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KEI-P89-0801.QR6
November 25, 1991

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

Attention: Mr. Ron Bock

RE: Quarterly Report
Unocal Service Station #6034
4700 First Street
Livermore, California

Dear Mr. Bock:

This report presents the results of the most recent quarter of monitoring and sampling of the monitoring wells at the referenced site by Kaprealian Engineering, Inc. (KEI), per KEI's proposal KEI-P89-0801.P3 dated January 31, 1991. The wells are currently monitored monthly and sampled on a quarterly basis. This report covers the work performed by KEI from August through October, 1991.

SITE DESCRIPTION AND BACKGROUND

The subject site is presently used as a gasoline station. The subject site is situated on gently sloping, northwest trending topography, and is located adjacent to and northeast of the drainage channel for Arroyo Seco. In addition, the site is located approximately 9,000 feet northwest of the Lawrence Radiation Laboratory and the University of California. BP and Chevron service stations are located to the south and southeast of the Unocal site. A Location Map, Site Plans, and Site Vicinity Map are attached to this report.

KEI's initial work at the site began on August 2, 1989, when KEI was asked to collect soil samples from beneath two 12,000 gallon gasoline storage tanks and one waste oil tank during their replacement. The tanks were made of steel, and no apparent holes or cracks were observed in the tanks. Six soil samples (designated as A1, A2, A3, B1, B2, and B3) were collected from beneath the fuel tanks at depths of 15 to 16 feet below grade, and one soil sample, labeled WO1, was collected from beneath the waste oil tank at a depth of 8.5 feet below grade. KEI returned to the site on August 7, 1989, in order to collect soil samples from the product pipe trenches. Seven soil samples, labeled P1 through P7, were collected from the pipe trenches at depths ranging from 2.5 to 3.5 feet below grade. Ground water was encountered in the fuel tank

pit at a depth of 17.5 feet below grade during subsequent excavation of contaminated soil from the location where sample A3 was collected. Locations of soil samples are shown on the attached Site Plan, Figure 2. One ground water sample, labeled W1, was collected from the excavated pit.

All 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). In addition, the sample collected from beneath the waste oil tank was analyzed for TPH as diesel, total oil and grease (TOG), and EPA methods 8010 and 8270 compounds. Analytical results of the soil samples collected from the fuel tank pit and pipe trenches indicated levels of TPH as gasoline ranging from non-detectable to 9.6 ppm for all samples, except for sample A3, which showed 390 ppm. However, the area below sample A3 was excavated to the depth of the water table. The soil sample collected from beneath the waste oil tank showed non-detectable levels of all constituents analyzed, except for TPH as diesel at 1.4 ppm. Analytical results of the water sample collected from the fuel tank pit showed 47,000 ppb of TPH as gasoline, and 260 ppb of benzene. Results of the soil analyses are summarized in Table 5, and results of the water sample are summarized in Table 6. Documentation of the tank and piping removal procedures, sample collection techniques, and analytical results are provided in KEI's report (KEI-J89-0801.R2) dated August 15, 1989. Based on the sample results, KEI recommended the installation of four monitoring wells.

On October 25 and 26, 1989, four two-inch diameter monitoring wells (designated as MW1, MW2, MW3, and MW4 on the attached Site Plan, Figure 1, and Site Vicinity Map, Figure 3) were installed at the site. The monitoring wells were drilled and completed to total depths ranging from 26 to 28.5 feet below grade. Ground water was encountered at depths ranging from 14.5 to 17.5 feet beneath the surface during drilling. The wells were developed on November 3 and 9, 1989, and were initially sampled on November 18, 1989. Water and selected soil samples were analyzed at Sequoia Analytical Laboratory in Redwood City, California, for TPH as gasoline and BTX&E. In addition, soil and water samples collected from monitoring well MW1 were analyzed for TPH as diesel, EPA method 8010 compounds, and TOG.

Analytical results of the soil samples collected from the borings indicated levels of TPH as gasoline ranging from non-detectable to 3.0 ppm for all samples, except for samples MW2(5), MW2(17), and MW4(15), which showed levels of TPH as gasoline at concentrations of 23 ppm, 790 ppm, and 56 ppm, respectively. TPH as diesel, EPA method 8010 results, and TOG were non-detectable in all soil samples collected from MW1.

Analytical results of the ground water samples collected from monitoring wells MW1 and MW3 indicated non-detectable levels of TPH as gasoline. TPH as gasoline was detected in monitoring wells MW2 and MW4 at concentrations of 53,000 ppb and 990 ppb, respectively. Benzene was detected in monitoring wells MW2, MW3, and MW4 at concentrations of 540 ppb, 0.35 ppb, and 9.8 ppb, respectively. In monitoring well MW1, TPH as diesel was detected at 400 ppb, TOG at 3.1 ppm, and EPA method 8010 constituents were non-detectable, except for trichloroethene, which was detected at a concentration of 0.55 ppb. Analytical results of the soil samples are summarized in Table 4, and results of the water samples are summarized in Table 2. Based on the analytical results, KEI recommended a monthly monitoring and quarterly sampling program. Documentation of the well installation procedures, sample collection techniques, and analytical results are presented in KEI's report (KEI-J89-0801.R4) dated December 18, 1989. The monthly monitoring and quarterly sampling program began on January 4, 1990. The well covers of all wells have been surveyed to Mean Sea Level (MSL).

Based on the levels of TPH as gasoline and benzene detected in well MW2 on December 24, 1990, KEI recommended the installation of three additional monitoring wells in KEI's fourth quarterly report (KEI-P89-0801.QR4) dated January 31, 1991.

On April 2, 1991, three additional two-inch diameter monitoring wells (designated as MW5, MW6, and MW7 on the attached Site Plan, Figure 1, and Site Vicinity Map, Figure 3) were installed at the site. The wells were drilled and completed to total depths ranging from 24 to 24.5 feet below grade. Ground water was encountered at depths ranging from 15.5 to 16 feet beneath the surface during drilling. The surface of each well cover was surveyed by Kier & Wright of Pleasanton, California, to MSL and to a vertical accuracy of 0.01 feet.

Wells MW5, MW6, and MW7 were developed on April 5, 1991, and all wells were sampled on April 10, 1991. Water samples from all wells, and selected soil samples from the borings of MW5 through MW7, were analyzed at Sequoia Analytical Laboratory in Concord, California, for TPH as gasoline and BTX&E. In addition, the water sample collected from MW1 was analyzed for TPH as diesel, TOG, and EPA method 8010 constituents.

Analytical results of the soil samples collected from the borings for monitoring wells MW5, MW6, and MW7 indicated non-detectable levels of TPH as gasoline and benzene in all analyzed samples. Analytical results of the water samples collected from monitoring wells MW1, MW3, MW6, and MW7 indicated non-detectable levels of TPH as gasoline and BTX&E. In wells MW2, MW4, and MW5, levels of TPH as gasoline were detected at 22,000 ppb, 950 ppb, and 630 ppb,

respectively, with benzene levels at 170 ppb, 0.84 ppb, and 35 ppb, respectively. In monitoring well MW1, TPH as diesel, TOG and all EPA method 8010 constituents were non-detectable. Results of the soil analyses are summarized in Table 3, and results of the water analyses are summarized in Table 2. Documentation of the well installation procedure, sample collection techniques, the last quarter of monitoring and sampling, and laboratory analyses are presented in KEI's report (KEI-P89-0801.R5) dated May 10, 1991. Based on the analytical results, KEI recommended the continuation of the monthly monitoring and quarterly sampling program.

On January 24, 1991, KEI reviewed the most recent quarterly report (available for review by KEI) prepared for Chevron USA by Western Geologic Resources, Inc., dated June 12, 1990. At the time, there were 18 active monitoring wells (designated as C-1 through C-19 on the attached Site Vicinity Map, Figure 3) in the vicinity of the Chevron station. Chevron monitoring well C-4 was previously destroyed.

A review of the historical water quality data for Chevron's monitoring wells (C-2, C-3, C-6, C-7, C-8, and C-9) that are located directly upgradient of Unocal's monitoring well MW4 showed that "total fuel hydrocarbons" (TFH) were detected in ground water samples collected from these wells in 1988 at levels ranging from 2,100 ppb to 86,000 ppb. Based on analytical results from samples collected on January 1, 1990, the levels of contamination detected in each of the above mentioned Chevron wells had decreased significantly; however, "total petroleum hydrocarbons" (TPH) were still detected in each of the wells at levels ranging from 910 ppb to 5,600 ppb. The decreasing levels of petroleum hydrocarbons previously detected in Chevron's monitoring wells, coupled with the elevated levels of TPH as gasoline detected in Unocal's upgradient monitoring well MW4 and the general northwesterly ground water flow direction, suggested that upgradient contamination has migrated onto the Unocal site and may be contributing to contamination detected in Unocal's monitoring well MW2.

RECENT FIELD ACTIVITIES

The seven wells (MW1 through MW7) were monitored three times and six of the wells (MW2 through MW7) were sampled once during the quarter. Well MW1 is no longer sampled based on previous non-detectable levels detected in the well. During monitoring, the wells were checked for depth to water and presence of free product. In addition, during sampling, the wells were also checked for the presence of sheen. No free product or sheen was noted in any of the wells during the quarter. Well MW2 was purged of 40 gallons, 55 gallons, and 7 gallons during the last three monthly monitoring events. Monitoring data are summarized in Table 1.

Water samples were collected from the wells MW2 through MW7 on October 14, 1991. Prior to sampling, the wells were each purged of between 5 and 7 gallons by the use of a Teflon bailer. Samples were then collected using a clean Teflon bailer. Samples were decanted into clean VOA vials, which were then sealed with Teflon-lined screw caps, and stored in a cooler, on ice, until delivery to a State certified laboratory.

HYDROLOGY AND GEOLOGY

Based on the water level data gathered on October 14, 1991, the ground water flow direction appeared to be toward the northwest, which is similar to the flow direction reported in previous quarters. The average hydraulic gradient at the site on October 14, 1991, was approximately 0.006. Water levels have fluctuated during the quarter, showing a net increase of 0.40 to 0.86 feet in all wells since July 10, 1991. The measured depth to ground water at the site on October 14, 1991, ranged between 15.83 and 17.45 feet below grade.

KEI coordinated a joint monitoring on December 24, 1990, with the BP and Chevron stations located to the south and southeast, respectively, of the Unocal station (across First Street). The ground water flow direction on that date appeared to be generally toward the northwest from the BP and Chevron stations (i.e. toward the Unocal station).

Review of the Fall 1990 Ground Water Level Report, produced by the Alameda County Flood Control and Water Conservation District, indicates that the subject site is located near the northeastern corner of the Mocho Subbasin (Mocho 1), and near the boundary with the Spring Subbasin, where the regional ground water flow direction is toward the northwest.

Based on review of regional geologic maps (U.S. Geological Survey Open-File Report 80-533B "Preliminary Geologic Map of the Livermore Quadrangle, Alameda and Contra Costa Counties, California" by Thomas W. Dibblee, Jr., 1980), the subject site is inferred to be underlain by Quaternary-age alluvium. In addition, adjacent hillside areas northwest and southwest of the site are mapped as being underlain by the Livermore Gravel formation. The Livermore Gravel is typically composed of light redding-gray cobble-pebble gravel, pebbly sand, silt, and clay.

The results of our previous subsurface study indicate that the subject site is underlain by Quaternary alluvium materials to the maximum depth explored (28.5 feet below grade). These alluvium materials generally consist of a gravelly unit at the surface varying from about 5 to 7 feet thick. This upper gravel unit is

underlain by a clay unit to depths below grade of about 11 to 12.5 feet. A second gravelly unit underlies the clay unit but varies significantly in thickness from about 6.5 to 8 feet thick in the vicinity of MW1 and MW2, to about 12.5 feet thick in the vicinity of MW3. This second gravelly unit is inturn underlain by a second clay unit, which locally contains sandy and gravelly lenses and extends from depths below grade of about 23.5 to 25 feet to the maximum depths explored (26 to 28.5 feet below grade).

The results of our recent subsurface study indicate that the site is underlain by fill materials that extend to depths below grade of about 4 to 5.75 feet at MW6 and MW7 and may extend to a depth of about 6.5 feet below grade at MW5. The fill materials are inturn underlain by clay and/or silt materials to depths below grade of about 12.25 feet at MW6, and to about 15 to 15.5 feet at MW5 and MW7. These fine-grained soils are inturn underlain by silty to clayey sand and gravel materials at MW5 and MW6 to depths below grade of about 16 to 18 feet. At MW5 and MW6, these coarse-grained soils are inturn underlain by clay and silt materials, which extend to depths below grade of about 17.5 feet at MW6, and to about 22.75 feet at MW5. Underlying the clay and silt soils at depths below grade of about 22.75 feet at MW5, 17.5 feet at MW6, and 15 feet at MW7, is a zone of well graded gravel, which is about 4 to 7 feet thick at MW6 and MW7, and by clayey sand at MW5, which is about 0.5 feet thick. These coarse-grained soils are inturn underlain by clay materials at depths of about 21.5 to 23.25 feet below grade, which extend to the maximum depths explored (24 to 24.5 feet below grade).

ANALYTICAL RESULTS

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

Analytical results of ground water samples collected from monitoring wells MW3, MW6, and MW7 indicated non-detectable levels of TPH as gasoline and BTX&E. In wells MW2, MW4, and MW5, levels of TPH as gasoline were detected at concentrations of 11,000 ppb, 800 ppb and 660 ppb, respectively, with benzene levels detected at concentrations of 79 ppb, 3.8 ppb, and 55 ppb, respectively. Concentrations of TPH as gasoline and benzene detected in ground water during this quarterly sampling are shown on the attached Site Plan, Figure 1a. Results of the analyses are summarized in Table 2. Copies of the laboratory analyses and Chain of Custody documentation are attached to this report.

DISCUSSION AND RECOMMENDATIONS

Based on the analytical results collected and evaluated to date, and no evidence of free product or sheen in any of the wells, KEI recommends the continuation of the current monitoring and sampling program of the existing wells, per KEI's proposal (KEI-P89-0801.P3) dated January 31, 1991. As recommended in KEI's last report (KEI-P89-0801.QR5) dated August 7, 1991, well MW1 will no longer be sampled. However, well MW1 should continue to be monitored monthly in order to collect ground water elevation data.

Monitoring wells MW3, MW6, and MW7 continue to show non-detectable levels of TPH as gasoline and BTX&E; however, upgradient monitoring well MW4, located at the southeast corner of the Unocal site, has consistently shown TPH as gasoline levels greater than or equal to 800 ppb in all eight quarterly samples collected to date. These findings would appear to support a conclusion that a local off-site source of contamination has migrated onto the Unocal site.

Therefore, KEI continues to recommend that a meeting be arranged between representatives of Chevron and Unocal Corporation to discuss further the investigations and remediation at the respective sites. Furthermore, additional joint monitoring and sampling of the wells at the Unocal, Chevron, and the BP sites should be conducted on a regular basis.

DISTRIBUTION

Copies of this report should be sent to the Alameda County Health Care Services Agency, 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.

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

Sincerely,

Kaprealian Engineering, Inc.

Thomas J. Berkins
Senior Environmental Engineer

Joel G. Greger
Certified Engineering Geologist

License No. 1633
Exp. Date 6/30/92

Timothy R. Ross
Project Manager

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Attachments: Tables 1 through 6
Location Map
Site Plans - Figures 1, 1a & 2
Site Vicinity Map - Figure 3
Laboratory Results
Chain of Custody documentation

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TABLE 1

SUMMARY OF GROUND WATER MONITORING
AND PURGING DATA

Well No.	Ground Water Elevation (feet)	Depth to Water (feet)	Product Thickness	Sheen	Water Bailed (gallons)
(Monitored and Sampled on October 14, 1991)					
MW1	503.43	17.45	0	No	0
MW2	503.39	16.78	0	No	7
MW3	503.68	16.23	0	No	7
MW4	504.29	15.83	0	No	7
MW5	503.75	16.83	0	No	5
MW6	503.35	15.99	0	No	6
MW7	503.31	16.06	0	No	6
(Monitored on September 13, 1991)					
MW1	504.61	16.27	0	--	0
MW2	504.39	15.78	0	--	55
MW3	504.93	14.98	0	--	0
MW4	504.89	15.23	0	--	0
MW5	505.22	15.36	0	--	0
MW6	504.17	15.17	0	--	0
MW7	504.20	15.17	0	--	0
(Monitored on August 13, 1991)					
MW1	504.46	16.82	0	--	0
MW2	503.86	16.31	0	--	40
MW3	504.41	15.50	0	--	0
MW4	504.67	15.45	0	--	0
MW5	504.02	16.56	0	--	0
MW6	503.64	15.70	0	--	0
MW7	503.67	15.70	0	--	0

TABLE 1 (Continued)

SUMMARY OF GROUND WATER MONITORING
AND PURGING DATA

Well #	Surface Elevation* (feet)
MW1	520.88
MW2	520.17
MW3	519.91
MW4	520.12
MW5	520.58
MW6	519.34
MW7	519.37

-- Sheen determination not performed.

* Elevation of top of well covers surveyed to MSL per City of Livermore Benchmark No. C-18-5.

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TABLE 2

SUMMARY OF LABORATORY ANALYSES
WATER

Date	Sample Well #	TPH as Diesel	TPH as Gasoline	Benzene	Toluene	Xylenes	Ethyl-benzene
10/14/91	MW2	--	11,000	79	130	4,700	660
	MW3	--	ND	ND	ND	ND	ND
	MW4	--	880	3.8	2.2	5.8	8.6
	MW5	--	660	55	4.4	66	50
	MW6	--	ND	ND	ND	ND	ND
	MW7	--	ND	ND	ND	ND	ND
7/10/91	MW1*	ND	ND	ND	ND	ND	ND
	MW2	--	14,000	70	160	5,400	570
	MW3	--	ND	ND	ND	ND	ND
	MW4	--	830	8.4	19	7.2	7.7
	MW5	--	220	5.1	8.7	9.7	9.1
	MW6	--	ND	ND	ND	ND	ND
	MW7	--	ND	ND	ND	ND	ND
4/10/91	MW1*	ND	ND	ND	ND	ND	ND
	MW2	--	22,000	170	190	6,200	490
	MW3	--	ND	ND	ND	ND	ND
	MW4	--	950	0.84	4.3	5.0	9.6
	MW5	--	630	35	14	30	47
	MW6	--	ND	ND	ND	ND	ND
	MW7	--	ND	ND	ND	ND	ND
12/24/90	MW1*	ND	ND	ND	ND	0.40	ND
	MW2	--	32,000	440	340	13,000	460
	MW3	--	ND	ND	ND	ND	ND
	MW4	--	1,400	ND	8.7	10	15
9/07/90	MW1*	ND	ND	ND	1.2	ND	ND
	MW2	--	ND	ND	1.5	ND	ND
	MW3	--	1,100	11	ND	16	6.6
	MW4	--	15,000	100	140	4,600	210
6/05/90	MW1*	ND	ND	ND	ND	ND	ND
	MW2	--	31,000	250	460	9,200	950
	MW3	--	ND	ND	ND	ND	ND
	MW4	--	1,400	1.2	4.7	12	24

TABLE 2 (Continued)

SUMMARY OF LABORATORY ANALYSES
WATER

Date	Sample Well #	TPH as Diesel	TPH as Gasoline	Benzene	Toluene	Xylenes	Ethyl-benzene
3/08/90	MW1**	ND	ND	ND	ND	ND	ND
	MW2	--	26,000	230	410	2,100	1,300
	MW3	--	ND	ND	ND	ND	ND
	MW4	--	1,200	18	8.4	28	37
11/18/89	MW1***	400	ND	ND	ND	ND	ND
	MW2	--	53,000	540	500	22,000	130
	MW3	--	ND	0.35	ND	ND	ND
	MW4	--	990	9.8	10	4.7	7.1
Detection Limits		50	30	0.3	0.3	0.3	0.3

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

** TOG showed 4.7 ppm. All EPA method 8010 compounds were non-detectable.

*** TOG showed 3.1 ppm, and all EPA method 8010 compounds were non-detectable, except trichloroethene at 0.55 ppb.

ND = Non-detectable.

-- Indicates analysis not performed.

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

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TABLE 3

SUMMARY OF LABORATORY ANALYSES
SOIL

Date	Sample Number	Depth (feet)	TPH as Gasoline	Benzene	Toluene	Xylenes	Ethyl-benzene
4/02/91	MW5(5)	5.0	ND	ND	0.0056	ND	ND
	MW5(10)	10.0	ND	ND	ND	ND	ND
	MW5(15.5)	15.5	ND	ND	ND	0.0060	ND
	MW6(5)	5.0	ND	ND	0.010	0.0086	ND
	MW6(10)	10.0	ND	ND	ND	0.017	ND
	MW6(15.5)	15.5	ND	ND	ND	0.058	ND
	MW7(5.5)	5.5	ND	ND	ND	ND	ND
	MW7(10)	10.0	ND	ND	0.0086	0.030	ND
	MW7(15)	15.0	ND	ND	0.0098	0.010	ND
Detection Limits			1.0	0.0050	0.0050	0.0050	0.0050

ND = Non-detectable.

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

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TABLE 4

SUMMARY OF LABORATORY ANALYSES
SOIL

Date	Sample Number	Depth (feet)	TPH as Gasoline	Benzene	Toluene	Xylenes	Ethyl-benzene
10/25/89	MW1(5)*	5.0	ND	ND	ND	ND	ND
&	MW1(7)*	7.0	ND	ND	ND	ND	ND
10/26/89	MW1(10)*	10.0	ND	ND	ND	ND	ND
	MW1(12.5)*	12.5	ND	ND	ND	ND	ND
	MW1(15)*	15.0	ND	ND	ND	ND	ND
	MW1(17)*	17.0	ND	ND	ND	ND	ND
	MW2(5)	5.0	23	ND	ND	ND	ND
	MW2(10)	10.0	ND	ND	ND	ND	ND
	MW2(12.5)	12.5	ND	ND	ND	ND	ND
	MW2(15)	15.0	3.0	ND	ND	ND	ND
	MW2(17)	17.0	790	0.14	0.23	10	2.7
	MW3(5)	5.0	1.1	ND	ND	ND	ND
	MW3(10)	10.0	ND	ND	ND	ND	ND
	MW3(11.5)	11.5	ND	ND	ND	ND	ND
	MW3(14)	14.0	ND	ND	ND	ND	ND
	MW4(5)	5.0	1.9	ND	ND	ND	ND
	MW4(9.5	9.5	ND	ND	ND	ND	ND
	MW4(12)	12.0	ND	ND	ND	ND	ND
	MW4(15)	15.0	56	0.10	0.11	1.5	1.5
Detection Limits			1.0	0.05	0.1	0.1	0.1

* TPH as diesel and EPA method 8010 constituents were non-detectable. TOG was non-detectable.

ND = Non-detectable.

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

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TABLE 5

SUMMARY OF LABORATORY ANALYSES
SOIL

Date	Sample	Depth (feet)	TPH as Diesel	TPH as Gasoline	Benzene	Toluene	Xylenes	Ethyl-benzene
8/02/89	A1	15.0	--	2.1	ND	ND	0.21	ND
&	A2	15.0	--	1.6	ND	ND	ND	ND
8/07/89	A3	16.0	--	390	1.7	45	86	16
	B1	15.0	--	ND	ND	ND	0.10	ND
	B2	15.0	--	ND	ND	ND	ND	ND
	B3	15.0	--	2.3	ND	ND	0.30	0.12
	P1	3.5	--	9.6	ND	ND	0.94	0.16
	P2	3.5	--	ND	ND	ND	ND	ND
	P3	3.5	--	ND	ND	ND	ND	ND
	P4	3.5	--	ND	ND	ND	ND	ND
	P5	2.5	--	ND	ND	ND	ND	ND
	P6	2.5	--	ND	ND	ND	ND	ND
	P7	2.5	--	1.5	ND	ND	ND	ND
	WO1*	8.5	1.4	ND	ND	ND	ND	ND
Detection Limits			1.0	1.0	0.05	0.1	0.1	0.1

* TOG, and all EPA method 8010 and 8270 constituents were non-detectable.

-- Indicates analysis not performed.

ND = Non-detectable.

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

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TABLE 6

SUMMARY OF LABORATORY ANALYSES
WATER

Date	Sample	TPH as Gasoline	Benzene	Toluene	Xylenes	Ethylbenzene
8/07/89	W1	47,000	260	840	9,400	830
Detection Limits		30	0.3	0.3	0.3	0.3

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

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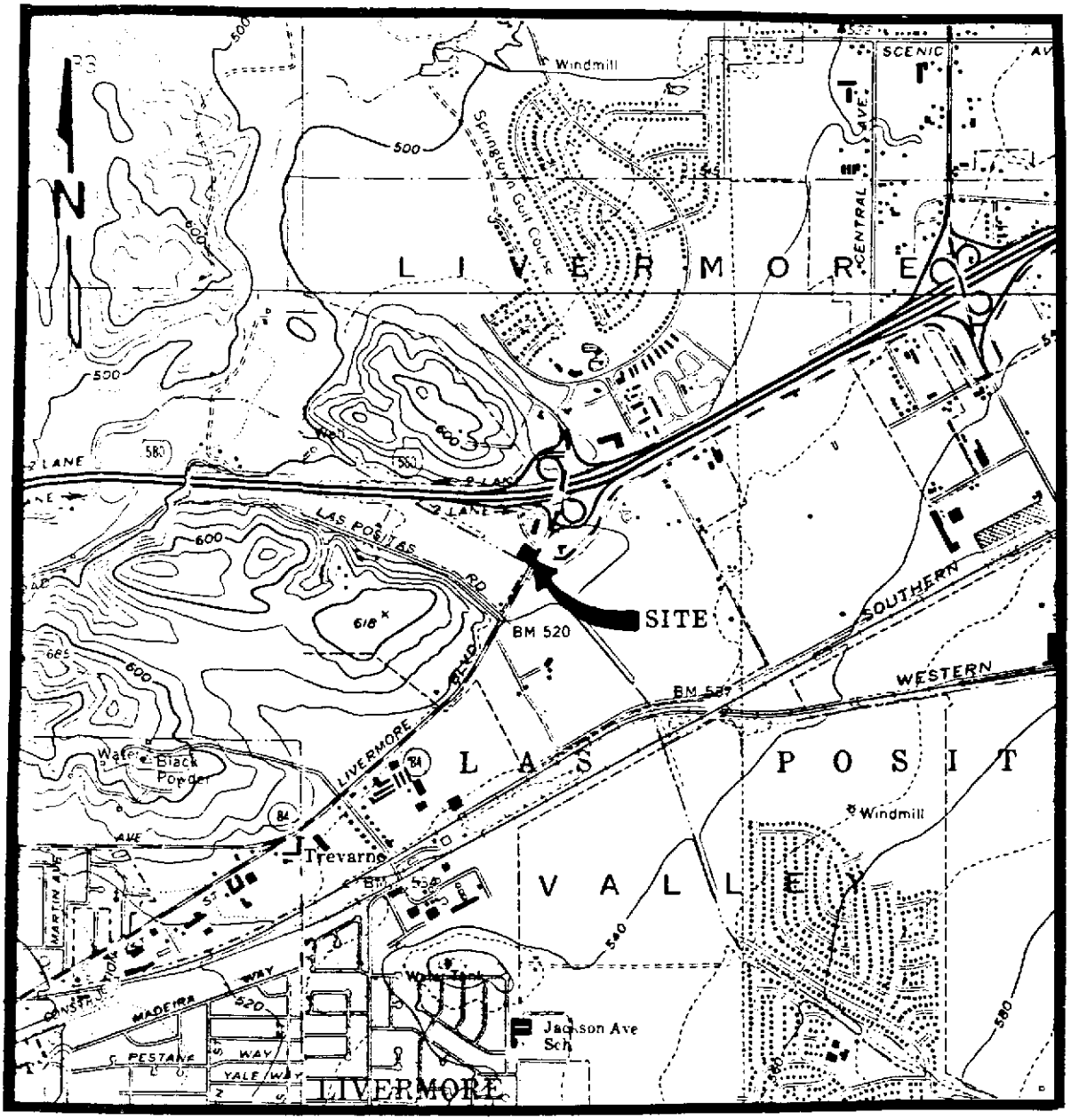

LOCATION MAP

Base from U.S.G.S. 7.5 minute Livermore Quadrangle
(photorevised 1980) and Altamont Quadrangle (photorevised 1981)

Unocal S/S #6034
4700 First Street
Livermore, CA

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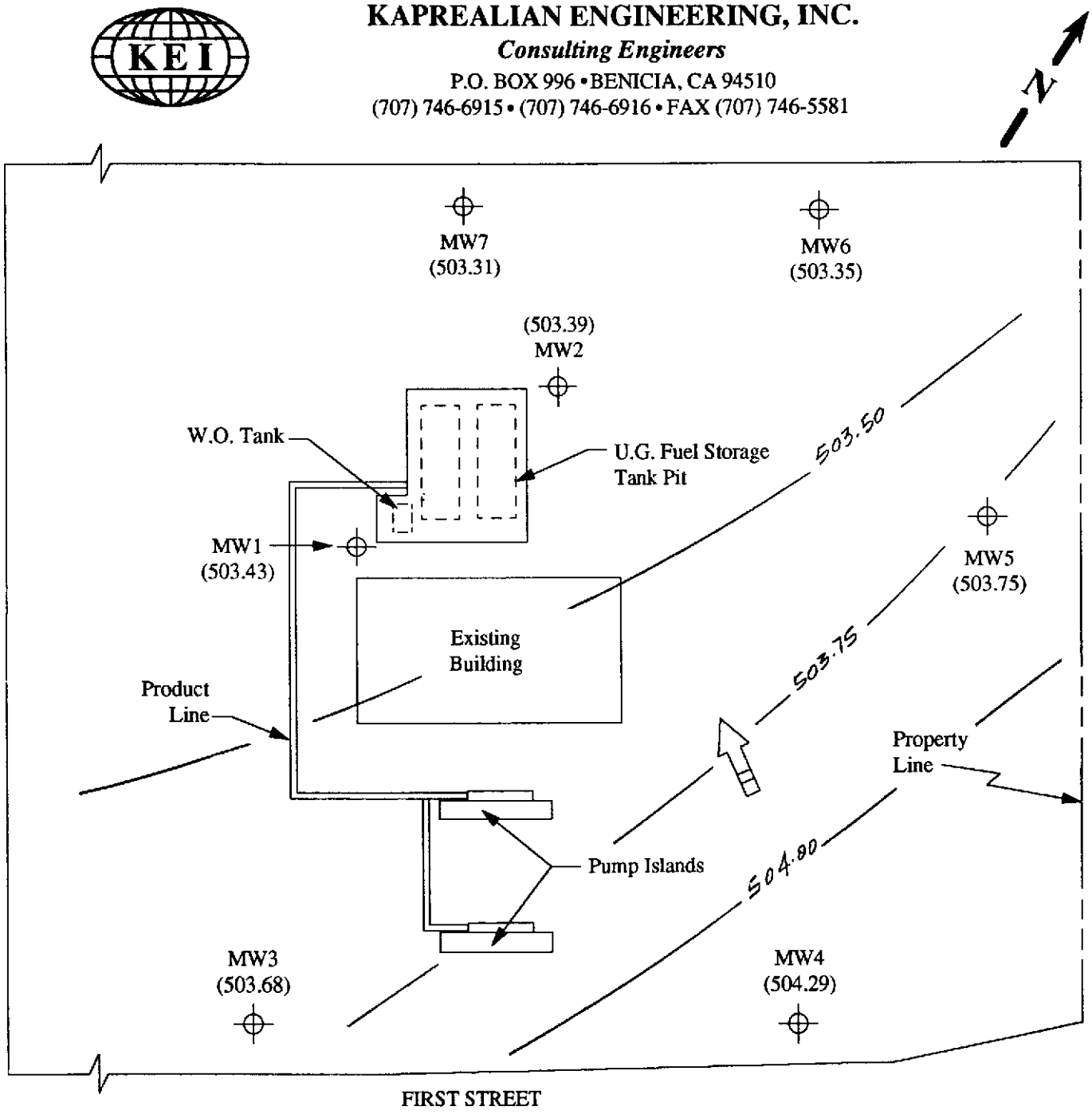

LEGEND

- Monitoring Well
- ( ) Water Table Elevation in feet above Mean Sea Level on 10/14/91
- Contour of equal elevation of ground water table
- Direction of Ground Water Flow

SITE PLAN

Figure 1

0 30 60

Approx. scale feet

Unocal Service Station #6034
4700 First Street
Livermore, CA

KAPREALIAN ENGINEERING, INC.
Consulting Engineers
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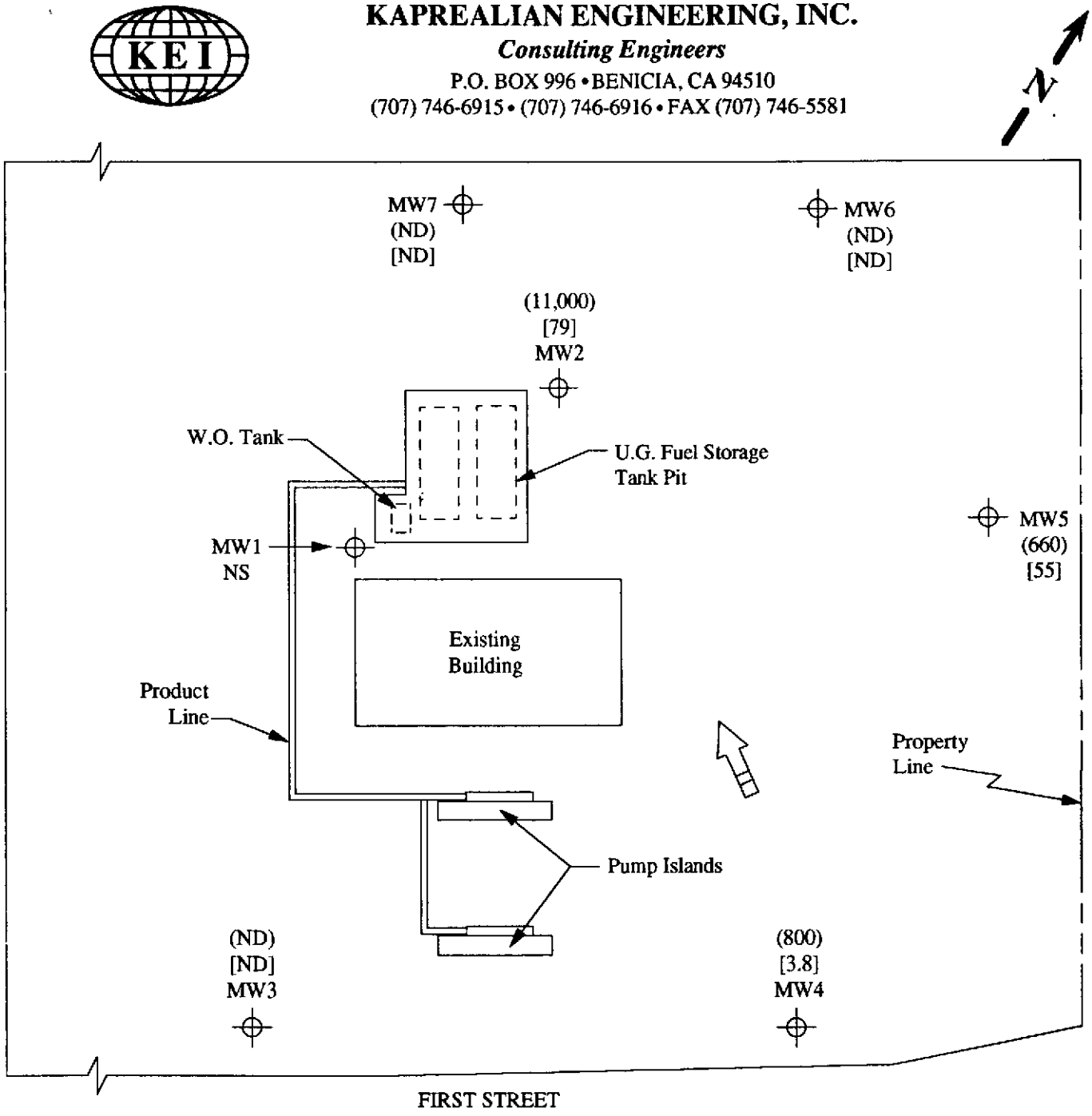

SITE PLAN

Figure 1a
(Samples Collected on 10/14/91)

LEGEND

- ⊕ Monitoring Well
- ( ) Concentration of TPH as gasoline in ppb
- [ ] Concentration of benzene in ppb
- ⇨ Direction of ground water flow

ND = Non-detectable
NS = Not sampled

0 30 60
Approx. scale feet

Unocal Service Station #6034
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Livermore, CA

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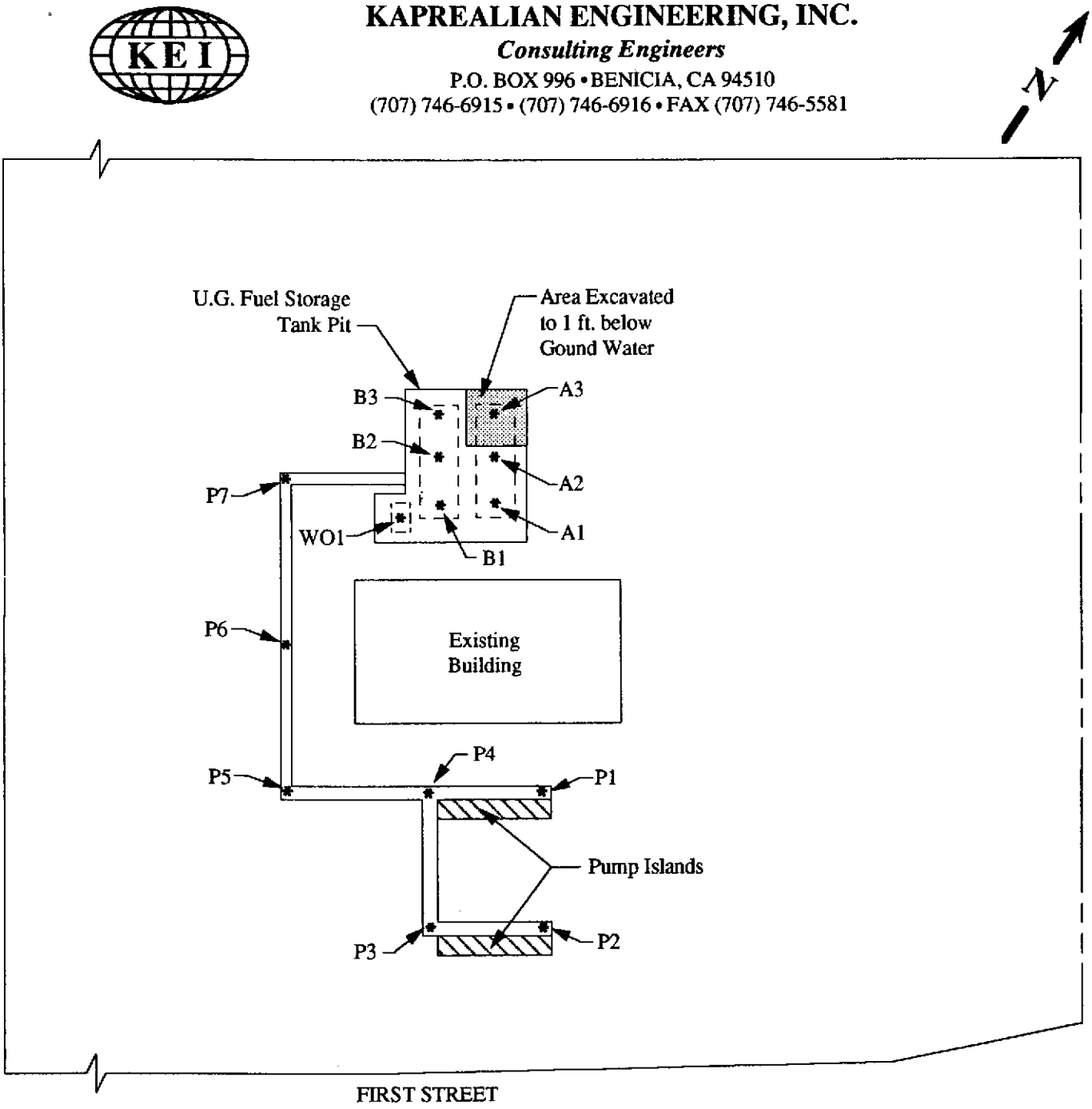

SITE PLAN

Figure 2

0 30 60

Approx. scale feet

LEGEND

* Sample Point Location

Unocal Service Station #6034
4700 First Street
Livermore, CA

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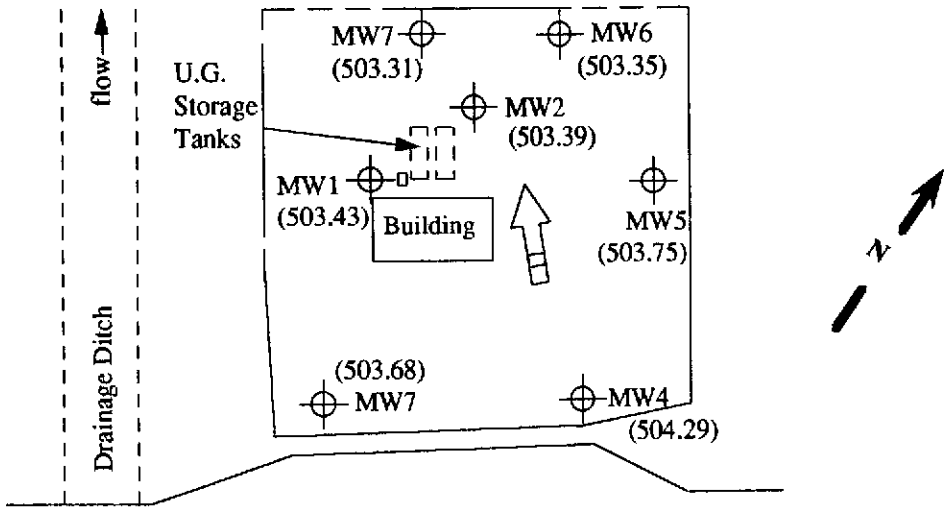
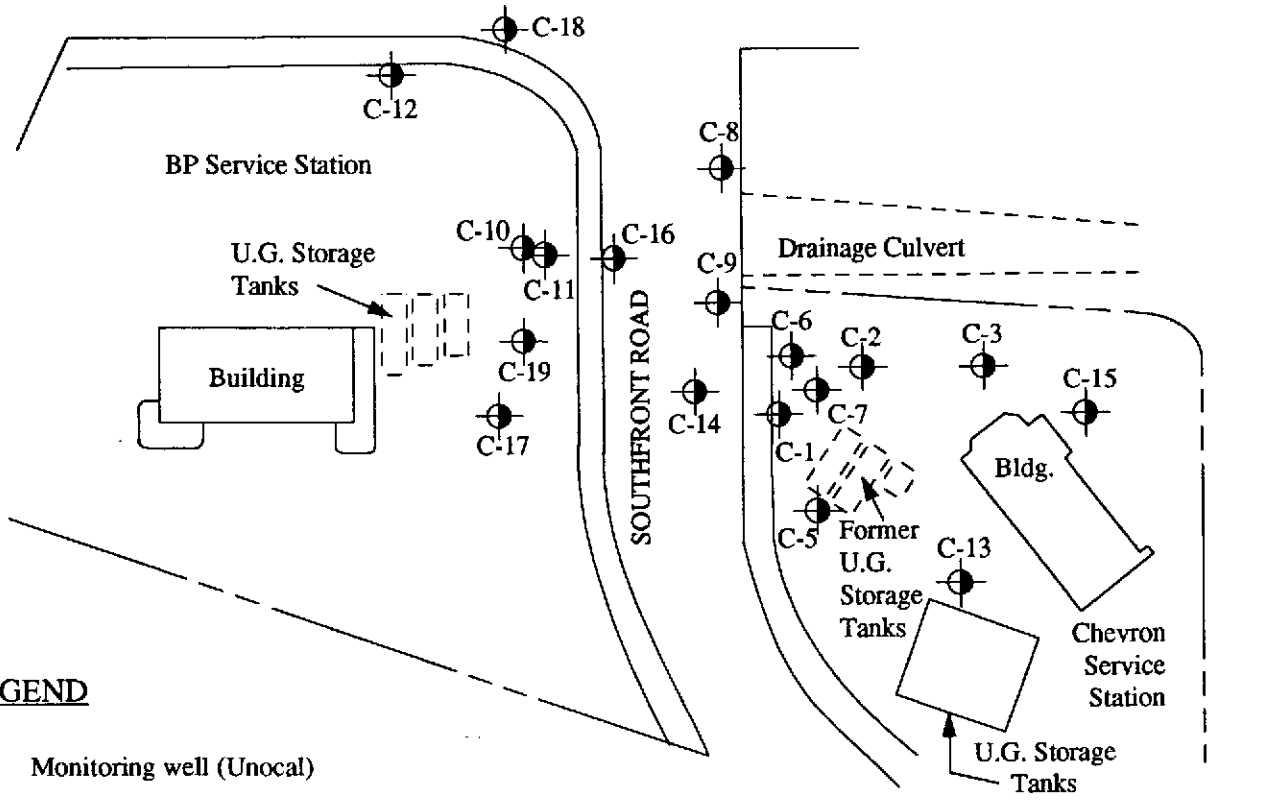


FIRST STREET



LEGEND

- Monitoring well (Unocal)
- Monitoring well (Chevron)
- ( ) Ground water elevation in feet above Mean Sea Level on 10/14/91
- Direction of ground water flow

SITE VICINITY MAP
Figure 3

0 80 160
Approx. scale feet

Unocal Service Station # 6034
4700 First Street
Livermore, CA

SEQUOIA ANALYTICAL

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

Kaprealian Engineering, Inc.	Client Project ID:	Unocal, Livermore, 4700 1st. St.	Sampled:	Oct 14, 1991
P.O. Box 996	Matrix Descript:	Water	Received:	Oct 14, 1991
Benicia, CA 94510	Analysis Method:	EPA 5030/8015/8020	Analyzed:	Oct 23, 1991
Attention: Mardo Kaprealian, P.E.	First Sample #:	110-0692	Reported:	Oct 26, 1991

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

Sample Number	Sample Description	Low/Medium B.P. Hydrocarbons µg/L (ppb)	Benzene µg/L (ppb)	Toluene µg/L (ppb)	Ethyl Benzene µg/L (ppb)	Xylenes µg/L (ppb)
110-0692	MW-2	11,000	79	130	660	4,700
110-0693	MW-3	N.D.	N.D.	N.D.	N.D.	N.D.
110-0694	MW-4	800	3.8	2.2	8.6	5.8
110-0695	MW-5	660	55	4.4	50	66
110-0696	MW-6	N.D.	N.D.	N.D.	N.D.	N.D.
110-0697	MW-7	N.D.	N.D.	N.D.	N.D.	N.D.
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
Laboratory Director

1100692.KEI <1>

SEQUOIA ANALYTICAL

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

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

Client Project ID: Unocal, Livermore, 4700 1st. St.
QC Sample Group: 1100692-7

Reported: Oct 26, 1991

QUALITY CONTROL DATA REPORT

ANALYTE	Benzene	Toluene	Ethyl-Benzene	Xylenes
Method:	EPA 8015/8020	EPA 8015/8020	EPA 8015/8020	EPA 8015/8020
Analyst:	R.H./J.F.	R.H./J.F.	R.H./J.F.	R.H./J.F.
Reporting Units:	ug/L	ug/L	ug/L	ug/L
Date Analyzed:	Oct 23, 1991	Oct 23, 1991	Oct 23, 1991	Oct 23, 1991
QC Sample #:	Matrix Blank	Matrix Blank	Matrix Blank	Matrix Blank
Sample Conc.:	N.D.	N.D.	N.D.	N.D.
Spike Conc. Added:	20	20	20	60
Conc. Matrix Spike:	22	21	22	69
Matrix Spike % Recovery:	110	105	110	115
Conc. Matrix Spike Dup.:	22	22	23	71
Matrix Spike Duplicate % Recovery:	110	110	115	118
Relative % Difference:	0	4.7	4.4	2.9

Laboratory blank contained the following analytes: None Detected

SEQUOIA ANALYTICAL

Belinda C. Vega
Laboratory Director

% Recovery:	$\frac{\text{Conc. of M.S. - Conc. of Sample}}{\text{Spike Conc. Added}}$	x 100
Relative % Difference:	$\frac{\text{Conc. of M.S. - Conc. of M.S.D.}}{\text{(Conc. of M.S. + Conc. of M.S.D.) / 2}}$	x 100

SEQUOIA ANALYTICAL

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

Client Project ID: Unocal, Livermore, 4700 1st. St.
QC Sample Group: 1100692-7

Reported: Oct 26, 1991

QUALITY CONTROL DATA REPORT

SURROGATE

Method:	EPA 8015/8020	EPA 8015/8020	EPA 8015/8020	EPA 8015/8020	EPA 8015/8020	EPA 8015/8020	EPA 8015/8020
Analyst:	R.H./J.F.	R.H./J.F.	R.H./J.F.	R.H./J.F.	R.H./J.F.	R.H./J.F.	R.H./J.F.
Reporting Units:	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Date Analyzed:	Oct 23, 1991	Oct 23, 1991	Oct 23, 1991	Oct 23, 1991	Oct 23, 1991	Oct 23, 1991	Oct 23, 1991
Sample #:	110-0692	110-0693	110-0694	110-0695	110-0696	110-0697	Blank
Surrogate % Recovery:	85	106	103	108	109	109	108

SEQUOIA ANALYTICAL

Belinda C. Vega
Laboratory Director

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

KAPREALIAN ENGINEERING, INC.

CHAIN OF CUSTODY

SAMPLER: JOE

WITNESSING AGENCY:

SITE NAME & ADDRESS: Unocal / Livermore 4700 1st Street

ANALYSES REQUESTED: TPH-G/BTXE

TURN AROUND TIME: Regular

SAMPLE ID NO.	DATE	TIME	SOIL	WATER	GRAB	COMP	NO. OF CONT.	SAMPLING LOCATION	REMARKS
MW-2	10/14/91			✓	✓		2	MW	1100692 AB VoA -> preserved
MW-3	"	0		✓	✓		2	"	693
MW-4	"	2:30		✓	✓		2	"	694
MW-5	"	1		✓	✓		2	"	695
MW-6	"	12:15		✓	✓		2	"	696
MW-7	"			✓	✓		2	"	697

Relinquished by: (Signature)	Date/Time 10/14/91	Received by: (Signature)
Relinquished by: (Signature)	Date/Time 10-14 7:05p	Received by: (Signature)
Relinquished by: (Signature)	Date/Time 10/15/91/2050	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received by: (Signature)

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

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

Signature _____ Title _____ Date 10/14/91

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

KEI-P89-0801.P3
January 31, 1991

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

Attention: Mr. Ron Bock

RE: Work Plan/Proposal
Unocal Service Station #6034
4700 First Street
Livermore, California

INTRODUCTION

1. Background:

Kaprealian Engineering, Inc's. (KEI) work at the site began on August 2, 1989, when KEI was asked to collect soil samples from beneath two 12,000 gallon fuel storage tanks and one waste oil tank during their replacement. The tanks were made of steel and no apparent holes or cracks were observed in the tanks. Six soil samples (designated as A1, A2, A3, B1, B2 and B3) were collected from beneath the fuel tanks at depths of 15 to 16 feet, and one soil sample, labeled WO1, was collected from beneath the waste oil tank at a depth of 8.5 feet. KEI returned to the site on August 7, 1989 in order to collect soil samples from the product pipe trenches. Seven soil samples, labeled P1 through P7, were collected from the pipe trench at depths ranging from 2.5 to 3.5 feet. Ground water was encountered in the fuel tank pit at a depth of 17.5 feet during subsequent excavation of contaminated soil from the location where sample A3 was collected. Locations of soil samples are shown on the attached Site Plan, Figure 2. One ground water sample, labeled W1, was collected from the excavated pit. All 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). In addition, the sample collected from beneath the waste oil tank was analyzed for TPH as diesel, total oil and grease (TOG) and EPA methods 8010 and 8270 compounds. Analytical results of the soil samples, collected from the fuel tank pit and pipe trenches, indicated levels of TPH as gasoline ranging from non-detectable to 9.6 ppm for all samples except for sample A3, which showed 390 ppm. However, the area below sample A3 was excavated to the depth of the water table. The soil sample collected from be-

neath the waste oil tank showed non-detectable levels of all constituents analyzed, except for TPH as diesel at 1.4 ppm. Analytical results of the water sample collected from the fuel tank pit showed 47,000 ppb of TPH as gasoline, and 260 ppb of benzene. Results of the soil analyses are summarized in Table 2, and the water sample in Table 4. Documentation of soil and water sample collection and analytical results are provided in KEI's report (KEI-J89-0801.R2) dated August 15, 1989. Based on the sample results, KEI recommended the installation of four monitoring wells.

On October 25 and 26, 1989, four two-inch diameter monitoring wells (designated as MW1, MW2, MW3 and MW4 on the attached Site Vicinity Map, Figure 1) were installed at the site. The monitoring wells were drilled and completed to total depths ranging from 26 to 28.5 feet. Ground water was encountered at depths ranging from 14.5 to 17.5 feet beneath the surface during drilling. The wells were developed on November 3 and 9, 1989, and initially sampled on November 18, 1989. Water and selected soil samples were analyzed at Sequoia Analytical Laboratory in Redwood City, California, for TPH as gasoline and BTX&E. In addition, soil and water samples collected from monitoring well MW1 were analyzed for TPH as diesel, EPA method 8010 compounds, and TOG.

Analytical results of the soil samples, collected from the borings, indicated levels of TPH as gasoline ranging from non-detectable to 3.0 ppm for all samples, except for samples MW2(5), MW2(17) and MW4(15), which showed levels of TPH as gasoline at concentrations of 23 ppm, 790 ppm and 56 ppm, respectively. TPH as diesel and EPA method 8010 results were non-detectable, and TOG was <50 ppm in all samples.

Analytical results of the ground water samples, collected from monitoring wells MW1 and MW3, indicated non-detectable levels of TPH as gasoline. TPH as gasoline was detected in monitoring wells MW2 and MW4 at concentrations of 53,000 ppb and 990 ppb, respectively. Benzene was detected in monitoring wells MW2, MW3 and MW4 at concentrations of 540 ppb, 0.35 ppb and 9.8 ppb, respectively. In monitoring well MW1, TPH as diesel was detected at 400 ppb, TOG at 3.1 ppm, and EPA method 8010 constituents were non-detectable except for trichloroethene, which was detected at a concentration of 0.55 ppb. Analytical results of the soil samples are summarized in Table 3, and water samples in Table 1. Based on the analytical results, KEI recommended a monthly monitoring and quarterly sampling program. Documentation of the well installation and laboratory analyses are presented in KEI's report (KEI-J89-0801.R4) dated December 18, 1989. The monthly monitoring and quarterly sampling program began on January 4, 1990. The well covers of

all wells were surveyed to Mean Sea Level (MSL) on July 23, 1990.

2. Site Description:

The subject site is presently used as a gasoline station. The subject site is situated on gently sloping northwest trending topography and is located adjacent to and northeast of the drainage channel for Arroyo Seco. In addition, the site is located approximately 9,000 feet northwest of the Lawrence Radiation Laboratory and the University of California. A Location Map, Site Vicinity Map, and Site Plans are attached to this report. BP and Chevron Service Stations are located to the south and southeast of the Unocal site.

3. Hydrology and Geology

For the December 24, 1990 quarterly monitoring event, KEI coordinated a joint monitoring at the BP and Chevron stations located to the south and southeast of the Unocal station, across First Street. The ground water flow direction on that date appeared to be generally toward the northwest at an average gradient of 0.006 from the BP and Chevron sites toward the Unocal station (see the attached Site Vicinity Map, Figure 1).

At the Unocal site, water levels have fluctuated during the most recent quarter, showing a net decrease of 0.14 feet in well MW4, no change in well MW1, and increases of 0.04 feet and 0.06 feet in wells MW2 and MW3, respectively, since September 7, 1990. The measured depth to ground water at the site on December 24, 1990 ranged between 15.34 and 16.75 feet.

Review of the Spring 1990 Ground Water Level Report produced by the Alameda County Flood Control and Water Conservation District indicates that the subject site is located near the northeastern corner of the Mocho Subbasin, and near the boundary with the Spring Subbasin, where the regional ground water flow direction is toward the northwest.

Based on review of regional geologic maps (U.S. Geological Survey Open-File Report 80-533B "Preliminary Geologic Map of the Livermore Quadrangle, Alameda and Contra Costa Counties, California" by Thomas W. Dibblee, Jr., 1980), the subject site is inferred to be underlain by Quaternary-age alluvium. In addition, adjacent hillside areas northwest and southwest of the site are mapped as being underlain by the Livermore Gravel formation. The Livermore Gravel is typically composed of light redding-gray cobble-pebble gravel, pebbly sand, silt and clay.

The results of our previous subsurface study indicate that the subject site is underlain by Quaternary alluvium materials to the maximum depth explored (28.5 feet). These alluvium materials generally consist of a gravelly unit at the surface varying from about 5 to 7 feet thick. This upper gravel unit is underlain by a clay unit to depths below grade of about 11 to 12.5 feet. A second gravelly unit underlies the clay unit but varies significantly in thickness from about 6.5 to 8 feet thick in the vicinity of MW1 and MW2, and about 12.5 feet thick in the vicinity of MW3. This second gravelly unit is inturn underlain by a second clay unit which locally contains sandy and gravelly lenses and extends from depths below grade of about 23.5 to 25 feet and extends to the maximum depths explored (26 to 28.5 feet).

PROPOSED FIELD WORK

PHASE II - DEFINING THE EXTENT OF SUBSURFACE CONTAMINATION

1. KEI proposes to install three two-inch diameter monitoring wells, designated as MW5, MW6 and MW7 on the attached Site Plan, Figure 3, using hollow stem auger equipment. Permits will be obtained from the Alameda County Flood Control District prior to beginning work.

   The wells will be drilled about 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. The wells are anticipated to be terminated at a depth of approximately 30 feet.

2. Soil samples will be collected at a maximum spacing of 5 foot intervals, significant changes in lithology, at obvious areas of contamination, and at/or within the soil/ground water interface beginning at a depth of about 4 to 5 feet below grade. Sampling for laboratory analyses and lithologic logging purposes will continue until the first water table is encountered. Sampling for lithologic logging purposes only will continue below the water table at the total depth drilled. Classification of soil will be done using the Unified Soils 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. Samples will be removed from the sampler and retained in brass liners. The liners will be sealed with aluminum foil, plastic caps and tape. They will be labeled and stored on ice for delivery to a state certified laboratory.

3. Finalized Boring Logs will be prepared from field logs and submitted to the Alameda County Health Agency (ACHA), and to the Regional Water Quality Control Board (RWQCB), San Francisco Bay Region.

4. Ground water is anticipated at approximately 15 to 17 feet below grade based on the ground water level found in the existing monitoring wells.

5. Well Construction:

   Casing Type: Schedule 40 PVC, flush threaded joints, 0.020 inch factory slot, two-inch diameter. Screen to run from total depth of the well to approximately 5 feet above the depth of the first encountered ground water. Monterey sand (#3) will fill the annular space from total depth to 2 feet above the perforated casing interval. A two foot thick bentonite seal will be placed in the annular space on top of the sand pack. Neat cement will be placed on top of the bentonite seal to the surface.

   Well casings 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 each casing.

6. Water levels will be measured with an electronic sounder. The wells 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 materials hauler.

   Casing elevations will be surveyed by a licensed land surveyor to Mean Sea Level and to a vertical accuracy of 0.01 feet.

7. Ground Water Sampling:

   The wells will be purged with a surface bailer approximately four casing volumes prior to sampling, at least 72 hours after development. After recovery, samples will be collected using a clean Teflon bailer and 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 on ice for delivery to a state certified laboratory. The sampling bailer will be cleaned with soap and a clean water rinse between uses.

Wells will be checked for free product and sheen (using an interface probe and/or paste tape) prior to development and sampling.

Properly executed Chain of Custody documentation will accompany all samples.

8. Laboratory Analyses:

Water and selected soil samples will be analyzed by Sequoia Analytical Laboratory in either Concord or Redwood City, California, a state certified laboratory, for TPH as gasoline using EPA method 5030 in conjunction with modified 8015, and BTX&E using EPA method 8020 as recommended by the RWQCB, and as specified in the Tri-regional guidelines.

Analytical results will be presented in tabular form, showing sample depths, results and detection limits.

The analytical results will be used to delineate the vertical and lateral extent of the contaminants in soil and ground water. A cross sectional profile will be constructed showing the subsurface lithology to depth drilled and first water table depth.

9. Hydrology:

Ground water flow direction will be determined from the survey data and water table depths from both the new and existing wells. The flow direction will be shown on the Site Plan.

10. Ongoing Pumping, Monitoring and Sampling:

10.1 Monitor all monitoring wells on-site on a monthly basis. Record the elevation of the water table and any abnormal conditions noted during inspection, including presence of product and sheen.

10.2 Purge and sample ground water from all monitoring wells, and analyze for TPH as gasoline and BTX&E on a quarterly basis. In addition, ground water from MW1 (adjacent to the waste oil tank), will be analyzed for TPH as diesel, total oil and grease, and EPA method 8010 constituents. Prior to sampling, water table elevation will be recorded as well as the presence of any free product.

10.3 Preparation and submission of quarterly technical reports summarizing the field activity water sampling and analyses with discussion and recommendations.

11. Conclusions:

Conclusions and results of Phase II will be described in a technical report.

The technical report will be submitted to the ACHA, and to the RWQCB.

PHASE III

Once the zero line is established through the completion of Phase II, a final remedial plan will be developed.

LIMITATIONS

Soil deposits and rock formations may vary in thickness, lithology, saturation, strength and other properties across any site. In addition, environmental changes, either naturally-occurring or artificially-induced, may cause changes in the extent and concentration of any contaminants. Our studies assume that the field and laboratory data are reasonably representative of the site as a whole, and assume that subsurface conditions are reasonably conducive to interpolation and extrapolation.

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

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

Approved by:

Don R. Braun
Certified Engineering Geologist

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

\jad

Attachments: Tables 1 through 4
Location Map
Site Vicinity Map - Figure 1
Site Plans - Figures 1a, 2 & 3
Well Completion Diagram

KEI-P89-0801.P3
January 31, 1991

TABLE 1

SUMMARY OF LABORATORY ANALYSES
WATER

Date	Sample Well #	TPH as Diesel	TPH as Gasoline	Benzene	Toluene	Xylenes	Ethyl-benzene
12/24/90	MW1*	ND	ND	ND	ND	0.40	ND
	MW2	--	32,000	440	340	13,000	460
	MW3	--	ND	ND	ND	ND	ND
	MW4	--	1,400	ND	8.7	10	15
9/07/90	MW1*	ND	ND	ND	1.2	ND	ND
	MW2	--	ND	ND	1.5	ND	ND
	MW3	--	1,100	11	ND	16	6.6
	MW4	--	15,000	100	140	4,600	210
6/05/90	MW1*	ND	ND	ND	ND	ND	ND
	MW2	--	31,000	250	460	9,200	950
	MW3	--	ND	ND	ND	ND	ND
	MW4	--	1,400	1.2	4.7	12	24
3/08/90	MW1**	ND	ND	ND	ND	ND	ND
	MW2	--	26,000	230	410	2,100	1,300
	MW3	--	ND	ND	ND	ND	ND
	MW4	--	1,200	18	8.4	28	37
11/18/89	MW1***	400	ND	ND	ND	ND	ND
	MW2	--	53,000	540	500	22,000	130
	MW3	--	ND	0.35	ND	ND	ND
	MW4	--	990	9.8	10	4.7	7.1
Detection Limits		50	30	0.3	0.3	0.3	0.3

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

** TOG showed 4.7 ppm. EPA method 8010 compounds were non-detectable.

*** TOG showed 3.1 ppm, and all EPA method 8010 compounds were non-detectable, except trichloroethene at 0.55 ppb.

ND = Non-detectable.

-- Indicates analysis not performed.

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

KEI-P89-0801.P3
January 31, 1991

TABLE 3

SUMMARY OF LABORATORY ANALYSES
SOIL

(Collected on October 25 & 26, 1989)

Sample Number	Depth (feet)	TPH as Gasoline	Benzene	Toluene	Xylenes	Ethyl-benzene
MW1(5)*	5	ND	ND	ND	ND	ND
MW1(7)*	7	ND	ND	ND	ND	ND
MW1(10)*	10	ND	ND	ND	ND	ND
MW1(12.5)*	12.5	ND	ND	ND	ND	ND
MW1(15)*	15	ND	ND	ND	ND	ND
MW1(17)*	17	ND	ND	ND	ND	ND
MW2(5)	5	23	ND	ND	ND	ND
MW2(10)	10	ND	ND	ND	ND	ND
MW2(12.5)	12.5	ND	ND	ND	ND	ND
MW2(15)	15	3.0	ND	ND	ND	ND
MW2(17)	17	790	0.14	0.23	10	2.7
MW3(5)	5	1.1	ND	ND	ND	ND
MW3(10)	10	ND	ND	ND	ND	ND
MW3(11.5)	11.5	ND	ND	ND	ND	ND
MW3(14)	14	ND	ND	ND	ND	ND
MW4(5)	5	1.9	ND	ND	ND	ND
MW4(9.5	9.5	ND	ND	ND	ND	ND
MW4(12)	12	ND	ND	ND	ND	ND
MW4(15)	15	56	0.10	0.11	1.5	1.5
Detection Limits		1.0	0.05	0.1	0.1	0.1

* TPH as diesel and EPA method 8010 constituents were non-detectable. TOG was <50 ppm.

ND = Non-detectable.

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

KEI-P89-0801.P3
January 31, 1991

TABLE 4

SUMMARY OF LABORATORY ANALYSES
WATER

(Collected on August 7, 1989)

Sample	TPH as Gasoline	Benzene	Toluene	Xylenes	Ethylbenzene
W1	47,000	260	840	9,400	830
Detection Limits	30	0.3	0.3	0.3	0.3

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

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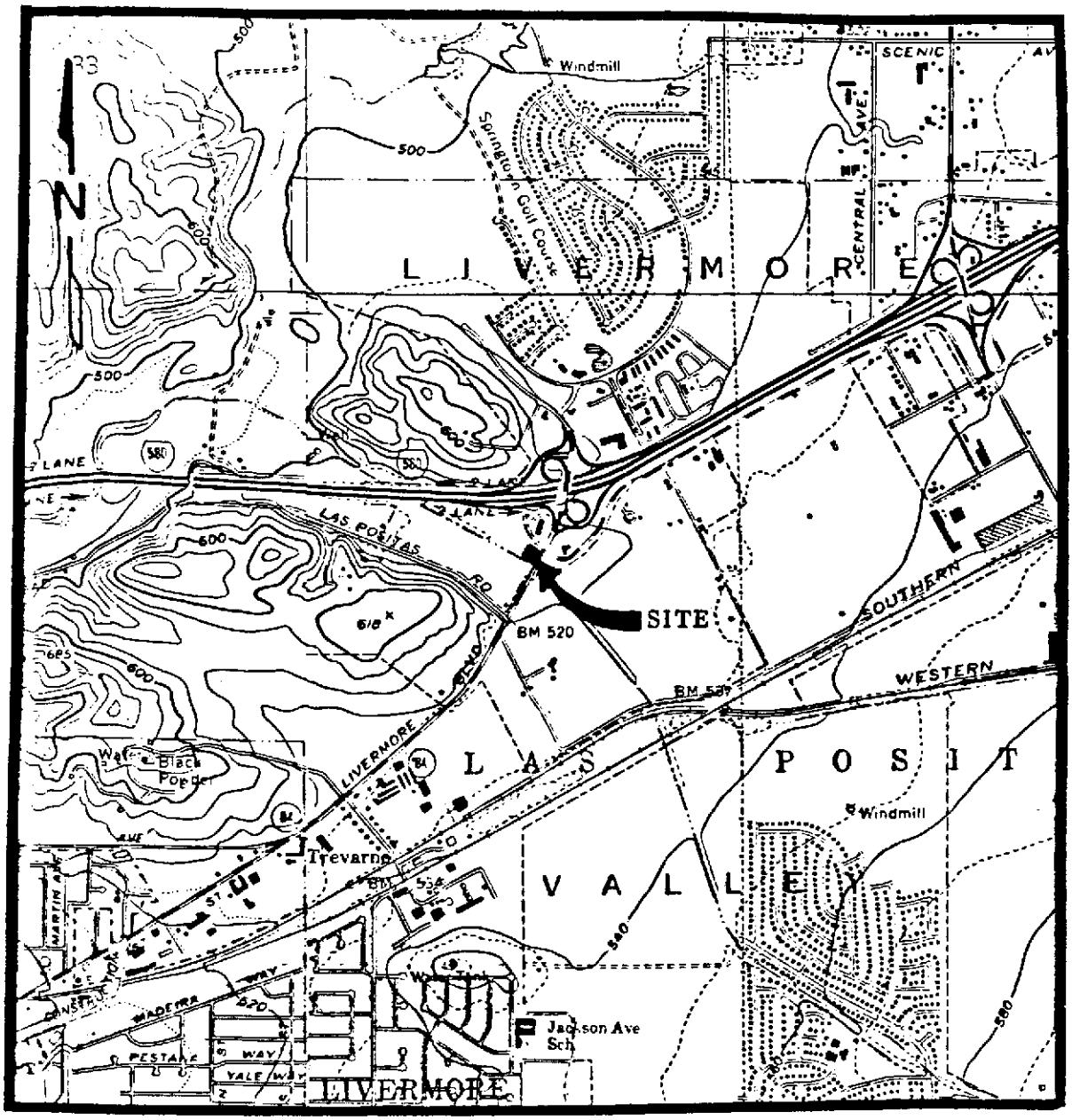

LOCATION MAP

Base from U.S.G.S. 7.5 minute Livermore Quadrangle
(photorevised 1980) and Altamont Quadrangle (photorevised 1981)

Unocal S/S #6034
4700 First Street
Livermore, CA

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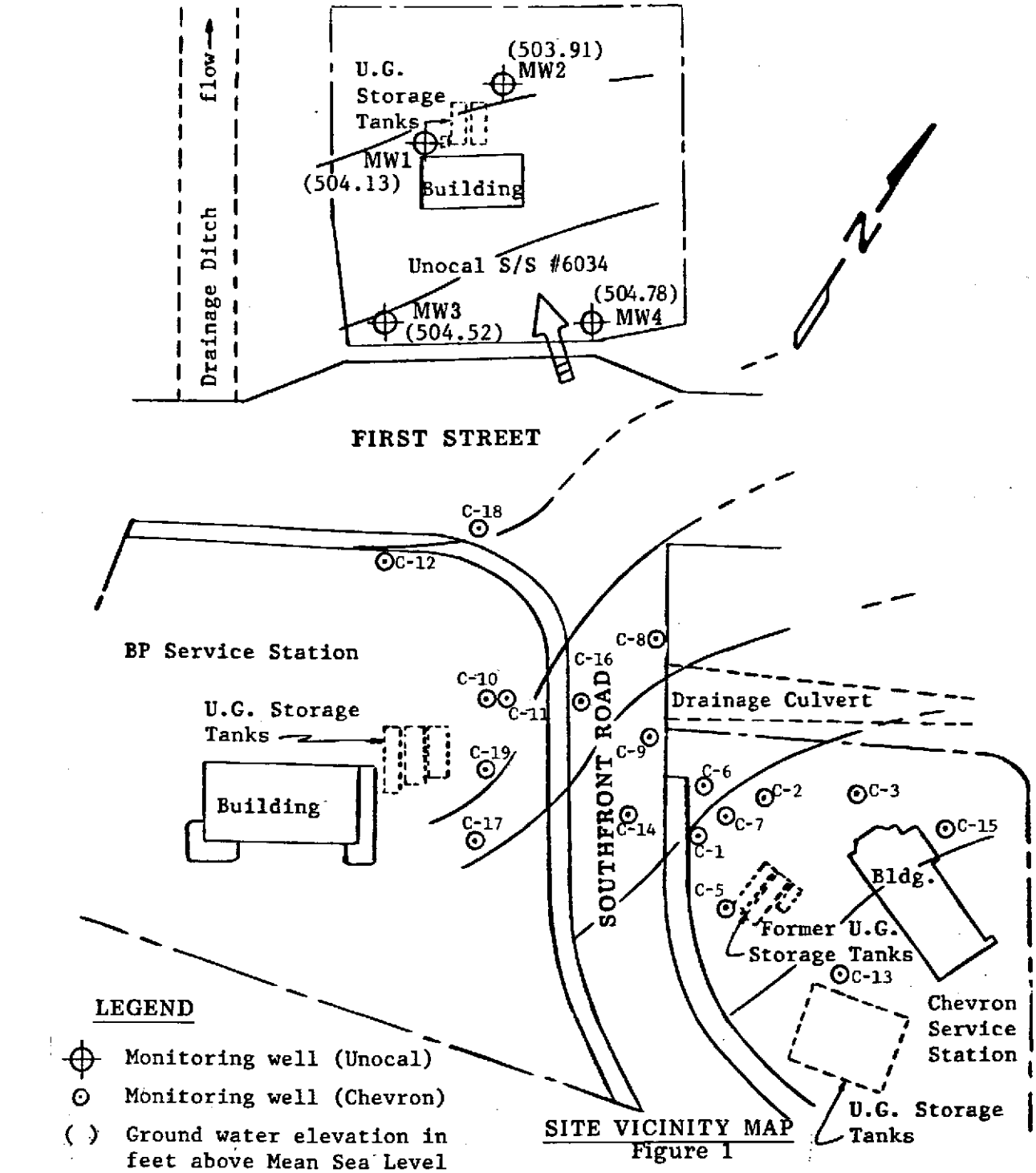

LEGEND

- Monitoring well (Unocal)
- ⊙ Monitoring well (Chevron)
- ( ) Ground water elevation in feet above Mean Sea Level on 12/24/90
- Direction of ground water flow
- ——— Contours on ground water surface in feet

Note: ground water elevations for Chevron's wells are summarized in Table 1A

SITE VICINITY MAP
Figure 1

0 80 160
Approx. scale feet

Unocal S/S #6034
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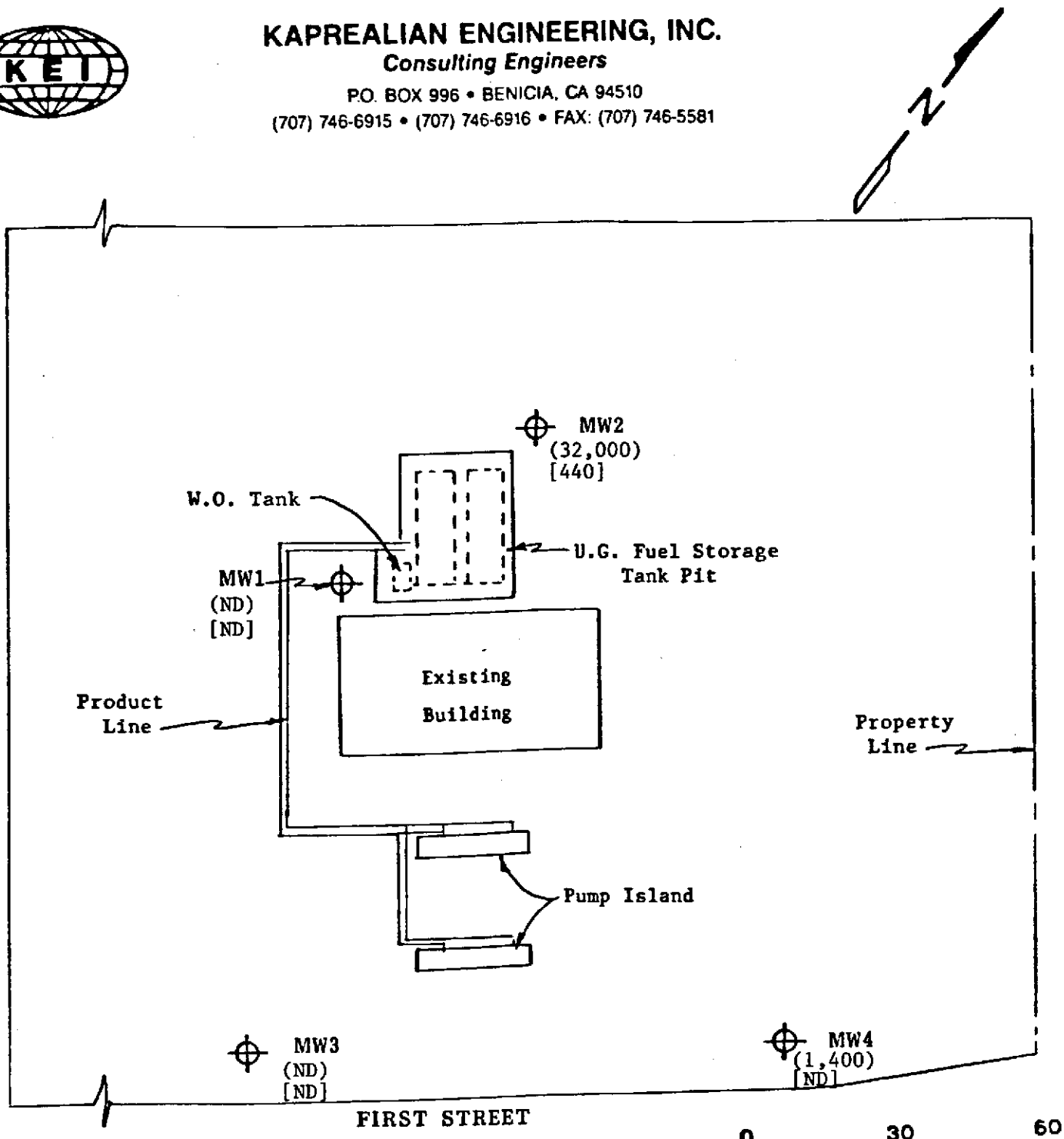

LEGEND

⊕ Monitoring Well

( ) Concentration of TPH as gasoline in ppb on 12/24/90

[ ] Concentration of benzene in ppb on 12/24/90

SITE PLAN
Figure 1a

Unocal S/S #6034
4700 First Street
Livermore, CA

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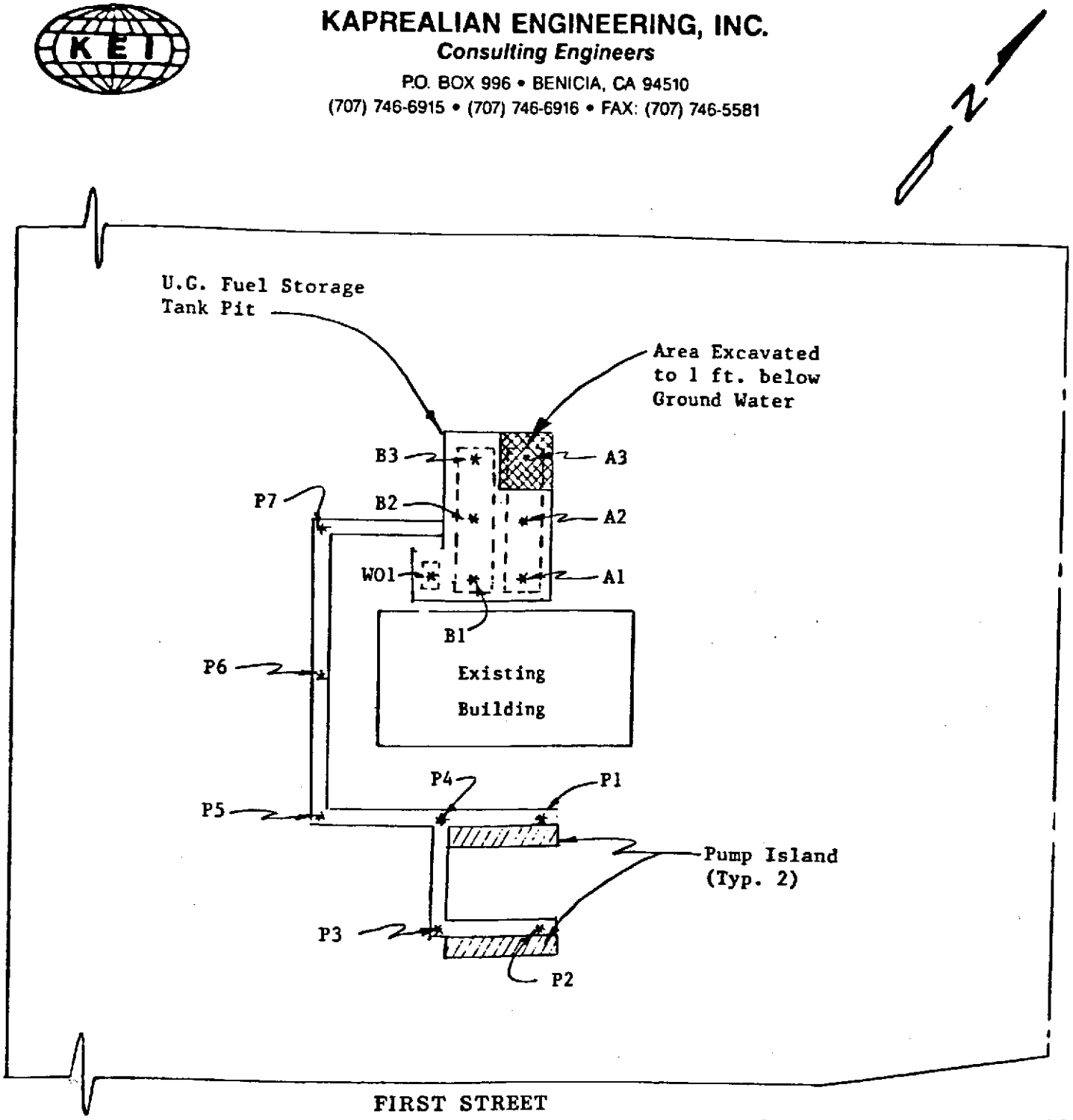

SITE PLAN
Figure 2

LEGEND

* Sample Point Location

Unocal S/S #6034
4700 First Street
Livermore, CA

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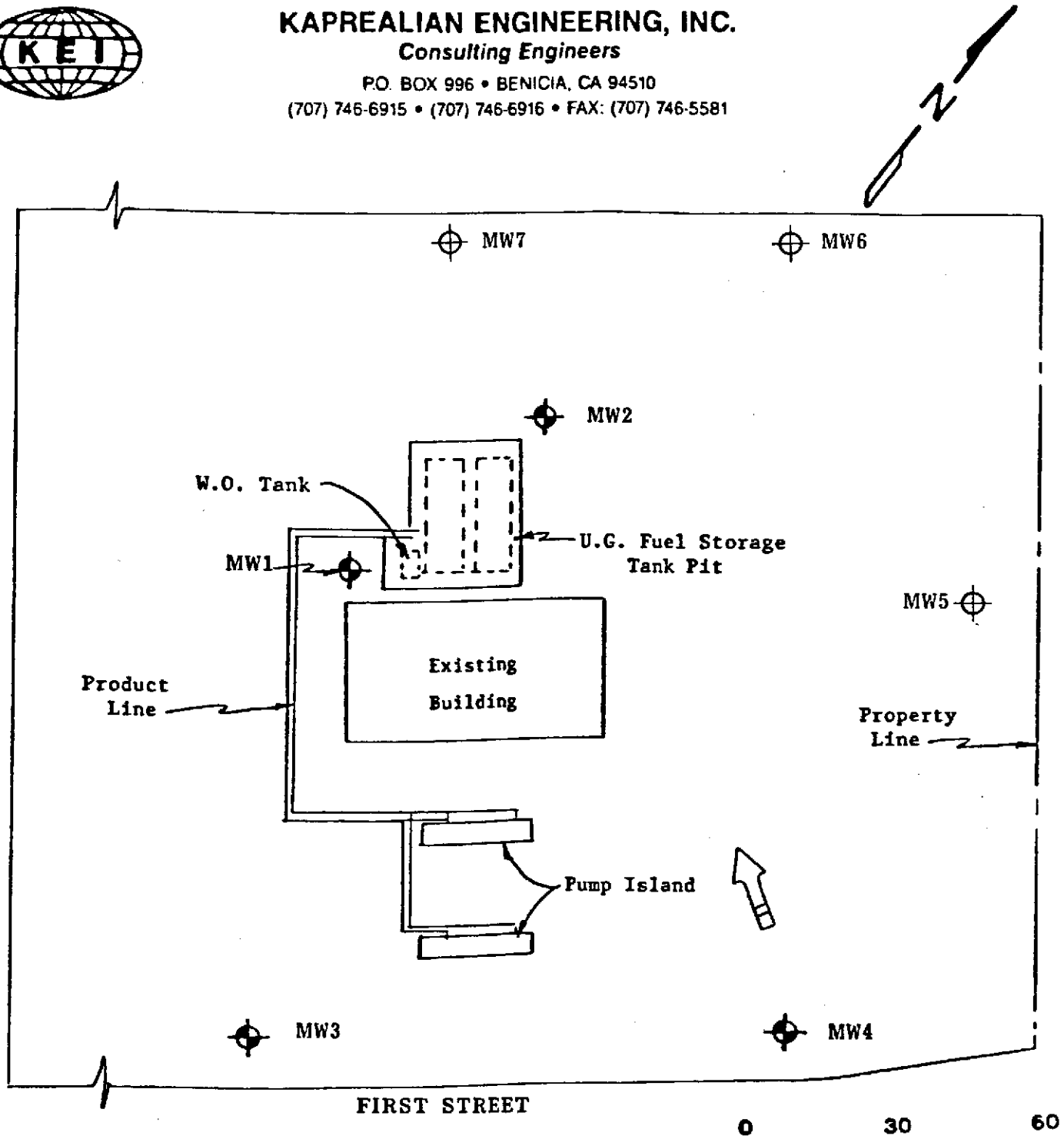


LEGEND

Monitoring Well (Existing)

Monitoring Well (Proposed)

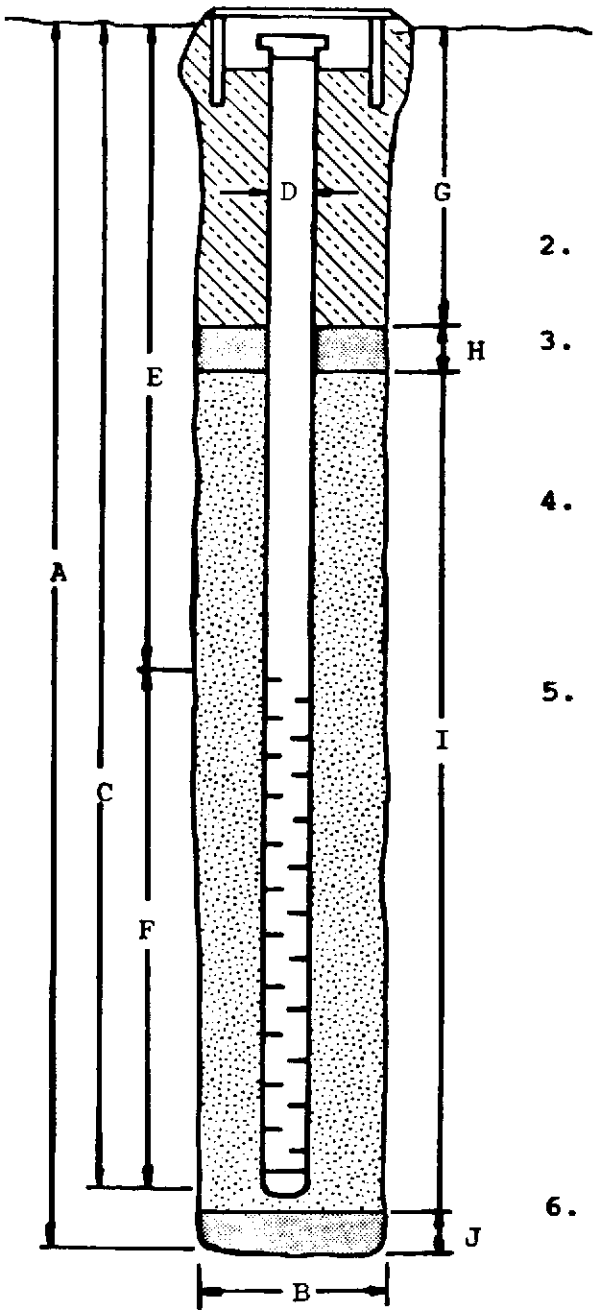
Direction of Ground Water Flow

SITE PLAN
Figure 3

Unocal S/S #6034
4700 First Street
Livermore, CA

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.) One foot 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.