



KAPREALIAN ENGINEERING, INC.
Consulting Engineers

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KEI-P88-1203.R8
September 24, 1990

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

Attention: Mr. Rick Sisk

RE: Continuing Ground Water Investigation at
Unocal Service Station #3135
845 - 66th Avenue
Oakland, California

Dear Mr. Sisk:

This report presents the results of Kaprealian Engineering, Inc.'s. (KEI) soil and ground water investigation for the referenced site in accordance with proposal KEI-P88-1203.P2 dated May 31, 1990. The purpose of the investigation was to further define the ground water flow direction, and to further determine the degree and extent of ground water contamination at the site. The scope of the work performed by KEI consisted of the following:

Coordination with regulatory agencies.

Geologic logging of three borings for the installation of three monitoring wells.

Soil sampling.

Ground water monitoring, purging and sampling.

Laboratory analyses.

Data analysis, interpretation and report preparation.

SITE DESCRIPTION AND BACKGROUND

The subject site is presently used as a gasoline station. A Location Map and four Site Plans are attached to this report.

KEI's work at the site began on December 8, 1988 during modifications to the pump island located along San Leandro Street. Three soil samples were collected from undisturbed soil at depths ranging from 2 to 3 feet. The 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). Laboratory analyses indicated non-detectable levels of all constituents for all three samples. This work was previously presented in KEI's report (KEI-J88-1203.R1) dated December 16, 1988.

KEI returned to the site on November 29, 1989 when two 10,000 gallon underground fuel storage tanks, and one 280 gallon waste oil tank were removed from the site. The gasoline tanks and the waste oil tank were made of steel and no apparent cracks or holes were observed in any of the tanks.

Water was initially encountered in the fuel tank pit at a depth of approximately 10.5 feet, thus prohibiting the collection of any soil samples from immediately beneath the tanks. Six soil samples, labeled SW1 through SW6, were collected from the sidewalls of the fuel tank pit approximately 18 to 30-inches above the water table. One soil sample, labeled WO1, was collected from beneath the waste oil tank at a depth of 8.5 feet. The area beneath the waste oil tank was then excavated to ground water and two sidewall soil samples, labeled SWA and SWB, were collected from the waste oil tank pit sidewalls approximately 12-inches above the water table. Sample point locations are as shown on the attached Site Plan, Figure 2.

All soil samples were analyzed by Sequoia Analytical Laboratory in Redwood City, California. All of the fuel tank pit sidewall samples were analyzed for TPH as gasoline and BTX&E. Analytical results showed TPH as gasoline ranging from non-detectable to 32 ppm, with benzene levels ranging from non-detectable to 1.2 ppm. The waste oil tank bottom and sidewall samples were analyzed for TPH as gasoline, BTX&E, TPH as diesel, total oil and grease (TOG), EPA 8010 constituents, and the metals - cadmium, chromium, lead and zinc. Analyses of the waste oil pit soil samples indicated less than 50 ppm of TOG, non-detectable levels of BTX&E, TPH as diesel and EPA 8010 constituents, and less than 5.0 ppm of TPH as gasoline for all three samples. Metals concentrations are as indicated in Table 4.

KEI collected 11 pipe trench samples, labeled D1 through D6 and P1 through P5, at depths ranging from 3.5 to 6 feet on November 29, and December 5 & 29, 1989. Upon review of the laboratory analyses for sample P2, KEI returned to the site on January 9, 1990, to collect additional soil samples. Following the trench excavation to a depth of 12 feet, one sample, labeled P2(12), was collected at a depth of 12 feet, and two samples, labeled SWP2E and SWP2W, were taken at a depth of 11 feet from the easterly and westerly sidewalls of the trench adjacent to sample point location P2(12). KEI completed the pipe trench sampling on

January 10, 1990 when two samples, labeled P6 and P7, were collected at depths of 3 and 4 feet, respectively. Pipe trench sample point locations are as shown on the attached Site Plan, Figure 3. Laboratory analyses of the pipe trench sample indicated TPH as gasoline levels ranging from non-detectable to 20 ppm, with non-detectable to 0.13 ppm benzene for all samples except sample P2, which showed TPH as gasoline at 3,800 ppm and benzene at 6.1 ppm. Following the additional excavation in the area of sample point P2, laboratory analyses of samples P2(12), SWP2E and SWP2W indicated non-detectable levels of TPH as gasoline and benzene for samples P2(12) and SWP2W, while sample SWP2E showed TPH as gasoline at 20 ppm with non-detectable levels of benzene. Laboratory results are summarized in Table 4.

After fuel tank pit soil sampling was completed, approximately 5,000 gallons of ground water were pumped from the fuel tank pit. On December 5, 1989, one water sample, labeled W1, was collected from the fuel tank pit. The water sample was analyzed for TPH as gasoline, BTX&E and EPA 8010 constituents. Analyses of the water sample indicated 7,900 ppb of TPH as gasoline, 850 ppb of benzene, and non-detectable levels of EPA 8010 constituents. Laboratory results are summarized in Table 5. The details of our soil sampling activities are presented in KEI's report (KEI-J88-1203.R2) dated January 15, 1990.

Based on the analytical results and in accordance with the guidelines established by the RWQCB, KEI recommended the installation of three monitoring wells at the site to begin to define the extent of the soil and ground water contamination, and to determine the ground water flow direction.

On April 26 & 27, 1990, three two-inch diameter monitoring wells, designated as MW1, MW2 and MW3, were installed at the site. During drilling, an attempt was made to install MW2 near the pump island, however, drill bit refusal was encountered, and MW2 was installed at the modified location indicated on the attached Site Plan, Figure 1. The earlier attempts to install well MW2 resulted in the drilling of two shallow exploratory borings, designated as EB1 and EB2 on the attached Site Plan, Figure 1. The exploratory borings were backfilled to the surface with neat cement.

The three wells were drilled and completed to total depths ranging from 22 to 23 feet. The exploratory borings were drilled and/or sampled to depths of 8.5 and 10.5 feet. Ground water was encountered at depths ranging from 9.5 to 14.5 feet beneath the surface during drilling. The wells were developed on May 3 and 4, 1990 and sampled on May 11, 1990.

Water and selected soil samples were analyzed at Sequoia Analytical Laboratory in Redwood City, California. Samples were analyzed for TPH as gasoline by EPA method 5030 in conjunction with modified 8015, and BTX&E by EPA method 8020. In addition, sample EB2(9), collected from boring EB2, was analyzed for TPH as diesel by EPA method 3550 in conjunction with 8015, and for TOG by EPA 418.1 with clean up.

Analytical results of the soil samples, collected from the borings for monitoring wells (MW1 and MW3), indicate non-detectable levels of TPH as gasoline in all soil samples. Analytical results of the soil samples, collected from monitoring well MW2, indicate levels of TPH as gasoline ranging from 2.2 ppm to 6.8 ppm. However, analyses of the soil samples collected from EB2 indicated levels of TPH as gasoline ranging from 2,400 ppm to 12,000 ppm. In sample EB2(9), TPH as diesel was detected at 1,400 ppm, and TOG at 7,000 ppm. Benzene was detected in all soil samples collected from MW1, MW2 and MW3, except for samples MW2(10) and MW2(12), and the levels ranged from 0.0075 ppm to 0.012 ppm. However, benzene was detected in samples EB2(7) and EB2(9) at concentrations of 5.0 ppm and 84 ppm, respectively.

Analytical results of the ground water samples, collected from monitoring wells MW1 and MW2, indicated levels of TPH as gasoline ranging from 22,000 ppb to 65,000 ppb. Benzene was detected in samples MW1 and MW2, and levels ranged from 590 ppb to 3,300 ppb. Analyses of the ground water sample collected from MW3 showed non-detectable levels of all constituents analyzed. Results of the soil analyses are summarized in Table 6, and the water analyses in Table 3.

Based on the analytical results, KEI recommended implementation of a monthly monitoring and quarterly sampling program. In addition, KEI recommended the installation of three additional monitoring wells to further define the extent of ground water contamination. Details of the subsurface exploration and monitoring well installation activities are summarized in KEI's report (KEI-P88-1203.R7) dated May 31, 1990.

FIELD ACTIVITIES

On August 14, 1990, three additional two-inch diameter monitoring wells (designated as MW4, MW5 and MW6 on the attached Site Plan, Figure 1) were installed at the site. The wells were drilled, constructed and completed in accordance with the guidelines of the Regional Water Quality Control Board (RWQCB), and County well standards.

The subsurface materials penetrated and details of the construction of the wells are described in the attached Boring Logs.

The three wells were each drilled and completed to a total depth of 26 feet except for well MW4, which was only completed at a depth of 25 feet. Ground water was encountered at depths ranging from 13.5 to 16.5 feet beneath the surface during drilling. Soil samples were taken for laboratory analyses and lithologic logging purposes at a maximum spacing of 5 foot intervals beginning at approximately 5 feet below grade until ground water was encountered. Soil samples were obtained below the water table for lithologic logging purposes only at the depths indicated on the attached Boring Logs. 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 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 wells were developed on August 21, 1990. Prior to development, the wells were checked for depth to water table using an electronic sounder, presence of free product (using paste tape) and sheen. No free product or sheen was noted in any of the wells. After recording the monitoring data, the wells were purged with a surface pump until the evacuated water was clear and free of suspended sediment. Monitoring and well development data are summarized in Table 1.

The wells were sampled on August 28, 1990. Prior to sampling, monitoring data were collected and water samples were then collected using a clean Teflon bailer. The samples were decanted into clean glass VOA vials, sealed with Teflon-lined screw caps, and labeled and stored on ice until delivery to a certified laboratory.

ANALYTICAL RESULTS

Water and selected soil samples 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 in conjunction with modified 8015, and BTX&E by EPA method 8020. In addition, soil samples from MW6 and water samples from MW2 and MW6 were analyzed for TPH as diesel by EPA method 3510 or 3550 in conjunction with modified 8015, and for TOG by method 503A&E or 503D&E as appropriate.

The analytical results of the soil samples collected from the borings for wells MW4, MW5 and MW6 show non-detectable levels of TPH as gasoline and benzene in all samples analyzed, except for MW6(10), MW6(12.5) and MW6(15.5), which showed levels of TPH as gasoline at 18 ppm, 160 ppm and 2.5 ppm, respectively, and levels of benzene at 0.24 ppm, 3.4 ppm and 0.43 ppm, respectively. In addition, TPH as diesel were detected only in samples MW6(10) and MW6(12.5), with levels at 5.1 ppm and 93 ppm, respectively. Also, TOG was detected in sample MW6(12.5) at a level of 200 ppm.

The analytical results of the water samples collected from monitoring wells MW3 and MW5 indicated non-detectable levels of TPH as gasoline and benzene. Levels of TPH as gasoline and benzene were detected in wells MW1, MW2, MW4, MW6 and MW7 and the concentrations ranged from 1,700 ppb to 62,000 ppb for TPH as gasoline, with benzene concentrations ranging from 140 ppb to 2,600 ppb. Also, TPH as diesel was detected in MW2 and MW6 at levels of 3,100 ppb and 1,000 ppb, respectively.

Results of the soil analyses are summarized in Table 2, and the water analyses in Table 3. Copies of the laboratory analyses and Chain of Custody documentation are attached to this report.

HYDROLOGY AND GEOLOGY

The water table stabilized in the monitoring wells at depths ranging from 9.96 to 12.39 feet below the surface on August 28, 1990. Ground water flow direction appeared to be predominantly toward the northeast with a north-northwest flow direction at the northern corner of the site on both August 21 and 28, 1990, (based on water level data collected from the six monitoring wells prior to purging and sampling). Ground water table contour maps have been prepared from the August 21 and August 28, 1990 monitoring data and are presented on the attached Site Plans, Figures 1 and 4.

Based on review of regional geologic maps (U.S. Geological Survey Professional Paper 943, "Flatland Deposits - Their Geology and Engineering Properties and Their Importance to Comprehensive Planning", 1979), the subject site is underlain by relatively unconsolidated alluvial deposits described as fine-grained alluvium (Qhaf) typically consisting of clay and silt materials. In addition, the site is closely adjacent to a mapped geologic contact with Bay Mud (Qhbm) to the west.

Based on inspection of the tank pit excavation, the site is underlain by artificial fill materials to a depth of about 7.5 feet below grade. The fill materials are underlain by about 1.5 feet of adobe topsoil materials, which appears to inturn be

underlain by light brown sandy silt containing a trace of fine gravel and light brown very fine-grained sand.

The results of our previous subsurface study (borings MW1, MW2 and MW3) indicate the site is underlain by artificial fill materials to depths of about 7 to 8 feet. Locally, the fill materials extend to depths of at least 8.5 and 10.5 feet in the vicinity of borings EB1 and EB2 (maximum depth explored). The fill materials are generally underlain by a 1.5 to 2 foot thick bed of silt which is in turn underlain by a persistent coarse-grained sequence of clayey to sandy gravel interbedded with clayey to silty sand to the maximum depth explored (23 feet).

The results of our most recent subsurface study (borings MW4, MW5, and MW6) indicated that the site is underlain by artificial fill materials to depths below grade of about 2.5 to 4.4 feet. The fill materials are in turn underlain by silty clay materials to depths below grade of about 8 to 12.7 feet. This silty clay zone is in turn underlain by a coarse-grained zone composed of clayey gravel and/or clayey sand materials extending to depths below grade of about 12.1 to 14.3 feet. This coarse-grained zone is in turn underlain by a clayey silt bed varying from about 1 to 3 feet in thickness and extending to depths below grade of about 14.2 to 14.8 feet in wells MW4 and MW5, and about 17.3 feet in MW6. The ground water table encountered during drilling activities was detected within or immediately below the silt bed. This relatively thin clayey silt bed is underlain by a generally thick sequence of silty to clayey sand and gravel lenses extending to the maximum depth explored (26 feet), except in the boring for well MW5 where a second clayey silt bed was encountered at depths below grade of about 15.6 to 19.5 feet and where a clay bed was encountered at approximately 24 feet extending to the total depth drilled (26 feet).

DISCUSSION AND RECOMMENDATIONS

Based on the analytical results, KEI recommends continuation of our monthly monitoring and quarterly sampling program. Results of the monitoring program will be documented and evaluated after each monitoring and sampling event. Also, it is KEI's understanding that the soil materials in the vicinity of borings EB1 and EB2, previously recommended to be excavated in KEI's report (KEI-P88-1203-R7) dated May 31, 1990, are scheduled to be removed from the site in the near future.

In addition, the lateral extent of ground water contamination at the site is not defined. However, KEI recommends that a Hydro-punch study be conducted around the perimeter of the site to better determine the locations of additional monitoring wells

necessary to define the extent of ground water contamination. Grab samples will be collected from each probe hole. The precise locations of each hydropunch probe hole will be determined in the field, but will include at least five probe holes in San Leandro Street, and at least four probe holes in 66th Street, and probe holes on adjacent private property.

Also, to further determine the possible influence of tidal action on the ground water table level and flow direction, KEI recommends that the depth to ground water from one monitoring well at the site be determined each hour during the course of an 8 to 12 hour period for each scheduled monthly monitoring event for a period of one quarter. The water table flow direction will be shown in ground water gradient maps prepared for each separate monitoring event and presented in the quarterly report due at the end of 1990.

DISTRIBUTION

Copies of this report should be sent to Ms. Cynthia Chapman of the Alameda County Health Care Services, and to 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.

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

Sincerely,

Kaprealian Engineering, Inc.



Don R. Braun
Certified Engineering Geologist

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



Mardo Kaprealian
President

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Attachments: Tables 1 through 6
Location Map
Site Plans - Figures 1, 2, 3 & 4
Boring Logs
Laboratory Results
Chain of Custody documentation

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TABLE 1

SUMMARY OF GROUND WATER MONITORING AND PURGING DATA

<u>Well #</u>	<u>Depth to Water (feet)</u>	<u>Product Thickness</u>	<u>Sheen</u>	<u>Gallons Pumped</u>
(Monitored and Developed on August 21, 1990)				
MW1*	12.25	0	None	0
MW2*	10.85	0	None	0
MW3*	9.92	0	None	0
MW4	12.46	0	None	133
MW5	11.71	0	None	165
MW6	11.36	0	None	160

* Monitored only

(Monitored and Sampled on August 28, 1990)				
MW1	12.26	0	None	55
MW2	10.88	0	None	55
MW3	9.96	0	None	15
MW4	12.39	0	None	15
MW5	11.72	0	None	15
MW6	11.41	0	None	15

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TABLE 2

SUMMARY OF LABORATORY ANALYSES
 SOIL

(Collected on August 14, 1990)

<u>Sample Number</u>	<u>Depth (feet)</u>	<u>TPH as Diesel</u>	<u>TPH as Gasoline</u>	<u>Benzene</u>	<u>Toluene</u>	<u>Xylenes</u>	<u>Ethyl-benzene</u>	<u>TOG</u>
MW4 (14.5)	14.5	--	ND	ND	ND	ND	ND	--
MW5 (13)	13	--	ND	ND	0.010	ND	ND	--
MW6 (5)	5	ND	ND	ND	0.042	ND	ND	ND
MW6 (10)		5.1	18	0.26	0.22	1.2	0.34	ND
MW6 (12.5)	12.5	93	160	3.4	12	3.6	20	200
MW6 (15.5)	15.5	ND	2.5	0.43	0.41	0.12	0.50	ND
Detection Limits		1.0	1.0	0.0050	0.0050	0.0050	0.0050	30

-- Indicates analysis not performed.

ND = Non-detectable.

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

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TABLE 3

SUMMARY OF LABORATORY ANALYSES
 WATER

<u>Sample Number</u>	<u>TPH as Diesel</u>	<u>TPH as Gasoline</u>	<u>Benzene</u>	<u>Toluene</u>	<u>Xylenes</u>	<u>Ethyl-benzene</u>	<u>TOG</u>
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(Collected on August 28, 1990)

MW1	--	1,700	140	1.4	150	180	--
MW2	3,100	27,000	2,600	1,300	3,000	1,900	ND
MW3	--	ND	ND	ND	0.70	ND	--
MW4	--	62,000	810	72	4,600	4,400	--
MW5	--	ND	ND	ND	1.2	ND	--
MW6	1,000	12,000	1,700	1,400	2,100	230	16
MW7*	--	2,600	180	3.0	270	810	--

(Collected on May 11, 1990)

MW1	--	22,000	590	42	3,600	1,200	--
MW2	--	65,000	3,300	3,300	12,000	4,100	--
MW3	--	ND	ND	ND	ND	ND	--

Detection Limits	50	30	0.30	0.30	0.3	0.3	5.0
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ND = Non-detectable.

-- Indicates analysis not performed.

* MW7 is an additional sample from MW1.

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

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TABLE 4

SUMMARY OF LABORATORY ANALYSES
SOIL

(Collected on November 29, and
December 5 & 29, 1989)

<u>Sample</u>	<u>Depth (feet)</u>	<u>TPH as Diesel</u>	<u>TPH as Gasoline</u>	<u>Benzene</u>	<u>Toluene</u>	<u>Xylenes</u>	<u>Ethyl- benzene</u>
SW1	9.0	--	1.6	ND	ND	ND	ND
SW2	9.0	--	3.8	ND	ND	ND	ND
SW3	9.0	--	5.6	ND	ND	2.3	0.42
SW4	9.0	--	32	1.2	ND	1.0	2.1
SW5	9.0	--	4.8	0.20	ND	0.11	ND
SW6	8.0	--	ND	ND	ND	ND	ND
D1	3.5	--	ND	ND	ND	ND	ND
D2	3.5	--	1.5	0.08	ND	ND	ND
D3	3.5	--	6.6	0.14	ND	0.31	ND
D4	3.5	--	7.4	0.11	ND	0.1	ND
D5	3.5	--	1.9	ND	ND	ND	ND
D6	3.5	--	2.0	ND	0.17	0.25	ND
P1	6.0	--	15	0.086	ND	8.5	0.18
P2	5.5	--	3,800	6.1	290	750	140
P2 (12)	12.0	--	ND	ND	ND	ND	ND
P3	5.0	--	11	0.13	ND	1.3	0.18
P4	4.5	--	1.4	ND	ND	0.23	ND
P5	4.5	--	ND	ND	ND	ND	ND
P6	3.0	--	ND	ND	ND	ND	ND
P7	4.0	--	ND	ND	ND	ND	ND
SWP2E	11.0	--	2	ND	0.16	3.1	0.50
SWP2W	11.0	--	ND	ND	ND	ND	ND
WO1*	8.5	ND	1.6	ND	ND	ND	ND

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TABLE 4 (Continued)

SUMMARY OF LABORATORY ANALYSES
SOIL

(Collected on November 29, and
December 5 & 29, 1989)

<u>Sample</u>	<u>Depth (feet)</u>	<u>TPH as Diesel</u>	<u>TPH as Gasoline</u>	<u>Benzene</u>	<u>Toluene</u>	<u>Xylenes</u>	<u>Ethyl- benzene</u>
SWA**	9.5	ND	2.1	ND	ND	ND	ND
SWB***	9.5	ND	3.9	ND	ND	ND	ND
Detection Limits		1.0	1.0	0.05	0.1	0.1	0.1

* TOG was <50 ppm, and all 8010 constituents were non-detectable. Metal concentrations were as follows: cadmium non-detectable, chromium 20 ppm, lead 75 ppm, and zinc 65 ppm.

** TOG was <50 ppm, and all 8010 constituents were non-detectable. Metals concentrations were as follows: cadmium non-detectable, chromium 20 ppm, lead 5.9 ppm and zinc 44 ppm.

*** TOG was <50 ppm and all 8010 constituents were non-detectable. Metals concentrations were as follows: cadmium non-detectable, chromium 15 ppm, lead 5.0 ppm, and zinc 39 ppm.

-- Indicates analysis not performed.

ND = Non-detectable.

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

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TABLE 5

SUMMARY OF LABORATORY ANALYSES
WATER

(Collected on December 5, 1989)

<u>Sample #</u>	<u>TPH as Gasoline</u>	<u>Benzene</u>	<u>Toluene</u>	<u>Xylenes</u>	<u>Ethylbenzene</u>
W1	7,900	850	150	720	ND
Detection Limits	30.0	0.3	0.3	0.3	0.3

NOTE: All 8010 constituents were non-detectable.

ND = Non-detectable.

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

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TABLE 6

SUMMARY OF LABORATORY ANALYSES
SOIL

(Collected on April 26 and 27, 1990)

<u>Sample Number</u>	<u>Depth (feet)</u>	<u>TPH as Gasoline</u>	<u>Benzene</u>	<u>Toluene</u>	<u>Xylenes</u>	<u>Ethyl-benzene</u>
MW1(5)	5	ND	0.012	0.16	ND	ND
MW1(10)	10	ND	0.0094	0.024	ND	ND
MW1(14)	14	ND	0.0075	0.031	ND	ND
MW2(5)	5	2.4	0.075	0.0071	ND	ND
MW2(10)	10	2.2	ND	0.017	0.018	0.0088
MW2(12)	12	6.8	ND	0.028	0.015	0.10
MW3(5)	5	ND	0.0094	0.048	ND	ND
MW3(10)	10	ND	0.0088	0.015	ND	ND
EB2(7)	7	2,400	5.0	16	230	62
EB2(9)*	9	12,000	84	12	860	360
Detection Limits		1.0	0.0050	0.0050	0.0050	0.0050

ND = Non-detectable.

* TPH as diesel was 1,400 ppm, and TOG was 7,000 ppm.

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



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LOCATION MAP

Unocal S/S #3135
845-66th Avenue
Oakland, CA

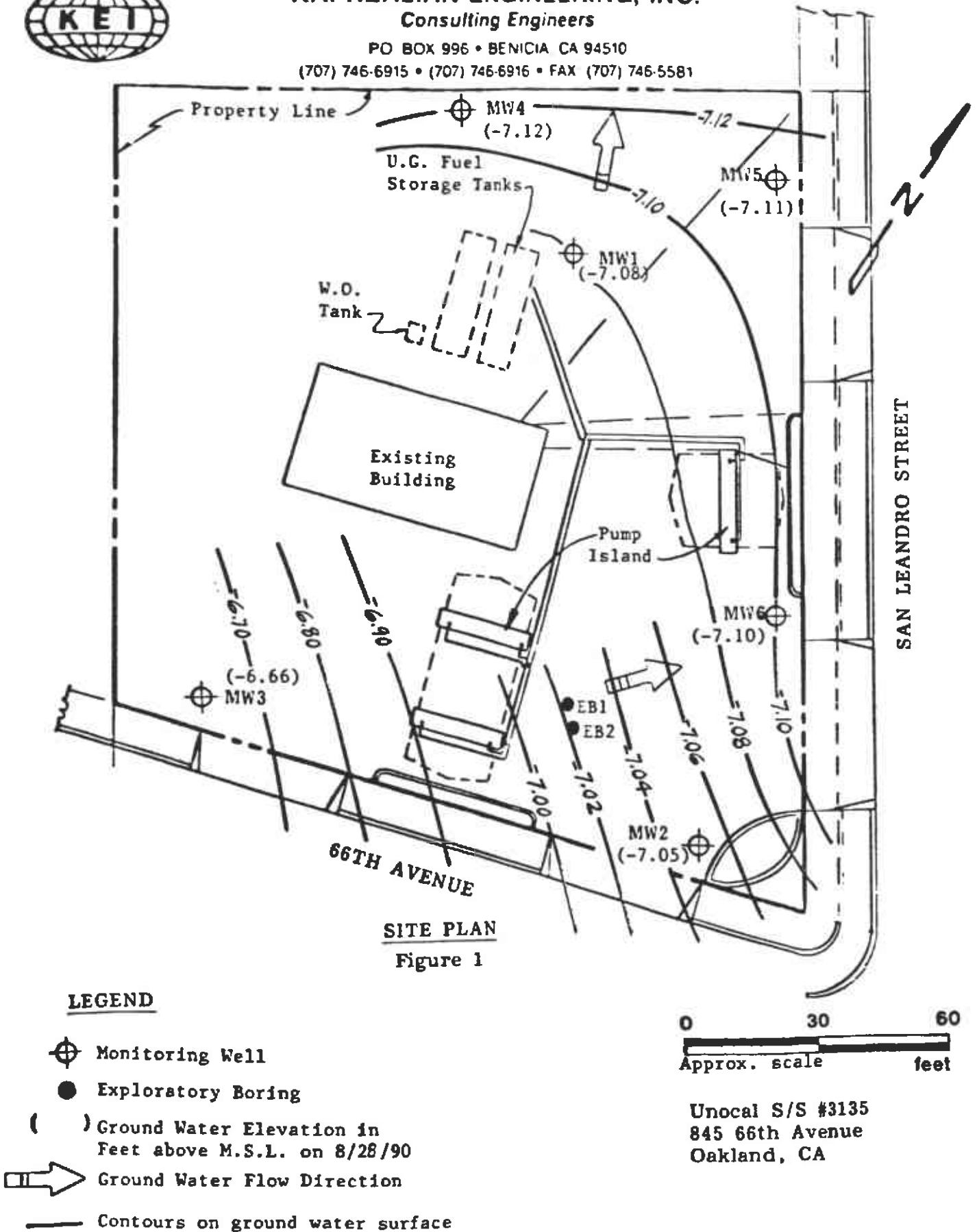


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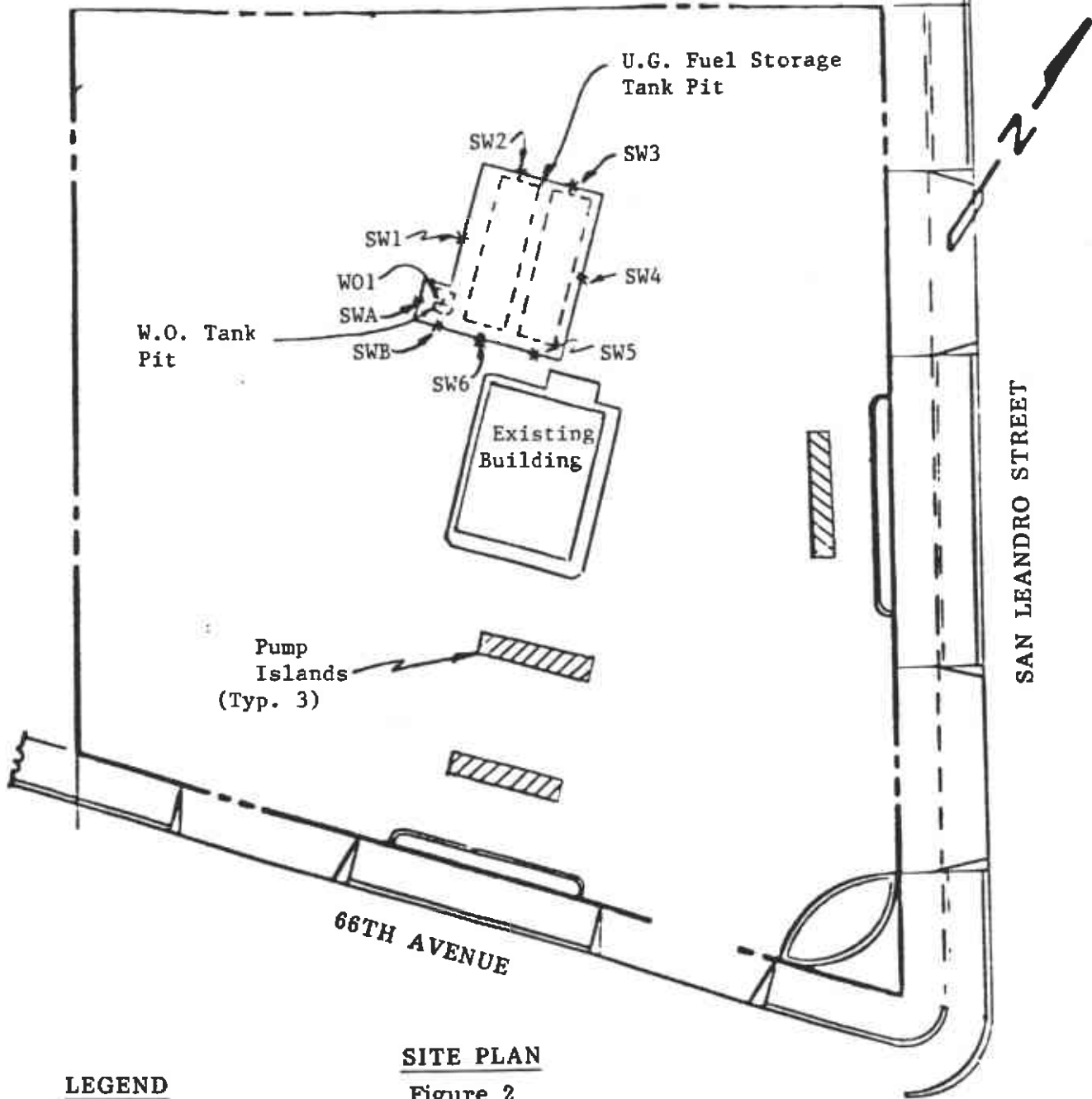
SITE PLAN

Figure 1



KAPREALIAN ENGINEERING, INC.
Consulting Engineers

P.O. BOX 996 • BENICIA, CA 94510
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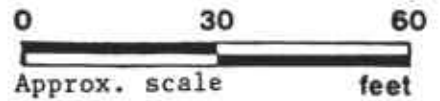


SITE PLAN

Figure 2

LEGEND

* Sample Point Location



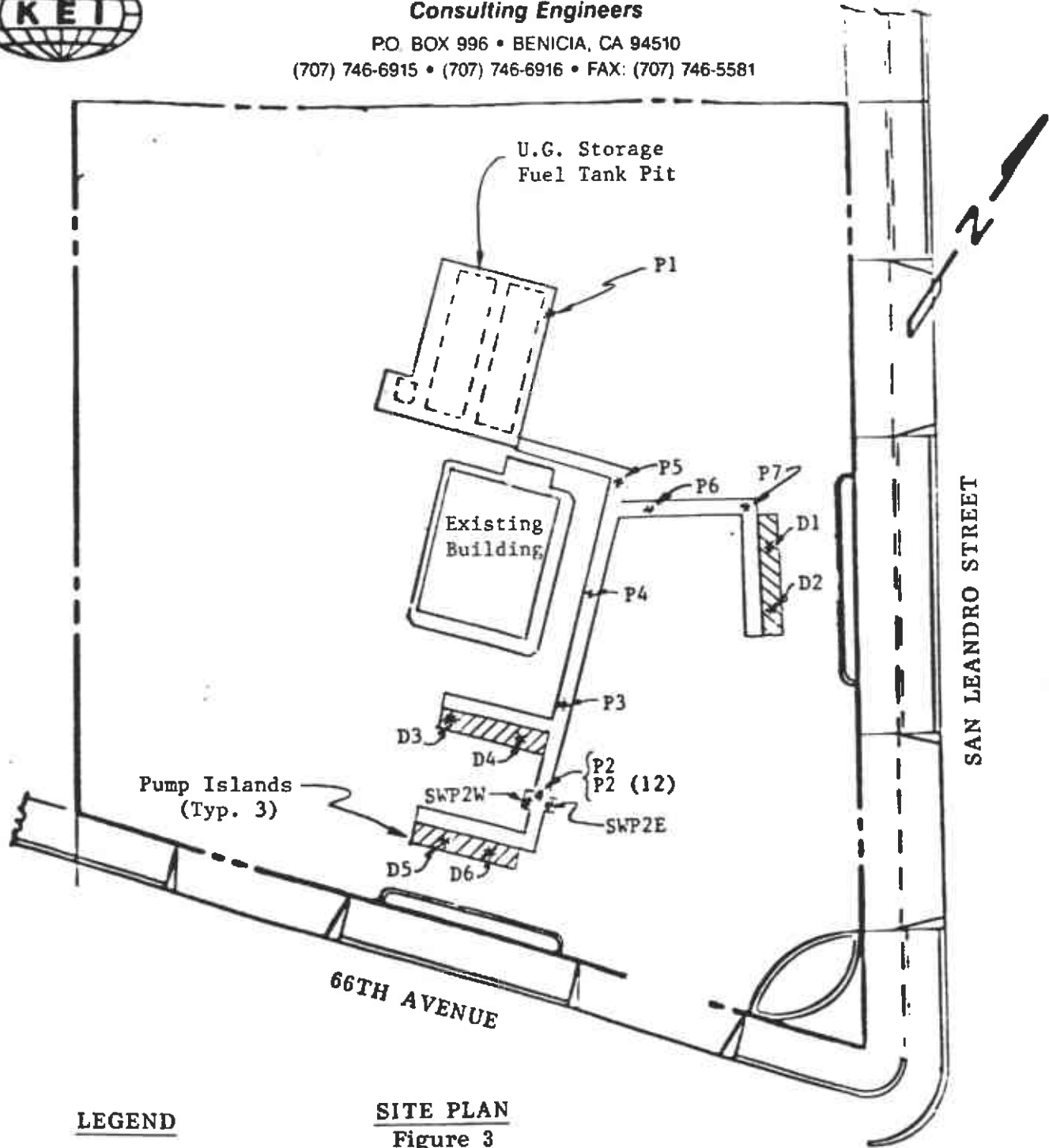
Unocal S/S #3135
845 66th Avenue
Oakland, CA



KAPREALIAN ENGINEERING, INC.

Consulting Engineers

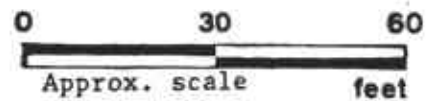
P.O. BOX 996 • BENICIA, CA 94510
(707) 746-6915 • (707) 746-6916 • FAX: (707) 746-5581



LEGEND

* Sample Point Location

SITE PLAN Figure 3



Unocal S/S #3135
845 66th Avenue
Oakland, CA

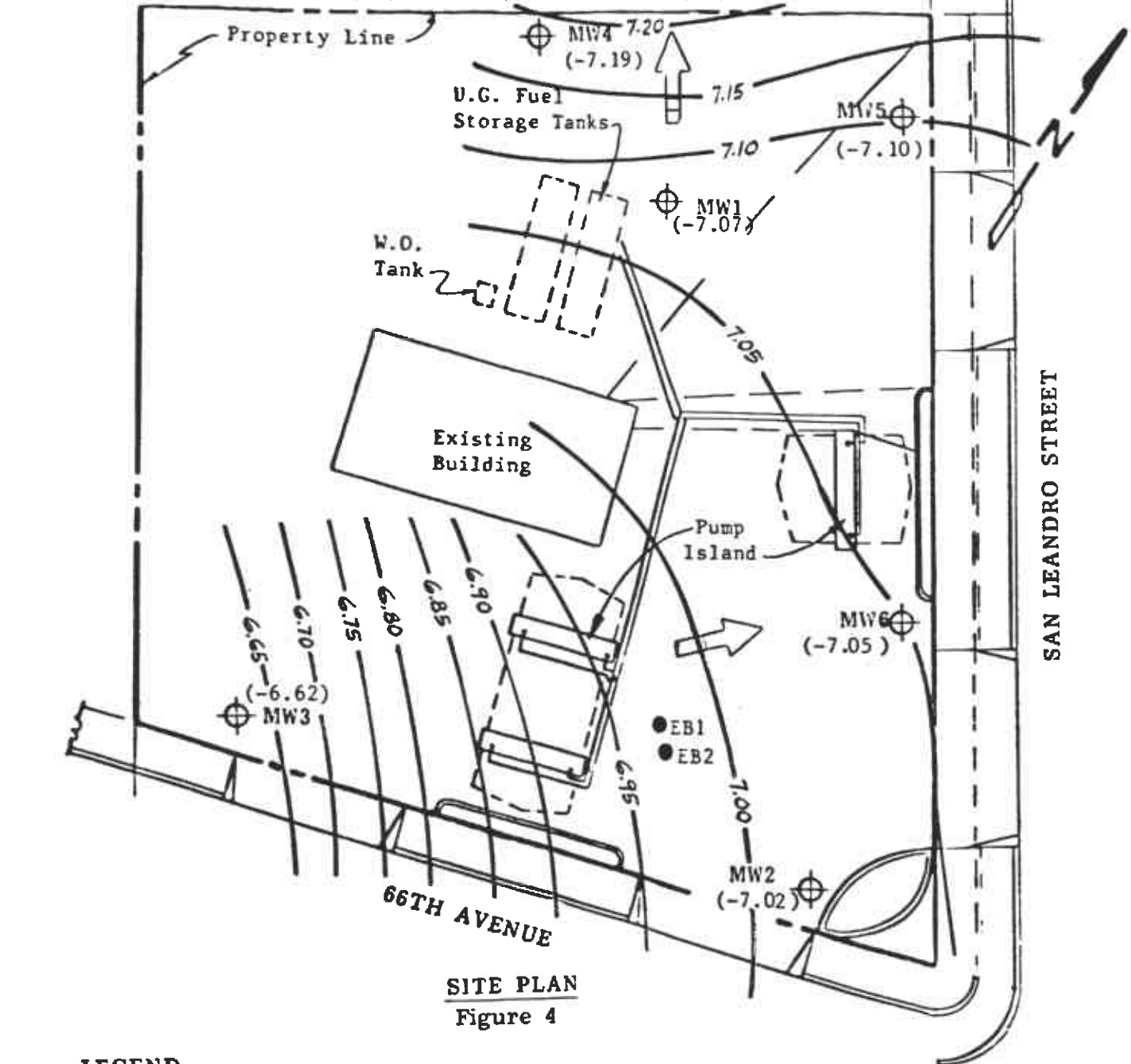


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SITE PLAN
Figure 4

LEGEND

-  Monitoring Well
-  Exploratory Boring
-  Ground Water Elevation in Feet above M.S.L. on 8/21/90
-  Ground Water Flow Direction
-  Ground water surface contours in feet




Unocal S/S #3135
845 66th Avenue
Oakland, CA

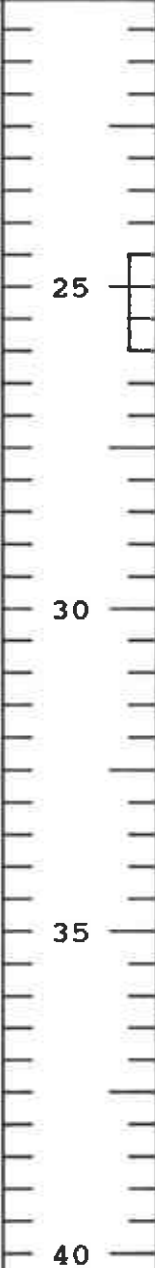
B O R I N G L O G

Project No. KEI-P88-1203	Boring & Casing Diameter 9" 2"	Logged By W.W. DRB
Project Name Unocal Oakland - 66th Ave.	Well Head Elevation N/A	Date Drilled 8/14/90
Boring No. MW4	Drilling Method Hollow-stem Auger	Drilling Company EGI

Penetration blows/6"	G. W. level	Depth (feet) Samples	Strati- graphy USCS	Description
		0		A.C. Pavement over clay, sand and gravel fill, trace cobbles to 5" dia. moist, dense, orangish brown.
2/3/6		5	CL	Silty clay, trace to 10% gravel to 1/2" dia., 5% sand, moist to very moist, stiff, gray with slight mottling of greenish gray, trace organic matter.
9/15/24		10	GC	Clayey gravel, trace sand, olive green grading to orange, subangular gravel to 1/2" dia., moist, dense.
9/15/18			SC	Clayey sand, sand is fine-grained, moist, olive green, dense, grading to orangish brown with trace organic matter.
			ML	
8/11/14	▼	15	SM	Clayey silt, trace organic matter, orangish brown mottled with olive gray, very moist, very stiff.
			SM	Silty sand trace clay, sand is fine-grained, medium dense, wet, dark olive gray.
			GW	Well graded gravel with sand, trace to 10% fines, gravel to 1-1/4" dia., medium dense, wet, dark yellowish brown.
6/14/15		20	GC	Clayey gravel with sand, subangular

B O R I N G L O G

Project No. KEI-P88-1203	Boring & Casing Diameter 9" 2"	Logged By W.W. 
Project Name Unocal Oakland - 66th Ave.	Well Head Elevation N/A	Date Drilled 8/14/90
Boring No. MW4	Drilling Method Hollow-stem Auger	Drilling Company EGI

Penetration blows/6"	G. W. level	Depth (feet) Samples	Strati- graphy USCS	Description
15/32/32			GC	gravel to 1-1/2" dia., sand wet, medium dense to dense, dark yellowish brown.
			SW	Sand, well stratified, fining upward from very coarse-grained to very fine grained, saturated, dense, gray.
			GC	Clayey gravel with sand, gravel to 1-1/2" dia., wet, very dense, orangish brown.
		40		TOTAL DEPTH: 26'

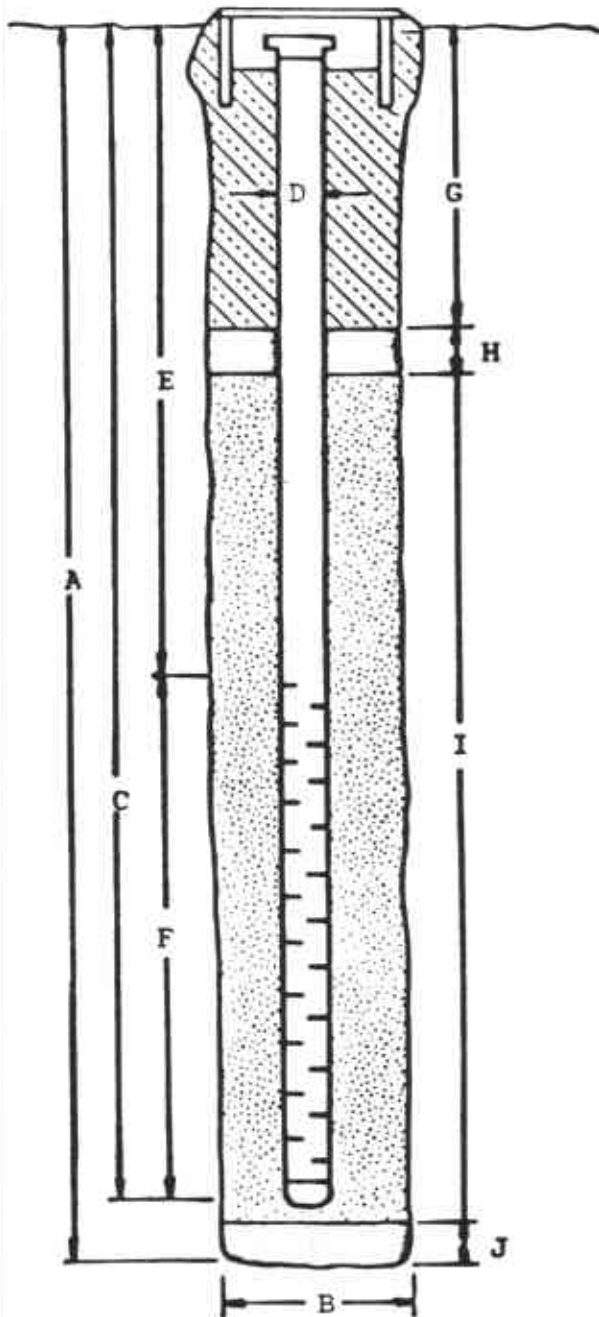
W E L L C O M P L E T I O N D I A G R A M

PROJECT NAME: Unocal - Oakland - 845 66th Ave. BORING/WELL NO. MW4

PROJECT NUMBER: KEI-P88-1203

WELL PERMIT NO.: _____

Flush-mounted Well Cover



- A. Total Depth: 26'
- B. Boring Diameter*: 9"
Drilling Method: Hollow Stem Auger
- C. Casing Length: 25'
Material: Schedule 40 PVC
- D. Casing Diameter: OD = 2.375"
ID = 2.067"
- E. Depth to Perforations: 5'
- F. Perforated Length: 20'
Perforation Type: Machined Slot
Perforation Size: 0.020"
- G. Surface Seal: 3'
Seal Material: Concrete
- H. Seal: 1'
Seal Material: Bentonite
- I. Gravel Pack: 22'
Pack Material: RMC Lonestar Sand
Size: #3
- J. Bottom Seal: None
Seal Material: N/A

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

B O R I N G L O G

Project No. KEI-P88-1203	Boring & Casing Diameter 9" 2"	Logged By W.W. <i>DRB</i>
Project Name Unocal Oakland - 66th Ave.	Well Head Elevation N/A	Date Drilled 8/14/90
Boring No. MW5	Drilling Method Hollow-stem Auger	Drilling Company EGI

Penetration blows/6"	G. W. level	Depth (feet) Samples	Strati- graphy USCS	Description
		0		A.C. Pavement underlain by clay, sand and gravel fill, orangish brown.
			GC	Clayey gravel with sand, gravel to 3/4" dia., trace organic matter, trace debris, dense, moist, black. <u>Base of Fill Materials</u>
4/5/6		5	CL	Clay, trace to 10% fine gravel to 1/4" dia., trace to 5% fine-grained sand, moist, stiff, olive gray grading to olive brown.
7/9/11		10	SC	Clayey sand with gravel, trace organic matter, fine gravel to 1/4" dia., sand is predominantly coarse-grained with 5% fine-grained, trace caliche, moist, medium dense, orangish brown, trace olive gray.
12/15/18	▼		ML	Clayey silt, trace organic matter, moist, very stiff, dark yellowish brown, grading to silt with fine-grained sand, orangish brown with bluish green mottling.
13/15/13		15	SC	Clayey sand, fine-to medium-grained, trace gravel to 3/4" dia., saturated, medium dense, olive brown.
			ML	Clayey silt, trace to 5% fine-grained sand, very moist, medium dense, orangish brown and olive gray.
		20	GC	Clayey gravel with sand.

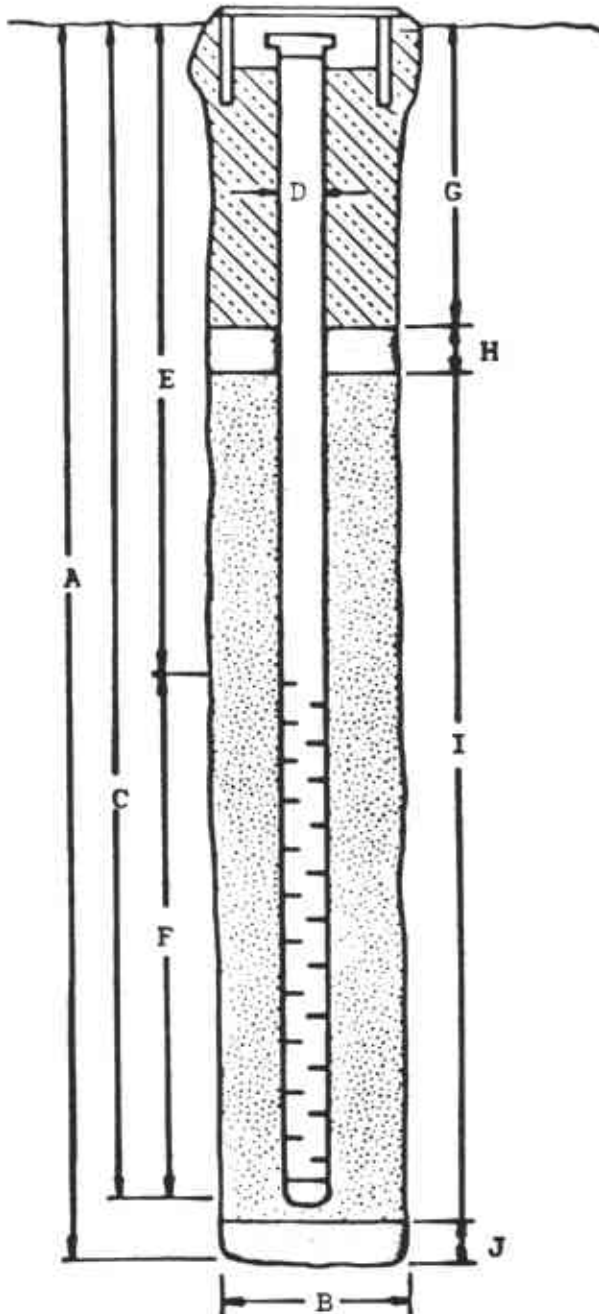
W E L L C O M P L E T I O N D I A G R A M

PROJECT NAME: Unocal - Oakland - 845 66th Ave. BORING/WELL NO. MW5

PROJECT NUMBER: KEI-P88-1203

WELL PERMIT NO.: _____

Flush-mounted Well Cover



A. Total Depth: 26'

B. Boring Diameter*: 9"

Drilling Method: Hollow Stem

Auger

C. Casing Length: 26'

Material: Schedule 40 PVC

D. Casing Diameter: OD = 2.375"

ID = 2.067"

E. Depth to Perforations: 6'

F. Perforated Length: 20'

Machined
Perforation Type: Slot

Perforation Size: 0.020"

G. Surface Seal: 4'

Seal Material: Concrete

H. Seal: 1'

Seal Material: Bentonite

I. Gravel Pack: 21'

RMC Lonestar
Pack Material: Sand

Size: #3

J. Bottom Seal: None

Seal Material: N/A

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

B O R I N G L O G

Project No. KEI-P88-1203	Boring & Casing Diameter 9" 2"	Logged By W.W. <i>DRB</i>
Project Name Unocal Oakland - 66th Ave.	Well Head Elevation N/A	Date Drilled 8/14/90
Boring No. MW6	Drilling Method Hollow-stem Auger	Drilling Company EGI

Penetration blows/6"	G. W. level	Depth (feet) Samples	Strati- graphy USCS	Description
		0		A.C. Pavement underlain by clay, sand and gravel: fill.
4/4/7		5	CL	Silty clay, trace gravel to 1/2" dia., trace organic matter, trace caliche, moist, stiff, olive gray, traces of bluish green clay lenses.
3/4/6		10		Silty clay, trace caliche, moist, stiff, trace fine-grained sand, bluish gray with slight dark yellowish brown mottling.
8/11/11				Silty clay, as above, dark yellowish brown with slight blue gray mottling, very moist, very stiff.
8/14/21		15	GC	Clayey gravel with sand, subrounded gravel to 1/2" dia., very moist, medium dense, orangish brown.
			ML	Clayey silt, trace organic matter, moist, hard, orangish brown mottled with olive brown grading to bluish gray.
12/17/13			GC	Clayey gravel with sand, gravel to 3/4" dia., saturated, dense, bluish gray with orangish brown below 18 feet.
		20		

B O R I N G L O G

Project No. KEI-P88-1203	Boring & Casing Diameter 9" 2"	Logged By W.W. <i>DRB</i>
Project Name Unocal Oakland - 66th Ave.	Well Head Elevation N/A	Date Drilled 8/14/90
Boring No. MW6	Drilling Method Hollow-stem Auger	Drilling Company EGI

Penetration blows/6"	G. W. level	Depth (feet) Samples	Strati- graphy USCS	Description
			GC	Clayey gravel, as above.
			SW	Sand, well stratified, fining upward sequence, from very-coarse-grained to very fine-grained, saturated, medium dense, gray.
8/15/48		25	GC	Clayey gravel with sand, gravel to 3/4" dia., saturated, very dense, orangish brown.
		30		
		35		
		40		
				TOTAL DEPTH: 26'

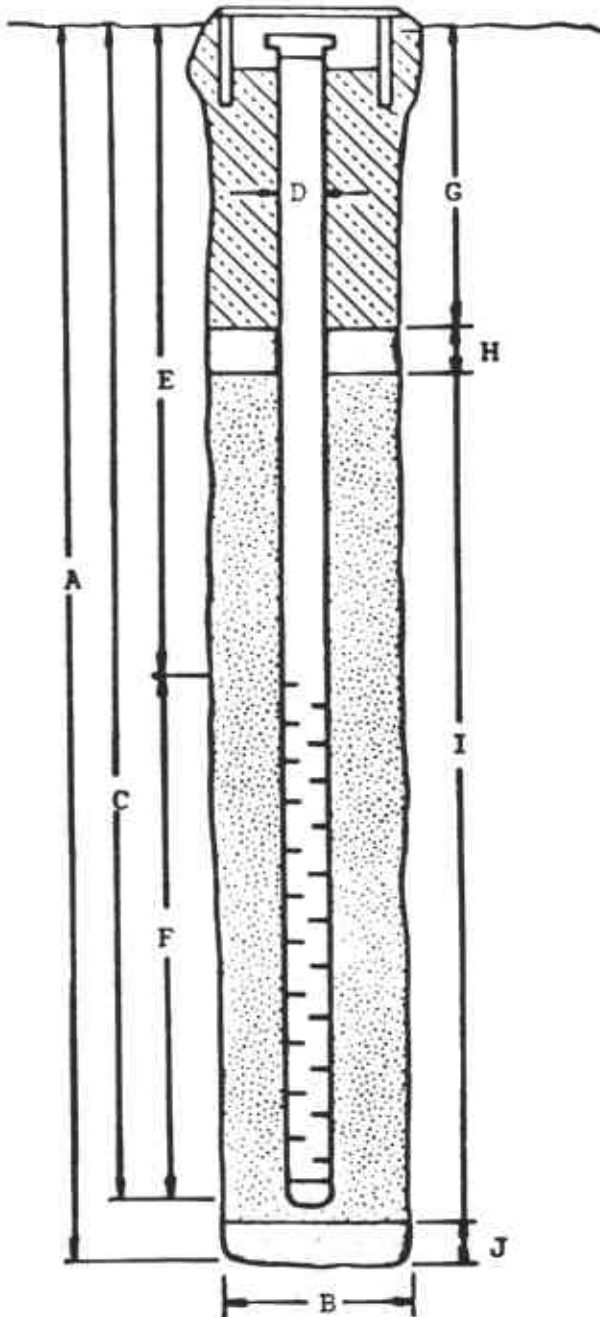
W E L L C O M P L E T I O N D I A G R A M

PROJECT NAME: Unocal - Oakland - 845 66th Ave. BORING/WELL NO. MW6

PROJECT NUMBER: KEI-P88-1203

WELL PERMIT NO.: _____

Flush-mounted Well Cover



A. Total Depth: 26'

B. Boring Diameter*: 9"

Drilling Method: Hollow Stem Auger

C. Casing Length: 26'

Material: Schedule 40 PVC

D. Casing Diameter: OD = 2.375"

ID = 2.067"

E. Depth to Perforations: 6'

F. Perforated Length: 20'

Machined Perforation Type: Slot

Perforation Size: 0.020"

G. Surface Seal: 4'

Seal Material: Concrete

H. Seal: 1'

Seal Material: Bentonite

I. Gravel Pack: 21'

RMC Lonestar Pack Material: Sand

Size: #3

J. Bottom Seal: None

Seal Material: N/A

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



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/845 66th Ave./Oakland Matrix Descript: Soil Analysis Method: EPA 5030/8015/8020 First Sample #: 008-0353	Sampled: Aug 14, 1990 Received: Aug 15, 1990 Analyzed: Aug 24, 1990 Reported: Aug 29, 1990
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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)
008-0353	MW-4-(14.5)	N.D.	N.D.	N.D.	N.D.	N.D.
008-0354	MW5-(13)	N.D.	N.D.	0.010	N.D.	N.D.
008-0355	MW6-(5)	N.D.	N.D.	0.042	N.D.	N.D.
008-0356	MW6-(10)	18	0.26	0.22	0.34	1.2
008-0357	MW6-(12.5)	160	3.4	12	3.6	20
008-0358	MW6-(15.5)	2.5	0.43	0.41	0.12	0.50

Detection Limits:	1.0	0.0050	0.0050	0.0050	0.0050
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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


Belinda C. Vega
Laboratory Director



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/845 66th Ave./Oakland
Matrix Descript: Soil
Analysis Method: EPA 3550/8015
First Sample #: 008-0355

Sampled: Aug 14, 1990
Received: Aug 15, 1990
Extracted: Aug 22, 1990
Analyzed: Aug 24, 1990
Reported: Aug 29, 1990

TOTAL PETROLEUM FUEL HYDROCARBONS (EPA 8015)

Sample Number	Sample Description	High B.P. Hydrocarbons mg/kg (ppm)
008-0355	MW6-(5)	N.D.
008-0356	MW-6-(10)	5.1
008-0357	MW6-(12.5)	93
008-0358	MW6-(15.5)	N.D.

Detection Limits:

1.0

High Boiling Point Hydrocarbons are quantitated against a diesel fuel standard.
Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL

Belinda C. Vega
Laboratory Director

80353.KEI <2>



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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/845 66th Ave./Oakland
Matrix Descript: Soil
Analysis Method: SM 503 D&E (Gravimetric)
First Sample #: 008-0355

Sampled: Aug 14, 1990
Received: Aug 15, 1990
Extracted: Aug 22, 1990
Analyzed: Aug 28, 1990
Reported: Aug 29, 1990

TOTAL RECOVERABLE PETROLEUM OIL

Sample Number	Sample Description	Oil & Grease mg/kg (ppm)
008-0355	MW6-(5)	N.D.
008-0356	MW6-(10)	N.D.
008-0357	MW6-(12.5)	200
008-0358	MW6-(15.5)	N.D.

Detection Limits:

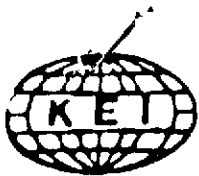
30

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL


Belinda C. Vega
Laboratory Director

80353.KEI <3>



KAPREALIAN ENGINEERING, INC.

CHAIN OF CUSTODY

SAMPLER <i>Wade Weston</i>		SITE NAME & ADDRESS Unocal - Oakland 845-66th Ave						ANALYSES REQUESTED				TURN AROUND TIME: <u>Regular</u>	
WITNESSING AGENCY								TPH-G BIXE					REMARKS
SAMPLE ID NO.	DATE	TIME	SOIL	WATER	GRAB	COMP	NO. OF CONT.	SAMPLING LOCATION					
MW4-(5)	8/14/90		✓		✓		1	See Sample ID.#	✓	✓			HOLD
MW4-(10.5)	8/14/90		✓		✓		1	↓	✓	✓			HOLD
MW4-(12)	"		✓		✓		1		✓	✓			lithology change HOLD
MW4-(14.5)	"		✓		✓		1		✓	✓			≅ 0080353
MWS-(5)	"		✓		✓		1		✓	✓			HOLD
MWS-(10)	"		✓		✓		1		✓	✓			HOLD
MWS-(13)	"		✓		✓		1		✓	✓			≅ 0080354
Relinquished by: (Signature) <i>Wade Weston</i>		Date/Time 8/15/90 4:25		Received by: (Signature) <i>Tom M. Li</i>		The following MUST BE completed by the laboratory accepting samples for analysis: 1. Have all samples received for analysis been stored in ice? <input checked="" type="checkbox"/> 2. Will samples remain refrigerated until analyzed? <input checked="" type="checkbox"/> 3. Did any samples received for analysis have head space? <u>NO</u> 4. Were samples in appropriate containers and properly packaged? <input checked="" type="checkbox"/>							
Relinquished by: (Signature) <i>Tom M. Li</i>		Date/Time 8/15/90 4:50		Received by: (Signature) <i>[Signature]</i>									
Relinquished by: (Signature)		Date/Time		Received by: (Signature)									
Relinquished by: (Signature)		Date/Time		Received by: (Signature)									
						Signature <i>[Signature]</i>		Title <i>SR</i>		Date <u>8/15</u>			



KAPREALIAN ENGINEERING, INC.

CHAIN OF CUSTODY

SAMPLER		SITE NAME & ADDRESS						ANALYSES REQUESTED				TURN AROUND TIME:	
Wade Weston		Unocal - Oakland 845 - 66TH AVE						TPH-G BIXE TPH-D TOG (SDBUE)				Regular	
WITNESSING AGENCY												REMARKS	
SAMPLE ID NO.	DATE	TIME	SOIL	WATER	GRAB	COMP	NO. OF CONT.	SAMPLING LOCATION	TPH-G	BIXE	TPH-D	TOG (SDBUE)	
MW6-(5)	8/14/90		✓		✓		1	See Sample I.D.*	✓	✓	✓	✓	0080355
MW6-(10)	"		✓		✓		1	↓	✓	✓	✓	✓	356
MW6-(12S)	"		✓		✓	1			✓	✓	✓	✓	Lithology change 357
MW6-(15S)	"		✓		✓	1			✓	✓	✓	✓	358
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? <input checked="" type="checkbox"/> 2. Will samples remain refrigerated until analyzed? <input checked="" type="checkbox"/> 3. Did any samples received for analysis have head space? <u>NO</u> 4. Were samples in appropriate containers and properly packaged? <input checked="" type="checkbox"/>							
Wade Weston		8/15/90 4:25		Jim McLean									
Relinquished by: (Signature)		Date/Time		Received by: (Signature)									
Jim McLean		8/15/90 4:25		[Signature]									
Relinquished by: (Signature)		Date/Time		Received by: (Signature)									
[Signature]				[Signature]									
Relinquished by: (Signature)		Date/Time		Received by: (Signature)									
[Signature]				[Signature]									
[Signature]				[Signature]		[Signature]		SR		8/15		Date	



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

Client Project ID: Unocal/845 66th St./Oakland
Matrix Descript: Water
Analysis Method: EPA 5030/8015/8020
First Sample #: 008-0710 A-B

Sampled: Aug 28, 1990
Received: Aug 29, 1990
Analyzed: Aug 30, 1990
Reported: Sep 4, 1990

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

Sample Number	Sample Description	Low/Medium B.P.	Benzene	Toluene	Ethyl Benzene	Xylenes
		Hydrocarbons $\mu\text{g/L}$ (ppb)	$\mu\text{g/L}$ (ppb)	$\mu\text{g/L}$ (ppb)	$\mu\text{g/L}$ (ppb)	$\mu\text{g/L}$ (ppb)
008-0710 A-B	MW1	1,700	140	1.4	180	150
008-0711 A-B	MW2	27,000	2,600	1,300	1,900	3,000
008-0712 A-B	MW3	N.D.	N.D.	N.D.	N.D.	0.70
008-0713 A-B	MW4	62,000	810	72	4,600	4,400
008-0714 A-B	MW5	N.D.	N.D.	N.D.	N.D.	1.2
008-0715 A-B	MW6	12,000	1,700	1,400	230	2,100
008-0716 A-B	MW7	2,600	180	3.0	270	180

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

Belinda C. Vega
Belinda C. Vega
Laboratory Director



SEQUOIA ANALYTICAL

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(415) 686-9600 • FAX (415) 686-9689

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

Client Project ID: Unocal/845 66th St./Oakland
Matrix Descript: Water
Analysis Method: EPA 3510/8015
First Sample #: 008-0711 C

Sampled: Aug 28, 1990
Received: Aug 29, 1990
Extracted: Aug 30, 1990
Analyzed: Aug 31, 1990
Reported: Sep 4, 1990

TOTAL PETROLEUM FUEL HYDROCARBONS (EPA 8015)

Sample Number	Sample Description	High B.P. Hydrocarbons $\mu\text{g/L}$ (ppb)
008-0711 C	MW2	3,100
008-0715 C	MW6	1,000

Detection Limits:

50

High Boiling Point Hydrocarbons are quantitated against a diesel fuel standard.
Analytes reported as N.D. were not present above the stated limit of detection.

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Belinda C. Vega
Laboratory Director

Please Note:

The above samples do not appear to contain diesel.

80710.KEI <2>



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

Client Project ID: Unocal/845 66th St./Oakland
Matrix Descript: Water
Analysis Method: SM 503 A&E (Gravimetric)
First Sample #: 008-0711 D

Sampled: Aug 28, 1990
Received: Aug 29, 1990
Extracted: Aug 30, 1990
Analyzed: Sep 4, 1990
Reported: Sep 4, 1990

TOTAL RECOVERABLE PETROLEUM OIL

Sample Number	Sample Description	Oil & Grease mg/L (ppm)
008-0711 D	MW2	N.D.
008-0715 C	MW6	16

Detection Limits:

5.0

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL


Belinda C. Vega
Laboratory Director



KAPREALIAN ENGINEERING, INC.
CHAIN OF CUSTODY

SAMPLER RAY (KEI)	SITE NAME & ADDRESS UNOCAL OAKLAND 845 66TH ST.	ANALYSES REQUESTED TPH & BTX E TPHD as Diesel TOG (503 mg/l)	TURN AROUND TIME: 1 Week
WITNESSING AGENCY			

SAMPLE ID NO.	DATE	TIME	SOIL	WATER	GRAB	COMP	NO. OF CONT.	SAMPLING LOCATION	TPH &	BTX E	TPHD as Diesel	TOG (503 mg/l)	REMARKS
MW1	8/28	16:00		X	X		2VOA		X	X			
MW2	"	"		X	X		2VOA 2AMB		X	X	X	X	
MW3	"	"		X	X		2VOA		X	X			
MW4	"	"		X	X		"		X	X			
MW5	"	"		X	X		"		X	X			
MW6	"	"		X	X		2VOA 2AMB		X	X	X	X	
MW7	"	"		X	X		2VOA		X	X			

Relinquished by: (Signature) Ray (KEI)	Date/Time 8-28-98	Received by: (Signature) David Asmund
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:

- Have all samples received for analysis been stored in ice?
- Will samples remain refrigerated until analyzed?
- Did any samples received for analysis have head space? **NO**
- Were samples in appropriate containers and properly packaged?

DN **SR** **8/29/98**
 Signature Title Date