



KAPREALIAN ENGINEERING, INC.
Consulting Engineers

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KEI-P89-1106.R9
September 28, 1990

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

Attention: Mr. Ron Bock

RE: Continuing Ground Water Investigation at
Unocal Service Station #3072
2445 Castro Valley Blvd.
Castro Valley, California

Dear Mr. Bock:

This report presents the results of Kaprealian Engineering, Inc's. (KEI) soil and ground water investigation for the referenced site in accordance with proposal KEI-P89-1106.P3 dated June 11, 1990. The purpose of the investigation was to further define the ground water flow direction, and to continue to determine the degree and extent of ground water contamination at the site. The scope of the work performed by KEI consisted of the following:

Coordination with regulatory agencies.

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

Soil sampling.

Ground water monitoring, purging and sampling.

Laboratory analyses.

Data analysis, interpretation and report preparation.

SITE DESCRIPTION AND BACKGROUND

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

KEI's work at the site began on November 14, 1989, when KEI collected soil samples following the removal of three fuel storage tanks and one waste oil tank at the referenced site. The soil samples (A1, A2, B1, B2, C1 and C2) under the fuel storage tanks

were collected at a depth of 13.5 feet. The soil sample (W01) under the waste oil tank was collected at a depth of 10.5 feet. All soil samples were analyzed by Sequoia Analytical Laboratory in Redwood City, California. The samples under the fuel storage tanks were analyzed for total petroleum hydrocarbons (TPH) as gasoline, and benzene, toluene, xylenes and ethylbenzene (BTX&E). In addition, the two samples from under the diesel tank were analyzed for TPH as diesel. Analytical results showed TPH as gasoline ranging from non-detectable to 11 ppm, with non-detectable BTX&E concentrations in each case. TPH as diesel concentrations were non-detectable for the two diesel tank bottom samples. The soil sample from under the waste oil tank was analyzed for TPH as gasoline, BTX&E, TPH as diesel, total oil and grease (TOG), EPA method 8010, and EPA method 8270 compounds, and the metals cadmium, chromium, lead and zinc. Laboratory analyses showed TPH as gasoline at 5.9 ppm, metals ranging from non-detectable to 45 ppm, 55 ppb of 1,1-dichloroethene, and non-detectable levels of all other constituents analyzed. Analytical results are summarized in Table 5, and sample point locations are as shown on the attached Site Plan, Figure 2.

On November 16, 1989, KEI collected six sidewall soil samples, designated as SW1 through SW6, and a water sample, designated as W1, from the fuel tank pit. The tank pit water level was measured to be 11.5 feet below the ground surface. The sidewall soil samples were collected approximately 6 to 12-inches above the tank pit water level. All samples were analyzed for TPH as gasoline and BTX&E. Three of the six sidewall soil samples (labeled SW2, SW3 and SW4) and the water sample (labeled W1) were also analyzed for TPH as diesel. Laboratory analyses of the soil samples showed TPH as gasoline ranging from non-detectable to 29 ppm for four of the six samples, with samples SW1 and SW4 showing 140 ppm and 160 ppm, respectively. TPH as diesel levels were non-detectable for two of the sidewall samples with sample SW4 showing 24 ppm. Analyses of the water sample showed 11,000 ppb of TPH as diesel, 26,000 ppb of TPH as gasoline, and 670 ppb of benzene. Analytical results of the soil samples are summarized in Table 5, and sample point locations are as shown on the attached Site Plan, Figure 2.

On November 28, 1989, KEI returned to the site to meet with the representative of the Alameda County Health Care Services (ACHCS) to clarify ACHCS guidelines as applied to the subject site for fuel tank pit excavation and sampling. In response to the meeting, KEI submitted a Phase I work plan (KEI-P89-1106.P1) dated November 30, 1989, to define the extent of contamination in the vicinity of the tank pit. The work plan was approved by the ACHCS in a letter dated December 8, 1989.

On December 22, 1989, KEI returned to the site after further excavation to collect additional sidewall soil samples from the fuel tank pit. Soil was excavated from the north, east and south sides of the pit. Sidewall soil samples, designated as SW1(17), SW2(17), SW7, SW8, SW9, SW10, SW11 and SW3(13), were collected at depths of approximately 9 or 11 feet, and analyzed on-site by Mobile Chem Labs, Inc., of Lafayette, California, a state-certified mobile laboratory. After excavation, TPH as gasoline was detected at concentrations of 1,500 ppm and 1,900 ppm on the northerly wall of the pit, at concentrations ranging from 3.0 ppm to 1,700 ppm on the easterly wall, and at 410 ppm on the southerly wall. Analytical results are summarized in Table 6, and sample point locations are as shown on the attached Site Plan, Figure 3.

Based on the analytical results, KEI recommended the installation of nine exploratory borings to further define the extent of the soil contamination.

On January 18 and 19, 1990, three two-inch diameter monitoring wells (designated as MW1, MW2 and MW3 on the attached Site Plan, Figure 1) were installed at the site. The monitoring wells were drilled and completed to total depths ranging from 22 to 30 feet. Ground water was encountered at depths ranging from 9 to 20.5 feet beneath the surface during drilling. The wells were developed on January 22 and 23, 1990. Analytical results of the soil samples, collected from the borings for monitoring wells (MW1, MW2 and MW3), indicated non-detectable levels of TPH as gasoline and BTX&E in all soil samples, except for sample MW1(5), which showed 2.8 ppm of TPH as gasoline, 0.051 ppm of benzene, and 0.11 ppm of ethylbenzene. Analytical results of the ground water samples collected from monitoring wells MW2 and MW3 indicated non-detectable levels of TPH as gasoline and BTX&E. In well MW1, TPH as gasoline and benzene were detected at 32 ppb and 4.2 ppb, respectively. Analytical results of the soil samples are summarized in Table 9, and water samples in Table 3.

On February 14, 1990, three soil samples, labeled P1, P2 and P3, were collected from the product pipe trenches at depths ranging from 2.5 to 4.0 feet. Analytical results indicated levels of TPH as gasoline ranging from 6.0 ppm to 87 ppm. Results of the soil analyses are summarized in Table 7. Soil sample locations are shown on the attached Site Plan, Figure 4.

KEI returned to the site on March 9, 1990, when three sidewall soil samples, labeled SWB, SWC and SWD, were collected from the sidewalls of the waste oil tank at depths of 8 to 9 feet. The waste oil tank pit had been excavated to a depth of 11 to 12 feet. Analytical results of the soil samples (SWB, SWC and SWD),

collected from sidewalls of the waste oil tank pit, indicated non-detectable levels of TOG and all EPA 8010 constituents for each of the three samples. Laboratory analyses indicated non-detectable levels of TPH as gasoline and BTX&E for samples SWC and SWD, while SWB showed 37 ppm of TPH as gasoline with 0.10 ppm benzene. TPH as diesel levels were non-detectable for sample SWC, with both SWB and SWD less than 10 ppm. Results of the soil samples are summarized in Table 8. Soil sample point locations are as shown on the attached Site Plan, Figure 5.

On April 24 and 25, 1990, eight exploratory borings (designated as EB1 through EB8 on the attached Site Plan, Figure 1) were drilled at the site. The eight borings were drilled and/or sampled to depths of 10.5 to 15 feet below grade. Ground water was encountered at depths of approximately 10 to 14 feet beneath the surface in each boring except EB4 where ground water was not encountered. Drilling was generally stopped about 1 to 2 feet after intersecting the first water table, except for EB4, which was terminated at a depth of 14.5 feet and ground water was not encountered. A water sample was collected from boring EB5 only. All borings were backfilled to the surface with neat cement.

Samples were analyzed at Sequoia Analytical Laboratory in Redwood City, California. Soil samples from all borings and the water sample from EB5 were analyzed for TPH as gasoline using EPA method 5030 in conjunction with modified 8015, and BTX&E using EPA method 8020. The results of soil analyses are summarized in Table 4, and the results of the water analyses are summarized in Table 10.

Analytical results of the soil samples, collected from the eight exploratory borings (EB1 through EB8), indicated non-detectable levels of TPH as gasoline in all samples, except EB1(9.5), EB4(14), EB6(5), EB7(5) and EB8(5), in which levels ranged from 1.7 to 5.0 ppm. Benzene was detected in all soil samples and the levels ranged from 0.0053 ppm to 0.023 ppm. The water sample analysis collected from boring EB5 immediately after drilling indicated a level of TPH as gasoline at 5,900 ppb with a level of benzene at 840 ppb. However, the results of the analyses may not be representative of formation water, and therefore they should be used for information purposes only.

Based on the analytical results, KEI recommended the installation of two additional monitoring wells to further define the extent of ground water contamination. In addition, KEI recommended the implementation of monthly monitoring and quarterly sampling of the existing monitoring wells. Results of the exploratory drilling and soil sampling activities are presented in KEI's report (KEI-J89-1108.R8) dated June 11, 1990.

FIELD ACTIVITIES

On August 13, 1990, two two-inch diameter monitoring wells (designated as MW4 and MW5 on the attached Site Plan, Figure 1) were installed at the site. The wells were drilled, constructed and completed in accordance with the guidelines of the Regional Water Quality Control Board (RWQCB) and County well standards.

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

The two wells were drilled and completed to total depths ranging from 23.5 to 24 feet. Ground water was encountered at depths ranging from 10 to 14.5 feet beneath the surface during drilling. Soil/bedrock samples were taken at a maximum spacing of 5 foot intervals beginning at approximately 5 feet below grade until ground water was encountered. The undisturbed soil/bedrock samples were taken by driving a California-modified split-spoon sampler ahead of the drilling augers. The two-inch diameter brass liners holding the samples were sealed with aluminum foil, plastic caps and tape, and stored in a cooled ice chest for delivery to a certified laboratory. Each well casing was installed with a watertight cap and padlock. A round, watertight, flush-mounted well cover was cemented in place over each well casing.

The wells were developed on August 20, 1990. Prior to development, the wells were checked for depth to water table using an electronic sounder, presence of free product (using paste tape) and sheen. No free product or sheen was noted in any of the wells. After recording the monitoring data, the wells were purged with a surface pump until the evacuated water was clear and free of suspended sediment. Monitoring and well development data are summarized in Table 1.

The wells were sampled on August 27, 1990. Prior to sampling, monitoring data were collected and water samples were then collected using a clean Teflon bailer. The samples were decanted into clean glass VOA vials, sealed with Teflon-lined screw caps, and labeled and stored on ice until delivery to a certified laboratory.

ANALYTICAL RESULTS

Water from all wells (MW1 through MW5) and selected soil samples from MW4 and MW5 were analyzed at Sequoia Analytical Laboratory, Redwood City, California. All samples analyzed were accompanied by properly executed Chain of Custody documentation. The samples were analyzed for TPH as gasoline by EPA method 5030 in conjunction with modified 8015 and BTX&E by EPA method 8020.

Analytical results of the soil samples indicate non-detectable levels of TPH as gasoline and BTX&E in all analyzed samples. Water sample analyses show non-detectable levels of TPH as gasoline in all wells. Benzene was detected in wells MW1, MW3 and MW4 at levels of 3.2 ppb, 1.1 ppb and 0.34 ppb, respectively.

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

HYDROLOGY AND GEOLOGY

The water table stabilized in the existing monitoring wells at depths ranging from 6.65 to 9.06 feet below the surface. Ground water flow direction appeared to be complex with an approximately due north flow direction at the northwest portion of the site and a flow direction toward the southeast at the southeastern portion of the site on August 20, 1990.

Based on review of regional geologic maps (U.S. Geological Survey Open-File Report 80-540 "Preliminary Geologic Map of the Hayward Quadrangle, Alameda and Contra Costa Counties, California" by T.W. Dibblee, Jr., 1980), the subject site is underlain by Quaternary-age alluvium. Mapped bedrock outcrops adjacent to the site include the marine Panoche Formation (Kpc), which is described as a conglomerate generally composed of granite, diorite, quartzite and black chert cobbles in a sandstone matrix and the Knoxville Formation (JKk), which is described as consisting of dark micaceous shale with minor thin sandstone.

Also, the site is situated approximately 3,000 feet northeast of the mapped trace of the active Hayward Fault; 1,900 feet southwest of the concealed mapped trace of the East Chabot Fault; and 1,800 feet northeast of the mapped trace (northern terminus?) of the West Chabot Fault.

As exposed in the underground tank pit excavation, the earth materials at the subject site consist of artificial fill materials at the surface which are typically 1 to 2 feet thick, and locally vary up to a maximum of about 9 feet at the east wall of

the pit excavation. These fill materials are in turn underlain by dark gray silty clay soil materials, which are about 2.5 feet thick. The soil materials are underlain by greenish-brown to yellowish brown highly weathered to slightly weathered shale, which varies from soft to moderately hard with abundant fractures (both clay healed and relatively open).

The results of the drilling activities at the site indicate that bedrock materials underlying the site are composed of brown and gray shale, which is slightly to highly weathered. The depth to the bedrock materials appears to vary considerably from about 5 to 6 feet below grade in the vicinity of well MW1 and boring EB2, to about 21.5 feet in the vicinity of well MW2, to greater than 22 feet in the vicinity of well MW3 (maximum depth explored). However, bedrock commonly underlies that site at a depth of about 8 to 10 feet as encountered in the majority of the borings at the site and exposures in the old tank pit excavation.

DISCUSSION AND RECOMMENDATIONS

Based on the analytical results and no evidence of free product or sheen, KEI recommends continuation of our monthly monitoring and quarterly sampling program. The proposed program should be conducted for a period of 12 months. Results of the monitoring program will be documented and evaluated after each monitoring and sampling event. Recommendations for altering or terminating the program will be made as needed.

DISTRIBUTION

A copy of this report should be sent to the Alameda County Health Care Services, and to the RWQCB, San Francisco Bay Region.

LIMITATIONS

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

KEI-P89-1106.R9
September 28, 1990
Page 8

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.



Don R. Braun
Certified Engineering Geologist

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



Mardo Kaprealian
President

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Attachments: Tables 1 through 10
Location Map
Site Plans - Figures 1, 2, 3, 4 & 5
Boring Logs
Laboratory Results
Chain of Custody documentation

KEI-P89-1106.R9
September 28, 1990

TABLE 1

SUMMARY OF GROUND WATER MONITORING AND PURGING DATA

<u>Well #</u>	<u>Depth to Water (feet)</u>	<u>Product Thickness</u>	<u>Sheen</u>	<u>Gallons Pumped</u>
(Monitored and Developed on August 20, 1990)				
MW1*	9.06	0	None	0
MW2*	8.88	0	None	0
MW3*	6.65	0	None	0
MW4	6.90	0	None	21
MW5	8.21	0	None	19

* Monitored only.

(Monitored and Sampled on August 27, 1990)

MW1	9.08	0	None	15
MW2	8.93	0	None	15
MW3	6.68	0	None	15
MW4	6.92	0	None	15
MW5	7.67	0	None	15

KEI-P89-1106.R9
September 28, 1990

TABLE 2

SUMMARY OF LABORATORY ANALYSES
SOIL

(Collected on August 13, 1990)

<u>Sample Number</u>	<u>Depth (feet)</u>	<u>TPH as Gasoline</u>	<u>Benzene</u>	<u>Toluene</u>	<u>Xylenes</u>	<u>Ethyl-benzene</u>
MW4 (5)	5	ND	ND	ND	ND	ND
MW5 (9.5)	9.5	ND	ND	ND	ND	ND
MW5 (13.5)	13.5	ND	ND	ND	ND	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.

KEI-J89-1106.R9
September 28, 1990

TABLE 3

SUMMARY OF LABORATORY ANALYSES
WATER

<u>Sample Number</u>	<u>TPH as Gasoline</u>	<u>Benzene</u>	<u>Toluene</u>	<u>Xylenes</u>	<u>Ethylbenzene</u>
(Collected on August 27, 1990)					
MW1	ND	3.2	ND	ND	ND
MW2	ND	ND	ND	ND	ND
MW3	ND	1.1	0.50	0.89	0.54
MW4	ND	0.34	ND	ND	ND
MW5	ND	ND	ND	ND	ND
(Collected on March 22, 1990)					
MW1	32	4.2	ND	1.1	0.36
MW2	ND	ND	ND	ND	ND
MW3	ND	ND	ND	ND	ND
MW4*	ND	ND	ND	ND	ND
Detection Limits	30	0.3	0.3	0.3	0.3

ND = Non-detectable.

* Sample MW4 is a duplicate of sample MW2.

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

KEI-J89-1106.R9
September 28, 1990

TABLE 4

SUMMARY OF LABORATORY ANALYSES
SOIL

(Collected on April 24 and 25, 1990)

<u>Sample Number</u>	<u>TPH as Gasoline</u>	<u>Benzene</u>	<u>Toluene</u>	<u>Xylenes</u>	<u>Ethylbenzene</u>
EB1 (5)	ND	0.0063	0.042	0.011	ND
EB1 (9.5)	4.9	0.0078	0.24	0.11	0.028
EB1 (13.5)	ND	0.0087	0.048	ND	ND
EB2 (5)	ND	0.0053	0.020	0.013	0.0068
EB2 (10)	ND	0.0059	0.026	0.013	0.0050
EB3 (5)	ND	0.0069	0.031	0.017	ND
EB3 (9)	ND	0.0093	0.023	ND	ND
EB4 (5)	ND	0.0091	0.034	ND	ND
EB4 (10)	ND	0.0090	0.27	ND	ND
EB4 (14)	1.7	0.0079	0.43	ND	ND
EB5 (5)	ND	0.0095	0.015	ND	ND
EB6 (5)	5.0	0.066	0.021	0.11	0.032
EB6 (10)	ND	0.0086	0.060	0.014	0.0052
EB6 (13)	ND	0.0080	0.16	0.24	0.0092
EB7 (5)	3.0	0.040	0.056	0.073	0.034
EB7 (9.5)	ND	0.0081	0.078	0.025	0.015
EB7 (13.5)	ND	0.0054	0.085	0.012	ND
EB8 (5)	2.7	0.023	0.067	0.078	0.013
EB8 (10)	ND	0.0072	0.056	0.019	0.0050
Detection Limits	1.0	0.0050	0.0050	0.0050	0.0050

ND = Non-detectable.

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

KEI-J89-1106.R9
 September 28, 1990

TABLE 5

SUMMARY OF LABORATORY ANALYSES
 SOIL

(Collected on November 14 & 16, 1989)

<u>Sample</u>	<u>Depth (feet)</u>	<u>TPH as Diesel</u>	<u>TPH as Gasoline</u>	<u>Benzene</u>	<u>Toluene</u>	<u>Xylenes</u>	<u>Ethyl- benzene</u>
A1	13.5	ND	2.4	ND	ND	ND	ND
A2	13.5	ND	ND	ND	ND	ND	ND
B1	13.5	--	1.9	ND	ND	ND	ND
B2	13.5	--	11	ND	ND	ND	ND
C1	13.5	--	1.5	ND	ND	ND	ND
C2	13.5	--	7.5	ND	ND	ND	ND
SW1	10.5	--	140	0.31	0.12	3.0	0.88
SW2	10.5	ND	ND	ND	ND	ND	ND
SW3	10.5	ND	ND	ND	ND	ND	ND
SW4	9.5	24	160	0.33	6.4	30	9.4
SW5	9.5	--	3.5	0.06	0.27	0.76	0.19
SW6	10	--	29	0.12	0.21	2.0	0.58
WO1(11)*	11	ND	5.9	ND	ND	ND	ND
Detection Limits		1.0	1.0	0.05	0.1	0.1	0.1

* TOG and all 8270 constituents were non-detectable. All 8010 constituents were non-detectable, except 1,1-dichloroethene at 55 ppb. Metals concentrations were as follows: cadmium 2.5 ppm, chromium 39 ppm, lead 1.1 ppm, and zinc 45 ppm.

ND = Non-detectable.

-- Indicates analysis not performed.

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

KEI-J89-1106.R9
September 28, 1990

TABLE 6

SUMMARY OF LABORATORY ANALYSES
SOIL

(Collected on December 22, 1989)

<u>Sample</u>	<u>Depth (feet)</u>	<u>TPH as Diesel</u>	<u>TPH as Gasoline</u>	<u>Benzene</u>	<u>Toluene</u>	<u>Xylenes</u>	<u>Ethyl- benzene</u>
SW1(17)	11	ND	1,900	14	24	120	28
SW2(17)	11	ND	1,500	17	29	92	23
SW7	9	ND	1,700	16	33	110	26
SW8	9	ND	200	2.6	0.9	7.7	5.0
SW3(13)	9	ND	690	11	11	28	11
SW9	9	ND	3.0	0.2	0.1	0.1	ND
SW10	9	ND	500	4.0	5.9	22	6.9
SW4(11)	9	ND	410	2.7	3.9	19	3.8
Detection Limits		1.0	1.0	0.1	0.1	0.1	0.1

ND = Non-detectable.

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

KEI-J89-1106.R9
September 28, 1990

TABLE 7

SUMMARY OF LABORATORY ANALYSES
SOIL

(Collected on February 14, 1990)

<u>Sample</u>	<u>Depth (feet)</u>	<u>TPH as Gasoline</u>	<u>Benzene</u>	<u>Toluene</u>	<u>Xylenes</u>	<u>Ethylbenzene</u>
P1	4.0	87	0.33	0.17	10	2.3
P2	2.5	6.0	0.23	ND	0.33	0.11
P3	3.0	10	0.47	0.11	1.1	0.32
Detection Limits		1.0	0.05	0.1	0.1	0.1

ND = Non-detectable.

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

KEI-J89-1106.R9
September 28, 1990

TABLE 8

SUMMARY OF LABORATORY ANALYSES
SOIL

(Collected on March 9, 1990)

<u>Sample</u>	<u>Depth (feet)</u>	<u>TPH as Diesel</u>	<u>TPH as Gasoline</u>	<u>Benzene</u>	<u>Toluene</u>	<u>Xylenes</u>	<u>Ethyl- benzene</u>
SWB*	8.0	<10	37	0.10	0.10	0.74	0.25
SWC*	9.0	ND	ND	ND	ND	ND	ND
SWD*	9.0	<10	ND	ND	ND	ND	ND
Detection Limits		1.0	1.0	0.05	0.1	0.1	0.1

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

ND = Non-detectable.

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

KEI-J89-1106.R9
September 28, 1990

TABLE 9

SUMMARY OF LABORATORY ANALYSES
SOIL

(Collected on January 18, 1990)

<u>Sample Number</u>	<u>Depth (feet)</u>	<u>TPH as Gasoline</u>	<u>Benzene</u>	<u>Toluene</u>	<u>Xylenes</u>	<u>Ethylbenzene</u>
MW1(5)	5.0	2.8	0.051	ND	ND	0.11
MW1(6.5)	6.5	ND	ND	ND	ND	ND
MW1(10.0)	10.0	ND	ND	ND	ND	ND
MW2(5)	5.0	ND	ND	ND	ND	ND
MW2(6.5)	6.5	ND	ND	ND	ND	ND
MW2(9.0)	9.0	ND	ND	ND	ND	ND
MW2(10)	10.0	ND	ND	ND	ND	ND
MW2(15)	15.0	ND	ND	ND	ND	ND
MW2(16.5)	16.5	ND	ND	ND	ND	ND
MW2(20)	20.0	ND	ND	ND	ND	ND
MW3(5)	5.0	ND	ND	ND	ND	ND
MW3(6.5)	6.5	ND	ND	ND	ND	ND
MW3(9)	9.0	ND	ND	ND	ND	ND
Detection Limits		1.0	0.05	0.1	0.1	0.1

ND = Non-detectable.

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

KEI-J89-1106.R9
September 28, 1990

TABLE 10

SUMMARY OF LABORATORY ANALYSES
WATER

(Collected on April 25, 1990)

<u>Sample Number</u>	<u>TPH as Gasoline</u>	<u>Benzene</u>	<u>Toluene</u>	<u>Xylenes</u>	<u>Ethylbenzene</u>
EB6	5,900	840	34	73	100
Detection Limits	30	0.3	0.3	0.3	0.3

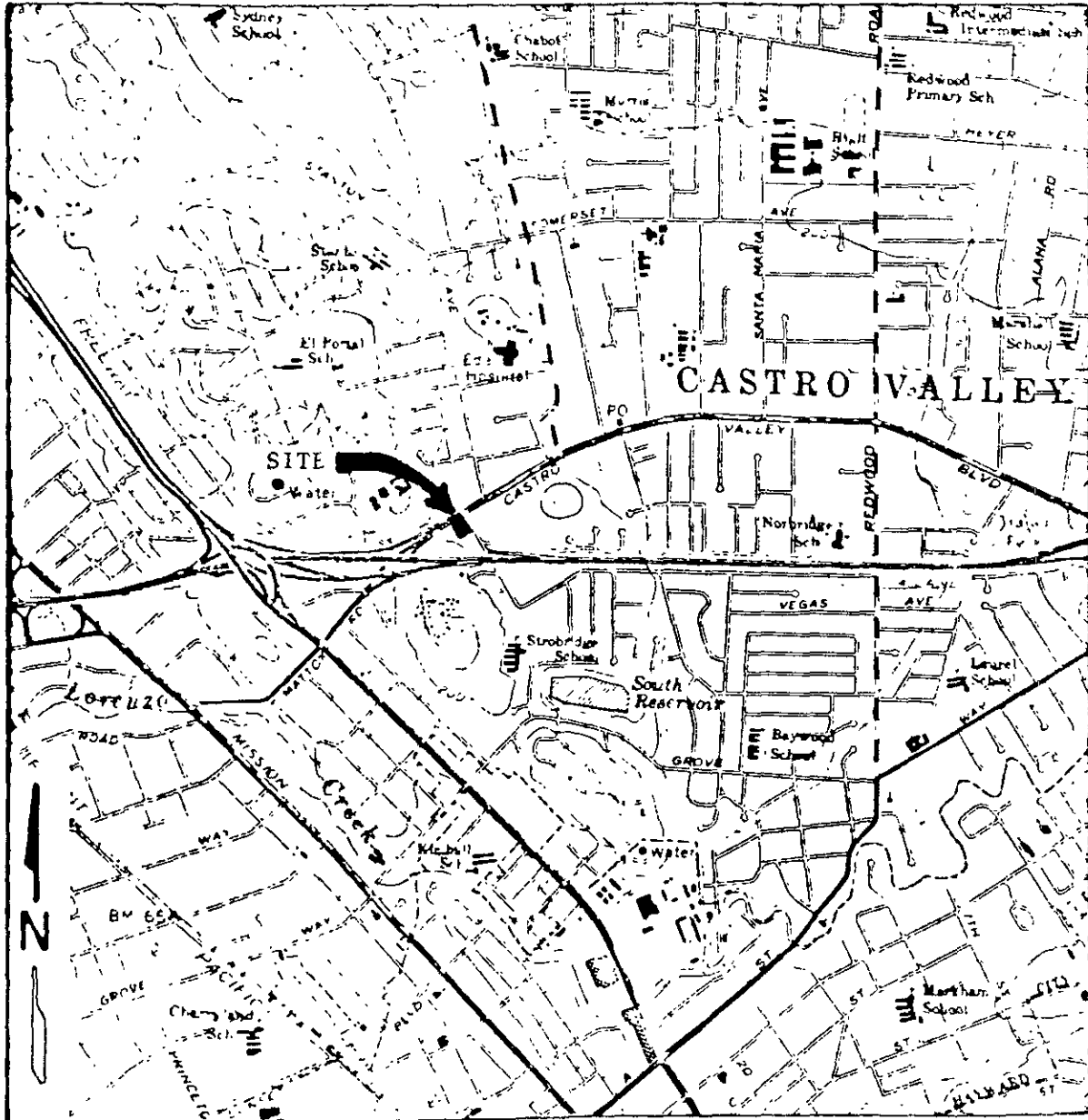
Results in parts per billion (ppb), unless otherwise indicated.

NOTE: Water samples were collected during drilling. The results of the analyses may not be representative of formation water, they should be used for information only.



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LOCATION MAP

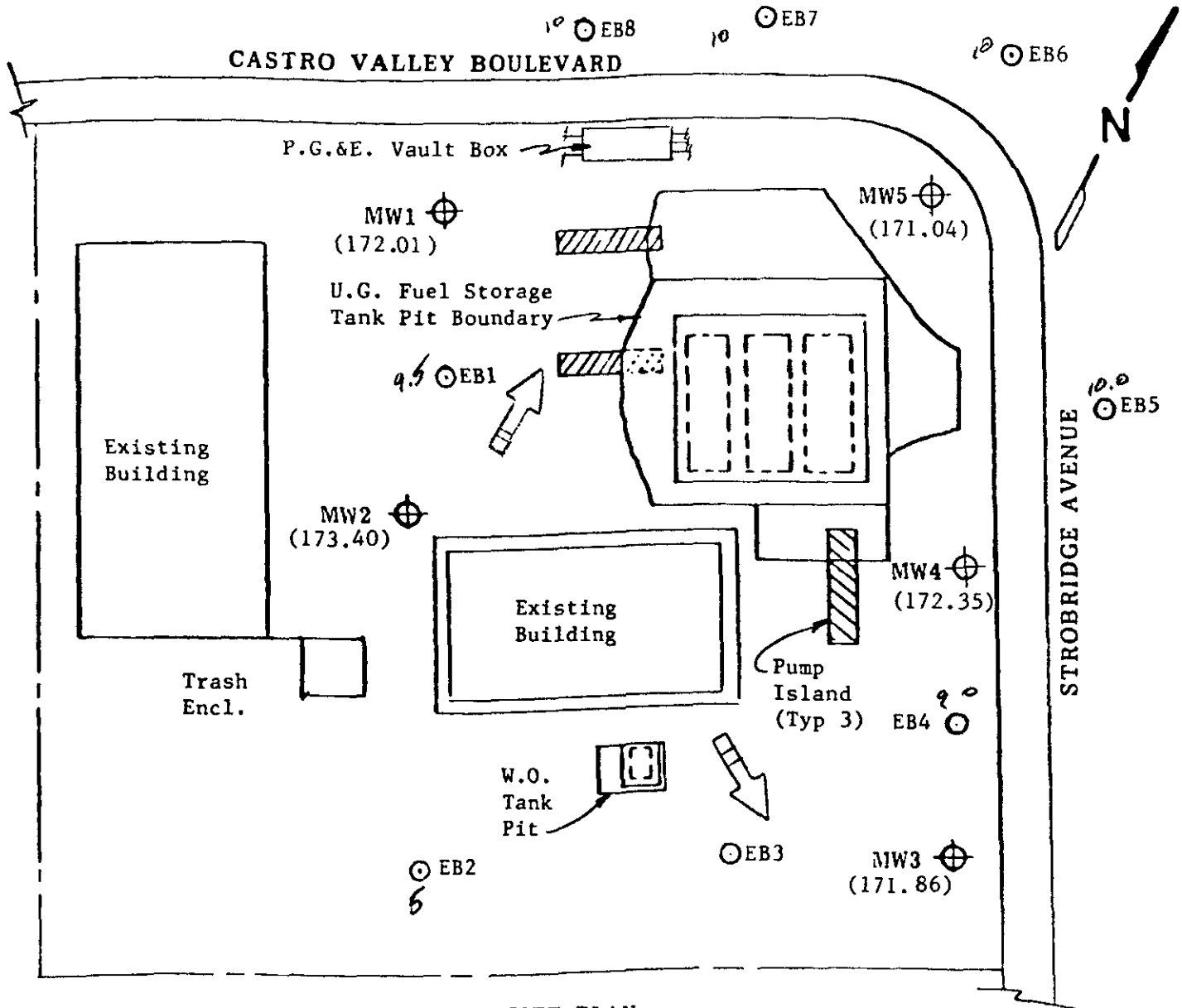
Unocal S/S #3072
2445 Castro Valley Blvd.
Castro Valley, CA



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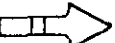
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SITE PLAN

Figure 1

LEGEND

-  Monitoring Well (Existing)
-  Exploratory Boring
-  Ground Water Flow Direction
- () Ground Water Elevation in feet (above MSL) on 8/20/90

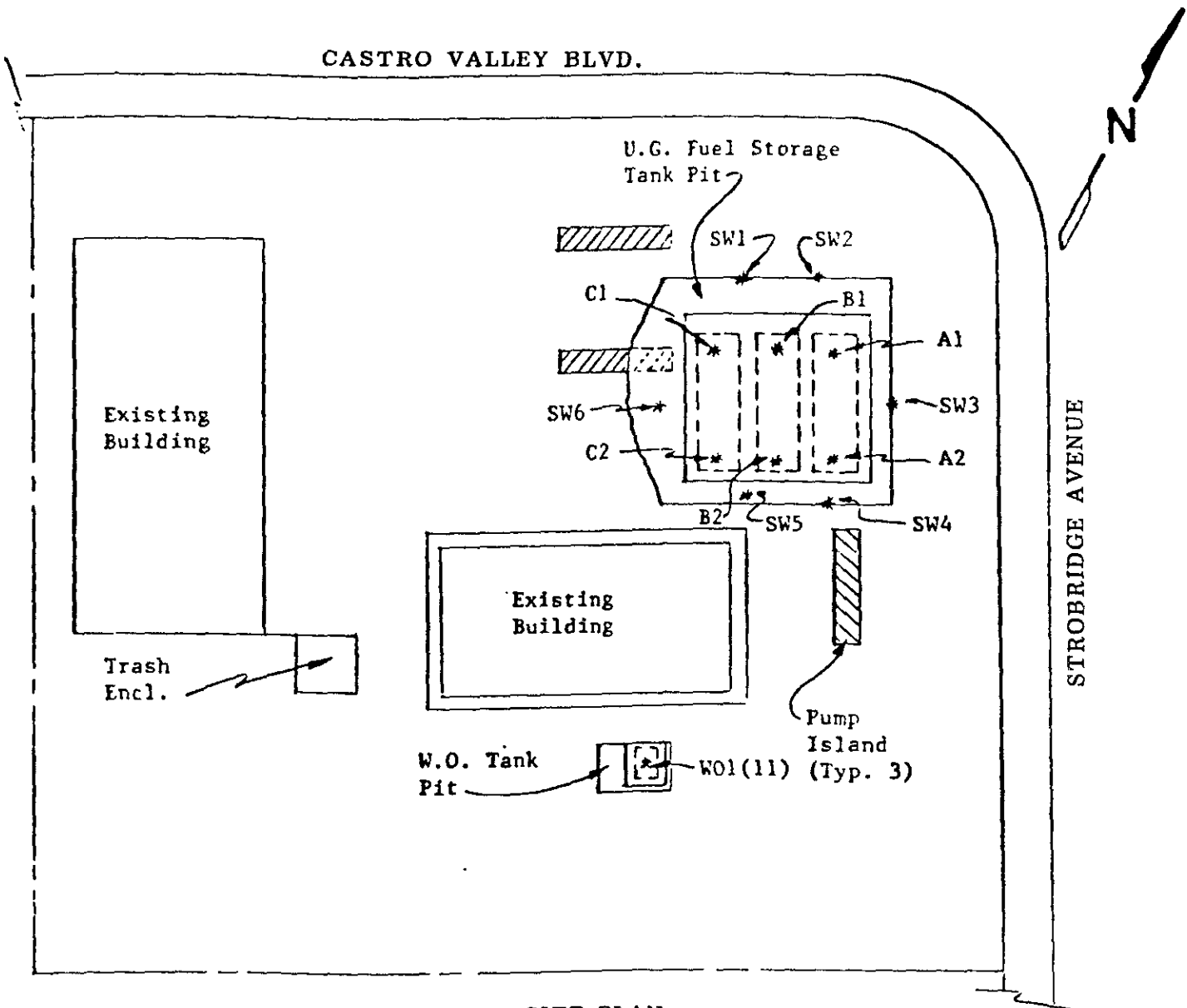


Unocal S/S #3072
2445 Castro Valley Blvd.
Castro Valley, CA

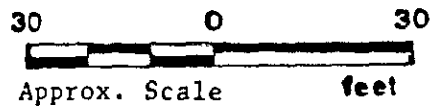


KAPREALIAN ENGINEERING, INC.
Consulting Engineers

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



SITE PLAN
Figure 2



LEGEND

* Sample Point Location

Unocal S/S #3072
2445 Castro Valley Blvd.
Castro Valley, CA

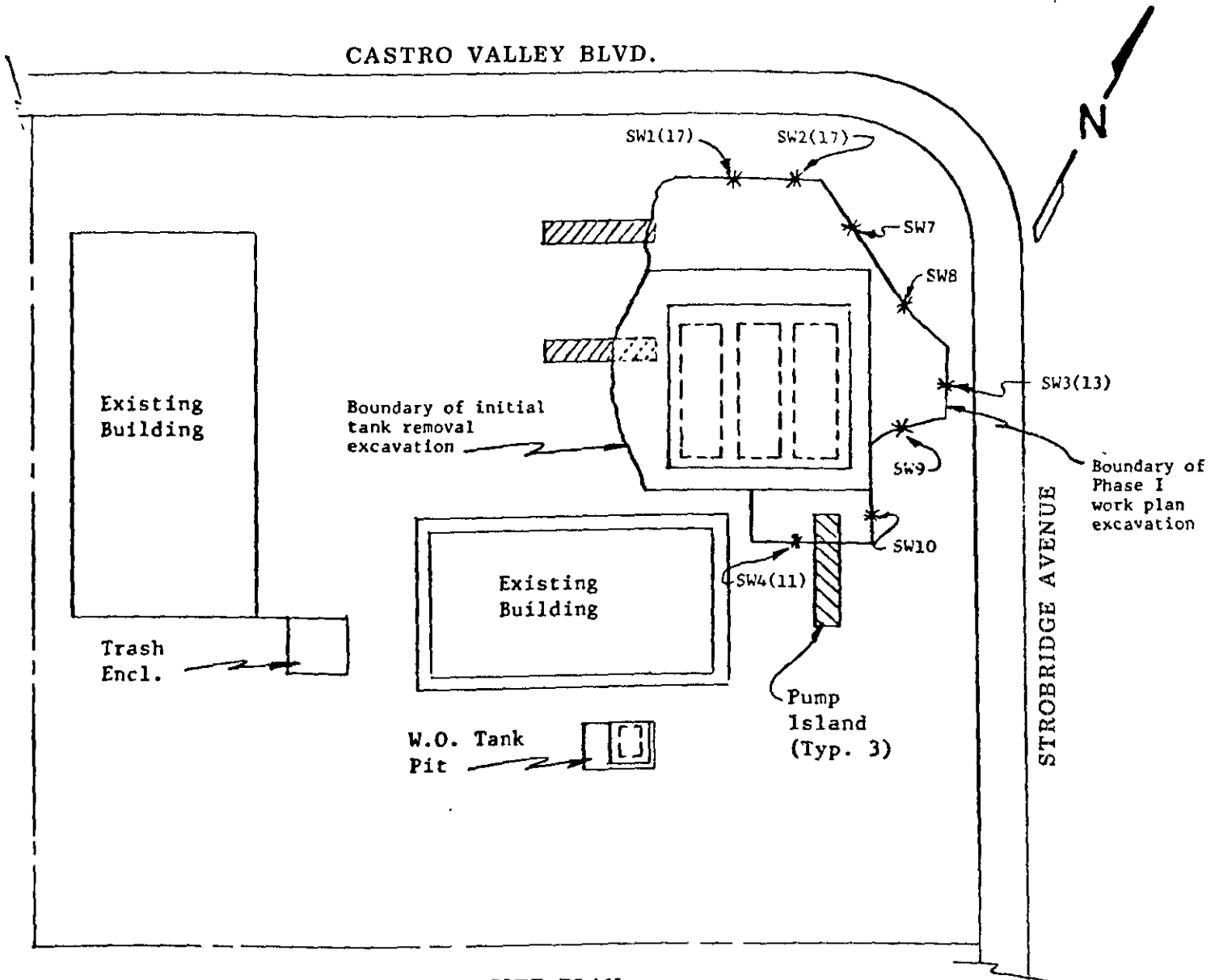


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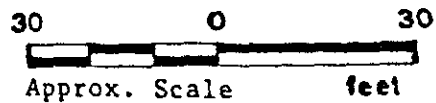
Consulting Engineers

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SITE PLAN
Figure 3



LEGEND

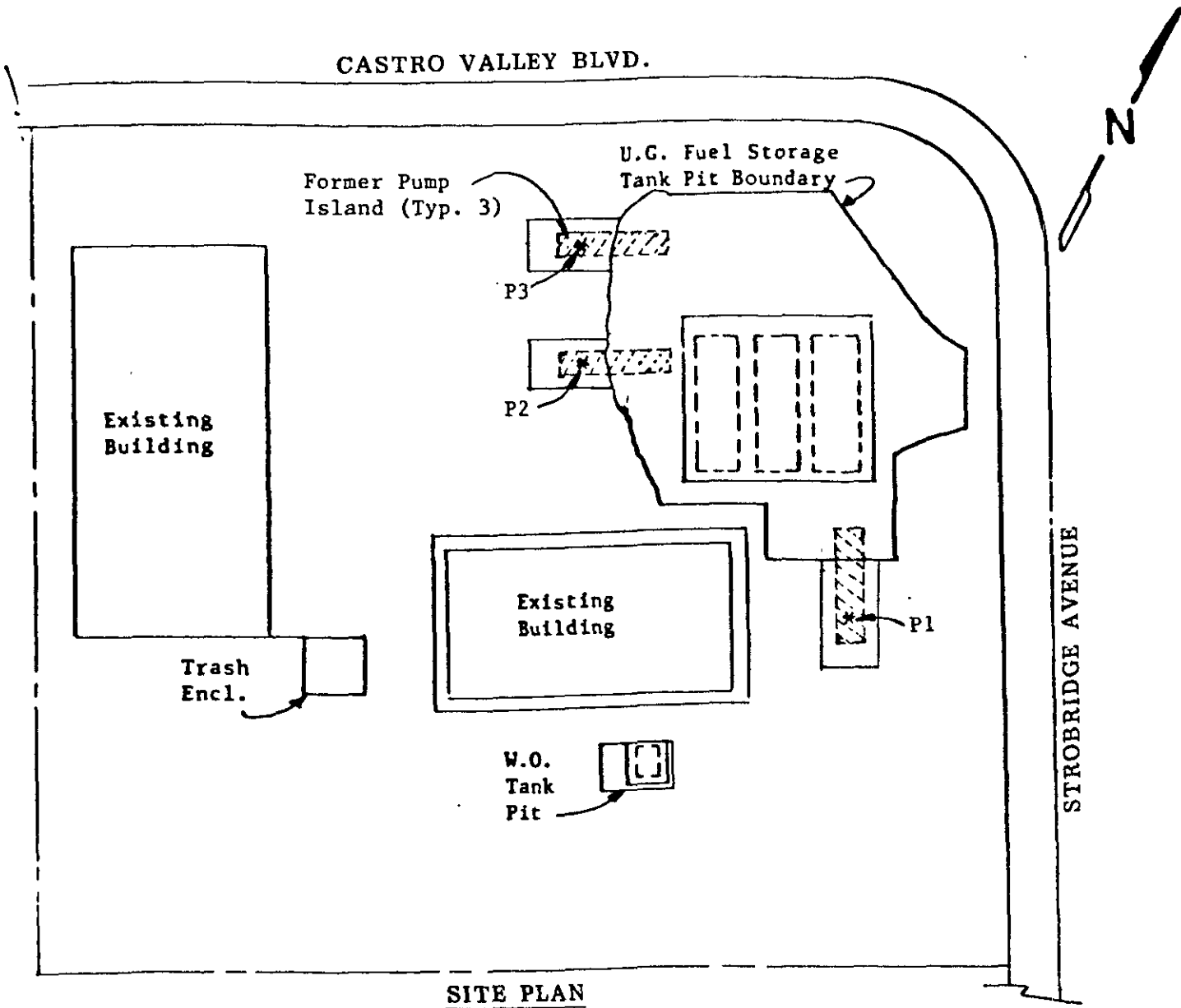
* Sample Point Location

Unocal S/S #3072
2445 Castro Valley Blvd.
Castro Valley, CA



KAPREALIAN ENGINEERING, INC.
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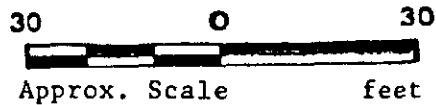
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SITE PLAN
Figure 4

LEGEND

* Sample Point Location



Unocal S/S #3072
2445 Castro Valley Blvd.
Castro Valley, CA

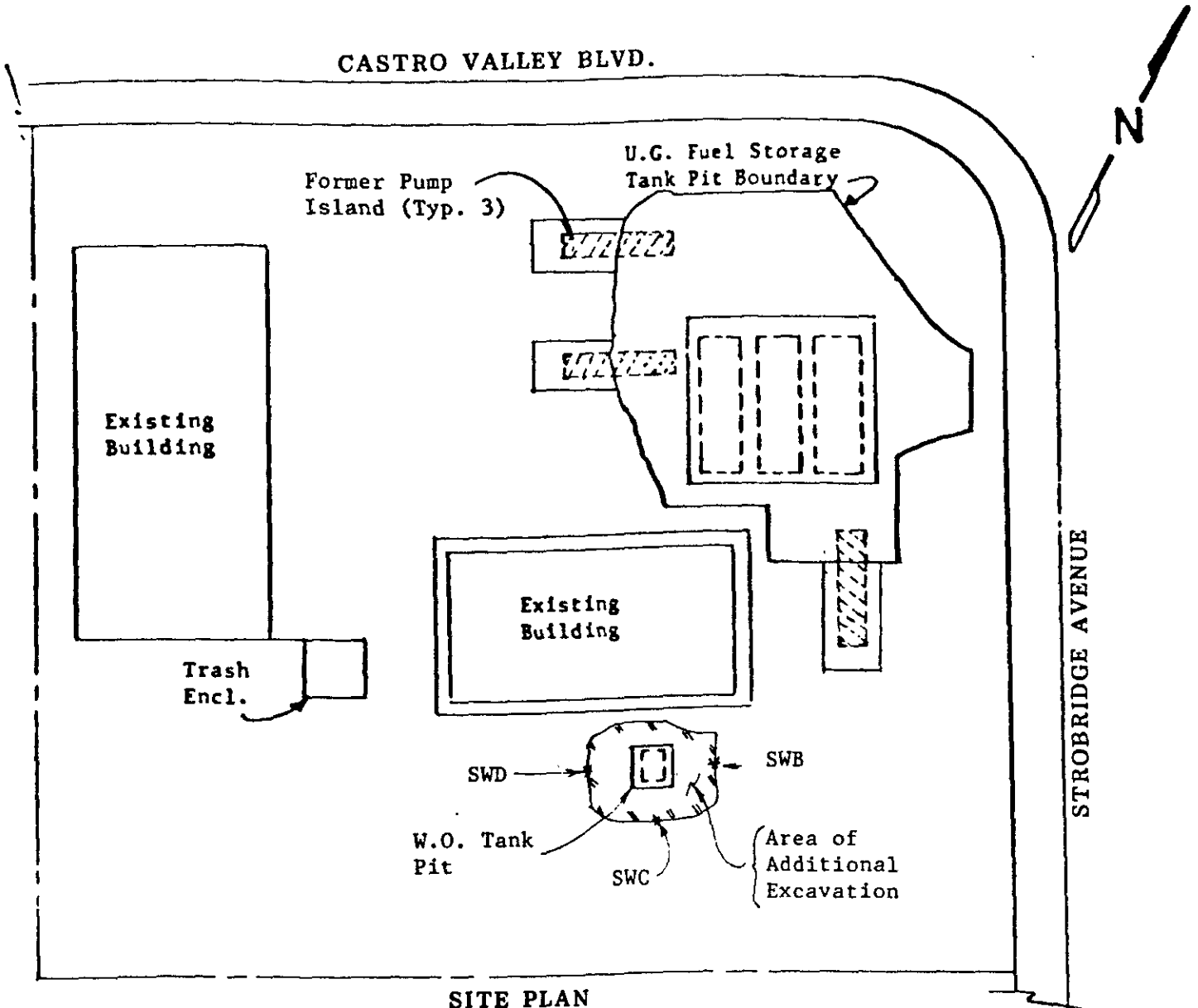


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SITE PLAN

Figure 5

LEGEND

* Sample Point Location



Unocal S/S #3072
2445 Castro Valley Blvd.
Castro Valley, CA

B O R I N G L O G

Project No. KEI-P89-1106	Boring & Casing Diameter 9" 2"	Logged By D.L. <i>D.L. Brown</i>
Project Name Unocal Castro Valley	Well Head Elevation N/A	Date Drilled 1/18/90
Boring No. MW1	Drilling Method Hollow-stem Auger	Drilling Company EGI

Penetration blows/6"	G. W. level	Depth (ft) Samples	Strati- graphy USCS	Description
		0		A.C. Pavement Clay, sand, and gravel: fill
			CH	Clay, high plasticity, stiff, moist, black.
5/7/14		5		Color change at 5 feet to dark gray 10-15% sand.
			N/A	Shale bedrock, weathered, locally hard, fractured, slightly moist, olive brown, clayey inside fractures.
16/33/43				
22/46/ 50-5"		10		
	▼ =			Shale bedrock at 13 feet, as above, wet.
		15		
				Color change at 20 feet to very dark gray.
		20		

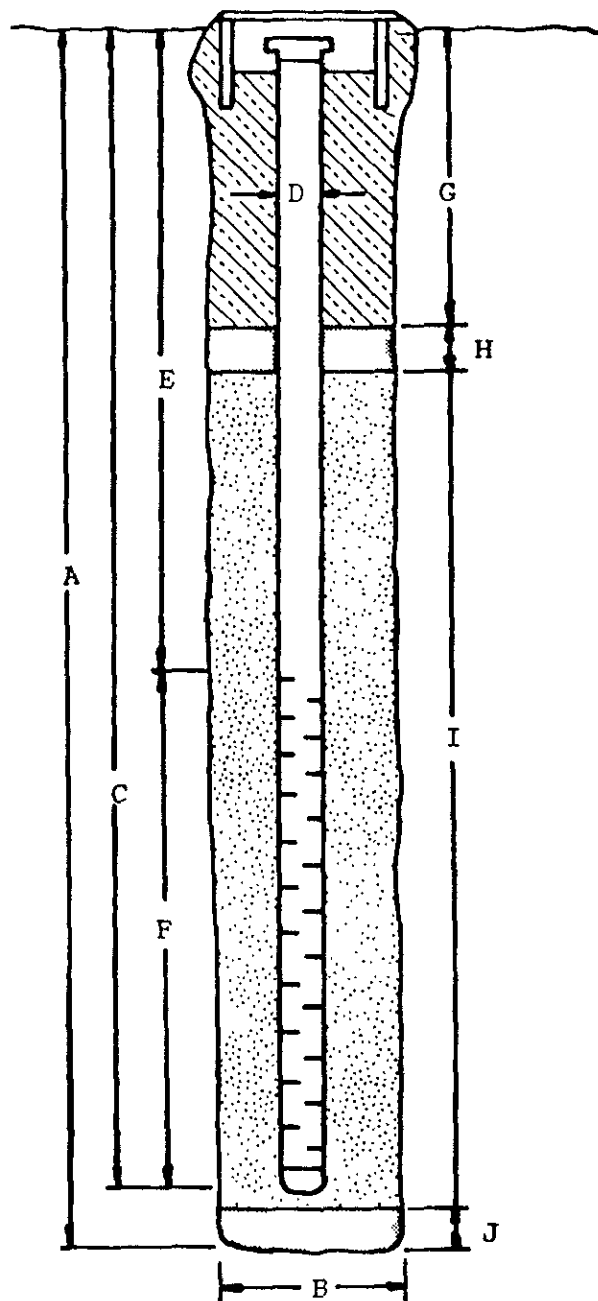
W E L L C O M P L E T I O N D I A G R A M

PROJECT NAME: Unocal - Castro Valley BORING/WELL NO. MW1

PROJECT NUMBER: KEI-P89-1106

WELL PERMIT NO.: _____

Flush-mounted Well Cover



A. Total Depth: 25.5'

B. Boring Diameter*: 9"

Drilling Method: Hollow Stem Auger

C. Casing Length: 25.5'

Material: Schedule 40 PVC

D. Casing Diameter: OD = 2.375"

ID = 2.067"

E. Depth to Perforations: 8'

F. Perforated Length: 17.5'

Perforation Type: Machined Slot

Perforation Size: 0.020"

G. Surface Seal: 4'

Seal Material: Concrete

H. Seal: 2'

Seal Material: Bentonite

I. Gravel Pack: 19.5'

Pack Material: RMC Lonestar Sand

Size: #3

J. Bottom Seal: None

Seal Material: N/A

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

B O R I N G L O G

Project No. KEI-P89-1106	Boring & Casing Diameter 9" 2"	Logged By D.L. <i>D.L. Brown</i>
Project Name Unocal Castro Valley	Well Head Elevation N/A	Date Drilled 1/18/90
Boring No. MW2	Drilling Method Hollow-stem Auger	Drilling Company EGI

Penetration blows/6"	G. W. level	Depth (ft) Samples	Strati- graphy USCS	Description
		0		A.C. Pavement
				Silty clay, high plasticity, stiff, moist, very dark gray, locally gravelly, gravel to 1/2".
6/8/10		5	CH	Clay, high plasticity, with silt, 10-15% sand, stiff, moist, dark greenish gray, locally cemented, with gravel below 6 feet.
16/25/26			GC	Clayey gravel with sand, dense, moist, dark greenish gray, mottled with olive brown below 7.5 feet.
4/7/13		10	CH	Sandy clay, moderate to high plasticity, 10-15% gravel, stiff, friable, moist, yellowish brown.
8/11/15				Very stiff at 12 feet, occasional gravel, gravel is olive brown shale.
7/13/22				
13/20/28		15		
10/19/21			GC	Clayey gravel with sand, dense, moist, yellowish brown, gravel is shale, dark brown within clay.
13/19/23 50-2"	▼	20		At 20 feet, varied gravel, some serpentine. No recovery at 20.5 feet

B O R I N G L O G

Project No. KEI-P89-1106	Boring & Casing Diameter 9" 2"	Logged By D.L. <i>[Signature]</i>
Project Name Unocal Castro Valley	Well Head Elevation N/A	Date Drilled 1/18/90
Boring No. MW2	Drilling Method Hollow-stem Auger	Drilling Company EGI

Penetration blows/6"	G. W. level	Depth (ft) Samples	Strati- graphy USCS	Description
36/48/ 50-5"		0	SW- SC	Clayey sand with gravel, 15% clay, gravel as above, hard, wet, olive brown.
22/50-5"		25	N/A	Shale bedrock, very hard, fractured, dark yellowish brown to dark brown.
50-3"		30		Shale bedrock, well weathered to clay, locally hard, very dark gray.
		35		No recovery, shale bedrock, as above, near refusal.
		40		<p style="text-align: right;">TOTAL DEPTH: 30'</p>

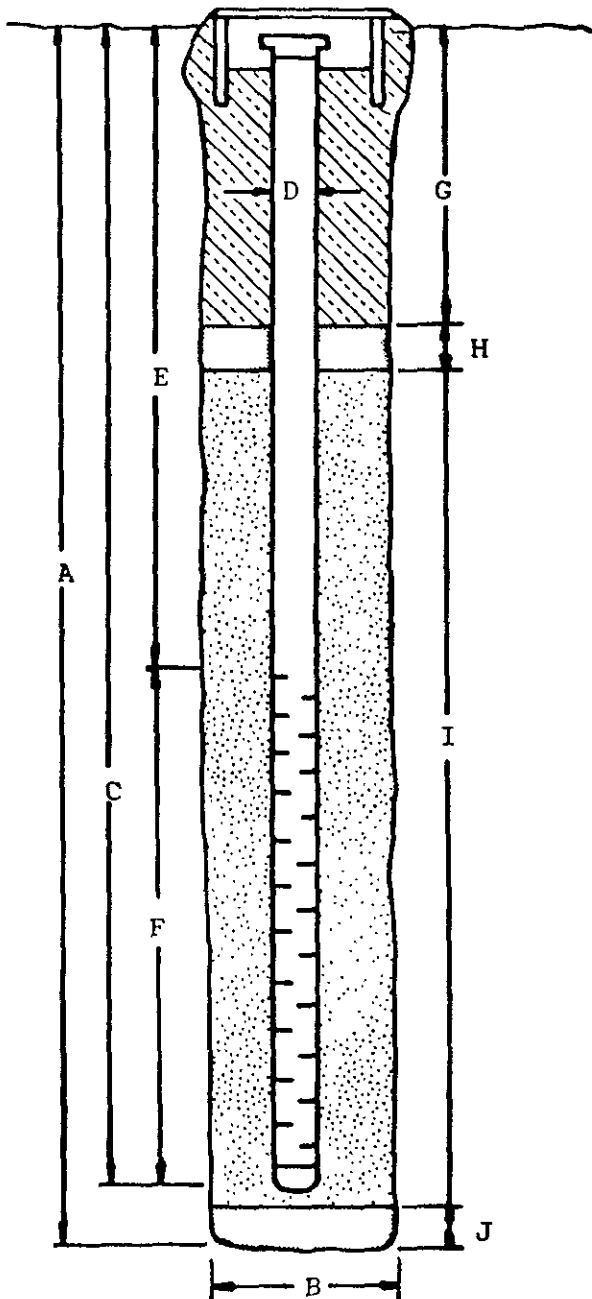
W E L L C O M P L E T I O N D I A G R A M

PROJECT NAME: Unocal - Castro Valley BORING/WELL NO. MW2

PROJECT NUMBER: KEI-P89-1106

WELL PERMIT NO.: _____

Flush-mounted Well Cover



A. Total Depth: 30'

B. Boring Diameter*: 9"

Drilling Method: Hollow Stem
Auger

C. Casing Length: 25'

Material: Schedule 40 PVC

D. Casing Diameter: OD = 2.375"

ID = 2.067"

E. Depth to Perforations: 5'

F. Perforated Length: 20'

Perforation Type: Machined
Slot

Perforation Size: 0.020"

G. Surface Seal: 2'

Seal Material: Concrete

H. Seal: 2'

Seal Material: Bentonite

I. Gravel Pack: 26'

Pack Material: RMC Lonestar
Sand

Size: #3

J. Bottom Seal: None

Seal Material: N/A

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

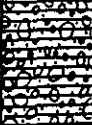
B O R I N G L O G

Project No. KEI-P89-1106	Boring & Casing Diameter 9" 2"	Logged By D.L. <i>D.L. Brown</i>
Project Name Unocal Castro Valley	Well Head Elevation N/A	Date Drilled 1/19/90
Boring No. MW3	Drilling Method Hollow-stem Auger	Drilling Company EGI

Penetration blows/6"	G. W. level	Depth (ft) Samples	Strati- graphy USCS	Description
		0		A.C. Pavement Sand and gravel: fill
				Silty clay, high plasticity, stiff, moist, very dark grayish brown, 5-10% sand.
10/17/22		5	CH	Gravelly clay, high plasticity, 5-10% silt, very stiff, moist, light olive brown.
20/21/24			GC	Clayey gravel with sand, very dense, moist to wet, olive brown, gravel is almost entirely shale.
23/28/33	▼	10		
18/30/23		15		Clayey gravel with sand, as above, ocasionally grading to gravelly clay, very stiff, moist, olive brown.
		20		

B O R I N G L O G

Project No. KEI-P89-1106		Boring & Casing Diameter 9" 2"	Logged By D.L. <i>D.R. Brown</i>
Project Name Unocal Castro Valley		Well Head Elevation N/A	Date Drilled 1/19/90
Boring No. MW3		Drilling Method Hollow-stem Auger	Drilling Company EGI

Penetration blows/6"	G. W. level	Depth (ft) Samples	Strati- graphy USCS	Description
				Clayey gravel with sand, as above, ocasionally grading to gravelly clay, as above.
		25		
		30		
		35		
		40		
				TOTAL DEPTH: 22'

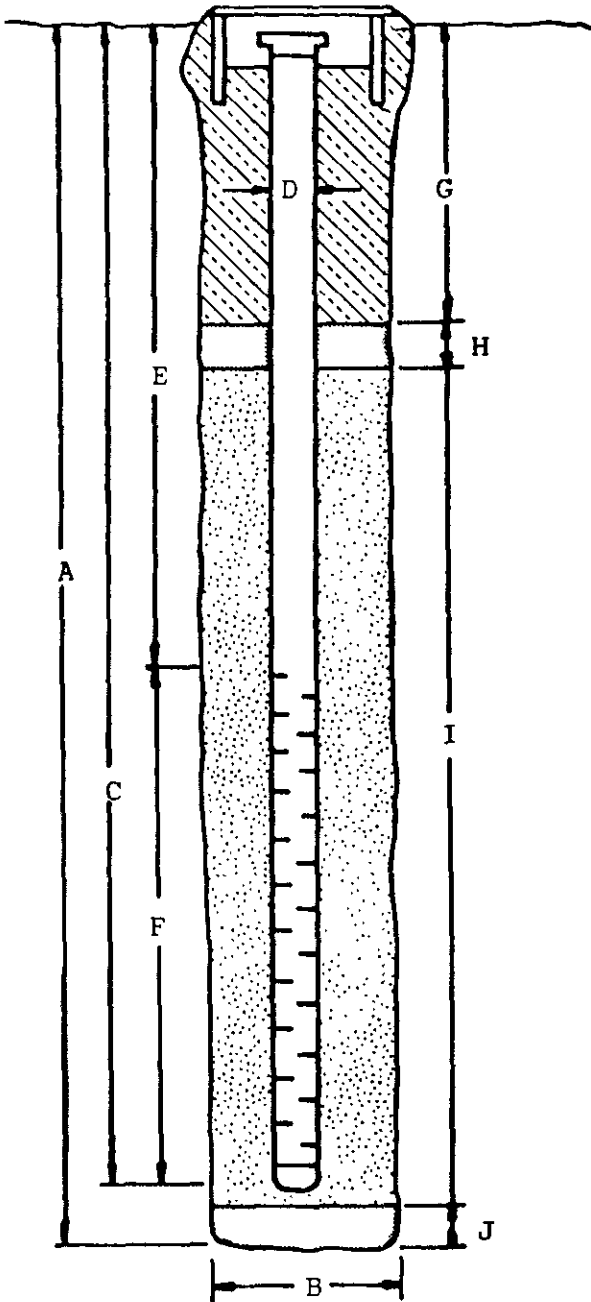
W E L L C O M P L E T I O N D I A G R A M

PROJECT NAME: Unocal - Castro Valley BORING/WELL NO. MW3

PROJECT NUMBER: KEI-P89-1106

WELL PERMIT NO.: _____

Flush-mounted Well Cover




- A. Total Depth: 22'
- B. Boring Diameter*: 9"
Drilling Method: Hollow Stem Auger
- C. Casing Length: 22'
Material: Schedule 40 PVC
- D. Casing Diameter: OD = 2.375"
ID = 2.067"
- E. Depth to Perforations: 5'
- F. Perforated Length: 17'
Perforation Type: Machined Slot
Perforation Size: 0.020"
- G. Surface Seal: 2'
Seal Material: Concrete
- H. Seal: 18'
Seal Material: Bentonite
- I. Gravel Pack: _____
Pack Material: RMC Lonestar Sand
Size: #3
- J. Bottom Seal: None
Seal Material: N/A

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

B O R I N G L O G

Project No. KEI-P89-1106	Boring & Casing Diameter 9" 2"	Logged By W.W. <i>ORB</i>
Project Name Unocal-Castro Valley	Well Head Elevation N/A	Date Drilled 8/13/90
Boring No. MW4	Drilling Method Hollow-stem Auger	Drilling Company EGI

Penetration blows/6"	G. W. level	Depth (feet) Samples	Stratigraphy USCS	Description
		0		Asphalt concrete over clayey sand and gravel base
			CH	Clay, trace to 5% coarse-grained sand trace of gravel to 1/2 inch dia. moist, hard, dark gray, 5% orangish brown banding
6/11/24		5	CL/CH	Clay, trace to 5% sand, trace to 10% caliche, light dive gray to greenish gray, moist, hard
				----- Bedrock -----
50		10	N/A	Shale, moderately hard, fractured, very weathered, decomposed and clayey, wet below 10', olive brown
		15		
22/50-5"		20		Shale, moist, clayey, moderately hard, medium gray to olive gray

B O R I N G L O G

Project No. KEI-P89-1106	Boring & Casing Diameter 9" 2"	Logged By W.W. <i>DRB</i>
Project Name Unocal-Castro Valley	Well Head Elevation N/A	Date Drilled 8/13/90
Boring No. MW4	Drilling Method Hollow-stem Auger	Drilling Company EGI

Penetration blows/6"	G. W. level	Depth (feet) Samples	Stratigraphy USCS	Description
17/28/37		<div style="display: flex; align-items: center;"> <div style="border-left: 1px solid black; border-right: 1px solid black; width: 10px; height: 100%;"></div> <div style="margin-left: 5px;"> <p style="text-align: center;">N/A</p> </div> </div>		Clayey shale bedrock as above, moderately hard, moist, gray
		<div style="display: flex; align-items: center;"> <div style="border-left: 1px solid black; border-right: 1px solid black; width: 10px; height: 100%;"></div> <div style="margin-left: 5px;"> <p>25</p> </div> </div>		
		<div style="display: flex; align-items: center;"> <div style="border-left: 1px solid black; border-right: 1px solid black; width: 10px; height: 100%;"></div> <div style="margin-left: 5px;"> <p>30</p> </div> </div>		
		<div style="display: flex; align-items: center;"> <div style="border-left: 1px solid black; border-right: 1px solid black; width: 10px; height: 100%;"></div> <div style="margin-left: 5px;"> <p>35</p> </div> </div>		
		<div style="display: flex; align-items: center;"> <div style="border-left: 1px solid black; border-right: 1px solid black; width: 10px; height: 100%;"></div> <div style="margin-left: 5px;"> <p>40</p> </div> </div>		
				<p align="right">TOTAL DEPTH DRILLED: 22'</p> <p align="right">TOTAL DEPTH SAMPLED: 23.5'</p>

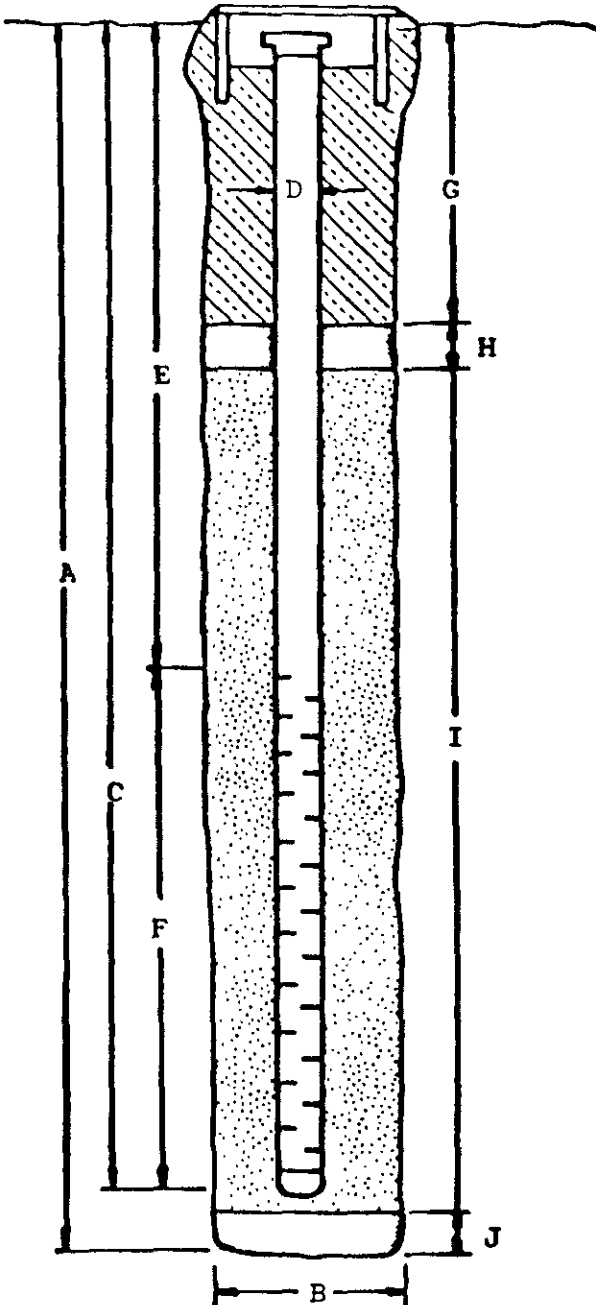
W E L L C O M P L E T I O N D I A G R A M

PROJECT NAME: Unocal Castro Valley BORING/WELL NO. MW4

PROJECT NUMBER: KEI-P89-1106

WELL PERMIT NO.: _____

Flush-mounted Well Cover



A. Total Depth: 23.5'

B. Boring Diameter*: 9"

Drilling Method: Hollow Stem

Auger

C. Casing Length: 21'

Material: Schedule 40 PVC

D. Casing Diameter: OD = 2.375"

ID = 2.067"

E. Depth to Perforations: 6'

F. Perforated Length: 15'

Machined
Perforation Type: Slot

Perforation Size: 0.020"

G. Surface Seal: 4'

Seal Material: Concrete

H. Seal: 18'

Seal Material: Bentonite

I. Gravel Pack: 17'

RMC Lonestar
Pack Material: Sand

Size: #3

J. Bottom Seal: None

Seal Material: N/A

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

B O R I N G L O G

Project No. KEI-P89-1106	Boring & Casing Diameter 9" 2"	Logged By W.W. <i>DRB</i>
Project Name Unocal Castro Valley	Well Head Elevation N/A	Date Drilled 8/13/90
Boring No. MW5	Drilling Method Hollow-stem Auger	Drilling Company EGI

Penetration blows/6"	G. W. level	Depth (feet) Samples	Strati- graphy USCS	Description
		0		A.C. Pavement over clayey sand and and gravel base
			CL/ CH	Clay with gravel, gravel angular to 1 1/8 dia., trace sand and caliche, moist, firm, greenish gray.
				Clay, trace sand, moist, firm, very dark gray.
7/14/15		5		Clay, trace fine sand, moist, very stiff, light olive gray to greenish gray trace to 10% caliche with nodules to 1/2 dia.
			N/A	Bedrock
50				Clayey shale, trace caliche(?), moist, olive gray, orangish brown, trace greenish gray (clay) highly weather- ed, decomposed
16/24/30		10		
36/40/45				Clayey shale, trace organic matter, moist, olive gray to olive brown with trace of orange-brown, moderately hard, less weathered than above
35/50		15		
				Clayey shale, slightly weathered and decomposed, saturated, moderately hard, olive gray
40/50-5"		20		

B O R I N G L O G

Project No. KEI-P89-1106		Boring & Casing Diameter 9" 2"		Logged By W.W. <i>DRB</i>
Project Name Unocal Castro Valley		Well Head Elevation N/A		Date Drilled 8/13/90
Boring No. MW5		Drilling Method	Hollow-stem Auger	Drilling Company EGI
Penetration blows/6"	G. W. level	Depth (feet) Samples	Strati- graphy USCS	Description
15/28/32			N/A	Shale, as above, very moist less weathered than above, clay in fractures, moderately hard, gray.
				TOTAL DEPTH: 24'

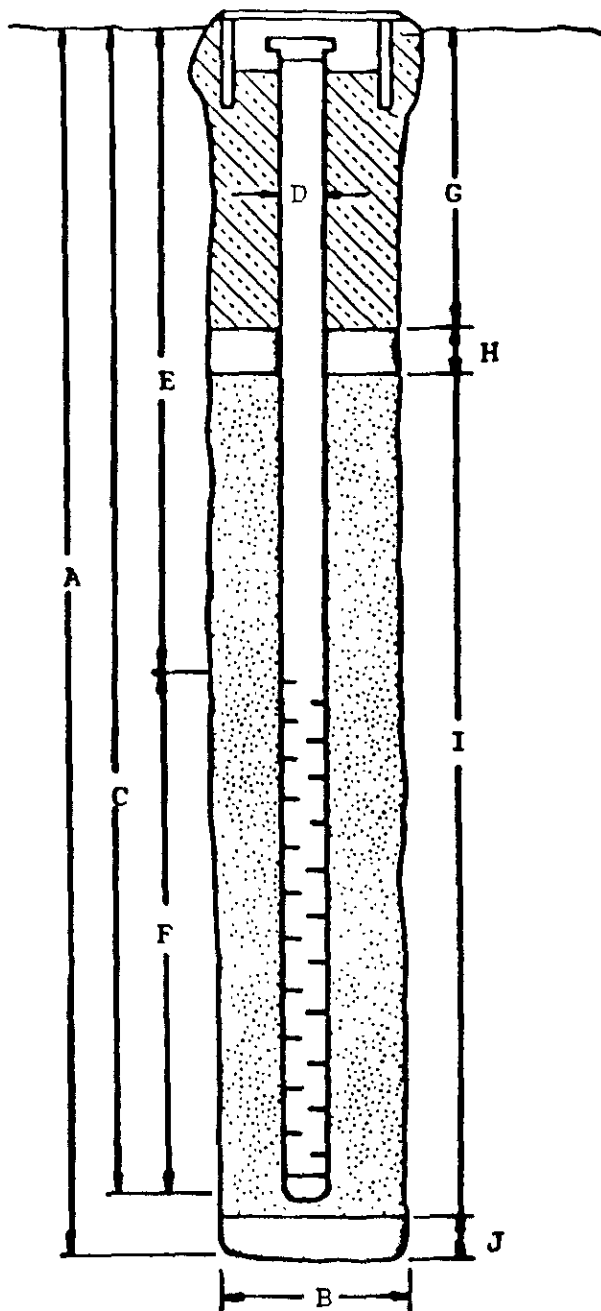
W E L L C O M P L E T I O N D I A G R A M

PROJECT NAME: Unocal-Castro Valley 2445 C.V. Blvd. BORING/WELL NO. MW5

PROJECT NUMBER: KEI-P89-1106

WELL PERMIT NO.: _____

Flush-mounted Well Cover



- A. Total Depth: 24'
- B. Boring Diameter*: 9"
Drilling Method: Hollow Stem Auger
- C. Casing Length: 23.5'
Material: Schedule 40 PVC
- D. Casing Diameter: OD = 2.375"
ID = 2.067"
- E. Depth to Perforations: 8.5'
- F. Perforated Length: 15'
Perforation Type: Machined Slot
Perforation Size: 0.020"
- G. Surface Seal: 6.5'
Seal Material: Concrete
- H. Seal: 1'
Seal Material: Bentonite
- I. Gravel Pack: 16.5'
Pack Material: RMC Lonestar Sand
Size: #3
- J. Bottom Seal: None
Seal Material: N/A

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



SEQUOIA ANALYTICAL

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

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

Client Project ID: Unocal/Castro Valley Blvd./Castro Valley
Matrix Descript: Water
Analysis Method: EPA 5030/8015/8020
First Sample #: 008-0681 A-B

Sampled: Aug 27, 1990
Received: Aug 28, 1990
Analyzed: Aug 29, 1990
Reported: Aug 30, 1990

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

Sample Number	Sample Description	Low/Medium B.P. Hydrocarbons	Benzene	Toluene	Ethyl Benzene	Xylenes
		$\mu\text{g/L}$ (ppb)	$\mu\text{g/L}$ (ppb)	$\mu\text{g/L}$ (ppb)	$\mu\text{g/L}$ (ppb)	$\mu\text{g/L}$ (ppb)
008-0681 A-B	MW1	N.D.	3.2	N.D.	N.D.	N.D.
008-0682 A-B	MW2	N.D.	N.D.	N.D.	N.D.	N.D.
008-0683 A-B	MW3	N.D.	1.1	0.50	0.54	0.89
008-0684 A-B	MW4	N.D.	0.34	N.D.	N.D.	N.D.
008-0685 A-B	MW5	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
Belinda C. Vega
Laboratory Director



KAPREALIAN ENGINEERING, INC.

CHAIN OF CUSTODY

SAMPLER RAY (KEI)		SITE NAME & ADDRESS UNOCAL CASTRO VALLEY CASTRO VALLEY BLVD					ANALYSES REQUESTED TPH/G PBTX/E				TURN AROUND TIME: 1 Week
WITNESSING AGENCY											REMARKS
SAMPLE ID NO.	DATE	TIME	SOIL	WATER	GRAB	COMP	NO. OF CONT.	SAMPLING LOCATION			
MW1	8-27	15:30	X	X			2 Vials		X	X	
MW2	"		X	X			"		X	X	
MW3	"		X	X			"		X	X	
MW4	"		X	X			"		X	X	
MW5	"		X	X			"		X	X	
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? <u>yes</u> 2. Will samples remain refrigerated until analyzed? <u>yes</u> 3. Did any samples received for analysis have head space? <u>no</u> 4. Were samples in appropriate containers and properly packaged? <u>yes</u>					
Ray (KEI)		8-27-90		16:07							
Relinquished by: (Signature)		Date/Time		Received by: (Signature)							
Relinquished by: (Signature)		Date/Time		Received by: (Signature)							
Relinquished by: (Signature)		Date/Time		Received by: (Signature)		Signature		Title		Date	
		8/27/90 16:10		[Signature]		[Signature]		Log in		8/27/90	



SEQUOIA ANALYTICAL

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

Kaprealian Engineering, Inc.	Client Project ID: Unocal/2445 Castro Valley Blvd.,	Sampled: Aug 13, 1990
P.O. Box 996	Matrix Descript: Soil CastroValley	Received: Aug 14, 1990
Benicia, CA 94510	Analysis Method: EPA 5030/8015/8020	Analyzed: Aug 14, 1990
Attention: Mardo Kaprealian, P.E.	First Sample #: 008-0211	Reported: Aug 16, 1990

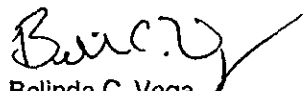
TOTAL PETROLEUM FUEL HYDROCARBONS with BTEX DISTINCTION (EPA 8015/8020)

Sample Number	Sample Description	Low/Medium B.P. Hydrocarbons mg/kg (ppm)	Benzene mg/kg (ppm)	Toluene mg/kg (ppm)	Ethyl Benzene mg/kg (ppm)	Xylenes mg/kg (ppm)
008-0211	MW4-(5)	N.D.	N.D.	N.D.	N.D.	N.D.
008-0212	MW4-(9.5)	N.D.	N.D.	N.D.	N.D.	N.D.
008-0213	MW5-(13.5)	N.D.	N.D.	N.D.	N.D.	N.D.

Detection Limits:	1.0	0.0050	0.0050	0.0050	0.0050
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Low to Medium Boiling Point Hydrocarbons are quantitated against a gasoline standard.
Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL


Belinda C. Vega
Laboratory Director



KAPREALIAN ENGINEERING, INC.

CHAIN OF CUSTODY

SAMPLER <i>Wade Weston</i>		SITE NAME & ADDRESS Unocal - Castro Valley. 2445 Castro Valley Blvd.		ANALYSES REQUESTED		TURN AROUND TIME: <i>Regular</i>
WITNESSING AGENCY						

SAMPLE ID NO.	DATE	TIME	SOIL	WATER	GRAB	COMP	NO. OF CONT.	SAMPLING LOCATION	ANALYSES REQUESTED		REMARKS
									TPH-G	BTXE	
MW4-(5)	8/13/90		✓		✓		1	See Sample ID #	✓	✓	0080211
MW4-(9.5)	"		✓		✓		1		✓	✓	0080212
MW5-(5)	"		✓		✓		1		✓	✓	HOLD
MW5-(10)	"		✓		✓		1		✓	✓	HOLD
MW5-(13.5)	"		✓		✓		1		✓	✓	0080213

Relinquished by: (Signature) <i>Wade Weston</i>	Date/Time <i>8/14/90</i>	Received by: (Signature) <i>Tim M. L...</i>	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? 4. Were samples in appropriate containers and properly packaged?
Relinquished by: (Signature) <i>Tim M. L...</i>	Date/Time <i>8/14/90</i>	Received by: (Signature) <i>[Signature]</i>	
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	

Signature: *[Signature]* Title: *[Signature]* Date: *8/14*