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

90 AUG -4 PM 12:41

September 11, 1990

Alameda County Health Care Services
80 Swan Way, Room 200
Oakland, CA 94621

RE: Unocal Service Station #5781
3535 Pierson Street
Oakland, California

Gentlemen:

Per the request of Mr. Rick Sisk of Unocal Corporation, enclosed please find our report and our work plan/proposal, both dated August 23, 1990, for the above referenced site.

Should you have any questions, please feel free to call our office at (707) 746-6915.

Sincerely,

Kaprealian Engineering, Inc.

Judy A. Dewey

jad\82

Enclosure

cc: Rick Sisk, Unocal Corporation

KAPREALIAN ENGINEERING, INC.
Consulting Engineers
P.O. BOX 996 • BENICIA, CA 94510
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KEI-P89-1204.R7
August 23, 1990

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

Attention: Mr. Rick Sisk

RE: Supplementary Subsurface Investigation at
Unocal Service Station #5781
3535 Pierson Street
Oakland, California

Dear Mr. Sisk:

This report presents the results of our subsurface investigation for the referenced site in accordance with Kaprealian Engineering, Inc's. (KEI's) proposal KEI-P89-1204.P2 dated May 21, 1990. The purpose of the investigation was to further define the extent of the subsurface soil contamination and to determine if the ground water (if encountered) has been impacted at the site. The following work performed by KEI was initiated for the purpose of divestment.

Coordination with regulatory agencies.

Geologic logging of two exploratory borings.

Soil sampling.

Ground water sampling.

Laboratory analyses.

Data analyses, interpretation and report preparation.

SITE DESCRIPTION AND BACKGROUND

The subject site is developed and consists of a Unocal Service Station. The station occupies the northwest corner at the intersection of Pierson Street with MacArthur Boulevard in Oakland, California. In addition, the site is situated southwest of and adjacent to the Highway 580 off-ramp for MacArthur Boulevard. The site is located near the base of a east-northeast trending hillside area on relatively gently sloping developed property. A Location Map and three Site Plans are attached to this report.

KEI's initial field work was conducted on December 14, 1989, when three underground storage tanks were removed from the site. The tanks consisted of two 10,000 gallon fuel storage tanks, and one 280 gallon waste oil tank. The fuel tanks were made of steel and no apparent holes or cracks were observed. However, the waste oil tank had one hole of approximately 1.25 square inches.

Three soil samples, labeled A1, B1, and A2/B2, were taken from beneath the fuel tanks at a depth of about 12.5 feet. In addition, two soil samples, labeled SW1 and SW2, were collected from the fuel tank pit sidewalls at a depth of 10.5 feet. The fuel tank pit sidewalls were analyzed for total petroleum hydrocarbons (TPH) as gasoline and benzene, toluene, xylenes and ethylbenzene (BTX&E). Analyses of the samples by Sequoia Analytical Laboratory in Redwood City, California, indicate levels of TPH as gasoline ranging from non-detectable to 46 ppm, with non-detectable levels of BTX&E in all samples, except for samples A2/B2 and SW2, which showed benzene at 0.10 ppm and 0.65 ppm, respectively.

Also on December 14, 1989, one soil sample, labeled WO1, was collected from beneath the waste oil tank at a depth of 6 feet. The waste oil tank pit sample was analyzed by Sequoia Analytical Laboratory in Redwood City, California, for TPH as gasoline, BTX&E, TPH as diesel, total oil and grease (TOG), EPA method 8010 compounds and metals - cadmium, chromium, lead and zinc. The analytical results of soil sample WO1 indicated TPH as gasoline at 670 ppm, 5.4 ppm benzene, TPH as diesel at 8,300 ppm and TOG at 48,000 ppm. EPA method 8010 results showed 1,2-dichlorobenzene at 10 ppb, tetrachloroethene at 77 ppb, and 1,1,1-trichloroethane at 15 ppb. Metals concentrations were as follows: cadmium non-detectable; chromium 8.3 ppm, lead 340 ppm, and zinc 70 ppm.

On January 17, 1990, two soil samples, labeled P1 and P2, were collected from beneath the product pipe trenches at depths of 5.5 to 6.0 feet. Analyses of these samples by Sequoia Analytical indicate non-detectable levels of TPH as gasoline and BTX&E constituents for both samples.

KEI recommended further soil excavation in the area of the waste oil tank, and the installation of three monitoring wells at the site, to begin to define the vertical extent of soil contamination, to determine the ground water flow direction, and to determine if the ground water has been impacted. Documentation of the soil sampling activities are presented in KEI's report (KEI-J89-1204.R2) dated February 9, 1990. The results of the laboratory analyses for the soil samples collected from underground storage tanks and from pipe trenches are summarized in

Table 1, and sample collection locations are shown on the attached Site Plan, Figure 1.

On February 22, 1990, KEI returned to the site to collect additional soil samples from the excavated waste oil tank pit. On this date, one soil sample, labeled WO1(16), was collected from beneath the waste oil tank at a depth of 16 feet. In addition, four soil samples, labeled SWA through SWD, were collected from the sidewalls of the waste oil tank pit excavation at depths of 9.0 to 10.0 feet. The lateral excavation was terminated due to the presence of underground sewer and gas lines on the south and west sides, and the existing building on the north side. A 12-inch diameter conductor casing was installed in the excavation at sample location WO1(16) prior to backfilling. Analytical results of sidewall soil sample SWB indicated non-detectable levels of all constituents analyzed, except for TPH as gasoline, which was 2.0 ppm. Analytical results of the soil sample, WO1(16), collected from the bottom of the excavation at a depth of 16 feet, indicate levels of TPH as gasoline at 15 ppm with 0.06 ppm benzene, 74 ppm TPH as diesel, 910 ppm TOG, and non-detectable levels of all 8010 compounds. Laboratory analyses of the remaining three sidewall samples, SWA, SWC and SWD, showed levels of TOG ranging from 4,100 ppm to 17,000 ppm, TPH as diesel ranging from 360 ppm to 1,400 ppm, TPH as gasoline ranging from 40 ppm to 220 ppm, with benzene levels from 0.31 to 2.3 ppm and non-detectable levels of all EPA method 8010 compounds except tetrachloroethene, which ranged from 40 ppb to 160 ppb. Sample SWD also showed 1,1,1-trichloroethane at 5.8 ppb. The results of the additional soil sampling activities are presented in KEI's report (KEI-P89-1204.R3) dated March 30, 1990. The laboratory analytical results of the soil samples, collected from the waste oil tank pit, are summarized in Table 2, and the locations of soil samples are shown on the attached Site Plan, Figure 2.

On April 9 and 10, 1990, three eight-inch diameter exploratory borings (designated as MW1, MW2 and MW3 on the attached Site Plan, Figure 3) were drilled at the site. The borings were drilled to total depths ranging from 40 to 50 feet. Ground water was not encountered during drilling activities. The borings were observed for ground water accumulation for a period of up to 15 hours prior to backfilling with neat cement. Soil samples were collected for laboratory analysis and lithologic logging purposes at a maximum spacing of 5 foot intervals, changes in lithology, and obvious areas of contamination, beginning at a depth of approximately 5 feet below grade until the borings were terminated. Each boring was fully backfilled with neat cement placed with a tremie pipe from the total depth drilled up to the surface. The borings were not converted to monitoring wells because ground water was not encountered.

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, samples collected from MW1 were analyzed for TPH as diesel by EPA method 3550 in conjunction with modified 8015, for TOG by EPA 418.1 with clean up, and for EPA method 8010 compounds.

Analytical results of all of the soil samples, collected from the borings (MW1, MW2 and MW3), indicate non-detectable levels of TPH as gasoline and BTX&E in all soil samples. In boring MW1, TPH as diesel, TOG and EPA 8010 compounds were non-detectable in all samples. Results of the soil analyses are summarized in Table 3.

Due to the confirmed soil contamination in the vicinity of the waste oil tank pit, and in order to determine the lateral and vertical extent of the soil contamination, KEI recommended that three additional exploratory borings be drilled closely adjacent to the former waste oil tank pit to a maximum depth of 50 feet. Details of the exploratory boring drilling and sampling activities are summarized in KEI's report (KEI-P89-1204.R6) dated May 21, 1990.

FIELD ACTIVITIES

On July 5 & 6, 1990, two exploratory borings (designated as EB1 and EB2 on the attached Site Plan, Figure 3) were drilled at the site. A third proposed boring could not be drilled as originally proposed within the conductor casing in the waste oil tank pit due to drill rig access limitation with the roof overhang. Subsurface materials penetrated and the depths at which soil samples were collected are shown in the attached Boring Logs.

The two borings were drilled to depths of 34.5 to 38 feet. Ground water was encountered at depths of 33.5 to approximately 36.7 feet beneath the surface. Soil samples were collected at a maximum spacing of 5 foot intervals, significant changes in lithology, obvious areas of contamination, and at the soil/ground water interface beginning at a depth of approximately 4 to 5 feet in each of the borings, except in boring EB1, where a soil sample was not obtained at the soil/ground water interface. Undisturbed soil samples were collected by driving a California-modified split-spoon sampler ahead of the drilling augers. The clean, two-inch diameter brass tubes 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. Drilling was stopped about 1 to 1.5 feet after intersecting the first water table. Water samples were collected from each of the borings using a clean acrylic bailer. The water samples were

placed in VOA vials and/or one liter amber bottles, as appropriate, with Teflon-lined screw caps, and labeled and stored in a cooler on ice for delivery to the laboratory. After the water samples were collected, the borings were backfilled to the surface using a 9-sack sand slurry.

ANALYTICAL RESULTS

Samples were analyzed at Sequoia Analytical Laboratory in Redwood City, California, and were accompanied by properly executed Chain of Custody documentation. Water and selected soil samples from borings EB1 and EB2 were analyzed for TPH as gasoline using EPA method 5030 in conjunction with modified 8015, for TPH as diesel by EPA method 3550 in conjunction with modified 8015, BTX&E using EPA method 8020, TOG by methods 503D&E and 503A&E, and purgeable halocarbons by EPA method 8010. The results of soil analyses are summarized in Table 4, and the results of the water analyses are summarized in Table 5. Copies of the laboratory analyses and Chain of Custody documentation are attached to this report.

Soil sample analyses from the borings EB1 and EB2 show non-detectable levels of TPH as gasoline, TPH as diesel and BTX&E in all soil samples, except EB2(9.5), which showed a level of TPH as gasoline at 1.2 ppm, and sample EB2(12.5), which showed a level of benzene at 0.0090 ppm. Also, TOG and EPA method 8010 compounds were non-detectable, except for sample EB1(28.5), which showed 6.2 ppb of 1,1,1-trichloroethane.

Water sample analyses (grab samples) show non-detectable levels of TPH as gasoline, TPH as diesel, benzene, TOG, and EPA method 8010 compounds, except in sample EB1 which showed a level of TPH as diesel at 6.7 ppb, and sample EB2 which showed a level of benzene at 0.61 ppb.

HYDROLOGY AND GEOLOGY

Ground water was encountered in borings EB1 at a depth of 33.5 feet and in boring EB2 at a depth of about 37.7 feet. However, ground water was not encountered in borings MW1, MW2 nor MW3, where they were drilled to depths between 40 and 50 feet.

Based on review of regional geologic maps ("Areal and Engineering Geology of the Oakland East Quadrangle, California" by Dorothy H. Radbruch (1969) in U.S.G.S. Map GQ-769; and "Map Showing Recently Active Breaks Along the Hayward Fault Zone and the Southern Part of the Calaveras Fault Zone, California" by Dorothy H. Radbruch-Hall (1974) in U.S.G.S. Map I-813), the subject site is underlain by undivided Quaternary deposits (Qu) and is closely adjacent to a mapped geologic contact with the upper member of the Quaternary

San Antonio Formation (Qsu). In addition, the site is situated approximately 1,200 to 2,800 feet southwest of mapped splays of the active Hayward Fault Zone.

The results of our subsurface study indicate that the site is generally underlain by very stiff clay and silty clay to the maximum depth explored (50 feet). Locally, interbedded zones of clayey gravel, well-to-poorly-graded gravel, clayey sand, and silt beds were encountered in each boring to depths below grade of about 22-1/2, 20 and 14-1/2 feet in borings MW1, MW2 and MW3, respectively, and extending to depths of only 6 and 5 feet in borings EB1 and EB2, respectively. However, in boring EB2, a clayey silt bed was encountered between depths of 29.5 to about 34.5 feet, and is in turn underlain by a clayey sand bed to the maximum depth explored (38 feet).

DISCUSSION AND RECOMMENDATIONS

The data indicate that soil contamination previously identified in the waste oil tank pit is very isolated. However, because ground water was encountered in borings EB1 and EB2, KEI recommends that one monitoring well be installed to determine if the ground water has been impacted at the site. It should be noted that ground water was not encountered in the previously drilled borings (MW1, MW2 or MW3), which extended up to depths below grade of 50 feet. Also, an existing sewer easement crosses the subject site and separates the borings with detected ground water from the deeper borings where ground water was not encountered. The relationship between this sewer easement and the ground water levels at the site is unclear at this time. Therefore, KEI recommends that details of the sewer pipeline within this easement be researched at the appropriate public agencies. KEI's proposal for this work is attached for your review and consideration.

DISTRIBUTION

A copy of this report should be sent to the Alameda County Health Care Services, the Alameda County Flood Control and Water Conservation District, 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 ground water levels and flow paths, thereby changing the extent and concentration of

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

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

Should you have any questions regarding this report, please feel free to call me at (707) 746-6915.

Sincerely,

Kaprealian Engineering, Inc.

Don R Braun

Don R. Braun
Certified Engineering Geologist

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

Mardo Kaprealian
President

jad

Attachments: Tables 1 through 5
Location Map
Site Plans - Figures 1, 2 & 3
Boring Logs
Laboratory Results
Chain of Custody documentation
Proposal

KEI-P89-1204.R7
August 23, 1990

TABLE 1

SUMMARY OF LABORATORY ANALYSES
SOIL

(Collected on December 14, 1989 & January 17, 1990)

Sample	Depth (feet)	TPH as Gasoline	Benzene	Toluene	Xylenes	Ethylbenzene
A1	12.5	3.5	ND	ND	ND	ND
B1	12.5	ND	ND	ND	ND	ND
A2/B2	12.5	5.8	0.10	ND	ND	ND
SW1	10.5	15	ND	ND	ND	ND
SW2	10.5	46	0.65	ND	ND	ND
P1	5.5	ND	ND	ND	ND	ND
P2	6.0	ND	ND	ND	ND	ND
WO1*	6	670	5.4	15	17	2.3
Detection Limits		1.0	0.05	0.1	0.1	0.1

* All EPA method 8010 compounds were non-detectable, except 1,2-dichlorobenzene at 10 ppb, tetrachloroethene at 77 ppb, and 1,1,1-trichloroethane at 15 ppb. Metals concentrations were as follows: cadmium non-detectable, chromium 8.3 ppm, lead 340 ppm, and zinc 70 ppm. TPH as diesel showed 8,300 ppm, and TOG showed 48,000 ppm.

ND = Non-detectable.

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

KEI-P89-1204.R7
August 23, 1990

TABLE 2

SUMMARY OF LABORATORY ANALYSES
SOIL

(Collected on February 22, 1990)

Sample	Depth (feet)	TOG	TPH as Diesel	TPH as Gasoline	Benzene	Toluene	Xylenes	Ethyl-benzene
*WO1(16)	16.0	910	74	15	0.060	ND	2.0	0.10
**SWA	9.0	17,000	1,400	220	2.3	2.1	23	7.3
*SWB	10.0	ND	ND	2.0	ND	ND	ND	ND
***SWC	10.0	4,100	460	63	0.31	0.33	2.2	1.3
****SWD	10.0	6,400	360	40	0.32	ND	4.0	0.49
Detection Limits		50	1.0	1.0	0.05	0.10	0.10	0.10

* All EPA method 8010 compounds were non-detectable.

** All EPA method 8010 compounds were non-detectable, except tetrachloroethene at 160 ppb.

*** All EPA method 8010 compounds were non-detectable, except tetrachloroethene at 56 ppb.

**** All EPA method 8010 compounds were non-detectable, except tetrachloroethene at 40 ppb and 1,1,1-trichloroethane at 5.8 ppb.

ND = Non-detectable.

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

KEI-P89-1204.R7
August 23, 1990

TABLE 3

SUMMARY OF LABORATORY ANALYSES
SOIL

(Collected on April 9 & 10, 1990)

Sample Number	Depth (feet)	TPH as Diesel	TPH as Gasoline	Benzene	Toluene	Xylenes	Ethyl-benzene
MW1(5)*	5	ND	ND	ND	ND	ND	ND
MW1(9.5)*	9.5	ND	ND	ND	ND	ND	ND
MW1(15)*	15	ND	ND	ND	ND	ND	ND
MW1(20)*	20	ND	ND	ND	ND	ND	ND
MW1(25)*	25	ND	ND	ND	ND	ND	ND
MW1(30)*	30	ND	ND	ND	ND	ND	ND
MW1(35)*	35	ND	ND	ND	ND	ND	ND
MW1(40)*	40	ND	ND	ND	ND	ND	ND
MW1(45)*	45	ND	ND	ND	ND	ND	ND
MW1(50)*	50	ND	ND	ND	ND	ND	ND
MW2(5)	5	ND	ND	ND	ND	ND	ND
MW2(10)	9.5	ND	ND	ND	ND	ND	ND
MW2(12)	12	ND	ND	ND	ND	ND	ND
MW2(15)	15	ND	ND	ND	ND	ND	ND
MW2(20)	20	ND	ND	ND	ND	ND	ND
MW2(25)	25	ND	ND	ND	ND	ND	ND
MW2(30)	30	ND	ND	ND	ND	ND	ND
MW2(35)	35	ND	ND	ND	ND	ND	ND
MW2(40)	39.5	ND	ND	ND	ND	ND	ND
MW3(5)	5	ND	ND	ND	ND	ND	ND
MW3(10)	10	ND	ND	ND	ND	ND	ND
MW3(15)	15	ND	ND	ND	ND	ND	ND
MW3(20)	20	ND	ND	ND	ND	ND	ND
MW3(25)	25	ND	ND	ND	ND	ND	ND
MW3(30)	30	ND	ND	ND	ND	ND	ND
MW3(35)	35	ND	ND	ND	ND	ND	ND
MW3(40)	40	ND	ND	ND	ND	ND	ND
Detection Limits		1.0	1.0	0.0050	0.0050	0.0050	0.0050

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

ND = Non-detectable.

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

KEI-P89-1204.R7
August 23, 1990

TABLE 4

SUMMARY OF LABORATORY ANALYSES
SOIL

(Collected on July 5 & 6, 1990)

Sample Number	TPH as Diesel	TPH as Gasoline	Benzene	Toluene	Xylenes	Ethyl-benzene
EB1(8.5)*	ND	ND	ND	0.014	0.0056	ND
EB1(13.5)*	ND	ND	ND	0.015	ND	ND
EB1(18.5)*	ND	ND	ND	0.017	0.024	0.011
EB1(23.5)*	ND	ND	ND	0.011	ND	ND
EB1(28.5)*	ND	ND	ND	0.012	ND	ND
EB2(9.5)*	ND	1.2	ND	0.038	0.016	0.012
EB2(12.5)*	ND	ND	0.0090	0.025	0.0060	ND
EB2(16.5)*	ND	ND	ND	0.021	0.0050	ND
EB2(22)*	ND	ND	ND	0.020	ND	ND
EB2(26.5)*	ND	ND	ND	0.017	ND	ND
EB2(32)	ND	ND	ND	ND	ND	ND
Detection Limits	1.0	1.0	0.0050	0.0050	0.0050	0.0050

* TOG and all EPA 8010 compounds were non-detectable, except 1,1,1-trichloroethane at 6.2 ppb in EB1(28.5).

ND = Non-detectable.

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

KEI-P89-1204.R7
August 23, 1990

TABLE 5

SUMMARY OF LABORATORY ANALYSES
WATER

(Collected on July 6, 1990)

Sample Number	TPH as Diesel	TPH as Gasoline	Benzene	Toluene	Xylenes	Ethylbenzene
EB1*	6.7	ND	ND	1.5	1.0	ND
EB2*	ND	ND	0.61	1.5	1.0	ND
Detection Limits	50	30	0.3	0.3	0.3	0.3

* TOG and EPA 8010 compounds were non-detectable.

ND = Non-detectable.

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

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Consulting Engineers
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LOCATION MAP

Unocal Service Station #5781
3535 Pierson Street
Oakland, California

KAPREALIAN ENGINEERING, INC.
Consulting Engineers
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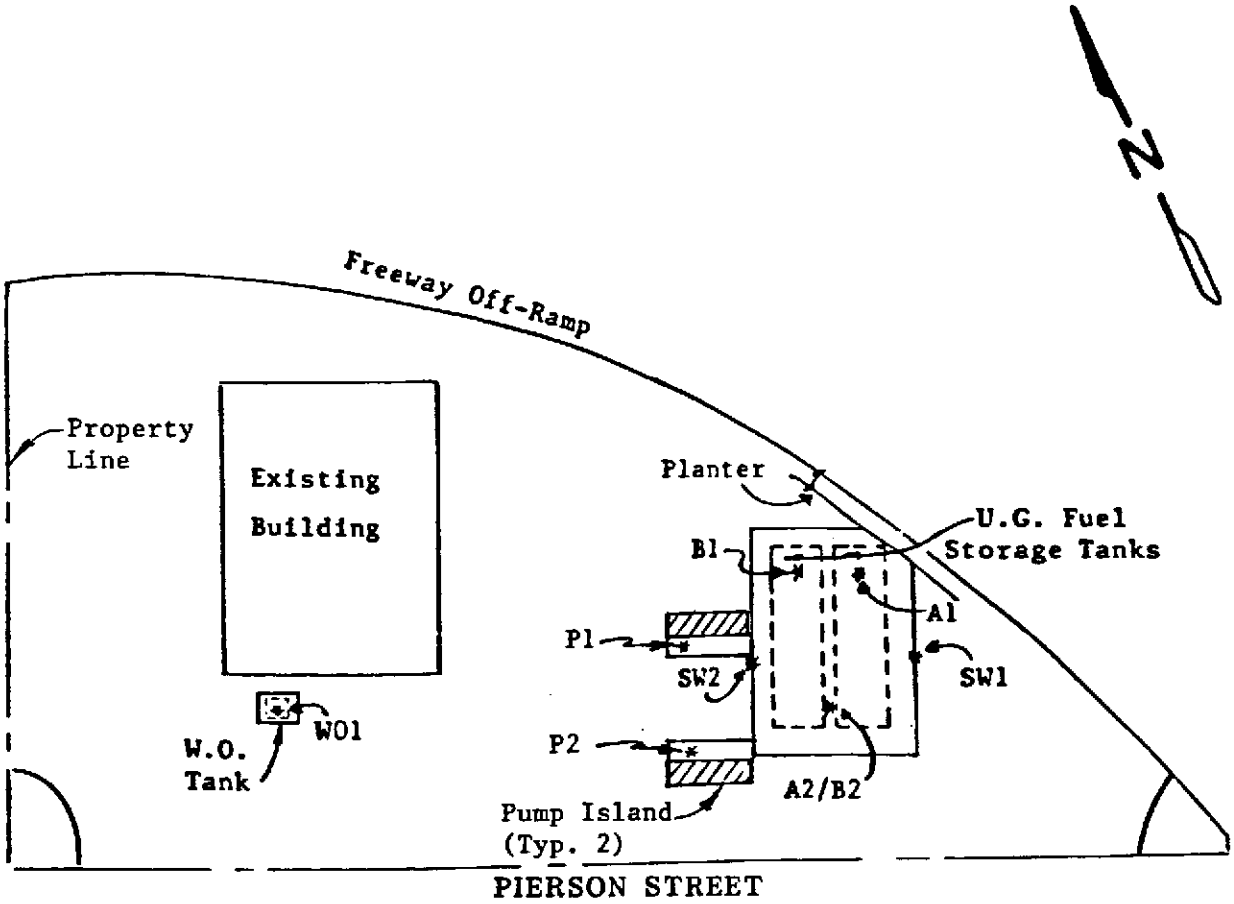

SITE PLAN
Figure 1

LEGEND

* Sample Point Location

Unocal Service Station #5781
3535 Pierson Street
Oakland, California

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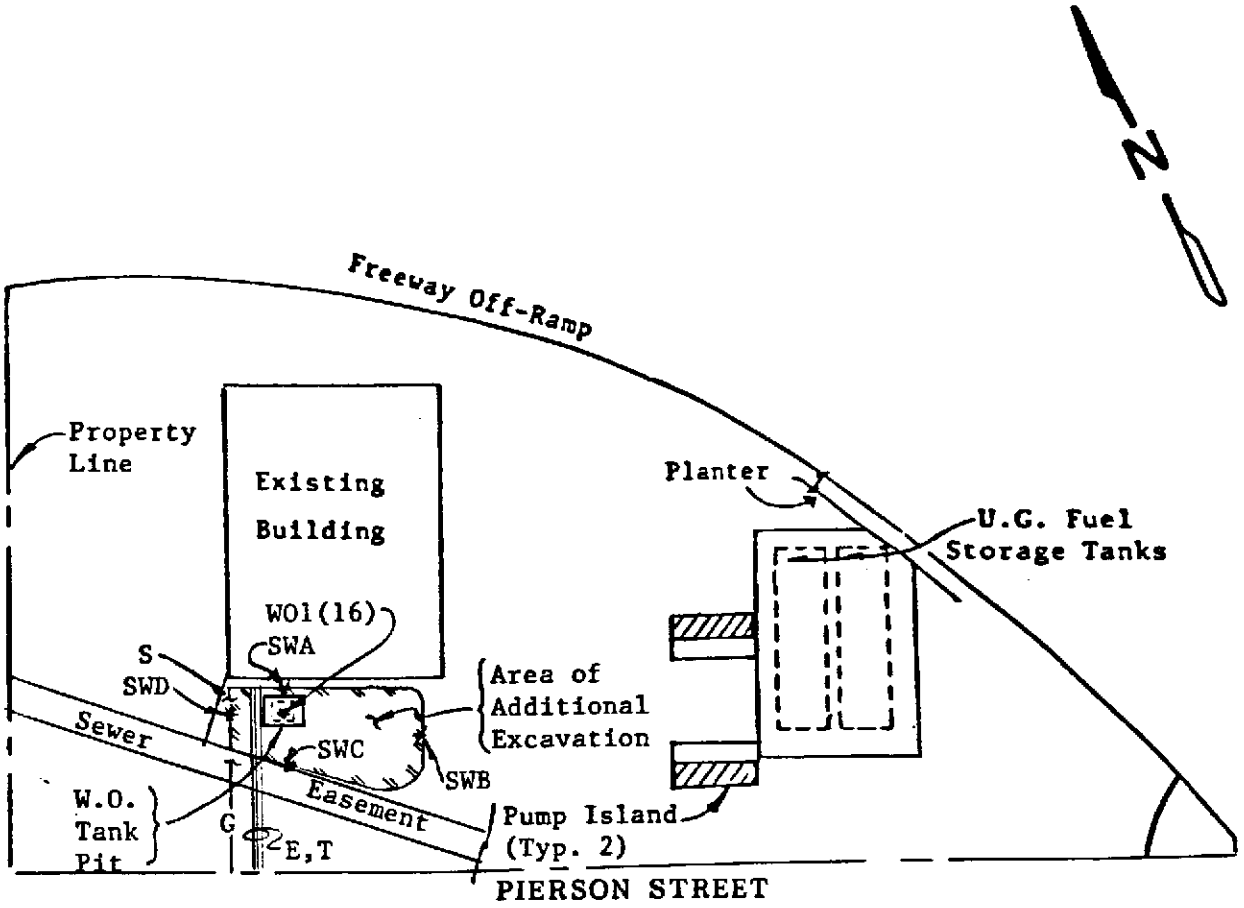

SITE PLAN
Figure 2

0 30 60
Approx. Scale feet

LEGEND

* Sample Point Location
E Electrical
T Telephone
G Natural Gas
S Sewer

Unocal Service Station #5781
3535 Pierson Street
Oakland, California

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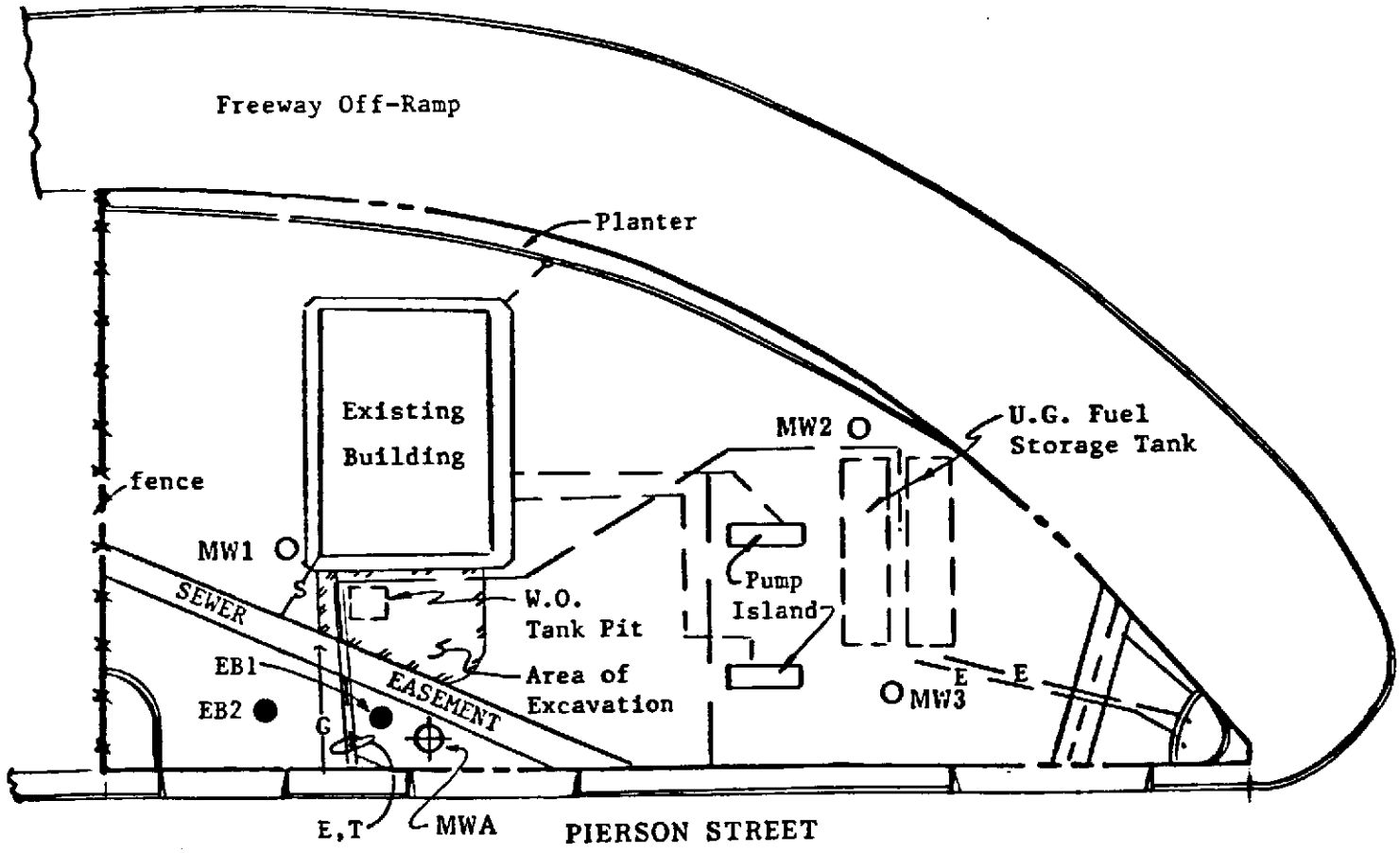

SITE PLAN
Figure 3

0 30 60
Approx. Scale feet

LEGEND

- ● Exploratory Boring (drilled 7/5 & 7/6/90)
- E U.G. Electrical Line
- T U.G. Telephone Line
- G U.G. Natural Gas Line
- S U.G. Sewer Line
- ○ Exploratory Boring (drilled 4/9 & 4/10/90)
- ⊕ Monitoring Well (proposed)

Unocal Service Station #5781
3535 Pierson Street
Oakland, California

BORING LOG

Project No.	Boring Diameter	Logged By
KEI-P89-1204	9"	W.W.
Project Name Unocal Oakland - 3535 Pierson	**Well Head Elevation** N/A	**Date Drilled** 7/5/90
Boring No. EB1	**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 sand and gravel base.
			CL/ CH	Clay with silt, 5-10% sand, 10% fine gravel to 3/8" dia., firm, moist, olive brown.
			ML/ MH	Clayey silt, 30% clay, 10% coarse-grained sand, trace to 5% fine gravel to 3/8" dia., moist, olive gray.
3/5/6		5		Clayey silt, trace fine gravel, 5% sand, moist, brown.
				Clay, trace silt and sand, trace organic matter, moist, stiff, orang-ish brown.
5/6/8			CL/ CH	Clay, 10-15% sand, trace silt, trace to 5% gravel to 1/2" dia., moist, stiff, dark brown.
		10		
				Clay, minor organic material, slightly moist, very stiff, dark yellowish brown.
8/13/18		15		
				Clay, as above, with light gray mot-tling.
9/12/17		20		

BORING LOG

Project No. KEI-P89-1204	Boring Diameter 9"	Logged By W.W.
Project Name Unocal Oakland - 3535 Pierson	Well Head Elevation N/A	Date Drilled 7/5/90
Boring No. EB1	Drilling Method Hollow-stem Auger	Drilling Company EGI

Penetration blows/6"	G. W. level	Depth (feet) Samples	Strati-graphy USCS	Description
7/13/18		25	CL/ CH	Clay, minor organic material, trace fine-grained sand, trace silt, slightly moist, very stiff to hard, light orangish brown with light gray, mottling.
8/15/21		30		
9/18/36	▼	35		Clay with silt, 15-20% silt, 5-15% sand, trace organic matter, hard, very moist to wet, dark yellowish brown.
		40		TOTAL DEPTH: 34.5'

BORING LOG

Project No. KEI-P89-1204	Boring Diameter 9"	Logged By W.W.
Project Name Unocal Oakland - 3535 Pierson	Well Head Elevation N/A	Date Drilled 7/6/90
Boring No. EB2	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 sand and gravel.
			GC	Clayey gravel 15% silt, 10% sand, gravel to 1/2" dia., moist, medium dense, olive brown.
4/4/5		5	CL	Sandy clay with gravel, 15% sand, gravel to 1/4" dia., trace organic matter, moist to wet, firm, dark yellowish brown.
				Clay, 10% silt, 10% coarse-grained sand, trace fine gravel to 1/4" dia., moist, firm to stiff, olive brown.
4/5/8		10	CL/ CH	Clay, trace rootlets, stiff, slightly moist, dark yellowish brown with trace light gray mottling.
7/14/18				Clay, as above, trace to 5% silt, hard, slightly moist, dark yellowish brown with light gray mottling.
		15		
8/15/19				Clay, as above, trace to 15% silt, moist, hard, yellowish brown with light gray mottling.
		20		

BORING LOG

Project No. KEI-P89-1204	Boring Diameter 9"	Logged By W.W.
Project Name Unocal Oakland - 3535 Pierson	Well Head Elevation N/A	Date Drilled 7/6/90
Boring No. EB2	Drilling Method Hollow-stem Auger	Drilling Company EGI

Penetration blows/6"	G. W. level	Depth (feet) Samples	Strati-graphy USCS	Description
8/12/22			CL/ CH	Clay, trace organic matter, trace silt hard, moist, dark yellowish brown with light gray mottling, slight orangish brown, mottling.
		25		
7/8/12				Clay with silt, trace to 5% organic matter, moist, very stiff, beige with light gray mottling.
		30		
8/14/20			ML/ MH	Clayey silt with fine-grained sand, up to 20% sand, hard, moist, light olive brown, trace light gray mottling.
		35		
13/15/28	▼		SC	Clayey sand with silt, silt to 15%, very moist to wet, dense, light olive brown to beige.
		40		TOTAL DEPTH: 38'

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Kaprealian Engineering, Inc.	Client Project ID:	Unocal, Oakland, 3535 Pierson	Sampled:	Jul 5-6, 1990
P.O. Box 996	Matrix Descript:	Soil	Received:	Jul 6, 1990
Benicia, CA 94510	Analysis Method:	EPA 3550/8015		
Attention: Mardo Kaprealian, P.E.	First Sample #:	007-1049	Analyzed:	Jul 20, 1990
			Reported:	Jul 31, 1990

TOTAL PETROLEUM FUEL HYDROCARBONS (EPA 8015)

Sample Number	Sample Description	High B.P. Hydrocarbons mg/kg (ppm)
007-1049	EB1 (8.5)	N.D.
007-1050	EB1 (13.5)	N.D.
007-1051	EB1 (18.5)	N.D.
007-1052	EB1 (23.5)	N.D.
007-1053	EB1 (28.5)	N.D.
007-1054	EB2 (9.5)	N.D.
007-1055	EB2 (12.5)	N.D.
007-1056	EB2 (16.5)	N.D.
007-1057	EB2 (22)	N.D.
007-1058	EB2 (26.5)	N.D.
007-1059	EB2 (32)	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.

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Elizabeth W. Hackl
Project Manager

Please Note:
Amended report dated: 8/16/90

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Kaprealian Engineering, Inc.	Client Project ID:	Unocal, Oakland, 3535 Pierson	Sampled:	Jul 5-6, 1990
P.O. Box 996	Matrix Descript:	Soil	Received:	Jul 6, 1990
Benicia, CA 94510	Analysis Method:	SM 503 D&E (Gravimetric)	Extracted:	Jul 18, 1990
Attention: Mardo Kaprealian, P.E.	First Sample #:	007-1049	Analyzed:	Jul 20, 1990
			Reported:	Jul 31, 1990

TOTAL RECOVERABLE PETROLEUM OIL

Sample Number	Sample Description	Oil & Grease mg/kg (ppm)
007-1049	EB1 (8.5)	N.D.
007-1050	EB1 (13.5)	N.D.
007-1051	EB1 (18.5)	N.D.
007-1052	EB1 (23.5)	N.D.
007-1053	EB1 (28.5)	80
007-1054	EB2 (9.5)	160
007-1055	EB2 (12.5)	N.D.
007-1056	EB2 (16.5)	N.D.
007-1057	EB2 (22)	N.D.
007-1058	EB2 (26.5)	N.D.
007-1059	EB2 (32)	
Detection Limits:		30

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

SEQUOIA ANALYTICAL

Elizabeth W. Hackl
Project Manager

Please Note:
Amended report dated: 8/16/90

71049.KEI <3>

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Kaprealian Engineering, Inc.	Client Project ID:	Unocal, Oakland, 3535 Pierson	Sampled:	Jul 5-6, 1990
P.O. Box 996	Sample Descript:	Soil, EB1 (8.5)	Received:	Jul 6, 1990
Benicia, CA 94510	Analysis Method:	EPA 5030/8010	Analyzed:	Jul 19, 1990
Attention: Mardo Kaprealian, P.E.	Lab Number:	007-1049	Reported:	Jul 31, 1990

HALOGENATED VOLATILE ORGANICS (EPA 8010)

Analyte	Detection Limit µg/kg	Sample Results µg/kg
Bromodichloromethane	5.0	N.D.
Bromoform	5.0	N.D.
Bromomethane	5.0	N.D.
Carbon tetrachloride	5.0	N.D.
Chlorobenzene	5.0	N.D.
Chloroethane	25	N.D.
2-Chloroethylvinyl ether	5.0	N.D.
Chloroform	5.0	N.D.
Chloromethane	5.0	N.D.
Dibromochloromethane	5.0	N.D.
1,2-Dichlorobenzene	10	N.D.
1,3-Dichlorobenzene	10	N.D.
1,4-Dichlorobenzene	10	N.D.
1,1-Dichloroethane	5.0	N.D.
1,2-Dichloroethane	5.0	N.D.
1,1-Dichloroethene	5.0	N.D.
Total 1,2-Dichloroethene	5.0	N.D.
1,2-Dichloropropane	5.0	N.D.
cis-1,3-Dichloropropene	5.0	N.D.
trans-1,3-Dichloropropene	5.0	N.D.
Methylene chloride	10	N.D.
1,1,2,2-Tetrachloroethane	5.0	N.D.
Tetrachloroethene	5.0	N.D.
1,1,1-Trichloroethane	5.0	N.D.
1,1,2-Trichloroethane	5.0	N.D.
Trichloroethene	5.0	N.D.
Trichlorofluoromethane	5.0	N.D.
Vinyl chloride	10	N.D.

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

SEQUOIA ANALYTICAL

for Arthur G. Burton
Laboratory Director

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Kaprealian Engineering, Inc.	Client Project ID:	Unocal, Oakland, 3535 Pierson	Sampled:	Jul 5-6, 1990
P.O. Box 996	Sample Descript:	Soil, EB1 (13.5)	Received:	Jul 6, 1990
Benicia, CA 94510	Analysis Method:	EPA 5030/8010	Analyzed:	Jul 19, 1990
Attention: Mardo Kaprealian, P.E.	Lab Number:	007-1050	Reported:	Jul 31, 1990

HALOGENATED VOLATILE ORGANICS (EPA 8010)

Analyte	Detection Limit µg/kg	Sample Results µg/kg
Bromodichloromethane	5.0	N.D.
Bromoform	5.0	N.D.
Bromomethane	5.0	N.D.
Carbon tetrachloride	5.0	N.D.
Chlorobenzene	5.0	N.D.
Chloroethane	25	N.D.
2-Chloroethylvinyl ether	5.0	N.D.
Chloroform	5.0	N.D.
Chloromethane	5.0	N.D.
Dibromochloromethane	5.0	N.D.
1,2-Dichlorobenzene	10	N.D.
1,3-Dichlorobenzene	10	N.D.
1,4-Dichlorobenzene	10	N.D.
1,1-Dichloroethane	5.0	N.D.
1,2-Dichloroethane	5.0	N.D.
1,1-Dichloroethene	5.0	N.D.
Total 1,2-Dichloroethene	5.0	N.D.
1,2-Dichloropropane	5.0	N.D.
cis-1,3-Dichloropropene	5.0	N.D.
trans-1,3-Dichloropropene	5.0	N.D.
Methylene chloride	10	N.D.
1,1,2,2-Tetrachloroethane	5.0	N.D.
Tetrachloroethene	5.0	N.D.
1,1,1-Trichloroethane	5.0	N.D.
1,1,2-Trichloroethane	5.0	N.D.
Trichloroethene	5.0	N.D.
Trichlorofluoromethane	5.0	N.D.
Vinyl chloride	10	N.D.

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

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for Arthur G. Burton
Laboratory Director

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Kaprealian Engineering, Inc.	Client Project ID:	Unocal, Oakland, 3535 Pierson	Sampled:	Jul 5-6, 1990
P.O. Box 996	Sample Descript:	Soil, EB1 (18.5)	Received:	Jul 6, 1990
Benicia, CA 94510	Analysis Method:	EPA 5030/8010	Analyzed:	Jul 19, 1990
Attention: Mardo Kaprealian, P.E.	Lab Number:	007-1051	Reported:	Jul 31, 1990

HALOGENATED VOLATILE ORGANICS (EPA 8010)

Analyte	Detection Limit µg/kg	Sample Results µg/kg
Bromodichloromethane	5.0	N.D.
Bromoform	5.0	N.D.
Bromomethane	5.0	N.D.
Carbon tetrachloride	5.0	N.D.
Chlorobenzene	5.0	N.D.
Chloroethane	25	N.D.
2-Chloroethylvinyl ether	5.0	N.D.
Chloroform	5.0	N.D.
Chloromethane	5.0	N.D.
Dibromochloromethane	5.0	N.D.
1,2-Dichlorobenzene	10	N.D.
1,3-Dichlorobenzene	10	N.D.
1,4-Dichlorobenzene	10	N.D.
1,1-Dichloroethane	5.0	N.D.
1,2-Dichloroethane	5.0	N.D.
1,1-Dichloroethene	5.0	N.D.
Total 1,2-Dichloroethene	5.0	N.D.
1,2-Dichloropropane	5.0	N.D.
cis-1,3-Dichloropropene	5.0	N.D.
trans-1,3-Dichloropropene	5.0	N.D.
Methylene chloride	10	N.D.
1,1,2,2-Tetrachloroethane	5.0	N.D.
Tetrachloroethene	5.0	N.D.
1,1,1-Trichloroethane	5.0	N.D.
1,1,2-Trichloroethane	5.0	N.D.
Trichloroethene	5.0	N.D.
Trichlorofluoromethane	5.0	N.D.
Vinyl chloride	10	N.D.

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

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Laboratory Director

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Kaprealian Engineering, Inc.	Client Project ID:	Unocal, Oakland, 3535 Pierson	Sampled:	Jul 5-6, 1990
P.O. Box 996	Sample Descript:	Soil, EB1 (23.5)	Received:	Jul 6, 1990
Benicia, CA 94510	Analysis Method:	EPA 5030/8010	Analyzed:	Jul 19, 1990
Attention: Mardo Kaprealian, P.E.	Lab Number:	007-1052	Reported:	Jul 31, 1990

HALOGENATED VOLATILE ORGANICS (EPA 8010)

Analyte	Detection Limit µg/kg	Sample Results µg/kg
Bromodichloromethane	5.0	N.D.
Bromoform	5.0	N.D.
Bromomethane	5.0	N.D.
Carbon tetrachloride	5.0	N.D.
Chlorobenzene	5.0	N.D.
Chloroethane	25	N.D.
2-Chloroethylvinyl ether	5.0	N.D.
Chloroform	5.0	N.D.
Chloromethane	5.0	N.D.
Dibromochloromethane	5.0	N.D.
1,2-Dichlorobenzene	10	N.D.
1,3-Dichlorobenzene	10	N.D.
1,4-Dichlorobenzene	10	N.D.
1,1-Dichloroethane	5.0	N.D.
1,2-Dichloroethane	5.0	N.D.
1,1-Dichloroethene	5.0	N.D.
Total 1,2-Dichloroethene	5.0	N.D.
1,2-Dichloropropane	5.0	N.D.
cis-1,3-Dichloropropene	5.0	N.D.
trans-1,3-Dichloropropene	5.0	N.D.
Methylene chloride	10	N.D.
1,1,2,2-Tetrachloroethane	5.0	N.D.
Tetrachloroethene	5.0	N.D.
1,1,1-Trichloroethane	5.0	N.D.
1,1,2-Trichloroethane	5.0	N.D.
Trichloroethene	5.0	N.D.
Trichlorofluoromethane	5.0	N.D.
Vinyl chloride	10	N.D.

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

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Laboratory Director

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Kaprealian Engineering, Inc.	Client Project ID:	Unocal, Oakland, 3535 Pierson	Sampled:	Jul 5-6, 1990
P.O. Box 996	Sample Descript:	Soil, EB1 (28.5)	Received:	Jul 6, 1990
Benicia, CA 94510	Analysis Method:	EPA 5030/8010	Analyzed:	Jul 19, 1990
Attention: Mardo Kapreallan, P.E.	Lab Number:	007-1053	Reported:	Jul 31, 1990

HALOGENATED VOLATILE ORGANICS (EPA 8010)

Analyte	Detection Limit µg/kg	Sample Results µg/kg
Bromodichloromethane	5.0	N.D.
Bromoform	5.0	N.D.
Bromomethane	5.0	N.D.
Carbon tetrachloride	5.0	N.D.
Chlorobenzene	5.0	N.D.
Chloroethane	25	N.D.
2-Chloroethylvinyl ether	5.0	N.D.
Chloroform	5.0	N.D.
Chloromethane	5.0	N.D.
Dibromochloromethane	5.0	N.D.
1,2-Dichlorobenzene	10	N.D.
1,3-Dichlorobenzene	10	N.D.
1,4-Dichlorobenzene	10	N.D.
1,1-Dichloroethane	5.0	N.D.
1,2-Dichloroethane	5.0	N.D.
1,1-Dichloroethene	5.0	N.D.
Total 1,2-Dichloroethene	5.0	N.D.
1,2-Dichloropropane	5.0	N.D.
cis-1,3-Dichloropropene	5.0	N.D.
trans-1,3-Dichloropropene	5.0	N.D.
Methylene chloride	10	N.D.
1,1,2,2-Tetrachloroethane	5.0	N.D.
Tetrachloroethene	5.0	N.D.
1,1,1-Trichloroethane	5.0	6.2
1,1,2-Trichloroethane	5.0	N.D.
Trichloroethene	5.0	N.D.
Trichlorofluoromethane	5.0	N.D.
Vinyl chloride	10	N.D.

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

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For Arthur G. Burton
Laboratory Director

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Kaprealian Engineering, Inc.	Client Project ID:	Unocal, Oakland, 3535 Pierson	Sampled:	Jul 5-6, 1990
P.O. Box 996	Sample Descript:	Soil, EB2 (9.5)	Received:	Jul 6, 1990
Benicia, CA 94510	Analysis Method:	EPA 5030/8010	Analyzed:	Jul 19, 1990
Attention: Mardo Kaprealian, P.E.	Lab Number:	007-1054	Reported:	Jul 31, 1990

HALOGENATED VOLATILE ORGANICS (EPA 8010)

Analyte	Detection Limit µg/kg	Sample Results µg/kg
Bromodichloromethane	10	N.D.
Bromoform	10	N.D.
Bromomethane	10	N.D.
Carbon tetrachloride	10	N.D.
Chlorobenzene	10	N.D.
Chloroethane	50	N.D.
2-Chloroethylvinyl ether	10	N.D.
Chloroform	10	N.D.
Chloromethane	10	N.D.
Dibromochloromethane	10	N.D.
1,2-Dichlorobenzene	20	N.D.
1,3-Dichlorobenzene	20	N.D.
1,4-Dichlorobenzene	20	N.D.
1,1-Dichloroethane	10	N.D.
1,2-Dichloroethane	10	N.D.
1,1-Dichloroethene	10	N.D.
Total 1,2-Dichloroethene	10	N.D.
1,2-Dichloropropane	10	N.D.
cis-1,3-Dichloropropene	10	N.D.
trans-1,3-Dichloropropene	10	N.D.
Methylene chloride	20	N.D.
1,1,2,2-Tetrachloroethane	10	N.D.
Tetrachloroethene	10	N.D.
1,1,1-Trichloroethane	10	N.D.
1,1,2-Trichloroethane	10	N.D.
Trichloroethene	10	N.D.
Trichlorofluoromethane	10	N.D.
Vinyl chloride	20	N.D.

Analytes reported as N.D. were not present above the stated limit of detection. Because matrix effects and/or other factors required additional sample dilution, detection limits for this sample have been raised.

SEQUOIA ANALYTICAL

for Arthur G. Burton
Laboratory Director

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Kaprealian Engineering, Inc.	Client Project ID:	Unocal, Oakland, 3535 Pierson	Sampled:	Jul 5-6, 1990
P.O. Box 996	Sample Descript:	Soil, EB2 (12.5)	Received:	Jul 6, 1990
Benicia, CA 94510	Analysis Method:	EPA 5030/8010	Analyzed:	Jul 19, 1990
Attention: Mardo Kaprealian, P.E.	Lab Number:	007-1055	Reported:	Jul 31, 1990

HALOGENATED VOLATILE ORGANICS (EPA 8010)

Analyte	Detection Limit µg/kg	Sample Results µg/kg
Bromodichloromethane	5.0	N.D.
Bromoform	5.0	N.D.
Bromomethane	5.0	N.D.
Carbon tetrachloride	5.0	N.D.
Chlorobenzene	5.0	N.D.
Chloroethane	25	N.D.
2-Chloroethylvinyl ether	5.0	N.D.
Chloroform	5.0	N.D.
Chloromethane	5.0	N.D.
Dibromochloromethane	5.0	N.D.
1,2-Dichlorobenzene	10	N.D.
1,3-Dichlorobenzene	10	N.D.
1,4-Dichlorobenzene	10	N.D.
1,1-Dichloroethane	5.0	N.D.
1,2-Dichloroethane	5.0	N.D.
1,1-Dichloroethene	5.0	N.D.
Total 1,2-Dichloroethene	5.0	N.D.
1,2-Dichloropropane	5.0	N.D.
cis-1,3-Dichloropropene	5.0	N.D.
trans-1,3-Dichloropropene	5.0	N.D.
Methylene chloride	10	N.D.
1,1,2,2-Tetrachloroethane	5.0	N.D.
Tetrachloroethene	5.0	N.D.
1,1,1-Trichloroethane	5.0	N.D.
1,1,2-Trichloroethane	5.0	N.D.
Trichloroethene	5.0	N.D.
Trichlorofluoromethane	5.0	N.D.
Vinyl chloride	10	N.D.

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

SEQUOIA ANALYTICAL

per Arthur G. Burton
Laboratory Director

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Kaprealian Engineering, Inc.	Client Project ID:	Unocal, Oakland, 3535 Pierson	Sampled:	Jul 5-6, 1990
P.O. Box 996	Sample Descript:	Soil, EB2 (16.5)	Received:	Jul 6, 1990
Benicia, CA 94510	Analysis Method:	EPA 5030/8010	Analyzed:	Jul 19, 1990
Attention: Mardo Kaprealian, P.E.	Lab Number:	007-1056	Reported:	Jul 31, 1990

HALOGENATED VOLATILE ORGANICS (EPA 8010)

Analyte	Detection Limit µg/kg	Sample Results µg/kg
Bromodichloromethane	5.0	N.D.
Bromoform	5.0	N.D.
Bromomethane	5.0	N.D.
Carbon tetrachloride	5.0	N.D.
Chlorobenzene	5.0	N.D.
Chloroethane	25	N.D.
2-Chloroethylvinyl ether	5.0	N.D.
Chloroform	5.0	N.D.
Chloromethane	5.0	N.D.
Dibromochloromethane	5.0	N.D.
1,2-Dichlorobenzene	10	N.D.
1,3-Dichlorobenzene	10	N.D.
1,4-Dichlorobenzene	10	N.D.
1,1-Dichloroethane	5.0	N.D.
1,2-Dichloroethane	5.0	N.D.
1,1-Dichloroethene	5.0	N.D.
Total 1,2-Dichloroethene	5.0	N.D.
1,2-Dichloropropane	5.0	N.D.
cis-1,3-Dichloropropene	5.0	N.D.
trans-1,3-Dichloropropene	5.0	N.D.
Methylene chloride	10	N.D.
1,1,2,2-Tetrachloroethane	5.0	N.D.
Tetrachloroethene	5.0	N.D.
1,1,1-Trichloroethane	5.0	N.D.
1,1,2-Trichloroethane	5.0	N.D.
Trichloroethene	5.0	N.D.
Trichlorofluoromethane	5.0	N.D.
Vinyl chloride	10	N.D.

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

SEQUOIA ANALYTICAL

for Arthur G. Burton
Laboratory Director

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Kaprealian Engineering, Inc.	Client Project ID:	Unocal, Oakland, 3535 Pierson	Sampled:	Jul 5-6, 1990
P.O. Box 996	Sample Descript:	Soil, EB2 (22)	Received:	Jul 6, 1990
Benicia, CA 94510	Analysis Method:	EPA 5030/8010	Analyzed:	Jul 19, 1990
Attention: Mardo Kaprealian, P.E.	Lab Number:	007-1057	Reported:	Jul 31, 1990

HALOGENATED VOLATILE ORGANICS (EPA 8010)

Analyte	Detection Limit µg/kg	Sample Results µg/kg
Bromodichloromethane	5.0	N.D.
Bromoform	5.0	N.D.
Bromomethane	5.0	N.D.
Carbon tetrachloride	5.0	N.D.
Chlorobenzene	5.0	N.D.
Chloroethane	25	N.D.
2-Chloroethylvinyl ether	5.0	N.D.
Chloroform	5.0	N.D.
Chloromethane	5.0	N.D.
Dibromochloromethane	5.0	N.D.
1,2-Dichlorobenzene	10	N.D.
1,3-Dichlorobenzene	10	N.D.
1,4-Dichlorobenzene	10	N.D.
1,1-Dichloroethane	5.0	N.D.
1,2-Dichloroethane	5.0	N.D.
1,1-Dichloroethene	5.0	N.D.
Total 1,2-Dichloroethene	5.0	N.D.
1,2-Dichloropropane	5.0	N.D.
cis-1,3-Dichloropropene	5.0	N.D.
trans-1,3-Dichloropropene	5.0	N.D.
Methylene chloride	10	N.D.
1,1,2,2-Tetrachloroethane	5.0	N.D.
Tetrachloroethene	5.0	N.D.
1,1,1-Trichloroethane	5.0	N.D.
1,1,2-Trichloroethane	5.0	N.D.
Trichloroethene	5.0	N.D.
Trichlorofluoromethane	5.0	N.D.
Vinyl chloride	10	N.D.

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

SEQUOIA ANALYTICAL

for Arthur G. Burton
Laboratory Director

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

Kaprealian Engineering, Inc.	Client Project ID:	Unocal, Oakland, 3535 Pierson	Sampled:	Jul 5-6, 1990
P.O. Box 996	Sample Descript:	Soil, EB2 (26.5)	Received:	Jul 6, 1990
Benicia, CA 94510	Analysis Method:	EPA 5030/8010	Analyzed:	Jul 19, 1990
Attention: Mardo Kaprealian, P.E.	Lab Number:	007-1058	Reported:	Jul 31, 1990

HALOGENATED VOLATILE ORGANICS (EPA 8010)

Analyte	Detection Limit µg/kg	Sample Results µg/kg
Bromodichloromethane	5.0	N.D.
Bromoform	5.0	N.D.
Bromomethane	5.0	N.D.
Carbon tetrachloride	5.0	N.D.
Chlorobenzene	5.0	N.D.
Chloroethane	25	N.D.
2-Chloroethylvinyl ether	5.0	N.D.
Chloroform	5.0	N.D.
Chloromethane	5.0	N.D.
Dibromochloromethane	5.0	N.D.
1,2-Dichlorobenzene	10	N.D.
1,3-Dichlorobenzene	10	N.D.
1,4-Dichlorobenzene	10	N.D.
1,1-Dichloroethane	5.0	N.D.
1,2-Dichloroethane	5.0	N.D.
1,1-Dichloroethene	5.0	N.D.
Total 1,2-Dichloroethene	5.0	N.D.
1,2-Dichloropropane	5.0	N.D.
cis-1,3-Dichloropropene	5.0	N.D.
trans-1,3-Dichloropropene	5.0	N.D.
Methylene chloride	10	N.D.
1,1,2,2-Tetrachloroethane	5.0	N.D.
Tetrachloroethene	5.0	N.D.
1,1,1-Trichloroethane	5.0	N.D.
1,1,2-Trichloroethane	5.0	N.D.
Trichloroethene	5.0	N.D.
Trichlorofluoromethane	5.0	N.D.
Vinyl chloride	10	N.D.

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

SEQUOIA ANALYTICAL

for Arthur G. Burton
Laboratory Director

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

Kaprealian Engineering, Inc.	Client Project ID:	Unocal, Oakland, 3535 Pierson	Sampled:	Jul 5-6, 1990
P.O. Box 996	Sample Descript:	Soil, EB2 (32)	Received:	Jul 6, 1990
Benicia, CA 94510	Analysis Method:	EPA 5030/8010	Analyzed:	Jul 19, 1990
Attention: Mardo Kapreallan, P.E.	Lab Number:	007-1059	Reported:	Jul 31, 1990

HALOGENATED VOLATILE ORGANICS (EPA 8010)

Analyte	Detection Limit µg/kg	Sample Results µg/kg
Bromodichloromethane	5.0	N.D.
Bromoform	5.0	N.D.
Bromomethane	5.0	N.D.
Carbon tetrachloride	5.0	N.D.
Chlorobenzene	5.0	N.D.
Chloroethane	25	N.D.
2-Chloroethylvinyl ether	5.0	N.D.
Chloroform	5.0	N.D.
Chloromethane	5.0	N.D.
Dibromochloromethane	5.0	N.D.
1,2-Dichlorobenzene	10	N.D.
1,3-Dichlorobenzene	10	N.D.
1,4-Dichlorobenzene	10	N.D.
1,1-Dichloroethane	5.0	N.D.
1,2-Dichloroethane	5.0	N.D.
1,1-Dichloroethene	5.0	N.D.
Total 1,2-Dichloroethene	5.0	N.D.
1,2-Dichloropropane	5.0	N.D.
cis-1,3-Dichloropropene	5.0	N.D.
trans-1,3-Dichloropropene	5.0	N.D.
Methylene chloride	10	N.D.
1,1,2,2-Tetrachloroethane	5.0	N.D.
Tetrachloroethene	5.0	N.D.
1,1,1-Trichloroethane	5.0	N.D.
1,1,2-Trichloroethane	5.0	N.D.
Trichloroethene	5.0	N.D.
Trichlorofluoromethane	5.0	N.D.
Vinyl chloride	10	N.D.

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

SEQUOIA ANALYTICAL

for Arthur G. Burton
Laboratory Director

KAPREALIAN ENGINEERING, INC.

CHAIN OF CUSTODY

PAGE 1 OF 2

SAMPLER: Wade Weston
WITNESSING AGENCY:

SITE NAME & ADDRESS: Unocal - Oakland
3535 Pierson ST.

ANALYSES REQUESTED: TPH-G, BTXE, TPH-D, TOG (503 D&E), 8010

TURN AROUND TIME: Regular

SAMPLE ID NO.	DATE	TIME	SOIL	WATER	GRAB	COMP	NO. OF CONT.	SAMPLING LOCATION	REMARKS
EB1-(4.5)	7/5/90		✓		✓		1	See Sample I.D. #	- HOLD
EB1-(8.5)	"		✓		✓		1		0071049
EB1-(13.5)	"		✓		✓		1		0071050
EB1-(18.5)	"		✓		✓		1		0071051
EB1-(23.5)	"		✓		✓		1		0071052
EB1-(28.5)	"		✓		✓		1		0071053
EB2-(4.5)	7/6/90		✓		✓		1		- HOLD
EB2-(9.5)	"		✓		✓		1		0071054
EB2-(12.5)	"		✓		✓		1	↓	0071055

Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Wade Weston	7-6-90 0900	T. Bolton
		Received by: (Signature) 7/9 10:30

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

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

Signature: [signature] Title: SR Date: 7/9/90

KAPREALIAN ENGINEERING, INC.

CHAIN OF CUSTODY

SAMPLER: Wade Weston
WITNESSING AGENCY:

SITE NAME & ADDRESS: Unocal - Oakland
3535 Pierson ST.

ANALYSES REQUESTED: TPH-G, BTXE, TPH-D, TOG (SDS Diff), 8010

TURN AROUND TIME: Regular

SAMPLE ID NO.	DATE	TIME	SOIL	WATER	GRAB	COMP	NO. OF CONT.	SAMPLING LOCATION	REMARKS
EB2-(16.5)	7/6/90		✓		✓		1	See Sample ID.#	0071056
EB2-(22)	"		✓		✓		1		0071057
EB2-(26.5)	"		✓		✓		1		0071058
EB2-(32)	"		✓		✓		1		0071059
EB2-(36)	"		✓		✓		1		-HOLD

Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Wade Weston	7-9-90 0900	T. Bolan
	7/9	10:30

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

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

Signature	Title	Date
	SR	7/9/90

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

Kaprealian Engineering, Inc.	Client Project ID:	Unocal, Oakland, 3535 Pierson St.	Sampled:	Jul 6, 1990
P.O. Box 996	Matrix Descript:	Water	Received:	Jul 9, 1990
Benicia, CA 94510	Analysis Method:	EPA 5030/8015/8020	Analyzed:	Jul 9, 1990
Attention: Mardo Kaprealian, P.E.	First Sample #:	007-1060 A-B	Reported:	Jul 23, 1990

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

Sample Number	Sample Description	Low/Medium B.P. Hydrocarbons µg/L (ppb)	Benzene µg/L (ppb)	Toluene µg/L (ppb)	Ethyl Benzene µg/L (ppb)	Xylenes µg/L (ppb)
0071060 A-B	EB1	N.D.	N.D.	1.5	N.D.	1.0
0071061 A-B	EB2	N.D.	0.61	1.5	N.D.	1.0
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
Project Manager

for

71060.KEI <1>

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

Kaprealian Engineering, Inc.	Client Project ID:	Unocal, Oakland, 3535 Pierson St.	Sampled:	Jul 6, 1990
P.O. Box 996	Matrix Descript:	Water	Received:	Jul 9, 1990
Benicia, CA 94510	Analysis Method:	EPA 3510/8015	Extracted:	Jul 12, 1990
Attention: Mardo Kaprealian, P.E.	First Sample #:	007-1060 E	Analyzed:	Jul 20, 1990
			Reported:	Jul 23, 1990

TOTAL PETROLEUM FUEL HYDROCARBONS (EPA 8015)

Sample Number	Sample Description	High B.P. Hydrocarbons µg/L (ppb)
0071060 E	EB1	6.7
0071061 E	EB2	N.D.

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.

SEQUOIA ANALYTICAL

Belinda C. Vega
Project Manager

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

Kaprealian Engineering, Inc.	Client Project ID:	Unocal, Oakland, 3535 Pierson St.	Sampled:	Jul 6, 1990
P.O. Box 996	Matrix Descript:	Water	Received:	Jul 9, 1990
Benicia, CA 94510	Analysis Method:	SM 503 A&E (Gravimetric)	Extracted:	Jul 10, 1990
Attention: Mardo Kaprealian, P.E.	First Sample #:	007-1060 F	Analyzed:	Jul 12, 1990
			Reported:	Jul 23, 1990

TOTAL RECOVERABLE PETROLEUM OIL

Sample Number	Sample Description	Oil & Grease mg/L (ppm)
0071060 F	EB1	N.D.
0071061 F	EB2	N.D.

Detection Limits:	5.0

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

SEQUOIA ANALYTICAL

Belinda C. Vega
Project Manager

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

Kaprealian Engineering, Inc.	Client Project ID:	Unocal, Oakland, 3535 Pierson St.	Sampled:	Jul 5, 1990
P.O. Box 996	Sample Descript:	Water, EB1	Received:	Jul 9, 1990
Benicia, CA 94510	Analysis Method:	EPA 5030/8010	Analyzed:	Jul 10, 1990
Attention: Mardo Kaprealian, P.E.	Lab Number:	007-1060 C-D	Reported:	Jul 23, 1990

HALOGENATED VOLATILE ORGANICS (EPA 8010)

Analyte	Detection Limit µg/L	Sample Results µg/L
Bromodichloromethane	1.0	N.D.
Bromoform	1.0	N.D.
Bromomethane	1.0	N.D.
Carbon tetrachloride	1.0	N.D.
Chlorobenzene	1.0	N.D.
Chloroethane	5.0	N.D.
2-Chloroethylvinyl ether	1.0	N.D.
Chloroform	0.50	N.D.
Chloromethane	0.50	N.D.
Dibromochloromethane	0.50	N.D.
1,2-Dichlorobenzene	2.0	N.D.
1,3-Dichlorobenzene	2.0	N.D.
1,4-Dichlorobenzene	2.0	N.D.
1,1-Dichloroethane	0.50	N.D.
1,2-Dichloroethane	0.50	N.D.
1,1-Dichloroethene	1.0	N.D.
Total 1,2-Dichloroethene	1.0	N.D.
1,2-Dichloropropane	0.50	N.D.
cis-1,3-Dichloropropene	5.0	N.D.
trans-1,3-Dichloropropene	5.0	N.D.
Methylene chloride	2.0	N.D.
1,1,2,2-Tetrachloroethane	0.50	N.D.
Tetrachloroethene	0.50	N.D.
1,1,1-Trichloroethane	0.50	N.D.
1,1,2-Trichloroethane	0.50	N.D.
Trichloroethene	0.50	N.D.
Trichlorofluoromethane	1.0	N.D.
Vinyl chloride	2.0	N.D.

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

SEQUOIA ANALYTICAL

for Belinda C. Vega
Project Manager

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

Kaprealian Engineering, Inc.	Client Project ID:	Unocal, Oakland, 3535 Pierson St.	Sampled:	Jul 5, 1990
P.O. Box 996	Sample Descript:	Water, EB2	Received:	Jul 9, 1990
Benicia, CA 94510	Analysis Method:	EPA 5030/8010	Analyzed:	Jul 10, 1990
Attention: Mardo Kaprealian, P.E.	Lab Number:	007-1061 C-D	Reported:	Jul 23, 1990

HALOGENATED VOLATILE ORGANICS (EPA 8010)

Analyte	Detection Limit µg/L	Sample Results µg/L
Bromodichloromethane	1.0	N.D.
Bromoform	1.0	N.D.
Bromomethane	1.0	N.D.
Carbon tetrachloride	1.0	N.D.
Chlorobenzene	1.0	N.D.
Chloroethane	5.0	N.D.
2-Chloroethylvinyl ether	1.0	N.D.
Chloroform	0.50	N.D.
Chloromethane	0.50	N.D.
Dibromochloromethane	0.50	N.D.
1,2-Dichlorobenzene	2.0	N.D.
1,3-Dichlorobenzene	2.0	N.D.
1,4-Dichlorobenzene	2.0	N.D.
1,1-Dichloroethane	0.50	N.D.
1,2-Dichloroethane	0.50	N.D.
1,1-Dichloroethene	1.0	N.D.
Total 1,2-Dichloroethene	1.0	N.D.
1,2-Dichloropropane	0.50	N.D.
cis-1,3-Dichloropropene	5.0	N.D.
trans-1,3-Dichloropropene	5.0	N.D.
Methylene chloride	2.0	N.D.
1,1,2,2-Tetrachloroethane	0.50	N.D.
Tetrachloroethene	0.50	N.D.
1,1,1-Trichloroethane	0.50	N.D.
1,1,2-Trichloroethane	0.50	N.D.
Trichloroethene	0.50	N.D.
Trichlorofluoromethane	1.0	N.D.
Vinyl chloride	2.0	N.D.

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

SEQUOIA ANALYTICAL

Belinda C. Vega
Project Manager

71060.KEI <5>

KAPREALIAN ENGINEERING, INC.

CHAIN OF CUSTODY

SAMPLER: Wade Weston

WITNESSING AGENCY:

SITE NAME & ADDRESS: Unocal- Oakland, 3535 Pierson ST.

TURN AROUND TIME: Regular

SAMPLE ID NO.	DATE	TIME	SOIL	WATER	GRAB	COMP	NO. OF CONT.	SAMPLING LOCATION	TPH-G	BTXE	TPH-D	TOG	8010	REMARKS
EB 1	7/5/90			✓	✓		2L 4Vo	Exploratory Boring	✓	✓	✓	✓	✓	007 1060
EB 2	7/6/90			✓	✓		2L 4Vo	" "	✓	✓	✓	✓	✓	007 1061

Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Wade Weston	7-9-90 0900	T. Bolan
	7/9 10:32	

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? Yes No
4. Were samples in appropriate containers and properly packaged? Yes

Signature: [signature] Title: SR Date: 7/9/90

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

KEI-P89-1204.P3
August 23, 1990

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

Attention: Mr. Rick Sisk

RE: Work Plan/Proposal
Unocal Service Station #5781
3535 Pierson Street
Oakland, California

I. INTRODUCTION

This work plan for Phase II subsurface investigation is prepared in accordance with requirements and format of the Tri-Regional "Regional Board Staff Recommendations for Initial Evaluation and Investigation of Underground Tanks". A copy of the guidelines is attached with this work plan. All work will be performed under the direct supervision of Mr. Don Braun, Certified Engineering Geologist #1310, Expiration Date 6/30/92.

A. Statement of Scope of Work

The scope of work in this work plan/proposal entails defining the extent of subsurface contamination at the site.

B. Site Location

The service station site occupies the northwest corner at the intersection of Pierson and MacArthur Streets in Oakland, California. A Location Map and Site Plans are attached.

C. Background

KEI's initial field work was conducted on December 14, 1989, when three underground storage tanks were removed from the site. The tanks consisted of two 10,000 gallon fuel storage tanks, and one 280 gallon waste oil tank. The fuel tanks were made of steel and no apparent holes or cracks were observed. However, the

waste oil tank had one hole of approximately 1.25 square inches.

Three soil samples, labeled A1, B1, and A2/B2, were taken from beneath the fuel tanks at a depth of about 12.5 feet. In addition, two soil samples, labeled SW1 and SW2, were collected from the fuel tank pit sidewalls at a depth of 10.5 feet. The fuel tank pit sidewalls were analyzed for total petroleum hydrocarbons (TPH) as gasoline and benzene, toluene, xylenes and ethylbenzene (BTX&E). Analyses of the samples by Sequoia Analytical Laboratory in Redwood City, California, indicate levels of TPH as gasoline ranging from non-detectable to 46 ppm, with non-detectable levels of BTX&E in all samples, except for samples A2/B2 and SW2, which showed benzene at 0.10 ppm and 0.65 ppm, respectively.

Also on December 14, 1989, one soil sample, labeled WO1, was collected from beneath the waste oil tank at a depth of 6 feet. The waste oil tank pit sample was analyzed by Sequoia Analytical Laboratory in Redwood City, California, for TPH as gasoline, BTX&E, TPH as diesel, total oil and grease (TOG), EPA method 8010 compounds and metals - cadmium, chromium, lead and zinc. The analytical results of soil sample WO1 indicated TPH as gasoline at 670 ppm, 5.4 ppm benzene, TPH as diesel at 8,300 ppm and TOG at 48,000 ppm. EPA method 8010 results showed 1,2-dichlorobenzene at 10 ppb, tetrachloroethene at 77 ppb, and 1,1,1-trichloroethane at 15 ppb. Metals concentrations were as follows: cadmium non-detectable; chromium 8.3 ppm, lead 340 ppm, and zinc 70 ppm.

On January 17, 1990, two soil samples, labeled P1 and P2, were collected from beneath the product pipe trenches at depths of 5.5 to 6.0 feet. Analyses of these samples by Sequoia Analytical indicate non-detectable levels of TPH as gasoline and BTX&E constituents for both samples. KEI recommended further soil excavation in the area of the waste oil tank, and the installation of three monitoring wells at the site, to begin to define the vertical extent of soil contamination, to determine the ground water flow direction, and to determine if the ground water has been impacted. Documentation of the soil sampling activities are presented in KEI's report (KEI-J89-1204.R2) dated February 9, 1990. The results of the laboratory analyses for the soil samples collected from under-

ground storage tanks and from pipe trenches are summarized in Table 1, and sample collection locations are shown on the attached Site Plan, Figure 1.

On February 22, 1990, KEI returned to the site to collect additional soil samples from the excavated waste oil tank pit. On this date, one soil sample, labeled WO1(16), was collected from beneath the waste oil tank at a depth of 16 feet. In addition, four soil samples, labeled SWA through SWD, were collected from the sidewalls of the waste oil tank pit excavation at depths of 9.0 to 10.0 feet. The lateral excavation was terminated due to the presence of underground sewer and gas lines on the south and west sides, and the existing building on the north side. A 12-inch diameter conductor casing was installed in the excavation at sample location WO1(16) prior to backfilling. Analytical results of sidewall soil sample SWB indicated non-detectable levels of all constituents analyzed, except for TPH as gasoline, which was 2.0 ppm. Analytical results of the soil sample, WO1(16), collected from the bottom of the excavation at a depth of 16 feet, indicate levels of TPH as gasoline at 15 ppm with 0.06 ppm benzene, 74 ppm TPH as diesel, 910 ppm TOG, and non-detectable levels of all 8010 compounds. Laboratory analyses of the remaining three sidewall samples, SWA, SWC and SWD, showed levels of TOG ranging from 4,100 ppm to 17,000 ppm, TPH as diesel ranging from 360 ppm to 1,400 ppm, TPH as gasoline ranging from 40 ppm to 220 ppm, with benzene levels from 0.31 to 2.3 ppm and non-detectable levels of all EPA method 8010 compounds except tetrachloroethene, which ranged from 40 ppb to 160 ppb. Sample SWD also showed 1,1,1-trichloroethane at 5.8 ppb. The results of the additional soil sampling activities are presented in KEI's report (KEI-P89-1204.R3) dated March 30, 1990. The laboratory analytical results of the soil samples, collected from the waste oil tank pit, are summarized in Table 2, and the locations of soil samples are shown on the attached Site Plan, Figure 2.

On April 9 and 10, 1990, three eight-inch diameter exploratory borings (designated as MW1, MW2 and MW3 on the attached Site Plan, Figure 3) were drilled at the site. The borings were drilled to total depths ranging from 40 to 50 feet. Ground water was not encountered during drilling activities. The borings were observed for ground water accumulation for a period of up to 15 hours prior to backfilling with neat cement. Soil

samples were collected for laboratory analysis and lithologic logging purposes at a maximum spacing of 5 foot intervals, changes in lithology, and obvious areas of contamination, beginning at a depth of approximately 5 feet below grade until the borings were terminated. Each boring was fully backfilled with neat cement placed with a tremie pipe from the total depth drilled up to the surface. The borings were not converted to monitoring wells because ground water was not encountered.

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, samples collected from MW1 were analyzed for TPH as diesel by EPA method 3550 in conjunction with modified 8015, for TOG by EPA 418.1 with clean up, and for EPA method 8010 compounds.

Analytical results of all of the soil samples, collected from the borings (MW1, MW2 and MW3), indicate non-detectable levels of TPH as gasoline and BTX&E in all soil samples. In boring MW1, TPH as diesel, TOG and EPA 8010 compounds were non-detectable in all samples. Results of the soil analyses are summarized in Table 3.

Due to the confirmed soil contamination in the vicinity of the waste oil tank pit, and in order to determine the lateral and vertical extent of the soil contamination, KEI recommended that three additional exploratory borings be drilled closely adjacent to the former waste oil tank pit to a maximum depth of 50 feet. Details of the exploratory boring drilling and sampling activities are summarized in KEI's report (KEI-P89-1204.R6) dated May 21, 1990.

On July 5 & 6, 1990, two exploratory borings (designated as EB1 and EB2 on the attached Site Plan, Figure 3) were drilled at the site. A third proposed boring could not be drilled as originally proposed within the conductor casing in the waste oil tank pit due to drill rig access limitation with the roof overhang.

The two borings were drilled to depths of 34.5 to 38 feet. Ground water was encountered at depths of 33.5 to approximately 36.7 feet beneath the surface. Drilling was stopped about 1 to 1.5 feet after inter-

secting the first water table. After the water samples were collected, the borings were backfilled to the surface using a 9-sack sand slurry.

Soil sample analyses from the borings EB1 and EB2 show non-detectable levels of TPH as gasoline, TPH as diesel and BTX&E in all soil samples, except EB2(9.5), which showed a level of TPH as gasoline at 1.2 ppm, and sample EB2(12.5), which showed a level of benzene at 0.0090 ppm. Also, TOG and EPA method 8010 compounds were non-detectable, except for sample EB1(28.5), which showed a level of 1,1,1-trichloroethane at 6.2 ppb.

Water sample analyses (grab samples) show non-detectable levels of TPH as gasoline, TPH as diesel, benzene, TOG, and EPA method 8010 compounds, except in sample EB1 which showed a level of TPH as diesel at 6.7 ppb, and sample EB2 which showed a level of benzene at 0.61 ppb.

II. SITE DESCRIPTION

A. Vicinity Description and Hydrogeologic Setting

The subject site is developed and consists of a Unocal Service Station. The station occupies the northwest corner at the intersection of Pierson Street with MacArthur Boulevard in Oakland, California. In addition, the site is situated southwest of and adjacent to the Highway 580 off-ramp for MacArthur Boulevard. The site is located near the base of a east-northeast trending hillside area on relatively gently sloping developed property. A Location Map and three Site Plans are attached to this report.

Ground water was encountered in borings EB1 at a depth of 33.5 feet and in boring EB2 at a depth of about 37.7 feet. However, ground water was not encountered in borings MW1, MW2 nor MW3, where they were drilled to depths between 40 and 50 feet.

Based on review of regional geologic maps ("Areal and Engineering Geology of the Oakland East Quadrangle, California" by Dorothy H. Radbruch (1969) in U.S.G.S. Map GQ-769; and "Map Showing Recently Active Breaks Along the Hayward Fault Zone and the Southern Part of the Calaveras Fault Zone, California" by Dorothy H. Radbruch-Hall (1974) in U.S.G.S. Map I-813), the subject site is underlain by undivided Quaternary

deposits (Qu) and is closely adjacent to a mapped geologic contact with the upper member of the Quaternary San Antonio Formation (Qsu). In addition, the site is situated approximately 1,200 to 2,800 feet southwest of mapped splays of the active Hayward Fault Zone.

The results of our subsurface study indicate that the site is generally underlain by very stiff clay and silty clay to the maximum depth explored (50 feet). Locally, interbedded zones of clayey gravel, well-to-poorly-graded gravel, clayey sand, and silt beds were encountered in each boring to depths below grade of about 22-1/2, 20 and 14-1/2 feet in borings MW1, MW2 and MW3, respectively, and extending to depths of only 6 and 5 feet in borings EB1 and EB2, respectively. However, in boring EB2, a clayey silt bed was encountered between depths of 29.5 to about 34.5 feet, and is in turn underlain by a clayey sand bed to the maximum depth explored (38 feet).

B. & C. Vicinity Map

A Location Map and Site Plans showing various features of the site are attached with this work plan. Figure 2 shows the locations of subsurface utilities, the former tank locations and affiliated piping.

III. PLAN FOR DETERMINING EXTENT OF SOIL CONTAMINATION ON-SITE

A. Method/Technique for Determining Extent of Contamination within the Excavation

The extent of contamination was determined within the excavation by collecting soil samples from the bottom and sidewalls of the pit as described in section I. C. above.

B. 2. KEI proposes the installation of one monitoring well to determine if ground water has been impacted (see the attached Site Plan, Figure 3).

IV. PLAN FOR DETERMINING GROUND WATER CONTAMINATION

A. Placement and Rationale for Location of Monitoring Wells

To determine if ground water has been impacted, KEI proposes the installation of one monitoring well.

B. Drilling Method for Construction of Monitoring Wells, including Decontamination Procedures

KEI proposes to install one two-inch diameter monitoring well using truck mounted eight-inch outside diameter hollow stem auger drilling equipment. Permits will be obtained from the Alameda County Department of Environmental Health and or other regulatory agencies as necessary prior to beginning work.

The wells will be drilled 10 to 15 feet into the saturated zone of the first encountered ground water unless a 5 foot thick clay aquitard is encountered first, at which time drilling will be terminated.

Soil samples will be collected at a maximum spacing of 5 foot intervals, at changes in lithology, at any areas of obvious contamination and at the soil/water interface beginning at a depth of approximately 5 feet below grade. Sampling for laboratory analysis will continue until the first water table is encountered. Sampling for lithologic logging purposes only will continue to the total depth drilled. Classification of soil will be done using the Unified Soil Classification System (USCS) by KEI's field engineer or geologist. Samples will be collected in a California modified split-spoon sampler with two-inch diameter brass liners. The sampler will be advanced ahead of the drilling augers at designated depths by dropping a 140 pound hammer 30 inches. Blow counts will be recorded. The samples will be removed from the sampler, retained in the brass liners, and sealed with aluminum foil, plastic caps and tape. They will be labeled and stored in a cooler on ice for delivery to a state certified laboratory. However, since soil samples collected from EB1, adjacent to the proposed monitoring well, were analyzed previously, one soil sample at the soil/water interface only will be analyzed at this time.

California modified split-spoon samplers and brass tubes will be decontaminated prior to each use with a trisodium phosphate solution wash followed by a clean water rinse. Hollow stem augers will be steam cleaned prior to each use. Steam cleaning will be performed on visqueen. Water from the steam cleaning will be contained on the visqueen and placed in DOT-approved 55-gallon drums, pending appropriate disposal. The wells will be constructed in the following manner:

Casing Type: Schedule 40 PVC, flush threaded joints, 0.01 inch factory slot, two-inch diameter. Screen to run from total depth of the well to approximately 5 feet above first encountered ground water. Monterey sand (#2/16) will fill the annular space from total depth to 2 feet above the screened interval. A two foot thick bentonite seal will be placed in the annular space on top of the sand pack. Neat cement will be poured from the top of the bentonite seal to the surface.

The well casing will be secured with a waterproof cap and a padlock. A round, watertight, flush-mounted well cover will be concreted in place over the top of the casing. A typical well construction diagram is attached to this work plan.

Drilled cuttings will be stored under visqueen, until appropriate disposal can be determined.

The well will be developed using a surface pump approximately one week after well completion. Wells will be pumped until expelled water is clear and free of turbidity. Effluent generated during well development will be contained in barrels and hauled from the site by a licensed hazardous waste hauler.

C. Ground Water Sampling Plans

The well will be checked for depth to the water table, the presence of free product and sheen (using an interface probe and/or paste tape) prior to both development and sampling. The water level will be measured with an electronic sounder or paste tape.

The well will be purged with a surface bailer of a minimum of four casing volumes prior to sampling, at least 72 hours after development. Samples will be collected using a clean Teflon bailer and will be promptly decanted into 40 ml VOA vials and/or one liter amber bottles as appropriate. Vials and/or bottles will be sealed with Teflon-lined screw caps, labeled and stored in a cooler on ice for delivery to a state certified laboratory. Properly executed chain of custody documentation will accompany all samples. The sampling bailer will be cleaned with soap and a clean water rinse prior to each use.

One soil sample at the soil/water interface and the water sample will be analyzed by Sequoia Analytical Laboratory in Redwood City, California, a state certified laboratory, for TPH as gasoline using EPA method 5030 in conjunction with modified 8015, BTX&E using EPA method 8020, for TPH as diesel using EPA method 3550 in conjunction with modified 8015, for TOG using methods 503D&E and 503A&E, and for purgeable halocarbons by EPA method 8010, as recommended by the RWQCB, and specified in the Tri-Regional guidelines.

Analytical results will be presented in tabular form, showing sample depths, results and detection limits. The results will be used to delineate the vertical and lateral extent of the subsurface contaminants. A cross sectional profile will be constructed as appropriate showing subsurface lithology to depth drilled and first water table depth.

If petroleum hydrocarbons in excess of action levels, as set by the regulatory agencies, are found in the soil during well installation, additional monitoring wells and/or borings will be proposed and installed until zero-lines for soil and ground water contamination are defined.

A report documenting field activities and sample results will be submitted within 45 days after the completion of the field work. The report will set out the collected information in an orderly fashion, and include any recommendations for additional needed work.

Sincerely,

Kaprealian Engineering, Inc.

Don R Braun

Don R. Braun
Certified Engineering Geologist

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

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Attachments: Tables 1 through 5
Guidelines for Work Plan Preparation
Location Map
Site Plans - Figures 1, 2 & 3
Well Construction Diagram

KEI-P89-1204.P3
August 23, 1990

TABLE 1

SUMMARY OF LABORATORY ANALYSES
SOIL

(Samples collected on December 14, 1989
and January 17, 1990)

Sample	Depth (feet)	TPH as Gasoline	Benzene	Toluene	Xylenes	Ethylbenzene
A1	12.5	3.5	ND	ND	ND	ND
B1	12.5	ND	ND	ND	ND	ND
A2/B2	12.5	5.8	0.10	ND	ND	ND
SW1	10.5	15	ND	ND	ND	ND
SW2	10.5	46	0.65	ND	ND	ND
P1	5.5	ND	ND	ND	ND	ND
P2	6.0	ND	ND	ND	ND	ND
WO1*	6	670	5.4	15	17	2.3
Detection Limits		1.0	0.05	0.1	0.1	0.1

* All EPA method 8010 compounds were non-detectable, except 1,2-dichlorobenzene at 10 ppb, tetrachloroethene at 77 ppb, and 1,1,1-trichloroethane at 15 ppb. Metals concentrations were as follows: cadmium non-detectable, chromium 8.3 ppm, lead 340 ppm, and zinc 70 ppm. TPH as diesel showed 8,300 ppm, and TOG showed 48,000 ppm.

ND = Non-detectable.

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

KEI-P89-1204.P3
August 23, 1990

TABLE 2

SUMMARY OF LABORATORY ANALYSES
SOIL

(Samples collected on February 22, 1990)

Sample	Depth (feet)	TOG	TPH as Diesel	TPH as Gasoline	Benzene	Toluene	Xylenes	Ethyl-benzene
*WO1(16)	16.0	910	74	15	0.060	ND	2.0	0.10
**SWA	9.0	17,000	1,400	220	2.3	2.1	23	7.3
*SWB	10.0	ND	ND	2.0	ND	ND	ND	ND
***SWC	10.0	4,100	460	63	0.31	0.33	2.2	1.3
****SWD	10.0	6,400	360	40	0.32	ND	4.0	0.49
Detection Limits		50	1.0	1.0	0.05	0.10	0.10	0.10

* All EPA method 8010 compounds were non-detectable.

** All EPA method 8010 compounds were non-detectable, except tetrachloroethene at 160 ppb.

*** All EPA method 8010 compounds were non-detectable, except tetrachloroethene at 56 ppb.

**** All EPA method 8010 compounds were non-detectable, except tetrachloroethene at 40 ppb and 1,1,1-trichloroethane at 5.8 ppb.

ND = Non-detectable.

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

KEI-P89-1204.P3
August 23, 1990

TABLE 3

SUMMARY OF LABORATORY ANALYSES
SOIL

(Collected on April 9 and 10, 1990)

Sample Number	Depth (feet)	TPH as Diesel	TPH as Gasoline	Benzene	Toluene	Xylenes	Ethyl-benzene
MW1(5)*	5	ND	ND	ND	ND	ND	ND
MW1(9.5)*	9.5	ND	ND	ND	ND	ND	ND
MW1(15)*	15	ND	ND	ND	ND	ND	ND
MW1(20)*	20	ND	ND	ND	ND	ND	ND
MW1(25)*	25	ND	ND	ND	ND	ND	ND
MW1(30)*	30	ND	ND	ND	ND	ND	ND
MW1(35)*	35	ND	ND	ND	ND	ND	ND
MW1(40)*	40	ND	ND	ND	ND	ND	ND
MW1(45)*	45	ND	ND	ND	ND	ND	ND
MW1(50)*	50	ND	ND	ND	ND	ND	ND
MW2(5)	5	ND	ND	ND	ND	ND	ND
MW2(10)	9.5	ND	ND	ND	ND	ND	ND
MW2(12)	12	ND	ND	ND	ND	ND	ND
MW2(15)	15	ND	ND	ND	ND	ND	ND
MW2(20)	20	ND	ND	ND	ND	ND	ND
MW2(25)	25	ND	ND	ND	ND	ND	ND
MW2(30)	30	ND	ND	ND	ND	ND	ND
MW2(35)	35	ND	ND	ND	ND	ND	ND
MW2(40)	39.5	ND	ND	ND	ND	ND	ND
MW3(5)	5	ND	ND	ND	ND	ND	ND
MW3(10)	10	ND	ND	ND	ND	ND	ND
MW3(15)	15	ND	ND	ND	ND	ND	ND
MW3(20)	20	ND	ND	ND	ND	ND	ND
MW3(25)	25	ND	ND	ND	ND	ND	ND
MW3(30)	30	ND	ND	ND	ND	ND	ND
MW3(35)	35	ND	ND	ND	ND	ND	ND
MW3(40)	40	ND	ND	ND	ND	ND	ND
Detection Limits		1.0	1.0	0.0050	0.0050	0.0050	0.0050

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

ND = Non-detectable.

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

KEI-P89-1204.P3
August 23, 1990

TABLE 4

SUMMARY OF LABORATORY ANALYSES
SOIL

(Collected on July 5 & 6, 1990)

Sample Number	TPH as Diesel	TPH as Gasoline	Benzene	Toluene	Xylenes	Ethyl-benzene
EB1(8.5)*	ND	ND	ND	0.014	0.0056	ND
EB1(13.5)*	ND	ND	ND	0.015	ND	ND
EB1(18.5)*	ND	ND	ND	0.017	0.024	0.011
EB1(23.5)*	ND	ND	ND	0.011	ND	ND
EB1(28.5)*	ND	ND	ND	0.012	ND	ND
EB2(9.5)*	ND	1.2	ND	0.038	0.016	0.012
EB2(12.5)*	ND	ND	0.0090	0.025	0.0060	ND
EB2(16.5)*	ND	ND	ND	0.021	0.0050	ND
EB2(22)*	ND	ND	ND	0.020	ND	ND
EB2(26.5)*	ND	ND	ND	0.017	ND	ND
EB2(32)	ND	ND	ND	ND	ND	ND
Detection Limits	1.0	1.0	0.0050	0.0050	0.0050	0.0050

* TOG and all EPA 8010 compounds were non-detectable, except 1,1,1-trichloroethane at 6.2 ppb in EB1(28.5).

ND = Non-detectable.

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

KEI-P89-1204.P3
August 23, 1990

TABLE 5

SUMMARY OF LABORATORY ANALYSES
WATER

(Collected on July 6, 1990)

Sample Number	TPH as Diesel	TPH as Gasoline	Benzene	Toluene	Xylenes	Ethylbenzene
EB1*	6.7	ND	ND	1.5	1.0	ND
EB2*	ND	ND	0.61	1.5	1.0	ND
Detection Limits	50	30	0.3	0.3	0.3	0.3

* TOG and EPA 8010 compounds were non-detectable.

ND = Non-detectable.

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

Appendix A

Workplan for Initial Subsurface Investigation

There are a large number of initial site investigations related to unauthorized releases of fuel products. The number of workplans and reports to be reviewed and approved require that these documents have uniform organization and content. The purpose of this appendix as to present an outline to be followed by professional engineering or geologic consultants in preparing workplans to be submitted for approval to the Regional Board and local agencies.

A statement of qualifications and registration number for the California registered engineer and/or registered geologist responsible for the project will need to be included with the submitted workplan and reports.

This appendix should be referred to in context with the "Regional Board Staff Recommendations for Initial Evaluation and Investigation of Underground Tanks".

PROPOSAL AND REPORT FORMAT

I. Introduction

A. Statement of Scope of Work

B. Site location

C. Background

D. Site History

1. Brief description of the type of business and associated activities that take place at the site, including the number and capacity of operating tanks.

2. Description of previous businesses at the site.

3. Complete description of tank activities, tank contents, and tank removal.

a. number of underground tanks, uses, etc. (include the volume of each tank, construction material, and tank condition)

b. Date of tank removal and condition of tank.

c. Description of all waste removal, including copies of all manifests.

d. Filing status and copy of unauthorized release form, if not previously submitted.

e. Previous tank testing results and date. Include discussion of inventory reconciliation methods and results for previous three years.

f. Estimate of the total quantity of product lost.

4. Other spill, leak and accident history at the site, including any previously removed tanks.

5. Describe any previous subsurface work at the site or adjacent sites.

II. Site Description

A. Vicinity description and hydrogeologic setting.

B. Vicinity map (including wells located on-site or on adjoining lots, as well as any nearby streams).

C. Site map to include:

1. Adjacent streets.

2. Site building locations.

3. Tank locations.

4. Island locations and piping to pumps from tanks.

5. Any known subsurface conduits, underground utilities. etc.

D. Existing soil contamination and excavation results.

1. Provide sampling procedures used.

2. Indicate depth to groundwater, if encountered.

3. Describe soil strata encountered in excavation.

4. Provide results in tabular form and location of all soil sampling (and water sampling if appropriate). The date sampled, the identity of the sampler, and signed laboratory data sheets need to be included.*

5. Identify underground utilities

6. Describe any unusual problems encountered.

7. Completely describe methods for storing and disposal of all contaminated soil.

8. Reference all required permits, including those issued by the Air Quality Management District and local underground tank permitting agency.

III. Plan for determining extent of soil contamination on site.

A. Describe method/technique for determining extent of contamination within the excavation.

B. Describe sampling methods and procedures to be used.

1. If a soil gas survey is planned, then:

a. Identify number of boreholes, location, sampling depth, etc.

b. Identify subcontractors, if any

c. Identify methods or techniques used for analysis

d. Provide quality assurance plan for field testing

2. If soil borings are to be used to determine the extent of soil contamination, then,

a. Identify number and location (mapped) of proposed borings.

b. Describe depth of borings

c. Describe soil classification system, soil sampling method and rationale
d. Describe boring drilling method, including decontamination procedures.

e. Describe boring abandonment method

C. Describe method and criteria for screening clean versus contaminated soil, including a complete description of procedures to be used for storing and disposal of any excavated soil. If on-site soil aeration is to be utilized, then a complete description of the treatment method is required:

1. Volume and rate of aeration/turning

2. Method of containment and cover

3. Wet weather contingency plans

Other on-site treatments (such as bioremediation requires permits issued by the Regional Board. Off-site storage or treatment also requires permits issued by the Regional Board.

D. Security measures planned for excavated hole and contaminated soil (i.e., six foot fence around hole, ripped up piping, spoil piles, etc.)

IV. Plan for determining groundwater contamination.

Construction and placement of wells should adhere to the requirements of the "Regional Board Staff Recommendations for Initial Evaluation and Investigation of Underground Tanks", June, 1988. If the verified downgradient location has been established, then a complete description of the rationale must be provided.

A. Placement and rationale for location of monitoring wells, including a map to scale.

B. Drilling method for construction of monitoring wells, including decontamination procedures.

1. Expected depth and diameter of monitoring wells

2. Date of expected drilling

3. Method and location of soil sampling of borings

4. Casing type, diameter, screen interval, and pack and slot sizing technique

5. Depth and type of seal

6. Construction diagram for wells

7. Development method and criteria for determination of adequacy of development

8. Plans for disposal of cuttings and development water

9. Surveying plans for wells (requirements include surveying to established benchmark to 0.01 foot)

C. Groundwater sampling plans (include plans for sampling and on-site domestic wells)*

1. Water level measurement procedure

2. Methods for free product measurement, observation of sheen and odor

3. Well purging procedures

4. Well purge water disposal plans

5. Sample collection procedures

6. Sample analyses to be used

7. Quality assurance plan

8. Chain of custody procedures

V. Include a site safety plan

A report will need to be submitted following collection of the information proposed and approved in the workplan. The report should set out the collected information in an orderly fashion and include any recommendations for additional needed work.

* Signed laboratory data sheets need to be submitted which include the laboratory's assessment of the condition of the samples (i.e., cool, warm, etc; air bubbles present/absent in VOA vials; and suitable container type)

November, 1989

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Consulting Engineers
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LOCATION MAP

Unocal Service Station #5781
3535 Pierson Street
Oakland, California

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P.O. BOX 996 • BENICIA, CA 94510
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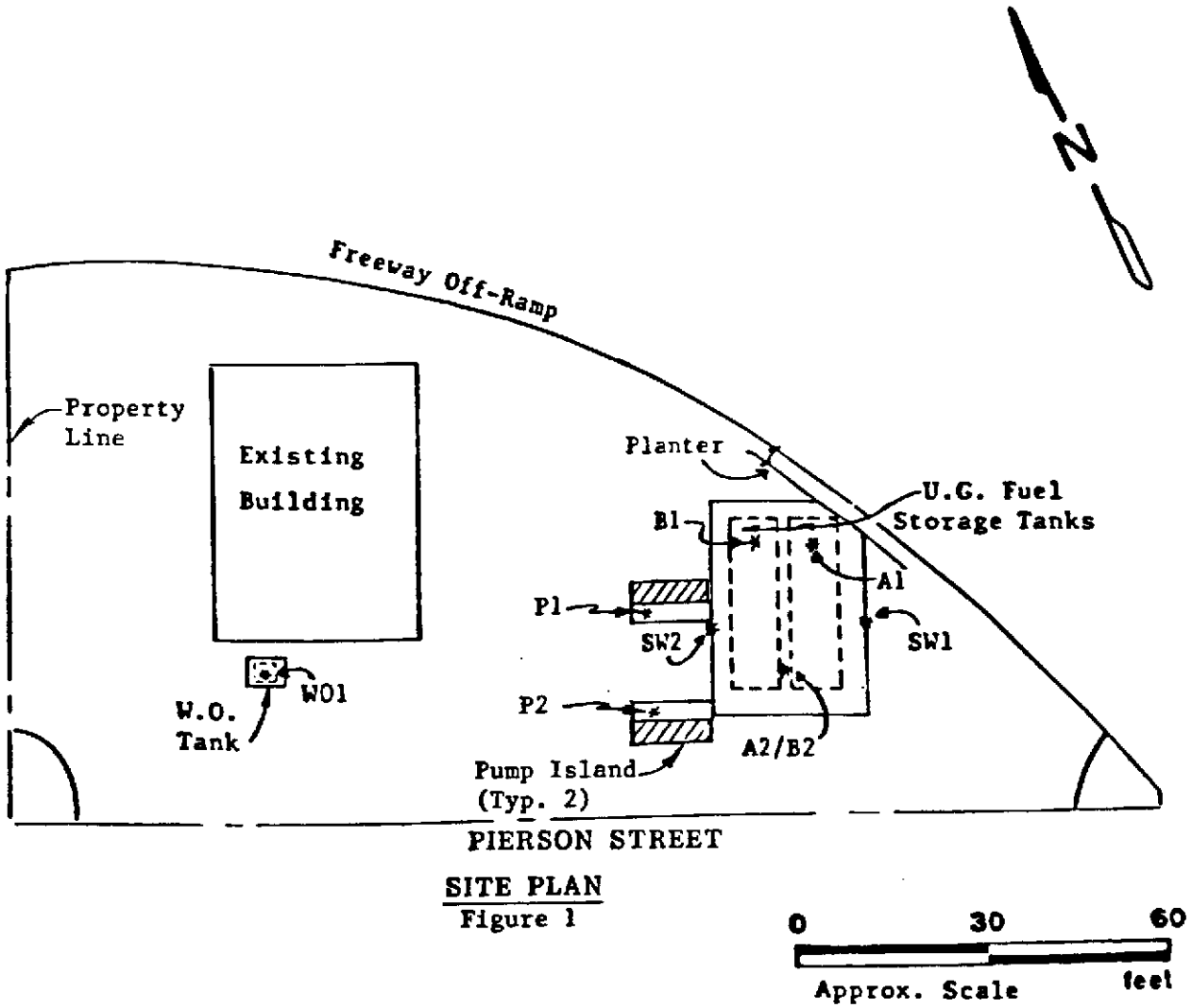

SITE PLAN
Figure 1

LEGEND

* Sample Point Location

Unocal Service Station #5781
3535 Pierson Street
Oakland, California

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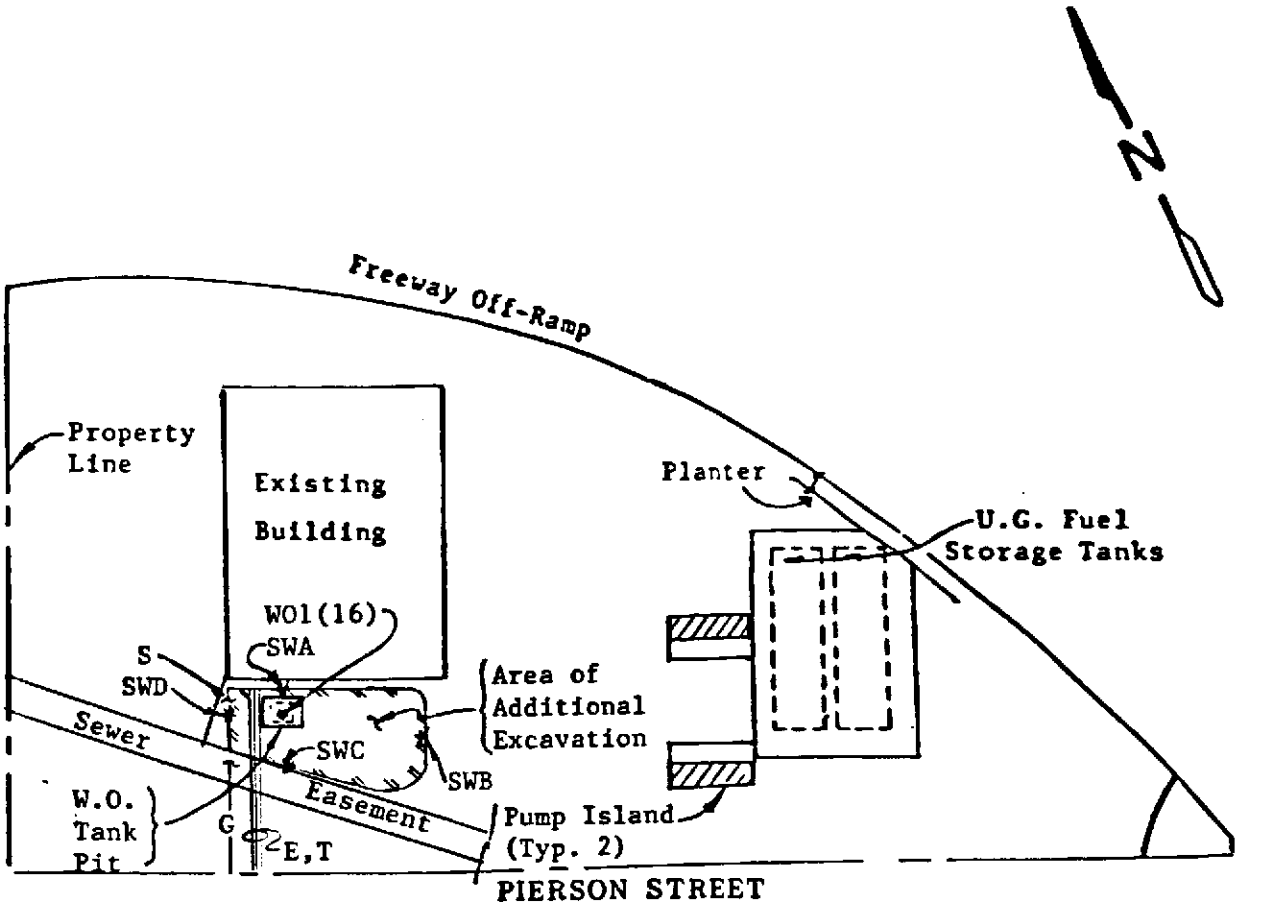

SITE PLAN
Figure 2

0 30 60
Approx. Scale feet

LEGEND

* Sample Point Location
E Electrical
T Telephone
G Natural Gas
S Sewer

Unocal Service Station #5781
3535 Pierson Street
Oakland, California

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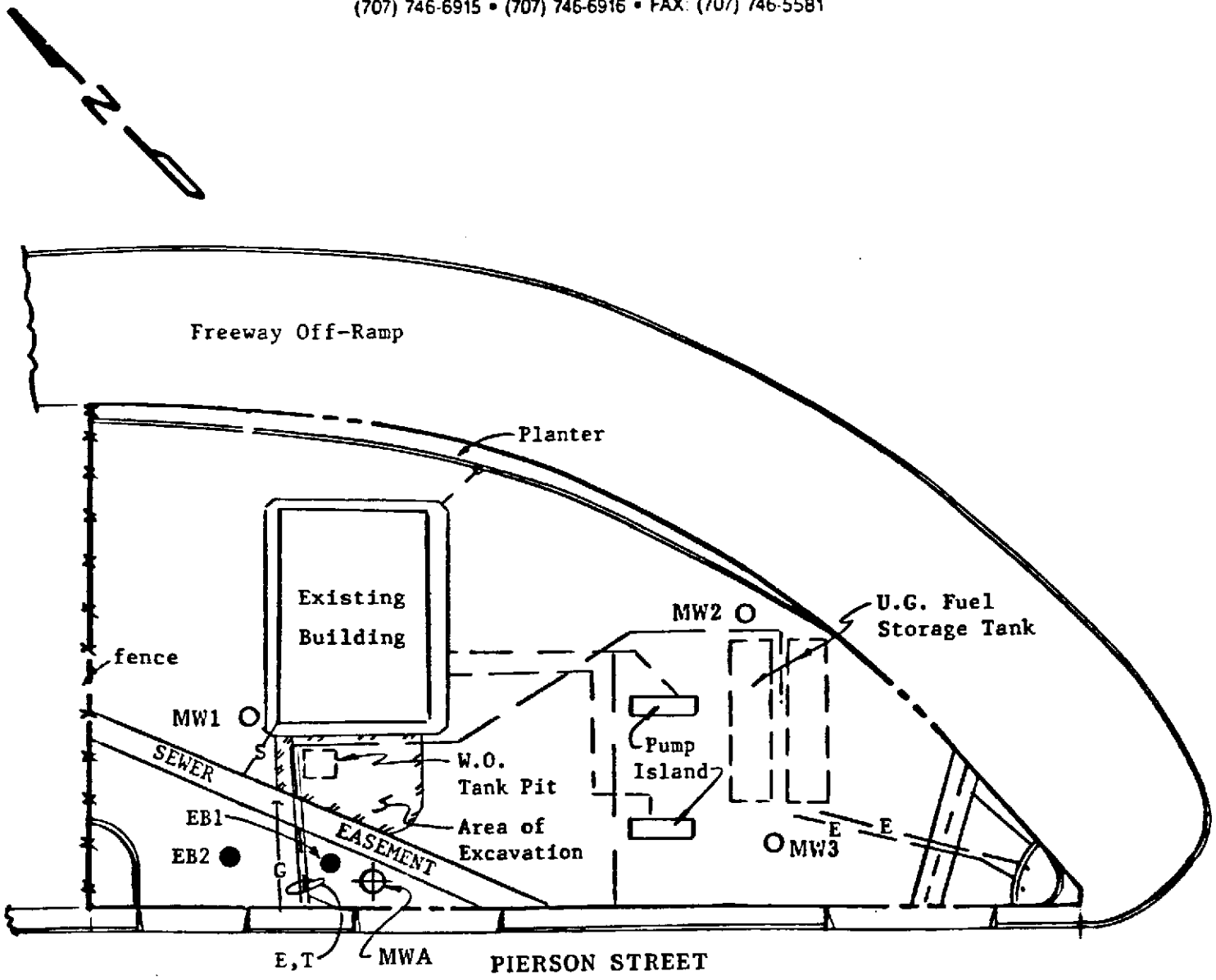


SITE PLAN
Figure 3

0 30 60
Approx. Scale feet

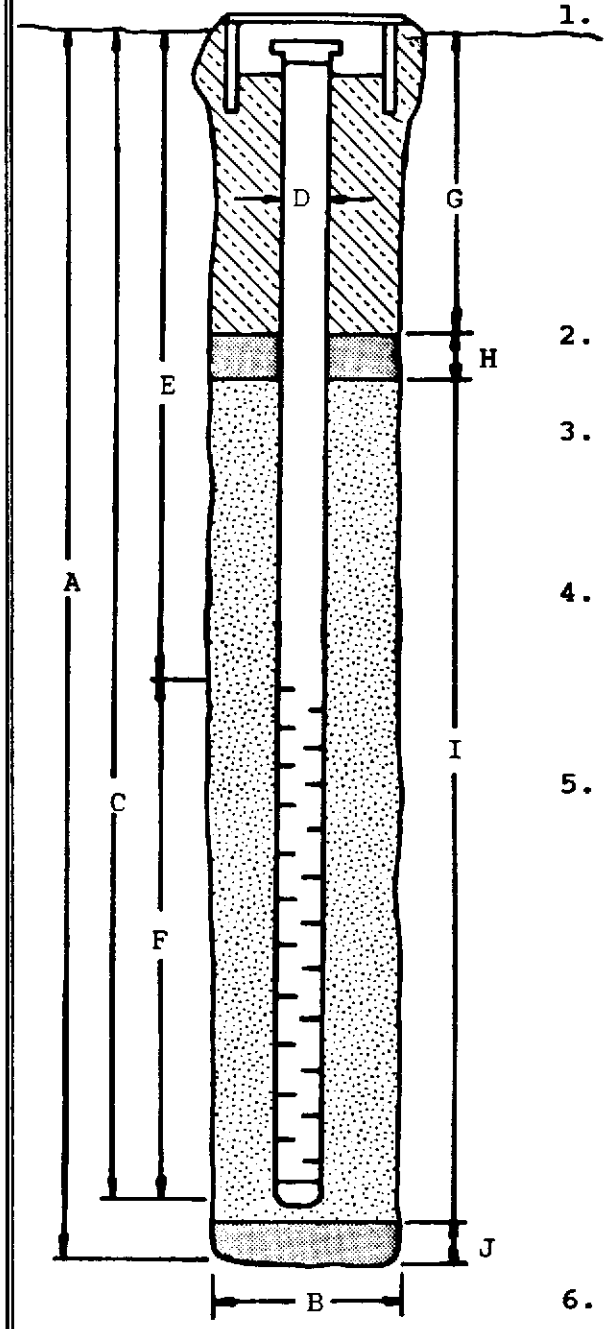
LEGEND

- ● Exploratory Boring (drilled 7/5 & 7/6/90)
- E U.G. Electrical Line
- T U.G. Telephone Line
- G U.G. Natural Gas Line
- S U.G. Sewer Line
- ○ Exploratory Boring (drilled 4/9 & 4/10/90)
- ⊕ Monitoring Well (proposed)

Unocal Service Station #5781
3535 Pierson Street
Oakland, California

WELL COMPLETION DIAGRAM
(SCHEMATIC)

Flush-mounted Well Cover



WELL DETAILS*

1. Well will be terminated 10 to 15 feet into first ground water unless a five foot thick aquitard is encountered below the water table, in which case the aquitard will be backfilled with bentonite pellets and the well terminated at the top of this aquitard [A].
2. Boring diameter [B] is 9 inches for 2 inch wells and 12 inches for 4 inch wells.
3. Perforated interval [F] will extend from bottom of casing to five feet above first ground water table (unless water <5 feet deep).
4. Schedule 40, PVC casing, 2 inch in diameter [D], will be used [C]. Screen is 0.020 or 0.010 inch factory machined slots, depending on filter pack grain size.
5. Filter pack will be placed from bottom of casing to two feet above perforated interval [I]. (Bottom seal [J] is not installed unless required.) Two feet of bentonite [H] will be placed above the filter pack. Concrete grout [G] will be placed from top of bentonite seal to the surface (unless modified due to shallow water). Blank casing [E] will extend from the top of the perforated casing to the top of the hole.
6. The well will be installed with a waterproof cap, padlock and a flush-mounted well cover.

* See text for additional information.