Corporate Offices 41674 Christy Street, Fremont, CA 94538-3114 (415) 659-0404 Fax: (415) 651-4677 Contr. Lic. No. 464324

ensco environmental services, inc.

LETTER OF TRANSMITTAL

Date: 11/7/88

Project: 1847G

To: Alameda County Health Department
Dept. of Environmental Health
80 Swan Way Room 200
Oakland CA 94621

From: Steve Costello

Description: For your Records ... Copy of
site assessment report for Shell station
at 230 MacArthur.

Sc

ENSCO ENVIRONMENTAL SERVICES, INC.

SOIL AND GROUND-WATER INVESTIGATION

FOR

SHELL OIL COMPANY SITE AT 230 MacARTHUR BOULEVARD OAKLAND, CALIFORNIA

Shell P.O. No. MOH 302662

Project No. 1847G
September, 1988

Corporate Offices 41674 Christy Street, Fremont, CA 94538-3114 (415) 659-0404 Fax: (415) 651-4677 Contr. Lic. No. 464324

ensco environmental services, inc.

September 30, 1988

Shell Oil Company
1390 Willow Pass Road
Concord, CA 94520

Attn.: Mr. Stan Roller

Re: Reconnaissance Soil and Ground-Water Investigation at Shell Service Station, 230 MacArthur Boulevard, Oakland, California
Shell P.O. Number MOH302662
EES Project Number 1847G

Dear Mr. Roller:

Ensco Environmental Services, Inc. has completed a preliminary soil investigation at the above referenced property in Oakland, California. The results of the investigation are presented in the attached report along with a description of methodology. The scope of work included the collection of soil samples from three exploratory borings, conversion of the borings to ground-water monitoring wells, sampling of the monitoring wells, chemical analyses of all samples, and the preparation of this report.

If you have any questions concerning this report, please call.

Sincerely,
Ensco Environmental Services, Inc.

Stephen Costello
Project Geologist

Lawrence D. Pavlak, C.E.G. 1187
Senior Program Geologist

SOIL AND GROUND-WATER INVESTIGATION
AT
SHELL SERVICE STATION
230 MACARTHUR BOULEVARD
OAKLAND, CALIFORNIA

EXECUTIVE SUMMARY

Ensco Environmental Services Inc. (EES) has recently completed a soil and ground-water investigation for Shell Oil Company at the Shell Service Station located at 230 MacArthur Boulevard in the City of Oakland, Alameda County, California. The investigation included the installation of three ground-water monitoring wells, the collection of soil and ground-water samples, and chemical analyses of soil and ground-water samples. A summary of findings follows:

1) Three exploratory borings were drilled on the site to a maximum depth of 31.5 feet and were converted to ground-water monitoring wells. The ground surface at the drilling locations was paved with asphalt or concrete underlain by baserock. Well MW-3 was located in an area where a subsurface storage tank had been removed. At this location pea gravel backfill extended to a depth of approximately 9 feet below grade. Native soils encountered consisted of clayey sand, sand, and silty clay.

2) Ground water was first observed in the borings at a depth of 15 feet below grade. Static water level measurements show that the ground-water potentiometric surface is between 14 and 16 feet below grade, inclined to the northwest at an approximate gradient of 0.0073 feet-per-foot.

3) No gasoline odors were noted in the soil samples or drill cuttings from well MW-1. A slight petroleum odor was noted in the soil cuttings from just below the asphalt pavement at MW-2. During the drilling of well MW-3 a slight odor was detected in the soil sample collected at a depth of 10 feet and a very faint odor was detected in the 15-foot sample.

   The laboratory analyses detected gasoline hydrocarbons in the soil at the 10-foot depth in well MW-3. Trace concentrations of toluene were detected in all borings. Trace concentrations of total xylenes were revealed in MW-1 and MW-3 at the 15- and 10-foot depths, respectively. Ethylbenzene was detected in MW-3 at 20 feet.

4) During ground-water sampling of the wells, a slight product odor was noted in MW-3. Results of the analyses performed on the water samples revealed that no hydrocarbon compounds were detected in the ground-water samples from MW-1 or MW-3. The ground-water from MW-2 had detectable levels of the compounds benzene, toluene, ethylbenzene, and total xylenes. The concentration of benzene detected in this well (7.9 parts-per-billion) exceeds the current state action levels.

INTRODUCTION

At the request of Mr. Stan Roller of Shell Oil Company (Shell), Ensco Environmental Services (EES) has completed a field investigation to ascertain potential subsurface contamination in both soil and ground water beneath the Shell Service Station located at 230 MacArthur Boulevard in Oakland, California. The location of the site is shown on Figure 1. The field investigation was conducted under Shell Oil Purchase Order No. MOH 302662.

This report will present available background for the project, the scope of work, a description of the field investigation and sample analyses, a summary of findings, and conclusions.

BACKGROUND

The station currently utilizes two dispensing islands and three recently installed underground gasoline storage tanks. To the best of our knowledge there has never been a waste oil tank located on the property. Emcon Associates performed an investigation on the property on April 14, 1986 which involved drilling four exploratory borings within the tank complex. These borings were advanced to total depths of 20.5 feet. Ground water was encountered at approximately 13 feet. Emcon reported that the soils beneath the tank complex consisted of fine to medium silty sand and clayey silt to the total depth explored. The soil samples collected were analyzed for the presence of total petroleum hydrocarbons (TPH) and benzene, toluene, and xylene (BTX) compounds. One soil sample was analyzed for total lead. Results indicated that hydrocarbon concentrations in the soils analyzed ranged from 1,200 to 5,700 parts-per-million (ppm) at depths between 8 and 15 feet.

An additional site assessment was performed by W.W. Irwin, Inc. on December 2, and 3, 1986 which consisted of analyzing soil gas vapors from 38 probe holes within the tank complex as well as the entire site. They concluded that

very high concentrations of hydrocarbons were primarily confined to the area of the tank complex and the vicinity of the pump island (southwest portion of site) nearest MacArthur Boulevard.

On March 12, 1987, Wayne Perry Construction, Inc. installed three recovery wells within the tank complex for the purpose of venting the soils. These wells were installed to a depth of 13 feet and were constructed of 4-inch diameter PVC pipe. The slotted interval (slot size 0.02) extended from the bottom of the boring to three feet below ground surface. The soil venting system utilizing an activated carbon scrubber operated between the period of April and November, 1987. Gas vapors were analyzed using a Foxboro 128 OVA system with a portable chart recorder. Wayne Perry concluded that the well gas contained light hydrocarbon compounds and that prolonged venting reduced the concentrations. Once the venting operation stopped, however, the hydrocarbon concentrations began increasing. On August 27, 1987 Wayne Perry drilled and sampled two additional borings within the tank complex for the purpose of analyzing concentrations of residual hydrocarbons remaining in the soils beneath the tanks after the first phase of soil venting was completed. Analyses of the samples collected indicated that the highest remaining concentrations of hydrocarbons (1,870 ppm) occurred at a depth of eight feet.

On November 2, 1987 the underground storage tanks were removed and soil samples were collected from the excavation and soil stockpile. Analytical results indicated that hydrocarbon concentrations ranged from 8.6 to 480 ppm at a depth of 15 feet. Five composite samples were collected from the stockpile and the hydrocarbon concentrations ranged from 8.4 to 250 ppm.

SCOPE OF WORK

Shell contracted EES to perform a supplemental site assessment for the purpose of further delineating the subsurface conditions at the subject property prior to its relinquishment. The scope of work for this project includes drilling three exploratory borings, collecting soil samples from the

borings, converting each boring to a ground-water monitoring well, development and sampling of the wells, laboratory analyses of the samples, surveying the well heads, and preparing this report.

FIELD INVESTIGATION

The field investigation was conducted on July 11, and 12, 1988. Two ground-water monitoring wells were installed adjacent to the underground storage tanks and one well was installed in the down ground-water gradient side of the site (see Figure 2).

Exploratory Borings

A Mobile B-53 drilling rig, equipped with 6.63-inch inside diameter hollow stem augers, was used to drill the three exploratory borings required for soil sampling and monitoring well installation. The borings were logged by an EES geologist with soil descriptions classified according to the Unified Soil Classification System and Munsell Soil Color Charts. Prior to work and during drilling at the site, all drilling and sampling equipment was cleaned to reduce the potential for cross-contamination between borings and between sampling intervals.

Soil samples were collected through the hollow stem auger at five-foot depth intervals beginning at a depth of five feet. A modified California split-spoon sampler, equipped with three internal brass liner tubes, each six inches long and two inches in diameter, was used to collect and retain the soil sample at the desired sample depth. The sampler was advanced 18-inches into the undisturbed soils ahead of the auger by driving it with a 140-pound rig-operated hammer. After recovery from the borehole and the sampler, the soil was visually characterized and was also tested with a portable photo-ionization detector for the presence of volatile hydrocarbons. Upon completion of field characterization, the bottom sample liner was retained for chemical analysis. Both ends of the liner were covered with aluminum foil and plastic

caps, labeled with a unique sample number and pertinent sample information, placed in a plastic "zip-lock" bag, entered onto a chain-of-custody form, and packed in a suitable container chilled with ice. All soil cuttings from the drilling process were placed on visqueen and stored on-site.

Ground-Water Monitoring Well Construction

Upon completion of each exploratory borehole, it was converted to a ground-water monitoring well. Each monitoring well was constructed using four-inch diameter schedule-40 PVC blank and factory-slotted casing with 0.020 inch slots and flush-threaded couplings. No solvents or cements were used during well construction. The screened interval of the monitoring well was determined in the field by the EES geologist based on the characteristics of the uppermost saturated zone which was the one being monitored.

After the casing was installed, clean No. 2/12 sand was poured through the auger, as the auger was being removed, to fill the annulus between the casing and the borehole wall. The sand was added to a depth of one to two feet above the top of the screened interval. A two-foot bentonite seal was placed on top of the sand and hydrated. The annulus was sealed to the surface with a neat cement grout seal. A steel protective cover, with a locking cap, was placed over the well head and into the cement grout to secure the well. The well was completed at grade with a traffic-rated vault box. Construction details of each monitoring well are contained in Appendix A.

Well Development And Ground-Water Sampling

After completion of construction, each well was developed to remove suspended fine-grained material and to improve the hydraulic communication with the surrounding formation. A minimum of 36 gallons (approximately five well volumes) of ground water was removed from each well.

Prior to ground-water sampling, the monitoring wells were checked for the presence of free-floating petroleum product with a clear acrylic bailer. Product was not observed in any of the monitoring wells. The wells were purged of approximately four well volumes of water. Ground-water samples were then collected using a clean teflon bailer. The water sample from each well was placed into two 40-milliliter vials with teflon septa caps, labeled with a unique sample number, entered onto a chain-of-custody form, and placed in a suitable container chilled with ice.

Site Survey

The elevations of the tops of the PVC well casings, the tops of the protective covers, and the tops of the vault boxes were surveyed by Ron Archer, Civil Engineer, Inc. of Pleasanton, California. The elevations were recorded to the nearest 0.01 foot relative to the City of Oakland datum. The reference benchmark is a cut square in the top of curb in the northeasterly corner of the intersection of MacArthur Boulevard and Piedmont Avenue adjacent to the site. The property boundaries and the locations of the monitoring wells on the property were also surveyed.

SUBSURFACE CONDITIONS

All of the boring locations were overlain by concrete or asphalt pavement. The soils underlying the areas of investigation consist of interbedded clayey sand, sand, and silty clay. At well MW-1, clayey sand, alternating with sand, was encountered throughout the depth explored (31.5 feet). Two thin clay units were recognized in this boring; a sandy clay layer from approximately 15.5 to 16.0 feet and a silty clay from approximately 21 to 23 feet.

At well MW-2, clayey sand was encountered between 1 and 11.5 feet. The boring then progressed through a sandy to silty clay between 11.5 and approximately 14 feet. This was underlain by a poorly graded fine sand to a

depth of 20 feet. A silty clay unit was then encountered which persisted through the total depth explored (30 feet).

Well MW-3 initially penetrated a pea gravel backfill. Native material was encountered at approximately nine feet. The native soils consisted predominantly of clayey sand to the final depth explored with a 5-foot well-graded sand unit encountered at approximately 11.5 feet and silty clay units penetrated between 16.5 and 18.5 feet, 21 and approximately 23 feet, and 25.5 to 27.5 feet.

Ground water was encountered in all three monitoring wells at an approximate depth of 15 feet. No piezometric rise was observed, so it is surmised that the aquifer beneath the property is unconfined. Ground-water level measurements in the wells were recorded on July 14, 1988 and this data was utilized to construct a ground-water elevation contour map, Figure 3. The ground-water flow direction appears to be toward the northwest at a calculated gradient of 0.0073 feet per foot.

SAMPLE ANALYSES

Tables 1 and 2 summarize analytical results. Soil and ground-water samples collected at the site were analyzed at Superior Analytical Laboratory, Inc. in San Francisco, California. All samples analyzed were tested for the presence of total petroleum hydrocarbons as gasoline (TPHG) as well as benzene, toluene, total xylenes, and ethylbenzene (BTXE). In addition, two soil samples from the tank complex area were analyzed for total lead.

Nine soil samples were analyzed for TPHG and eight were reported to be below the detection limit (BDL). The sample collected at a depth of ten feet in well MW-3 contained a concentration of 278 ppm of TPHG. Benzene concentrations in the soil samples were all BDL. Toluene was detected at concentrations ranging from 0.009 ppm (MW-2 at 10 feet) to 0.388 ppm (MW-3 at 10 feet). Xylenes were BDL except from the sample collected at 15 feet from well MW-1

and 10 feet from well MW-3. These two samples contained xylene concentrations of 0.005 and 0.411 ppm, respectively. Ethylbenzene was BDL in all samples, except at 20 feet in well MW-3 where a concentration of 0.008 ppm was detected. Total lead was detected at concentrations of 11 ppm (MW-3 at 10 feet) and 8.3 ppm (MW-3 at 15 feet).

Three ground-water samples were analyzed for TPHG and BTXE. These compounds were found to be BDL in the water samples from MW-1 and MW-3. Benzene was reported at a concentration of 7.9 parts-per-billion (ppb) in well MW-2. This value is above the current state action level of 0.7 ppb in drinking water. The compounds toluene, ethylbenzene, and total xylenes were detected in the water sample from well MW-2 at concentrations of 2.6 ppb, 1.1 ppb, and 4.0 ppb, respectively. These concentrations are below the current state action levels which are listed in Table 2.

CONCLUSIONS

The soils encountered beneath the property consisted of clayey sand, sand, and silty clay. Ground water was encountered at an approximate depth of 15 feet below the pavement surface. No piezometric rise was observed, so it is surmised that this shallow aquifer beneath the property is unconfined. Analytical data indicates that TPHG concentrations are detectable in the soil at well MW-3 at a depth of 10 feet. TPHG is not detectable in the ground water, however, benzene was found at a concentration of 7.9 ppb in well MW-2 which is in excess of the current state action level in drinking water.

REPORTING REQUIREMENTS

A copy of this report should be forwarded by the client to the following agencies in a timely manner:

Alameda County Flood Control and
Water Conservation District
5997 Parkside Drive
Pleasanton, California 94566
Attn: Mr. Craig Mayfield

Regional Water Quality Control Board
San Francisco Bay Region
1111 Jackson Street
Oakland, California 94607
Attn: Mr. Peter Johnson

Alameda County Health Department
Department of Environmental Health
80 Swan Way, Room 200
Oakland, California 94621
Attn: Mr. Storm Goranson

LIMITATIONS

Ensco Environmental Services, Inc. makes no warranty, expressed or implied, except that our services have been performed in accordance with generally accepted, existing engineering, geological, hydrogeological, health and safety principles and applicable regulations at the time and location of the study.

The chemical analytical data included in this report have been obtained from a state-certified laboratory. The analytical methods employed by the laboratory were in accordance with procedures suggested by the U.S. EPA and the State of California. EES is not responsible for laboratory errors in procedure or result reporting.

LEGEND:

SITE LOCATION

0 1

SCALE IN MILES

BASE: USGS 7.5 MINUTE TOPOGRAPHIC SHEET

ensco environmental services, Inc.

SITE LOCATION MAP

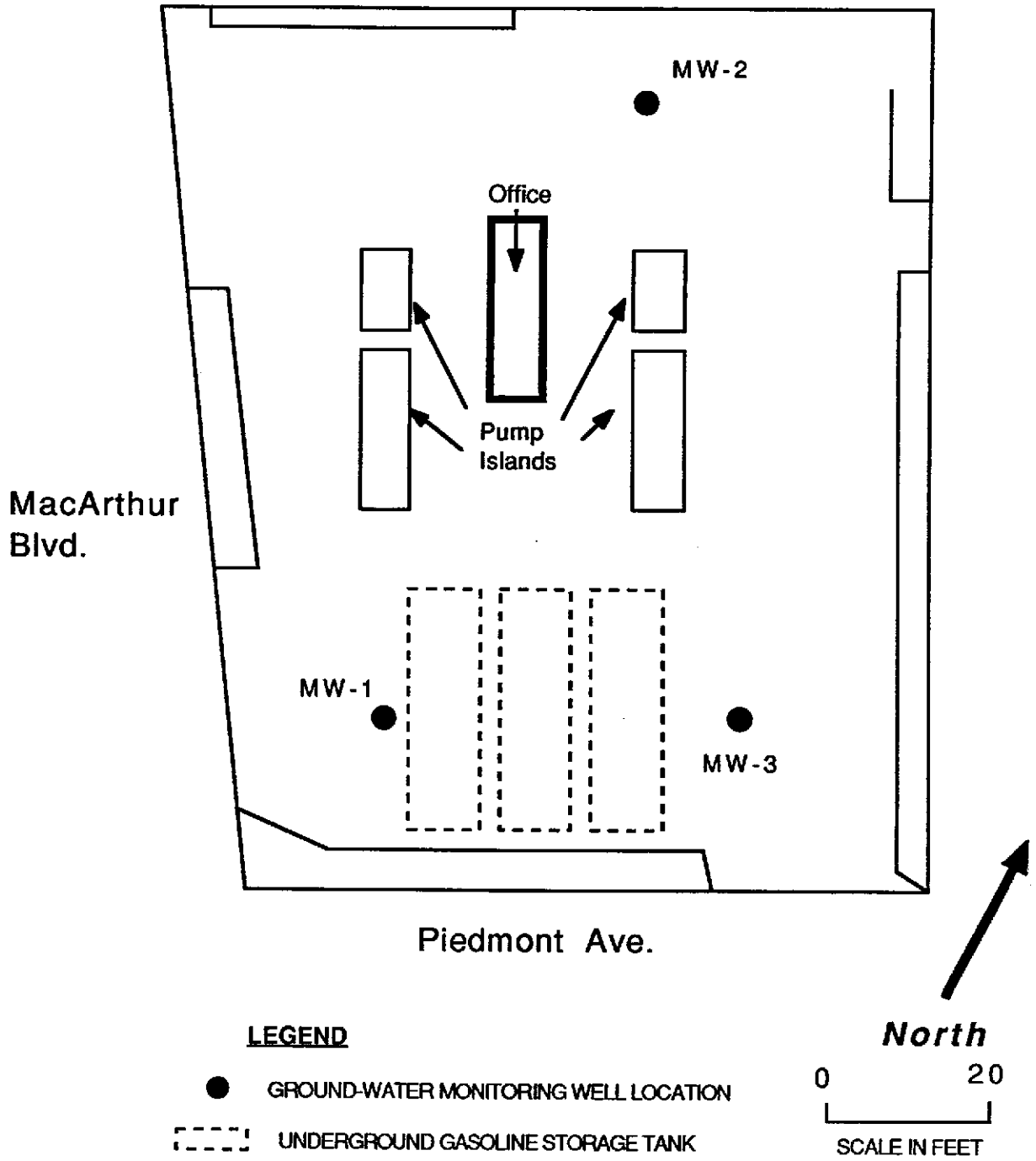
SHELL SERVICE STATION

230 MacARTHUR BOULEVARD

OAKLAND, CALIFORNIA

REVIEWED BY:	APPROVED BY:
JOB #: 1847G	DRAWN BY: SLS
DATE: 9-16-88	DRAWING #: FIG: 1

A-1847G-1



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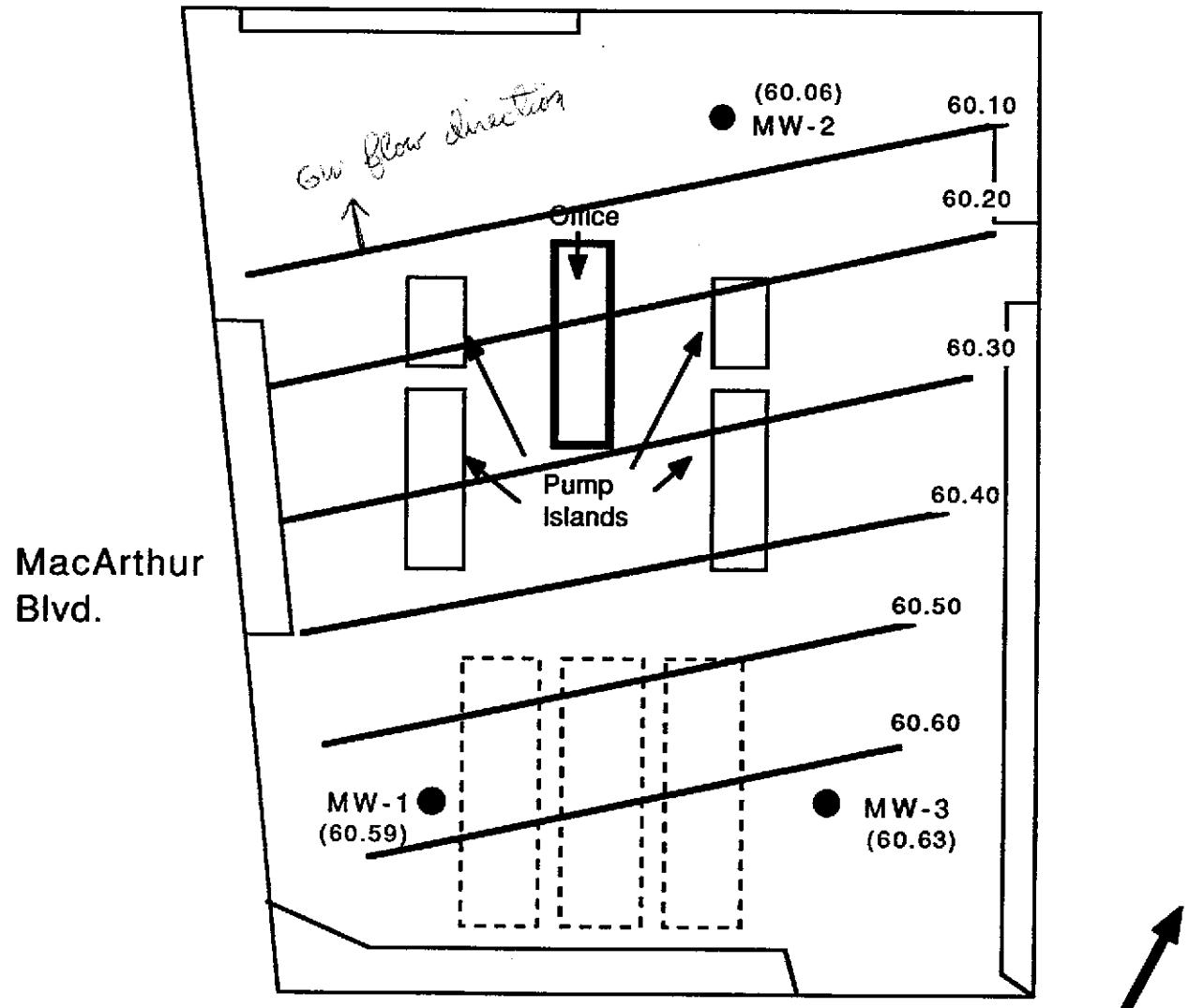
SITE PLAN

Shell Service Station	Job no. 1847 G
230 MacArthur Boulevard, Oakland, CA	Figure 2



LEGEND

- ● GROUND-WATER MONITORING WELL
- (60.59) GROUND-WATER ELEVATION IN WELL (FEET ABOVE M.S.L.)
- 60.60 GROUND-WATER ELEVATION CONTOUR (FEET ABOVE M.S.L.)
- UNDERGROUND GASOLINE STORAGE TANK

0 20

SCALE IN FEET

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GROUND-WATER CONTOUR MAP

Shell Service Station

Job no. 1847 G

230 MacArthur Blvd, Oakland, CA

Figure 3

TABLE 1
SOIL ANALYSES DATA

1847; Shell Oil
230 MacArthur Blvd., Oakland

SAMPLE NUMBER	TPHG (ppm)	BENZENE ~~(ppm)~~	TOLUENE ~~(ppm)~~	XYLENES ~~(ppm)~~	ETHYLBENZENE ~~(ppm)~~	Total Lead (ppm)
MW1-2	BDL	BDL	11.6 (ppb)	BDL	BDL	NA
MW1-3	BDL	BDL	12.9	5.1	BDL	8.3
MW1-4	BDL	BDL	23.	BDL	BDL	NA
MW2-1	BDL	BDL	16.1	BDL	BDL	NA
MW2-2	BDL	BDL	9.3	BDL	BDL	NA
MW2-3	BDL	BDL	10.	BDL	BDL	NA
MW3-1	BDL	BDL	388.	411.	BDL	11
MW3-2	278	BDL	36.7	BDL	BDL	NA
MW3-3	BDL	BDL	30.4	BDL	7.6	NA

TPHG = Total Petroleum Hydrocarbons as Gasoline
ppm = parts-per-million
BDL = Below Detection Limit
NA = Not Analyzed

Note: For detection limits, refer to laboratory reports

TABLE 2
WATER ANALYSES DATA

Shell Oil; 1847
230 MacArthur Blvd., Oakland

WELL NUMBER	TPHG (ppb)	BENZENE (ppb)	TOLUENE (ppb)	XYLENES (ppb)	ETHYLBENZENE (ppb)
MW-1	BDL	BDL	BDL	BDL	BDL
MW-2	BDL	7.9	2.6	4.0	1.1
MW-3	BDL	BDL	BDL	BDL	BDL

TPHG = Total Petroleum Hydrocarbons as Gasoline
ppb = parts-per-billion
BDL = Below Detection Limit

Note: For reporting limits, refer to laboratory reports

Current Department of Health Services Action Levels
Benzene 0.7 ppb
Toluene 100 ppb
Xylenes 620 ppb
Ethylbenzene 680 ppb
Note: Subject to change as reviewed by Department of Health Services

APPENDIX A

BORING LOGS

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STANDARD SYMBOLS

Legend

No Soil Recovery

Soil Sample Location

first Encountered Ground Water Level

Piezometric Ground Water Level

Disturbed or Bag Soil Sample

2.5YR 6/2 Soil Color according to Munsell Soil Color Charts. (1975 Edition)

Penetration Sample drive hammer weight - 140 pounds falling 30 inches. Blows required to drive sampler 1 foot are indicated on the logs.

Monitoring Well

Soil Boring

Recovery Well

Angle Boring

UNIFIED SOIL CLASSIFICATION SYSTEM

Compiled by B. W. Pipkin, Univ. of Southern Calif.

MAJOR DIVISIONS			GROUP SYMBOLS	TYPICAL NAMES
COARSE-GRAINED SOILS More than half of material is larger than no. 200 sieve size	GRAVELS More than half of coarse fraction is larger than no. 4 sieve size	Clean Gravels	GW	Well-grained gravels, gravel-sand mixtures, little or no fines
			GP	Poorly graded gravels, gravel-sand mixture, little or no fines
		Gravels with Fines	GM	Silty gravels, gravel-sand-silt mixtures
			GC	Clayey gravels, gravel-sandy-clay mixtures
	SANDS More than half of coarse fraction is smaller than no. 4 sieve size	Clean Sands	SW	Well-graded sands, gravelly sand, little or no fines
			SP	Poorly graded, sands, gravelly sands, little or no fines
		Sands with Fines	SM	Silty sands, sand-silt mixtures
			SC	Clayey sands, sand-clay mixtures
FINE-GRAINED SOILS More than half of material is smaller than no. 200 sieve size	SILTS AND CLAYS	Low Liquid Limit	ML	Inorganic silts and very fine sands, rock flour, silty clayey fine sands, or clayey silts, with slight plasticity
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
			OL	Organic silts and organic silty clays of low plasticity
		High Liquid Limit	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
			CH	Inorganic clays of high plasticity, fat clays
			OH	Organic clays of medium to high plasticity, organic silts
Highly Organic Soils			Pt	Peat and other highly organic silts

NOTES:

1. Boundary Classification: Soils possessing characteristics of two groups are designated by combinations of group symbols. For example, GW-GC, well-graded gravel-sand mixture with clay binder.
2. All sieve sizes on this chart are U.S. Standard.
3. The terms "silt" and "clay" are used respectively to distinguish materials exhibiting lower plasticity from those with higher plasticity. The minus no. 200 sieve material is silt if the liquid limit and plasticity index plot below the "A" line on the plasticity chart (next page), and is clay if the liquid limit and plasticity index plot above the "A" line on the chart.
4. For a complete description of the Unified Soil Classification System, see "Technical Memorandum No. 3-357," prepared for Office, Chief of Engineers, by Waterways Equipment Station, Vicksburg Mississippi, March 1953. (See also Data Sheet 17.)

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PROJECT NAME: SHELL Service Station
230 MacArthur Blvd.
Oakland, California

BORING No.: MW-1
DATE DRILLED: 7-11-88
PROJECT No.: 1847 G
LOGGED BY: SC

EXPLORATORY BORING LOG

DEPTH (ft.)	SAMPLE No	BLOWS/FOOT 140 ft/lbs.	UNIFIED SOIL CLASSIFICATION	SOIL DESCRIPTION	WATER LEVEL	OVA READING ppm
				8" concrete over 6" pea gravel		
1-5			SP	CLAYEY SAND, greenish gray, predominantly fine sand 20% fine gravel, damp		
5-6			SP	SAND, greenish gray, predominantly fine to medium sand, 5-10% coarse sand, 10-15% fine gravel, <5% fines, very dense, damp		
6	1-1	72	SP	SAND, olive brown, fine to medium grained trace silt, very dense, damp		0
7-9			SP			
9-10			SC	CLAYEY SAND, orangish brown, fine to medium grained organic staining, 4" lens of fine to medium sand (poorly sorted, greenish gray), dense, damp		
11	1-2	30	SC			1
12-14			SC			
14-15			SW			
15			SW	SAND, bluish gray, fine to coarse grained <5% fines, color to brown at 15.5 feet, wet, dense	▽	
16	1-3	37	CL	SANDY CLAY, yellowish brown, 30% fine sand, very moist		2
16-18			SC	CLAYEY SAND, tannish brown, predominantly fine sand, trace medium sand, 15-20% fines, rare rootholes, moist, dense		
18-19			SP	SAND, brown, predominantly fine sand, becomes silty at 20.5', dense, very moist to wet		
19-20						

REVIEWED BY R.G./C.E.G.

ensco environmental services, inc.

PROJECT NAME: SHELL Service Station
230 MacArthur Blvd.
Oakland, California

BORING No.: MW-1
DATE DRILLED: 7-11-88
PROJECT No.: 1847 G
LOGGED BY: SC

EXPLORATORY BORING LOG

DEPTH (ft.)	SAMPLE No	BLOWS/FOOT 140 ft/lbs.	UNIFIED SOIL CLASSIFICATION	SOIL DESCRIPTION	WATER LEVEL	OVA READING ppm	
20			SP	SAND cont.			
21	1-4	30	CL	SILTY CLAY, brown, 5-10% fine sand locally to 20% disseminated, hard, very moist		0	
22							
23							
24			SP-SC	SAND, light olive, fine to medium grained <10% clay fines, rare oxidation stains, dense, very moist to wet			
25							
26	1-5	48	SC	CLAYEY SAND, light olive, predominantly fine to medium sand, 40% clay, rare organics, dense, very moist to wet		1	
27							
28							
29							
30			SP-SC	SAND, light olive, predominantly fine to medium grained, 15% coarse sand, <10% clay fines, dense, saturated			
31	1-6	36					
32				BOTTOM OF BORING 31.5'			
33							
34							
35							
36							
37							
38							
39							
40							

REVIEWED BY R.G./C.E.G.

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PROJECT NAME: SHELL Service Station
230 MacArthur Blvd.
Oakland, California

BORING No.: MW-2
DATE DRILLED: 7-11-88
PROJECT No.: 1847 G
LOGGED BY: SC

EXPLORATORY BORING LOG

DEPTH (ft.)	SAMPLE No	BLOWS/FOOT 140 ft/lbs.	UNIFIED SOIL CLASSIFICATION	SOIL DESCRIPTION	WATER LEVEL	OVA READING ppm
0				4" Asphalt pavement over 9" baserock		
1–5			SC	CLAYEY SAND, orangish brown, fine to medium sand, 20% fines, damp		
4–6	2-1	44	SC	-as above; color to dark olive gray, locally 40% fine to coarse gravel composed of angular chert fragments, rare coarse sand, dense, damp		2
9–11	2-2	34	SC	-as above, color to yellowish brown with minor olive gray staining, ~40% fines, trace organic black staining, rare rootholes, dense, damp		1
12–15			CL	SANDY TO SILTY CLAY, olive beige with slight orange staining, 10 to 20% fine sand, orange staining low plasticity, hard, damp	▽	
15–16	2-3	34	SP-SM	SAND, brown, predominantly fine sand, 5 to 10% silt, trace organic staining, dense, wet, fine to medium sand		0.5

REVIEWED BY R.G./C.E.G.

ensco environmental services, inc.

PROJECT NAME: SHELL Service Station
230 MacArthur Blvd.
Oakland, California

BORING No.: MW-2
DATE DRILLED: 7-11-88
PROJECT No.: 1847 G
LOGGED BY: SC

EXPLORATORY BORING LOG

DEPTH (ft.)	SAMPLE No	BLOWS/FOOT 140 ft/lbs.	UNIFIED SOIL CLASSIFICATION	SOIL DESCRIPTION	WATER LEVEL	OVA READING ppm	
20							
21	2-4	28	CL	SILTY CLAY, tannish brown, trace of organic staining, 10% very fine sand, low plasticity, very stiff, wet, color changes to tan in shoe		0	
22							
23							
24							
25							
26	2-5	64		SILTY CLAY, light olive gray and orangish brown, organic staining common, low to moderate plasticity, hard, moist, (4" lens of sandy silt with clay, damp to moist)		0	
27							
28							
29							
30	2-6	26		-- as above: becomes sandy and orangish brown, 30% fine sand, abundant silt, very stiff		0	
				BOTTOM OF BORING 30.0'			
31							
32							
33							
34							
35							
36							
37							
38							
39							
40							

REVIEWED BY R.G./C.E.G.

ensco
environmental
services, inc.

PROJECT NAME: SHELL Service Station
230 MacArthur Blvd.
Oakland, California

BORING No.: MW-3
DATE DRILLED: 7-12-88
PROJECT No.: 1847 G
LOGGED BY: SC

EXPLORATORY BORING LOG

DEPTH (ft.)	SAMPLE No	BLOWS/FOOT 140 ft/lbs.	UNIFIED SOIL CLASSIFICATION	SOIL DESCRIPTION	WATER LEVEL	OVA READING ppm
				8" concrete		
1–9				FILL, pea gravel		0
10–11	3-1	12	SC	CLAYEY SAND, olive grey mottled with orangish brown, 50 to 60% fine sand, trace medium to coarse sand, slight petroleum odor, medium dense, damp		120
12–14			SW	SAND, orangish brown, fine to coarse grained with fine angular chert gravels, medium dense, damp		
15–16	3-2	13		SAND, greenish gray, well graded, fine to coarse grained 10 to 15% fine gravels (angular to subangular white, yellow, and red cherts, graywacke), very faint petroleum odor, medium dense, saturated	▽	2
17–18			CL	SILTY CLAY, tannish brown, trace organic staining, 10% fine sand, rare root holes, low plasticity, stiff, moist		
19–20			SC			

REVIEWED BY R.G./C.E.G.

ensco environmental services, inc.

PROJECT NAME: SHELL Service Station
230 MacArthur Blvd.
Oakland, CA

BORING No.: MW-3
DATE DRILLED: 7-12-88
PROJECT No.: 1847 G
LOGGED BY: SC

EXPLORATORY BORING LOG

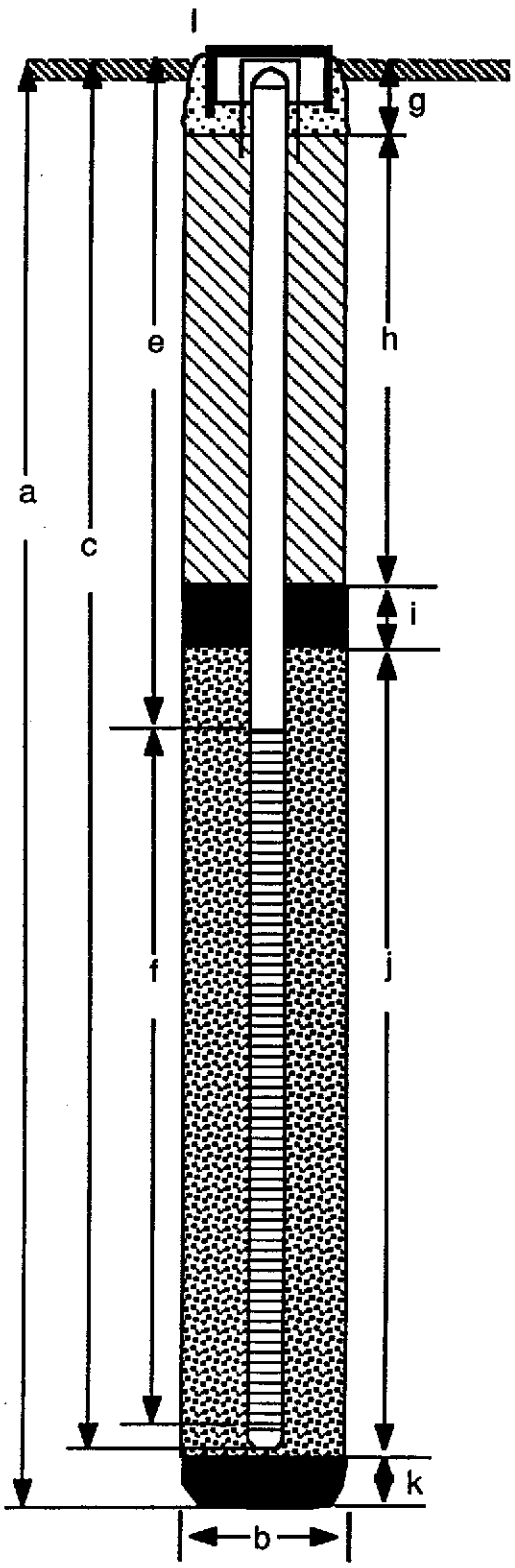
DEPTH (ft.)	SAMPLE No	BLOWS/FOOT 140 ft/lbs.	UNIFIED SOIL CLASSIFICATION	SOIL DESCRIPTION	WATER LEVEL	OVA READING ppm
20–21	3-3	31	SC	CLAYEY SAND, brown, 70% fine sand, medium dense, moist to wet		0
21–25			CL	SILTY CLAY, tannish brown, 10% fine sand, trace organic staining, no rootholes, low plasticity, very stiff, wet		
25–26			SC	CLAYEY SAND, olive with minor orange staining, 60% fine sand, 10% medium to coarse sand, shell fragment, very dense, moist to wet		
26–28	3-4	72	CL	SANDY CLAY to SILTY CLAY, olive, 25% fine sand (locally sand <10%), low plasticity, hard, moist		0
28–30	3-5	44	SP	CLAYEY SAND, olive with minor orange oxide staining, 60 to 70% fine sand, locally clay to 50%, (becomes very sandy at 30', olive to bluish gray), dense, moist		
30				BOTTOM OF BORING 30'		0
31–40						

REVIEWED BY R.G./C.E.G.

Monitoring Well Detail

PROJECT NUMBER 1847 G Shell Oil Co.
PROJECT NAME 230 MacArthur Blvd.
COUNTY Oakland, Alameda Co.
WELL PERMIT NO. 88305

BORING / WELL NO. MW-1
TOP OF CASING ELEV. 73.89'
GROUND SURFACE ELEV. 74.34'
DATUM 72.96' City of Oakland



EXPLORATORY BORING

a. Total Depth 31.5 ft.
b. Diameter 10 in.
Drilling method Hollowstem Auger

WELL CONSTRUCTION

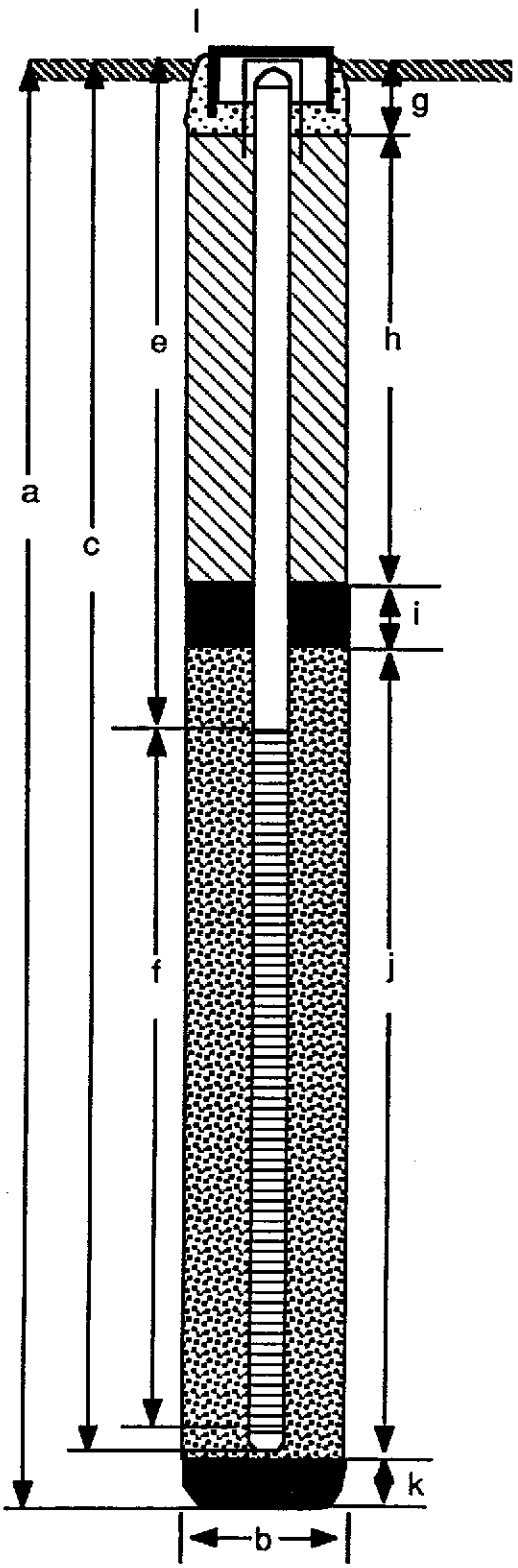
c. Casing length 30 ft.
Material Schedule 40 PVC
d. Diameter 4 in.
e. Depth to top perforations 10 ft.
f. Perforated length 20 ft.
Perforated interval from 30 to 10 ft.
Perforation type machine slot
Perforation size 0.020 in.
g. Surface seal 1 ft.
Seal Material Concrete
h. Backfill 5 ft.
Backfill material Cement Grout
i. Seal 2 ft.
Seal Material Bentonite Pellets
j. Gravel pack 22 ft.
Pack material #2/12 Aqua Sand
k. Bottom seal -- ft.
Seal material NA
l. F-8 vault box, locking cover and lock

ensco
environmental
services, inc.

Monitoring Well Detail

PROJECT NUMBER 1847 G Shell Oil Co.
PROJECT NAME 230 MacArthur Blvd.
COUNTY Oakland, Alameda Co.
WELL PERMIT NO. 88305

BORING / WELL NO. MW-2
TOP OF CASING ELEV. 75.24'
GROUND SURFACE ELEV. 75.96'
DATUM 72.96' City of Oakland



EXPLORATORY BORING

a. Total Depth 30 ft.
b. Diameter 10 in.
Drilling method Hollowstem Auger

WELL CONSTRUCTION

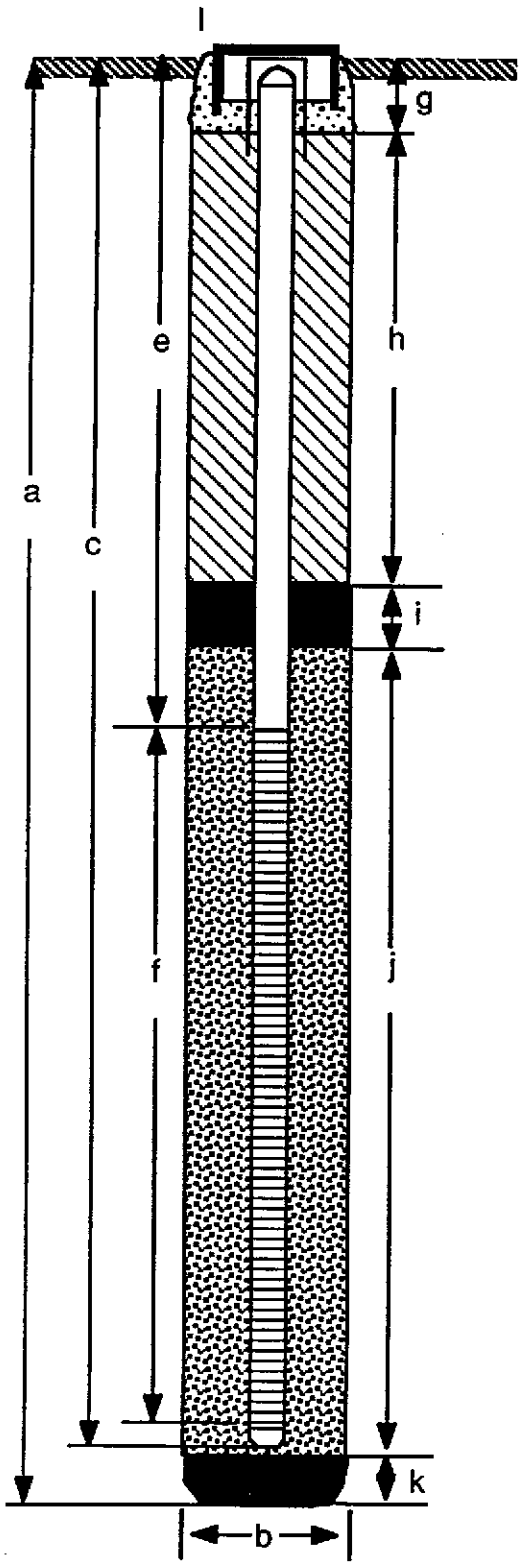
c. Casing length 28 ft.
Material Schedule 40 PVC
d. Diameter 4 in.
e. Depth to top perforations 10 ft.
f. Perforated length 18 ft.
Perforated interval from 28 to 10 ft.
Perforation type machine slot
Perforation size 0.020 in.
g. Surface seal 1 ft.
Seal Material Concrete
h. Backfill 5 ft.
Backfill material Cement Grout
i. Seal 2 ft.
Seal Material Bentonite Pellets
j. Gravel pack 20 ft.
Pack material #2/12 Aqua Sand
k. Bottom seal -- ft.
Seal material NA
l. F-8 vault box, locking cover and lock

ensco
environmental
services, inc.

Monitoring Well Detail

PROJECT NUMBER 1847 G Shell Oil Co.
PROJECT NAME 230 MacArthur Blvd
COUNTY Oakland, Alameda Co.
WELL PERMIT NO. 88305

BORING / WELL NO. MW-3
TOP OF CASING ELEV. 74.68'
GROUND SURFACE ELEV. 75.05'
DATUM 72.96' City of Oakland



EXPLORATORY BORING

a. Total Depth 30 ft.
b. Diameter 10 in.
Drilling method Hollowstem Auger

WELL CONSTRUCTION

c. Casing length 28.5 ft.
Material Schedule 40 PVC
d. Diameter 4 in.
e. Depth to top perforations 11.5 ft.
f. Perforated length 17 ft.
Perforated interval from 28.5 to 11.5 ft.
Perforation type machine slot
Perforation size 0.020 in.
g. Surface seal 1 ft.
Seal Material Concrete
h. Backfill 7.5 ft.
Backfill material Cement Grout
i. Seal 1.5 ft.
Seal Material Bentonite Pellets
j. Gravel pack 18.5 ft.
Pack material #2/12 Aqua Sand
k. Bottom seal -- ft.
Seal material NA
l. F-8 vault box, locking cover and lock

ensco
environmental
services, inc.

APPENDIX B

LABORATORY ANALYTICAL REPORT

SUPERIOR ANALYTICAL LABORATORY, INC.
1385 FAIRFAX ST., STE D • SAN FRANCISCO, CA 94124 • PHONE (415) 647-2081

CERTIFICATE OF ANALYSIS

LABORATORY NO. 50249
CLIENT: Ensco Environmental
CLIENT ID: Shell Oil

DATE RECEIVED: 7/15/88
DATE REPORTED: 7/20/88
JOB NO.: 1847G

ANALYSIS FOR TOTAL PETROLEUM HYDROCARBONS
by Modified EPA SW-846 Method 8015

SAMPLE LOCATION: 230 MacArthur Boulevard, Oakland

Sample Identification	Concentration (ug/L)
MW-1 7/14 Shell Oil	ND<500
MW-2 7/14	ND<500
MW-3 7/14	ND<500

ug/L = part per billion (ppb)

Les Partridge, Ph.D.
Laboratory Manager

OUTSTANDING QUALITY AND SERVICE

SUPERIOR ANALYTICAL LABORATORY, INC.
1385 FAIRFAX ST., STE D • SAN FRANCISCO, CA 94124 • PHONE (415) 647-2081

CERTIFICATE OF ANALYSIS

LABORATORY NO. 50249
CLIENT: Ensco Environmental
JOB NO.: 1847G

DATE SAMPLED: 7/14/88
DATE RECEIVED: 7/15/88
DATE REPORTED: 7/20/88

ANALYSIS FOR BENZENE, TOLUENE, ETHYL BENZENE & XYLENES
by EPA SW-846 Methods 5030 and 8020

SAMPLE LOCATION: 230 MacArthur Boulevard, Oakland

Concentration (ug/L)

Sample Identification	Benzene	Toluene	Ethyl Benzene	Xylenes
MW-1 7/14 Shell Oil	ND<0.3	ND<0.3	ND<0.3	ND<0.3
MW-2 7/14	7.9	2.6	1.1	4.0
MW-3 7/14	ND<0.3	ND<0.3	ND<0.3	ND<0.3

QA/QC Summary: Average surrogate compound recovery: 86.5%

ug/L = part per billion (ppb)

Les Partridge, Ph.D.
Les Partridge
Laboratory Manager

OUTSTANDING QUALITY AND SERVICE

SUPERIOR ANALYTICAL LABORATORY, INC.
1385 FAIRFAX ST., STE D • SAN FRANCISCO, CA 94124 • PHONE (415) 647-2081

CERTIFICATE OF ANALYSIS

LABORATORY NO. 50236
CLIENT: Ensco
CLIENT ID: Shell Oil

DATE RECEIVED: 7/13/88
DATE REPORTED: 7/21/88
JOB NO.: 1847G

ANALYSIS FOR TOTAL PETROLEUM HYDROCARBONS
by Modified EPA SW-846 Method 8015

SAMPLE LOCATION: 230 MacArthur Boulevard, Oakland

Sample Identification	Concentration (mg/kg)
MW1-2 7/11 10'	ND < 10
MW1-3 7/11 15'	ND < 10
MW1-4 7/11 20'	ND < 10
MW2-1 7/11 5'	ND < 10
MW2-2 7/11 10'	ND < 10
MW2-3 7/11 15'	ND < 10
MW3-1 7/12 10'	278 Weathered Gasoline
MW3-2 7/12 15'	ND < 10
MW3-3 7/12 20'	ND < 10

mg/kg = part per million (ppm)

Les Partridge, Ph.D.
Les Partridge
Laboratory Manager

OUTSTANDING QUALITY AND SERVICE

SUPERIOR ANALYTICAL LABORATORY, INC.
1385 FAIRFAX ST., STE D • SAN FRANCISCO, CA 94124 • PHONE (415) 647-2081

CERTIFICATE OF ANALYSIS

LABORATORY NO. 50236
CLIENT: Ensco
JOB NO.: Shell Oil

DATE SAMPLED: 7/11/88
DATE RECEIVED: 7/13/88
DATE REPORTED: 7/21/88

ANALYSIS FOR BENZENE, TOLUENE, ETHYL BENZENE & XYLENES
by EPA SW-846 Methods 5030 and 8020

SAMPLE LOCATION: 230 MacArthur Boulevard, Oakland

Concentration (ug/kg)

Sample Identification	Benzene	Toluene	Ethyl Benzene	Xylenes
MW1-2 7/11 10'	ND< 3	11.6	ND< 3	ND< 3
MW1-3 7/11 15'	ND< 3	12.9	ND< 3	5.1
MW1-4 7/11 20'	ND< 3	23.	ND< 3	ND< 3
MW2-1 7/11 5'	ND< 3	16.1	ND< 3	ND< 3
MW2-2 7/11 10'	ND< 3	9.3	ND< 3	ND< 3
MW2-3 7/11 15'	ND< 3	10.	ND< 3	ND< 3
MW3-1 7/12 10'	ND<50	388.	ND<50	411.
MW3-2 7/12 15'	ND< 3	36.7	ND< 3	ND< 3
MW3-3 7/12 20'	ND< 3	30.4	7.6	ND< 3

ug/kg = part per billion (ppb)

QA/QC Summary: Average surrogate compound recovery: 86%

Les Partridge, Ph.D.

Les Partridge

Laboratory Manager

OUTSTANDING QUALITY AND SERVICE

SUPERIOR ANALYTICAL LABORATORY, INC.
1385 FAIRFAX ST., STE D • SAN FRANCISCO, CA 94124 • PHONE (415) 647-2081

C E R T I F I C A T E O F A N A L Y S I S

LABORATORY NO. 50236
CLIENT: Ensco
CLIENT ID: Shell Oil, Oakland

DATE RECEIVED: 7/13/88
DATE REPORTED: 7/27/88
JOB NO.: 1847G

ANALYSIS FOR LEAD
by EPA SW-846 Method 7240

SAMPLE LOCATION: 230 MacArthur Boulevard, Oakland

Sample Identification	Concentration (mg/kg)
MW3-1 7/12 10'	11
MW3-2 7/12 15'	8.3

mg/kg = part per million (ppm)

Les Partridge, Ph.D.
Les Partridge
Laboratory Manager

OUTSTANDING QUALITY AND SERVICE