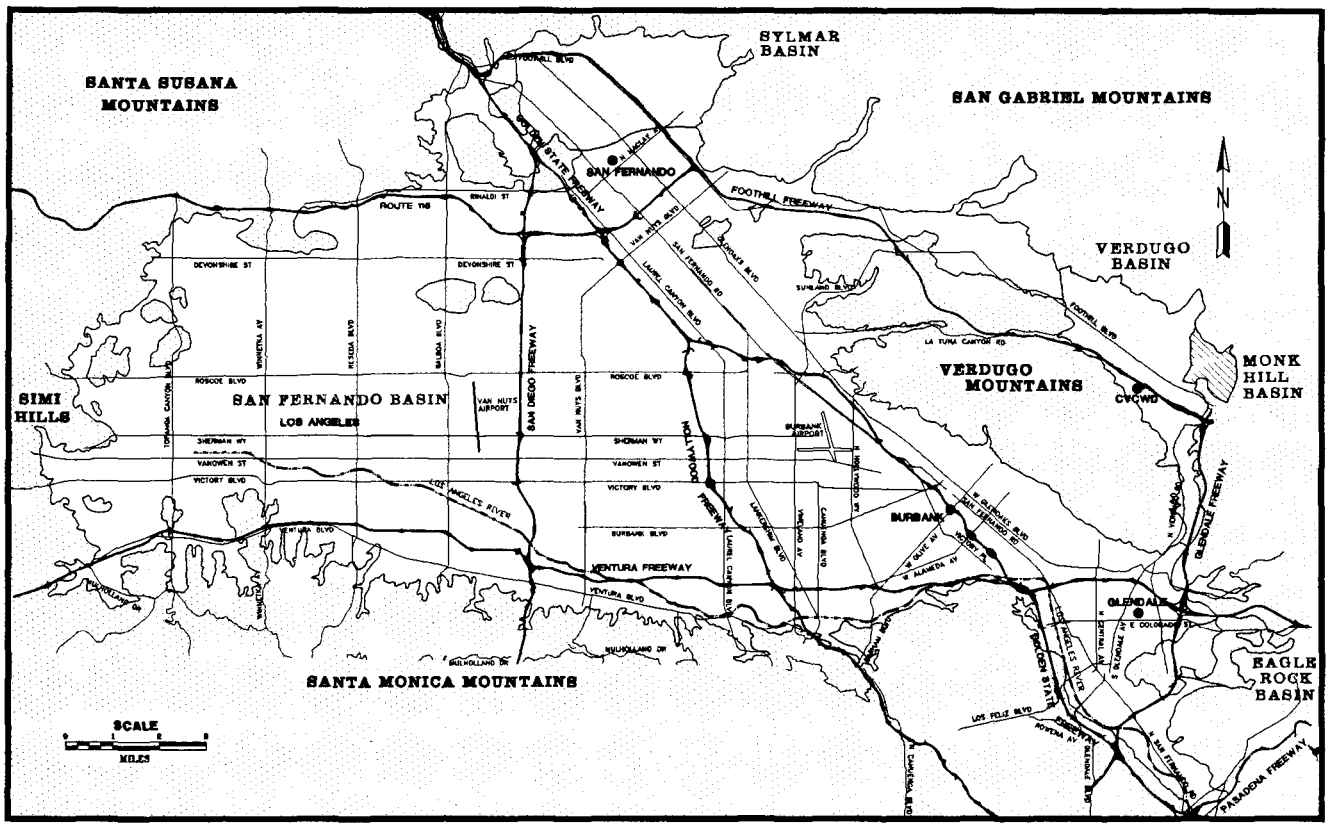
UPPER LOS ANGELES RIVER AREA WATERMASTER

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

1993-94 WATER YEAR
OCTOBER 1, 1993 - SEPTEMBER 30, 1994



MAY 1995

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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 1994-95 Water Year and indicates the water in storage to the credit of each party as of October 1, 1994. In addition, this report includes background information on the history of the San Fernando Case, information as to each basin and the ULARA in total on water supply, groundwater extractions, groundwater levels, quantities of imported water use, recharge operations, water quality conditions, and other pertinent information occurring during the 1993-94 Water Year pursuant to the provisions of the Judgment.

Updates on the development of significant issues that took place through the printing of this report are discussed in Section 1.5. These include status of the Headworks Wellfield Remediation Project, the progress of the East Valley Water Recycling Project, the status of the Pollock Wellfield Redevelopment, Burbank's reclaimed system expansion, the Burbank and Glendale OU's, and the Glendale Water Treatment Plant in the Verdugo Basin. The progress of the San Fernando Valley Remedial Investigation and related activities is discussed in Section 3.6.

In dealing with the amount of stored groundwater, change in groundwater storage and the groundwater contours for the ULARA, eight additional monitoring wells are required at the general locations shown in Appendix L. These monitoring wells would provide more control on the status of groundwater levels and underflow calculations required by the ULARA Judgment. Some of these wells have been installed as part of other projects, and may provide the data required. I strongly recommend that these wells be installed in the near future to ensure adequate groundwater management for the future.

By the next ULARA Watermaster Report (May 1996) adjustments for the return water credit for Glendale (Forest Lawn water), and Burbank (Valhalla water) will be made for the period 1978-79 through 1992-93. Adjustments have already been made for the Water Year 1993-94. Other matters that need to be investigated are the pumped groundwater by CalMat in the San Fernando Basin, and Meurer Engineering (Santiago Estates) in the Sylmar Basin. Additional investigation and review of the amounts to be pumped for the Burbank OU and the Glendale North and South OU's are needed.

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

Sincerely,

M L Blevins

MELVIN L. BLEVINS
ULARA Watermaster

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MAY 1995

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1. 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 ground water 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 ground water 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 ground water basins in ULARA are the San Fernando, Sylmar, Verdugo, and Eagle Rock Basins.

The San Fernando Basin, 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 San Fernando Basin.

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 ground water 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 ground water and the surface and ground water 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 ground water within the area; the historic extractions of ground water 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 ground water in the San Fernando Basin derived from precipitation within ULARA. The City of Los Angeles' Pueblo Water Rights were not allowed to extend to the ground waters of the Sylmar and Verdugo Basins.

The City of Los Angeles was also given rights to all San Fernando Basin ground water derived from water imported by it from outside ULARA and either spread or delivered within ULARA. The Cities of Glendale and Burbank each were also given rights to all San Fernando Basin ground water 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.

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, signed by the Honorable Harry L. Hupp, was entered on January 26, 1979. Copies of the Final Judgment are available from the ULARA Watermaster's office at Post Office Box 111, Room 1455, Los Angeles, California 90051. The water rights set forth in the Judgment are consistent with the opinion of the Supreme Court described above. In addition, the Final 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.

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

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% of all delivered water (including reclaimed water) to valley fill lands of the San Fernando Basin.

Burbank: 20.0% of all delivered water (including reclaimed water) to the San Fernando Basin and its tributary hill and mountain areas.

Glendale: 20.0% of all delivered water (including reclaimed water) to the San Fernando Basin and its tributary hill and mountain areas (i.e., total delivered water [including reclaimed water] less 105% 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	120
	Toluca Lake	100
	Sportsmen's Lodge	25
City of Glendale	Forest Lawn	400
	Angelica Healthcare	75
City of Burbank	Valhalla	300
	Lockheed	25

Under the Judgment, Walt Disney Pictures and Television (Defendant No. 105) operates under a separate stipulation (filed on May 11, 1961 and merged into the ULARA Judgment) whereby ground water extracted for cooling water is discharged into the channel of the Los Angeles River just upstream from the Headworks Spreading Grounds (HSG). The original stipulation between Los Angeles and Disney anticipated that the water so discharged would be diverted by the then-existing rubber dam into the HSG and returned to the San Fernando Basin as ground water storage. The operation of the rubber dam was discontinued in the 1982-83 Water Year due to water quality concerns by the California Department of Health Services. Thus, the water discharged by Disney, since it was not being spread at HSG, was considered flowing to the ocean and being wasted. As a result of meetings between the Parties and the ULARA Watermaster, a solution to the problem has been obtained. As of January 1993, Disney no longer pumped from its wells. It has installed a system for air conditioning and heating that does not require the use of ground water. Disney plans to destroy their three extraction wells in late 1995.

Under the Judgment, Calmat (Defendant No. 18) was assigned physical solution rights to pump, with the understanding that its use of ground water for gravel washing would be non-consumptive. As the gravel pits became more extensive, permanent ponds were produced from which evaporation of perched water has occurred on a continuous basis. The Watermaster received from CalMat, a plan to take the pumped ground water to a separate area for recharge. If done properly, on a continuous basis, such an approach is acceptable. This plan has been implemented, and an additional investigation is being undertaken to confirm how much evaporation, if any, may be occurring in the transfer of ground water to the recharge basins. Any pond evaporation loss of ground water would be charged to CalMat.

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 pump the safe yield of the basin (6,210

acre-feet), less one half any pumping which occurs pursuant to the overlying rights of two private parties, Kisag Moordigian and Meurer Engineering. The private party Kisag Moordigian has sold and subdivided his property and there are no longer any overlying rights to extract and use water on his lands. The only active private overlying rights as of 1994 are those of Meurer Engineering. Santiago Estates Homeowners Group is pumping for landscaping, purportedly under the rights of Meurer Engineering. This is being investigated.

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 County Water District own prescriptive rights to extract 3,856 acre-feet and 3,294 acre-feet per year, respectively.

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. Los Angeles has the right to extract or cause to be extracted the safe yield of the basin.

Physical Solution Water: McKesson Water Products 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 Final 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, ground water levels, water quality, and ownership and location of new wells within ULARA. Ground water

pumpers report their extractions monthly to the Watermaster. This makes it possible to update the Watermaster Water Production Accounts monthly and keep track of the amount pumped during the water year, and the amount that can be legally pumped out the remainder of the year.

Section 8, Paragraph 8.3 of the ULARA 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, 1994, are:

Burbank, City of	Glendale, City of
Fred Lantz (President)	Donald Froelich (Vice-President)
Ross Burke (Alternate)	Wil Wilson (Alternate)
San Fernando, City of	Los Angeles, City of
Michael Drake	Henry R. Venegas
Harold Tighe (Alternate)	Donald G. McBride (Alternate)
Crescenta Valley County Water District	Private Parties
Michael Sovich	Charles Meurer
Phil McCleaf (Alternate)	Roger Meurer

The Administrative Committee may be convened by the Watermaster at any time in order to seek its advice. In addition, the Committee is responsible for reviewing and approving with the Watermaster the proposed annual report. A meeting was held to discuss the status of Watermaster activities, and the 1993-94 Watermaster Report was approved by the Committee on April 19, 1995.

1.5 Significant Events Through April 1995

Headworks Pilot Project

This project is completed. See Appendix E.

Headworks Wellfield Remediation Project

Planning is underway for the pumping of selected wells in the inactive Headworks wellfield, treatment of the high VOC water, and spreading in the Headworks Spreading Grounds (HSG). A 6-inch line to the HSG has been connected to the 36-inch Headworks wells collector line as part

of the test project. The test water from selected Headworks wells will be delivered to a portable Granular Activated Carbon unit located at the HSG. The treated effluent from this unit will be spread at the HSG The plan has been submitted to the Regional Board for a Discharge Permit, and LADWP has responded to the Board's request for additional information.

East Valley Water Recycling Project

The LADWP continues to make progress in the implementation of this project. This project, originally entitled the East Valley Water Reclamation Project (EVWRP), will utilize up to 35,000 acre-feet per year of reclaimed water from the Tillman Water Reclamation Plant primarily for ground water recharge in the Sun Valley area of the San Fernando Valley. Other incidental uses will be for irrigation and industrial applications (Appendix D).

Approximately 13 miles of pipeline and a pump station will be constructed in the first phase. Design of the pipeline is 30% completed as of April 1995. Construction is scheduled to start in January 1996. Start of recharging is scheduled for December 1998.

Information has been provided to the regulatory agencies to show that groundwater recharging can be accomplished safely in accordance with prescribed criteria. The project's expected operational conditions include the following:

- Compliance with all applicable drinking water standards (except nitrates) prior to spreading;
- Continued compliance with all drinking water standards upon extraction;
- About 200 feet of soil separation between the ground surface and groundwater table, which is 10 times the minimum depth required;
- About 6,000 feet separation between the point of recharge and extraction wells, 12 times the minimum distance required;
- About 5 years of retention time in the soil before extraction, which is 10 times the minimum requirement.

In addition, new monitoring wells to be sited in the spreading basins and between the basins and the extraction wells will be used as an "early warning system" to monitor impacts and changes in groundwater quality and determine if such changes are acceptable. The results of groundwater modeling show that the impact of initially spreading 10,000 acre-feet per year at the Hansen Spreading Grounds is minimal. Parameters of interest are total nitrogen, nitrates, total organic carbon, total dissolved solids, chlorides, sulfates, and boron.

A public hearing was conducted by the California Department of Health Services on March 16, 1995, at LAWDP's Anthony Office Building near the Tujunga Spreading Grounds. The public response was very favorable.

Pollock Wellfield Redevelopment

The Pollock wellfield, which is located in the Los Angeles River Narrows area, was removed from service in the late 1980's due to unacceptable levels of VOC's. The LADWP is proceeding with the Pollock Wells Treatment Plant to restore two of the existing Pollock production wells to operation by providing treatment for VOC removal and blending for nitrate reduction.

The main purpose of the Pollock project is to reduce the rising water discharges from the San Fernando Basin and therefore to retain approximately 2,400 acre-feet per year of groundwater pumping rights for the City of Los Angeles. The Pollock plant will also provide increased flexibility in utilizing the basin.

Burbank Reclaimed System Expansion

Construction is under way on Burbank's project to bring reclaimed water to the DeBell Golf Course, Stough Landfill, McCambridge Park, Muir Middle School, Starlight Bowl, and Stough Park. This will require installing 17,000 feet of pipe, two new pump stations, and two storage tanks. There will also be modifications to existing facilities.

The reclaimed water will come from Burbank's Water Reclamation Plant. This plant processes the City's wastewater to a high enough quality to allow it to be discharged into an open storm channel that feeds the Los Angeles River. While not suitable for potable applications, it is an ideal source for landscape irrigation. It is already being used by CalTrans and the Media City Center for landscape irrigation.

The total project cost is about $6 million, and construction is scheduled for completion in June 1995.

Burbank EPA Consent Decree Project

Under Phase I of the EPA Consent Decree project (Burbank OU), Lockheed (now Lockheed-Martin) is to pump 6,000 gpm from 7 wells to the completed treatment plant for removal of VOC's. The treated water (which is high in nitrates) is to be delivered to the City of Burbank's Forebay for blending prior to delivery to the City's system. Delivery of treated effluent to the

Forebay commenced on February 16, 1995. Extraction well testing commenced on March 6, 1995.

Glendale EPA Project

Remedial activities on the North and South OU's are proceeding under an Administrative Order of Consent (AOC) dated March 1994 (appendix J). Remedial design on behalf of 25 PRP's is being conducted by the consulting firm Camp-Dresser-McKee (CDM). The plan calls for the pumping of 5,000 gpm from extraction wells-2,000 gpm from the South OU and 3,000 gpm from the North OU. The pumped water will be delivered to a single treatment plant in the North OU area. In the South OU three 8-inch wells have been drilled, step-drawdown tests have been performed, and water quality samples have been taken. In the North OU, where it was intended to utilize existing wells as extraction wells, two of the three proposed wells have been found acceptable. These wells (CS44 and CS46) have been pump tested and water quality samples have been taken after the wells were plugged below 200 ft. Extensive model studies indicate that plume control may be achieved with the pumping of less than 5,000 gpm but this and many other problems remain unresolved. From the treatment plant the water will be delivered to the City of Glendale, and blended for nitrate reduction if necessary, before introduction to the City's system.

Glendale-Verdugo Park Water Treatment Plant

The City of Glendale's Verdugo Park Water Treatment Plant is under construction near the southern boundary of the Verdugo Basin. This facility is scheduled for completion in July 1995, and is expected to pump and treat approximately 1,625 acre-feet/year of Verdugo Basin ground water. Presently, Glendale is not able to pump its water right of 3,856 acre-feet/year in the Verdugo Basin, and this facility will help with this problem.

1.6 Summary of Water Supply, Operations, and Hydrologic Conditions

Highlights of operations for the 1992-93 and 1993-94 Water Years are summarized in Table 1-3. Details of the 1993-94 Water Year operations and hydrologic conditions are given in Section 2. Locations of the ground water 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 was 10.19 inches, 62 percent of the calculated 100-year mean (16.48 inches); precipitation in the mountain areas was 12.89 inches, 59 percent of the calculated 100-year mean (21.62 inches).

Spreading Operations

A total of 19,980 acre-feet of water was spread- a large decrease from the 64,659 acre-feet spread last year. Average annual spreading for the 1968-1993 period was 34,563 acre-feet.

Extractions

Total ULARA extractions amounted to 76,591 acre-feet. Of this total, 50 acre-feet was for testing and 717 acre-feet was for non-consumptive use pumping. Total extractions increased 28,308 acre-feet from the previous water year. This increase is related to decreased surface water available statewide; demands were met by higher pumping by the City of Los Angeles in the San Fernando Basin. Appendix A contains a summary of ground water extractions for the 1993-94 Water Year.

Imports

Gross imports totaled 551,659 acre-feet, an increase of approximately three percent from last year, while net imports used within ULARA amounted to 320,717 acre-feet, a 18,342 acre-feet increase.

Exports

A total of 291,364 acre-feet of water was exported from ULARA, an increase of 36,378 acre-feet from the previous year. Of the 291,364 acre-feet exported, 60,422 acre-feet was from ground water extractions, and 230,942 acre-feet was from imports (pass-through). This increase is related to decreased surface water available statewide; as a consequence more ground water was extracted and exported from the basin by Los Angeles.

Treated Wastewater

A total of 102,410 acre-feet of wastewater was treated in ULARA. The majority of the treated water is discharged to the Los Angeles River or delivered to the Hyperion Treatment Plant; a small portion was used as reclaimed water.

Reclaimed Water

Total reclaimed water use in ULARA was 8,872 acre-feet, a 1,312 acre-feet increase from last year. The reclaimed water is used for in-plant use, power plant use (i.e. cooling), irrigation and landscaping.

Sewage Export

Sewage export was estimated at 99,605 acre-feet. All sewage exported from ULARA is delivered to the Hyperion Treatment Plant.

Ground Water Storage

Ground water storage in the San Fernando Basin during 1993-94 decreased by 22,238 acre-feet; the total cumulative increase in ground water storage since October 1, 1968 has been 232,077 acre-feet. The 1993-94 decrease is due to a combination of increased pumping by Los Angeles, decreased spreading activities by the LACDPW, and well-below-average rainfall. The cumulative change in ground water storage for the Sylmar, Verdugo, and Eagle Rock Basins was -3,317, +3,575, and -135 acre-feet, respectively. The total change in ground water storage in ULARA was -22,115 acre-feet.

Wells

During the 1993-94 Water Year, a total of 6 wells were drilled for use in ground water investigations within ULARA. Five wells were destroyed (Appendix H).

TABLE 1-3: SUMMARY OF OPERATIONS IN ULARA

Item	Water Year 1992-93	Water Year 1993-94
Active Pumpers (party and nonparties)	29	29
Inactive Pumpers (parties within valley fill)*	2	2
Valley Rainfall, in inches		
Valley Floor	36.62	10.19
Mountain Area	44.15	11.86
Spreading Operations, in acre-feet	64,659	19,980
Extractions, in acre-feet		
Used in ULARA	22,080	15,402
Exported from ULARA	23,352	60,422
Nonconsumptive Use	2,461	717
Testing **	390	50
Total	48,283	76,591
Gross Imports, in acre-feet		
Los Angeles Aqueduct Water	271,825	184,675
MWD Water	262,184	367,542
Total	534,009	552,217
Exports, in acre-feet		
Los Angeles Aqueduct Water	138,692	87,762
MWD Water	92,942	143,180
Ground Water	23,352	60,422
Total	254,986	291,364
Net Imports Used in ULARA, in acre-feet	302,375	321,275
Reclaimed Water Use, in acre-feet	7,560	8,964
Total Water Use in ULARA, in acre-feet ***	332,015	345,641
Treated Wastewater, in acre-feet	105,306	102,410
Sewage Export to Hyperion, in acre-feet ****	115,000	99,605

* The two inactive pumpers are Deep Rock Bottled Water Company and Van de Kamp.

** Parties are allowed to extract a limited amount for facility testing purposes.

*** Extractions plus Net Imports used plus Reclaimed.

**** 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 1994-95 Water Year

Table 1-4 shows a summary of extraction rights for the 1994-95 Water Year and stored water credit as of October 1, 1994, for the Cities of Los Angeles, Burbank, Glendale, San Fernando, and the Crescenta Valley County Water District. The calculation of these values is shown in more detail in Section 2.

TABLE 1-4: ALLOWABLE PUMPING 1994-95 WATER YEAR
(acre-feet)

	Extraction Right			Stored Water Credit (as of Oct. 1, 1994)	Allowable Pumping 1994-95 Water Year
	Native Credit *	Import Credit **	Total		
San Fernando Basin					
City of Los Angeles	43,660	44,630	88,290	265,943	354,233
City of Burbank	—	4,913	4,913	55,180	60,093
City of Glendale	—	5,166	5,166	44,457	49,623
Total	43,660	54,709	98,369	365,580	463,949
Sylmar Basin					
City of Los Angeles	—	—	3,105	2,704	5,809
City of San Fernando	—	—	3,105	2,359	5,464
Total	—	—	6,210	5,063	11,273
Verdugo Basin					
CVCWD	—	—	3,294	—	3,294
City of Glendale	—	—	3,856	—	3,856
Total	—	—	7,150	—	7,150

* Native Safe Yield, Per Judgment, p.11
** Import Return, Per Judgment p.17

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 1993-94 Water Year experienced below average rainfall. The valley floor received 10.19 inches of rain (62% of the 100-year mean), while the mountain areas received 12.89 inches (59% 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 11.86 inches (60 % 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 location.

FIGURE 2.1 - MONTHLY RAINFALL

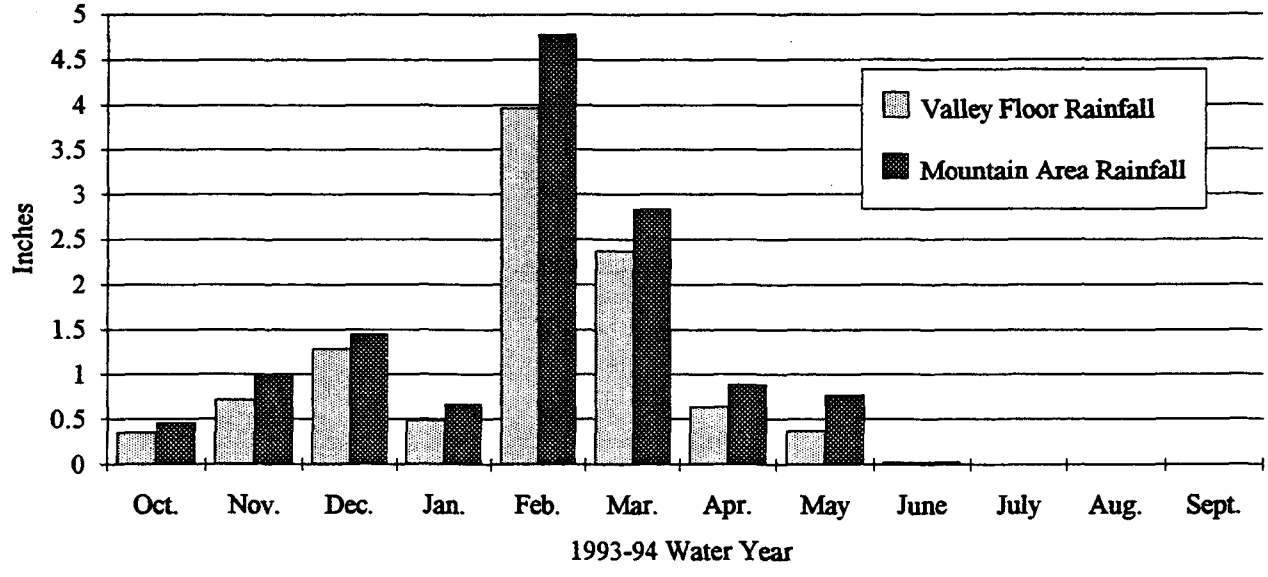

TABLE 2-1: 1993-94 PRECIPITATION
(inches)

LACDPW Rain Gage Stations No.	Name	1993-94 Precipitation	100-Year Mean (1881-1981)	Percent of 100-Year Mean
	Valley Stations			
13C	North Hollywood-Lakeside	11.83	16.63	71%
14C	Roscoe-Merrill	8.19	14.98	55%
15A	Van Nuys	9.47	15.30	62%
21B	Woodland Hills	11.20	14.60	77%
23B	Chatsworth Reservoir	8.98	15.19	59%
25C	Northridge-LADWP	8.98	15.16	59%
251C	La Crescenta	12.21	23.31	52%
293B	Los Angeles Reservoir	11.32	17.32	65%
	Weighted Average*	10.19	16.48	62%
	Mountain Stations			
11D	Upper Franklin Canyon Reservoir	9.46	18.50	51%
292D**	Encino Reservoir	11.53	16.84	68%
33A	Pacoima Dam	11.56	19.64	59%
47D	Clear Creek - City School	16.10	33.01	49%
53D	Colby's	13.70	29.04	47%
54C	Loomis Ranch-Alder Creek	12.10	18.62	65%
1081B**	Glendale-Gregg	12.07	19.97	60%
797	DeSoto Reservoir	11.92	17.52	68%
1190	Pacoima N. Fork-Ranger Station	15.81	23.06	69%
	Weighted Average*	12.89	21.76	59%
	Weighted Average of both Valley and Mountain Areas*	11.86	19.72	60%

*Weighted Average calculations performed according to Report of Referee-7/62

** Station 292D replaced Station 17 due to insufficient data.
Station 1081B replaced Station 210C due to insufficient data.

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 water.

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.

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Table 2-2 summarizes the 1992-93 and 1993-94 monthly runoff for these stations. The lower runoff in 1993-94 is related to much lower rainfall in 1993-94 than in 1992-93. The mean daily discharge rates for these six stations during 1993-94 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	June	July	Aug.	Sept.	Total
F-57C-R	1993-94*	10,890	8,363	11,050	16,692	9,948	22,603	7,836	8,398	7,008	6,997	14,350	12,560	136,695
L.A. River	1992-93	14,290	7,563	34,810	253,200	132,000	48,000*	14,500*	10,120	12,810	10,420	11,320	10,990	560,023
Arroyo Seco														
F-252-R	1993-94	148	619	667	479	1,891	1,708	543	607	753	67	31	30	7,543
Verdugo Wash	1992-93	960	158	2,573	8,966	6,759	1,735	478	601	660	230	202	198	23,520
E-285-R	1993-94	654	1,018	1,038	865	3,007	1,875	709	596	662	674	545	512	12,155
Burbank	1992-93	1,068	532	3,725	5,802	6,357	3,028	772	555	909	711	588	520	24,567
Storm Drain														
F-300-R	1993-94	5,377	5,860	7,196	4,320	27,260	12,880	6,834	6,007	5,492	5,117	5,025	3,898	95,266
L.A. River	1992-93	5,389	3,722	22,250	93,270	115,300	31,970	7,861	4,664	5,768	3,904	3,593	3,580	301,271
Tujunga Ave.														
F-168-R	1993-94	827	756	1,074	939	2,167	1,452	1,620	488*	0*	26*	31*	35	9,415
Big Tujunga	1992-93	0	269	1,724	25,720	32,020	11,620	8,398	3,145	3,036	1,340	720	471	88,463
Dam														
118B-R	1993-94	450	0	323	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	773
Pacoima Dam	1992-93	0	4	821	15,970	18,620	10,290	1,802	1,846	1,781*	638*	343*	224*	52,339

* Incomplete Record - Numbers Estimated.

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
4. Rising ground water

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In the Report of Referee (Volume II, Appendix O), procedures were developed for the calculation of rising ground water 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 water was considered to have fallen to zero by the late 1950s. Ground water levels along the course of the Los Angeles River were studied recently in the January 1993 report by Brown and Caldwell, "Potential Infiltration of Chlorides from the Los Angeles River into the Groundwater Aquifer". Figure 2-4 of that report is especially informative. As of the end of the drought period in 1977, ground water levels in the Los Angeles Narrows were very low, with very little potential for rising ground water. Heavy runoff occurred during the 1978-83 period, which, combined with reduced pumping in the Crystal Springs and Pollock Well Fields permitted large recoveries of ground water 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. Conditions in the Spring of 1991, during an extended drought, are shown in Figure 2-4 of the Brown and Caldwell Report. 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 reach is believed to circulate through shallow zones and re-appear as rising ground water 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 ground water conditions.

Under 1993-94 conditions, rising ground water is believed to occur 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 water above gage F-57C-R is considered to be related to the increase of rising water above the Verdugo Narrows. Thus from 1991-92 (Table 2-3) to 1992-93 there was an increase of rising water at Gage F-252-R of about 1,900 acre-feet. From 1992-93 to 1993-94 flows of rising water at gage F-252-R decreased by about 1,900 acre-feet. For 1993-94 the rising water flow at gage F-57C-R was estimated to have decreased by 1,900 acre-feet to 3,000 acre-feet, similar to estimates for the drought years of 1986-1990.

TABLE 2-3: SEPARATION OF SURFACE FLOW AT STATIONS F-57C-R & F-252-R
(acre-feet)

Water Year	Base Flow		Storm Runoff	Total Measured Outflow
	Rising Ground Water	Waste Discharge		
		Station F-57C-R		
1972-73	4,596	8,776	100,587	113,959
1973-74	2,694	6,366	79,587	88,878
1974-75	427	7,318	56,396	64,141
1975-76	261	6,741	32,723	39,725
1976-77	839	7,128	58,046	66,013
1977-78	1,331	7,449	357,883	366,663
1978-79	2,840	16,450	119,810	139,100
1979-80	5,500	16,500	n/a	n/a
1980-81	4,710	19,580	51,940	76,230
1981-82	1,280	18,180	80,000	99,460
1982-83	3,460	17,610	384,620	405,690
1983-84	3,000	17,780	49,090	69,870
1984-85	3,260	21,600	46,300	71,160
1985-86	3,880	48,370	102,840	155,090
1986-87	3,000	64,125	19,060	83,295
1987-88	3,000	81,920	74,074	156,204
1988-89	3,000	80,020	56,535	136,843
1989-90	3,000	76,789	55,811	167,639
1990-91	3,203	75,647	117,779	196,629
1991-92	3,000	120,789	197,040	320,829
1992-93	4,900	77,000	478,123	560,023
1993-94	2,952	60,594	73,149	136,695
		Station F-252-R		
1971-72	2,050	0	2,513	4,563
1972-73	1,706	0	7,702	9,408
1973-74	1,772	0	5,613	7,385
1974-75	1,333	0	4,255	5,588
1975-76	2,170	0	2,380	4,550
1976-77	1,683	0	2,635	4,318
1977-78	1,168	0	23,571	24,739
1978-79	2,470	0	n/a	n/a
1979-80	5,150	0	7,752	12,902
1980-81	5,780	0	2,917	8,697
1981-82	3,710	0	5,367	9,077
1982-83	5,330	0	21,384	26,714
1983-84	4,000	0	n/a	n/a
1984-85	2,710	0	3,970	6,680
1985-86	2,470	0	6,270	8,740
1986-87	2,100	0	1,690	3,790
1987-88	3,548	0	10,493	14,041
1988-89	1,995	0	4,453	6,448
1989-90	1,182	0	2,938	4,120
1990-91	1,157	0	6,865	8,022
1991-92	1,412	0	13,209	14,621
1992-93	3,335	0	20,185	23,520
1993-94	1,387	0	6,156	7,543

2.4 Ground Water Recharge

Precipitation has a marked influence on ground water recharge and, with some delay, ground water storage. Urban development during the past years 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. 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. A pilot project for the spreading of Los Angeles River water, which contains over 65,000 acre-feet/year of treated municipal wastewaters, at the Headworks spreading grounds has been completed and is discussed in Appendix E. Table 2-4 summarizes the spreading operations for the 1993-94 Water Year, and Plate 6 shows the locations of the spreading basins.

TABLE 2-4: 1993-94 SPREADING OPERATIONS IN THE SAN FERNANDO BASIN
(acre-feet)

Agency	Spreading Facility	1993			1994								Total
		Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	
LACDPW														
	Branford	21	32	69	22	178	109	22	9	0	0	0	0	462
	Hansen	1,300	842	1,130	1,210	2,480	1,560	1,380	1,690	264	196	0	0	12,052
	Lopez	0	0	0	0	0	0	0	0	153	10	12	6	182
	Pacoima	143	33	432	230	1,120	472	257	158	311	0	0	0	3,156
	Tujunga	0	321	634	672	634	702	565	160	439	2	0	0	4,129
	Total	1,464	1,228	2,265	2,134	4,412	2,843	2,224	2,017	1,167	208	12	6	19,980
City of Los Angeles														
	Tujunga	0	0	0	0	0	0	0	0	0	0	0	0	0
	Headworks	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	0	0	0	0	0	0	0	0	0	0	0	0	0
City of Burbank*														
	Pacoima	0	0	0	0	0	0	0	0	0	0	0	0	0
Basin Total		1,464	1,228	2,265	2,134	4,412	2,843	2,224	2,017	1,167	208	12	6	19,980

2.5 Ground Water Extractions

The original trial court adjudication of ground water rights in ULARA restricted all ground water 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 Final Judgment entered on January 26, 1979, provides a similar restriction in ground water pumping.

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

Figure 2.2 illustrates the annual ground water 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 26 years (1968-69 to 1993-94) 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 76,535 acre-feet was pumped from ULARA during the 1993-94 Water Year; 65,858 acre-feet from the San Fernando Basin, 5,451 acre-feet from the Sylmar Basin, 5,037 acre-feet from the Verdugo Basin, and 189 acre-feet from the Eagle Rock Basin. The respective safe yield values for the 1993-94 Water Year are 96,634 acre-feet (Native Safe Yield of 43,660 and an import return of 52,974 acre-feet) for the San Fernando Basin, 6,210 acre-feet for the Sylmar Basin, and 7,150 acre-feet for the Verdugo Basin. Appendix A contains a summary of ground water extractions for the 1993-94 Water Year and Plate 9 shows the locations of the well fields.

Of the total amount pumped in the San Fernando Basin (65,867 acre-feet), 62,940 acre-feet constitutes extraction rights by Parties to the Judgment, 50 acre-feet was for testing, 717 acre-feet constitutes nonconsumptive use, and 2,160 acre-feet was by physical solution parties, ground water cleanup and dewatering parties (Appendix G). Table 2-5 summarizes 1993-94 private party pumping in the San Fernando Basin, and Plate 3 shows the locations of the individual producers.

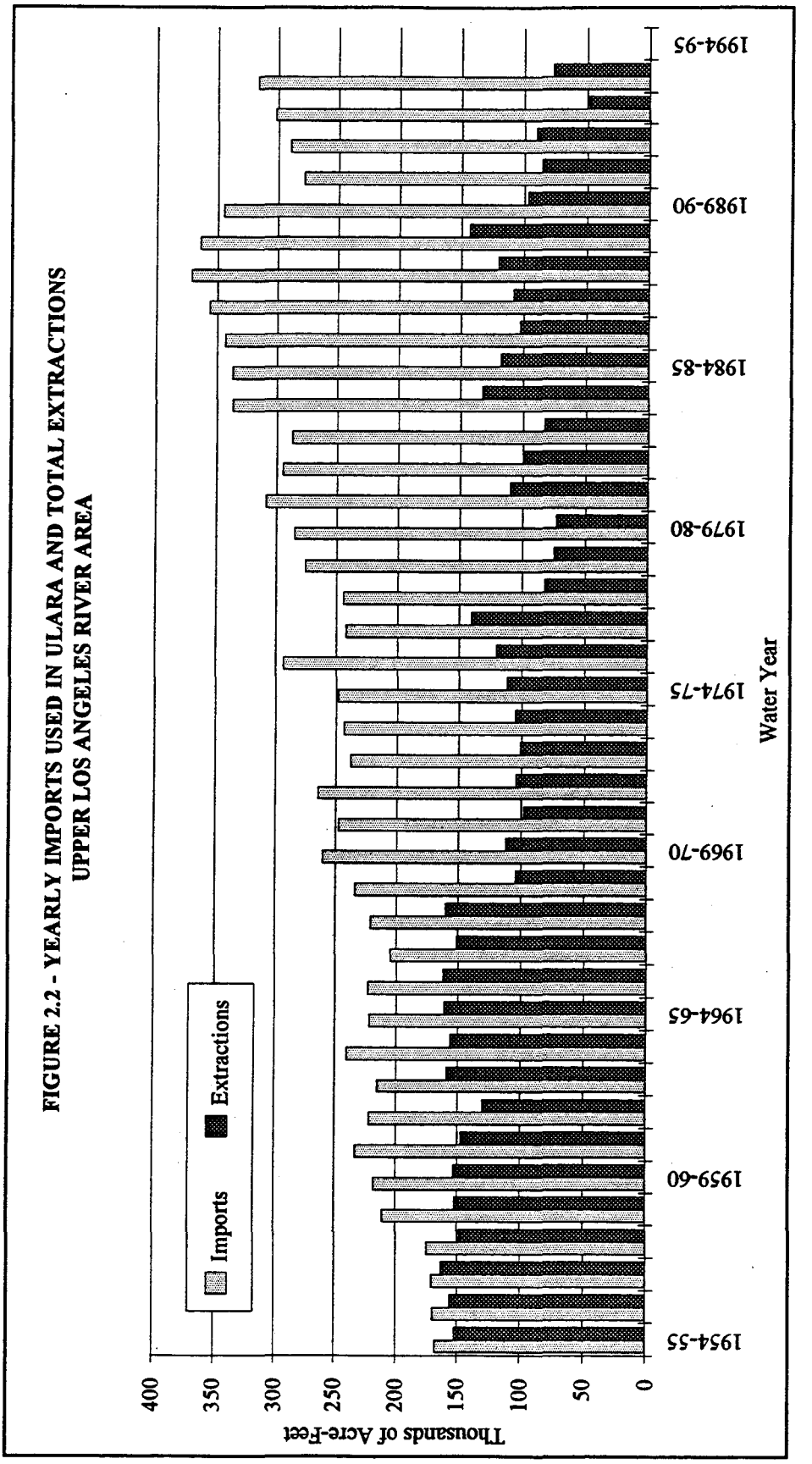

FIGURE 2.2 - YEARLY IMPORTS USED IN ULARA AND TOTAL EXTRACTIONS UPPER LOS ANGELES RIVER AREA

TABLE 2-5: 1993-94 PRIVATE PARTY PUMPING SAN FERNANDO BASIN
(acre-feet)

Nonconsumptive Use			**Physical Solution**		
CalMat (Gravel washing)	482		Angelica Healthcare Services (various uses)	9	*
Livingston-Graham Co. (Gravel washing)	2		Forest Lawn Cemetery Assn. (Charged to City of Glendale's water right)	404	
Sears, Roebuck and Company (Air Conditioning)	204		Sportsmen's Lodge (Charged to City of Los Angeles' water right)	0	
Sportsmen's Lodge	0		Toluca Lake Property Owners (Charged to City of Los Angeles' water right)	30	
Toluca Lake Property Owners Ass'n (Lake overflows to LA River)	29		Valhalla Memorial Park (Charged to City of Burbank's water right)	391	
Walt Disney Productions	0		Waste Management Disposal Services of California	0	
Total	717		Total	834	
Ground Water Cleanup					
Burbank Operable Unit (Burbank's pump and treat system)	378		**Ground Water Dewatering**		
Lockheed (Lockheed's pump and treat system)	450	**	Auto Stiegler (Charged to City of Los Angeles' water right)	10	
Mobil Oil Corporation (Charged to City of Los Angeles' water right)	2		First Financial Plaza Site (Charged to City of Los Angeles' water right)	22	
Philips Components (Recharged to groundwater)	55		Trillium Corporation (Charged to City of Los Angeles' water right)	35	
Rockwell International (Charged to City of Los Angeles' water right)	343		Total	67	
3M-Pharmaceutical (Recycled for on-site use)	16				
Total	1,243				
			Total Extractions:	2,862	

* Not subtracted from Glendale's allowable pumping for the 1994-95 Water Year. Further evaluation is being made by the ULARA Watermaster.

** 25 acre-feet were re-injected.

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 ground water basins.

The imported supplies to ULARA are from the Los Angeles Aqueducts and the Metropolitan Water District (MWD). Los Angeles Aqueduct water consists of runoff from the Eastern Sierra Nevada and ground water from Owens Valley; MWD supplies consists of State Water Project and Colorado River Aqueduct waters.

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

Table 2-6 summarizes the nontributary imports and exports from ULARA during the 1992-93 and 1993-94 Water Years, and Figure 2.3 shows the monthly extractions and imports.

FIGURE 2.3 - TOTAL MONTHLY EXTRACTIONS AND GROSS IMPORTS

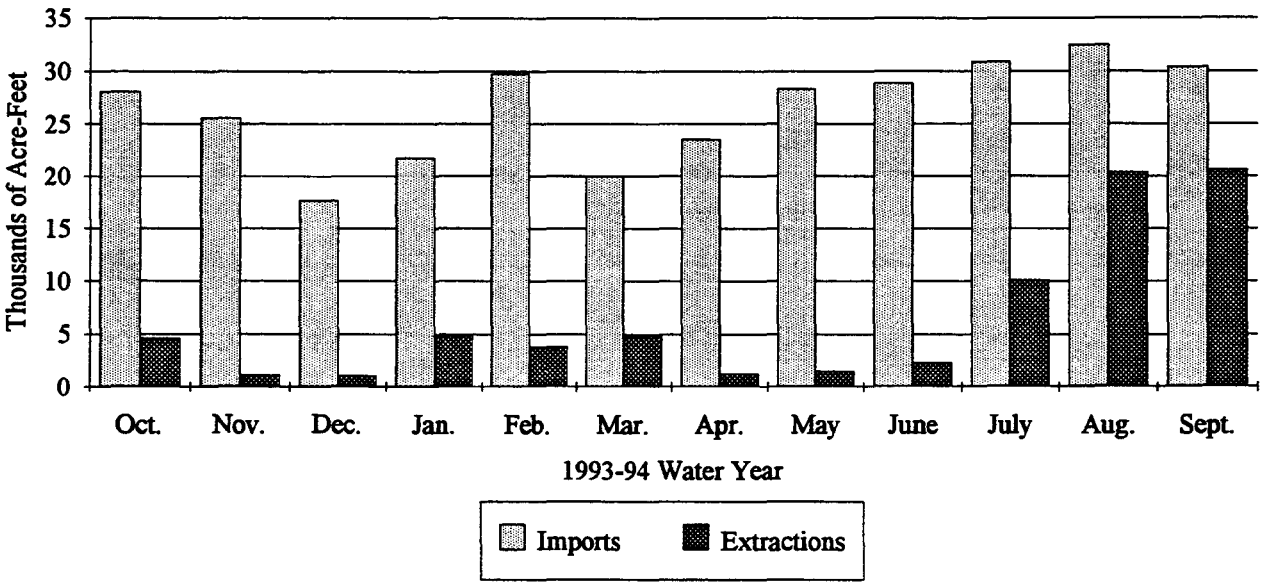

TABLE 2-6: ULARA NONTRIBUTARY WATERS IMPORTS AND EXPORTS
(acre-feet)

Source and Agency	Water Year 1992-93	Water Year 1993-94
Gross Imported Water		
Los Angeles Aqueduct		
City of Los Angeles	271,825	184,675
MWD Water		
City of Burbank	18,005	18,074
Crescenta Valley County Water District	1,697	1,175
City of Glendale	25,970	31,019
City of Los Angeles	208,965	310,315
La Canada Irrigation District*	886	1,009
Las Virgenes Municipal Water District*	5,376	5,858
City of San Fernando	1,285	92
Total MWD Water	262,184	367,542
Total Imported Water	534,009	552,217
Exported Water (Pass-through)		
Los Angeles Aqueduct		
City of Los Angeles	138,692	87,762
MWD water		
City of Los Angeles	92,942	143,180
Total Exported Water	231,634	230,942
Net Imported Water Used in ULARA:	302,375	321,275

* Deliveries to those portions of these Districts that are within ULARA

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2.7 Water Reclamation

Water reclamation presently provides a source of water for irrigation, industrial, and recreational uses. In the future, water reclamation could provide water for ground water recharge within the ULARA spreading basins. Six wastewater reclamation plants are in operation in ULARA. The Las Virgenes Municipal Water District operates a water reclamation facility outside ULARA but uses part of the treated water in ULARA. The East Valley Water Recycling Project envisions the use of up to 35,000 acre-feet/year of reclaimed water from the Tillman Plant for ground water recharge. This is discussed in Appendix D. Table 2-7 summarizes the 1993-94 reclamation plant operations, and Plate 6 shows their location.

TABLE 2-7: 1993-94 WASTEWATER RECLAMATION PLANT OPERATIONS
(acre-feet)

Plant/Agency	Treated Water	Discharged to		Reclaimed Water	
		L.A. River	Hyperion		
City of Burbank	5,775	5,320	4,765	3,706	(a)
Los Angeles-Glendale	21,767	12,576	5,209	3,394	(b)
Donald C. Tillman	74,828	63,164	11,032	632	(c)
Indian Hills Mobile Homes	20	0	0	20	(d)
The Independent Order of Foresters	20	0	0	20	(d)
Rocketdyne	n/a	n/a	n/a	n/a	(e)
Las Virgenes MWD	—	0	0	1,192	(f)
Total	102,410	81,060	21,006	8,964	

(a) Of the total reclaimed water (3,706 AF), 3,613 AF was delivered to the Burbank power plant. Of that, 723 ac-ft is for cooling and 2890 ac-ft is for meeting discharge requirements to the river. The latter is also included in the "river discharges" column. 93 AF was used by CalTrans, the Media City Center, and City water trucks.

(b) Of the total reclaimed water (3,394 AF), 698 AF was delivered to Glendale for use in Glendale's Phosphate Plant and for irrigation water for CalTrans and Forest Lawn; 763 AF was for in plant use; 1,727 AF was was delivered to Griffith Park by Los Angeles for irrigation; and 267 AF was used by CalTrans, Lake Side, Sinai Memorial Park, and Universal City MCA for irrigation.

(c) Of the total reclaimed water (632 AF), 616 AF was for in plant use and 16 AF was used offsite.

(d) Reclaimed water is used for irrigation.

(e) Rocketdyne does not meter treated water; all water is reused within the facility.

(f) Portion of reclaimed water is used within ULARA for irrigation.

2.8 Water Level Elevations

During the 1993-94 Water Year, water level data were collected and processed to determine prevailing ground water conditions during the Spring and Fall of 1994. Plates 10 and 11 show ground water elevation contours for these two seasons. Plate 12 shows the average change in water elevations from the Fall of 1993 to the Fall of 1994. The decrease in water levels throughout the eastern half of the valley reflects increased pumping by the City of Los Angeles throughout the 1993-94 Water Year. The decrease in water levels northeast of the Verdugo Fault and southerly of the Hansen Spreading Grounds is related to the very low volumes of spreading in 1993-94. Plate 14 shows ground water flow directions and estimated ground water velocities in ULARA. Figure 2.4 shows historic hydrographs of wells throughout ULARA and their locations.

2.9 Ground Water Storage

San Fernando Basin

The total ground water storage capacity of the San Fernando Basin 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 ground water storage for 1993-94 is -22,238 acre-feet (Table 2-8). From the start of safe yield operation in the Fall of 1968 through 1993-94, the amount of ground water in storage has increased by +232,077 acre-feet. However, during the 1968-94 period there has been an accumulation of 366,160 acre-feet of stored water credit through spreading and in-lieu activities of the parties. Such ground water 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 -134,083 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 1992-93. Plate 15 shows the cumulative change in storage from Fall 1928 to the present.

Sylmar Basin

The ground water storage capacity of the Sylmar Basin is approximately 310,000 acre-feet. The estimated change in storage for 1993-94 is -3,317 acre-feet, and the cumulative change in storage from 1968-69 through 1993-94 is +2,442 acre-feet.

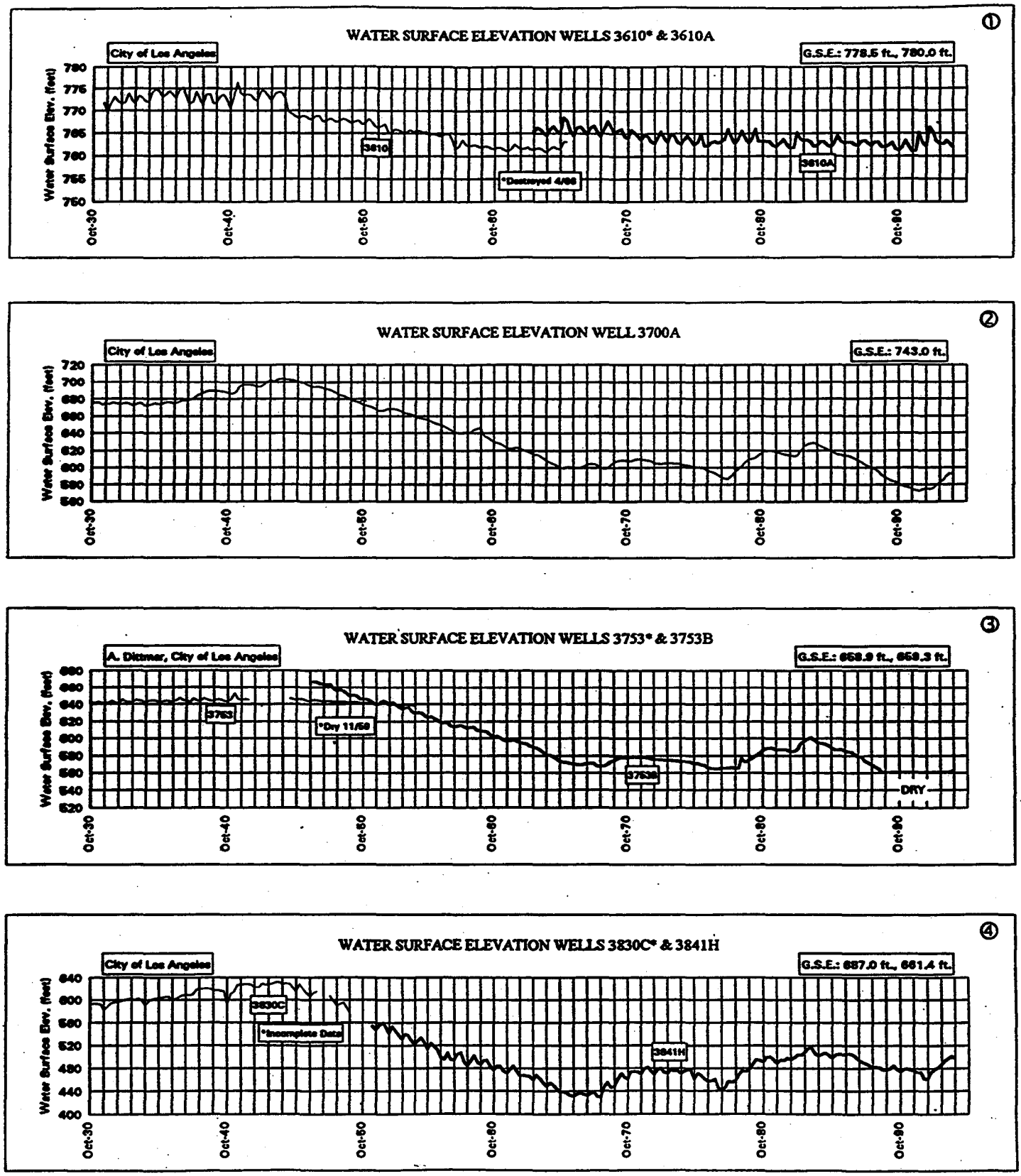
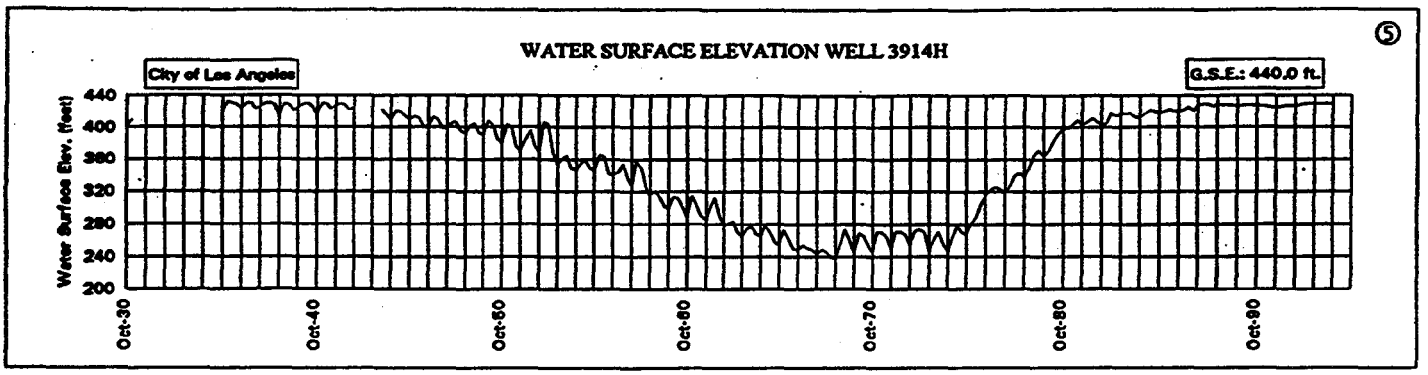
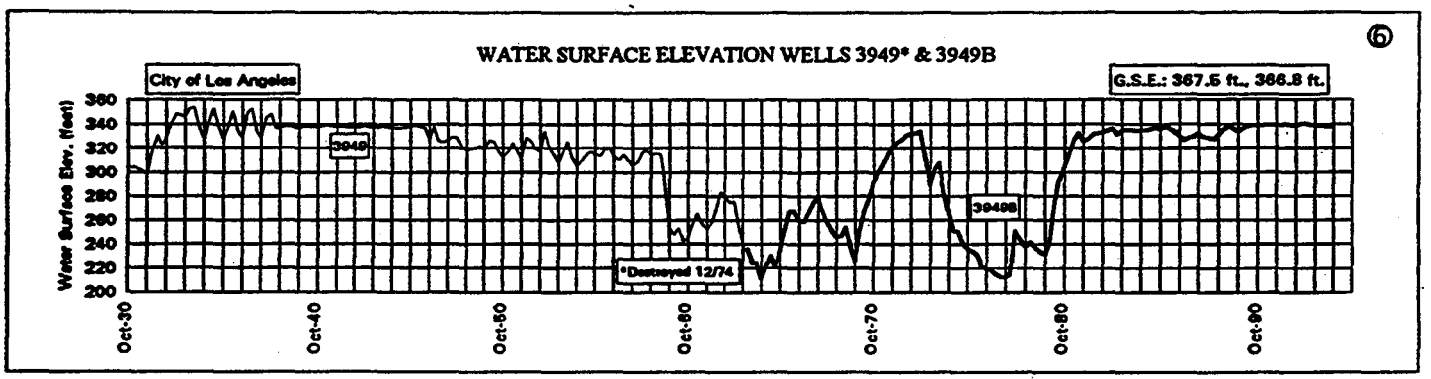
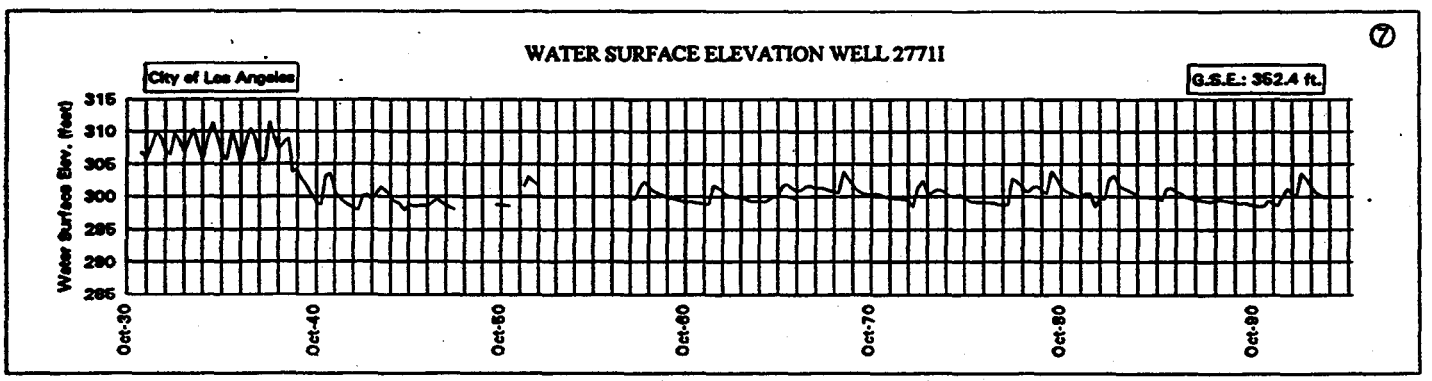


FIGURE 2.4 - HYDROGRAPHS OF WELLS THROUGHOUT ULARA AND WELL LOCATION MAP

SAN FERNANDO BASIN







SYLMAR BASIN

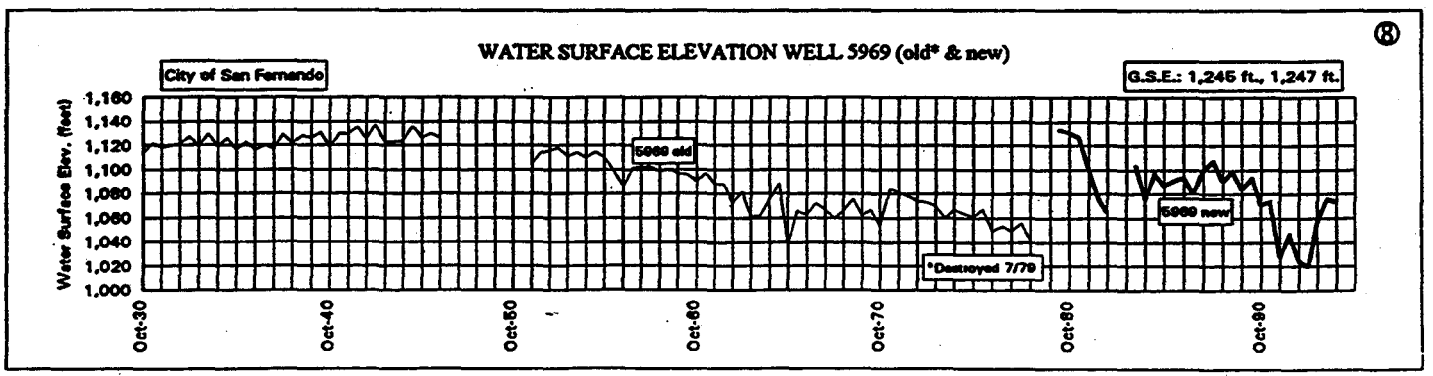
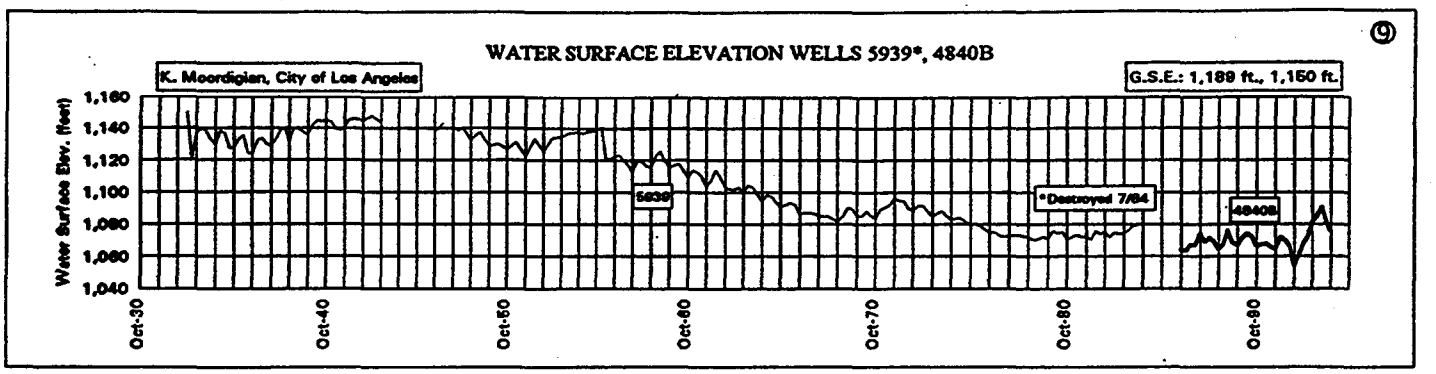
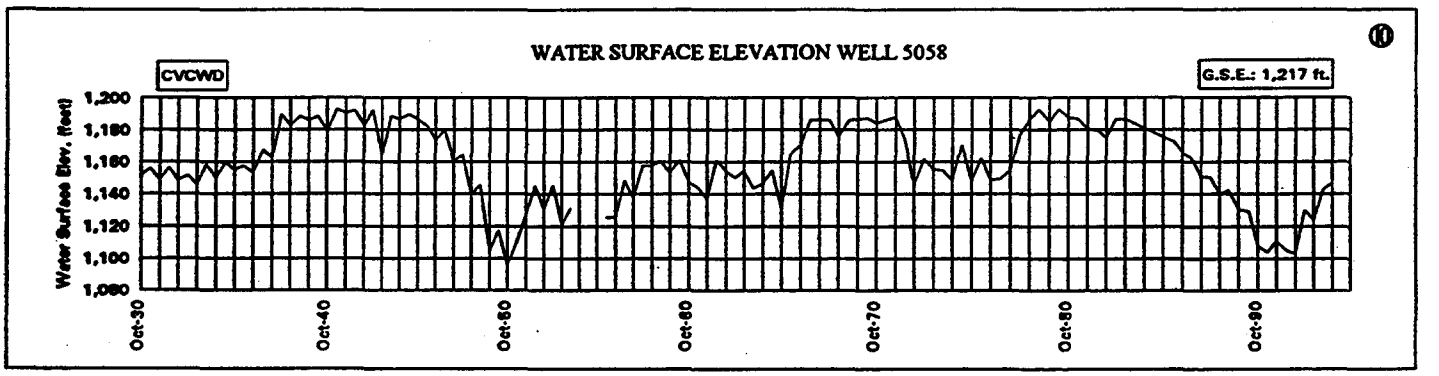


FIGURE 2.4 - HYDROGRAPHS OF WELLS THROUGHOUT ULARA AND WELL LOCATION MAP

SYLMAR BASIN



VERDUGO BASIN



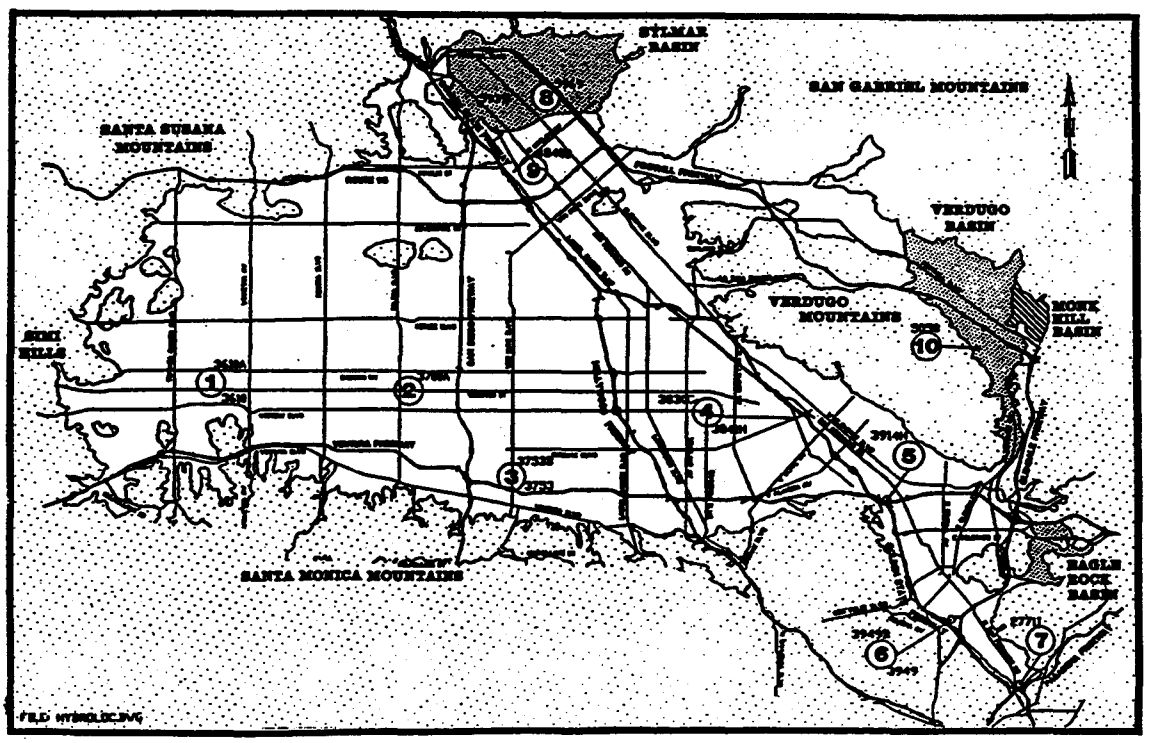


FIGURE 2.4 - HYDROGRAPHS OF WELLS THROUGHOUT ULARA AND WELL LOCATION MAP

Verdugo Basin

The ground water storage capacity of the Verdugo Basin is approximately 160,000 acre-feet. The estimated change in storage for 1993-94 is +3,575 acre-feet, and the cumulative change in storage from 1968-69 through 1993-94 is -1,773 acre-feet.

Eagle Rock Basin

The estimated change in storage is -135 acre-feet.

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 Basin, 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 San Fernando Basin extraction rights for the 1994-95 Water Year and stored water credit (as of October 1, 1994) 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 1994-95 Water Year and stored water credit (as of October 1, 1994) 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).

TABLE 2-8: CHANGE IN GROUND WATER STORAGE SAN FERNANDO BASIN

Water Year	Valley Floor Precipitation (Inches)	Change in Storage (AF)	Cumulative Change in Storage (AF)
1968-69	29.00	79,240	79,240 *
1969-70	10.50	(9,740)	69,500
1970-71	15.57	15,340	84,840
1971-72	8.10	(17,090)	67,750
1972-73	20.65	17,020	84,770
1973-74	15.75	(21,820)	62,950
1974-75	14.74	(22,580)	40,370
1975-76	9.90	(30,090)	10,280
1976-77	14.19	(50,490)	(40,210)
1977-78	35.43	136,150	95,940
1978-79	21.76	78,080	174,020
1979-80	30.25	99,970	273,990
1980-81	11.04	(32,560)	241,430
1981-82	17.18	(530)	240,900
1982-83	39.64	121,090	361,990
1983-84	9.97	(63,180)	298,810
1984-85	11.00	(31,690)	267,120
1985-86	20.27	(7,980)	259,140
1986-87	5.99	(31,940)	227,200
1987-88	18.62	(5,000)	222,200
1988-89	9.12	(30,550)	191,650
1989-90	8.20	(29,941)	161,709
1990-91	14.38	(14,122)	147,587
1991-92	30.05	411	147,998
1992-93	36.62	106,317	254,315
1993-94	10.19	(22,238)	232,077
26 Year Average	18.00	8,926	

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

TABLE 2-9A: SUMMARY OF 1993-94 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	2,395	115	60,430	—	2,160	65,100
Testing	0	0	50	—	0	50
Non-consumptive Use	—	—	—	—	717	717
Total	2,395	115	60,480	0	2,877	65,867
Imports						
LA Aqueduct Water	—	—	181,102	—	—	181,102
MWD Water	18,074	27,811	300,605	84	5,858	352,432
Ground Water from Sylmar Basin	—	—	2,052	3,092	—	5,144
Total	18,074	27,811	483,759	3,177	5,858	538,679
Reclaimed Water Use	3,706	698	3,328	0	1,232	8,964
Exports						
LA Aqueduct Water	—	—	87,762	—	—	87,762
MWD Water						
out of ULARA	—	—	143,180	—	—	143,180
to Verdugo Basin	—	3,208	—	—	—	3,208
Ground Water	—	—	60,233	—	—	60,233
Total	0	3,208	291,175	0	0	294,383
Total Delivered Water	24,175	25,416	256,342	3,177	9,250	318,360
Water Delivered to Hill and Mountain Areas	—	—	41,773	—	—	41,773
Water Outflow						
Surface (Sta. F-57C-R)	—	—	—	—	—	136,695
Subsurface	—	—	—	—	—	421
Sewage	4,765	16,049	71,000 (a)	1,962	—	93,776
Reclaimed Water to the LA River	5,320	6,288	69,452	—	—	81,060
Total	10,085	22,337	140,452	1,962	0	311,952

(a) Estimated from historic data.

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TABLE 2-9B: SUMMARY OF 1993-94 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	2,052	3,398	1 *	5,451
Imports				
LA Aqueduct Water	3,301	–	–	3,301
MWD Water	5,492	8	–	5,500
Total	8,793	8	0	8,801
Exports (transfers) Groundwater to the San Fernando Basin	2,052	3,092	0	5,144
Total Delivered Water	8,793	314	1	9,108
Water Outflow				
Subsurface	460 **	–	–	460
Sewage	830 ***	177	–	1,007
Total	1,290	177	0	1,467

* Pumping for landscape irrigation by Santiago Estates under the overlying right of Meurer Engineering; under investigation by the Watermaster.
** Estimated in the Report of Referee.
*** Estimated.

TABLE 2-9C: SUMMARY OF 1993-94 WATER SUPPLY AND DISPOSAL VERDUGO BASIN
(acre-feet)

Water Source and Use	Crescenta Valley County Water District	City of Glendale	La Canada Irrigation District	City of Los Angeles	Total
Total Extractions	3,634	1,402	0	—	5,036
Imports					
LA Aqueduct Water	—	—	—	272	272
MWD Water	1,175	3,208	1,009	456	5,848
Total	1,175	3,208	1,009	728	6,120
Exports	0	0	0	0	0
Total Delivered Water	4,809	4,610 (a)	1,009	728	11,156
Water Outflow					
Subsurface to:					
Monk Hill Basin	—	—	—	—	300 (b)
San Fern. Basin	—	—	—	—	70
Sewage	1,590	1,102	0	190 (b)	2,882
Total	1,590	1,102	0	190	3,252

(a) Verdugo Basin metered sales x 105%.
(b) Maximum with high groundwater levels (Report of Referee).

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TABLE 2-9D: SUMMARY OF 1993-94 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 (a)	189 (a)	189
Imports				
LA Aqueduct Water	0	--	--	0
MWD Water	3,762	--	--	3,762
Total	3,762	0	0	3,762
Exports				
Ground Water	0	0	189	189
Total Delivered Water	3,762	0	0	3,762
Water Outflow				
Surface	--	--	--	0
Subsurface	0 (b)	--	--	0
Sewage	1,940 (c)	0	0	1,940
Total	1,940	0	0	1,940

(a) 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.

(b) Estimated in Supplement No. 2 to Report of Referee for dry years 1960-61. Currently considered insignificant.

(c) Estimated.

TABLE 2-10A: CALCULATION OF 1994-95 EXTRACTION RIGHTS SAN FERNANDO BASIN
(acre-feet)

	City of Burbank	City of Glendale	City of Los Angeles
Total Delivered Water, 1993-94	24,566	25,829	256,342
Water Delivered to Hill and Mountain Areas, 1993-94	---	---	41,773
Water Delivered to Valley Fill, 1993-94	24,566	25,829	214,569
Percent Recharge Credit	20.0%	20.0%	20.8%
Return Water Extraction Right	4,913	5,166	44,630
Native Safe Yield Credit	---	---	43,660
Total Extraction Right for the 1994-95 Water Year *	**4,913**	**5,166**	**88,290**

* Does not include stored water credit.

TABLE 2-10B: CALCULATION OF 1994-95 EXTRACTION RIGHTS SYLMAR BASIN
(acre-feet)

	City of Los Angeles	City of San Fernando	All Others
Extraction Right for the 1994-95 Water Year*	**3,105**	**3,105**	**

* The safe yield of the Sylmar Basin is 6,210 acre-feet. Effective October 1, 1984, the safe yield less pumping by two overlying parties, is equally shared by Los Angeles and San Fernando.

** Entitled to reasonable overlying pumping rights by Meurer Engineering only. Santiago Estates (Home Owners Group) are pumping for irrigation of their properties. This is being investigated further.

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, 1993)	54,981	40,293	239,257
2. Extraction Right for the 1993-94 Water Year	4,368	4,692	87,574
3a. 1993-94 Extractions			
Party Extractions	2,395	115	60,480
Physical Solution Extractions	1,194	413	458
Total:	3,589	528	60,938
3b. Extractions for Testing	50	0	50
4. Total 1993-94 Spread Water	0	0	0
5. Stored Water Credit (as of October 1, 1994)	**55,810**	**44,457**	**265,943**

Note: Item 5 = 1 + 2 - 3a + 3b + 4

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

(acre-feet)

	City of Los Angeles	City of San Fernando	All Others
1. Stored Water Credit (as of October 1, 1993)	1,651	2,652	—
2. Extraction Right for the 1993-94 Water Year	3,105	3,105	—
3. Total 1993-94 Extractions	2,052	3,398	1 *
4. Stored Water Credit (as of October 1, 1994)	**2,704**	**2,359**	—

Note: Item 4 = 1 + 2 - 3

* Santiago Estates pumping is under investigation.

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 September 14, 1994 was 241 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 684 mg/l for the 1993-94 Fiscal Year.

3. Northern California water (State Water Project water) 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 410 mg/l during the 1993-94 Fiscal Year.

4. Colorado River/Northern California water were first blended at Weymouth Plant in May, 1975. Blending ratios vary at the Weymouth Plant and tests are taken from the effluent.

Surface Water

Surface runoff contains salts dissolved from rocks in the tributary areas and is sodium-calcium, sulfate-bicarbonate in character. In December 1993, low flows in the Los Angeles River at the Arroyo Seco showed a TDS concentration of 670 and a total hardness of 287 mg/l. These values

also reflect the inclusion of rising ground water in the Los Angeles River reach between Los Feliz Blvd. and Gage F-57C-R.

Ground Water

Ground water in ULARA is moderately hard to very hard. The character of ground water 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.

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

A history of the TDS content in the various water sources and mineral analyses of imported, surface, and ground waters are contained in Appendix F.

3.2 Ground Water Quality Management Plan

During the 1993-94 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 San Fernando Valley ground water basin. Special emphasis is placed on monitoring and removing the organic contaminants Trichloroethylene (TCE) and Perchloroethylene (PCE) found in the ground water. Table 3-1 summarizes the number of wells in the ULARA well fields exceeding the Maximum Contaminant Levels of the California Drinking Water Standards of 5 ppb for TCE and 5 ppb for PCE.

TABLE 3.1 - 1993-94 NUMBER OF WELLS IN THE ULARA WELL FIELDS EXCEEDING CALIFORNIA STATE MCL FOR TCE AND PCE

	Number of Wells Exceeding Contaminant Level													
	City of Los Angeles									Sub-	Others			Grand
	NH	CS	P	HW	E	W	T	V	AE	Total	B	G	CVCWD	Total
TCE Levels (ppb)														
5-20	10	0	0	0	2	2	1	1	1	17	0	3	0	20
20-100	4	2	3	6	0	4	0	0	5	24	5	2	0	31
>100	2	0	0	0	0	0	0	0	1	3	4	2	0	9
Total	16	2	3	6	2	6	1	1	7	44	9	7	0	60
PCE Levels (ppb)														
5-20	5	0	0	3	0	0	0	1	0	9	1	2	1	13
20-100	1	0	3	1	0	0	0	0	1	6	3	0	0	9
>100	0	0	0	0	0	0	0	0	0	0	4	0	0	4
Total	6	0	3	4	0	0	0	1	1	15	8	2	1	26

Well Fields:
- NH - North Hollywood
- CS - Crystal Springs
- P - Pollock
- HW - Headworks
- E - Erwin
- W - Whitnall
- T - Tujunga (added this year)
- V - Verdugo
- AE - LADWP Aeration Tower Wells
- B - City of Burbank
- G - City of Glendale
- CVCWD - Crescenta Valley County Water District

Notes:
1) Wells are categorized based upon maximum TCE and PCE values attained during the 1993-94 Water Year, where data was not available, data from the most recent water year was used.
2) MCL: Maximum Contaminant Level

3.3 Underground Tanks, Sumps, and Pipelines

The City of Los Angeles Fire Department (LAFD) continues to implement the Satet-mandated Underground Storage Tank Program (UST) and is actively carrying on a program to bring the large number of underground tanks in the San Fernando Valley into compliance with current law.

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 Los Angeles Regional Water Quality Control Board for further action.

3.4 Private Sewage Disposal Systems (PSDS)

In order to eliminate existing commercial and industrial PSDS and their discharges of wastewater to the ground water 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 1993-1994 Water Year, a total of twelve areas have had construction completed, and six areas have been designed. Plate 8 shows the locations of the Districts.

The Industrial Waste Management Division (formerly the Enforcement Division) of the Bureau of Sanitation continued to pursue the enforcement aspect to the PSDS elimination program. There had been good compliance with the mandatory sewer hook-up ordinance and more than one thousand properties have already abandoned PSDS and connected to the public sewer.

A group of 180 owners of PSDS were recently notified of the requirement to discontinue use of their PSDS and connect to newly constructed sanitary sewers. The prior group of owners achieved 100% compliance by April 1994, and it is anticipated that this compliance rate will again be achieved for this most recent group.

3.5 Landfills

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 RWQCB are listed in Table 3-2.

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 volatile organic compounds in their underlying groundwater.

The SWAT report of the Pendleton landfill, owned by the Water System of the Los Angeles Department of Water and Power was approved by the RWQCB subject to two additional semiannual monitorings to verify the results of program testing. The latter monitorings have been completed and the results submitted to the RWQCB.

3.6 San Fernando Valley Remedial Investigation (RI) and Related Activities

A remedial investigation (RI) of ground water contamination in the San Fernando Valley was initiated in July 1987 by the United States Environmental Protection Agency (EPA) to characterize the San Fernando Basin (SFB) and the Verdugo Basin and their contamination with TCE and PCE. The Los Angeles Department of Water and Power (LADWP) was selected by the EPA to serve as the its lead agency in conducting the RI and entered into a cooperative agreement that has provided over $19 million in federal funding to LADWP since July 1987. In August 1987, the LADWP selected James M. Montgomery, Consulting Engineers, Incorporated (JMM) 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 which 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 Ground Water 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-

TABLE 3-2: LANDFILLS WITH SWAT INVESTIGATIONS

(reported to Interagency Coordinating Committee)

Name	Rank	Status	Current Owner	Location	SWAT Report Completed	Final SWAT Submitted	Phase II SWAT Required	Approved by RWQCB	Site Leak	Type of Leak	Further Ground Water Monitoring
Bradley West	1	Open	WMDSC	Sun Valley, Southeast of Sheldon Street	6/87	11/90		4/92	Y	NHA	d
Sheldon-Arleta	1	Closed	City of Los Angeles Bureau of Sanitation	Sun Valley District Near Hollywood & Golden State Freeways.	5/87	5/87		2/90	U		b
Scholl Canyon	1	Open	City of Glendale	San Rafael Hills, 1 mile West of Rose Bowl.	7/87	4/88		8/90	Y	NHA	d
Scholl Canyon	2	Closed	City of Glendale	San Rafael Hills, 1 mile West of Rose Bowl.	7/87	1/91		12/93	P		c
Bradley East	2	Closed	WMDSC	Southeast of Sheldon St.	6/87	11/90		4/92	Y	NHA	b*
Sunshine Cyn.	2	Open	Browning - Ferris Industries	Southeast Santa Susana Mtns. West of Golden State Fwy.	7/88	7/89		4/94			a
Gregg Pit/Bentz	2	Closed	Cal Mat Properties	Between Pendleton Street and Tujunga Ave.	7/89	7/89		2/90	Y	NHA	b
Branford	2	Closed	City of Los Angeles Bureau of Sanitation	Sun Valley District Northwest of Tujunga Wash	7/88	10/90	X				c
Cal Mat (Sun Valley #3)	2	Open	Cal Mat Properties	Sun Valley District Northeast of Glenoaks Blvd.	7/88	11/90		6/92	N		
Lopez Canyon	2	Open	City of Los Angeles Bureau of Sanitation	North of Hansen Dam Between Lopez and Kagel Cyn.	6/88	6/88	X				a
Toyon Canyon	2	Closed	City of Los Angeles Bureau of Sanitation	Griffith Park	6/88	3/89		4/91	Y	NHA	b*
Tuxford Pit	2	Closed	Aadlin Bros. (Los Angeles By-Products Co.)	Sun Valley District Southwest of Golden State Freeway and Tujunga Ave.	6/88	12/90		6/92	P		b*
Penrose	2	Closed	Los Angeles By-Products Co.	N. of Strathern St., Tujunga Ave.	6/88	7/89		9/89	Y	NHB	b
Newberry	3	Closed	Los Angeles By-Products Co.	N. of Strathern St., Tujunga Ave.	6/88	7/89		9/89	Y	NHB	b
Hewitt Pit	2	Closed	Cal Mat Properties	North Hollywood District Hollywood Fwy., Laurel Canyon Blvd.	6/88	7/89		5/91	Y	NHB	
CalMat (old) Bradley Landfill Complex	3	Closed	WMDSC	Sun Valley District Sheldon St., San Fernando	7/88	7/89		4/92	Y	NHA	b*
Pendleton St.	4	Open	Department of Water & Power	Sun Valley intersection Pendelton St., Glenoaks Blvd.	7/90	5/91		6/92	N		c
Stough Park	2	Open	City of Burbank	Bel Air Dr. & Cambridge Dr.	6/88	12/88		4/90	Y	NHA	a*

* Ground water contamination Evaluation Monitoring Program (EMP) required under chapter 15.

(a) All open landfills are required to have ground water monitoring under Chapter 15. Monitoring results are submitted to the Regional Board quarterly.

(b) Closed landfills with ground water monitoring required under Chapter 15. Monitoring results are submitted to the Regional Board periodically.

(c) Subject to SWAT requirements. Further monitoring may be required under Chapter 15.

(d) Under Chapter 15 Corrective Action Program (CAP), after completion of EMP.

U - Undetermined due to dry wells.

Y - Yes

N - no

P - Pending leakage determination.

NHA - Non-Hazardous but above state drinking water regulatory levels., H - Hazardous waste based on Title 22, CCR.

NHB - Non-Hazardous but below state drinking water regulatory levels., H - Hazardous waste based on Title 22, CCR.

dimensional mass transport model is being developed for the SFB. The model has been utilized to analyze the storage, characteristics, and quality of ground water in the SFB from the proposed East Valley Water Recycling Project and ground water extraction scenarios.

EPA's consultant, CH2M HILL, continues to periodically sample the 87 ground water monitoring wells that were installed as part of the RI. CH2M HILL also obtains ground water quality and ground water elevation data from the LADWP, 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, perform simulations with the SFB flow model, and proceed with the Feasibility Study to provide a remedial action plan for the SFB.

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, LADWP, California State University-Northridge, and the University of California - Los Angeles.

The LADWP also maintains a current SFB database for use with the SFB flow model and generation of ground water contour maps and contaminant plume maps. CH2M HILL forwards current ground water quality and ground water elevation data to the LADWP for the 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 Operable Units (OUs), which are part of the EPA's overall, long-term ground water remediation activities in the San Fernando Valley. The OUs are described below.

1. North Hollywood OU - The North Hollywood OU which was funded by USEPA and DHS, was shut down from November 1993 through June 1994 because of construction at the North Hollywood Pumping Plant.

   The North Hollywood OU went back into service in mid-June 1994 and continued to operate satisfactorily during the rest of the 1993-94 Water Year, treating more than 226 million gallons of water

2. Burbank OU - The consent decree on the Burbank OU was entered by the court on March 25, 1992. Construction of Phase I of the Burbank OU facility, which will extract and treat 6,000 gpm of contaminated ground water from the Burbank area, is expected to be completed in Fall 1994. Once the blending facility has been completed to reduce nitrate levels, Phase I will be put into operation. The City of Burbank will use a portion of the treated ground water, and the City of Los Angeles is considering using a portion of the treated ground water upon completion of Phase II of the project in 1996.

3. Glendale North and Glendale South OUs - The Glendale North and Glendale South OUs are being planned to extract and treat a total of 5,000 gpm. The Records of Decision (RODs) were signed by the EPA in June 1993. The Glendale North OU is located in the Glendale Grandview Well Field area and will extract and treat 3,000 gpm of contaminated ground water. The Glendale South OU is located in the northern portion of the Los Angeles River Narrows Area and will extract 2,000 gpm of contaminated ground water for transmission to the Glendale South OU for treatment (the RODs specify a single treatment facility for both OUs). The combined 5,000-gpm flow of treated ground water will be delivered to the City of Glendale.

4. Pollock OU - The EPA is completing a site assessment of contaminated ground water in the Pollock Well Field area. LADWP has made use of all data and reports from the EPA for its Pollock Well Field Remediation Project on a cooperative basis.

Other Treatment Facilities

1. Advanced Oxidation Process (AOP) Plant - The AOP Plant was shut down from November 1993 through June 1994 because of construction at the North Hollywood Pumping Plant. Thereafter, the AOP operations were not resumed until October 1994. Subsequently reliability testing and equipment modifications are being performed in preparation for special tests to confirm VOC removal capability of the AOP Plant at elevated contaminant levels of TCE and PCE. The level of TCE in supply well water continues to be below original design estimates.

2. Glenwood Nitrate Water Treatment Plant - The Crescenta Valley County Water District's Glenwood Nitrate Water Treatment Plant which uses an anion-exchange process for nitrate removal, was back in full service in July 1993, and continued to operate satisfactorily during the remainder of the year.

3. Pollock Well Field Remediation Project - While the Pollock Project is compatible with the EPA's goal of basinwide ground water cleanup and protection, it is not directly related to the EPA's ground water cleanup efforts and will not be funded by the EPA. The Pollock Project's main focus is to reduce rising ground water flowing past gaging station F-57C-R, thus maintaining water rights for the City of Los Angeles.

The Pollock Project will entail the following:

- pumping approximately 3,000 gallons per minute of ground water from the existing Pollock Well No. 4 and Pollock Well No. 6 for a six-month period followed by a non-pumping period of six months
- treating the ground water with liquid-phase granular activated carbon (GAC) for VOC removal and disinfecting the treated ground water with liquid sodium hypochlorite
- blending the treated and chlorinated ground water to reduce nitrate levels
- delivering the blended water to LADWP's distribution system

4. Burbank GAC Treatment Plant - The City of Burbank placed a Granular Activated Carbon (GAC) Treatment Plant in operation in November 1992. The treatment facility underwent a carbon change out beginning in April 1993, and was placed back on line in September 1993. The GAC Treatment Plant uses ground water produced by Burbank Wells No. 7 and 15. Burbank continued to detect DCA and DCE in shallow Well No. 15. The origin of the DCA and DCE is suspected to be the plating operations in the vicinity of the facility.. The GAC Treatment Plant was out of operation from January 15, 1994 until March 3, 1994 for a carbon change out. Burbank expects to change carbon again in July 1994. Carbon efficiency is proving to be significantly less than expected. Burbank is considering switching contactors from parallel to series if the Department of Health Services allows it.

3.8 Ground Water Quality Investigations

During the 1993-94 Water Year, several ground water contamination investigations were performed at various sites. As part of these investigations ground water monitoring wells have been drilled and ground water has been extracted for the purpose of well development, testing or cleanup. Some of the major sites and their activities through March 1995 are summarized below:

Philips Components

Groundwater remediation, which involves extraction, air-stripping, and reinjection through a trench was started in July 1988. The main contaminant in Methylene Chloride (MEC) which has been found only in Extraction Well (EW-1), and in a nearby monitoring well (MW-19). Concentrations of MEC have decreased by two orders of magnitude since July 1988. During 1993-94, 55 acre-feet were pumped, treated and reinjected. The TCE and PCE present in most of the monitoring wells is believed to originate off-site, to the north. A soil-vapor extraction system was started in 1994 but has since been shut down due to the absence of MEC in the air stream. Five soil samples showed similar results. Phillips has petitioned the Regional Board for removal of the system.

Rockwell-Rocketdyne (Canoga Park)

Contaminants 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 monitor wells-65 in the shallow zone, 14 in the upper zone, and 6 in the lower zone. Additionally there are another 31 monitoring wells near the four upgradient service stations. Nine extraction wells feed a treatment facility in the southeast portion of the property. During the 1993-94 Water Year, about 343 acre-feet were pumped. An interim liquid phase granular activated carbon system was replaced by an air-stripping system with vapor phase GAC, which commenced operation during February 1994, following delays caused by the Northridge earthquake (January 1994). The treated water is discharged under an NPDES permit to a storm drain, and thence to the Los Angeles River, which is monitored both upstream and downstream from the storm drain confluence. During September 1994 two additional monitoring wells were installed-one in the upper zone (U-16) and one in the lower zone (L-7).

3M (Formerly Riker Lab)

The main pollutant is chloroform. There as been a groundwater extraction and treatment system since 1988. REW-1 and REW-2 pump from the shallow zone and RMW-1 from the lower water-bearing zone. There are numerous monitor wells on the property, and off-site to the south.

Treatment is by three GAC columns in series, thence to an on-site holding tank. Water is used on-site for cooling towers as make-up water. The demand for this purpose drives the amount pumped. During 1993-94 Water Year the amount pumped was 16 acre-feet Treated water not used on-site was to be discharge to the Los Angeles River under an NPDES permit, but high nitrates created a problem with this proposal. The problem has now been resolved and start-up is expected in late 1995. A soil vapor extraction system has been installed and start-up is scheduled for the second quarter 1995.

Allied-Signal (Formerly Bendix Corp.)

The only VOC that was detected above 5µg/l was TCE in three of the ten monitor wells. Nitrates are in the range of 27-76mg/l. There is no remediation system. Allied-Signal was named a potentially responsible party (PRP) by the EPA in the Burbank OU. Allied-Signal is currently investigating the possibility of Los Angeles' pumping in the North Hollywood wellfield drawing additional contamination under their property.

Hughes (Canoga Park)

The most prominent contaminant is 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). Thirty-five monitor wells were sampled on March 7-8 195. Final testing of the air-sparging/vapor extraction system was delayed due to the Northridge earthquake but full system operation is expected in May 1995. An application was made to the Regional Board on May 24, 1995, to discharge the effluent from the treatment system, but the TDS is in excess of the Basin Plan objectives, even though the origin of the high TDS is related to the naturally occurring groundwaters. Instead of being discharged to the Los Angeles River, the treatment plant effluent will be stored in holding tanks, and used for on-site irrigation. The treated water will supply about half the water required for landscaping.

Greeff Fabrics (Formerly Wickes)

The main contaminant from an on-site source is chlorotoluene. Other plumes from off-site sources are mostly TCE, PCE, and PCA. There are three extraction wells. The pumped water is treated by chemical oxidation and returned to the groundwater via a percolation trench. There is also a vapor extraction system which has been operating satisfactorily. Twenty test holes have been proposed to evaluate plume migration.

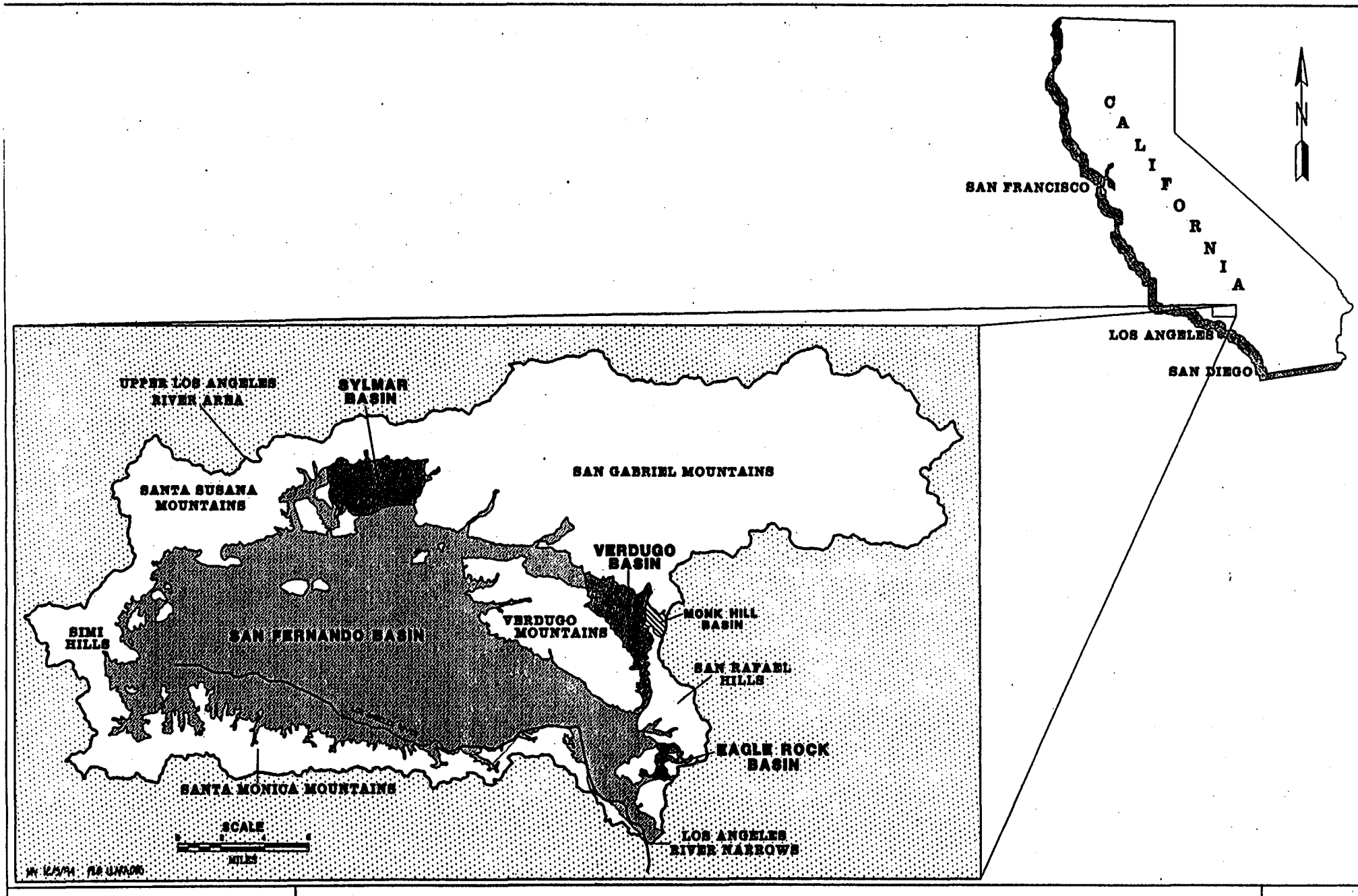
Taylor Yard (Narrows Area)

The remediation of the Taylor Yard of the Southern Pacific Transportation Company is under the jurisdiction of the Department of Toxic Substances Control (DTSC) of the California Environmental Protection Agency (Cal-EPA). To expedite the remediation the Taylor Yard has been divided in two parts-active yard and sale parcel. Remediation activities to the present time have involved mainly soils on the sale parcel. Many shallow soils have been found to be contaminated with petroleum hydrocarbons and with lead. These have been handled in two ways. Some have been stockpiled; others have been treated in-situ. The stockpiled soils have been rendered non-hazardous by chemical fixation technology and to reduce the potential for leaching so that these treated soils can meet the Regional Board requirements for use as a daily cover on class III landfills. Similar chemical fixation procedures were used in-situ to accomplish similar objectives without excavation of the soils. Remediation of the sale parcel has been completed. The groundwater investigation is in its early stages. Its primary focus is to assess the lateral distribution of VOC's and petroleum hydrocarbons from possible off-site and on-site sources at specific areas where sufficient data were not previously available. Nineteen monitoring wells were installed previously, and four additional wells were installed recently. The first quarterly monitoring report for these wells was for the fourth quarter of 1994. This monitoring is done in conjunction with monitoring of wells drilled for the Pollock Superfund site. Two areas of contamination have been recognized. In the northern part of the Taylor yard is a plume of VOC's coming from the north. LADWP's Pollock well project will be controlling this plume and removing VOC's (primarily TCE and PCE). Along the northeastern part of Taylor Yard are areas that show high VOC's (mainly TCE and PCE) in the groundwater. The sources of these VOC's appear to be two industries immediately adjacent to the northeast boundary, along San Fernando Road. Along this northeast boundary a vapor extraction system was operated continuously from August 25 to November 15, 1994 in the area close to the Weiand Automotive property. A portion of the vapor extraction system close to the Profile Plastics property was taken out of service because soil samples taken in August indicated that soil remediation in that area had been completed. However, one monitor well in that area shows high PCE.

The field investigation report will consist of four phases:
Phase 1: Initiation of groundwater monitoring
Phase 2: Vapor probe survey
Phase 3: Hydro punch and soil boring
Phase 4: Focused groundwater investigation

The aquitard inferred to exist by earlier investigators was not found during this investigation. The entire thickness of alluvium in this portion of the Narrows has free hydraulic communication.

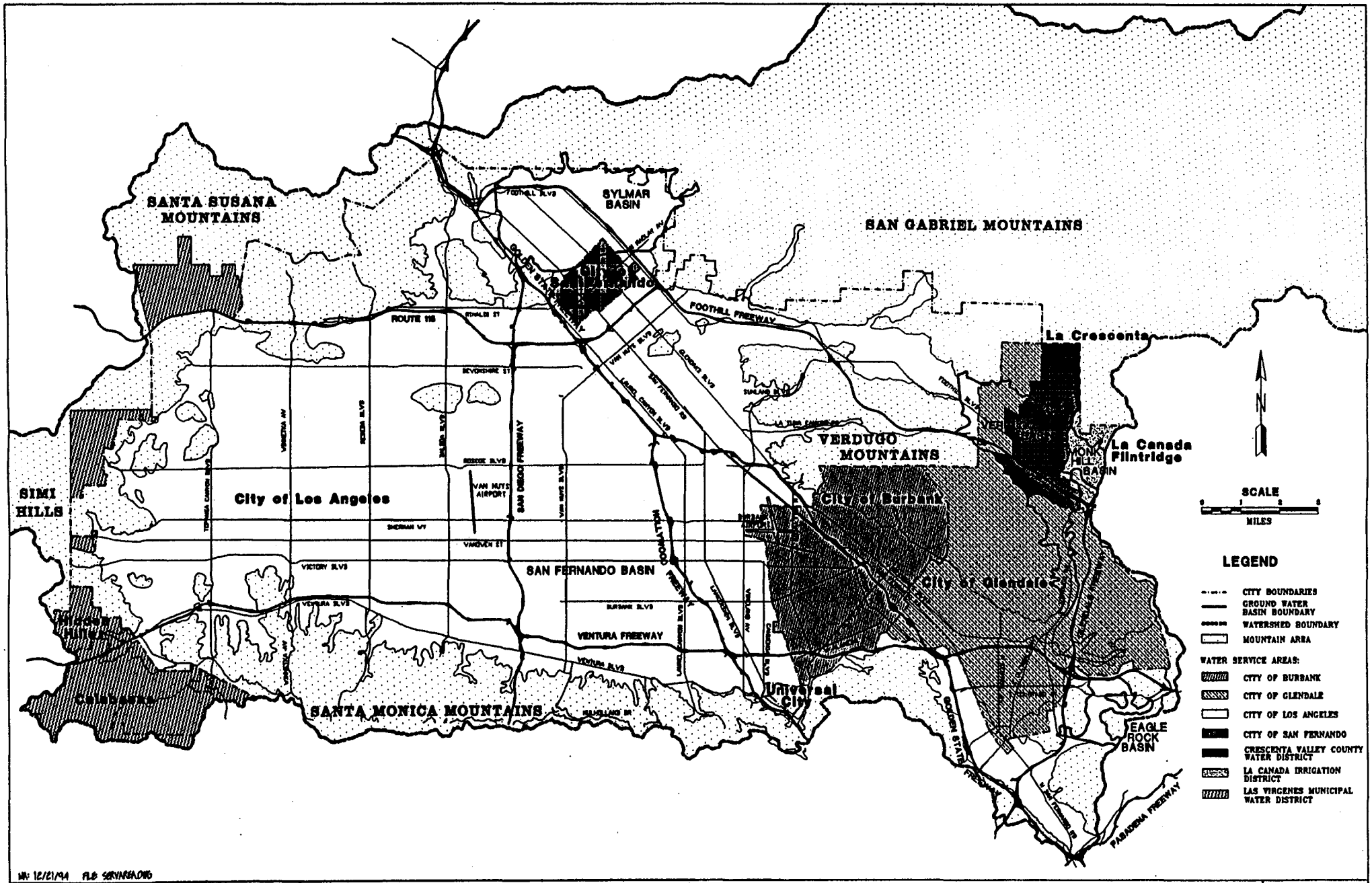
PLATES



1993-94 Water Year
ULARA Watermaster
Report

Upper Los Angeles River Area: Vicinity and Location Map

PLATE 1



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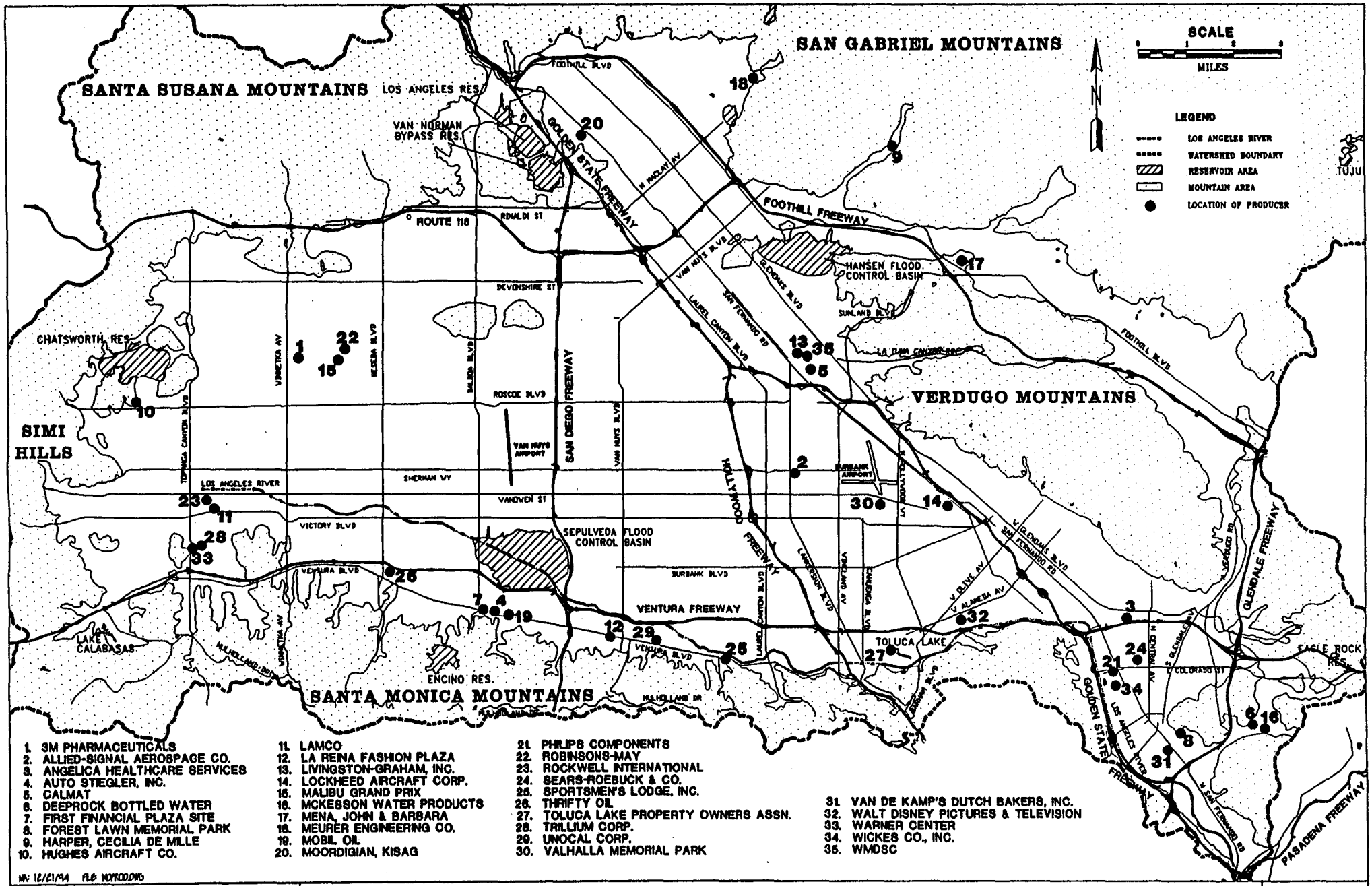
1993-94 Water Year
ULARA Watermaster
Report

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. HARPER, CECILIA DE MILLE
10. HUGHES AIRCRAFT CO.
11. LAMCO
12. LA REINA FASHION PLAZA
13. LIVINGSTON-GRAHAM, INC.
14. LOCKHEED AIRCRAFT CORP.
15. MALIBU GRAND PRIX
16. MCKESSON WATER PRODUCTS
17. MENA, JOHN & BARBARA
18. MEURER ENGINEERING CO.
19. MOBIL OIL
20. MOORDIGIAN, KISAG
21. PHILIPS COMPONENTS
22. ROBINSONS-MAY
23. ROCKWELL INTERNATIONAL
24. SEARS-ROEBUCK & CO.
25. SPORTSMEN'S LODGE, INC.
26. THRIFTY OIL
27. TOLUCA LAKE PROPERTY OWNERS ASSN.
28. TRILLIUM CORP.
29. UNOCAL CORP.
30. VALHALLA MEMORIAL PARK
31. VAN DE KAMP'S DUTCH BAKERS, INC.
32. WALT DISNEY PICTURES & TELEVISION
33. WARNER CENTER
34. WICKES CO., INC.
35. WMDSC

MA: 12/21/94 FILE NOMCODING

1993-94 Water Year ULARA Watermaster Report

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

Foothill Blvd.

Forestvre Wastewater Treatment Plant

Big Tujunga Reservoir

Indian Hills Mobile Homes Wastewater Treatment Plant

San Fernando

Valley

Granada Hills

Devonshire

Chatsworth

Rockdyne Santa Susana Field Laboratory Wastewater Treatment Plants

Chatsworth Res. Area

Northridge

Roscoe Blvd.

Sepulveda

Hansen Dam

Groundwater Divide

Sunland

Tujunga

Foothill Fwy.

Hansen Spreg. Grnds.

Pacoima Spreg. Grnds.

Branford Spreg. Grnds.

Tujunga Spreg. Grnds.

CVCWD Wastewater Treatment Plant

La Crescenta

Van Nuys Airport

Burbank-Glendale-Pasadena Airport

City Of Burbank Wastewater Treatment Plant

Canoga Park

Reseda

Vanowen

Los Angeles River

Sepulveda Flood Control Dam

Van Nuys

Woodland Hills

Ventura Fwy.

Tarzana

Encino

Encino Reservoir

Sherman Oaks

Roscoe

Burbank

North Hollywood

Universal City

Woodworks Spreg. Grnds.

L.A. - Glendale Wastewater Treatment Plant

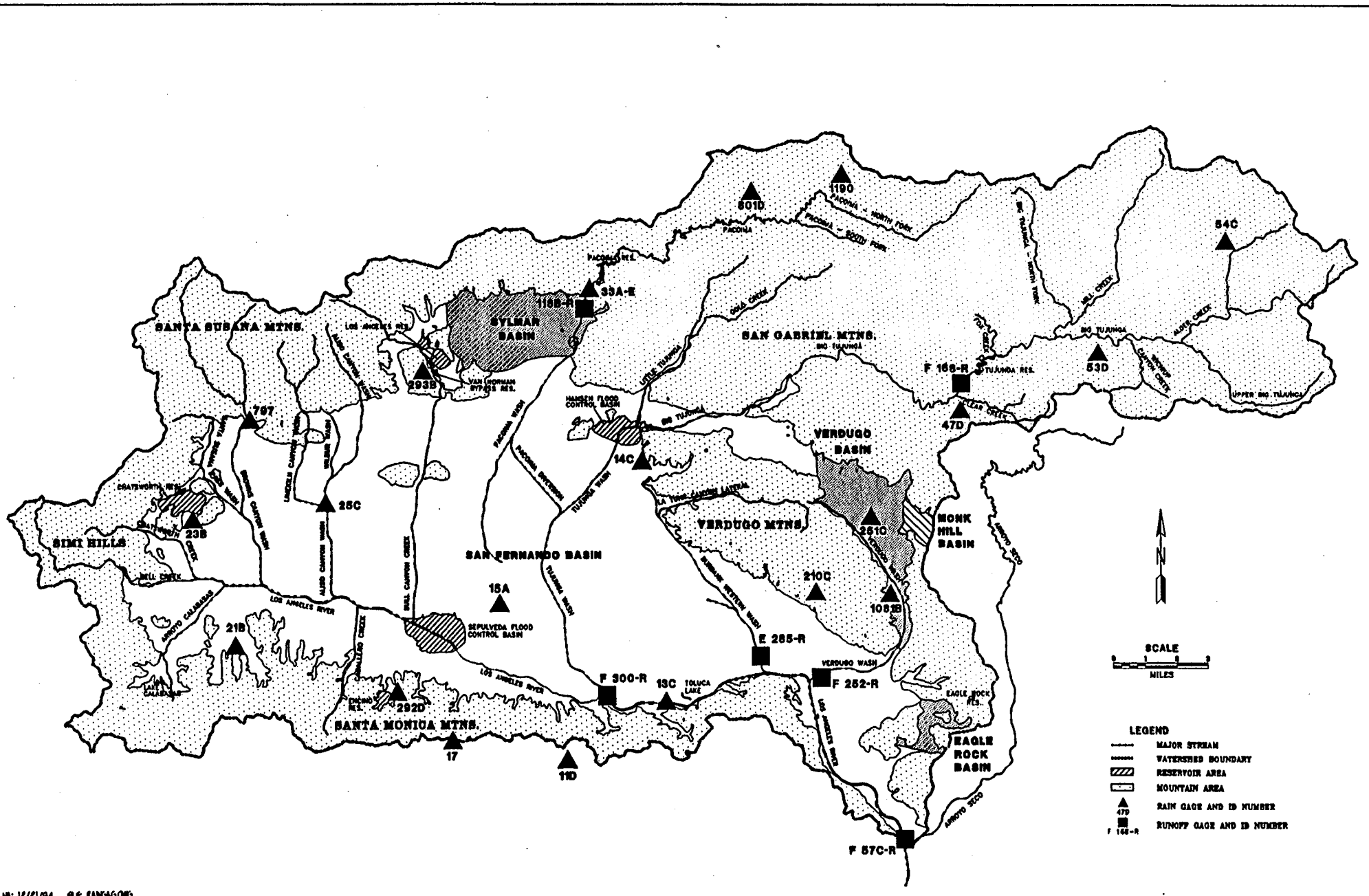
Glendale

Colorado Blvd.

Eagle Rock

Raymond Fault

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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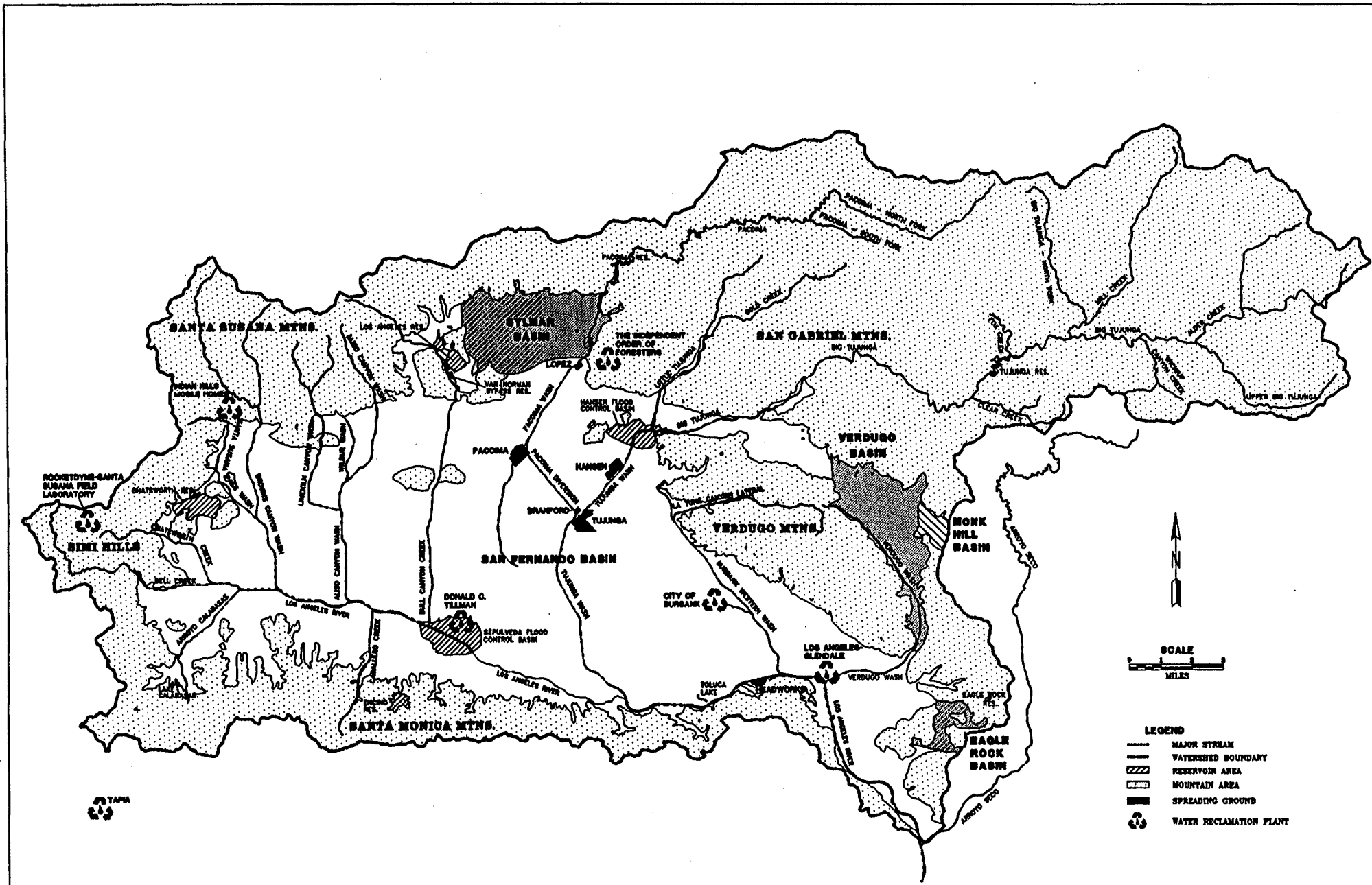
1993-94 Water Year ULARA Watermaster Report	**Upper Los Angeles River Area: Locations of Rain and Runoff Measuring Stations**	PLATE 5



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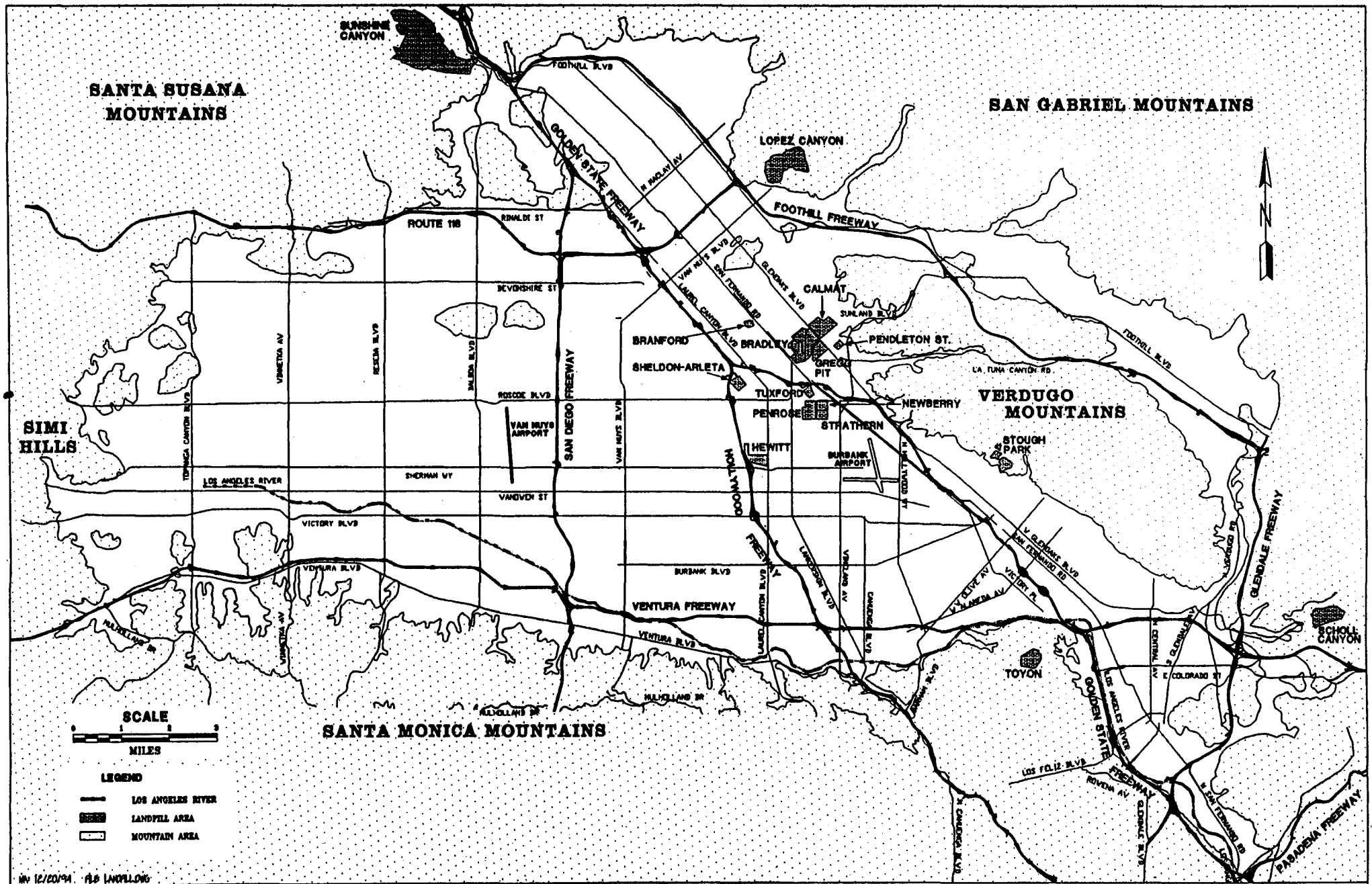
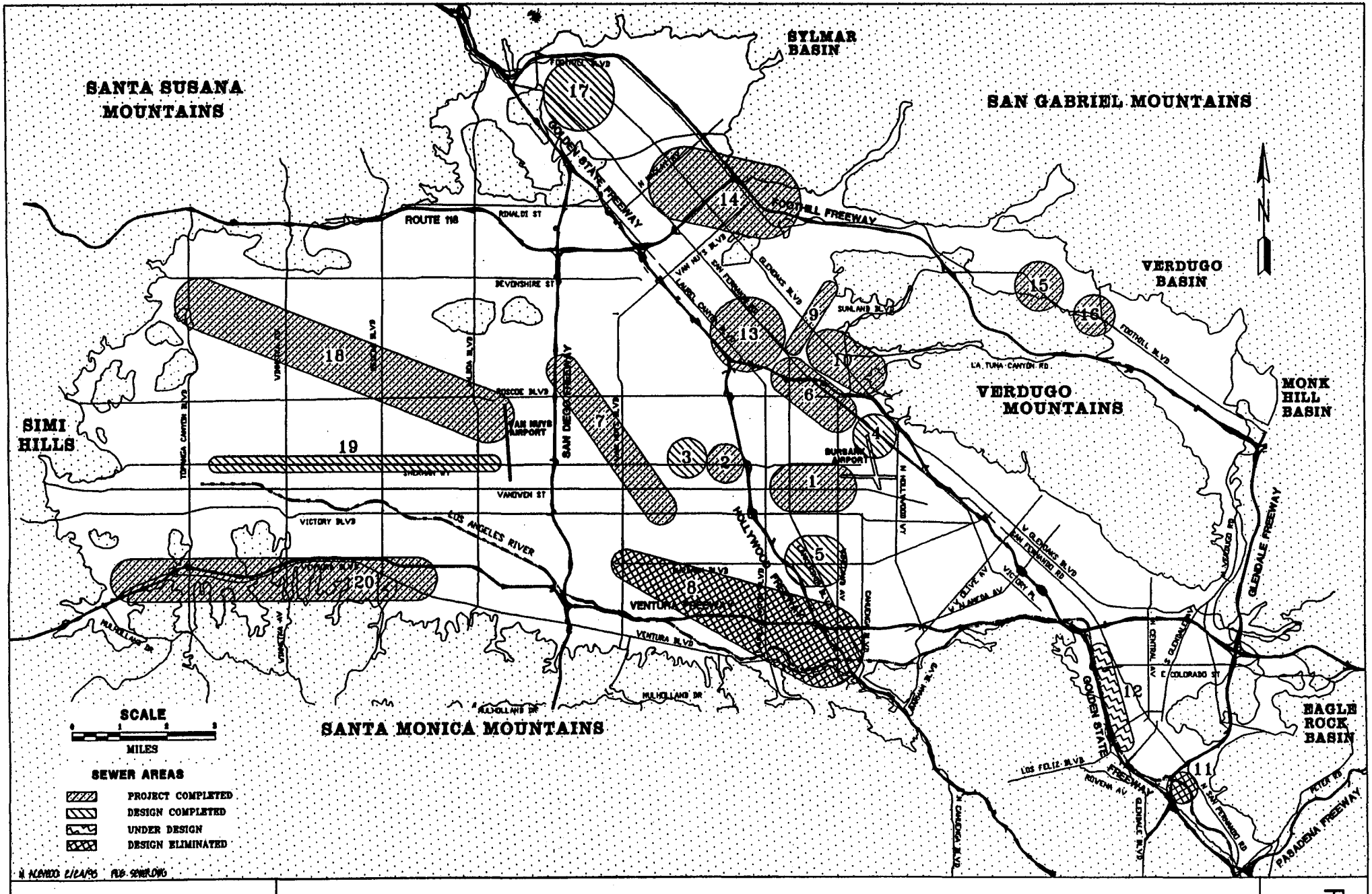
1993-94 Water Year ULARA Watermaster Report	Upper Los Angeles River Area: Spreading Basins and Water Reclamation Plants	PLATE 6



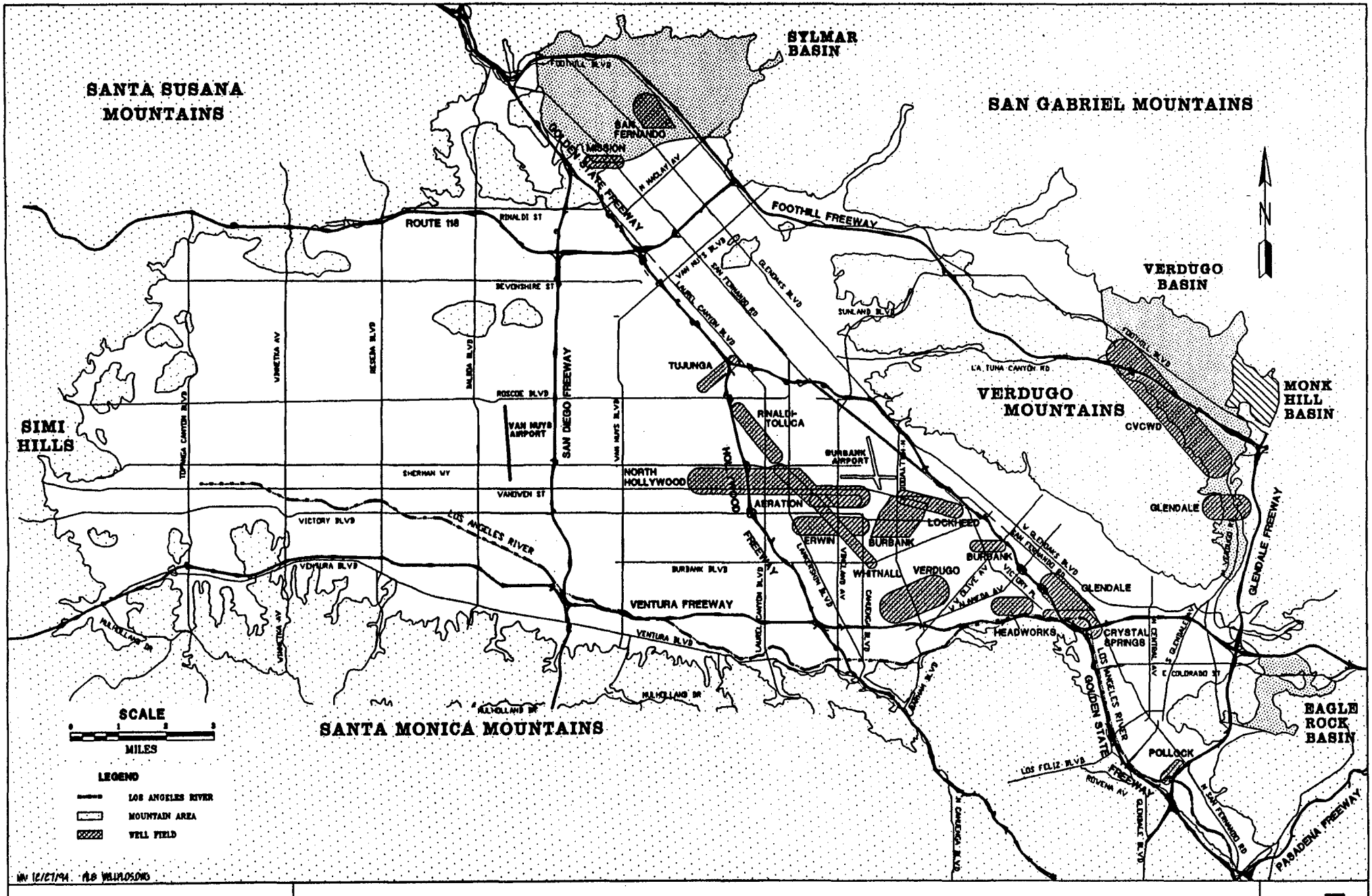
1993-94 Water Year ULARA Watermaster Report	**Upper Los Angeles River Area: Landfills with Solid Waste Assessment Test [SWAT] Evaluations**	PLATE 7



1993-94 Water Year ULARA Watermaster Report

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

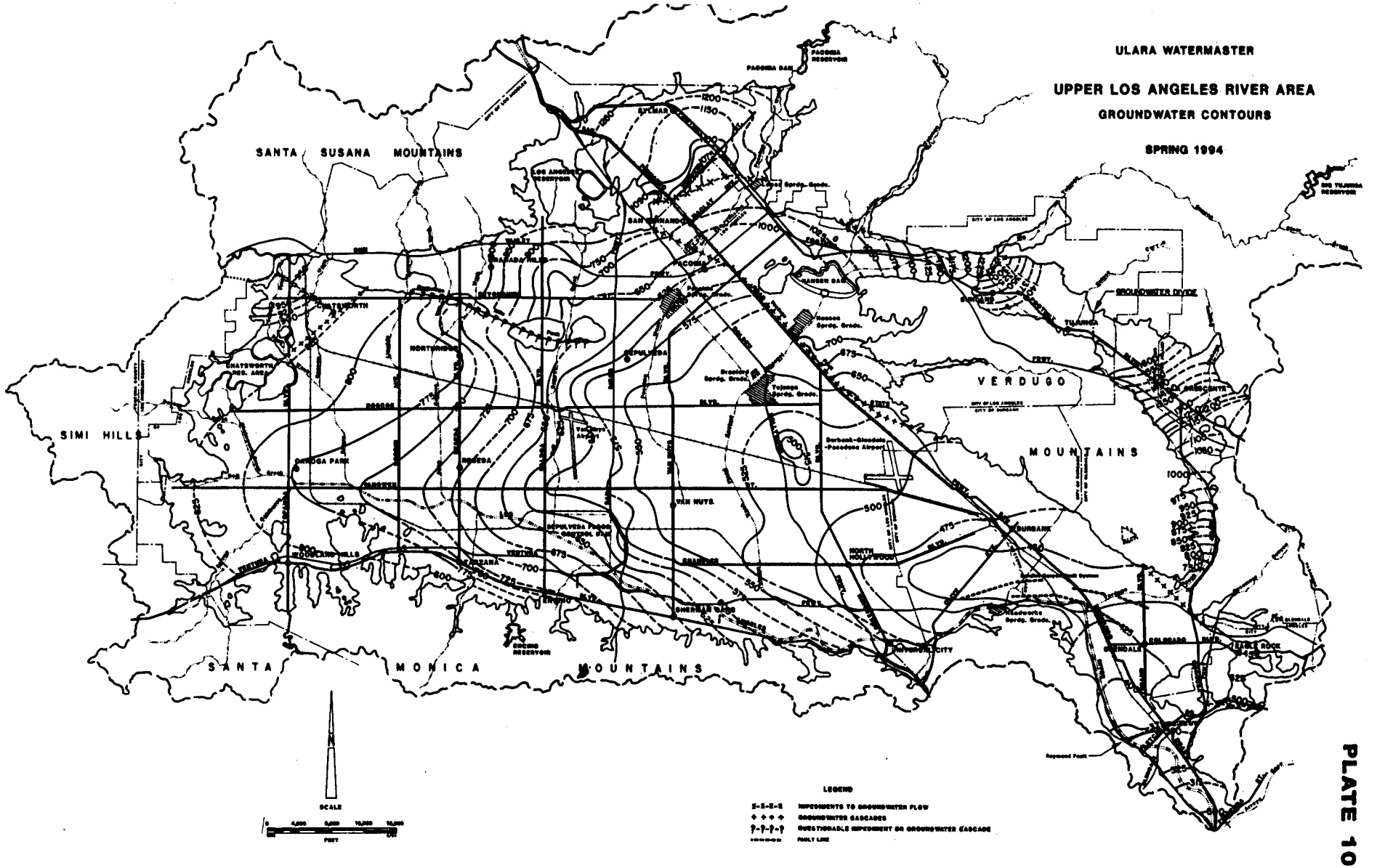
PLATE 8



1993-94 Water Year ULARA Watermaster Report

Upper Los Angeles River Area: Well Field Locations

PLATE 9


ULARA WATERMASTER
UPPER LOS ANGELES RIVER AREA
GROUNDWATER CONTOURS
SPRING 1994
SANTA SUSANA MOUNTAINS
SIMI HILLS
SANTA MONICA MOUNTAINS
VERDUGO MOUNTAINS
GROUNDWATER DIVIDE
SCALE
LEGEND
PLATE 10

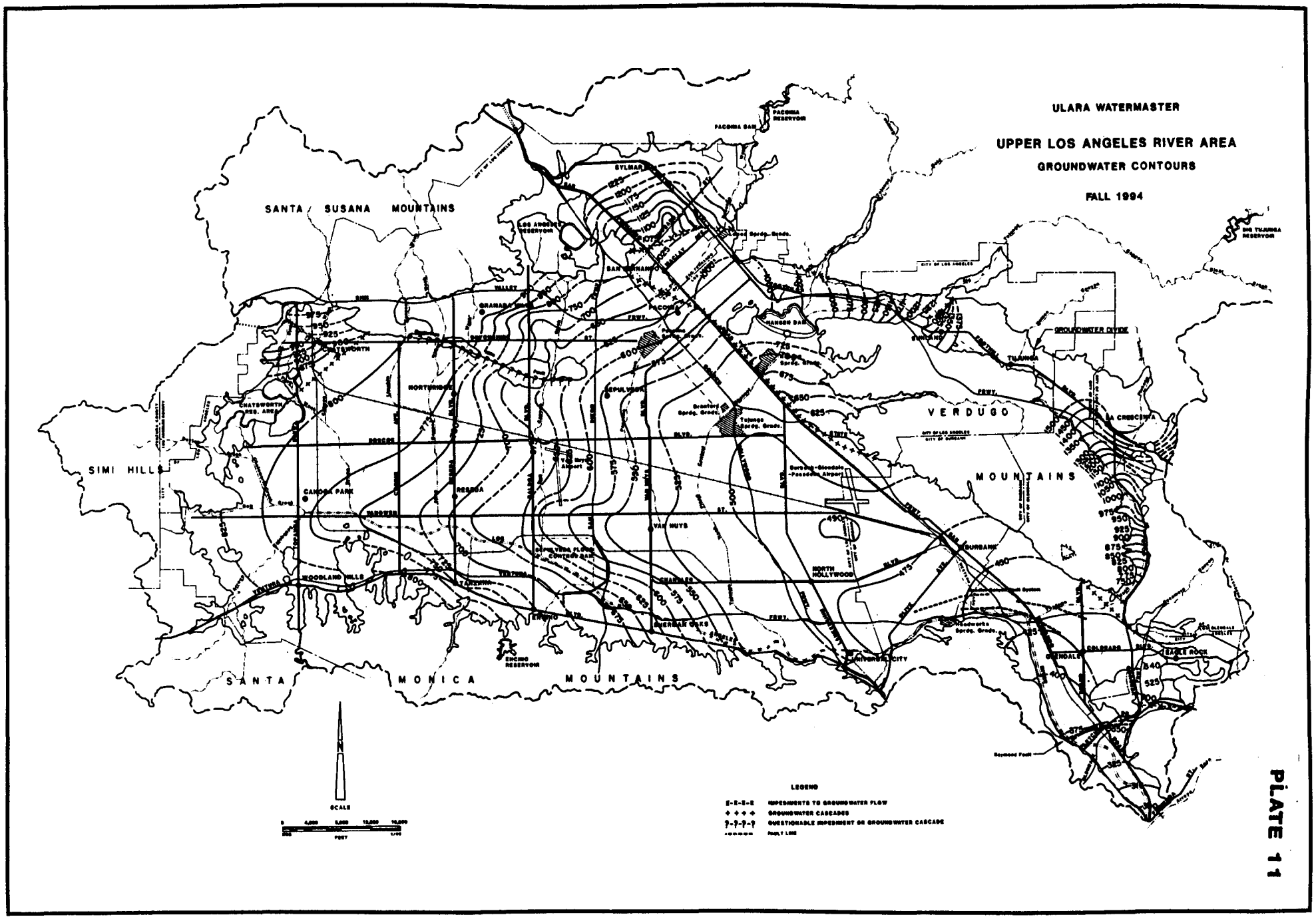
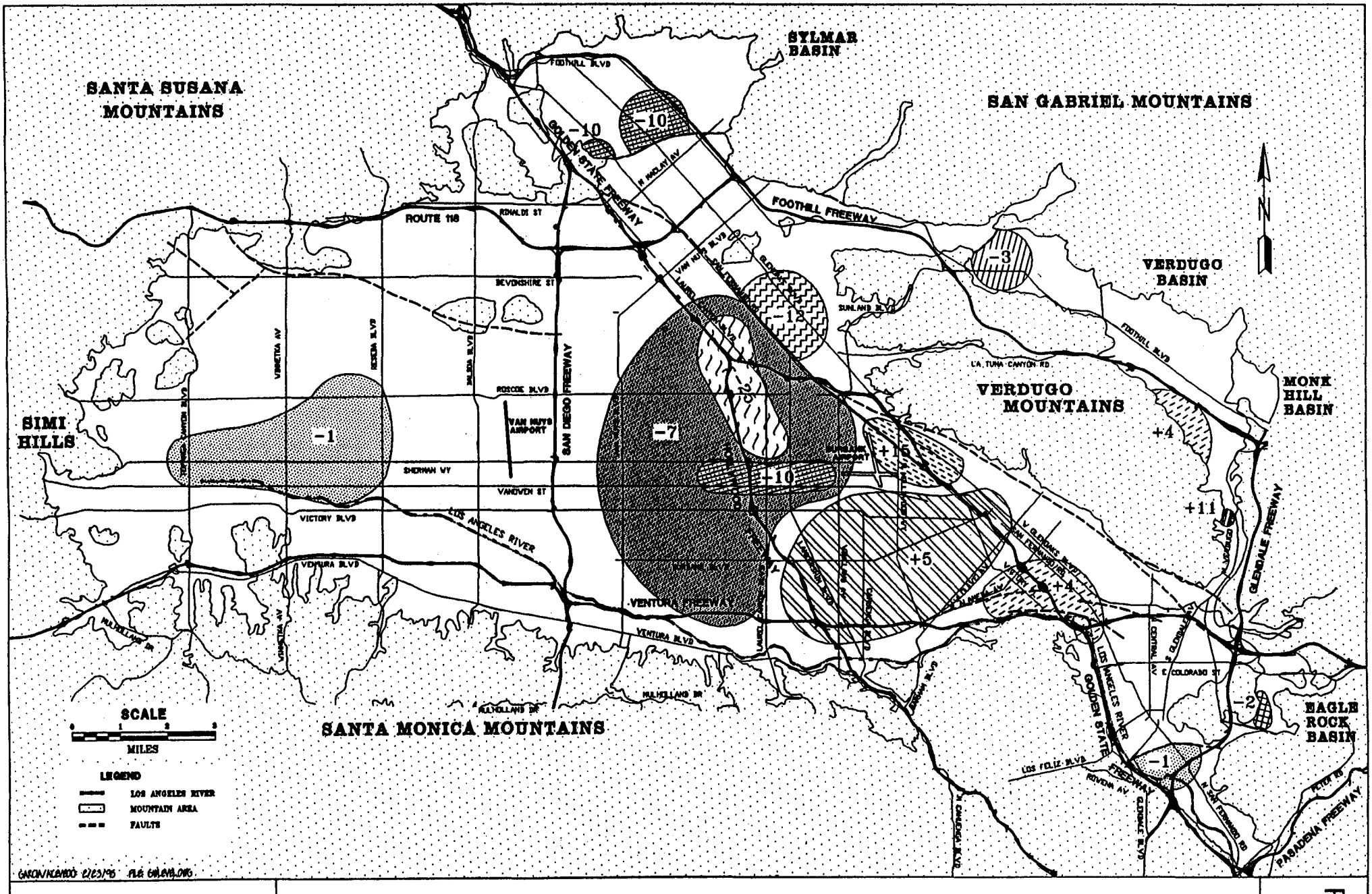

ULARA WATERMASTER
UPPER LOS ANGELES RIVER AREA
GROUNDWATER CONTOURS
FALL 1994
SANTA SUSANA MOUNTAINS
SIMI HILLS
SANTA MONICA MOUNTAINS
VERDUGO MOUNTAINS
PACOIMA RESERVOIR
LOS ANGELES RESERVOIR
HANSEN DAM
TUJUNGA RESERVOIR
ENCINO RESERVOIR
CHATSWORTH RES. AREA
CANOGA PARK
WOODLAND HILLS
VAN NUYS
NORTH HOLLYWOOD
BURBANK
UNIVERSAL CITY
GLENDALE
EAGLE ROCK
LA CRESCENTA
TUJUNGA
SUNLAND
GROUNDWATER DIVIDE
SCALE
LEGEND
IMPEDIMENTS TO GROUNDWATER FLOW
GROUNDWATER CASCADES
QUESTIONABLE IMPEDIMENT OR GROUNDWATER CASCADE
FAULT LINE

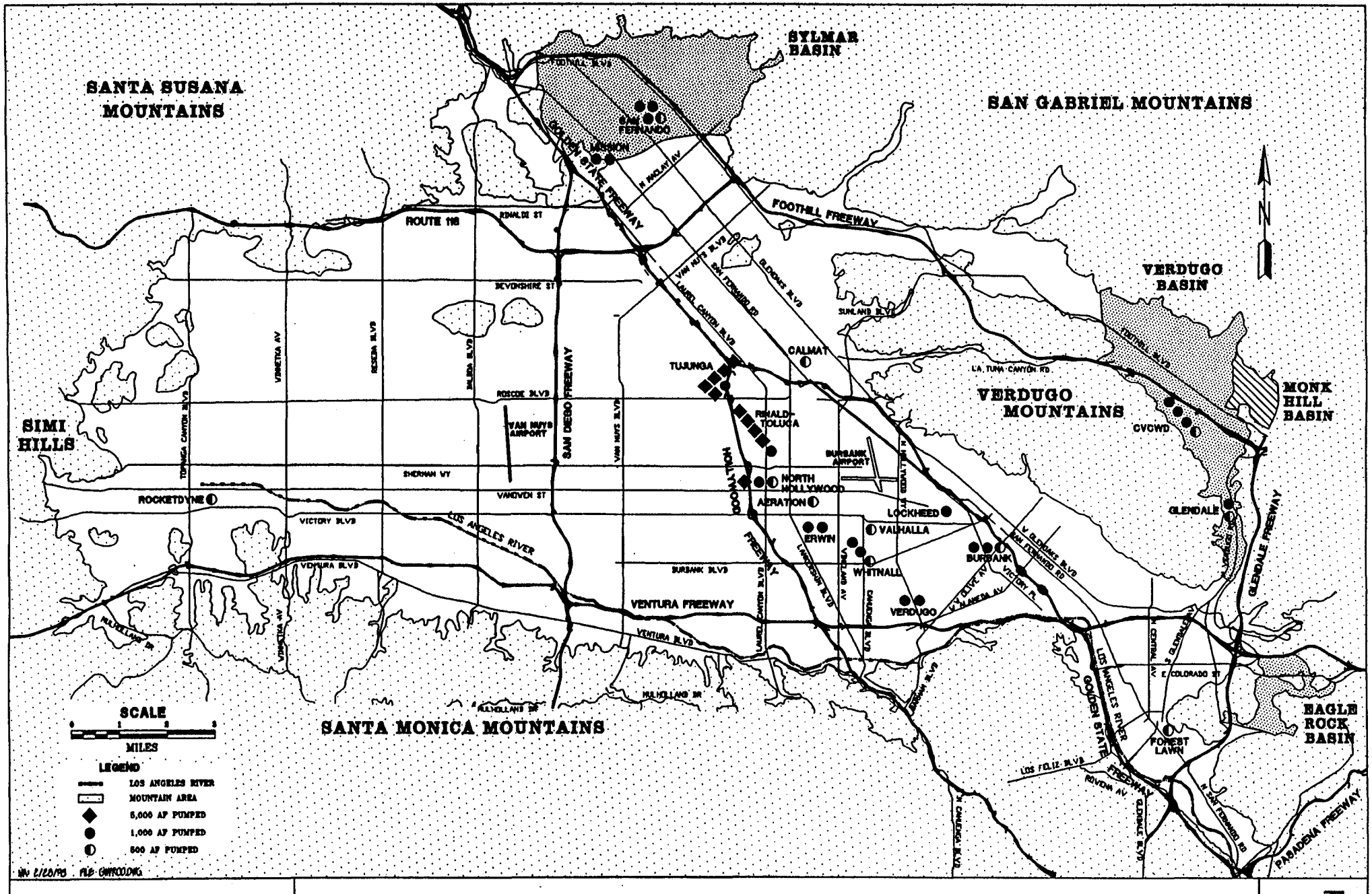
PLATE 11



1993-94 Water Year ULARA Watermaster Report

Upper Los Angeles River Area: Average Change in Groundwater Elevations: Fall 1993 - Fall 1994

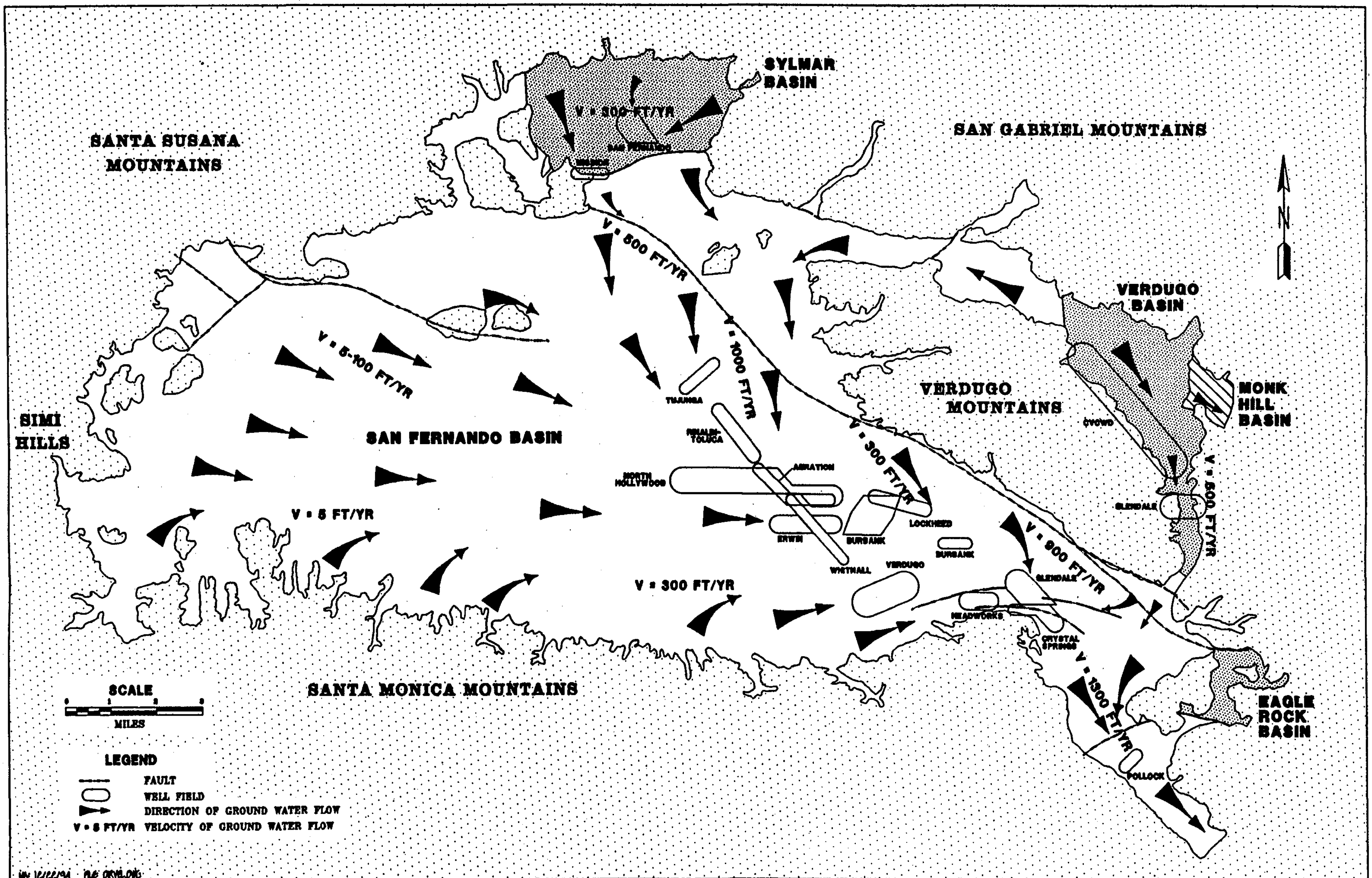
PLATE 12



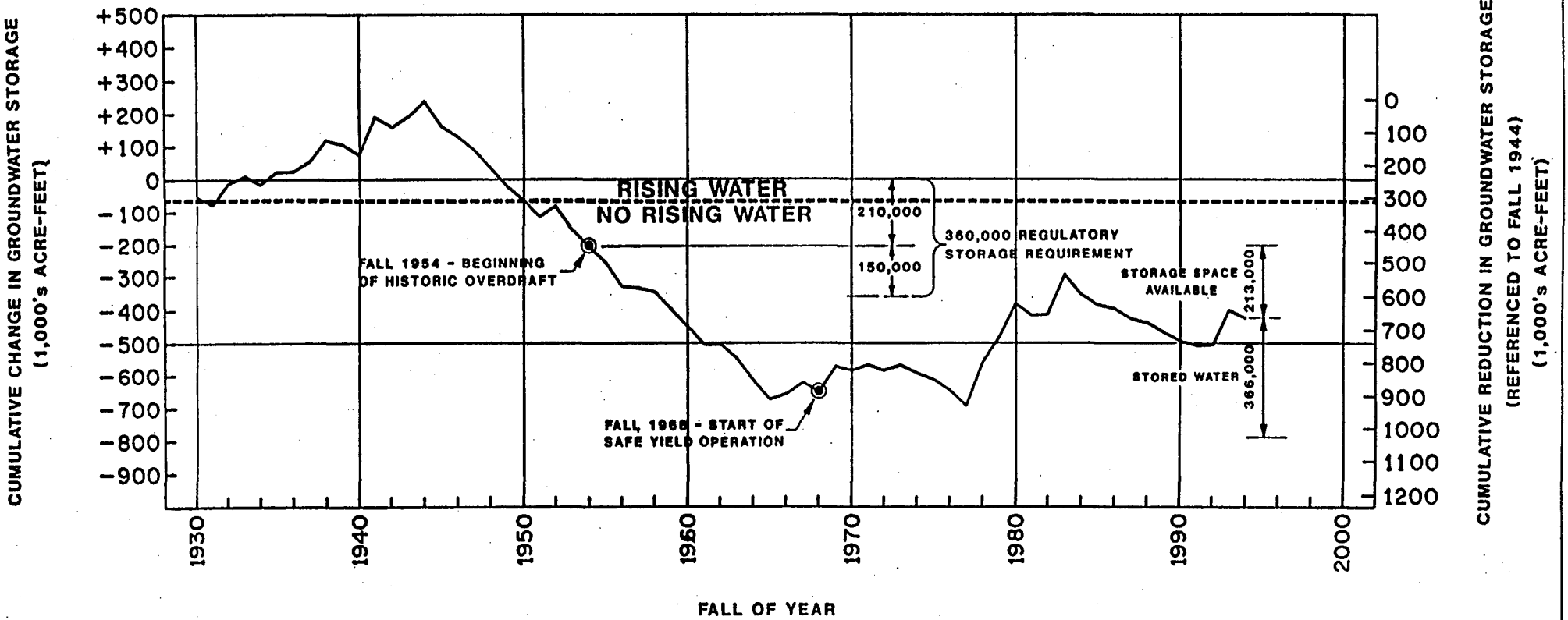
1993-94 Water Year
ULARA Watermaster
Report

Upper Los Angeles River Area: Pattern of Ground Water Production

PLATE 13

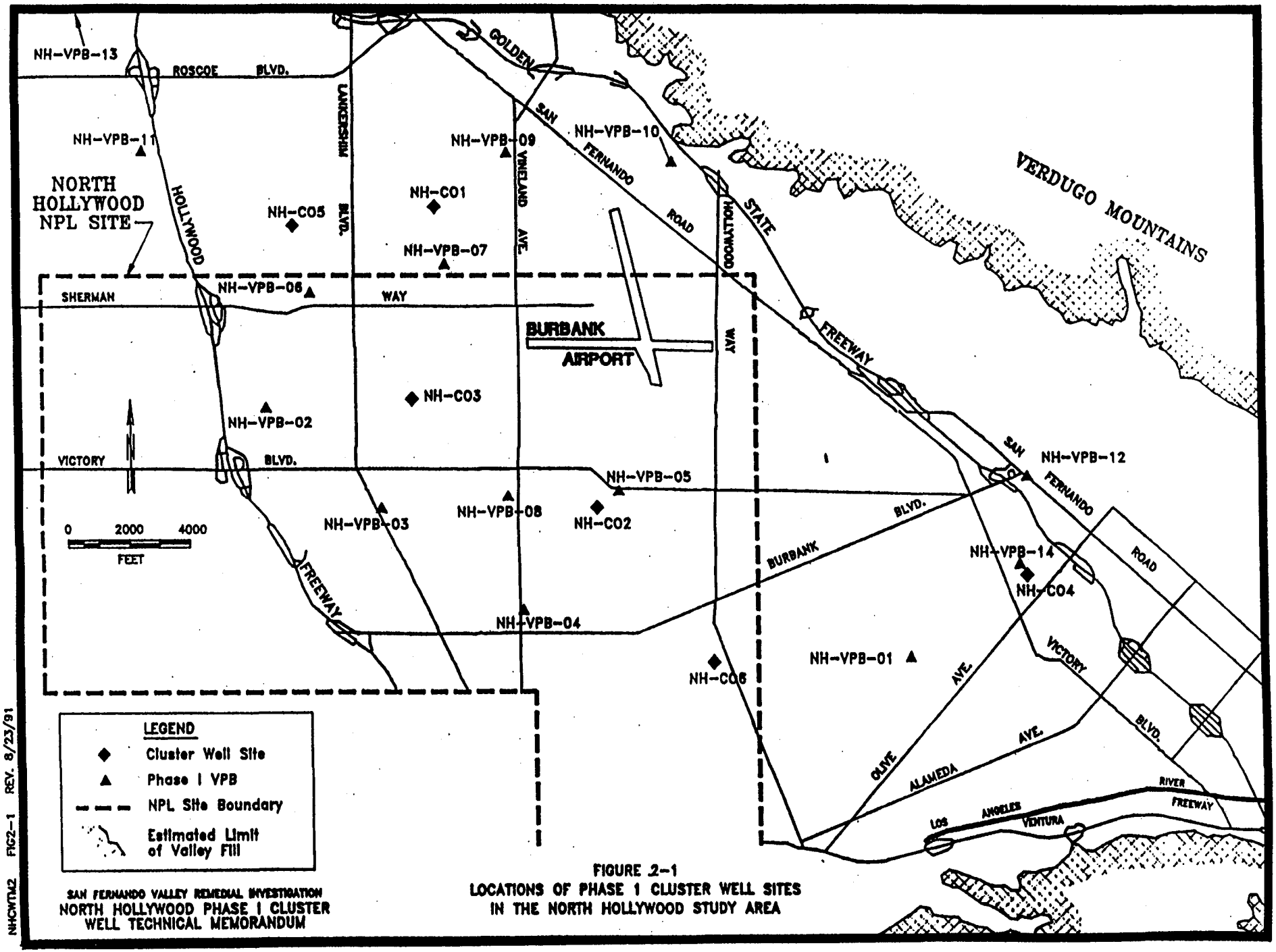


1993-94 Water Year ULARA Watermaster Report	Upper Los Angeles River Area: Estimated Directions and Velocities of Ground Water Flow	PLATE 14



* 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.

1993-94 Water Year **ULARA Watermaster Report**	**San Fernando Basin:** **Cumulative Change in Ground Water Storage**	PLATE 15

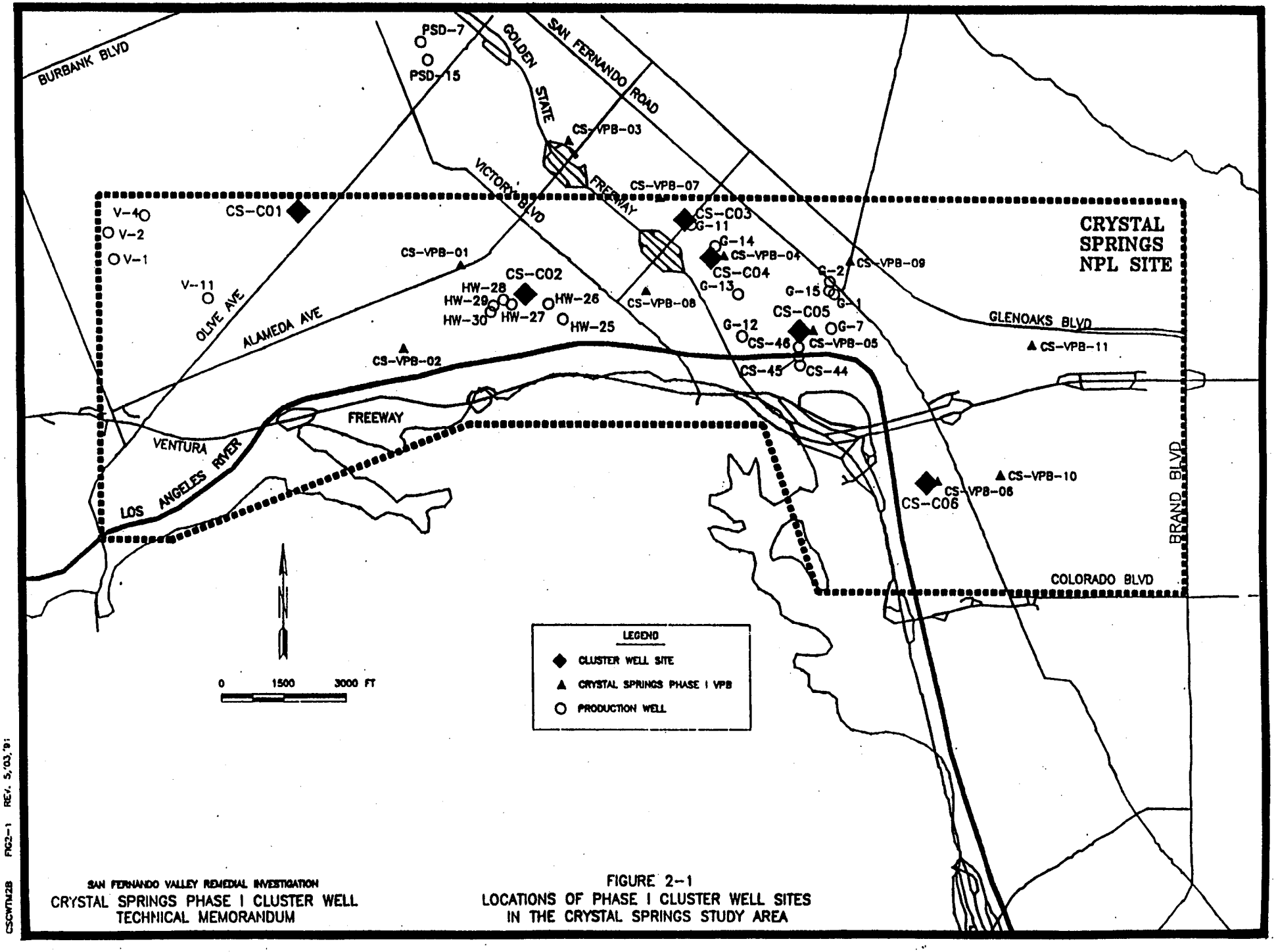


SAN FERNANDO VALLEY REMEDIAL INVESTIGATION
NORTH HOLLYWOOD PHASE I CLUSTER WELL TECHNICAL MEMORANDUM

FIGURE 2-1
LOCATIONS OF PHASE 1 CLUSTER WELL SITES IN THE NORTH HOLLYWOOD STUDY AREA

NHCWTM2 FIG2-1 REV. 8/23/91

PLATE 16



SAN FERNANDO VALLEY REMEDIAL INVESTIGATION
CRYSTAL SPRINGS PHASE I CLUSTER WELL
TECHNICAL MEMORANDUM

FIGURE 2-1
LOCATIONS OF PHASE I CLUSTER WELL SITES
IN THE CRYSTAL SPRINGS STUDY AREA

PLATE 17

CSCWTM2B FIG2-1 REV. 5/03/91

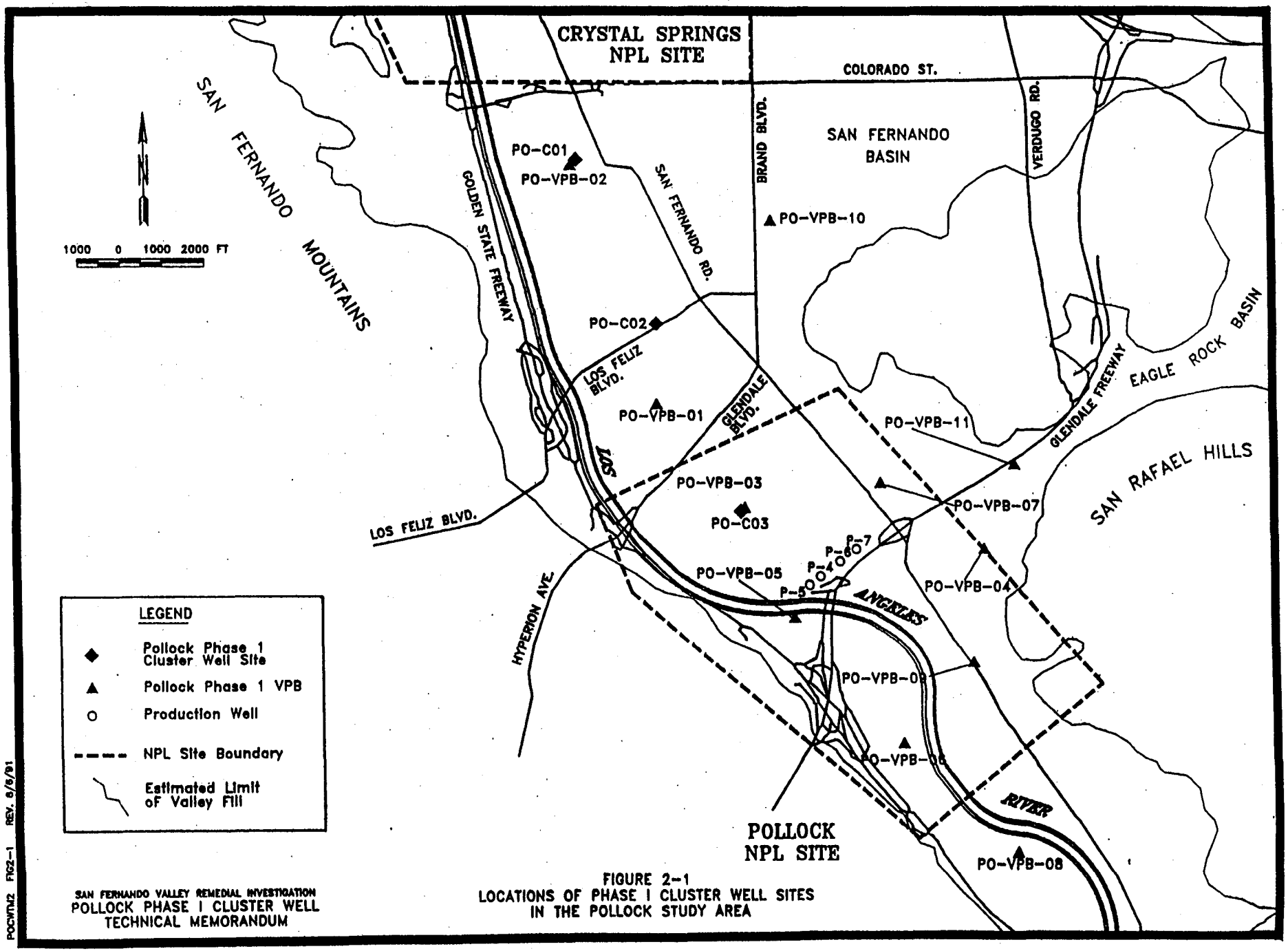
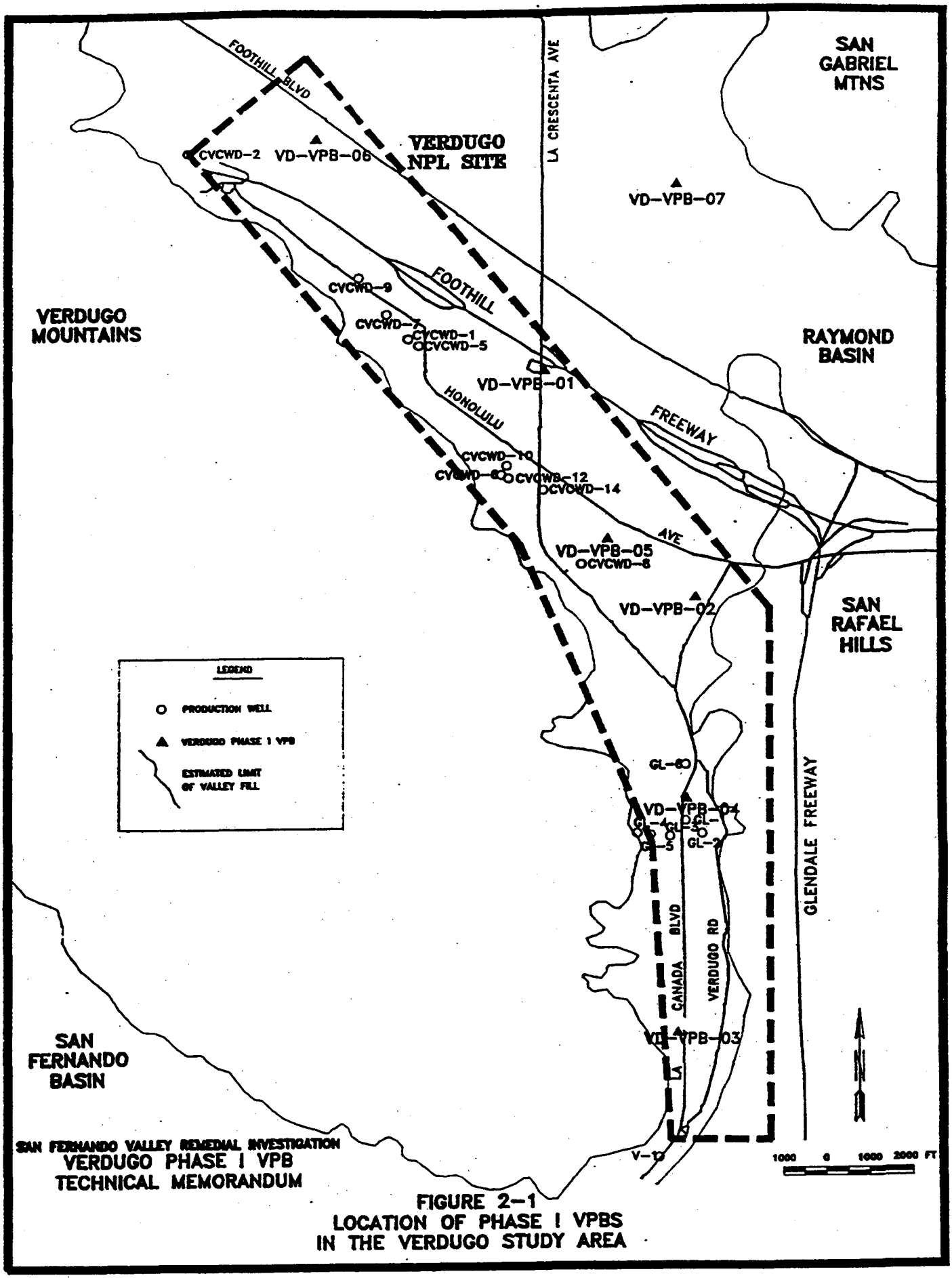


FIGURE 2-1
LOCATIONS OF PHASE I CLUSTER WELL SITES
IN THE POLLOCK STUDY AREA

SAN FERNANDO VALLEY REMEDIAL INVESTIGATION
POLLOCK PHASE I CLUSTER WELL
TECHNICAL MEMORANDUM

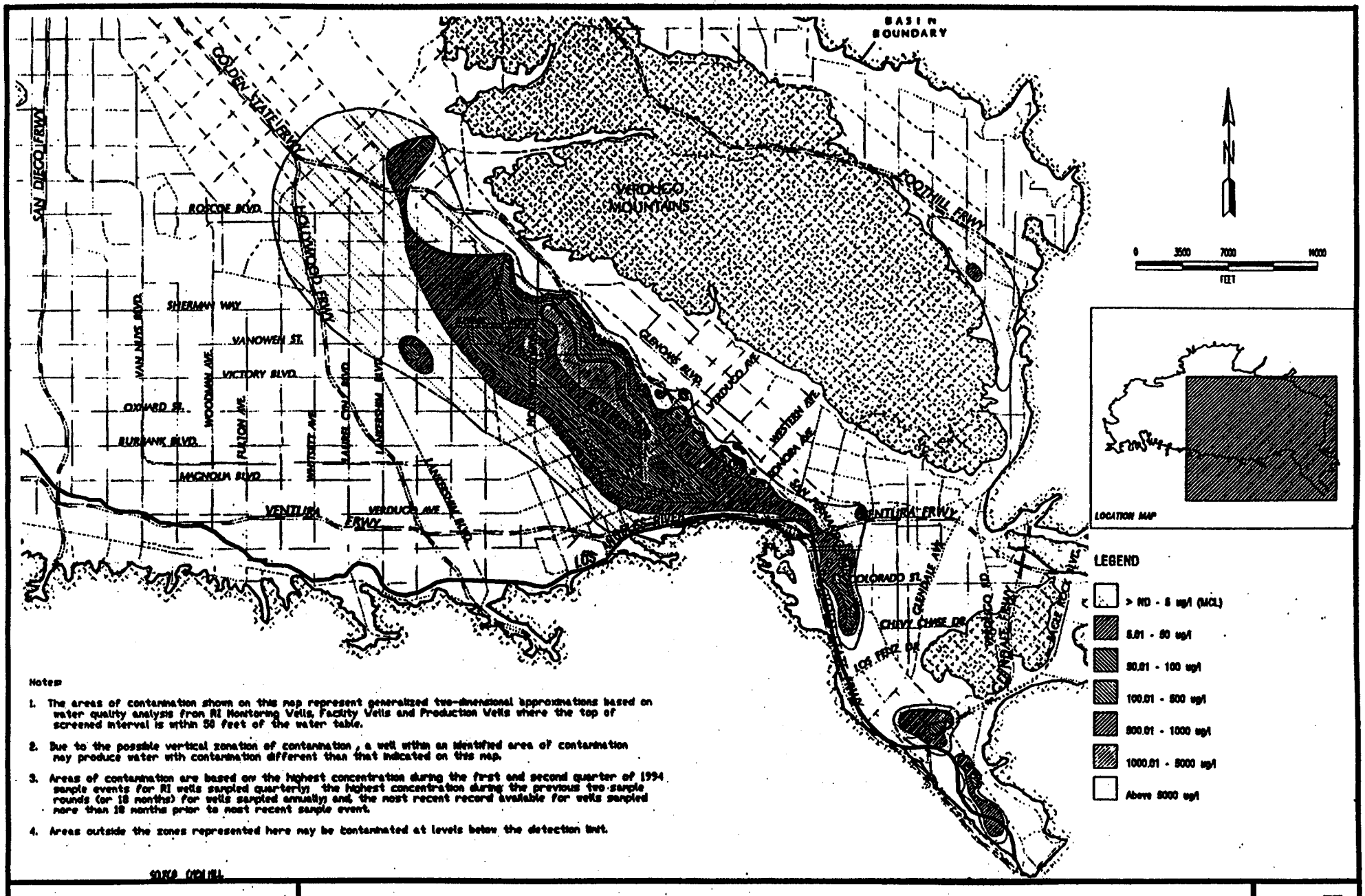
POCWTM2 FIG2-1 REV. 8/6/91

PLATE 18



SAN FERNANDO VALLEY REMEDIAL INVESTIGATION
VERDUGO PHASE I VPB
TECHNICAL MEMORANDUM

FIGURE 2-1
LOCATION OF PHASE I VPBS
IN THE VERDUGO STUDY AREA



Notes:

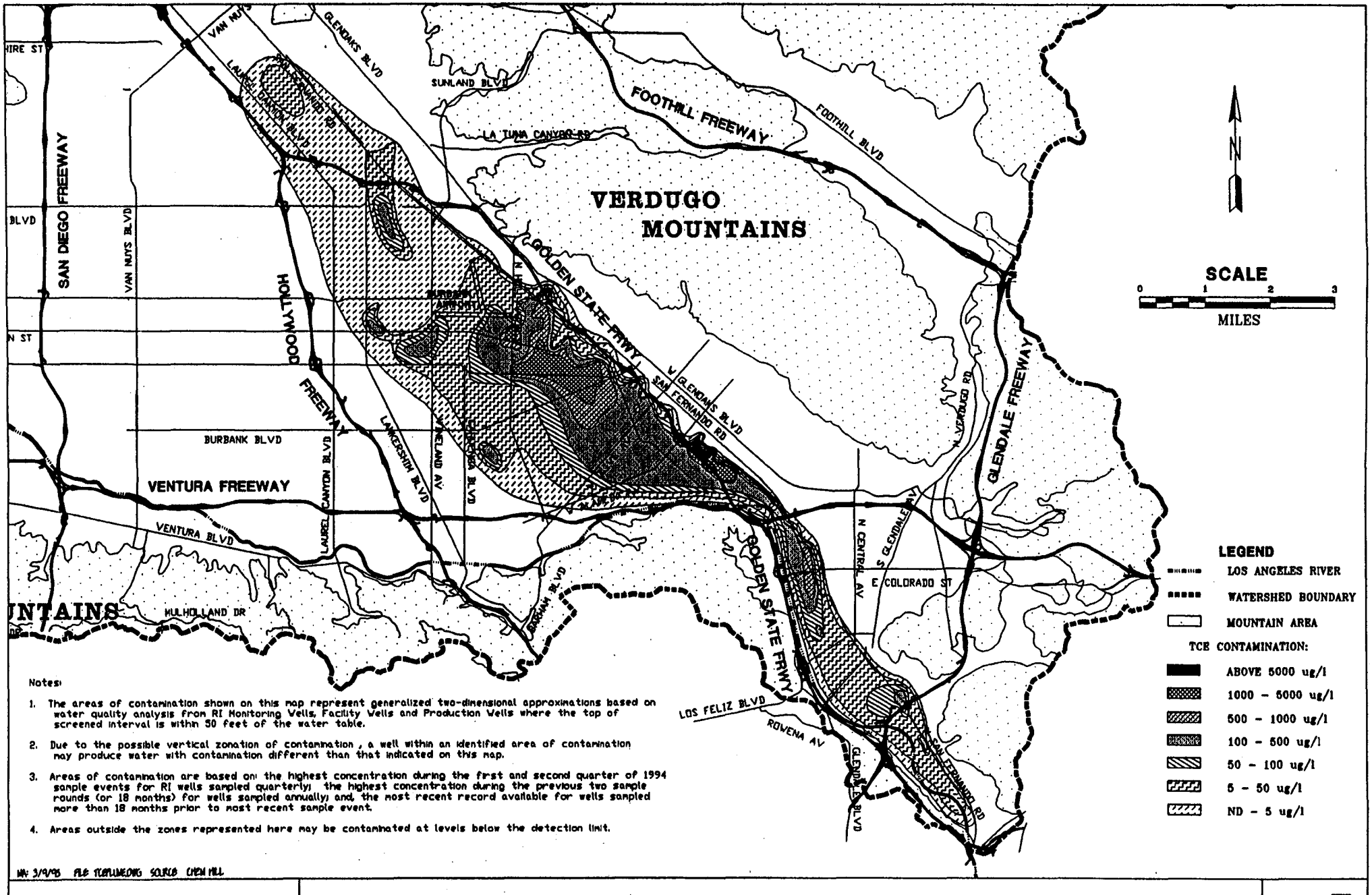
1. The areas of contamination shown on this map represent generalized two-dimensional approximations based on water quality analysis from RI Monitoring Wells, Facility Wells and Production Wells where the top of screened interval is within 50 feet of the water table.
2. Due to the possible vertical zonation of contamination, a well within an identified area of contamination may produce water with contamination different than that indicated on this map.
3. Areas of contamination are based on the highest concentration during the first and second quarter of 1994 sample events for RI wells sampled quarterly; the highest concentration during the previous two sample rounds (or 18 months) for wells sampled annually; and, the most recent record available for wells sampled more than 18 months prior to most recent sample event.
4. Areas outside the zones represented here may be contaminated at levels below the detection limit.

SOURCE: (VOLIEL)

1993-94 Water Year
ULARA Watermaster Report

San Fernando Basin: PCE Contamination [ug/l] in the Upper Zone [Spring 1994]

PLATE 20



Notes:

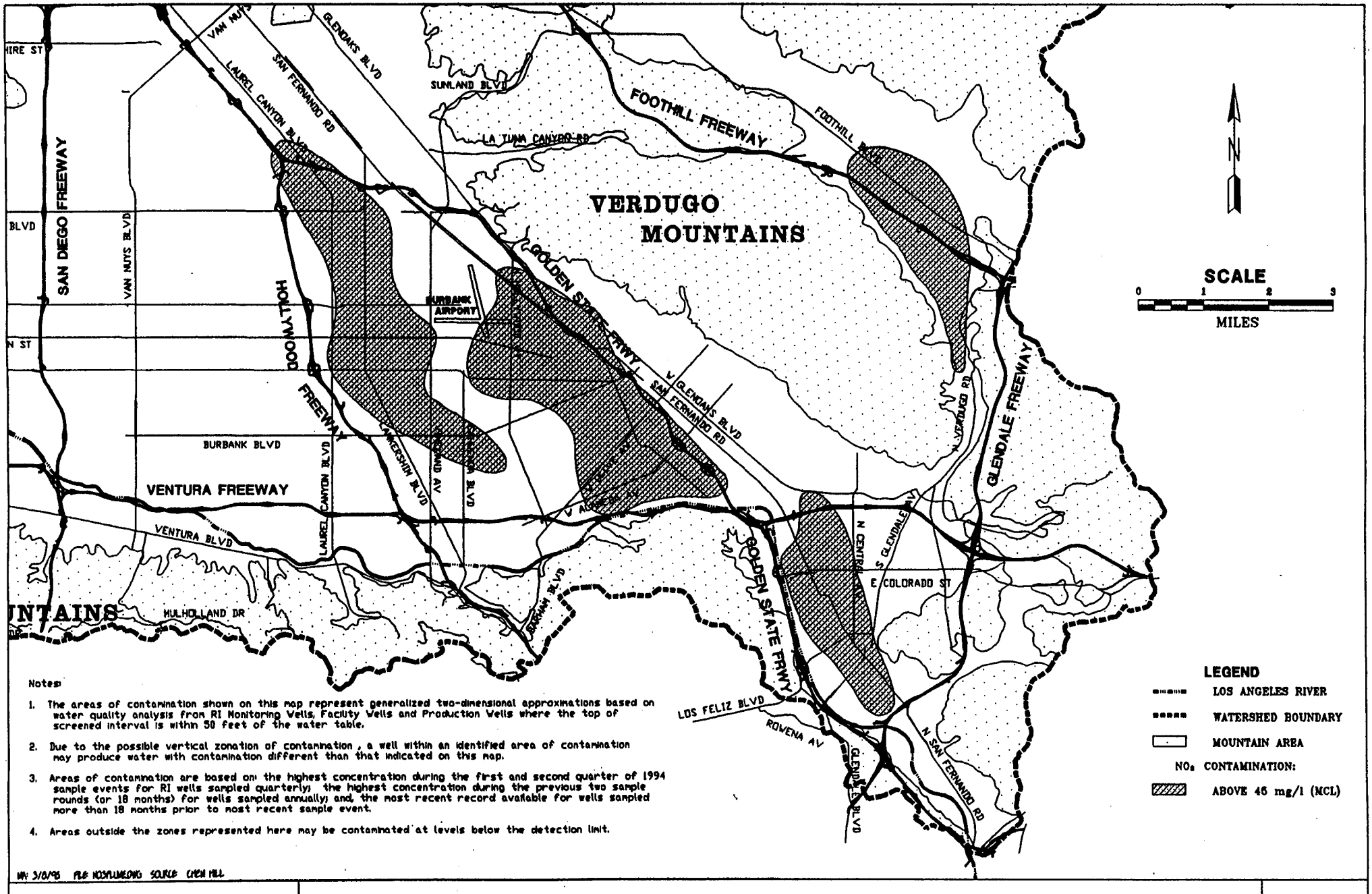
1. The areas of contamination shown on this map represent generalized two-dimensional approximations based on water quality analysis from RI Monitoring Wells, Facility Wells and Production Wells where the top of screened interval is within 50 feet of the water table.
2. Due to the possible vertical zonation of contamination , a well within an identified area of contamination may produce water with contamination different than that indicated on this map.
3. Areas of contamination are based on the highest concentration during the first and second quarter of 1994 sample events for RI wells sampled quarterly) the highest concentration during the previous two sample rounds (or 18 months) for wells sampled annually) and, the most recent record available for wells sampled more than 18 months prior to most recent sample event.
4. Areas outside the zones represented here may be contaminated at levels below the detection limit.

MM 3/9/95 FILE TCEPLUMEONG SOURCE CHEM HILL

1993-94 Water Year
ULARA Watermaster Report

San Fernando Basin: TCE Contamination [ug/l] in the Upper Zone [Spring 1994]

PLATE 21



Notes:

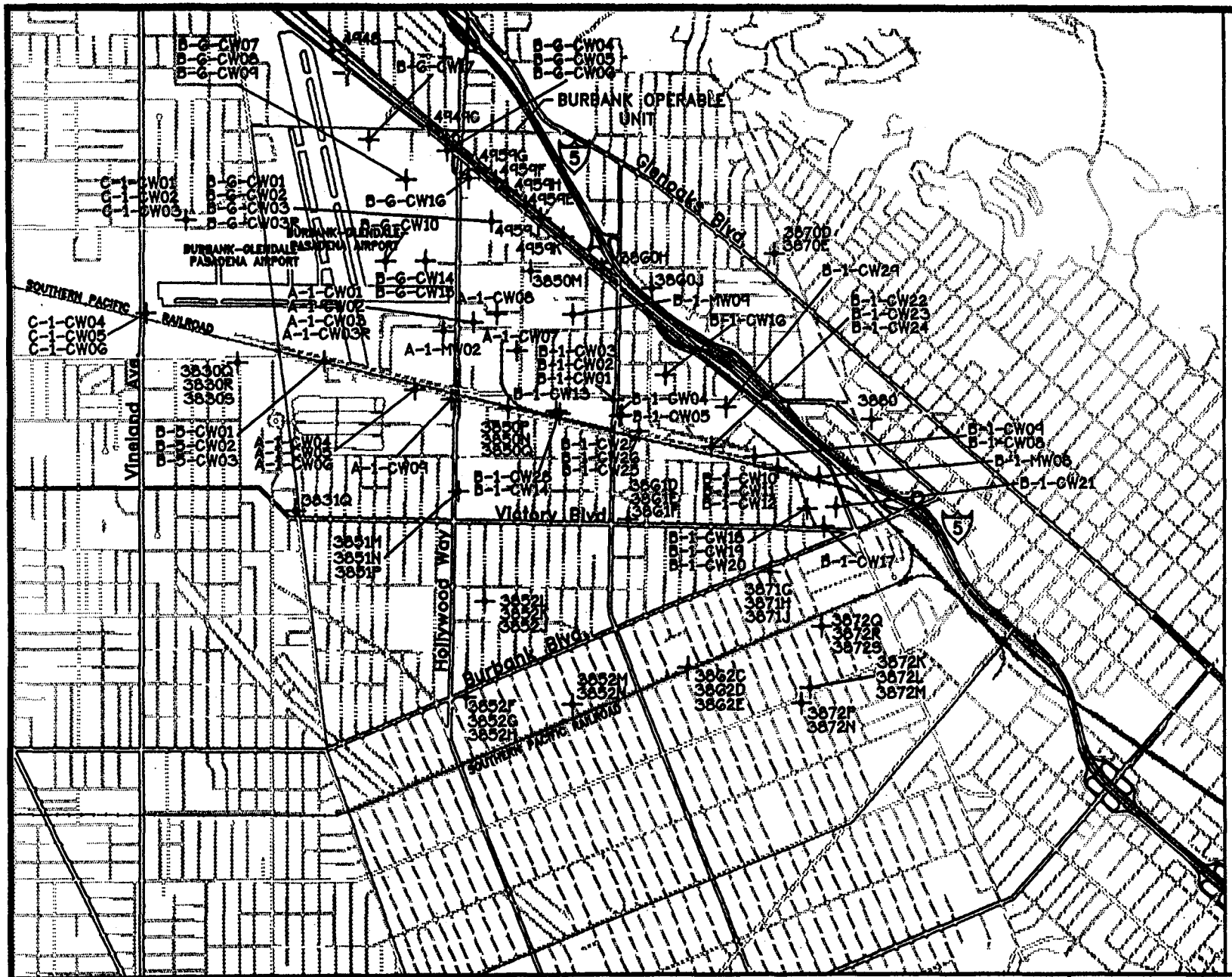
1. The areas of contamination shown on this map represent generalized two-dimensional approximations based on water quality analysis from RI Monitoring Wells, Facility Wells and Production Wells where the top of screened interval is within 50 feet of the water table.
2. Due to the possible vertical zonation of contamination, a well within an identified area of contamination may produce water with contamination different than that indicated on this map.
3. Areas of contamination are based on: the highest concentration during the first and second quarter of 1994 sample events for RI wells sampled quarterly; the highest concentration during the previous two sample rounds (or 18 months) for wells sampled annually; and, the most recent record available for wells sampled more than 18 months prior to most recent sample event.
4. Areas outside the zones represented here may be contaminated at levels below the detection limit.

MW 3/8/95 FILE NO3FLUMEDWG SOURCE CREW MILL

1993-94 Water Year
ULARA Watermaster Report

San Fernando and Verdugo Basins: NO_3 Contamination [mg/l] In the Upper Zone [Spring 1994]

PLATE 22



Explanation

3861F + Monitor Well

LOCKHEED MARTIN

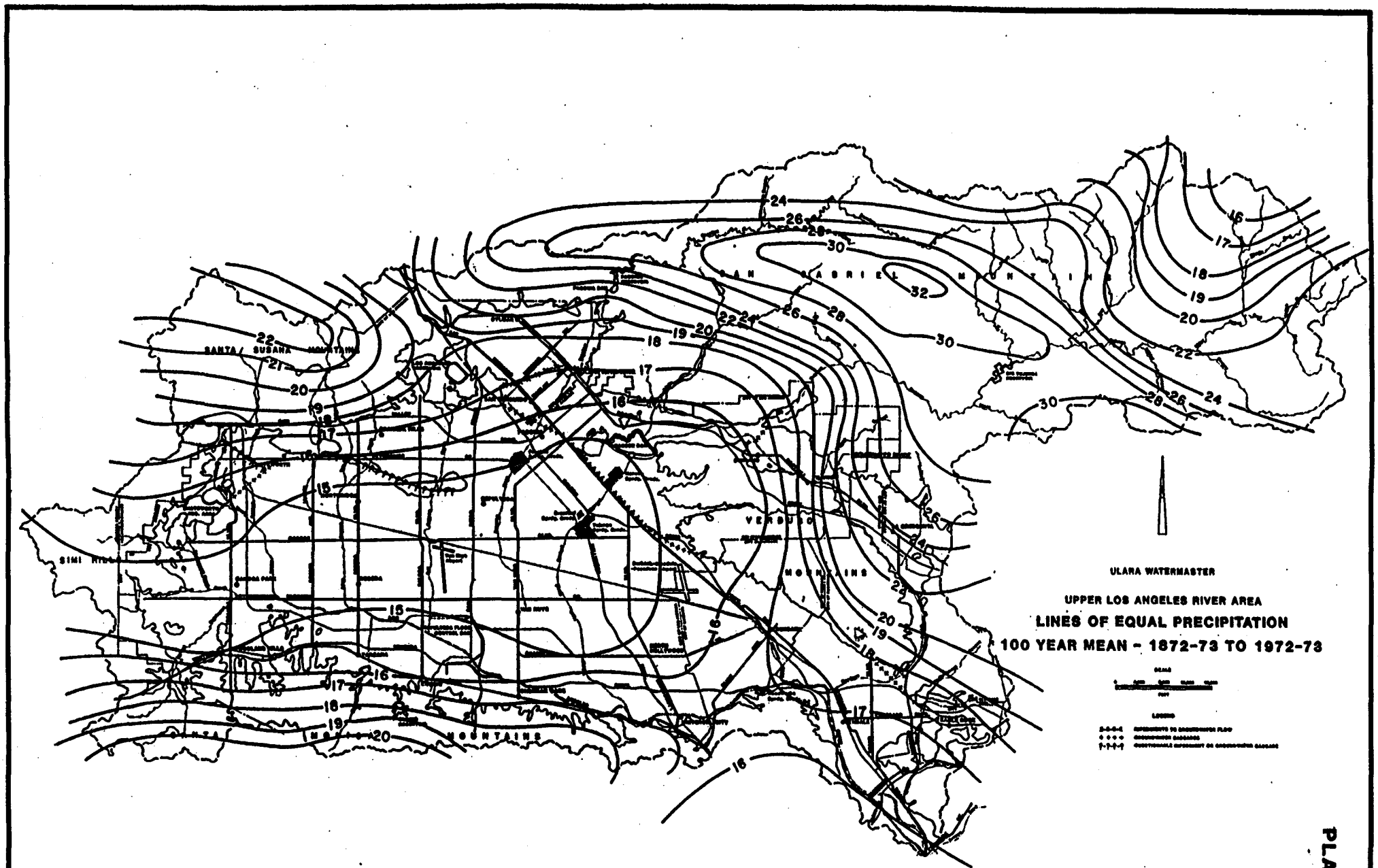
Lockheed Martin Monitor Well Locations

DATE:	03/20/98
DESIGNED:	
CHECKED:	
APPROVED:	
DRAWN:	RDH
PROJ.:	102911100

HYDRO-SEARCH, INC.
A Tetra Tech Company

/usr4/lockheed/report/00r104-a.dwg

PLATE 23


ULARA WATERMASTER
UPPER LOS ANGELES RIVER AREA
LINES OF EQUAL PRECIPITATION
100 YEAR MEAN - 1872-73 TO 1972-73
SAN GABRIEL MOUNTAINS
SANTA SUSANA MOUNTAINS
SIMI HILLS
VERDUGO MOUNTAINS
SOURCE : LOS ANGELES COUNTY DEPARTMENT OF PUBLIC WORKS
PLATE 24

APPENDICES

APPENDIX A

GROUND WATER EXTRACTIONS

GROUND WATER EXTRACTIONS
1993-94 WATER YEAR
(acre-feet)

LACDPW Well No.	Owner Well No.	1993 Oct.	Nov.	Dec.	1994 Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	TOTAL
							San Fernando Basin							
Angelica Healthcare Services														
3934A	M050A	8.70	0.65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.35
Auto Stiegler														
—	—	0.92	0.36	1.07	0.88	1.30	0.88	0.26	1.15	0.51	1.12	0.92	0.89	10.26
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	150.26	145.94	148.93	97.13	0.00	140.69	145.44	60.59	107.65	150.96	60.49	147.87	1,355.95
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	118.67	119.00	119.65	73.50	0.00	114.49	120.73	50.58	111.69	112.37	1.07	97.10	1,038.85
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:	268.93	264.94	268.58	170.63	0.00	255.18	266.17	111.17	219.34	263.33	61.56	244.97	2,394.80
CalMat														
4916A	2	194.48	88.18	0.66	0.24	0.06	0.01	0.03	0.21	0.05	0.03	0.81	7.81	292.57
4916	3	0.00	0.12	0.00	5.32	30.19	6.03	29.17	28.24	53.48	23.50	4.58	8.43	189.06
	Total:	194.48	88.30	0.66	5.56	30.25	6.04	29.20	28.45	53.53	23.53	5.39	16.24	481.63
First Financial Plaza Site														
N/A	F.F.P.S.	1.55	1.38	1.66	3.28	2.72	2.78	1.79	1.72	1.54	1.06	1.11	1.10	21.69
Forest Lawn Memorial Park														
3947A	2	13.75	10.92	7.20	5.81	1.89	3.96	10.05	5.53	19.04	23.29	19.44	25.84	146.72
3947B	3	13.36	11.95	7.96	6.45	2.09	4.39	11.29	6.16	21.49	26.43	18.61	26.21	156.39
3947C	4	10.86	8.51	3.90	4.55	1.47	3.08	7.89	3.05	13.89	17.86	15.94	9.62	100.62
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:	37.97	31.38	19.06	16.81	5.45	11.43	29.23	14.74	54.42	67.58	53.99	61.67	403.73
Glendale, City of														
3924N	STPT 1	12.60	9.94	13.69	9.26	7.66	9.86	8.90	5.16	6.40	5.25	9.37	13.37	111.46
3924R	STPT 2	0.00	0.10	0.17	0.78	0.00	0.12	0.34	0.03	1.12	0.02	0.60	0.05	3.33
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:	12.60	10.04	13.86	10.04	7.66	9.98	9.24	5.19	7.52	5.27	9.97	13.42	114.79
Harper, Cecelia DeMille														
4940A	NORTH	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	15.00
Lockheed - Burbank Operable Unit														
3871L	VO-1	—	—	—	—	—	—	1.33	0.00	0.00	0.02	0.19	0.00	1.54
3861G	VO-2	—	—	—	—	—	—	0.11	0.00	0.00	0.02	0.17	0.00	0.30
3861K	VO-3	—	—	—	—	—	—	7.39	120.87	6.53	9.36	0.00	2.06	146.21
3861L	VO-4	—	—	—	—	—	—	4.16	0.00	9.67	14.19	0.46	36.31	64.79
3850X	VO-5	—	—	—	—	—	—	10.14	19.47	19.25	27.31	3.48	0.00	79.65
3850Z	VO-6	—	—	—	—	—	—	1.12	0.00	17.20	19.33	4.03	0.00	41.68
3850	VO-7	—	—	—	—	—	—	3.65	3.39	14.01	11.51	3.12	8.17	43.85
	Total:	—	—	—	—	—	—	27.90	143.73	66.66	81.74	11.45	46.54	378.02

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GROUND WATER EXTRACTIONS
1993-94 WATER YEAR
(acre-feet)

LACDPW Well No.	Owner Well No.	1993 Oct.	Nov.	Dec.	1994 Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	TOTAL
					San Fernando Basin (cont'd)									
Lockheed - AquaDetox Treatment Plant														
3861C	B175-E1	0.00	19.49	67.24	65.64	86.62	55.55	76.15	50.95	28.76	0.00	0.00	0.00	450.40
Livingston-Graham, Inc.														
4916B	SnVal	0.13	0.13	0.47	0.21	0.42	0.33	0.41	0.02	0.05	0.06	0.07	0.07	2.37
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
Mobil Oil Corporation														
—	—	0.45	0.80	0.68	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.93
Philips Components														
—	—	4.62	4.62	4.62	5.40	5.40	5.40	2.09	2.09	2.09	6.07	6.07	6.07	54.54
Robinsons-May/North Ridge Fashion Plaza														
—	—	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
Rockwell International														
—	E-1 to E-9	36.67	31.97	38.56	22.66	13.43	32.75	35.93	23.60	25.03	31.89	26.29	24.43	343.21
Sears Roebuck & Co.														
3945	3945	17.85	16.27	16.16	16.02	15.83	16.86	16.69	17.05	18.94	16.14	18.10	18.39	204.30
Sportsmen's Lodge														
3785A	1	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08
3M-Pharmaceuticals														
—	—	0.00	0.64	0.42	1.17	1.36	2.20	2.00	1.84	1.13	1.16	1.68	1.96	15.56
Toluca Lake Property Owners Association														
3845F	3845F	3.90	3.54	1.54	1.93	1.60	0.30	0.00	7.85	6.28	7.41	8.19	6.49	49.03
Trillium Corporation														
Well #1	—	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	15.00
Well #2	—	1.68	1.68	1.68	1.68	1.68	1.68	1.68	1.68	1.68	1.68	1.68	1.68	20.16
	Total:	2.93	2.93	2.93	2.93	2.93	2.93	2.93	2.93	2.93	2.93	2.93	2.93	35.16
Valhalla Memorial Park and Mortuary														
3840K	4	25.01	20.43	18.10	10.80	19.01	14.37	13.22	29.31	58.75	53.68	56.55	71.88	391.11
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														
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

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GROUND WATER EXTRACTIONS
1993-94 WATER YEAR
(acre-feet)

LACDPW Well No.	Owner Well No.	1993 Oct.	Nov.	Dec.	1994 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	0.02	0.00	0.00	0.07	0.00	0.00	0.00	0.00	11.55	23.94	15.86	19.35	70.79
3810V	A-3	0.07	0.00	0.00	0.09	0.00	0.00	0.00	0.00	17.45	8.61	43.18	27.34	96.74
3810W	A-4	0.05	0.00	0.00	0.02	0.00	0.00	0.00	0.00	21.67	46.88	43.27	35.22	147.11
3820H	A-5	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.71	21.86	19.44	23.19	76.22
3821J	A-6	0.05	0.00	0.00	0.28	0.00	0.00	0.00	0.00	19.58	12.51	0.18	24.33	56.93
3830P	A-7	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	22.66	43.18	40.31	31.31	137.51
3831K	A-8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25.00	47.59	33.82	34.41	140.82
	A Total:	0.21	0.00	0.00	0.51	0.00	0.00	0.00	0.00	129.62	204.57	196.06	195.15	726.12
Crystal Springs (CS)														
3914L	CS-45	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
3914M	CS-46	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
	CS 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
Erwin (E)														
3831H	E-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
3821I	E-2A	27.48	0.00	0.00	0.00	0.00	0.09	0.00	0.07	0.00	0.00	0.00	0.16	27.80
3831G	E-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
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	38.61	0.00	0.00	77.39	35.61	53.21	0.00	0.00	7.07	192.66	173.19	182.76	760.50
3811F	E-10	28.17	0.00	0.00	89.33	139.53	62.28	0.00	0.00	8.61	226.75	196.99	207.12	958.78
	E Total:	94.26	0.00	0.00	166.72	175.14	115.58	0.00	0.07	15.68	419.41	370.18	390.04	1,747.08
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	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
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	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
3810	NH-11	76.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	76.01
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

GROUND WATER EXTRACTIONS
1993-94 WATER YEAR
(acre-feet)

LACDPW Well No.	Owner Well No.	1993 Oct.	Nov.	Dec.	1994 Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	TOTAL
							San Fernando Basin (cont'd)							
North Hollywood (NH), cont'd														
3820C	NH-17	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
3820B	NH-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
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	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	242.56	89.46	332.02
3790D	NH-23	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
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	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
3790E	NH-26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	204.09	215.22	419.31
3820F	NH-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
3810K	NH-28	76.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	76.29
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	0.00	0.00	0.00
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	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
3780C	NH-33	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
3790G	NH-34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	326.59	303.88	630.47
3830N	NH-35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	159.34	345.94	505.28
3790H	NH-36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.56	5.56
3790J	NH-37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	456.94	447.04	903.98
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	436.41	439.70	876.11
3810Q	NH-41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	349.54	355.56	705.10
3810R	NH-42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	283.68	166.46	450.14
3790K	NH-43A	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	65.77	230.69	296.46
3790L	NH-44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	411.21	261.64	672.85
3790M	NH-45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	186.89	515.06	701.95
	NH Total:	152.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3,123.02	3,376.21	6,651.53
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	0.00	0.00	0.00	169.90	107.74	29.27	0.00	0.00	0.00	0.09	429.71	439.81	1,176.52
4898A	RT-2	0.00	0.00	0.09	205.05	377.85	150.25	0.00	0.00	0.00	0.09	505.03	512.15	1,750.51
4898B	RT-3	0.00	0.00	0.00	107.58	70.55	150.46	0.00	0.00	0.21	0.00	519.61	525.05	1,373.46
4898C	RT-4	0.00	0.00	0.00	112.83	73.05	158.01	0.00	0.00	0.23	0.00	410.08	558.80	1,313.00
4898D	RT-5	0.00	0.00	0.00	0.00	146.19	165.29	0.00	0.00	0.25	0.00	580.72	585.29	1,477.74
4898E	RT-6	0.00	0.00	0.00	0.00	68.46	165.45	0.00	0.00	0.18	0.00	567.77	574.48	1,376.34

GROUND WATER EXTRACTIONS
1993-94 WATER YEAR
(acre-feet)

LACDPW Well No.	Owner Well No.	1993 Oct.	Nov.	Dec.	1994 Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	TOTAL
							San Fernando Basin (cont'd)							
Rinaldi-Toluca (RT), cont'd														
4898F	RT-7	0.00	0.00	0.00	0.00	67.72	161.92	0.00	0.00	0.32	0.00	540.20	536.94	1,307.10
4898G	RT-8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.16	519.70	517.66	1,037.52
4898H	RT-9	0.00	0.00	0.14	0.00	62.42	149.84	0.00	0.00	0.34	0.00	496.42	497.87	1,207.03
4909G	RT-10	0.00	0.00	0.00	210.29	307.72	72.64	0.00	0.00	0.00	0.14	575.51	579.80	1,746.10
4909K	RT-11	0.00	0.00	0.11	199.11	352.11	67.54	0.00	0.00	0.00	0.11	513.66	523.76	1,656.40
4909H	RT-12	0.00	0.00	0.07	203.74	251.45	70.39	0.00	0.00	0.00	0.07	556.55	566.53	1,648.80
4909J	RT-13	0.00	0.00	0.11	54.43	19.49	148.28	0.00	0.00	0.00	0.07	530.83	541.62	1,294.83
4909L	RT-14	0.00	0.00	0.00	211.43	70.02	155.60	0.00	0.00	0.00	0.14	543.23	549.84	1,530.26
4909M	RT-15	0.00	0.00	0.00	9.94	0.00	0.00	0.00	0.00	0.00	0.32	557.24	584.30	1,151.80
	RT Total:	0.00	0.00	0.52	1,484.30	1,974.77	1,644.94	0.00	0.00	1.53	1.19	7,846.26	8,093.90	21,047.41
Tujunga (T)														
4887C	T-1	269.68	0.00	0.00	116.25	0.00	197.82	0.00	0.00	36.59	598.03	507.97	551.01	2,277.35
4887D	T-2	275.67	0.00	0.00	138.06	0.00	203.93	0.00	0.00	37.51	621.38	608.38	577.92	2,462.85
4887E	T-3	73.76	0.00	0.00	135.95	0.00	200.62	0.00	0.00	22.73	379.62	580.38	548.86	1,941.92
4887F	T-4	266.35	0.00	0.00	132.90	0.00	99.56	0.00	0.00	36.66	438.09	583.02	553.91	2,110.49
4887G	T-5	262.58	0.00	0.00	205.86	120.96	80.26	0.00	0.00	36.87	582.21	562.26	512.22	2,363.22
4887H	T-6	277.89	0.00	0.00	218.32	71.53	172.18	0.00	0.00	38.02	614.88	601.27	570.00	2,564.09
4887J	T-7	271.15	0.00	0.00	208.79	124.40	159.41	0.00	0.00	18.78	610.06	432.51	566.21	2,391.31
4887K	T-8	271.15	0.00	0.00	130.30	53.26	181.70	0.00	0.00	37.08	614.90	604.16	573.28	2,465.83
4886B	T-9	270.62	0.00	0.00	126.10	0.00	88.11	0.00	0.00	36.57	612.06	597.87	566.74	2,298.07
4886C	T-10	257.69	0.00	0.00	118.44	0.00	130.76	0.00	0.00	34.92	586.44	554.73	412.84	2,095.82
4886D	T-11	260.93	0.00	0.00	67.63	0.00	121.42	0.00	0.00	30.92	532.19	439.95	354.89	1,807.93
4886E	T-12	211.39	0.00	0.00	21.81	0.00	104.39	0.00	0.00	1.54	138.96	278.58	305.60	1,062.27
	T Total:	2,968.86	0.00	0.00	1,620.41	370.15	1,740.16	0.00	0.00	368.19	6,328.82	6,351.08	6,093.48	25,841.15
Tujunga Gallery														
4992A		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
Verdugo (V)														
3863H	V-1	1.95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.95
3863P	V-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
3863J	V-4	0.00	0.02	0.00	0.00	0.00	57.21	0.00	0.07	0.00	0.00	0.00	0.00	57.30
3863L	V-11	49.56	0.05	0.00	92.93	42.77	62.86	0.00	0.05	8.24	226.59	217.72	231.87	932.64
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	39.69	0.09	0.00	80.69	37.14	54.57	0.00	0.00	7.16	196.74	189.07	199.22	804.37
	V Total:	91.20	0.16	0.00	173.62	79.91	174.64	0.00	0.12	15.40	423.33	406.79	431.09	1,796.26
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	0.14	0.00	0.00	195.78	358.50	0.00	0.00	0.83	17.77	321.03	0.00	0.41	894.46

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GROUND WATER EXTRACTIONS
1993-94 WATER YEAR
(acre-feet)

LACDPW Well No.	Owner Well No.	1993 Oct.	Nov.	Dec.	1994 Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	TOTAL
San Fernando Basin (cont'd)														
Whitnall (W), cont'd														
3821E	W-5	0.00	0.00	0.00	124.66	0.00	0.00	0.00	0.09	10.40	203.05	0.00	0.16	338.36
3831J	W-6A	0.00	0.00	0.00	132.62	89.37	91.97	0.00	0.44	12.14	267.72	174.43	53.17	821.86
3832K	W-7	0.00	0.00	0.00	0.00	51.54	0.00	0.00	0.34	7.00	155.17	217.33	184.73	616.11
3832L	W-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
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:	0.14	0.00	0.00	453.06	499.41	91.97	0.00	1.70	47.31	946.97	391.76	238.47	2,670.79
Los Angeles, City of														
	Total:	3,306.97	0.16	0.52	3,898.62	3,099.38	3,767.29	0.00	1.89	577.73	8,324.29	18,685.15	18,818.34	60,480.34
San Fernando Basin Total:		3,925.01	499.37	457.47	4,233.91	3,294.69	4,185.60	514.55	445.01	1,126.54	8,888.60	18,950.77	19,336.74	65,858.26
Sylmar Basin														
Los Angeles, City of														
Plant	Mission	0.00	0.00	0.00	0.00	0.00	0.00	0.00	346.05	340.34	380.19	521.49	464.42	2,052.49
Meurer Engineering														
5998	3	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.60
San Fernando, City of														
5969D	2A	208.38	172.46	37.15	0.00	99.02	93.93	195.95	160.41	222.98	250.18	250.95	272.57	1,963.98
5959	3	50.70	63.53	155.29	172.40	88.54	116.42	42.64	79.61	87.35	66.23	95.31	42.39	1,060.41
5969	4	23.96	22.80	40.98	40.98	20.80	38.28	25.28	30.88	32.77	35.76	35.96	25.49	373.94
5968	7A	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:	283.04	258.79	233.42	213.38	208.36	248.63	263.87	270.90	343.10	352.17	382.22	340.45	3,398.33
Sylmar Basin Total:		283.09	258.84	233.47	213.43	208.41	248.68	263.92	617.00	683.49	732.41	903.76	804.92	5,451.42
Verdugo Basin														
Crescenta Valley County Water District														
5058B	1	9.68	3.23	2.77	9.33	1.25	0.68	3.35	5.60	7.70	13.38	40.48	28.33	125.78
5036A	2	3.46	1.22	2.63	1.88	0.76	1.69	0.52	0.00	0.00	0.00	0.00	0.00	12.16
5058H	5	20.50	31.51	29.84	39.14	29.59	63.59	60.22	24.79	71.54	78.38	85.12	69.24	603.46
5058	6	11.13	8.82	19.07	13.91	3.84	19.87	12.56	8.70	1.16	9.92	16.19	6.31	131.48
5047B	7	15.61	1.71	6.82	16.60	2.66	10.48	7.22	6.54	11.18	20.26	49.41	38.11	186.60
5069J	8	53.77	58.65	61.15	58.98	37.90	58.76	57.64	62.17	57.91	57.05	49.15	62.35	675.48

GROUND WATER EXTRACTIONS
1993-94 WATER YEAR
(acre-feet)

LACDPW Well No.	Owner Well No.	1993 Oct.	Nov.	Dec.	1994 Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	TOTAL
Verdugo Basin (cont'd)														
Crescenta Valley County Water District, cont'd														
5047D	9	13.88	1.83	4.15	14.83	2.42	3.99	13.70	5.52	7.73	6.67	0.00	0.00	74.72
5058D	10	17.98	43.20	32.59	32.55	27.08	21.54	16.22	30.91	55.58	42.83	53.10	68.47	442.05
5058E	11	46.73	46.14	47.93	43.28	30.06	30.16	39.86	31.16	20.10	33.31	2.29	12.52	383.54
5058J	12	56.72	25.86	36.42	39.01	39.26	69.63	65.09	70.59	71.03	67.95	53.81	55.28	650.65
5069F	14	43.55	39.47	38.12	35.58	16.46	12.01	24.12	23.94	16.24	10.25	17.38	3.43	280.55
	PICK	5.48	5.34	5.45	6.09	5.91	6.31	5.85	5.82	5.53	5.51	5.37	5.00	67.66
	Total:	298.49	266.98	286.94	311.18	197.19	298.71	306.35	275.74	325.70	345.51	372.30	349.04	3,634.13
Glendale, City of														
3961-3971	GL3-5	49.10	49.10	53.03	53.03	53.03	53.03	53.03	66.29	53.03	70.71	75.13	65.50	694.01
3970	GL-6	31.67	31.67	31.67	23.90	56.66	76.18	64.09	81.14	64.81	94.57	76.41	75.60	708.37
—	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:	80.77	80.77	84.70	76.93	109.69	129.21	117.12	147.43	117.84	165.28	151.54	141.10	1,402.38
Verdugo Basin Total:		379.26	347.75	371.64	388.11	306.88	427.92	423.47	423.17	443.54	510.79	523.84	490.14	5,036.51
Eagle Rock Basin														
McKesson Water Products														
3987A	1	5.13	6.75	2.73	6.68	5.63	3.16	4.79	6.54	7.45	7.25	5.66	5.84	67.61
3987B	2	4.35	4.06	6.34	5.31	4.03	6.74	5.35	3.19	4.68	2.95	7.36	9.01	63.37
3987F	3	5.63	5.21	6.41	5.63	5.07	2.94	4.00	4.10	7.96	2.46	3.13	5.75	58.29
	Total:	15.11	16.02	15.48	17.62	14.73	12.84	14.14	13.83	20.09	12.66	16.15	20.60	189.27
Eagle Rock Basin Total:		15.11	16.02	15.48	17.62	14.73	12.84	14.14	13.83	20.09	12.66	16.15	20.60	189.27
ULARA Total:		4,602.47	1,121.98	1,078.06	4,853.07	3,824.71	4,875.04	1,216.08	1,499.01	2,273.66	10,144.46	20,394.52	20,652.40	76,535.46

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APPENDIX B

KEY GAGING STATIONS SURFACE RUNOFF

LOS ANGELES COUNTY DEPARTMENT OF PUBLIC WORKS

F57C-R LOS ANGELES RIVER ABOVE ARROYO SECO

DAILY DISCHARGE IN CUBIC FEET PER SECOND WATER YEAR OCT 1993 TO SEP 1994

Day	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	135	206	116	114							197	299
2	151	201	113	111							201	264
3	143	213	108	115							202	258
4	144	205	110	116							206	252
5	148	203	111	106							218	250
6	135	214	110	121							222	248
7	153	214	119	125							217	270
8	143	104	108	115							240	250
9	141	39.5	122	115							244	238
10	138	39.8	113	128							249	238
11	699	87.8	1,410	131							241	223
12	157	35.5	160	120							222	224
13	157	34.2	115	127							232	232
14	154	32.5	670	127							210	220
15	153	31.7	159	124							221	209
16	149	33.5	112	117							255	197
17	153	31.2	104	417							245	185
18	157	36.0	109	247							248	179
19	161	33.5	267	212							233	196
20	163	36.0	111	173							254	188
21	171	35.3	102								239	193
22	170	150	111							206	242	192
23	163	154	108							213	251	187
24	161	160	108							217	242	187
25	179	149	114							187	246	179
26	185	145	106							195	246	198
27	170	140	108							192	235	195
28	167	135	113							189	230	193
29	188	144	116		———					200	247	186
30	198	973	117		———					203	260	
31	202	———	119		———		———		———	212	241	———
TOTAL	5,488	4,216.5	5,569	2,961						2,014	7,236	6,330
MEAN	177	141	180	148						201	233	218
MAX	699	973	1,410	417						217	260	299
MIN	135	31.2	102	106						187	197	179
AC-FT	10,890	8,363	11,050	5,873						3,995	14,350	12,560

MALFUNCTION

* * * * * * * * *

CAL YEAR 1993	TOTAL	237,685.8	MEAN	651	MAX	18,100	MIN	31.2	AC-FT	471,400
WTR YEAR 1994	TOTAL*	33,814.5	MEAN	186	MAX	1,410	MIN	31.2	AC-FT	67,070

* Incomplete Record

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LOS ANGELES COUNTY DEPARTMENT OF PUBLIC WORKS

F252-R VERDUGO WASH AT ESTELLE AVENUE

DAILY DISCHARGE IN CUBIC FEET PER SECOND WATER YEAR OCT 1993 TO SEP 1994

Day	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.5	2.8	2.8	2.3	6.2	13.4	2.3	8.4	15.3	4.7	.5	.5
2	2.5	2.8	2.4	2.3	6.2	15.1	2.5	9.1	16.4	3.8	.5	.5
3	2.3	2.8	2.3	2.3	88.4	18.2	2.5	9.7	17.4	2.8	.5	.5
4	2.3	2.8	2.3	2.3	59.0	21.2	4.7	10.7	17.8	2.6	.5	.5
5	2.3	2.8	2.3	2.3	10.5	21.2	3.3	11.6	18.7	2.5	.5	.5
6	2.3	2.8	2.3	2.3	53.2	36.4	2.5	23.5	18.7	2.3	.5	.5
7	2.3	2.8	2.3	2.3	265	36.2	3.0	13.3	18.7	2.1	.5	.5
8	2.4	2.8	2.3	2.3	27.3	24.2	5.6	13.7	18.5	2.0	.5	.5
9	2.5	2.6	2.3	2.3	7.2	23.5	10.5	11.7	16.4	1.7	.5	.5
10	2.6	3.0	2.3	2.5	7.2	23.5	6.2	7.2	16.4	1.7	.5	.5
11	9.2	111	163	2.5	8.3	23.5	6.9	2.1	16.4	1.5	.5	.5
12	2.8	3.7	7.4	2.5	8.4	22.8	8.3	2.5	14.6	1.2	.5	.5
13	2.2	2.3	2.5	2.8	8.9	23.3	7.8	2.2	14.0	1.0	.5	.5
14	2.5	2.0	97.5	3.6	9.4	28.8	5.0	2.0	13.4	1.0	.5	.5
15	2.1	2.3	4.5	4.5	9.9	27.6	5.8	2.1	12.9	.7	.5	.5
16	2.0	2.1	2.5	5.0	11.0	8.9	6.8	2.3	11.9	.7	.5	.5
17	2.0	2.1	2.4	5.9	87.8	1.7	7.2	74.4	11.7	.5	.5	.5
18	2.0	2.0	2.5	6.2	2.3	1.7	7.2	4.2	11.7	.3	.5	.5
19	2.0	2.0	5.4	6.8	1.7	148	7.5	2.5	10.6	.2	.5	.5
20	2.0	2.0	2.3	7.2	189	8.5	8.0	2.5	10.6	.1	.5	.5
21	2.0	2.0	2.2	7.2	10.5	2.7	8.5	2.5	9.7	.1	.5	.5
22	2.0	2.0	2.0	7.2	10.5	2.5	8.0	3.5	9.4	.1	.5	.5
23	2.0	1.9	2.0	21.0	10.5	2.3	7.2	5.6	9.3	.1	.5	.5
24	2.0	2.0	2.0	83.6	10.5	225	8.3	6.7	8.4	0	.5	.5
25	2.0	2.0	2.0	14.9	10.5	78.4	38.8	8.8	8.4	0	.5	.5
26	2.0	2.0	2.0	6.3	10.5	8.8	47.4	9.4	7.7	0	.5	.5
27	2.0	2.0	2.0	6.2	11.2	2.8	14.0	9.4	7.2	0	.5	.5
28	2.0	2.0	2.0	6.2	12.3	2.8	12.5	10.4	6.3	0	.5	.5
29	2.0	6.6	2.0	6.2	———	2.8	7.3	10.5	6.2	0	.5	.5
30	2.0	130	2.2	6.2	———	2.8	8.4	11.2	5.1	0	.5	.5
31	2.0	———	2.3	6.2	———	2.5	———	12.3	———	0	.5	———
TOTAL	74.8	312.0	336.3	241.4	953.4	861.1	274.0	306.0	379.7	33.7	15.5	15.0
MEAN	2.4	10.4	10.8	7.8	34.1	27.8	9.1	9.9	12.7	1.1	.5	.5
MAX	9.2	130	163	83.6	265	225	47.4	74.4	18.7	4.7	.5	.5
MIN	2.0	1.9	2.0	2.3	1.7	1.7	2.3	2.0	5.1	0	.5	.5
AC-FT	148	619	667	479	1,891	1,708	543	607	753	67	31	30

CAL YEAR 1993	TOTAL	10,722.3	MEAN	29.4	MAX	733	MIN	1.7	AC-FT	21,270
WTR YEAR 1994	TOTAL	3,802.9	MEAN	10.4	MAX	265	MIN	0	AC-FT	7,543

MAXIMUM INSTANTANEOUS PEAK IS 2,220 CFS AT 00:45 ON 11/30/93.

LOS ANGELES COUNTY DEPARTMENT OF PUBLIC WORKS
E285-R BURBANK-WESTERN STORM DRAIN

DAILY DISCHARGE IN CUBIC FEET PER SECOND WATER YEAR OCT 1993 TO SEP 1994

Day	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	8.9	12.4	13.6	11.1	9.4	11.5	13.6	11.2	9.7	10.2	10.2	7.9
2	8.5	9.5	12.8	10.2	8.9	12.1	13.0	11.5	9.5	11.2	10.2	7.9
3	8.7	8.2	12.9	10.1	8.0	14.0	12.8	10.6	10.2	11.3	9.4	7.9
4	9.5	7.3	13.5	11.9	199	14.0	12.8	10.5	10.9	11.4	9.5	7.9
5	9.6	7.7	13.4	12.4	10.9	11.5	13.1	10.2	12.7	11.3	9.3	7.9
6	9.6	7.8	13.3	13.2	10.8	11.0	12.6	10.2	13.9	11.3	9.0	7.9
7	9.0	8.5	13.5	13.6	273	11.8	12.3	10.3	14.6	11.3	9.0	7.9
8	8.4	8.9	13.4	13.9	154	10.8	12.1	11.2	12.7	11.5	9.0	8.8
9	8.8	9.1	12.2	13.7	12.4	10.2	12.7	11.3	10.4	11.5	9.0	9.0
10	22.3	8.3	11.5	13.0	10.2	10.1	12.4	10.4	9.8	11.7	9.0	9.0
11	32.2	74.9	115	11.9	9.1	9.3	11.7	10.3	10.1	12.0	9.0	9.0
12	7.9	10.5	10.9	11.4	9.0	9.2	11.5	11.0	11.0	11.7	9.0	9.0
13	7.1	8.0	11.1	12.9	9.0	9.7	11.5	11.2	11.2	11.5	9.0	9.0
14	8.0	8.0	84.1	14.3	9.3	10.7	11.6	10.0	11.2	11.5	9.0	9.0
15	7.9	7.8	11.3	11.3	9.9	11.5	11.5	9.0	9.5	11.5	9.0	9.0
16	8.2	7.9	11.3	10.9	10.2	11.5	11.5	9.0	9.1	11.5	9.0	9.0
17	8.2	6.6	10.1	10.8	282	11.5	11.5	9.0	9.2	11.3	9.0	8.9
18	9.0	8.6	11.9	9.3	18.9	11.8	11.5	9.2	10.2	11.5	9.0	8.3
19	12.9	8.7	14.7	10.5	11.4	290	11.1	9.5	10.3	11.3	9.6	8.0
20	10.6	8.6	11.2	12.5	355	30.7	10.8	9.0	11.1	10.8	9.3	7.9
21	9.5	7.2	10.4	13.4	13.4	16.8	10.2	9.0	11.5	10.5	9.0	8.5
22	9.1	7.8	10.1	10.6	11.3	13.1	10.4	8.4	11.6	10.4	9.0	8.8
23	7.9	7.3	10.0	15.5	11.7	12.7	10.4	6.7	12.0	10.2	9.0	9.0
24	6.8	6.6	9.3	73.0	12.2	238	9.8	7.3	12.2	10.2	9.0	9.0
25	11.2	5.7	8.8	19.3	12.5	56.2	13.9	8.7	11.9	10.2	8.3	8.8
26	12.4	8.4	9.0	12.5	12.2	19.1	15.4	9.4	11.7	10.2	7.9	8.9
27	11.1	8.9	8.2	9.5	11.5	14.4	12.3	9.9	11.5	10.2	7.9	9.0
28	11.4	11.2	7.9	10.8	10.8	12.9	11.5	10.2	11.5	10.2	7.9	9.0
29	11.2	47.7	8.7	12.2	———	12.5	10.7	9.3	11.6	10.2	7.9	9.0
30	12.0	165	8.8	10.2	———	13.4	11.2	8.9	11.0	10.2	7.0	9.0
31	12.0	———	10.5	10.3	———	13.2	———	8.1	———	10.2	7.6	———
TOTAL	329.9	513.1	523.4	436.2	1,516.0	945.2	357.4	300.5	333.7	340.0	275.0	258.2
MEAN	10.6	17.1	16.9	14.1	54.1	30.5	11.9	9.7	11.1	11.0	8.9	8.6
MAX	32.2	165	115	73.0	355	290	15.4	11.5	14.6	12.0	10.2	9.0
MIN	6.8	5.7	7.9	9.3	8.0	9.2	9.8	6.7	9.1	10.2	7.0	7.9
AC-FT	654	1,018	1,038	865	3,007	1,876	709	596	662	674	545	512

CAL YEAR 1993	TOTAL	11,065.5	MEAN	30.3	MAX	564	MIN	5.7	AC-FT	21,950
WTR YEAR 1994	TOTAL	6,128.6	MEAN	16.8	MAX	355	MIN	5.7	AC-FT	12,160

MAXIMUM INSTANTANEOUS PEAK IS 5,600 CFS AT 00:30 ON 11/30/93.

LOS ANGELES COUNTY DEPARTMENT OF PUBLIC WORKS

F300-R LOS ANGELES RIVER AT TUJUNGA AVENUE

DAILY DISCHARGE IN CUBIC FEET PER SECOND WATER YEAR OCT 1993 TO SEP 1994

Day	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	54.7	82.0	77.1	67.7	110	110	101	83.5	88.8	88.7	83.8	83.8
2	54.7	76.7	68.5	67.1	130	118	99.9	96.3	92.1	83.2	85.6	77.8
3	54.7	82.2	65.8	74.8	144	114	89.0	94.1	93.2	73.6	84.9	72.6
4	54.7	79.3	70.1	77.7	1,200	130	101	97.8	89.7	75.5	87.1	69.9
5	54.7	81.8	72.8	55.8	134	113	93.0	102	83.5	79.5	88.1	67.5
6	54.7	85.3	70.4	83.5	140	632	94.8	105	89.6	81.7	85.9	76.4
7	86.2	82.4	78.3	78.0	1,690	363	99.3	94.3	97.8	90.7	83.8	84.8
8	85.5	89.2	57.7	72.1	1,720	121	98.8	106	90.8	89.4	89.2	89.0
9	85.8	78.3	77.1	71.2	2,390	115	123	97.2	97.7	88.7	83.3	78.1
10	84.6	87.4	69.4	88.9	158	117	93.0	92.3	104	85.1	86.6	75.6
11	407	232	849	93.7	144	114	98.4	92.7	89.8	93.6	89.3	89.1
12	91.8	90.0	109	79.9	129	108	90.5	90.8	84.1	89.3	82.2	75.2
13	90.1	84.1	94.3	84.4	91.0	95.0	86.5	93.7	93.6	88.6	81.0	85.8
14	82.9	79.8	351	85.0	104	107	84.4	93.6	101	85.8	71.3	72.0
15	81.8	79.5	111	81.0	122	96.0	88.4	85.8	103	85.8	79.1	78.7
16	77.3	80.3	85.4	68.9	106	89.6	89.9	99.2	102	85.4	86.1	76.6
17	77.8	56.9	77.9	62.3	1,450	87.2	81.2	214	94.3	90.4	86.5	73.9
18	78.7	84.6	88.2	63.3	223	82.3	86.1	148	91.3	98.9	86.4	76.7
19	78.8	82.6	203	63.3	186	1,000	91.8	104	86.5	83.2	82.4	76.9
20	80.4	80.5	84.5	63.3	2,190	151	93.0	97.2	98.0	80.2	82.0	80.1
21	85.7	76.4	74.2	63.3	298	124	92.5	86.6	106	82.3	75.2	84.2
22	88.6	84.4	85.0	63.3	175	110	86.8	82.0	99.5	76.8	76.8	83.8
23	84.1	83.4	79.2	63.3	153	106	85.4	98.4	97.5	74.7	78.5	75.4
24	81.2	90.4	80.5	63.3	128	1,410	89.3	90.1	88.8	74.6	78.5	76.7
25	92.8	85.6	74.9	63.3	123	230	279	83.7	83.9	78.3	82.8	88.2
26	81.1	73.9	66.9	63.3	106	111	500	86.3	77.1	80.6	78.3	85.5
27	72.9	73.3	72.3	63.3	98.0	98.4	131	84.7	82.1	73.5	75.9	83.1
28	75.5	66.9	82.0	63.3	102	130	111	84.9	82.1	78.8	72.9	78.1
29	78.1	81.1	83.2	63.3	———	99.4	99.3	73.3	86.9	82.8	77.3	78.4
30	77.2	484	84.3	63.3	———	106	88.2	77.3	94.1	81.4	72.7	89.2
31	74.7	———	85.0	63.3	———	106	———	93.5	———	78.9	80.1	———
TOTAL	2,710.8	2,954.3	3,628.0	2,178.2	13,744.0	6,493.9	3,445.5	3,028.3	2,768.8	2,579.8	2,533.6	2,344.3
MEAN	87.4	98.5	117	70.3	491	209	115	97.7	92.3	83.2	81.7	78.1
MAX	407	484	849	93.7	2,390	1,410	500	214	106	98.9	89.3	88.2
MIN	54.7	56.9	57.7	55.8	91.0	82.3	81.2	73.3	77.1	73.5	71.3	67.5
AC-FT	5,377	5,860	7,196	4,320	27,260	12,880	6,834	6,007	5,492	5,117	5,025	4,650

CAL YEAR 1993	TOTAL	145,319.1	MEAN	398	MAX	10,600	MIN	54.7	AC-FT	288,200
WTR YEAR 1994	TOTAL	48,409.5	MEAN	133	MAX	2,390	MIN	54.7	AC-FT	96,020

*MEAN DAILY DISCHARGES ARE FROM ALERT UNIT FOR 02/01/94 THROUGH 03/15/94.

LOS ANGELES COUNTY DEPARTMENT OF PUBLIC WORKS

F168-R BIG TUJUNGA CREEK BELOW BIG TUJUNGA DAM

DAILY DISCHARGE IN CUBIC FEET PER SECOND WATER YEAR OCT 1993 TO SEP 1994

Day	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	8.2	11.1	20.7	15.1	24.8	25.5	35.8					1.0
2	8.2	11.1	20.7	15.1	24.8	25.5	39.7	20.3				.9
3	8.2	11.1	20.7	15.1	24.8	25.5	32.9	59.8				.8
4	8.2	11.1	20.7	15.1	17.6	25.5	10.8	45.3				.7
5	8.2	11.1	20.7	15.1	17.6	25.5	4.6	35.3				.6
6	8.2	11.1	20.7	13.9	17.6	25.5	4.2	32.3				.5
7	9.7	11.1	20.7	12.0	21.0	25.5	4.0	32.0				.5
8	12.0	11.1	20.7	12.0	60.2	25.5	16.7	2.1				.5
9	12.0	11.1	20.7	12.0	113	25.5	16.7	2.1			.7	.5
10	12.0	11.1	20.7	12.0	61.6	25.5	12.9	2.1			.6	.5
11	12.0	17.4	19.8	12.4	32.7	25.5	4.4	2.1			.6	.4
12	18.3	18.0	18.7	13.0	32.7	25.5	3.9	2.1		.5	.9	.4
13	25.5	18.0	18.7	13.0	32.7	15.3	3.9	2.1		.9	1.0	.4
14	25.5	18.0	18.7	13.0	32.7	5.1	3.9	2.1		.8	.6	.5
15	25.5	15.0	18.7	13.0	32.7	17.2	60.0	2.1		.7	.6	.4
16	25.5	11.1	18.7	13.0	32.7	25.5	74.1	2.1		.6	.6	.5
17	25.5	11.1	18.7	13.0	33.4	22.4	44.4	2.1		.6	.6	.6
18	20.1	11.1	18.7	13.0	75.5	16.3	39.4			.6	.6	.7
19	11.1	11.1	15.6	13.0	64.4	16.3	39.0			.6	.7	.6
20	11.1	11.1	14.0	13.0	33.8	16.3	38.6			.6	.7	.5
21	11.1	11.1	14.0	13.0	33.4	16.3	38.1			.8	.6	.6
22	11.1	11.1	14.0	13.0	41.8	16.3	37.5			.7	.6	.6
23	11.1	11.1	14.0	13.0	54.2	19.5	37.4			.7	.9	.5
24	11.1	11.1	14.0	13.0	45.9	25.5	36.8			.6	1.0	.7
25	11.1	11.1	14.0	13.0	32.7	25.5	36.2			.7	.8	.7
26	11.1	11.1	14.0	17.4	32.7	25.5	35.4			.7	.9	.6
27	11.1	11.1	14.0	24.8	32.7	25.5	35.3			.9	.9	.7
28	11.1	11.1	14.0	24.8	32.7	25.5	33.6			.7	.6	.6
29	11.1	17.8	14.0	24.8	———	31.1	21.7			.6	.4	.7
30	11.1	21.6	14.0	24.8	———	40.6	14.7			.3	.4	.6
31	11.1	———	14.0	24.8	———	40.6	———		———	.3	.5	———
TOTAL	417.1	381.1	541.3	473.2	1,092.4	732.3	816.6	246.0		12.9	15.8	17.8
MEAN	13.5	12.7	17.5	15.3	39.0	23.6	27.2	14.5		.6	.7	.6
MAX	25.5	21.6	20.7	24.8	113	40.6	74.1	59.8		.9	1.0	1.0
MIN	8.2	11.1	14.0	12.0	17.6	5.1	3.9	0		.3	.4	.4
AC-FT	827	756	1,074	939	2,167	1,452	1,620	488		26	31	35
								*	*	*	*	

MALFUNCTION

MALFUNCTION

CAL YEAR 1993	TOTAL	44,254.7	MEAN	121	MAX	2,040	MIN	3.0	AC-FT	87,780
WTR YEAR 1994	TOTAL*	4,746.5	MEAN	15.7	MAX	113	MIN	0	AC-FT	9,415

* Incomplete Record

MAXIMUM INSTANTANEOUS PEAK IS 159 CFS AT 15:30 ON 02/08/94.

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LOS ANGELES COUNTY DEPARTMENT OF PUBLIC WORKS

F118B-R PACOIMA CREEK FLUME BELOW PACOIMA DAM

DAILY DISCHARGE IN CUBIC FEET PER SECOND WATER YEAR OCT 1993 TO SEP

Day	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG
1	0	0	0								
2	0	0	0								
3	0	0	0								
4	0	0	0								
5	0	0	0								
6	0	0	0								
7	0	0	0								
8	0	0	0								
9	0	0	0								
10	0	0	0								
11	0	0	0								
12	15.0	0	0								
13	24.3	0	0								
14	24.2	0	0								
15	24.0	0	0								
16	23.2	0	0								
17	23.0	0	0								
18	22.4	0	0								
19	22.0	0	0								
20	22.7	0	0								
21	20.6	0	0								
22	5.7	0	0								
23	0	0	0								
24	0	0	0								
25	0	0	0								
26	0	0	0								
27	0	0	46.8								
28	0	0	71.3								
29	0	0	44.9		-----						
30	0	0	0		-----						
31	0	-----	0		-----		-----		-----		
TOTAL	227.1	0	163.0								
MEAN	7.3	0	5.3								
MAX	24.3	0	71.3								
MIN	0	0	0								
AC-FT	450	0	323								

CAL YEAR 1993	TOTAL	25,433.5	MEAN	69.7	MAX	688	MIN	0	AC-FT	50,450	
WTR YEAR 1994	TOTAL*	390.1	MEAN	4.2	MAX	71.3	MIN	0	AC-FT	774	

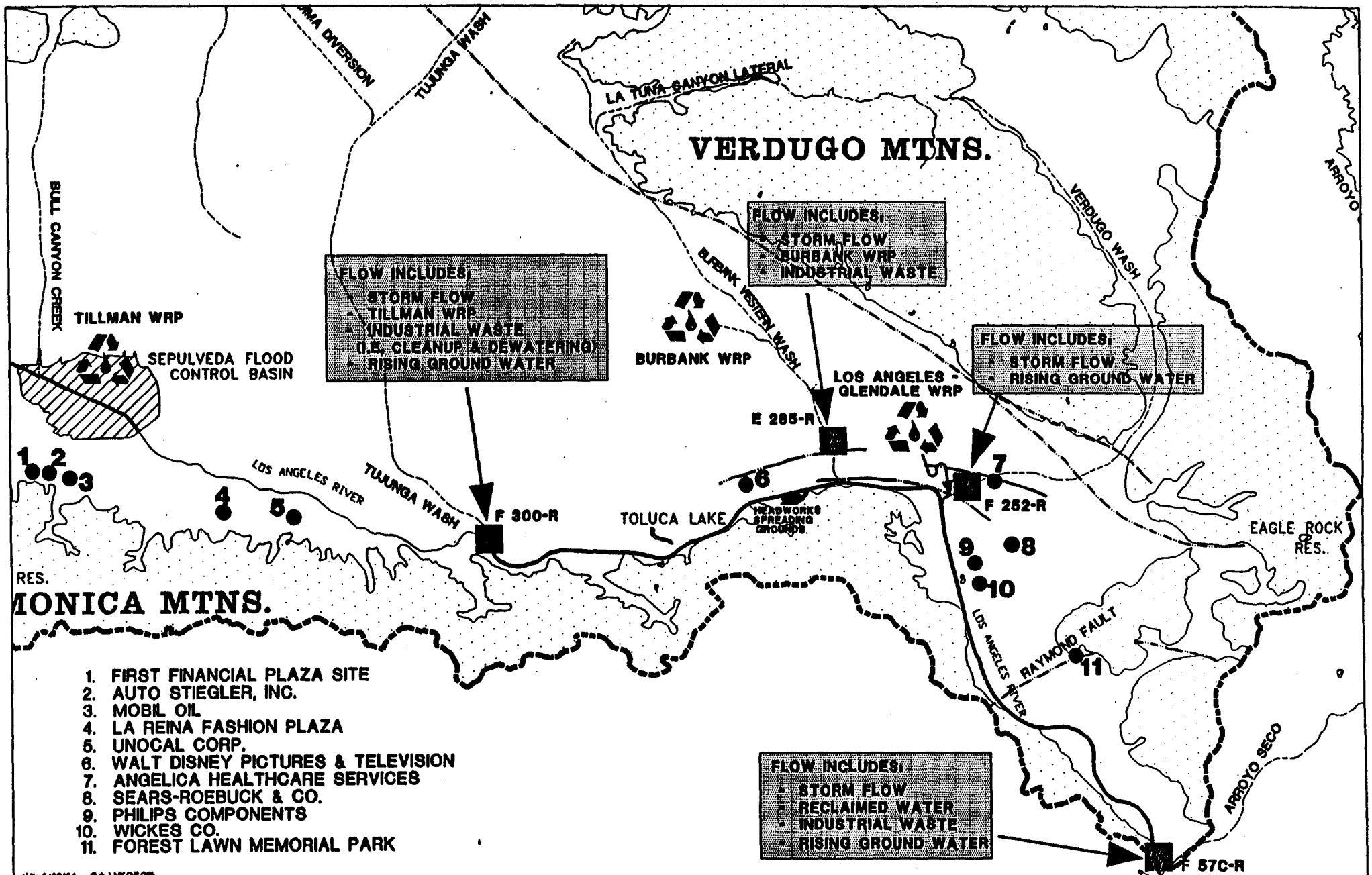
* Incomplete Record

APPENDIX C

COMPONENTS OF LOS ANGELES RIVER FLOW

UPPER LOS ANGELES RIVER AREA: COMPONENTS OF LOS ANGELES RIVER FLOW; 1993-94 WATER YEAR

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep		
TOTAL FLOW AT GAGE F-57C-R														F-57C-R: Storm, Reclaimed, Industrial, Rising Ground Water
Total:	10890	8363	11050	16692	9948	22603	7836	8398	7008	6997	14350	12560	136695	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:	3353	3130	3377	2616	2406	2959	2740	2902	2918	3225	3092	2909		: Record
L.A.-Glendale:	1169	1158	1264	1108	1116	1090	1071	1164	880	908	772	876		: Record
Burbank WRP:	452	437	452	452	408	452	437	452	437	452	452	437		: Record
Total:	4974	4725	5093	4176	3930	4501	4248	4518	4235	4585	4316	4222	53523	
II. INDUSTRIAL WATER DISCHARGED TO L.A. RIVER IN ULARA														
Upstream of F300-R	44	37	46	30	19	40	42	29	30	37	31	29		: 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:	12	10	13	8	5	11	11	8	8	10	8	8		:20% of discharges 'Upstream of F300-R'; approximately 2cfs
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	417	430	430	389	430	417	430	417	430	430	417		:7 cfs assumed
Western Drain:	63	39	164	185	153	216	224	84	103	106	97	43		: From E285-R separation of flow
Total:	549	503	653	653	566	697	694	551	558	583	566	497	7071	
III. RISING WATER IN L.A. RIVER IN ULARA														
Total:	246	246	246	246	246	246	246	246	246	246	246	246	2952	: See Section 2.3 of the Watermaster's Report



1993-94 Water Year
ULARA Watermaster
Report

Upper Los Angeles River Area:
Components of Los Angeles River Flow

FIGURE C.1

APPENDIX D

EAST VALLEY WATER RECLAMATION PROJECT

FINAL

ENVIRONMENTAL IMPACT REPORT
(SCH NO. 90010909)

EAST VALLEY WATER RECLAMATION PROJECT

JULY 1, 1991

PREPARED BY

CITY OF LOS ANGELES DEPARTMENT OF WATER AND POWER

111 North Hope Street, Room 1348

Los Angeles, California 90012

3 PROJECT DESCRIPTION

3.1 INTRODUCTION

The proposed East Valley Water Reclamation Project (EVWRP) is to be constructed in the San Fernando Valley, approximately 10 miles north of downtown Los Angeles, California (Figure 3-1). The EVWRP will include a distribution system capable of transporting up to 40 million gallons per day of reclaimed water from the Donald C. Tillman Water Reclamation Plant (Tillman Plant) to users at higher elevations in the northeast portion of the San Fernando Valley.

The Tillman Plant, located in the Sepulveda Basin near the intersection of the San Diego and Ventura Freeways, presently treats 42 million gallons per day of municipal wastewater. It is now undergoing an expansion program that will increase its capacity to 80 million gallons per day. Reclaimed water from the Tillman Plant will be supplied to various users in the northeast portion of the San Fernando Valley by the Los Angeles Department of Water and Power (LADWP) as part of the proposed project, and by the Los Angeles Department of Public Works (Public Works) as part of separate projects. A chart showing the proposed distribution of reclaimed water from the Tillman Plant is presented in Figure 3-2. In the future, the LADWP will propose one or more additional projects to supply Tillman Plant effluent to users in the western portion of the San Fernando Valley.

The proposed EVWRP facilities required to distribute reclaimed water in the northeast San Fernando Valley will be contained in three systems, consisting of several pump stations, water

tanks and approximately 13 miles of large diameter pipeline. Table 3-1 outlines the major features of the three proposed distribution systems, while Figure 3-3 shows the location of the proposed facilities for Systems 1 and 2. Systems 1 and 2 will serve low and medium elevation users, and System 3 will be required to supply reclaimed water to industrial and irrigation users at higher elevations in the San Fernando Valley. The exact type and location of the facilities for System 3 will depend on future customer demand.

Many factors were considered in choosing pipe routes and in siting the pump station and storage tank for Systems 1 and 2. These considerations included:

- Size and location of existing utilities in City streets;
- Existence of street construction moratoriums due to the presence of recently laid pavement;
- Availability of public right-of-ways, (ie. rail corridors, power line corridors, flood control channels);
- Location of potential customers;
- Hydraulic requirements of proposed system;
- Aesthetics of completed project; and
- Potential disturbances to residences and businesses during construction.

A study was conducted to determine which of several possible configurations of pipe routes and appurtenant facilities would best meet the objectives of the project. The project design which best meets the needs of the City is described below. Those alternatives which were deemed less satisfactory are described in Chapter 16.

3.2 PROPOSED FACILITIES

To deliver reclaimed water from the Tillman Plant to the Hansen and Pacoima Spreading Grounds, approximately 64,000 feet of 48 54-inch diameter pipe must be installed. The pipeline will tie into an existing 54-inch diameter pipeline near the intersection of Woodley Avenue and Victory Boulevard. It will then continue ~~in the easterly direction on Victory Boulevard towards~~

~~Haskell Avenue, where it will turn left (north)~~ north on Woodley Avenue. At the intersection of ~~Haskell Avenue~~ Woodley Avenue and Sherman Way, the pipeline will turn right (east), and continue on Sherman Way to the Tujunga Wash. Between Allott Avenue and Varna Avenue, the pipeline will turn left (north) onto the Tujunga Wash right-of-way. The pipeline will continue on the Tujunga Wash right-of-way to Glenoaks Boulevard, where it will turn left (northwest). Near where the pipeline passes the northern end of the Hansen Spreading Grounds, an outlet structure will be constructed to deliver reclaimed water for groundwater recharge.

From Glenoaks Boulevard, the pipeline will turn right (north) on Osborne Street, and continue past the west abutment of Hansen Dam, where the pipeline will end. At a later date, the appropriate connections will be made to bring the reclaimed water pipeline onto the Hansen Dam Recreation Area property.

A second pipeline, approximately 36 inches in diameter, will branch off the main pipeline at the intersection of Osborne Street and Glenoaks Boulevard. This smaller line will continue on Glenoaks Boulevard in a northwesterly direction to Terra Bella Street, where it will turn left (south). Next, the pipeline will turn left on Dehaven Avenue, and then right on Garber Street. At the end of Garber Street, the pipeline will continue up a hill onto Los Angeles County property. The pipeline will terminate in a 2 million gallon tank which will be constructed as part of the project on a hilltop on the grounds of the Whiteman Airport, in Pacoima.

At the intersection of the Tujunga Wash and the LADWP Rinaldi-Toluca transmission line corridor (which parallels Canterbury Avenue), the main 48 54-inch reclaimed water pipeline will branch off in a northwesterly direction towards Pacoima Spreading Grounds. The 48 54-inch diameter pipeline will be installed in the Rinaldi-Toluca transmission line corridor between Tonapah and Filmore Streets. An outlet structure will be constructed at the northern end of the spreading grounds to discharge the reclaimed water into the Pacoima Spreading Grounds.

The rise in elevation from the Tillman Plant to Hansen and Pacoima Spreading Grounds is 250 feet and 240 feet respectively. To attain this uphill flow of water, an existing pump station at the Tillman Plant will be modified to pump the additional flows required by the EVWRP.

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A booster pump station will also be required at the LADWP's Valley Generating Station to deliver the reclaimed water to the Hansen Dam Recreation Area and the proposed storage tank at the Whiteman Airport. This pump station will be located on LADWP property adjacent to existing power generation facilities. The Valley Generating Station will require water treatment facilities on site in order to use reclaimed water.

3.3 DISCRETIONARY ACTIONS

Completion of the proposed project will require approval of thirteen separate discretionary actions on the part of eight agencies. The actions to be completed are identified below:

City of Los Angeles Department of Water and Power Board of Commissioners

- Certification of the Final EIR.
- Approval of the proposed project.
- Completion of a Notice of Determination.

City of Los Angeles Planning Commission

- Approval of a Conditional Use Permit to allow construction of the pump stations and reclaimed water storage tank.

City of Los Angeles Cultural Affairs Commission

- Pump station and tank architectural design approval.

City of Los Angeles Department of Building and Safety

- Issuance of Permit to Construct for pump station and tank.

City of Los Angeles Bureau of Engineering

- Issuance of an Excavation Permit to construct the pipeline.

State of California Department of Health Services

- Engineering Report Recommendation

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- Issuance of Operation Permit

Los Angeles Regional Water Quality Control Board

- Approval of Report of Waste Discharge
- Issuance of ~~Waste Discharge~~ Water Reclamation Requirements
- Engineering Report Recommendation

Los Angeles County Department of Public Works

- Issuance of Flood Control Permit

3.4 PROJECT SCHEDULE

Construction activities on the EVWRP are scheduled to begin in 1993 following a 12 to 18 month design phase. The construction process for System 1 is expected to continue for approximately two years. According to this schedule, the spreading of reclaimed water would begin in mid 1995. Use of reclaimed water by industrial and irrigation customers may be implemented in phases beginning in 1994, as portions of the 48 54 inch diameter pipeline are completed. System 2 facilities may be designed and constructed concurrent with System 1 or may proceed somewhat later. System 3 facilities will be constructed after completion of System 1 and 2 facilities.

3.5 CONSTRUCTION ACTIVITIES

After the plans and specifications are finalized, a construction contract for the EVWRP will be advertised for bidding. The contract will be awarded to the lowest responsible bidder.

Construction methods and scheduling will be determined to a large extent by the contractor. Therefore, it is impossible at this time to precisely describe these activities. However, a brief discussion of pipe laying, pump station and tank construction follows.

Installation of the pipeline will take place in public streets and in electrical transmission line and

flood control channel right-of-ways. Pipeline construction typically involves the following steps:

1. Set-up of traffic signs, barriers and flagmen (on roadways);
2. Delivery of pipe to curbside;
3. Cutting and removal of pavement (on roadways);
4. Trenching;
5. Installation of pipe in trench;
6. Backfill of trench; and
7. Restoration of pavement/cleanup.

Construction of the pump station and storage tank will involve earth work, foundation work, structural work, painting, and other construction disciplines.

Personnel for the construction project will be provided by the contractor. It is expected that a crew of approximately 20 workers will be required for each major portion of the project.

Some of the workers on the project will be providing labor, while others will be operating heavy equipment. Typical heavy equipment used for a project of this type includes cranes, dozers, loaders, trucks, graders, excavators, backhoes, pavement breakers, compactors, vibratory rollers, and compressors. Although these pieces of equipment may be used at some time on the project, it is not likely that they all would be running at the same time.

3.6 REGULATION AND INSPECTION OF CONSTRUCTION ACTIVITY

Construction activities in Los Angeles are regulated by several government agencies, including the Los Angeles Department of Building and Safety (LADBS), the Los Angeles Department of Transportation (LADOT), the Federal Occupational Safety and Health Administration (OSHA), and the Los Angeles Bureau of Engineering (LABOE).

Full time inspection will be provided at the job site by LADWP personnel. The contractor will be required to follow all applicable rules and regulations concerning noise, work hours, traffic

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control, safety of persons and property, and use of premises and highways.

3.7 PROJECT OPERATIONS

Once construction of needed facilities is completed, reclaimed water will become available for groundwater recharge, industrial, and irrigation use.

Reclaimed water will be available for groundwater recharge at the Hansen and Pacoima Spreading Grounds. As required by the Department of Health Services' Proposed Guidelines for Groundwater Recharge with Reclaimed Water, the reclaimed water will be diluted with water from other sources. In addition to Hansen and Pacoima Spreading Grounds, dilution water may be spread at Tujunga and Branford Spreading Grounds. Dilution water may include the following:

- Imported aqueduct waters spread at spreading grounds;
- Native runoff (i.e. local rainwater, storm water);
- Imported aqueduct waters which reach the groundwater basin from infiltration of irrigation water; and
- Existing groundwater.

Several industrial and irrigation water users in the northeast San Fernando Valley have expressed interest in replacing some or all of their potable water purchases with reclaimed water. Reclaimed water will be sold to customers near the pipeline route at a substantially discounted rate after the completion of construction. A marketing plan for reclaimed water in the project area can be found in Appendix E.

Responsibility for the operation of the EVWRP will be shared by several parties. A brief outline of responsibilities is given below.

The City of Los Angles Department of Public Works, Bureau of Sanitation will be responsible for operating the Tillman Plant such that it provides a reliable source of reclaimed water. Bureau of Sanitation personnel will monitor the treatment process and periodically test the reclaimed water to ensure a high quality product. Bureau of

Sanitation Personnel will also operate pumping facilities at the Tillman Plant.

The Los Angeles Department of Water and Power will maintain and operate the reclaimed water pipeline, storage tank, booster pump station at the Valley Generating Station, and the associated water system valves and meters. The LADWP will test water quality on a periodic basis.

The Los Angeles County Department of Public Works will be responsible for the spreading reclaimed and/or dilution waters at the Hansen, Tujunga, Branford and Pacoima Spreading Grounds.

Industrial and Irrigation Customers who choose to use reclaimed water will be responsible for providing and/or installing the necessary facilities to distribute the reclaimed water throughout their premises. Each user will be required to install safety features at their facilities to ensure the proper use of reclaimed water.

3.8 PROJECT FINANCING

The estimated construction costs for the proposed project range between 29 and 38 million dollars. This total does not include land acquisition, project engineering, and management costs. The project will be financed through the normal capital improvement program of the Los Angeles Department of Water and Power. ~~All funds will be derived from city-wide water sales.~~ Water system projects (potable and reclaimed) are financed from the Water Revenue Fund (WRF). The WRF is funded through the sale of potable and reclaimed water and the sale of Water Revenue Bonds which provide long term funding of capital projects. Other sources of funding are being investigated to reduce the need for WRF financing. The project is expected to qualify for assistance under the Metropolitan Water District of Southern California's (MWD) Local Projects Program. Currently that program provides $154 per acre-foot for projects that displace the use of MWD water. Assembly Bill 444 funds may also be available for this project. The availability of alternative financing is subject to project eligibility criteria and requirements as determined by the appropriate agencies.

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TABLE 3-1

RECLAIMED WATER DISTRIBUTION SYSTEMS

	SYSTEM 1	SYSTEM 2	SYSTEM 3
PROPOSED FACILITIES	1. Pump station at Tillman plant 2. 64,000 feet of 54 inch diameter pipe	1. 4,000 feet of 36 inch diameter pipe 2. One 2 million gallon storage tank 3. Booster pump station at Valley Generating Station	1. Small booster pump station(s) 2. Hydropnuematic tank(s) 3. Small diameter distribution pipelines
SERVICE TO:	1. Pacoima Spreading Grounds 2. Hansen Spreading Grounds	1. Valley Generating Station 2. Irrigation and industrial users at lower and middle elevations	1. Irrigation and industrial users at higher elevations

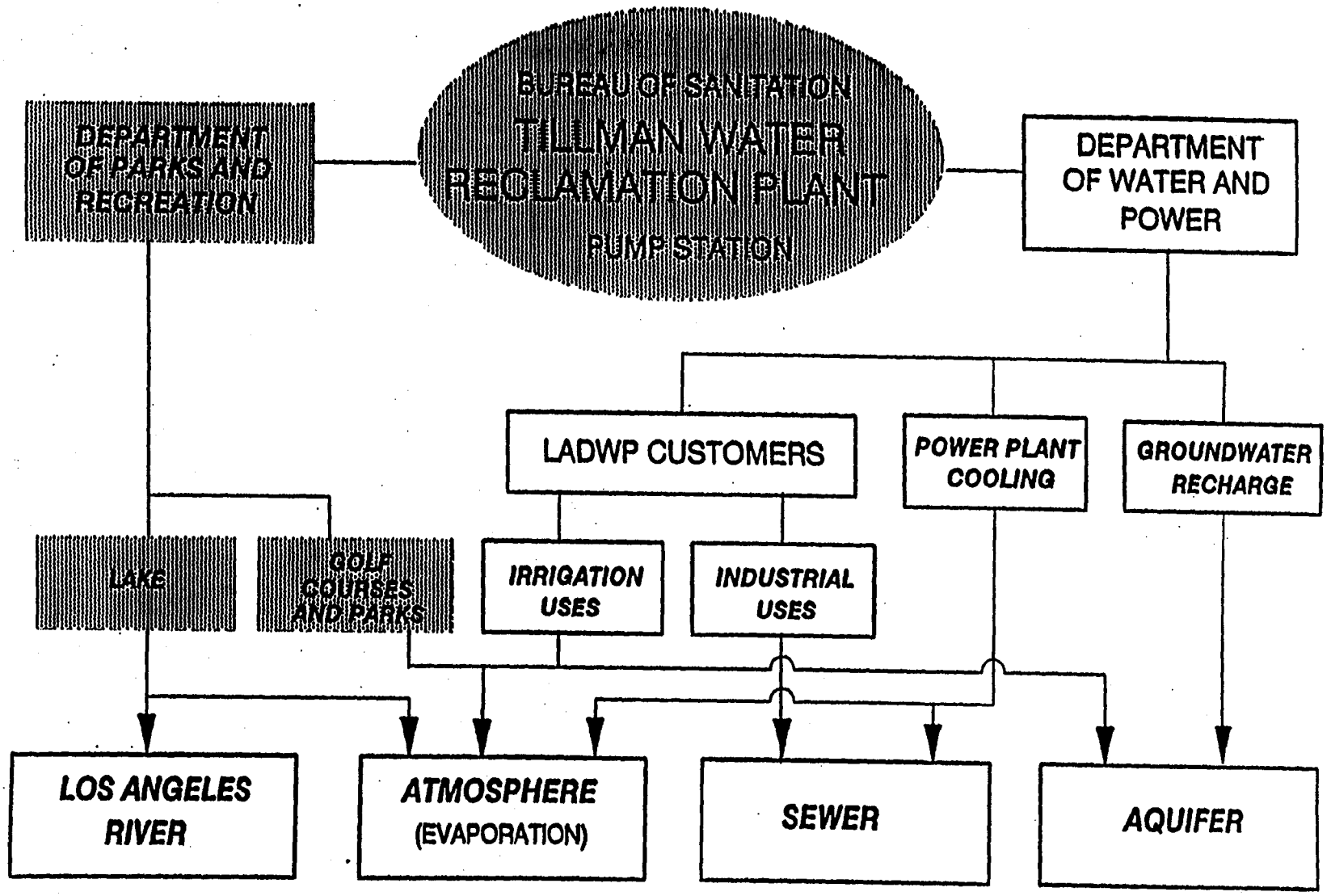


FIGURE 3-2
TILLMAN PLANT
RECLAIMED WATER
UTILIZATION

NOTE: Shaded areas are not part of the proposed project

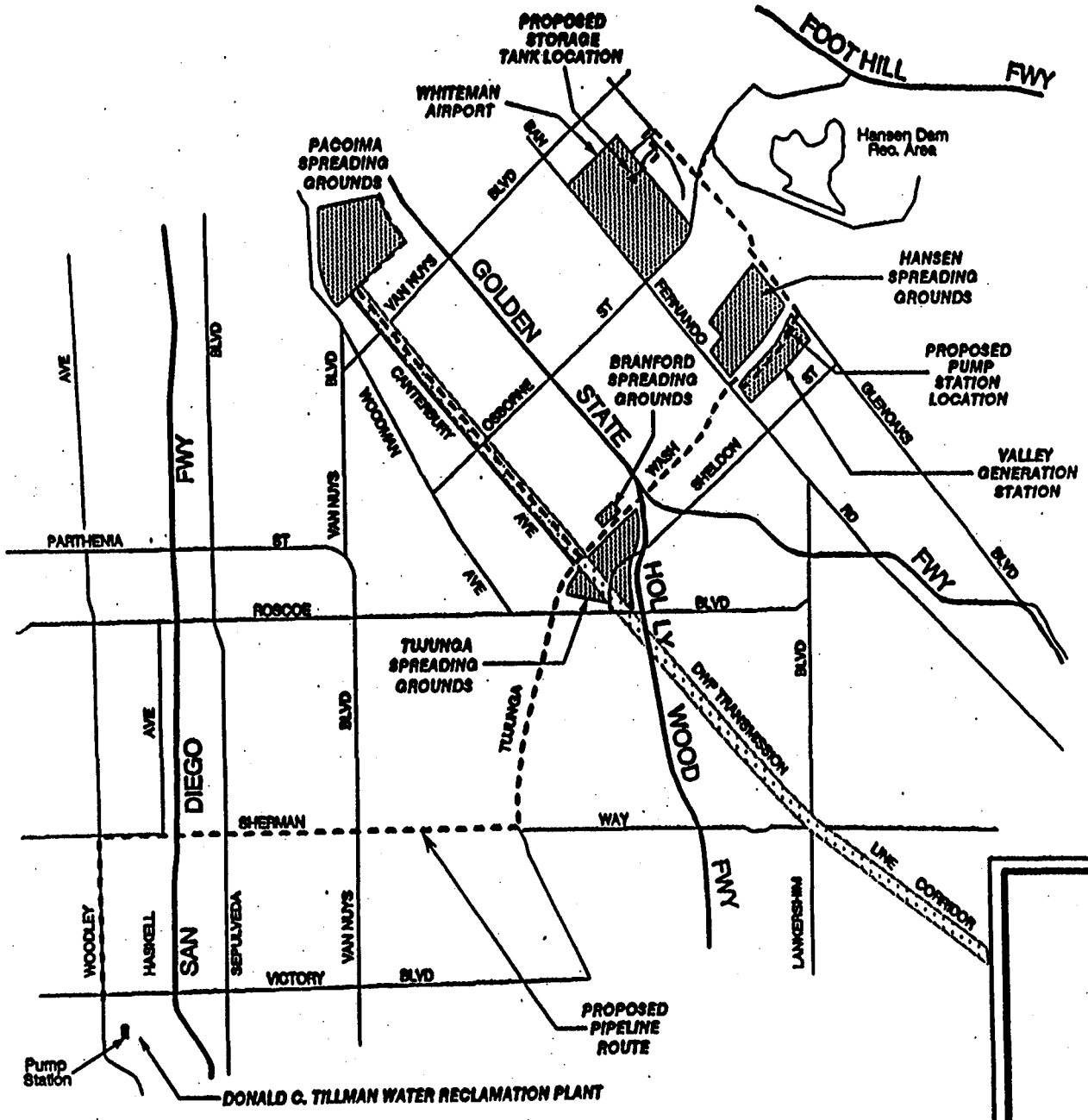


FIGURE 3-3

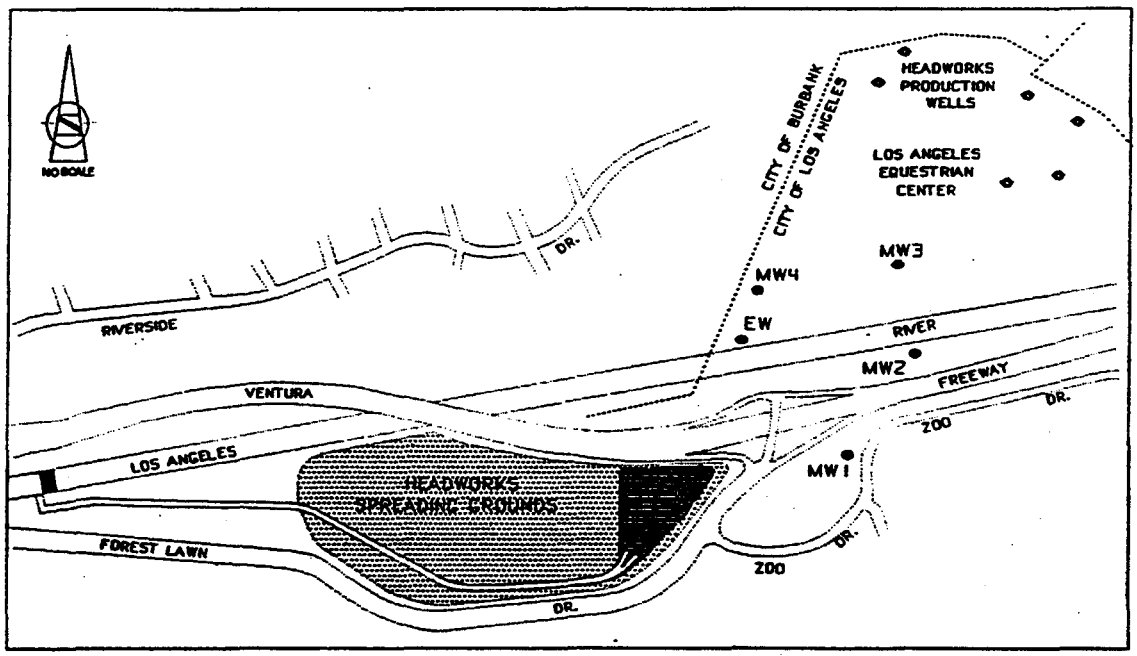
PROPOSED FACILITIES

APPENDIX E

HEADWORKS RECLAIMED WATER PILOT RECHARGE STUDY

Headworks Pilot Recharge Project

Water Quality Investigation



City of Los Angeles
Los Angeles Department of Water and Power
Water Engineering Design Division
In Cooperation with Metropolitan
Water District of Southern California

December 1993

Abstract

The objective of the Headworks Pilot Recharge Project was to demonstrate that Los Angeles River (LAR) water can be used to recharge the San Fernando Groundwater Basin (SFGB), thereby augmenting the City of Los Angeles' potable water supply. During the spreading season (April to November), the LAR contains approximately 71 percent tertiary treated reclaimed water from the Donald C. Tillman Water Reclamation Plant (Tillman).

A pilot spreading project and a comprehensive water quality monitoring program was implemented at the Headworks Spreading Grounds in June 1991 and was completed in July 1993. The project was jointly funded by the Los Angeles Department of Water and Power and The Metropolitan Water District of Southern California.

Approximately 1 cubic foot per second (cfs) of the LAR water was diverted by a rubber dam and was spread on a 2-day wet and 5-day dry cycle. An extraction well, located approximately 1,000 feet downgradient from the spreading area was used to recover the spread water. The extraction well was pumped at a constant rate of 200 gallons per minute (0.45 cfs). Due to dilution with natural groundwater, the extracted water contained about 45 percent reclaimed water.

A portion of the extracted water was diverted through a granular activated carbon (GAC) filter to evaluate its effect on improving extracted water quality.

Groundwater flow analysis indicated the spread water was recovered by the extraction well.

This 2-year pilot project indicates that:

- The extracted water complied with all drinking water standards.
- No adverse impact on water quality in the basin occurred.
- Complete removal of coliform bacteria was noticed. Compliance with the drinking water standards was achieved without disinfection.
- Giardia, and Cryptosporidium which were present in the LAR water, were removed by the filtering action of the soil and were not detected in the extracted water even though the water was not chlorinated.
- Viruses were neither detected in the LAR water nor in the extracted water.

- The groundwater recharge operation reduced the trihalomethane (THM) formation potential of the spread water by about 93 percent at the extraction well.

- The concentration of total organic carbon (TOC) and biochemical oxygen demand (BOD) in the extracted water were reduced by 92 percent and 87 percent, respectively, as compared to LAR water.

- GAC filtration improved the organic content (i.e., TOC) of the product water by an additional 46 percent (about 95 percent when compared to LAR water); however, due to high quality of the extracted water, the addition of GAC is not necessary.

- The recharge water (i.e., LAR blend) complied with the basin water quality objectives (non-degradation), except for chloride. The chloride level in the spread water averaged 122 mg/L during the course of the project. The basin water quality objective for chloride is 100 mg/L. The recharge operation resulted in a chloride increase of 8 mg/L in the extraction well, from 59 mg/L to 67 mg/L. This level is lower than the basin water quality objective and also lower than the maximum recommended level of 250 mg/L for drinking water.

Based on the results of this pilot project, an Engineering Report and an operational plan will be developed for a full-scale groundwater recharge project at the Headworks Spreading Grounds. This project is expected to result in the diversion of up to 10,000 acre-feet of LAR, which now flows to the Pacific Ocean, to the SFGB, where it will augment the City's groundwater supply.

Goal

The goal of this pilot project was to investigate the feasibility of using LAR water, containing 71 percent reclaimed water from Tillman, to recharge the SFGB. In order to demonstrate this, the Los Angeles Department of Water and Power conducted a pilot spreading project at the Headworks Spreading Grounds from June 1991 to July 1993. The specific goal was to determine the changes in the water quality as it moved through the soil, mixed with existing groundwater and was then extracted. Various physical, chemical, and microbiological water quality parameters were investigated throughout the course of the project.

This report summarizes the findings of the project as required by the California Regional Water Quality Control Board (RWQCB), Los Angeles Region and the Department of Health Services. The findings will also be included in an Engineering Report which is being prepared for the approval of a full-scale project.

Operation

Sampling and analysis of the background water quality of the basin began on June 6, 1991. The spreading operation started on July 2, 1991 and was continued until April 14, 1993. Extraction of the spread water, however, continued until July 15, 1993.

Approximately 1 cfs of the LAR water was diverted on a 2-day wet and 5-day dry cycle into a highly permeable spreading area known as the Headworks Spreading Grounds. The intermittent 1 cfs flow rate equates to a 0.29 cfs flow rate on a continuous basis. During the spreading season (April to November), reclaimed water averaged approximately 71 percent of the LAR, ranging from 53 percent to 79 percent. During the course of the pilot project, Tillman, which is located approximately 7 miles upstream

of the spreading area, was producing about 60 million gallons per day (MGD). Most of the tertiary treated effluent is discharged into the LAR. The process flow diagram of the Tillman is depicted in Figure 1. The treatment rate will be increased to 80 MGD in the near future. However, it is expected that up to 34 MGD (approximately 38,000 acre-feet per year) of the Tillman effluent in the future will be used for irrigation (approximately 3,000 acre-feet per year) in the Sepulveda Basin and for groundwater recharge (approximately 35,000 acre-feet per year) in the northeastern San Fernando Valley.

Figure 2 shows the proportion of the Tillman effluent and the LAR under the present and future flow conditions. As can be seen from this figure, during the spreading season (April to November), approximately 71 percent of the LAR flow consists of Tillman effluent.

The spreading operation was ceased during heavy rains due to the high turbidity of the LAR water and to avoid spreading of the storm water. Urban storm runoff may contain significant quantities of oils, greases, and pesticides which may adversely affect the quality of the LAR water. Also, the turbid water can leave a sediment deposit of fine particles on the bottom of the spreading basin thus lowering the permeability of the spreading basin. The diverted LAR water was conveyed by gravity through a corrugated metal pipe to the eastern portion of the Headworks Spreading Grounds, to an area of about 1 acre. The hydraulic load on the spreading ground during the course of the spreading operation was approximately 2 ft/day.

The spreading grounds occupy an area of approximately 30 acres, consisting of fine sand and gravel in the first 20 feet of depth, coarse gravel and boulder from 20 feet to 45 feet, and bedrock (decomposed granite and granite) below 45 feet of depth. The plan view of the spreading grounds is shown in Figure 3. The cross section of the pilot project area

is depicted in Figure 4. The spread water was then extracted at a constant flow rate of 0.45 cfs through an extraction well. This well is located approximately 1000 feet downgradient from the spreading grounds. Continuous pumping of the extraction well at a flow rate of 0.45 cfs resulted in a 1.5 to 1 ratio of water extracted to water spread. Figure 5 shows the capture of the spread water by the extraction well as evident from the groundwater stream lines.

In addition to the extraction well, four monitoring wells were used to track the movement of the spread water (Figure 3) and to obtain samples of the groundwater for water quality analysis. Information on the geological formation and the groundwater depth in the project area is contained on the well logs depicted in Figures 6 through 10.

Throughout the course of the project operation, approximately 368 acre-feet of the LAR water was spread at the Headworks Spreading Grounds (Table 1). Approximately 547 acre-feet of water was pumped from the extraction well, 1.5 times the spread water volume, between July 1991 to April 1993. The spreading operation was ceased in March 1993 while pumping continued until July 1993 to ensure total extraction of the spread water.

The LAR monthly flow data were collected for a period of 20 years from 1969 to 1989. The Tillman flow rates were then subtracted from the LAR total flow for the period from 1984 to 1989 in order to determine the LAR base flow rates. Tillman began discharging into the LAR in 1984. During the spreading period, the LAR on average contained 71 percent of Tillman reclaimed water. The percentage of reclaimed water in the extracted water was about 45 percent.

Conclusion

- Spreading of LAR water at Headworks Spreading Grounds effectively reduced coliform, TOC, BOD, chloride, nitrite, ammonia, and turbidity levels to the point where the extracted water met all drinking water standards. This was demonstrated through a comprehensive water quality monitoring program performed over a period of two years.

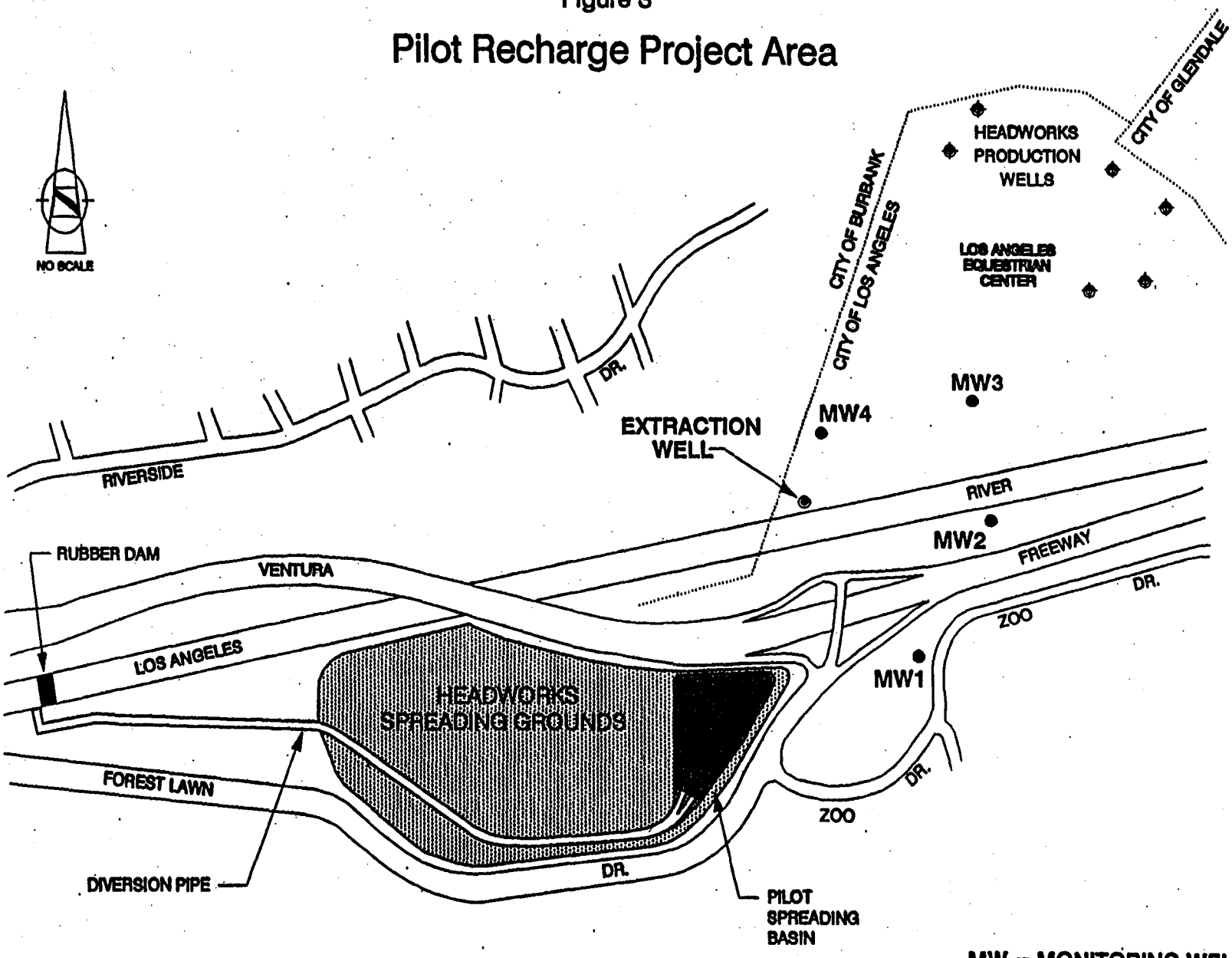
- The water quality basin objectives established for the spread water by the RWQCB were met except for chloride (122 mg/L vs. 100 mg/L). During the spreading operation an average increase of 8 mg/L was noticed in the background concentration of chloride from 59 mg/L to 67 mg/L. This level is less than one-third of the maximum recommended level of 250 mg/L for drinking water.

- The extracted water met the basin water quality objective except for TDS. The background concentration of TDS was 853 mg/L. The TDS level of 738 mg/L in the extracted water was approximately 5 percent higher than the objective level of 700 mg/L. This higher level of TDS did not result from the spreading operation since the TDS level in the spread water averaged 658 mg/L during the course of the pilot project.

- A full-scale project can be implemented at the Headworks Spreading Grounds and should be developed as soon as practical to make use of water which presently flows to the Pacific Ocean. Such a project would result in an increased supply of groundwater for the City of Los Angeles.

Figure 3

Pilot Recharge Project Area



APPENDIX F

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) pH	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	NO_3	F	B	TDS mg/l	Hardness as $CaCO_3$ mg/l
Imported Water																
Colorado River Water at Eagle Rock Reservoir	1992	1008	8.0	69	29	96	4.4	0	146	240	91	1	0.2	0.2	614	289
LA Aqueduct Influent	9/14/94	399	8.1	29	7.32	36.4	-	0	171	33.4	17.3	0.44	0.68	0.6	241	106
LA Aqueduct/MWD Filtration Plant Influent	3/23/94	378	8.4	27.5	7.12	40	-	0	174	35.7	19	0.44	0.74	0.54	232	104
State Water Project at Joseph Jensen Filtration Plant (Influent)	93/94 FY	686	8.2	41	18.5	68	3.6	0	122	124	74	2.05	0.26	0.33	410	180
Surface Water																
Tillman Rec. Plant Discharge to LA River	1992 CY	-	7.0	55	18	129	14	-	-	195	137	0.5	0.9	1	665	211
Los Angeles River at Arroyo Seco	12/93	981	7.3	71	27	117	17	<2	181	204	118	3.7	0.3	0.6	670	287
LA/Glendale Rec. Plant Discharge to LA River	1993 CY	-	7.4	51	19	149	16	-	-	207	164	2.8	0.9	0.7	736	188
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)																
3810 (a) (No. Hollywood No. 11)	3/17/91	513	8.3	56	15.9	29.6	-	0	170	57	18.6	7.7	0.31	0.1	308	170
3841C (Burbank No. 6)	5/1/91	500	7.9	52	9.7	30	4.1	<0.6	220	44	19	2.2	0.28	-	290	170
3913H (Grandview No. 16)	12/93	540	7.9	56	13	33	3.6	1.2	225	56	24	13	0.5	-	330	193
(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)	11/30/94	653	7.3	81.6	17	34.5	-	0	251	37.3	35.2	27.3	0.33	0.36	426	271
5959 (San Fernando No. 3)	2/13/91	630	7.5	61	21	30	2.8	<0.6	210	75	28	27	-	-	380	170
(Verdugo Basin)																
3971 (Glorietta No. 3)	6/23/92	840	7.0	86	32	39	3.3	0.1	226	115	75	52.8	0.21	-	500	346
5058 (CVCWD No. 14)	2/9/93	705	7.2	68	27	30	2.5	0.21	201	76	56	54	0.33	-	410	281

(a) Substituted for No. Hollywood No. 30
(b) Substituted for Pollock No. 6

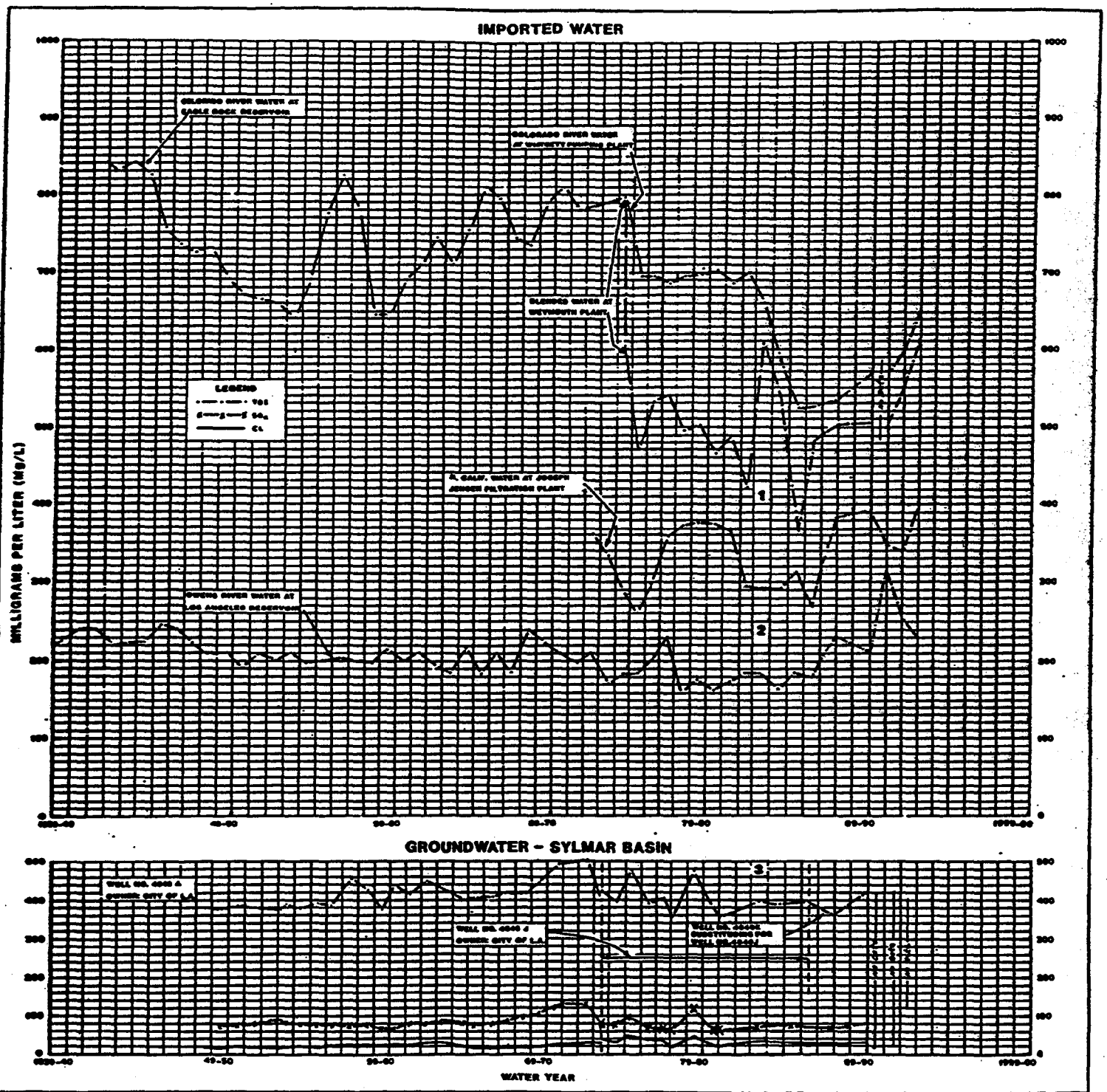


Figure 3 - MINERAL CONSTITUENTS OF WATER SOURCES IN THE ULARA

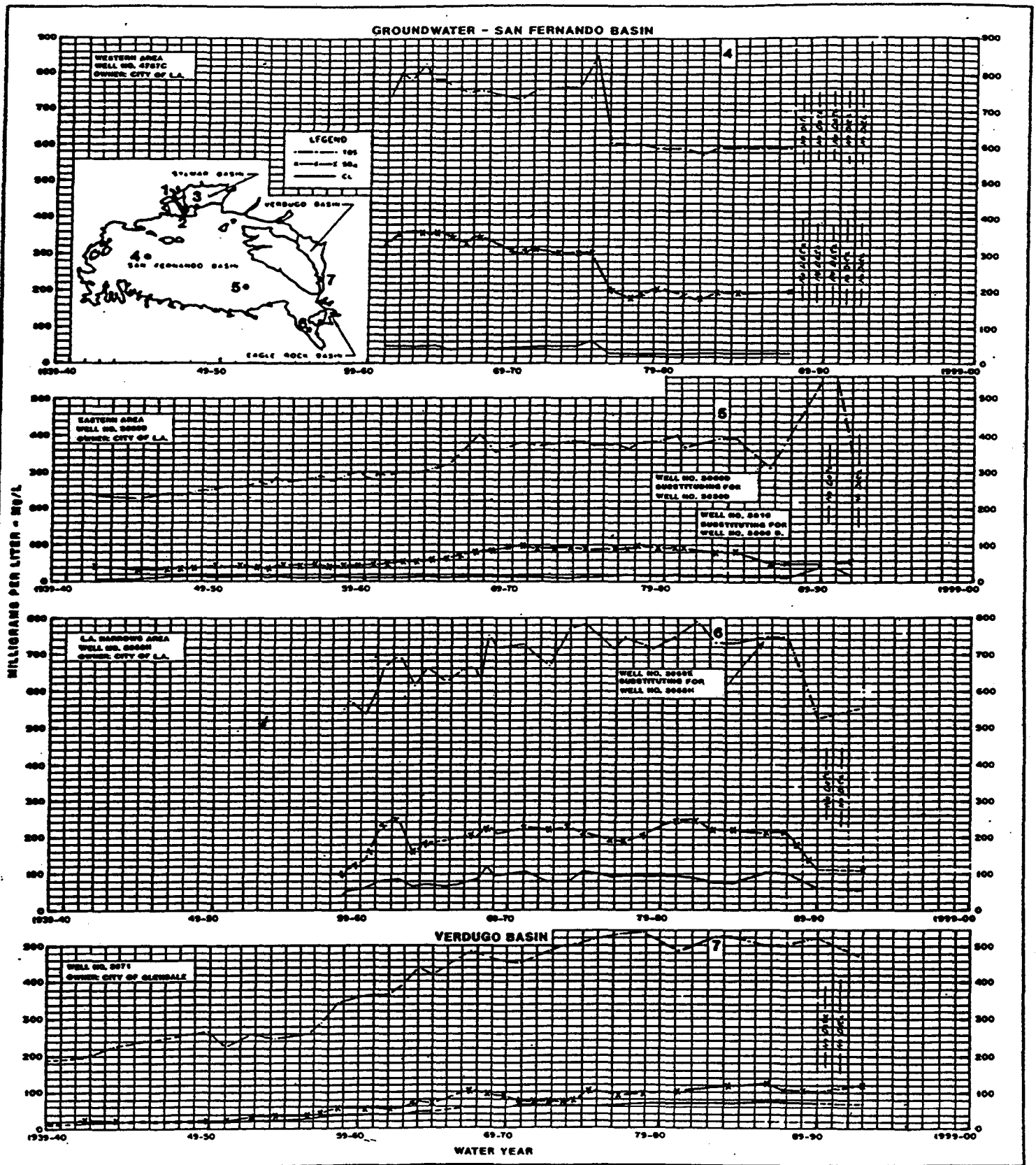


Figure 3(cont.) - MINERAL CONSTITUENTS OF WATER SOURES IN THE ULARA

APPENDIX G

DEWATERING AND REMEDIATION PROJECTS

DEWATERING AND REMEDIATION 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	Mobil Oil	Alton Geoscience	16461 Ventura Blvd.	R	May 11, 1989
10		Eccleston, C. W.	22020 Clarendon St.	P	
11	Thrifty Oil	Delta Tech. Eng.	18226 Ventura Blvd.	R	Feb 2, 1990
12		Marks, Ronald	5348 Topanga Canyon	P	
13		Helfman, Haloosim & Ass.	21820 Burbank Blvd.	P	
14	Park Hill Medical Plaza	Anjomshoaa, Mahmoud	7303 Medical Center Dr.	D	Dec 27, 1989
15	Danalex Engineering		12050 Ventura Blvd.	P	
16	Ellis Plumbing Co.	Ellis, Chris	4235 Mary Ellen Ave.	P	
17	Tarzana Office Plaza	Varadi Engineering	18701 Burbank Ave.	P	
18	Helfman, Haloosim & Associates	Varadi, Ivan	5350 White Oak Ave.	P	
19	California Environmental	Buckley, Charlie	5455 Van Nuys Blvd.	R	Oct 4, 1989
20	First Financial Plaza Site	Slade, Richard	16830 Ventura Blvd.	D	Oct 9, 1987
21	Trillium	Lewis, Bill	6310 Canoga Ave.	D	Apr 27, 1988
22	LAMCO	O'Neil, John	21300 Victory Blvd?	D	Apr 27, 1988
23	La Reina Fashion Plaza	Blumenfeld, Dolores	14622 Ventura Blvd.	D	Apr 27, 1988
24	Rockwell International	Lafflam, S. R.	6633 Canoga Park Ave.	R	Jun 10, 1990
25	Lockheed	Helgerson, Ron	E. Empire Ave.	R	Jan 5, 1989
26	3M Pharmaceutical	Lee, M. E.	19901 Nordhoff St.	R	Feb 8, 1989
27	Philips Components	Smith, Wade	4561 Colorado St.	R	Jul 14, 1987
28	Auto Stiegler	Stiegler, John	16721 Ventura Blvd.	D	Oct 31, 1987
29	Sherway Properties	Vasquez, Rodney	4477 Woodman Ave.	P	
30	Ellis Plumbing Co.	Ellis, Chris	19951 Roscoe Blvd.	P	

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.

R: Ground water remediation site.

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

APPENDIX H

WELLS DRILLED FOR GROUND WATER INVESTIGATIONS

WELLS DRILLED FOR GROUND WATER INVESTIGATIONS

1993-94 WATER YEAR

1. Allied Signal
   Three new wells have been approved and are expected to be drilled in late 1995. There are 9 active monitoring wells.

2. Hughes Missile Systems Company
   No new wells were reported. There are a total of 42 onsite and offsite wells.

3. Lockheed Aircraft Corp.
   One test extraction well and 4 additional observation wells were drilled. Three old water wells, one injection well and one pilot extraction well were abandoned Lockheed has a total of 60 onsite and 80 offsite wells. The breakdown of the onsite and offsite wells is as follows: Onsite wells - 47 monitoring wells, 5 extraction wells, 4 observation wells, 2 piezometers, 1 injection well, and 1 pilot extraction well; Offsite wells - 73 monitoring wells, 3 extraction wells, 3 observation wells, and 1 piezometer.

4. City of Los Angeles
   No new wells were drilled.

5. Philips Components
   No new wells were drilled. There is a total of 22 onsite and offsite wells. Two of the 22 wells are extraction wells, however, only 1 is active.

6. Rocketdyne (Canoga Park Facility)
   One new monitoring well was completed in the lower zone. There is a total of 87 onsite monitoring wells (66 in the Shallow Zone, 15 in the Upper Zone, and 6 in the Lower Zone), and 30 offsite monitoring wells. There are 11 wells which are capable of being used as extraction wells.

7. 3M
   No new wells were drilled. There are 25 onsite monitoring wells, 8 offsite monitoring wells, and 11 onsite extraction wells. Of the 11 extraction wells, 2 are active.

8. Walt Disney
   There is a total of 9 wells. Disney has 3 extraction wells which they expect to destroy in late 1995.

APPENDIX I

LANDFILLS - SWAT REPORT SUMMARY

STATUS OF LANDFILLS
SOLID WASTE ASSESSMENT TEST REPORTS

Attached are sixteen summary reports on the status of various landfills that exist within the Upper Los Angeles River Area (ULARA). For each of these landfills a Solid Waste Assessment Test (SWAT) Report was prepared and submitted to the Los Angeles Regional Water Quality Control Board.

These are reports prepared by the ULARA Watermaster and staff. Updated status reports will be available in the future as data becomes available. The date that gas control systems are installed and the depth-to-water at the landfill site are significant parameters as to the potential impact on groundwater in the alluvial area. Additional work is required in obtaining these data. A better understanding of the San Fernando Basin's increased hardness and total dissolved solids levels will be provided when these data are available.

Included in the summary sheets provided are the name and owner of the various landfills, along with location maps and general hydrogeologic information at the landfill site.

The following landfills are included in this report:

1. Bradley East
2. Bradley West
3. Branford Street
4. CalMat (Sun Valley #3)
5. CalMat (Old) Class 3 Site
6. Gregg Pit/Bentz
7. Hewitt
8. Lopez Canyon
9. Penrose/Newberry
10. Pendleton Street
11. Sheldon-Arleta
12. Scholl Canyon
13. Stough Park
14. Sunshine Canyon
15. Toyon
16. Tuxford

The SWAT program has been discontinued after completion of only 4 ranks of landfills in an original group that included 15 ranks. SWAT activities now include only a study of previously submitted reports. The controlling program now is Article 5 of Chapter 15, which became effective on July 1, 1991. However, this program was deemed unsuitable by the USEPA for RCRA authorization and had to be revised. The DHS and SWRCB agreed to jointly draft a suitable replacement. Among the changes are the requirements to analyze for many more VOCs, and to subject the results to more sophisticated statistical techniques. If a leak is detected, an Evaluation Monitoring Program (EMP) is required, followed by a Corrective Actior Program (CAP).

STATUS AS OF MAY 1994

SWAT Completed

NAME OF LANDFILL - Bradley East Disposal Site (Bradley Landfill complex)

OWNER - Valley Reclamation Company

LOCATION - Sun Valley District. Southeast of Sheldon Street and San Fernando Road.

GEOLOGY - Holocene and Late Pleistocene alluvium in the Hansen subarea northeast of San Fernando Road.

GROUND WATER FLOW DIRECTION - Southeasterly

GENERAL OPERATIONS - Part of the 138-acre Bradley Landfill complex. Started accepting trash in 1960. Residential and commercial refuse with low moisture and nonhazardous waste. Stopped accepting trash in the early 1980s. Contains about 7.5 million tons of trash.

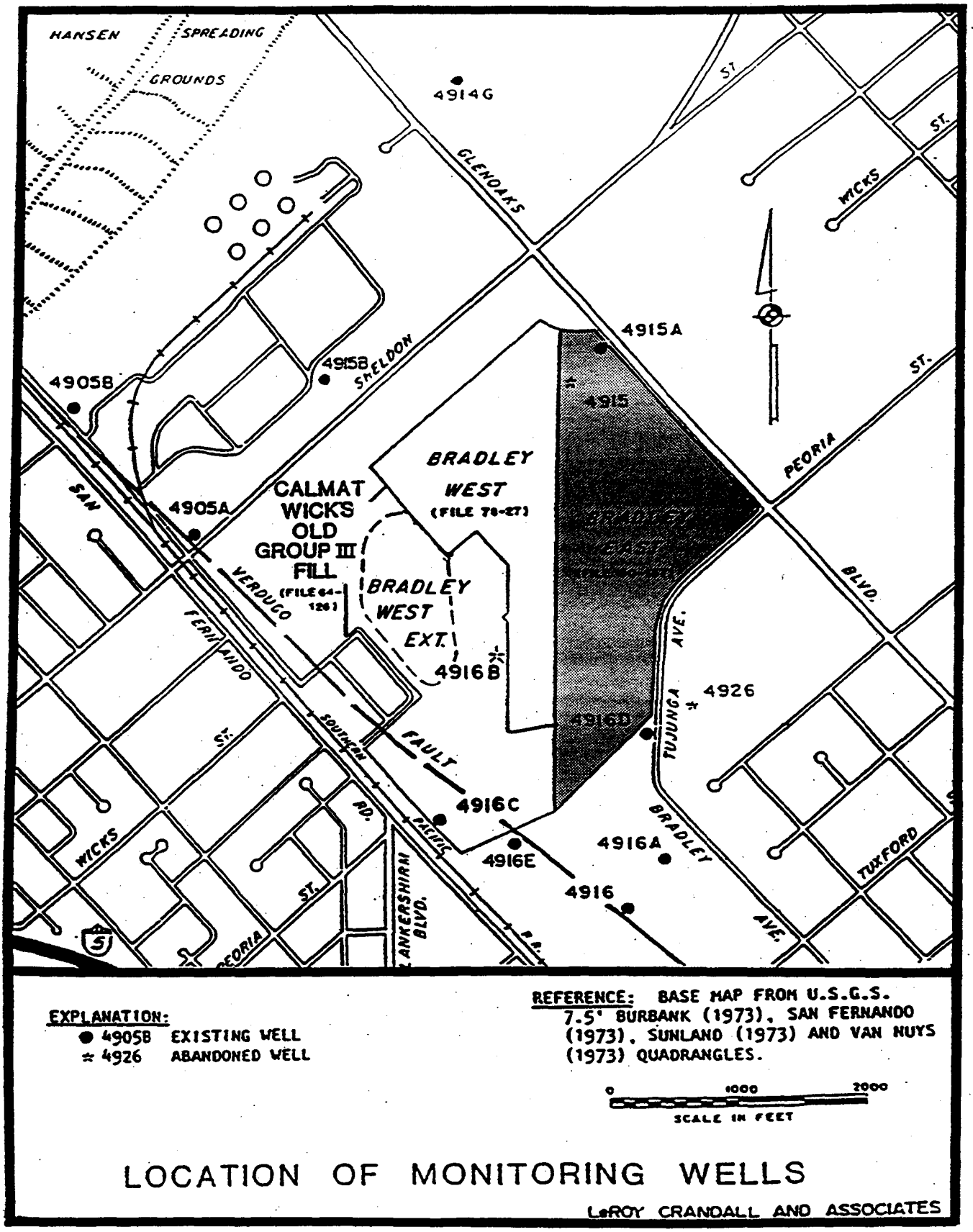
GAS CONTROL SYSTEM - Yes

LEACHATE CONTROL AND MONITORING - Has no liner. No visible seeps on western slope. No leachate in monitoring wells. No formal leachate collection system.

GROUND WATER QUALITY MONITORING - The SWAT reports completed in June 1987 and November 1990 provide the background ground water quality data upgradient and downgradient of the Bradley East Landfill.

REPORTS -
SWAT Report (Rank 2) - June 26, 1987 - LeRoy Crandall and Associates

STATUS WITH LOS ANGELES REGIONAL WATER QUALITY CONTROL BOARD - Final SWAT Report (Rank 2) was approved by the RWQCB in April 1992. Non-hazardous substances were detected in monitoring wells above State drinking water regulatory levels. Although this landfill has been closed, an EMP will be required. A CAP will be required upon completion of the EMP.



LOCATION OF MONITORING WELLS

LeROY CRANDALL AND ASSOCIATES

1. BRADLEY EAST DISPOSAL SITE

STATUS AS OF MAY 1994

SWAT Completed

NAME OF LANDFILL - Bradley West Disposal Site (Part of Bradley Landfill complex)

OWNER - Valley Reclamation Company

LOCATION - Sun Valley District. Southeast of Sheldon Street and northeast of San Fernando Road.

GEOLOGY - Holocene and Late Pleistocene alluvium in the Hansen subarea northeast of the Verdugo Fault.

GROUND WATER FLOW DIRECTION - Southeasterly

GENERAL OPERATIONS - Originally designed during the period 1975 to 1977. Started accepting trash in 1981 -- relatively dry, inert or decomposable, nonhazardous. Bradley West extension was designed according to 1984 Subchapter 15 requirements, and has a clay liner and leachate collection system.

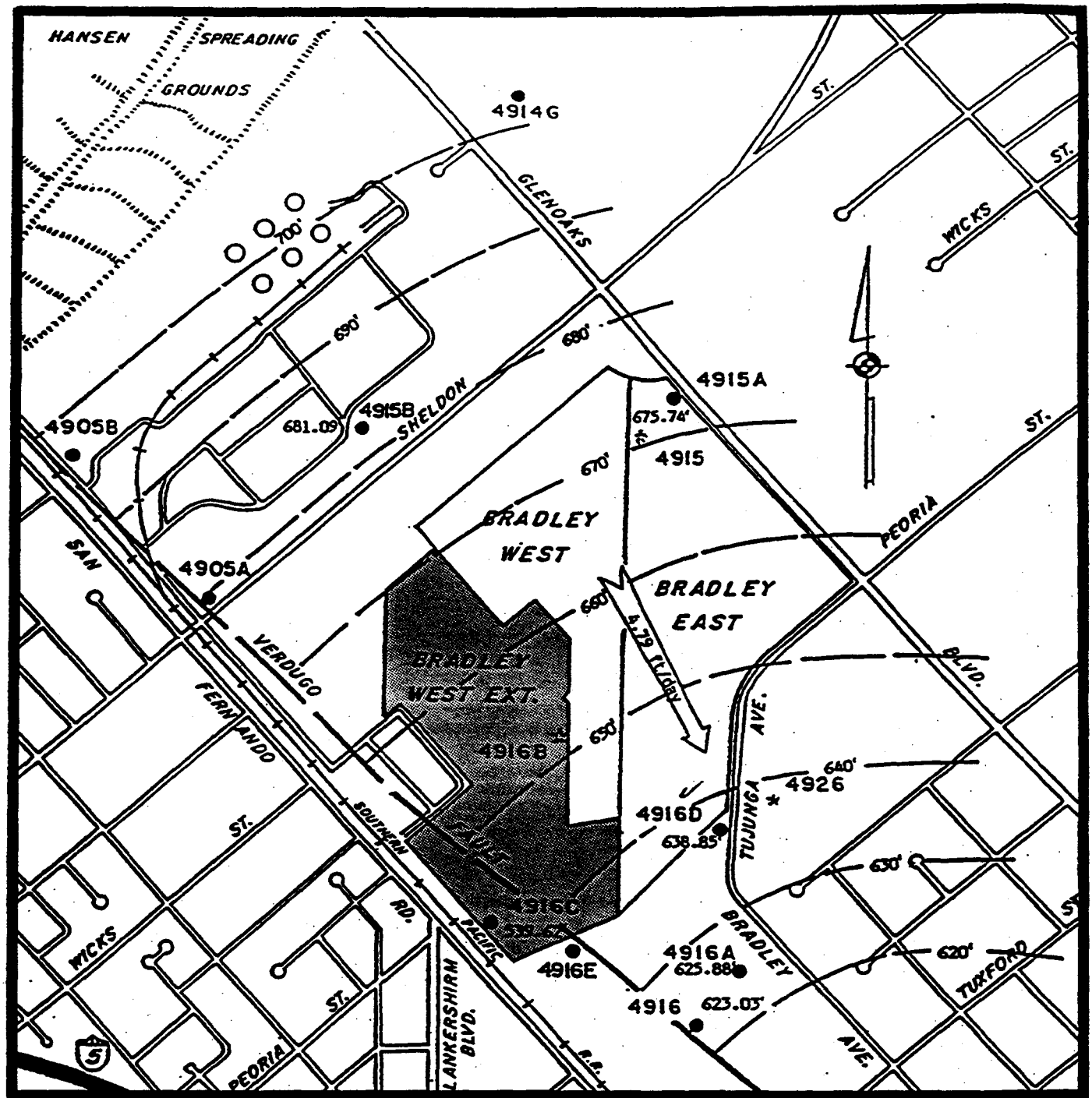
GAS CONTROL SYSTEM - Date started is unknown.

LEACHATE CONTROL AND MONITORING - First system in operation since 1980. Other systems have been installed as operations have expanded. As of June 26, 1987, no leachate was detected. There was ponding during the water year 1981-82 and about 1/2 million gallons of water percolated into the trash prism. As placed, trash has about 25-percent moisture. Holding capacity is 40- to 53-percent moisture.

GROUND WATER QUALITY MONITORING - May be slight increase in chloride and total dissolved solids with lower water levels. No evidence of chloride increase due to landfill; no evidence of increase in bicarbonate due to the landfill. Liner and gas control system seem to be effective in preventing gas from reaching the water table.

REPORTS -
SWAT Report (Rank 1) - June 25, 1987 - LeRoy Crandall and Associates
SWAT Report Supplement - March 21, 1988 - Law Environmental

STATUS WITH LOS ANGELES REGIONAL WATER QUALITY CONTROL BOARD - Final SWAT Report (Rank 1) was approved by the RWQCB in April 1992. Non-hazardous substances were detected in monitoring wells above State drinking water regulatory levels. An EMP is required.



EXPLANATION:

525.88' ● 4905B — EXISTING WELL, GROUND WATER ELEVATION

* 4926 — ABANDONED WELL

640' — GROUND WATER ELEVATION CONTOUR

4.79 ft/day — GROUND WATER VELOCITY & DIRECTION

REFERENCE: BASE MAP FROM U.S.G.S. 7.5' BURBANK (1973), SAN FERNANDO (1973), SUNLAND (1973) AND VAN NUYS (1973) QUADRANGLES.

0 1000 2000

SCALE IN FEET

12-19-87

WELL LOCATIONS, GROUND WATER LEVELS AND VELOCITY MAP

2. BRADLEY WEST DISPOSAL SITE

190

STATUS AS OF MAY 1994

SWAT Not Completed

NAME OF LANDFILL - Branford Sanitary Landfill

OWNER - City of Los Angeles, Bureau of Sanitation

LOCATION - Sun Valley District. Southwest of San Fernando Road, northwest of Tujunga Wash.

GEOLOGY - Holocene and Late Pleistocene alluvium just southwest of the Verdugo Fault. Old gravel pit.

GENERAL OPERATIONS - Class III landfill operated by the City of Los Angeles, Department of Sanitation. Not open to the public. Accepted only solid, nonhazardous waste.

TIME OF OPERATION - Landfilling began on August 5, 1957 and continued through January 25, 1961. About 435,000 tons of trash were deposited.

MINIMUM ELEVATION OF TRASH - 70 feet below ground surface.

ELEVATION RANGE OF WATER TABLE - In early 1988, depth to ground water was 334 to 344 feet.

GROUND WATER QUALITY MONITORING - Two SWAT wells drilled - one upgradient (ITB-1) and one downgradient (ITB-2). Later, two additional wells were drilled downgradient on CalMat property.

REPORTS -
SWAT Report (Rank 2) - June 1988 - International Technology Corporation

STATUS WITH LOS ANGELES REGIONAL WATER QUALITY CONTROL BOARD - Final SWAT Report submitted October 1990. Rejected SWAT Report April 1992 due to inadequate monitoring procedures which are under review. Although this landfill has been closed it is still subject to SWAT requirements. Further monitoring may be required under Chapter 15.

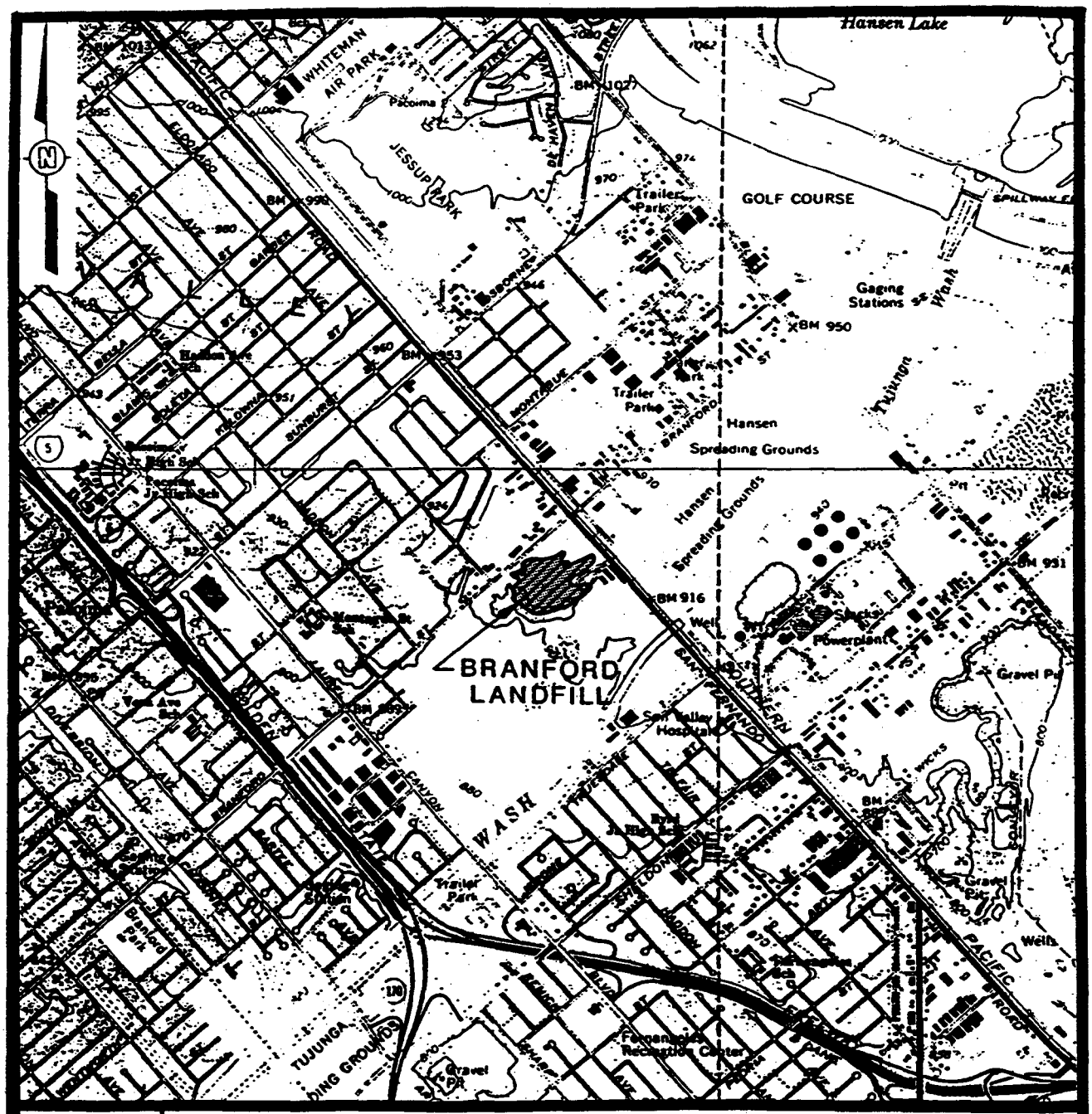


FIGURE 1

SITE LOCATION MAP
BRANFORD LANDFILL

PREPARED FOR

BUREAU OF SANITATION
DEPARTMENT OF PUBLIC WORKS
CITY OF LOS ANGELES

INTERNATIONAL TECHNOLOGY CORPORATION

REFERENCE:

USGS 7.5 MINUTE TOPOGRAPHIC MAPS OF VAN NUYS AND SAN FERNANDO, CALIFORNIA QUADRANGLES. DATED: 1966 AND PHOTOREVISED 1972 FOR BOTH SCALE: 1:24,000

3. BRANFORD SANITARY LANDFILL

STATUS AS OF MAY 1994

SWAT Completed

NAME OF LANDFILL - CalMat Landfill (Sun Valley #3)

OWNER - CalMat Properties

LOCATION - Sun Valley District. Northeast of Glenoaks Boulevard and northwest of Peoria Street.

GEOLOGY - Holocene and Late Pleistocene alluvium in the Hansen subarea northeast of the Verdugo Fault.

GROUND WATER FLOW DIRECTION - Mostly southeasterly along the Verdugo Fault.

GENERAL OPERATIONS - Covers 125 acres in an active gravel quarry. Open to the public since 1983 for general rubble and demolition debris (nondecomposable). No metal other than embedded rebar. As of July 1, 1988, contained about 1 million tons of trash. Receives about 75,000 tons per month. Has 15-year permit (to 1998). Total capacity, 75 million tons.

GAS CONTROL SYSTEM - Not needed because the trash is inert.

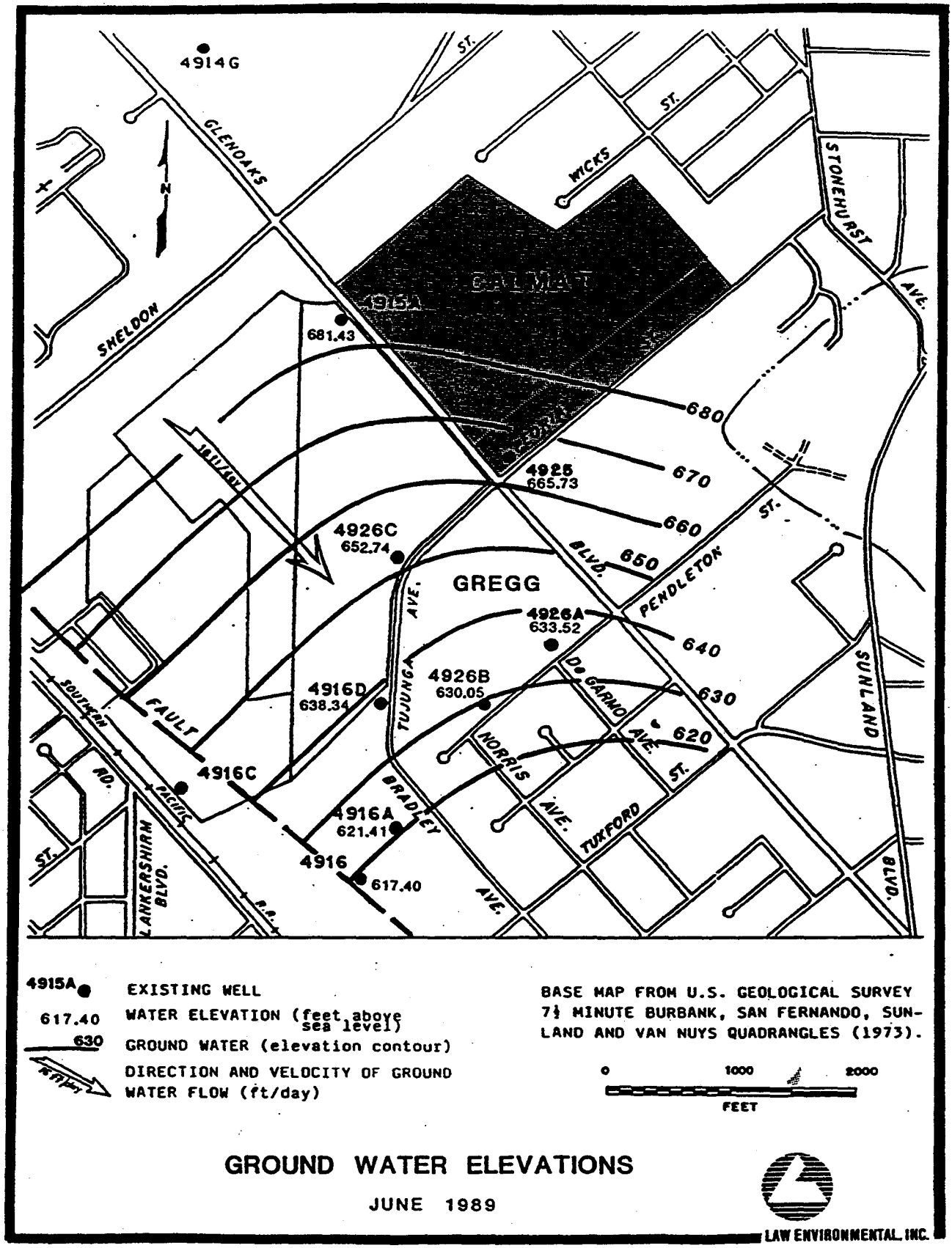
VADOSE ZONE MONITORING - One soil boring into the vadose zone. No contamination found.

LEACHATE CONTROL AND MONITORING - No evidence of leachate production.

GROUND WATER QUALITY MONITORING - Background quality is obtained from the Bradley Landfill complex SWAT wells. Quarterly sampling started in April 1988. There are regional plumes of trichloroethylene which are unrelated to the landfill. There are two different water types under the landfill which appear to be related to two different alluvial channels.

REPORTS -
SWAT Report (Rank 2) - July 1, 1988 - Law Environmental
SWAT Report Supplement - July 1989 - Law Environmental

STATUS WITH LOS ANGELES REGIONAL WATER QUALITY CONTROL BOARD - Final SWAT Report (Rank 2) approved in June 1992. No evidence of leakage. No further monitoring will be required.



4. CALMAT LANDFILL(SUN VALLEY #3)

STATUS AS OF MAY 1994

SWAT Completed

NAME OF LANDFILL - CalMat (Old) Class 3 Site

OWNER - Valley Reclamation Company

LOCATION - Sun Valley District. Southeast of Sheldon Street and northeast of San Fernando Road.

GEOLOGY - Holocene and Late Pleistocene alluvium in the Hansen subarea northeast of the Verdugo Fault.

GENERAL OPERATIONS - Part of the 138-acre Bradley Landfill complex. Formerly a concrete wash-out area. Now accepts only inert fill.

GAS CONTROL SYSTEM - Not needed.

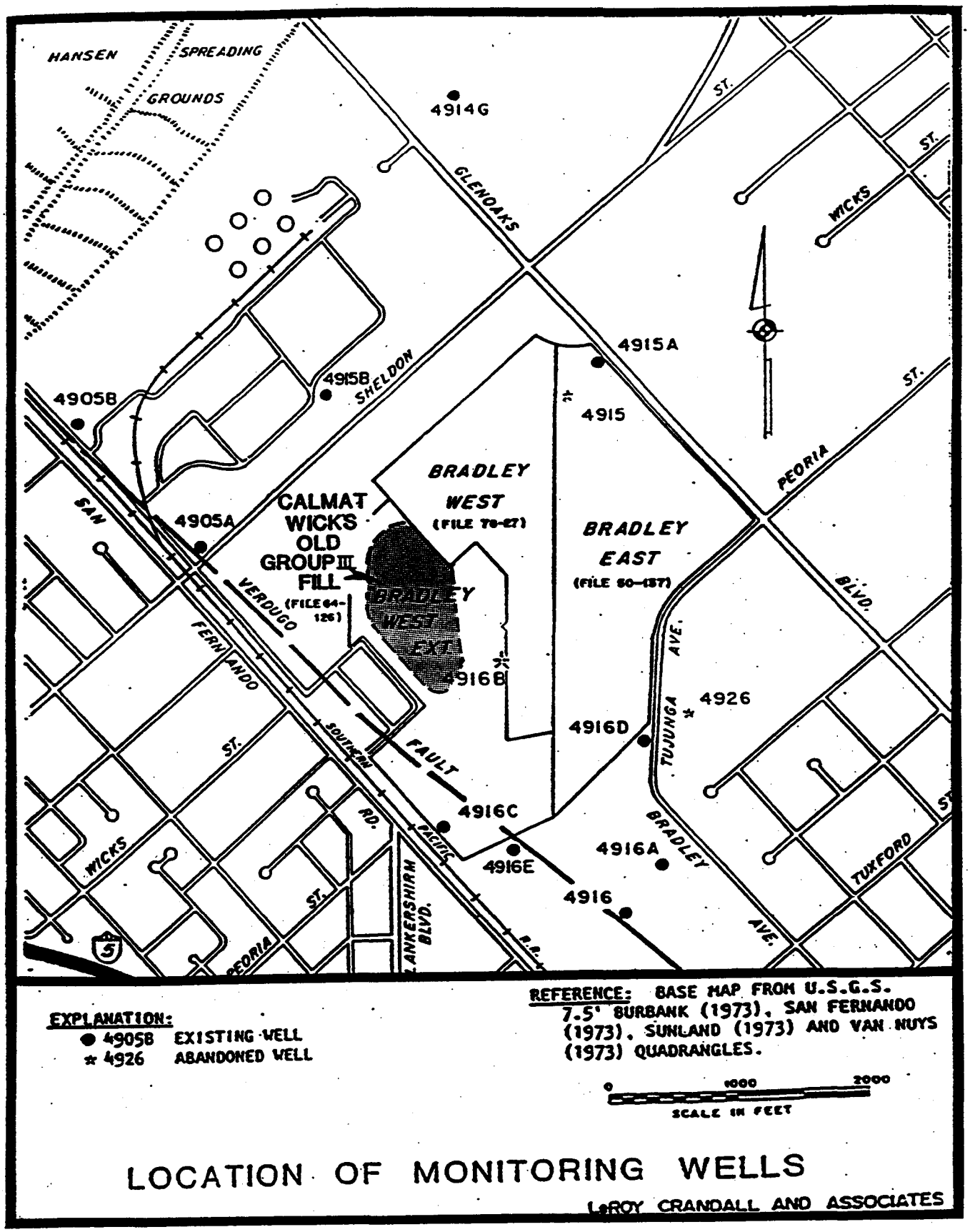
VADOSE ZONE MONITORING - Tried nine borings in 1986. Could not drill through concrete and steel.

LEACHATE CONTROL AND MONITORING - No liquid in any of the borings.

GROUND WATER QUALITY MONITORING - Started in this area in 1980. Higher total dissolved solids at lower levels is attributed to naturally higher salinities with depth. Increasing hardness could be related to landfill gas in one of the other landfills in the complex. High hardness is considered reversible.

REPORTS -
SWAT Report - June 26, 1987 - LeRoy Crandall and Associates

STATUS WITH LOS ANGELES REGIONAL WATER QUALITY CONTROL BOARD - Final SWAT Report submitted November 1990. Revised Water Monitoring Plan, required by Article 5 of Chapter 15, is under review. The Evaluation Monitoring Program required is under review. SWAT Report approved April 1992.



EXPLANATION:

- ● 4905B EXISTING WELL
- ✱ 4926 ABANDONED WELL

REFERENCE: BASE MAP FROM U.S.G.S. 7.5' BURBANK (1973), SAN FERNANDO (1973), SUNLAND (1973) AND VAN NUYS (1973) QUADRANGLES.

0 1000 2000
SCALE IN FEET

LOCATION OF MONITORING WELLS

LeROY CRANDALL AND ASSOCIATES

5. CALMAT (OLD) CLASS 3 SITE

196

STATUS AS OF MAY 1994

SWAT Completed

NAME OF LANDFILL - Gregg Pit/Bentz Disposal Sites

OWNER - CalMat Company

LOCATION - Southwest side of Glenoaks Boulevard between Pendleton Street and Tujunga Avenue.

GEOLOGY - Holocene and Late Pleistocene alluvium northeast of the Verdugo Fault. In the Hansen subarea.

GROUNDWATER FLOW DIRECTION - Mostly southerly, changing to southeasterly along the Verdugo Fault.

GENERAL OPERATIONS - Gregg Pit Approximately 30 acres in size. Operated from 1955 to 1963. Accepted combustible and noncombustible wastes, but specified wet or hazardous wastes were prohibited. The eastern portion was reactivated after the main Gregg Fill closed in 1963. Bentz Dump The reactivated area, which closed in 1963 to 1966, accepted only demolition debris. It was filled to street level but is still settling. Sign notes "clean fill dirt wanted". An estimated 3.5 million cubic yards of "debris and dirt" has been deposited with this combined operation.

GAS CONTROL SYSTEM - Four wells and a gas flare were installed in 1987 (32 years after the first trash was placed). The system produces about 310 cubic feet per minute of gas consisting of 30-percent methane, 30-percent carbon dioxide, nitrogen and trace gases.

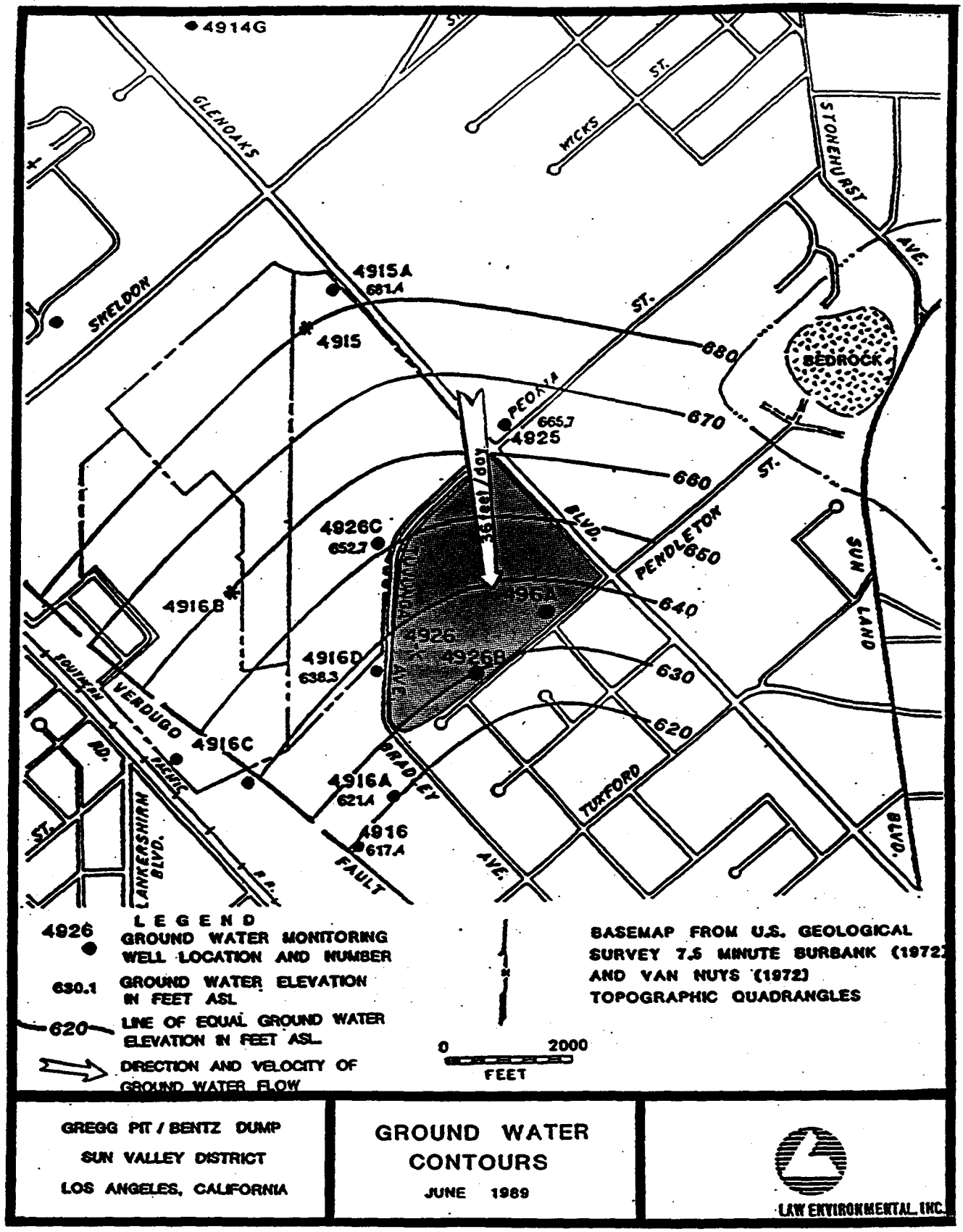
LEACHATE CONTROL AND MONITORING - A leachate test hole was drilled into the deepest part of the trash. No leachate was found.

GROUND WATER QUALITY MONITORING - Share monitoring wells with the program for the Bradley Landfill complex. Two monitoring wells drilled along Pendleton Street. Pumps with packers used to sample the uppermost 20 feet of saturation. Landfill gas contains no tetrachloroethylene (PCE), and the PCE found in upgradient wells is believed to be coming from an industrial area. Fill is not releasing hazardous wastes to ground water.

REPORTS -
SWAT Report (Rank 2) - July 1, 1989 - Law Environmental

STATUS WITH LOS ANGELES REGIONAL WATER QUALITY CONTROL BOARD - SWAT Report (Rank 2) approved in February, 1990. There is evidence of possible leakage of non-hazardous substances in monitoring wells above State drinking water regulatory levels. Although this landfill has been closed further monitoring will be required under Chapter 15.

197



6. GREGG PIT / BENTZ

STATUS AS OF MAY 1994

SWAT Completed

NAME OF LANDFILL - Hewitt Landfill (Closed)

OWNER - CalMat Properties

LOCATION - North Hollywood District, between the Hollywood Freeway and Laurel Canyon Boulevard, and north of Sherman Way. Just southwest of the Rinaldi-Toluca Well Field.

GEOLOGY - Holocene and Late Pleistocene alluvium of the San Fernando Basin.

GROUND WATER FLOW DIRECTION - A little north of east.

GENERAL OPERATIONS - Operated by Los Angeles By-Products Company. Opened to the public from 1962 to November 12, 1975. Below elevations 555 to 560 feet waste was limited to solid inert materials. Above those elevations, accepted solid commercial and residential waste.

GAS CONTROL SYSTEM - Installed during the mid-70s, and about 12 years after landfilling started.

VADOSE ZONE MONITORING - Two Timco Teflon Lysimeters were installed to depths of 50 and 52 feet. Too little moisture to sample.

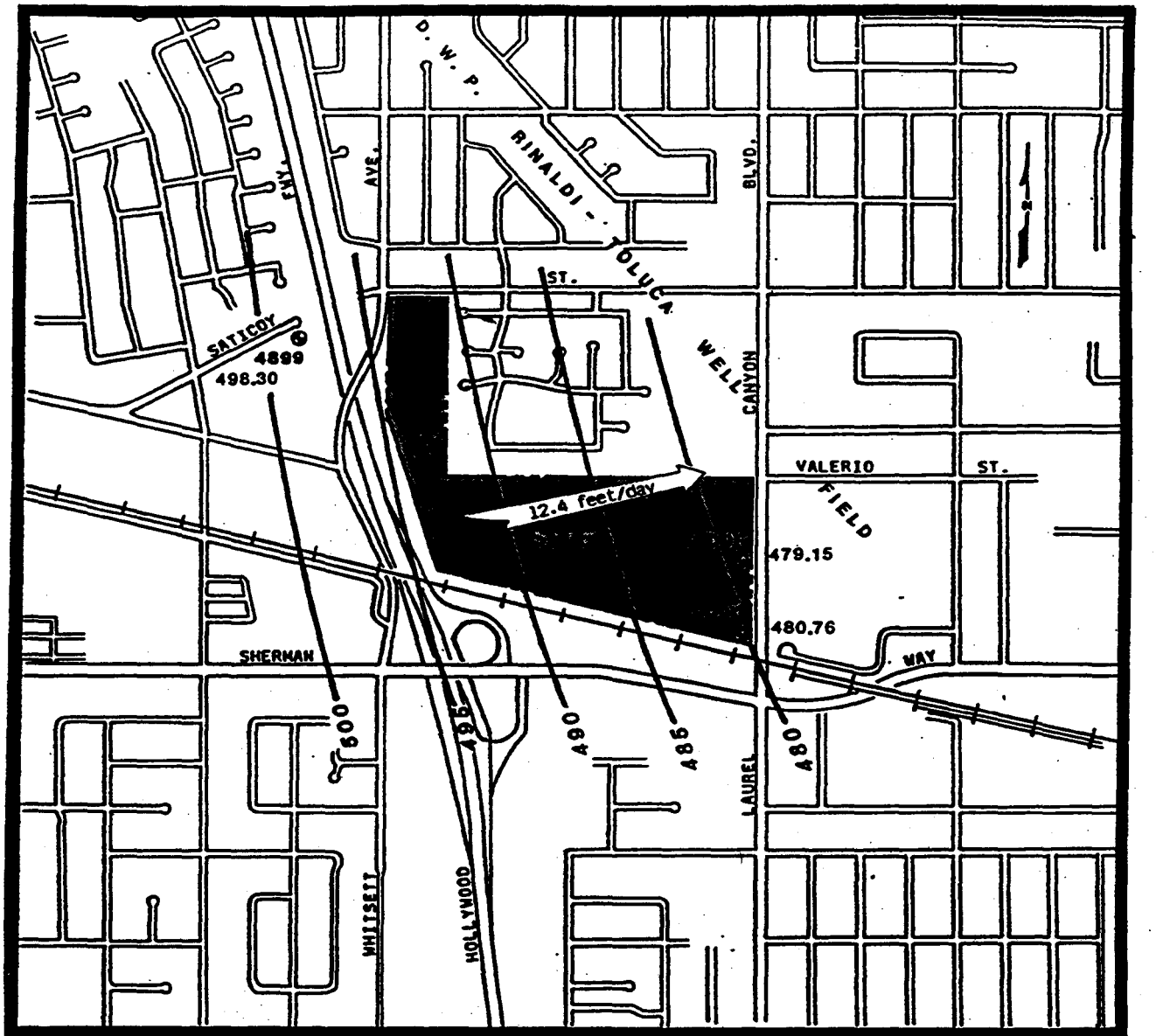
LEACHATE CONTROL AND MONITORING - A leachate well drilled in the trash showed moist conditions but no free leachate.

GROUND WATER QUALITY MONITORING - Has one upgradient and two downgradient wells. Use pump with inflatable packer to sample the top 20 feet of the saturated zone. One downgradient well has four perforated zones with grout seals. Upgradient samples show trichloroethylene and tetrachloroethylene above action levels, and high nitrates (over 70 mg/l). These are believed to be derived from upgradient sources, the plumes from which are passing under the landfill. High bicarbonates in downgradient wells may be related to gas production before the gas control system was in operation. Low chlorides indicate leachate cannot be an important contributor to ground water.

REPORTS -
SWAT Report (Rank 2) - June 6, 1988 - Law Environmental
Final SWAT Report - July 1, 1989 - Law Environmental

STATUS WITH LOS ANGELES REGIONAL WATER QUALITY CONTROL BOARD - SWAT Report approved in May 1991. Non-hazardous substances were detected but were below State drinking water regulatory levels. No further monitoring will be required.

/99



7. HEWITT LANDFILL

200

STATUS AS OF MAY 1994

SWAT Not Completed

NAME OF LANDFILL - Lopez Canyon Sanitary Landfill

OWNER - City of Los Angeles, Bureau of Sanitation

LOCATION - In the foothills north of Hansen Dam, between Lopez Canyon and Kagel Canyon.

GEOLOGY - Underlain by Modelo, Towsley and/or Pico formations on the south limb of Merrick (or Little Tujunga) syncline. Quaternary terrace deposits near southeastern boundary of the property. Thin Holocene alluvium tributary to San Fernando Valley. Also, the San Fernando Fault (a reverse fault) lies between the landfill and the San Fernando Valley alluvium.

HYDROGEOLOGY - Ground water is found in the thin Holocene alluvium and in fractures in the underlying bedrock. It is seasonal and may not be found in summer. Elevations of the ground water decrease to the north but no single ground water surface occurs beneath the landfill.

GENERAL OPERATIONS - Began accepting refuse in 1975. Closed to the public. Accepts only nonhazardous solid waste fill of municipal origin on 392-acre site. Canyons A and B (presently active) are not lined. Disposal Area C (not yet significantly active) will be lined and equipped with subdrains as well as leachate collection and removal systems.

GAS CONTROL SYSTEM - Yes.

VADOSE ZONE MONITORING - Two lysimeters installed in the canyon below Disposal Area A.

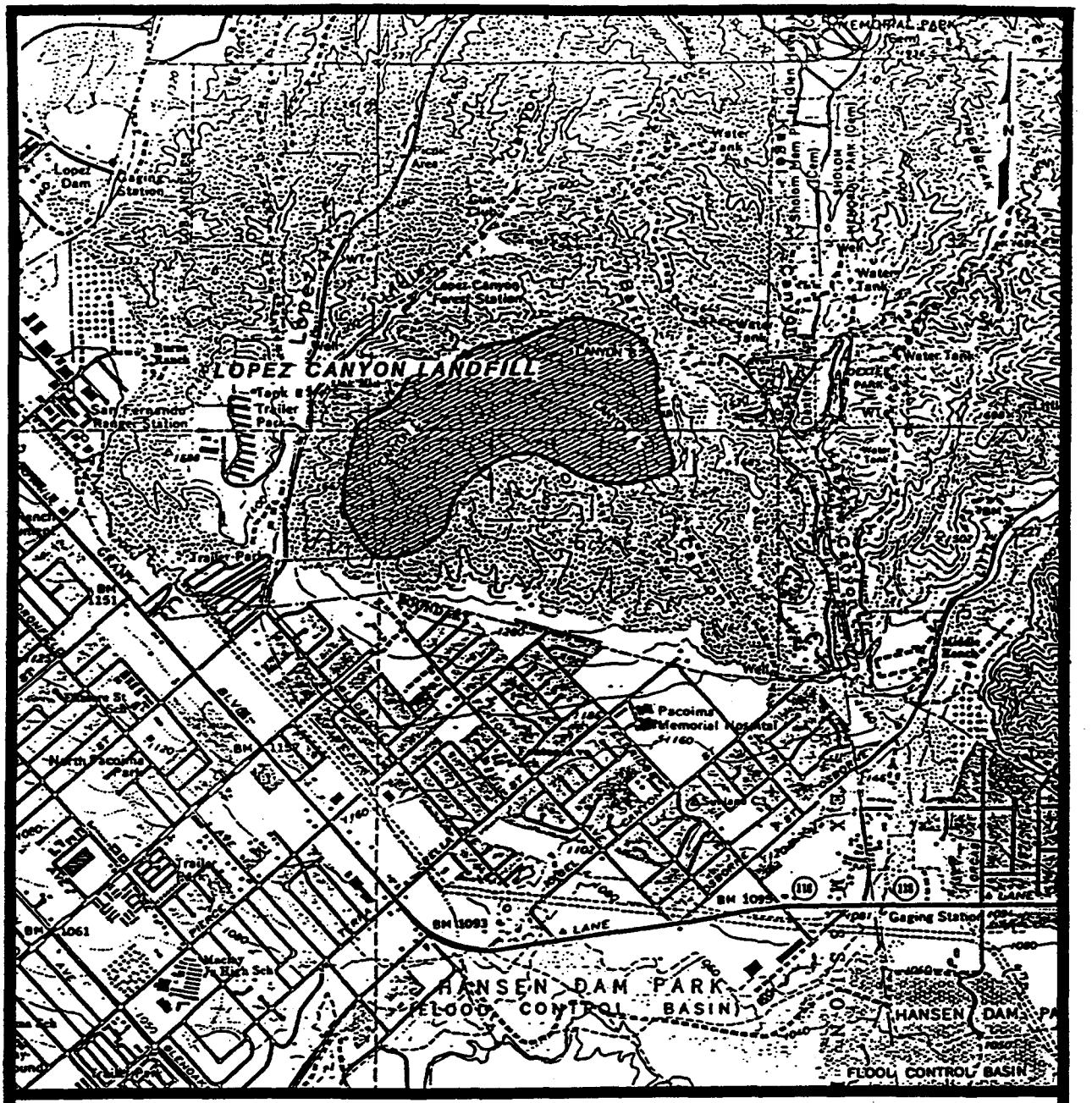
LEACHATE CONTROL AND MONITORING - A leachate well was drilled into the deepest part of the trash in Disposal Area B to a depth of 178 feet. No liquid was encountered during the drilling.

GROUND WATER QUALITY MONITORING - Two upgradient and three downgradient monitoring wells. Only ground water encountered was in shallow silty sand near the lower-debris basin in Disposal Area B. Native water is highly mineralized. The landfill is dry with no evidence of leakage.

SURFACE WATER AND SUBDRAIN SAMPLING - Site runoff is collected and then routed into storm drains. Acetone and toluene in runoff are believed due to a reaction between landfill gas and the runoff water. The gas control system is expected to reduce the formation of these substances.

REPORTS -
SWAT Report (Rank 2) - June 22, 1988 - Law Environmental
SWAT Report Supplement - July 1, 1989

STATUS WITH LOS ANGELES REGIONAL WATER QUALITY CONTROL BOARD - There is ongoing monitoring under Chapter 15. Construction for the required SWAT wells was delayed due to landfill expansion but is now complete.



BASEMAP FROM U.S. GEOLOGICAL SURVEY
7½ MINUTE SAN FERNANDO (1972) AND
SUNLAND (1972) QUADRANGLES.

SITE LOCATION MAP

Project No. 58-6425-11

LAW ENVIRONMENTAL, INC.

8. LOPEZ CANYON LANDFILL

202

STATUS AS OF MAY 1994

SWAT Completed

NAME OF LANDFILL - Penrose and Newberry Landfills (closed); Strathern Pit

OWNER - Los Angeles By-Products Company

LOCATION - Sun Valley District. North of Strathern Street on both sides of Tujunga Avenue.

GEOLOGY - Holocene and Late Pleistocene alluvium of the Tujunga alluvial cone. Southwest side of the Verdugo Fault.

GROUND WATER FLOW DIRECTION - Formerly to the south but now to the southwest because of pumping in the Rinaldi-Toluca Well Field.

GENERAL OPERATIONS - Penrose started accepting trash in 1960. Open to the public until March 1985. Dry nonhazardous waste (15 million cubic yards). Filled to 45 feet above grade. Settles two or more feet per year. Site is vacant except for an extraction/power generating plant. Newberry was open to the public from about 1948 to May 1955. Filled to level of surrounding streets with dry nonhazardous trash. Still settling. Low spots refilled with dirt. Two auto dismantlers and a ready-mix plant on site.

GAS CONTROL SYSTEM - Newberry has none. Penrose started operation in early 1980s.

VADOSE ZONE MONITORING - Pressure-vacuum lysimeters were installed in the Penrose and Newberry Landfills and in the bottom of the Strathern Pit. Could not get a sample from any of these.

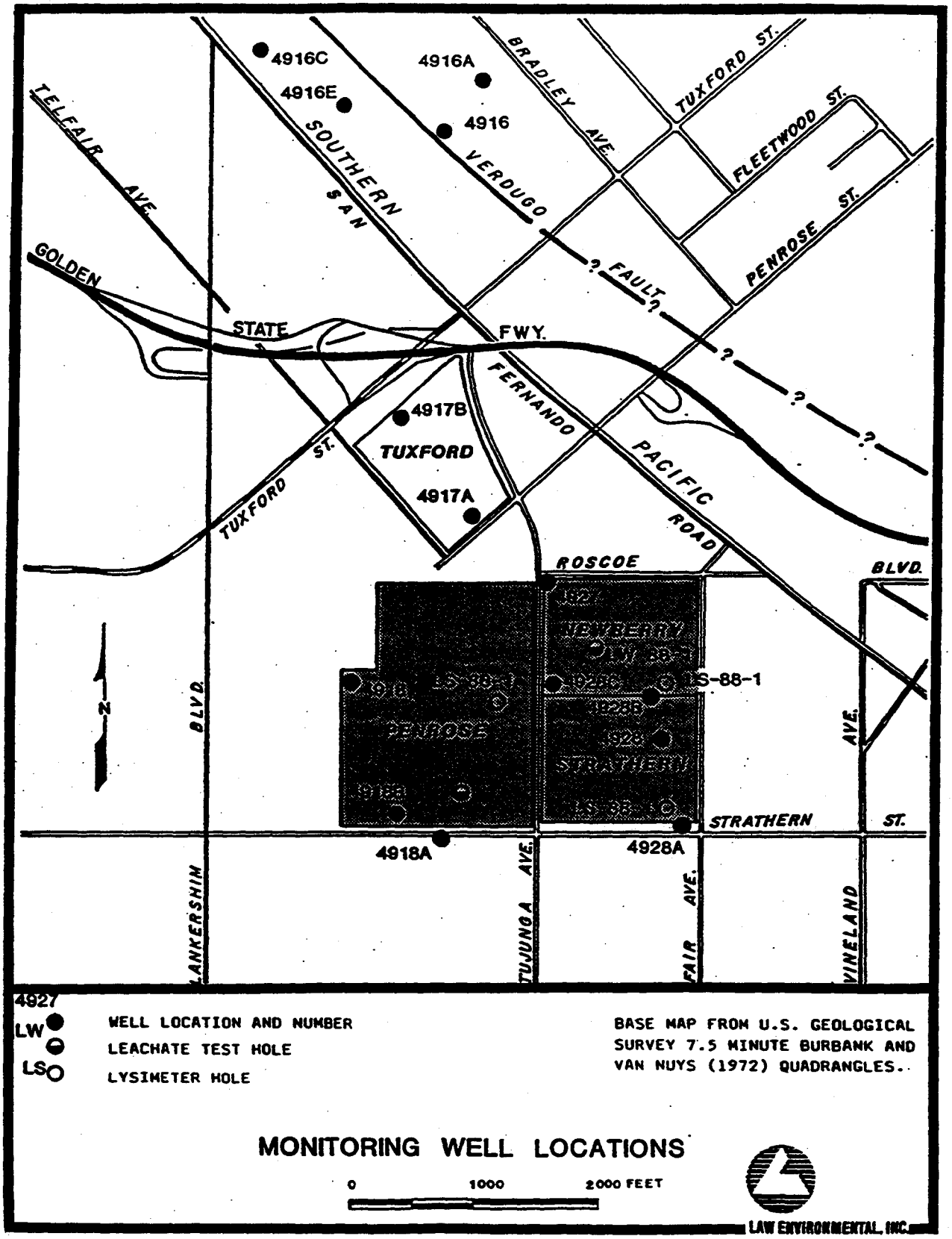
LEACHATE CONTROL AND MONITORING - Penrose - Replacement gas well showed 8- to 30-percent (25-percent average) moisture in trash samples. No leachate was found. Newberry - In leachate test hold, moisture was 9.8 to 20.8 percent. No liquid leachate was found.

GROUND WATER QUALITY MONITORING - Five wells have been monitored since 1985. Two new SWAT wells were drilled. Pump with packer samples uppermost 20 feet of saturated zone. SWAT monitoring started in April 1988. Rise and fall of trichloroethylene concentrations seems to be related to regional plumes moving through the area. High nitrates in upgradient wells. High levels of carbon dioxide in wells may be related to the period of time when the Penrose gas collection system was undergoing improvements. Generally speaking, these landfills are not affecting ground water quality.

REPORTS -
SWAT Report - June 29, 1988 - Law Environmental
SWAT Report Supplement - July 1, 1989 - Law Environmental

STATUS WITH LOS ANGELES REGIONAL WATER QUALITY CONTROL BOARD - Approved SWAT Reports in September 1989. There is evidence of leakage of non-hazardous substances, but below State drinking water regulatory levels. Detection monitoring will continue, but no EMP required at this time.

203



9. PENROSE / NEWBERRY LANDFILLS (CLOSED)

STATUS AS OF MAY 1994

SWAT Completed

NAME OF LANDFILL - Pendleton Street Landfill

OWNER - City of Los Angeles, Department of Water and Power

LOCATION - Southeast side of Pendleton Street, about 700-1600 feet northeast of Glenoaks Boulevard.

GEOLOGY - Holocene and Late Pleistocene alluvium in the Hansen subarea which lies to the northeast of the Verdugo Fault. North of La Tuna Canyon Fault.

GROUND WATER FLOW DIRECTION - Mostly southerly, changing to southeasterly toward the Verdugo Fault.

GENERAL OPERATIONS - Area of 15 acres, of which 10 acres have already been filled. Not open to the public. Accepts only water-soluble, nondecomposable, inert solids, mainly construction debris from Los Angeles Department of Water and Power sources.

GAS CONTROL SYSTEM - None required.

VADOSE ZONE MONITORING - None required.

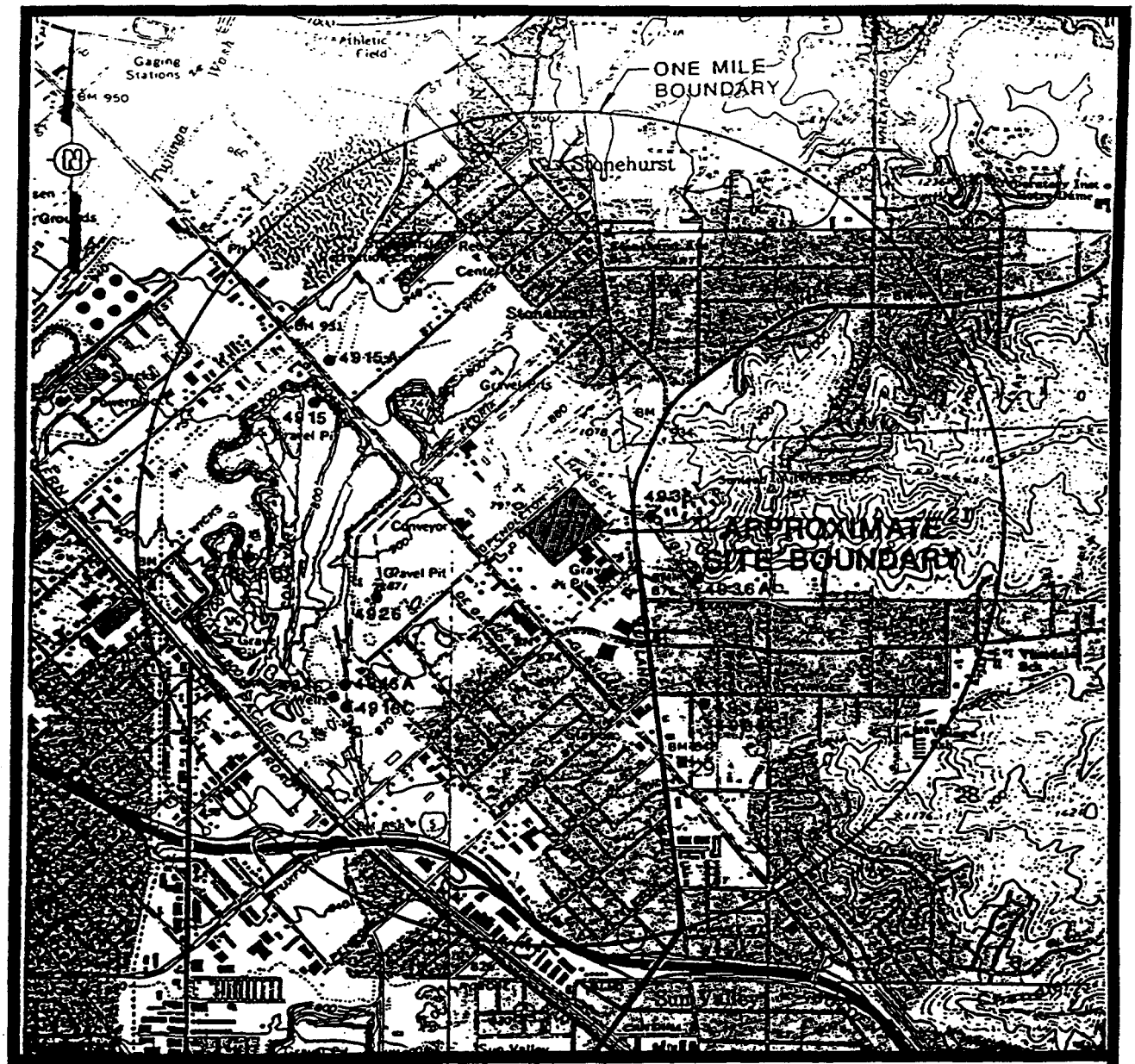
LEACHATE CONTROL AND MONITORING - No containment structures, drainage control, covers, liners, leachate collection, or leak detection systems.

GROUND WATER QUALITY MONITORING - Three monitoring wells on periphery of property.

REPORTS -
SWAT Report (Rank 4) - June 1990 - International Technology Corporation

STATUS WITH LOS ANGELES REGIONAL WATER QUALITY CONTROL BOARD - Final SWAT Report submitted May 1991. Approved SWAT Report conditionally June 1992. Two semi-annual samplings were required, which are under review. Further monitoring may be required under Chapter 15.

205



LEGEND:

4936● WELL LOCATION AND WELL NUMBER (WELL NUMBER ACCORDING TO LOS ANGELES COUNTY WELL NUMBERING SYSTEM)

SCALE

0 2000 4000 FEET

REFERENCE:

U.S.G.S. 7.5 MINUTE TOPOGRAPHIC MAP OF BURBANK, SAN FERNANDO, SUNLAND, AND VAN NUYS; CALIFORNIA QUADRANGLES; DATED: 1966, PHOTOREVISED: 1972

LOCATIONS OF WELLS WITHIN ONE MILE OF THE SITE
PENDLETON STREET LANDFILL

PREPARED FOR

CITY OF LOS ANGELES
DEPARTMENT OF WATER AND POWER
LOS ANGELES, CALIFORNIA

INTERNATIONAL TECHNOLOGY CORPORATION

10. PENDLETON STREET LANDFILL

206

STATUS AS OF MAY 1994

SWAT Completed

NAME OF LANDFILL - Sheldon-Arleta Landfill

OWNER - City of Los Angeles, Bureau of Sanitation

LOCATION - Sun Valley District. Near the Hollywood and Golden State Freeways. Just to the east and southeast of the Tujunga Spreading Grounds.

GEOLOGY - Holocene and Late Pleistocene alluvium southwest of the Verdugo Fault. Old gravel pit.

GROUND WATER FLOW DIRECTION - Southerly to southeasterly, depending on spreading in the Tujunga Spreading Grounds.

GENERAL OPERATIONS - Started accepting trash (low moisture, nonhazardous) as of February 1962. Only inert materials allowed below 700-foot elevation. Filled by July 1974, at which time about 6 million tons of trash had been deposited. Partial clay barriers to prevent inundation of trash by water spread at the Tujunga Spreading Grounds.

MINIMUM ELEVATION OF TRASH - 700 feet.

GAS CONTROL SYSTEM - In 1967, about five years after the start of operation, methane was detected in an adjoining residential area and raised the concern about explosions. In mid-1969, the first gas extraction system was installed consisting of three wells in native soil. In 1971, eighteen 25-foot wells were installed, with the collected gas burned and discharged to the atmosphere. In 1973, a 100-foot well was installed. From 1974 through 1976, landfill gas was delivered to the Valley Steam Plant. In 1980, eighteen 100-foot wells were drilled to replace the earlier 25-foot holes.

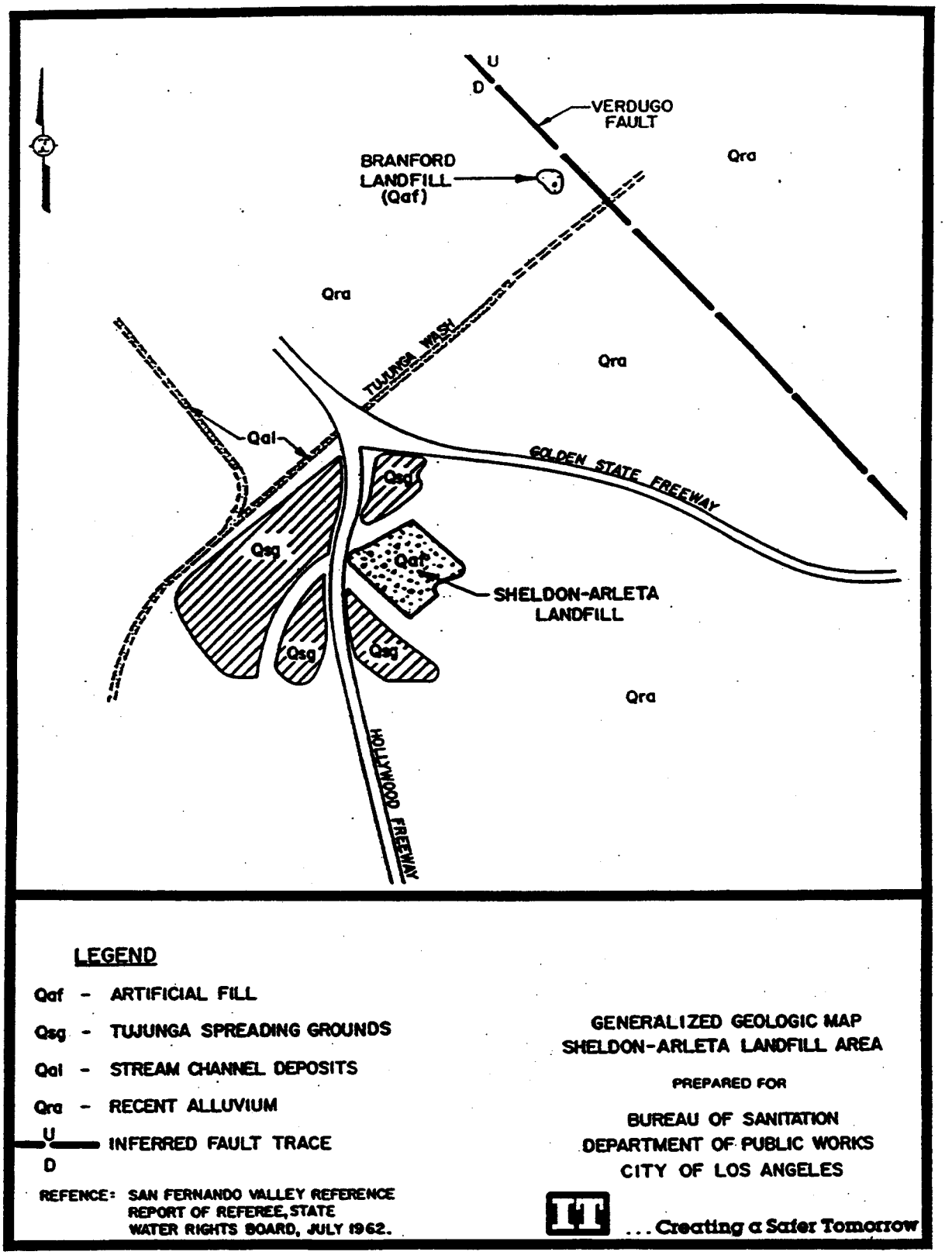
VADOSE ZONE MONITORING - Only two of 25 soil samples showed moisture above 25 percent. Additional sampling will be done after spreading.

LEACHATE CONTROL AND MONITORING - No evidence of leachate buildup within the landfill. Will be sampled again after spreading at the Tujunga Spreading Grounds.

GROUND WATER QUALITY MONITORING - A well drilled downgradient (Wickes Well) showed a sharp increase in bicarbonate hardness and carbon dioxide between 1967 and 1972, then a sharp decrease in 1972 after the gas control system began operating effectively. This same "temporary wave" of hardness may have later affected some of the Rinaldi-Toluca production wells.

REPORTS -
SWAT Report (Rank 1) - May 7, 1987 - International Technology Corporation

STATUS WITH LOS ANGELES REGIONAL WATER QUALITY CONTROL BOARD - Final Swat Report (Rank 1) approved by the RWQCB in February 1990. The water table has dropped to more than 100 ft below the bottom of the trash and the monitoring wells are dry. These are being checked quarterly to see if water levels rise. If so monitoring will continue under Chapter 15.



11. SHELDON-ARLETA LANDFILL

208

STATUS AS OF MAY 1994

SWAT Completed

NAME OF LANDFILL - Scholl Canyon Landfill - (Active and Inactive)

OWNER - Los Angeles County - 85 acres; City of Glendale - 200 acres; Southern California Edison Company - 25 acres. Operated by Los Angeles County Sanitation Districts. Upon completion of fill, entire property will go to City of Glendale.

LOCATION - In the City of Glendale, on the southwestern flank of the San Rafael Hills, about one mile west of the Rose Bowl.

GEOLOGY - Canyon cut in quartz diorite gneiss. Thin alluvium is tributary to San Fernando Valley.

GENERAL OPERATIONS - Class III site open to the public. Operations began March 22, 1961. Accepts residential, commercial, and some industrial wastes, but no liquid or hazardous wastes. Weathered rock and colluvium is used for cover.

GAS CONTROL SYSTEM - Yes in both active and inactive areas. Inactive-original system replaced in 1987-89. Building pipeline to use gas in Glendale Power Plant. Active-since 1971-73.

VADOSE ZONE MONITORING - Not required.

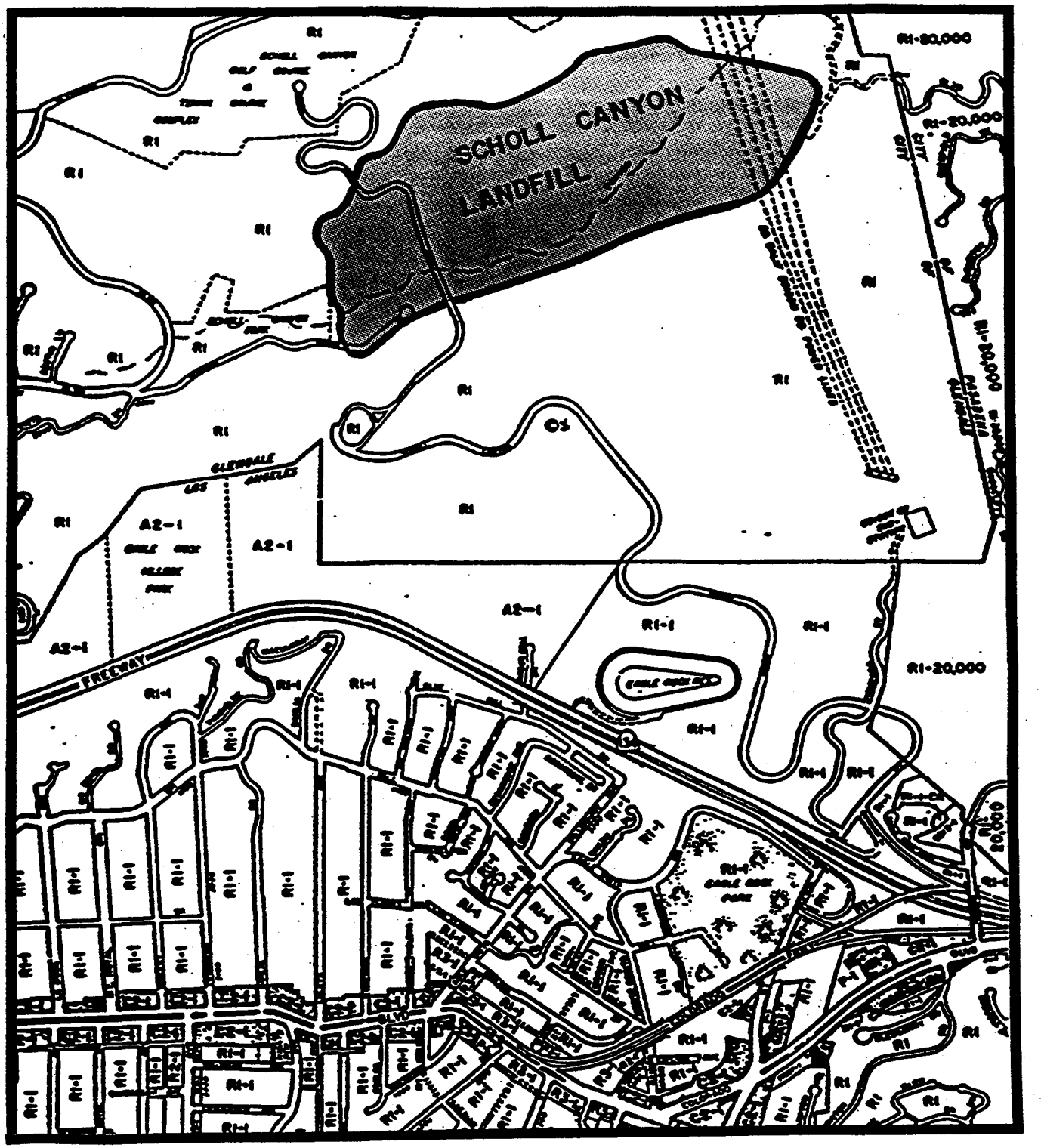
LEACHATE CONTROL AND MONITORING - Two subsurface barriers to cut off alluvial underflow. Extraction wells upgradient from barriers. Alluvial monitoring wells downgradient from barriers.

REPORTS -
Stone Geological Service - 1967
Converse Consultants - 1984
Woodward-Clyde - 1986
Earth Technology - 1987
SWAT Report - July 1, 1987 - Dale Hinkel
SWAT Progress Report - April 15, 1988, County Sanitation Districts

STATUS WITH LOS ANGELES REGIONAL WATER QUALITY CONTROL BOARD -
Active - (Rank 1) SWAT Report completed July 1987. Final SWAT Report completed April 1988. SWAT Report approved August 1990. Revised monitoring program required by Article 5, Chapter 15 is under review. EMP has been completed. CAP will be submitted soon.

Inactive - (Rank 2) - SWAT Report completed July 1987. Final SWAT Report approved in December 1993. Revised monitoring plan has been submitted and is under review.

209



12. SCHOLL CANYON LANDFILL

210

STATUS AS OF MAY 1994

SWAT Completed

NAME OF LANDFILL - Stough Park Landfill

OWNER - City of Burbank

LOCATION - Southwest flank of the Verdugo Mountains.

GEOLOGY - Landfill is underlain by metamorphic and igneous basement rocks of lower-Cretaceous to pre-Cambrian age that form the Verdugo Mountains.

HYDROGEOLOGY - Ground water is present in some fractures as evidenced by groundwater discharge at on-site ephemeral springs.

GROUND WATER FLOW DIRECTION - Ground water is present in both the alluvium and bedrock in one of the landfills (#2). Groundwater flow direction would be southerly.

GENERAL OPERATIONS - In operation since 1949. Consists of three fill areas (#1 - 31 acres up to 130 feet thick; #2 - 15 acres up to 70 feet thick; #3 - 24 acres up to 110 feet thick). Accepts nonhazardous waste and inert waste.

MINIMUM ELEVATION OF TRASH - Elevation data not available. Landfills have up to 110 feet of material deposited within canyons to bedrock.

GAS CONTROL SYSTEM - LFG gas collection/recovery system installed mid-summer 1988. Other gas migration control/monitoring systems installed in 1981.

ELEVATION RANGE OF WATER TABLE - Landfill in mountains and canyons. Ground water occurs mainly in fractured rock. No water table.

VADOSE ZONE MONITORING - None required.

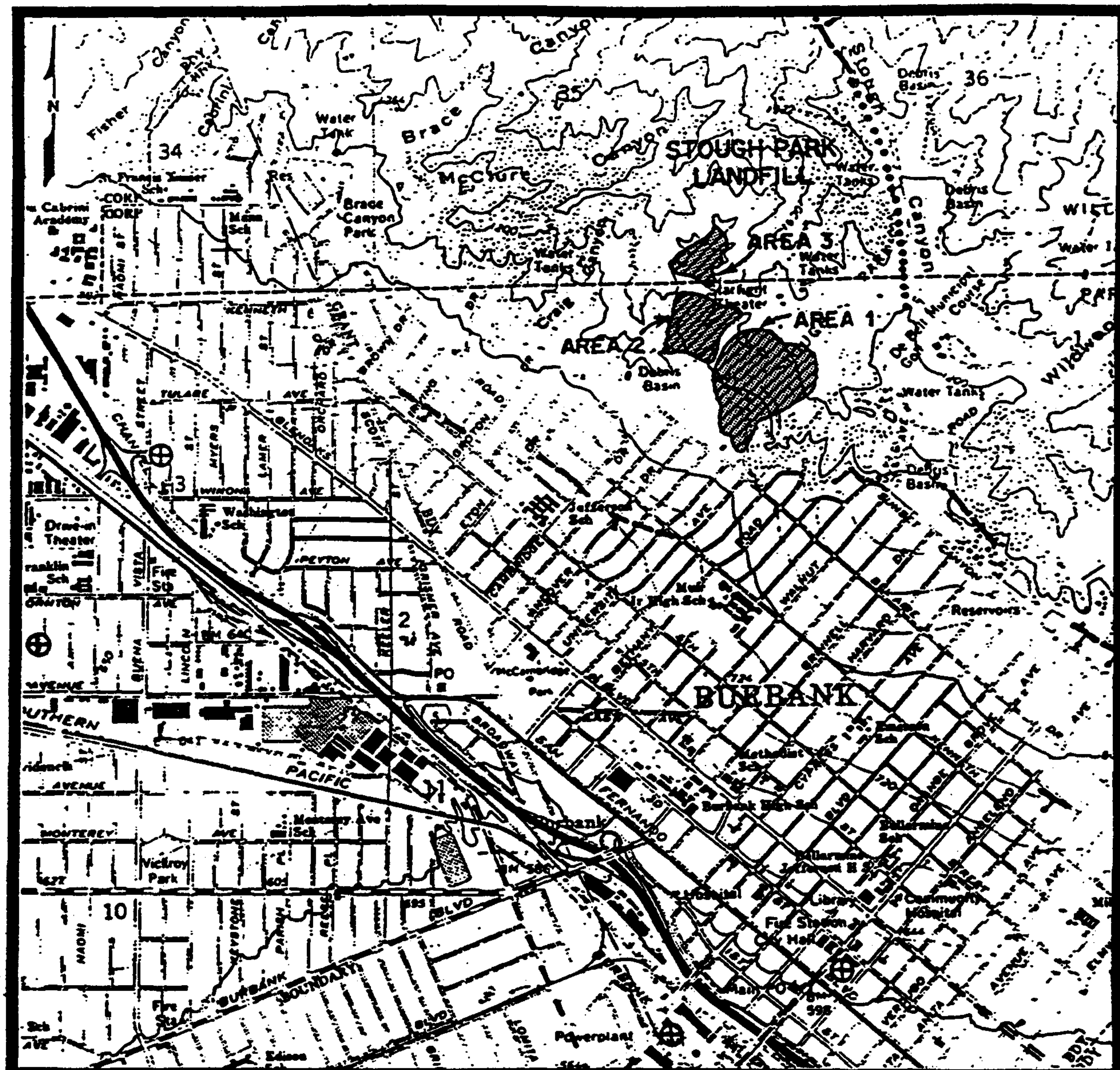
LEACHATE CONTROL AND MONITORING - No appreciable amount of water has infiltrated the landfill to generate lechate. Drainage of runoff controlled.

GROUND WATER QUALITY MONITORING - Seven monitoring wells drilled to depths between 60 and 510 feet to monitor the shallow alluvium and deep bedrock.

REPORTS -
SWAT Report - June 1988
Final SWAT Report - December 1988 - Approved by LARWQCB - April 1990.

STATUS WITH LOS ANGELES REGIONAL WATER QUALITY CONTROL BOARD - Revised Monitoring Plan, required by Article 5 of Chapter 15, is under review. An EMP is required and is under review.

21/



EXPLANATION

⊕ WATER WELL WITH GROUND WATER LEVEL MEASUREMENTS (1974-1975)

TRACE OF FAULT AND/OR FAULT SCARP
dotted where concealed)
Indicates direction of scarp slope

LANDFILL AREA

REFERENCE :
BASE MAP : U.S.G.S. 7.5' QUADRANGLE MAP, BURBANK, CALIF. 1966-PHOTOREVISED 1972.
GEOLOGY ADAPTED FROM: C.D.M.G. OPEN FILE REPORT 79 - 16 .

LOCAL GEOLOGY MAP

LAW ENVIRONMENTAL, INC.

13. STOUGH PARK LANDFILL

212

STATUS AS OF MAY 1994

SWAT Not Completed

NAME OF LANDFILL - Sunshine Canyon Sanitary Landfill

OWNER - Browning-Ferris Industries

LOCATION - Southeast margin of the Santa Susana Mountains, west of the Golden State Freeway.

GEOLOGY - Underlain by the Towsley formation which has been folded along east-west axes into the Pico anticline and Oat Mountain syncline. Unnamed fault ("A") trends southeasterly across the site. Towsley formation is mainly sandstone with lesser amounts of siltstone, mudstone and conglomerate. The interstitial permeability of the Towsley formation is low, as is the secondary hydraulic conductivity of the fracture systems. Surficial deposits consist of alluvium, colluvium and landslides as much as 50-feet thick.

HYDROGEOLOGY - Sunshine Canyon is separated from the San Fernando Valley by a narrow, rock-walled canyon with thin alluvium. Upstream from this constriction the alluvium is recharged by slope runoff and direct penetration of rainfall. 24 piezometers were drilled into the alluvium and Towsley formation. Ground water was found in the alluvium and beneath the lower slopes in the Towsley formation. Ground water flow follows the axes of the canyons.

GENERAL OPERATIONS - There is an existing 230-acre Class III landfill which has operated continuously since 1958. This permit expired in September 1991. Accepts only nonhazardous wastes at 6,400 tons per day or about 2.0 million tons per year. Expect an increase from12,000 to 14,000 tons per day.

GAS CONTROL SYSTEM - In operation since November 1981. Extracts (nine wells), processes, sells or flares the landfill gas (up to 3.0 million cubic feet per day).

VADOSE ZONE MONITORING - No volatile organics detected in five lysimeter wells.

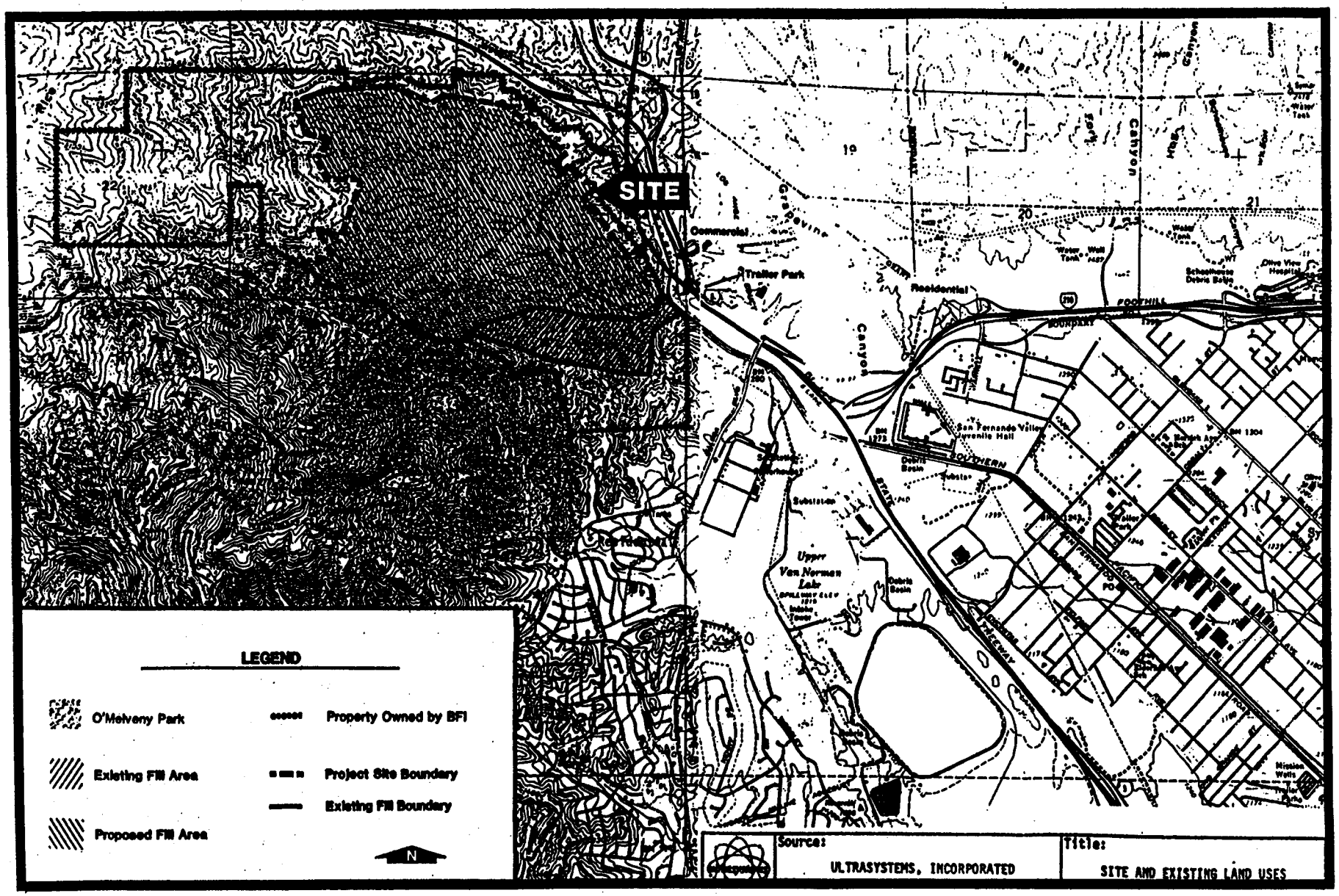
LEACHATE CONTROL AND MONITORING - The main concern is the potential for leachate leaving Sunshine Canyon and joining the ground water of the San Fernando Valley.

GROUND WATER QUALITY MONITORING - The native waters of the Towsley formation are of poor quality because of excessive total dissolved solids, but rather low in chloride. The appearance of much higher chlorides in downgradient monitoring well MW-1 raises the suspicion of leachate contribution from the landfill, but there are other possible explanations. The source(s) of these chlorides have yet to be defined.

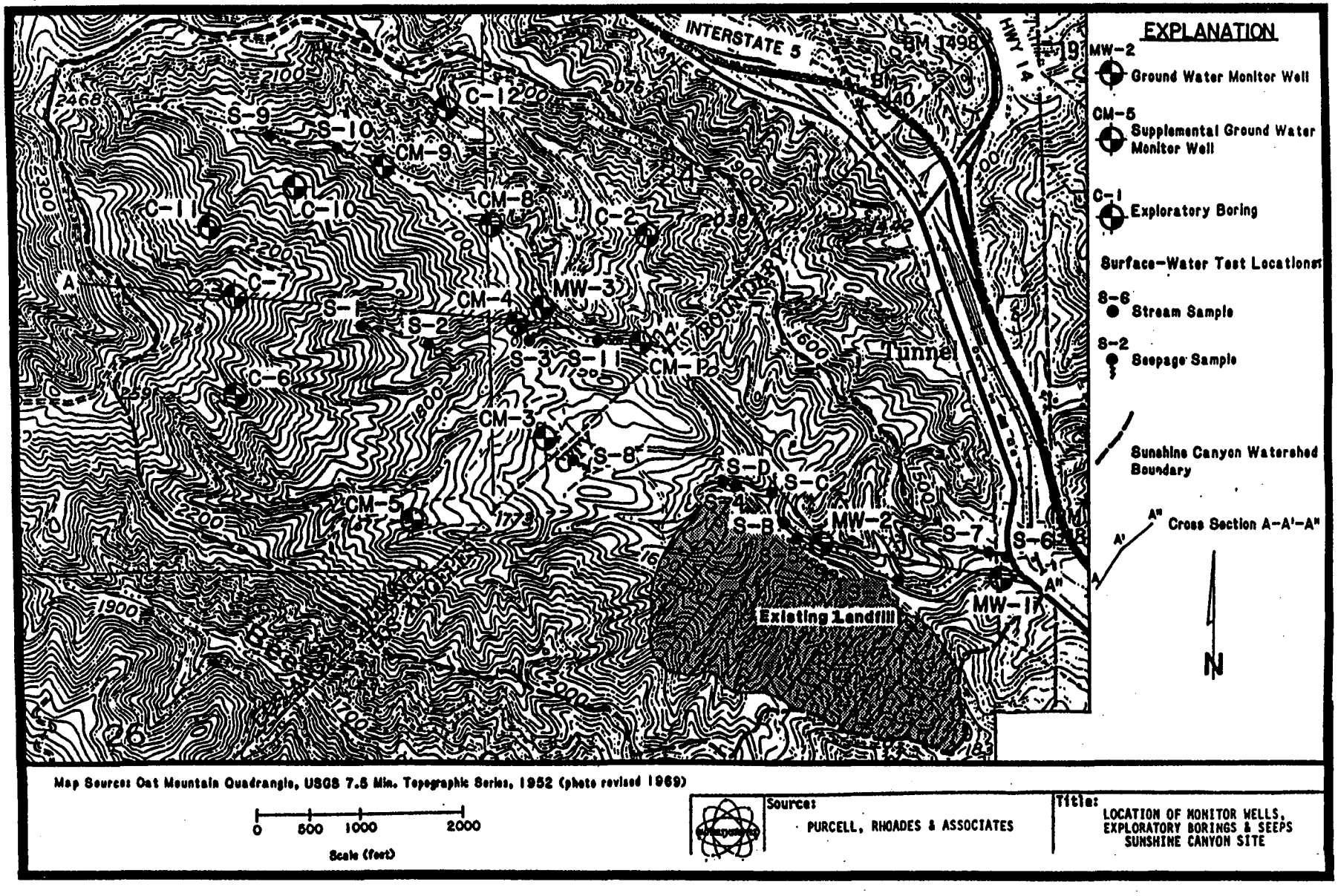
REPORTS -
SWAT Report (Rank 2) - July 1, 1988 - Purcell, Rhoades and Associates
SWAT Addendum - July 26, 1989 - Purcell, Rhoades and Associates
Draft Environmental Impact Report Landfill Extension - April 1989 - Ultrasystems

STATUS WITH LOS ANGELES REGIONAL WATER QUALITY CONTROL BOARD - Revised Monitoring Plan, required by Article 5 of Chapter 15, is under review. One additional alluvial background and three alluvial downgradient wells were required to determine possible sources for elevated chloride levels. An eMP will be required under Chapter 15.

213



14a. SUNSHINE CANYON LANDFILL



I-30

14b. SUNSHINE CANYON LANDFILL

STATUS AS OF MAY 1994

SWAT Completed

NAME OF LANDFILL - Toyon Landfill

OWNER - City of Los Angeles, Bureau of Sanitation

LOCATION - Griffith Park

GEOLOGY - In old rocks away from alluvium of San Fernando Valley and the Los Angeles Narrows. Arkosic sandstones and conglomerates of the Miocene Hollycrest formation along a northwest-trending overturned anticline and displaced along a northeast-trending fault.

GENERAL OPERATIONS - 90 acres. Operated from 1957 to February 1986 for the placement of a total of 16 million tons of household trash. Fills a former northeast-facing canyon with 140 to 290 feet of trash. Never open to the public.

GAS CONTROL SYSTEM - Gas samples from 16 perimeter probes are analyzed monthly for toxic constituents. Gas is collected from 30 duplex- and 41 single-pipe wells 40 to 100 feet deep. Power plant operated by Pacific Lighting Systems consists of six 150-HP generators which deliver 9.4 megawatts to the Southern California Edison Company.

VADOSE ZONE MONITORING - None

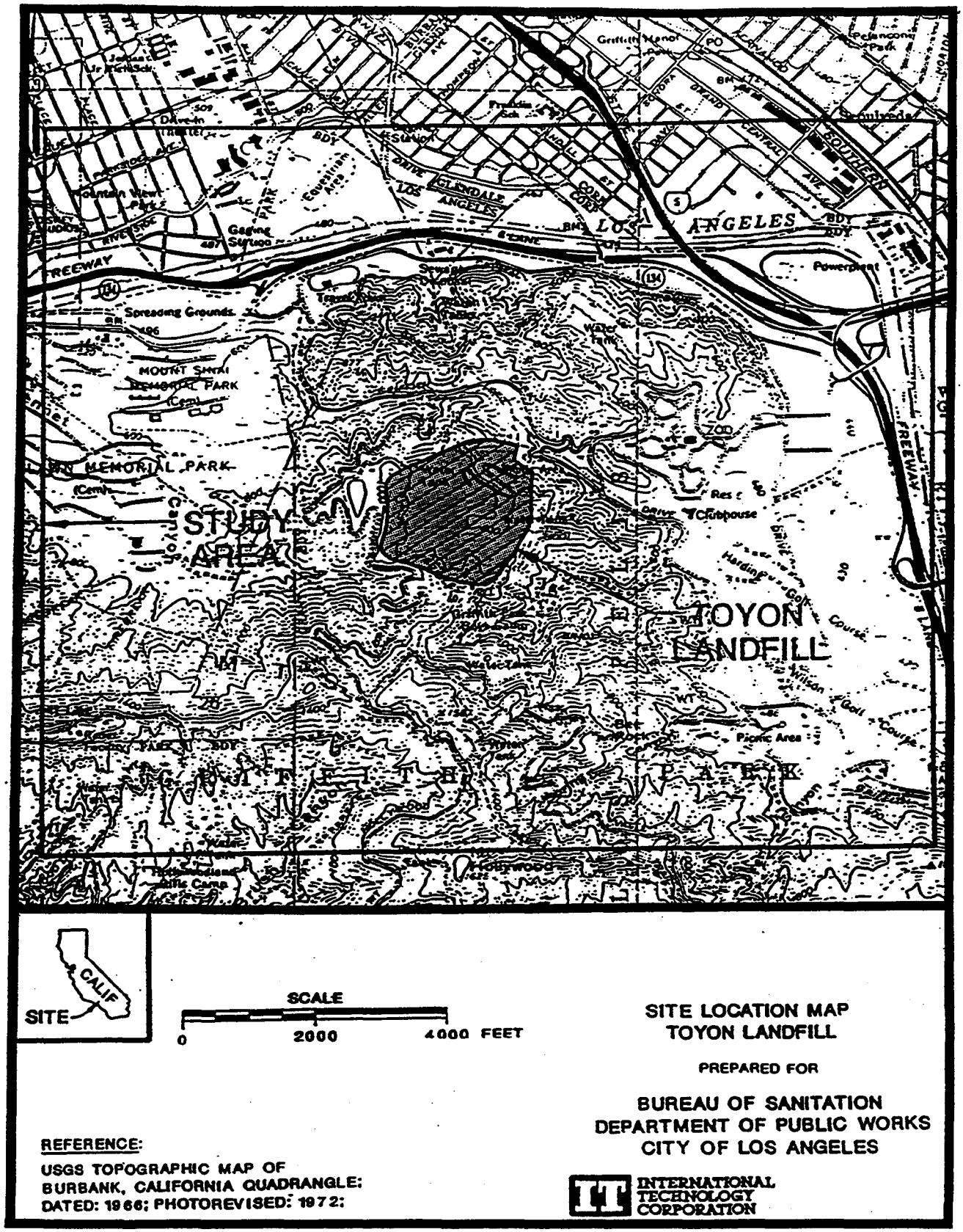
LEACHATE CONTROL AND MONITORING - Three systems of perforated pipes in the gravel-filled trenches, which drain to sewer. Total leachate flow of 3 to 7 gpm. No liners or containment structures.

GROUND WATER QUALITY MONITORING - Six monitoring wells around periphery. Direction of ground water flow in old fractured rocks is poorly known. Some evidence of leachate in the monitoring wells, with chlorides, bicarbonates and sodium above background levels. However, significant concentrations of toxic pollutants are not believed to be migrating away from the landfill.

REPORTS -
SWAT Report (Rank 2) - June 1988 - International Technology Corporation
Final SWAT Report - March 1989

STATUS WITH LOS ANGELES REGIONAL WATER QUALITY CONTROL BOARD - Approved Final SWAT Report April 1991. Evidence of leakage of non-hazardous substances above State drinking water regulatory levels.. Closure Plan is under review. Revised Monitoring Plan, required by Article 5 of Chapter 15, is under review. EMP has been received and is under review. Waste discharge requirements (WDR) have been changed. Now under Monitoring and Reporting Program (MRP). Closure will require an MRP.

217



SITE LOCATION MAP
TOYON LANDFILL

PREPARED FOR

BUREAU OF SANITATION
DEPARTMENT OF PUBLIC WORKS
CITY OF LOS ANGELES

REFERENCE:

USGS TOPOGRAPHIC MAP OF
BURBANK, CALIFORNIA QUADRANGLE;
DATED: 1966; PHOTOREVISED: 1972;

INTERNATIONAL TECHNOLOGY CORPORATION

15. TOYON LANDFILL

STATUS AS OF MAY 1994

SWAT Completed

NAME OF LANDFILL - Tuxford Landfill (Closed)

OWNER - Los Angeles By-Products Company

LOCATION - Sun Valley District. Just south of the Golden State Freeway, on the west side of Tujunga Avenue.

GEOLOGY - On alluvial cone of Tujunga Wash southwest of the Verdugo Fault. Former gravel pit (20 acres).

GROUND WATER FLOW DIRECTION - Southeasterly

GENERAL OPERATIONS - Was open to the public. Closed before 1984. Accepted only dry nonhazardous wastes.

MINIMUM ELEVATION OF TRASH - Original bottom of the gravel pit was about Elevation 710 feet.

GAS CONTROL SYSTEM - Started operation between June 1988 and June 1989. Fill has an impermeable cover (paving).

ELEVATION RANGE OF WATER TABLE - 514 feet in February 1989. Possibly as high as 697 feet in 1948.

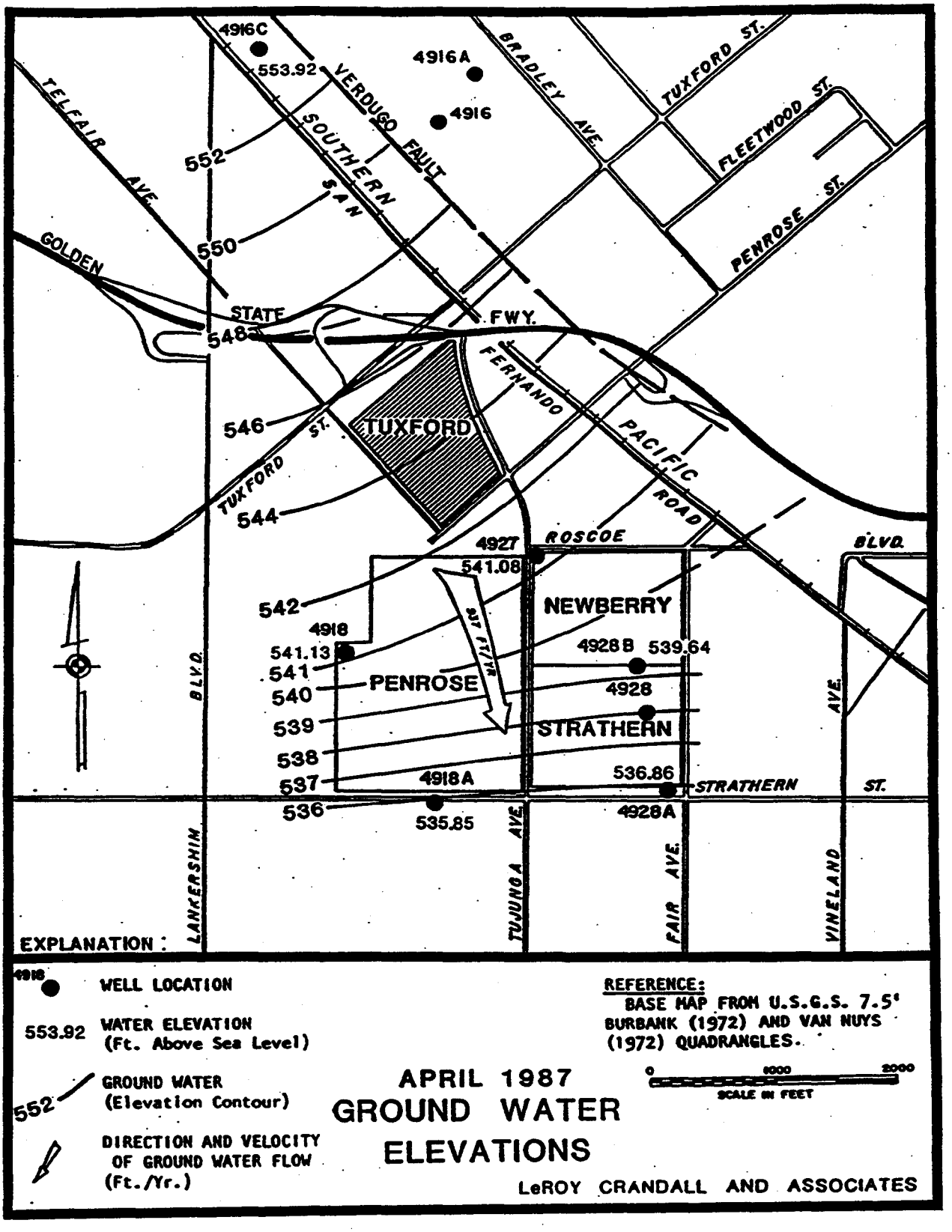
VADOSE ZONE MONITORING - Two wells drilled to 50 feet. Cannot generate enough suction to get a liquid sample.

LEACHATE CONTROL AND MONITORING - Five wells drilled to 100 feet. No leachate encountered.

GROUND WATER QUALITY MONITORING - Shares monitoring wells with Penrose/Newberry/ Strathern. Sampled by a pump with packer. Two wells upgradient and two wells downgradient. Volatile organic compounds are above action levels -- appear to be coming from upgradient. High nitrates in two upgradient wells (84 and 88 mg/l) are probably related to earlier dairy operations. Landfill does not appear to be generating any hazardous pollutants.

REPORTS -
SWAT Report (Rank 2) - June 29, 1989 - Law Environmental
SWAT Report Supplement - July 1, 1989 - Law Environmental

STATUS WITH LOS ANGELES REGIONAL WATER QUALITY CONTROL BOARD - Final SWAT Report submitted December 1990. Approved SWAT Report June 1992. Leakage determination not yet made; awaiting study of background ground water contamination. EMP required under Chapter 15 is underway.



16. TUXFORD LANDFILL

APPENDIX J

FACT SHEET NUMBER 13.
SAN FERNANDO VALLEY SUPERFUND SITES

EPA San Fernando Valley Superfund Sites

EPA Continues Its Investigation And Cleanup Efforts In The San Fernando Valley

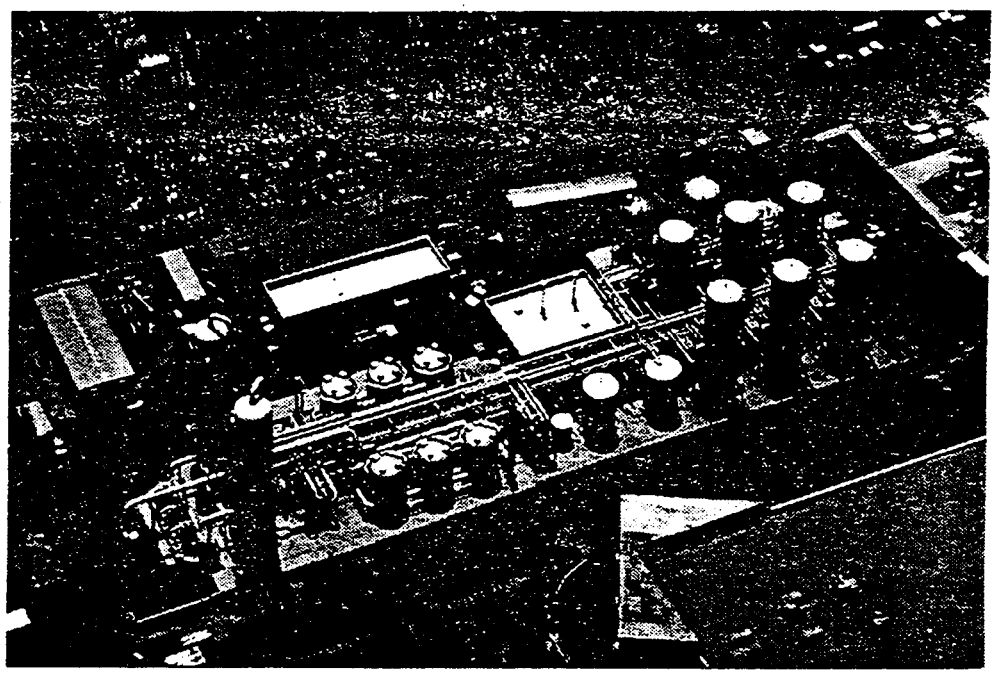


Figure 1. Burbank OU Groundwater Treatment Plant

The U.S. Environmental Protection Agency (EPA), under the Superfund program, is continuing to develop and construct individual cleanup projects addressing the most significant contamination problems in the San Fernando Valley. Through its Superfund program mandate, EPA has developed four ground water cleanup projects, called operable units (OUs), for the North Hollywood, Burbank, Glendale North and Glendale South areas. Additionally, EPA is continuing to investigate and evaluate areawide contamination of the San Fernando Valley Superfund sites. This annual update fact sheet describes the status of each of the OUs as well as progress in the overall investigation.

BURBANK OPERABLE UNIT

Background

In June 1989, EPA selected a cleanup remedy for the Burbank OU involving the extraction and cleanup of 12,000 gallons per minute (gpm) of groundwater contaminated with volatile organic compounds (VOCs). VOCs are organic compounds that evaporate readily at room temperature. In 1991, EPA reached agreement with three parties, Lockheed Corporation, Weber Aircraft and the City of Burbank to implement part of this remedy. These parties signed a Consent Decree to design and construct a treatment system and operate it for two years. Treated water will be delivered to the City of Burbank public water distribution system.

Current Status

The Burbank OU involves three phases. Lockheed Corporation, Weber Aircraft and the City of Burbank, with EPA oversight, have completed Phase I construction of the extraction and treatment facility, which employs air stripping, liquid phase granular activated carbon and vapor phase activated carbon to remove VOCs. Operation will begin upon completion of a pipeline and blending facility to be constructed under an EPA Administrative Order issued to the Aeroquip, Crane, Janco, Sargent Industries, and Ocean Technology companies, and the Antonini Family Trust. EPA projects the two facilities will be fully operational in spring 1995. Phase I involves extracting and treating 6,000 gallons per minute (gpm) of contaminated water to remove VOCs and blending the treated water with Metropolitan Water District water to meet drinking water standards for nitrate.

Burbank OU (continued)

Next Steps

The Lockheed Corporation, with EPA oversight, is designing Phase II of the project. Phase II will add 3,000 gpm of groundwater extraction and treatment capacity. When Phase II is complete, Lockheed will begin designing Phase III of the selected remedy, which involves extracting and treating another 3,000 gpm. Starting from the date when all three phases of the project are complete, the treatment facilities will operate for a period of 20 years. EPA is currently negotiating for the long term operation and maintenance of these facilities with a group of 50 potentially responsible parties (PRPs) designated by EPA in May 1994. PRPs are owners or operators of facilities determined by EPA to be potentially responsible for the contamination.

GLENDALE OPERABLE UNIT

Background

In 1989, EPA found elevated concentrations of VOCs in the groundwater of the Glendale area of the San Fernando Valley. In the spring of 1990, EPA commenced a Remedial Investigation (RI) of the Glendale area and discovered two distinct plumes of VOC contamination in the area's groundwater. These plumes are referred to as the Glendale North Plume and Glendale South Plume. EPA conducted separate feasibility studies and developed two OUs to address contamination associated with each plume.

The final remedial investigation report for both OUs was completed in January 1992. Feasability Study (FS) reports for the Glendale North and South OUs were issued in April 1992 and August 1992, respectively. On June 18, 1993, after receiving and considering public comments, EPA signed Records of Decision (RODs) for both the Glendale North and South OUs, describing EPA's selected remedies for a combined cleanup project to address the groundwater contamination in the Glendale Study Area.

Under the combined OU remedy, groundwater is to be extracted at a rate of 3,000 gpm from Glendale North and 2,000

SITE HISTORY

The San Fernando Valley Superfund site is located in the eastern portion of the San Fernando Valley, between the San Gabriel and Santa Monica Mountains. The San Fernando Valley Basin is an important source of drinking water for the Los Angeles metropolitan area, the Cities of Glendale, Burbank, and San Fernando, La Cañada- Flintridge, and the unincorporated area of La Crescenta.

In 1980, after finding organic chemical contamination in the groundwater of the San Gabriel Valley, the California Department of Health Services (DHS) requested all major groundwater users to conduct tests for the presence of certain industrial chemicals in the water they were serving. The results of testing revealed volatile organic compound (VOC) contamination in the groundwater beneath large areas of the San Fernando Valley. The primary contaminants of concern are the solvents trichloroethylene (TCE) and perchloroethylene (PCE), widely used in a variety of industries including metal plating, machinery degreasing, and dry cleaning.

TCE and PCE have been detected in a large number of production wells at levels that are above the Federal Maximum Contaminant Level (MCL), which is 5 parts per billion (ppb) for each of these VOCs. The State of California MCL is also 5 ppb for TCE and PCE. MCLs are drinking water standards. Other VOC contaminants in the San Fernando Valley have also been detected above Federal and/or State MCLs. As a result of the groundwater contamination, many production wells have been taken out of service. The water agencies of the San Fernando Valley closely monitor the quality of drinking water delivered to residents. **The water meets all federal and state requirements and is safe to drink.** Due to groundwater contamination, much of the drinking water delivered to residents is purchased from the Metropolitan Water District (MWD) of Southern California.

Nitrate, an inorganic contaminant, has also been detected in the groundwater in the San Fernando Valley, consistently at levels in excess of the MCL of 45 ppm. Nitrate contamination may be the result of past agricultural practices and/or septic system or ammonia releases.

State and local agencies acted to provide alternative water supplies and to investigate and clean up potential sources. EPA and other agencies became involved in coordinating efforts to address the large-scale contamination. In 1984, EPA proposed four sites for inclusion on the National Priorities List (NPL): North Hollywood, Crystal Springs, Pollock, and Verdugo. The original boundaries of these sites were based on drinking water wellfields that were known to be contaminated by VOCs in 1984. In 1986, the four sites were included on the NPL. EPA manages the four sites and adjacent areas where contamination has (or may have) migrated as one large site called the San Fernando Valley Superfund Site. EPA uses the perimeter of the groundwater contamination plume as the boundary for the San Fernando Valley Superfund site. This has allowed the agency to pursue a more comprehensive approach for the investigation and cleanup of the contamination. Figures 2 and 3 (pages 4-5) show the TCE and PCE groundwater contamination plumes in the San Fernando Valley.

In 1987, EPA and the Los Angeles Department of Water and Power (LADWP) signed a Cooperative Agreement providing federal funds to perform a remedial investigation (RI) of groundwater contamination in the San Fernando Valley. EPA is coordinating the large-scale effort for subsequent groundwater monitoring and the basinwide groundwater Feasibility Study (FS).

EPA is administering four operable units (OUs) within the San Fernando Valley Superfund Site to accelerate the investigation and cleanup of the study area. Each OU represents a discrete, interim containment remedy currently in progress throughout the eastern portion of the San Fernando Valley. EPA has signed Record of Decision (ROD) documents for four OUs in the San Fernando Valley: North Hollywood OU (1987), Burbank OU (1989), and Glendale North and South OUs (1993). The North Hollywood OU Interim Remedy is currently operating. The Burbank OU is in the construction phase and Glendale North and South OUs are currently in the remedial design phase. All remedial actions established by EPA in the Records of Decision issued to date are interim measures but are intended to be consistent with the overall long-term remediation of the San Fernando Valley. EPA has not yet selected a final remedy for the entire San Fernando Valley.

Glendale OU (continued)

gpm from Glendale South for 12 years. The total 5,000 gpm extracted water will be treated for VOCs using either air stripping or liquid-phase granular activated carbon. The nitrate standard will be met by blending. The treated and blended water will meet all drinking water standards and be conveyed to the City of Glendale for distribution through its public water supply system.

Current Status

In October 1993, EPA sent Special Notice letters to 34 potentially responsible parties (PRPs) in the Glendale area. Many of these PRPs responded to EPA's special notice and subsequently began negotiations to conduct the remedial design for the two Glendale OUs. EPA eventually reached agreements with 25 of the PRPs to conduct the remedial design.

Concurrently, EPA entered into discussions with the City of Glendale on a Memorandum of Agreement (MOA) which requires the city to work cooperatively with the PRPs in their remedial design efforts. The MOA is of particular importance because both Glendale OU remedies call for the city to accept the treated water.

On March 30, 1994, EPA signed an Administrative Order on Consent (AOC) with the 25 PRPs who responded to EPA's Special Notice letter. An AOC is a legal and enforceable agreement in which the PRPs agree to perform or pay the cost of site cleanup. Unlike a consent decree, an AOC does not have to be approved by a federal judge in a court of law. Under the Glendale OU AOC, the 25 parties agreed to conduct the remedial design for the two Glendale OUs and to pay for EPA's oversight of the work. EPA also signed the MOA with Glendale on March 30, 1994.

Since these documents were signed, the PRPs have started designing the combined Glendale OU remedy. The remedial design is scheduled to be completed in October 1995.

Next Steps

EPA is continuing to work on its future enforcement actions. EPA intends to issue Special Notice letters to initiate negotiations for the Remedial Action in the fall of 1994. Remedial Action is the actual construction, implementation, and operation and maintenance of the selected cleanup remedy. Construction is expected to begin in winter 1996 and will take at least one year. At the end of construction, the remedies will be operated for 12 years. Prior to the conclusion of the 12 year period, EPA will evaluate the cleanup projects and determine whether additional pumping in the Glendale North and/or Glendale South OUs will be necessary.

NORTH HOLLYWOOD OU

Background

The Los Angeles Department of Water and Power (LADWP), with EPA funding and oversight, has been operating a groundwater extraction and treatment facility to remove VOCs and inhibit migration of contamination within the North Hollywood site. An average of 1,750 gpm of groundwater is treated by the North Hollywood OU using air stripping and vapor phase activated carbon. The treated water is distributed to the public through LADWP's North Hollywood Pumping Station.

Current Status

EPA has been working to recover costs for the investigation, construction and operation of the North Hollywood OU. EPA is negotiating a consent decree for this purpose with four PRPs that have offered to settle. EPA has filed suit against six non-settling PRPs to recover the additional costs.

Next Steps

EPA anticipates reaching agreement on the consent decree by fall 1994. EPA will continue in its attempts to settle with other PRPs pending litigation.

POLLOCK STUDY AREA

Background

The Pollock Study Area is located at the southern portion of the San Fernando Valley Basin in the vicinity of LADWP's Pollock Wellfield. On April 30, 1994, EPA completed a site assessment of the Pollock Study Area. The site assessment was conducted to assist EPA in making determinations about the need and scope for future RI/FS work including the need for an OU in this area. As a result of the site assessment work, EPA determined that establishing an OU in the Pollock area is not necessary at this time because LADWP intends to conduct a pump and treat project in the Pollock Wellfield. This reactivation of the Pollock Wellfield will inhibit the migration of the contamination.

Current Status

As a result of the site assessment, EPA has decided to suspend its RI/FS activities in the Pollock Study Area for the present. Under the LADWP proposal, they will reactivate two wells in the Pollock Wellfield to extract 3,000 gpm starting in 1997. The water will be treated and conveyed to LADWP's public water supply. Preliminary groundwater modeling suggests that if pumping by LADWP from the Pollock Wellfield starts in 1997 as planned, it will capture nearly all of the contamination upgradient of the wellfield and inhibit migration of VOC-contaminated groundwater into the Los Angeles River. EPA will monitor LADWP's reactivation of the Pollock Wellfield to determine its effects on the groundwater contaminant plume, and will determine what additional actions are necessary.

Next Steps

Although EPA has determined that establishing an OU for the Pollock Study Area is not necessary at this time, EPA will continue to monitor the groundwater and will revisit the possibility of creating a Pollock OU if contamination warrants such action.

VERDUGO STUDY AREA

Background

The Verdugo NPL site includes the contaminated groundwater in and around several wellfields located in the Verdugo Basin. In April 1993, EPA completed a site assessment for the Verdugo Basin. As stated in the report entitled, *Site Assessment and Monitoring Plan for the Verdugo Basin*, perchloroethylene (PCE) continues to be the only VOC detected at or above its maximum contaminant level (MCL) of 5 ppb and in only a small number of the total wells sampled.

Current Status

In the past year, EPA has been sampling more wells in the Verdugo Basin because additional municipal and EPA monitoring wells have become accessible. As is the case with most of the wells sampled in the Verdugo Basin, VOC concentrations in these newer wells are equal to or slightly above MCLs.

Next Steps

EPA will continue to sample groundwater monitoring wells in the Verdugo Basin on a quarterly basis to monitor the quality of the groundwater and to observe any changes in the extent or level of contamination.

BASINWIDE ACTIVITIES

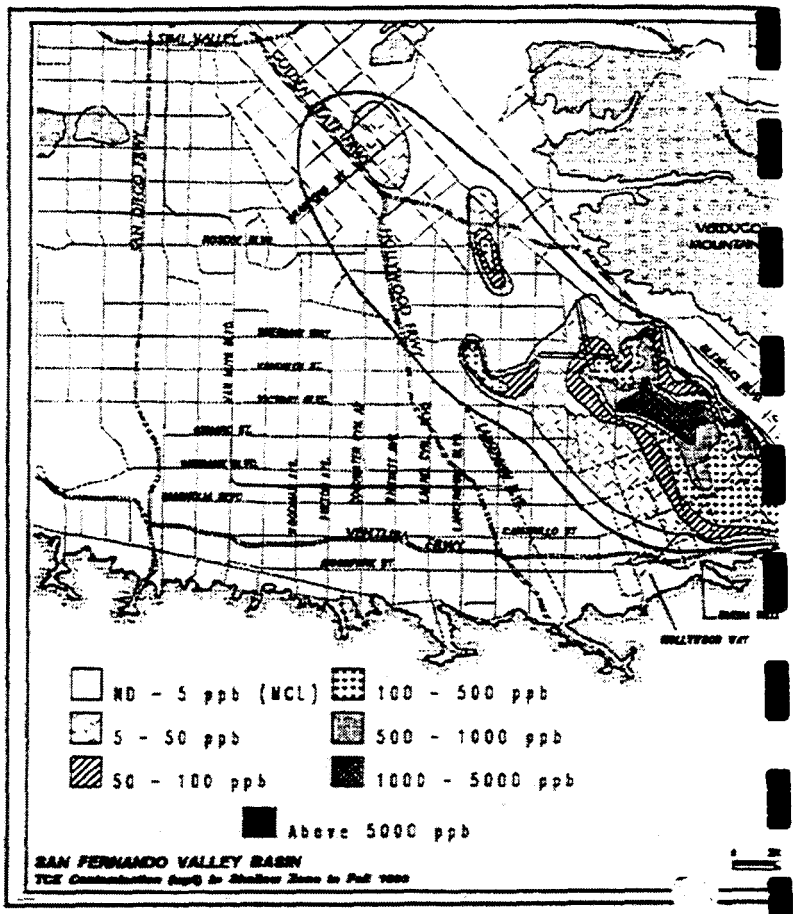
EPA completed a Basinwide Remedial Investigation in 1992. EPA is continuing work on its Basinwide Feasibility Study (FS), to identify, screen and analyze methods to clean up both the vadose zone (the layers of soil above the water table) and the groundwater. EPA intends to complete its Basinwide FS activities sometime in 1996.

Vadose Zone

EPA continues to work on a vadose zone FS to examine ways to protect the groundwater from contaminants in the soil that could reach the groundwater in the future. EPA has been collecting soil data from facilities overseen by the Regional Water Quality Control Board. This information is being used by EPA to estimate the quantity and extent of VOC contamination in the vadose zone. In addition, EPA is currently developing a model of VOC transport in the vadose zone as an aid in determining the fate of the VOC contaminants. As part of the vadose zone FS, EPA will review and evaluate potential cleanup alternatives for the VOC contamination in the vadose zone. Within EPA, vadose zone studies are being coordinated with work conducted on the San Gabriel Valley Superfund project in order to develop consistent cleanup standards.

Groundwater

EPA completed a Remedial Investigation (RI) report on groundwater contamination in the San Fernando Valley in December 1992. This RI work provided EPA with a better understanding of the nature and extent of VOC contamination in the groundwater of the San Fernando Valley. The figures to the right show the most current understanding of the TCE and PCE contamination. Since the RI report was completed, EPA has



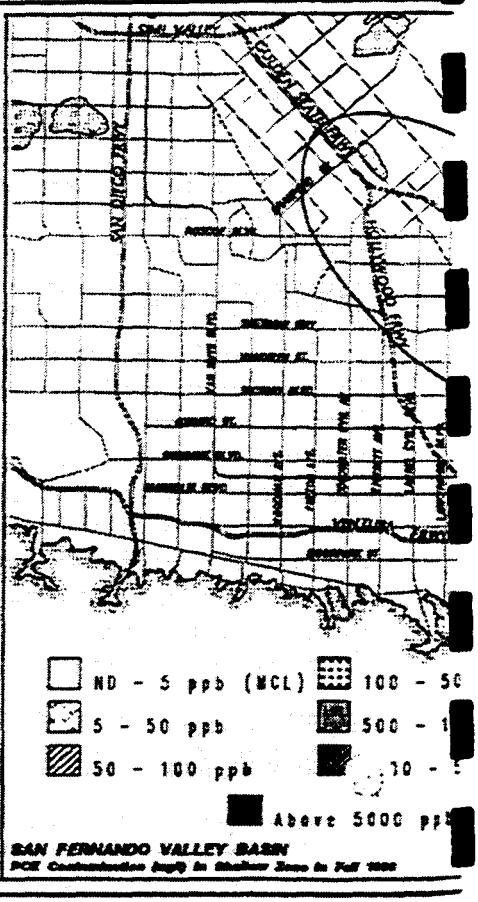


Figure 3. PCE Plume Map

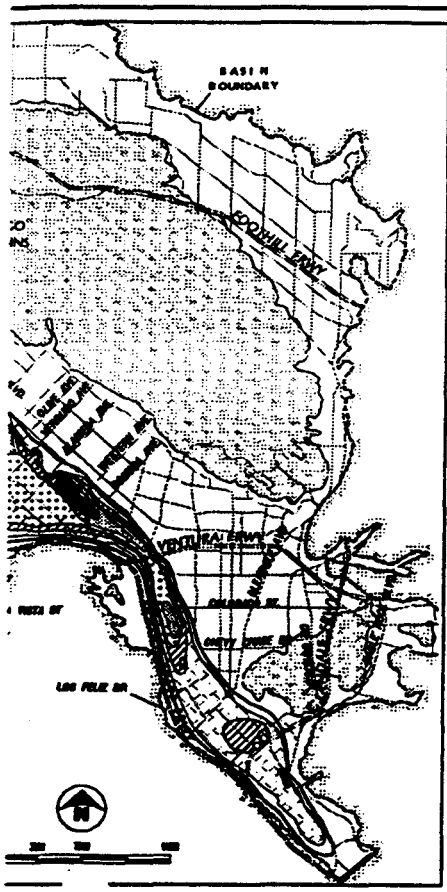
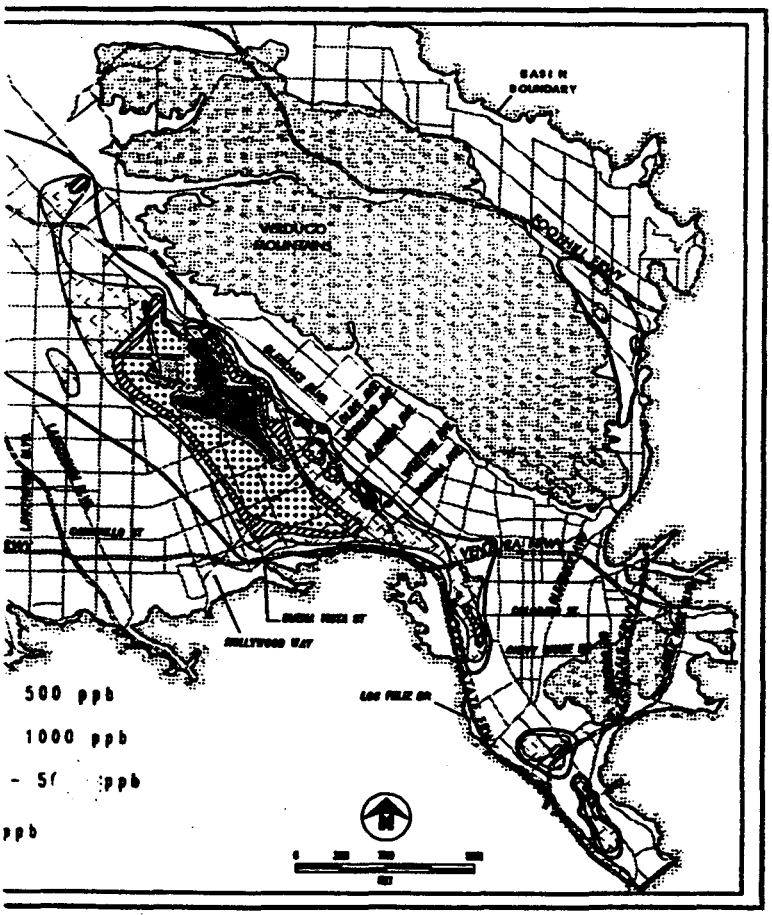


Figure 2. TCE Plume Map



Basinwide Groundwater (Continued)

continued to conduct a large quarterly groundwater monitoring program for the San Fernando Valley Superfund project. This program includes sampling of approximately 500 wells, 87 of which were installed by EPA as part of the Basinwide Groundwater RI. Monitoring reports and contamination plume maps are produced semi-annually.

EPA continues to work on its Basinwide Groundwater Feasibility Study, including preparation of technical memoranda on water rights and water management in the San Fernando Valley and recalibration and verification of the basinwide groundwater flow model. EPA's newly recalibrated groundwater flow model provides a more realistic representation of the hydrogeology and changing groundwater conditions of the San Fernando Valley than was achieved by previous models.

Currently, EPA is conducting an evaluation of the effectiveness of the OU projects. These evaluations should be completed by fall 1994. EPA is also reviewing and evaluating additional potential groundwater remediation options for the basin including regional pump and treat, well-head treatment and innovative technologies. EPA will then make a determination as to whether or not additional OUs are necessary.

WHAT IS SUPERFUND?

Superfund is the commonly-used name for the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), a federal law enacted in 1980 and amended in 1986. CERCLA enables EPA to respond to hazardous sites that threaten public health and the environment where owners or operators are either unwilling or unable to address the contamination themselves.

Two major steps in the Superfund process are to conduct an in-depth investigation of a site (called a Remedial Investigation) and evaluate possible cleanup alternatives (the Feasibility Study). During the Remedial Investigation, information is gathered to determine the general nature, extent, and sources of contamination at a site. Using the alternatives developed during the Feasibility Study, EPA selects a preferred cleanup alternative considering the following criteria: (1) overall protection of human health and the environment; (2) compliance with federal and more stringent state laws; (3) long-term effectiveness; (4) reduction of potency of the contamination (toxicity), ability of the contaminants to move through the environment (mobility), and the amount of contamination (volume); (5) cost; (6) short-term effectiveness; (7) how easily an alternative can be applied (implementability); (8) state acceptance; and (9) community acceptance.

Once the final cleanup plan has been selected, EPA formalizes this decision by signing a Record of Decision (ROD). The ROD also contains a Responsiveness Summary, EPA's response to public comments. Design and actual cleanup activities (Remedial Design and Remedial Action) can then proceed.

OU or Study Area	Site Discovery	NPL Ranking and Listing	Remedial Investigation (RI)	Feasibility Study (FS)	Public Comment Period	Record of Decision (ROD)	Remedial Design (RD)	Remedial Action (RA)
North Hollywood OU	In 1980, contaminated groundwater was discovered by San Fernando Valley Water purveyors through testing mandated by the State of California Department of Health Services.	In 1984, four sites within the San Fernando groundwater basin were proposed for inclusion on the National Priorities List (NPL), because of VOC contamination in municipal wellfields. EPA added the four sites to the NPL in 1986.	LADWP completed RI/FS activities for the North Hollywood OU in November, 1986.			EPA signed the Record of Decision in September 1987.	The RD phase lasted from 1987 to 1989.	Construction of the extraction and treatment facility was completed in early 1989. 24-hour operation began in December 1989.
Burbank OU			EPA issued this RI report as part of the October 1988 OU Feasibility Study.	EPA released the FS for the Burbank OU in October 1988. The cleanup remedy involved extracting and treating the contaminated groundwater.	EPA had a public comment period from October to December 1988 for its Proposed Plan for the Burbank OU.	EPA signed a ROD in June 1989 for extraction and treatment of 12,000 gpm of contaminated water. EPA issued an Explanation of Significant Differences in December 1990 for blending to reduce nitrate contamination.	The RD is being conducted by PRPs under a Consent Decree and an EPA order signed in 1991. The Phase I RD was completed in November 1993 and the Phase II RD is currently underway.	The Phase I extraction well-field and treatment facility were completed in March 1994. Phase I will not be fully operational until a blending facility to reduce nitrates in the treated water is complete. Full operation is expected by spring 1995.
Glendale North OU			EPA issued the RI report for the Glendale Study Area in January 1992.	EPA issued this Feasibility Study in April 1992. The selected remedy involves treating groundwater in the shallow aquifer in the Glendale North OU.	A public comment period on EPA's preferred alternative was held from July to September 1992. A public hearing was held on July 23, 1992.	EPA signed Records of Decision for both Glendale North and South OUs on June 18, 1993. The treatment facilities for both OUs will be combined at a single location in the Glendale North OU area. Extraction rates will be 3,000 gpm for Glendale North and 2,000 for Glendale South.	EPA signed an Administrative Order on Consent in March 1994 with 25 PRPs to conduct the remedial design for the Glendale OUs.	EPA intends to issue Special Notice letters for the Remedial Action in the fall of 1994 to conduct negotiations with PRPs to construct, operate, and maintain the combined remedies for the two Glendale OUs.
Glendale South OU				EPA issued this Feasibility Study in August 1992. The selected remedy involves groundwater extraction and treatment.	EPA held a public comment period from October 1992 to January 1993 on the preferred alternative for this OU. A public hearing was held on October 21, 1992.			
Pollock Study			EPA completed its site assessment in April 1994 and determined that an OU is not necessary for the Pollock Study Area at this time. LADWP intends to reactivate pumping at the Pollock Wellfield in 1997 at an extraction rate of 3,000 gpm.					
Basinwide Study			EPA issued the Basinwide Groundwater RI Report in December 1992.	EPA is continuing to work on the Basinwide Groundwater and Vadose Zone Feasibility Studies.				

Completed Current or To Be Completed

Where the OUs Are Within the Superfund Process

WHO'S INVOLVED

The San Fernando Superfund project is large and complex, requiring many agencies to work together. EPA is coordinating efforts to address groundwater contamination in the San Fernando Valley Basin. Representatives from the agencies listed below meet quarterly as the Management Committee for the San Fernando Valley Superfund Sites to address water supply management and RI/FS-related technical issues on both an OU and Basinwide scale.

EPA

The U.S. Environmental Protection Agency has overall responsibility for cleanup and enforcement efforts at the San Fernando Valley Superfund Sites. EPA is responsible for groundwater and vadose zone feasibility studies, community relations activities and enforcement efforts. EPA is also responsible for the quarterly groundwater monitoring program.

Cal-EPA

The California EPA (formerly called the Department of Health Services) is the state agency responsible for protecting the health and welfare of California residents. It requires regular testing of drinking water and has established state standards for more than 50 potential contaminants. Through its Department of Toxic Substances Control, Cal-EPA also enforces state hazardous waste cleanup requirements and oversees potential source sites. Cal-EPA also reviews EPA documents and provides input to ensure compliance with state regulations. Cal-EPA is the coordinating agency for the state and is also involved in cleanup of sites around and within the San Fernando Valley.

Regional Board

The Regional Water Quality Control Board, Los Angeles Region, is responsible for the protection of surface and groundwater for the State of California. The Regional Board investigates facilities which use, store, or handle chemicals. When contamination is found, the Regional Board requires and oversees site cleanup. Through a cooperative agreement, EPA provides the Regional Board with funds to investigate potential sources of groundwater contamination in the San Fernando Valley.

LADWP

The Los Angeles Department of Water and Power has overall responsibility for water supply in the City of Los Angeles. It is required to provide water to its customers which meets state and federal drinking water standards. LADWP was responsible for a number of tasks under a cooperative agreement with EPA originally signed in 1987. LADWP completed the Phase 1 Basinwide Groundwater RI (December 1992) and feasibility studies for the North Hollywood OU (1986), Burbank OU (1989), Glendale North OU (April 1992) and Glendale South OU (August 1992).

Now that the basinwide groundwater RI report is final, LADWP's direct role in the overall project has decreased significantly. LADWP's continuing involvement includes preparation of cost documentation to support EPA enforcement/cost recovery actions, and coordination and consultation with EPA about the Pollock Study Area, and basinwide water management issues pertinent to remedial actions. In addition, LADWP continues to operate and maintain the North Hollywood OU treatment facility.

Burbank and Glendale

The Cities of Burbank and Glendale each provide drinking water to their residents through local municipal utilities. As water providers, each city must test water regularly and ensure that water supplies meet federal and state standards. Both cities have been closely involved in the Superfund studies. The City of Burbank is a signatory to the Consent Decree for the Burbank OU and the City of Glendale may be a signatory to a Consent Decree or Memorandum of Agreement for the Glendale OUs.

ULARA Watermaster

The Upper Los Angeles River Area (ULARA) Watermaster, appointed by the Los Angeles Superior Court, oversees and documents all actions that affect groundwater supply in the basin such as annual rainfall, import and export of water to other areas, and pumping of groundwater for both water supply and remediation purposes. The Watermaster is working with EPA, the Regional Board, and water purveyors to address groundwater management issues in the San Fernando Valley.

MAILING LIST COUPON

If you did not receive this fact sheet by mail and would like to be included on the mailing list for the San Fernando Valley Superfund project, please fill out this coupon and return it to the EPA Office of Community Relations.

Name: _____

Address: _____

_____

Telephone: _____

Affiliation (if any):

Return to: Office of Community Relations, U.S. EPA, 75 Hawthorne Street (H-1-1), San Francisco, CA 94105

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San Fernando Valley Information Repositories

EPA maintains information repositories at the following locations containing fact sheets, technical documents, the Remedial Investigation/Feasibility Study documents, the Community Relations Plan, the Records of Decision, and other reference materials. Many of the documents are available on microfilm instead of, or as well as, on hardcopy. If documents are not available, contact Fraser Felter, Community Relations Coordinator, at (415) 744-2181.

City of Burbank Public Library
110 North Glenoaks Boulevard
Burbank, CA 91502
(818) 953-9741
Contact: Andrea Anzalone
Hours: M–Th 9:30 am–9:00 pm
F 9:30 am–6:00 pm
Sat 10:00 am–6:00 pm

California State University Northridge Library
18111 Nordhoff Street
Northridge, CA 91330
(818) 885-2285
Contact: Mary Finley
Hours: M–Th 8:00 am–10:00 pm
F 8:00 am–5:00 pm
Sat 9:00 am–5:00 pm

City of Glendale Public Library
222 East Harvard Street
Glendale, CA 91205
(818) 548-2021
Contact: Lois Brown
Hours: M–Th10:00 am–8:55 pm
F–Sat 10:00 am–5:55 pm

Los Angeles Department of Water and Power
(LADWP) Library
111 North Hope Street, Room 518
Los Angeles, CA 90012
(213) 481-4612
Contact: Joyce Purcell
Hours: M–F 7:30 am–5:30 pm

The University Research Library/U.C.L.A.
Public Affairs Service
405 Hilgard Avenue
Los Angeles, CA 90024
(310) 825-3135
Contact: Barbara Silvernail
Hours: M–F 10:00 am–7:00 pm
Sat 1:00 pm–5:00 pm

For Further Information

about the Basinwide investigation and specific cleanup efforts, contact:

Ned Black/Project Manager
U.S. EPA, Region IX
75 Hawthorne Street (H-6-4)
San Francisco, CA 94105
(415) 744-2253
FAX: (415) 744-2180

Fraser Felter/Community Relations Coordinator
U.S. EPA, Region IX
75 Hawthorne Street (H-1-1)
San Francisco, CA 94105
(415) 744-2181 or
(800) 231-3075

United States Environmental Protection Agency
Region 9
75 Hawthorne Street (H-1-1)
San Francisco, CA 94105
Attn: Fraser Felter

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INSIDE: STATUS OF ACTIVITIES AT THE SAN FERNANDO VALLEY SUPERFUND SITES

APPENDIX K

AN EVALUATION OF WATER RIGHTS AND WATER USE OPTIONS IN THE SAN FERNANDO VALLEY BASIN

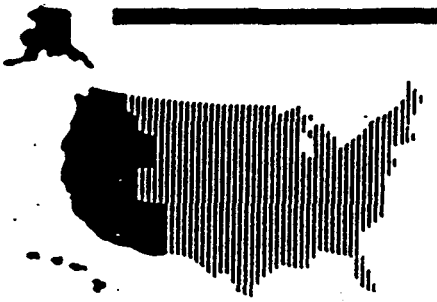
AN EVALUATION OF WATER RIGHTS AND WATER USE OPTIONS IN THE SAN FERNANDO VALLEY BASIN

As part of the San Fernando Basin Superfund Project, the Environmental Protection Agency (EPA) completed a report in March of 1991 entitled - "Evaluation of Water Rights and Water Use Options in the San Fernando Valley Basin".

This report was reviewed by the ULARA Watermaster and staff. EPA has indicated that any implied conflict in interpretations are not intentional and should be resolved in consultations with the ULARA Watermaster.

The "Executive Summary" (pages iv to vi) and conclusion (Section 7) are enclosed to provide some insight as to the nature of this report. Basically, this report describes both the adjudicated water rights in the four basins - San Fernando, Sylmar, Verdugo, and Eagle Rock, and possible uses for the water that EPA expects will be extracted from the valley and treated to remove the volatile organic compounds. Also described are implications for basin-wide remedial planning that result from water rights and water use options in the San Fernando Valley.

ARCS WEST



Remedial Activities at Selected Uncontrolled Hazardous Waste Sites in the Zone of Regions IX and X

AN EVALUATION OF WATER RIGHTS AND WATER USE OPTIONS IN THE SAN FERNANDO VALLEY BASIN LOS ANGELES, CALIFORNIA

Environmental Protection Agency
Contract No. 68-W9-0031

CH2M HILL

EXECUTIVE SUMMARY

The purpose of this document, An Evaluation of Water Rights and Water Use Options in the San Fernando Valley Basin (SFVB), is to describe how some of the institutional and physical constraints associated with water supply management will affect remedial action planning as the SFVB Remedial Investigation/Feasibility Study (RI/FS) progresses. Preliminary estimates indicate that it might be necessary to extract, treat, and use as much as three-quarters of the safe yield of the SFVB (about 80,000 acre-feet per year) in the process of remediating the SFVB groundwater contamination. Extraction of such a large amount of water will require close coordination among EPA, the Upper Los Angeles River Area (ULARA) Watermaster, and the local water purveyors and a shared understanding of both objectives and constraints.

The SFVB is located in Los Angeles County, California, within the ULARA. The ULARA contains the watershed of the Los Angeles River and its tributaries above the confluence of the Los Angeles River and the Arroyo Seco Flood Control Channel. Four separate groundwater basins form the SFVB: the San Fernando Basin, Sylmar Basin, Verdugo Basin, and Eagle Rock Basin. Five water purveyors pump groundwater from the SFVB: the Los Angeles Department of Water and Power (LADWP); the Burbank Public Services Department; the Glendale Public Services Department; the San Fernando Department of Public Works--Water Division; and the Crescenta Valley County Water District. Each of these purveyors uses both local groundwater and imported surface water as sources of supply. Both supplies are now facing possible future limitations due to contamination, litigation over Owens Valley/Mono Lake supplies, debate over exports from the San Francisco Bay-Delta, and startup of the Central Arizona Project.

Four sites in the SFVB were listed on the EPA National Priorities List in 1986 due to contamination of production wells by trichloroethylene (TCE) and perchloroethylene (PCE). Since then, EPA has entered into cooperative agreements and provided funding to LADWP to conduct the basinwide Remedial Investigation and to the Regional Water Quality Control Board (RWQCB) to conduct source identification and investigation activities. Two Records of Decisions (RODs) have been signed: one for the North Hollywood Operable Unit in 1987 and one for the Burbank Operable Unit in 1989. LADWP is currently conducting an OUFS in the Glendale area; a ROD is expected in 1991. EPA is also conducting a basinwide Feasibility Study, of which this water rights and water use evaluation is a part.

Because the SFVB is an adjudicated groundwater basin, court-defined water rights affect who can extract groundwater, how much they can extract, and how the extracted groundwater can be used. The 1979 ULARA Judgment assigned specific water rights to each of the five purveyors and to some additional private parties. The Judgment mandated safe yield operation of the four groundwater basins and designated a Watermaster and an Administrative Committee, who now operate the basin under

Court supervision. A variety of different types of water rights are incorporated into the Judgment, including the right of some parties to store imported water in the SFVB and to accumulate import return flow. In addition, non-parties (those not assigned water rights as part of the Judgment) can extract groundwater from the SFVB under specified physical solution arrangements.

The ULARA Watermaster has also developed specific policies on non-party extraction for groundwater remediation purposes. These policies require compliance with safe yield operation, prior approval by the Watermaster, and compensation to parties to the Judgment who may be adversely affected by the extraction. These policies have already been applied to extractions at several facilities that are extracting groundwater as part of preliminary investigations required by the RWQCB. It is expected that the Burbank Operable Unit will be the first Superfund remedial action in the SFVB affected by the Watermaster policy.

Water use options in the SFVB fall into two categories: consumptive uses and non-consumptive uses. Consumptive uses are those that do not directly return the water to the groundwater basin; these uses include (1) use as drinking water, industrial, or irrigation supplies, or (2) discharge of the extracted water into a sanitary sewer or storm drain. Non-consumptive uses are those that do return the water to the SFVB and include recharge using either spreading grounds or injection wells.

Before choosing any one of these options as part of a remedial alternative for a future operable unit, specific information would need to be collected and various different design elements would need to be considered. In addition, each option would be limited by either technical or institutional constraints. Examples of constraints that would need to be evaluated include: the water quality requirements associated with specific industrial uses and the limited capacity of spreading ground facilities. Compatibility with existing water distribution systems and seasonal demand fluctuations would also be important considerations.

Two local water management programs and two agency policy directives on using treated water for potable supply have been identified as important considerations during development of future remedial alternatives. The City of Los Angeles Water Reclamation Program is increasing the amount of reclaimed water used for irrigation and industrial uses, which will limit the usefulness of treated groundwater for those purposes. MWD's Seasonal Storage Service Program will most likely increase seasonal fluctuations in groundwater pumping by the purveyors and will also increase the use of local spreading grounds. Increased recharge could cause changes in the migration of contaminants, which must be considered during remedial planning for specific operable units. DHS' guidelines on domestic use of treated water and MWD's policy on acceptance of treated water into their distribution lines are also discussed as they apply to use of the treated water as a potable supply.

In conclusion, this report describes some of the local institutional and system operation constraints in the SFVB. As the amount of water extracted and treated for remedial purposes increases, these constraints will become increasingly apparent. Integrating remedial action planning and water supply planning will be necessary to achieve both remedial and water supply goals. Mechanisms are already in place to allow for extractions to meet short-term goals. In the long term, the cumulative effects of the constraints posed by both water rights and water use options will need to be carefully considered and mechanisms to overcome them will need to be built into operable-unit design and basinwide remedial planning.

Section 7
CONCLUSIONS

Remediation efforts have begun in the SFVB and are expected to increase steadily in magnitude. During the 1986-1987 Water Year, a total of 1.88 acre-feet of groundwater was extracted by non-parties for groundwater remediation purposes (ULARA, 1988) compared to 14.42 acre-feet extracted during the 1987-1988 Water Year (ULARA, 1989). In March 1989, the North Hollywood extraction and treatment facility began operation which, when fully operational, is intended to extract 2,000 gpm or 3,200 AFY. This represents a significant increase over time in extraction for remediation purposes. When the planned Burbank facility begins operation, the total amount of groundwater extracted for remediation purposes (North Hollywood and Burbank) will increase to more than 22,400 AFY. Eventually, extractions for remedial purposes could approach three-quarters of the safe yield of the SFVB (EPA, 1988). The discussion presented in the previous sections of this report is intended to illustrate some of the ways water rights and water use issues will affect future remediation efforts in the SFVB.

The SFVB is an adjudicated groundwater basin, and remediation efforts must be conducted within the constraints of the 1979 Judgment. The Judgment specifies who can extract groundwater and how much groundwater each party can extract. To address issues that were not included in the original text of the Judgment, the ULARA Watermaster has developed new policies to implement the intent of the Judgment; additional policies could be developed in the future, as necessary. In response to the groundwater contamination problem in the SFVB, the ULARA Watermaster has developed a policy for groundwater extractions for remediation purposes by parties or non-parties (non-parties are those who do not hold water rights under the Judgment). According to this policy, groundwater extractions for remediation purposes that are then used consumptively require approval from the ULARA Watermaster and may require an agreement with a party to the Judgment and payment to the local purveyor.

As the amount of groundwater extracted for remediation purposes increases over time, the cumulative impact of these extractions will become more apparent. Integration of remedial action planning and water supply planning will be necessary if both remedial goals and water supply goals are to be achieved. Existing water supply conditions influence the feasibility of water use options that might be included as part of a remedial action. For example, low winter water demand could be a limiting factor when evaluating potable water use options. Current knowledge of the lateral and vertical extent of contamination could also be a limiting factor when evaluating the feasibility of water use options involving groundwater recharge.

Existing water supply conditions could also change as the population in Southern California increases and if the availability of imported water supplies decreases. The imported water supply from the Central Arizona Project will decrease, and the Bay Delta Hearings could result in less water being exported to the South. In partial

response to this situation of increasing water demand and potentially decreasing water supply, MWD has developed the SSSP to reduce the summer peak demand for MWD import water. This program is intended to increase groundwater recharge during the winter and groundwater extraction during the summer. This program may alter water management planning in the SFVB and, as a result, could influence remedial action planning. The potential effect of increasing recharge on groundwater flow and on the direction and velocity of contaminant migration will be especially important considerations.

In the short term, mechanisms are already in place to allow for the extraction of groundwater for remedial purposes. In the long term, however, the cumulative effect of extracting more and more water will present constraints. The technical, political, and economic considerations described in this report must be evaluated in more depth and addressed as basinwide remedial planning continues.

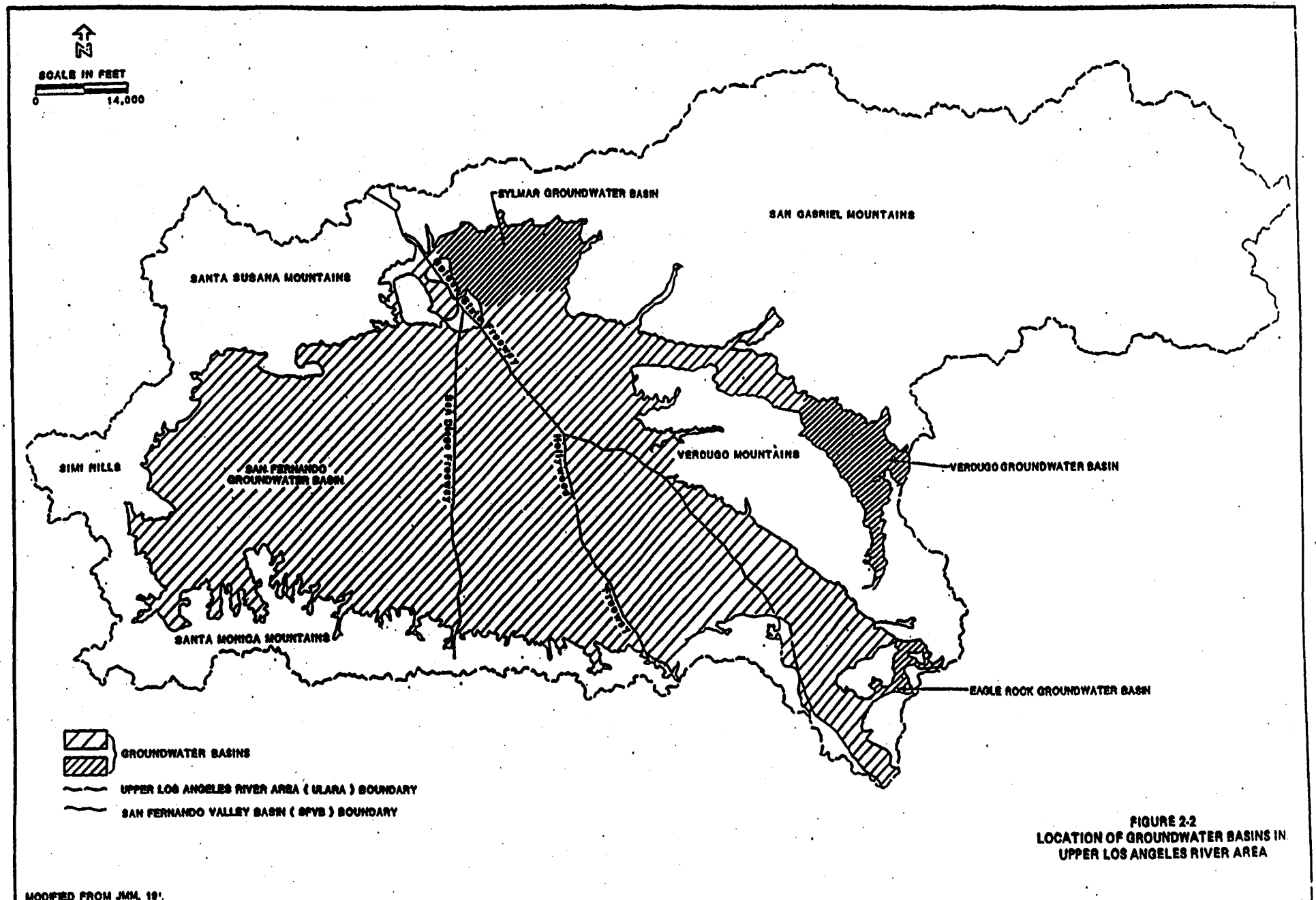


FIGURE 2-2
LOCATION OF GROUNDWATER BASINS IN
UPPER LOS ANGELES RIVER AREA

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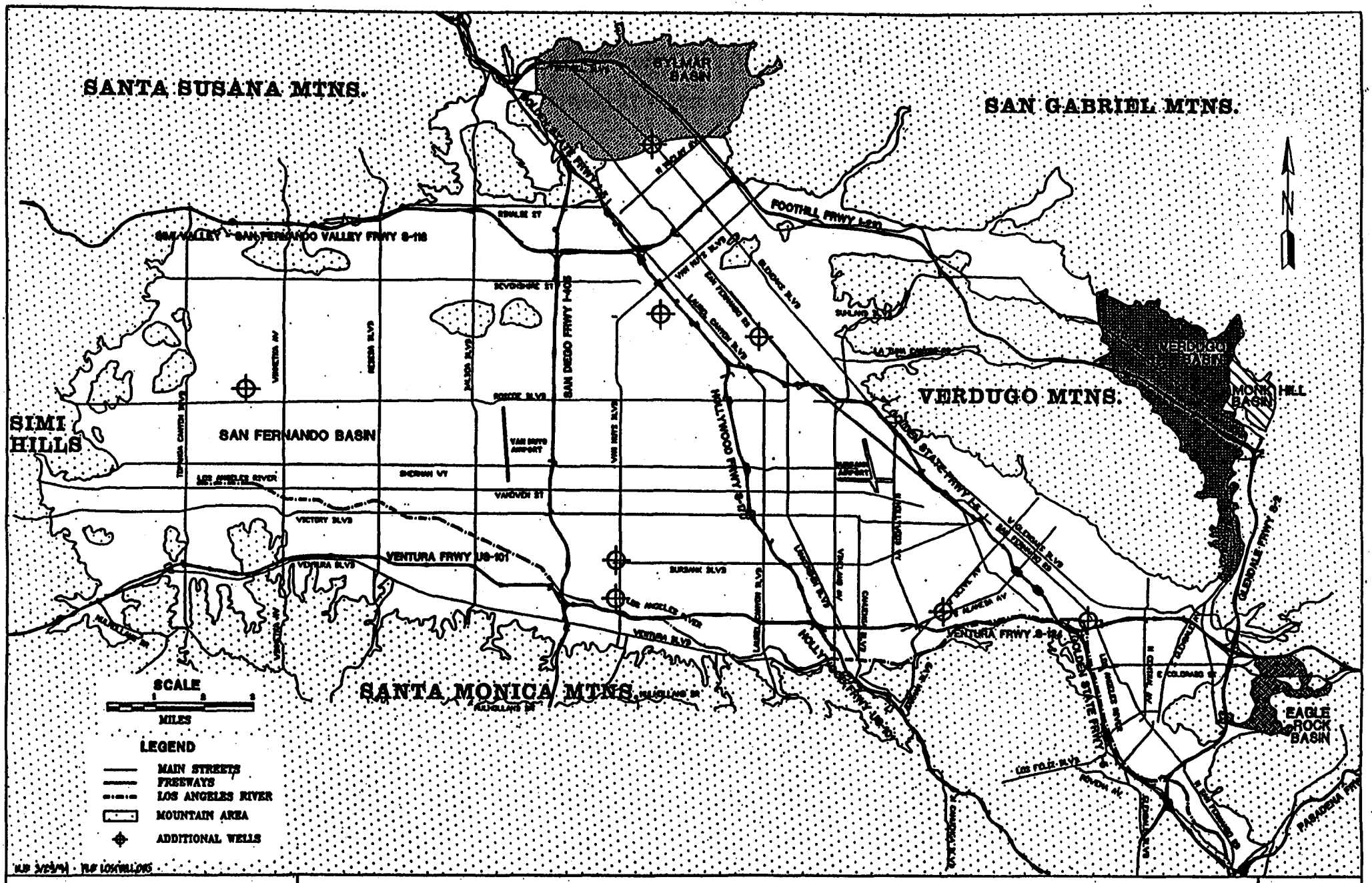
APPENDIX L

REQUIRED ADDITIONAL MONITORING WELLS



1993-94 Water Year
ULARA Watermaster
Report

Upper Los Angeles River Area:
Locations of Eight Required Additional Monitoring Wells

FIGURE
L.1

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

250