GeoStrategies Inc.

REMEDIAL ACTION PLAN

for

UNOCAL Service Station No. 5760
376 Lewelling Boulevard
San Lorenzo, California

780910-19

Prepared for

UNOCAL Corporation
Post Office Box 5155
San Ramon, California 94583

Prepared by

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April 21, 1994

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INTRODUCTION

At the request of Unocal Corporation (Unocal), GeoStrategies Inc. (GSI) has prepared this Interim Remedial Action Plan (RAP) for Unocal Service Station No. 5760 at 376 Lewelling Boulevard in San Lorenzo, California (Figure 1). The service station is currently in operation; site features are shown on the Site Plan (Figure 2). Previous environmental investigations have identified the presence of gasoline range hydrocarbons beneath and adjacent to the site.

This RAP summarizes previous environmental investigations, results of previous investigations, and site conditions, as well as presents an evaluation of remedial alternatives and recommended remedial action.

PREVIOUS INVESTIGATIONS

In November and December 1987, two gasoline underground storage tanks (USTs) and one waste-oil UST were removed and replaced at the subject site. Soil beneath the former gasoline USTs was excavated vertically to groundwater (ranging from 18 to 20 feet below surface grade [bsg]). Four soil samples collected and analyzed from the limits of the excavation contained petroleum hydrocarbons ranging from 12.7 to 1620 parts per million (ppm). The soil sample collected beneath the former waste-oil UST did not contain petroleum hydrocarbons or volatile organic compounds above the reporting limits for the laboratory. The water sample collected from the gasoline UST pit contained a petroleum hydrocarbon concentration of 550,000 parts per billion (ppb).

In February 1988 one groundwater monitoring well (U-1) was installed onsite west of the USTs by Woodward-Clyde Consultants (WCC). Soil samples from the boring were not submitted for laboratory analysis. Floating product was observed in the well and results of laboratory analyses indicated that the groundwater sample contained 93,000 ppb of low boiling hydrocarbons (WCC, March 1988).

In August 1990, three groundwater monitoring wells (U-2 through U-4) were installed onsite by GSI (GSI, November 1990). Analytical results indicated that the soil samples from borings U-2 and U-4 did not contain detectable concentrations of total petroleum hydrocarbons as gasoline (TPHg). Two soil samples from boring U-3 contained concentrations of TPHg at 2.9 and 640 ppm. The groundwater sample from well U-3 contained 110,000 ppb of TPHg and 4,400 ppb of benzene.

In March 1992, three groundwater monitoring wells (U-5 through U-7) were installed offsite in Usher Street and one groundwater monitoring well (U-8) was installed south of the site in the adjacent property (GSI, June 1992). None of the soil samples submitted for laboratory analyses contained detectable concentrations of TPHg and benzene. Groundwater samples collected from wells U-5, U-7, and U-8 did not contain detectable concentrations of TPHg and benzene. **The groundwater sample from U-6 contained concentrations of TPHg and benzene at 6,600 and 90 ppb, respectively.** a downgradient well

In May 1993, one additional offsite groundwater monitoring well (U-9) was installed southwest of well U-6 (GSI, August 1993). The soil samples did not contain detectable concentrations of TPHg and benzene. Benzene concentrations were not detected in the groundwater sample, however, a concentration of TPHg was detected at 2,100 ppb (the laboratory noted that a discrete peak not indicative of gasoline was present).

In February 1994, GSI performed an aquifer pumping test to evaluate the hydraulic parameters transmissivity (T) and storativity (S) of the aquifer (GSI, March 1994). These parameters will be discussed in Site Conditions.

In March 1990, monitoring and sampling of groundwater wells began on a quarterly basis and has continued to date. Analytical results indicated that wells U-2, U-4, U-5, U-7, and U-8 have never contained detectable hydrocarbon concentrations for all sampling events. Historically wells U-1, U-3, and U-6 have contained detectable concentrations of TPHg and benzene. Well U-9 has never contained detectable concentrations of benzene for all sampling events. Well U-9 was reported to have detectable concentrations of TPHg during the second and third quarters of 1993. However, the reported values were primarily due to discrete hydrocarbon peaks not indicative of gasoline. Detectable TPHg concentrations were not reported in the December 1993 sampling event for well U-9.

Well locations are shown on the Site Plan, Figure 2. Historical soil and groundwater analytical data are presented in Appendix A.

SITE CONDITIONS

Regional Geology

The site is located approximately 500 feet north of San Lorenzo Creek and one mile east of San Francisco Bay in San Lorenzo, California. Soil beneath the site has been described as Holocene-age alluvial deposits consisting of unconsolidated, moderately sorted fine sand, silt, and clayey silt with thin beds of coarse sand (Helley, 1979).

Site Geology

Lithology beneath the site consists of stratified alluvial deposits of sand and silty sand from the surface grade to a depth of approximately 6 to 14 feet below grade (fbg). A silt and silty clay zone extends to approximately 19 to 21 feet bsg and overlays a sand zone that extends to approximately 21 to 34 feet bsg. A basal clay unit extends to the total explored depth in each boring. A generalized interpretation of the soil stratigraphy beneath the site is shown on Figures 3 through 5, Cross Sections A-A', B-B', and C-C'. A falling permeability test performed on a soil sample collected from 30 feet bsg (within the clay layer) indicates that this zone may be a local aquitard.

Site Hydrogeology

Saturated sediments consists of a thin layer of sand beneath a silt and silty clay layer. Depth to groundwater has been as high as approximately 14.5 feet bsg (well U-6) and as low as approximately 22.5 feet bsg (well U-2). Historically, groundwater has fluctuated as much as 5 feet. The groundwater flow direction has consistently been to the southwest with a gradient ranging from 0.002 to 0.006. The potentiometric surface map for the fourth quarter, 1993 monitoring event is shown on Figure 6.

Based on the aquifer pumping test data, transmissivity (T) and storativity (S) were calculated utilizing the Jacob Straight-Line Method (Cooper & Jacob, 1946) and Theis Method (Neuman, 1975). The values are included in Appendix B. The calculated T values indicate the shallow water bearing zone is capable of sustaining a constant pumping rate of 2 gallons per minute (gpm). The calculated S values are indicative of an aquifer that is unconfined to semiconfined.

Two modeling programs were used to simulate pumping well influence: EPA's Wellhead Protection Areas (WHPA), a semi-analytical model (International Groundwater Modeling Center, 1990) and Dream, an analytical groundwater flow model (B. Bonds and S. Rounds, 1990) as shown on Figures 7 and 8, respectively. The modeling assumed a 4-inch diameter recovery well would be installed near the southwest corner of the Unocal property. Parameters used to simulate well influence were:

Transmissivity (T)	2736 gallons per day/square foot (gpd/sq. ft)
Storativity (S)	0.036
Gradient/Flow Direction	0.001/southwest
Porosity	0.30
Pumping Rate (Q)	2 gpm
Duration of Pumping	180 days
Average aquifer thickness	6 feet

The simulated results generated by the two modeling programs illustrate similar areal extents of hydrologic control for a water bearing zone that is assumed to be homogenous, isotropic, and laterally continuous. However, boundary conditions may exist that could influence the actual radius of hydraulic control.

Distribution of Hydrocarbons

Vadose soil containing gasoline range hydrocarbons has been excavated from beneath the former gasoline USTs (approximately 13 feet bsg) to groundwater (approximately 18 to 20 feet bsg). Based on historical groundwater data and laboratory results, soil containing gasoline range hydrocarbons is limited to the groundwater fluctuation zone/capillary fringe adjacent to the western portion of the USTs.

Groundwater containing dissolved gasoline range hydrocarbons and BTEX has been delineated as shown on Figure 9 (according to the data from the fourth quarter, 1993 sampling event). Floating product has been observed in well U-1 near the USTs. The lateral distribution of dissolved gasoline range hydrocarbons extends from the onsite well U-1 to the offsite well U-6. The estimated hydrocarbon mass in groundwater is approximately 182 pounds. Well U-9 (furthest downgradient well) has in the past contained hydrocarbon concentrations on two sampling events. Due to the location of well U-9 there may be other potential sources of hydrocarbons in the area of this well other than Unocal. Potential secondary sources of hydrocarbons will be evaluated. When?

EVALUATION OF REMEDIAL ALTERNATIVES

The criteria used to evaluate potential remedial options for the site include relative effectiveness, time frame, and costs. The three remedial options evaluated include groundwater extraction and treatment system, groundwater extraction and treatment/vapor extraction systems, and in-situ bioremediation.

An air sparging system probably would not be very effective for this site and is not discussed as an alternative in the RAP because: 1) vadose soil does not contain residual hydrocarbons; 2) subsurface conditions (silt and silty clay above the saturated zone and a thin layer of sand within the saturated zone); and 3) existence of an offsite dissolved hydrocarbon plume. Because it might spread?

The goal of the proposed remedial option is to reduce existing hydrocarbon concentrations to the respective MCL's specified in Title 22 of the California Code of Regulations.

Groundwater Extraction and Treatment System

The groundwater extraction and treatment system would provide hydraulic control of the hydrocarbon plume while removing and treating hydrocarbon mass. Based on the aquifer pumping data and modeling, GSI recommends installing a 4 inch diameter recovery well near the southwestern corner of the Unocal property. By pumping at 2 gpm the theoretical radius of influence from this well would encompass the dissolved hydrocarbon plume.

The system would include a 4 inch recovery well, a 4 inch electric submersible pump, two one-thousand pound granular activated carbon vessels, floats, a control panel, particulate filters, subsurface piping and treatment enclosure. Groundwater would be pumped through two granular activated carbon vessels in series and discharged to the sanitary sewer. All above ground equipment would be housed in a portable treatment enclosure which would deter possible vandalism and satisfy double containment requirements.

Approval and/or permits would be required by East Bay Municipal Utilities District (EBMUD) for sanitary sewer discharge, San Lorenzo Building Department, San Lorenzo Fire Department, Alameda County Health Care Services Agency (ACHCSA), and California Regional Water Quality Control Board (CRWQCB).

One of the disadvantages to this approach is the remedial time frame which may require up to five years (pump approximately 15 pore-volumes or 5,256,000 gallons). Further, this approach may not remove all residual hydrocarbons within the groundwater fluctuation zone/capillary fringe. It is also the most expensive remedial system of the alternatives discussed.

Groundwater Extraction and Treatment/Vapor Extraction Systems

The groundwater pump and treat system in combination with vapor extraction system would consist of two separate systems. The groundwater extraction system will control the migration of the plume and will draw the water table down to expose the fluctuation zone/capillary fringe for vapor extraction. Based on the aquifer pumping data and modeling, the vapor extraction system may not be effective due to the limited drawdown of the groundwater table. The groundwater pump and treat system would be consistent with the groundwater pump and treat system described in the previous alternative system. The same approvals and/or permits apply to this alternative with the addition of the Bay Area Air Quality Management District (BAAQMD).

A one-day vapor extraction test (VET) would be performed to evaluate vapor concentration, flow rate, mass removal rates, effective radius of influence, as well as feasibility. Based on the VET data the location of the vapor extraction wells to effectively remediate the hydrocarbon impacted zones and the appropriate abatement device for the vapor extraction system (VES) would be determined. Possible abatement devices include vapor phase granular activated carbon vessels and/or an internal combustion engine (ICE).

The remedial time frame for this alternative is approximately two years. With the addition of the vapor extraction system the annual costs increase over the annual costs for solely implementing a groundwater pump and treat system. However, the overall project expense would decrease due to the reduced remedial time frame.

In-Situ Bioremediation

This remedial approach appears to be the least expensive and has the shortest remedial time frame of the three remedial alternatives. **Therefore, GSI recommends implementing in-situ bioremediation.** GSI would subcontract BioConverters Inc. to administer their biological culture, JFT-1. Bioconverters Inc. has several documented case studies involving in-situ bioremediation of soil and groundwater containing hydrocarbons. They currently have two remedial sites approved for in-situ field pilot test by CRWQCB. This option includes installing a groundwater monitoring well, performing a bioremediation field pilot test and, if applicable, applying bioremediation to the entire hydrocarbon impacted area.

The treatment of hydrocarbon impacted groundwater would be performed primarily in-situ and the treatment of hydrocarbon impacted soil would be performed entirely in-situ. **JFT-1, a bioculture manufactured by BioConverters Inc. would be injected, along with a tracer, into an upgradient well and smeared over the contaminated area by means of a gradient induced by pumping from a downgradient extraction well.** When the tracer appears in the downgradient extraction well, signifying the presence of JFT-1, groundwater extraction will stop, allowing JFT-1 to reduce hydrocarbon concentrations in the soil and groundwater. Periodic samples will be collected to evaluate the effectiveness of the bioremediation process.

Information supplied by BioConverters asserts that their biological culture JFT-1 is different from traditional bioremediation bacteria. **According to BioConverters' literature, their product converts hydrocarbons to harmless materials through an extracellular enzymatic process, rather than through the traditional digestive process.** BioConverters states this difference accelerates remediation. **JFT-1 cleaves long hydrocarbon chains in the middle and enables an oxygen or hydrogen atom to attach, thereby creating safe, stable by-products such as amino acids.** In comparison, traditional remedial bacteria begin by cleaving and consuming the terminal carbon, a prolonged process in comparison. BioConverters claims JFT-1's differences arise through their "intensive culturing process which involves a rapid heat pulse of temperatures up to 200 degrees fahrenheit in a short time frame; an increase to 12 pH, both maintained for 24 hours." This culturing process also allows their product to endure varying ranges in conditions such as temperature, pH and contaminant levels, which is another advantage over traditionally used bacteria, which typically require narrow ranges in temperature, pH, and other conditions within which they can survive and be productive.

PROPOSED IN-SITU BIOREMEDIATION FIELD PILOT TEST

One soil boring will be drilled using hollow-stem auger drilling equipment to an anticipated depth of 30 feet or until an aquitard is reached (see Figure 2 for boring location). Soil samples will be collected with a California Modified split-barrel sampler equipped with pre-cleaned stainless steel liners, and advanced ahead of the drill bit. Soil samples will be collected at five-foot intervals, at a minimum, and at significant lithologic changes. Samples will be collected for lithologic identification, field screening with a photoionization detector (PID), and possible laboratory analysis.

The boring will be logged by a GSI geologist using the Unified Soil Classification System (ASTM-D2488-84). Selected soil samples collected above the saturated zone will be analyzed for the presence of petroleum hydrocarbons. Additional samples may be selected for chemical analysis. Soil and groundwater samples collected from the exploratory boring and well will be analyzed at a California State-certified analytical laboratory for TPH-Gasoline according to EPA Method 8015 (Modified) and BTEX according to EPA Method 8020.

The monitoring well will be constructed using 2-inch-diameter Schedule 40 PVC casing. The well screen will extend a minimum of 5 feet above the equilibrated water-level. The annular sandpack will be placed from the total depth of the designed well and will extend to a minimum of 2-feet above the well screen. A minimum 1-foot bentonite seal, followed by a cement-grout seal to one-half foot below ground surface, will be placed above the sandpack. The well screen will be emplaced so that well design is compatible with subsurface geologic conditions. No well screen will be installed that could potentially permit cross contamination of adjacent aquifers.

Upon completion of the monitoring well installation, a bioremediation field pilot test will be conducted. The objective of the field pilot test is to evaluate the effectiveness of reducing hydrocarbon concentrations utilizing bioremediation. The field pilot test will simulate application of bioremediation to the entire hydrocarbon impacted area. During the field pilot test approximately 8,000 gallons of fluid containing JFT-1 will be trickled into the newly installed monitoring well through flexible tubing, fed by a gravity feed tank. At the same time, groundwater will be extracted from Well U-1, which will be located approximately 20 feet away and downgradient of the new well. The extracted groundwater will be retained in a 21,000 gallon Frac tank for treatment by JFT-1. Once treated the groundwater will be discharged to the sanitary sewer, under an EBMUD Discharge Permit. GSI anticipates extracting close to 17,000 gallons of groundwater at a flow rate of 2 gpm. The pumping portion of the bioremediation field pilot test should take one week and an additional 3-4 weeks will be required to evaluate hydrocarbon reduction.

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ALCO
HAZMAT
94 APR 22 PM 1:48

April 21, 1994

Alameda County Health Agency
Division of Hazardous Materials
Department of Environmental Health
80 Swan Way, Room 200
Oakland, California 94521

Juliet Shin

Attention: Ms. Pamela Evans

Reference: **UNOCAL Service Station No. 5760**
376 Lewelling Boulevard
San Lorenzo, California

Ms. Evans:

As requested by Ms. Tina Berry of the UNOCAL Corporation, we are forwarding a copy of the **Remedial Action Plan** dated April 21, 1994 for the above referenced location.

If you have questions or comments, please call.

GeoStrategies Inc. by,

Lisa L. Kelly
Staff Engineer

enclosure

cc: Ms. Tina Berry, UNOCAL Corporation

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The evaluation portion of the bioremediation field pilot test will require analytical testing of groundwater samples from Well U-1 and the newly installed monitoring well. Before pumping begins groundwater will be tested for TPH-G, BTEX and nitrogen, phosphate and potassium (NPK). When the tracer appears in Well U-1, the groundwater from both wells will be tested for NPK to confirm the presence of JFT-1. From that point in time, the groundwater will be tested for TPH-G, BTEX and NPK on a weekly basis for approximately 3-4 weeks. All samples will be submitted under Chain-of-Custody Documentation to a State-certified hazardous waste testing laboratory on a one-week turnaround.

How will you know tracer appears?

Approval and/or a permit will be required from EBMUD, the ACHCSA and the CRWQCB.

Upon completion of the bioremediation field pilot test a report documenting procedures, methodology, results and recommendations will be prepared and submitted to Unocal. These recommendations will include whether to implement in-situ bioremediation of the entire hydrocarbon impacted area or to consider other remedial alternatives.

Time Schedule

Upon gaining approval to perform the conceptual in-situ bioremediation field pilot study for treatment of hydrocarbon impacted soil and groundwater from CRWQCB and ACHCSA, the necessary permit application will be submitted to EBMUD. We anticipate two to four weeks to obtain the EBMUD Discharge Permit.

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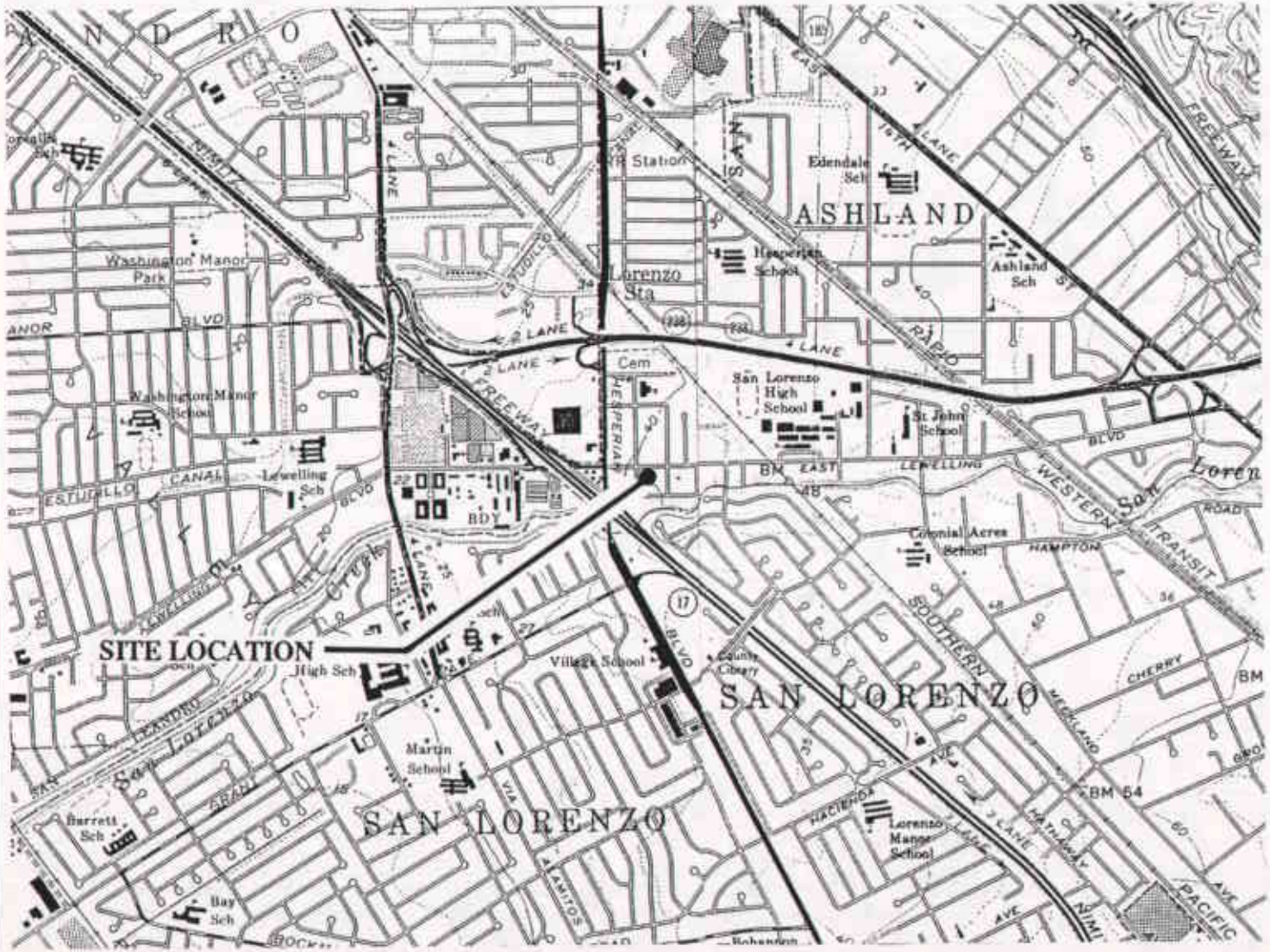

Base Map: USGS Topographic Map

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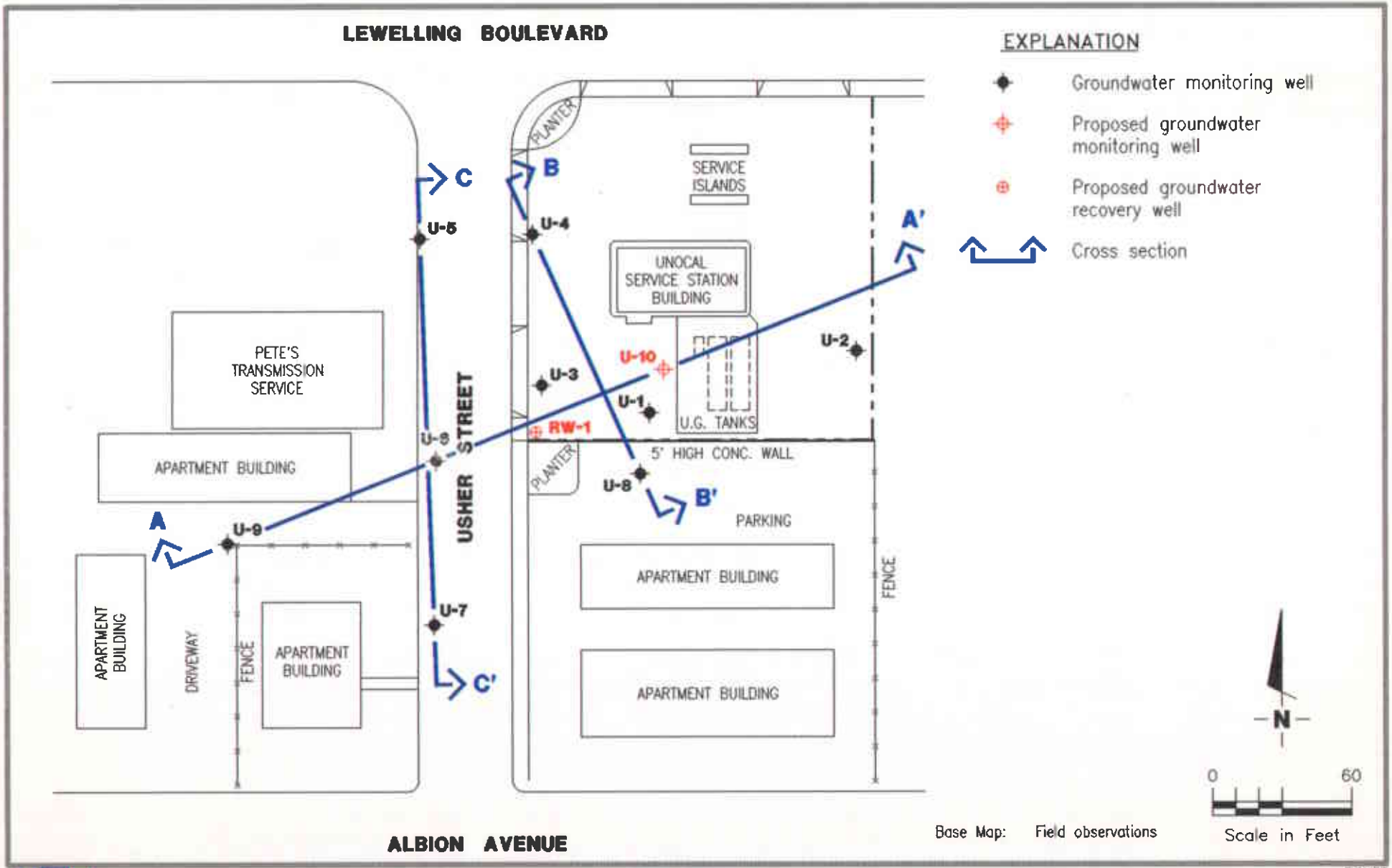
VICINITY MAP
UNOCAL Service Station #5760
376 Lewelling Boulevard
San Lorenzo, California

FIGURE
1

JOB NUMBER	REVIEWED BY	DATE	REVISED DATE
7809		2/91	



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SITE PLAN
UNOCAL Service Station #5760
376 Lewelling Boulevard
San Lorenzo, California

FIGURE 2

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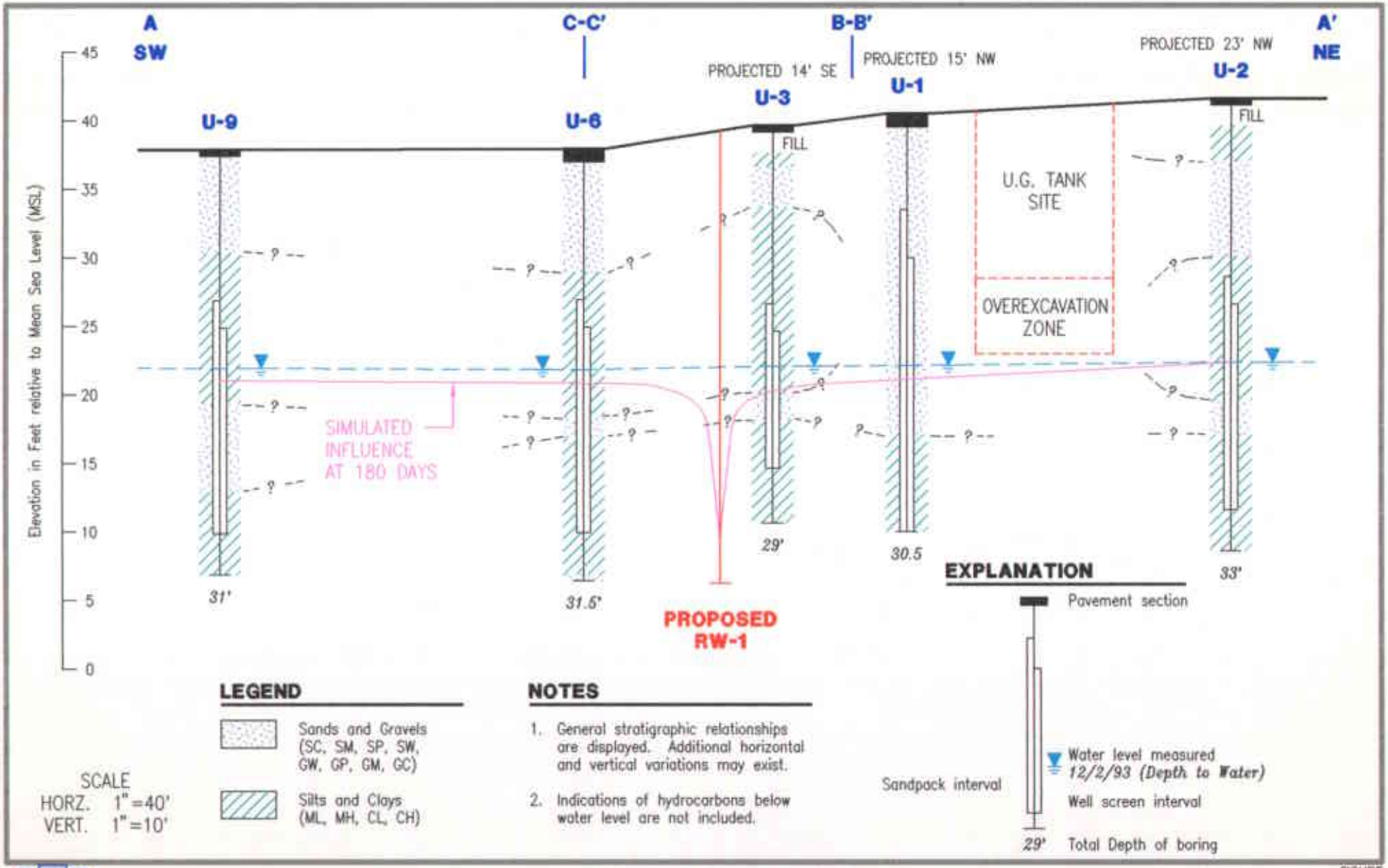
7809		4/94	



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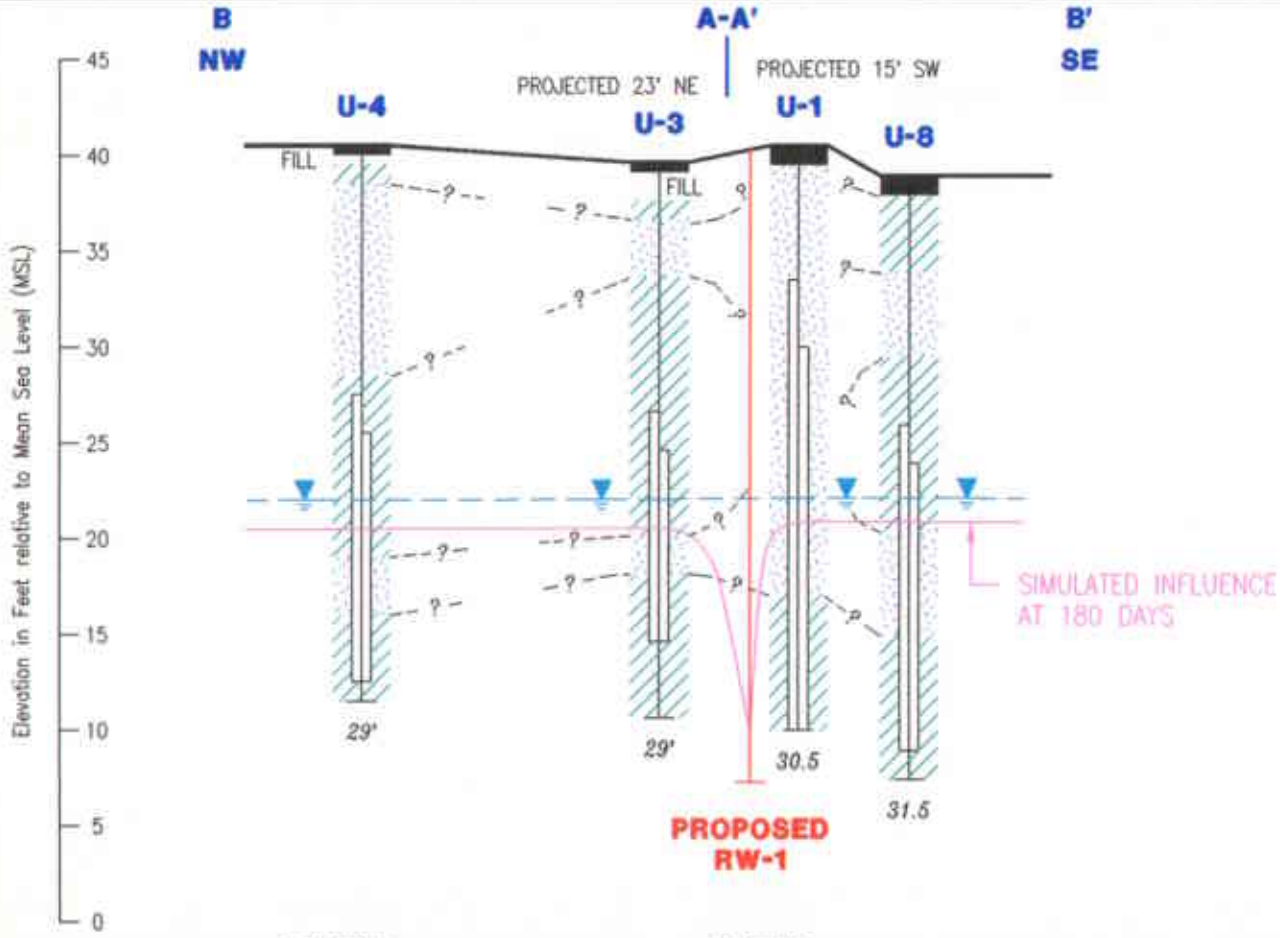
CROSS SECTION A–A'
UNOCAL Service Station #5760
376 Lewelling Boulevard
San Lorenzo, California

FIGURE
3

JOB NUMBER	REVIEWED BY	DATE	REVISED DATE
789010-19		4/94	



LEGEND

Sands and Gravels (SC, SM, SP, SW, GW, GP, GM, GC)

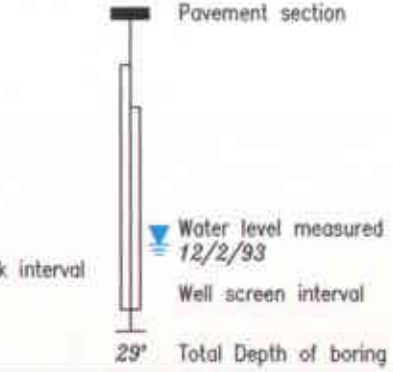
Silts and Clays (ML, MH, CL, CH)

SCALE
HORZ. 1"=40'
VERT. 1"=10'

NOTES

1. General stratigraphic relationships are displayed. Additional horizontal and vertical variations may exist.
2. Indications of hydrocarbons below water level are not included.

EXPLANATION



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CROSS SECTION B-B'
UNOCAL Service Station #5760
376 Lewelling Boulevard
San Lorenzo, California

FIGURE
4

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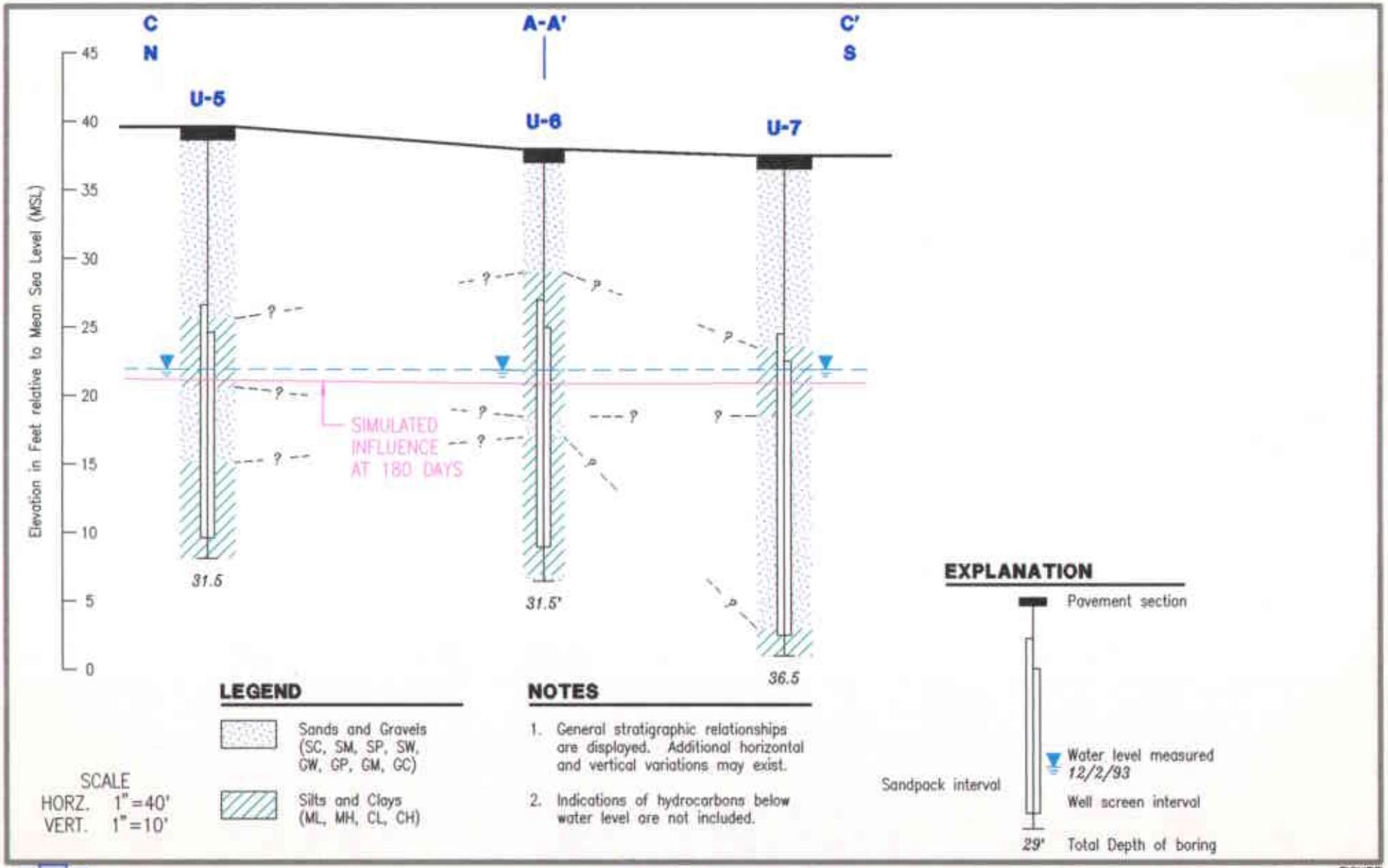

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CROSS SECTION C–C'
UNOCAL Service Station #5760
376 Lewelling Boulevard
San Lorenzo, California

FIGURE 5

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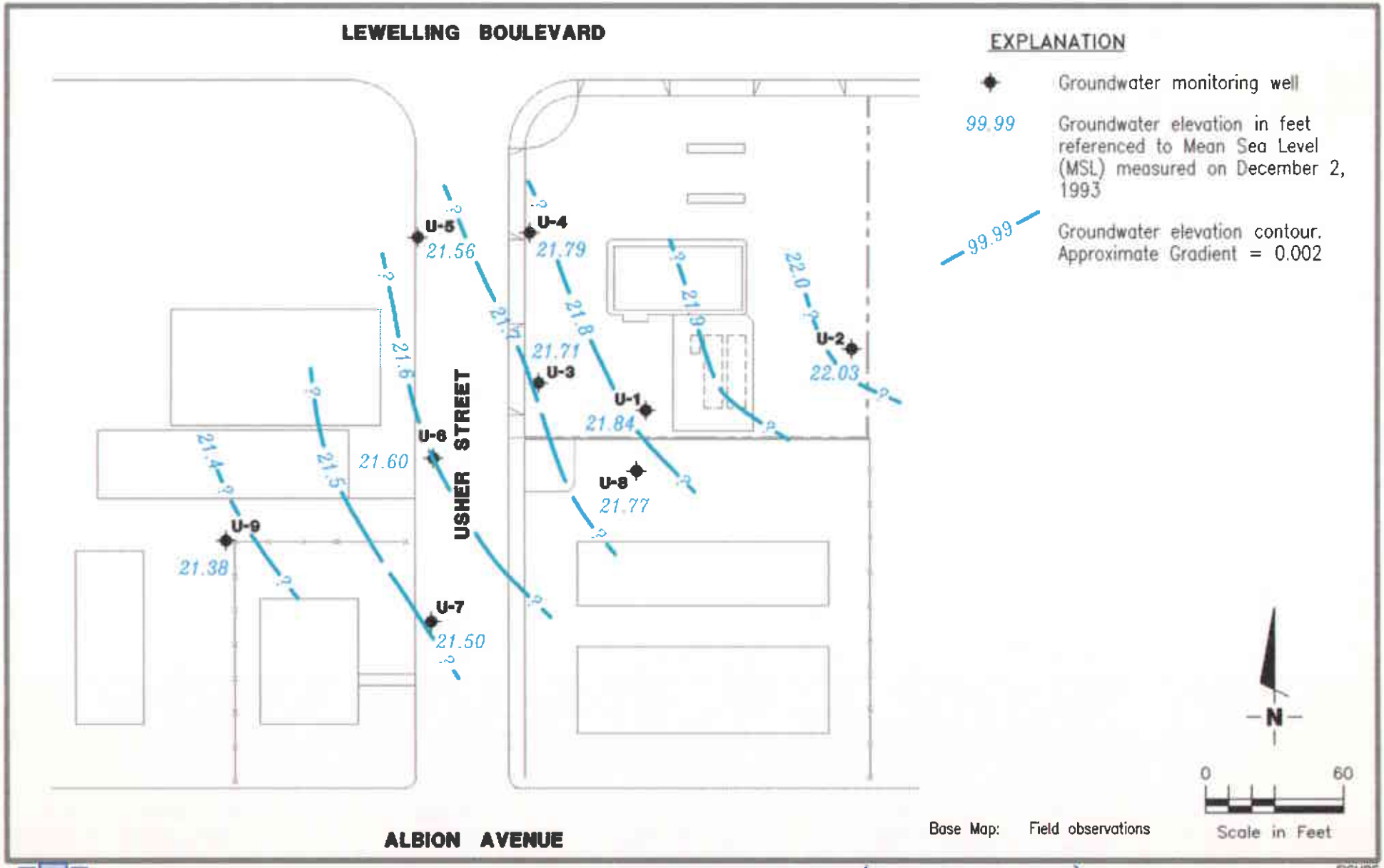

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POTENTIOMETRIC MAP (December 2, 1993)
UNOCAL Service Station #5760
376 Lewelling Boulevard
San Lorenzo, California

FIGURE 6

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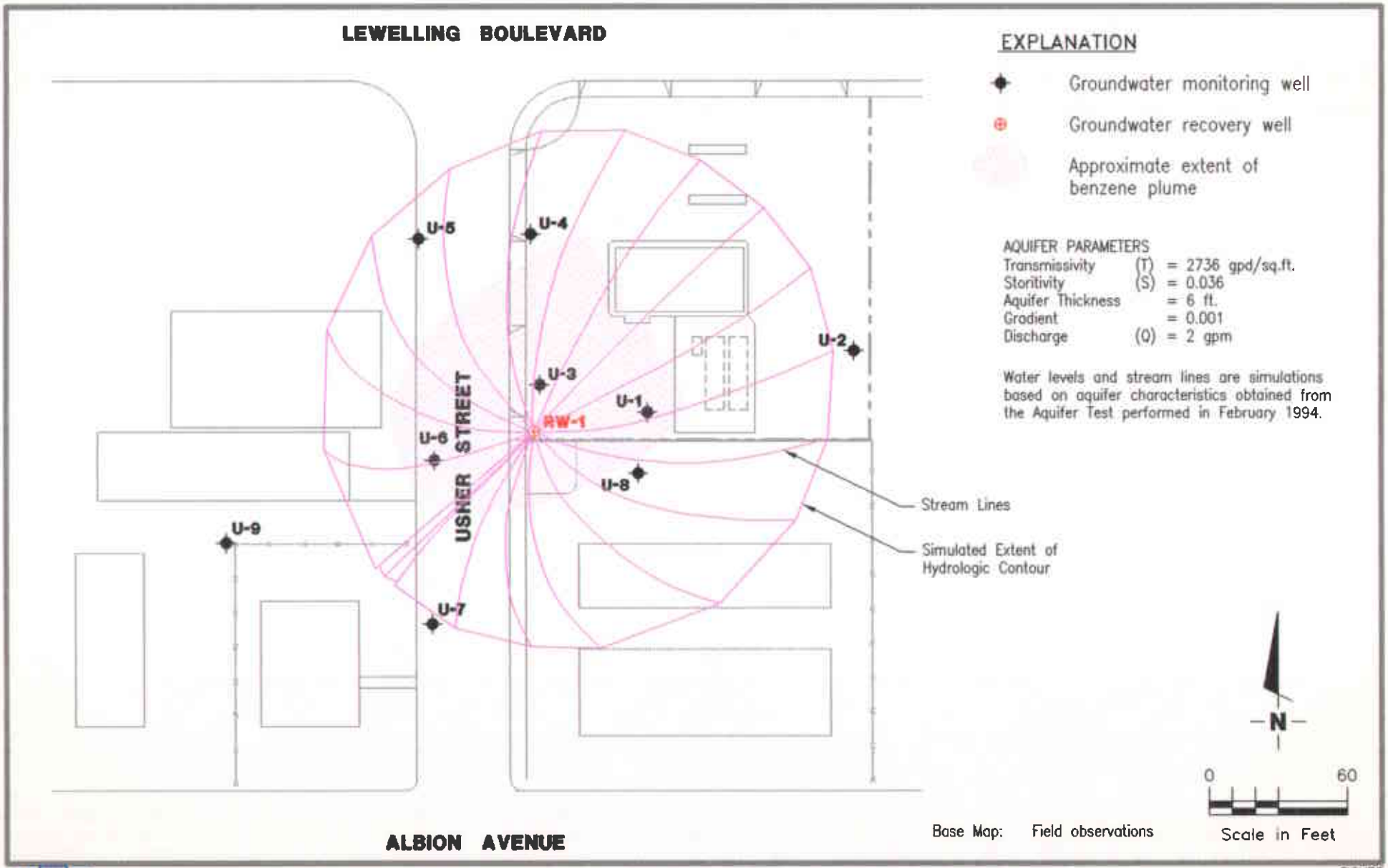

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SIMULATED WELL INFLUENCE – 180 DAYS
UNOCAL Service Station #5760
376 Lewelling Boulevard
San Lorenzo, California

FIGURE 7

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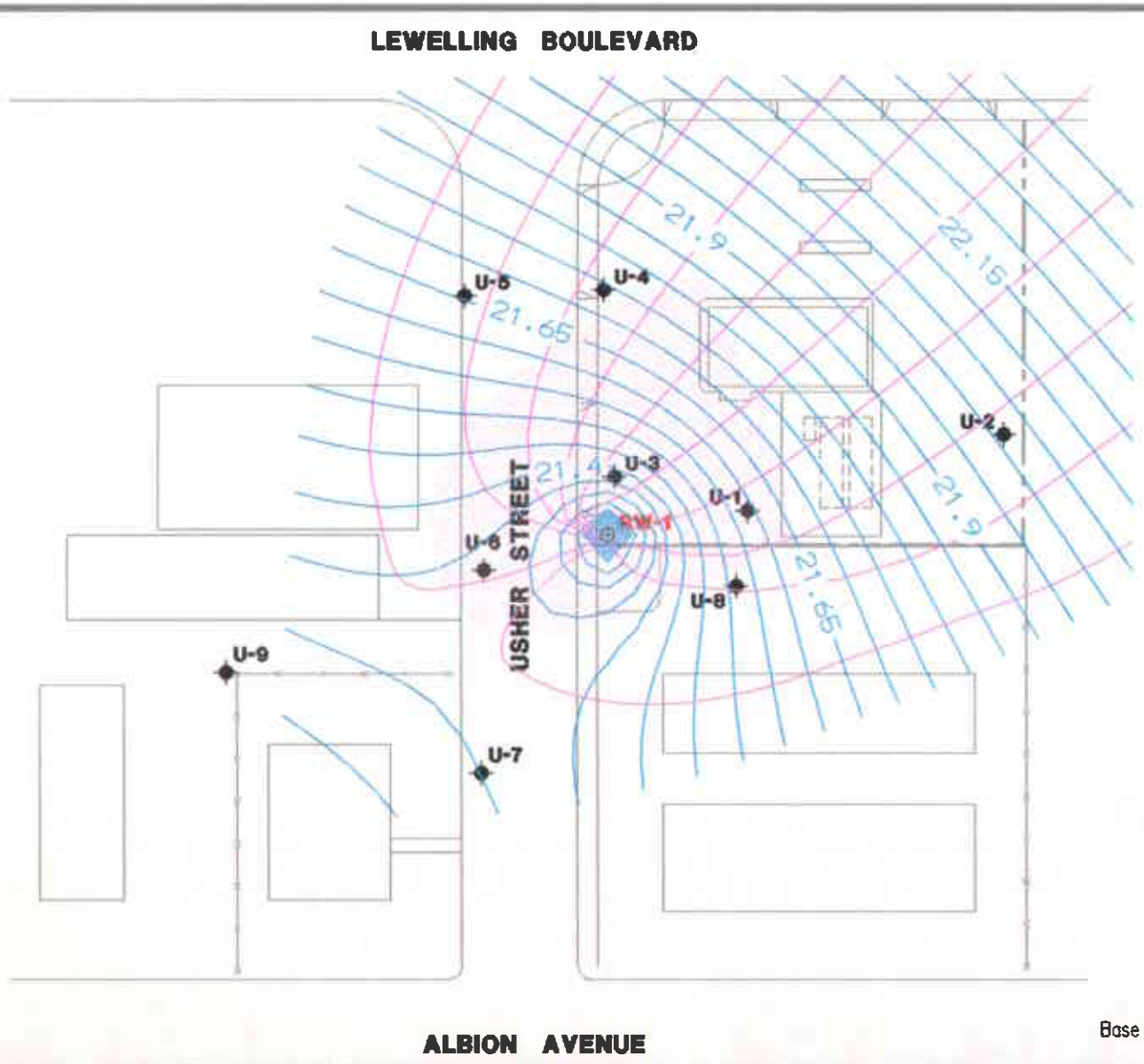

EXPLANATION

- Groundwater monitoring well
- Groundwater recovery well
- Approximate extent of benzene plume
- Simulated stream line
- Simulated water level contour, referenced to Mean Sea Level (MSL), after pumping Well RW-1 for 180 days at 2 gpm

AQUIFER PARAMETERS

Transmissivity	(T)	= 2736 gpd/sq.ft.
Storitivity	(S)	= 0.036
Aquifer Thickness		= 6 ft.
Gradient		= 0.001
Discharge	(Q)	= 2 gpm

Water levels and stream lines are simulations based on aquifer characteristics obtained from the Aquifer Test performed in February 1994.

N

0 60

Scale in Feet

Base Map: Field observations

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SIMULATED WELL INFLUENCE - 180 DAYS
UNOCAL Service Station #5760
376 Lewelling Boulevard
San Lorenzo, California

FIGURE 8

JOB NUMBER	REVIEWED BY	DATE	REVISED DATE
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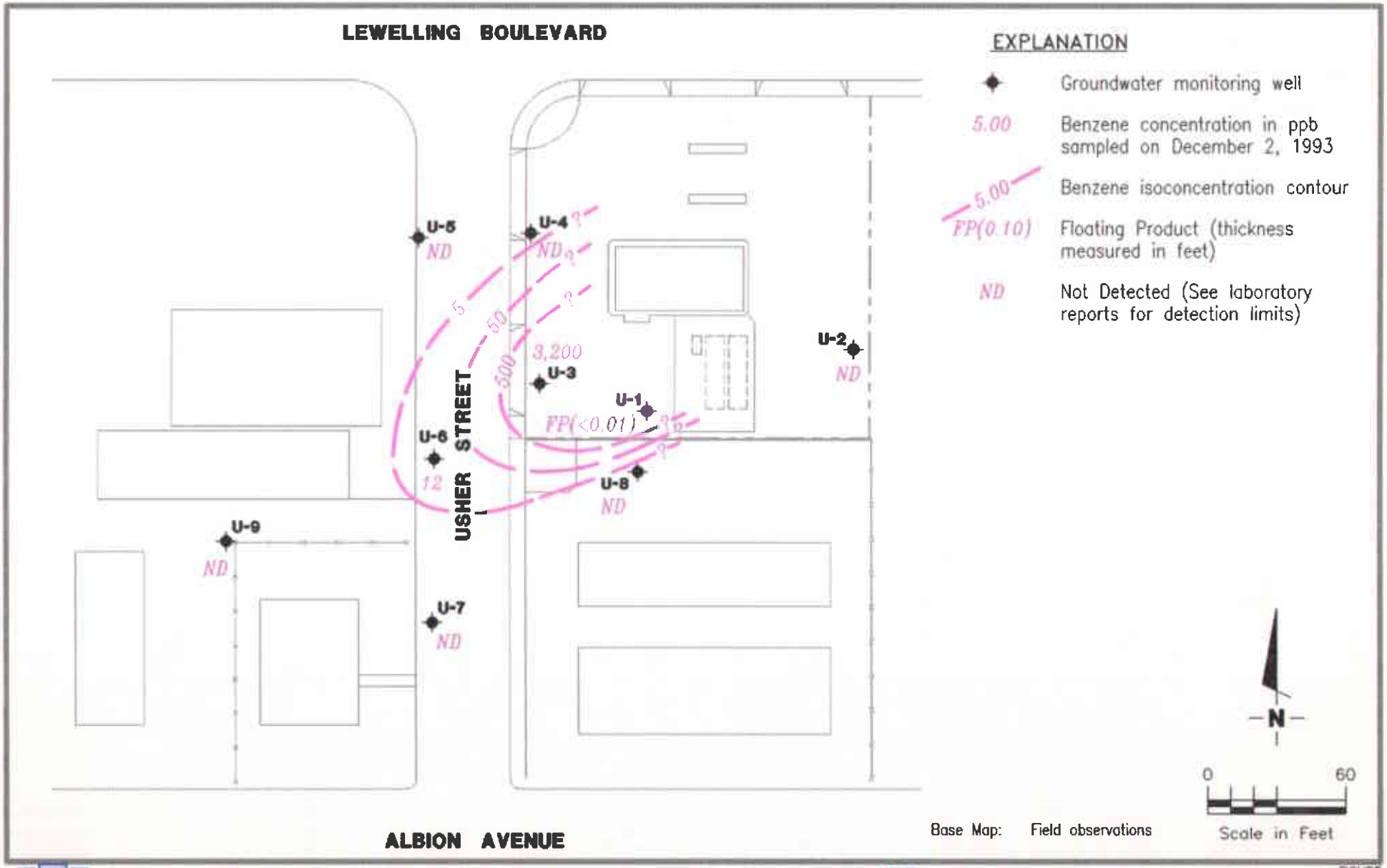

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BENZENE ISOCONCENTRATION MAP
UNOCAL Service Station #5760
376 Lewelling Boulevard
San Lorenzo, California

FIGURE 9

JOB NUMBER	REVIEWED BY	DATE	REVISED DATE
780910-19		4/94	

TABLE 1
HISTORICAL GROUNDWATER QUALITY DATABASE
UNOCAL Service Station No. 5760
376 Lewelling Boulevard
San Lorenzo, California

SAMPLE DATE	SAMPLE POINT	DEPTH TO WATER (FT)	TPH-G (PPB)	BENZENE (PPB)	TOLUENE (PPB)	ETHYLBENZENE (PPB)	XYLENES (PPB)
09-Feb-88	U-1	NM	93000	3600.	11000.	---	20000.
20-Mar-90	U-1	19.72	36000	2100.	5500.	1900.	9300.
05-Jun-90	U-1	NM	46000	2300.	5500.	2500.	11000.
24-Aug-90	U-1	20.76	27000	1200.	1800.	1400.	5500.
05-Dec-90	U-1	21.61	Floating Product 0.10 ft				
04-Mar-91	U-1	20.05	Floating Product 0.05 ft				
03-Jun-91	U-1	18.76	Floating Product 0.06 ft				
19-Sep-91	U-1	19.74	Floating Product 0.04 ft				
04-Dec-91	U-1	20.35	Floating Product 0.36 ft				
05-Mar-92	U-1	18.22	Floating Product 0.02 ft				
07-Apr-92	U-1	PS	PS				
06-Aug-92	U-1	19.04	Floating Product 0.01 ft				
20-Nov-92	U-1	20.29	Floating Product 0.02 ft				
12-Feb-93	U-1	17.09	70000	2200	8400	3100	18000
04-Jun-93	U-1	16.72	35000	1300	5700	900	9200
09-Sep-93	U-1	17.77	67000	2900	18000	6200	32000
02-Dec-93	U-1	18.36	Product Sheen				
23-Aug-90	U-2	21.66	<50.	<0.5	<0.5	<0.5	<0.5
05-Dec-90	U-2	22.52	<50	<0.3	<0.3	<0.3	<0.3
04-Mar-91	U-2	21.04	<50.	<0.5	0.9	<0.5	2.6
03-Jun-91	U-2	19.60	<30	<0.30	<0.30	<0.30	<0.30
19-Sep-91	U-2	20.82	<30	<0.30	<0.30	<0.30	<0.30
04-Dec-91	U-2	21.35	<30	<0.30	<0.30	<0.30	<0.30
05-Mar-92	U-2	19.15	<30	<0.30	0.36	<0.30	<0.30
07-Apr-92	U-2	18.73	<50	<0.5	<0.5	<0.5	<0.5
06-Aug-92	U-2	19.90	<50	<0.5	<0.5	<0.5	<0.5
20-Nov-92	U-2	21.17	<50	<0.5	<0.5	<0.5	<0.5
12-Feb-93	U-2	18.00	<50	<0.5	<0.5	<0.5	<0.5
04-Jun-93	U-2	17.59	<50	<0.5	<0.5	<0.5	<0.5
09-Sep-93	U-2	18.68	<50	<0.5	<0.5	<0.5	<0.5
02-Dec-93	U-2	19.23	<50	<0.5	<0.5	<0.5	<0.5
23-Aug-90	U-3	20.01	110000.	4400.	13000.	2800.	17000.
05-Dec-90	U-3	20.82	69000	1900	3500	1600	9800

TABLE 1
HISTORICAL GROUNDWATER QUALITY DATABASE
UNOCAL Service Station No. 5760
376 Lewelling Boulevard
San Lorenzo, California

SAMPLE DATE	SAMPLE POINT	DEPTH TO WATER (FT)	TPH-G (PPB)	BENZENE (PPB)	TOLUENE (PPB)	ETHYLBENZENE (PPB)	XYLENES (PPB)
18-Jan-91	U-3	NM	51000.	1700.	3100.	1500.	7500.
04-Mar-91	U-3	19.25	84000.	1400.	10000.	2900.	17000.
03-Jun-91	U-3	17.98	130000	5800	19000	4600	24000
19-Sep-91	U-3	19.15	61000	3300	9700	2800	15000
04-Dec-91	U-3	19.66	75000	2500	6100	1900	11000
05-Mar-92	U-3	17.48	160000	5300	15000	5400	26000
07-Apr-92	U-3	17.18	97000	6100	16000	5400	28000
06-Aug-92	U-3	18.28	140,000	5,100	13,000	5,000	23,000
20-Nov-92	U-3	19.48	50,000	3,200	4,700	1,900	10,000
12-Feb-93	U-3	16.34	80,000	3,700	9,400	3,700	18,000
04-Jun-93	U-3	15.48	92,000	2,900	8,700	4,300	20,000
09-Sep-93	U-3	17.04	110,000	2,800	10,000	6,500	31,000
02-Dec-93	U-3	17.55	110,000	3,200	7,700	5,600	26,000
23-Aug-90	U-4	20.83	<50.	<0.5	1.0	<0.5	1.8
05-Dec-90	U-4	21.63	<50	<0.3	<0.3	<0.3	<0.3
18-Jan-91	U-4	NM	<50.	<0.5	<0.5	<0.5	<0.5
04-Mar-91	U-4	20.20	<50.	<0.5	<0.5	<0.5	<0.5
03-Jun-91	U-4	18.82	<30	<0.30	<0.30	<0.30	<0.30
19-Sep-91	U-4	20.0	<30	<0.30	<0.30	<0.30	<0.30
04-Dec-91	U-4	20.5	<30	<0.30	<0.30	<0.30	<0.30
05-Mar-92	U-4	18.4	<30	<0.30	<0.30	<0.30	<0.30
07-Apr-92	U-4	17.96	<50	<0.5	<0.5	<0.5	<0.5
06-Aug-92	U-4	19.10	<50	<0.5	<0.5	<0.5	<0.5
20-Nov-92	U-4	20.31	<50	<0.5	2.5	<0.5	<0.5
12-Feb-93	U-4	17.21	<50	<0.5	<0.5	<0.5	<0.5
04-Jun-93	U-4	16.73	<50	<0.5	<0.5	<0.5	<0.5
09-Sep-93	U-4	16.89	<50	<0.5	<0.5	<0.5	<0.5
02-Dec-93	U-4	18.46	<50	<0.5	<0.5	<0.5	<0.5
07-Apr-92	U-5	17.16	<50	<0.5	<0.5	<0.5	<0.5
06-Aug-92	U-5	18.31	<50	<0.5	<0.5	<0.5	<0.5
20-Nov-92	U-5	19.46	<50	<0.5	<0.5	<0.5	<0.5
12-Feb-93	U-5	16.54	<50	<0.5	<0.5	<0.5	<0.5
04-Jun-93	U-5	16.05	<50	<0.5	<0.5	<0.5	<0.5

TABLE 1
HISTORICAL GROUNDWATER QUALITY DATABASE
UNOCAL Service Station No. 5760
376 Lewelling Boulevard
San Lorenzo, California

SAMPLE DATE	SAMPLE POINT	DEPTH TO WATER (FT)	TPH-G (PPB)	BENZENE (PPB)	TOLUENE (PPB)	ETHYLBENZENE (PPB)	XYLENES (PPB)
09-Sep-93	U-5	16.90	<50	<0.5	<0.5	<0.5	<0.5
02-Dec-93	U-5	17.66	<50	<0.5	<0.5	<0.5	<0.5
07-Apr-92	U-6	15.47	6600	90	<0.5	820	1200
06-Aug-92	U-6	16.71	9200	160	<0.5	360	150
20-Nov-92	U-6	NM	NA	NA	NA	NA	NA
12-Feb-93	U-6	14.75	2600	27	<0.5	120	51
04-Jun-93	U-6	14.45	13,000	100	38	450	320
09-Sep-93	U-6	15.56	6300++	29	<5	120	34
02-Dec-93	U-6	16.08	2,100	12	1.6	21	1.1
07-Apr-92	U-7	15.12	<50	<0.5	<0.5	<0.5	<0.5
06-Aug-92	U-7	16.34	<50	<0.5	<0.5	<0.5	<0.5
20-Nov-92	U-7	17.54	<50	<0.5	<0.5	<0.5	<0.5
12-Feb-93	U-7	14.37	<50	<0.5	<0.5	<0.5	<0.5
04-Jun-93	U-7	14.17	<50	<0.5	<0.5	<0.5	<0.5
09-Sep-93	U-7	15.23	<50	<0.5	<0.5	<0.5	<0.5
02-Dec-93	U-7	15.61	<50	<0.5	<0.5	<0.5	<0.5
07-Apr-92	U-8	16.37	<50	<0.5	<0.5	<0.5	<0.5
06-Aug-92	U-8	17.53	<50	<0.5	<0.5	<0.5	<0.5
20-Nov-92	U-8	18.74	<50	<0.5	<0.5	<0.5	<0.5
12-Feb-93	U-8	15.60	<50	<0.5	<0.5	<0.5	<0.5
04-Jun-93	U-8	15.26	<50	<0.5	<0.5	<0.5	<0.5
09-Sep-93	U-8	16.38	<50	<0.5	<0.5	<0.5	<0.5
02-Dec-93	U-8	16.80	<50	<0.5	<0.5	<0.5	<0.5
04-Jun-93	U-9	14.67	2100+	<2.5	<2.5	<2.5	<2.5
09-Sep-93	U-9	15.79	1200+	<1.0	<1.0	<1.0	<1.0
02-Dec-93	U-9	15.93	<50	<0.5	<0.5	<0.5	<0.5

TPH-G = Total Petroleum Hydrocarbons calculated as Gasoline
PPB = Parts Per Billion
NA = Not Accessible
NM = Not Measured
PS = Product Skimmer installed in well

\+ = The concentration reported as gasoline is primarily due to the presence of a discrete hydrocarbon peak not indicative of standard gasoline.

++ = The concentration reported as gasoline for sample U-6 is primarily due to the presence of a combination of gasoline and a discrete peak not indicative of gasoline.

TABLE 1
HISTORICAL GROUNDWATER QUALITY DATABASE
UNOCAL Service Station No. 5760
376 Lewelling Boulevard
San Lorenzo, California

Notes:
1. All data shown as <x are reported as ND (none detected).
2. Ethylbenzene and xylenes were combined prior to March 1990.
3. Laboratory values are reported in units of ug/L, which generally are synonymous with parts per billion (ppb).

TABLE 2
HISTORICAL SOIL ANALYTICAL DATA
UNOCAL Service Station No. 5760
376 Lewelling Boulevard
San Lorenzo, California

SAMPLE I.D.	SAMPLE DEPTH	SAMPLE DATE	ANALYZED DATE	TPH-G (PPM)	TPH (PPM)	BENZENE (PPM)	TOLUENE (PPM)	ETHYLBENZENE (PPM)	XYLENES (PPM)
1	19	19-Nov-87	19-Nov-87	12.7[2]	NA	NA	NA	NA	NA
2	20	19-Nov-87	19-Nov-87	838[2]	NA	NA	NA	NA	NA
3	18	19-Nov-87	19-Nov-87	51.7[2]	NA	NA	NA	NA	NA
4	20	19-Nov-87	19-Nov-87	1620[2]	NA	NA	NA	NA	NA
WO1	7	19-Nov-87	19-Nov-87	NA	<1.0	<.01	<.01	<.05	<.01
U-2-15	15	06-Aug-90	16-Aug-90	<1	NA	<0.005	<0.005	<0.005	0.006
U-2-20	20	06-Aug-90	16-Aug-90	<1	NA	<0.005	<0.005	<0.005	0.006
U-3-15	15	06-Aug-90	16-Aug-90	2.9	NA	<0.005	<0.005	0.29	<0.005
U-3-20	20	06-Aug-90	16-Aug-90	640	NA	4.5	37	22	110
U-3-29	29	06-Aug-90	16-Aug-90	<1	NA	<0.005	0.017	0.009	0.045
U-4-15	15	06-Aug-90	16-Aug-90	<1	NA	<0.005	<0.005	<0.005	<0.005
U-4-20	20	06-Aug-90	16-Aug-90	<1	NA	<0.005	<0.005	<0.005	<0.005
U-5-16.5	16.5	12-Mar-92	16-Mar-92	<1	NA	<0.005	<0.005	<0.005	<0.005
U-6-16.5	16.5	13-Mar-92	13-Mar-92	<1	NA	<0.005	<0.005	<0.005	<0.005
U-7-16.0	16.0	13-Mar-92	16-Mar-92	<1	NA	<0.005	<0.005	<0.005	<0.005
U-8-16.5	16.5	12-Mar-92	16-Mar-92	<1	NA	<0.005	<0.005	<0.005	<0.005
U-9-4.5	4.5	25-May-93	28-May-93	<.50	NA	<.0050	<.0050	<.0050	<.0050
U-9-11.5	11.5	25-May-93	28-May-93	<.50	NA	<.0050	<.0050	<.0050	<.0050

TABLE 2
HISTORICAL SOIL ANALYTICAL DATA
UNOCAL Service Station No. 5760
376 Lewelling Boulevard
San Lorenzo, California

TPH = Total Petroleum Hydrocarbons (by EPA Method 418.1)
TPH-G = Total Petroleum Hydrocarbons calculated as Gasoline.
PPM = Parts Per Million.

Notes:

1. All data shown as <x are reported as ND (none detected).
2. The laboratory report for these samples indicated the analytical method as Modified EPA Method 8015.
3. Soil samples for Boring U-1 were not analyzed for chemical constituents.

Table 1
AQUIFER PARAMETERS
UNOCAL Service Station No. 5760
376 Lewelling Boulevard
San Lorenzo, California

Monitoring Well	Transmissivity (Jacobs) (gpd/ft)	Storativity (Jacobs)	Transmissivity (Neuman) (gpd/ft)	Storativity (Neuman)	Hydraulic Conductivity (gpd/ft^2)
U-2	5077	0.036	5013	0.012	334.2
U-3	2736	0.036	2631	0.034	175.4
U-7	7437	0.014	7081	0.014	472.1
U-8	6140	0.02	5249	0.035	350.0

Note: 1. Well U-1 pumped at Q = 2 gpm for t = 1440 minutes.
2. gpd/ft = gallons per day per foot.
3. gpd/ft^2 = gallons per day per square foot.

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