



KAPREALIAN ENGINEERING, INC.

Consulting Engineers

P. O. BOX 913

BENICIA, CA 94510

(707) 746-6915 (707) 746-6916

FAX: (707) 746-5581

KEI-J89-0801.R4

December 18, 1989

Unocal Corporation
2175 N. California Blvd., Suite #650
Walnut Creek, CA 94596

Attention: Mr. Ron Bock

RE: Preliminary Ground Water Investigation at
Unocal Service Station #6034
4700 First Street
Livermore, California

Dear Mr. Bock:

This report presents the results of KEI's soil and ground water investigation for the referenced site in accordance with proposal KEI-P89-0801.P1 dated August 15, 1989. The purpose of the investigation was to determine the ground water flow direction, and to begin to determine the degree and extent of the contamination at the site. The work performed consisted of the following:

Coordination with regulatory agencies.

Drilling, installation and development of four 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. The site is situated adjacent to and northeast of the Arroyo Seco (drainage stream). A Site Location Map and detailed Site Plan are attached to this report.

KEI's 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 soil samples from beneath the fuel tanks were collected at depths of 15 to 16 feet. The soil sample from beneath the waste

oil tank was taken at a depth of 8.5 feet. Pipe trench samples were collected 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. One ground water sample was collected from the excavated pit. The results of the soil analyses for total petroleum hydrocarbon (TPH) as gasoline ranged from non-detectable to 9.6 ppm in all samples, except A3, which showed 390 ppm. The sample from beneath the waste oil tank showed non-detectable levels of all constituents analyzed, except for TPH as diesel at 1.4 ppm. The water sample showed 47,000 ppb TPH as gasoline, and 260 ppb of benzene. Documentation of soil and water sample collection and analytical results are provided in KEI's report (KEI-J89-0801.R2) dated August 15, 1989.

FIELD ACTIVITIES

On October 25 and 26, 1989, four 2-inch diameter monitoring wells (designated as MW1, MW2, MW3 and MW4 on the attached Site Plan) 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 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. Soil samples were collected beginning at approximately 5 feet below grade until ground water was encountered. The undisturbed soil samples were taken by driving a California-modified split-spoon sampler ahead of the drilling augers. The 2-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 November 3 and 9, 1989. 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 November 18, 1989. Prior to sampling, monitoring data were collected and water samples were then collected using a clean Teflon bailer. The samples were decanted into clean glass VOA vials, sealed with Teflon lined screw caps, and labeled and stored on ice until delivery to a certified laboratory.

ANALYTICAL RESULTS

Water and selected soil samples were analyzed at Sequoia Analytical Laboratory in 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. In addition, soil and water samples from the boring for MW1 were analyzed for TPH as diesel using EPA method 3550 or 3510 in conjunction with modified 8015, halogenated volatile organics using EPA method 8010, and total oil and grease (TOG) using EPA method 418.1 with clean up. Soil sample MW3(18.5) was analyzed with a sieve analysis to determine formation particle size distribution.

The soil sample analyses show non-detectable levels of TPH as gasoline and BTX&E in all analyzed samples except in MW2 at 5, 15 and 17 feet, MW3 at 5 feet, and MW4 at 5 and 15 feet, which had TPH as gasoline levels of 23, 3.0, 790, 1.1, 1.9 and 56 ppm, respectively. TPH as diesel and EPA method 8010 results were non-detectable, and TOG was <50 ppm in all samples. Water sample analyses show TPH as gasoline in MW2 and MW4 at concentrations of 53,000 and 990 ppb, respectively, and benzene in MW2, MW3 and MW4 at concentrations of 540, 0.35 and 9.8 ppb, respectively. In 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 sample analyses are summarized in Table 2, and water analyses in Table 3. Copies of the laboratory analyses and Chain of Custody documentation are attached to this report.

HYDROLOGY AND GEOLOGY

The water table stabilized in the monitoring wells at depths ranging from 15.55 to 16.85 feet below the surface. Ground water flow direction appeared to be to the northwest with a gradient of 0.0055 on November 18, 1989, (based on water level data collected from the four monitoring wells prior to pumping).

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 in turn underlain by a second clay unit which locally contains sandy and gravelly lenses and is present at depths below grade of about 23.5 to 25 feet and extends to the maximum depths explored (26 to 28.5 feet).

DISCUSSION AND RECOMMENDATIONS

Based on the analytical results, KEI recommends implementation of a monitoring and sampling program. The wells should be monitored on a monthly basis and sampled on a quarterly basis. 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. Concentrations of TPH as gasoline and benzene which were detected in upgradient monitoring well MW4 indicate that contamination may be migrating on-site from off-site sources. Across the street from the Unocal site are two service stations. The locations of the service stations relative to the Unocal site are shown on the attached Site Vicinity Map. Both on-site and off-site monitoring wells appear to be present at and near the Chevron service station. Therefore, KEI recommends to survey all monitoring wells, in the vicinity of the subject site, to a common benchmark and to obtain ground water level measurements. This work will require coordination with the owners of the adjacent service stations.

DISTRIBUTION

Copies of this report should be sent to Mr. Lowell Miller of the Alameda County Health Agency, Mr. R. Griffith of the City of Livermore Fire Department, and to the RWQCB, San Francisco Bay Region.

LIMITATIONS

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

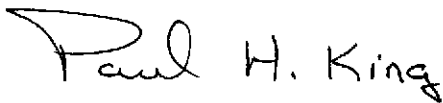
The results of this study are based on the data obtained from the field work and laboratory analyses. We have analyzed this data using what we believe to be currently applicable engineering techniques and principles in the Northern California region. We make no warranty, either expressed or implied,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

KEI-J89-0801.R4
December 18, 1989
Page 6

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

Sincerely,

Kaprealian Engineering, Inc.



Paul H. King
Hydrogeologist



Don R. Braun
Certified Engineering Geologist

License No. 1310
Exp. Date 6/30/90



Mardo Kaprealian
President

Attachments: Tables 1, 2 & 3
Location Map
Site Vicinity Map
Site Plan
Boring Logs
Laboratory Results
Chain of Custody documentation
Proposal

KEI-J89-0801.R4
December 18, 1989

TABLE 1

SUMMARY OF GROUND WATER MONITORING AND DEVELOPMENT 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 November 9, 1989)

MW1	16.85	0	None	95
MW2	16.35	0	None	65
MW3	15.50	0	None	55
MW4	15.50	0	None	55

(Monitored and Developed on November 3, 1989)

MW1	16.79	0	None	55
MW2	15.28	0	None	55
MW3	15.46	0	None	55
MW4	15.44	0	None	55

KEI-J89-0801.R4
December 18, 1989

TABLE 2

SUMMARY OF LABORATORY ANALYSES
SOIL

(Collected on October 25 & 26, 1989)

<u>Sample Number</u>	<u>Depth (feet)</u>	<u>TPH as Gasoline</u>	<u>Benzene</u>	<u>Toluene</u>	<u>Xylenes</u>	<u>Ethyl-benzene</u>
MW1(5)*	5	ND	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.

All results in ppm.

KEI-J89-0801.R4
December 18, 1989

TABLE 3

SUMMARY OF LABORATORY ANALYSES
WATER

(Collected on November 18, 1989)

<u>Sample Number</u>	<u>Depth to Water (feet)</u>	<u>TPH as Gasoline</u>	<u>Benzene</u>	<u>Toluene</u>	<u>Xylenes</u>	<u>Ethylbenzene</u>
MW1*	16.85	ND	ND	ND	ND	ND
MW2	16.35	53,000	540	500	22,000	130
MW3	15.50	ND	0.35	ND	ND	ND
MW4	15.55	990	9.8	10	4.7	7.1
Detection Limits		30	0.3	0.3	0.3	0.3

* TOG was detected at 3.1 ppm; TPH as diesel at 400 ppb; and all EPA method 8010 constituents were non-detectable, except trichloroethene at 0.55 ppb.

ND = Non-detectable.

All results in ppb.



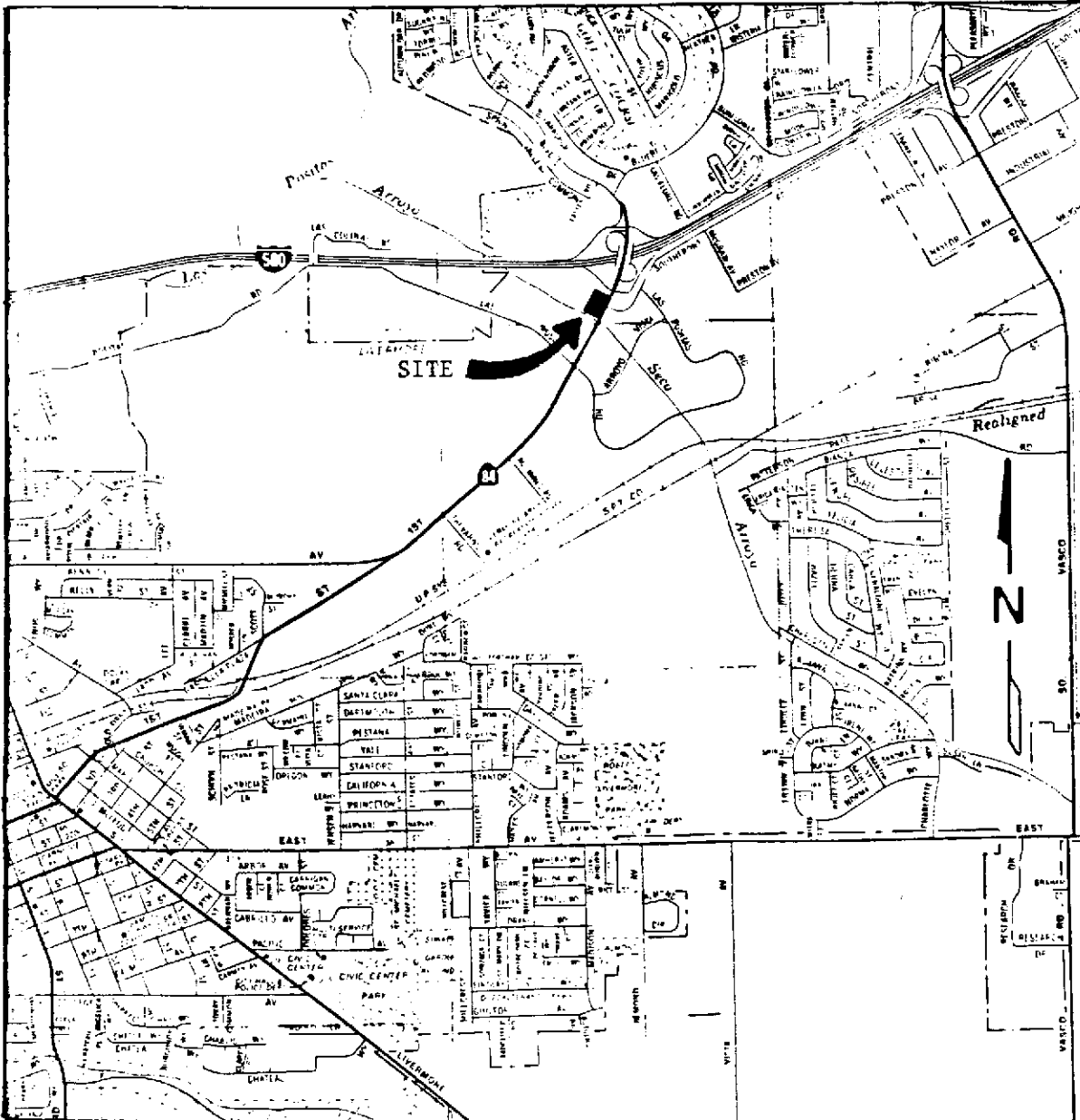
KAPREALIAN ENGINEERING, INC.

Consulting Engineers

P. O. BOX 913

BENICIA, CA 94510

(707) 746-6915



LOCATION MAP

Unocal Service Station #6034
4700 First Street
Livermore, California



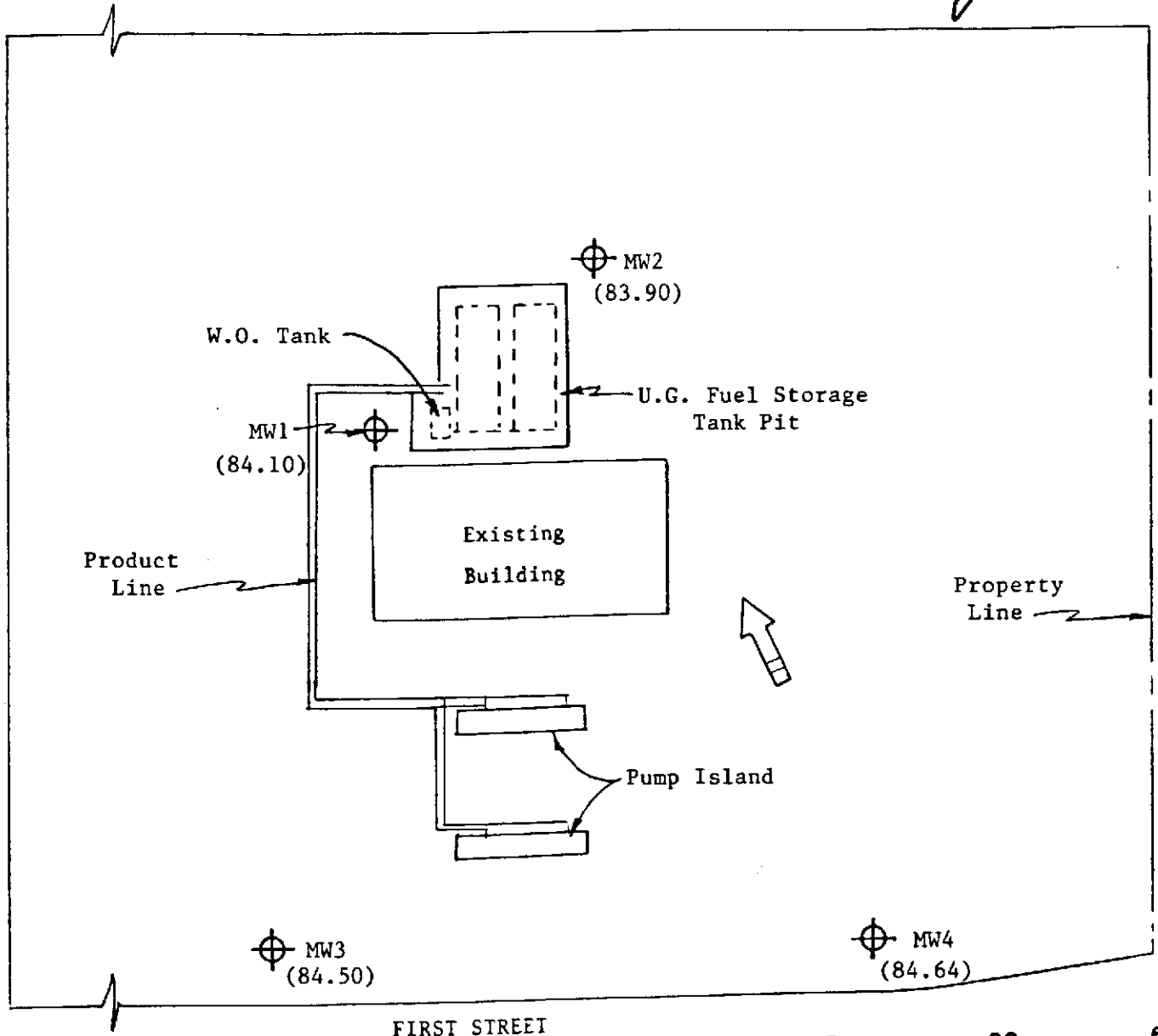
KAPREALIAN ENGINEERING, INC.

Consulting Engineers

P. O. BOX 913

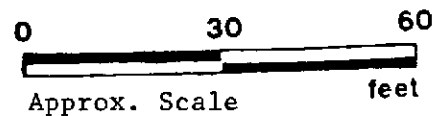
BENICIA, CA 94510

(707) 746-6915



FIRST STREET

SITE PLAN



LEGEND



Monitoring Well



Water table elevation on 11/18/89.
MW3 well cover assumed 100.00' as datum.



Direction of ground water flow on 11/18/89.

Unocal Service Station #6034
4700 First Street
Livermore, California



KAPREALIAN ENGINEERING, INC.

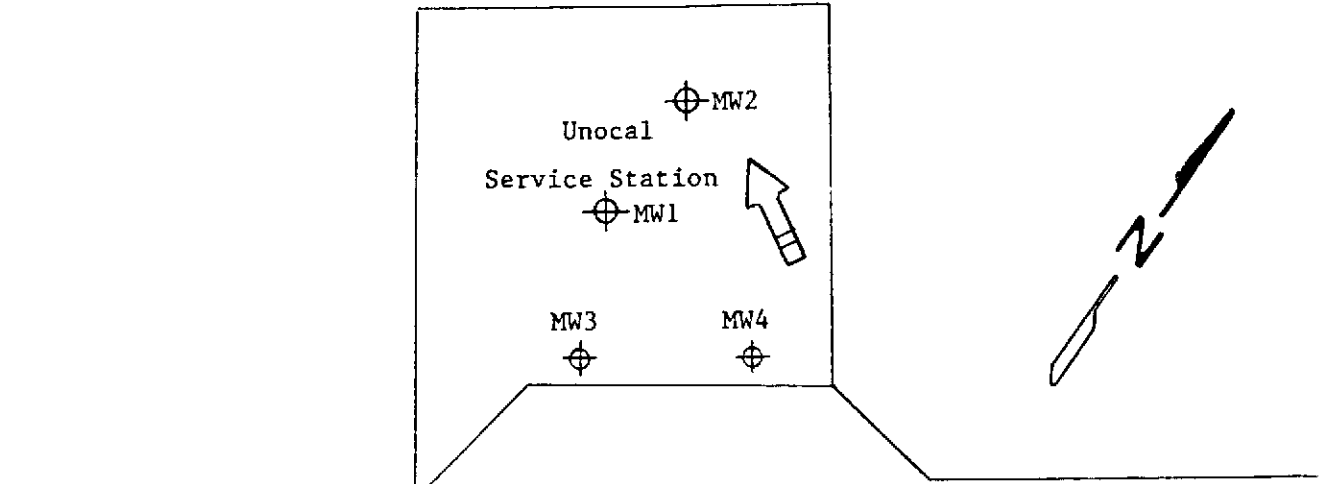
Consulting Engineers

P. O. BOX 913

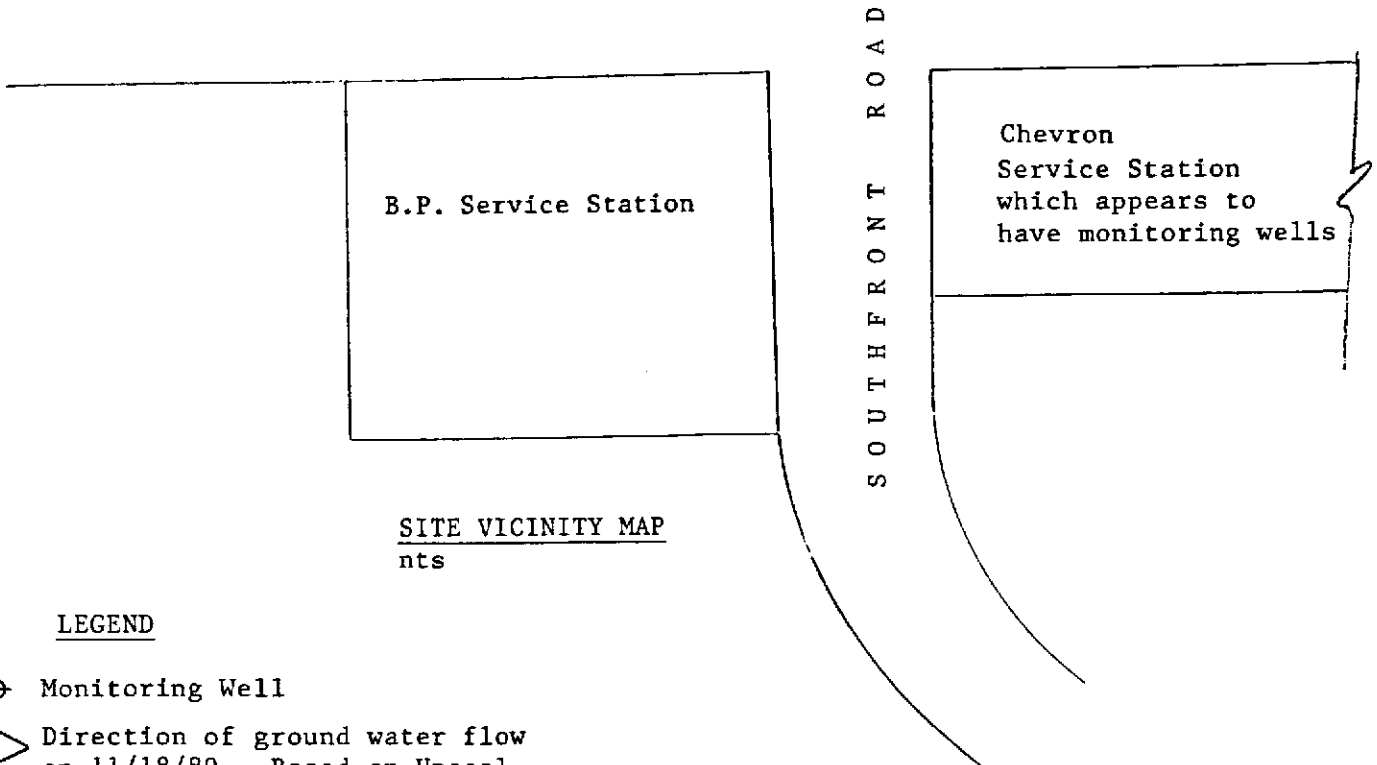
BENICIA, CA 94510

(707) 746-6915 (707) 746-6916

FAX: (707) 746-5581


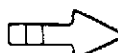


FIRST STREET



SITE VICINITY MAP
nts


LEGEND

-  Monitoring Well
-  Direction of ground water flow on 11/18/89. Based on Unocal site water level data.

Unocal Service Station #6034
4700 First Street
Livermore, California

BORING LOG

Project No. KEI-P89-0801	Boring & Casing Diameter 9" 2"	Logged By D.L. <i>DRB</i>
Project Name Unocal Livermore - First St.	Well Head Elevation N/A	Date Drilled 10-26-89
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
			GW/ GC	Well graded gravel with clay and sand, trace-5% silt, dense, moist, dark brown, gravel to 8", gravel is sandstone, angular; fill.
12/18/22		5		No sample recovery at 6 feet.
13/9/7			CH	Clay, high plasticity, trace silt and sand, stiff, moist, black.
4/6/7				Clay, as above, 10% gravel to 1/4" with weak cementation.
6/8/10		10		Clay, high plasticity, 10-15% silt and sand, stiff to very stiff, moist, w/weak cementation, dark olive gray.
7/9/18			GC	Clayey gravel, 5-15% sand, dense, slightly moist, greenish gray.
4/5/8		15	CL/ CH	Sandy clay, 10% silt, stiff to firm, moist, olive gray.
			ML	Fine sandy silt, 5-15% clay, very stiff, moist, dark greenish gray.
5/8/12				
12/30/35		20	GW	Well graded gravel with sand, trace - 10% fines, very dense, wet, olive brown, gravel to 2", angular to rounded.

B O R I N G L O G

Project No. KEI-P89-0801	Boring & Casing Diameter 9" 2"	Logged By D.L. <i>DRB</i>
Project Name Unocal Livermore - First St.	Well Head Elevation N/A	Date Drilled 10-26-89
Boring No. MW1	Drilling Method Hollow-stem Auger	Drilling Company EGI

Penetration blows/6"	G. W. level	Depth (ft) Samples	Strati- graphy USCS	Description
			GW	Well graded gravel, as above, very dense.
				Silty clay, 5-10% fine sand, very stiff, moist, light olive brown and pale olive w/weak cementation.
8/12/17		25	CL/ CH	Poorly graded sand, fine, very dense, very moist, olive.
9/14/22			SP	Poorly graded gravel, dense to very dense, wet, dark brown.
			GP CH	Clay with sand, 5-10% silt, very stiff to hard, slightly moist, olive.
8/16/20		30		
		35		
		40		
				TOTAL DEPTH 28.5'

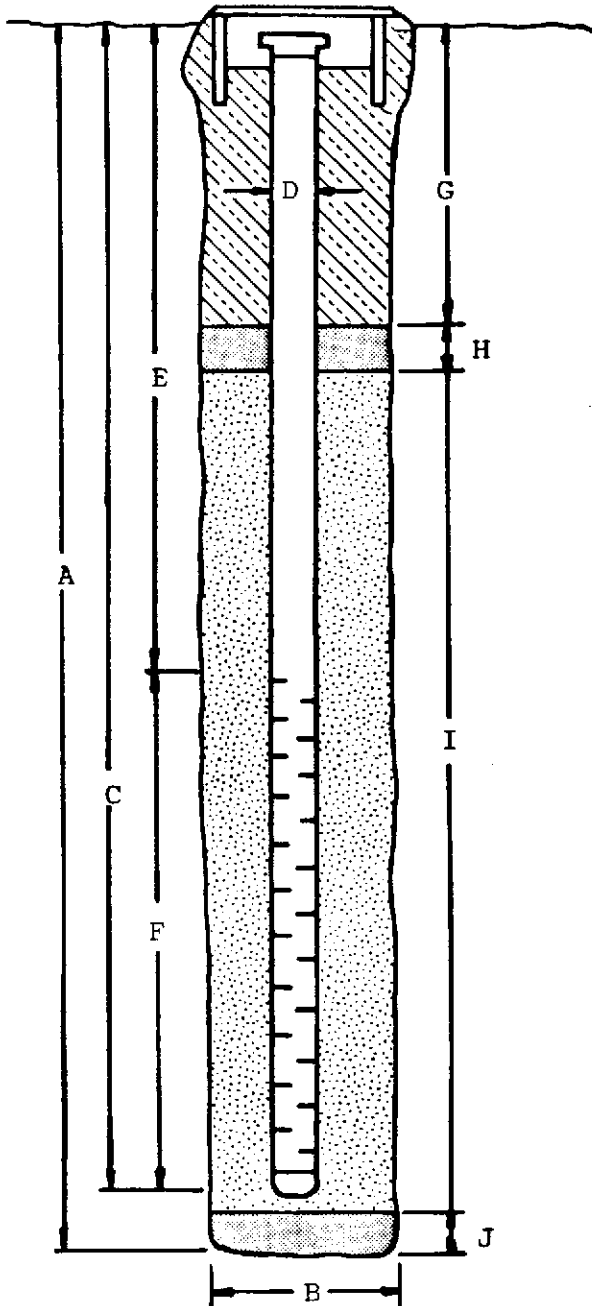
W E L L C O M P L E T I O N D I A G R A M

PROJECT NAME: Unocal - Livermore - 4700 First St. BORING/WELL NO. ~~1~~

PROJECT NUMBER: KEI-P89-0801

WELL PERMIT NO.: _____

Flush-mounted Well Cover



A. Total Depth: 28.5'

B. Boring Diameter*: 9"

Drilling Method: Hollow Stem Auger

C. Casing Length: 28.5'

Material: Schedule 40 PVC

D. Casing Diameter: OD = 2.375"

ID = 2.067"

E. Depth to Perforations: 11'

F. Perforated Length: 17.5'

Perforation Type: Machined Slot

Perforation Size: 0.020"

G. Surface Seal: 7'

Seal Material: Concrete

H. Seal: 2'

Seal Material: Bentonite

I. Gravel Pack: 18.5'

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-P89-0801	Boring & Casing Diameter 9" 2"	Logged By D.L. <i>DLB</i>
Project Name Unocal Livermore - First St.	Well Head Elevation N/A	Date Drilled 10-25-89
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
9/12/14		5	GW/ GM	Well graded gravel with silt and sand, medium dense, moist, olive brown: fill.
5/8/11		10	CH	Clay, high plasticity, 10-15% sand and gravel, gravel to 3/8" stiff, moist, black.
6/8/10			CL/ CH	Clay, moderate plasticity, stiff, moist, dark gray w/mod. cementation, blocky, dark greenish gray below 11 feet.
3/4/6		15	ML	Silt with clay, 10-15% fine sand from 12.5-13.5 feet, stiff, moist, dark greenish gray. Grading stiff to very stiff Poor sample recovery at 16 feet.
10/22/32	▽			
40/50-5"		20	GW	Well graded gravel with sand, 5-10% fines, very dense, wet, dark gray. Well graded gravel with sand, lensed with well graded gravel

B O R I N G L O G

Project No. KEI-P89-0801	Boring & Casing Diameter 9" 2"	Logged By D.L. <i>JRB</i>
Project Name Unocal Livermore - First St.	Well Head Elevation N/A	Date Drilled 10-25-89
Boring No. MW2	Drilling Method Hollow-stem Auger	Drilling Company EGI

Penetration blows/6"	G. W. level	Depth (ft) Samples	Strati- graphy USCS	Description
			GW	with silt and sand, trace clay, very dense, wet, dark gray, discolored, some gravel is weathered.
8/11/20		25	CL/ CH	Clay, moderate plasticity, trace to 10% silt and sand, very stiff, cemented, slightly moist, light olive brown to pale olive, mottled, gravelly from 25.5' to 26', sandy below 26.75'.
8/11/18				
		30		
		35		
		40		
				TOTAL DEPTH 27'

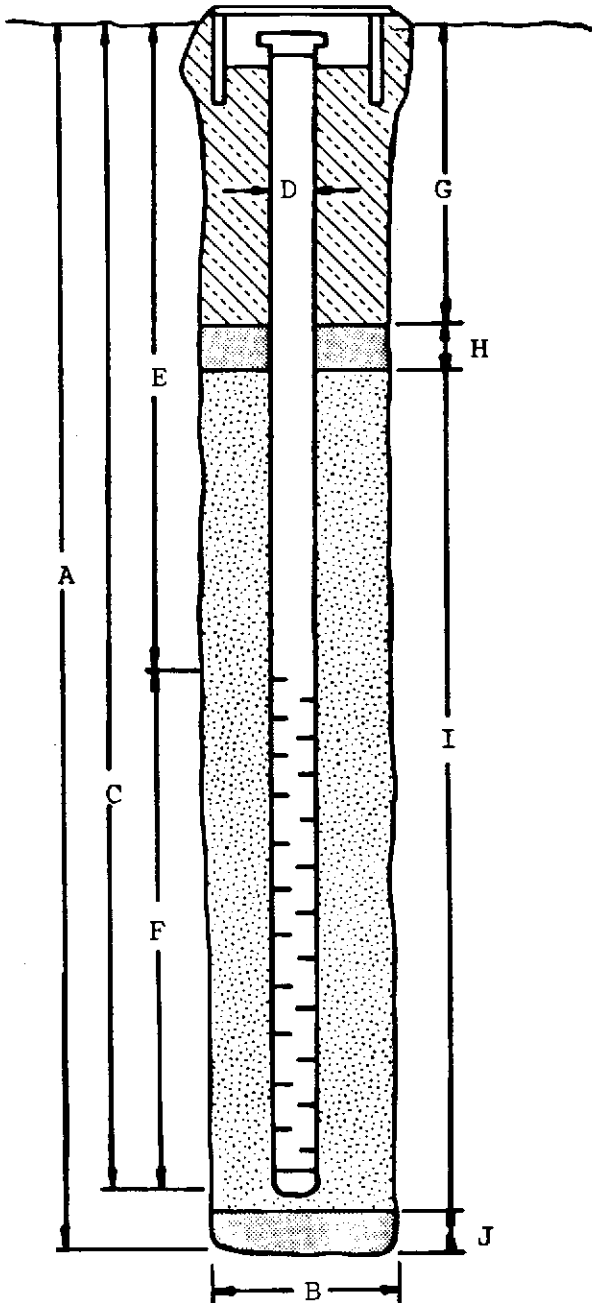
W E L L C O M P L E T I O N D I A G R A M

PROJECT NAME: Unocal - Livermore - 4700 First St. BORING/WELL NO. MW2

PROJECT NUMBER: KEI-P89-0801

WELL PERMIT NO.: _____

Flush-mounted Well Cover



A. Total Depth: 26'

B. Boring Diameter*: 9"

Drilling Method: Hollow Stem Auger

C. Casing Length: 26'

Material: Schedule 40 PVC

D. Casing Diameter: OD = 2.375"

ID = 2.067"

E. Depth to Perforations: 11'

F. Perforated Length: 15'

Perforation Type: Machined Slot

Perforation Size: 0.020"

G. Surface Seal: 7'

Seal Material: Concrete

H. Seal: 2'

Seal Material: Bentonite

I. Gravel Pack: 17'

Pack Material: RMC Lonestar Sand

Size: #3

J. Bottom Seal: 1' (Sampler hole)

Seal Material: Bentonite

*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-P89-0801	Boring & Casing Diameter 9" 2"	Logged By D.L. <i>DLB</i>
Project Name Unocal Livermore - First St.	Well Head Elevation N/A	Date Drilled 10-25-89
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
			GW/ GC	Well graded gravel with clay and sand, dense, moist, olive brown fill, gravel to 4" diameter.
4/3/4		5	GC	Clayey gravel w/sand, 10% silt, dense, moist, dark grayish green, olive brown below 4 feet gravel to 4", gravel is sandstone, angular: fill.
3/6/6			CH	Silty clay, high plasticity, firm, moist, black, silt content decreases w/depth, trace sand below 7 feet.
9/11/12		10		Color change to olive, very stiff, moderately cemented.
8/9/10			GC	Sandy gravel w/clay, 15-25% clay, 20-35% sand, med. dense, moist, olive to olive brown.
3/11/26	▽	15	GP	Poorly graded gravel w/sand, medium dense, very moist to wet, olive gray.
6/22/27			GW	Well graded gravel with sand, gravel to 2", lensed w/well graded sand with gravel, very dense, wet, olive brown to dark grayish brown; dark gray discolored at 15-16 feet, 6" thick sand lense.
		20		

B O R I N G L O G

Project No. KEI-P89-0801	Boring & Casing Diameter 9" 2"	Logged By D.L. <i>DRP</i>
Project Name Unocal Livermore - First St.	Well Head Elevation N/A	Date Drilled 10-25-89
Boring No. MW3	Drilling Method Hollow-stem Auger	Drilling Company EGI

Penetration blows/6"	G. W. level	Depth (ft) Samples	Strati- graphy USCS	Description
11/17/35			GW	Well graded gravel, as above, 5-10% fines, below 21.5 feet.
3/7/9		25	CL/ CH	Clay, stiff to very stiff, cemented, blocky, moist to wet, pale olive with white, locally cemented.
		30		
		35		
		40		
				TOTAL DEPTH 26'

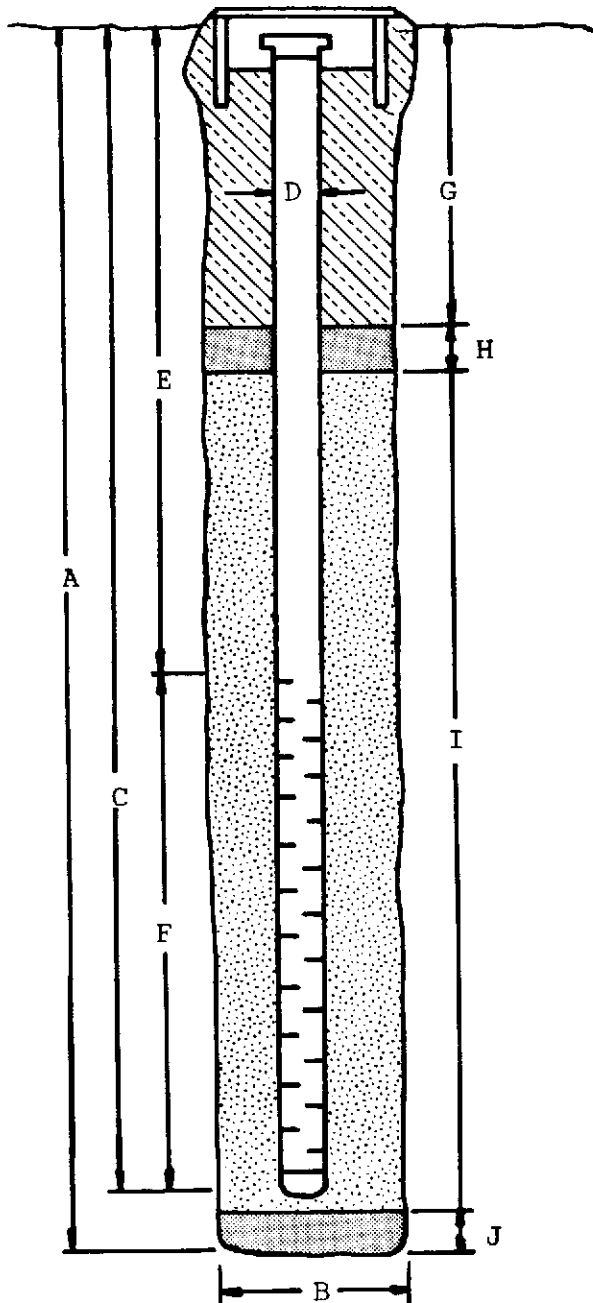
W E L L C O M P L E T I O N D I A G R A M

PROJECT NAME: Unocal - Livermore - 4700 First St. BORING/WELL NO. MW3

PROJECT NUMBER: KEI-P89-0801

WELL PERMIT NO.: _____

Flush-mounted Well Cover



A. Total Depth: 26'

B. Boring Diameter*: 9"

Drilling Method: Hollow Stem
Auger

C. Casing Length: 26'

Material: Schedule 40 PVC

D. Casing Diameter: OD = 2.375"

ID = 2.067"

E. Depth to Perforations: 11'

F. Perforated Length: 15'

Perforation Type: Machined
Slot

Perforation Size: 0.020"

G. Surface Seal: 7'

Seal Material: Concrete

H. Seal: 2'

Seal Material: Bentonite

I. Gravel Pack: 17'

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-P89-0801	Boring & Casing Diameter 9" 2"	Logged By D.L. <i>DLB</i>
Project Name Unocal Livermore - First St.	Well Head Elevation N/A	Date Drilled 10-25-89
Boring No. MW4	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
4/5/6		5	GW/ GC	Well graded gravel w/clay and sand, loose to medium dense moist, olive brown, gravel to 6" diameter: fill.
5/6/11			CH	Gravelly clay, high plasticity, 10-15% sand and silt, firm, moist, black. Clay, high plasticity, 10-15% silt, 5-10% coarse sand, stiff to very stiff, moist, black.
9/7/6		10	SM	Silty sand w/gravel and clay, med. dense, moist, light olive brown.
2/3/8			CL/ CH	Sandy clay, moderate plasticity, 10-15% gravel to 1/2", firm, moist, very dark grayish brown. Clay, mod. plasticity, 5-10% silt and sand, stiff, slightly moist, olive brown and dark olive gray, mottled.
3/3/3	▽	15		Clay, mod. to high plasticity, firm, very moist, light olive gray and white, weakly cemented
4/8/15				Clay, 5-10% silt and sand, very stiff, blocky, moist, pale olive and white, cemented.
5/8/12		20		

B O R I N G L O G

Project No. KEI-P89-0801	Boring & Casing Diameter 9" 2"	Logged By D.L. <i>DDB</i>
Project Name Unocal Livermore - First St.	Well Head Elevation N/A	Date Drilled 10-25-89
Boring No. MW4	Drilling Method Hollow-stem Auger	Drilling Company EGI

Penetration blows/6"	G. W. level	Depth (ft) Samples	Strati- graphy USCS	Description
5/8/11		25	CL/ CH	Clay, mod. to high plasticity, 5-10% sand and silt, stiff to very stiff, blocky, moist to wet, light olive brown and white, cementation stratified in clay instead of throughout as above 20 feet, layers of cementation are wet.
		30		
		35		
		40		
				TOTAL DEPTH 26'

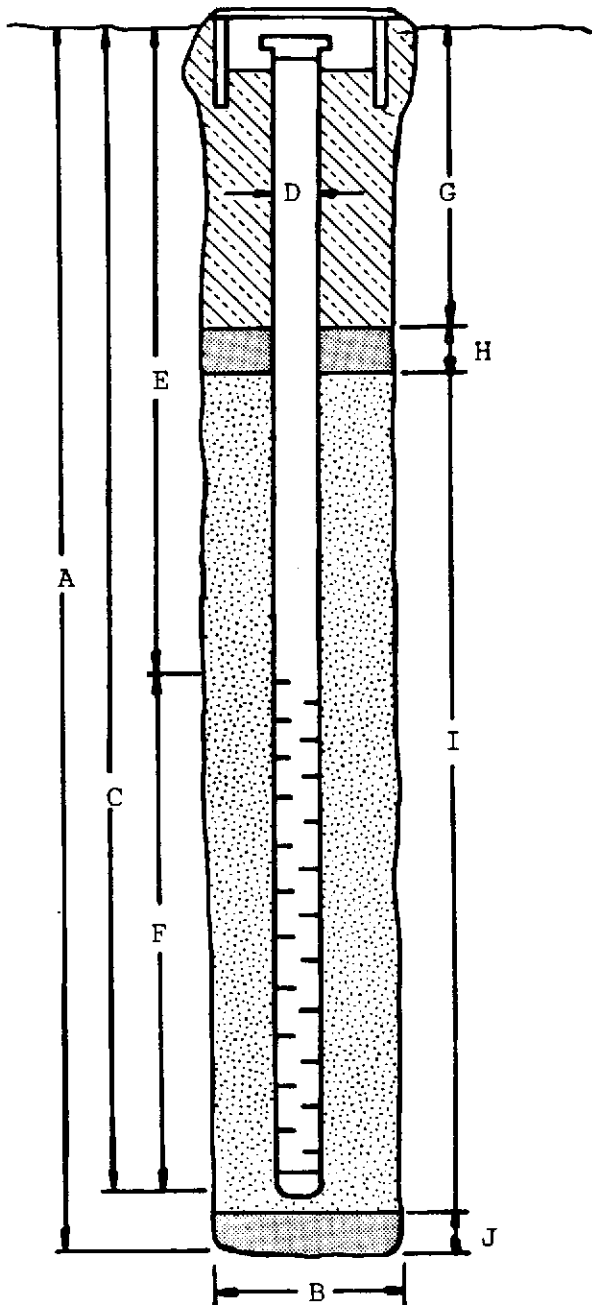
W E L L C O M P L E T I O N D I A G R A M

PROJECT NAME: Unocal - Livermore - 4700 First St. BORING/WELL NO. MW4

PROJECT NUMBER: KEI-P89-0801

WELL PERMIT NO.: _____

Flush-mounted Well Cover



- A. Total Depth: 26'
- B. Boring Diameter*: 9"
Drilling Method: Hollow Stem Auger
- C. Casing Length: 26'
Material: Schedule 40 PVC
- D. Casing Diameter: OD = 2.375"
ID = 2.067"
- E. Depth to Perforations: 11'
- F. Perforated Length: 15'
Perforation Type: Machined Slot
Perforation Size: 0.020"
- G. Surface Seal: 7'
Seal Material: Concrete
- H. Seal: 2'
Seal Material: Bentonite
- I. Gravel Pack: 17'
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

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

Kaprealian Engineering, Inc.
P.O. Box 913
Benicia, CA 94510
Attention: Mardo Kaprealian, P.E.

Client Project ID: Unocal, Livermore, 1st St., KEI-P89-0801
Sample Descript: Soil, MW-3-(18.5)
First Sample #: 910-3832

Sampled: Oct 26, 1989
Received: Oct 27, 1989
Analyzed: Nov 10, 1989
Reported: Nov 10, 1989

PARTICLE SIZE DISTRIBUTION

Sample Number	Sample Description	Tyler Screen Scale	% Distribution by Weight
910-3832	MW-3-(18.5)	5	54.3
		6	3.9
		7	3.9
		9	7.4
		10	3.1
		12	2.3
		16	5.2
		24	3.3
		28	1.9
		32	2.1
		42	3.2
		48	1.6
		80	2.7
		120	2.1
		200	1.6
		pan	1.4

SEQUOIA ANALYTICAL

Belinda C. Vega
Belinda C. Vega
Project Manager



KAPREALIAN ENGINEERING, INC.

Consulting Engineers
P. O. BOX 913
BENICIA, CA 94510
(415) 676-9100 (707) 746-6915

CHAIN OF CUSTODY

SAMPLER: [Signature] DATE/TIME OF COLLECTION: 10-26-89 TURN AROUND TIME: REGULAR
(Signature)

SAMPLE DESCRIPTION AND PROJECT NUMBER: UNOAK / LIVERMORE / FIRST ST.
KEI-89-0801

<u>SAMPLE #</u>	<u>ANALYSES</u>	<u>GRAB OR COMP.</u>	<u>NUMBER OF CONTAINERS</u>	<u>SOIL/WATER</u>
<u>MM-3-(185)</u>	<u>STEVE</u>	<u>G</u>	<u>1</u>	<u>S</u>

<u>RELINQUISHED BY*</u>	<u>TIME/DATE</u>	<u>RECEIVED BY*</u>	<u>TIME/DATE</u>
<u>[Signature] (KEI)</u>	<u>9:30 10/27/89</u>	<u>Tim McLean</u>	<u>9:30 10/27/89</u>
<u>Tim McLean</u>	<u>11:30 10/27/89</u>	<u>Bl. Olin</u>	<u>10/27 11:30 a.m.</u>
<u>3.</u>			

* STATE AFFILIATION NEXT TO SIGNATURE

REMARKS: _____

NOTE: IF REGULAR TURNAROUND, SOIL ANALYSES MUST BE COMPLETED WITHIN 14 CALENDAR DAYS OF SAMPLE COLLECTION. WATER ANALYSES MUST BE COMPLETED WITHIN 7 CALENDAR DAYS FOR BTX&E (UNLESS SAMPLE HAS BEEN PRESERVED), AND 14 CALENDAR DAYS FOR TPH AS GASOLINE; EXTRACT TPH AS DIESEL WITHIN 14 CALENDAR DAYS.



SEQUOIA ANALYTICAL

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

Kaprealian Engineering, Inc.
P.O. Box 913
Benicia, CA 94510
Attention: Mardo Kaprealian, P.E.

Client Project ID: Unocal, Livermore, 1st St., KEI-P89-0801
Matrix Descript: Soil
Analysis Method: EPA 3550/8015
First Sample #: 910-3836

Sampled: 10/25-10/26/89
Received: Oct 27, 1989
Extracted: Nov 7, 1989
Analyzed: Nov 8, 1989
Reported: Nov 10, 1989

TOTAL PETROLEUM FUEL HYDROCARBONS (EPA 8015)

Sample Number	Sample Description	High B.P. Hydrocarbons mg/kg (ppm)
910-3836	MW-1-(5)	N.D.
910-3837	MW-1-(7)	N.D.
910-3838	MW-1-(10)	N.D.
910-3839	MW-1-(12.5)	N.D.
910-3840	MW-1-(15)	N.D.
910-3841	MW-1-(17)	N.D.

Detection Limits:

1.0

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

SEQUOIA ANALYTICAL

Belinda C. Vega
Project Manager

9103836.KEI <1>



SEQUOIA ANALYTICAL

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

Kaprealian Engineering, Inc.	Client Project ID: Unocal, Livermore, 1st St., KEI-P89-0801	Sampled: 10/25-10/26/89
P.O. Box 913	Matrix Descript: Soil	Received: Oct 27, 1989
Benicia, CA 94510	Analysis Method: EPA 418.1 (I.R. with clean-up)	Extracted: Nov 8, 1989
Attention: Mardo Kaprealian, P.E.	First Sample #: 910-3836	Analyzed: Nov 9, 1989
		Reported: Nov 10, 1989

TOTAL RECOVERABLE PETROLEUM HYDROCARBONS

Sample Number	Sample Description	Petroleum Oil mg/kg (ppm)
910-3836	MW-1-(5)	< 50
910-3837	MW-1-(7)	< 50
910-3838	MW-1-(10)	N.D.
910-3839	MW-1-(12.5)	< 50
910-3840	MW-1-(15)	< 50
910-3841	MW-1-(17)	< 50

Detection Limits: 1.0

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

SEQUOIA ANALYTICAL

Belinda C. Vega
Project Manager

9103836.KEI <2>



SEQUOIA ANALYTICAL

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

Kaprealian Engineering, Inc. P.O. Box 913 Benicia, CA 94510 Attention: Mardo Kaprealian, P.E.	Client Project ID: Unocal, Livermore, 1st St., KEI-P89-0801 Matrix Descript: Soil Analysis Method: EPA 5030/8015/8020 First Sample #: 910-3836	Sampled: 10/25-10/26/89 Received: Oct 27, 1989 Analyzed: Nov 3, 1989 Reported: Nov 10, 1989
--	---	--

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)
910-3836	MW-1-(5)	N.D.	N.D.	N.D.	N.D.	N.D.
910-3837	MW-1-(7)	N.D.	N.D.	N.D.	N.D.	N.D.
910-3838	MW-1-(10)	N.D.	N.D.	N.D.	N.D.	N.D.
910-3839	MW-1-(12.5)	N.D.	N.D.	N.D.	N.D.	N.D.
910-3840	MW-1-(15)	N.D.	N.D.	N.D.	N.D.	N.D.
910-3841	MW-1-(17)	N.D.	N.D.	N.D.	N.D.	N.D.
910-3842	MW-2-(5)	23	N.D.	N.D.	N.D.	N.D.
910-3843	MW-2-(10)	N.D.	N.D.	N.D.	N.D.	N.D.
910-3844	MW-2-(12.5)	N.D.	N.D.	N.D.	N.D.	N.D.
910-3845	MW-2-(15)	3.0	N.D.	N.D.	N.D.	N.D.

Detection Limits:	1.0	0.05	0.1	0.1	0.1
--------------------------	------------	-------------	------------	------------	------------

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

SEQUOIA ANALYTICAL

Belinda C. Vega
Project Manager



SEQUOIA ANALYTICAL

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

Kaprealian Engineering, Inc.	Client Project ID: Unocal, Livermore, 1st St., KEI-P89-0801	Sampled: 10/25-10/26/89
P.O. Box 913	Matrix Descript: Soil	Received: Oct 27, 1989
Benicia, CA 94510	Analysis Method: EPA 5030/8015/8020	Analyzed: Nov 3, 1989
Attention: Mardo Kaprealian, P.E.	First Sample #: 910-3846	Reported: Nov 10, 1989

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)
910-3846	MW-2-(17)	790	0.14	0.23	2.7	10
910-3847	MW-3-(5)	1.1	N.D.	N.D.	N.D.	N.D.
910-3848	MW-3-(10)	N.D.	N.D.	N.D.	N.D.	N.D.
910-3849	MW-3-(11.5)	N.D.	N.D.	N.D.	N.D.	N.D.
910-3850	MW-3-(14)	N.D.	N.D.	N.D.	N.D.	N.D.
910-3851	MW-4-(5)	1.9	N.D.	N.D.	N.D.	N.D.
910-3852	MW-4-(9.5)	N.D.	N.D.	N.D.	N.D.	N.D.
910-3853	MW-4-(12)	N.D.	N.D.	N.D.	N.D.	N.D.
910-3854	MW-4-(15)	56	0.10	0.11	1.5	1.5

Detection Limits:	1.0	0.05	0.1	0.1	0.1
--------------------------	------------	-------------	------------	------------	------------

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

SEQUOIA ANALYTICAL

Belinda C. Vega
Project Manager



SEQUOIA ANALYTICAL

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

Kaprealian Engineering, Inc.
P.O. Box 913
Benicia, CA 94510
Attention: Mardo Kaprealian, P.E.

Client Project ID: Unocal, Livermore, 1st St., KEI-P89-0801
Sample Descript: Soil, MW-1-(5)
Analysis Method: EPA 5030/8010
Lab Number: 910-3836

Sampled: 10/25-10/26/89
Received: Oct 27, 1989
Analyzed: Nov 6, 1989
Reported: Nov 10, 1989

HALOGENATED VOLATILE ORGANICS (EPA 8010)

Analyte	Detection Limit µg/kg	Sample Results µg/kg
Bromodichloromethane.....	5.0	N.D.
Bromoform.....	5.0	N.D.
Bromomethane.....	5.0	N.D.
Carbon tetrachloride.....	5.0	N.D.
Chlorobenzene.....	5.0	N.D.
Chloroethane.....	25.0	N.D.
2-Chloroethylvinyl ether.....	5.0	N.D.
Chloroform.....	5.0	N.D.
Chloromethane.....	5.0	N.D.
Dibromochloromethane.....	5.0	N.D.
1,2-Dichlorobenzene.....	10.0	N.D.
1,3-Dichlorobenzene.....	10.0	N.D.
1,4-Dichlorobenzene.....	10.0	N.D.
1,1-Dichloroethane.....	5.0	N.D.
1,2-Dichloroethane.....	5.0	N.D.
1,1-Dichloroethene.....	5.0	N.D.
Total 1,2-Dichloroethene.....	5.0	N.D.
1,2-Dichloropropane.....	5.0	N.D.
cis-1,3-Dichloropropene.....	5.0	N.D.
trans-1,3-Dichloropropene.....	5.0	N.D.
Methylene chloride.....	10.0	N.D.
1,1,2,2-Tetrachloroethane.....	5.0	N.D.
Tetrachloroethene.....	5.0	N.D.
1,1,1-Trichloroethane.....	5.0	N.D.
1,1,2-Trichloroethane.....	5.0	N.D.
Trichloroethene.....	5.0	N.D.
Trichlorofluoromethane.....	5.0	N.D.
Vinyl chloride.....	10.0	N.D.

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

SEQUOIA ANALYTICAL

Belinda C. Vega
Project Manager



SEQUOIA ANALYTICAL

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

Kaprealian Engineering, Inc. P.O. Box 913 Benicia, CA 94510 Attention: Mardo Kaprealian, P.E.	Client Project ID: Unocal, Livermore, 1st St., KEI-P89-0801 Sample Descript: Soil, MW-1-(7) Analysis Method: EPA 5030/8010 Lab Number: 910-3837	Sampled: 10/25-10/26/89 Received: Oct 27, 1989 Analyzed: Nov 6, 1989 Reported: Nov 10, 1989
--	--	--

HALOGENATED VOLATILE ORGANICS (EPA 8010)

Analyte	Detection Limit µg/kg	Sample Results µg/kg
Bromodichloromethane.....	5.0	N.D.
Bromoform.....	5.0	N.D.
Bromomethane.....	5.0	N.D.
Carbon tetrachloride.....	5.0	N.D.
Chlorobenzene.....	5.0	N.D.
Chloroethane.....	25.0	N.D.
2-Chloroethylvinyl ether.....	5.0	N.D.
Chloroform.....	5.0	N.D.
Chloromethane.....	5.0	N.D.
Dibromochloromethane.....	5.0	N.D.
1,2-Dichlorobenzene.....	10.0	N.D.
1,3-Dichlorobenzene.....	10.0	N.D.
1,4-Dichlorobenzene.....	10.0	N.D.
1,1-Dichloroethane.....	5.0	N.D.
1,2-Dichloroethane.....	5.0	N.D.
1,1-Dichloroethene.....	5.0	N.D.
Total 1,2-Dichloroethene.....	5.0	N.D.
1,2-Dichloropropane.....	5.0	N.D.
cis-1,3-Dichloropropene.....	5.0	N.D.
trans-1,3-Dichloropropene.....	5.0	N.D.
Methylene chloride.....	10.0	N.D.
1,1,2,2-Tetrachloroethane.....	5.0	N.D.
Tetrachloroethene.....	5.0	N.D.
1,1,1-Trichloroethane.....	5.0	N.D.
1,1,2-Trichloroethane.....	5.0	N.D.
Trichloroethene.....	5.0	N.D.
Trichlorofluoromethane.....	5.0	N.D.
Vinyl chloride.....	10.0	N.D.

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

SEQUOIA ANALYTICAL

Belinda C. Vega
Belinda C. Vega
Project Manager



SEQUOIA ANALYTICAL

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

Kaprealian Engineering, Inc.	Client Project ID: Unocal, Livermore, 1st St., KEI-P89-0801	Sampled: 10/25-10/26/89
P.O. Box 913	Sample Descript: Soil, MW-1-(10)	Received: Oct 27, 1989
Benicia, CA 94510	Analysis Method: EPA 5030/8010	Analyzed: Nov 6, 1989
Attention: Mardo Kaprealian, P.E.	Lab Number: 910-3838	Reported: Nov 10, 1989

HALOGENATED VOLATILE ORGANICS (EPA 8010)

Analyte	Detection Limit µg/kg	Sample Results µg/kg
Bromodichloromethane.....	5.0	N.D.
Bromoform.....	5.0	N.D.
Bromomethane.....	5.0	N.D.
Carbon tetrachloride.....	5.0	N.D.
Chlorobenzene.....	5.0	N.D.
Chloroethane.....	25.0	N.D.
2-Chloroethylvinyl ether.....	5.0	N.D.
Chloroform.....	5.0	N.D.
Chloromethane.....	5.0	N.D.
Dibromochloromethane.....	5.0	N.D.
1,2-Dichlorobenzene.....	10.0	N.D.
1,3-Dichlorobenzene.....	10.0	N.D.
1,4-Dichlorobenzene.....	10.0	N.D.
1,1-Dichloroethane.....	5.0	N.D.
1,2-Dichloroethane.....	5.0	N.D.
1,1-Dichloroethene.....	5.0	N.D.
Total 1,2-Dichloroethene.....	5.0	N.D.
1,2-Dichloropropane.....	5.0	N.D.
cis-1,3-Dichloropropene.....	5.0	N.D.
trans-1,3-Dichloropropene.....	5.0	N.D.
Methylene chloride.....	10.0	N.D.
1,1,2,2-Tetrachloroethane.....	5.0	N.D.
Tetrachloroethene.....	5.0	N.D.
1,1,1-Trichloroethane.....	5.0	N.D.
1,1,2-Trichloroethane.....	5.0	N.D.
Trichloroethene.....	5.0	N.D.
Trichlorofluoromethane.....	5.0	N.D.
Vinyl chloride.....	10.0	N.D.

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

SEQUOIA ANALYTICAL

Belinda C. Vega
Project Manager



SEQUOIA ANALYTICAL

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

Kaprealian Engineering, Inc.	Client Project ID: Unocal, Livermore, 1st St., KEI-P89-0801	Sampled: 10/25-10/26/89
P.O. Box 913	Sample Descript: Soil, MW-1-(12.5)	Received: Oct 27, 1989
Benicia, CA 94510	Analysis Method: EPA 5030/8010	Analyzed: Nov 6, 1989
Attention: Mardo Kaprealian, P.E.	Lab Number: 910-3839	Reported: Nov 10, 1989

HALOGENATED VOLATILE ORGANICS (EPA 8010)

Analyte	Detection Limit µg/kg	Sample Results µg/kg
Bromodichloromethane.....	5.0	N.D.
Bromoform.....	5.0	N.D.
Bromomethane.....	5.0	N.D.
Carbon tetrachloride.....	5.0	N.D.
Chlorobenzene.....	5.0	N.D.
Chloroethane.....	25.0	N.D.
2-Chloroethylvinyl ether.....	5.0	N.D.
Chloroform.....	5.0	N.D.
Chloromethane.....	5.0	N.D.
Dibromochloromethane.....	5.0	N.D.
1,2-Dichlorobenzene.....	10.0	N.D.
1,3-Dichlorobenzene.....	10.0	N.D.
1,4-Dichlorobenzene.....	10.0	N.D.
1,1-Dichloroethane.....	5.0	N.D.
1,2-Dichloroethane.....	5.0	N.D.
1,1-Dichloroethene.....	5.0	N.D.
Total 1,2-Dichloroethene.....	5.0	N.D.
1,2-Dichloropropane.....	5.0	N.D.
cis-1,3-Dichloropropene.....	5.0	N.D.
trans-1,3-Dichloropropene.....	5.0	N.D.
Methylene chloride.....	10.0	N.D.
1,1,2,2-Tetrachloroethane.....	5.0	N.D.
Tetrachloroethene.....	5.0	N.D.
1,1,1-Trichloroethane.....	5.0	N.D.
1,1,2-Trichloroethane.....	5.0	N.D.
Trichloroethene.....	5.0	N.D.
Trichlorofluoromethane.....	5.0	N.D.
Vinyl chloride.....	10.0	N.D.

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

SEQUOIA ANALYTICAL

Belinda Vega
 Belinda C. Vega
 Project Manager



SEQUOIA ANALYTICAL

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

Kaprealian Engineering, Inc.
P.O. Box 913
Benicia, CA 94510
Attention: Mardo Kaprealian, P.E.

Client Project ID: Unocal, Livermore, 1st St., KEI-P89-0801
Sample Descript: Soil, MW-1-(15)
Analysis Method: EPA 5030/8010
Lab Number: 910-3840

Sampled: 10/25-10/26/89
Received: Oct 27, 1989
Analyzed: Nov 6, 1989
Reported: Nov 10, 1989

HALOGENATED VOLATILE ORGANICS (EPA 8010)

Analyte	Detection Limit µg/kg	Sample Results µg/kg
Bromodichloromethane.....	5.0	N.D.
Bromoform.....	5.0	N.D.
Bromomethane.....	5.0	N.D.
Carbon tetrachloride.....	5.0	N.D.
Chlorobenzene.....	5.0	N.D.
Chloroethane.....	25.0	N.D.
2-Chloroethylvinyl ether.....	5.0	N.D.
Chloroform.....	5.0	N.D.
Chloromethane.....	5.0	N.D.
Dibromochloromethane.....	5.0	N.D.
1,2-Dichlorobenzene.....	10.0	N.D.
1,3-Dichlorobenzene.....	10.0	N.D.
1,4-Dichlorobenzene.....	10.0	N.D.
1,1-Dichloroethane.....	5.0	N.D.
1,2-Dichloroethane.....	5.0	N.D.
1,1-Dichloroethene.....	5.0	N.D.
Total 1,2-Dichloroethene.....	5.0	N.D.
1,2-Dichloropropane.....	5.0	N.D.
cis-1,3-Dichloropropene.....	5.0	N.D.
trans-1,3-Dichloropropene.....	5.0	N.D.
Methylene chloride.....	10.0	N.D.
1,1,2,2-Tetrachloroethane.....	5.0	N.D.
Tetrachloroethene.....	5.0	N.D.
1,1,1-Trichloroethane.....	5.0	N.D.
1,1,2-Trichloroethane.....	5.0	N.D.
Trichloroethene.....	5.0	N.D.
Trichlorofluoromethane.....	5.0	N.D.
Vinyl chloride.....	10.0	N.D.

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

SEQUOIA ANALYTICAL

Belinda C. Vega
Project Manager



SEQUOIA ANALYTICAL

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

Kaprealian Engineering, Inc.
P.O. Box 913
Benicia, CA 94510
Attention: Mardo Kaprealian, P.E.

Client Project ID: Unocal, Livermore, 1st St., KEI-P89-0801
Sample Descript: Soil, MW-1-(17)
Analysis Method: EPA 5030/8010
Lab Number: 910-3841

Sampled: 10/25-10/26/89
Received: Oct 27, 1989
Analyzed: Nov 6, 1989
Reported: Nov 10, 1989

HALOGENATED VOLATILE ORGANICS (EPA 8010)

Analyte	Detection Limit µg/kg	Sample Results µg/kg
Bromodichloromethane.....	5.0	N.D.
Bromoform.....	5.0	N.D.
Bromomethane.....	5.0	N.D.
Carbon tetrachloride.....	5.0	N.D.
Chlorobenzene.....	5.0	N.D.
Chloroethane.....	25.0	N.D.
2-Chloroethylvinyl ether.....	5.0	N.D.
Chloroform.....	5.0	N.D.
Chloromethane.....	5.0	N.D.
Dibromochloromethane.....	5.0	N.D.
1,2-Dichlorobenzene.....	10.0	N.D.
1,3-Dichlorobenzene.....	10.0	N.D.
1,4-Dichlorobenzene.....	10.0	N.D.
1,1-Dichloroethane.....	5.0	N.D.
1,2-Dichloroethane.....	5.0	N.D.
1,1-Dichloroethene.....	5.0	N.D.
Total 1,2-Dichloroethene.....	5.0	N.D.
1,2-Dichloropropane.....	5.0	N.D.
cis-1,3-Dichloropropene.....	5.0	N.D.
trans-1,3-Dichloropropene.....	5.0	N.D.
Methylene chloride.....	10.0	N.D.
1,1,2,2-Tetrachloroethane.....	5.0	N.D.
Tetrachloroethene.....	5.0	N.D.
1,1,1-Trichloroethane.....	5.0	N.D.
1,1,2-Trichloroethane.....	5.0	N.D.
Trichloroethene.....	5.0	N.D.
Trichlorofluoromethane.....	5.0	N.D.
Vinyl chloride.....	10.0	N.D.

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

SEQUOIA ANALYTICAL


Belinda C. Vega
Project Manager



KAPREALIAN ENGINEERING, INC.

Consulting Engineers

P. O. BOX 913

BENICIA CA 94510

(415) 676-9100 (707) 746-6915

CHAIN OF CUSTODY

SAMPLER: [Signature] DATE/TIME OF COLLECTION: 10-25/10-26-89 TURN AROUND TIME: REGULAR
 (Signature)

SAMPLE DESCRIPTION AND PROJECT NUMBER: UNOCAL/LIVERMORE/FIRST ST
KEI-89-0801

SAMPLE #	ANALYSES	GRAB OR COMP.	NUMBER OF CONTAINERS	SOIL/WATER
MW-1-(5)	TPH-G/BTX&E/TPH-D/TOC(412.1)/SOIL	G	1	S
MW-1-(7)	TPH-G/BTX&E/TPH-D/TOC(412.1)/SOIL	G	1	S
MW-1-(10)	TPH-G/BTX&E/TPH-D/TOC(412.1)/SOIL	G	1	S
MW-1-(12S)	TPH-G/BTX&E/TPH-D/TOC(412.1)/SOIL	G	1	S
MW-1-(15)	TPH-G/BTX&E/TPH-D/TOC(412.1)/SOIL	G	1	S
MW-1-(17)	TPH-G/BTX&E/TPH-D/TOC(412.1)/SOIL	G	1	S
MW-2-(5)	TPH-G/BTX&E	G	1	S
MW-2-(10)	TPH-G/BTX&E	G	1	S

RELINQUISHED BY*	TIME/DATE	RECEIVED BY*	TIME/DATE
1. <u>[Signature] (KEI)</u>	9:30 10/27/89	Tim McLean	9:30 10/27/89
2. Tim McLean	11:30 10/27/89	B.L. Olson	11:30am 10/27
3.			

* STATE AFFILIATION NEXT TO SIGNATURE

REMARKS: _____

NOTE: IF REGULAR TURNAROUND, SOIL ANALYSES MUST BE COMPLETED WITHIN 14 CALENDAR DAYS OF SAMPLE COLLECTION. WATER ANALYSES MUST BE COMPLETED WITHIN 7 CALENDAR DAYS FOR BTX&E (UNLESS SAMPLE HAS BEEN PRESERVED), AND 14 CALENDAR DAYS FOR TPH AS GASOLINE; EXTRACT TPH AS DIESEL WITHIN 14 CALENDAR DAYS.



KAPREALIAN ENGINEERING, INC.

Consulting Engineers
P. O. BOX 913
BENICIA, CA 94510
(415) 676-9100 (707) 746-6915

CHAIN OF CUSTODY

SAMPLER: [Signature] DATE/TIME OF COLLECTION: 10-25/10-26-89 TURN AROUND TIME: REGULAR
(Signature)

SAMPLE DESCRIPTION AND PROJECT NUMBER: UNION LIVERMORE FIRST ST.
KEY-089-0801

SAMPLE #	ANALYSES	GRAB OR COMP.	NUMBER OF CONTAINERS	SOIL/WATER
MU-2-(125)	TPH-G/BTX&E	G	1	S
MU-2-(15)	TPH-G/BTX&E	G	1	S
MU-2-(17)	TPH-G/BTX&E	G	1	S
MU-3-(5)	TPH-G/BTX&E	G	1	S
MU-3-(10)	TPH-G/BTX&E	G	1	S
MU-3-(11S)	TPH-G/BTX&E	G	1	S
MU-3-(14)	TPH-G/BTX&E	G	1	S
MU-4-(5)	TPH-G/BTX&E	G	1	S

RELINQUISHED BY*	TIME/DATE	RECEIVED BY*	TIME/DATE
1. <u>[Signature]</u> (KE)	9:30 10/27/89	Tim McFarlin	9:30 10/27/89
2. Tim McFarlin	11:30 10/27/89	R. L. Otter	10/27 11:45 am
3.			

* STATE AFFILIATION NEXT TO SIGNATURE

REMARKS: _____

NOTE: IF REGULAR TURNAROUND, SOIL ANALYSES MUST BE COMPLETED WITHIN 14 CALENDAR DAYS OF SAMPLE COLLECTION. WATER ANALYSES MUST BE COMPLETED WITHIN 7 CALENDAR DAYS FOR BTX&E (UNLESS SAMPLE HAS BEEN PRESERVED), AND 14 CALENDAR DAYS FOR TPH AS GASOLINE; EXTRACT TPH AS DIESEL WITHIN 14 CALENDAR DAYS.



KAPREALIAN ENGINEERING, INC.

Consulting Engineers
P. O. BOX 913
BENICIA, CA 94510
(415) 676-9100 (707) 746-6915

CHAIN OF CUSTODY

SAMPLER: [Signature] DATE/TIME OF COLLECTION: 10-25/10-26-89 TURN AROUND TIME: REGULAR
(Signature)

SAMPLE DESCRIPTION AND PROJECT NUMBER: INDIA WILDERMERE / EAST ST.
KEL-88-0801

SAMPLE #	ANALYSES	GRAB OR COMP.	NUMBER OF CONTAINERS	SOIL/WATER
MU-4-(95)	TPH-G/BTX&E	G	1	S
MU-4-(12)	TPH-G/BTX&E	G	1	S
MU-4-(15)	TPH-G/BTX&E	G	1	S

RELINQUISHED BY*	TIME/DATE	RECEIVED BY*	TIME/DATE
1. <u>[Signature]</u> (KEY)	9:30 10/27/89	Tom McLean	9:30 10/27/89
2. Tom McLean	11:30 10/27/89	B.L. Olin	11:30am 10/27
3.			

* STATE AFFILIATION NEXT TO SIGNATURE

REMARKS: _____

NOTE: IF REGULAR TURNAROUND, SOIL ANALYSES MUST BE COMPLETED WITHIN 14 CALENDAR DAYS OF SAMPLE COLLECTION. WATER ANALYSES MUST BE COMPLETED WITHIN 7 CALENDAR DAYS FOR BTX&E (UNLESS SAMPLE HAS BEEN PRESERVED), AND 14 CALENDAR DAYS FOR TPH AS GASOLINE; EXTRACT TPH AS DIESEL WITHIN 14 CALENDAR DAYS.



SEQUOIA ANALYTICAL

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

Kaprealian Engineering, Inc. P.O. Box 996 Benicia, CA 94510 Attention: Mardo Kaprealian, P.E.	Client Project ID: Unocal, Livermore, 1st/Hwy 580 Matrix Descript: Water, MW1 Analysis Method: EPA 418.1 (I.R. with clean-up) First Sample #: 911-2585 C	Sampled: Nov 18, 1989 Received: Nov 18, 1989 Extracted: Dec 1, 1989 Analyzed: Dec 6, 1989 Reported: Dec 6, 1989
--	---	---

TOTAL RECOVERABLE PETROLEUM HYDROCARBONS

Sample Number	Sample Description	Petroleum Oil mg/L (ppm)
9112585 C	MW1	3.1

Detection Limits:

1.0

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

SEQUOIA ANALYTICAL

Belinda C. Vega
Project Manager

9112585.KEI <1>



SEQUOIA ANALYTICAL

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

Kaprealian Engineering, Inc.	Client Project ID: Unocal, Livermore, 1st/Hwy 580	Sampled: Nov 18, 1989
P.O. Box 996	Matrix Descript: Water, MW1	Received: Nov 18, 1989
Benicia, CA 94510	Analysis Method: EPA 3510/8015	Extracted: Dec 1, 1989
Attention: Mardo Kaprealian, P.E.	First Sample #: 911-2585 D	Analyzed: Dec 5, 1989
		Reported: Dec 6, 1989

TOTAL PETROLEUM FUEL HYDROCARBONS (EPA 8015)

Sample Number	Sample Description	High B.P. Hydrocarbons $\mu\text{g/L}$ (ppb)
9112585 D	MW1	400

Detection Limits:

50.0

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

SEQUOIA ANALYTICAL


Belinda C. Vega
Project Manager

9112585.KEI <2>



SEQUOIA ANALYTICAL

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

Kaprealian Engineering, Inc. P.O. Box 996 Benicia, CA 94510 Attention: Mardo Kaprealian, P.E.	Client Project ID: Unocal, Livermore, 1st/Hwy 580 Matrix Descript: Water, MW1 thru MW4 Analysis Method: EPA 5030/8015/8020 First Sample #: 911-2585 A-B	Sampled: Nov 18, 1989 Received: Nov 18, 1989 Analyzed: Nov 30, 1989 Reported: Dec 6, 1989
--	--	--

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

Sample Number	Sample Description	Low/Medium B.P.	Benzene	Toluene	Ethyl Benzene	Xylenes
		Hydrocarbons				
		$\mu\text{g/L}$ (ppb)	$\mu\text{g/L}$ (ppb)	$\mu\text{g/L}$ (ppb)	$\mu\text{g/L}$ (ppb)	$\mu\text{g/L}$ (ppb)
9112585 A-B	MW1	N.D.	N.D.	N.D.	N.D.	N.D.
9112586 A-B	MW2	53,000	540	500	130	22,000
9112587 A-B	MW3	N.D.	0.35	N.D.	N.D.	N.D.
9112588 A-B	MW4	990	9.8	10	7.1	4.7

Detection Limits:	30.0	0.3	0.3	0.3	0.3
--------------------------	-------------	------------	------------	------------	------------

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

SEQUOIA ANALYTICAL

Belinda C. Vega
Project Manager



SEQUOIA ANALYTICAL

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

Kaprealian Engineering, Inc.	Client Project ID: Unocal, Livermore, 1st/Hwy 580	Sampled: Nov 18, 1989
P.O. Box 996	Sample Descript: Water, MW1	Received: Nov 18, 1989
Benicia, CA 94510	Analysis Method: EPA 5030/8010	Analyzed: Dec 1, 1989
Attention: Mardo Kaprealian, P.E.	Lab Number: 911-2585 E-G	Reported: Dec 6, 1989

HALOGENATED VOLATILE ORGANICS (EPA 8010)

Analyte	Detection Limit µg/L	Sample Results µg/L
Bromodichloromethane.....	1.0	N.D.
Bromoform.....	1.0	N.D.
Bromomethane.....	1.0	N.D.
Carbon tetrachloride.....	1.0	N.D.
Chlorobenzene.....	1.0	N.D.
Chloroethane.....	5.0	N.D.
2-Chloroethylvinyl ether.....	1.0	N.D.
Chloroform.....	0.5	N.D.
Chloromethane.....	0.5	N.D.
Dibromochloromethane.....	0.5	N.D.
1,2-Dichlorobenzene.....	2.0	N.D.
1,3-Dichlorobenzene.....	2.0	N.D.
1,4-Dichlorobenzene.....	2.0	N.D.
1,1-Dichloroethane.....	0.5	N.D.
1,2-Dichloroethane.....	0.5	N.D.
1,1-Dichloroethene.....	1.0	N.D.
Total 1,2-Dichloroethene.....	1.0	N.D.
1,2-Dichloropropane.....	0.5	N.D.
cis-1,3-Dichloropropene.....	5.0	N.D.
trans-1,3-Dichloropropene.....	5.0	N.D.
Methylene chloride.....	2.0	N.D.
1,1,2,2-Tetrachloroethane.....	0.5	N.D.
Tetrachloroethene.....	0.5	N.D.
1,1,1-Trichloroethane.....	0.5	N.D.
1,1,2-Trichloroethane.....	0.5	N.D.
Trichloroethene.....	0.5	0.55
Trichlorofluoromethane.....	1.0	N.D.
Vinyl chloride.....	2.0	N.D.

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

SEQUOIA ANALYTICAL

Belinda C. Vega
Belinda C. Vega
Project Manager



KAPREALIAN ENGINEERING, INC.

CHAIN OF CUSTODY

SAMPLER JOE / KEI		SITE NAME & ADDRESS Unocal / Livermore First st. / Hi. 580				ANALYSES REQUESTED				TURN AROUND TIME: 10 days			
WITNESSING AGENCY						TPHG, BTXE	TPHD	TOG	601				
SAMPLE ID NO.	DATE	TIME	SOIL	WATER	GRAB	COMP	NO. OF CONT.	SAMPLING LOCATION		REMARKS			
MW1	11/18/89	9:40					7	MW	✓	✓	✓	✓	
MW2	"	10:25					2	"	✓				
MW3	"	11:20					2	"	✓				
MW4	"	12:50					2	"	✓				
Relinquished by: (Signature) Joe Lewis			Date/Time 11/18/89 7:00 PM			Received by: (Signature) Paul Newman			The following MUST BE completed by the laboratory accepting samples for analysis: 1. Have all samples received for analysis been stored in ice? YES 2. Will samples remain refrigerated until analyzed? YES 3. Did any samples received for analysis have head space? NO 4. Were samples in appropriate containers and properly packaged? YES				
Relinquished by: (Signature)			Date/Time			Received by: (Signature)							
Relinquished by: (Signature)			Date/Time			Received by: (Signature)							
Relinquished by: (Signature)			Date/Time			Received by: (Signature)							
			11-18-89 300 pm						Signature: Paul Newman Title: S.K. Date: 11-18-89				