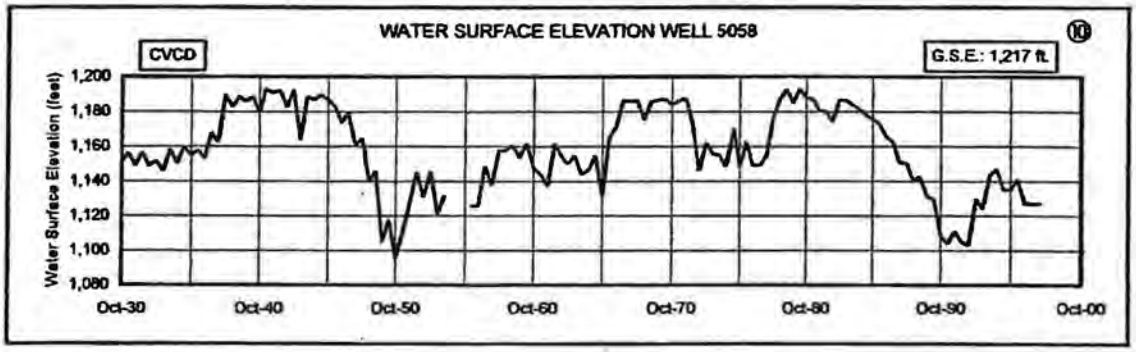
SYLMAR BASIN

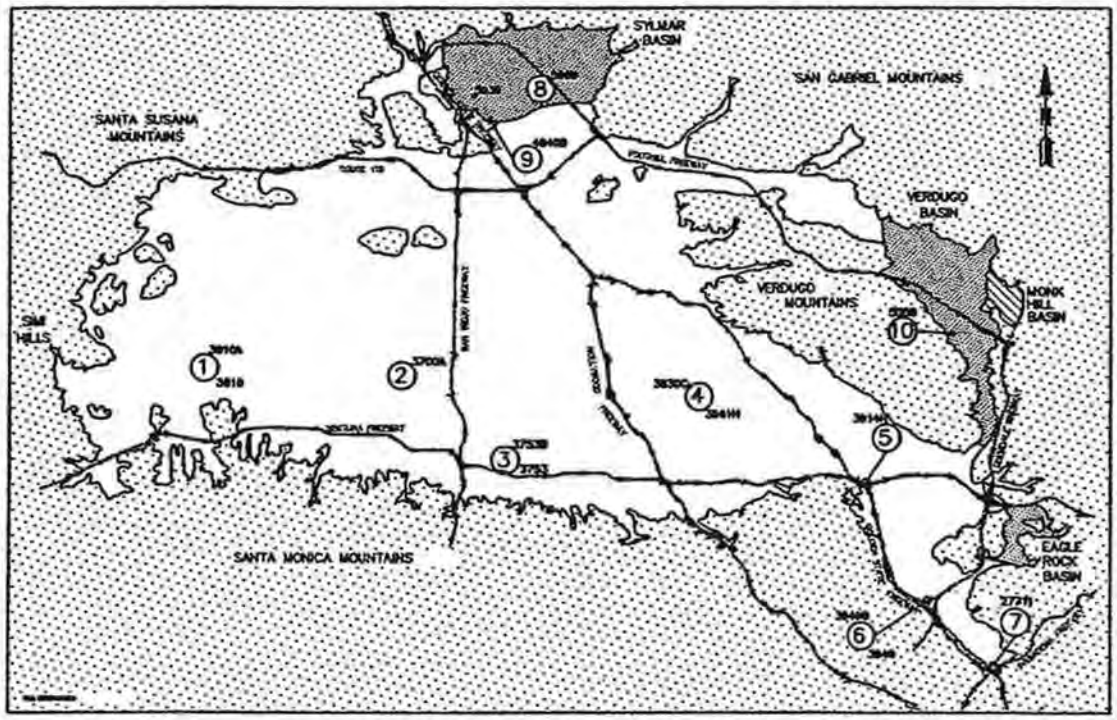


SYLMAR BASIN



VERDUGO BASIN





2.10 Water Supply and Disposal - Basin Summaries

Tables 2-9A, 2-9B, 2-9C, and 2-9D summarize water supply and disposal in the San Fernando, Sylmar, Verdugo, and Eagle Rock basins, respectively. The Watermaster made computations of subsurface outflows based on similar computations made by the State Water Rights Board in the Report of Referee.

2.11 Extraction Rights and Stored Water Credit - Basin Summaries

San Fernando Basin

Tables 2-10A and 2-11A show the calculation of SFB extraction rights for the 1997-98 Water Year and stored water credit (as of October 1, 1997) for the Cities of Burbank, Glendale, and Los Angeles. All rights are based on the City of Los Angeles vs. City of San Fernando, et al., Judgment, dated January 26, 1979.

Sylmar Basin

Tables 2-10B and 2-11B show the calculation of Sylmar Basin extraction rights for the 1997-98 Water Year and stored water credit (as of October 1, 1997) for the Cities of Los Angeles and San Fernando. All rights are based on the March 22, 1984 stipulation between the City of San Fernando and the City of Los Angeles (filed with the Superior Court) and the action by the Administrative Committee on July 16, 1996 to increase the safe yield from 6,210 AF/Yr. to 6,510 AF/Yr.

TABLE 2-8: CHANGE IN GROUNDWATER STORAGE SAN FERNANDO BASIN

Water Year	Valley Floor Precipitation (in)	Change in Storage (acre-feet)	Cumulative Change in Storage (acre-feet)	Pumping (acre-feet)
1996-97	15.17	(35,737)	226,249	105,899
1995-96	12.03	(49,223)	261,986	82,862
1994-95	33.36	79,132	311,209	58,121
1993-94	10.19	(22,238)	232,077	62,990
1992-93	36.62	106,317	254,315	36,419
1991-92	30.05	411	147,998	76,213
1990-91	14.38	(14,122)	147,587	71,065
1989-90	8.20	(29,941)	161,709	81,466
1988-89	9.12	(30,550)	191,650	127,973
1987-88	18.62	(5,000)	222,200	105,470
1986-87	5.99	(31,940)	227,200	91,632
1985-86	20.27	(7,980)	259,140	86,904
1984-85	11.00	(31,690)	267,120	101,591
1983-84	9.97	(63,180)	298,810	115,611
1982-83	39.64	121,090	361,990	68,394
1981-82	17.18	(530)	240,900	84,682
1980-81	11.04	(32,560)	241,430	92,791
1979-80	30.25	99,970	273,990	58,915
1978-79	21.76	78,080	174,020	59,843
1977-78	35.43	136,150	95,940	66,314
1976-77	14.19	(50,490)	(40,210)	125,445
1975-76	9.90	(30,090)	10,280	103,740
1974-75	14.74	(22,580)	40,370	95,830
1973-74	15.75	(21,820)	62,950	88,017
1972-73	20.65	17,020	84,770	82,004
1971-72	8.10	(17,090)	67,750	84,140
1970-71	15.57	15,340	84,840	79,010
1969-70	10.50	(9,740)	69,500	88,856
1968-69	29.00	79,240	79,240 [1]	84,186
29 Year Average	**18.23**	**7,802**		**85,048**

1. Assumes storage as of October 1, 1968, to be zero.

TABLE 2-9A: SUMMARY OF 1996-97 WATER SUPPLY AND DISPOSAL SAN FERNANDO BASIN

(acre-feet)

Water Source and Use	City of Burbank	City of Glendale	City of Los Angeles	City of San Fernando	All Others	Total
Extractions						
Municipal Use	10,900	25	89,935	—	84	100,944
Basin Account		0	0	—	1,095	1,095
Physical Solution	343 [1]	420 [1]	—	—	258	1,023
Cleanup/Dewaterers	—	—	—	—	553	553
Non-consumptive Use	—	—	—	—	2,286	2,286
Total	**11,243**	**445**	**89,935**	**0**	**4,276**	**105,901**
Imports						
LA Aqueduct Water	—	—	451,048	—	—	451,048
MWD Water (25+35)	10,525	28,061	32,250	287	6,624 [2]	77,747
Groundwater from Sylmar Basin	—	—	2,482	2,965	—	5,447
Total	**10,525**	**28,061**	**485,780**	**3,252**	**6,624**	**534,242**
Reclaimed Water Use	3,120	1,246	4,219	0	1,066	9,651
Exports						
LA Aqueduct Water out of ULARA	—	—	213,448	—	—	213,448
LA Aqueduct Water to Eagle Rock Basin	—	—	2,323	—	—	2,323
MWD Water out of ULARA	—	—	13,823	—	—	13,823
MWD Water to Verdugo Basin	—	2,214	56	—	—	2,270
MWD Water to Sylmar Basin	—	—	662	—	—	662
Groundwater	—	—	86,572	—	—	86,572
Total	**0**	**2,214**	**316,884**	**0**	**0**	**319,098**
Delivered Water						
Hill & Mountain Areas	—	—	45,122	—	—	45,122
Total - All Areas	24,887	27,539	263,050	3,252	11,966	330,696
Water Outflow						
Surface (Sta. F-57C-R)	—	—	—	—	—	155,290
Subsurface	—	—	—	—	—	414
Sewage	5,349	16,561	71,000	2,427	—	95,337
Reclaimed Water to the LA River	6,134	—	—	—	—	6,134
Total	**11,483**	**16,561**	**71,000**	**2,427**	**0**	**257,175**

1. Includes Valhalla (Burbank) and Forest Lawn (Glendale).
2. Las Virgenes Municipal Water District.

TABLE 2-9B: SUMMARY OF 1996-97 WATER SUPPLY AND DISPOSAL SYLMAR BASIN

(acre-feet)

Water Source and Use	City of Los Angeles	City of San Fernando	All Others	Total
Total Extractions	2,482	3,259	1 [1]	5,743
Imports				
LA Aqueduct Water	8,799	–	–	8,799
MWD Water	662	28	–	690
Total	**9,461**	**28**	**0**	**9,489**
Exports - Groundwater				
San Fernando Basin	2,482	2,965	0	5,447
Total Delivered Water	9,461	322	1	9,785
Water Outflow				
Subsurface	460 [2]	–	–	462
Sewage	830 [3]	200	–	1,033
Total	**1,290**	**200**	**0**	**1,495**

1. Pumping for landscape irrigation by Santiago Estates.
2. Estimated in the Report of Referee.
3. Estimated.

TABLE 2-9C: SUMMARY OF 1996-97 WATER SUPPLY AND DISPOSAL VERDUGO BASIN

(acre-feet)

Water Source and Use	Crescenta Valley Water District	City of Glendale	La Canada Irrigation District	City of Los Angeles	Total
Total Extractions	3,672 [1]	2,674	0	—	6,347
Imports					
LA Aqueduct Water	—	—	—	740	740
MWD Water	1,811	2,214	1,173	56	5,254
Total	1,811	2,214	1,173	796	5,994
Exports	0	0	0	0	0
Total Delivered Water	5,483	4,888 [2]	1,173	796	12,341
Water Outflow					
Subsurface to:					
Monk Hill Basin	—	—	—	—	300 [3]
San Fernando Basin	—	—	—	—	70 [3]
Sewage	1,750	1,138	0	190 [3]	3,078
Total	**1,750**	**1,138**	**0**	**190**	**3,448**

1. Administrative Committee and Watermaster approval (10/97), on a temporary basis, that CVWD may pump in excess of its prescriptive rights until the city of Glendale is able to pump its complete prescriptive right (Appendix G).
2. Verdugo Basin metered sales x 105%.
3. Maximum with high groundwater levels (Report of Referee).

TABLE 2-9D: SUMMARY OF 1996-97 WATER SUPPLY AND DISPOSAL EAGLE ROCK BASIN

(acre-feet)

Water Source and Use	City of Los Angeles	Deep Rock Water Company	McKesson Water Products Co.	Total
Total Extractions	0	0 [1]	198 [1]	200
Imports				
LA Aqueduct Water	2,323	–	–	2,323
MWD Water (17)	2,047	–	–	2,047
Total	**4,370**	**0**	**0**	**4,370**
Exports				
Groundwater	0	0	198	198
Total Delivered Water	4,370	0	0	4,372
Water Outflow				
Surface	–	–	–	0
Subsurface	0 [2]	–	–	0
Sewage	1,940 [3]	0	0	1,943
Total	**1,940**	**0**	**0**	**1,943**

1. Deep Rock Water Co. and McKesson Water Products Co. (formerly Sparkletts Drinking Water Co.) are allowed to pump under a stipulated agreement with The City of Los Angeles; extractions are limited to 500 AF/year, and they are allowed to export equivalent amounts.
2. Estimated in Supplement No. 2 to Report of Referee for dry years 1960-61. Currently considered insignificant.
3. Estimated.

TABLE 2-10A: CALCULATION OF 1996-97 EXTRACTION RIGHTS SAN FERNANDO BASIN

(acre-feet)

	City of Burbank	City of Glendale	City of Los Angeles
Total Delivered Water, 1996-97	24,887	27,539	263,050
Water Delivered to Hill and Mountain Areas, 1996-97	—	—	48,688
Water Delivered to Valley Fill, 1996-97	24,887	27,539	214,362
Percent Recharge Credit	20.0%	20.0%	20.8%
Return Water Extraction Right	4,977	5,508	44,587
Native Safe Yield Credit	—	—	43,660
Total Extraction Right for the 1997-98 Water Year[1]	**4,977**	**5,508**	**88,247**

1. Does not include stored water credit.

TABLE 2-10B: CALCULATION OF 1996-97 EXTRACTION RIGHTS SYLMAR BASIN

(acre-feet)

	City of Los Angeles	City of San Fernando	All Others
Extraction Right for the 1997-98 Water Year[1]	3,255	3,255	—[2]

1. Does not include stored water credit. The safe yield of the Sylmar Basin has been increased on a trial basis to 6,510 AF/YR effective 10/1/95. Effective October 1, 1984 safe yield less pumping by one overlying party is equally shared by Los Angeles and San Fernando.
2. Santiago Estates (Home Owners Group) is pumping for irrigation.

TABLE 2-11A: CALCULATION OF STORED WATER CREDIT SAN FERNANDO BASIN

(acre-feet)

	City of Burbank	City of Glendale	City of Los Angeles
1. Stored Water Credit (as of October 1, 1996)	61,415	54,797	302,670
1a. Physical Solution Water	1,500 [1]	—	(1,500)
1b. MWD Dewatering 1992-96	—	—	(1,156) [2]
2. Extraction Right for the 1996-97 Water Year	4,625	5,424	87,361
3. 1996-97 Extractions			
Party Extractions	10,900	25	89,935
Physical Solution Extractions	343	420	258
Clean-up/Dewaterers			553
Total	11,243	445	90,746
4. Total 1996-97 Spread Water	0	0	0
5. Stored Water Credit[3] (as of October 1, 1997)	**56,297**	**59,776**	**296,630**

1. Burbank exercised option under MWD Replenishment and purchased 1500 AF from Los Angeles.
2. MWD began reimbursing Los Angeles for dewatering at the Jensen Plant.
3. Item 5 = 1 + 1a + 1b + 2 - 3 + 4

TABLE 2-11B: CALCULATION OF STORED WATER CREDIT SYLMAR BASIN

(acre-feet)

	City of Los Angeles	City of San Fernando
1. Stored Water Credit (as of October 1, 1996)	3,986	2,312
2. Extraction Right for the 1996-97 Water Year	3,255	3,255
3. Total 1996-97 Extractions	2,482	3,259
Santiago Estates[2]	0.5	0.5
4. Stored Water Credit[3] (as of October 1, 1997)	**4,758**	**2,308**

1. The safe yield of the Sylmar Basin has been increased on a trial basis to 6,510 AF/YR as of 10/1/95.
2. Santiago Estates pumping is equally taken from the rights of San Fernando and Los Angeles.
3. Item 4 = 1 + 2 - 3

3. WATER QUALITY, TREATMENT, AND REMEDIAL INVESTIGATION ACTIVITIES

3. WATER QUALITY, TREATMENT, AND REMEDIAL INVESTIGATION ACTIVITIES

3.1 Water Quality

Imported Water

1. *LOS ANGELES AQUEDUCT* water is sodium bicarbonate in character and is the highest quality water available to ULARA. Its TDS concentration averaged about 210 milligrams per liter (mg/L) for 30 years before 1969. The highest on record was 320 mg/L on April 1, 1946. TDS concentration on August 21, 1996, was 160 mg/L.

2. *COLORADO RIVER* water is predominantly sodium-calcium sulfate in character, changing to sodium sulfate after treatment to reduce total hardness. Samples taken at the Burbank turnout between 1941 and 1975 indicated a high TDS concentration of 875 mg/L in August 1955 and a low of 625 mg/L in April 1959. The average TDS concentration over the 34-year period was approximately 740 mg/L. Tests conducted at Lake Matthews showed an average TDS concentration of 660 mg/L for the 1996-97 Fiscal Year.

3. *NORTHERN CALIFORNIA* water (State Water Project) is sodium bicarbonate-sulfate in character. It generally contains less TDS and is softer than local and Colorado River water. Since its arrival in Southern California in April 1972, the water has had a high TDS concentration of 410 mg/L and a low of 247 mg/l. Tests conducted at the Joseph Jensen Filtration Plant showed an average TDS concentration of 335 mg/L during the 1996-97 Fiscal Year.

4. *COLORADO RIVER/NORTHERN CALIFORNIA* water were first blended at Weymouth Plant in May 1975. Blending ratios vary, and tests are taken from the effluent. Tests conducted at the Weymouth Plant showed an average TDS concentration of 599 mg/L during the 1996-97 Fiscal Year.

Surface Water

Surface runoff contains salts dissolved from rocks in the tributary areas and is sodium-calcium, sulfate-bicarbonate in character. The most recent tests taken in September 1995 from flows in the Los Angeles River at the Arroyo Seco showed a TDS concentration of 667 and a total

hardness of 270 mg/L. These values also reflect the inclusion of rising groundwater in the Los Angeles River reach between Los Feliz Blvd. and Gage F-57C-R.

Groundwater

Groundwater in ULARA is moderately hard to very hard. The character of groundwater from the major water-bearing formations is of two general types, each reflecting the composition of the surface runoff in the area. In the western part of ULARA, it is calcium sulfate-bicarbonate in character, while in the eastern part, including Sylmar and Verdugo Basins, it is calcium bicarbonate in character.

Groundwater is generally within the recommended limits of the California Title 22 Drinking Water Standards, except for: 1) areas of the eastern SFB where high concentrations of TCE, PCE, and nitrates are present; 2) wells in the western end of the SFB having excess concentrations of sulfate; and 3) areas throughout the Verdugo Basin that have abnormally high concentrations of nitrate. In each area the groundwater delivered is either being treated or blended in order to meet State Drinking Water Standards.

A history of the TDS content and mineral analyses of imported, surface, and groundwater is contained in Appendix D.

3.2 Groundwater Quality Management Plan

During the 1996-97 Water Year, the Interagency Coordinating Committee continued to implement the recommendations of the "Groundwater Quality Management Plan - San Fernando Valley Basins" issued in July 1983. The objective of this effort is to protect and upgrade the quality of stored water held in ULARA. Special emphasis is placed on monitoring and removing the organic contaminants TCE and PCE found in the groundwater. Table 3-1 summarizes the number of wells in the ULARA well fields exceeding the State Maximum Contaminant Level of 5 µg/l for TCE and PCE.

TABLE 3-1: 1996-97 NUMBER OF WELLS IN THE ULARA WELL FIELDS EXCEEDING STATE MCL FOR TCE AND PCE

	Number of Wells Exceeding Contaminant Level[1]													
	City of Los Angeles[3]									Sub-	Others[3]			Grand
Total Number of	NH	RT	P	HW	E	W	TJ	V	AE	Total	B	G	C	Total
Wells in Well Field[2]	30	15	3	6	4	6	12	6	7	89	9	8	11	117
TCE Levels µg/L														
5-20	5	3	0	0	2	4	4	3	0	21	0	3	0	24
20-100	8	0	3	5	1	3	0	0	5	25	5	4	0	34
>100	4	0	0	1	0	0	0	0	2	7	4	2	0	13
Total	17	3	3	6	3	7	4	3	7	53	9	9	0	71
PCE Levels µg/L														
5-20	8	0	0	3	0	1	0	1	5	18	1	2	1	22
20-100	2	0	3	1	0	0	0	0	1	7	4	0	0	11
>100	0	0	0	0	0	0	0	0	0	0	4	0	0	4
Total	10	0	3	4	0	1	0	1	6	25	9	2	1	37

1. Wells are categorized based upon maximum TCE and PCE values attained during the 1996-97 Water Year, where data was not available for 1996-97; data from the most recent water year was used.
2. Includes active, inactive, and stand-by wells.
3. Well Fields: NH - North Hollywood; P - Pollock; HW - Headworks; E - Erwin; W - Whitnall; TJ - Tujunga; V - Verdugo; AE - LADWP Aeration Tower Wells; B - City of Burbank; G - City of Glendale; C - Crescenta Valley Water District

3.3 Underground Tanks, Sumps, and Pipelines

The City of Los Angeles Fire Department (LAFD) continues to implement the State-mandated Underground Storage Tank Program (UST) and is actively conducting a program to bring the large number of underground tanks in the San Fernando Valley into compliance with current law. During the 1996-97 Water Year, a total of 289 sites were remediated under the direction of the LAFD.

The main focus of the LAFD UST in ULARA has been the monitoring and removal of gasoline, diesel, and their related constituents from the soils, in order to prevent contamination of the underlying groundwater. If a site investigation indicates contamination, the site is referred to the RWQCB for further action. Since October 1, 1988, 2,963 sites have been assigned to the Underground Tank Plan Check Unit, and of these, 1,509 have been remediated. In addition,

941 sites have been referred to the RWQCB. Currently, the Environmental Unit of the LAFD is monitoring the remediation of 577 sites.

3.4 Private Sewage Disposal Systems (PSDS)

In order to eliminate existing commercial and industrial PSDS and their discharges of wastewater to the groundwater basin, a sanitary sewer construction program has been in progress for many years. This program is continuing to systematically install sanitary sewers in eighteen designated areas throughout the San Fernando Valley. At the end of the 1996-1997 water year, a total of twelve areas have had construction completed, and five areas are in various stages of right-of-way acquisition and processing. A contract for project construction for the remaining area may be awarded during the 1997-98 Water Year. Plate 8 shows the locations of the Districts.

The sewer construction program ordered by the City Council was affected through Assessment Act provisions. Proposition 218, approved by the electorate on November 5, 1996, will require a weighted majority mail-in ballot of property owners for any new or increased assessments. The passage of Proposition 218 and continued downsizing of the workforce of the City of Los Angeles has impeded the sewer construction program for the remaining six areas.

The Industrial Waste Management Division of the Bureau of Sanitation continued to pursue the enforcement aspect to the PSDS elimination program. There has been good compliance with the mandatory sewer hook-up ordinance, and more than 1180 properties have already abandoned PSDS and connected to the public sewer. Continuation of this effort depends upon completion of the sanitary sewer construction program.

During the 1996-97 Water Year, a group of 49 owners of PSDS received the Final Reminder Notices to discontinue use of their PSDS and connect to newly constructed sanitary sewers. Also 47 cases were investigated and 30 confirmation letters confirming connection to the sewer were issued.

3.5 Landfills

The Solid Waste Assessment Test (SWAT) reports for major SWAT Rank 1 to 4 landfills in the Los Angeles area have been completed and submitted to the RWQCB for approval. The reports reviewed by the RWQCB are listed in Table 3-2.

TABLE 3-2: LANDFILLS WITH SWAT INVESTIGATIONS

(reported to Interagency Coordinating Committee)

Name	Rank	Status	Current Owner	Location	SWAP Report Completed	Final SWAT Submitted	Phase II SWAT Req.	Approved by RWQCB	Site Leak (1)	Type of Emission (2)	Further Monitoring
Bradley West	1	Open	WMDSC	Sun Valley, SE of Sheldon St.	6/87	11/90		4/92	G	NHA (I/O)	3
Sheldon-Arleta	1	Closed	City of Los Angeles Bureau of Sanitation	Sun Valley District near Hollywood & Golden State Fwys	5/87	5/87		2/90			4
Scholl Canyon	1	Open	City of Glendale	San Rafael Hills, 1 mile West of Rose Bowl	7/87	4/88		8/90	G	NHA (I/O)	3
Scholl Canyon	2	Closed	City of Glendale	San Rafael Hills, 1 mile West of Rose Bowl	7/87	1/91		12/93			5
Bradley East	2	Closed	WMDSC	SE of Sheldon St	6/87	11/90		4/92	G	NHA (I/O)	4, 8
Bradley West Extension	3	Open	WMDSC	Near Canyon Blvd & Sheldon St	7/88	7/89		4/92	G	Inert Site	4, 8
Sunshine Cyn. LA City	2	Closed	Browning - Ferris Industries	SE Santa Susana Mtns W of Golden State Fwy	7/88	7/89		4/94			6
Sunshine Cyn. LA County	2	Open	Browning - Ferris Industries	SE Santa Susana Mtns W of Golden State Fwy	7/88	7/89		4/94			6
Gregg Pit/Bentz	2	Closed	CalMat Properties	Between Pendleton St & Tujunga Ave	7/89	7/89		2/90	G	NHA	4
Branford	2	Closed	City of Los Angeles Bureau of Sanitation	Sun Valley District, NW of Tujunga Wash	7/88	10/90	X				5
CalMat (Sun Valley #3)	2	Open	CalMat Properties	Sun Valley District, NE of Glenoaks Blvd	7/88	11/90		6/92	N		7
Lopez Canyon	2	Closed	City of Los Angeles Bureau of Sanitation	N of Hansen Dam near Lopez and Kagel Cyn	6/88	6/88	X				6
Toyon Canyon	2	Closed	City of Los Angeles Bureau of Sanitation	Griffith Park	6/88	3/89		4/91	L	NHA (I/O)	4, 8
Tuxford Pit	2	Closed	Aadlin Bros. (LA By-Products Co.)	Sun Valley District, SW of Golden State Fwy & Tujunga Ave	6/88	12/90		6/92			4, 8
Penrose	2	Closed	Los Angeles (LA By-Products Co.)	N of Strathern St, Tujunga Ave	6/88	7/89		9/89	G	NHB (I/O)	4
Newberry	3	Closed	Los Angeles (LA By-Products Co.)	N of Strathern St, Tujunga Ave	6/88	7/89		9/89	G	NHB (I/O)	4
Hewitt Pit	2	Closed	CalMat Properties	North Hollywood District Hollywood Fwy, Laurel	6/88	7/89		5/91	G	NHB (I)	
Pendleton St.	4	Open	DWP	Sun Valley, Pendelton St & Glenoaks Blvd	7/90	5/91		6/92	N		
Stough Park Strathern	2	Open	City of Burbank	Bel Air Drive & Cambridge Drive	6/88	12/88		4/90	G	NHA Inert Site	3

1. G – Gas, L – Liquid.
2. NHA - Non-Hazardous but above state drinking water regulatory levels
   NHB - Non-Hazardous but below state drinking water regulatory levels
   I – Inorganic, O – Organic
3. Under Chapter 15 Corrective Action Program (CAP), after completion of EMP.
4. Closed landfills with groundwater monitoring required under Chapter 15. Monitoring results are submitted to the Regional Board periodically.
5. Subject to SWAT requirements. Further monitoring may be required under Chapter 15.
6. All open landfills are required to have groundwater monitoring under Chapter 15. Monitoring results are submitted to the Regional Board quarterly.
7. Semi-annual groundwater monitoring.
8. Groundwater contamination Evaluation Monitoring Program (EMP) required under chapter 15.

As stipulated by Article 5 of Chapter 15, a follow-on sampling program under an Evaluation Monitoring Plan was required for some landfills due to the presence of VOCs in the underlying groundwater.

The SWAT report of the Pendleton landfill, owned by the Water System of the DWP was approved by the RWQCB. The landfill Closure Plan has been filed with RWQCB. Closure activities are in progress.

3.6 San Fernando Valley Remedial Investigation Activities

A remedial investigation (RI) of groundwater contamination in the San Fernando Valley was initiated in July 1987 by the EPA to characterize the SFB and the Verdugo Basin and their contamination with TCE and PCE. The DWP was selected by the EPA to serve as the lead agency in conducting the RI and entered into a cooperative agreement that has provided over $21 million in federal funding to DWP since July 1987. In August 1987, the DWP selected James M. Montgomery, Consulting Engineers, Incorporated to serve as its consultant to perform various RI tasks.

The report, "Remedial Investigation of Groundwater Contamination in the San Fernando Valley," was completed in December 1992 and is a comprehensive, five-volume report that presents the findings and characterizations of the SFB and the Verdugo Basin with regard to their geology, hydrogeology, and nature and extent of contamination. The RI report also provides a description and the documentation of the SFB Groundwater Flow Model, summarizes the RI field investigation activities, and evaluates potential risks to human health and the environment.

The SFB Groundwater Flow Model was developed as a part of the San Fernando Valley Remedial Investigation and is a comprehensive, three-dimensional, regional-scale model. A three-dimensional mass transport model has also been developed for the SFB. The model has been utilized for the EVWRP and other groundwater remediation projects to analyze the storage and physical characteristics of groundwater in the SFB.

EPA's consultant, CH2M HILL, continues to periodically sample the 87 groundwater monitoring wells that were installed as part of the RI. CH2M HILL also obtains groundwater quality and groundwater elevation data from the DWP, other municipalities, and various agencies and facilities in the San Fernando Valley to update the SFB database. CH2M HILL utilizes the data to produce contaminant plume maps.

The RI Report and semi-annual sampling reports are available for public use at the Superfund Primary Information Repositories, which are located in the following agencies' libraries: City of

Glendale, City of Burbank, DWP, California State University-Northridge, and the University of California - Los Angeles.

The DWP also maintains a current SFB database for use with the SFB flow model and generation of groundwater contour maps and contaminant plume maps. CH2M HILL forwards current groundwater quality data for incorporation into the DWP database.

3.7 Water Treatment

EPA Operable Units

The EPA is proceeding with enforcement actions against potentially responsible parties (PRPs) for the North Hollywood, Burbank, Glendale North and Glendale South OUs, which are part of the EPA's overall, long-term groundwater remediation activities in the SFB. The OUs are described below.

1. *NORTH HOLLYWOOD OU* - The North Hollywood OU was funded by the EPA and the California Department of Health Services (DHS). The facility operated satisfactorily during the 1996-1997 Water Year. A total of 476.5 million gallons (1,461 acre-feet) of groundwater was treated.

   The quality of air discharged to the atmosphere from the Aeration Facility was monitored on a regular basis to verify its conformance to permit requirements of the South Coast Air Quality Management District. The GAC in the off-gas adsorber was replaced in January 1997.

2. *BURBANK OU* - The Burbank OU, operated by Lockheed, removes VOCs from high nitrate groundwater and then blends it with water from the MWD for delivery to the City of Burbank. Lockheed started pumping and delivering groundwater to Burbank on January 3, 1996, pursuant to Phase I of the Consent Decree. A monthly peak of 1,027 acre-feet was pumped and delivered to Burbank in July 1997. The facility was shut down for several months beginning in mid-December 1997 to change the Liquid-Phase GAC contactors to a downward flow system. The filter backwash will have a drain filtering system to remove the carbon that is going into the river. Phase II of the project is slated for completion in 1998 and will increase the pumping capacity to 9,000 gpm. Throughout this year there have been on-going

negotiations to bring closure to the Second Consent Decree which will specify the obligations for 18 years of operation and maintenance on the treatment plant. The Department of Justice reviewed the bridge language on operation of the facility between the First Consent Decree and the Second Consent Decree. This language affects an overlap period of six months between January 1, 2000 and June 30, 2000.

3. *GLENDALE NORTH AND SOUTH OUs* – DreamWorks Inc. finished construction of their animation studio on the site of the former Crystal Springs Yard in December 1997 as scheduled. The City of Glendale's North OU wells for the treatment facility are being drilled on the DreamWorks property with cooperation from Disney for use of a right-of-way. Glendale, DHS, the Glendale Respondents Group, and the Watermaster have been in vigorous discussions with the EPA in an effort to determine who should operate the treatment facility and how the treated water should be used.

Other Treatment Facilities

1. *GLENDALE-VERDUGO PARK WATER TREATMENT PLANT (VPWTP)* - The VPWTP has failed to produce at the anticipated pumping rate of 700 gpm. The water supply is limited at the lower end of the Verdugo Basin. For brief periods of time after the plant has been shutdown then brought back on line, the water flows at 700 - 800 gpm followed by a decreasing flow rate. Even during the rainy season, the water flow does not remain high for an extended period of time. Glendale is investigating alternative areas to pump, possibly in the eastern end where the aquifer is deeper.

2. *GLENWOOD NITRATE WATER TREATMENT PLANT* - The CVWD's Glenwood Nitrate Water Treatment Plant, which uses an ion-exchange process for nitrate removal, continued to operate satisfactorily during the 1996-97 Water Year. A total of 509 million gallons (1,562 acre-feet) of water was treated.

3. *POLLOCK WELLS TREATMENT PLANT PROJECT* – This 3,000 gpm groundwater treatment facility is scheduled for completion in August 1998. The Pollock Project's main focus is to reactivate the Pollock Well Field and to reduce rising groundwater flowing past gaging station F-57C-R. The groundwater will be processed through Liquid-Phase GAC vessels intended for VOC

removal, followed by chlorinating and blending of groundwater to reduce nitrate levels. The processed water will then be delivered to DWP's distribution system. The tentative pumping pattern will be for a period of six months on followed by six months off.

4. *HEADWORKS WELL FIELD REMEDIATION* - The reactivation of the Headworks Well Field will restore four wells in the Headworks Well Field and treat at a rate of approximately 12,000 gpm. An alternative technology study was conducted evaluating Aeration, Liquid-Phase GAC, and Advanced Oxidation Processing. The Advanced Oxidation Process appears promising and is continuing to be evaluated with possible full scale (3,000 gpm) testing in 1998. The initial study is being developed under the concept of using aeration with Off-Gas GAC. The environmental phase of the work will be completed in 1998.

5. *BURBANK GAC TREATMENT PLANT* - The GAC system treated 1,675 acre-feet of water from the combined pumping of Burbank Wells No. 7 and No. 15. The facility was taken out of service beginning in October 1997. The treatment plant has been incorporated into Phase II of the Consent Decree (Burbank OU) between EPA, Lockheed, and Burbank. Production at the GAC may be considered as part of the designated average annual pumping goal of 9,000 gpm for the Burbank OU.

3.8 Groundwater Quality Investigations

During the 1996-97 Water Year, several groundwater contamination investigations were performed at various sites. As part of these investigations, groundwater monitoring wells have been drilled, and groundwater has been extracted for the purpose of testing or cleanup. Some of the major sites and their activities through April 1998 are summarized below:

Pacoima Area Groundwater Investigation

Progress has been made in the Pacoima Area investigation by a coordinated effort with the lead agency Cal-EPA DTSC, the RWQCB, the USEPA, DWP, and the Watermaster's Office. A potential groundwater contaminant plume was identified in the Pacoima district near the intersection of the Simi Valley Freeway and San Fernando Road (Plate 7). The contaminant plume is comprised of VOCs with levels upward of 12,000 µg/l of TCE, 3,900 µg/l of PCE, and

7,600 µg/l of 1,1,1-TCA. This site is approximately 2.5 miles upgradient of DWP's Tujunga Well Field, which can supply up to 120 cfs of groundwater. DWP installed two monitoring wells downgradient of the contaminant plumes. An interim removal action plan consisting of a soil vapor extraction and an air sparging system is being considered.

Philips Components (4561 Colorado Boulevard, Los Angeles)

Groundwater remediation, which involves extraction, air-stripping, and recharge through a trench was started in July 1988. The main contaminant is methylene chloride (MEC) which has been found in extraction well EW-1 and in a nearby monitoring well MW-19. Concentrations of MEC continue to exhibit a downward trend. During the 1996-97 Water Year, 68 acre-feet were pumped, treated, and recharged into the SFB. The TCE and PCE present in most of the monitoring wells is believed to originate off-site, to the north. The site was sold to Nichola International Co., an olive production company. Philips will continue to monitor and cleanup the site. In December 1997, the RWQCB issued a "No Further Action" letter addressing the on-site cleanup work; however, Philips remains a PRP to the Glendale North and South OUs.

Rockwell-Rocketdyne (6633 Canoga Avenue, Canoga Park)

Contaminants at this site include chloroform, TCE, PCE, 1,1-DCE, TCA and Freon 113. There are also free-floating hydrocarbons derived from several upgradient service stations. There are 85 monitoring wells on site: 65 in the shallow zone, 14 in the upper zone, and 6 in the lower zone. Additionally, there are another 31 monitoring wells near four upgradient service stations. Nine extraction wells feed a treatment facility in the southeast portion of the property. During the 1996-97 Water Year, 280 acre-feet were pumped and treated. Alternative uses for the treated water are being evaluated.

3M (Formerly Riker Lab, 19901 Nordhoff, Northridge)

The main pollutant at this site is chloroform. There has been an interim groundwater extraction and treatment system since 1988. REW-1 and REW-2 pump from the shallow zone. RMW-1 pumps from the lower water-bearing zone. There are numerous monitoring wells on the property, and off-site to the south. Treatment is by three GAC columns in series, then to an on-site holding tank. The pumping rate of the three wells is demand driven for the cooling tower. During the 1996-97 Water Year, 15 acre-feet were treated. The treated groundwater is currently discharged to the Los Angeles River. In the near future, 4,000 to 10,000 gpd will be beneficially re-used for on-site landscape irrigation. 3M, with the support of the Watermaster, is in the process of preparing and submitting a request for relief from the NPDES permit limit for TDS. High background levels of TDS are present in the site groundwater. A soil remediation

system was started in October 1996, underwent testing, and was subsequently shut down in December 1996 to make improvements to the system's operational reliability and performance. In January 1997, the system was re-started. Based on the analytical data from air samples collected during start-up and sustained operations, approximately 6,400 pounds of VOCs have been removed from the three affected areas from start-up through the end of August 1997. Clean-up of the affected areas is projected for completion in a two to three year time frame.

Hughes Missile Systems Company (8433 Fallbrook Avenue, Canoga Park)

The most prominent contaminant has been 1,1-DCE with lesser amounts of TCE, PCE, TCA, and 1,1-DCA. Petroleum compounds (BTEX) are found in the northwest area (Buildings 269 and 270). TDS is in excess of the Basin Plan objectives, and may not be discharged to the Los Angeles River, although the origin of the high TDS is related to the naturally occurring groundwater. As a result of the high TDS, the treatment plant effluent is stored in holding tanks, and used for on-site irrigation. Since September 1995, approximately 6,765 pounds of hydrocarbons and 500 pounds of chlorinated hydrocarbons have been removed from the soil. Due to significant decreases in contaminant concentrations, the RWQCB has approved groundwater sampling and analyses on a semiannual basis. Residual concentrations of VOCs in groundwater remain primarily along the northern boundary of the property. Portions of the facility have recently been sold and are being redeveloped for new tenants. Hughes is evaluating options to obtain approval for partial shutdown of portions of the treatment system and to focus remediation on smaller areas that remain a concern.

Greeff Fabrics (Formerly Wickes, 4000 Chevy Chase Drive, Los Angeles)

On July 17, 1997 Greeff submitted a request for closure of the Groundwater Extraction and Treatment System (GWETS) after a site visit by the RWQCB. Based on that visit and subsequent study of the annual and periodic monitoring reports submitted by Greeff to the RWQCB, Greeff was advised that the RWQCB would entertain a request to terminate the operation of the GWETS at the site and issue a "No Further Action" letter. The main contaminant from an on-site source was chlorotoluene. Other plumes from off-site sources were mostly TCE and PCE. Water was pumped from three extraction wells, treated by chemical oxidation, and returned to the groundwater via a percolation trench. Approximately 16 acre-feet of groundwater were extracted, treated, and discharged to the percolation trench during the 1996-97 Water Year.

Taylor Yard (Narrows Area)

The remediation of the Taylor Yard of the Southern Pacific Transportation Company is under the jurisdiction of the Cal-EPA DTSC. To expedite the remediation, the Taylor Yard has been divided into two parts - active yard and sale parcel. Part of the Taylor Yard was sold to Lincoln Properties for movie industry related facilities. The active yard has two areas of contamination located in the northern and northeastern sections of the Taylor Yard. Light nonaqueous phase liquids, approximately 6 inches deep, are perched at a depth of 30 feet over an area of five acres. Vapor extraction will be used in remediation. Phase III of the Remedial Investigation has been completed. Installation of 10 – 14 monitoring wells began in November 1997.

Chromium

Chromium is a naturally occurring element of the earth. It is usually found in two main forms: trivalent chromium III (Cr^{3+}) and hexavalent chromium VI (Cr^{6+}). Trivalent chromium occurs naturally in the environment. The occurrence of hexavalent chromium is usually the result of industrial processes. Chromium is used in chrome plating, leather tanning, wood preservatives, and in the manufacturing of stainless and hard-alloy steels, dyes and pigments.

Trivalent chromium is relatively harmless and is an essential nutrient for the human body. Hexavalent chromium is considered to be carcinogenic through inhalation, but it is uncertain whether it is a carcinogen through ingestion of drinking water. There is no known taste or odor associated with chromium. DHS set the State MCL for total chromium at 50 µg/L. Under a contract with the EPA, CH2M Hill conducted a basin-wide investigation of total and hexavalent chromium through evaluation of some existing databases and a sampling of the RI monitoring wells. The results were published in February 1996 and indicated some areas with pockets of relatively high chromium concentrations.

Chromium is sampled in DWP groundwater wells once every three years. From 1995-97, 66 well samples were taken and analyzed for total chromium. At the State detection limit of 10 µg/l, only four Aeration Tower wells had detectable chromium. At the DWP detection limit of 5 µg/l, ten wells had detectable chromium levels. In the DWP water system, most customers who receive groundwater receive a blend of groundwater and surface water. The blend is distributed to customers through the River Supply Conduit (RSC). The RSC is sampled quarterly for inorganics including total chromium. The Burbank OU wells are sampled monthly for chromium and chromium levels have ranged between 12-17 µg/l. Presently, the City of Glendale does not pump groundwater from the SFB. The Office of Health Environmental Administration is presently reviewing the health risk posed by the current MCL for chromium. A

draft issuance is scheduled for publication in June 1998, with a final rendering by January 1999. The Watermaster, EPA, RWQCB, DHS, DTSC, Burbank, Glendale, and Los Angeles have set up a group to review existing data and track any changes in water quality standards. The group will continue to evaluate the impact of chromium to the basin's water quality.

Perchlorate

Perchlorate (as ammonium perchlorate) is an inorganic chemical found in solid rocket propellants and manufactured by the defense industry for space programs. In dilute concentrations, Perchlorate (ClO_4) is chemically stable in water. Perchlorate has a possible adverse health effect on iodine balance in the thyroid. Perchlorate is not yet 'regulated' in drinking water because there is neither a MCL nor a treatment technique; however, the DHS has established a provisional action level for perchlorate in drinking water of 18 μg/l. The current detection limit for perchlorate is 4 μg/l.

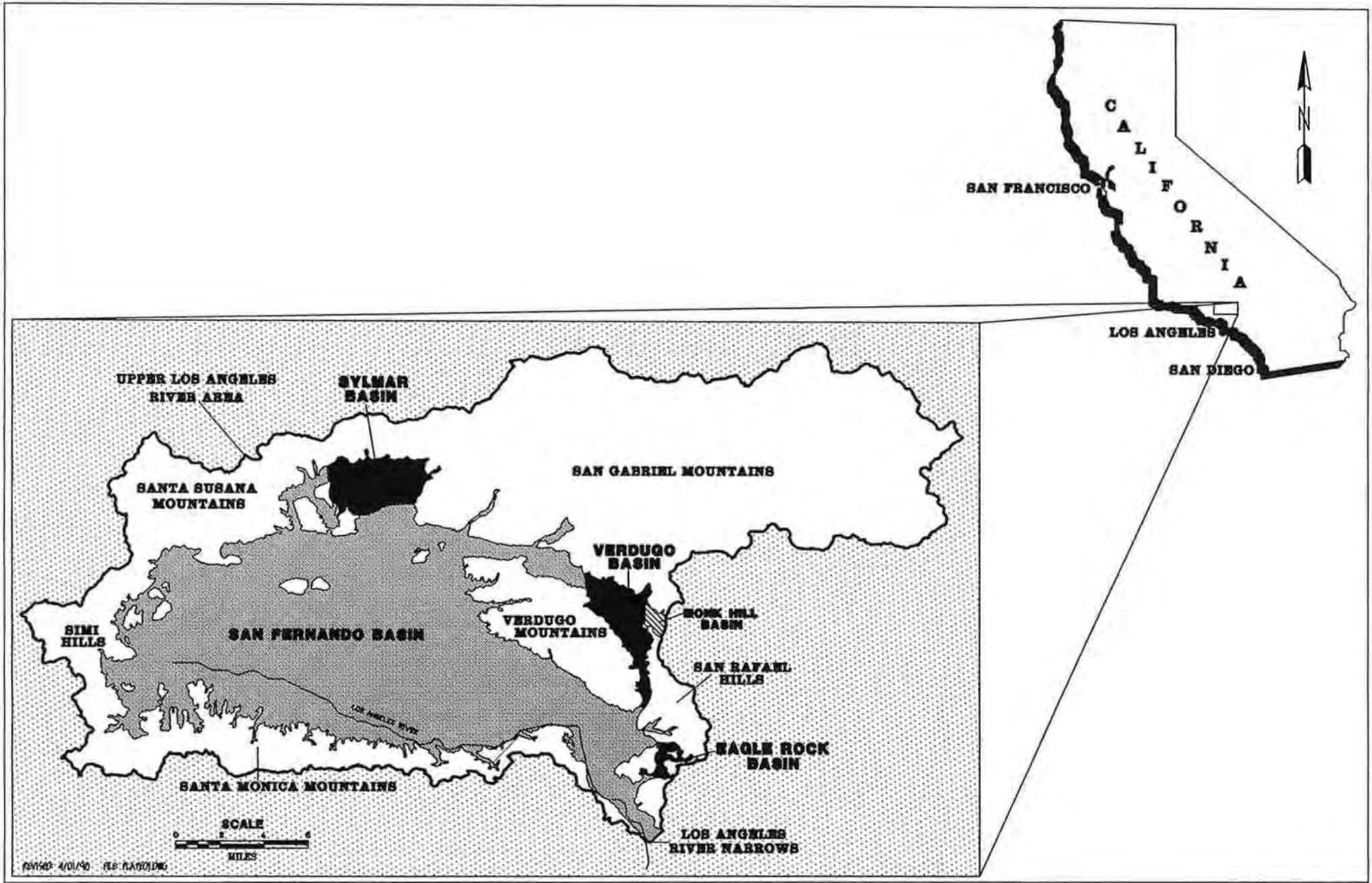
The DWP sampled several wells thought to have the greatest vulnerability to contamination by perchlorate. On July 9, 1997 the DHS analyzed seven samples for perchlorate taken at the following six wells – Tujunga No. 6, Rinaldi-Toluca No. 15, North Hollywood No. 18, Aeration Tower No. 8, Whitnall No. 6A, and Verdugo No. 11, as well as the RSC. All samples were non-detect. The DHS also analyzed samples for perchlorate taken from the Lockheed/Burbank OU wells and from the Burbank municipal wells. All samples were non-detect.

Perchlorate has become a hot issue in Southern California because wells tested in May and June 1997 showed perchlorate at concentrations of 4 to 159 μg/l in wells located in Azusa, Baldwin Park, Irwindale, La Canada-Flintridge, La Puente, Newhall, Pasadena, Santa Clarita and West Covina. However, the data presently suggests that perchlorate contamination is not a contaminant of concern in the SFB.

Purge Study

The Watermaster staff, in cooperation with DWP, conducted a purge study on seven monitoring wells in the SFB. The intent of the study was to evaluate the existing standard of purging three well pore volumes prior to sampling a monitoring well. This standard is important because the deeper monitoring wells in the SFB require as much as four hours of pumping prior to sampling which can lead to significant water containment and, potentially, treatment costs. The study concluded that in all seven test cases, the purge volume requirement could be reduced from three to one well pore volume, and could be reduced further with the pump installed adjacent to the perforated zone. This study is included in Appendix J.

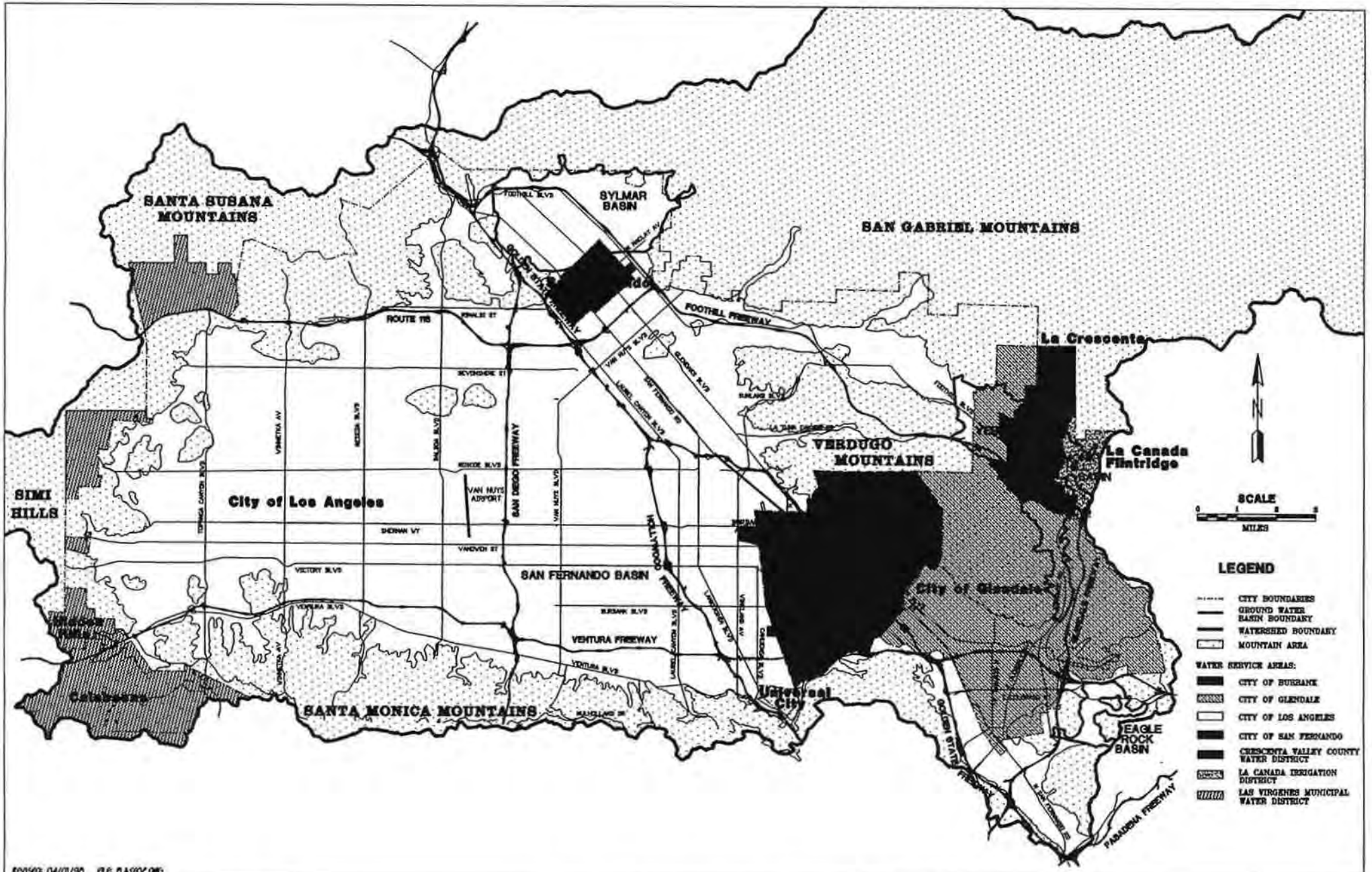
PLATES



1996-97 Water Year ULARA Watermaster Report

Upper Los Angeles River Area Vicinity and Location Map

PLATE 1



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1996-97 Water Year
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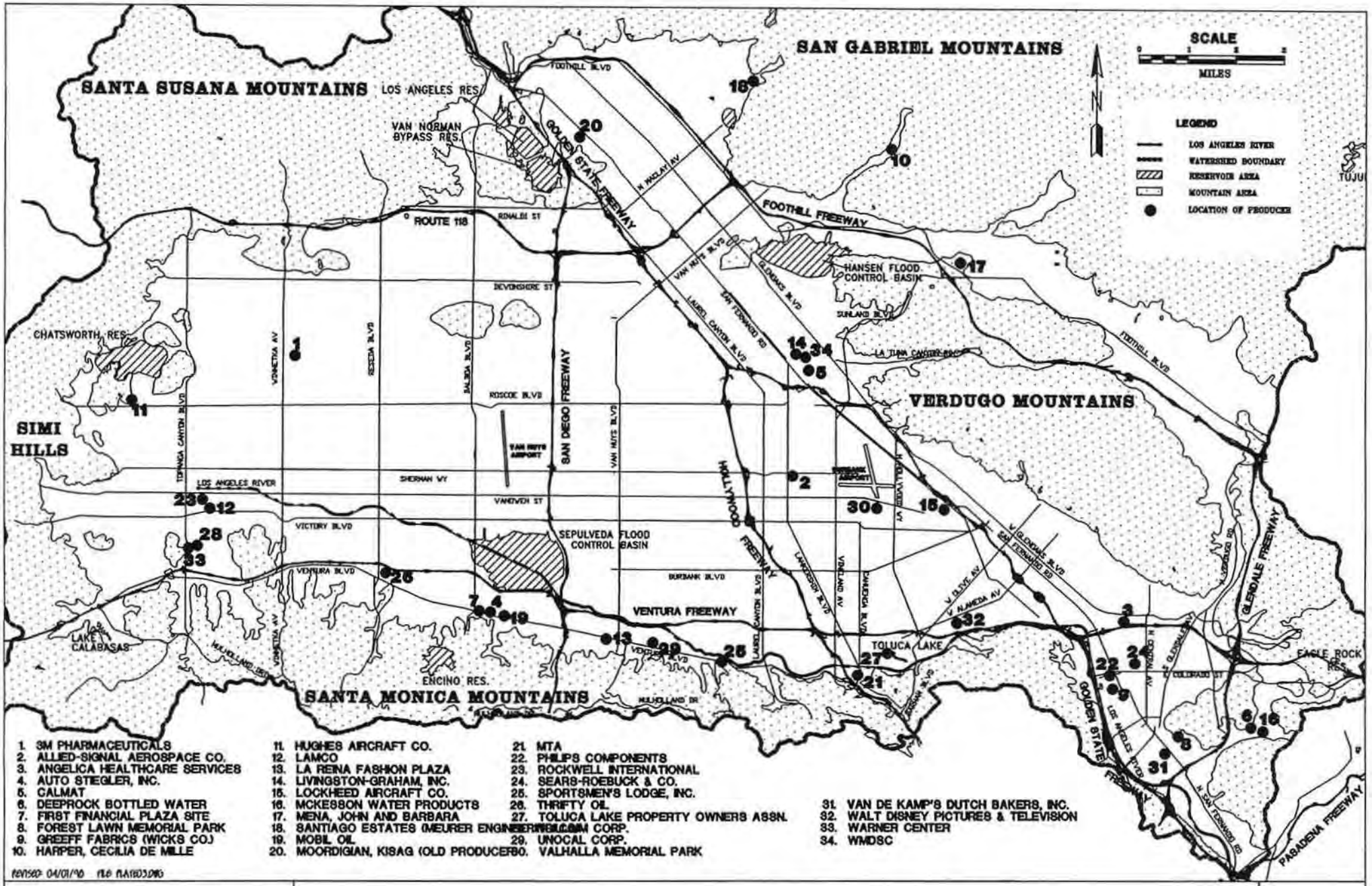
Upper Los Angeles River Area
Water Service Areas of Public Agencies

PLATE 2



1. 3M PHARMACEUTICALS
2. ALLIED-SIGNAL AEROSPACE CO.
3. ANGELICA HEALTHCARE SERVICES
4. AUTO STIEGLER, INC.
5. CALMAT
6. DEEPROCK BOTTLED WATER
7. FIRST FINANCIAL PLAZA SITE
8. FOREST LAWN MEMORIAL PARK
9. GREEFF FABRICS (WICKS CO.)
10. HARPER, CECILIA DE MILLE
11. HUGHES AIRCRAFT CO.
12. LAMCO
13. LA REINA FASHION PLAZA
14. LIVINGSTON-GRAHAM, INC.
15. LOCKHEED AIRCRAFT CO.
16. MCKESSON WATER PRODUCTS
17. MENA, JOHN AND BARBARA
18. SANTIAGO ESTATES (MEURER ENGINEERING CORP.
19. MOBIL OIL
20. MOORDIGIAN, KISAG (OLD PRODUCER)
21. MTA
22. PHILIPS COMPONENTS
23. ROCKWELL INTERNATIONAL
24. SEARS-ROEBUCK & CO.
25. SPORTSMEN'S LODGE, INC.
26. THRIFTY OIL
27. TOLUCA LAKE PROPERTY OWNERS ASSN.
29. UNOCAL CORP.
30. VALHALLA MEMORIAL PARK
31. VAN DE KAMP'S DUTCH BAKERS, INC.
32. WALT DISNEY PICTURES & TELEVISION
33. WARNER CENTER
34. WMDSC

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1995-96 Water Year
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Upper Los Angeles River Area
Locations of Individual Producers

PLATE 3

Plate 4

UPPER LOS ANGELES RIVER AREA

LOCATION OF WELLS AND HYDROLOGIC FACILITIES

LEGEND

- IMPEDIMENTS TO GROUNDWATER FLOW
- GROUNDWATER CASCADES
- QUESTIONABLE IMPEDIMENT OR GROUNDWATER CASCADE
- CLIMATIC STATION
- SURFACE WATER GAGING STATION
- SURFACE WATER SAMPLING POINT
- KEY WELL USED FOR HYDROGRAPHS
- KEY WELL USED FOR SAMPLING
- ACTIVE, OBSERVATION, OR TEST WELL
- SURFACE AND GRAVITY DIVERSION

N

SCALE

0 4,000 8,000 12,000 16,000 FEET

SANTA SUSANA MOUNTAINS

SIMI HILLS

SANTA MONICA MOUNTAINS

VERDUGO MOUNTAINS

PACOIMA RESERVOIR

PACOIMA DAM

SYLMAR

L.A. Aqueduct Filtration Plant

LOS ANGELES RESERVOIR

Foothills Wastewater Treatment Plant

SAN FERNANDO

Indian Hills Mobile Homes Wastewater Treatment Plant

VALLEY

GRANADA HILLS

DEVONSHIRE ST.

CHATSWORTH

Rocketdyne Santa Susana Field Laboratory Wastewater Treatment Plants

NORTHRIDGE

CHATSWORTH RES. AREA

ROSCOE BLVD.

CANOGA PARK

RESEDA

Van Nuys Airport

YARDWERK

Donald C. Tillman Water Reclamation Plant

SEPULVEDA FLOOD CONTROL DAM

WOODLAND HILLS

TARZANA

VENTURA FWY.

ENCINO RESERVOIR

SHERMAN OAKS

VAN NUYS

GLENOAL BLVD.

Burbank-Glendale-Pasadena Airport

HOLLYWOOD FWY.

HOLLYWOOD BOWL

HOLLYWOOD RESERVOIR

HOLLYWOOD

HARGEN DAM

GROUNDWATER DIVIDE

TUJUNGA

CVCWD Wastewater Treatment Plant

LA CRESCENTA

BURBANK

City Of Burbank Wastewater Treatment Plant

L.A. - Glendale Wastewater Treatment Plant

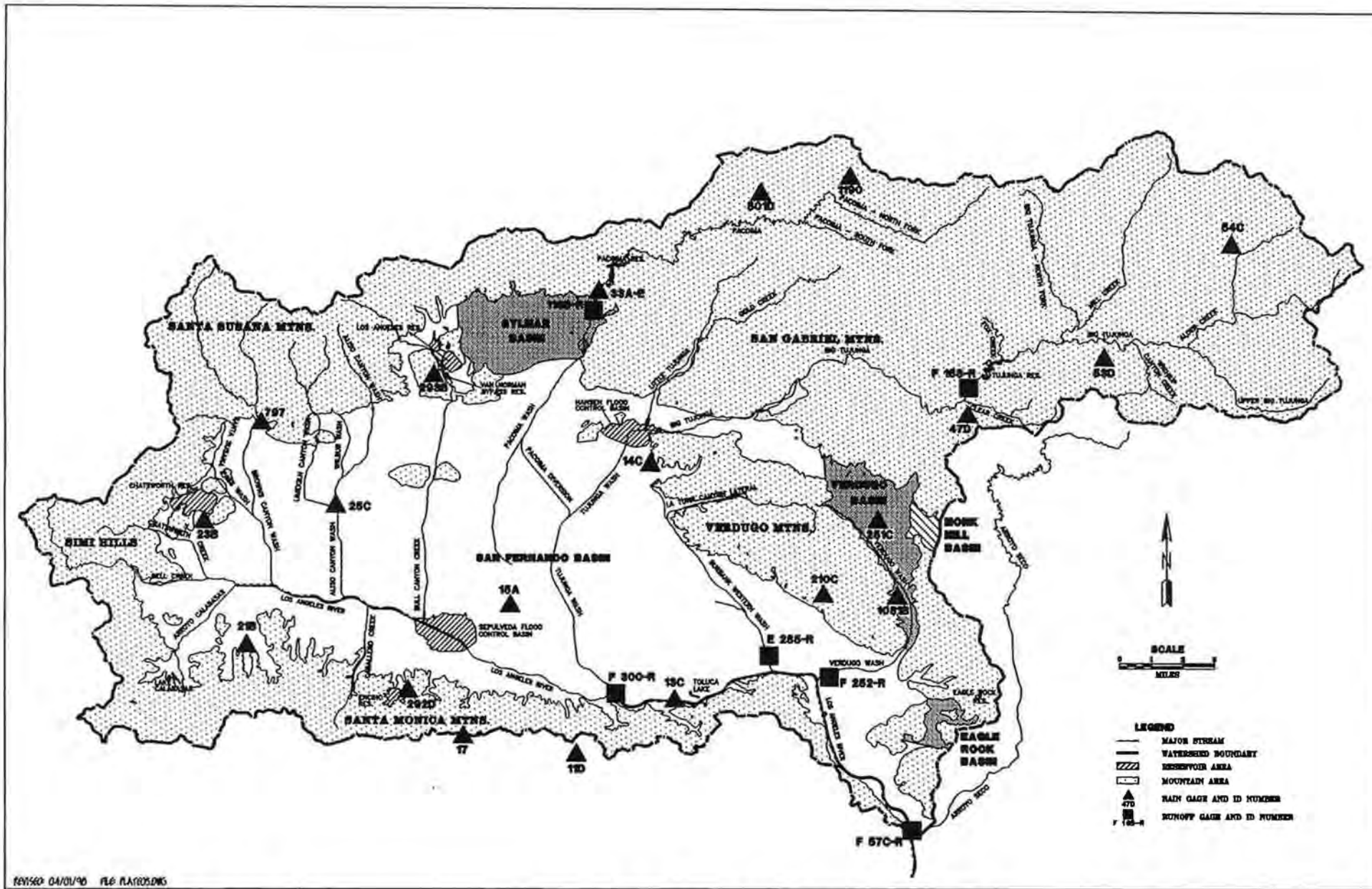
GLENDALE

COLORADO BLVD.

EAGLE ROCK

SAN TUJUNGA RESERVOIR

NOTE: 4.25 miles to Tapia Water Reclamation Plant which delivers water to a portion of the west end of ULARA area.



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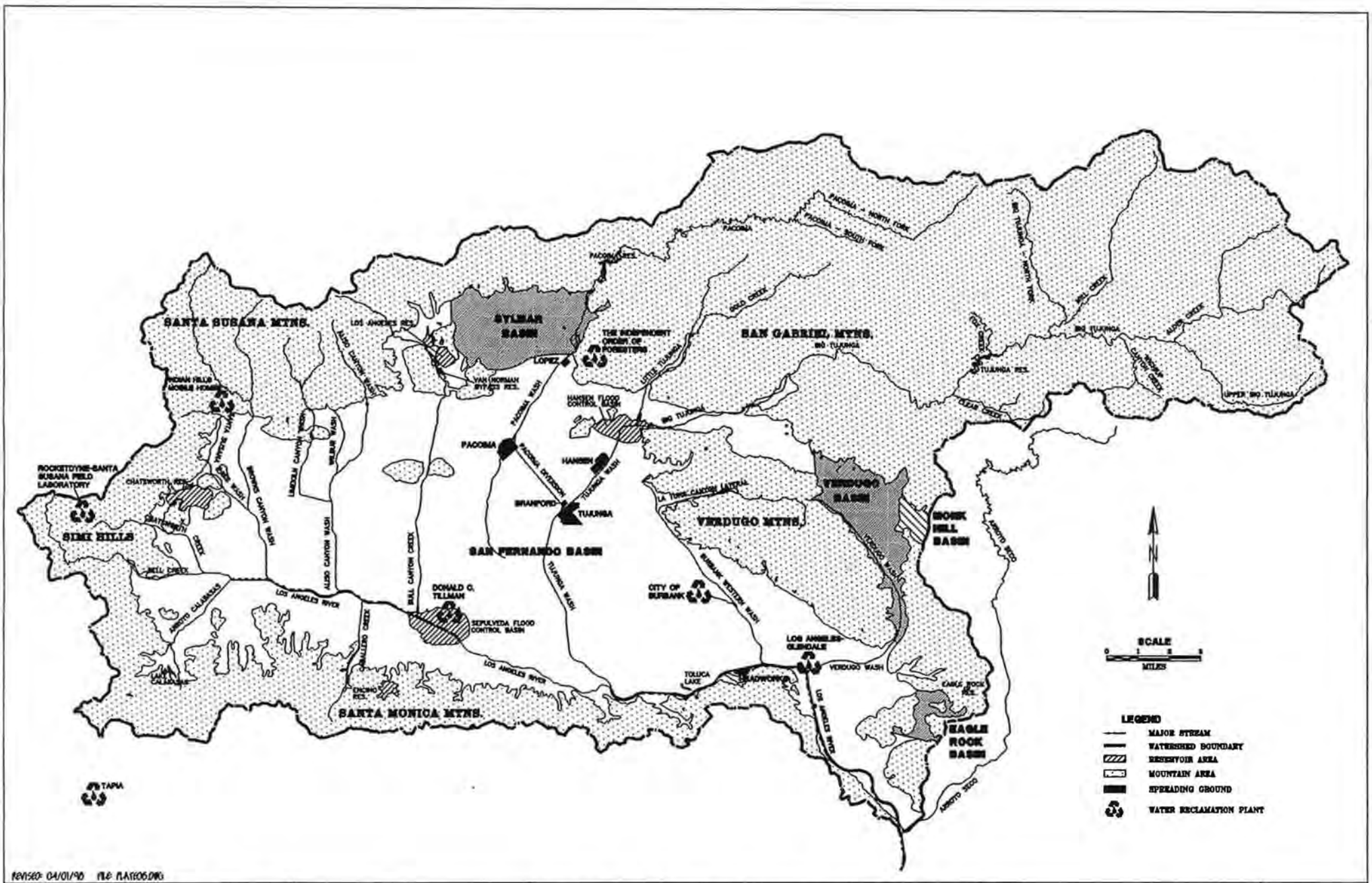
1996-97 Water Year ULARA Watermaster Report	**Upper Los Angeles River Area: Locations of Rain and Runoff Measuring Stations**	PLATE 5



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1996-97 Water Year
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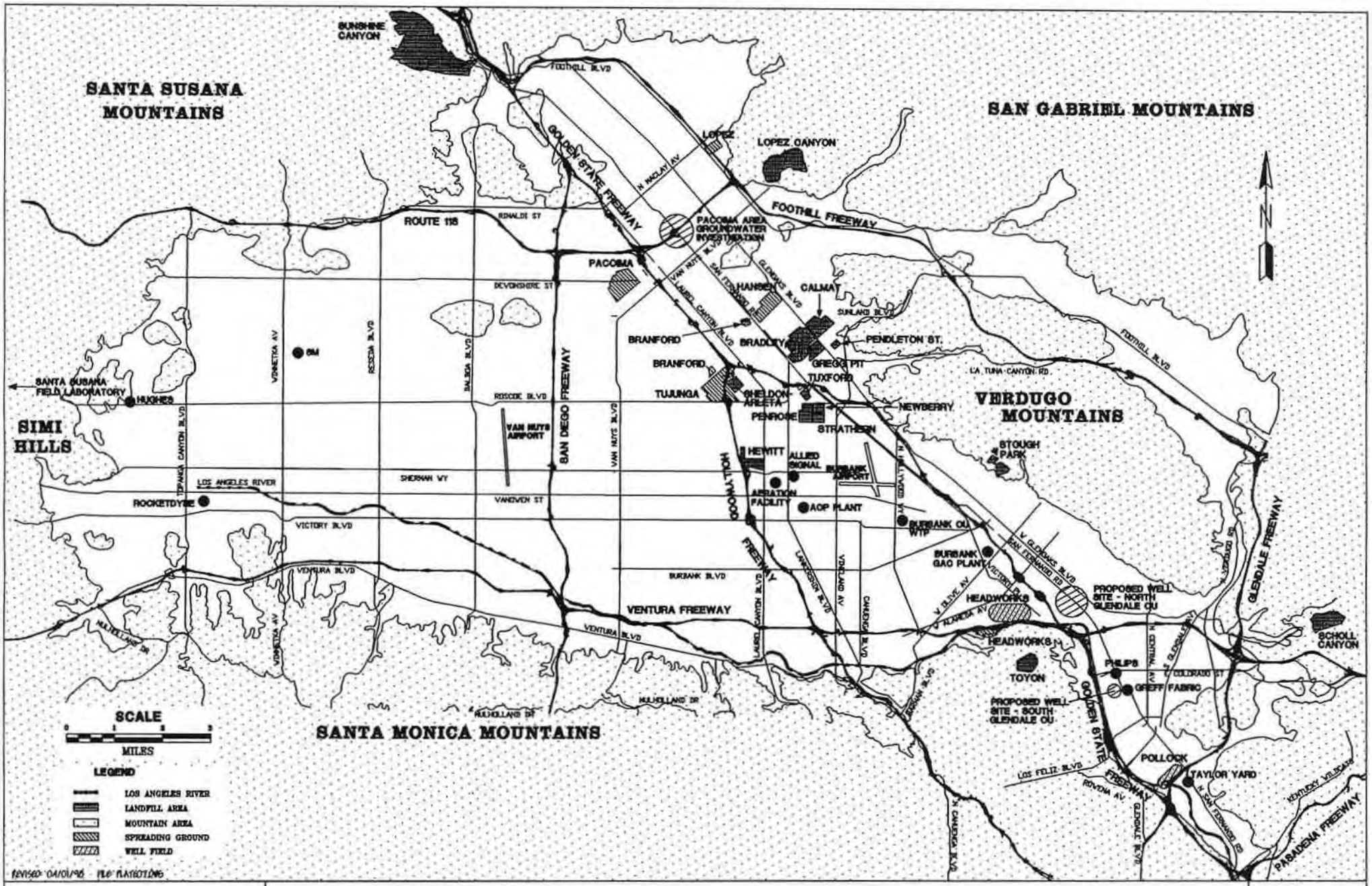
Upper Los Angeles River Area
Spreading Basins and Water Reclamation Plants

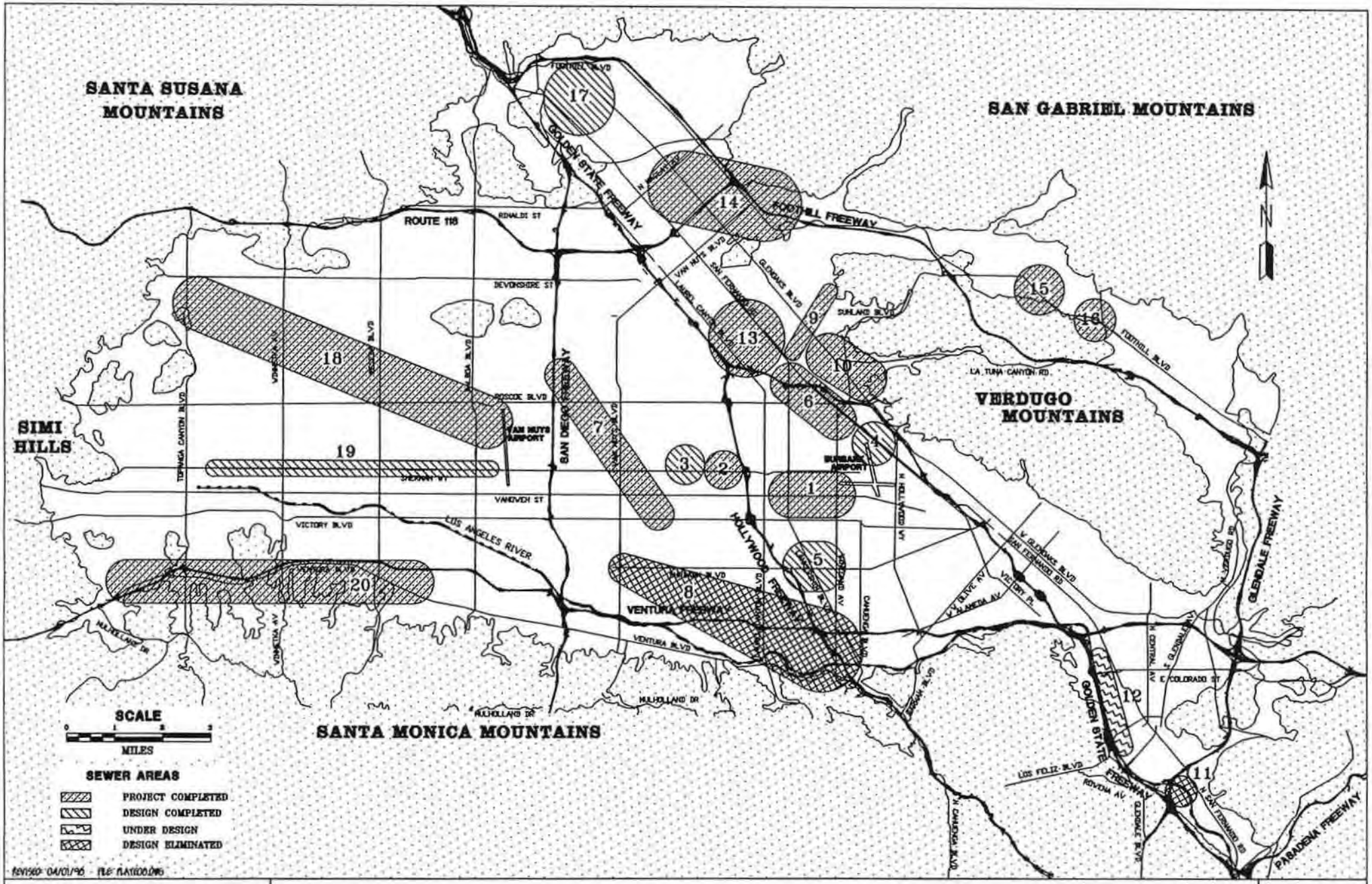
PLATE 6



1996-97 Water Year ULARA Watermaster Report

RELEVANT SITE AND LANDFILL LOCATIONS

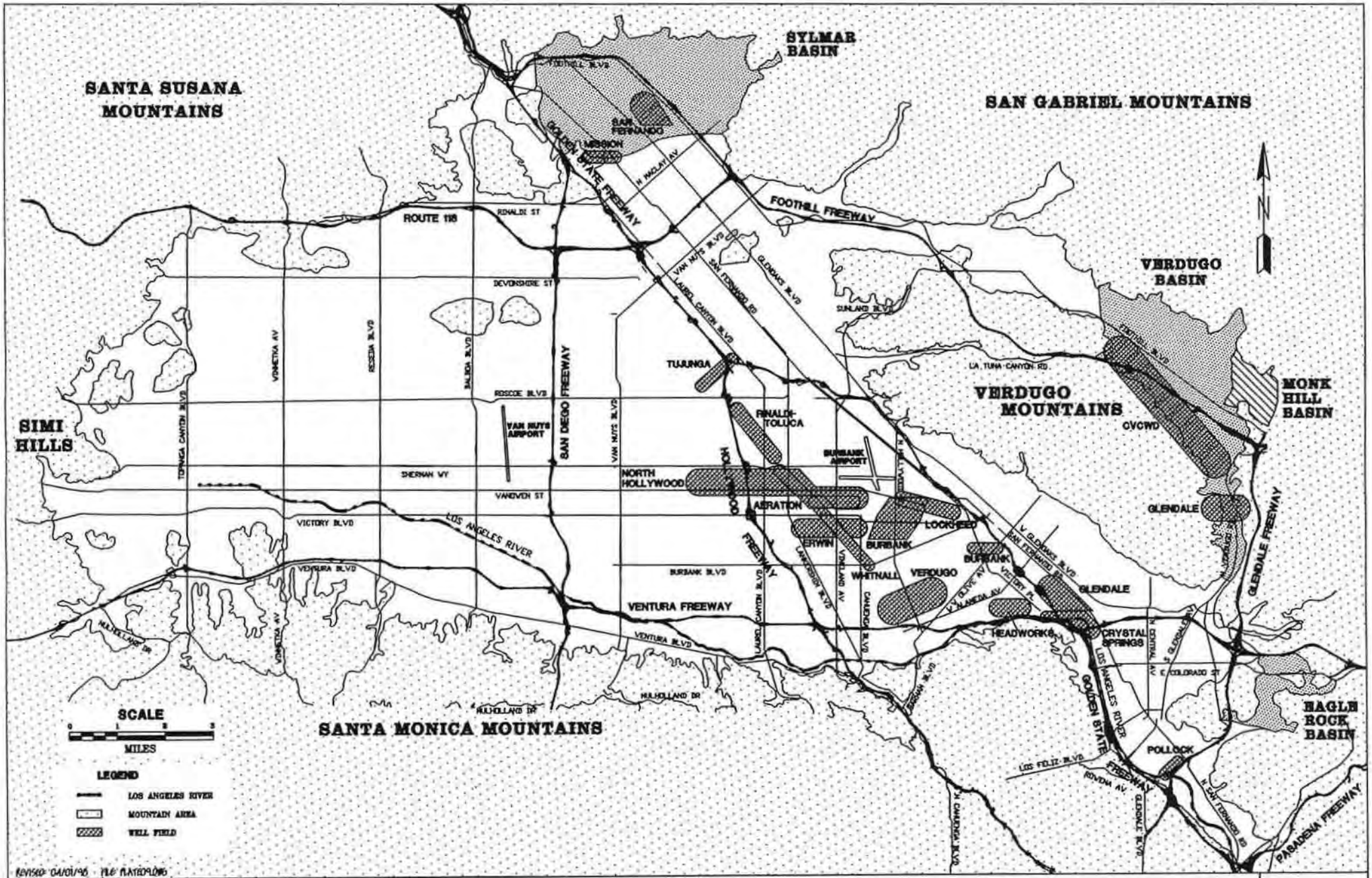
PLATE 7



1996-97 Water Year ULARA Watermaster Report

Upper Los Angeles River Area: Los Angeles Bureau of Sanitation Sewer Construction Program

PLATE 8

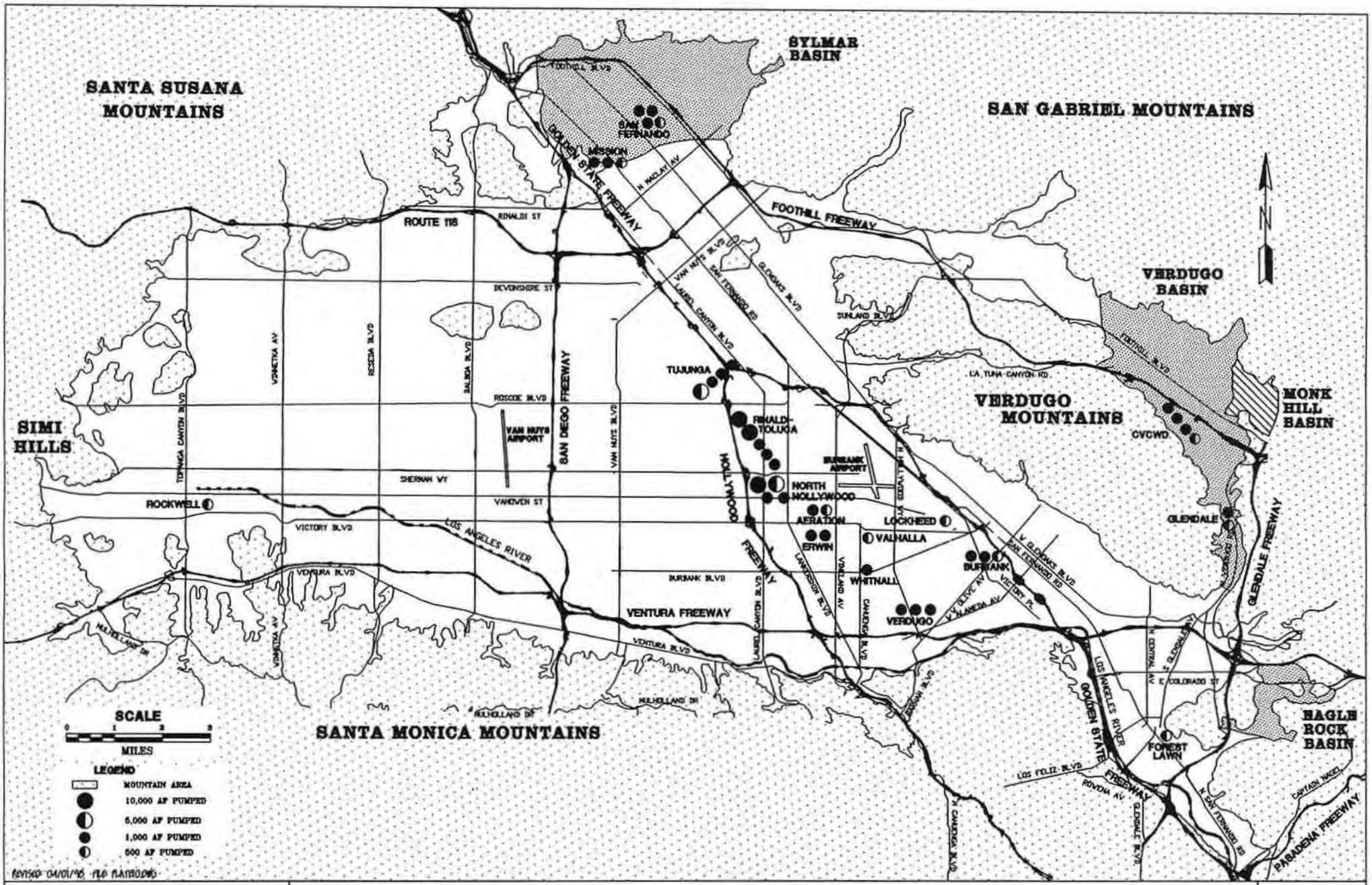


REVISED 04/01/96 FILE PLATE9.DWG

1996-7 Water Year ULARA Watermaster Report

Upper Los Angeles River Area Well Field Locations

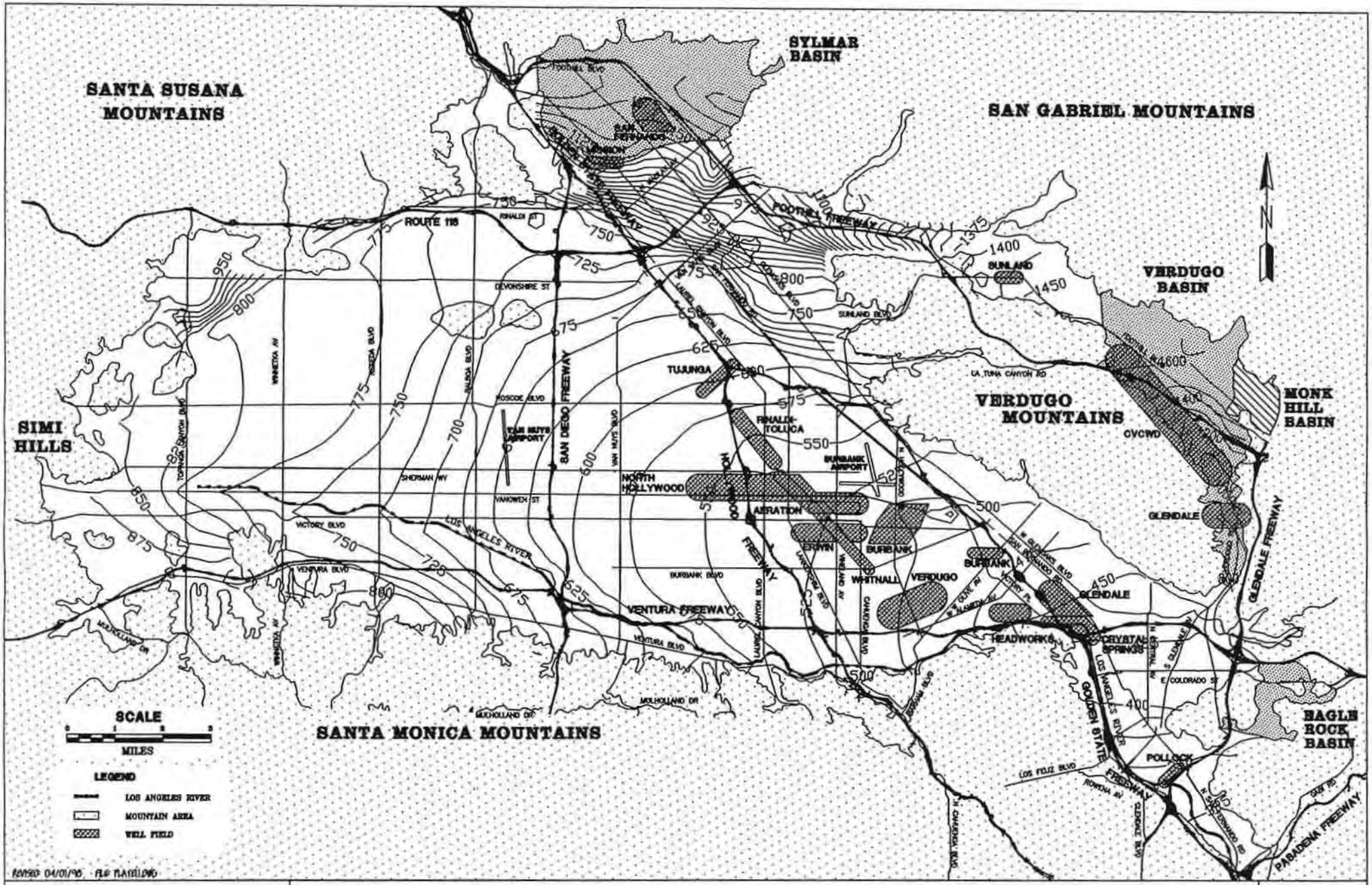
PLATE 9



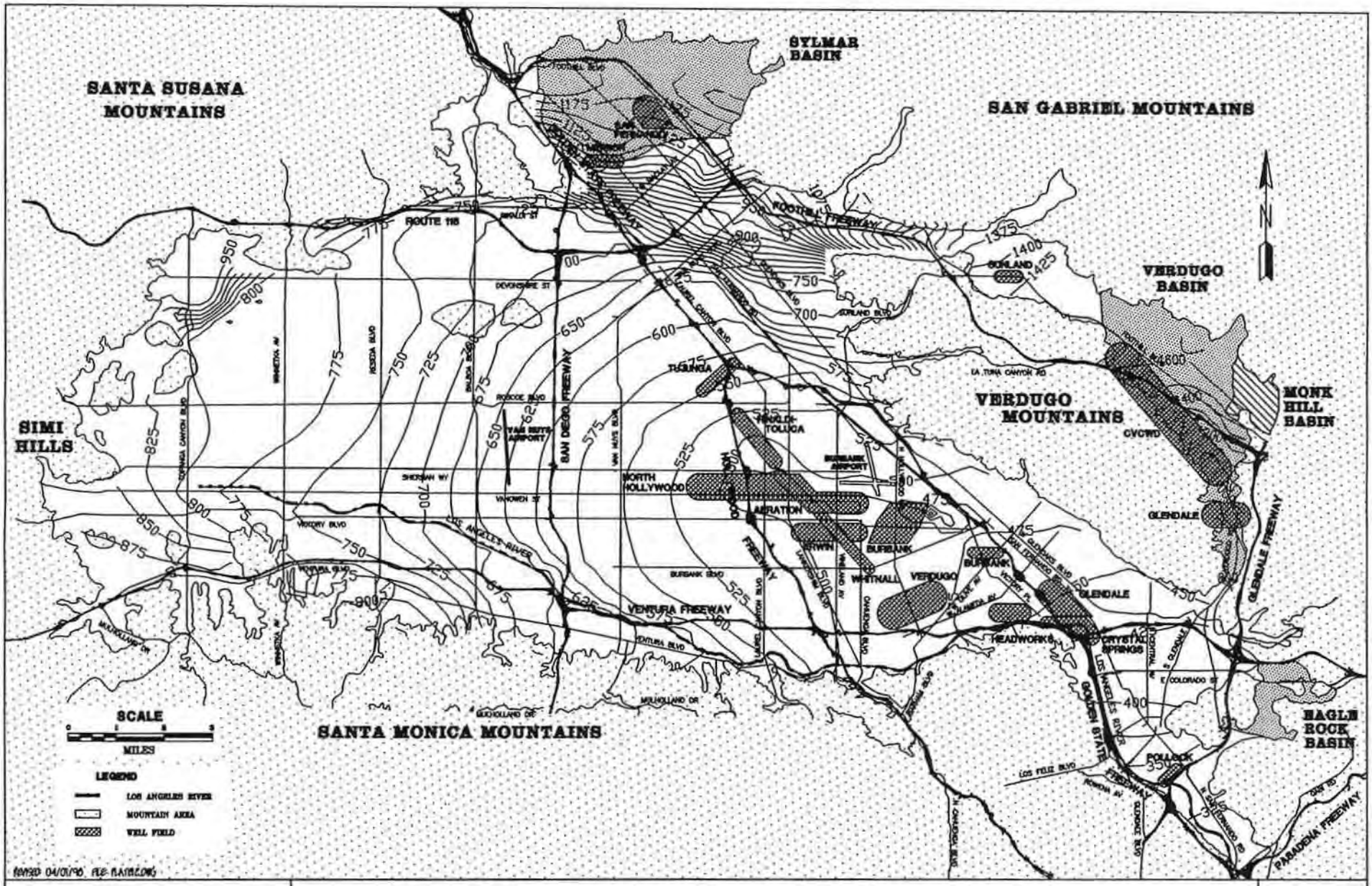
1996-97 Water Year ULARA Watermaster Report

Upper Los Angeles River Area Pattern of Groundwater Production

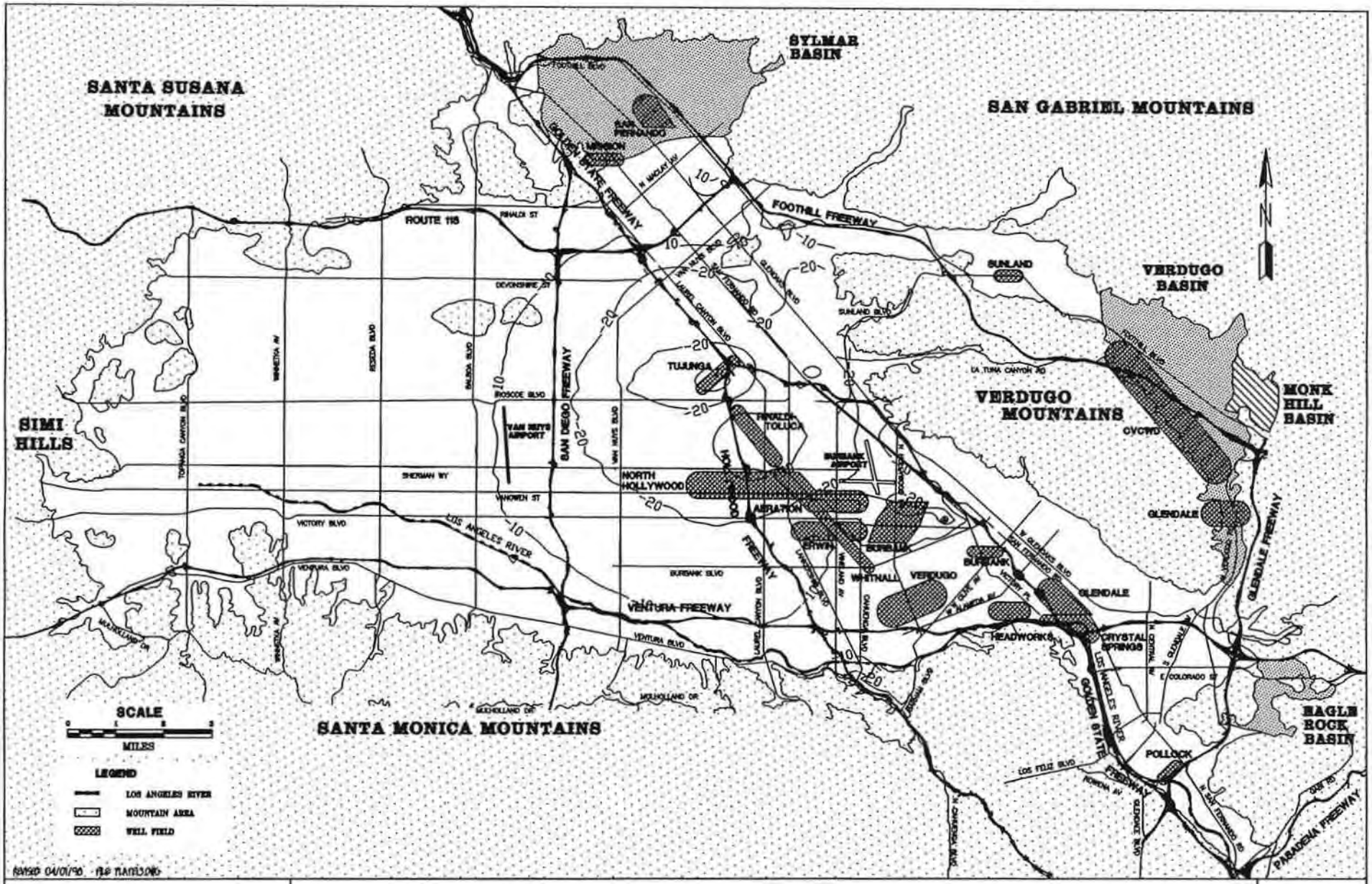
PLATE 10



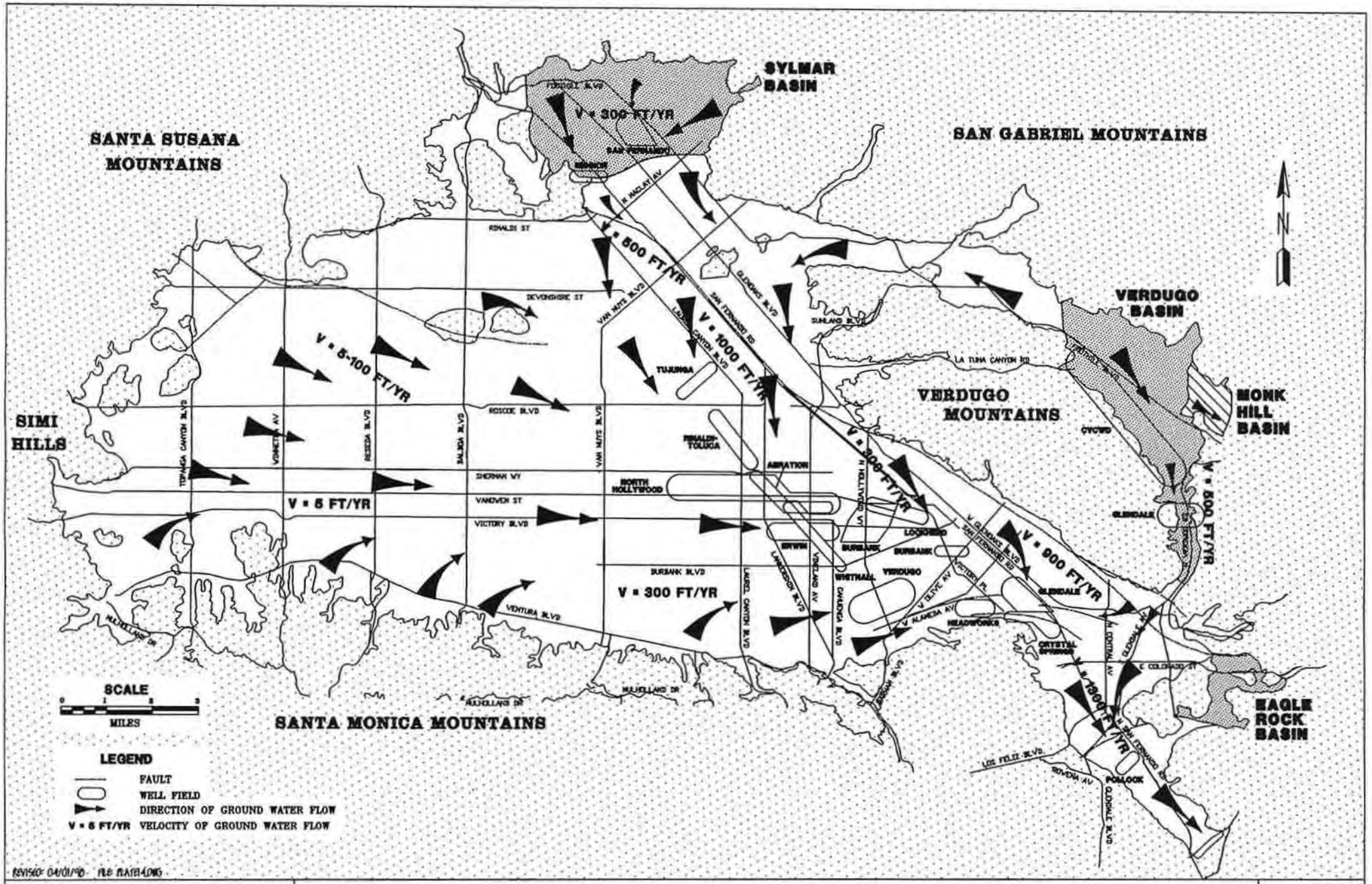
1996-97 Water Year **ULARA** **Watermaster Report**	**Simulated Groundwater Contours** **SPRING [April] 1997**	PLATE 11



1996-97 Water Year **ULARA** **Watermaster Report**	**Simulated Groundwater Contours** **FALL (September) 1997**	PLATE 12

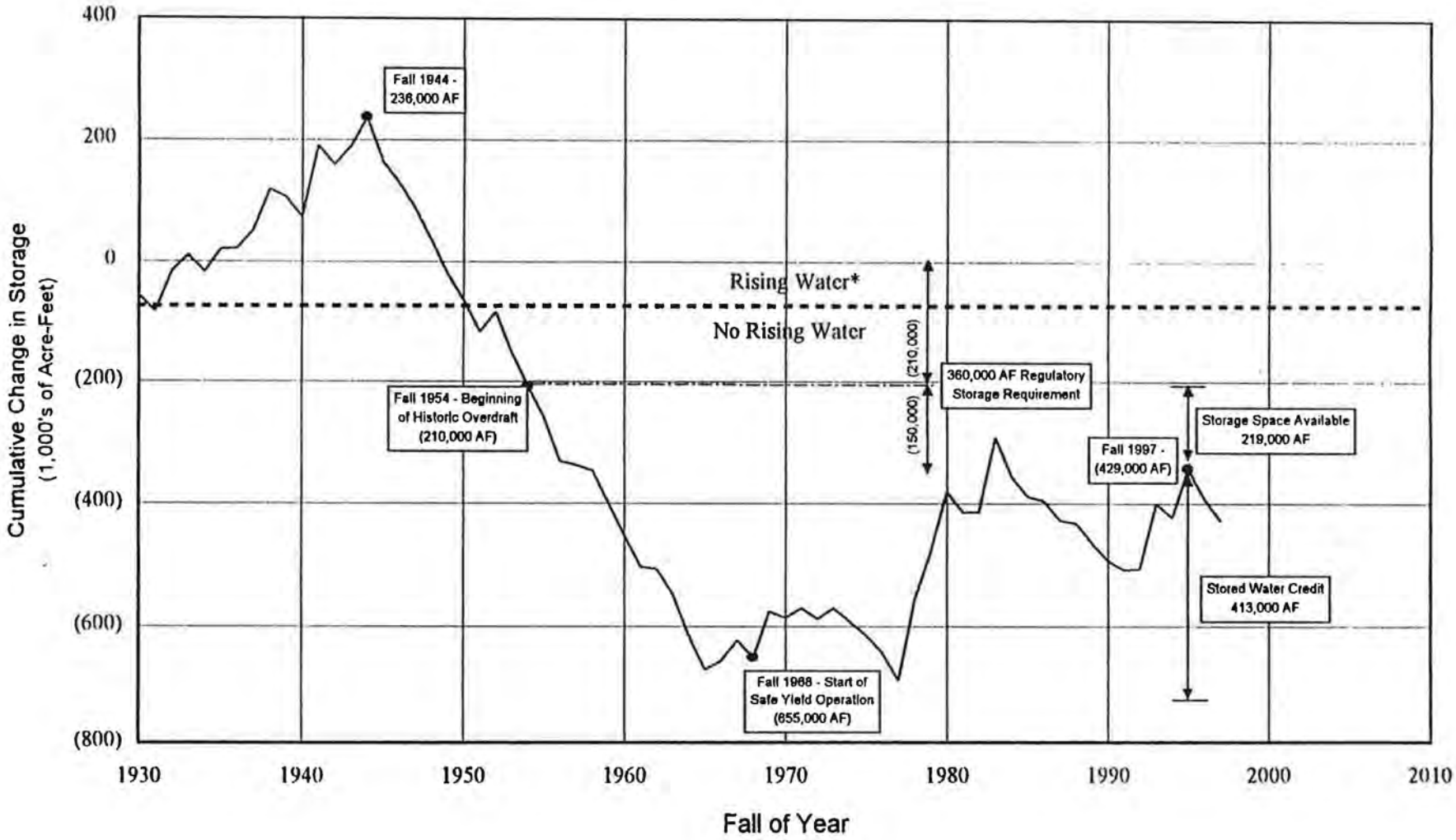


1996-97 Water Year **ULARA** **Watermaster Report**	**Change in Groundwater Elevations** **FALL 1996 - FALL 1997**	PLATE 13



REVISED 04/01/96 FILE PLATE14.DWG

1995-96 Water Year ULARA Watermaster Report	**Upper Los Angeles River Area Estimated Directions and Velocities of Groundwater Flow**	PLATE 14



* This line indicates levels at which excess rising ground water occurs and can be controlled by reduction of storage. Rising ground water can also occur naturally at lower levels.

1996-97 Water Year ULARA Watermaster Report	**San Fernando Basin: Cumulative Change in Groundwater Storage**	PLATE 15

PLATE 15 - ULARA WATERMASTER REPORT

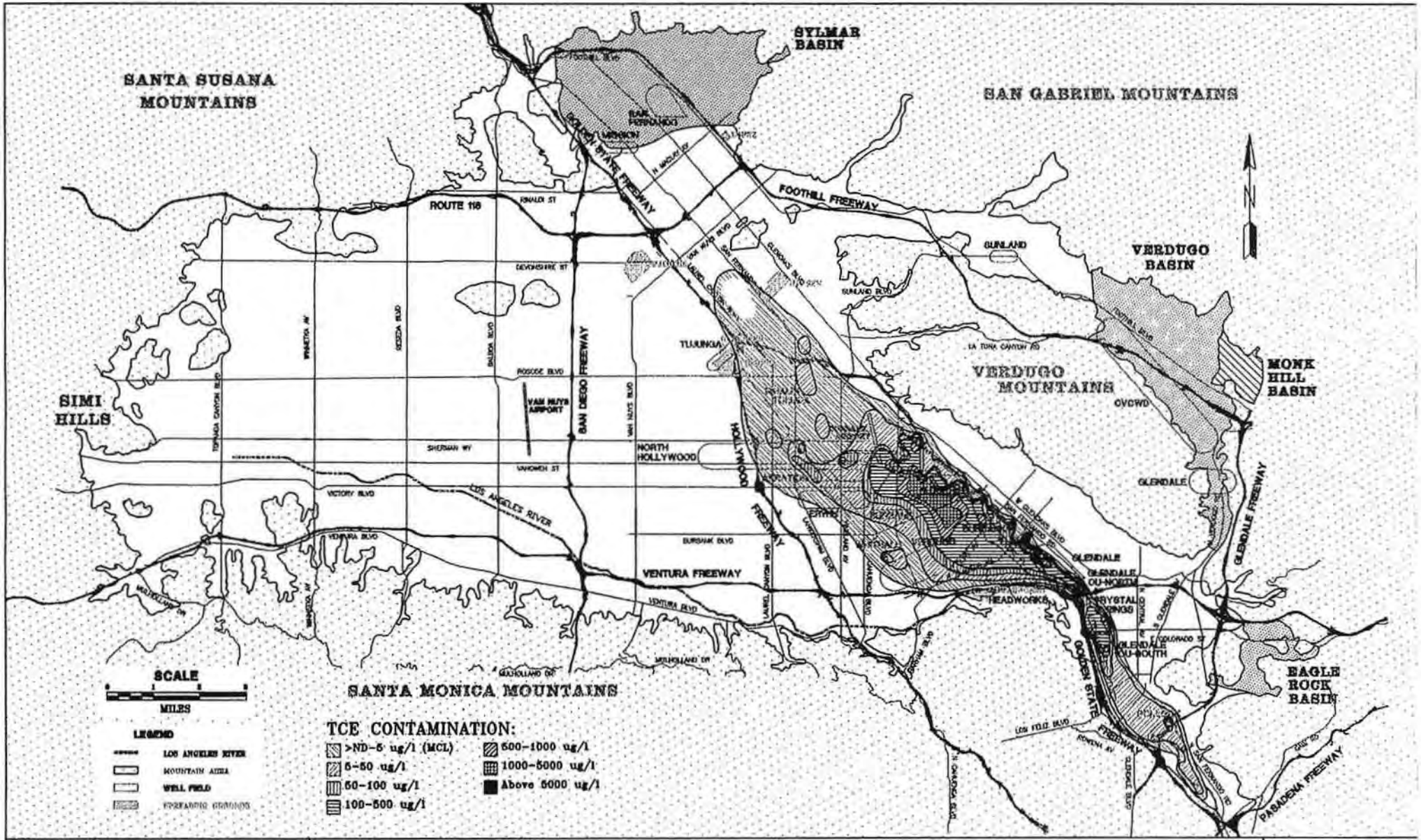
SAN FERNANDO BASIN
CUMULATIVE CHANGE IN GROUNDWATER STORAGE

Fall of Year	Change in Storage	Cumulative Chg. in Storage	Cumulative Chg. in Storage/1,000	Cumulative Chg. in Storage (1944)	Cumulative Chg. in Storage/1,000
1928	0	0	0		
1929	-41,510	-41,510	-42		
1930	-15,690	-57,200	-57		
1931	-26,320	-83,520	-84		
1932	67,030	-16,490	-16		
1933	26,640	10,150	10		
1934	-28,560	-18,410	-18		
1935	38,040	19,630	20		
1936	1,000	20,630	21		
1937	30,660	51,290	51		
1938	66,420	117,710	118		
1939	-12,540	105,170	105		
1940	-32,650	72,520	73		
1941	116,850	189,370	189		
1942	-31,230	158,140	158		
1943	31,030	189,170	189		
1944	47,200	236,370	236	0	0
1945	-74,180	162,190	162	-74,180	-74
1946	-33,300	128,890	129	-107,480	-107
1947	-41,200	87,690	88	-148,680	-149
1948	-52,770	34,920	35	-201,450	-201
1949	-56,360	-21,440	-21	-257,810	-258
1950	-43,390	-64,830	-65	-301,200	-301
1951	-53,290	-118,120	-118	-354,490	-354
1952	33,720	-84,400	-84	-320,770	-321
1953	-68,280	-152,680	-153	-389,050	-389
1954	-56,770	-209,450	-209	-445,820	-446
1955	-51,370	-260,820	-261	-497,190	-497
1956	-71,390	-332,210	-332	-568,580	-569
1957	-6,280	-338,490	-338	-574,860	-575
1958	-9,160	-347,650	-348	-584,020	-584
1959	-52,160	-399,810	-400	-636,180	-636
1960	-53,080	-452,890	-453	-689,260	-689
1961	-50,770	-503,660	-504	-740,030	-740
1962	-3,590	-507,250	-507	-743,620	-744
1963	-40,390	-547,640	-548	-784,010	-784
1964	-70,220	-617,860	-618	-854,230	-854
1965	-57,850	-675,710	-676	-912,080	-912
1966	14,970	-660,740	-661	-897,110	-897
1967	36,720	-624,020	-624	-860,390	-860
1968	-31,350	-655,370	-655	-891,740	-892
1969	79,240	-576,130	-576	-812,500	-813

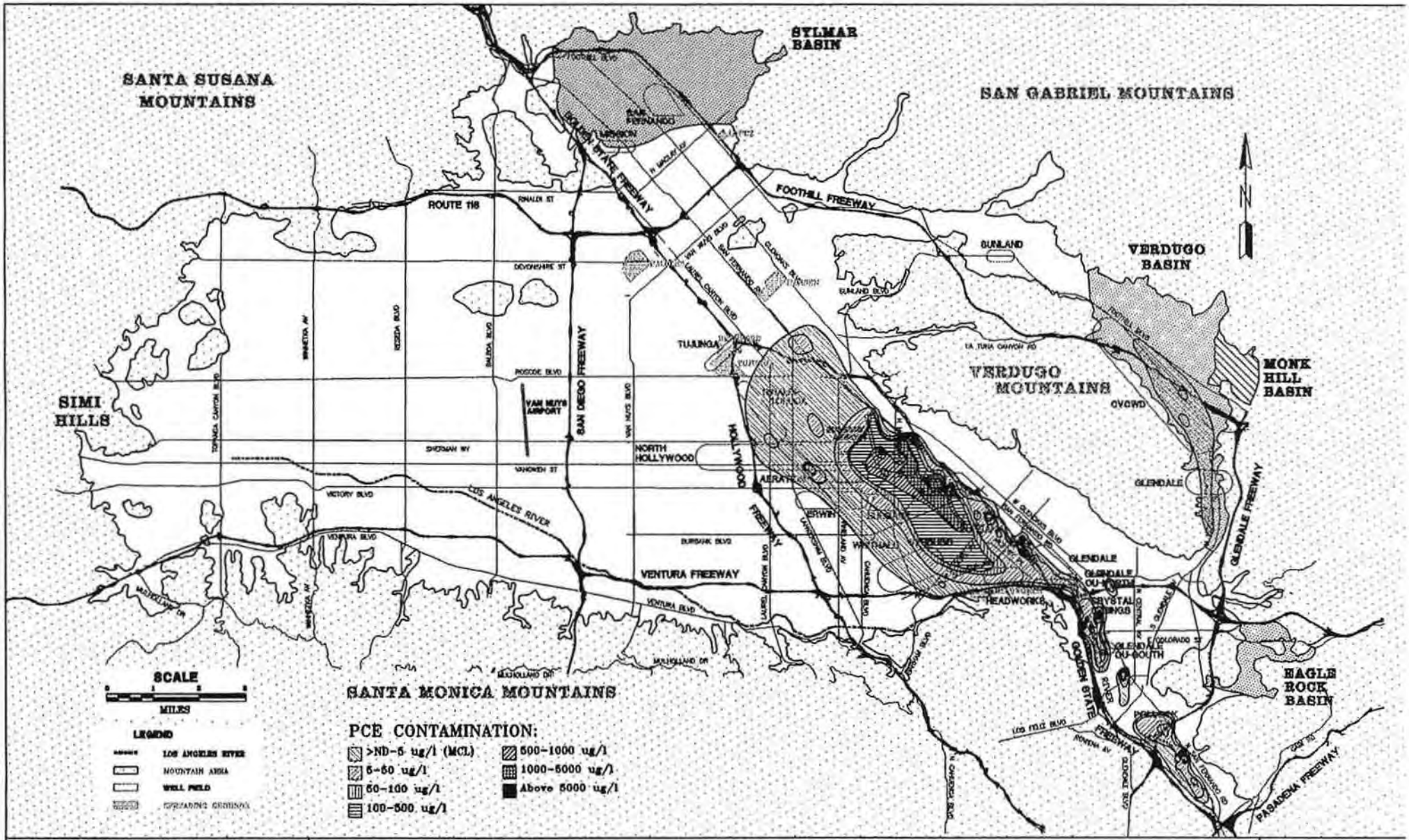
PLATE 15 - ULARA WATERMASTER REPORT

SAN FERNANDO BASIN
CUMULATIVE CHANGE IN GROUNDWATER STORAGE

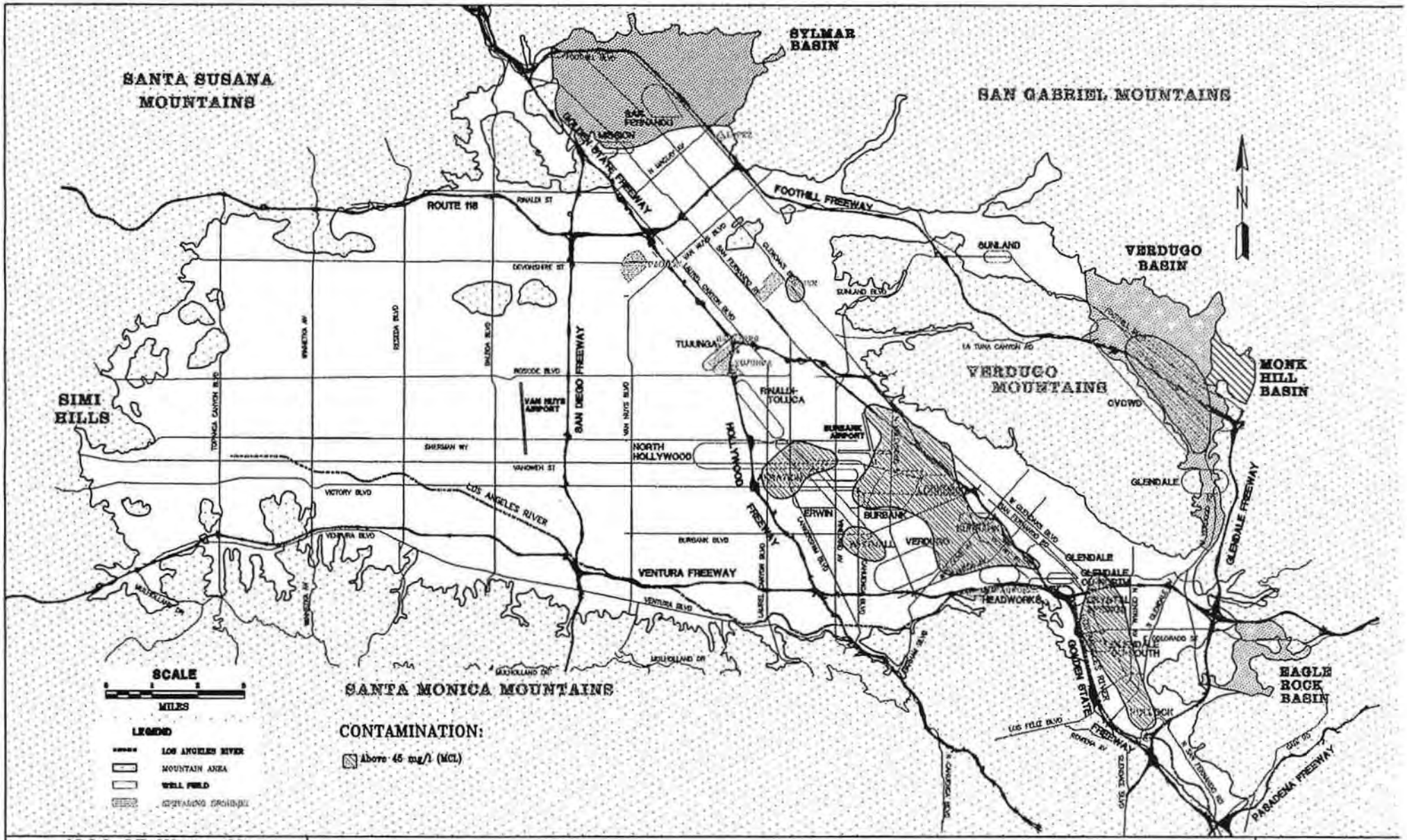
Fall of Year	Change in Storage	Cumulative Chg. in Storage	Cumulative Chg. in Storage/1,000	Cumulative Chg. in Storage (1944)	Cumulative Chg. in Storage/1,000
1928	0	0	0		
1929	-41,510	-41,510	-42		
1930	-15,690	-57,200	-57		
1970	-9,740	-585,870	-586	-822,240	-822
1971	15,340	-570,530	-571	-806,900	-807
1972	-17,090	-587,620	-588	-823,990	-824
1973	17,020	-570,600	-571	-806,970	-807
1974	-21,820	-592,420	-592	-828,790	-829
1975	-22,580	-615,000	-615	-851,370	-851
1976	-30,090	-645,090	-645	-881,460	-881
1977	-50,490	-695,580	-696	-931,950	-932
1978	136,150	-559,430	-559	-795,800	-796
1979	78,080	-481,350	-481	-717,720	-718
1980	99,970	-381,380	-381	-617,750	-618
1981	-32,560	-413,940	-414	-650,310	-650
1982	-530	-414,470	-414	-650,840	-651
1983	121,090	-293,380	-293	-529,750	-530
1984	-63,180	-356,560	-357	-592,930	-593
1985	-31,690	-388,250	-388	-624,620	-625
1986	-7,980	-396,230	-396	-632,600	-633
1987	-31,940	-428,170	-428	-664,540	-665
1988	-5,000	-433,170	-433	-669,540	-670
1989	-30,550	-463,720	-464	-700,090	-700
1990	-29,941	-493,661	-494	-730,031	-730
1991	-14,122	-507,783	-508	-744,153	-744
1992	411	-507,372	-507	-743,742	-744
1993	106,317	-401,055	-401	-637,425	-637
1994	-22,238	-423,293	-423	-659,663	-660
1995	79,132	-344,161	-344	-580,531	-581
1996	-49,223	-393,384	-393	-629,754	-630
1997	-35,737	-429,121	-429	-665,491	-665



1996-97 Water Year ULARA Watermaster Report	**TCE Contamination (ug/l) in the Upper Zone (Spring 1995)**	**PLATE 16**



1996-97 Water Year ULARA Watermaster Report	**PCE Contamination (ug/l) in the Upper Zone (Spring 1995)**	**PLATE 17**



1996-97 Water Year ULARA Watermaster Report	NO3 Contamination (ug/l) in the Upper Zone (Spring 1995)	PLATE 18

APPENDIX A

GROUNDWATER EXTRACTIONS

GROUND WATER EXTRACTIONS
1996-97 WATER YEAR
(acre-feet)

LACDPW	Owner	1996			1997								
Well No.	Well No.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	TOTAL
San Fernando Basin														
Angelica Healthcare Services		(abandoned 12/97)												
3934A	M050A	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Auto Stiegler														
—	—	2.96	2.00	2.50	2.42	2.62	2.85	2.99	3.75	2.07	2.94	3.03	2.79	32.92
Burbank, City of														
3841C	6A	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3882P	7	96.21	101.93	139.37	111.04	0.00	0.00	8.32	135.99	76.41	134.94	29.92	116.80	950.93
3851E	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3851K	13A	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3882T	15	89.28	101.05	36.92	0.00	0.00	0.00	19.95	123.61	81.08	121.67	28.15	122.45	724.16
3841G	18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total:	185.49	202.98	176.29	111.04	0.00	0.00	28.27	259.60	157.49	256.61	58.07	239.25	1,675.09
CalMat														
4916A	2	54.12	122.45	115.28	126.99	130.00	141.38	164.59	125.56	146.38	132.15	127.20	131.33	1,517.43
4916	3	61.53	54.19	52.58	59.50	61.88	68.32	78.84	60.82	71.68	65.74	64.80	57.63	757.51
	Total:	115.65	176.64	167.86	186.49	191.88	209.70	243.43	186.38	218.06	197.89	192.00	188.96	2,274.94
First Financial Plaza Site														
N/A	F.F.P.S.	1.57	1.15	2.43	3.02	3.00	2.56	2.35	2.65	1.25	1.61	1.52	1.27	24.38
Forest Lawn Memorial Park														
3947A	2	14.21	5.03	1.46	1.88	4.91	15.62	20.11	17.63	16.50	15.87	12.59	9.54	135.35
3947B	3	15.98	5.61	1.63	2.08	5.44	17.42	22.51	19.70	18.48	17.85	14.15	10.70	151.55
3947C	4	13.87	4.88	1.43	1.53	4.82	15.42	19.96	17.50	16.43	15.77	12.39	9.43	133.43
3858K	7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total:	44.06	15.52	4.52	5.49	15.17	48.46	62.58	54.83	51.41	49.49	39.13	29.67	420.33
Glendale, City of														
3924N	STPT 1	1.29	0.65	0.86	1.65	1.03	5.77	1.85	1.89	1.74	1.85	2.59	4.06	25.23
3924R	STPT 2	0.00	0.00	0.00	0.00	0.00	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.12
GVENT	GVENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total:	1.29	0.65	0.86	1.65	1.03	5.89	1.85	1.89	1.74	1.85	2.59	4.06	25.35
Greeff Fabrics														
—	—	1.64	1.22	0.93	1.32	1.36	1.27	1.51	1.82	1.59	1.56	2.18	0.00	16.40
Hughes Missile Systems														
—	—	0.45	0.41	0.35	0.49	0.58	0.27	0.54	0.58	0.56	0.72	0.58	0.66	6.19
Lockheed - Burbank Operable Unit														
3871L	VO-1	5.06	51.77	86.37	81.80	124.33	116.14	154.36	107.90	159.72	107.26	179.48	164.32	1,338.51
3861G	VO-2	16.46	62.67	138.60	94.71	138.94	146.42	165.43	114.85	141.92	188.60	157.13	151.88	1,517.61
3861K	VO-3	0.00	3.24	0.00	1.22	0.00	35.64	7.97	80.77	15.45	0.00	0.00	37.71	182.00
3861L	VO-4	25.26	18.39	103.91	127.11	70.55	174.58	198.58	171.76	180.86	208.73	204.73	192.28	1,676.74
3850X	VO-5	0.41	0.67	73.60	130.70	171.95	76.80	75.11	0.00	0.00	0.00	0.00	30.59	559.83
3850Z	VO-6	92.00	218.15	168.38	114.04	209.83	175.05	247.41	278.29	265.02	267.92	261.30	253.02	2,550.41
3850	VO-7	4.40	18.18	79.96	38.12	108.37	188.30	164.74	196.80	238.02	254.17	247.30	187.60	1,725.96
	Total:	143.59	373.07	650.82	587.70	823.97	912.93	1,013.60	950.37	1,000.99	1,026.68	1,049.94	1,017.40	9,551.06

GROUND WATER EXTRACTIONS
1996-97 WATER YEAR
(acre-feet)

LACDPW Well No.	Owner Well No.	1996 Oct.	Nov.	Dec.	1997 Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	TOTAL
					San Fernando Basin (cont'd)									
Mena, John & Barbara														
4973J		0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.96
Metropolitan Transportation Authority														
—	1065	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
—	1075	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
—	1130	22.10	25.17	32.20	52.34	53.73	79.92	74.30	67.95	74.59	81.60	81.60	113.46	758.96
—	1140	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
—	1150	0.92	0.48	1.02	1.49	0.63	0.46	0.63	0.80	1.31	0.78	0.78	0.26	9.56
	Total:	23.02	25.65	33.22	53.83	54.36	80.38	74.93	68.75	75.90	82.38	82.38	113.72	768.52
Metropolitan Water District														
	Jensen	14.90	14.90	14.90	14.80	14.80	14.80	14.80	14.80	14.80	11.70	14.60	14.10	173.90
Mobil Oil Corporation														
—	—	0.08	0.08	0.10	0.07	0.05	0.05	0.07	0.05	0.05	0.09	0.08	0.07	0.84
Philips Components														
—	—	8.30	5.50	6.15	8.63	7.74	6.19	7.33	8.30	7.73	0.04	1.85	0.44	68.20
Rockwell International														
—	E-1 to E-9	24.35	16.42	21.29	36.05	20.29	25.65	20.74	27.56	24.17	22.12	23.11	18.00	279.75
Sears Roebuck & Co.														
3945	3945	17.20	17.12	32.51	17.46	16.24	17.80	17.25	17.85	17.64	17.82	17.74	17.84	224.47
Sportsmen's Lodge														
3785A	1	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08
3M-Pharmaceuticals														
—	—	0.02	0.43	0.28	0.37	0.39	0.39	0.10	0.00	0.00	2.75	5.04	5.18	14.95
Tegatz/Pankow (DeMille)		(under investigation extraction amount not available)												
4940A	NORTH													0.00
Toluca Lake Property Owners Association														
3845F	3845F	2.97	0.00	0.00	0.69	0.00	5.71	6.07	5.77	5.84	4.24	6.14	5.92	43.35
Trillium Corporation														
Well #1	—	0.13	0.13	0.13	0.13	0.28	0.28	0.28	0.01	0.01	0.01	0.61	0.61	2.61
Well #2	—	1.22	1.22	1.22	1.22	2.56	2.56	2.56	0.75	0.76	0.76	1.04	1.04	16.91
	Total:	1.35	1.35	1.35	1.35	2.84	2.84	2.84	0.76	0.77	0.77	1.65	1.65	19.52
Valhalla Memorial Park and Mortuary														
3840K	4	13.23	12.66	4.21	0.00	1.55	38.90	18.69	47.79	51.42	51.42	51.42	51.42	342.71
Waste Management Disposal Services of Calif.														
4916D		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Walt Disney Pictures and Television		(wells inactive/ not abandoned)												
3874E	EAST	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3874F	WEST	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3874G	NORTH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

GROUND WATER EXTRACTIONS
1996-97 WATER YEAR
(acre-feet)

LACDPW Well No.	Owner Well No.	1996 Oct.	Nov.	Dec.	1997 Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	TOTAL
San Fernando Basin (cont'd)														
Los Angeles, City of														
Aeration (A)														
3800E	A-1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3810U	A-2	13.17	0.00	0.75	3.51	0.00	10.30	12.41	19.90	3.58	15.35	18.27	0.80	98.04
3810V	A-3	28.19	34.73	0.00	0.00	44.16	19.74	10.51	0.55	1.67	1.74	11.38	0.39	153.06
3810W	A-4	35.44	21.92	16.89	0.00	0.00	0.09	0.00	4.93	4.77	27.34	15.90	1.37	128.65
3820H	A-5	12.80	10.26	12.62	10.42	19.21	9.71	15.84	15.74	2.57	10.69	17.58	2.89	140.33
3821J	A-6	28.42	32.30	33.35	33.56	34.82	20.20	24.12	34.18	21.00	21.23	36.08	12.12	331.38
3830P	A-7	25.36	31.08	34.68	29.20	36.79	23.64	30.28	32.85	7.48	20.95	34.80	5.83	312.94
3831K	A-8	0.00	10.00	33.72	36.36	38.08	27.47	38.54	34.32	23.37	6.17	35.30	0.02	283.35
	A Total:	143.38	140.29	132.01	113.05	173.06	111.15	131.70	142.47	64.44	103.47	169.31	23.42	1,447.75
Erwin (E)														
3831H	E-1	122.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	122.15
3821I	E-2A	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3831G	E-3	0.00	49.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	49.24
3821F	E-4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3831F	E-5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3821H	E-6	148.11	183.56	108.60	0.00	0.22	0.00	0.09	95.77	5.57	42.67	108.81	0.20	693.60
3811F	E-10	162.16	185.07	102.96	0.00	0.09	0.00	0.00	103.67	5.94	45.93	188.77	146.51	941.10
	E Total:	432.42	417.87	211.56	0.00	0.31	0.00	0.09	199.44	11.51	88.60	297.58	146.71	1,806.09
Headworks (H)														
3893L	H-26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3893K	H-27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3893M	H-28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3893N	H-29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3893P	H-30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	H Total:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
North Hollywood (NH)														
3800	NH-2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3780A	NH-4	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02
3810S	NH-5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3770	NH-7	105.87	97.17	11.82	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	214.95
3810	NH-11	0.00	0.00	183.70	0.00	0.00	0.16	0.11	0.00	0.00	0.22	0.00	0.39	184.58
3810A	NH-13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3810B	NH-14A	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3790B	NH-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3820D	NH-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3820C	NH-17	0.00	0.22	0.16	0.13	0.50	0.00	0.16	0.29	0.16	0.00	0.00	0.73	2.35

GROUND WATER EXTRACTIONS
1996-97 WATER YEAR
(acre-feet)

LACDPW	Owner	1996			1997									
Well No.	Well No.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	TOTAL
San Fernando Basin (cont'd)														
North Hollywood (NH), cont'd														
3820B	NH-18	181.10	359.68	0.00	0.00	0.27	0.48	0.20	0.25	0.57	0.00	0.00	0.94	543.49
3830D	NH-19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3830C	NH-20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3830B	NH-21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3790C	NH-22	256.24	225.04	263.91	28.03	0.43	0.00	95.82	330.14	290.08	229.49	201.12	0.00	1,920.30
3790D	NH-23	318.91	274.17	311.59	0.00	0.00	0.00	101.67	379.82	270.89	184.45	268.96	215.08	2,325.54
3800C	NH-24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3790F	NH-25	200.36	178.46	67.19	0.00	0.00	0.00	0.00	0.00	0.00	42.14	249.40	199.51	937.06
3790E	NH-26	170.66	48.48	143.57	19.85	0.68	7.64	195.31	230.94	201.76	159.64	0.00	179.17	1,357.70
3820F	NH-27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.27	0.00	0.00	0.27
3810K	NH-28	0.00	0.00	189.39	0.00	0.16	0.50	0.20	0.16	0.00	0.29	0.00	0.57	191.27
3810L	NH-29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3800D	NH-30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19.19	0.00	19.19
3810T	NH-31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3770C	NH-32	232.09	217.07	111.34	0.00	0.00	0.00	0.00	0.00	0.00	7.94	289.55	239.76	1,097.75
3780C	NH-33	134.09	119.58	14.39	0.00	0.00	0.00	0.00	0.00	0.00	30.30	171.64	137.64	607.64
3790G	NH-34	231.35	200.29	231.70	24.93	0.00	9.06	239.53	287.21	250.80	199.12	226.60	219.69	2,120.28
3830N	NH-35	299.58	283.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	582.68
3790H	NH-36	129.10	112.76	101.03	134.66	15.61	5.23	134.73	159.87	139.46	110.53	153.74	122.29	1,319.01
3790J	NH-37	251.81	411.50	403.78	229.04	0.00	15.40	406.70	499.10	440.17	349.24	446.85	316.85	3,770.44
3810M	NH-38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3810N	NH-39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3810P	NH-40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3810Q	NH-41	0.00	0.00	0.00	0.34	0.27	0.48	0.52	0.32	0.59	0.00	0.52	0.48	3.52
3810R	NH-42	0.00	0.00	0.00	0.32	0.27	0.48	0.48	0.34	0.57	0.00	0.48	0.48	3.42
3790K	NH-43A	197.54	21.92	158.97	199.81	22.97	7.64	205.16	256.08	224.65	71.23	0.00	0.43	1,366.40
3790L	NH-44	369.35	379.54	372.29	379.31	43.11	14.27	380.83	466.36	411.20	326.37	456.26	364.30	3,963.19
3790M	NH-45	191.96	194.65	185.81	199.58	23.64	0.00	244.65	566.59	502.11	401.35	560.35	448.76	3,519.45
	NH Total:	3,270.01	3,123.65	2,750.64	1,216.00	107.91	61.34	2,006.07	3,177.47	2,733.01	2,112.58	3,044.66	2,447.16	26,050.50
Pollock (P)														
3959E	P-4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3958H	P-6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3958J	P-7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	P Total:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rinaldi-Toluca (RT)														
4909E	RT-1	0.39	57.64	0.00	0.00	0.13	0.00	373.94	479.01	381.17	379.93	469.10	379.79	2,521.10
4898A	RT-2	393.45	327.15	0.00	0.00	0.11	0.00	434.25	555.37	440.97	441.50	542.53	437.25	3,572.58
4898B	RT-3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.16	415.03	196.41	611.60
4898C	RT-4	502.47	300.39	336.06	0.00	0.00	0.00	482.69	554.88	0.00	0.00	348.41	486.54	3,011.44
4898D	RT-5	360.95	305.30	336.59	0.00	0.13	0.13	482.43	616.02	493.80	492.99	602.47	480.34	4,171.15
4898E	RT-6	0.00	0.13	37.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	37.13
4898F	RT-7	197.29	137.87	0.29	183.79	0.11	0.00	438.10	604.22	477.54	476.05	582.75	463.77	3,561.78
4898G	RT-8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

GROUND WATER EXTRACTIONS
1996-97 WATER YEAR
(acre-feet)

LACDPW	Owner	1996			1997								
Well No.	Well No.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	TOTAL
							San Fernando Basin (cont'd)						
Rinaldi-Toluca (RT), cont'd														
4898H	RT-9	0.22	142.07	0.39	231.38	0.16	0.00	438.77	122.38	421.99	430.37	493.36	425.16	2,706.25
4909G	RT-10	513.95	479.04	0.00	0.00	0.04	0.00	513.75	629.13	502.57	497.42	598.48	498.98	4,233.36
4909K	RT-11	460.81	294.07	0.00	0.00	0.11	0.00	461.61	565.74	452.96	445.20	220.91	0.00	2,901.41
4909H	RT-12	470.45	437.07	0.00	232.59	0.13	0.00	471.51	579.72	465.95	460.12	551.56	458.88	4,127.98
4909J	RT-13	474.47	442.21	456.12	234.73	0.11	0.00	474.83	580.30	462.78	449.90	551.49	456.26	4,583.20
4909L	RT-14	0.43	307.78	286.27	0.00	0.11	0.00	427.29	523.64	417.76	411.06	495.01	410.56	3,279.91
4909M	RT-15	0.34	227.18	324.49	0.00	0.11	0.00	0.00	458.97	474.97	468.22	128.25	0.71	2,083.24
	RT Total:	3,375.22	3,457.90	1,777.21	882.49	1.25	0.13	4,999.17	6,269.38	4,992.46	4,952.92	5,999.35	4,694.65	41,402.13
Tujunga (T)														
4887C	T-1	284.73	445.56	272.33	149.28	0.00	384.38	132.55	0.00	0.00	0.00	0.00	267.24	1,936.07
4887D	T-2	98.96	472.35	119.26	0.00	1.17	394.23	135.92	0.55	0.00	0.00	0.00	271.57	1,494.01
4887E	T-3	266.41	283.21	212.64	0.00	1.30	387.69	133.37	0.00	0.84	0.00	0.00	269.05	1,554.51
4887F	T-4	398.23	280.53	209.38	0.00	1.51	381.12	131.33	0.09	1.03	0.00	1.05	265.40	1,669.67
4887G	T-5	557.69	60.69	0.00	0.45	0.00	385.44	132.92	1.40	1.05	0.00	2.29	0.29	1,142.22
4887H	T-6	580.69	61.40	0.00	0.00	1.99	142.14	0.00	3.44	1.10	3.30	2.36	0.39	796.81
4887J	T-7	413.20	275.64	298.14	151.44	3.62	139.92	0.00	3.16	1.69	0.00	2.96	2.04	1,291.81
4887K	T-8	5.18	279.17	301.44	154.24	0.84	278.21	97.95	5.30	0.75	0.00	2.96	233.47	1,359.51
4886B	T-9	5.07	514.57	483.37	148.64	1.56	3.55	0.00	2.80	3.09	0.00	1.26	0.78	1,164.69
4886C	T-10	5.16	319.62	357.66	17.26	1.30	5.64	0.00	5.71	3.39	0.00	4.29	1.49	721.52
4886D	T-11	0.00	422.52	189.83	137.99	1.53	5.87	0.04	3.05	1.30	0.00	1.23	269.65	1,033.01
4886E	T-12	0.00	44.62	489.23	1.65	0.00	303.74	102.22	2.29	1.46	0.00	1.44	271.37	1,218.02
	T Total:	2,615.32	3,459.88	2,933.28	760.95	14.82	2,811.93	866.30	27.79	15.70	3.30	19.84	1,852.74	15,381.85
Verdugo (V)														
3863H	V-1	0.13	0.11	0.00	0.13	0.13	0.18	0.09	0.11	0.11	0.13	0.25	0.09	1.46
3863P	V-2	0.00	0.22	0.11	0.11	0.16	0.00	0.13	0.25	0.50	0.00	0.34	0.16	1.98
3863J	V-4	0.11	0.00	0.11	0.11	0.09	0.25	0.18	0.11	0.16	0.13	0.45	0.11	1.81
3863L	V-11	196.87	257.13	132.18	0.00	0.00	0.27	0.00	0.00	0.00	67.44	147.42	0.00	801.31
3853G	V-13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3854F	V-22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3844R	V-24	220.91	308.24	167.35	0.00	0.00	0.00	0.00	0.00	0.00	0.39	115.93	26.37	839.19
	V Total:	418.02	565.70	299.75	0.35	0.38	0.70	0.40	0.47	0.77	68.09	264.39	26.73	1,645.75
Whitnall (W)														
3820E	W-1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3821B	W-2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3821C	W-3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3821D	W-4	0.00	0.00	0.29	0.25	0.25	0.48	0.22	0.52	0.00	0.52	0.00	0.61	3.14
3821E	W-5	245.38	243.36	0.16	0.16	0.36	0.00	0.18	170.45	10.10	0.34	0.00	0.00	670.49
3831J	W-6A	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	84.09	360.03	50.75	494.87
3832K	W-7	157.59	159.11	58.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	186.52	16.16	578.31
3832L	W-8	226.17	228.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	454.26

GROUND WATER EXTRACTIONS
1996-97 WATER YEAR
(acre-feet)

LACDPW Well No.	Owner Well No.	1996 Oct.	Nov.	Dec.	1997 Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	TOTAL
San Fernando Basin (cont'd)														
Whitnall (W), cont'd														
3832M	W-9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3842E	W-10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	W Total:	629.14	630.56	59.38	0.41	0.61	0.48	0.40	170.97	10.10	84.95	546.55	67.52	2,201.07
Los Angeles, City of														
	Total:	10,883.51	11,795.85	8,163.83	2,973.25	298.34	2,985.73	8,004.13	9,987.99	7,827.99	7,413.91	10,341.68	9,258.93	89,935.14
San Fernando Basin Total:		11,485.73	12,663.70	9,284.48	4,006.20	1,456.29	4,362.45	9,524.15	11,641.57	9,461.55	9,146.67	11,894.81	10,971.41	105,899.04

Sylmar Basin														
Los Angeles, City of														
Plant	Mission	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Well	5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	139.43	211.11	155.96	506.59
Well	6	151.90	103.87	0.00	0.00	0.00	0.00	0.00	0.00	79.01	147.61	182.07	138.72	803.18
Well	7	210.99	207.50	0.00	0.00	0.00	0.00	0.00	0.00	115.05	206.45	244.60	187.99	1,172.58
		362.89	311.37	0.00	0.00	0.00	0.00	0.00	0.00	194.15	493.49	637.78	482.67	2,482.35
Santiago Estates														
5998	3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
San Fernando, City of														
5969D	2A	129.80	0.10	80.41	83.80	90.29	110.82	81.06	145.75	155.27	138.11	170.68	176.58	1,362.67
5959	3	82.45	0.10	39.30	60.95	64.43	77.69	105.28	84.15	87.49	153.38	140.19	112.33	1,007.74
5969	4	29.36	0.08	16.14	16.99	17.02	27.20	21.40	29.28	23.25	0.00	0.00	0.17	180.89
5968	7A	72.33	0.20	28.07	46.81	38.03	65.49	91.45	90.75	65.19	79.58	65.53	63.86	707.29
	Total:	313.94	0.48	163.92	208.55	209.77	281.20	299.19	349.93	331.20	371.07	376.40	352.94	3,258.59
Sylmar Basin Total:		676.83	311.85	163.92	208.55	209.77	281.20	299.19	349.93	525.35	864.56	1,014.18	835.61	5,740.94

Verdugo Basin														
Crescenta Valley County Water District														
5058B	1	47.29	29.27	49.77	20.82	6.51	14.06	11.00	23.79	30.44	22.18	18.51	31.35	304.99
5036A	2	0.00	0.00	0.00	0.00	0.30	0.23	0.10	0.36	0.20	0.19	0.30	0.19	1.87
5058H	5	58.26	36.80	13.69	0.31	0.51	40.41	51.36	56.29	60.03	33.72	12.27	0.00	363.65
5058	6	23.19	22.11	19.92	21.25	13.51	20.24	23.54	24.44	22.75	21.89	24.01	23.77	260.62
5047B	7	12.05	2.22	3.16	29.30	35.99	43.82	41.21	25.90	18.05	38.85	45.46	38.34	334.35
5069J	8	58.91	45.11	33.82	33.33	52.33	52.68	58.93	56.60	57.16	42.15	44.08	45.76	580.86
5047D	9	38.60	21.38	41.82	27.00	32.73	39.51	37.22	40.01	37.58	33.32	36.20	28.23	413.60
5058D	10	75.78	73.47	72.15	72.60	68.54	76.40	69.22	72.77	68.95	70.60	54.20	36.35	811.03
5058E	11	40.43	23.29	10.91	23.37	36.44	30.13	0.00	23.84	9.90	25.69	27.44	24.71	276.15

GROUND WATER EXTRACTIONS
1996-97 WATER YEAR
(acre-feet)

LACDPW	Owner	1996			1997								
Well No.	Well No.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	TOTAL
							Verdugo Basin (cont'd)							
Crescenta Valley County Water District, cont'd														
5058J	12	16.05	4.83	4.26	2.46	0.48	7.34	18.59	12.47	18.12	1.44	14.85	22.31	123.20
5069F	14	14.52	17.96	14.86	2.30	9.23	5.82	20.84	28.37	30.60	12.58	18.91	19.36	195.35
	PICK	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.14	4.81	5.95
	Total:	385.08	276.44	264.36	232.74	256.57	330.64	332.01	364.84	353.78	302.61	297.37	275.18	3,671.62
Glendale, City of														
3961-3971	GL3-5	23.32	124.83	91.82	109.72	95.98	96.52	89.15	87.09	60.35	68.96	73.52	70.26	991.52
3970	GL-6	123.58	113.27	88.95	22.08	66.35	115.37	109.02	107.79	83.50	102.22	101.20	94.48	1,127.81
—	VPCKP	80.80	48.45	75.76	37.10	63.38	70.08	27.45	0.00	0.00	35.20	59.45	56.59	554.26
—	MM-1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total:	227.70	286.55	256.53	168.90	225.71	281.97	225.62	194.88	143.85	206.38	234.17	221.33	2,673.59
Verdugo Basin Total:		612.78	562.99	520.89	401.64	482.28	612.61	557.63	559.72	497.63	508.99	531.54	496.51	6,345.21

							Eagle Rock Basin							
McKesson Water Products														
3987A	1	0.11	2.16	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.60
3987B	2	1.51	4.64	4.39	0.97	2.89	5.46	2.29	5.84	5.83	6.19	4.71	2.89	47.61
3987F	3	8.23	2.64	3.53	7.60	5.05	1.41	6.15	2.05	2.91	5.47	4.82	5.05	54.91
	4	8.64	4.94	7.17	6.80	7.31	9.23	8.32	9.29	8.15	6.43	8.82	7.31	92.41
	Total:	18.49	14.38	15.42	15.37	15.25	16.10	16.76	17.18	16.89	18.09	18.35	15.25	197.53
Eagle Rock Basin Total:		18.49	14.38	15.42	15.37	15.25	16.10	16.76	17.18	16.89	18.09	18.35	15.25	197.53

ULARA Total:	12,793.83	13,552.92	9,984.71	4,631.76	2,163.59	5,272.36	10,397.73	12,568.40	10,501.42	10,538.31	13,458.88	12,318.78	118,182.72

APPENDIX B

KEY GAGING STATIONS SURFACE RUNOFF

WESTERN HYDROLOGIC SYSTEMS - (916) 885-2480
0F57RO.97 F57C-R LOS ANGELES RIVER ABOVE ARROYO SECO

DAILY DISCHARGE IN CUBIC FEET PER SECOND WATER YEAR OCT 1996 TO SEP 1997

Day	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	149	146	144	151	152	117	105	95	137	164	111	97
2	146	144	144	674	151	114	101	94	133	172	108	105
3	147	144	144	766	137	119	101	97	127	170	109	94
4	149	144	144	149	137	117	101	95	120	183	102	91
5	146	144	144	156	139	108	106	96	112	171	102	96
6	144	144	430	145	142	106	107	96	107	175	105	103
7	144	144	145	145	137	106	112	98	111	167	99	113
8	144	145	145	144	130	109	113	98	111	157	94	113
9	147	144	3,760	145	137	120	113	100	108	144	95	112
10	149	145	2,350	146	208	122	115	101	110	148	95	128
11	145	146	3,360	149	212	128	122	109	116	145	94	134
12	145	146	614	1,310	129	121	121	109	116	153	91	135
13	145	148	147	1,330	129	117	119	112	117	154	93	141
14	145	158	144	193	126	117	125	103	112	157	95	144
15	146	150	144	2,280	126	116	131	115	116	141	93	140
16	147	151	144	212	131	116	129	114	116	145	93	148
17	146	153	144	150	553	112	135	121	111	131	93	156
18	157	152	144	148	129	113	131	118	128	118	92	162
19	163	155	144	147	111	108	136	128	117	127	90	132
20	152	163	144	977	106	107	138	123	114	117	92	138
21	153	2,820	144	540	109	108	135	123	113	115	93	137
22	154	772	2,330	552	113	112	123	119	117	124	92	146
23	156	155	193	1,700	113	105	110	134	122	120	92	155
24	161	144	145	205	116	107	100	137	133	113	90	158
25	167	144	144	1,150	116	107	101	141	135	115	89	626
26	158	144	145	1,900	119	105	98	147	133	113	89	95
27	147	144	849	469	121	103	95	156	149	112	88	90
28	157	145	306	209	122	105	94	147	156	113	91	90
29	149	144	145	212	------	106	94	165	171	116	92	92
30	2,020	144	147	174	------	109	94	154	172	113	97	91
31	152	------	146	152	------	107	———	154	------	111	97	———
TOTAL	6,530	7,722	17,373	16,780	4,151	3,467	3,405	3,699	3,740	4,304	2,956	4,162
MEAN	211	257	560	541	148	112	114	119	125	139	95.4	139
MAX	2,020	2,820	3,760	2,280	553	128	138	165	172	183	111	626
MIN	144	144	144	144	106	103	94	94	107	111	88	90
AC-FT	12,950	15,320	34,460	33,280	8,230	6,880	6,750	7,340	7,420	8,540	5,860	8,260

CAL YEAR 1996	TOTAL*	31,625	MEAN	344	MAX	3,760	MIN	144	AC-FT	62,730
WTR YEAR 1997	TOTAL	78,289	MEAN	214	MAX	3,760	MIN	88	AC-FT	155,300

* Incomplete Record

WESTERN HYDROLOGIC SYSTEMS - (916) 885-2480
F118RO F118 B-R PACIOMA DAM OUTFLOW

DAILY DISCHARGE IN CUBIC FEET PER SECOND WATER YEAR OCT 1996 TO SEP 1997

Day	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.0	1.0	1.0	24	60	8.0	27	.60	.60	.60	.60	.60
2	1.0	1.0	1.0	24	58	8.0	26	.60	.60	.60	.60	.60
3	1.0	1.0	10	24	38	8.0	9.5	.60	.60	.60	.60	.60
4	1.0	1.0	2.0	24	48	10	.60	.60	.60	.60	.60	.60
5	1.0	1.0	3.0	24	38	12	.60	.60	1.4	.60	.60	.60
6	1.0	1.0	3.0	24	38	11	.60	.60	.60	.60	.60	.60
7	1.0	1.0	3.0	24	38	11	.60	.60	.60	.60	.60	.60
8	1.0	1.0	1.0	17	38	11	.60	.60	.60	.60	.60	.60
9	1.0	1.0	1.0	17	37	11	.60	.60	17	.60	.60	.60
10	1.0	1.0	1.0	17	23	9.3	.60	.60	24	.60	.60	.60
11	1.0	1.0	1.0	17	18	8.0	.60	.60	14	.60	.60	.60
12	1.0	1.0	1.0	17	18	8.0	.60	.60	.60	.60	.60	.60
13	1.0	1.0	1.0	21	18	8.0	.60	.60	.60	.60	.60	.60
14	1.0	1.0	1.0	18	18	8.0	16	.60	.60	.60	.60	.60
15	1.0	1.0	1.0	24	18	8.0	24	.60	.60	.60	.60	.60
16	1.0	1.0	1.0	24	18	8.0	24	.60	.60	.60	.60	.60
17	1.0	1.0	15	26	18	8.0	23	.60	.60	.60	.60	.60
18	1.0	1.0	6.0	28	18	8.0	7.4	.60	.60	.60	.60	.60
19	1.0	1.0	6.0	35	18	8.0	.60	.60	.60	.60	.60	.60
20	1.0	1.0	2.0	37	18	6.5	.60	.60	.60	.60	.60	.60
21	1.0	.75	2.0	38	18	6.5	.60	.60	.60	.60	.60	.60
22	1.0	1.0	2.0	20	18	6.5	.60	.60	.60	.60	.60	.60
23	1.0	1.0	28	1.0	18	6.5	.60	.60	.60	.60	.60	.60
24	1.0	1.0	28	1.0	19	6.5	.60	.60	.60	.60	.60	.60
25	1.0	1.0	28	1.0	18	6.5	.60	.60	.60	.60	.60	.60
26	1.0	1.0	24	1.0	18	6.5	.60	.60	.60	.60	.60	.60
27	1.0	1.0	24	103	12	6.5	.60	.60	.60	.60	.60	.60
28	1.0	1.0	24	174	8.0	6.5	.60	.60	.60	.60	.60	.60
29	1.0	1.0	24	142	------	6.5	.60	.60	.60	.60	.60	.60
30	1.0	1.0	24	81	------	2.3	.60	.60	.60	.60	.60	.60
31	1.0	------	24	65	------	12	------	.60	------	.60	.60	------
TOTAL	31.0	29.75	293.0	1,093.0	725.0	250.6	170.10	18.60	72.00	18.60	18.60	18.00
MEAN	1.00	.99	9.45	35.3	25.9	8.08	5.67	.60	2.40	.60	.60	.60
MAX	1.0	1.0	28	174	60	12	27	.60	24	.60	.60	.60
MIN	1.0	.75	1.0	1.0	8.0	2.3	.60	.60	.60	.60	.60	.60
AC-FT	61	59	581	2,170	1,440	497	337	37	143	37	37	36

CAL YEAR 1996	TOTAL*	353.75	MEAN	3.85	MAX	28	MIN	.75	AC-FT	702
WTR YEAR 1997	TOTAL	2,738.25	MEAN	7.50	MAX	174	MIN	.60	AC-FT	5,430

* Incomplete Record Recorder reinstalled 10-22-96. Proper gage height was not set.
Flows estimated from Dam records: Oct., Nov., Dec., Jan., Feb., Mar.

WESTERN HYDROLOGIC SYSTEMS - (916) 885-2480
F300RO F300-R LOS ANGELES RIVER @ TUJUNGA AVE.

DAILY DISCHARGE IN CUBIC FEET PER SECOND WATER YEAR OCT 1996 TO SEP 1997

Day	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	76	100	72	202	114	84	80	85	84	86	87	84
2	83	90	77	638	112	78	75	86	93	83	88	93
3	67	90	79	534	96	79	67	91	88	82	73	74
4	83	96	56	117	94	72	83	78	93	74	86	80
5	82	93	142	117	105	56	92	83	91	86	92	89
6	79	87	381	100	103	53	90	87	93	88	92	90
7	84	83	78	107	95	55	97	91	100	85	90	84
8	82	90	81	95	93	66	85	92	97	85	84	88
9	86	81	2,590	95	84	79	90	91	85	83	90	86
10	82	83	2,110	96	182	86	97	97	91	86	89	98
11	79	84	2,170	99	125	91	96	95	92	89	88	86
12	78	79	520	999	104	99	93	89	91	93	81	95
13	75	89	99	774	100	99	86	90	86	90	88	95
14	81	97	86	159	99	103	96	68	84	92	88	89
15	83	80	79	1,460	98	105	97	86	85	93	85	86
16	85	86	83	162	102	104	94	91	93	96	96	89
17	86	83	85	116	444	100	99	92	91	89	90	88
18	91	76	88	112	112	97	94	88	104	91	92	111
19	94	88	85	102	93	94	94	99	88	85	82	84
20	85	92	91	657	86	94	95	94	86	83	88	85
21	93	2,050	92	526	94	100	92	95	85	92	91	82
22	89	330	1,940	599	98	109	91	88	87	93	88	81
23	92	105	162	1,200	93	97	87	95	77	88	100	80
24	97	81	105	196	98	102	89	93	85	89	95	80
25	99	71	99	861	87	102	97	83	84	90	92	480
26	89	88	97	1,340	98	98	90	88	85	89	84	101
27	76	80	773	345	98	97	90	86	90	87	62	91
28	92	84	201	255	98	100	80	91	90	93	86	81
29	90	71	107	259	------	105	87	94	90	86	86	82
30	1,450	80	113	147	------	101	77	93	86	89	91	79
31	108	------	110	108	------	96	------	90	------	90	84	------
TOTAL	4,016	4,787	12,851	12,577	3,205	2,801	2,680	2,769	2,674	2,725	2,708	3,011
MEAN	130	160	415	406	114	90.4	89.3	89.3	89.1	87.9	87.4	100
MAX	1,450	2,050	2,590	1,460	444	109	99	99	104	96	100	480
MIN	67	71	56	95	84	53	67	68	77	74	62	74
AC-FT	7,970	9,500	25,490	24,950	6,360	5,560	5,320	5,490	5,300	5,410	5,370	5,970

CAL YEAR 1996	TOTAL*	21,654	MEAN	235	MAX	2,590	MIN	56	AC-FT	42,950
WTR YEAR 1997	TOTAL	56,804	MEAN	156	MAX	2,590	MIN	53	AC-FT	112,700

* Incomplete Record

WESTERN HYDROLOGIC SYSTEMS - (916) 885-2480
E285RO E285-R BURBANK WESTERN STORM DRAIN

DAILY DISCHARGE IN CUBIC FEET PER SECOND WATER YEAR OCT 1996 TO SEP 1997

Day	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	12	15	9.6	13	10	9.9	8.0	8.4	10	8.8	9.7	11
2	11	15	10	44	9.6	9.8	7.7	8.4	10	8.5	8.9	11
3	11	15	10	35	9.4	9.3	7.9	7.9	11	8.5	9.5	10
4	12	13	11	12	10	9.1	7.9	7.9	11	8.2	9.1	9.7
5	11	13	10	15	10	9.2	7.9	7.9	11	8.8	9.5	10
6	9.0	13	12	11	10	9.0	7.4	8.5	11	8.5	11	9.9
7	10	13	12	11	9.7	9.0	7.2	8.4	10	8.7	9.9	10
8	8.8	12	11	11	9.9	8.5	7.6	9.0	11	8.4	9.6	9.1
9	12	12	293	11	9.8	8.7	8.4	9.0	11	8.4	9.9	9.5
10	14	14	142	11	11	9.0	8.4	8.4	10	8.6	11	8.8
11	13	13	81	11	11	8.8	9.1	8.0	10	8.6	9.2	9.2
12	12	15	18	115	9.1	8.1	9.6	7.9	9.7	8.2	10	8.1
13	12	16	11	60	8.4	8.5	9.1	7.9	9.6	8.1	10	8.2
14	12	14	12	18	9.0	9.0	8.3	7.9	9.4	10	11	8.3
15	12	16	12	144	9.0	9.0	8.0	7.9	9.0	9.5	10	7.7
16	11	15	12	43	8.7	8.9	7.9	7.9	8.5	9.1	9.1	8.8
17	12	14	12	23	44	8.3	7.8	7.9	7.9	9.5	9.7	8.9
18	13	13	12	17	11	8.0	7.5	7.4	8.5	9.1	9.1	9.1
19	13	12	12	14	10	8.2	7.6	7.2	8.5	9.4	8.8	8.6
20	10	12	12	74	10	8.7	7.9	7.2	7.9	8.0	9.3	8.9
21	12	174	12	26	8.8	9.2	7.9	6.9	7.9	6.9	9.9	8.9
22	15	24	79	26	8.4	9.4	7.8	6.9	7.6	8.2	8.8	8.5
23	15	12	13	60	10	9.0	7.9	7.1	7.6	8.8	8.5	8.9
24	14	12	13	12	11	9.2	7.7	6.5	8.5	8.7	8.8	8.7
25	14	12	12	72	11	9.0	7.9	6.5	7.9	9.8	9.4	33
26	14	11	13	60	11	8.9	7.3	6.5	7.5	9.9	9.3	10
27	15	11	24	14	11	9.1	7.2	6.5	7.2	10	9.2	10
28	16	11	14	12	11	9.6	7.2	6.5	7.4	9.2	10	10
29	17	11	12	12	------	8.9	6.8	6.5	7.2	10	12	10
30	106	9.7	9.9	11	------	9.2	8.3	6.5	6.8	10	13	9.9
31	13	------	13	10	------	8.6	------	6.5	------	9.7	13	------
TOTAL	481.8	562.7	929.5	1,008	311.8	277.1	237.2	233.9	270.6	276.1	306.2	302.7
MEAN	15.5	18.8	30.0	32.5	11.1	8.94	7.91	7.55	9.02	8.91	9.88	10.1
MAX	106	174	293	144	44	9.9	9.6	9.0	11	10	13	33
MIN	8.8	9.7	9.6	10	8.4	8.0	6.8	6.5	6.8	6.9	8.5	7.7
AC-FT	956	1,120	1,840	2,000	618	550	470	464	537	548	607	600

CAL YEAR 1996	TOTAL*	1,974.0	MEAN	21.5	MAX	293	MIN	8.8	AC-FT	3,920
WTR YEAR 1997	TOTAL	5,197.6	MEAN	14.2	MAX	293	MIN	6.5	AC-FT	10,310

* Incomplete Record

WESTERN HYDROLOGIC SYSTEMS - (916) 885-2480
F252RO F252-R VERDUGO WASH @ ESTELLE AVE.

DAILY DISCHARGE IN CUBIC FEET PER SECOND WATER YEAR OCT 1996 TO SEP 1997

Day	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	9.0	21	8.0	27	14	11	10	9.1	11	3.1	3.8	4.9
2	9.0	19	8.0	170	14	11	9.4	8.9	11	2.9	4.1	5.4
3	9.0	19	8.0	148	14	12	11	9.0	10	2.8	3.4	5.3
4	9.0	19	8.0	8.9	8.8	11	10	9.0	11	2.9	3.3	5.4
5	9.0	19	8.0	110	7.5	11	10	9.6	11	3.1	3.7	5.1
6	9.0	16	8.0	12	13	11	11	9.9	10	3.0	3.5	4.9
7	9.0	15	8.0	8.9	13	11	11	9.9	9.9	2.9	2.9	4.9
8	9.0	15	8.0	8.9	12	11	11	9.9	9.9	2.6	2.6	5.0
9	9.0	15	446	8.9	12	11	11	9.5	9.9	2.6	2.8	5.4
10	9.0	15	173	8.9	29	11	10	9.1	8.7	2.8	4.9	6.1
11	9.0	15	417	8.9	15	11	10	9.5	7.4	3.0	3.3	5.4
12	9.0	15	532	202	12	11	10	9.9	7.1	2.8	1.9	5.8
13	9.0	15	11	200	11	11	10	10	16	2.6	3.2	5.1
14	8.0	15	11	90	11	11	11	9.7	11	2.5	5.0	4.7
15	8.0	15	11	83	11	11	11	9.7	11	3.2	5.2	4.7
16	7.1	15	11	34	11	11	10	9.9	13	3.5	5.2	4.7
17	7.1	15	11	36	17	11	10	10	13	3.4	4.9	4.7
18	7.1	15	11	14	12	12	10	9.9	11	2.8	5.0	4.3
19	7.1	15	11	8.9	11	11	10	10	11	2.6	5.7	3.9
20	7.1	15	11	166	11	11	9.9	10	11	3.3	5.0	3.9
21	7.1	328	11	63	11	11	9.6	10	11	3.7	5.1	3.2
22	7.1	50	1,140	93	11	11	9.6	10	11	4.1	5.4	3.2
23	7.1	24	22	236	11	11	9.2	10	11	3.5	5.4	2.8
24	7.1	21	9.4	15	11	11	8.9	10	11	3.7	5.9	2.6
25	7.1	9.0	9.0	242	11	10	9.5	10	6.0	3.3	5.5	55
26	7.1	9.0	9.0	167	11	9.9	9.1	11	3.4	3.8	5.3	8.9
27	7.1	9.0	125	49	12	9.8	9.1	10	3.5	3.7	4.8	6.8
28	7.1	8.0	11	16	11	10	8.9	10	3.2	4.1	5.0	6.2
29	7.1	8.0	11	14	------	9.9	9.4	11	3.1	4.9	4.8	6.2
30	84	8.0	9.0	11	------	9.9	8.8	10	3.1	3.8	4.9	6.2
31	24	------	9.0	11	------	10	------	11	------	3.9	4.9	------
TOTAL	340.4	797.0	3,085.4	2,271.3	348.3	335.5	298.4	305.5	280.2	100.9	136.4	200.7
MEAN	11.0	26.6	99.5	73.3	12.4	10.8	9.95	9.85	9.34	3.25	4.40	6.69
MAX	84	328	1,140	242	29	12	11	11	16	4.9	5.9	55
MIN	7.1	8.0	8.0	8.9	7.5	9.8	8.8	8.9	3.1	2.5	1.9	2.6
AC-FT	675	1,580	6,120	4,510	691	665	592	606	556	200	271	398

CAL YEAR 1996	TOTAL*	4,222.8	MEAN	45.9	MAX	1,140	MIN	7.1	AC-FT	8,380
WTR YEAR 1997	TOTAL	8,500.0	MEAN	23.3	MAX	1,140	MIN	1.9	AC-FT	16,860

* Incomplete Record Recorder inoperative, record based on corps station 3388; Dates: Oct, Nov, Dec, Jan.

WESTERN HYDROLOGIC SYSTEMS - (916) 885-2480
F168RO F168-R BIG TUJUNGA CREEK BELOW DAM

Dsc
11-18-97

DAILY DISCHARGE IN CUBIC FEET PER SECOND WATER YEAR OCT 1996 TO SEP 1997

Day	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	.01	0	0	8.8	70	19	11	5.9	5.3	3.7	0	0
2	.01	0	0	9.1	75	19	11	5.7	1.6	0	0	0
3	.02	0	0	10	73	19	12	5.8	0	0	0	0
4	.03	0	0	10	73	19	13	6.1	0	0	0	0
5	.03	0	0	9.8	73	18	13	6.1	0	0	0	0
6	.03	0	0	9.8	57	18	13	5.9	2.3	0	0	0
7	.03	0	0	9.7	50	18	13	6.2	2.3	0	0	0
8	.03	0	0	17	47	18	13	6.2	2.9	0	0	0
9	.02	0	0	29	45	18	13	6.2	3.2	0	0	0
10	0	0	0	30	43	17	13	6.1	3.2	0	0	0
11	0	0	0	27	47	18	13	6.1	3.1	0	0	0
12	0	0	7.5	25	41	18	12	6.1	2.6	0	0	0
13	0	0	21	26	.21	17	12	6.0	2.7	0	0	0
14	0	0	14	25	.12	16	12	5.9	3.0	0	0	0
15	0	0	12	25	.10	16	10	5.9	2.7	0	0	0
16	0	0	13	32	.10	16	9.3	5.9	2.5	0	0	.01
17	0	0	14	53	4.4	16	9.3	5.9	2.4	0	0	.02
18	0	0	15	48	37	14	9.3	5.9	2.4	0	0	.03
19	0	0	15	45	25	11	9.3	5.9	2.4	0	0	.03
20	0	0	15	44	18	11	9.3	5.9	2.4	0	0	.04
21	0	0	15	43	18	11	9.3	5.9	2.4	0	0	.04
22	0	0	21	43	18	11	9.3	6.8	2.5	0	0	.04
23	0	0	70	46	19	11	8.5	4.7	2.5	0	0	.04
24	0	0	115	44	19	11	8.0	3.5	2.5	0	0	.04
25	0	0	99	55	18	11	8.1	3.1	2.5	0	0	.17
26	0	0	63	72	18	11	8.2	3.0	2.4	0	0	.12
27	0	0	44	132	18	11	8.2	3.3	2.4	0	0	.11
28	0	0	44	168	18	11	8.3	3.6	2.5	0	0	.09
29	0	0	44	145	------	11	5.7	3.9	2.4	0	0	.09
30	0	0	37	102	------	11	5.4	4.3	2.3	0	0	.09
31	0	------	20	70	------	11	------	5.0	------	0	0	------
TOTAL	0.21	0	698.5	1,413.2	924.93	457	309.5	166.8	71.4	3.7	0	0.96
MEAN	.007	0	22.5	45.6	33.0	14.7	10.3	5.38	2.38	.12	0	.032
MAX	.03	0	115	168	75	19	13	6.8	5.3	3.7	0	.17
MIN	0	0	0	8.8	.10	11	5.4	3.0	0	0	0	0
AC-FT	.4	0	1,390	2,800	1,830	906	614	331	142	7.3	0	1.9

CAL YEAR 1996	TOTAL*	698.71	MEAN	7.59	MAX	115	MIN	0	AC-FT	1,390
WTR YEAR 1997	TOTAL	4,046.20	MEAN	11.1	MAX	168	MIN	0	AC-FT	8,030

* Incomplete Record 6-2-97 thru 6-5-97 are estimate flows due to malfunction of recorder

APPENDIX C

COMPONENTS OF LOS ANGELES RIVER FLOW

UPPER LOS ANGELES RIVER AREA: COMPONENTS OF LOS ANGELES RIVER FLOW; 1996-97 WATER YEAR

TOTAL FLOW AT GAGE F-57C-R													
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	
Total:	12950	15320	34460	*33290*	8230	6880	6750	7340	7420	8540	5860	8260	155300

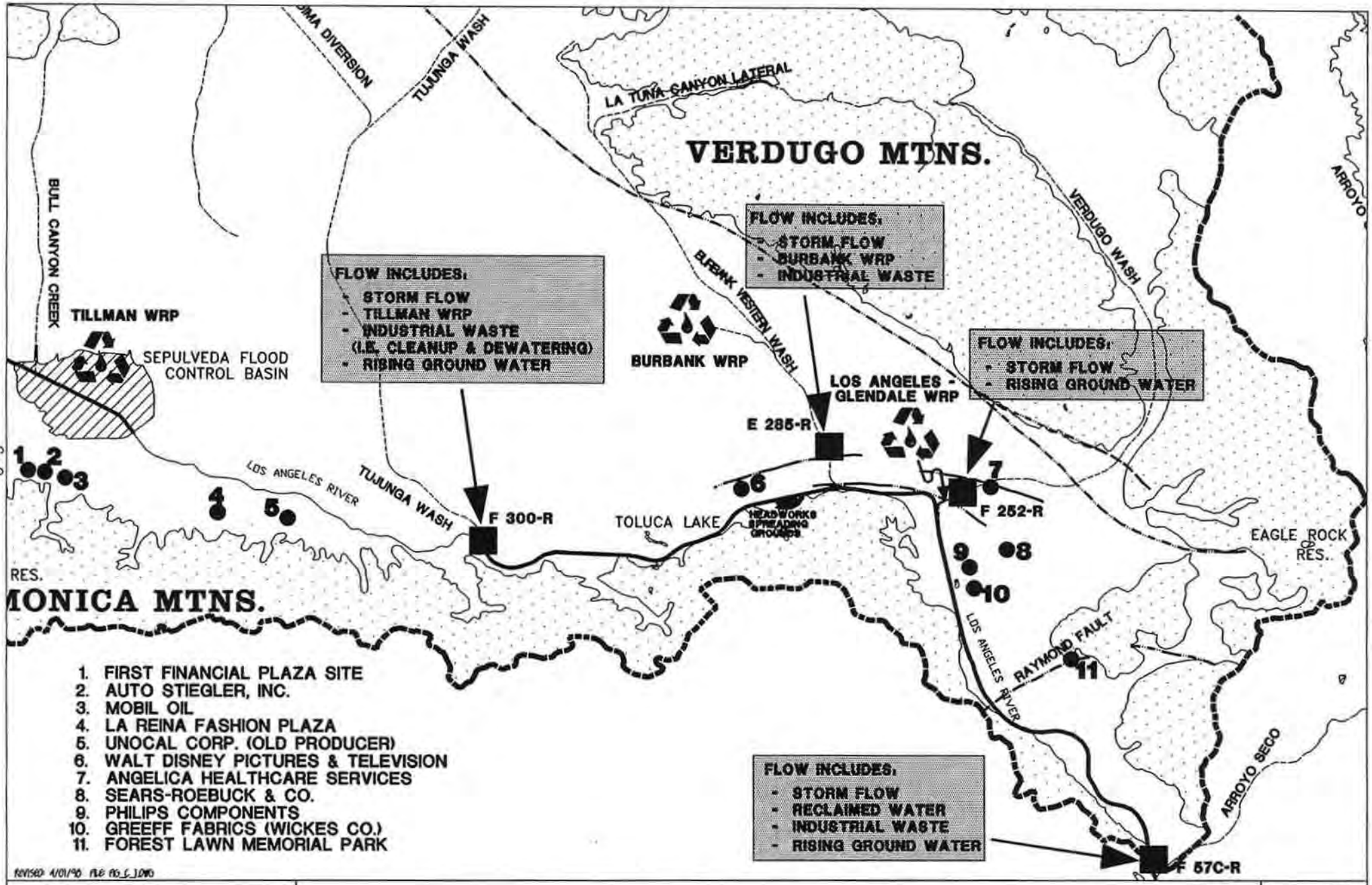
F-57C-R: Storm, Reclaimed, Industrial, Rising Ground Water
F300-R: storm, Tillman, industrial waste, and rising water
E285-R :storm, Burbank WRP, industrial waste
F252-R: storm, rising water

I. RECLAIMED WATER DISCHARGED TO L.A. RIVER IN ULARA														
Tillman:	2686	2872	2930	3073	2741	2645	2868	3548	3011	2883	2997	2753		: Record 35007
L.A.-Glendale:	1481	1601	1615	1591	1347	1390	1236	1166	1108	1714	1068	1106		: Record 16423
Burbank WRP:	511	542	570	558	519	546	496	476	520	478	463	456		: Record 6135
Total:	4678	5015	5115	5222	4607	4581	4600	5190	4639	5075	4528	4315	57565	

II. INDUSTRIAL WATER DISCHARGED TO L.A. RIVER IN ULARA														
Upstream of F300-R	45	32	42	64	43	51	43	51	43	42	41	44	541	: From F300-R separation of flow
Between F300-R and Rubber Dam														
Disney	0	0	0	0	0	0	0	0	0	0	0	0		
Other:	60	60	60	60	60	60	60	60	60	60	60	60		:20% of discharges 'Upstream of F300-R'; approximately 1cfs
Between Rubber Dam and F57C-R														
Headworks:	0	0	0	0	0	0	0	0	0	0	0	0		:pilot project record
Industrial waste:	430	416	430	430	388	430	416	430	416	430	430	416		:7 cfs assumed
Western Drain:	268	228	147	112	15	1	0	0	17	69	143	143		: From E285-R separation of flow
Total:	803	736	679	666	506	542	519	541	536	601	674	663	7469	

III. RISING WATER IN L.A. RIVER IN ULARA														
Total:	250	250	250	250	250	250	250	250	250	250	250	250	3000	: See Section 2.3 of the Watermaster's Report

Flosepr.xls;3/30/98



C-2

1996-97 Water Year ULARA Watermaster Report	**Upper Los Angeles River Area: Components of Los Angeles River Flow**	FIGURE C.1

APPENDIX D

WATER QUALITY DATA

REPRESENTATIVE MINERAL ANALYSES OF WATER

Well Number or Source	Date Sampled	Spec. Cond µmho/c	Mineral Constituents in milligrams per liter (mg/l)												TDS mg/l	Hardness as $CaCO_3$ mg/l
			pH	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	NO_3	F	B		
Imported Water																
Colorado River Water at Eagle Rock Reservoir	1997	963	8.0	68	27	92	4.2	0	139	238	88	0.84	0.22	0.14	599	281
LA Aqueduct Influent	8/21/96	258	8.1	20.4	3.8	25.6	3.21	0	110	17.9	13.4	0.44	0.4	0.46	160	74.9
LA Aqueduct/MWD Filtration Plant Influent	11/5/97	422	7.81	29.6	11.9	40	3.19	0	114.7	63.4	35.9	1.55	0.36	0.48	253	94
State Water Project at Joseph Jensen Filtration Plant (Influent)	96/97 FY	558	7.7	40	16	48	2.9	0	113	105	49	1.94	0.26	0.35	335	165
Surface Water																
Tillman Rec. Plant Discharge to LA River	1997CY	-	6.9	34	9.5	-	-	-	-	101	105	2.9	0.6	0.8	472	123
Los Angeles River at Arroyo Seco	9/95	981	8.0	68.1	24.3	96.5	9.75	ND	171	191	108	7.4	0.3	0.58	666	270
LA/Glendale Rec. Plant Discharge to LA River	1997 CY	-	7.2	40	14	-	-	-	-	134	140	3.4	0.89	0.6	580	160
Ground Water																
(San Fernando Basin - Western Portion)																
4757C (Reseda No. 6)	10/13/83	944	7.8	115	31	43	2.1	-	301	200	33	2.6	0.31	0.24	595	416
(San Fernando Basin - Eastern Portion)																
3800 (No. Hollywood No. 30)	8/5/97	835	7.6	109	22.8	41.7	4.93	0	303	133	35.2	37.4	0.23	0.33	578	338
3841C (Burbank No. 7)	6/24/97	570	7.4	63.2	14.8	35.2	3.39	ND	218.4	105	30.5	19	0.53	-	384	228
3913H (Grandview No. 16)	1/96	540	7.8	60	14	37	3.8	ND	220	54.8	27	12.6	ND	-	326	180
(San Fernando Basin - L.A. Narrows)																
3959E (Pollock No. 4) (b)	3/8/93	794	7.5	77	24	49	NA	0	242	103	58	37.3	0.33	0.38	559	284
(Sylmar Basin)																
4840J (Mission No. 5)	8/5/97	680	7.6	82.9	17	35.3	4.45	0	249	83.8	39.1	24.3	0.33	0.27	439	259
5959 (San Fernando No. 3)	9/3/94	630	7.6	59	22	27	2.7	0.58	225	67	25	21	0.39	-	360	238
(Verdugo Basin)																
3971 (Glorietta No. 3)	7/24/96	840	7.0	104	38.6	40.8	4	ND	210	211	92	40.8	0.16	-	655	420
5058 (CVWD No. 14)	6/2/96	720	7.2	81.1	27.8	30.5	2.8	<1.0	205	88.8	54.7	50.1	0.2	-	437	300

APPENDIX E

DEWATERING AND REMEDIATION PROJECTS

DEWATERING PROJECTS

No.	Company	Contact	Address	ID	Start Date
1	Danalax Engineering Corp.	Krell, Alex	11239 Ventura Blvd.	P	
2		Henkin, Doug	8806 Etiwanda Ave.	P	
3	Delta Tech. Engineering	Abbasi, Z. A.	12800 Ventura Blvd.	P	
4	Helfman, Hoffman & Associates	Varadi, Ivan	5550 Topanga Canyon	D	Jun 19, 1989
5	Encino Spectrum Project	Helfman, Haloosim & Ass.	15503 Ventura Blvd.	D	Jun 14, 1989
6	Home Savings of America	Eli Silon & Associates	13949 Ventura Blvd.	D	Jun 14, 1989
7	Warner Center Ent. Complex	Tsuchiyama and Kaino	5955 Owensmouth Ave.	D	Jun 26, 1989
8	T Violes Construction Company	Viole, Tim, Jr.	15840 Ventura Blvd.	P	
9		Eccleston, C. W.	22020 Clarendon St.	P	
10		Marks, Ronald	5348 Topanga Canyon	P	
11		Helfman, Haloosim & Assoc.	21820 Burbank Blvd.	P	
12	Park Hill Medical Plaza	Anjomshoaa, Mahmoud	7303 Medical Center Dr.	D	Dec 27, 1989
13	Danalex Engineering		12050 Ventura Blvd.	P	
14	Ellis Plumbing Co.	Ellis, Chris	4235 Mary Ellen Ave.	P	
15	Tarzana Office Plaza	Varadi Engineering	18701 Burbank Ave.	P	
16	Helfman, Haloosim & Associates	Varadi, Ivan	5350 White Oak Ave.	P	
17	First Financial Plaza Site	Slade, Richard	16830 Ventura Blvd.	D	Oct 9, 1987
18	Trillium	Lewis, Bill	6310 Canoga Ave.	D	Apr 27, 1988
19	LAMCO	O'Neil, John	21300 Victory Blvd	D	Apr 27, 1988
20	La Reina Fashion Plaza	Blumenfeld, Dolores	14622 Ventura Blvd.	D	Apr 27, 1988
21	Auto Stiegler	Stiegler, John	16721 Ventura Blvd.	D	Oct 31, 1987
22	Sherway Properties	Vasquez, Rodney	4477 Woodman Ave.	P	
23	Ellis Plumbing Co.	Ellis, Chris	19951 Roscoe Blvd.	P	
24	Metropolitan Transit Authority	Higgins, John	Metro Red Line	TD	April, 1995
25		Carter, Dennis	4547 Murietta Ave	P	Jan 16, 1997

Notes:

1) ID - Refers to the type of project;

D: Permanent dewatering required.

P: No dewatering required presently, however there is potential for dewatering in the future.

TD: Temporary Dewatering

2) Start Date - Date project was brought to the attention of the ULARA Watermaster.

PTK: 2/25/98

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REMEDIATION PROJECTS

No.	Company	Contact	Address	ID	Start Date
1	Mobil Oil	Alton Geoscience	16461 Ventura Blvd.	R	May 11, 1989
2	Thrifty Oil	Delta Tech. Eng.	18226 Ventura Blvd.	R	Feb 2, 1990
3	California Environmental	Buckley, Charles	5455 Van Nuys Blvd.	R	Oct 4, 1989
4	Rockwell International	Lafflam, S. R.	6633 Canoga Park Ave.	R	Jun 10, 1990
5	Lockheed	Helgerson, Ron	E. Empire Ave.	R	Jan 5, 1989
6	3M Pharmaceutical	Lee, M. E.	19901 Nordhoff St.	R	Feb 8, 1989
7	Philips Components	Smith, Wade	4561 Colorado St.	R	Jul 14, 1987
8	Greeff Fabrics	Edelson, Bruce	4000 Chevy Chase Dr.	R	March, 1993
9	Hughes Missile Systems Company	Barackman, Martin	Canoga Park, CA	R	February 1995

Notes:

1) ID - Refers to the type of project;
R: Ground water remediation site.

2) Start Date - Date project was brought to the attention of the ULARA Watermaster.

PTK: 2/25/98

File: Clean.xls

APPENDIX F

WELLS DRILLED FOR GROUNDWATER INVESTIGATIONS

WELLS DRILLED FOR GROUND WATER INVESTIGATIONS

1996-97 WATER YEAR

1. Hughes Missile Systems Company
   No new wells were drilled.

2. Lockheed Aircraft Corp.
   Burbank Well No. 10 was added to the Burbank OU plant capacity. The Burbank OU now has a total of eight wells.

3. City of Los Angeles
   Fourteen new monitoring wells were installed to analyze the impact of the East Valley Water Recycling Project on the groundwater.

4. Pacoima Area Investigation
   LADWP installed two monitoring wells downgradient of the Holchem property to characterize the contamination in the Pacoima Area.

5. Rocketdyne Division/Boeing North American, Inc.
   On March 5, 1998 well E-9 was abandoned.

6. Angelica Healthcare
   On December 30, 1997 well abandoned.

APPENDIX G

CRESCENTA VALLEY WATER DISTRICT

CVWD

Crescenta Valley Water District

2700 Foothill Boulevard, La Crescenta, California 91214
Phone (818) 248-3925 Fax (818) 248-1659

October 3, 1997

Mr. Mel Blevins
ULARA Watermaster
P.O. Box 51111, Room 1463
Los Angeles, CA 90051-0100

SUBJECT: **REQUEST FOR ADJUSTMENT**
1997-98 VERDUGO BASIN PRESCRIPTIVE RIGHTS

With the recently concluded 1996-97 water year, the District pumped approximately 3676 Acre-Feet (AF) of groundwater from the Verdugo Basin. This is 382 AF or 12% more than the 3294 AF adjudication and was allowed by the Watermaster and the ULARA Administrative Committee for said year.

I would now like to formally request a similar adjustment for our Verdugo Basin pumping for the 1997-98 water year. I realize that any adjustment will take into account the City of Glendale's projection of Verdugo Basin pumping for the coming year as well as your evaluation of the total safe yield of the basin. A decision early in the water year would certainly help in the District's water production planning process. Perhaps this issue could be agendized for the next regular Administrative Committee Meeting on October 14, 1997. Thanks in advance for your consideration and please call if you need more information.

Very truly yours,

CRESCENTA VALLEY WATER DISTRICT

Michael G. Sovich

Michael G. Sovich
General Manager

MGS:jb

cc: Mr. Don Froelich, City of Glendale

M. BLEVINS
OCT 08 1997

APPENDIX H

METROPOLITAN TRANSPORTATION AGENCY EXTENSION

UPPER LOS ANGELES RIVER AREA WATERMASTER

CITY OF LOS ANGELES VS. CITY OF SAN FERNANDO, ET AL
CASE NO. 650079 – COUNTY OF LOS ANGELES

MELVIN L. BLEVINS – WATERMASTER

OFFICE LOCATION:
111 North Hope Street, Room 1463
Los Angeles, CA 90012
TELEPHONE: (213) 367-1020
FAX: (213) 367-1131

MAILING ADDRESS:
ULARA WATERMASTER
P.O. Box 51111, Room 1463
Los Angeles, CA 90051-0100

April 8, 1998

Mr. John Higgins, Utilities Coordinator
Metro Red Line
Metropolitan Transportation Authority
One Gateway Plaza
Los Angeles, California 90012

Dear Mr. Higgins:

Metropolitan Transportation Authority Dewatering Increase

The Upper Los Angeles River Area (ULARA) Watermaster has reviewed your request for an increase in groundwater discharge allowance of 500 acre-feet to a total of 1700 acre-feet by January 1999. We understand that this is an estimate and that the MTA will submit a revised forecast in October 1998, the end of the 1997-1998 water year, to confirm the amount. The ULARA Watermaster grants approval for this request to increase the allowed amount of temporary groundwater discharge during dewatering for construction of the Metro Red Line tunnels underneath the Santa Monica Mountains. The Watermaster will notify the Administrative Committee at its board meeting on April 14, 1998.

Please continue to keep me advised as to your situation. If you need further information, please call me at (213) 367-1020 or Ms. Patricia T. Kiechler at (213) 367-0921.

Sincerely,

M L Blevins

MELVIN L. BLEVINS
ULARA Watermaster

PTK:jc

c: Mr. Gerardo Alvarez, Metropolitan Transportation Authority
Ms. Patricia T. Kiechler, Watermaster Office ✓
Mr. Frederic A. Fudacz, Special Counsel to Watermaster

ULARA Administrative Committee
Mr. Fred Lantz, President, City of Burbank
Mr. Michael Sovich, Crescenta Valley Water District
Mr. Michael Drake, City of San Fernando
Mr. Donald Froelich, City of Glendale
Mr. Robert Yoshimura, City of Los Angeles

bc: Melvin L. Blevins Gerald A. Gewe Richard A. Nagel
Arthur A. Walsh Ernest F. Wong

J14-MTA1700

ULARA Watermaster

APPENDIX I

METROPOLITAN WATER DISTRICT DEWATERING

MWD
METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

Office of the General Manager

October 8, 1997

Mr. James F. Wickser
Chief Engineer/Assistant General Manager
Los Angeles Department of Water & Power
111 North Hope Street, Room 1455
Los Angeles, California 90012

Dear Mr. Wickser:

Procedures for Crediting Groundwater Dewatering
at Metropolitan's Jensen Treatment Plant

On Wednesday, September 24, 1997 Nina Jazmadarian, of my staff, met with Melvin L. Blevins (ULARA Watermaster) to discuss procedures in which Metropolitan Water District (Metropolitan) would credit the City of Los Angeles Department of Water and Power (LADWP) for the volume of groundwater extracted from the San Fernando Basin at Metropolitan's Jensen Treatment Plant. Your signature on this letter will constitute such an agreement in procedures under the terms outlined below.

Background

In April 1991, Metropolitan began continuous dewatering operations at our Jensen Treatment Plant to maintain the groundwater level lower than the bottom of the Finished Water Reservoir 2. ULARA Watermaster was made aware of this dewatering operation by letter dated December 16, 1991, and in subsequent telephone conversations between Mr. Blevins and Metropolitan's Engineering Division staff. From April 12, 1991 through September 30, 1997, Metropolitan had pumped 1,340 acre-feet from the basin, which is summarized below. Also, as requested by ULARA Watermaster, the volume of water pumped in Water Year 1996-97 was 185 acre-feet. This figure is an estimate for the year, as monthly figures were not available during that time.

Terms

Monthly crediting will begin with the October 1997 invoice, which will be mailed on November 10, 1997. Metropolitan will credit LADWP's invoice monthly for the amount of groundwater which is pumped each month. This volume of water will be credited at Metropolitan's full service untreated rate as a separate line item referred to as LA-JP, "Water Exchange for Watermaster Requirements". Metropolitan will provide the ULARA Watermaster with a monthly reporting of this volume of water as well. Additionally, the water that has been produced from April 1991 through September 1997 will be credited on the October 1997 invoice. This volume of water will be credited at Metropolitan's full service

untreated rate at the time of production. Listed below is a table reflecting the historic production of this water and the rate at which it will be credited to LADWP.

Rate Period	Volume, af	Full Service Untreated Rate, $/af	Credit, $
4/91 - 6/91	140.0	192	26,880
7/91 - 12/91	220.0	217	47,740
1/92 - 6/92	79.0	222	17,538
7/92 - 6/93	126.0	269	33,894
7/93 - 6/94	200.0	318	63,600
7/94 - 6/95	167.0*	335	55,945
7/95 - 12/96	268.0*	344	92,192
1/97 - 9/97	140.0*	349	48,860
Total	1,340.0		386,649

* Please note that the volumes pumped for the from July, 1994 through June, 1997 were not metered on a monthly basis; thus, the volumes provided for the given rate periods are estimates

If you are in agreement with these terms please sign below, return this letter to me, and a signed copy of this original letter will be returned to you. If LADWP or if the ULARA Watermaster require further information, please contact Ms. Jazmadarian at (213) 217-6583 or Amy Gallaher at (213) 217-6573. Thank you for your cooperation with this matter.

Very truly yours,

Jay Malinowski
Chief of Operations

for

James F. Wickser
Los Angeles Department of Water and Power
Chief Engineer/Assistant General Manager

AG/ms
(O:\OPSEXEC\CONTRADM\AGREEMTS\ULARA.DOC)

cc: Mr. Melvin L. Blevins
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APPENDIX J

PURGE STUDY

Purging 3-5 Well Pore Volumes: Is This Practical for Sampling Monitoring Wells in Deep Alluvial Aquifers?

By Richard A. Nagel and Hadi S. Jonny

1.0 Introduction

The intent of sampling a monitoring well is to obtain a representative groundwater sample from the aquifer. This generally requires that a few conditions be satisfied. Foremost is to eliminate the stagnant column of water inside the well in order to obtain a sample that originates from the aquifer adjacent to the well's perforated zone. One commonly accepted way to achieve this goal is to purge a minimum of three to five well pore volumes. In addition, basic water quality parameters such as pH, temperature, turbidity, dissolved oxygen, and electrical conductivity are expected to reach a stage of equilibrium.

These requirements may be easy to achieve in very shallow wells located within thin aquifer environments. However, in deep alluvial aquifer settings, obtaining three to five well pore volumes can be very time consuming (in some instances involve hours of pumping) and costly due to increased volumes of containment water requiring proper disposal. This is demonstrated by the following comparison of purging two 4-inch wells at a rate of 5 gallons per minute (gpm). For practical purposes, one well is considered a shallow well and the other is a deep well.

	Shallow Well	Deep Well
Diameter (inches)	4	4
Depth (feet)	40	350
Depth to Water (feet)	10	50
3 Pore Volumes (gallons)	**59**	**589**
Pumping Time (minutes)*	**12**	**118**

* pump rate = 5 gpm

By comparison, the shallow well requires 12 minutes of pumping or 59 gallons of water and the deep well requires almost 2 hours of pumping or 589 gallons.

1.1 Objective

The objective of this study was to evaluate the relationship between a group of targeted constituents and basic water quality parameters to determine if a more rational method is appropriate in obtaining a representative sample as compared to the current 3-5 purge volume standard.

2.0 Background

The San Fernando Basin is an adjudicated groundwater basin with an areal coverage of approximately 112,000 acres or 175 square miles. The groundwater system is comprised of alluvial sediments to depths of at least 1,200 feet in the deepest areas, primarily in the eastern half of the basin. The depth to the water table varies from as shallow as 5 feet to greater than 350 feet. The major wellfields are located in areas where the deeper water table is present.

Unconfined aquifer characteristics dominate this groundwater system, especially near the supply wells. The deepest wells contain multiple perforated intervals that extend to as much as 800 feet. On average, these wells provide a flow of 4,000 gallons per minute (gpm), primarily because of relatively high hydraulic conductivities (K). Typical K values range from 100 feet/day (f/d) to 400 f/d.

Groundwater rights have a long and colorful history in the San Fernando Basin. With litigation spanning a quarter century, water rights were finally adjudicated in a 1979 California Superior Court decision referred to as the San Fernando Judgment. Los Angeles was granted the largest right with an annual allotment of approximately 90,000 acre-feet (AF). The two other primary parties to the litigation, Burbank and Glendale, were each granted annual rights of approximately 5,000 AF.

In the early 1980s, the ability to exercise these rights became significantly impacted due to the discovery of volatile organic contaminants, primarily trichloroethylene (TCE) and perchloroethylene (PCE), that were detected at the part-per-billion level in many supply wells. As a result of a comprehensive survey, TCE and PCE were discovered above their maximum contaminant levels (MCLs) in about 40% of Los Angeles' wells and 100% of Burbank's and Glendale's wells. This discovery prompted numerous programs and investigations that culminated in the Remedial Investigation (RI) of Groundwater Contamination of the San Fernando Valley that was completed in 1992 by the Los Angeles Department of Water and Power under a cooperative agreement with the U.S. Environmental Protection Agency. The purpose of the RI was to define the nature and extent of the contamination.

One element of the RI involved the installation of 87 monitoring wells. Each well was installed as a single depth zone monitoring well having one perforated (screened) zone. At several sites, cluster well sets consisting of up to four wells were installed in close proximity to one another. Another groundwater monitoring project has involved the installation of numerous monitoring wells to characterize nitrate (NO_3) contamination near one of Los Angeles' major well fields. Many of the monitoring wells have dedicated submersible pumps intended to meet sampling requirements for a multitude of groundwater monitoring programs.

The monitoring wells all range in size from 4 to 6 inches in diameter and range in depth from 50 to 800 feet. The typical construction of these wells from the bottom to the top is a single zone of stainless steel wire-wrap screen, followed by a 20-foot blank section of stainless steel casing, and finally completed with low carbon steel blank casing to the ground surface. Each well has been extensively developed using standard practices such as bailing, swabbing, surging, pumping, and in some instances jetting, until a turbidity level generally lower than 5 NTUs has been achieved.

Further investigations of the San Fernando Basin will add more monitoring wells to the 105 existing wells that are sampled regularly for a wide variety of constituents. Thus, to maintain practicality in continuing various groundwater monitoring programs, a rational method should be evaluated that requires less time and cost, and that may supersede the more arbitrary purging requirements currently being used.

3.0 Evaluation Criteria - Well Setting Conditions

The intended purpose of sampling a monitoring well is to obtain a sample that is representative of the groundwater adjacent to the well's screen. In theory, this occurs when groundwater has moved into a well's perforated zone, and is finally intercepted by the well's pump system. Practically speaking, this occurs at some period after a well has been pumped and the conditions inside that well have stabilized.

In establishing the evaluation criteria, it was determined that three 'well setting' conditions should be tested. A well's setting is defined by the relative depth of the well's perforated zone to the water table and the pump location. The three possible settings are:

- Case A - The water table and the pump are both *adjacent* to the perforated zone
- Case B - The water table and the pump are both *above* the perforated zone
- Case C - The water table is *above* and the pump is *adjacent* to the perforated zone

4.0 Test Set-Up

In each test case, the first item calculated was the well's pore volume. This was derived from the column of water present between the water table and the bottom of the well. The sampling frequency was selected as every five to 10 minutes upon commencement of pumping (purging the well). The basis for this frequency was simply the coordination of collecting samples and measuring the basic water quality parameters between sampling events.

In each test case, the method of water quality analysis was EPA Method 524.2 for TCE and PCE and Method 300A for NO_3. In general, these were the only known contaminants near or above their MCLs. The field parameters, measured at the same frequency, were turbidity, electrical conductivity, dissolved oxygen (DO), pH, and temperature.

Table 1 and Figures 1 through 3 provide the basic well setting information for each of the monitoring wells used to test each well setting scenario (Cases A through C).

5.0 Test Results

For Case A to purge the stagnant water inside the well, at a minimum, the volume of water inside the pump column should be purged prior to obtaining a representative sample. For Case B, the water inside the pump column, the water between the screen and pump setting, and the volume of water associated with the drawdown inside the well, should be purged. Finally, for Case C, the water inside the pump column, plus the volume of water associated with the drawdown inside the well should be purged.

Table 2 indicates the minimum ranges of purge volumes necessary for obtaining a representative sample under each test case condition and provides the percent pore volume for stabilization of the field parameters and drawdown levels.

5.1 Case A - The Water Table & Pump Are Adjacent to the Perforated Zone

- **Well TJ-MW-02:**

Test A: August 13, 1996

Monitoring well TJ-MW-02 was tested on two separate occasions. In both instances, the levels of TCE and PCE were non-detect (ND), therefore NO_3 was the only constituent that was evaluated. Evaluation of Figure 4 shows that within 5 minutes of pumping or 25% of one purge volume, the NO_3 level was representative to those throughout the entire test period, including the purging of nearly 4 pore volumes (80 minutes of pumping).

The measured field parameters are provided in Figure 5, and illustrate similar characteristics with the exception of DO, which appears to decrease near 20 minutes of pumping. Field reports indicated that the instrumentation used to measure DO was not functioning properly. Turbidity was inadvertently not measured during this test.

Test B: January 29, 1997

During the second test, the water table was approximately 12 feet lower than Test A. The results were very consistent, with NO_3 levels constant from start to finish (see Figure 6). One sidebar note is that the overall NO_3 levels for the second event were about three times lower than the previous test. Figure 7 demonstrates that all the field parameters, except DO, stabilized after 10 minutes of pumping.

- **Well TJ-MW-03:**

This test was conducted on February 6, 1997. Evaluation of Figure 8 shows that TCE levels stabilized at five minutes of pumping and remained stable throughout the remainder of the test period (Figure 8). NO_3 levels were relatively stable, especially considering the low levels and the analytical precision at their low detection limits. The field parameters (Figure 9) were also stable throughout the entire test, except turbidity, which stabilized after 20 minutes of pumping. PCE was not plotted because the levels were ND. The drawdown was measured just under 3 feet and stabilized within 30 seconds.

5.2 Case B - The Water Table and the Pump are Above the Perforated Zone

- **Wells CS-C01-285, CS-CO2-250 and CS-CO2-335:**

Evaluation of the TCE, PCE, and NO_3 curves for each well (Figures 10-12), show that each constituent stabilized between 5-20 minutes of pumping or between 40-101% purging of one well pore volume. These tests took place on September 15, 1997 and were specifically selected for this study because the TCE and PCE levels were considerably higher than the other tests, ranging from 200-240 ug/L for TCE and 100-230 ug/L for PCE.

For CS-CO1-285, the TCE and PCE levels were representative at 40% of one well pore volume and 80% for NO_3. For CS-CO2-250, TCE and PCE levels were representative at 76% and NO_3 between 76-101%. Finally, CS-CO2-335 had correlative TCE; PCE and NO_3 levels at about 73% of one well pore volume.

The field parameters also demonstrated equilibrium after approximately 20 minutes of pumping or 80-101 % of one well pore volume (Figures 13-15). Drawdown levels ranged between 0.1 and 1.2 feet and stabilized in less than 10 seconds.

5.3 Case C - The Water Table is Above and the Pump is Adjacent to the Perforated Zone

- **Well TJ-MW-04:**

The graph for this February 6, 1997 test (Figure 16) demonstrates that representative TCE, PCE and NO_3 samples can be achieved after 5-10 minutes of pumping or between 18-37% of one pore volume. Although the levels for these constituents were low, the data does show that all constituent levels were very constant during the period between 5 and 100 minutes of pumping, a pattern consistent for each analyte.

Analyses of the field parameters (Figure 17) indicates that stabilization occurred soon after 10 minutes of pumping or approximately 37% of one purge volume, except

turbidity, which required 20 minutes. The drawdown was measured throughout the entire test and stabilized at 0.4 feet and in less than 10 seconds.

6.0 Analytical Formula for Calculating Purge Volume

In describing a well's static condition, it can be assumed that the water level elevation on each side of the well casing is the same, and that the corresponding pressure inside the well, and within the adjacent formation, are the same at their corresponding depths.

During the initial pumping period, a portion of the water column above the pump begins to move towards the pump intake until the water level has stabilized. Once this has occurred, the primary source of water moving toward the pump's intake originates from the column of water beneath the pump, and eventually is water exclusively derived from the aquifer.

To describe this theory, an analytical formula was developed to calculate the minimum pumping time and the associated purge volumes necessary to meet the goal of obtaining a representative sample. The method calculates the volume of water inside the pump column, plus the water adjacent to the blank casing (below the pump), and the volume of water attributed to the well's drawdown. The calculations are provided in Table 3.

In summary, for each test case, the minimum purge volume and pumping time were calculated and compared to the study results (see Table 4). The data show a strong correlation for each well setting type and validates the analytical approach in determining the appropriate purge volumes. In the absence of the necessary resources to conduct an in-situ purge study, this approach can serve as a useful guide to planning a groundwater sampling program.

7.0 Conclusions

This study was conducted on monitoring wells where unconfined aquifer characteristics are present with relatively high hydraulic conductivities (100 f/d – 400 f/d). Each test case consisted of what is considered as a low pumping rate (< 11 gpm) for these types of conditions. Evaluation of all the possible 'well setting' conditions shows that purging less than one well pore volume was sufficient for obtaining a representative sample for TCE, PCE and NO_3.

Analysis of the field parameters shows that, in most instances, stabilization occurred with less than one well pore volume. The results further suggest that representative samples can be obtained with even smaller purge volumes (35-59%) when the pump is set within the screened zone. In this instance, it appears that formation water replaces the water adjacent to the screen shortly after the discharge of the pump column water.

The main conclusions are summarized as follows:

- In general, purging one well pore volume produced representative TCE, PCE and NO_3 data.

- A further reduction in purge volumes is possible when the pump is set adjacent to the perforated zone (35-59% of one pore volume).

- The analytical calculation of a purge volume is validated by the study results. In general, purging the volume of water inside the pump column, plus the water adjacent to the well's blank casing (below the pump) and the volume associated with the well's drawdown, compared favorably with the study results.

- In most instances, the field parameters stabilized after purging one well pore volume.

A graphical representation of the study results as compared to three pore volumes (in gallons and pumping time) are presented in Figures 18 and 19. Comparison of the study results to the analytical calculation of the required purge volume is presented in Figure 20. The following ranges of purge pore volumes, by test case, have been derived from the test results:

Case A: The Water Table & Pump Are Adjacent to the Perforations

	Purge (Pore) Volume Requirements for Obtaining a Representative Sample			Calculated 3 Pore Volumes	
Element	**Percent (max. range)**	**Pump Time (min.)**	**Volume (gallons)**	**Pump Time (min.)**	**Volume (gallons)**
TCE/NO_3	25-59%	**5-10**	***19-22***	**51-61**	***187-263***
Field Parameters	49-59%				
Stabilized Drawdown	<3%				
Analytical Calculation	33-52%				

Case B: The Water Table & Pump Are Above the Perforations

	Purge (Pore) Volume Requirements for Obtaining a Representative Sample			Calculated 3 Pore Volumes	
Element	**Percent (max. range)**	**Pump Time (min.)**	**Volume (gallons)**	**Pump Time (min.)**	**Volume (gallons)**
$TCE/PCE/NO_3$	73-101%	**5-20**	***49-111***	**52-70**	***420-607***
Field Parameters	80-101%				
Stabilized Drawdown	<1%				
Analytical Calculation	57-70%				

Case C: The Water is Above & the Pump is Adjacent to the Perforations

	Purge (Pore) Volume Requirements for Obtaining a Representative Sample			Calculated 3 Pore Volumes	
Element	**Percent (max. range)**	**Pump Time (min.)**	**Volume (gallons)**	**Pump Time (min.)**	**Volume (gallons)**
TCE/PCE/NO_3	37%	5-10	*21*	82	*344*
Field Parameters	37%				
Stabilized Drawdown	<1%				
Analytical Calculation	30%				

These data and conclusions support the premise that the currently accepted standard purge volume standard can be reduced by a ***minimum*** of two-thirds, which will result in a substantial reduction of field time, and if necessary, containment volumes and disposal costs.

8.0 Recommendations

The test cases evaluated for this study suggest that purging requirements can be reduced from three pore volumes to one pore volume for the targeted analytes of TCE, PCE and NO_3, and further if the pump is set adjacent to the well's perforations.

It is recommended that each particular groundwater monitoring program validate this concept with an in-situ study targeting the program's constituents of concern. Testing each well setting condition with the associated aquifer conditions is the most effective approach to validating a reduction in the purge volumes. In the absence of meeting this premise, the analytical approach to calculating the minimum level of pumping necessary to purge the stagnant water column provides valuable guidance towards meeting the minimum purging requirements.

It is also important to note that prior to implementing any of these concepts, each well should be carefully assessed to determine that it was properly constructed and developed.

Following is a summation of the recommendations:

- In general, purge requirements should be reduced from three well pore volumes to one well pore volume.
- Further reductions may be realized if the pump is set adjacent to the perforated zone.

- A conservative approach to determining the appropriate purge volume is to use the analytical method and increase that value by an additional 25%. This method calculates the column of water inside the pump column, plus the water adjacent to the well's blank casing (below the pump), and finally the volume of water associated with the well's drawdown.

- Determining the purging requirements for other targeted constituents (e.g. metals, etc.) may require a separate in-situ study.

- Another conservative option to determining the purge volume requirements is to sample the well upon field parameter stabilization.

Acknowledgements:
The authors would like to express sincere appreciation to the following individuals whom provided significant contributions to this publication: Mr. Melvin L. Blevins, Watermaster of the Upper Los Angeles River Area, for his study review and in-depth hydrogeologic perspective. Dr. John Mann, consulting hydrogeologist, for his critical review and vast understanding of groundwater systems. Mr. Ernest Wong, Waterworks Engineer, for his leadership, encouragement and precise editing skills. Mr. Mark Mackowski, R.G.E., for his report contributions

APPENDIX K

BLENDING OPERATIONS PLAN FOR CITY TRUNKLINE AND RIVER SUPPLY CONDUIT

August 8, 1997

Vera Melnyk-Vecchio, P.E.
District Engineer - Metropolitan District
State Department of Health Services
Drinking Water Field Operations Branch
1449 West Temple Street, Room 202
Los Angeles, California 90026-5698

Dear Ms. Melnyk-Vecchio:

Blending Operations Plan for the City Trunkline and River Supply Conduit

The following blending operations plan for the City Trunkline (TL) and River Supply Conduit (RSC) was developed in response to your letter dated January 16, 1997 and titled "Operation Plan to Control Trichloroethylene Level in the River Supply Conduit. System No. 1910067." This operations plan was discussed at a meeting held with you on April 15, 1997. The meeting participants from the Los Angeles Department of Water and Power (LADWP) were Mr. John D. Miller, Mr. Kendrick K. Okuda and Mr. Steve S. Hirai. This plan was effective as of May 1, 1997. The first monthly reports for May, June, and July 1997 will be submitted to your office by August 10, 1997.

The LADWP has groundwater wells in the San Fernando Basin that have detectable levels of contaminants such as TCE, PCE and NO_3. The active San Fernando Basin wells consist of wells from the following well fields: Tujunga, Rinaldi-Toluca, North Hollywood, North Hollywood Aeration, Erwin, Whitnall, and Verdugo well fields. All mention of wells in this letter and operations plan will refer to the San Fernando Basin wells only. Groundwater from wells that have detectable contaminants is blended with groundwater from other wells with no or very low concentrations of contaminants and with filtered and disinfected surface water from LADWP's Van Norman Complex to ensure that the concentration of contaminants entering the distribution system is well below the maximum contaminant levels (MCLs). The wells are blended into the distribution system at the City TL and the RSC. The Tujunga (TJ) wells are blended exclusively into the City TL with variable amounts of treated surface water; the blended water is represented by the TJ CANTERBURY sample tap. The Rinaldi-Toluca, North Hollywood, North Hollywood Aeration, Erwin, Whitnall and Verdugo wells are blended exclusively into the RSC with variable amounts of treated surface water and with blended supply from the City TL; this blended water is represented by the RSC BCL sample tap.

There are three contaminants that pose a risk to exceeding the MCL in the blended supply of water; these contaminants are TCE, PCE and NO_3. All other contaminants have been historically very low or non-detect in our wells, and thus do not pose a significant risk to exceeding the MCLs in the blended supply. The purpose of this plan is: 1) to prevent TCE, PCE and NO_3 from exceeding the MCLs in the City TL and the RSC at all times, and 2) to determine compliance with the MCLs for TCE, PCE and NO_3. This plan consists of two major sections. The first section addresses an operations plan for the City TL and the RSC. The second section addresses compliance determination for TCE, PCE and NO_3 at the two points where groundwater enters the distribution system.

If you have any questions, please contact Mr. Kendrick K. Okuda at (213) 367-3301.

Sincerely,

ORIGINAL SIGNED BY
ROBERT H. GILES FOR
BRUCE W. KUEBLER
Director of Water Quality
and Distribution Division

SSH:gg

Enclosure

c: Ms. Vera Melnyk-Vecchio
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DEPARTMENT OF HEALTH SERVICES

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Blending Operations Plan for the City TL and RSC

I. **Purpose**

A. Prevent TCE, PCE and NO_3 from exceeding the MCLs in the City TL and RSC at all times.

B. Determine compliance with the MCLs for TCE, PCE and NO_3.

II. **Operations Plan**

A. Criteria for Implementation

1. The operations plan will not be implemented if no well is serving the City TL or RSC.
2. Implement operations plan if any well is serving the City TL or RSC.
3. If the North Hollywood Aeration wells are the only wells serving the distribution system, the operations plan will be implemented only for NO_3 due to the North Hollywood Aeration Tower's ability to remove volatile organic compounds (VOCs).

B. The contaminants of concern are TCE, PCE and NO_3.

C. As a guideline, a well will be operated if the following conditions are met:

1. TCE concentration is less than 10 µg/L (MCL = 5 µg/L).
2. PCE concentration is less than 10 µg/L (MCL = 5 µg/L).
3. NO_3 (as N) concentration is less than 15 mg/L (MCL = 10 mg/L).

D. Well and System Operations

1. All well operations and system operations affecting the City TL or RSC will be planned and coordinated with the Engineering Operations & Analysis (EOA) group of the Water Quality Section.
   a) The EOA group will assign one person to be responsible for coordinating all well and system operations at all times. This person will attend a morning meeting each business day to discuss all operations for the day. This person is the contact person for planning and coordinating all well operations and system operations affecting the City TL or RSC.
   b) Well and system operations affecting the City TL or RSC will be limited to normal business hours when possible.
   c) Emergency and unplanned operations will be handled on a case by case basis.
2. EOA will use a predictive contaminant model as a tool to assess the impact of planned operations on the TCE, PCE and NO_3 values at the TJ CANTERBURY and RSC BCL sample taps before well and system operations occur.

3. EOA will review TCE, PCE and NO_3 data from the TJ CANTERBURY and RSC BCL sample taps to determine if operational changes are necessary to meet compliance requirements.
   a) Operational changes will be implemented if the daily TCE, PCE or NO_3 (as N) values exceed 3 µg/L, 3 µg/L or 6 mg/L, respectively. These values are 60% of the MCL, respectively.
   b) Daily sample analysis will be implemented for a minimum of 2 days if the daily TCE, PCE or NO_3 values exceed 3 µg/L, 3 µg/L or 6 mg/L, respectively. Daily analysis will continue until there are 2 consecutive days where the TCE, PCE or NO_3 values are less than 3 µg/L, 3 µg/L or 6 mg/L, respectively.

III. Compliance Determination

A. Criteria for Sampling

1. Sampling will not be performed if no wells are serving the distribution system.
2. Daily sampling for TCE, PCE and NO_3 will be performed at the TJ CANTERBURY sample tap only, if any Tujunga well is serving the City TL exclusively and no other wells are serving the RSC.
3. Daily sampling for TCE, PCE and NO_3 will be performed at the RSC BCL sample tap, if any well besides the Tujunga wells is serving the RSC.
4. If the North Hollywood Aeration wells are the only wells serving the distribution system, daily sampling will be implemented only for NO_3 at the RSC BCL sample tap due to the North Hollywood Aeration Tower's ability to remove VOCs.

B. Water quality compliance will be determined by collecting daily samples for TCE, PCE and NO_3 at the TJ CANTERBURY and/or RSC BCL sample taps. Analysis will be performed as follows:
   1. Samples collected Monday and Tuesday will be analyzed on Wednesday.
   2. Samples collected Wednesday and Thursday will be analyzed on Friday.
   3. Samples collected Friday, Saturday, and Sunday will be analyzed on Monday.

C. EOA will determine compliance by reviewing the data from the TJ CANTERBURY and/or RSC BCL sample taps.

D. Reporting to DHS
   1. DHS will be notified within 48 hours if any MCL is exceeded at either the TJ CANTERBURY or RSC BCL sample taps. Resampling is already addressed because of daily sampling.
   2. A monthly report will be submitted to DHS (Sacramento) via EDT and DHS (Los Angeles County) via mail for the TJ CANTERBURY and RSC BCL sample taps by the 10th day of each month for the previous month's data. The report will contain TCE, PCE and NO_3 data obtained from samples collected every Friday of the report month.

APPENDIX L

ACTION ITEMS 1997-98

ACTION ITEMS

WATERMASTER ACTIVITIES FOR 1997-98 REPORT

- Investigate Dewaterers and Small Pumpers
- Develop Public Notification of Water Rights to DHS offices for drillers
- Coordinate Water Service for County Areas
- Continue working with Department of Building and Safety to notify potential dewaterers
- Address CalMat Mining Operations
- Facilitate Pacoima Area Investigation
- Facilitate dissemination of information on chromium standards
- Respond to Middle Ranch Claim
- Evaluate method to calculate Separation of Flow at Gage F57
- Continue conversion of Basinwide Groundwater Flow Model to the GMS System
- Re-evaluate Verdugo Basin Safe-Yield
- Complete the installation of pressure transducers in the Remedial Investigation and other monitoring wells

APPENDIX M

CONVERSION FACTORS

CONVERSION FACTORS

Quantity	Metric Unit	Customary Unit	To Convert to Customary Unit Multiply Metric Unit By	To Convert to Metric Unit Multiply Customary Unit By
Length	millimeters (mm)	inches (in)	0.03937	25.4
	centimeters (cm)	inches (in)	0.3937	2.54
	meters (m)	feet (ft)	3.2808	0.3048
	kilometers (km)	miles (mi)	0.62139	1.6093
Area	square millimeters (mm^2)	square inches (in^2)	0.00155	645.16
	square meters (m^2)	square feet (ft^2)	10.764	0.092903
	square meters (m^2)	acres (ac)	0.00025	4046.9
	hectares (ha)	acres (ac)	2.4710	0.40469
	square kilometers (km^2)	square miles (mi^2)	0.3861	2.590
Volume	liters (L)	gallons (gal)	0.26417	3.7854
	megaliters	million gallons (10^6 gal)	0.26417	3.7854
	cubic meters (m^3)	gallons (gal)	264.17	0.003785
	cubic meters (m^3)	cubic feet (ft^3)	35.315	0.028317
	cubic meters (m^3)	cubic yards (yd^3)	1.308	0.76455
	cubic meters (m^3)	acre-feet (ac-ft)	0.00081	1233.5
	cubic decameters (dam^3)	acre-feet (ac-ft)	0.8107	1.2335
Flow	cubic meters per second (m^3/s)	cubic feet per second (ft^3/s)	35.315	0.028327
	liters per second (L/s)	cubic feet per second (ft^3/s)	0.035325	28.317
	liters per second (L/s)	gallons per minute (gal/min)	15.850	0.06309
	liters per minute (L/min)	gallons per minute (gal/min)	0.26417	3.7854
	liters per day (L/day)	gallons per day (gal/day)	0.26417	3.7854
	megaliters per day (ML/day)	million gallons per day (mgd)	0.26417	3.7854
	cubic decameters per day (dam^3/day)	acre-feet per day (ac-ft/day)	0.8107	1.2335
Mass	kilograms (kg)	pounds (lb)	2.2046	0.45359
	megagrams (Mg)	tons	1.1.023	0.90718
Velocity	meters per second (m/s)	feet per second (ft/s)	3.2808	0.3048
Concentration	milligrams per liter (mg/L)	parts per million (ppm)	1.0	1.0
Temperature	degrees Celsius (°C)	degrees Fahrenheit (°F)	(1.8 x °C)+32	(°F - 32)/1.8

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