KEI

KAPREALIAN ENGINEERING
INCORPORATED

KEI-P90-1103.R10
October 23, 1995

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

Attention: Ms. Tina Berry

RE: Pilot Vapor Extraction Test Report
Unocal Service Station #0752
800 Harrison Street
Oakland, California

Dear Ms. Berry:

This report presents the results of Kaprealian Engineering, Inc's. (KEI) most recent vapor extraction test (VET) conducted at the referenced site, in accordance with KEI's proposal (KEI-P90-1103.P5R) dated December 1, 1994. The purpose of the VET was to determine whether vapor extraction is a feasible and practical means of remediation at the subject Unocal facility. The scope of the work performed by KEI consisted of the following:

Coordination with regulatory agencies

Completion of pilot VET

Ground water and air bag sampling

Delivery of ground water and air bag samples (including properly executed Chain of Custody documentation) to a California-certified analytical laboratory for laboratory analyses

Data analysis, interpretation, and report preparation

SITE DESCRIPTION AND BACKGROUND

The subject site contains a Unocal service facility. The site is characterized by gently sloping, southward trending topography, and is located approximately 0.5 miles north-northeast of the Oakland Inner Harbor. The site is also located northeast and across 8th Street from a Shell service station that is located adjacent to and northeast of a currently closed Arco service station (which is located at the intersection of 7th and Harrison). In addition, a gasoline and diesel service station referred to as "Mandarin Auto Service" is located east-southeast of the Unocal site at Alice

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

Street. A Location Map is attached. In our letter dated May 18, 1995, KEI identified several active and former service stations in the vicinity of the subject Unocal site. A copy of this letter is included in Appendix C.

HYDROLOGY AND GEOLOGY

The measured depth to ground water at the site on August 21, 1995, ranged between 17.35 and 19.23 feet below grade. The ground water flow direction appeared to be to the south-southwest (see Figure 1) on July 14, 1995, with a hydraulic gradient of approximately 0.008.

Based on review of regional geologic maps (U.S. Geological Survey Professional Paper 943 "Flatland Deposits - Their Geology and Engineering Properties and Their Importance to Comprehensive Planning" by E.J. Helley and K.R. Lajoie, 1979), the subject site is underlain by Quaternary-age dune sand deposits referred to as the Merritt Sand (Qps). The Merritt Sand is described as typically consisting of loose, well-sorted, fine-to medium-grained sand with silt. This sand apparently reaches a maximum depth of about 50 feet below grade in the Oakland area.

Based on the results of our subsurface studies, the site is underlain by fill materials to depths of between 1 and 3.5 feet below grade. The fill is in turn underlain by alluvium to the maximum depth explored (35 feet below grade).

The alluvium underlying the site consists initially of fine-grained sand with silt. This material is underlain by silty to sandy clay beginning at a depth of between 30 and 33 feet below grade and extending to the total depth explored (35 feet below grade).

The unsaturated zone beneath the site is approximately 22 feet thick and consists of fine-grained sand with silt. The base of the unsaturated zone and the saturated zone also predominantly consists of the same fine-grained sand with silt that composes the greater part of the alluvium encountered in the existing wells.

A particle size analysis (sieve analysis) was previously performed on a saturated sample collected from the boring for well MW2 at a depth of 30 feet below grade. The analysis indicated that the sample consisted of approximately 90% fine-grained sand, 8% medium-grained sand, and 2% silt and clay. The sample is classified as fine-grained sand (SP).

RECENT FIELD ACTIVITIES - PILOT VET

Prior to conducting the proposed pilot VET on August 21, 1995, the depth to water was monitored in wells MW1, MW3, MW4, MW5, MW6, and MW7. This data was compared to the depth to perforations in the respective wells in order to determine the unsaturated screen length (exposed screen) in each well. The unsaturated screen length ranged from 2.35 feet to 5.73 feet in the wells. The ground water monitoring data is summarized in the attached Table 1. Copies of the Boring Logs and well completion diagrams for MW1 and MW3 are included in the attached Appendix B.

The proposed pilot VET was scheduled to be conducted on well MW3. On the morning of August 21, 1995, the hydrocarbon concentrations in the influent stream of MW3 were sampled and labeled INF-1(MW3). The system was shut down after 1 hour of operation because no flow was measurable on the flow meter. After approximately 1.5 hours, the test was restarted and run for 2 more hours. Another influent sample was collected at this time and labeled INF-2(MW3) and an effluent sample was collected and labeled EFF-1(MW3). The test system was then shut down and moved to well MW1 because of continued non-measurable flow.

The test system was started at MW1 and continued for 1 hour, during which flow could again not be measured. An influent sample was collected, labeled INF-1(MW1), and the system was shut down. The system was restarted the next day and run for 2 hours, during which flow again could not be measured. Before shut down, influent and effluent samples were taken and labeled INF-2(MW1) and EFF-1(MW1), respectively.

In order to locate a well in which an adequate flow could be achieved, flow tests were also conducted on wells MW5 and MW6. The blower was connected to these wells, and again, no measurable flow was attained. In addition, KEI re-developed both MW1 and MW2 in an attempt to optimize the flow rate from these wells. The wells were each purged of approximately 25 gallons of water during development. However, no apparent increase in the flow rate was noted in the wells. Therefore, KEI proceeded with the pilot VET at the site in order to collect any potentially useful information from the wells.

The test was conducted on August 21 through 22, 1995, using well MW3 as the initial test well. The test system consisted of a vapor extraction well head attached to the test well, two-inch diameter flexible tubing, vacuum gauge, regenerative blower, two vapor phase carbon canisters connected in series, and a flow meter, as shown on the attached schematic diagram, labeled Figure 2. Hydrocarbon emissions were abated by ducting the blower exhaust through the two carbon canisters that were connected in series. The Bay Area Air Quality Management District was notified prior to conducting the pilot VET.

Wells MW1, MW4, MW5, MW6, and MW7 were used as observation wells and are located approximately 70, 30, 30, 20, and 70 feet, respectively, from well MW3. When the test was moved to MW1, wells MW2, MW3, MW4, MW5, and MW6 were used as observation wells. These wells are located approximately 50, 70, 60, 80, and 90 feet from MW1.

In order to determine the extent and effective influence of the applied vacuum, differential pressures at all of the observation wells were measured by the use of specially fitted well caps and magnahelic gauges. The magnahelic gauges are capable of measuring vacuum influence changes to an accuracy of 0.02 inches of water. In order to establish a base line for comparison of measurements taken during the test, vacuum influence measurements were taken at all of the observation wells prior to beginning the test at both well locations. The applied vacuum, extraction air flow rate, and vacuum influence measurements were taken four times during the first hour of the test, and on a reduced frequency for the remainder of the test at both well locations.

Influent and effluent air samples were collected in Tedlar bags using a vacuum sampling box. Influent air bag samples were collected to determine the concentrations of hydrocarbons in the extracted air stream. Effluent air bag samples were collected after abatement to verify compliance with local air quality standards. Air samples INF-1(MW3), INF-2(MW3), INF-1(MW1), and INF-2(MW1) were collected from the extracted air stream of each indicated well before abatement. Air samples EFF-1(MW3) and EFF-1(MW1) were collected from the exhaust air stream of the abatement equipment from each well. A summary of Extraction Calculations is shown on attached Table 3. All of the air bag samples were analyzed for total petroleum hydrocarbons (TPH) as gasoline by EPA method 5030/modified 8015, and benzene, toluene, ethylbenzene, and xylenes by EPA method 8020.

TEST AND ANALYTICAL RESULTS - PILOT VET

The total duration of the test on MW3 and MW1 was 4.5 hours and 15 hours, respectively, with an applied vacuum on both wells of approximately 50 inches of water and no measurable flow rate. The applied vacuum and extraction flow rates measured during the VET on MW3 and MW1 are plotted versus time on the attached Figures 3 and 4, respectively. The field measurement of the applied vacuum and extraction flow rates during these two periods of operation are included in Appendix A.

Monitoring well MW6, located approximately 20 feet from MW3, indicated the greatest vacuum influence of 0.44 inches of water during the test performed on MW3. Monitoring well MW6, located approximately 120 feet from MW1, indicated the greatest vacuum influence of 0.37 inches of water during the test performed on MW1. The vacuum influence data measured from all of the observation wells during the 4.5 hours of operation on MW3 and 15 hours of operation on MW1 on August 21 and 22, 1995, are plotted versus time on the attached Figures 5 and 6, respectively. The field measurement of vacuum influence during these two periods of operation are included in Appendix A.

The analytical results of the air bag samples collected from the influent air stream of MW3 indicated TPH as gasoline concentrations of 19,000 micrograms per liter (μg/L), and benzene concentrations ranging from 130 μg/L to 300 μg/L. The analytical results of the air bag samples collected from the influent air stream of MW1 indicated TPH as gasoline concentrations ranging from 9,700 μg/L to 13,000 μg/L, and benzene concentrations ranging from 85 μg/L to 89 μg/L. A summary of the analytical results for all of the air bag samples collected during the test are presented in Table 2.

Based on the analytical results of the air bag samples and the respective air flow rates measured in the field, the system achieved a maximum extraction rate for TPH as gasoline of approximately 0.11 pounds per hour.

The analytical results of the ground water sample collected from MW3 upon completion of the test indicated concentrations of TPH as gasoline and benzene of 2,600 μg/L and 1,500 μg/L, respectively. The analytical results of the ground water samples collected during the test are also presented in Table 2. Copies of the laboratory analytical results for both the air and ground water samples and Chain of Custody documentation are attached to this report.

DISCUSSION

As previously discussed, prior to conducting the recent VET, a minimum of 2 feet of exposed screen were measured in the wells. As seen in the attached Boring Logs, the vadose zone consists primarily of fine-grained sand. However, no measurable flow was achieved in any of the wells tested. The relatively high vacuum generated in the extraction well(s) indicates that the vacuum blower was functioning correctly. However, water levels at the site have dropped approximately 2 feet since the April monitoring event. The soils in the area of the exposed screens of the wells tested may have been partially saturated.

The analytical results of the initial influent air samples indicated relatively high concentrations of hydrocarbons during the comparatively short-term pilot test. However, based on KEI's previous experience under similar test conditions, **the lack of flow generated during the pilot test will most likely preclude the consistent extraction of significant hydrocarbon influent concentrations under these conditions.** This is supported by the second influent sample collected from MW1 (after a period of approximately 15 hours), in which hydrocarbon concentrations were significantly reduced.

In light of the results of the recent pilot VET, **Unocal is currently investigating employing an oxygen releasing compound (ORC) at the subject site.** Recent studies indicate that the use of an ORC increases the dissolved oxygen in ground water and thus may improve the natural biodegradation rate of dissolved hydrocarbons. **ORC "socks" can be installed directly into existing monitoring wells and can be removed and/or replaced with relative ease.** Unocal has utilized ORC at various other service station sites with favorable results. Copies of the vendor literature are included in Appendix D.

In order to establish background parameters of the natural bioactivity at the subject site, KEI **recommends that during the next quarterly monitoring and sampling event, selected ground water samples should also be analyzed for dissolved oxygen, heterotrophic plate count, biological oxygen demand, sulfates, and nitrates.** The results of these analyses will be used to help determine the potential effectiveness of utilizing ORC at this site.

DISTRIBUTION

Copies of this report should be sent to Ms. Jennifer Eberle of the Alameda County Health Care Services Agency, and to the Regional Water Quality Control Board, San Francisco Bay Region.

LIMITATIONS

Soil deposits and rock formations may vary in thickness, lithology, saturation, strength and other properties across any site. In addition, environmental changes, either naturally-occurring or artificially-induced, may cause changes in 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 this 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.

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

Sincerely,

Kaprealian Engineering, Inc.

Armond A. Balaian
Staff Engineer

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

License No. 1633
Exp. Date 8/31/96

REGISTERED GEOLOGIST
JOEL G. GREGER
No. EG 1633
CERTIFIED
ENGINEERING
GEOLOGIST
STATE OF CALIFORNIA

Robert H. Kezerian
Project Manager

aab:jad

Attachments: Tables 1, 2 & 3
Location Map
Figures 1 through 6
Appendix A - Vapor Extraction Test Field Summary
Appendix B - MW1 & MW3 Boring Logs and Well Completion Diagrams
Appendix C - Site Vicinity Historical Review Letter
Appendix D - ORC Vendor Information
Laboratory Analyses
Chain of Custody documentation

TABLE 1

SUMMARY OF MONITORING DATA

Date	Well	Depth to Water (feet)	Depth to Perforations (feet)	Unsaturated Screen Length (feet)
8/21/95	MW1	19.23	13.5	5.73
	MW3	18.14	15	3.14
	MW4	17.72	15	2.72
	MW5	17.83	15	2.83
	MW6	17.35	15	2.35
	MW7	17.71	13	4.71

Unocal Service Station #0752
800 Harrison Street
Oakland, California

Vapor Extraction Tests
8/21-22/95

FIELD MONITORING DATA

TEST WELL: MW3

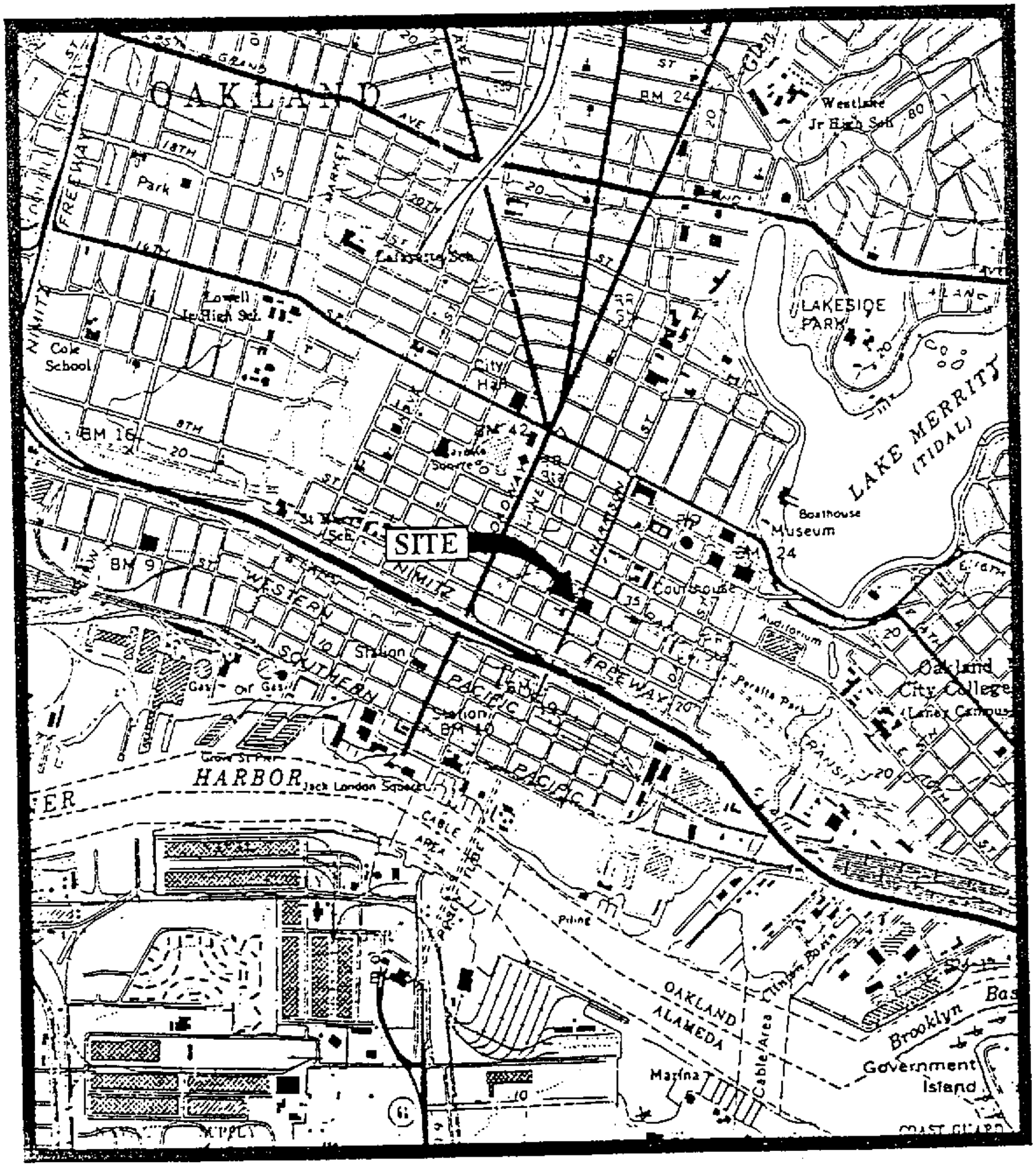
Date	Time	Test Time (Hours)	Applied Vacuum (In. Water)	Flow (CFM)	Vacuum Influence (Inches of Water) MW1	MW4	MW5	MW6	MW7
8/21/95	13:00	0	50	N.M.	0	0.33	0.13	0.4	0.12
	13:15	0.25	50	N.M.	0	0.25	0.01	0.29	0.12
	13:30	0.5	50	N.M.	0	0.28	0	0.23	0.08
	13:45	0.75	50	N.M.	0	0.28	0.01	0.44	0.12
	14:00	1	50	N.M.	0	0.26	0.02	0.36	0.12
	15:30	2.5	51	N.M.	0	0.15	0.05	0.14	0.04
	16:00	3	51	N.M.	0	0.02	0.05	0.32	-0.03
	16:30	3.5	51	N.M.	0	0	0.05	0.24	-0.03
	17:00	4	51	N.M.	0	-0.01	0.05	0.23	-0.02
	17:30	4.5	51	N.M.	0	0	0.05	0.25	-0.03

TEST WELL: MW1

Date	Time	Test Time (Hours)	Applied Vacuum (In. Water)	Flow (CFM)	Vacuum Influence (Inches of Water) MW2	MW3	MW4	MW5	MW6
8/21/95	18:00	0	50	N.M.	0.10	-0.02	0.04	0.10	0.09
	18:15	0.25	50	N.M.	0.15	0	0.01	0.15	0.15
	18:30	0.5	50	N.M.	0.10	-0.02	0.04	0.10	0.15
	18:45	0.85	50	N.M.	0.10	-0.02	0.03	0.10	0.15
	19:00	1	50	N.M.	0.10	-0.01	0.04	0.11	0.15
8/22/95	7:00	13	50	N.M.	0.10	-0.02	0.08	0.10	0.23
	8:00	14	50	N.M.	0.12	-0.02	0.08	0.10	0.33
	9:00	15	50	N.M.	0.13	-0.02	0.08	0.10	0.37

In. Water = Inches of Water
CFM = Cubic Feet per Minute
N.M. = Not Measurable

N

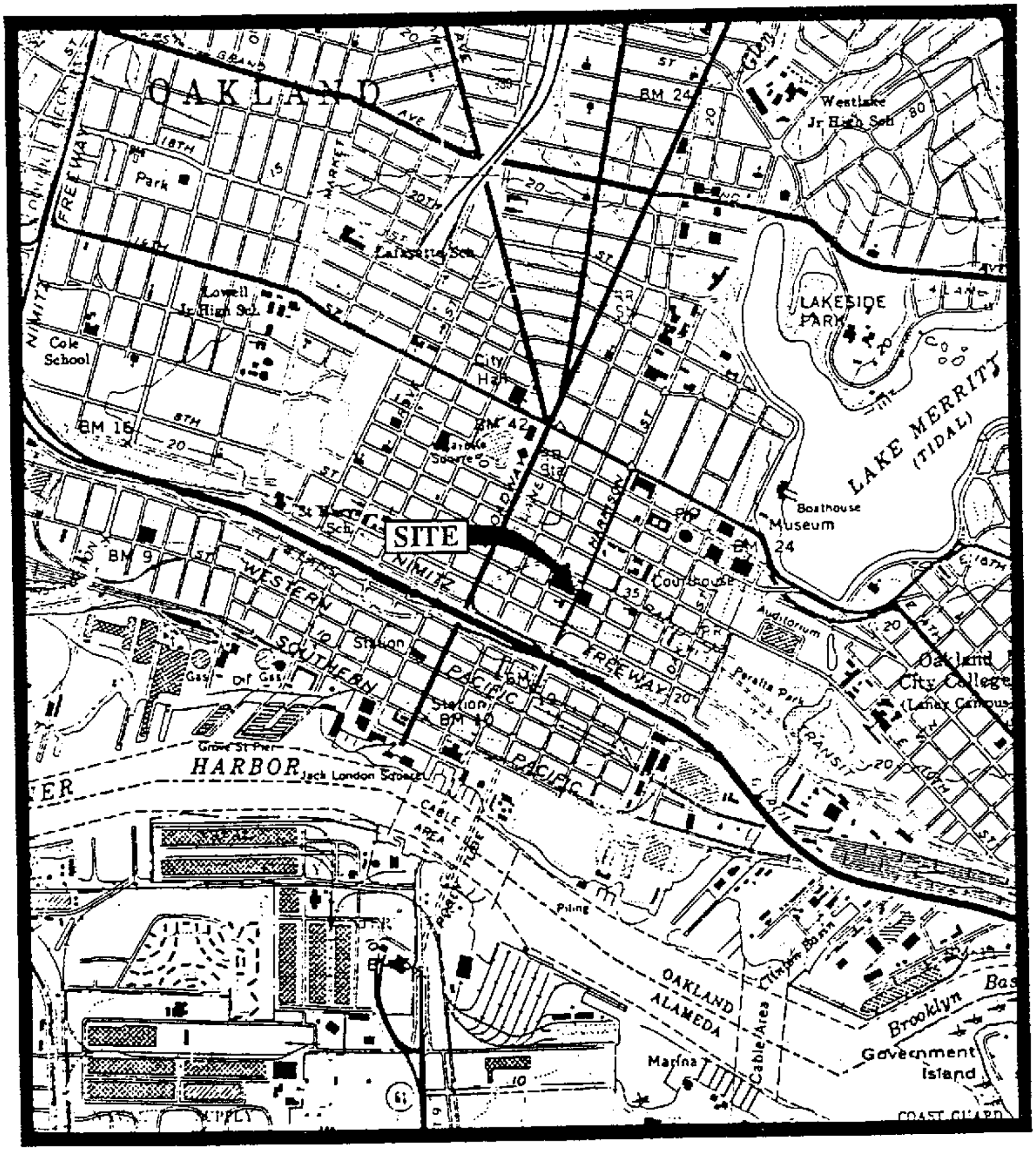


Base modified from 7.5 minute U.S.G.S. Oakland West Quadrangle
(photorevised 1980)

0 2000 4000

Approx. scale feet

KAPREALIAN ENGINEERING INCORPORATED	UNOCAL SERVICE STATION #0752 800 HARRISON STREET OAKLAND, CALIFORNIA	LOCATION MAP

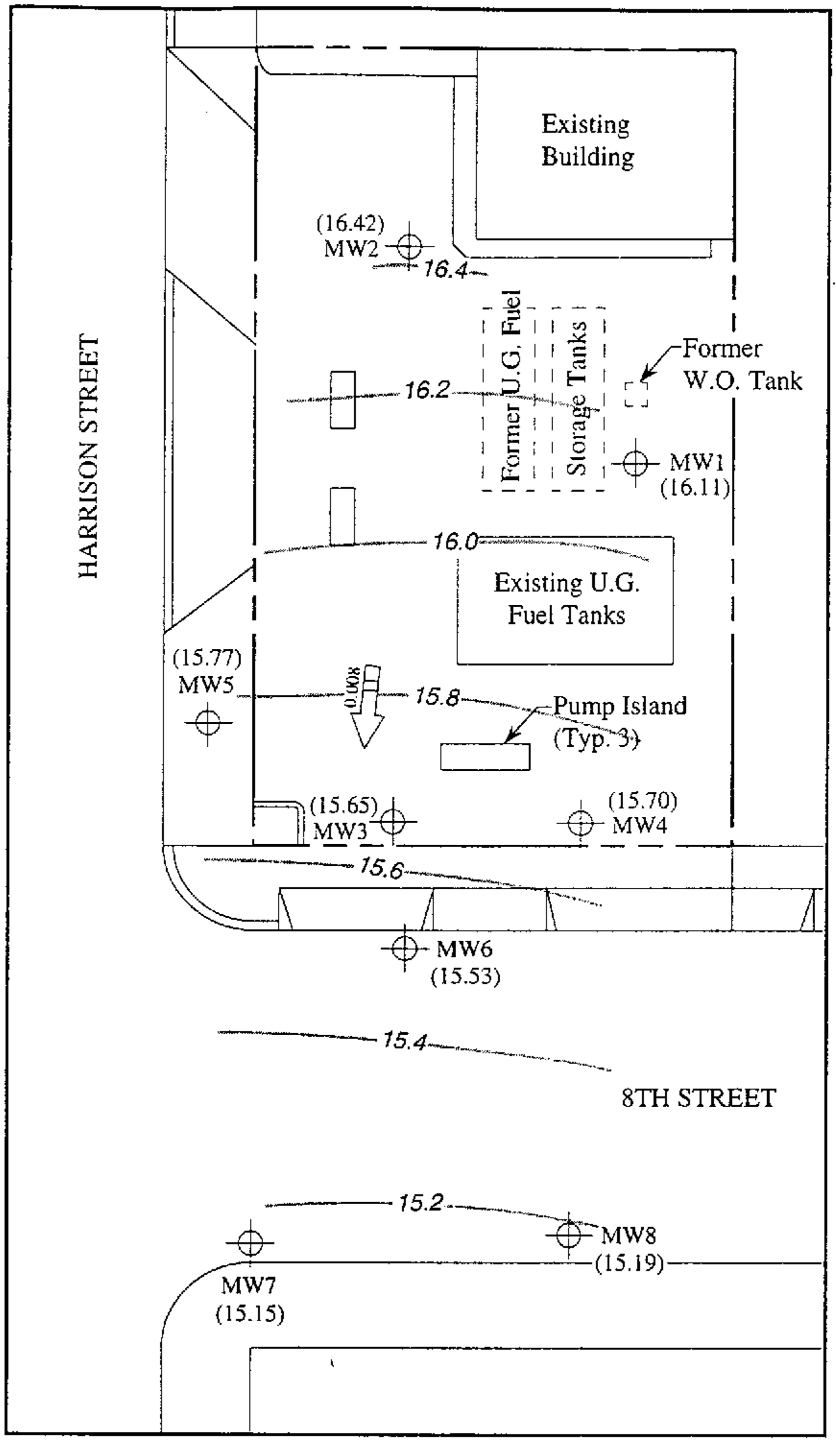


N

Base modified from 7.5 minute U.S.G.S. Oakland West Quadrangle
(photorevised 1980)

0 2000 4000
Approx. scale feet

KAPREALIAN ENGINEERING INCORPORATED	UNOCAL SERVICE STATION #0752 800 HARRISON STREET OAKLAND, CALIFORNIA	LOCATION MAP



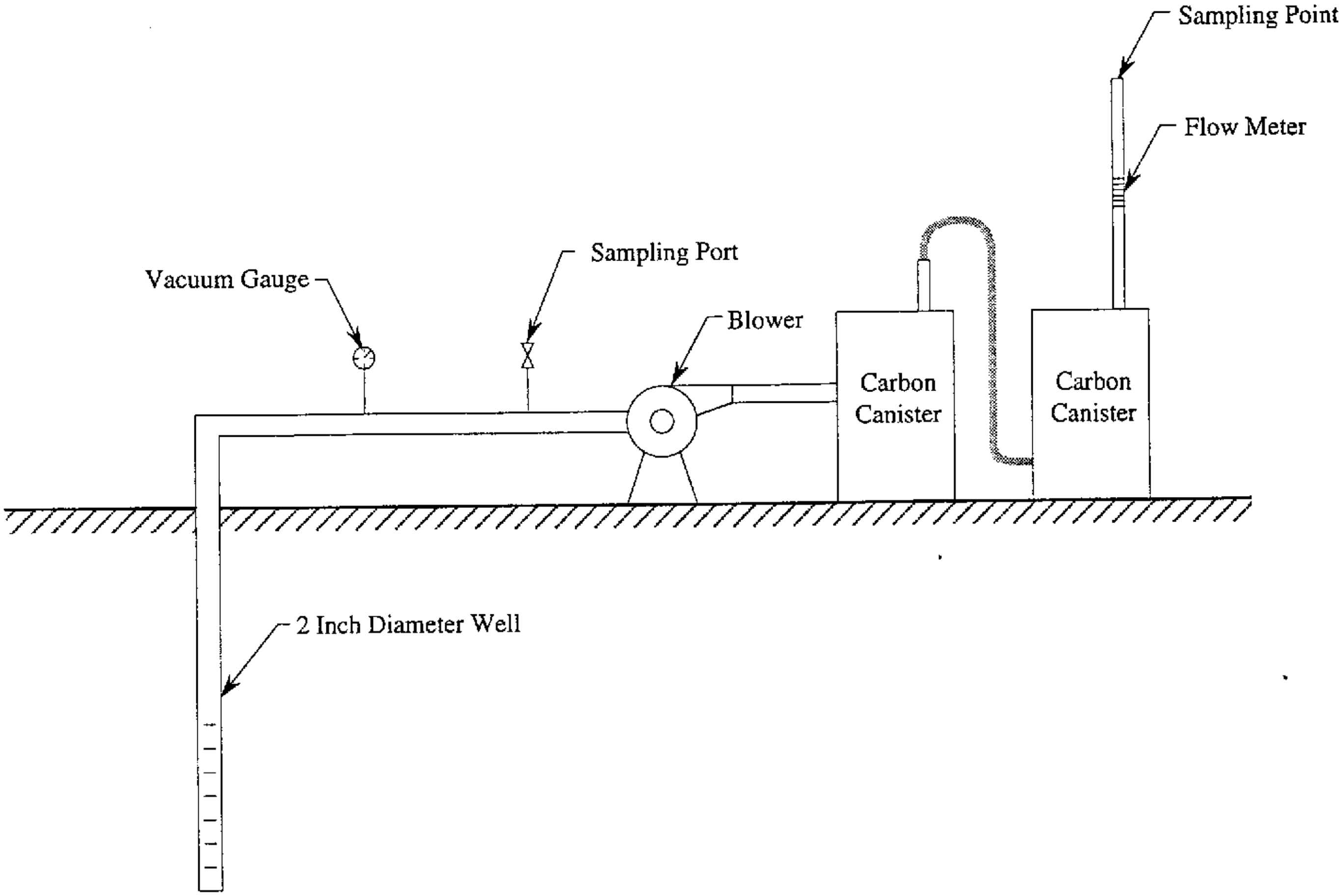
LEGEND

- Monitoring well
- ( ) Ground water elevation in feet above Mean Sea Level
- #.## Direction of ground water flow with approximate hydraulic gradient
- Contours of ground water elevation

0 30 60
Approx. scale feet

POTENTIOMETRIC SURFACE MAP FOR THE JULY 14, 1995 MONITORING EVENT

KAPREALIAN ENGINEERING INCORPORATED	**UNOCAL SERVICE STATION #0752** **800 HARRISON STREET** **OAKLAND, CALIFORNIA**	FIGURE **1**



PILOT VAPOR EXTRACTION TEST SCHEMATIC DIAGRAM

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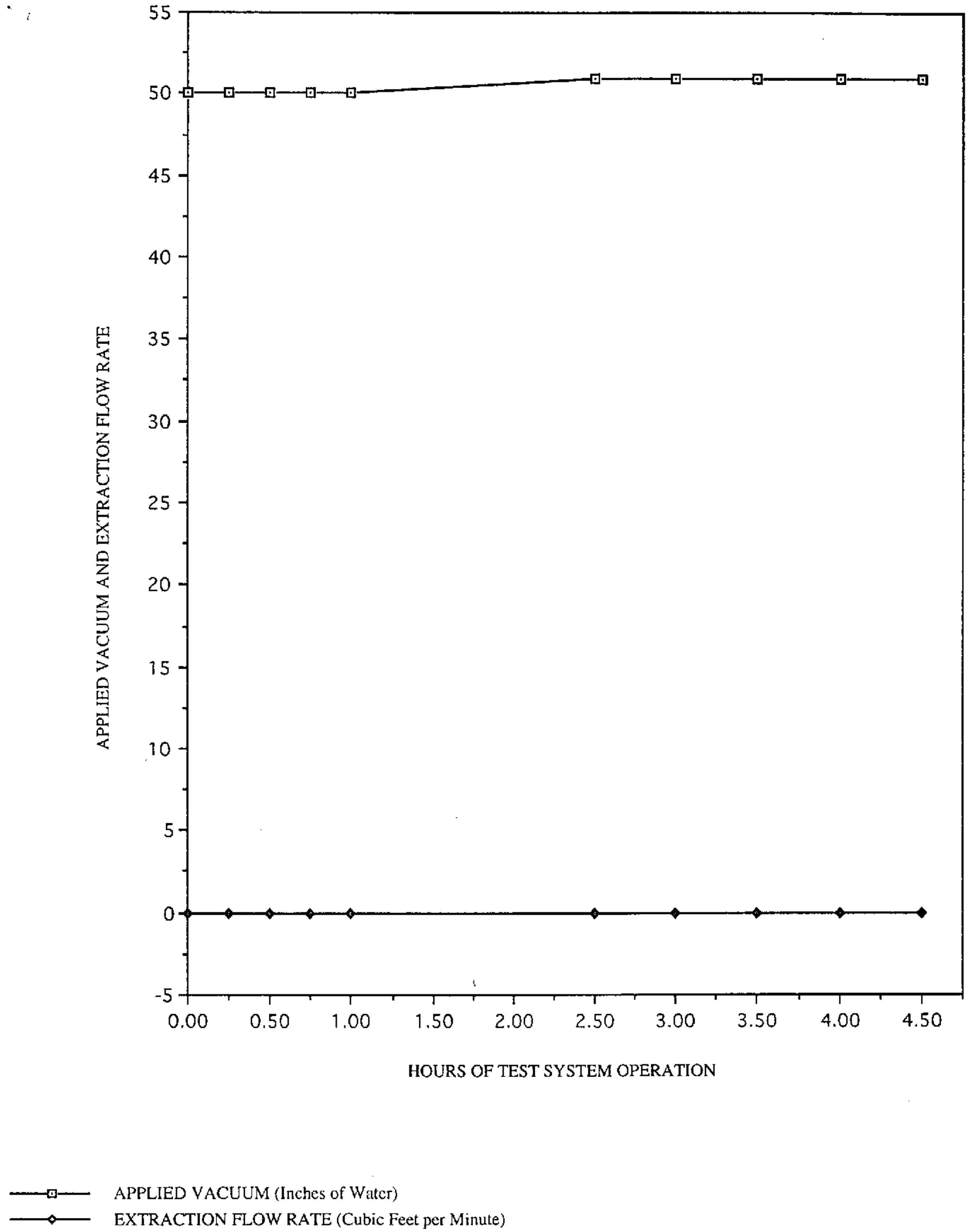
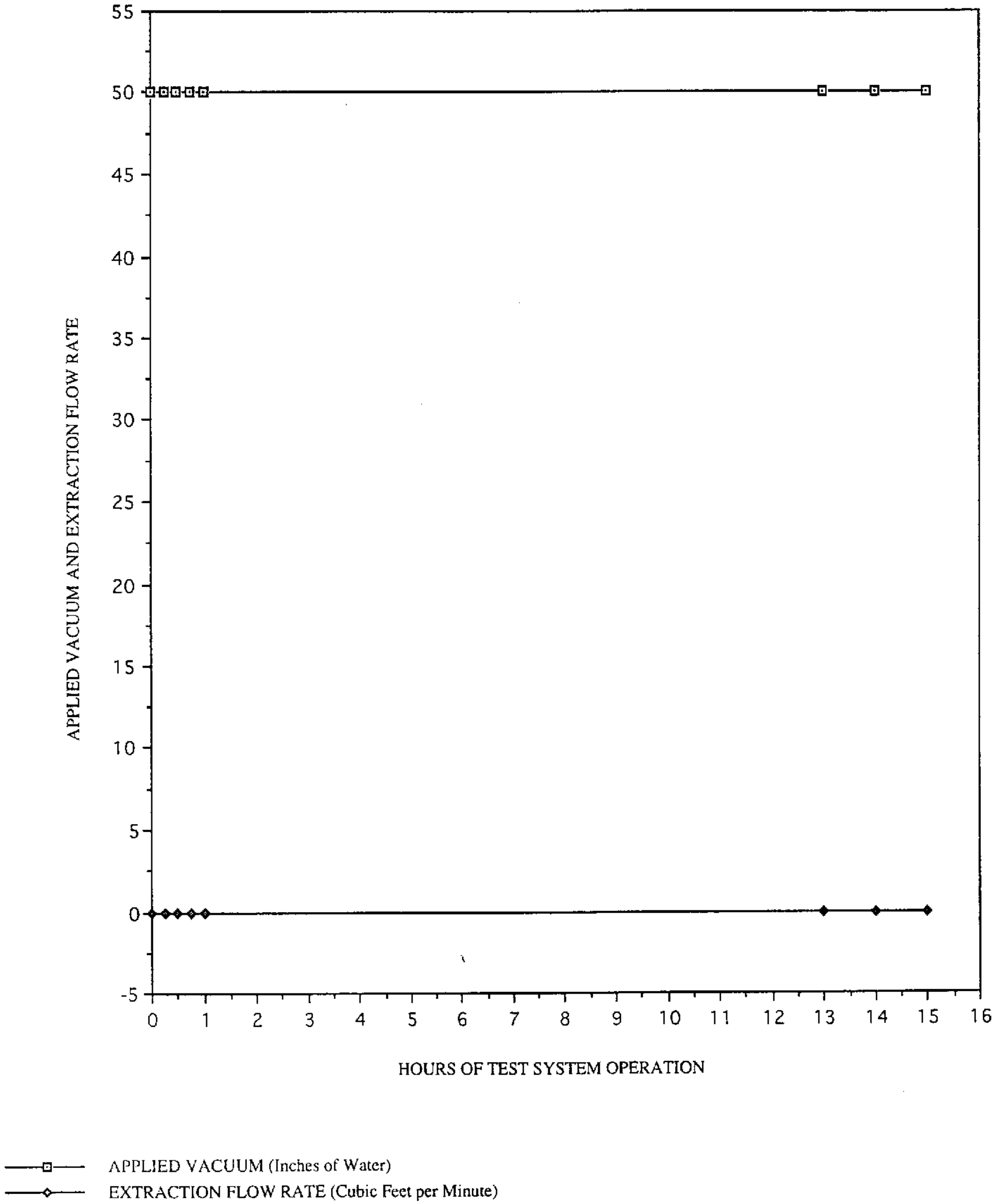
UNOCAL SERVICE STATION #0752
800 HARRISON STREET
OAKLAND, CALIFORNIA

FIGURE
2



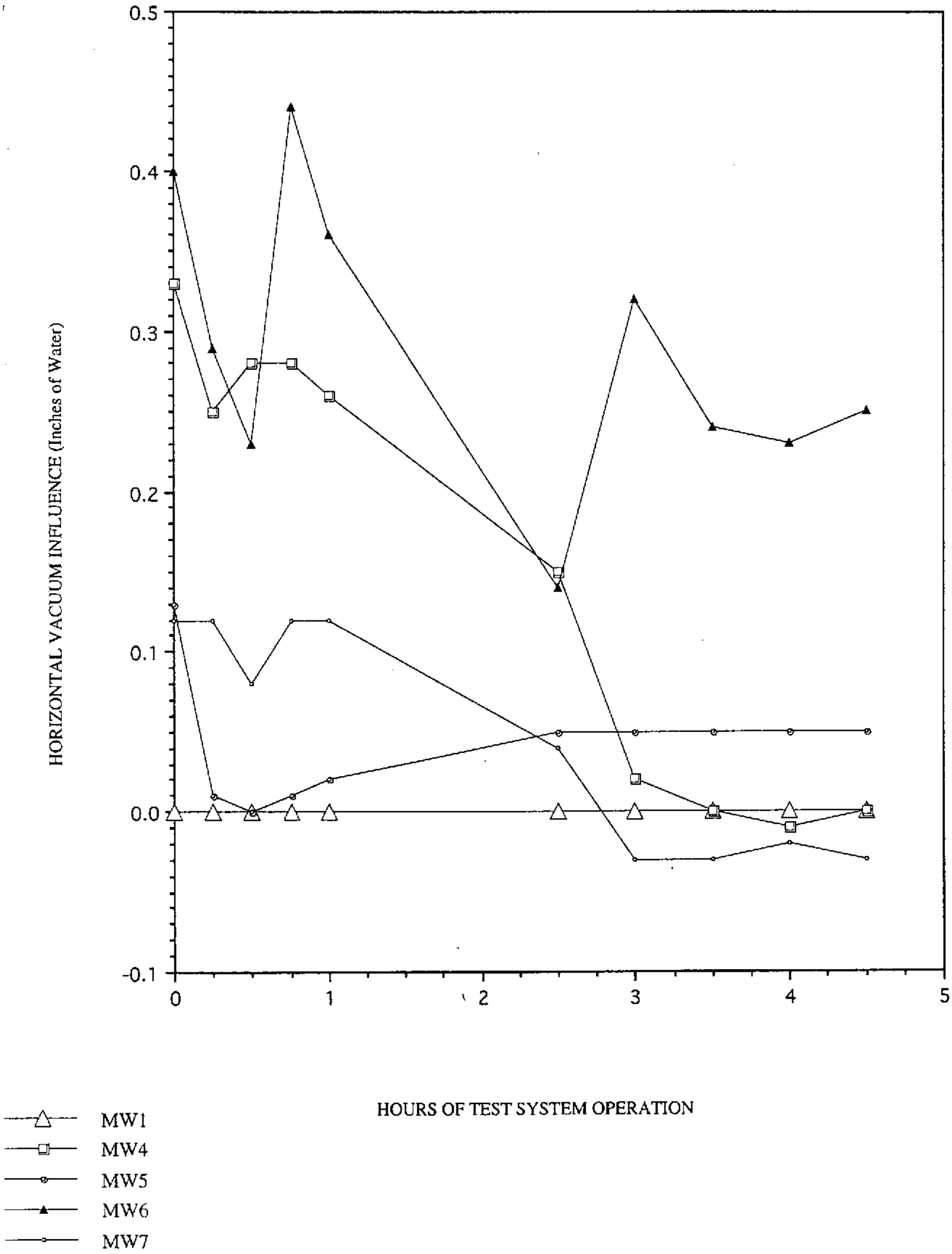
APPLIED VACUUM AND EXTRACTION FLOW RATE VS HOURS OF TEST SYSTEM OPERATION - (MW3)

KAPREALIAN ENGINEERING INCORPORATED	**UNOCAL SERVICE STATION #0752** **800 HARRISON STREET** **OAKLAND, CALIFORNIA**	FIGURE **3**



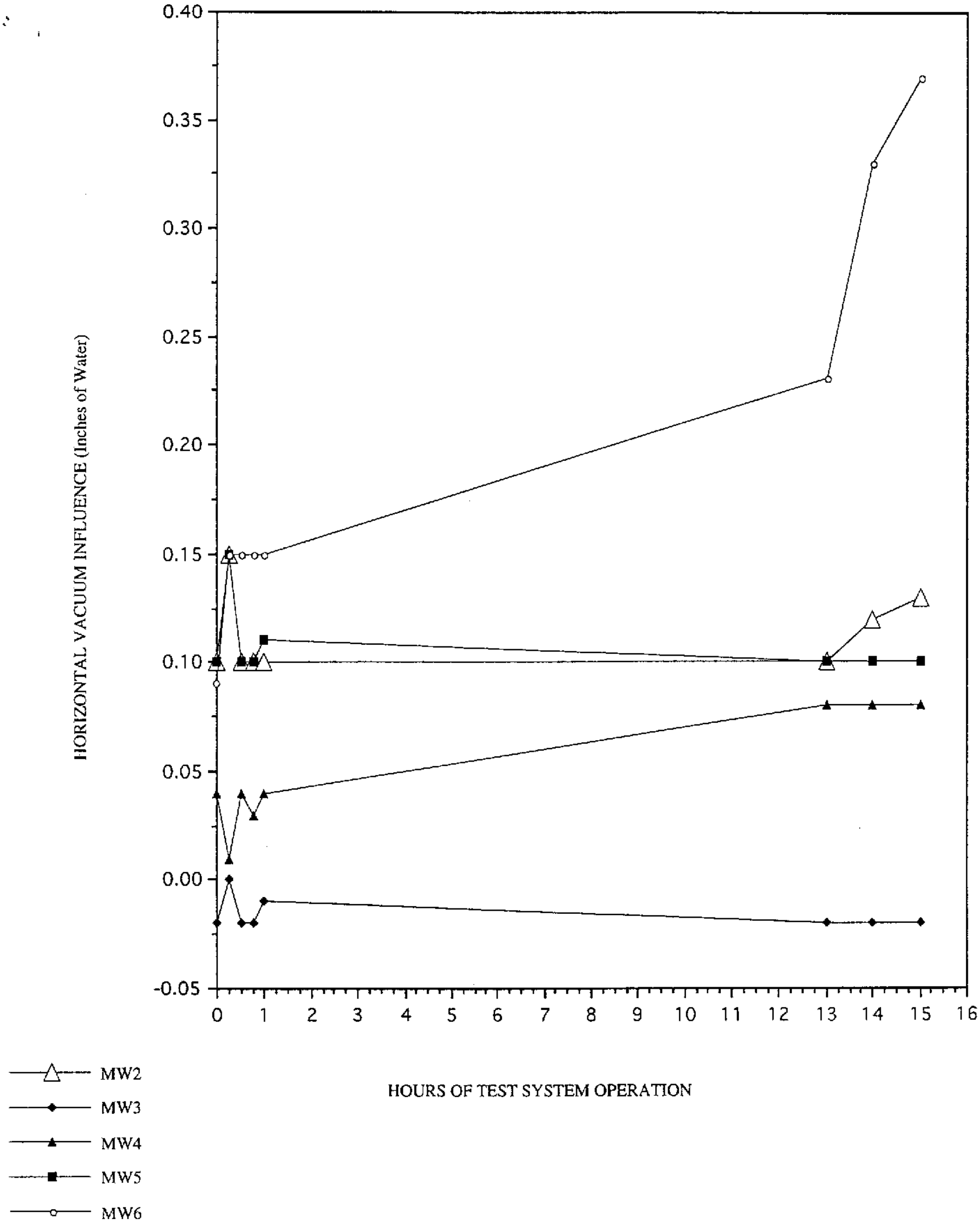
APPLIED VACUUM AND EXTRACTION FLOW RATE VS HOURS OF TEST SYSTEM OPERATION - (MW1)

KAPREALIAN ENGINEERING INCORPORATED	UNOCAL SERVICE STATION #0752 800 HARRISON STREET OAKLAND, CALIFORNIA	FIGURE **4**



HORIZONTAL VACUUM INFLUENCE - MW3

KAPREALIAN ENGINEERING INCORPORATED	UNOCAL SERVICE STATION #0752 800 HARRISON STREET OAKLAND, CALIFORNIA	FIGURE **5**



HORIZONTAL VACUUM INFLUENCE - MW1

KAPREALIAN ENGINEERING
INCORPORATED

UNOCAL SERVICE STATION #0752
800 HARRISON STREET
OAKLAND, CALIFORNIA

FIGURE
6

APPENDIX A

VAPOR EXTRACTION TEST FIELD SUMMARY

TABLE 2

SUMMARY OF LABORATORY ANALYSES (AIR)

Date	Sample	TPH as Gasoline	Benzene	Toluene	Ethylbenzene	Xylenes
8/21/95	INF-1(MW3)	19,000	300	150	60	180
	INF-2(MW3)	19,000	130	170	41	120
	EFF-1(MW3)	ND	ND	ND	ND	ND
	INF-1(MW1)	13,000	89	14	14	140
8/22/95	INF-2(MW1)	9,700	85	17	21	130
	EFF-1(MW1)	ND	ND	ND	ND	ND

SUMMARY OF LABORATORY ANALYSES (WATER)

Date	Sample	TPH as Gasoline	Benzene	Toluene	Ethylbenzene	Xylenes
8/21/95	MW3	2,600	1,500	55	58	41

ND = Non-detectable.

Results are in micrograms per liter ($\mu g/L$), unless otherwise indicated.

KEI-P90-1103.R10
October 23, 1995

TABLE 3

SUMMARY OF EXTRACTION CALCULATIONS

Date	Sample	TPH as Gasoline (µg/L)	Flow Rate (SCFM)	Hydrocarbon Extraction Rate (lbs/hr)
8/21/95	INF-1(MW3)	13,000	<1.5	0.073
	INF-2(MW3)	19,000	<1.5	0.11
	INF-1(MW1)	19,000	<1.5	0.11
8/22/95	INF-2(MW1)	9,700	<1.5	0.054

NOTE: The flow meter used during the pilot VET had a measurement range of 3-25 standard cubic feet per minute (SCFM). Due to the fact that no measurable flow was indicated, the above calculations were conducted using the assumption of one-half of the lower limit of the meter.

APPENDIX B

MW1 AND MW3 BORING LOGS AND WELL COMPLETION DIAGRAMS

BORING LOG

Project No. KEI-P90-1109	**Boring & Casing Diameter** 9" 2"	**Logged By** W.W. DRB
Project Name Unocal 800 Harrison St. Oakl	**Well Cover Elevation**	**Date Drilled** 5/29/91
Boring No. MW1	**Drilling Method** Hollow-stem Auger	**Drilling Company** Woodward Drilling

Penetration blows/6"	G. W. level	Depth (feet) Samples	Strati-graphy USCS	Description
		0		5" thick concrete slab over sand and gravel.
				Fill material consisting of silt, clay and gravel, with concrete, wood and glass, moist, gray, brown and yellowish brown mottled.
10/18/28		5	SP/ SM	Fine-grained sand, with silt, trace clay, moist, dense, pale brown to yellowish brown, trace black specks.
18/18/18		10		Fine-grained sand, with silt, trace root holes, moist, dense, olive gray and greenish gray mottled.
6/12/20		15		Fine-grained sand, with silt, trace silt, trace clay, moist, dense,olive brown with slight greenish gray mottling.
20/25/38			SP	Fine-grained sand, trace silt, moist, very dense, dark greenish gray to olive gray.
15/		20		Fine-grained sand, as above, moist, dense, olive gray.

B O R I N G   L O G

Project No. KEI-P90-1109	**Boring & Casing Diameter** 9" 2"	**Logged By** W.W.
Project Name Unocal 800 Harrison St. Oakl	**Well Cover Elevation**	**Date Drilled** 5/29/91
Boring No. MW1	**Drilling Method** Hollow-stem Auger	**Drilling Company** Woodward Drilling

Penetration blows/6"	G. W. level	Depth (feet) Samples	Strati-graphy USCS	Description
/19/23			SP	Fine-grained sand, trace silt, moist, dense, olive gray.
20/28/32	▽	25	SP/ SM	Fine-grained sand, with silt, saturated, very dense, grayish brown to light olive brown.
28/32/45		30	SP	Very fine- to fine-grained sand, trace silt, saturated, very dense, grayish brown.
18/23/35		35	CL/ CH	Clay, with silt, trace fine-grained sand, moist, hard, light brownish gray to pale brown.
		40		TOTAL DEPTH:35'

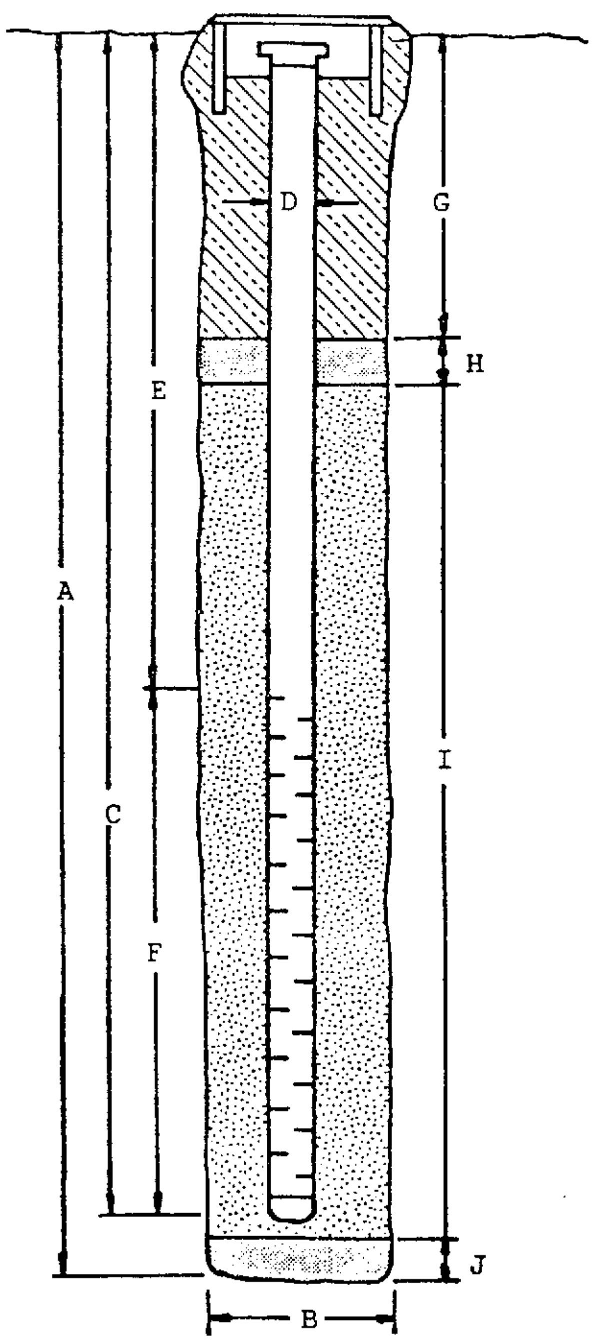
WELL COMPLETION DIAGRAM

PROJECT NAME: Unocal 800 Harrison St. Oakland BORING/WELL NO. MW1

PROJECT NUMBER: KEI-J90-1103

WELL PERMIT NO.:

Flush-mounted Well Cover



A. Total Depth: 35'

B. Boring Diameter*: 9"

Drilling Method: Hollow Stem Auger

C. Casing Length: 33.5'

Material: Schedule 40 PVC

D. Casing Diameter: OD = 2.375"

ID = 2.067"

E. Depth to Perforations: 13.5'

F. Perforated Length: 20'

Perforation Type: Machined Slot

Perforation Size: 0.020"

G. Surface Seal: 9.5'

Seal Material: Neat Cement

H. Seal: 2'

Seal Material: Bentonite

I. Gravel Pack: 23.5'

Pack Material: RMC Lonestar Sand

Size: #3

J. Bottom Seal: none

Seal Material: N/A

*Boring diameter can vary from 8-1/4" to 9" depending on bit wear.

B O R I N G   L O G

Project No. KEI-P90-1103	Boring & Casing Diameter 9" 2"	Logged By W.W. DRB
Project Name Unocal 800 Harrison St. Oakl	Well Cover Elevation	Date Drilled 5/30/91
Boring No. MW3	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.
			SM	Very fine- to fine-grained sand, with approximately 10% silt, moist, medium dense, very dark grayish brown.
				Sand, as above, brown, trace clay.
3/6/14		5	SP/SC	Very fine- to fine-grained sand, with approximately 10% clay, trace silt, moist, medium dense, dark yellowish brown with light grayish brown mottling.
16/18/22		10		Very fine- to fine-grained sand, with approximately 5% clay, trace silt, moist, dense, yellowish to grayish brown, changing to olive gray below 10.3'.
16/33/41		15		Fine-grained sand, with approximately 5% clay, moist, very dense, olive.
9/14/		20		Fine-grained sand, with approximately 5% clay, moist, dense, light olive gray.

B O R I N G   L O G

Project No. KEI-P90-1103	**Boring & Casing Diameter** 9" 2"	**Logged By** W.W. DRB
Project Name Unocal 800 Harrison St. Oakl	**Well Cover Elevation**	**Date Drilled** 5/30/91
Boring No. MW3	**Drilling Method** Hollow-stem Auger	**Drilling Company** Woodward Drilling

Penetration blows/6"	G. W. level	Depth (feet) Samples	Strati-graphy USCS	Description
/22			SP/SC	Sand, with clay, as above.
12/24/33	▽		SP	Fine-grained sand, trace silt, very moist to saturated below 23.3', very dense, gray to greenish gray.
16/28/42		25		Very fine- to fine-grained sand, trace silt, saturated, very dense, greenish gray.
19/29/40		30		Very fine- to fine-grained sand, trace silt, saturated, very dense, dark grayish brown to olive brown.
9/14/22			SP/SC	Very fine- to fine-grained sand, with approximately 10% clay, very moist, very dense, light brownish gray.
			SC/CL	Very clayey sand to very sandy clay, moist to very moist, dense to hard, light yellowish brown.
		35		
		40		TOTAL DEPTH: 33'

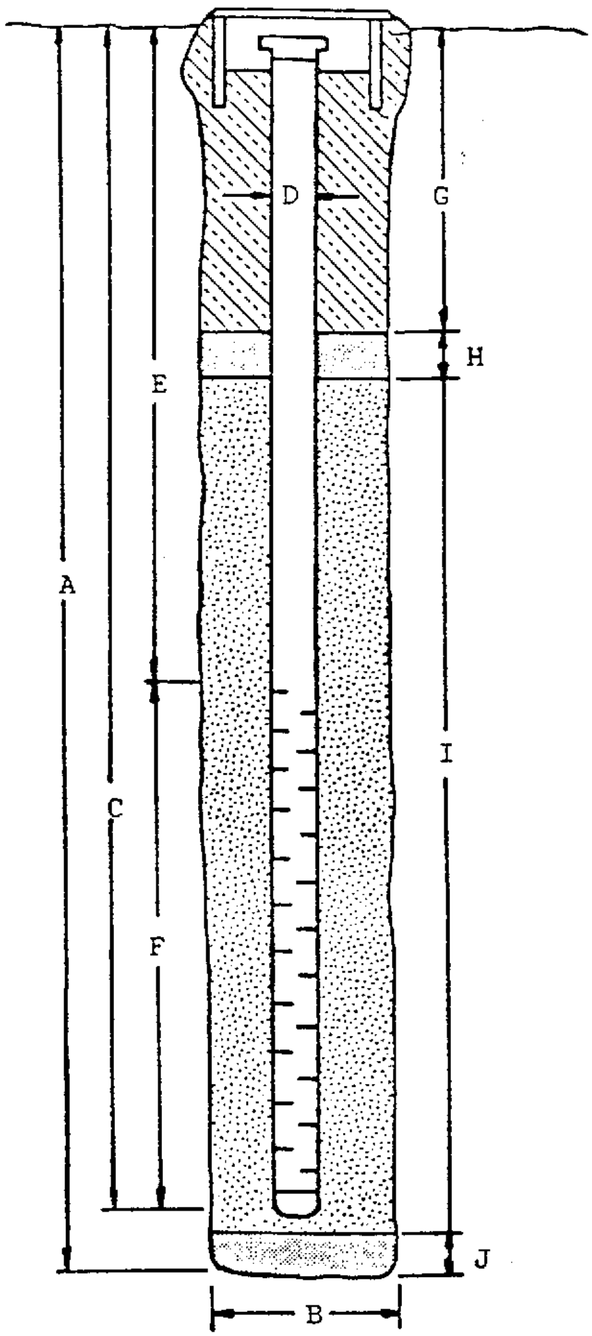
WELL COMPLETION DIAGRAM

PROJECT NAME: Unocal 800 Harrison St. Oakland BORING/WELL NO. MW3

PROJECT NUMBER: KEI-J90-1103

WELL PERMIT NO.:

Flush-mounted Well Cover



A. Total Depth: 33'

B. Boring Diameter*: 9"

Drilling Method: Hollow Stem Auger

C. Casing Length: 33'

Material: Schedule 40 PVC

D. Casing Diameter: OD = 2.375"

ID = 2.067"

E. Depth to Perforations: 15'

F. Perforated Length: 18'

Perforation Type: Machined Slot

Perforation Size: 0.020"

G. Surface Seal: 11'

Seal Material: Neat Cement

H. Seal: 2'

Seal Material: Bentonite

I. Gravel Pack: 20'

Pack Material: RMC Lonestar Sand

Size: #3

J. Bottom Seal: none

Seal Material: N/A

*Boring diameter can vary from 8-1/4" to 9" depending on bit wear.

APPENDIX C

SITE VICINITY HISTORICAL REVIEW

cc: Eva Chu / Scott Seery / Acct Clerk / Adams

KAPREALIAN ENGINEERING INCORPORATED

May 18, 1995

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

Attention: Ms. Tina Berry

RE: Unocal Service Station #0752
800 Harrison Street
Oakland, California

Dear Ms. Berry:

This letter summarizes the information obtained for other underground tank sites in the vicinity of the subject Unocal site. Previous file review information was last presented in Kaprealian Engineering, Inc's. (KEI) report (KEI-P90-1103.R8) dated April 1, 1994. The site vicinity is shown on the attached Figure 1.

On January 17, 1995, a representative of Kaprealian Engineering, Inc. (KEI) reviewed historical Oakland city directories available at the Pleasant Hill library in Pleasant Hill, California. The directories (Polk's) reviewed were the years 1928, 1933, 1938, 1943, and 1967. The following is a summary of the information obtained from this review:

Unocal Service Station #0752, 800 Harrison Street - The station is listed in 1943 under L.C. Wong, and in 1967 as a Unocal station.

Shell Station, 726 Harrison Street (presently operating on LUST list as Exxon station) - This station is listed as Lim Brothers in 1943, and as Mandarin Phillips 66 in the 1966 directory.

706 Harrison (current Oakland Auto Parts and Tires) - Listed as a Richfield station in the 1967 directory.

715 Harrison Street - Listed as a Gulf station in the 1967 directory.

901 Harrison Street - Listed as a Standard station in the 1933 and 1938 directories.

245 - 8th Street - Listed as a service station (Wong's) in the 1967 directory, presently Vic's Automotive.

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

300 7th Street - Listed as a Signal station in the 1933 directory.

831 Webster Street - Listed as a Phillips 66 station in 1967.

925 Webster Street - Listed as a Standard station in 1967 directory.

On February 15, 1995, a representative of KEI reviewed the Alameda County Health Care Services (ACHCS) Agency file for the Shell service station located at 726 Harrison Street, adjacent to the Unocal site. The file review was conducted at the ACHCS offices at 1131 Harbor Bay Parkway in Alameda, California. The following is a summary of the information obtained from the file:

Applications were submitted in August 1990 to operate five underground storage tanks at the site. All of the tanks are single-walled. The tanks consist of three 5,000 gallon tanks, one 8,000 gallon tank, and a 750 gallon waste oil tank. As of September 23, 1994, one 5,000 gallon tank on the west side of the tank pit was not in service.

On May 9, 1995, a representative of KEI reviewed files at the offices of the Oakland Fire Department at 421 - 14th Street in Oakland, California. According to Fire Department personnel, the files have been purged of documents older than 1980. The following is a summary of the information contained in the files:

No file on the Shell station located at 726 Harrison Street existed at the Fire Department. Therefore, it appears that no tanks have been either removed or installed since 1980.

A file existed for a former service station at 706 Harrison Street, currently Oakland Auto Parts and Tires. A permit dated June 27, 1990, for the removal of four 1,000 gallon tanks, two 6,000 gallon tanks, and one waste oil tank was contained in the file.

In the file for the former service station located at 245 8th Street, now Vic's Automotive, documents indicate that two 6,000 gallon tanks were removed in August 1994.

In summary, based on all of the information obtained to date, the vicinity of the subject Unocal site has a high density of former and currently operating service station or underground tank sites (ten stations or sites within 1-1/2 blocks, as shown on Figure 1).

The historical ground water flow direction at the Unocal site is southwest to south-southwest. None of these sites appear to be located directly upgradient of Unocal or appear to have contributed to the contamination at the Unocal site. However, the Shell station, located southwest of and directly across 8th Street from Unocal, has operated since at least 1943. According to Oakland Fire Department records, none of the single-wall steel tanks presently in use have been installed or replaced since at least 1980. It is therefore possible that the ground water contamination encountered in Unocal's off-site well MW8, adjacent to the Shell station, may involve a separate contaminant plume.

Finally, during a phone conversation with Bob Kezerian on February 7, 1995, Ms. Eberle of the ACHCS stated that while no investigation has been conducted by Shell, the Arco/Richfield site downgradient (from Shell) has wells. Ms. Eberle noted that Arco was reporting free product in their upgradient wells, and implied that it might be coming from the upgradient Shell station

Should you have any questions on this matter, please call me at (510) 602-5105.

Sincerely,

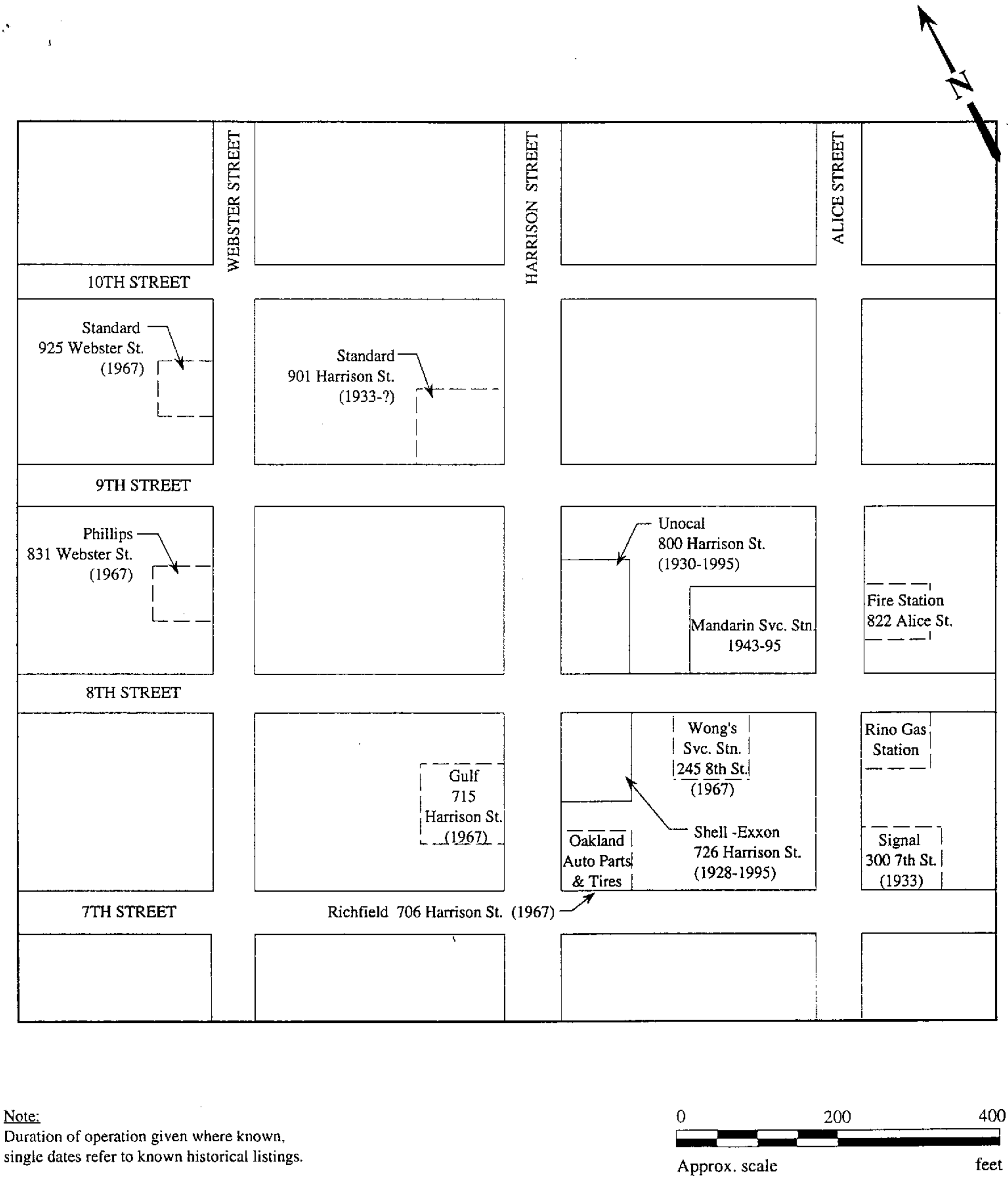
Kaprealian Engineering, Inc.

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

License No. EG 1633
Exp. Date 8/31/96

JGG:jad\TB0518

Attachment



Note:
Duration of operation given where known,
single dates refer to known historical listings.

SITE VICINITY MAP

KAPREALIAN ENGINEERING INCORPORATED

UNOCAL SERVICE STATION #0752
800 HARRISON STREET
OAKLAND, CALIFORNIA

FIGURE **1**

APPENDIX D

ORC
VENDOR INFORMATION

REGENESIS

BIOREMEDIATION PRODUCTS

Oxygen Release Compound (ORC®)

ORC releases oxygen slowly to enhance bioremediation.

Oxygen Release Compound (ORC®)

Bioremediation—A Natural Process

Bioremediation is a process by which microorganisms degrade hazardous substances. For example, common bacteria can metabolically transform toxic petroleum products into carbon dioxide and water. Aerobic bioremediation requires oxygen, as well as moisture and commonly occurring nutrients.

There are several advantages to implementing a bioremediation system as compared to other technologies. Other remediation methods may simply transfer the contaminants to another medium which requires additional clean up. Excavation and transportation of the contaminant is often required. Bioremediation degrades contaminants on-site and can be more cost effective than other treatment technologies. The EPA actively promotes bioremediation as it is an ecologically sound, natural process.

Oxygen is often the limiting factor in aerobic bioremediation. Moisture and nutrients, such as phosphorus and nitrogen, are generally present in sufficient quantities. However, oxygen is rapidly consumed by microbes which thrive in an oxygen rich environment. Without adequate oxygen, contaminant degradation will slow and then stop. Thus, additional oxygen is needed to stimulate further microbial growth and activity.

Oxygen Release Compound, ORC

Oxygen Release Compound (ORC) is an innovative technology which enhances bioremediation. ORC is a patented formulation of a very fine, insoluble peroxygen that releases oxygen at a slow, controlled rate when hydrated. Its use has been demonstrated to increase the remediation of hydrocarbon contamination in soil and groundwater.

Features

- Magnesium peroxide compound is activated by moisture
- Patented technology controls and prolongs the release of oxygen
- Moderate pH levels are maintained
- Fine particle size has stable, long shelf life
- No external coating of product is required to control rate of oxygen release
- Pure oxygen source saturates water to higher levels than aeration

Benefits

- Provides a passive, low-cost, long-term oxygen source
- Does not generate harmful residue; environmentally safe
- Is perfect for in-situ remediation where other methods are impractical
- Will not disturb the hydraulics of the contaminated plume
- Does not volatilize pollutants
- Can be used as a redox control agent

ORC Technology

The product releases oxygen when it comes in contact with water as shown by the following equation:

$$MgO_2 + H_2O \rightarrow {}^1/_2O_2 \uparrow + Mg(OH)_2$$

ORC will stop releasing when dry and will again release when rehydrated. The by-products of the reaction are oxygen and magnesium hydroxide (Milk of Magnesia). ORC is environmentally safe to use.

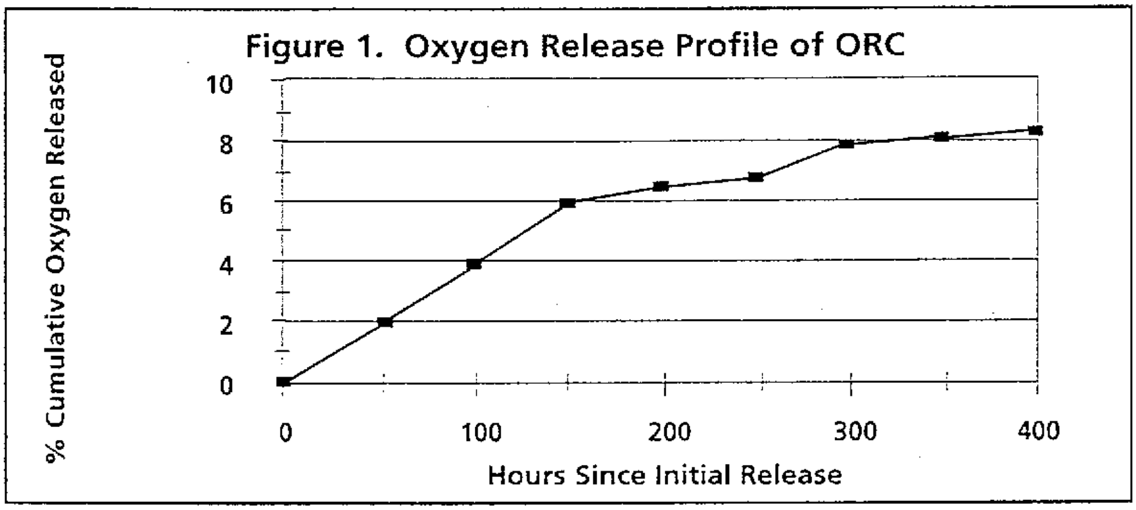


Figure 1 presents a typical release pattern for ORC. In general terms, the product releases up to 10% of the available oxygen in the first several hundred hours, followed by a release of an additional 10% every thousand hours. This translates to a longevity of about one year under static conditions.

ORC Application — The "Oxygen Barrier"

ORC should be considered for contaminated sites whenever aerobic bioremediation is the appropriate treatment technology. For application, ORC powder is mixed in a matrix such as Portland Cement or sand and then lowered into a well or trench in an inert filter sock. After the oxygen dissipates, the socks and spent ORC are removed from the ground and, if necessary, new charges of ORC may be added.

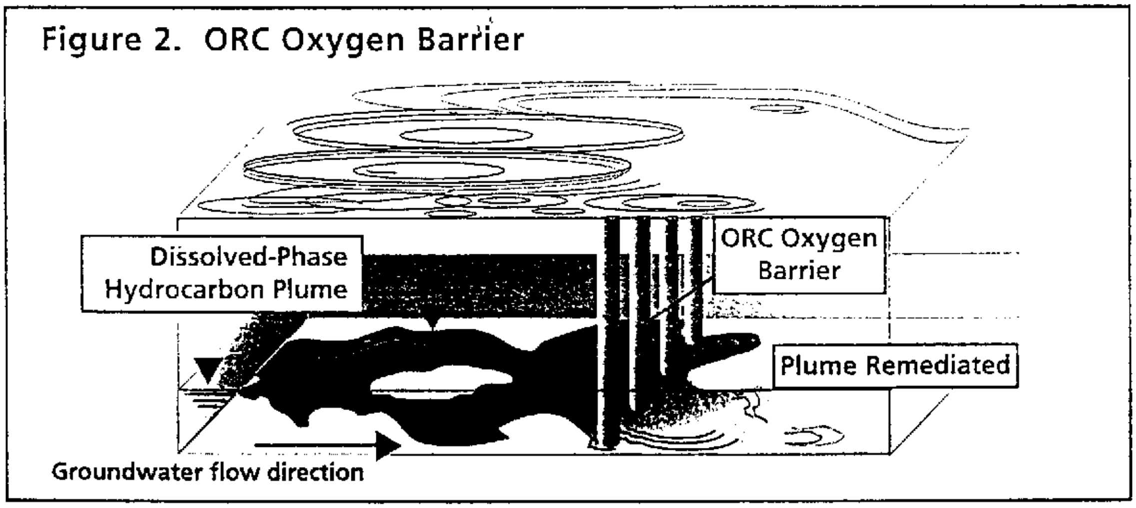
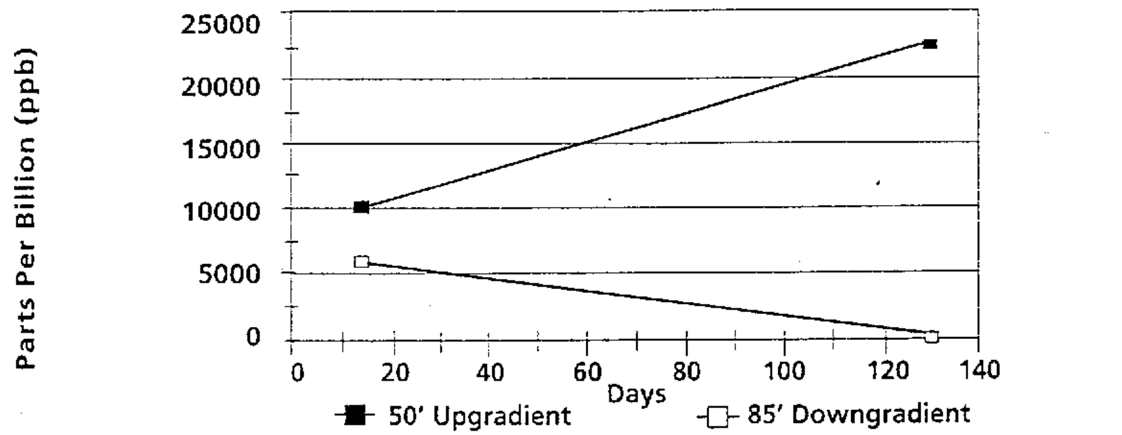


Figure 2 depicts the Oxygen Barrier concept which has been successfully demonstrated to significantly reduce BTEX levels.

Various applications of ORC can meet a wide range of remediation objectives. In ground water applications, ORC can be configured to form an Oxygen Barrier across a contaminated plume. A properly placed row of wells or a trench containing ORC will slowly release oxygen, enhance bioremediation, and cut off the plume in the oxygenated zone (see Figures 2 and 3). The Oxygen Barrier concept was successfully demonstrated at both the University of Waterloo and a site in North Carolina, dramatically remediating BTEX compounds downgradient from the Oxygen Barrier.

Figure 3. Total BTEX — Concentration Over Time



As Figure 3 indicates, while the contaminant source in the North Carolina study continually released increasing levels of BTEX, ORC successfully remediated the contamination downgradient from the "Oxygen Barrier."

Other ORC Applications

► Reduce Risk	Surround highly contaminated area with ORC for fast remediation
► Replace Other Methods	Turn off pump and treat, and use less expensive ORC for final remediation
► Compliment Other Methods	Supplement air sparging with ORC for hard-to-reach contamination
► Treat Soil	Mix ORC into biopiles or use in land farming for faster clean up
► Clean Up Remote Site	May be the best alternative in remote or inclement areas since ORC is a "passive" treatment system
► Control Odor	Successfully demonstrated to control odor in anaerobic impoundments

Please print clearly.

If you would like further information regarding Oxygen Release Compound (ORC®), please call (714) 443-3136 or complete and return this short information card.

A **REGENESIS** representative will contact you to discuss your remediation needs.

Name of Company ____________________

Name/Title ____________________

Address ____________________

City ____________________ State __________ Zip __________

Phone (   ) ____________________ Fax (   ) ____________________

Type of Company: ____________________

Remediation Needs: ____________________

ORC — Proven Effectiveness

Studies at several recognized private companies and universities proved that ORC releases oxygen, enhances microbial activity and promotes remediation. Subsequent field applications demonstrated that ORC was effective in promoting bioremediation under "real world" conditions.

- University of Waterloo (published, *Groundwater Monitoring and Remediation,* Winter 1994 edition) — conducted at the widely studied Borden Aquifer in Ontario, Canada. The study indicates that an Oxygen Barrier generated by ORC released significant amounts of dissolved oxygen (D.O.). It concluded that the enhancement of D.O. by ORC led to the biodegradation of at least 4 mg/L each of benzene and toluene.
- North Carolina Site (published, *Proceedings from the Second International Symposium on In Situ and On-Site Bioreclamation,* San Diego, CA, 1993) — study demonstrated that the use of ORC in an Oxygen Barrier dramatically reduced BTEX compounds downgradient from leaking gasoline UST.
- Alaska Site — A study was completed showing the effectiveness of ORC remediation as compared to air sparging. Sparge points fouled in the high iron environment and there was evidence of channeling — a problem common with this technology. ORC was effective in remediation and a full barrier was installed.
- New Mexico Site — The regulatory community showed interest in ORC barriers. From a single test well, remediation occurred downgradient in a wide dispersive pattern. A full barrier proposal was requested.

ORC vs. Other Remediation Technologies

ORC is a safe and effective remediation technology with many application advantages over other chemical oxygen sources, such as hydrogen peroxide and calcium peroxide. Because ORC is formulated to release a constant supply of oxygen over an extended period of time, replenishment is less frequent and more convenient. In addition, ORC's harmless by-products — oxygen and magnesium hydroxide — provide confidence in regulatory approval.

ORC can also provide cost and operational advantages over mechanical oxygen sources. In many circumstances, the cost of implementing an ORC remediation application can be substantially lower than a pump and treat or an air sparging system.

First-Class Postage Required

Post Office will not deliver without proper postage.

REGENESIS BIOREMEDIATION PRODUCTS
27130 PASEO ESPADA STE A1407
SAN JUAN CAPISTRANO CA 92675-2758

Safety, Storage and Handling

ORC is an oxidizer. ORC should not come into contact with combustible materials. Though the material itself is not flammable, it can release oxygen to feed a fire. In the event of a fire, the area should be flooded with large volumes of water.

Since ORC can be mildly hazardous to human health, certain precautions should be taken when handling the material. Direct contact with the skin and eyes should be avoided, as irritation may occur. Rubber gloves and protective goggles should be worn as a preventative measure. Should contact with skin occur, wash immediately with soap and water. Flush eyes thoroughly and repeatedly for 15 minutes and contact a physician, if necessary.

Inhalation may also cause mild irritation to the lungs, nose, and throat, but should not result in significant, long-term hazard. A proper dust mask or breathing apparatus should be used when the product is handled in the powder form. If inhalation irritation occurs, move to a well ventilated space, or outside to fresh air.

ORC is a very stable compound. Though it is designed to release oxygen when in contact with water, it will remain stable at up to 3% moisture which facilitates storage. Storage areas should remain dry. Avoid areas with high humidity. Store the product away from combustible material. Keep containers closed when not in use.

REGENESIS—The Company

REGENESIS Bioremediation Products was formed to continue the development and marketing of ORC®. Oxygen Release Compound was first sold commercially in 1994 after three years of development. The inventors originally began working on a similar product used to facilitate the growth of plants in oxygen-poor soils. Formulations of ORC, more appropriate to bioremediation applications, were successfully tested in the laboratory and followed by several field demonstrations. The company is now in the commercialization phase, working with clients to meet their specific remediation needs.

The Scientific Advisory Board and the Board of Directors of **REGENESIS Bioremediation Products** are composed of recognized leaders from industry, academia and government.

For further information or technical assistance, please contact:

REGENESIS Bioremediation Products
27130A Paseo Espada, Suite 1407
San Juan Capistrano, CA 92675
(714) 443-3136 (Voice) (714) 443-3140 (Fax)

REGENESIS
Bioremediation Products

27130A Pasco Espada, Suite 1407
San Juan Capistrano,CA 92675
Phone: (714) 443-3136
Fax: (714) 443-3140

The Company and Its Products

Introduction

REGENESIS was incorporated in the Spring of 1994 to continue the development and commercialization of Oxygen Release Compound, ORC®. ORC is a patented formulation of a very fine, insoluble solid peroxygen which has been formulated to release oxygen at a controlled rate when hydrated. Since oxygen is frequently the limiting factor in bioremediation, the product has been demonstrated to increase the remediation of hydrocarbon contamination in soil and groundwater. The company is now in the commercialization stage, working with clients to meet their specific project needs.

The Company

The roots of the company go back several years before its incorporation in California. The inventors originally began working on a similar product used to facilitate the growth of plants in oxygen poor soils. That product, OXYGEN PLUS®, is now sold to the horticultural market.

Formulations of ORC, more appropriate to bioremediation applications, were first tested in the laboratory over three years ago. After several successful laboratory results and small scale field tests, the company commissioned Arthur D. Little to complete a market study. This September 1993 study indicated a significant commercial opportunity. Concurrent with the study and encouraged by its results, REGENESIS decided to conduct several full scale field demonstrations. One of the most significant was published in a Ground Water Monitoring and Remediation article (Winter 1994) which describes the results of an application of ORC by the University of Waterloo at the widely studied Borden Aquifer.

The Founder and Chairman of the Board of REGENESIS is Mr. Gavin S. Herbert, who also founded Allergan Pharmaceuticals--a Fortune 300 company with almost $1 billion is sales. The President and CEO of the company is Mr. John B. Griffiths, who came to the company after 15 years in the oil equipment industry. Mr. Griffiths was Vice President and Group Manager of FMCs $350 million petroleum equipment business and later became President of Hydril. The co-inventor of the product, Dr. Stephen Koenigsberg is the company's Vice President of Research. The Scientific Advisory Board is headed by Dr. Herb Ward, Chairman Emeritus of the Department of Environmental Science and Engineering at Rice University. He and the other four members are renown scientists in the environmental remediation industry. REGENESIS' Board of Directors is composed of recognized leaders from industry and government.

ORC Features and Benefits

The core technology involves a patented formulation which when hydrated releases oxygen slowly, from a period of a few months to in excess of one year. Regenesis is working almost exclusively with magnesium peroxide although the patent covers the use of several other peroxygen materials as a basis for formulating ORC. ORC is environmentally safe to use. The time-release technology is not based on a coating process which could introduce regulatory concerns regarding the introduction of such materials to aquifers. ORC releases oxygen when it is contacted with water, however, the material is stable at up to 3% moisture which facilitates storage (long shelf life) and handling. Moderate pH levels are maintained when ORC is used. The particle size of ORC is extremely small (-325 mesh or about 44 microns and below) which facilitates oxygen dispersion. Although it is designed to be removed upon depletion, if left in place, ORC would ultimately be converted to ordinary magnesium hydroxide (Milk of Magnesia) which is also insoluble.

As a result of these features, ORC can provide a passive, low cost, long term remediation in many circumstances. In groundwater, the hydraulics of a contaminated plume will not be disturbed and pollutants will not be volatized. Also, the rate control features of ORC make it a "redox control" agent which can be important where specific microbial systems yield the desired bioremediation activity in a restricted range of redox potentials.

Technology

When ORC comes in contact with moisture, oxygen is slowly released. The reaction proceeds according to the following equation:

$$MgO_2 + H_2O \rightarrow \frac{1}{2}O_2\uparrow + Mg(OH)_2$$

In groundwater application, the ORC powder is contained in a matrix, such as cement briquettes or sand, and then lowered into the groundwater in an inert container. When the oxygen has been dissipated, this container and spent ORC is removed from the groundwater. The by-products of the reaction are oxygen and magnesium hydroxide. The oxygen is consumed and the insoluble magnesium hydroxide is removed.

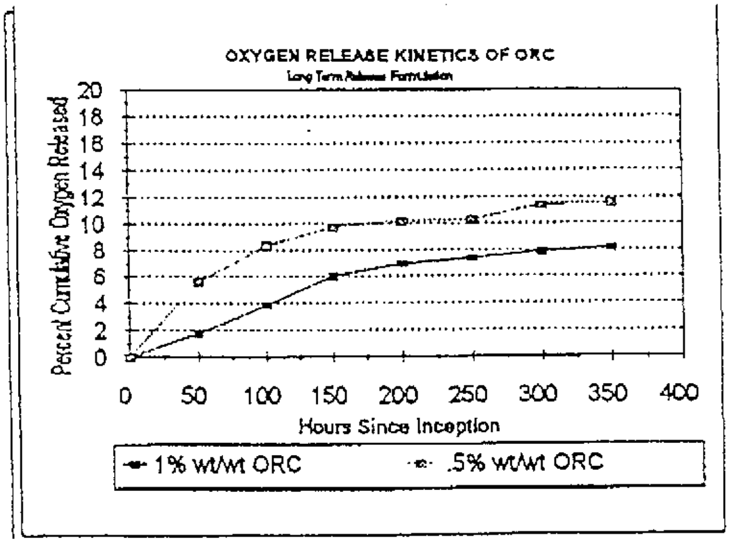
Magnesium peroxide has several uses outside of bioremediation. In agriculture, magnesium peroxide is used to provide oxygen to treat anaerobic soils that limit plant growth. Fifty states have registered Oxygen Plus® Plant Food, a magnesium peroxide based product, for use. Magnesium peroxide is listed in the Merck Index as a digestive antiacid making it even safe to ingest.

The manufacture of ORC uses hydrogen peroxide in an exothermic reaction that is essentially irreversible. Thus, magnesium peroxide does not degrade to hydrogen peroxide as is often assumed. Consequently, it does not have a significant ability to chemically oxidize compounds, or emit powerful free-radical mechanisms as is the case with hydrogen peroxide and peroxide hydrates, such as sodium percarbonate.

Applications

Figure 1 presents typical release patterns for two concentration of ORC in saturated sod. In general terms, the product can be described as releasing up to 10% of the available oxygen in about the first 200 hours followed by a release of each additional 10% every thousand hours. This translates into a longevity of about one year under static conditions.

Figure 1



In field applications, longevity can be reduced by oxygen demand factors. Other conditions, such as temperature and pH play a role; acidic conditions promote a faster oxygen release and basic conditions slow it down.

During the past three years, studies have been conducted at several recognized private laboratories and universities which proved that ORC could release oxygen slowly and that remediation of hydrocarbons could be causally linked to this property through enhanced microbial activity. Subsequent field applications in contaminated soil demonstrated that ORC was effective in promoting bioremediation under "real world" conditions. Having established the value of ORC in soil bioremediation, its applicability to groundwater remediation became a focal point of activity.

ORC can be configured to form an **oxygen barrier** across a contaminated plume. A row of wells or a trench containing ORC can release oxygen slowly and cut off the plume by fostering bioremediation in the oxygenated zone. Oxygen barriers are a passive, in-situ treatment that can represent significant capital and maintenance cost advantages over alternative means of remediation. A properly placed and maintained oxygen barrier offers the assurance that the plume remains "cut-off," and does not reappear as it can with other methods.

The first field evaluations of oxygen barriers were made by the University of Waterloo and North Carolina State University (NCSU). The first limited commercial test application was recently completed by a major consulting firm in Alaska. At Waterloo, the contamination was created by measured addition to the groundwater at a widely studied site (Canadian Forces Base Borden). The Waterloo experiment used two of the BTEX components, benzene and toluene, whereas in the NCSU and Alaska projects the entire BTEX fraction was involved, since an actual fuel spill was the contaminant source.

The Waterloo experiment has been completed and the results published as previously mentioned. The preliminary results of the NCSU experiment were presented at The Second International Symposium for In Situ and On Site Bioreclamation (1993 Battelle

Conference). The full experiment ran for 233 days and the final results are being prepared for publication. Of great significance was the fact that remediation occurred even though concentrations of BTEX entering the barrier had increased several fold during the course of the experiment. Nevertheless, upon passing through, all of the compounds were remediated to federal standards except for benzene which was reduced 98%, dropping from 1870 ppb to 34 ppb. In some states this would be acceptable for closure. The Alaska study looked at the dispersion of oxygen in the field, with special reference to a predictive model. The field test oxygen measurements exceeded the predicted dispersion results by a factor of two to three times. The actual results were significant enough for the company to propose a full scale barrier and purchase the product for installation.

In all of these studies the effectiveness of ORC was clearly demonstrated. The validity of the basic concept was proven. Oxygen can be delivered to the subsurface in a passive, low cost time release manner, which can be effective in the remediation of moderate levels of dissolved phase hydrocarbons, traversing the barrier with typical groundwater flow velocities.

ORC is appropriate to be considered whenever aerobic bioremediation could be the technology of choice. The oxygen barrier concept can be used to contain a spreading groundwater plume as described. Another use of ORC is the in-situ treatment of "hot spots" to bring down contamination quickly to more acceptable levels. Or, ORC can be used as a "polishing agent" to continue remediation after a more expensive pump and treat system is turned off. Finally, ORC has been successfully demonstrated for odor control and in biopiles; particularly in remote or inclement areas that limit the viability of other treatment methods and/or where the passive release of oxygen in-situ offers safety or operational advantages.

REGENESIS
Bioremediation Products

27130A Paseo Espada, Suite 1407
San Juan Capistrano,CA 92675
Phone: (714) 443-3136
Fax: (714) 443-3140

ORC Target Market BTEX Plume

Cost Comparison-Summary
Hypothetical Plume Treatment

Plume Characteristics

- Contamination: BTEX
- Concentration: 5 ppm in groundwater
- Plume width: 100 feet
- Groundwater seepage velocity: 0.5 feet/day
- Saturated treatment zone: 15 feet thick
- Depth to groundwater: 15 feet
- Assumed weight ratio of oxygen to hydrocarbon for remediation
  Year 1: 6x
  Year 2 and following: 3x
- Testing and monitoring costs:
  Testing necessitated by the nature of the treatment is included in cost.
  Standard monitoring of site is excluded since cost will be approximately the same for each treatment and will vary by site depending on field conditions and regulatory requirements.
- No floating product, and as much contaminated soil as possible previously removed.

Sequoia Analytical

680 Chesapeake Drive, Redwood City, CA 94063, (415) 364-9600, FAX (415) 364-9233
404 N. Wiget Lane, Walnut Creek, CA 94598, (510) 988-9600, FAX (510) 988-9673
819 Striker Avenue, Suite 8, Sacramento, CA 95834, (916) 921-9600, FAX (916) 921-0100

Kaprealian Engineering, Inc.	Client Project ID: Unocal #0752, 800 Harrison St., Oakland	Sampled: Aug 21& 22, 1995
2401 Stanwell Dr., Ste. 400	Sample Matrix: Air	Received: Aug 22, 1995
Concord, CA 94520	Analysis Method: EPA 5030/8015 Mod./8020	Reported: Sep 7, 1995
Attention: Dennis Royce	First Sample #: 508-1632	

TOTAL PURGEABLE PETROLEUM HYDROCARBONS with BTEX DISTINCTION

Analyte	Reporting Limit µg/L	Sample I.D. 508-1632 MW3 EFF1	Sample I.D. 508-1633 MW1 INF1	Sample I.D. 508-1634 MW1 EFF1	Sample I.D. 508-1635 MW1 INF2	Sample I.D. 508-1636 MW3 INF2
Purgeable Hydrocarbons	5.0	N.D.	13,000	N.D.	9,700	19,000
Benzene	0.050	N.D.	89	N.D.	85	130
Toluene	0.050	N.D.	14	N.D.	17	170
Ethyl Benzene	0.050	N.D.	14	N.D.	21	41
Total Xylenes	0.050	N.D.	140	N.D.	130	120
Chromatogram Pattern:		--	Gasoline	--	Gasoline	Gasoline

Quality Control Data

Report Limit Multiplication Factor:	1.0	250	1.0	250	500
Date Analyzed:	8/23/95	8/23/95	8/23/95	8/23/95	8/23/95
Instrument Identification:	HP-5	HP-5	HP-5	HP-5	HP-5
Surrogate Recovery, %: (QC Limits = 70-130%)	92	80	86	74	82

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

SEQUOIA ANALYTICAL, #1271

Alan B. Kemp
Project Manager

UNOCAL 76

❑ 680 Chesapeake Drive • Redwood City, CA 94063 • (415) 364-9600
❑ 819 Striker Ave., Suite 8 • Sacramento, CA 95834 • (916) 921-9600
❑ 1900 Bates Ave., Suite LM • Concord, CA 94520 • (510) 686-9600
❑ 18939 120th Ave., N.E., Suite 101 • Bothell, WA 98011 • (206) 481-9200
❑ East 11115 Montgomery, Suite B • Spokane, WA 99206 • (509) 924-9200
❑ 15055 S.W. Sequoia Pkwy, Suite 110 • Portland, OR 97222 • (503) 624-9800

Company Name: KEI	Project Name: 800 Harrison St. Oakland
Address: 2401 Stanwell Dr. #400	UNOCAL Project Manager:
City: Concord State: Ca. Zip Code: 94520	Release #:
Telephone: 510-602-5100 FAX #: 687-0602	Site #: 0752
Report To: Dennis Rouse Sampler: John Giddings	QC Data: ☒ Level D (Standard) ❑ Level C ❑ Level B ❑ Level A

Turnaround Time: ☒ 10 Work Days ❑ 5 Work Days ❑ 3 Work Days ❑ 2 Work Days ❑ 1 Work Day ❑ 2-8 Hours

CODE: ❑ Misc. ❑ Detect. ☒ Eval. ❑ Remed. ❑ Demol. ❑ Closure

❑ Drinking Water ❑ Waste Water ☒ Other

Analyses Requested

Client Sample I.D.	Date/Time Sampled	Matrix Desc.	# of Cont.	Cont. Type	Laboratory Sample #	TPH-G	BTXE							Comments
1. MW3 Eff 1	8/21/95		1	Air bag		/	/		5081632					
2. MW1 Inf 1	8/21/95		1	"		/	/		5081633					
3. MW1 Eff 1	8/22/95		1	"		/	/		5081634					
4. MW1 Inf 2	8/22/95		1	"		/	/		5081635					
5. MW3 Inf 2	8/21/95		1	"		/	/		5081636					
6.														
7.														
8.														
9.														
10.														

Relinquished By: [signature]	Date: 8/22/95	Time: 1730	Received By:	Date:	Time:
Relinquished By:	Date:	Time:	Received By:	Date:	Time:
Relinquished By:	Date:	Time:	Received By Lab: [signature]	Date: 8/22/95	Time: 1730

Were Samples Received in Good Condition? ❑ Yes ❑ No   Samples on Ice? ❑ Yes ❑ No   Method of Shipment ______   Page __ of __

To be completed upon receipt of report:
1) Were the analyses requested on the Chain of Custody reported? ❑ Yes ❑ No If no, what analyses are still needed?
2) Was the report issued within the requested turnaround time? ❑ Yes ❑ No If no, what was the turnaround time?

Approved by: ______ Signature: ______ Company: ______ Date:

Pink - Client
Yellow - Laboratory
White - Laboratory

Sequoia Analytical

680 Chesapeake Drive, Redwood City, CA 94063, (415) 364-9600, FAX (415) 364-9233
404 N. Wiget Lane, Walnut Creek, CA 94598, (510) 988-9600, FAX (510) 988-9673
819 Striker Avenue, Suite 8, Sacramento, CA 95834, (916) 921-9600, FAX (916) 921-0100

Kaprealian Engineering, Inc.
2401 Stanwell Dr., Ste. 400
Concord, CA 94520
Attention: Dennis Royce

Client Project ID: Unocal #0752, 800 Harrison St., Oakland
Sample Matrix: Air
Analysis Method: EPA 5030/8015 Mod./8020
First Sample #: 508-1446

Sampled: Aug 21, 1995
Received: Aug 21, 1995
Reported: Sep 11, 1995

TOTAL PURGEABLE PETROLEUM HYDROCARBONS with BTEX DISTINCTION

Analyte	Reporting Limit μg/L	Sample I.D. 508-1446 MW3 Inf 1
Purgeable Hydrocarbons	10	19,000
Benzene	0.050	300
Toluene	0.050	150
Ethyl Benzene	0.050	60
Total Xylenes	0.050	180
Chromatogram Pattern:		Gasoline

Quality Control Data

Report Limit Multiplication Factor:	500
Date Analyzed:	8/23/95
Instrument Identification:	HP-2
Surrogate Recovery, %: (QC Limits = 70-130%)	152

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

SEQUOIA ANALYTICAL, #1271

Alan B. Kemp
Project Manager

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Kaprealian Engineering, Inc.	Client Project ID: Unocal #0752, 800 Harrison St., Oakland	Sampled:	Aug 21, 1995
2401 Stanwell Dr., Ste. 400	Sample Matrix: Water	Received:	Aug 21, 1995
Concord, CA 94520	Analysis Method: EPA 5030/8015 Mod./8020	Reported:	Sep 11, 1995
Attention: Dennis Royce	First Sample #: 508-1447		

TOTAL PURGEABLE PETROLEUM HYDROCARBONS with BTEX DISTINCTION

Analyte	Reporting Limit μg/L	Sample I.D. 508-1447 MW 3
Purgeable Hydrocarbons	50	2,600
Benzene	0.50	1,500
Toluene	0.50	55
Ethyl Benzene	0.50	58
Total Xylenes	0.50	41
Chromatogram Pattern:		Gasoline

Quality Control Data

Report Limit Multiplication Factor:	50
Date Analyzed:	8/31/95
Instrument Identification:	HP-2
Surrogate Recovery, %: (QC Limits = 70-130%)	109

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

SEQUOIA ANALYTICAL, #1271

Alan B. Kemp
Project Manager