KAPREALIAN ENGINEERING
INCORPORATED

KEI-P89-0805.R9
September 25, 1992

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

Attention: Mr. Ed Ralston

RE: Continuing Ground Water Investigation
and Quarterly Report
Unocal Service Station #0746
3943 Broadway
Oakland, California

Dear Mr. Ralston:

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 KEI's proposal (KEI-P89-0805.P6) dated April 15, 1991, and as modified in KEI's quarterly report (KEI-P89-0805.QR5) dated December 13, 1991. The wells are currently monitored monthly and sampled on a quarterly basis. This report covers the work performed by KEI from June through August of 1992.

This report also presents the results of KEI's most recent soil and ground water investigation for the referenced site, in accordance with KEI's proposals (KEI-P89-0805.P6) dated April 15, 1991, and (KEI-P89-0805.P7) dated March 9, 1992. The purpose of the investigation was to further determine the degree and extent of ground water contamination at the site, to characterize the aquifer, and to gather information for use in the possible design and implementation of a ground water remediation system. The scope of the work performed by KEI consisted of the following:

Coordination with regulatory agencies

Geologic logging of two borings for the installation of one monitoring well and one recovery well

Soil sampling

Ground water monitoring, purging, and sampling

Laboratory analyses

Data analysis, interpretation, and report preparation

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SITE DESCRIPTION AND BACKGROUND

The subject site presently contains a Unocal service station facility. 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 is 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 gasoline storage tanks and one 280 gallon waste oil tank at the site. The fuel tanks consisted of one 10,000 gallon unleaded gasoline tank and one 10,000 gallon super unleaded gasoline 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 below grade, 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 below grade. Soil sample point locations are shown on the attached Figure 6.

On August 17, 1989, approximately 1,500 gallons of ground water were 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 below grade. 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 below grade. 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 6.

KEI again returned to the site on August 24, 1989, to collect an additional ground water sample. After approximately 5,000 gallons of ground water were 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 hydro-

carbons (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 the 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 an additional 5,000 gallons). The analytical results of the soil samples are summarized in Table 7, and the analytical results of the water samples are summarized in Table 8. Documentation of soil sample collection techniques and the 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 the 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 below grade. 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 were 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 below grade, 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 only detected in well MW3 at a concentration of 57 ppb. The analytical results of the soil samples are summarized in Table 5, and the analytical results of the water samples are summarized 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. Documentation of the well installation protocol, sampling techniques, and analytical results are presented in KEI's report (KEI-P89-0805.R4) dated November 30, 1989.

On January 26, 1990, two additional 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 each drilled and completed to total depths of 20 feet below grade. 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 of the wells were sampled on February 15, 1990.

Water samples from all of the existing wells, and soil samples from the borings for wells MW4 and MW5, 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. The results of the soil analyses are summarized in Table 5, and the results of the water analyses are summarized 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 hydrocarbon contamination. In addition, KEI recommended the continuation of the monthly monitoring and quarterly sampling program. Documentation of the monitor-

ing well installation procedures, sample collection techniques, analytical results, and recommendations for further work are presented in KEI's report (KEI-P89-0805.R5) dated March 16, 1990.

On October 23, 1990, four additional 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 below grade. 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 of the wells were sampled on November 7, 1990. Water samples from all of the existing wells, and selected soil samples from the borings for wells MW6 through MW9, 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. The results of the soil analyses are summarized in Table 6, and the results of the water analyses are summarized in Table 2. Documentation of the well installation protocol, sample collection techniques, and the analytical results are presented in KEI's report (KEI-P89-0805.R6) dated December 17, 1990. Based on the analytical results, KEI recommended the continuation of the monthly monitoring and quarterly sampling program.

In KEI's report (KEI-P89-0805.QR2) dated April 12, 1991, KEI recommended the installation of three additional off-site monitoring wells to further define the extent of ground water contamination downgradient of the site.

Based on the analytical results collected and evaluated through August 28, 1991, KEI recommended 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. In addition, KEI also recommended that wells MW3, MW4, MW5, and MW8 continue to be purged on a bi-weekly basis, in an attempt to reduce levels of contamination in the vicinity of these wells (until the lateral extent of contamination had been delineated).

On October 22, 1991, water recovery tests were performed on wells MW3, MW5, MW8, and MW9. The wells were uniformly pumped of various amounts of ground water, and the water levels were measured at periodic time intervals to determine the ground water recovery rate for each well. The water recovery tests were performed to obtain information about relative recovery rates at various locations at the site, and to better determine potential locations of recovery wells. Well recovery data are summarized in Table 4.

On January 7, 1992, two additional two-inch diameter monitoring wells (designated as MW10 and MW11 on the attached Site Vicinity Map, Figure 1) were installed at the site. The third proposed well (MW12) was not installed at that time since the City of Oakland encroachment permit had not yet been received by KEI. The two wells were each drilled to depths of 21 to 22 feet below grade and were completed to total depths ranging from 19 to 22 feet below grade. Ground water was encountered during drilling at depths below grade ranging from 20 feet at MW10 to about 10.5 feet at MW11. Wells MW10 and MW11 were developed on January 10, 1992, and all of the wells (except MW5) were sampled on February 6, 1992. Well MW5 was not sampled due to the presence of 0.01 feet of free product.

Water samples from all wells (except MW5), and selected soil samples from borings of MW10 and MW11, were analyzed at Sequoia Analytical Laboratory in Concord, California.

Analytical results of the soil samples collected from borings MW10 and MW11 indicated non-detectable levels of TPH as gasoline and BTX&E in all analyzed samples, except for 0.021 ppm of xylenes detected in sample MW10(5). Analytical results of the water samples collected from MW1, MW6, MW7, MW10, and MW11 indicated non-detectable levels of TPH as gasoline and BTX&E. TPH as gasoline was also non-detectable in well MW2. In wells MW3, MW4, MW8, and MW9, TPH as gasoline was detected at concentrations of 24,000 ppb, 5,700 ppb, 2,600 ppb, and 660 ppb, respectively. In wells MW2, MW3, MW4, MW8, and MW9, benzene was detected at levels of 0.36 ppb, 600 ppb, 2,200 ppb, 4.1 ppb, and 41 ppb, respectively. Well MW5 was not sampled due to the presence of free product. The results of the soil analyses are summarized in Table 3, and the results of the water analyses are summarized in Table 2.

Documentation of the well installation procedures, sample collection techniques, and the analytical results are presented in KEI's report (KEI-P89-0805.R7) dated March 9, 1992. Based on the analytical results, KEI recommended the continuation of the monthly monitoring and quarterly sampling program for all of the wells. In addition, KEI recommended the installation and subsequent pump testing of a recovery well.

RECENT FIELD ACTIVITIES - QUARTERLY MONITORING AND SAMPLING

All eleven wells (MW1 through MW11) were monitored three times and were sampled once during the quarter, except for well MW5, which was not sampled due to the presence of a trace of free product. In addition, wells MW3 and MW5 were monitored and purged three additional times during the quarter, and well MW4 was monitored and purged two additional times. During monitoring, the wells were checked for depth to water and presence of free product. During sampling, the wells were also checked for the presence of sheen. Free product was noted in well MW5 on four occasions and in well MW3 on one occasion during the quarter. Sheen was not observed in any of the wells, except in wells MW3 and MW8. Monitoring data are summarized in Table 1.

Water samples were collected from the wells on August 25, 1992, except for well MW5, which was not sampled due to the presence of free product. Prior to sampling, the wells were each purged of between 3 and 9 gallons by the use of a surface pump. Samples were then collected by a clean Teflon bailer. Samples were decanted into clean VOA vials and/or one liter amber bottles, as appropriate, which were then sealed with Teflon-lined screw caps and stored in a cooler, on ice, until delivery to the state-certified laboratory.

RECENT FIELD ACTIVITIES - WELL INSTALLATION

On June 25 and 26, 1992, one six-inch diameter recovery well and one additional two-inch diameter monitoring well (designated as RW1 and MW12, respectively, on the attached Figure 1) were installed at the site. The subsurface materials penetrated and details of the construction of the wells are described in the attached Boring Logs.

The monitoring well (MW12) was drilled and completed to a total depth of 17.5 feet below grade. Ground water was encountered at a depth of 12 feet below grade during drilling. Soil samples were taken for laboratory analysis and for lithologic logging purposes at a maximum spacing of 5 foot intervals, at significant changes in lithology, at obvious areas of contamination, and at or within the

soil/ground water interface, beginning at a depth of approximately 5 feet below grade and continuing until ground water was encountered. Soil sampling conducted below the ground water table was for lithologic logging purposes only. The undisturbed soil samples were taken by driving a California-modified split-spoon sampler ahead of the drilling augers. The two-inch diameter brass liners holding the samples were sealed with aluminum foil, plastic caps and tape, and stored in a cooled ice chest for delivery to a state-certified laboratory. Each well casing was installed with a watertight cap and padlock. A round, watertight, flush-mounted well cover was cemented in place over each well casing.

The recovery well (RW1) was also drilled to a depth of 17.5 feet below grade. Ground water was not encountered during drilling and soil samples were not collected.

The surface of each well cover was surveyed by Kier & Wright of Pleasanton, California, to Mean Sea Level (MSL) and to a vertical accuracy of 0.01 feet.

Recovery well RW1 was developed on July 3, 1992. Prior to the development of RW1, both wells were checked for depth to the water table (by the use of an electronic sounder), and the presence of free product (by the use of an interface probe or paste tape). No free product was noted in the two wells.

After recording the monitoring data, recovery well RW1 was purged of 105 gallons, until the evacuated water was clear and free of suspended sediment. However, the development procedure for monitoring well MW12 could not be completed due to insufficient water in the well.

Monitoring well MW12 was sampled on August 25, 1992. Prior to sampling, monitoring data was collected, the well was purged of 3 gallons, and water samples were then collected by the use of a clean Teflon bailer. Samples were decanted into clean VOA vials and/or one-liter amber bottles, as appropriate, then sealed with Teflon-lined screw caps and stored in a cooler, on ice, until delivery to a state-certified laboratory.

ANALYTICAL RESULTS

Water samples from all of the wells, and selected soil samples from the boring for MW12, were analyzed at Sequoia Analytical Laboratory in Concord, California. All samples analyzed were accompanied by properly executed Chain of Custody documentation. The samples were analyzed for TPH as gasoline by EPA method 5030/modified 8015, and BTX&E by EPA method 8020.

Concentrations of TPH as gasoline and benzene detected in the ground water samples collected on August 25 1992, are shown on the attached Figures 4 and 5, respectively. The results of the soil analyses are summarized in Table 3, and the results of the water analyses are summarized in Table 2. Copies of the laboratory analyses and Chain of Custody documentation are attached to this report.

HYDROLOGY AND GEOLOGY

The measured depth to ground water at the site on August 25, 1992, ranged between 8.08 and 13.52 feet below grade. The water levels in all of the wells have shown net decreases ranging from 0.04 to 0.60 feet since May 23, 1992, except for the water level in well MW4, which has shown an increase of 0.65 feet since May 23, 1992. Based on the water level data gathered during the quarter, the ground water flow direction appeared to be to the south-southwest, as shown on the attached Potentiometric Surface Maps, Figures 1, 2, and 3. The flow direction reported this quarter is similar to the southwesterly flow direction reported since the inception of monitoring in November 1989. The average hydraulic gradient across the site on August 25, 1992, ranged between 0.012 and 0.052.

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 consist of lenses of clayey gravel, sandy silty clay, and sand-clay-silt mixtures.

The results of our previous subsurface studies indicate that the site and immediate vicinity are directly underlain by artificial fill materials that range from 2 feet to 6 feet in thickness. The fill materials are in turn underlain predominantly by clay materials that extend to depths below grade of approximately 5 feet at MW11 to about 11.5 feet at MW9. The clay zone is further underlain by a coarse-grained zone, which extends to approximately 10 feet below grade at MW6 and MW11 to approximately 15.5 feet below grade at MW5 and MW9. Generally, ground water was encountered within the coarse-grained zone during drilling, except at MW6, MW10, and MW11, where ground water was encountered between 1 to 8 feet below the base of this zone. The coarse-grained zone is generally underlain by clay and/or silt materials that extend to the maximum depths explored (20 to 22.5 feet below grade). At MW1, MW10, and MW11, a second coarse-grained zone composed of clayey gravel or clayey to silty sand extends to depths of about 19 to 20 feet below grade.

The results of our most recent subsurface studies (the borings for MW12 and RW1) indicate that in the immediate vicinity of the two wells, the site is underlain by fill materials to a depth of 2.5 to 3 feet below grade level. The fill materials are in turn underlain by a succession of clayey sands, clayey gravels, clayey silts, and sandy clays. A 3 foot thick clayey gravel unit is present at a depth of 8.5 feet below grade in MW12. A similar but thinner clayey gravel zone (about 1.5 feet thick) is present in RW1 at a depth of 11.5 feet below grade.

DISCUSSION AND RECOMMENDATIONS

The analytical results of the soil and ground water samples collected from MW12 indicated non-detectable concentrations of TPH as gasoline and BTX&E. Therefore, it appears that the lateral extent of the hydrocarbon contamination at the subject site has been defined. The extent of ground water contamination is shown on the attached Figures 4 and 5.

KEI is currently proceeding with steps necessary for the design and implementation of a remediation system at the subject site. However, during the development of RW1, the ground water recovery rate was relatively slow, and the well dewatered several times. Therefore, KEI is currently reviewing the available data and evaluating alternate ground water remediation methods. A separate technical report on these activities will be submitted in the future.

Lastly, based on the analytical results of the samples collected to date, KEI recommends the continuation of the current monthly monitoring and quarterly sampling program of the monitoring wells, per KEI's proposal (KEI-P89-0805.P6) dated April 15, 1991, and as modified in KEI's quarterly report (KEI-P89-0805.QR5) dated December 13, 1991. In addition, KEI recommends the continuation of the bi-weekly purging of monitoring wells MW3, MW5, and MW8, in order to reduce levels of contamination in the vicinity of these wells until a remediation system is designed and implemented at the subject site. In the interim, a continuous surface skimming free product recovery system has been installed in MW5.

DISTRIBUTION

Copies of this report should be sent to the Alameda County Health Care Services Agency, and to Mr. Lester Feldman of the RWQCB, 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 me at (510) 602-5100.

Sincerely,

Kaprealian Engineering, Inc.

Thomas J. Berkins
Senior Environmental Engineer

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

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

Robert H. Kezerian, P.E.
Project Engineer

/bp

Attachments: Tables 1 through 8
Location Map
Potentiometric Surface Maps - Figures 1 through 3
TPH as Gasoline Concentration Map - Figure 4
Benzene Concentration Map - Figure 5
Soil Sample Location Map - Figure 6
Boring Logs
Laboratory Analyses
Chain of Custody documentation

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TABLE 1

SUMMARY OF GROUND WATER MONITORING AND PURGING DATA

Well #	Ground Water Elevation (feet)	Depth to Water (feet)	Product Thickness (feet)	Sheen	Water Purged (Gallons)	Product Purged (ounces)
(Monitored and Sampled on August 25, 1992)						
MW1	72.62	8.45	0	No	8	0
MW2	71.90	9.72	0	No	7	0
MW3	71.48	10.53	0	Yes	9	0
MW4	71.18	10.30	0	No	7	0
MW5	70.93	10.66	Trace	N/A	0	0
MW6	72.39	8.08	0	No	8	0
MW7	72.71	9.12	0	No	8	0
MW8	70.61	11.10	0	Yes	7	0
MW9	69.95	11.18	0	No	9	0
MW10	68.75	13.15	0	No	5	0
MW11	67.28	11.15	0	No	3	0
MW12	66.37	13.52	0	No	3	0
(Monitored on August 3, 1992)						
MW3	71.47	10.54	Trace	--	55	<1
MW5	71.29	10.30	Trace	--	55	<1
MW8	WELL WAS NOT SAMPLED - INACCESSIBLE					
(Monitored on July 22, 1992)						
MW1	72.48	8.59	0	--	0	0
MW2	71.71	9.91	0	--	0	0
MW3	71.54	10.47	0	--	30	0
MW4	71.50	9.98	0	--	0	0
MW5	69.56	12.03	0	--	30	0
MW6	72.23	8.24	0	--	0	0
MW7	72.70	9.13	0	--	0	0
MW8	70.24	11.47	0	--	30	0
MW9	69.75	11.38	0	--	0	0
MW10	68.36	13.54	0	--	0	0
MW11	65.96	12.47	0	--	0	0

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TABLE 1 (Continued)

SUMMARY OF GROUND WATER MONITORING AND PURGING DATA

Well #	Ground Water Elevation (feet)	Depth to Water (feet)	Product Thickness (feet)	Sheen	Water Purged (Gallons)	Product Purged (ounces)
(Monitored and Developed on July 3, 1992)						
MW3*	71.80	10.21	0	--	35	0
MW4*	69.53	11.95	0	--	5	0
MW5*	71.63	9.96	0	--	50	0
MW12	61.92	17.07	0	--	0	0
RW1	71.70	9.50	0	--	105	0
(Monitored June 23, 1992)						
MW1	72.52	8.55	0	--	0	0
MW2	71.74	9.88	0	--	0	0
MW3	71.61	10.40	0	--	35	0
MW4	71.67	9.81	0	--	10	0
MW5**	71.45	10.16	0.02	N/A	52	<1
MW6	72.28	8.19	0	--	0	0
MW7	72.76	9.07	0	--	0	0
MW8	70.28	11.43	0	--	0	0
MW9	69.85	11.28	0	--	0	0
MW10	68.61	13.29	0	--	0	0
MW11	65.85	12.58	0	--	0	0
(Monitored June 11, 1992)						
MW3	71.65	10.36	Trace	N/A	0.25	<1
MW4	70.22	11.26	0	--	8	0
MW5**	71.47	10.12	0.01	N/A	0.5	<1

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TABLE 1 (Continued)

SUMMARY OF GROUND WATER MONITORING AND PURGING DATA

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
MW10	81.90
MW11	78.43
MW12	79.89
RW1	81.20

-- Sheen determination was not performed.

* Monitored only.

** The elevation of ground water was corrected due to the presence of free product by the use of a specific gravity of 0.75.

*** The elevations of the tops of the well covers have been surveyed relative to MSL, per City of Oakland Benchmark #1336.

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TABLE 2

SUMMARY OF LABORATORY ANALYSES
WATER

Date	Well #	TPH as Gasoline	Benzene	Toluene	Xylenes	Ethyl-benzene
8/26/92	MW1	ND	ND	ND	ND	ND
	MW2	ND	ND	ND	ND	ND
	MW3	20,000	690	1,900	5,700	1,300
	MW4	120	86	0.52	1.6	0.57
	MW5	NOT SAMPLED DUE TO THE PRESENCE OF FREE PRODUCT				
	MW6	ND	ND	ND	ND	ND
	MW7	ND	ND	ND	ND	0.73
	MW8	1,800	12	8.0	13	4.0
	MW9	250	13	ND	3.8	8.6
	MW10	ND	ND	ND	ND	ND
	MW11	ND	ND	ND	ND	ND
	MW12	ND	ND	ND	ND	ND
5/23/92	MW1	ND	ND	ND	ND	ND
	MW2	ND	ND	ND	ND	ND
	MW3	25,000	300	130	4,900	880
	MW4	ND	ND	ND	ND	ND
	MW5	NOT SAMPLED DUE TO THE PRESENCE OF FREE PRODUCT				
	MW6	ND	ND	ND	ND	ND
	MW7	ND	ND	ND	ND	ND
	MW8	2,100	8.6	1.6	28	1.7
	MW9	460	18	0.66	3.2	1.4
	MW10	ND	ND	ND	ND	ND
	MW11	ND	ND	ND	ND	ND
2/06/92	MW1	ND	ND	ND	ND	ND
	MW2	ND	0.36	0.66	0.62	ND
	MW3	24,000	600	1,800	5,800	1,200
	MW4	5,700	2,200	140	980	57
	MW5	NOT SAMPLED DUE TO THE PRESENCE OF FREE PRODUCT				
	MW6	ND	ND	ND	ND	ND
	MW7	ND	ND	ND	ND	ND
	MW8	2,600	4.1	7.0	93	31
	MW9	660	41	1.0	15	33
	MW10	ND	ND	ND	ND	ND
	MW11	ND	ND	ND	ND	ND

KEI-P89-0805.R9
September 25, 1992

TABLE 2 (Continued)

SUMMARY OF LABORATORY ANALYSES
WATER

Date	Well #	TPH as Gasoline	Benzene	Toluene	Xylenes	Ethyl-benzene
11/19/91	MW1	ND	ND	ND	ND	ND
	MW2	ND	ND	ND	ND	ND
	MW3	22,000	250	440	3,000	660
	MW4	55	9.2	4.5	6.7	1.4
	MW5	NOT SAMPLED DUE TO THE PRESENCE OF FREE PRODUCT				
	MW6	ND	ND	ND	ND	ND
	MW7	32	ND	ND	ND	ND
	MW8	1,600	8.1	1.8	52	19
	MW9	360	17	0.45	11	15
8/28/91	MW1	ND	ND	ND	ND	ND
	MW2	ND	ND	ND	ND	ND
	MW3	16,000	650	2,200	5,400	1,100
	MW4	2,000	1,500	20	300	120
	MW5	NOT SAMPLED DUE TO THE PRESENCE OF FREE PRODUCT				
	MW6	ND	ND	ND	ND	ND
	MW7	ND	ND	ND	ND	ND
	MW8	1,800	3.2	1.9	74	19
	MW9	450	17	0.9	14	13
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

KEI-P89-0805.R9
September 25, 1992

TABLE 2 (Continued)

SUMMARY OF LABORATORY ANALYSES
WATER

Date	Well #	TPH as Gasoline	Benzene	Toluene	Xylenes	Ethyl-benzene
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
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

ND = Non-detectable.

-- Indicates analysis was not performed.

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

KEI-P89-0805.R9
September 25, 1992

TABLE 3

SUMMARY OF LABORATORY ANALYSES
SOIL

Date	Sample Number	Depth (feet)	TPH as Gasoline	Benzene	Toluene	Xylenes	Ethyl-benzene
1/07/92	MW10(5)	5.0	ND	ND	ND	0.021	ND
	MW10(7)	7.0	ND	ND	ND	ND	ND
	MW10(11.5)	11.5	ND	ND	ND	ND	ND
	MW10(14.5)	14.5	ND	ND	ND	ND	ND
	MW10(19.5)	19.5	ND	ND	ND	ND	ND
	MW11(5)	5.0	ND	ND	ND	ND	ND
	MW11(10)	10.0	ND	ND	ND	ND	ND
	MW11(12.5)	12.5	ND	ND	ND	ND	ND
6/26/92	MW12(5)	5.0	ND	ND	ND	ND	ND
	MW12(10)	10.0	ND	ND	ND	ND	ND
	MW12(11.5)	11.5	ND	ND	ND	ND	ND

ND = Non-detectable.

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

KEI-P89-0805.R9
September 25, 1992

TABLE 4

SUMMARY OF WELL RECOVERY DATA

(Measured on October 22, 1991)

Well #	Average Flow Rate (gpm)	Casing Volume (gallons)	Amount Purged (gallons)	Purged Casing Volume	Recovery (%)	Recovery Time (hours)
MW3	0.79	1.97	15	7.62	50	0.07
					70	0.11
					90	0.23
					95	0.33
					99	0.73
MW5	1.68	1.62	47	29.1	60	0.03
					70	0.08
					80	0.13
					90	0.53
					95	1.33
					96	1.58
MW8	1.08	1.66	14	8.43	50	0.06
					70	0.11
					90	0.19
					97	0.43
MW9	1.11	1.88	30	15.93	50	0.02
					70	0.05
					90	0.08
					95	0.16
					99	0.50

KEI-P89-0805.R9
September 25, 1992

TABLE 5

SUMMARY OF LABORATORY ANALYSES
SOIL

Date	Sample Number	Depth (feet)	TPH as Gasoline	Benzene	Toluene	Xylenes	Ethyl-benzene
10/17/89	MW1(5)	5.0	8.5	ND	ND	0.14	ND
	MW1(10)	10.0	ND	ND	ND	ND	ND
	MW2(5)	5.0	ND	ND	ND	ND	ND
	MW2(10)	10.0	ND	ND	ND	ND	ND
	MW2(12.5)	12.5	ND	ND	ND	ND	ND
	MW3(5)	5.0	3.1	0.068	ND	ND	ND
	MW3(10)	10.0	69	0.89	2.6	7.9	2.0
	MW3(11)	11.0	1,100	16	85	150	35
1/26/90	MW4(5)	5.0	22	0.059	ND	ND	ND
	MW4(7)	7.0	2.5	ND	ND	ND	ND
	MW4(10)	10.0	250	1.2	0.66	20	1.4
	MW4(11)	11.0	280	1.0	4.0	36	7.6
	MW5(5)	5.0	25	0.21	ND	ND	ND
	MW5(7.5)	7.5	46	0.25	0.28	0.20	0.46
	MW5(10)	10.0	140	1.5	1.7	10	4.0
	MW5(11.5)	11.5	370	1.8	14	51	11

ND = Non-detectable.

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

KEI-P89-0805.R9
September 25, 1992

TABLE 6

SUMMARY OF LABORATORY ANALYSES
SOIL

Date	Sample Number	Depth (feet)	TPH as Gasoline	Benzene	Toluene	Xylenes	Ethyl-benzene
10/23/90	MW6(5)	5.0	ND	ND	ND	ND	ND
	MW6(9)	9.0	ND	ND	ND	0.010	ND
	MW6(11.5)	11.5	ND	ND	ND	ND	ND
	MW7(5)	5.0	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)	5.0	ND	ND	ND	ND	ND
	MW8(10)	10.0	ND	ND	ND	0.0080	ND
	MW9(5.5)	5.5	ND	ND	ND	ND	ND
	MW9(10)	10.0	84	0.32	0.27	0.51	0.63
	MW9(12)	12.0	120	0.19	0.11	0.69	0.14

ND = Non-detectable.

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

KEI-P89-0805.R9
September 25, 1992

TABLE 7

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*	8.0	ND	1.6	ND	1.3	ND	ND

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

-- Indicates analysis was not performed.

ND = Non-detectable.

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

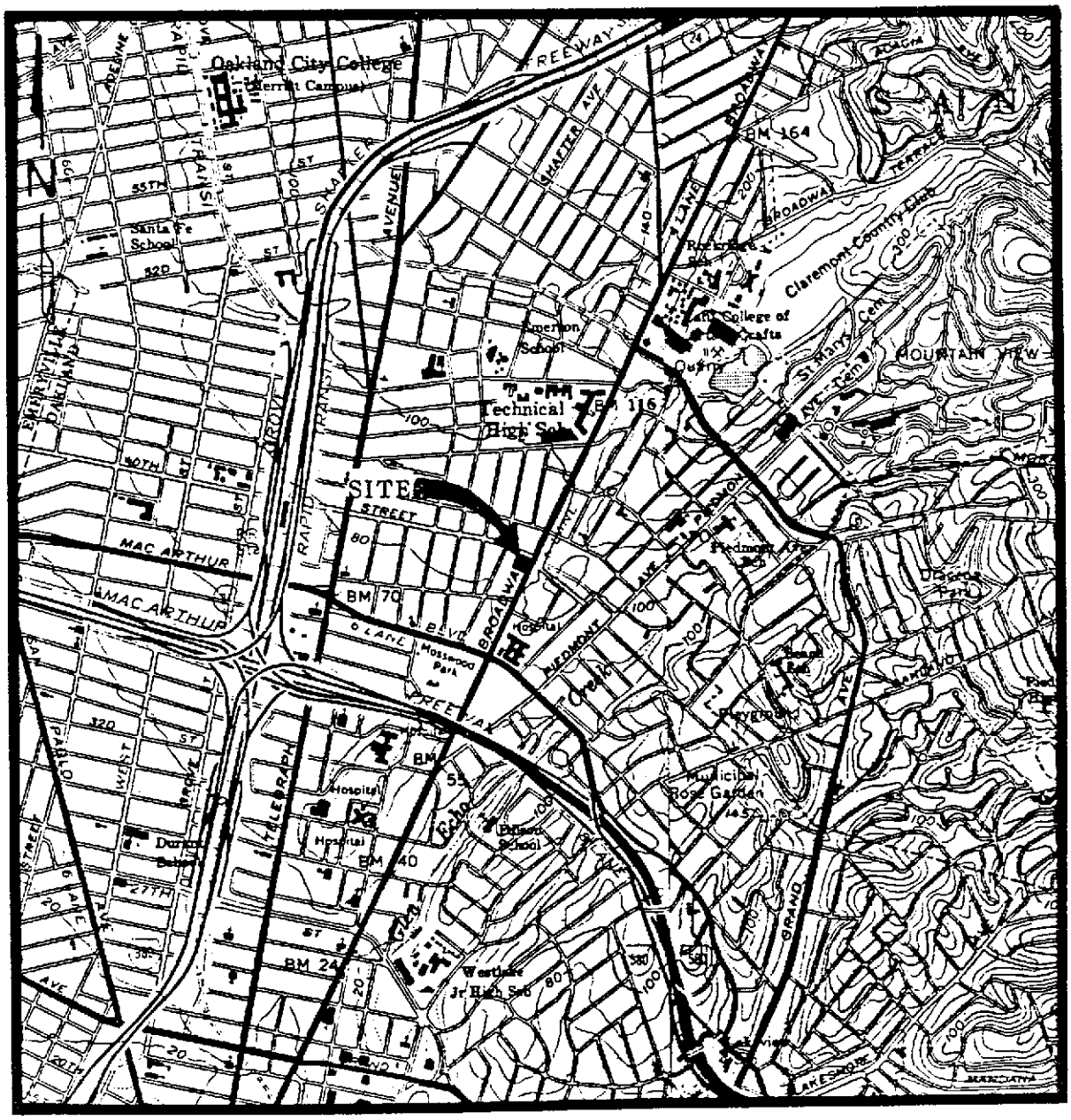
TABLE 8

SUMMARY OF LABORATORY ANALYSES
WATER

Date	Sample #	TPH as Gasoline	Benzene	Toluene	Xylenes	Ethylbenzene
8/17/89	W1	4,700	180	420	860	150
8/24/89	W2*	1,200	12	10	88	5.9

* 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.

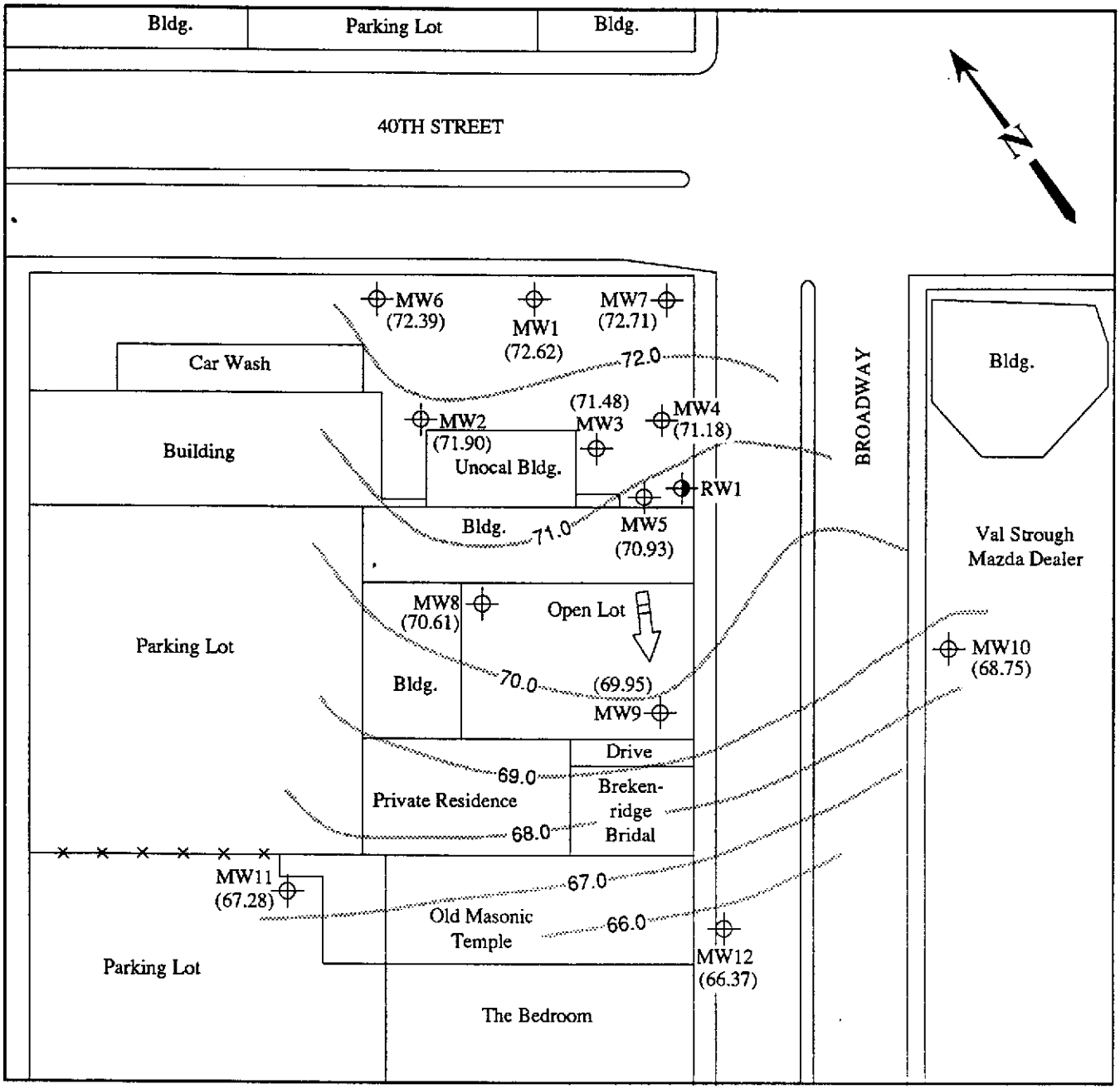


Base modified from 7.5 minute U.S.G.S. Oakland East and West Quadrangles (both photorevised 1980)

0 2000 4000

Approx. scale feet

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



LEGEND

- Monitoring well
- 6-inch diameter recovery well
- ( ) Ground water elevation in feet above Mean Sea Level
- Direction of ground water flow
- Contours of ground water elevation

0 60 120

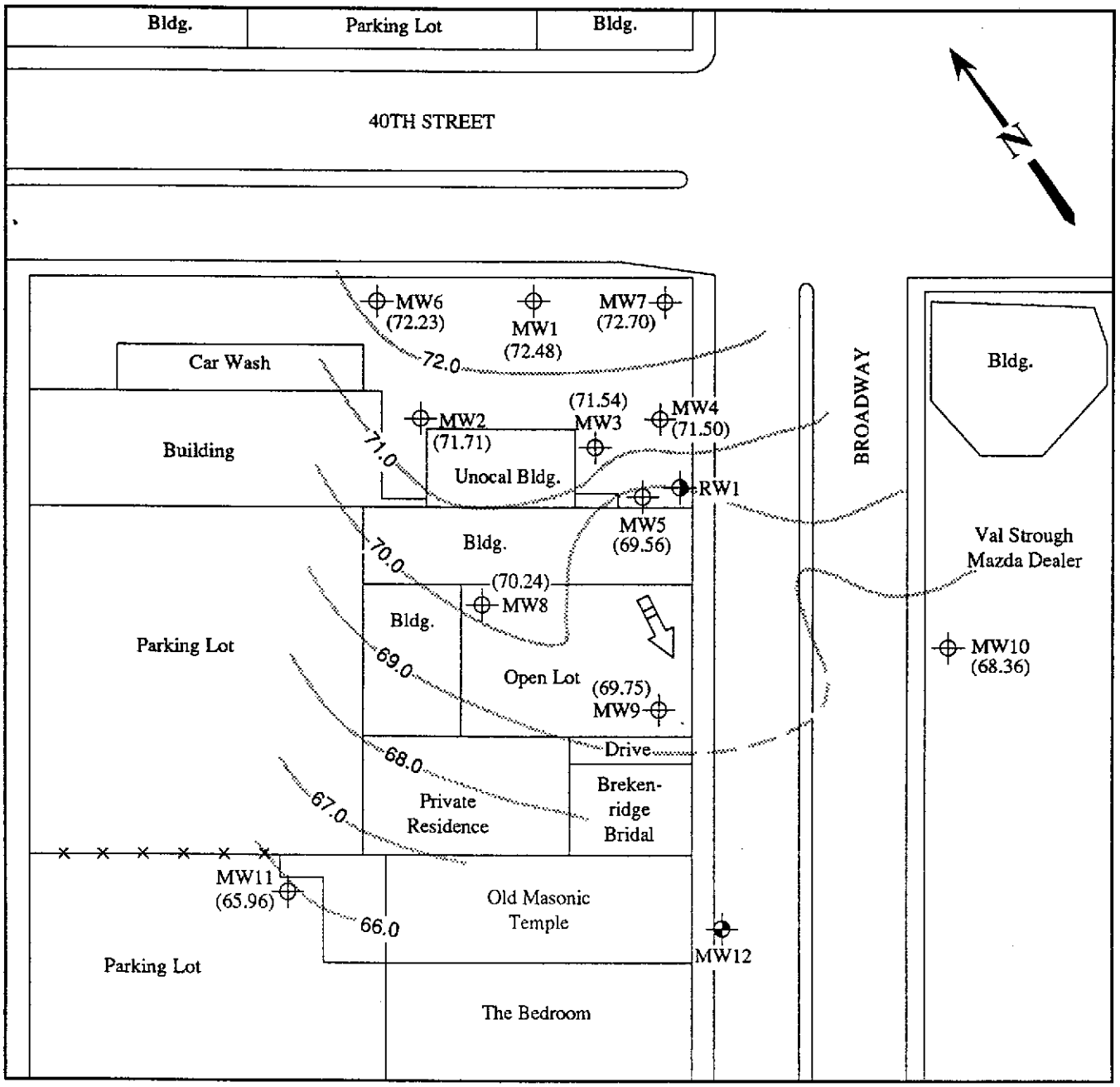
Approx. scale feet

POTENTIOMETRIC SURFACE MAP FOR THE AUGUST 25, 1992 MONITORING EVENT

KAPREALIAN ENGINEERING
INCORPORATED

UNOCAL SERVICE STATION #0746
3943 BROADWAY
OAKLAND, CA

FIGURE
1



LEGEND

- Monitoring well (existing)
- Monitoring well (previously proposed)
- 6-inch diameter recovery well
- ( ) Ground water elevation in feet above Mean Sea Level
- Direction of ground water flow
- Contours of ground water elevation

0 60 120

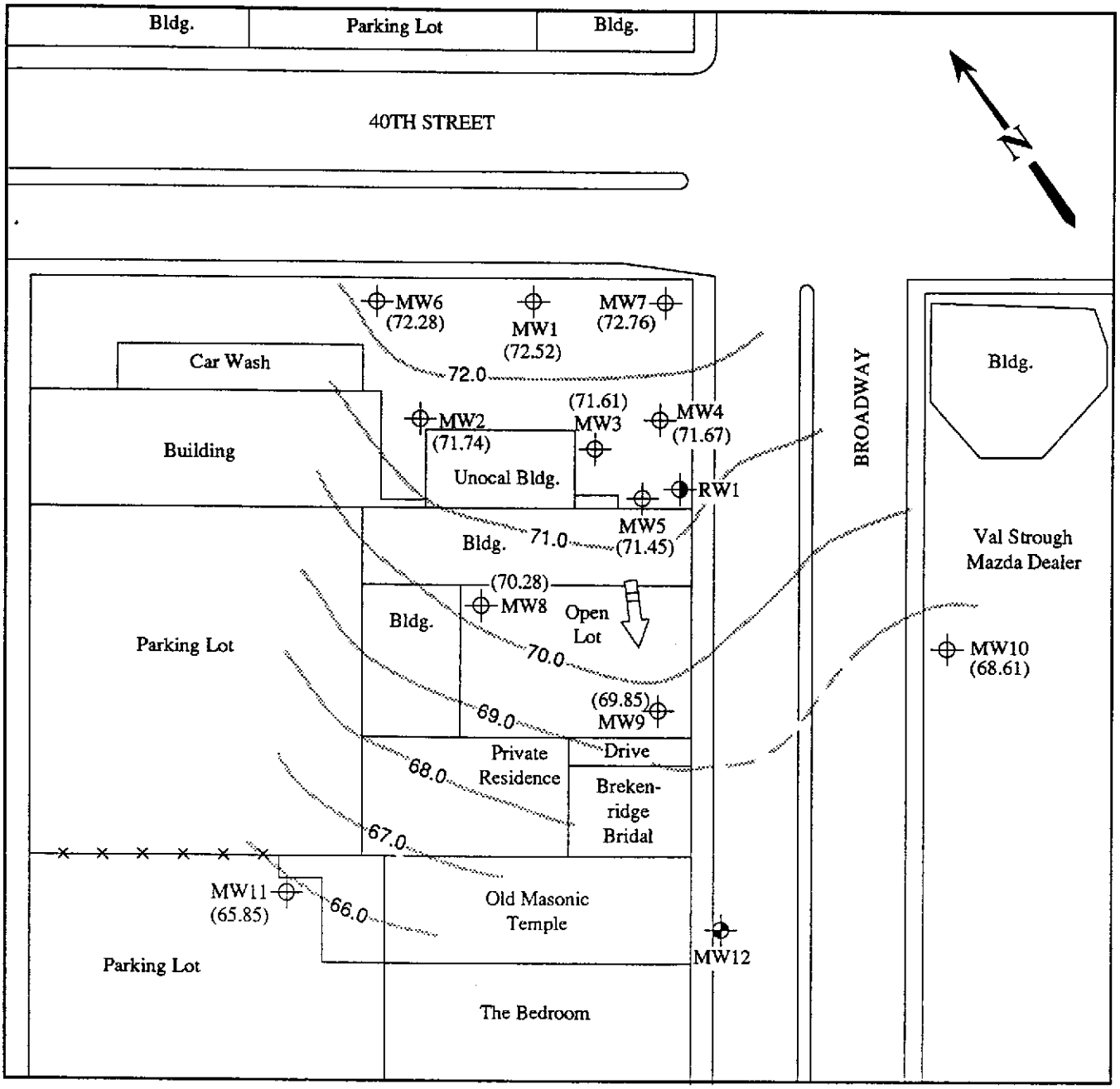
Approx. scale feet

POTENTIOMETRIC SURFACE MAP FOR THE JULY 22, 1992 MONITORING EVENT

KAPREALIAN ENGINEERING
INCORPORATED

UNOCAL SERVICE STATION #0746
3943 BROADWAY
OAKLAND, CA

FIGURE
2



LEGEND

- Monitoring well (existing)
- Monitoring well (previously proposed)
- 6-inch diameter recovery well
- ( ) Ground water elevation in feet above Mean Sea Level
- Direction of ground water flow
- Contours of ground water elevation

0 60 120

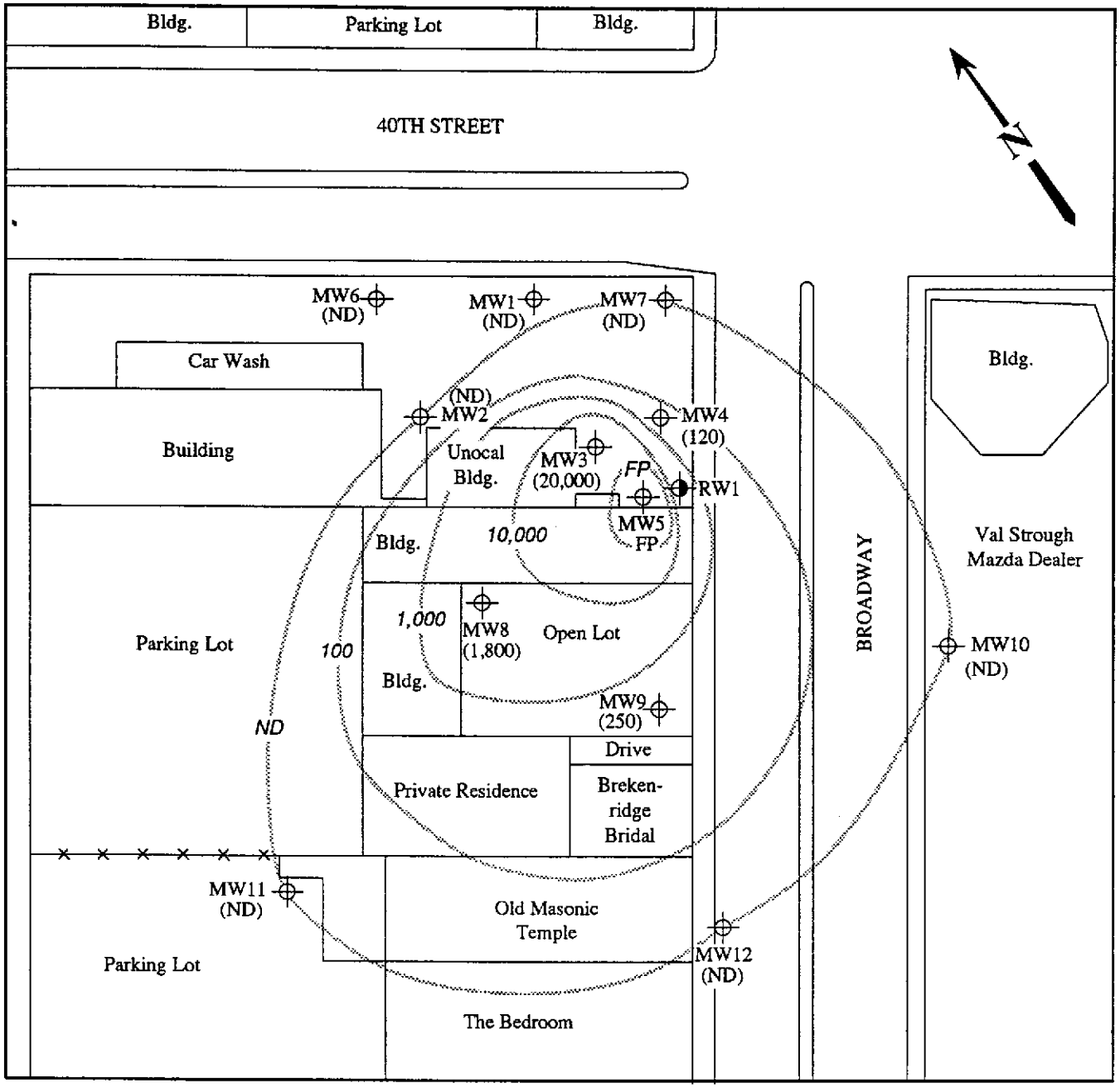
Approx. scale feet

POTENTIOMETRIC SURFACE MAP FOR THE JUNE 23, 1992 MONITORING EVENT

KAPREALIAN ENGINEERING
INCORPORATED

UNOCAL SERVICE STATION #0746
3943 BROADWAY
OAKLAND, CA

FIGURE
3



LEGEND

- Monitoring well
- 6-inch diameter recovery well
- [ ] Concentration of TPH as gasoline in ppb
- Direction of ground water flow
- Approximate iso-concentration contours of TPH as gasoline contamination in ground water

ND = Non-detectable, FP = Free product

0 60 120

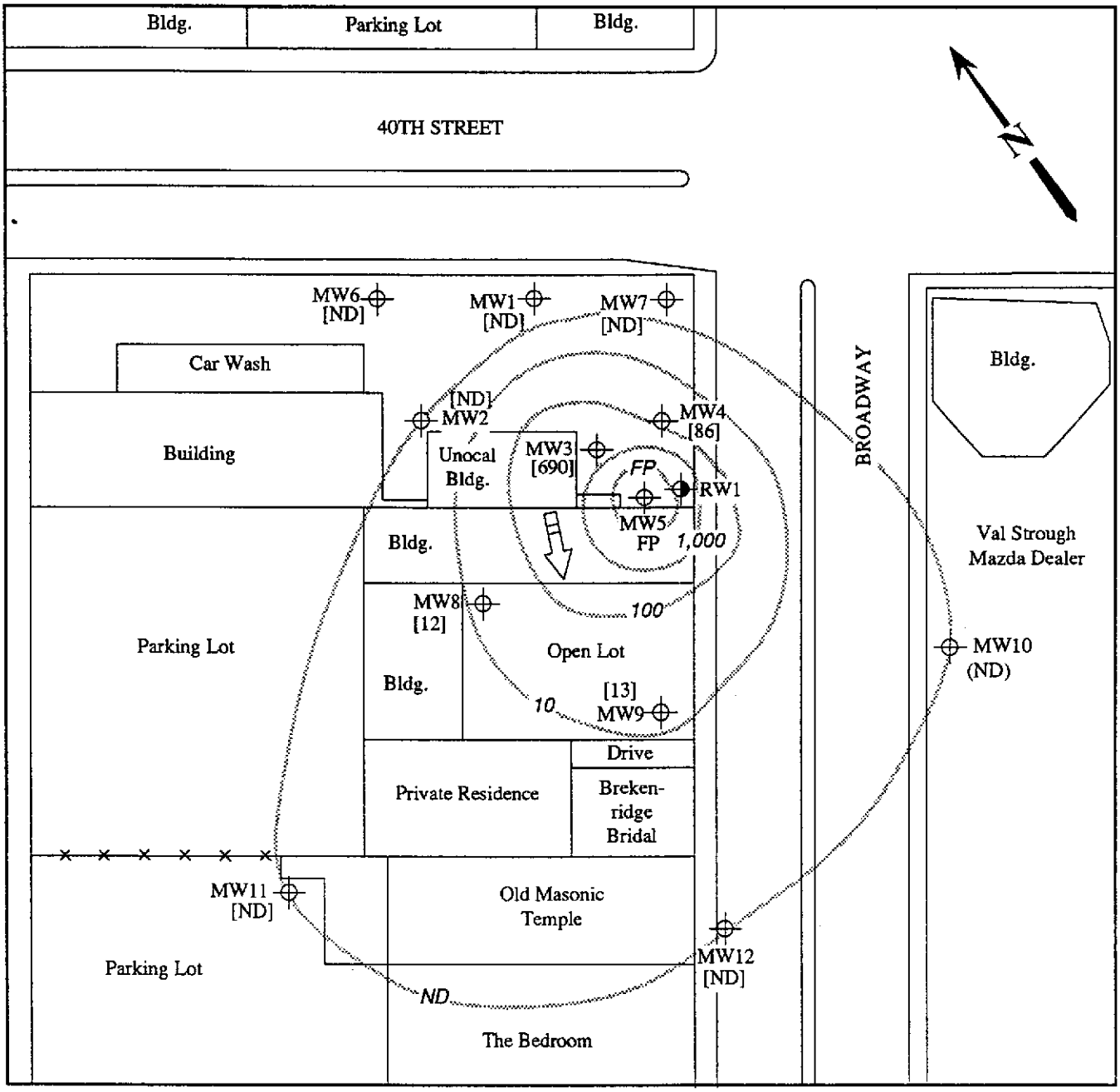
Approx. scale feet

CONCENTRATIONS OF TPH AS GASOLINE IN GROUND WATER ON AUGUST 25, 1992

KAPREALIAN ENGINEERING INCORPORATED

UNOCAL SERVICE STATION #0746
3943 BROADWAY
OAKLAND, CA

FIGURE 4



LEGEND

- Monitoring well
- 6-inch diameter recovery well
- [ ] Concentration of benzene in ppb
- Direction of ground water flow
- Approximate iso-concentration contours of benzene contamination in ground water

ND = Non-detectable, FP = Free product

0 60 120

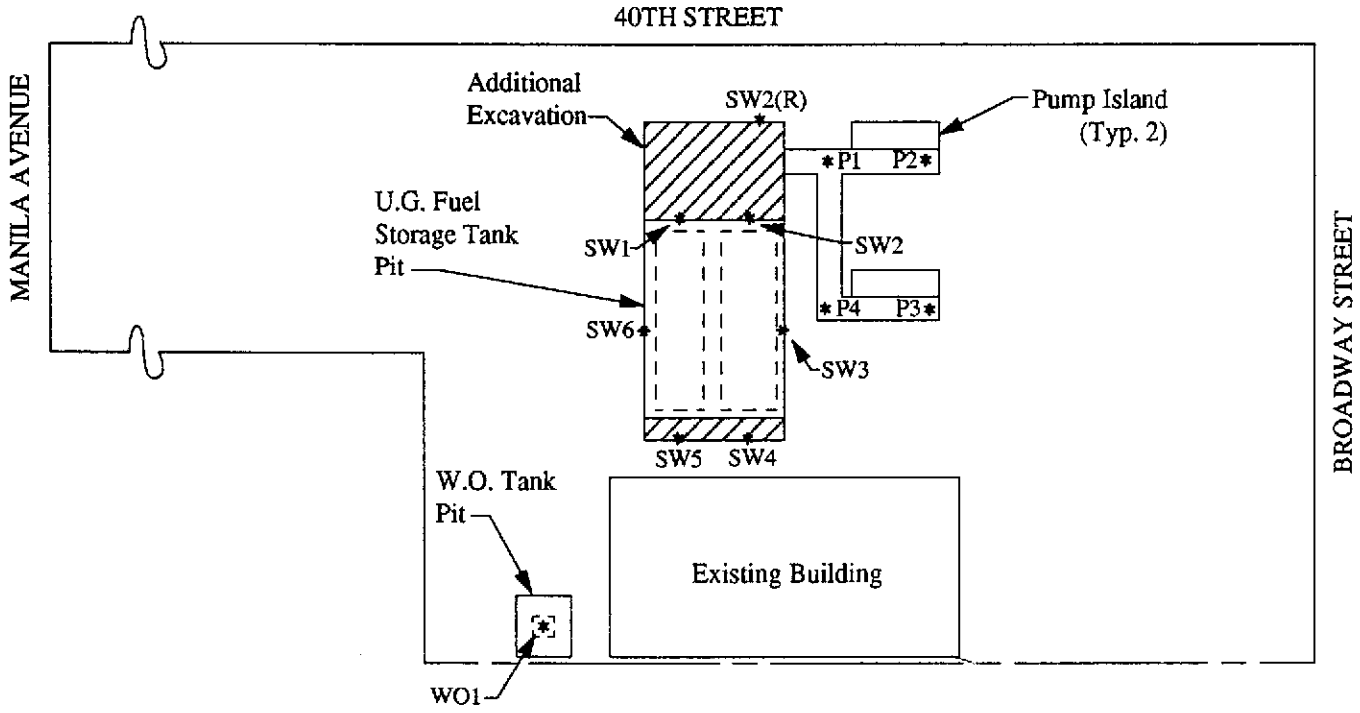
Approx. scale feet

CONCENTRATIONS OF BENZENE IN GROUND WATER ON AUGUST 25, 1992

KAPREALIAN ENGINEERING INCORPORATED

UNOCAL SERVICE STATION #0746
3943 BROADWAY
OAKLAND, CA

FIGURE **5**



LEGEND

* Sample Point Location

0 30 60

Approx. scale feet

SOIL SAMPLE LOCATIONS

KAPREALIAN ENGINEERING INCORPORATED

UNOCAL SERVICE STATION #0746
3943 BROADWAY
OAKLAND, CA

FIGURE 6

KAPREALIAN ENGINEERING
INCORPORATED

MAJOR DIVISIONS		SYMBOLS	TYPICAL SOIL DESCRIPTIONS
GRAVELS (More than 1/2 of coarse fraction > No. 4 sieve size)		GW	Well graded gravels or gravel - sand mixtures, little or no fines
		GP	Poorly graded gravels or gravel - sand mixtures, little or no fines
		GM	Silty gravels, gravel - sand - silt mixtures
		GC	Clayey gravels, gravel - sand - clay mixtures
SANDS (More than 1/2 of coarse fraction < No. 4 sieve size)		SW	Well graded sands or gravelly sands, little or no fines
		SP	Poorly graded sands or gravelly sands, little or no fines
		SM	Silty sands, sand - silt mixtures
		SC	Clayey sands, sand - clay mixtures
SILTS & CLAYS LL < 50		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
		OL	Organic silts and organic silty clays of low plasticity
SILTS & CLAYS LL > 50		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
		CH	Inorganic clays of high plasticity, fat clays
		OH	Organic clays of medium to high plasticity, organic silty clays, organic silts
HIGHLY ORGANIC SOILS		Pt	Peat and other highly organic soils
DUAL (TRANSITION) SOILS			Soil characterisitics are transitional between the soil classifications listed above

CLASSIFICATION CHART (Unified Soil Classification System)

BORING LOG

Project No. KEI-P89-0805	**Boring & Casing Diameter** 8' 2'	**Logged By** JGG D.L. CEG 1633
Project Name Unocal S/S #0746 3943 Broadway, Oakland	**Well Cover Elevation**	**Date Drilled** 6/26/92
Boring No. MW12	**Drilling Method** Hollow-stem Auger	**Drilling Company** Woodward Drilling

Penetration blows/6"	G. W. level	Depth (feet) Samples	Strati-graphy USCS	Description
		0		Concrete pavement.
				Clayey sand and gravel and disturbed soil (fill).
			SC	Clayey sand with trace silt, medium dense, moist, dark greenish gray.
2/3/5		5	MH	Clayey silt, trace fine grained sand, firm, very moist, black.
			CL/SC	Sandy clay, firm, moist, dark greenish gray, lensed with clayey sand.
4/7/10			CH	Clay, estimated at 10-15% gravel to 1/2 inch in diameter, trace sand, stiff to very stiff, moist, black with root holes.
11/22/19		10	GC	Clayey gravel with sand, angular to rounded gravel to 1-1/2 inches in diameter, dense, moist, very dark grayish brown.
6/9/13	▼			Clayey gravel with sand as above, except dark grayish brown and olive brown, mottled.
5/7/12		15	CL	Sandy clay, trace gravel to 1/4 inch in diameter, very stiff, moist, dark yellowish brown and olive brown, mottled. Clay, trace gravel to 3/8 inch in diameter, stiff to very stiff, moist, olive and light olive brown, mottled.
9/14/20				Clay, as above, stiff to very stiff, friable.
		20		TOTAL DEPTH 17.5'

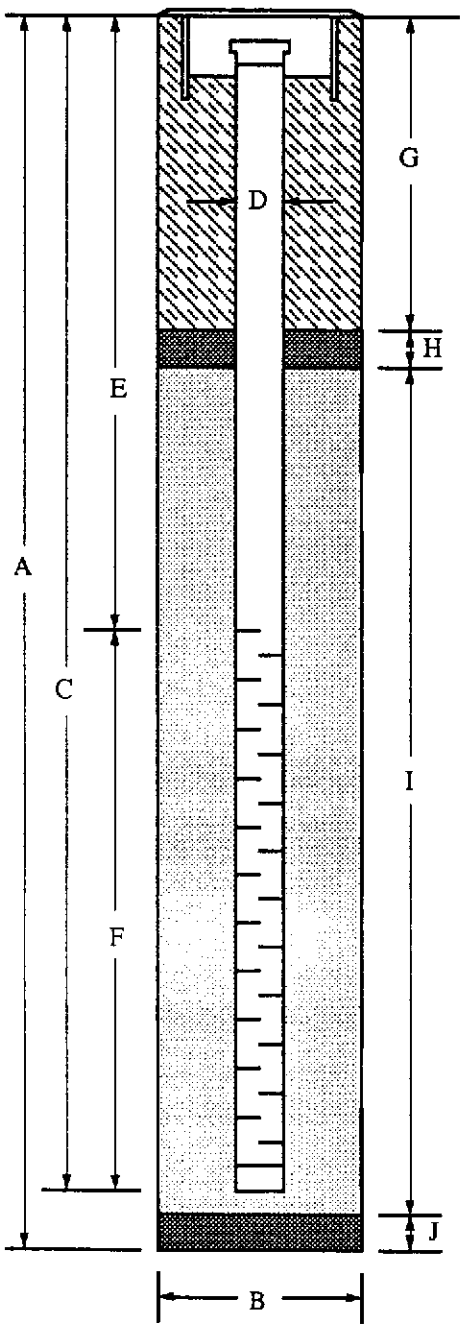
WELL COMPLETION DIAGRAM

PROJECT NAME: Unocal S/S #0746, 3943 Broadway, Oakland WELL NO. MW12

PROJECT NUMBER: KEI-P89-0805

WELL PERMIT NO.:

Flush-mounted Well Cover



A. Total Depth : 17.5'

B. Boring Diameter: 8"

Drilling Method: Hollow Stem Auger

C. Casing Length: 17.5'

Material: Schedule 40 PVC

D. Casing Diameter: OD = 2.375"

ID = 2.067"

E. Depth to Perforations: 5'

F. Perforated Length: 12.5'

Perforation Type: Machined Slot

Perforation Size: 0.010"

G. Surface Seal: 2'

Seal Material: Neat Cement

H. Seal: 1.5'

Seal Material: Bentonite

I. Filter Pack: 14'

Pack Material: RMC Lonestar Sand

Size: #2/12

J. Bottom Seal: None

Seal Material: N/A

BORING LOG

Project No. KEI-P89-0805	**Boring & Casing Diameter** 13.5' 6'	**Logged By** JGG D.L. CEG 1633
Project Name Unocal S/S #0746 3943 Broadway, Oakland	**Well Cover Elevation**	**Date Drilled** 6/25/92
Boring No. RW1	**Drilling Method** Hollow-stem Auger	**Drilling Company** Woodward Drilling

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

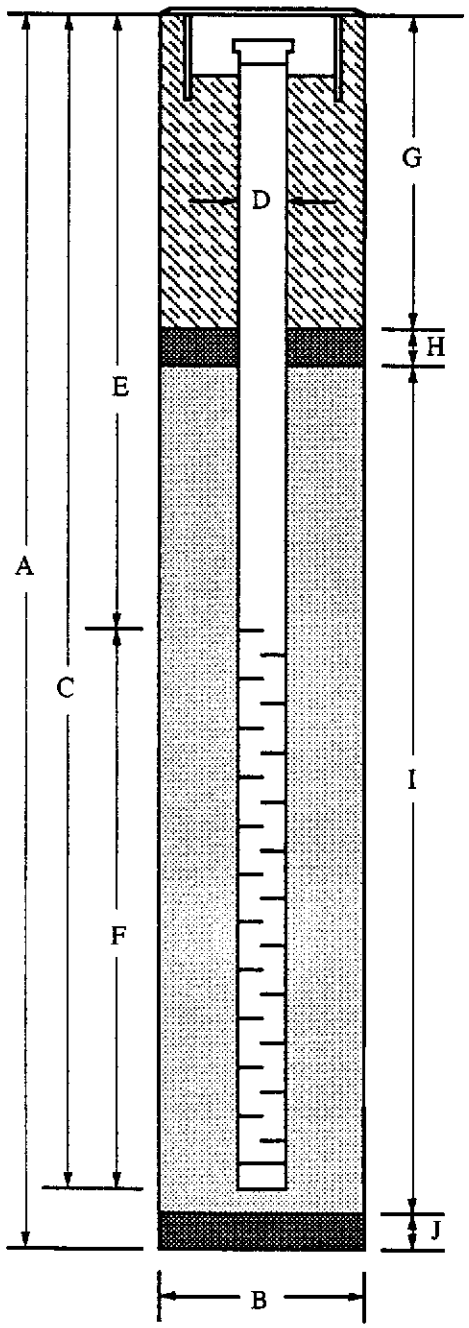
WELL COMPLETION DIAGRAM

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

PROJECT NUMBER: KEI-P89-0805

WELL PERMIT NO.: ACFC & WCD 92270

Flush-mounted Well Cover



A. Total Depth : 17.5'

B. Boring Diameter*: 13.5"

Drilling Method: Hollow Stem Auger

C. Casing Length: 17'

Material: Schedule 40 PVC

D. Casing Diameter: OD = 6.625"

ID = 6.065"

E. Depth to Perforations: 5'

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

Perforation Type: Machined Slot

Perforation Size: 0.010"

G. Surface Seal: 3'

Seal Material: Neat Cement

H. Seal: 1'

Seal Material: Bentonite

I. Filter Pack: 13'

Pack Material: RMC Lonestar Sand

Size: #2/12

J. Bottom Seal: 6"

Seal Material: Bentonite

SEQUOIA ANALYTICAL

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

Kaprealian Engineering, Inc.	Client Project ID:	Unocal, 3943 Broadway, Oakland	Sampled:	Aug 26, 1992
2401 Stanwell Drive, Suite 400	Sample Matrix:	Water	Received:	Aug 27, 1992
Concord, CA 94520	Analysis Method:	EPA 5030/8015/8020	Reported:	Sep 9, 1992
Attention: Mardo Kaprealian, P.E.	First Sample #:	208-1216		

TOTAL PURGEABLE PETROLEUM HYDROCARBONS with BTEX DISTINCTION

Analyte	Reporting Limit µg/L	Sample I.D. 208-1216 MW-1	Sample I.D. 208-1217 MW-2	Sample I.D. 208-1218 MW-3	Sample I.D. 208-1219 MW-4	Sample I.D. 208-1220 MW-6	Sample I.D. 208-1221 MW-7
Purgeable Hydrocarbons	50	N.D.	N.D.	20,000	120	N.D.	N.D.
Benzene	0.5	N.D.	N.D.	690	86	N.D.	N.D.
Toluene	0.5	N.D.	N.D.	1,900	0.52	N.D.	N.D.
Ethyl Benzene	0.5	N.D.	N.D.	1,300	0.57	N.D.	0.73
Total Xylenes	0.5	N.D.	N.D.	5,700	1.6	N.D.	N.D.
Chromatogram Pattern:		--	--	Gasoline	Gasoline	--	--

Quality Control Data

Report Limit Multiplication Factor:	1.0	1.0	200	1.0	1.0	1.0
Date Analyzed:	9/4/92	9/4/92	9/4/92	9/4/92	9/4/92	9/4/92
Instrument Identification:	ML-2	ML-2	ML-2	ML-2	ML-2	ML-2
Surrogate Recovery, %: (QC Limits = 70-130%)	104	99	102	102	106	102

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

SEQUOIA ANALYTICAL

Scott A. Chieffo
Project Manager

SEQUOIA ANALYTICAL

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

Kaprealian Engineering, Inc.	Client Project ID:	Unocal, 3943 Broadway, Oakland	Sampled:	Aug 26, 1992
2401 Stanwell Drive, Suite 400	Sample Matrix:	Water	Received:	Aug 27, 1992
Concord, CA 94520	Analysis Method:	EPA 5030/8015/8020	Reported:	Sep 9, 1992
Attention: Mardo Kaprealian, P.E.	First Sample #:	208-1222		

TOTAL PURGEABLE PETROLEUM HYDROCARBONS with BTEX DISTINCTION

Analyte	Reporting Limit µg/L	Sample I.D. 208-1222 MW-8	Sample I.D. 208-1223 MW-9	Sample I.D. 208-1224 MW-10	Sample I.D. 208-1225 MW-11	Sample I.D. 208-1226 MW-12	Sample I.D. Matrix Blank
Purgeable Hydrocarbons	50	1,800	250	N.D.	N.D.	N.D.	
Benzene	0.5	12	13	N.D.	N.D.	N.D.	
Toluene	0.5	8.0	N.D.	N.D.	N.D.	N.D.	
Ethyl Benzene	0.5	4.0	8.6	N.D.	N.D.	N.D.	
Total Xylenes	0.5	13	3.8	N.D.	N.D.	N.D.	
Chromatogram Pattern:		Gasoline	Gasoline	--	--	--	

Quality Control Data

Report Limit Multiplication Factor:	1.0	1.0	1.0	1.0	1.0	1.0
Date Analyzed:	9/8/92	9/8/92	9/4/92	9/4/92	9/4/92	9/4/92
Instrument Identification:	ML-2	ML-2	ML-2	ML-2	ML-2	ML-2
Surrogate Recovery, %: (QC Limits = 70-130%)	100	101	100	100	99	93

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

SEQUOIA ANALYTICAL

Scott A. Chieffo
Project Manager

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Kaprealian Engineering, Inc.
2401 Stanwell Drive, Suite 400
Concord, CA 94520
Attention: Mardo Kaprealian, P.E.

Client Project ID: Unocal, 3943 Broadway, Oakland
QC Sample Group: 2081216-1226
Reported: Sep 9, 1992

QUALITY CONTROL DATA REPORT

ANALYTE	Benzene	Toluene	Ethyl-Benzene	Xylenes
Method:	EPA 8015/8020	EPA 8015/8020	EPA 8015/8020	EPA 8015/8020
Analyst:	J.Dinsay	J.Dinsay	J.Dinsay	J.Dinsay
Reporting Units:	µg/L	µg/L	µg/L	µg/L
Date Analyzed:	Sep 4, 1992	Sep 4, 1992	Sep 4, 1992	Sep 4, 1992
QC Sample #:	Matrix Blank	Matrix Blank	Matrix Blank	Matrix Blank
Sample Conc.:	N.D.	N.D.	N.D.	N.D.
Spike Conc. Added:	10	10	10	30
Conc. Matrix Spike:	10	10	10	31
Matrix Spike % Recovery:	100	102	104	102
Conc. Matrix Spike Dup.:	10	10	10	31
Matrix Spike Duplicate % Recovery:	102	102	104	102
Relative % Difference:	2.0	0.0	0.0	0.0

Laboratory blank contained the following analytes: None Detected

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Scott A. Chieffo
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

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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	TPHG, BTXE	REMARKS
mw-1	8/26/92	11:10 A.M		✓	✓		2	mw	✓	208 1216 AB
mw-2	"			✓	✓		"	"	✓	1217
mw-3	"			✓	✓		"	"	✓	1218
mw-4	"			✓	✓		"	"	✓	1219
mw-6	"			✓	✓		"	"	✓	1220
mw-7	"			✓	✓		"	"	✓	1221
mw-8	"			✓	✓		"	"	✓	1222
mw-9	"			✓	✓		"	"	✓	1223
										[redacted]

Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Joe Devian	8/26/92 9:25 AM	[redacted] 8/27/92
Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received by: (Signature)

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

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

Signature: [redacted] Title: L.S. Date: 8/27/92

2401 Stanwell Drive, Suite 400
Concord, California 94520
Tel: 510 602 5100 Fax: 510 687 0602

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Page 2

CHAIN OF CUSTODY

SAMPLER: JOE
WITNESSING AGENCY:
SITE NAME & ADDRESS: Unocal/Oakland, 3943 Broadway

ANALYSES REQUESTED: TPH G, BTXE

TURN AROUND TIME: Regular

SAMPLE ID NO.	DATE	TIME	SOIL	WATER	GRAB	COMP	NO. OF CONT.	SAMPLING LOCATION	TPH G, BTXE	REMARKS
MW-10	8/26/92			✓	✓		2	MW	✓	2081226 AB
MW-11	"			✓	✓		"	"	✓	1225
MW-12	"	2:20 P.M		✓	✓		"	"	✓	1226

Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Joe Ajemian	8/26/92 9:25 am	8/27/92
Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received by: (Signature)

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

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

Signature: [signature] Title: F.S. Date: 8/27/92

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SEQUOIA ANALYTICAL

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Kaprealian Engineering, Inc.	Client Project ID:	Unocal #0746, 3943 Broadway, Oakland	Sampled:	Jun 26, 1992
2401 Stanwell Drive, Suite 400	Matrix Descript:	Soil	Received:	Jun 26, 1992
Concord, CA 94520	Analysis Method:	EPA 5030/8015/8020	Analyzed:	Jun 30, 1992
Attention: Mardo Kaprealian, P.E.	First Sample #:	206-1267	Reported:	Jul 8, 1992

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

Sample Number	Sample Description	Low/Medium B.P. Hydrocarbons mg/kg (ppm)	Benzene mg/kg (ppm)	Toluene mg/kg (ppm)	Ethyl Benzene mg/kg (ppm)	Xylenes mg/kg (ppm)
206-1267	MW12 (5)	N.D.	N.D.	N.D.	N.D.	N.D.
206-1268	MW12 (10)	N.D.	N.D.	N.D.	N.D.	N.D.
206-1269	MW12 (11.5)	N.D.	N.D.	N.D.	N.D.	N.D.

Method Detection Limits:	**1.0**	**0.0050**	**0.0050**	**0.0050**	**0.0050**

Low to Medium Boiling Point Hydrocarbons are quantitated against a gasoline standard.

SEQUOIA ANALYTICAL

Scott A. Chieffo
Project Manager

SEQUOIA ANALYTICAL

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Kaprealian Engineering, Inc.
2401 Stanwell Drive, Suite 400
Concord, CA 94520
Attention: Mardo Kaprealian, P.E.

Client Project ID: Unocal #0746, 3943 Broadway, Oakland
QC Sample Group: 2061267-69
Reported: Jul 8, 1992

QUALITY CONTROL DATA REPORT

ANALYTE	Benzene	Toluene	Ethyl-Benzene	Xylenes
Method:	EPA 8015/8020	EPA 8015/8020	EPA 8015/8020	EPA 8015/8020
Analyst:	J. F.	J. F.	J. F.	J. F.
Reporting Units:	mg/kg	mg/kg	mg/kg	mg/kg
Date Analyzed:	Jun 30, 1992	Jun 30, 1992	Jun 30, 1992	Jun 30, 1992
QC Sample #:	Matrix Blank	Matrix Blank	Matrix Blank	Matrix Blank
Sample Conc.:	N.D.	N.D.	N.D.	N.D.
Spike Conc. Added:	0.40	0.40	0.40	1.2
Conc. Matrix Spike:	0.46	0.46	0.43	1.4
Matrix Spike % Recovery:	115	115	107	116
Conc. Matrix Spike Dup.:	0.45	0.46	0.46	1.4
Matrix Spike Duplicate % Recovery:	112	115	115	116
Relative % Difference:	2.2	0.0	6.7	0.0

Laboratory Blank contained the following analytes: None detected.

SEQUOIA ANALYTICAL

Scott A. Chieffo
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

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

Client Project ID: Unocal #0746, 3943 Broadway, Oakland
QC Sample Group: 2061267-69
Reported: Jul 8, 1992

QUALITY CONTROL DATA REPORT

SURROGATE

Method:	EPA 8015/8020	EPA 8015/8020	EPA 8015/8020	EPA 8015/8020
Analyst:	J. F.	J. F.	J. F.	J. F.
Reporting Units:	mg/kg	mg/kg	mg/kg	mg/kg
Date Analyzed:	Jun 30, 1992	Jun 30, 1992	Jun 30, 1992	Jun 30, 1992
Sample #:	206-1267	206-1268	206-1269	Matrix Blank
Surrogate % Recovery:	99	100	100	100

SEQUOIA ANALYTICAL

Scott A. Chieffo
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

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CHAIN OF CUSTODY

SAMPLER: [illegible]
WITNESSING AGENCY:

SITE NAME & ADDRESS: UNOCAL #0746 / OAKLAND
3543 BROADWAY

ANALYSES REQUESTED: Oil & Grease; TPH

TURN AROUND TIME: REGULAR

SAMPLE ID NO.	DATE	TIME	SOIL	WATER	GRAB	COMP	NO. OF CONT.	SAMPLING LOCATION	Oil & Grease	TPH	REMARKS
MW12(5)	6-26-92		X		X		1	SEE SAMPLE ID NO.	X	X	2061267
MW12(10)	6-26-92		X		X		1	↓	X	X	1268
MW12(11.5)	6-26-92		X		X		1	↓	X	X	↓ 1269

Relinquished by: (Signature)	Date/Time	Received by: (Signature)
[signature] (KEI)	6/26/92 2050	[signature]
Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received by: (Signature)

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

1. Have all samples received for analysis been stored in ice? 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?

[signature] Signature — analyst Title — 6/26/92 Date

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Concord, California 94520
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