KAPREALIAN ENGINEERING, INC.
Consulting Engineers
P.O. BOX 996 • BENICIA, CA 94510
(707) 746-6915 • (707) 746-6916 • FAX: (707) 746-5581

KEI-P89-0805.QR3
July 11, 1991

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

Attention: Mr. Ron Bock

RE: Quarterly Report
Unocal Service Station #0746
3943 Broadway
Oakland, California

Dear Mr. Bock:

This report presents the results of the most recent quarter of monitoring and sampling of the monitoring wells at the referenced site by Kaprealian Engineering, Inc. (KEI), per proposal KEI-P89-0805.P5 dated December 17, 1990. The wells are currently monitored monthly and sampled on a quarterly basis. This report covers the work performed by KEI from March through May, 1991.

SITE DESCRIPTION AND BACKGROUND

The subject site is presently used as a gasoline station. The site is situated on gently sloping, south-southwest trending topography, and is located at the southwest corner of the intersection of Broadway and 40th Street in Oakland, California. A Location Map, Site Vicinity Maps, and a Site Plan are attached to this report.

KEI's initial work at the site began on August 16, 1989 when KEI was asked to collect soil samples following the removal of two underground fuel storage tanks and one 280 gallon waste oil tank at the site. The fuel tanks consisted of one 10,000 gallon unleaded tank and one 10,000 gallon super unleaded tank. The tanks were made of steel and no apparent holes or cracks were observed in any of the tanks. Water was encountered in the fuel tank pit at a depth of about 10 feet, thus prohibiting the collection of any soil samples from immediately beneath the tanks. Six soil samples, designated as SW1 through SW6, were collected from the sidewalls of the gasoline tank pit approximately six inches above the water table. One soil sample was collected from the bottom of the waste oil tank excavation at a depth of 8 feet. Soil sample point locations are shown on the attached Site Plan, Figure 2.

On August 17, 1989, approximately 1,500 gallons of ground water was pumped from the fuel tank pit. One water sample, labeled W1, was then collected from the fuel tank pit.

To accommodate the installation of new, larger tanks, additional soil was excavated approximately 14 feet laterally along the north wall of the tank pit, in the vicinity of sample points SW1 and SW2. On August 18, 1989, KEI returned to the site to collect additional soil samples. One soil sample, labeled SW2(R), was collected from the north sidewall of the fuel tank pit after additional excavation at a depth of 9.5 feet. Also on August 18, 1989, four soil samples, labeled P1 through P4, were collected from the product pipe trenches at depths ranging from 5 to 6.5 feet. After soil sampling, the pipe trenches were excavated to the sample depths. Collection points for the soil samples are shown on the attached Site Plan, Figure 2.

KEI again returned to the site on August 24, 1989 to collect an additional ground water sample. After approximately 5,000 gallons of contaminated ground water was pumped from the fuel tank pit, one ground water sample, labeled W2, was collected.

All soil and water samples were analyzed by Sequoia Analytical Laboratory in Redwood City, California, for total petroleum hydrocarbons (TPH) as gasoline, and benzene, toluene, xylenes and ethylbenzene (BTX&E). The soil sample collected from beneath the waste oil tank was analyzed for TPH as gasoline, BTX&E, TPH as diesel, total oil and grease (TOG), and EPA method 8010 constituents.

Analytical results of soil samples collected from the fuel tank pit indicated non-detectable levels of TPH as gasoline and BTX&E for all samples except samples SW1 and SW2, which showed levels of TPH as gasoline at 13 ppm and 290 ppm, respectively. However, the entire area of sample points SW1 and SW2 was excavated as described above, and the new sample, SW2(R), showed non-detectable levels of TPH as gasoline and BTX&E. Analytical results of the soil sample collected from the waste oil tank pit showed non-detectable levels of all constituents analyzed, except for TPH as gasoline at 1.6 ppm, and toluene at 1.3 ppm. Analytical results of soil samples collected from pipe trenches showed levels of TPH as gasoline ranging from 3.8 ppm to 36 ppm, and benzene ranging from non-detectable to 0.52 ppm. The analytical results of ground water samples collected from the tank pit (W1) showed 4,700 ppb of TPH as gasoline and 180 ppb of benzene (after purging 1,500 gallons), while W2 showed 1,200 ppb of TPH as gasoline and 12 ppb of benzene (after purging 5,000 gallons). Analytical results of the soil samples are summarized in Table 5, and water samples in Table 6.

Documentation of soil sample collection and sample analytical results are presented in KEI's report (KEI-J89-0805.R1) dated August 30, 1989. To comply with the requirements of the regulatory agencies and based on the analytical results, KEI proposed installation of three monitoring wells.

On October 17, 1989, three two-inch diameter monitoring wells, designated as MW1, MW2 and MW3 on the attached Site Vicinity Map, Figure 1, were installed at the site. The three wells were drilled and completed to total depths ranging from 20 to 22.5 feet. Ground water was encountered at depths ranging from 11 to 13 feet beneath the surface during drilling. The wells were developed on October 26 and 30, 1989, and initially sampled on November 1, 1989.

Water and selected soil samples were analyzed by Sequoia Analytical Laboratory in Redwood City, California, for TPH as gasoline and BTX&E. Analytical results of all soil samples collected from the borings for monitoring wells MW1 and MW2 showed non-detectable levels of TPH as gasoline and BTX&E, except for sample MW1(5) collected at a depth of 5 feet, which showed TPH as gasoline at 8.5 ppm, and xylenes at 0.14 ppm. Soil samples collected from the boring for well MW3 showed TPH as gasoline at levels ranging from 3.1 ppm to 1,100 ppm, and benzene levels ranging from 0.068 ppm to 16 ppm. The analytical results of water samples collected from wells MW2 and MW3 showed TPH as gasoline concentrations at 200 ppb and 13,000 ppb, respectively. Benzene was detected in well MW3 only at a concentration of 57 ppb. Analytical results for the soil samples are summarized in Table 4, and water samples in Table 2. Based on analytical results of the soil and ground water samples, KEI recommended the installation of three additional monitoring wells to further define the extent of contamination. The details of the monitoring well installation activities and recommendation for further work are presented in KEI's report (KEI-P89-0805.R4) dated November 30, 1989.

On January 26, 1990, two two-inch diameter monitoring wells (designated as MW4 and MW5 on the attached Site Vicinity Map, Figure 1) were installed at the site. A third proposed monitoring well could not be installed because of underground utilities and an on-site storage shed. The two wells were drilled and completed to total depths each of 20 feet. Ground water was encountered at depths of approximately 12.5 feet beneath the surface during drilling. The new wells (MW4 and MW5) were developed on February 9, 1990, and all wells were sampled on February 15, 1990.

Water and soil samples were analyzed at Sequoia Analytical Laboratory in Redwood City, California, for TPH as gasoline and BTX&E. Analytical results of the soil samples, collected from the

borings for monitoring wells MW4 and MW5, indicated levels of TPH as gasoline ranging from 2.5 ppm to 370 ppm. Benzene was detected at concentrations ranging from non-detectable to 1.8 ppm. Analytical results of the water samples collected from monitoring well MW2 showed non-detectable levels of all constituents analyzed. In wells MW1 and MW4, TPH as gasoline was detected at 170 ppb and 150 ppb, respectively, and benzene was detected at 7.9 ppb and 8.0 ppb, respectively. In wells MW3 and MW5, TPH as gasoline was detected at 20,000 ppb and 24,000 ppb, respectively, and benzene was detected at 1,700 ppb and 1,500 ppb, respectively. Results of the soil analyses are summarized in Table 4, and the water analyses in Table 2.

Based on the analytical results, KEI recommended the installation of four additional monitoring wells (two on-site, and two off-site) to further define the extent of detected contamination. In addition, KEI recommended continuation of the monthly monitoring and quarterly sampling program. The details of the monitoring well installation activities and recommendations for further work are presented in KEI's report (KEI-P89-0805.R5) dated March 16, 1990.

On October 23, 1990, four two-inch diameter monitoring wells (designated as MW6, MW7, MW8 and MW9 on the attached Site Vicinity Map, Figure 1) were installed at the site. The four wells were drilled and completed to total depths ranging from 20 to 22 feet. Ground water was encountered at depths ranging from 11.7 to 12.7 feet beneath the surface during drilling. All wells were surveyed by a licensed surveyor (Kier & Wright of Pleasanton, California) to Mean Sea Level (MSL) and to a vertical accuracy of 0.01 feet. The new wells (MW6, MW7, MW8 and MW9) were developed on October 26, 1990, and all wells were sampled on November 7, 1990. Water and selected soil samples were analyzed at Sequoia Analytical Laboratory in Concord, California, for TPH as gasoline and BTX&E.

The analytical results of the soil samples, collected from the borings for monitoring wells MW6 through MW9, showed non-detectable levels of TPH as gasoline and benzene in all analyzed samples, except in MW7(5), MW9(10) and MW9(12), which showed TPH as gasoline levels of 11 ppm, 84 ppm and 120 ppm, respectively, with benzene levels detected only in samples MW9(10) and MW9(12) at 0.32 ppm and 0.19 ppm, respectively. The analytical results of the ground water samples, showed non-detectable levels of TPH as gasoline and BTX&E in wells MW1, MW2, MW6 and MW7, except for TPH as gasoline detected at a level of 45 ppb in well MW1. In wells MW3, MW4, MW5, MW8 and MW9, TPH as gasoline was detected at levels of 42,000 ppb, 180 ppb, 20,000 ppb, 4,700 ppb and 480 ppb, respectively, with benzene detected at levels of 1,400 ppb, 1.5 ppb, 640 ppb, 28 ppb and 7.8 ppb, respectively. Results of the soil analyses are summarized in

borings for monitoring wells MW4 and MW5, indicated levels of TPH as gasoline ranging from 2.5 ppm to 370 ppm. Benzene was detected at concentrations ranging from non-detectable to 1.8 ppm. Analytical results of the water samples collected from monitoring well MW2 showed non-detectable levels of all constituents analyzed. In wells MW1 and MW4, TPH as gasoline was detected at 170 ppb and 150 ppb, respectively, and benzene was detected at 7.9 ppb and 8.0 ppb, respectively. In wells MW3 and MW5, TPH as gasoline was detected at 20,000 ppb and 24,000 ppb, respectively, and benzene was detected at 1,700 ppb and 1,500 ppb, respectively. Results of the soil analyses are summarized in Table 4, and the water analyses in Table 2.

Based on the analytical results, KEI recommended the installation of four additional monitoring wells (two on-site, and two off-site) to further define the extent of detected contamination. In addition, KEI recommended continuation of the monthly monitoring and quarterly sampling program. The details of the monitoring well installation activities and recommendations for further work are presented in KEI's report (KEI-P89-0805.R5) dated March 16, 1990.

On October 23, 1990, four two-inch diameter monitoring wells (designated as MW6, MW7, MW8 and MW9 on the attached Site Vicinity Map, Figure 1) were installed at the site. The four wells were drilled and completed to total depths ranging from 20 to 22 feet. Ground water was encountered at depths ranging from 11.7 to 12.7 feet beneath the surface during drilling. All wells were surveyed by a licensed surveyor (Kier & Wright of Pleasanton, California) to Mean Sea Level (MSL) and to a vertical accuracy of 0.01 feet. The new wells (MW6, MW7, MW8 and MW9) were developed on October 26, 1990, and all wells were sampled on November 7, 1990. Water and selected soil samples were analyzed at Sequoia Analytical Laboratory in Concord, California, for TPH as gasoline and BTX&E.

The analytical results of the soil samples, collected from the borings for monitoring wells MW6 through MW9, showed non-detectable levels of TPH as gasoline and benzene in all analyzed samples, except in MW7(5), MW9(10) and MW9(12), which showed TPH as gasoline levels of 11 ppm, 84 ppm and 120 ppm, respectively, with benzene levels detected only in samples MW9(10) and MW9(12) at 0.32 ppm and 0.19 ppm, respectively. The analytical results of the ground water samples, showed non-detectable levels of TPH as gasoline and BTX&E in wells MW1, MW2, MW6 and MW7, except for TPH as gasoline detected at a level of 45 ppb in well MW1. In wells MW3, MW4, MW5, MW8 and MW9, TPH as gasoline was detected at levels of 42,000 ppb, 180 ppb, 20,000 ppb, 4,700 ppb and 480 ppb, respectively, with benzene detected at levels of 1,400 ppb, 1.5 ppb, 640 ppb, 28 ppb and 7.8 ppb, respectively. Results of the soil analyses are summarized in

Table 3, and water analyses in Table 2. Documentation of well installation, sample collection and sample results are presented in KEI's report (KEI-P89-0805.R6) dated December 17, 1990. Based on the analytical results, KEI recommended continuation of the monthly monitoring and quarterly sampling program.

RECENT FIELD ACTIVITIES

The nine wells (MW1 through MW9) were monitored three times and sampled once during the quarter. Wells MW3, MW5 and MW8 were monitored and purged ten additional times during the quarter, and well MW4 was monitored and purged six additional times. During monitoring, the wells were checked for depth to water and presence of free product and sheen. No free product was noted in any of the wells during the quarter. Sheen was observed on several occasions in wells MW3, MW4 and MW5, but was not observed in any of the other wells during the quarter. Monitoring data are summarized in Table 1.

Water samples were collected from the wells on May 28, 1991. Prior to sampling, the wells were purged of between 8 to 55 gallons using a surface pump. Samples were then collected using a clean Teflon bailer. Samples were decanted into clean VOA vials and/or one liter amber bottles as appropriate which were sealed with Teflon-lined screw caps and stored in a cooler on ice until delivery to the state certified laboratory.

HYDROLOGY AND GEOLOGY

Based on the water level data gathered during the quarter, ground water flow direction appeared to be towards the south-southwest at an average gradient of approximately 0.014 on May 28, 1991, relatively unchanged from the flow direction determined for February 25, 1991. However, at MW4, a depression in the water table is indicated and was present intermittently during the quarter. The level of ground water in MW4 has fluctuated considerably during the quarter, up to 2.40 feet in elevation. Water levels have fluctuated during the quarter, showing a net increase of between 0.12 to 0.54 feet in all wells since February 25, 1991, except for MW4, which showed a net decrease of 0.77 feet. The measured depth to ground water at the site on May 28, 1991 ranged between 7.97 and 11.60 feet.

Based on review of regional geologic maps (U.S. Geological Survey Miscellaneous Geologic Investigations Map I-239 "Areal and Engineering Geology of the Oakland West Quadrangle, California" by D.H. Radbruch, 1957), the site is underlain by Quaternary-age alluvium fan deposits (Temescal Formation), which typically

consists of lenses of clayey gravel, sandy silty clay and sand-clay-silt mixtures. Specifically, the subsurface earth materials at the site, based on our previous subsurface exploration activities, consist predominantly of clayey silt and silty clay to gravelly clay with local lenses of well graded sand or gravel, and clayey sand or gravel. The lenses of coarse grained soils are generally less than about 2 feet thick. Artificial fill materials were encountered at the surface of this site varying from about 2 to 2.5 feet thick in the vicinity of wells MW4 and MW5.

The results of our most recent subsurface study indicates the site and immediate vicinity is underlain by artificial fill materials extending to depths below grade ranging from about 2-1/4 to 5-3/4 feet. The fill materials are inturn underlain by silty clay materials extending to depths below grade ranging from about 7-1/4 to 11-1/2 feet and which are about 4-3/4 to 6-1/2 feet in thickness. This silty clay zone is inturn underlain by a coarse-grained sequence consisting predominantly of clayey gravel (except in MW7 where clayey sand and a well graded gravel lens were also encountered). This coarse-grained zone extends to depths below grade ranging from 10 to 15-1/2 feet and ranging in thickness from approximately 3-1/2 to 4 feet. Ground water was encountered during drilling within this coarse-grained sequence in all borings except MW6. The coarse-grained sequence is inturn underlain by a fine-grained zone consisting of gravelly or sandy clay, silty clay, or clayey silt extending to the maximum depth explored (22 feet).

ANALYTICAL RESULTS

Ground water samples were analyzed at Sequoia Analytical Laboratory in Concord, California, and were accompanied by properly executed Chain of Custody documentation. The samples were analyzed for TPH as gasoline using EPA method 5030 in conjunction with modified 8015, and BTX&E using EPA method 8020.

Analytical results of the ground water samples, collected from monitoring wells MW1, MW2 and MW6 indicate non-detectable levels of TPH as gasoline and BTX&E, except for 0.42 ppb of xylenes detected in well MW6. Analytical results of the ground water samples, collected from wells MW4 and MW7, indicate levels of TPH as gasoline at 38 ppb and 39 ppb, respectively and non-detectable levels of benzene. In monitoring wells MW3, MW5, MW8 and MW9, TPH as gasoline was detected at concentrations of 24,000 ppb, 24,000 ppb, 4,800 ppb and 590 ppb, respectively, and benzene was detected at concentrations of 570 ppb, 2,300 ppb, 4.2 ppb and 6.0 ppb, respectively. Results of the water analyses are summarized in Table 2. Concentrations of TPH as gasoline and benzene detected in ground water on May 28, 1991, are shown on the attached Site

Vicinity Maps, Figures 1a and 1b, respectively. Copies of the analytical results and Chain of Custody documentation are attached to this report.

DISCUSSION AND RECOMMENDATIONS

Based on the analytical results collected and evaluated to date, KEI recommends the continuation of the current monitoring and sampling program of the existing wells per KEI's proposal (KEI-P89-0805.P5) dated December 17, 1990. Also, KEI recommends that wells MW3, MW4, MW5 and MW8 continue to be purged on a weekly basis in an attempt to reduce levels of contamination until the lateral extent of contamination has been delineated and a ground water remediation system is designed and implemented.

KEI is in the process of obtaining the necessary permits, as well as off-site access permission, to install the three additional off-site monitoring wells previously proposed. KEI is prepared to install these wells once all permits and access permission have been received.

DISTRIBUTION

A copy of this report should be sent to Mr. Gil Wistar of the Alameda County Health Care Services Agency, 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 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.

If you have any questions regarding this report, please do not hesitate to call me at (707) 746-6915.

Sincerely,

Kaprealian Engineering, Inc.

Thomas J. Berkins
Senior Environmental Engineer

Don R. Braun
Certified Engineering Geologist

License No. 1310
Exp. Date 6/30/92

Timothy R. Ross
Project Manager

\bam:jad

Attachments: Tables 1 through 6
Location Map
Site Vicinity Maps - Figures 1, 1a & 1b
Site Plan - Figure 2
Laboratory Analyses
Chain of Custody documentation

KEI-P89-0805.QR3
July 11, 1991

TABLE 1

SUMMARY OF MONITORING DATA

Well No.	Ground Water Elevation (feet)	Depth to Water (feet)	Product Thickness (feet)	Sheen	Water Purged (gallons)
(Monitored and Sampled on May 28, 1991)					
MW1	72.72	8.35	0	No	15
MW2	71.97	9.65	0	No	9
MW3	71.80	10.21	0	Yes	26
MW4	69.88	11.60	0	No	8
MW5	71.21	10.38	0	Yes	55
MW6	72.50	7.97	0	No	15
MW7	72.86	8.97	0	No	15
MW8	70.38	11.33	0	No	22
MW9	70.05	11.08	0	No	21
(Monitored on May 20, 1991)					
MW3	71.93	10.08	0	Yes	55
MW4	69.85	11.63	0	No	8
MW5	71.77	9.82	0	Yes	55
MW8	71.62	10.09	0	No	25
(Monitored on May 13, 1991)					
MW3	72.00	10.01	0	Yes	50
MW4	70.00	11.48	0	No	7
MW5	71.83	9.76	0	Yes	55
MW8	70.76	10.95	0	No	26
(Monitored on May 4, 1991)					
MW3	72.08	9.93	0	Yes	40
MW4	72.18	9.30	0	Yes	8.5
MW5	71.72	9.87	0	Yes	55
MW8	70.81	10.90	0	No	39
(Monitored on April 29, 1991)					
MW1	73.03	8.04	0	No	0
MW2	72.07	9.55	0	No	0
MW3	72.23	9.78	0	Yes	41
MW4	72.25	9.23	0	Yes	10
MW5	72.10	9.49	0	Yes	55
MW6	72.82	7.65	0	No	0
MW7	73.17	8.66	0	No	0
MW8	70.96	10.75	0	No	5
MW9	70.59	10.54	0	No	0

TABLE 1 (Continued)

SUMMARY OF MONITORING DATA

Well No.	Ground Water Elevation (feet)	Depth to Water (feet)	Product Thickness (feet)	Sheen	Water Purged (gallons)
		(Monitored on April 22, 1991)			
MW3	72.39	9.62	0	Yes	55
MW4	70.06	11.42	0	No	8.5
MW5	72.27	9.32	0	Yes	55
MW8	71.29	10.42	0	No	55
		(Monitored on April 15, 1991)			
MW3	72.26	9.75	0	Yes	55
MW4	69.92	11.56	0	No	8
MW5	72.14	9.45	0	No	55
MW8	71.07	10.64	0	No	55
		(Monitored on April 8, 1991)			
MW3	72.43	9.58	0	No	55
MW4	71.24	10.24	0	No	10
MW5	72.33	9.26	0	Yes	55
MW8	71.33	10.38	0	No	55
		(Monitored on April 1, 1991)			
MW3	73.07	8.94	0	Yes	55
MW5	72.98	8.61	0	No	55
MW8	72.23	9.48	0	No	55
		(Monitored on March 25, 1991)			
MW1	74.17	6.90	0	No	0
MW2	70.40	11.22	0	No	0
MW3	73.77	8.24	0	No	55
MW4	70.64	10.84	0	No	0
MW5	73.61	7.98	0	No	55
MW6	72.75	7.72	0	No	0
MW7	73.63	8.20	0	No	0
MW8	73.05	8.66	0	No	55
MW9	73.23	7.90	0	No	0

KEI-P89-0805.QR3
July 11, 1991

TABLE 1 (Continued)

SUMMARY OF MONITORING DATA

Well No.	Ground Water Elevation (feet)	Depth to Water (feet)	Product Thickness (feet)	Sheen	Water Purged (gallons)
		(Monitored on March 18, 1991)			
MW3	71.10	10.91	0	No	27
MW5	70.86	10.73	0	No	55
MW8	70.35	11.36	0	No	23
		(Monitored on March 11, 1991)			
MW3	72.56	9.45	0	No	32
MW5	72.43	9.16	0	No	55
MW8	71.68	10.03	0	No	16
		(Monitored on March 4, 1991)			
MW3	72.94	9.07	0	No	27
MW5	72.97	8.62	0	No	55
MW8	72.61	9.10	0	No	22

Well #	Surface Elevation* (feet)
MW1	81.07
MW2	81.62
MW3	82.01
MW4	81.48
MW5	81.59
MW6	80.47
MW7	81.83
MW8	81.71
MW9	81.13

* Elevation of top of well covers surveyed to MSL.

KEI-P89-0805.QR3
July 11, 1991

TABLE 2

SUMMARY OF LABORATORY ANALYSES
WATER

Date	Well #	TPH as Gasoline	Benzene	Toluene	Xylenes	Ethyl-benzene
5/28/91	MW1	ND	ND	ND	ND	ND
	MW2	ND	ND	ND	ND	ND
	MW3	24,000	570	1,100	4,200	810
	MW4	38	ND	ND	1.9	ND
	MW5	24,000	2,300	3,400	6,000	1,300
	MW6	ND	ND	ND	0.42	ND
	MW7	39	ND	ND	0.73	ND
	MW8	4,800	4.2	1.3	170	5.1
	MW9	590	6.0	0.43	1.4	6.8
2/25/91	MW1	ND	ND	ND	ND	ND
	MW2	ND	0.68	0.42	0.86	ND
	MW3	37,000	730	2,900	7,300	1,300
	MW4	22,000	600	1,300	2,800	780
	MW5	25,000	950	1,300	3,500	900
	MW6	ND	0.37	0.40	1.5	0.35
	MW7	70	ND	ND	0.52	ND
	MW8	5,300	17	6.1	300	53
	MW9	390	13	1.1	14	2.8
11/07/90	MW1	45	ND	ND	ND	ND
	MW2	ND	ND	ND	ND	ND
	MW3	42,000	1,400	5,000	7,500	1,800
	MW4	180	1.5	0.37	26	6.3
	MW5	20,000	640	1,100	3,000	670
	MW6	ND	ND	ND	ND	ND
	MW7	ND	ND	ND	ND	ND
	MW8	4,700	28	38	7,200	86
	MW9	480	7.8	1.2	47	13
8/16/90	MW1	ND	ND	ND	ND	ND
	MW2	ND	ND	6.7	ND	ND
	MW3	6,800	600	660	160	760
	MW4	3,600	480	17	260	230
	MW5	16,000	1,400	1,900	660	2,800

KEI-P89-0805.QR3
July 11, 1991

TABLE 2 (Continued)

SUMMARY OF LABORATORY ANALYSES
WATER

Date	Well #	TPH as Gasoline	Benzene	Toluene	Xylenes	Ethyl-benzene
2/15/90	MW1	170	7.9	ND	2.8	2.2
	MW2	ND	ND	ND	ND	ND
	MW3	20,000	1,700	2,100	3,100	750
	MW4	150	8.0	8.0	45	10
	MW5	24,000	1,500	1,700	3,600	260
11/01/89	MW1	ND	ND	ND	0.30	ND
	MW2	200	ND	ND	1.2	3.0
	MW3	13,000	57	48	120	1.7
Detection Limits		30	0.3	0.3	0.3	0.3

ND = Non-detectable.

Results in parts per billion (ppb), unless otherwise indicated.

KEI-P89-0805.QR3
July 11, 1991

TABLE 3

SUMMARY OF LABORATORY ANALYSES
SOIL

Date	Sample Number	Depth (feet)	TPH as Gasoline	Benzene	Toluene	Xylenes	Ethyl-benzene
10/23/90	MW6(5)	5	ND	ND	ND	ND	ND
	MW6(9)	9	ND	ND	ND	0.010	ND
	MW6(11.5)	11.5	ND	ND	ND	ND	ND
	MW7(5)	5	11	ND	ND	0.032	0.0064
	MW7(8.5)	8.5	ND	ND	ND	0.019	ND
	MW7(11.5)	11.5	ND	ND	ND	0.036	ND
	MW8(5)	5	ND	ND	ND	ND	ND
	MW8(10)	10	ND	ND	ND	0.0080	ND
	MW9(5.5)	5.5	ND	ND	ND	ND	ND
	MW9(10)	10	84	0.32	0.27	0.51	0.63
	MW9(12)	12	120	0.19	0.11	0.69	0.14
Detection Limits			1.0	0.0050	0.0050	0.0050	0.0050

ND = Non-detectable.

Results in parts per million (ppm), unless otherwise indicated.

KEI-P89-0805.QR3
July 11, 1991

TABLE 4

SUMMARY OF LABORATORY ANALYSES
SOIL

Date	Sample Number	Depth (feet)	TPH as Gasoline	Benzene	Toluene	Xylenes	Ethyl-benzene
10/17/89	MW1(5)	5	8.5	ND	ND	0.14	ND
	MW1(10)	10	ND	ND	ND	ND	ND
	MW2(5)	5	ND	ND	ND	ND	ND
	MW2(10)	10	ND	ND	ND	ND	ND
	MW2(12.5)	12.5	ND	ND	ND	ND	ND
	MW3(5)	5	3.1	0.068	ND	ND	ND
	MW3(10)	10	69	0.89	2.6	7.9	2.0
	MW3(11)	11	1,100	16	85	150	35
1/26/90	MW4(5)	5	22	0.059	ND	ND	ND
	MW4(7)	7	2.5	ND	ND	ND	ND
	MW4(10)	10	250	1.2	0.66	20	1.4
	MW4(11)	11	280	1.0	4.0	36	7.6
	MW5(5)	5	25	0.21	ND	ND	ND
	MW5(7.5)	7.5	46	0.25	0.28	0.20	0.46
	MW5(10)	10	140	1.5	1.7	10	4.0
	MW5(11.5)	11.5	370	1.8	14	51	11
Detection Limits			1.0	0.05	0.1	0.1	0.1

ND = Non-detectable.

Results in parts per million (ppm), unless otherwise indicated.

KEI-P89-0805.QR3
July 11, 1991

TABLE 5

SUMMARY OF LABORATORY ANALYSES
SOIL

(Collected on August 16, 17, 18 & 24, 1989)

Sample #	Depth (feet)	TPH as Diesel	TPH as Gasoline	Benzene	Toluene	Xylenes	Ethyl-benzene
SW1	9.5	--	13	ND	0.13	0.39	0.15
SW2	9.5	--	290	0.82	8.7	44	7.6
SW2(R)	9.5	--	ND	ND	ND	ND	ND
SW3	9.5	--	ND	ND	ND	ND	ND
SW4	9.5	--	ND	ND	ND	ND	ND
SW5	9.5	--	ND	ND	ND	ND	ND
SW6	9.5	--	ND	ND	ND	ND	ND
P1	6.5	--	6.1	ND	ND	ND	ND
P2	6.5	--	36	0.52	4.4	8.0	1.4
P3	5.0	--	20	0.30	2.5	5.6	1.1
P4	5.0	--	3.8	0.11	0.19	0.23	0.1
WO1*	8	ND	1.6	ND	1.3	ND	ND
Detection Limits		1.0	1.0	0.05	0.1	0.1	0.1

* TOG and EPA method 8010 constituents were non-detectable.

-- Indicates analysis not performed.

ND = Non-detectable.

Results in parts per million (ppm), unless otherwise indicated.

KEI-P89-0805.QR3
July 11, 1991

TABLE 6

SUMMARY OF LABORATORY ANALYSES
WATER

Sample #	TPH as Gasoline	Benzene	Toluene	Xylenes	Ethylbenzene
W1	4,700	180	420	860	150
W2*	1,200	12	10	88	5.9
Detection Limits	30	0.3	0.3	0.3	0.3

* Sample (W2) was collected after pumping 5,000 gallons of ground water from the fuel tank pit.

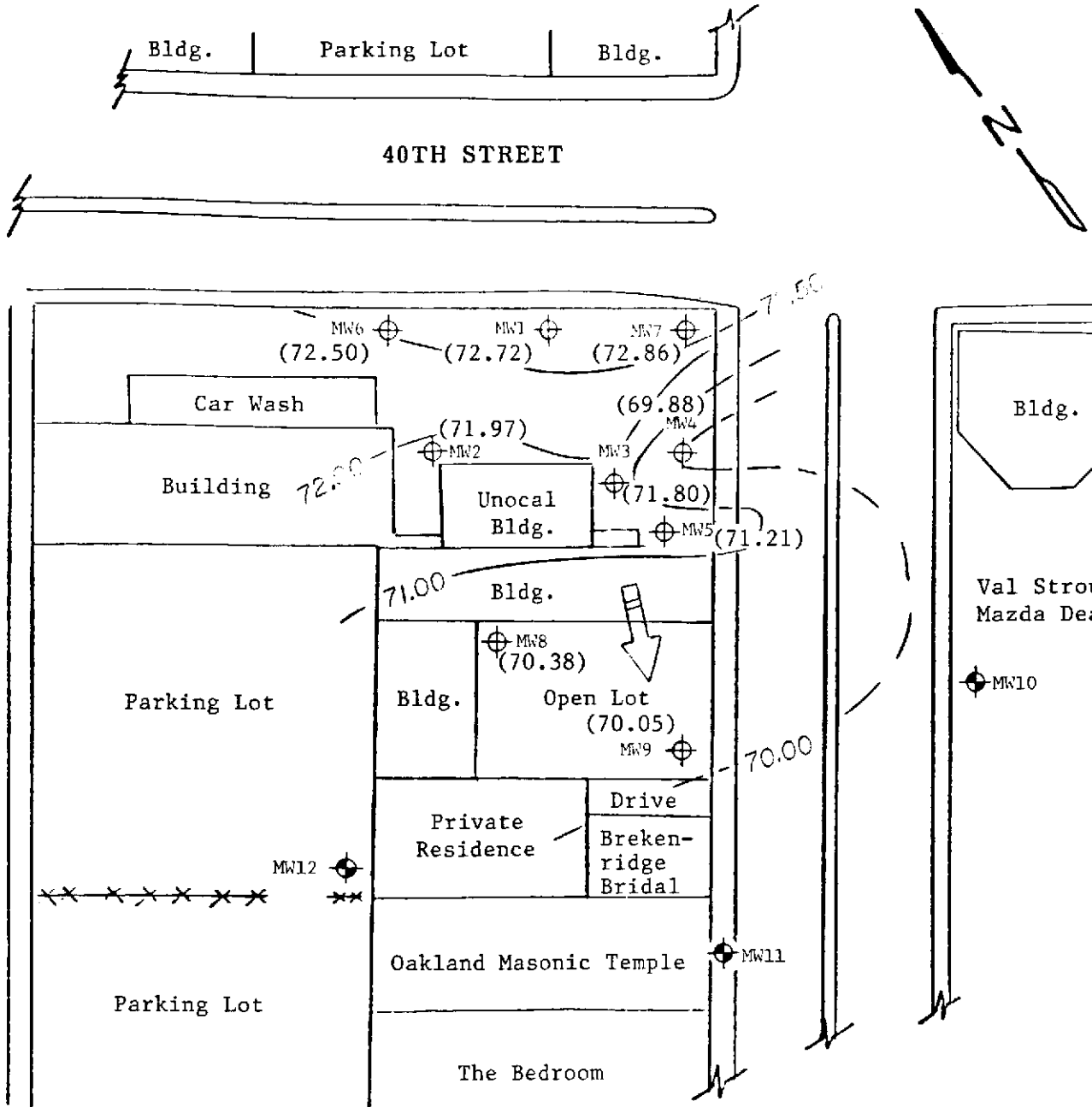
Results in parts per billion (ppb), unless otherwise indicated.

KAPREALIAN ENGINEERING, INC.
Consulting Engineers
P.O. BOX 996 • BENICIA, CA 94510
(707) 746-6915 • (707) 746-6916 • FAX: (707) 746-5581

LOCATION MAP

Unocal S/S #0746
3943 Broadway
Oakland, CA

KAPREALIAN ENGINEERING, INC.
Consulting Engineers
P.O. BOX 996 • BENICIA, CA 94510
(707) 746-6915 • (707) 746-6916 • FAX: (707) 746-5581



SITE VICINITY MAP
Figure 1

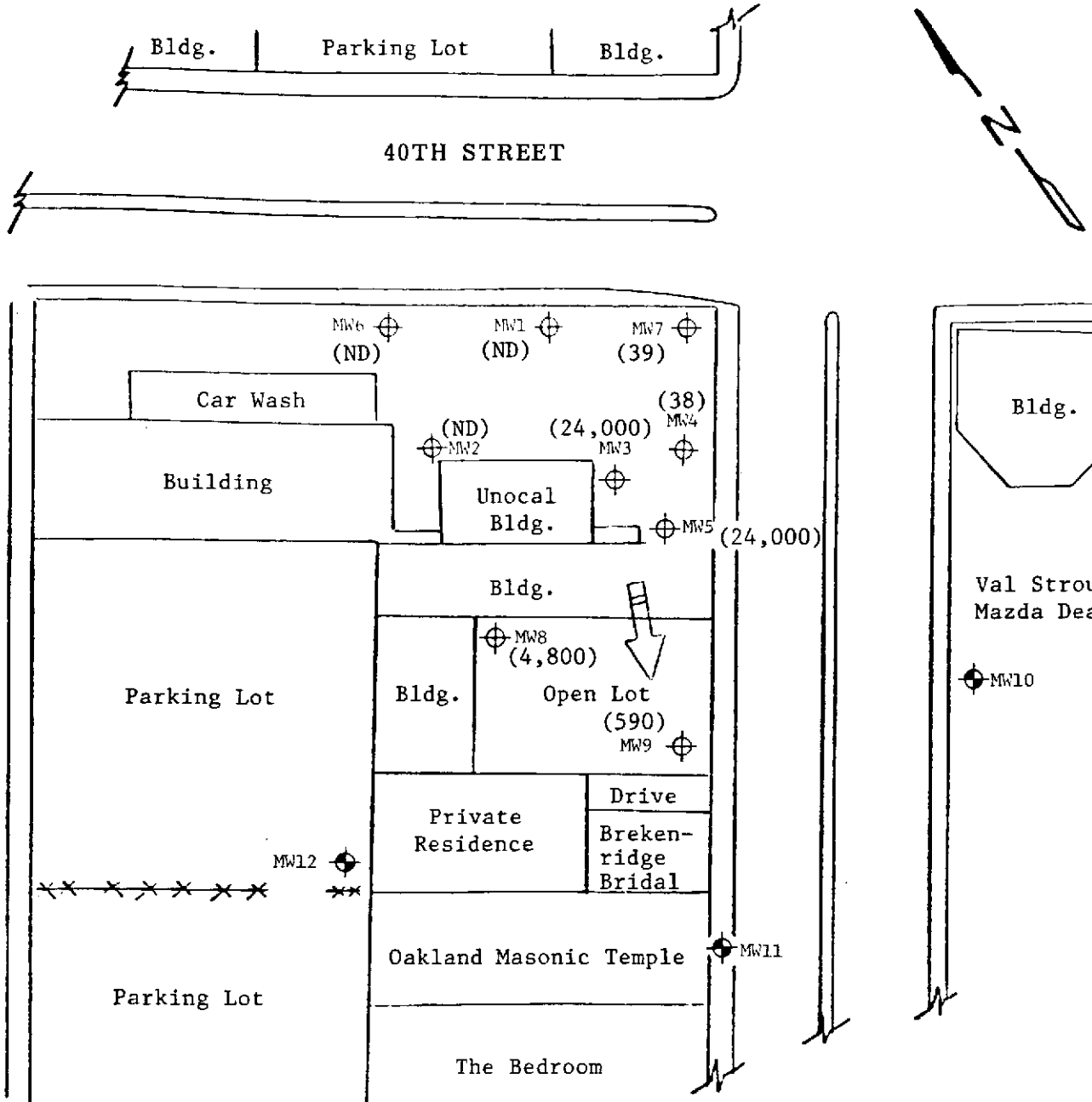
0 60 120
Approx. scale feet

LEGEND

- Monitoring well (existing)
- Monitoring well (proposed)
- ( ) Ground water elevation in feet above Mean Sea Level on 5/28/91
- Direction of ground water flow
- Contours of ground water elevation

Unocal S/S #0746
3943 Broadway
Oakland, CA

KAPREALIAN ENGINEERING, INC.
Consulting Engineers
P.O. BOX 996 • BENICIA, CA 94510
(707) 746-6915 • (707) 746-6916 • FAX: (707) 746-5581



SITE VICINITY MAP
Figure 1a

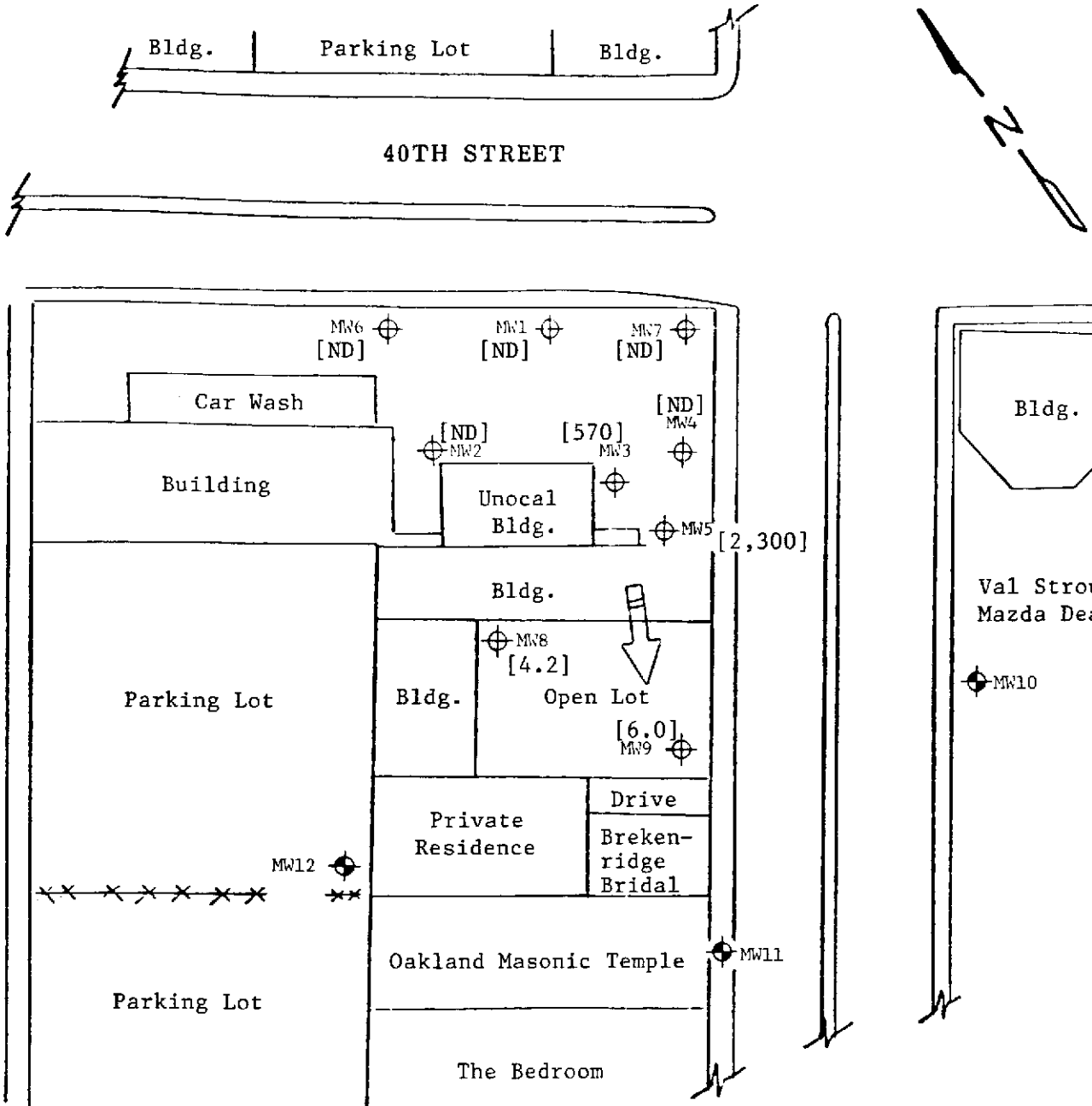
0 60 120
Approx. scale feet

LEGEND

- Monitoring well (existing)
- Monitoring well (proposed)
- ( ) Concentration of TPH as gasoline in ppb
- Direction of ground water flow

Unocal S/S #0746
3943 Broadway
Oakland, CA

KAPREALIAN ENGINEERING, INC.
Consulting Engineers
P.O. BOX 996 • BENICIA, CA 94510
(707) 746-6915 • (707) 746-6916 • FAX: (707) 746-5581



SITE VICINITY MAP
Figure 1b

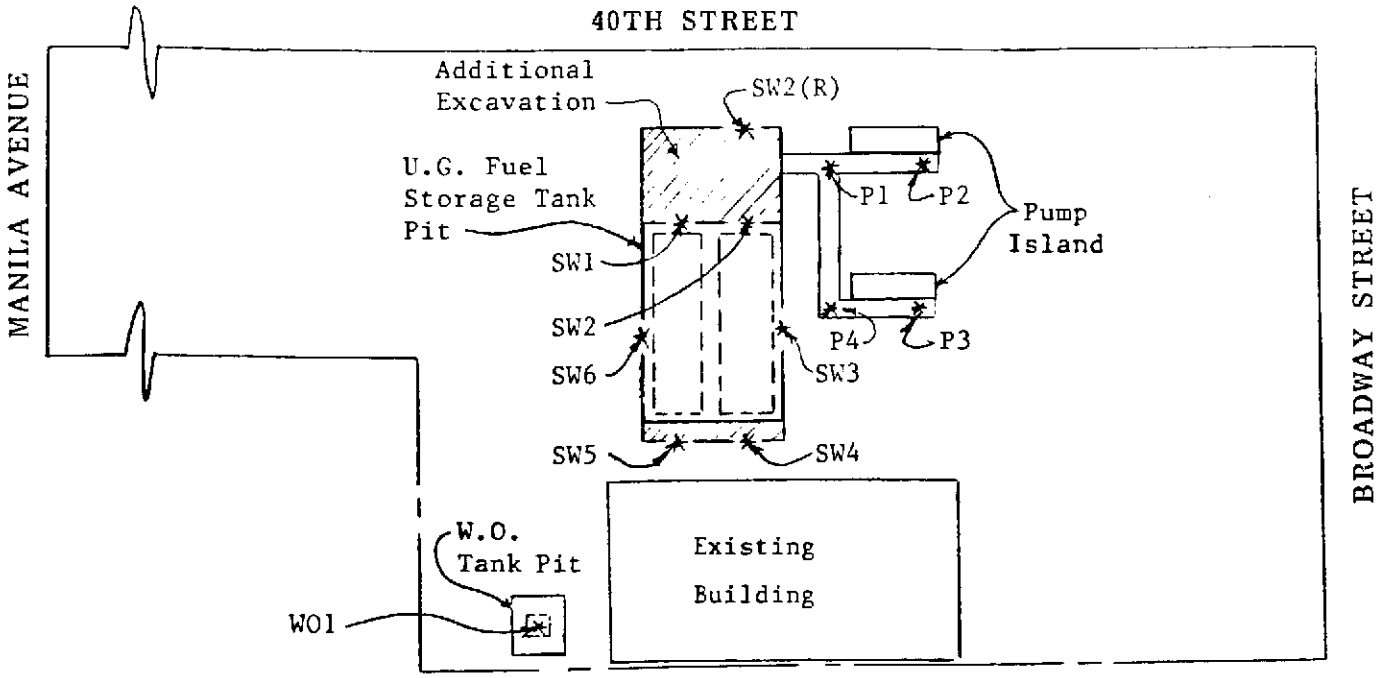
LEGEND

- Monitoring well (existing)
- Monitoring well (proposed)
- [ ] Concentration of benzene in ppb
- Direction of ground water flow

0 60 120
Approx. scale feet

Unocal S/S #0746
3943 Broadway
Oakland, CA

KAPREALIAN ENGINEERING, INC.
Consulting Engineers
P.O. BOX 996 • BENICIA, CA 94510
(707) 746-6915 • (707) 746-6916 • FAX: (707) 746-5581



SITE PLAN
Figure 2

0 30 60
Approx. scale feet

LEGEND

* Sample Point Location

Unocal S/S #0746
3943 Broadway Street
Oakland, CA

SEQUOIA ANALYTICAL
1900 Bates Avenue • Suite LM • Concord, California 94520
(415) 686-9600 • FAX (415) 686-9689

Kaprealian Engineering, Inc.	Client Project ID:	Unocal, 3943 Broadway, Oakland	Sampled: May 28, 1991
P.O. Box 996	Matrix Descript:	Water	Received: May 31, 1991
Benicia, CA 94510	Analysis Method:	EPA 5030/8015/8020	Analyzed: Jun 10, 1991
Attention: Mardo Kaprealian, P.E.	First Sample #:	105-0956 AB	Reported: Jun 12, 1991

TOTAL PETROLEUM FUEL HYDROCARBONS with BTEX DISTINCTION (EPA 8015/8020)

Sample Number	Sample Description	Low/Medium B.P. Hydrocarbons µg/L (ppb)	Benzene µg/L (ppb)	Toluene µg/L (ppb)	Ethyl Benzene µg/L (ppb)	Xylenes µg/L (ppb)
105-0956 AB	MW-1	N.D.	N.D.	N.D.	N.D.	N.D.
105-0957 AB	MW-2	N.D.	N.D.	N.D.	N.D.	N.D.
105-0958 AB	MW-3	24,000	570	1,100	810	4,200
105-0959 AB	MW-4	38	N.D.	N.D.	N.D.	1.9
105-0960 AB	MW-5	24,000	2,300	3,400	1,300	6,000
105-0961 AB	MW-6	N.D.	N.D.	N.D.	N.D.	0.42
105-0962 AB	MW-7	39	N.D.	N.D.	N.D.	0.73
105-0963 AB	MW-8	4,800	4.2	1.3	5.1	170
105-0964 AB	MW-9	590	6.0	0.43	6.8	1.4
Detection Limits:		**30**	**0.30**	**0.30**	**0.30**	**0.30**

Low to Medium Boiling Point Hydrocarbons are quantitated against a gasoline standard.
Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL

Julia R. Malerstein
Project Manager

SEQUOIA ANALYTICAL
1900 Bates Avenue • Suite LM • Concord, California 94520
(415) 686-9600 • FAX (415) 686-9689

Kaprealian Engineering, Inc.
P.O. Box 996
Benicia, CA 94510
Attention: Mardo Kaprealian, P.E.

Client Project ID: Unocal, 3943 Broadway, Oakland
QC Sample Group: 1050956-64
Reported: Jun 12, 1991

QUALITY CONTROL DATA REPORT

ANALYTE	Benzene	Toluene	Ethyl Benzene	Xylenes
Method:	EPA8015/8020	EPA8015/8020	EPA8015/8020	EPA8015/8020
Analyst:	J.F.	J.F.	J.F.	J.F.
Reporting Units:	ppb	ppb	ppb	ppb
Date Analyzed:	Jun 10, 1991	Jun 10, 1991	Jun 10, 1991	Jun 10, 1991
QC Sample #:	105-0956	105-0956	105-0956	105-0956
Sample Conc.:	N.D.	N.D.	N.D.	N.D.
Spike Conc. Added:	20	20	20	60
Conc. Matrix Spike:	18	19	22	69
Matrix Spike % Recovery:	90	95	110	120
Conc. Matrix Spike Dup.:	17	18	21	68
Matrix Spike Duplicate % Recovery:	85	90	110	110
Relative % Difference:	5.7	5.4	4.7	1.5

SEQUOIA ANALYTICAL

Julia R. Malerstein
Project Manager

% Recovery:	Conc. of M.S. - Conc. of Sample / Spike Conc. Added	x 100
Relative % Difference:	Conc. of M.S. - Conc. of M.S.D. / (Conc. of M.S. + Conc. of M.S.D.) / 2	x 100

SEQUOIA ANALYTICAL

1900 Bates Avenue • Suite LM • Concord, California 94520
(415) 686-9600 • FAX (415) 686-9689

Kaprealian Engineering, Inc.	Client Project ID:	Unocal, 3943 Broadway, Oakland	Sampled: - - - - - -
P.O. Box 996	Sample Descript.:	D I Blank	Received: - - - - - -
Benicia, CA 94510	Analysis Method:	EPA 5030/ 8015/8020	Analyzed: Jun 10, 1991
Attention: Mardo Kaprealian, P.E.	Lab Number:	- - - - - -	Reported: Jun 12, 1991

TOTAL PETROLEUM FUEL HYDROCARBONS WITH BTEX DISTINCTION (EPA 8015/8020)

Analyte	Detection Limit µg/L (ppb)	Sample Results µg/L (ppb)
Low to Medium Boiling Point Hydrocarbons	30	N.D.
Benzene	0.30	N.D.
Toluene	0.30	N.D.
Ethyl Benzene	0.30	N.D.
Xylenes	0.30	N.D.

Low to Medium Boiling Point Hydrocarbons are quantitated against a gasoline standard.
Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL

Julia R. Malerstein
Project Manager

SEQUOIA ANALYTICAL
1900 Bates Avenue • Suite LM • Concord, California 94520
(415) 686-9600 • FAX (415) 686-9689

Kaprealian Engineering, Inc.
P.O. Box 996
Benicia, CA 94510
Attention: Mardo Kaprealian, P.E.

Client Project ID: Unocal, 3943 Broadway, Oakland
QC Sample Group: 1050956-64
Reported: Jun 12, 1991

QUALITY CONTROL DATA REPORT

SURROGATE

Method:	EPA8015/8020	EPA8015/8020	EPA8015/8020	EPA8015/8020	EPA8015/8020	EPA8015/8020	EPA8015/8020
Analyst:	J.F.	J.F.	J.F.	J.F.	J.F.	J.F.	J.F.
Reporting Units:	ppb	ppb	ppb	ppb	ppb	ppb	ppb
Date Analyzed:	Jun 10, 1991	Jun 10, 1991	Jun 10, 1991	Jun 10, 1991	Jun 10, 1991	Jun 10, 1991	Jun 10, 1991
Sample #:	105-0956	105-0957	105-0958	105-0959	105-0960	105-0961	105-0962
Surrogate % Recovery:	110	99	80	93	79	100	100

SEQUOIA ANALYTICAL

Julia R. Malerstein
Project Manager

% Recovery:	Conc. of M.S. - Conc. of Sample / Spike Conc. Added	x 100
Relative % Difference:	Conc. of M.S. - Conc. of M.S.D. / (Conc. of M.S. + Conc. of M.S.D.) / 2	x 100

SEQUOIA ANALYTICAL
1900 Bates Avenue • Suite LM • Concord, California 94520
(415) 686-9600 • FAX (415) 686-9689

Kaprealian Engineering, Inc.
P.O. Box 996
Benicia, CA 94510
Attention: Mardo Kaprealian, P.E.

Client Project ID: Unocal, 3943 Broadway, Oakland
QC Sample Group: 1050956-64
Reported: Jun 12, 1991

QUALITY CONTROL DATA REPORT

SURROGATE

Method:	EPA8015/8020	EPA8015/8020	EPA8015/8020
Analyst:	J.F.	J.F.	J.F.
Reporting Units:	ppb	ppb	ppb
Date Analyzed:	Jun 10, 1991	Jun 10, 1991	Jun 10, 1991
Sample #:	105-0963	105-0964	Blank
Surrogate % Recovery:	82	75	100

SEQUOIA ANALYTICAL

Julia R. Malerstein
Project Manager

% Recovery:	Conc. of M.S. - Conc. of Sample / Spike Conc. Added	x 100
Relative % Difference:	Conc. of M.S. - Conc. of M.S.D. / (Conc. of M.S. + Conc. of M.S.D.) / 2	x 100

KAPREALIAN ENGINEERING, INC.

CHAIN OF CUSTODY

SAMPLER: JOE

WITNESSING AGENCY:

SITE NAME & ADDRESS: Unocal / Oakland / 3943 / Broadway

ANALYSES REQUESTED: TPHG, BTXE

TURN AROUND TIME: Regular

SAMPLE ID NO.	DATE	TIME	SOIL	WATER	GRAB	COMP	NO. OF CONT.	SAMPLING LOCATION	REMARKS
MW-1	5/28/91			✓	✓		2	MW	VOA's preserved
MW-2	"			✓	✓		"	"	
MW-3	"	2:05		✓	✓		"	"	
MW-4	"			✓	✓		"	"	
MW-5	"			✓	✓		"	"	
MW-6	"	9:45		✓	✓		"	"	
MW-7	"			✓	✓		"	"	
MW-8	"			✓	✓		"	"	
MW-9	"			✓	✓		"	"	

Relinquished by: (Signature)	Date/Time	Received by: (Signature)
[signature]	5/28/91	
Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received by: (Signature)
	5/31 8:30AM	[signature]
[illegible]ished by: (Signature)	Date/Time	Received by: (Signature)
	5/28/91 1600	[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

BS	login	5/28/91
Signature	Title	Date