KAPREALIAN ENGINEERING
INCORPORATED

KEI-P89-0805.R10
May 18, 1993

Unocal Corporation
2000 Crow Canyon Place, Suite 400
P.O. Box 5155
San Ramon, California 94583

Attention: Mr. Ed Ralston

RE: Pilot Vapor Extraction Test Report
Unocal Service Station #0746
3943 Broadway
Oakland, California

Dear Mr. Ralston:

This report presents the results of a pilot vapor extraction test, per Kaprealian Engineering, Inc's. (KEI) revised work plan/proposal (KEI-P89-0805.P7R) dated February 15, 1993. The purpose of the test was to determine the feasibility of vapor extraction as a remedial technique for the subject site. This report covers the work performed by KEI from February through April of 1993. The scope of work performed by KEI consisted of the following:

Coordination with regulatory agencies

Completion of a pilot vapor extraction test

Air bag sampling

Laboratory analyses

Data analysis, interpretation, and report preparation

The vapor extraction test well (designated as recovery well RW1) was installed on June 25, 1992. The recovery well was drilled and completed to a total depth of 17.5 feet below grade. Ground water was not encountered during drilling. The subsurface materials penetrated and details of the construction of the wells are described in the attached Boring Log and Well Completion Diagram, respectively, which are included in Appendix A.

A site description, detailed background information including a summary of the soil and ground water subsurface investigation/remediation work conducted to date, site hydrogeologic conditions, and tables that summarize all of the soil and ground water sample analytical results are presented in KEI's report (KEI-P89-0805.R9) dated September 25, 1992.

2401 Stanwell Drive, Suite 400
Concord, California 94520
Tel: 510.602.5100 Fax: 510.687.0602

RECENT FIELD ACTIVITIES - PILOT VAPOR EXTRACTION TEST

The pilot vapor extraction test was originally scheduled to begin on April 12, 1993 and end on April 16, 1993. However, due to difficulties encountered in the field, continuous operation of the test equipment was not possible. The longest continuous time of operation occurred on April 14, 1993, when the vapor extraction test equipment operated for approximately seven hours prior to shut down.

The test was performed using well RW1 as the vapor extraction test well. The test system consisted of a vapor extraction well head attached to RW1, two-inch diameter flexible tubing, an internal combustion engine (ICE), and a propane tank. A diagram of the pilot test system is shown on the attached Figure 2.

The ICE, which is capable of applying a vacuum of up to 16 inches of mercury (Hg") or 218 inches of water, was used to apply the vacuum to well RW1 during the test. Hydrocarbon emissions were abated by ducting the extracted vapors through the ICE and associated catalytic converters.

The pilot vapor extraction test was first started on April 12, 1993, at approximately 6:45 p.m. After the first hour of the test, ground water began to flow from the test well RW1 as a result of applying the vacuum. This extraction of ground water appears to have been caused by the high water table and the gradual development of a relatively large vacuum in the predominantly clayey, low permeability soils. The applied vacuum at the test well was subsequently reduced, greatly reducing the amount of ground water being extracted, and allowing the test to proceed.

The test was briefly stopped the following morning (April 13, 1993), at approximately 7:30 a.m., in order to add an external moisture separator to the vapor extraction test system. The separator was installed between the test well and the ICE and the test was re-started at 9:00 a.m. Approximately thirteen minutes later, the test was again stopped due to the large amount of ground water extracted from RW1. After the external moisture separator and the ICE moisture filter were both purged of the collected water, the test was again re-started at 11:25 a.m. After approximately four hours of system operation, an excessive amount of ground water had collected in the ICE moisture filter causing the system to again shut down. Due to the sporadic operation of the vapor extraction test equipment during the first two days of the test, the data collected from this time period were disregarded. The external moisture separator and the ICE moisture filter were both purged and allowed to dry so that the test could be started again the following morning.

The test was re-started on April 14, 1993, at 8:00 a.m. After seven continuous hours of operation, the ICE again failed due to the excessive amount of water that had accumulated in the ICE moisture filter as a result of ground water extraction. The scheduled remainder of the test was canceled.

Water samples were collected from well RW1 on April 12, 1993, prior to the vapor extraction test, and on April 14, 1993, upon completion of vapor extraction activities. Prior to sampling, well RW1 was monitored and purged of 20 gallons of water by the use of a surface pump. No free product was noted. The samples were collected by the use of a clean teflon bailer. The samples were decanted into clean VOA vials that were then sealed with teflon-lined screw caps and stored in a cooler, on ice, until delivery to a state-certified laboratory.

Wells MW3, MW4, MW5, MW7 and MW9 were used as observation wells. Radial distances from the test well, RW1, to the five observation wells ranged from approximately 15 to 84 feet. The five observation wells are generally screened between 5 and 22.5 feet below grade, with pre-test unsaturated screen lengths ranging from approximately 3.18 to 4.41 feet. In order to determine the extent and effective influence of the applied vacuum, differential pressures at each observation well were measured by the use of specially fitted well caps and magnehelic gauges. The magnehelic gauges are capable of measuring pressure changes to an accuracy of 0.02 inches of water. Prior to beginning the test, vacuum influence measurements were taken at all of the observation wells in order to establish a base line for comparison of measurements taken during the test.

The applied vacuum, extraction air flow rate, and vacuum influence measurements were taken during the seven hours of continuous operation only (April 14, 1993). Measurements were taken four times during the first hour of the test, twice during the second hour, and on an hourly basis for the remainder of the test. All other data collected were disregarded due to the sporadic nature of system operation.

Influent and effluent air samples were collected in Tedlar bags by the use of a vacuum pump in order to determine the concentrations of constituents in the extracted air stream and to monitor the destruction efficiency of the abatement system. Air samples INF-1 and INF-2 were collected from the extracted air stream of RW1 during the first two days of operation (the field data for which was later disregarded). Air sample INF-3 was collected from the extracted air stream during the pilot vapor extraction test on April 14, 1993. In order to ensure compliance with local air quality standards, air samples EFF-1 and EFF-2 were collected from the extracted air stream of the abatement equipment.

VAPOR EXTRACTION TEST RESULTS

The total duration of the pilot vapor extraction test on April 14, 1993, was 7 hours, with an applied vacuum on well RW1 ranging from approximately 4.6 to 48 inches of water. The vacuum was measured to be 4.6 inches of water immediately after system start-up. The vacuum stabilized between 38.5 and 48 inches of water after the first 0.08 hours of the test. The extraction flow rate ranged from 26.6 to 34.9 cubic feet per minute (CFM). The applied vacuum and extraction flow rates from RW1 are plotted versus time on the attached Figure 3. Field measurements of the applied vacuum and extraction flow rates are included in Appendix A.

Vacuum influence was measured in the observation wells immediately after system start-up. Measurements indicated an influence of 0.05 inches of water for MW3, 0.83 inches of water for MW4, 0.60 inches of water for MW5, and 0.02 inches of water for MW7 after 0.25 hours of applying the vacuum at RW1. Vacuum influence measurements for MW3 stabilized after the first 0.25 hours, remained relatively constant at approximately 0.41 inches of water for the first two hours, and then declined to near zero levels of influence for the remainder of the test. Vacuum influence measurements ranged from 0.71 to 1.31 inches of water for MW4, from 0.82 to 1.94 inches of water for MW5, and from 0.0 to 0.03 inches of water for MW7 (except for one pressure reading of 0.08 inches of water). Well MW9, located 83 feet away from RW1, showed no vacuum influence throughout the test. Vacuum influence data for all of the observation wells are plotted versus time on the attached Figure 4. Field measurements of vacuum influence for all of the observation wells are included in Appendix A.

The ground water samples collected from RW1 were analyzed at Sequoia Analytical Laboratory and were accompanied by properly executed Chain of Custody documentation. The samples were analyzed for total petroleum hydrocarbons (TPH) as gasoline by EPA method 5030/modified 8015, and benzene, toluene, xylenes, and ethylbenzene (BTX&E) by EPA Method 8020.

Air samples were analyzed at Sequoia Analytical Laboratory and were accompanied by properly executed Chain of Custody documentation. The samples were analyzed for TPH as gasoline by EPA method 5030/modified 8015, and BTX&E by EPA method 8020.

The analytical results of the ground water samples collected from RW1 before and after the pilot vapor extraction activities are summarized in Table 1. Copies of the laboratory analyses and the Chain of Custody documentation are attached to this report.

The analytical results of the air samples collected from the extracted air stream of RW1 indicate a maximum concentration of TPH

as gasoline of 8.6 micrograms per liter (µg/l), and a maximum concentration of benzene of 0.82 µg/l. The results of the air sample analyses for RW1 are summarized in Table 1. Copies of the laboratory analytical results and the Chain of Custody documentation are attached to this report.

Based on the ranges of flow rates measured in the field, and the analytical results of the air samples, the system achieved a maximum gasoline extraction rate of 0.00049 pounds per hour (lbs/hr). The results of the gasoline extraction rate calculations are summarized in Table 2.

DISCUSSION AND RECOMMENDATIONS

As summarized in this report, the results of the vapor extraction test indicate a maximum concentration of TPH as gasoline of 8.6 µg/l in the extracted air stream. Calculations using the data obtained during the vapor extraction test indicates a maximum hydrocarbon extraction rate of 0.00049 lbs/hr.

Furthermore, the water table at the site is relatively high and the soil is not highly permeable. Due to these conditions, the pilot vapor extraction test system was unable to continuously operate for more than seven hours. Based on these results, and based on the insignificant hydrocarbon extraction rate when the system was able to operate, vapor extraction does not appear to be a feasible means of soil and ground water remediation at the site.

Therefore, KEI recommends continuation of the bi-weekly purging of monitoring wells MW3, MW5, and MW8 in order to reduce the levels of contamination in the vicinity of these wells. In addition, a continuous surface skimming free product recovery system has been installed and continues to operate in well MW5.

DISTRIBUTION

A copy of this report should be sent to the Alameda County Health Care Services, and to Mr. Lester Feldman of the Regional Water Quality Control Board, San Francisco Bay Region.

LIMITATIONS

Environmental changes, either naturally-occurring or artificially-induced, may cause changes in ground water levels and flow paths, thereby changing the extent and concentration of any contaminants.

Our studies assume that the field and laboratory data are reasonably representative of the site as a whole, and assume that subsurface conditions are reasonably conducive to interpolation and extrapolation.

The results of this study are based on the data obtained from the field and laboratory analyses obtained from a state-certified laboratory. We have analyzed these data using what we believe to be currently applicable engineering techniques and principles in the Northern California region. We make no warranty, either expressed or implied, regarding the above, including laboratory analyses, except that our services have been performed in accordance with generally accepted professional principles and practices existing for such work.

If you have any questions regarding this report, please do not hesitate to call us at (510) 602-5100.

Sincerely,

Kaprealian Engineering, Inc.

Joel G. Greger, C.E.G.
Senior Engineering Geologist

License No. 1633
Exp. Date 6/30/94

Aram Kaloustian
Project Engineer

/bp

Attachments: Tables 1 & 2
Location Map
Figures 1 through 4
Appendix A - Boring Log and Field Measurements
Laboratory Analyses
Chain of Custody documentation

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TABLE 1

SUMMARY OF VAPOR EXTRACTION TEST RESULTS
AIR

Date	Sample	Time	TPH as Gasoline	Benzene	Toluene	Xylenes	Ethyl-benzene
4/14/93	INF-3	9:00	ND	0.063	0.16	0.23	ND
4/13/93	INF-2	17:30	5.0	0.34	0.24	0.38	0.081
	EFF-2	17:30	8.6	0.82	0.33	0.43	0.11
	INF-1	11:30	ND	0.08	0.20	0.33	ND
	EFF-1	11:30	5.4	0.42	0.33	0.45	0.073

SUMMARY OF GROUND WATER ANALYSES
WATER

Date	Time	TPH as Gasoline	Benzene	Toluene	Xylenes	Ethyl-benzene
4/14/93	RW1	14,000	1,900	180	1,800	610
4/12/93	RW1	1,800	40	3.0	70	110

Results are in micrograms per liter (µg/l), unless otherwise indicated.

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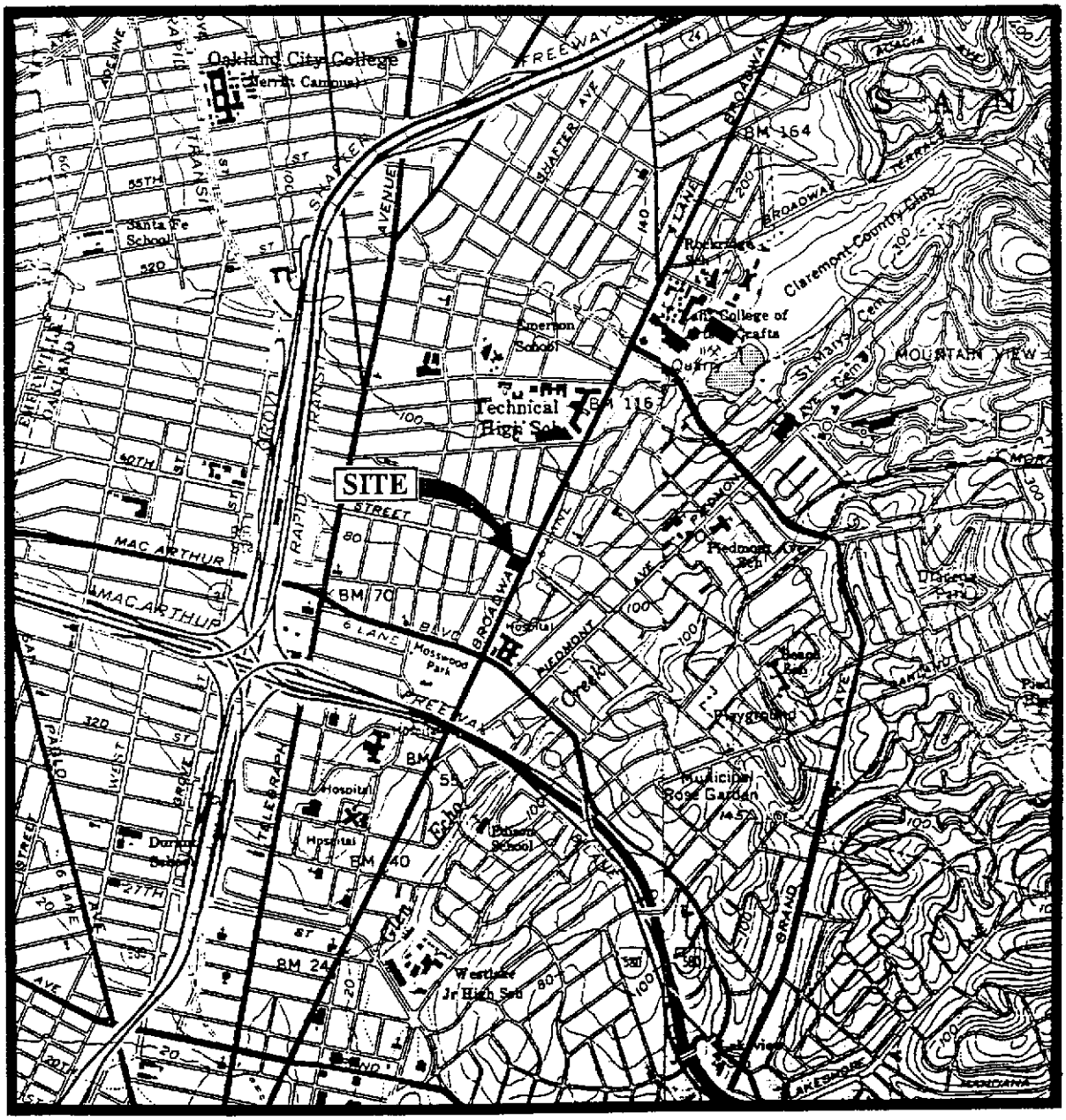
TABLE 2

SUMMARY OF EXTRACTION CALCULATION

Date	Sample	Time	TPH as Gasoline (µg/l)	Flow Rate (CFM)	Gasoline Extraction Rate (lbs/hr)
4/14/93	INF-3	9:00	ND	28.2	N/A
4/13/93	INF-2	17:30	5	26.3	0.00049
	INF-1	11:30	ND	27.0	N/A

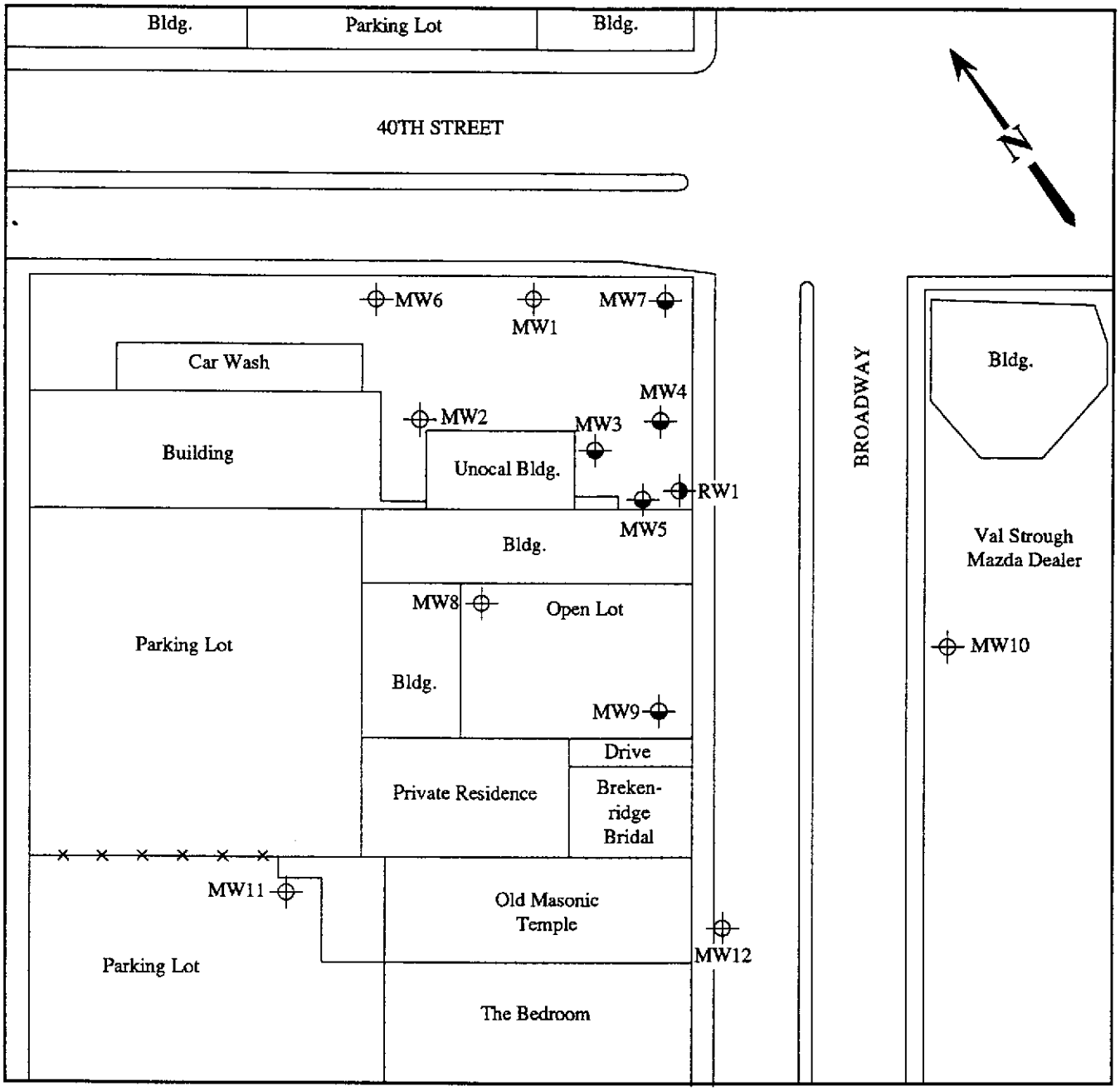


Base modified from 7.5 minute U.S.G.S. Oakland East and West Quadrangles (both photorevised 1980)

0 2000 4000

Approx. scale feet

KAPREALIAN ENGINEERING INCORPORATED	UNOCAL SERVICE STATION #0746 3943 BROADWAY OAKLAND, CA	LOCATION MAP



LEGEND

- Monitoring well
- 6-inch diameter well to be used for vapor extraction pilot test
- Monitoring well to be used as observation well during vapor extraction test

0 60 120

Approx. scale feet

WELL LOCATION MAP

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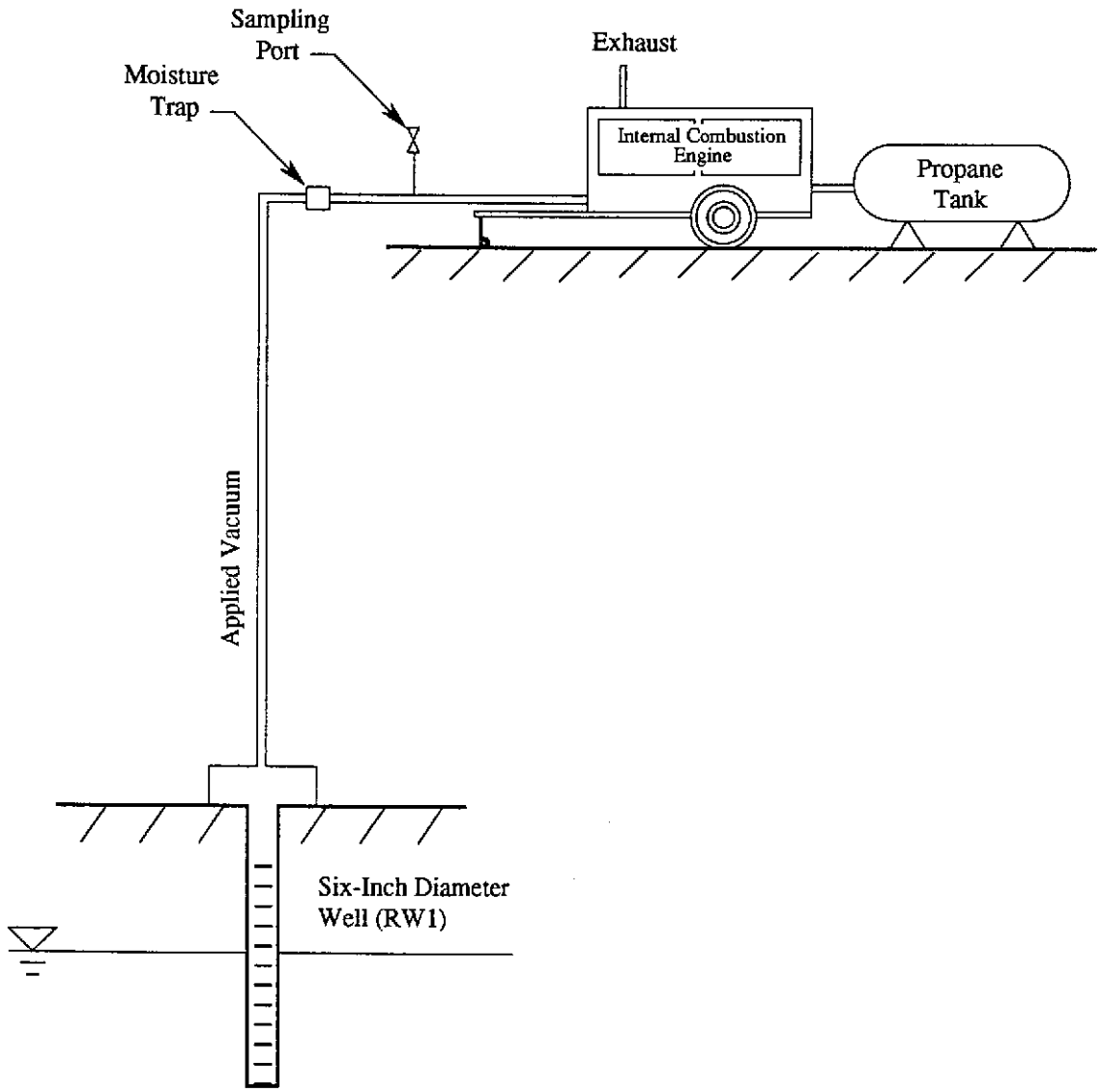
UNOCAL SERVICE STATION #0746
3943 BROADWAY
OAKLAND, CA

FIGURE
1



NOT TO SCALE

PILOT VAPOR EXTRACTION TEST SYSTEM

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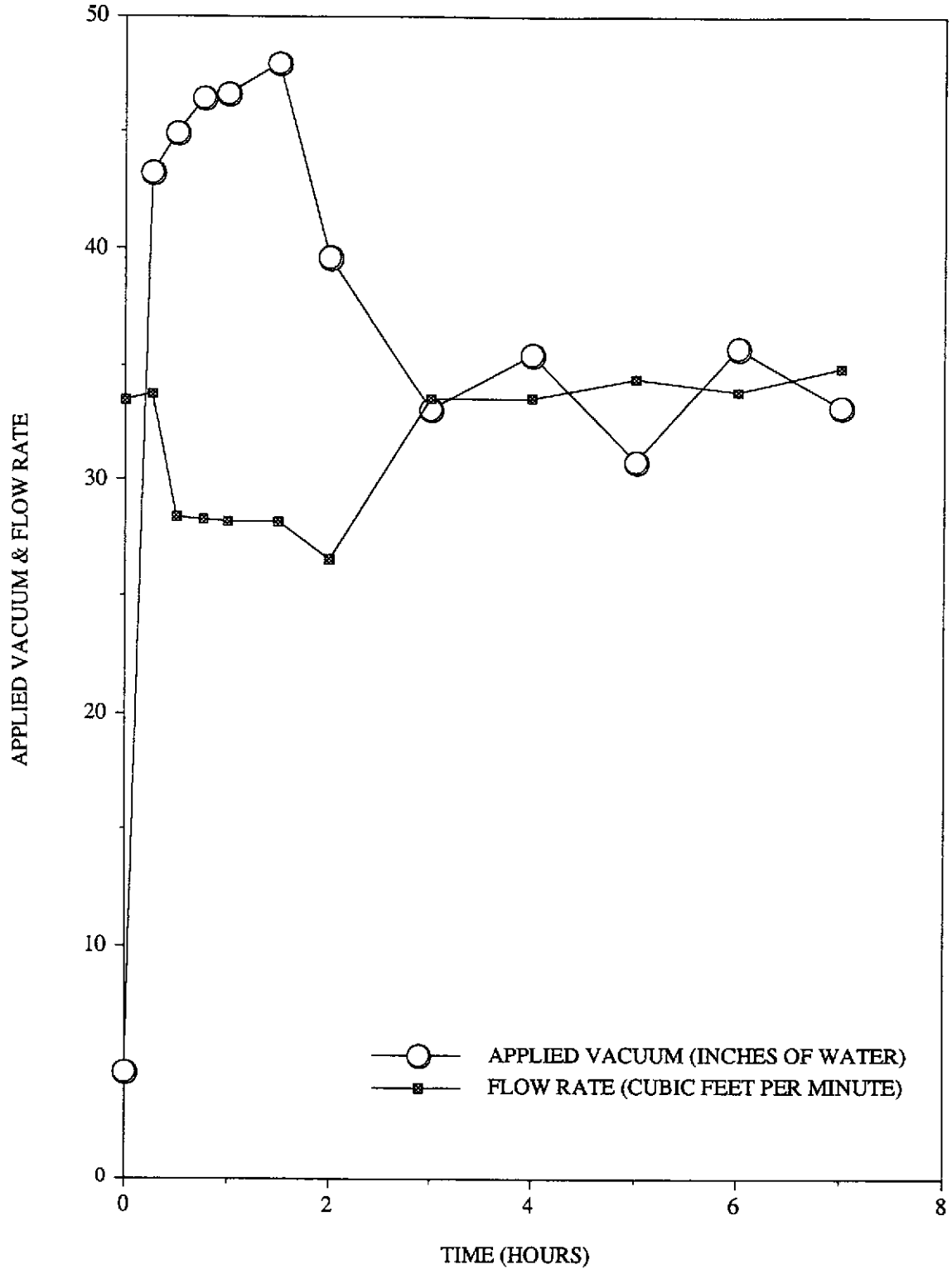
OAKLAND, CA

FIGURE
2



APPLIED VACUUM AND FLOW RATE VERSUS TIME

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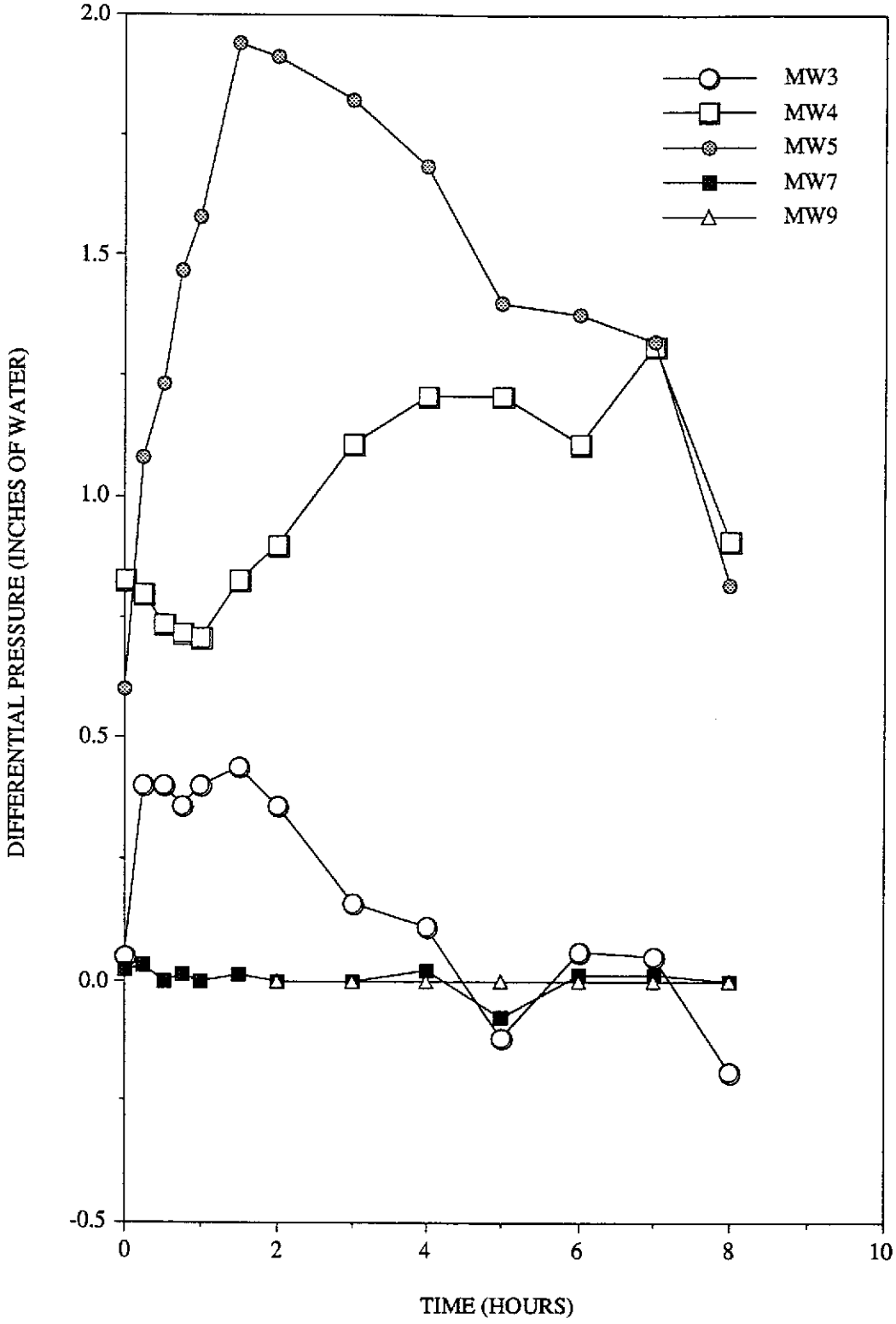
OAKLAND, CALIFORNIA

FIGURE
3



DIFFERENTIAL PRESSURE MEASUREMENTS VERSUS TIME

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UNOCAL SERVICE STATION #0746
3943 BROADWAY
OAKLAND, CALIFORNIA

FIGURE
4

APPENDIX A

BORING LOG AND FIELD MEASUREMENTS

BORING LOG

Project No. KEI-P89-9805	**Boring Diameter** 13.5' **Casing Diameter** 6'	**Logged By** JGG D.L. CEG 1633
Project Name Unocal S/S #0746 3943 Broadway, Oakland	**Well Cover Elevation**	**Date Drilled** 6/25/92
Boring No. RW1	**Drilling Method** Hollow-stem Auger	**Drilling Company** Woodward Drilling

Penetration blows/6"	G. W. level	Depth (feet) Samples	Strati-graphy USCS	Description
		0		Asphalt pavement over sand and gravel base.
				Clayey sand and gravel with cobbles to 10 inches in diameter, very stiff, moist (fill).
			CH	Sandy clay, stiff, moist, dark greenish gray.
			SC	Clayey sand with trace silt, medium dense, moist, dark greenish gray.
No blow count data - samples continuously cored		5	MH	Clayey silt, trace fine-grained sand, very stiff, moist, black, with organic matter.
			CH	Clay, estimated at 10-15% gravel to 4 inches in diameter, trace sand, stiff to very stiff, moist, dark olive gray and very dark grayish brown, mottled. Grades to gravelly clay with sand, gravel to 1 inch in diameter, very stiff, moist, dark olive gray and very dark grayish brown mottled.
		10	SC	Clayey sand, estimated at 10-15% gravel to 1 inch in diameter, medium dense, moist, dark greenish gray and dark olive gray mottled.
No recovery from 11.25 to 12.5 feet.			GC	Clayey gravel with sand, gravel to 3-1/2 inches in diameter, medium dense, moist, dark greenish gray.
			CL	Clay, estimated at 10-15% gravel, stiff, moist, olive brown and dark greenish gray, mottled, fissured.
		15		Silty clay, trace fine-grained sand, stiff, moist, olive brown and dark greenish gray mottled, fissured.
			SC	Clayey sand, trace silt, medium dense, moist, olive brown and dark greenish gray, mottled.
		20		TOTAL DEPTH: 17.5' No ground water encountered.

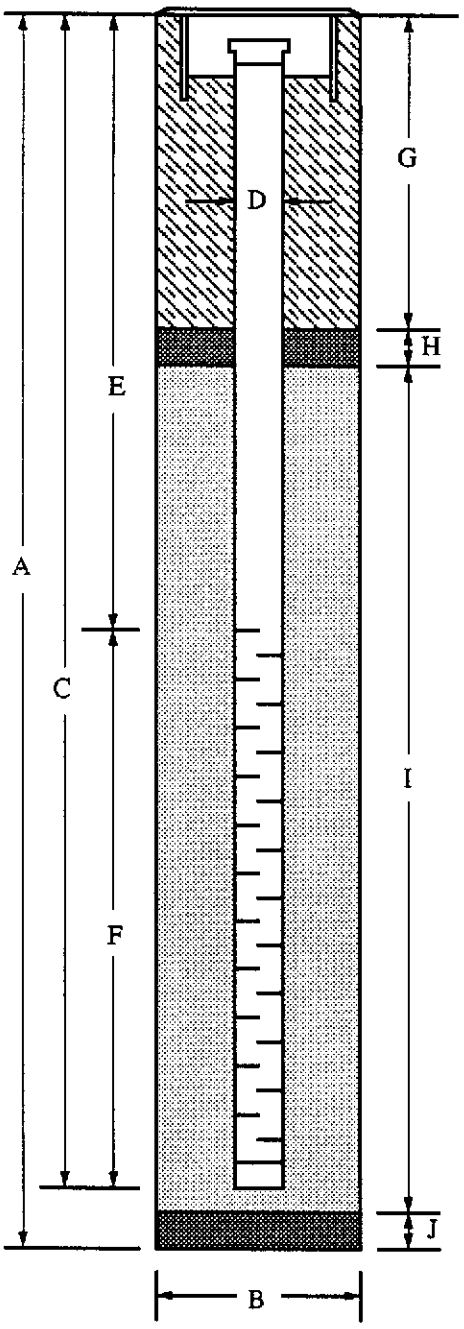
WELL COMPLETION DIAGRAM

PROJECT NAME: Unocal S/S #0746, 3943 Broadway, Oakland WELL NO. RW1

PROJECT NUMBER: KEI-P89-0805

WELL PERMIT NO.: ACFC & WCD 92270

Flush-mounted Well Cover



A. Total Depth : 17.5'

B. Boring Diameter*: 13.5"

Drilling Method: Hollow Stem Auger

C. Casing Length: 17'

Material: Schedule 40 PVC

D. Casing Diameter: OD = 6.625"

ID = 6.065"

E. Depth to Perforations: 5'

F. Perforated Length: 10' (2' Blank on bottom)

Perforation Type: Machined Slot

Perforation Size: 0.010"

G. Surface Seal: 3'

Seal Material: Neat Cement

H. Seal: 1'

Seal Material: Bentonite

I. Filter Pack: 13'

Pack Material: RMC Lonestar Sand

Size: #2/12

J. Bottom Seal: 6"

Seal Material: Bentonite

Unocal S/S #0746
3943 Broadway
Oakland, California

Vapor Extraction Test Well, RW1
Date: April 14, 1993
Vapor Extraction Test Data

Date	Field Time	Test Time	Applied Vacuum (inches of water)	Extraction Flow Rate (CFM)
4/14/93	7:45:00	0:00:00	N/A	N/A
	8:00:00	0:15:00	4.6	28.7
	8:15:00	0:30:00	43.2	33.7
	8:30:00	0:45:00	44.9	28.4
	8:45:00	1:00:00	46.5	28.3
	9:00:00	1:15:00	46.7	28.2
	9:30:00	1:45:00	48.0	28.2
	10:00:00	2:15:00	39.6	26.6
	11:00:00	3:15:00	33.1	33.6
	12:00:00	4:15:00	35.5	33.6
	13:00:00	5:15:00	30.8	34.4
	14:00:00	6:15:00	35.8	33.8
	15:00:00	7:15:00	33.2	34.9

Unocal S/S #0746
3943 Broadway
Oakland, California

Vapor Extraction Test Well, RW1
Date: April 14, 1993
Vapor Extraction Test Data

Date	Field Time	Test Time	Vacuum Influence Data (inches of water) MW3	MW4	MW5	MW7	MW9
4/14/93	7:45:00	0:00:00	N/A	N/A	N/A	N/A	N/A
	8:00:00	0:15:00	0.05	0.83	0.60	0.02	N/A
	8:15:00	0:30:00	0.40	0.80	1.08	0.03	N/A
	8:30:00	0:45:00	0.40	0.74	1.23	0.00	N/A
	8:45:00	1:00:00	0.36	0.72	1.47	0.01	N/A
	9:00:00	1:15:00	0.40	0.71	1.58	0.00	N/A
	9:30:00	1:45:00	0.44	0.83	1.94	0.01	N/A
	10:00:00	2:15:00	0.36	0.90	1.91	0.00	0.00
	11:00:00	3:15:00	0.15	1.11	1.82	0.00	0.00
	12:00:00	4:15:00	0.11	1.21	1.68	0.02	0.00
	13:00:00	5:15:00	-0.12	1.21	1.40	0.08	0.00
	14:00:00	6:15:00	-0.06	1.11	1.38	0.01	0.00
	15:00:00	7:15:00	-0.05	1.31	1.32	0.01	0.00

SEQUOIA ANALYTICAL

1900 Bates Avenue • Suite LM • Concord, California 94520
(510) 686-9600 • FAX (510) 686-9689

Kaprealian Engineering, Inc.	Client Project ID:	Unocal#0746, 3943 Broadway, Oakland	Sampled:	Apr 12, 1993
2401 Stanwell Dr., Ste. 400	Sample Matrix:	Water	Received:	Apr 12, 1993
Concord, CA 94520	Analysis Method:	EPA 5030/8015/8020	Reported:	Apr 22, 1993
Attention: Mardo Kaprealian, P.E.	First Sample #:	304-0523		

TOTAL PURGEABLE PETROLEUM HYDROCARBONS with BTEX DISTINCTION

Analyte	Reporting Limit µg/L	Sample I.D. 304-0523 RW 1	Sample I.D. Matrix Blank
Purgeable Hydrocarbons	50	1,800	
Benzene	0.5	40	
Toluene	0.5	3.0	
Ethyl Benzene	0.5	110	
Total Xylenes	0.5	70	
Chromatogram Pattern:		Gasoline	

Quality Control Data

Report Limit Multiplication Factor:	1.0	1.0
Date Analyzed:	4/19/93	4/19/93
Instrument Identification:	GCHP-1	GCHP-1
Surrogate Recovery, %: (QC Limits = 70-130%)	73	99

Purgeable Hydrocarbons are quantitated against a fresh gasoline standard.
Analytes reported as N.D. were not detected above the stated reporting limit.

SEQUOIA ANALYTICAL

Scott A. Chieffo
Project Manager

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(510) 686-9600 • FAX (510) 686-9689

Kaprealian Engineering, Inc.	Client Project ID:	Unocal#0746, 3943 Broadway, Oakland
2401 Stanwell Dr., Ste. 400	Matrix:	Water
Concord, CA 94520		
Attention: Mardo Kaprealian, P.E.	QC Sample Group	304-0523

Reported: Apr 22, 1993

QUALITY CONTROL DATA REPORT

ANALYTE	Benzene	Toluene	Ethyl-Benzene	Xylenes
Method:	EPA 8020	EPA 8020	EPA 8020	EPA 8020
Analyst:	TSM	TSM	TSM	TSM
Conc. Spiked:	10	10	10	15
Units:	µg/L	µg/L	µg/L	µg/L
LCS Batch#:	MB041993	MB041993	MB041993	MB041993
Date Prepared:	4/19/93	4/19/93	4/19/93	4/19/93
Date Analyzed:	4/19/93	4/19/93	4/19/93	4/19/93
Instrument I.D.#:	GCHP-1	GCHP-1	GCHP-1	GCHP-1
LCS % Recovery:	98	100	103	103
Control Limits:	70-130	70-130	70-130	70-130
MS/MSD Batch #:	041993	041993	041993	041993
Date Prepared:	4/19/93	4/19/93	4/19/93	4/19/93
Date Analyzed:	4/19/93	4/19/93	4/19/93	4/19/93
Instrument I.D.#:	GCHP-1	GCHP-1	GCHP-1	GCHP-1
Matrix Spike % Recovery:	98	100	103	103
Matrix Spike Duplicate % Recovery:	96	98	102	101
Relative % Difference:	2.1	2.0	1.0	2.0

SEQUOIA ANALYTICAL

Scott A. Chieffo
Project Manager

Please Note:

The LCS is a control sample of known, interferent free matrix that is analyzed using the same reagents, preparation and analytical methods employed for the samples. The LCS % recovery data is used for validation of sample batch results. Due to matrix effects, the QC limits for MS/MSD's are advisory only and are not used to accept or reject batch results.

KAPREALIAN ENGINEERING
INCORPORATED

CHAIN OF CUSTODY

SAMPLER: A. Gaddis
WITNESSING AGENCY:

SITE NAME & ADDRESS: Unocal 0746 / Oakland
3943 Broadway

ANALYSES REQUESTED: TPH-D; TPH-G; BTEX

TURN AROUND TIME: Regular

SAMPLE ID NO.	DATE	TIME	SOIL	WATER	GRAB	COMP	NO. OF CONT.	SAMPLING LOCATION	TPH-D	TPH-G	REMARKS
RW1	4/12/93	15:00		X			VOAs		X	X	304052 3AB

Relinquished by: (Signature)	Date/Time	Received by: (Signature)
[signature]	4/12/93 16:00	[signature]
[signature]	4/13/93	[signature]
[signature]	4/14/93 15:10	[signature]
Relinquished by: (Signature)	Date/Time	Received by: (Signature)

The following MUST BE completed by the laboratory accepting samples for analysis:

1. Have all samples received for analysis been stored in ice? Y
2. Will samples remain refrigerated until analyzed? Y
3. Did any samples received for analysis have head space? N
4. Were samples in appropriate containers and properly packaged? Y

ABK — Signature; SC — Title; 4-13-93 — Date

2401 Stanwell Drive, Suite 400
Concord, California 94520
Tel: 510.602.5100 Fax: 510.687.0602

SEQUOIA ANALYTICAL

1900 Bates Avenue • Suite LM • Concord, California 94520
(510) 686-9600 • FAX (510) 686-9689

Kaprealian Engineering, Inc.	Client Project ID:	Uncoal #0746, 3943 Broadway, Oakland	Sampled:	Apr 13, 1993
2401 Stanwell Dr., Ste. 400	Sample Matrix:	Air	Received:	Apr 13, 1993
Concord, CA 94520	Analysis Method:	EPA 5030/8015/8020	Reported:	Apr 23, 1993
Attention: Mardo Kaprealian, P.E.	First Sample #:	304-0559		

TOTAL PURGEABLE PETROLEUM HYDROCARBONS with BTEX DISTINCTION

Analyte	Reporting Limit µg/L	Sample I.D. 304-0559 INF 1	Sample I.D. 304-0560 EFF 1	Sample I.D. Matrix Blank
Purgeable Hydrocarbons	5.0	N.D.	5.4	
Benzene	0.05	0.080	0.42	
Toluene	0.05	0.20	0.33	
Ethyl Benzene	0.05	N.D.	0.073	
Total Xylenes	0.05	0.33	0.45	
Chromatogram Pattern:		Gasoline	Gasoline	

Quality Control Data

Report Limit Multiplication Factor:	1.0	1.0	1.0
Date Analyzed:	4/15/93	4/15/93	4/15/93
Instrument Identification:	HP-5	HP-5	HP-5
Surrogate Recovery, %: (QC Limits = 70-130%)	111	114	122

Purgeable Hydrocarbons are quantitated against a fresh gasoline standard.
Analytes reported as N.D. were not detected above the stated reporting limit.

SEQUOIA ANALYTICAL

Scott A. Chieffo
Project Manager

SEQUOIA ANALYTICAL
1900 Bates Avenue • Suite LM • Concord, California 94520
(510) 686-9600 • FAX (510) 686-9689

Kaprealian Engineering, Inc.	Client Project ID:	Uncoal #0746, 3943 Broadway, Oakland
2401 Stanwell Dr., Ste. 400	Matrix:	Water
Concord, CA 94520		
Attention: Mardo Kaprealian, P.E.	QC Sample Group	3040559-560

Reported: Apr 23, 1993

QUALITY CONTROL DATA REPORT

ANALYTE	Benzene	Toluene	Ethyl-Benzene	Xylenes
Method:	EPA 8020	EPA 8020	EPA 8020	EPA 8020
Analyst:	J.F.	J.F.	J.F.	J.F.
Conc. Spiked:	20	20	20	60
Units:	µg/L	µg/L	µg/L	µg/L
LCS Batch#:	3LCS041593	3LCS041593	3LCS041593	3LCS041593
Date Prepared:	4/15/93	4/15/93	4/15/93	4/15/93
Date Analyzed:	4/15/93	4/15/93	4/15/93	4/15/93
Instrument I.D.#:	HP-5	HP-5	HP-5	HP-5
LCS % Recovery:	114	102	101	109
Control Limits:	70-130%	70-130%	70-130%	70-130%
MS/MSD Batch #:	041593	041593	041593	041593
Date Prepared:	4/15/93	4/15/93	4/15/93	4/15/93
Date Analyzed:	4/15/93	4/15/93	4/15/93	4/15/93
Instrument I.D.#:	HP-5	HP-5	HP-5	HP-5
Matrix Spike % Recovery:	115	105	105	115
Matrix Spike Duplicate % Recovery:	115	120	115	116
Relative % Difference:	0.0	13	9.1	0.86

SEQUOIA ANALYTICAL

Scott A. Chieffo
Project Manager

Please Note:

The LCS is a control sample of known, interferent free matrix that is analyzed using the same reagents, preparation and analytical methods employed for the samples. The LCS % recovery data is used for validation of sample batch results. Due to matrix effects, the QC limits for MS/MSD's are advisory only and are not used to accept or reject batch results.

KAPREALIAN ENGINEERING
INCORPORATED

CHAIN OF CUSTODY

SAMPLER: Sarkis Soghomonian
WITNESSING AGENCY:

SITE NAME & ADDRESS: Unocal S/S #0746
3443 Broadway / Oakland

ANALYSES REQUESTED: TPH-G; BTXE

TURN AROUND TIME: Regular

SAMPLE ID NO.	DATE	TIME	SOIL	WATER	GRAB	COMP	NO. OF CONT.	SAMPLING LOCATION	TPH-G	BTXE	REMARKS
INF 1	4/13/93	11:50 AM						ICE influent air stream	2	2	3040559
EFF 1	4/13/93	11:30 AM						ICE effluent air stream	2	2	L 560

Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Sarkis Soghomonian	4/13/93	Jason Yoh
Jason Yoh	4/13 15:10	
Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received by: (Signature)

The following MUST BE completed by the laboratory accepting samples for analysis:

1. Have all samples received for analysis been stored in ice? Yes
2. Will samples remain refrigerated until analyzed? Yes
3. Did any samples received for analysis have head space? No
4. Were samples in appropriate containers and properly packaged? Yes

Signature: ABK Title: SC Date: 4-13-93

2401 Stanwell Drive, Suite 400
Concord, California 94520
Tel: 510.602.5100 Fax: 510.687.0602

SEQUOIA ANALYTICAL

1900 Bates Avenue • Suite LM • Concord, California 94520
(510) 686-9600 • FAX (510) 686-9689

Kaprealian Engineering, Inc.	Client Project ID:	Unocal #0746, 3943 Broadway, Oakland	Sampled: 4/13 & 4/14/93
2401 Stanwell Dr., Ste. 400	Sample Matrix:	Air	Received: Apr 16, 1993
Concord, CA 94520	Analysis Method:	EPA 5030/8015/8020	Reported: Apr 27, 1993
Attention: Mardo Kaprealian, P.E.	First Sample #:	304-0698	

TOTAL PURGEABLE PETROLEUM HYDROCARBONS with BTEX DISTINCTION

Analyte	Reporting Limit µg/L	Sample I.D. 304-0698 Eff 2	Sample I.D. 304-0699 Inf 2	Sample I.D. 304-0700 Inf 3	Sample I.D. Matrix Blank
Purgeable Hydrocarbons	5.0	8.6	5.0	N.D.	
Benzene	0.05	0.82	0.34	0.063	
Toluene	0.05	0.33	0.24	0.16	
Ethyl Benzene	0.05	0.11	0.081	N.D.	
Total Xylenes	0.05	0.43	0.38	0.23	
Chromatogram Pattern:		Gasoline	Gasoline	--	

Quality Control Data

Report Limit Multiplication Factor:	1.0	1.0	1.0	1.0
Date Analyzed:	4/16/93	4/16/93	4/16/93	4/16/93
Instrument Identification:	HP-2	HP-2	HP-2	HP-2
Surrogate Recovery, %: (QC Limits = 70-130%)	106	102	106	108

Purgeable Hydrocarbons are quantitated against a fresh gasoline standard.
Analytes reported as N.D. were not detected above the stated reporting limit.

SEQUOIA ANALYTICAL

Scott A. Chieffo
Project Manager

EQUOIA ANALYTICAL

0 Bates Avenue • Suite LM • Concord, California 94520
0) 686-9600 • FAX (510) 686-9689

ing, Inc.	Client Project ID:	Unocal #0746, 3943 Broadway, Oakland	Sampled:	Apr 14, 1993
te. 400	Sample Matrix:	Water	Received:	Apr 16, 1993
	Analysis Method:	EPA 5030/8015/8020	Reported:	Apr 27, 1993
prealian, P.E.	First Sample #:	304-0701		

1993

URGEABLE PETROLEUM HYDROCARBONS with BTEX DISTINCTION

Reporting Limit µg/L	Sample I.D. 304-0701 RW 1	Sample I.D. Matrix Blank
50	14,000	
0.5	1,900	
0.5	180	
0.5	610	
0.5	1,800	
ern:	Gasoline	

a

cation Factor:	1.0	1.0
	4/20/93	4/20/93
tion:	HP-2	HP-2
, %: %)	111	104

s are quantitated against a fresh gasoline standard.
. were not detected above the stated reporting limit.

CAL

e reagents, ed for ory only

3040698.KEI <2>

EI <3>

KAPREALIAN ENGINEERING
INCORPORATED

CHAIN OF CUSTODY

SAMPLER: D. Giddings
WITNESSING AGENCY:
SITE NAME & ADDRESS: Unocal #0746 / Oakland
3943 Broadway

ANALYSES REQUESTED: TPH 6-1 | BTEX EPA

TURN AROUND TIME: Regular

SAMPLE ID NO.	DATE	TIME	AIR ~~SOIL~~	WATER	GRAB	COMP	NO. OF CONT.	SAMPLING LOCATION	TPH 6-1	BTEX EPA	REMARKS
Eff 2	4/13	17:30	✓					RW1	✓	✓	9340698
Inf 2	"	17:30	✓						✓	✓	699
Inf 3	4/14	9:00	✓						✓	✓	700
RW4	"	17:30		✓			VOA		✓	✓	701AB

Relinquished by: (Signature)	Date/Time	Received by: (Signature)
		4/16/93 0830
Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received by: (Signature)

The following MUST BE completed by the laboratory accepting samples for analysis:

1. Have all samples received for analysis been stored in ice? Y
2. Will samples remain refrigerated until analyzed? Y
3. Did any samples received for analysis have head space? N
4. Were samples in appropriate containers and properly packaged? Y

EV — Signature
ES — Title
4/16/93 — Date

2401 Stanwell Drive, Suite 400
Concord, California 94520
Tel: 510.602.5100 Fax: 510.687.0602