**Corporate Offices** 41674 Christy Street, Fremont, CA 94538-3114 (415) 659-0404 Fax: (415) 651-4677 Contr. Lic. No. 550205

ensco environmental services, inc.
a subsidiary of environmental system company

October 9, 1989

Shell Oil Company
1390 Willow Pass Road
Suite 900
Concord, CA 94520

Attention: Ms. Diane Lundquist

Subject: September Quarterly Report
Groundwater Sampling and Analyses and Supplemental Soil Investigation
Shell Gas Station, 230 MacArthur Boulevard, Oakland, California
EES Project No. 1847-2G

Dear Ms. Lundquist:

This report presents the results of groundwater sampling and analyses performed at the subject site since July 1989. It includes all current and past analytical data acquired during this continuing investigation. In addition, Ensco Environmental Services, Inc. completed a supplemental soil investigation on August 16, 1989 at the site, and the results are presented in the attached report along with a description of methodology.

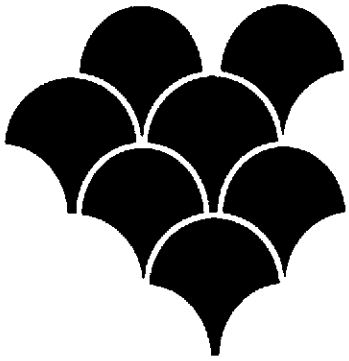
If you have any questions, please call.

Sincerely,
Ensco Environmental Services, Inc.

Kay Pannell
Staff Geologist

Neil H. Zickefoose, C.E.G. 398
Senior Program Geologist

KP/NHZ/sr
Enclosure



ensco
environmental
services, inc.

# SEPTEMBER QUARTERLY REPORT
# GROUNDWATER SAMPLING
# AND ANALYSES
# AND SUPPLEMENTAL
# SOIL INVESTIGATION

FOR

SHELL SERVICE STATION
230 MacARTHUR BOULEVARD
OAKLAND, CALIFORNIA

Project No. 1847-2G
October 1989

# CONTENTS

# SEPTEMBER QUARTERLY REPORT
# GROUNDWATER SAMPLING AND ANALYSES
# AND
# SUPPLEMENTAL SOIL INVESTIGATION

## FOR

## SHELL SERVICE STATION
## 230 MacARTHUR BOULEVARD
## OAKLAND, CALIFORNIA

This report presents the results of a Phase II supplemental soil investigation and groundwater monitoring by Ensco Environmental Services, Inc. (EES) at the Shell Gas Station located at 230 MacArthur Boulevard in the City of Oakland, Alameda County, California (see Figure 1). Groundwater sampling has been performed monthly from October 1988 to March 1989 with quarterly sampling performed thereafter. This report presents the data for the period of July through September 1989. The program objectives of the groundwater monitoring are listed below.

- Plot the groundwater contour surface and apparent flow direction.
- Investigate for the presence of a petroleum hydrocarbon plume and determine its concentrations.
- Compare current and past data.

The existence and degree of hydrocarbon contamination is determined by (1) checking free-floating product thickness and (2) performing laboratory analyses on groundwater samples to determine concentrations of total petroleum hydrocarbons as gasoline (TPHG), with benzene, toluene, ethyl benzene, and total xylenes (BTEX).

The objective of the Phase II supplemental soil exploration was to investigate possible contamination in the soils adjacent to the existing pump islands.

## BACKGROUND

The station currently utilizes two dispensing islands and three underground gasoline storage tanks (replaced in November 1987). The background information that follows was compiled from information provided to EES by Shell.

EMCON Associates performed an investigation at the property on April 14, 1986, which involved the drilling of four exploratory borings within the tank complex area. These borings were advanced to final depths of 20.5 feet. Groundwater was initially encountered at an approximate depth of 13 feet in each boring. EMCON reported that the soils underlying the tank complex consisted of fine- to medium-grained 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. Laboratory results indicated that TPH 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, performed by W.W. Irvin, Inc. on December 2 and 3, 1986, consisted of analyzing soil gas vapors from 38 probe holes located within the tank complex and throughout the rest of the site. The assessment indicated that concentrations of hydrocarbons existed in the soil gas primarily in 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 vapor recovery wells within the tank complex to vent the soil. Each well was installed to a depth of 13 feet and was constructed of solid and machine-slotted, 4-inch-diameter polyvinyl chloride (PVC) pipe. The slotted intervals (slot size 0.02-inch) extended from 3 feet below ground surface to the bottom of the borings. A soil venting system, using an activated carbon scrubber, was operated on the site between April and November 1987. Gas vapors were analyzed using a Foxboro 128 organic vapor analyzer (OVA) system with a portable chart recorder. Wayne Perry Construction concluded that the well gas contained light hydrocarbon compounds and that prolonged venting reduced their 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 to analyze 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 TPH (1,870 ppm) occurred at a depth of 8 feet.

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

In June of 1988, Shell contracted EES to perform a supplemental site assessment to delineate further the subsurface hydrocarbon contamination at the subject property. The scope of work for this project included drilling three exploratory borings, collecting soil samples from the borings, converting each boring to a groundwater monitoring well, developing and sampling the wells, providing laboratory analyses of the samples, surveying the well heads, and preparing a technical report. The field work was performed in July 1988. In October 1988, EES initiated a monthly sampling program to monitor depth to water, flow direction, gradient, and quality of the groundwater beneath the site.

The soil and groundwater samples collected during the June 1988 supplemental investigation were analyzed for TPHG and BTEX. Laboratory analyses revealed that the soil samples collected at a depth of 10 feet from the boring for MW-3 in the area of the former underground fuel tanks contained TPHG at a concentration of 287 ppm. No TPHG or BTEX contamination was detected in any other soil sample submitted for analysis. This information was presented in an EES report issued in November 1988.

In March 1989 monthly groundwater sampling was discontinued, and quarterly sampling began. Monthly water level measurements are continuing. In April 1989, the representative from Alameda County Health Department expressed concerns over the 1986 soil gas survey results around the pump islands. EES then submitted a work

plan for soil borings to address these concerns and the exploratory soil borings were drilled on August 16, 1989.

## PHASE II SUPPLEMENTAL SOIL INVESTIGATION

EES drilled three exploratory borings, retaining soil samples for laboratory analysis. The work included measuring groundwater levels and characterizing the subsurface. Details of the subsurface conditions are contained in the boring logs, presented as Appendix A.

### Soil Sampling

An EES Mobile B-34 drilling rig, equipped with 8-inch outside diameter hollow stem auger, was used to drill the three exploratory borings required for soil sampling. The locations of these borings, designated as SB-1, SB-2, and SB-3, are shown on Figure 2. An EES geologist logged and classified the material in the boring according to the Unified Soil Classification System and Munsell Soil Colors Charts. Before and during drilling, 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 5-foot intervals beginning at a depth of 5 feet. A modified California split-spoon sampler, equipped with three internal brass liner tubes, each 6 inches long and 2 inches in diameter, was used to collect and retain the soil samples. The sampler was advanced 18 inches into the undisturbed soils ahead of the auger with a 140-pound, rig-operated hammer. After recovery from the borehole, one sample liner was retained for chemical analysis. Both ends of the liner retained for chemical analysis were covered with aluminum foil and a plastic cap. The liner was then labeled with a unique sample number and pertinent sample information, placed in a plastic bag, entered onto a chain-of-custody form, and packed in a chilled ice chest. The soil in the remaining liners was visually characterized and checked for the presence of hydrocarbon vapors using a photoionization meter (OVM). All soil cuttings generated during drilling were stored on-site on plastic sheeting. The borings were infilled with cement grout.

The soil borings, extending 15 to 16 feet below the surface level were used to determine shallow soil contamination. In the original workplan, the shallowest samples were to be analyzed separately, while the deeper samples were to be composited to one and analyzed. However, the photoionization meter indicated higher values of hydrocarbon vapors at depth (238 ppm for SB2-3), and the decision was made to analyze each sample separately.

Subsurface Exploration

The water levels in the three on-site groundwater monitoring wells were measured on July 20, 1989, and indicated a groundwater depth of between 14 to 16 feet. SB-1 and SB-2 were drilled through 4 to 6 inches of concrete; SB-3 was drilled through 4 inches of asphalt. One foot of baserock underlies the pavement sections, followed by a clayey gravel to a depth of 5 feet. Silty clay, clay, or clay with minor sand extends to approximately 15 feet, and is underlain by silty sand and gravel.

Analytical Methods

The soil samples were transported to a state-certified laboratory, Sequoia Analytical Laboratory in Redwood City, California, where each sample was tested for TPHG and BTEX using EPA-approved test methods. Laboratory reports are attached in Appendix B. The samples from each boring were composited to one sample and tested for organic lead and total lead. No organic lead was detected in any of the composited samples. The composite sample from SB-1 had a total lead concentration of 4.5 ppm; SB-2 and SB-3 had concentrations of 2.5 ppm and 5.5 ppm, respectively. The individual sample SB2-3, at depth 15.5 to 16 feet, had TPHG concentrations of 490 ppm; toluene, ethyl benzene, and xylenes concentrations were 0.28 ppm, 1.3 ppm, and 1.0 ppm, respectively. Benzene in SB2-3 was not detected. In sample SB3-1, at depth 4.5 to 5.0 feet, TPHG concentrations were 6.6 ppm; benzene was not detected; and toluene, ethyl benzene, and xylenes were 0.26 ppm, 0.14 ppm, and 0.63 ppm, respectively.

## GROUNDWATER MONITORING

Sampling of the monitoring wells was performed in accordance with the attached EES protocol (Appendix C). Before sampling, all wells were field-checked for the presence of floating product: none was found. All water purged from each well was placed in drums and properly labeled. The water was transferred by Crosby and Overton, a licensed hauler, to the Shell refinery for recycling.

### Groundwater Conditions

The results of the quarterly monitoring program are summarized on Table 1. No hydrocarbon contamination was detected in the groundwater samples collected from MW-1, MW-2, or MW-3 during the last quarter. The analytical results for this quarter indicate that benzene was found in MW-3 at a concentration of 0.00065 ppm. All other analyses showed non-detectable results. The laboratory analytical reports are attached in Appendix B.

EES prepared groundwater surface contour maps based on the data collected from the on-site groundwater monitoring wells. These maps are presented as Figures 3, 4, and 5. The groundwater gradient is generally flat. The apparent groundwater surface was inclined to the northwest throughout the quarter. The calculated gradient has decreased over the past quarter from 0.89% in July to 0.65% in August and September.

## CONCLUSIONS AND RECOMMENDATIONS

1. Relatively low levels of gasoline constituents were detected in two of the nine individual soil samples tested.

2. Groundwater at the subject site was measured at elevations ranging between 58.5 and 59.6 feet above mean sea level during the last quarter. Gradient determinations have shown that the groundwater flow was typically flat and slightly inclined to the northwest until June. The June groundwater direction flowed to the southwest. In the past three months the gradient has had a westerly direction.

3. A relatively low concentration of benzene was detected in the groundwater in MW-3 only. No other constituents were detected. No free product was observed in the groundwater monitoring wells at the site.

4. EES will continue to monitor the wells on the site. The next quarterly groundwater monitoring report will be submitted in January 1990, and will include analytical results of samples collected in December 1989 as well as monthly groundwater surface elevation data. This schedule will continue until the reported conditions meet the approval of the San Francisco Bay Regional Water Quality Control Board (SFBRWQCB).

## REPORTING REQUIREMENTS

A copy of this report should be forwarded to the following agencies:

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

Regional Water Quality Control Board
San Francisco Bay Region
1111 Jackson Street
Oakland, California 94607
Attention: Ms. Lisa McCann

Alameda County Health Department
Department of Environmental Health
80 Swan Way, Room 200
Oakland, California 94621
Attention: Mr. Lowell Miller

## DISCLAIMER

This report has been prepared solely for the use of Shell and any reliance on this report by third parties shall be as such party's sole risk.

## REFERENCES

Wayne Perry Construction, Inc. Review of Venting Operations Shell Station, 230 MacArthur Boulevard, Oakland, California. Project No. 86.255, January 26, 1988.

## LIMITATIONS

The discussions and recommendations presented in this report are based on the following:

1. The exploratory test borings drilled at the site.
2. The observations by field personnel.
3. The results of laboratory analyses performed by a state-certified laboratory.
4. Our understanding of the regulations of the State of California and Alameda County and/or the City of Oakland.
5. Past Reports

It is possible that variations in the soil or groundwater conditions could exist beyond the points explored in this investigation. Also, changes in the groundwater conditions could occur at sometime in the future due to variations in rainfall, temperature, regional water usage or other factors.

The service performed by EES has been conducted in a manner consistent with the level of care and skill exercised by members of our profession currently practicing under similar conditions in the San Francisco Bay Area. Please note that contamination of soil and groundwater must be reported to the appropriate agencies in a timely manner. No other warranty, expressed or implied, is made.

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.

Ensco Environmental Services, Inc.
Project No. 1847G

Shell Oil Company
230 MacArthur Blvd

**TABLE 1**
**GROUNDWATER ANALYSES DATA**

| WELL | DATE | TPHG (ppm) | BENZENE (ppm) | TOLUENE (ppm) | ETHYL BENZENE (ppm) | TOTAL XYLENES (ppm) | TDS (ppm) | WELL ELEV. (ft.) | DEPTH TO WATER (ft.) |
|---|---|---|---|---|---|---|---|---|---|
| MW-1 | 7/14/88 | ND | ND | ND | ND | ND | NA | 73.89 | 13.30 |
| | 10/4/88 | BRL | 0.008 | 0.0043 | BRL | 0.009 | NA | | 13.65 |
| | 11/10/88 | BRL | BRL | BRL | BRL | BRL | NA | | 13.55 |
| | 12/9/88 | ND | ND | ND | ND | ND | NA | | 13.22 |
| | 1/10/89 | ND | ND | ND | ND | ND | NA | | 12.86 |
| | 1/20/89 | NA | NA | NA | NA | NA | NA | | 12.91 |
| | 2/6/89 | ND | ND | ND | ND | ND | NA | | 12.94 |
| | 3/10/89 | ND | ND | ND | ND | ND | NA | | 12.59 |
| | 6/6/89 | ND | ND | ND | ND | ND | NA | | 14.05 |
| | 9/7/89 | ND | ND | ND | ND | ND | NA | | 14.92 |
| MW-2 | 7/14/88 | ND | 0.0079 | 0.0026 | 0.0011 | 0.004 | NA | 75.24 | 15.18 |
| | 10/4/88 | 0.09 | BRL | 0.0013 | 0.0025 | 0.012 | NA | | 15.30 |
| | 11/10/88 | BRL | BRL | BRL | BRL | 0.002 | NA | | 15.17 |
| | 12/9/88 | ND | ND | 0.0006 | ND | 0.003 | NA | | 14.82 |
| | 1/20/89 | ND | ND | ND | ND | ND | 456 | | 14.54 |
| | 2/6/89 | ND | ND | ND | ND | ND | 400 | | 14.59 |
| | 3/10/89 | ND | ND | ND | ND | ND | 407 | | 14.88 |
| | 6/6/89 | ND | ND | ND | ND | ND | NA | | 15.30 |
| | 9/7/89 | ND | ND | ND | ND | ND | NA | | 16.76 |

Ensco Environmental Services, Inc.
Project No. 1847G

Shell Oil Company
230 MacArthur Blvd

**TABLE 1**
**GROUNDWATER ANALYSES DATA**

| WELL | DATE | TPHG (ppm) | BENZENE (ppm) | TOLUENE (ppm) | ETHYL BENZENE (ppm) | TOTAL XYLENES (ppm) | TDS (ppm) | WELL ELEV. (ft.) | DEPTH TO WATER (ft.) |
|---|---|---|---|---|---|---|---|---|---|
| MW-3 | 7/14/88 | ND | ND | ND | ND | ND | NA | 74.68 | 14.05 |
| | 10/4/88 | BRL | BRL | BRL | BRL | 0.005 | NA | | 14.60 |
| | 11/10/88 | BRL | BRL | BRL | BRL | BRL | NA | | 14.35 |
| | 12/9/88 | ND | ND | ND | ND | ND | NA | | 14.04 |
| | 1/10/89 | ND | ND | ND | ND | ND | NA | | 13.70 |
| | 1/20/89 | NA | NA | NA | NA | NA | NA | | 13.72 |
| | 2/6/89 | 0.07 | ND | ND | ND | ND | NA | | 13.75 |
| | 3/10/89 | 0.15 | ND | ND | ND | ND | NA | | 13.42 |
| | 6/6/89 | ND | ND | ND | ND | ND | NA | | 14.52 |
| | 9/7/89 | ND | 0.00065 | ND | ND | ND | NA | | 15.52 |

TPHG Total Petroleum Hydrocarbons as Gasoline
ppm parts per million
ND None Detected above detection limit method
BRL Below Reporting Limit
NA Not Analyzed
TDS Total Dissolved Solids

Note: See lab reports for detection limits and reporting limit

Ensco Environmental Services, Inc.
Project No. 1847G

Shell Oil, Inc.
230 MacArthur Blvd.
October 19, 1989

## TABLE 2
## SOIL SAMPLING ANALYSES DATA

| Sample Number | | Date Sampled | TPHG (ppm) | Benzene (ppm) | Toluene (ppm) | Ethyl Benzene (ppm) | Total Xylenes (ppm) | Total Lead (ppm) | Organic Lead (ppm) |
|---|---|---|---|---|---|---|---|---|---|
| SB1-1 | | 8/16/89 | N D | N D | N D | N D | N D | N A | N A |
| SB1-2 | | 8/16/89 | N D | N D | N D | N D | N D | N A | N A |
| SB1-3 | | 8/16/89 | N D | N D | N D | N D | N D | N A | N A |
| SB1 | Composite | 8/16/89 | N A | N A | N A | N A | N A | 4.5 | N D |
| SB2-1 | | 8/16/89 | N D | N D | N D | N D | N D | N A | N A |
| SB2-2 | | 8/16/89 | N D | N D | N D | N D | N D | N A | N A |
| SB2-3 | | 8/16/89 | 490 | N D | 0.28 | 1.3 | 1 | N A | N A |
| SB2 | Composite | 8/16/89 | N A | N A | N A | N A | N A | 2.5 | N D |
| SB3-1 | | 8/16/89 | 6.6 | N D | 0.26 | 0.14 | 0.63 | N A | N A |
| SB3-2 | | 8/16/89 | N D | N D | N D | N D | N D | N A | N A |
| SB3-3 | | 8/16/89 | N D | N D | N D | N D | N D | N A | N A |
| SB3 | Composite | 8/16/89 | N A | N A | N A | N A | N A | 5.5 | N D |

TPHG Total Petroleum Hydrocarbons as Gasoline
ppm parts per million
N D None Detected above detection limit method
NA Not Analyzed


**LEGEND:**

**SITE LOCATION**

**BASE: USGS 7.5 MINUTE TOPOGRAPHIC SHEET**

**SCALE IN MILES**

ensco environmental services, Inc.

# SITE LOCATION MAP

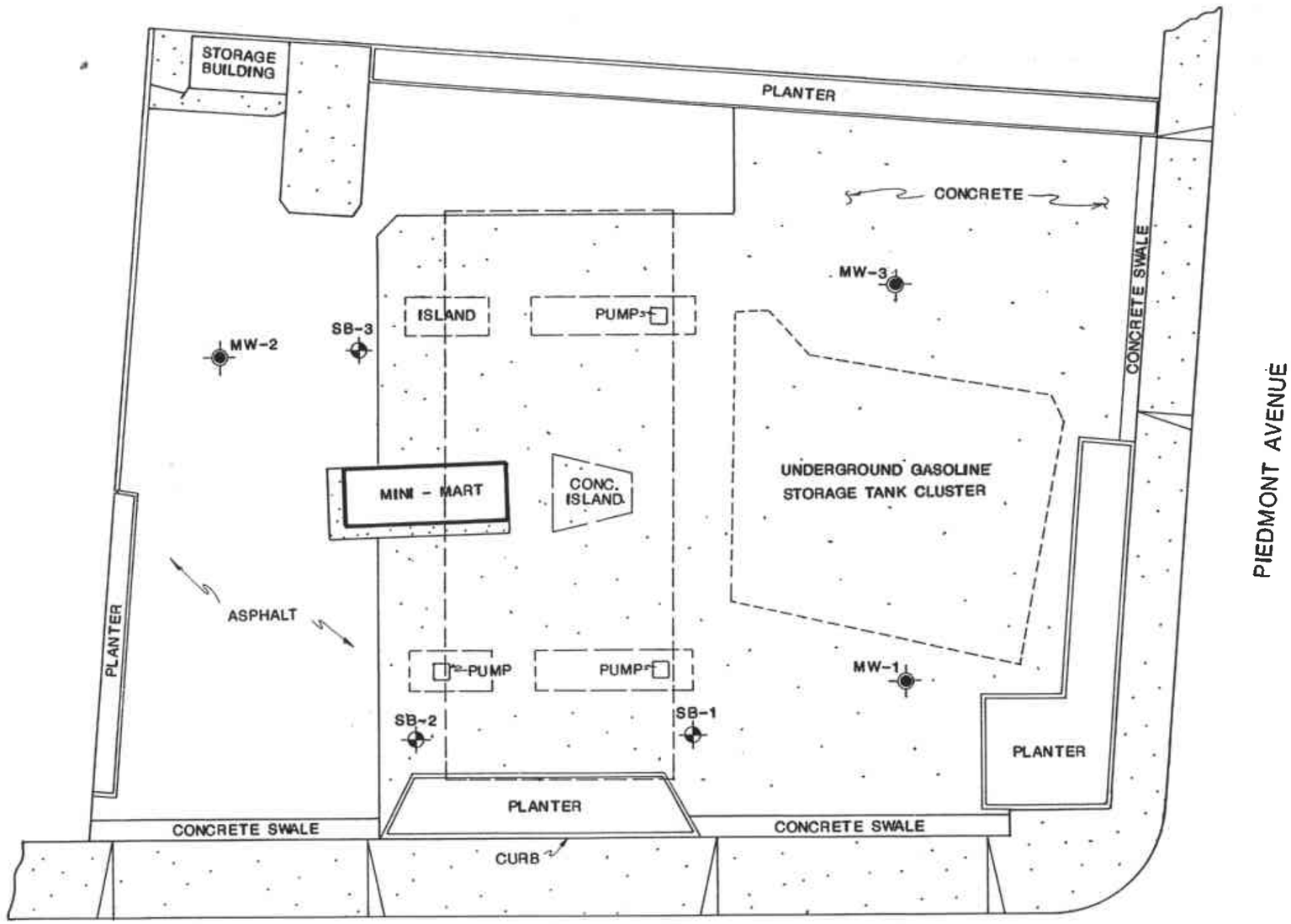
SHELL SERVICE STATION

230 MacARTHUR BOULEVARD

OAKLAND, CALIFORNIA

| REVIEWED BY: | APPROVED BY: |
|---|---|
| Z.P. | T.B. |
| JOB #: 1847G | DRAWN BY: SLS |
| DATE: 9-16-88 | DRAWING #: FIG: 1 |

A-1847G-1




LEGEND

MW-1 GROUNDWATER MONITORING WELL

SB-1 EXPLORATORY SOIL BORING

N

0 20

APPROX. SCALE IN FEET

ensco environmental services, inc.

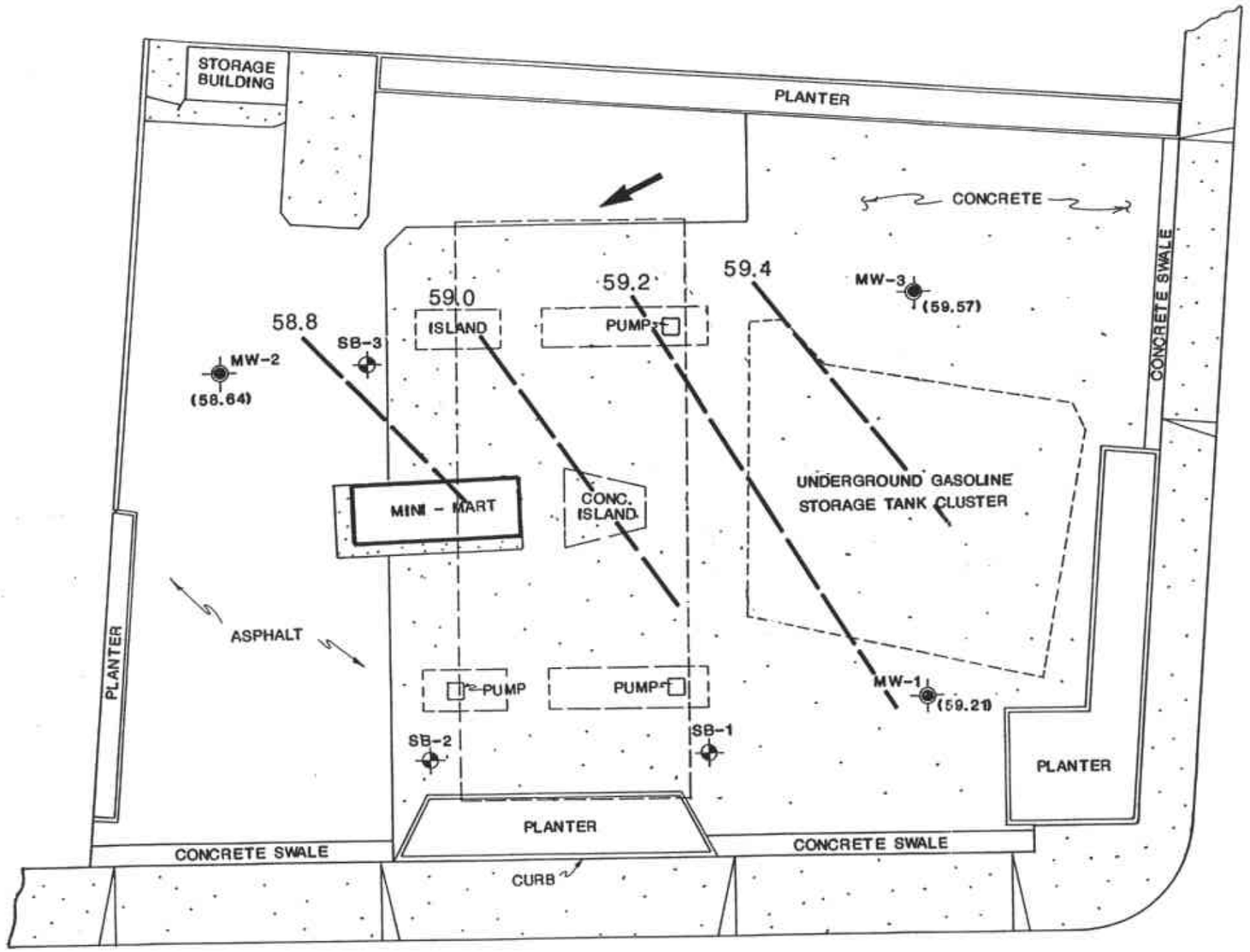
**EXPLORATORY SOIL BORING LOCATIONS**

SHELL SERVICE STATION

230 Mac ARTHUR BOULEVARD

OAKLAND, CALIFORNIA

| REVIEWED BY: | APPROVED BY: |
|---|---|
| K. P. | MAB |
| JOB #: 1847G | DRAWN BY: J.C. |
| DATE: 8-25-89 | DRAWING #: FIG. 2 |




LEGEND

- MW-1 GROUNDWATER MONITORING WELL
- SB-1 EXPLORATORY SOIL BORING
- (58.64) GROUNDWATER ELEVATION IN FEET (DATUM: M.S.L.)
- 59.0 GROUNDWATER ELEVATION CONTOUR LINE IN FEET (DATUM: M.S.L.)
- APPARENT GROUNDWATER FLOW DIRECTION

N

0 20

APPROX. SCALE IN FEET

ensco environmental services, Inc.

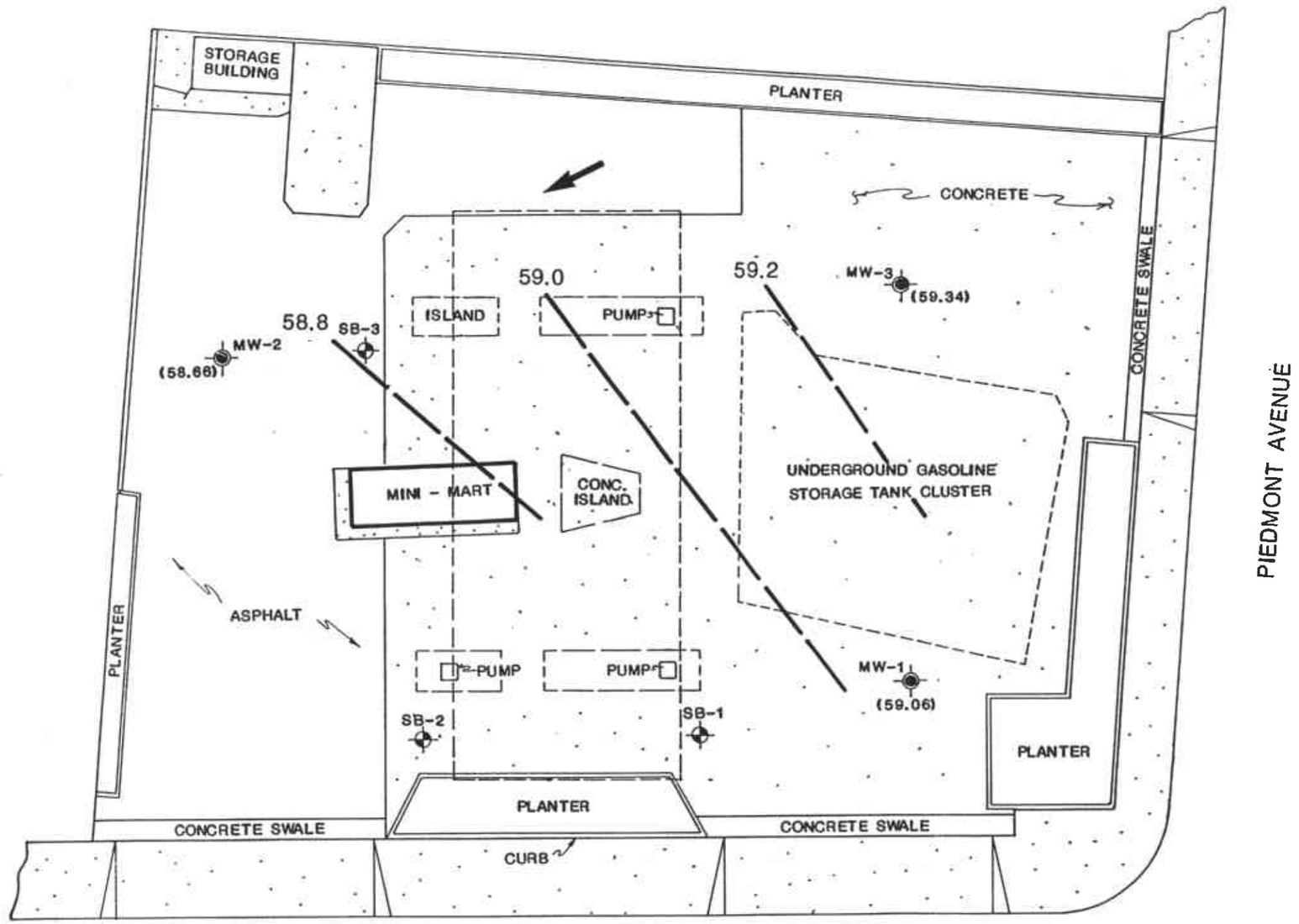
**GROUNDWATER ELEVATION MAP (7/20/89)**

SHELL SERVICE STATION

230 Mac ARTHUR BOULEVARD

OAKLAND, CALIFORNIA

| REVIEWED BY: | APPROVED BY: |
|---|---|
| K.P. | T.H. |
| JOB #: 1847G | DRAWN BY: J.C. |
| DATE: 9-13-89 | DRAWING #: FIG. 3 |




LEGEND

- MW-1 GROUNDWATER MONITORING WELL
- SB-1 EXPLORATORY SOIL BORING
- (59.34) GROUNDWATER ELEVATION IN FEET (DATUM: M.S.L.)
- 59.3 GROUNDWATER ELEVATION CONTOUR LINE IN FEET (DATUM: M.S.L.)
- APPARENT GROUNDWATER FLOW DIRECTION

N

0 20

APPROX. SCALE IN FEET

ensco environmental services, Inc.

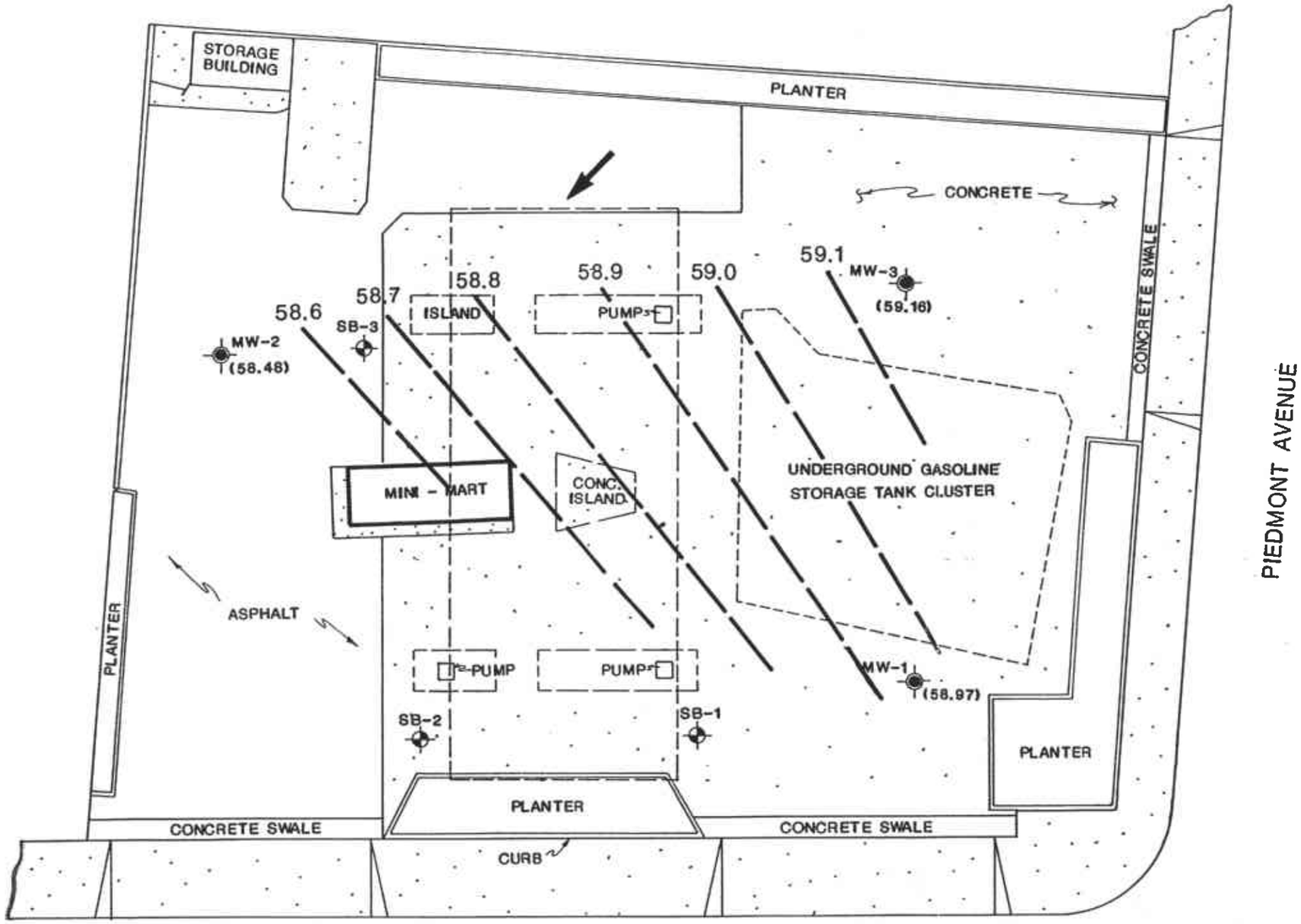
**GROUNDWATER ELEVATION MAP (8/18/89)**

SHELL SERVICE STATION

230 Mac ARTHUR BOULEVARD

OAKLAND, CALIFORNIA

| REVIEWED BY: | APPROVED BY: |
|---|---|
| K.P. | TNH |
| JOB #: 1847G | DRAWN BY: J.C. |
| DATE: 9-13-89 | DRAWING #: FIG. 4 |




LEGEND

- MW-1 GROUNDWATER MONITORING WELL
- SB-1 EXPLORATORY SOIL BORING
- (58.48) GROUNDWATER ELEVATION IN FEET (DATUM: M.S.L.)
- 59.1 GROUNDWATER ELEVATION CONTOUR LINE IN FEET (DATUM: M.S.L.)
- APPARENT GROUNDWATER FLOW DIRECTION

N

0 20

APPROX. SCALE IN FEET

ensco environmental services, Inc.

# GROUNDWATER ELEVATION MAP (9/7/89)

SHELL SERVICE STATION

230 Mac ARTHUR BOULEVARD

OAKLAND, CALIFORNIA

| REVIEWED BY: | APPROVED BY: |
|---|---|
| K.P. | TMD |
| JOB #: 1847G | DRAWN BY: J.C. |
| DATE: 9-13-89 | DRAWING #: FIG. 5 |

# APPENDIX A

# BORING LOGS

# EXPLORATORY BORING LOG

ensco environmental services, inc.

PROJECT NAME: Shell Oil Company
230 MacArthur, Oakland

BORING NO. SB1

DATE DRILLED: 8/16/89

PROJECT NUMBER: 1847-2G

LOGGED BY: K.P.

| DEPTH (ft.) | SAMPLE No | BLOWS/FOOT | UNIFIED SOIL CLASSIFICATION | SOIL DESCRIPTION | WATER LEVEL | OVA READING ppm |
|---|---|---|---|---|---|---|
| | | | | 6 inches concrete | | |
| | | | | 1 foot baserock | | |
| 1-4 | | | GC | CLAYEY GRAVEL | | |
| 5 | SB1-1 | 64 | CL | SILTY CLAY, mottled reddish yellow (7.5YR 7/6) and light gray (7.5YR 7/0), iron oxide discoloration, minor organics, dry to damp, very dense | | 7 |
| 10 | SB1-2 | 57 | CL | SILTY CLAY, mottled gray (7.5YR 6/0) with pink (7.5YR 7/4), very dense | | 79 |
| 15 | SB1-3 | 41 | SM | SILTY SAND, gray (5Y 5/1), fine to medium grained, minor gravel, minor clay, dense, moist | | 80 |
| | | | | Bottom of boring = 15.5 feet | | |

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

# EXPLORATORY BORING LOG

ensco environmental services, inc.

PROJECT NAME: Shell Oil Company
230 MacArthur, Oakland

BORING NO. SB2

DATE DRILLED: 8/16/89

PROJECT NUMBER: 1847-2G

LOGGED BY: K.P.

| DEPTH (ft.) | SAMPLE No | BLOWS/FOOT | UNIFIED SOIL CLASSIFICATION | SOIL DESCRIPTION | WATER LEVEL | OVA READING ppm |
|---|---|---|---|---|---|---|
| | | | | 4 inches Concrete | | |
| 1 | | | | 1 foot baserock | | |
| 2 | | | GC | CLAYEY GRAVEL, dark gray (7.5YR 4/0), angular to subangular, up to 2 inches in length | | |
| 3 | | | | | | |
| 4 | | | | | | |
| 5 | | | GC-CL | CLAYEY GRAVEL to CLAY, mottled dark gray (7.5YR 4/0) with iron oxide stains, very dense, minor organics in clay | | |
| 6 | SB2-1 | 57 | | | | 2.3 |
| 7 | | | | | | |
| 8 | | | | | | |
| 9 | | | | | | |
| 10 | | | | | | |
| 11 | SB2-2 | 40 | CL | CLAY, mottled gray (2.5Y 6/0) and pale yellow (2.5Y 7/4), minor organics, dense | | 9.2 |
| 12 | | | | | | |
| 13 | | | | | | |
| 14 | | | | | | |
| 15 | | | | | | |
| 16 | SB2-3 | 79 | GM | GRAVEL, poorly graded, angular to subangular, up to 1.5 inches in length, very dense | | 278 |
| 17 | | | | Bottom of boring = 16.0 feet | | |
| 18 | | | | | | |
| 19 | | | | | | |
| 20 | | | | | | |
| 21 | | | | | | |

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

# EXPLORATORY BORING LOG

ensco environmental services, inc.

PROJECT NAME: Shell Oil Company
230 MacArthur, Oakland

BORING NO. SB3

DATE DRILLED: 8/16/89

PROJECT NUMBER: 1847-2G

LOGGED BY: K.P.

| DEPTH (ft.) | SAMPLE No | BLOWS/FOOT | UNIFIED SOIL CLASSIFICATION | SOIL DESCRIPTION | WATER LEVEL | OVA READING ppm |
|---|---|---|---|---|---|---|
| | | | | 4 inches Asphalt | | |
| 1 | | | | 1 foot baserock | | |
| 2 | | | | | | |
| 3 | | | | | | |
| 4 | | | | | | |
| 5 | SB3-1 | 60 | CL | SILTY CLAY, yellowish brown (10YR 5/4), minor grained, minor organics, very dense, dry to damp<br><br>Gravel lens at 6-7 feet | | 6.8 |
| 6 | | | | | | |
| 7 | | | | | | |
| 8 | | | | | | |
| 9 | | | | | | |
| 10 | SB3-2 | 62 | CL | CLAY with minor sand, mottled pale yellow (2.5YR 7/4) and gray (2.5Y 6/0), dry to damp, very dense | | 0.9 |
| 11 | | | | | | |
| 12 | | | | | | |
| 13 | | | | | | |
| 14 | | | | | | |
| 15 | SB3-3 | 44 | SM | SILTY SAND, mottled pale yellow (2.5Y 7/4) and gray (2.5Y 6/0), fine to medium grained, minor fine gravel, moist, dense | | 8.0 |
| 16 | | | | | | |
| 17 | | | | Bottom of boring = 15.5 feet | | |
| 18 | | | | | | |
| 19 | | | | | | |
| 20 | | | | | | |
| 21 | | | | | | |

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

# APPENDIX B

# LABORATORY ANALYTICAL DATA
# AND
# CHAIN-OF-CUSTODY

# SEQUOIA ANALYTICAL

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


| | | | | |
|---|---|---|---|---|
| Ensco Environmental Services | Client Project ID: | #1847G, Shell, PO #13721 | Sampled: | Aug 16, 1989 |
| 41674 Christy Street | Matrix Descript: | Soil | Received: | Aug 17, 1989 |
| Fremont, CA 94538 | Analysis Method: | EPA 5030/8015/8020 | Analyzed: | Aug 29, 1989 |
| Attention: Kay Pannell | First Sample #: | 908-2470 | Reported: | Sep 5, 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) |
|---|---|---|---|---|---|---|
| 908-2470 | SB1-1 | N.D. | N.D. | N.D. | N.D. | N.D. |
| 908-2471 | SB1-2 | N.D. | N.D. | N.D. | N.D. | N.D. |
| 908-2472 | SB1-3 | N.D. | N.D. | N.D. | N.D. | N.D. |
| 908-2473 | SB2-1 | N.D. | N.D. | N.D. | N.D. | N.D. |
| 908-2474 | SB2-2 | N.D. | N.D. | N.D. | N.D. | N.D. |
| 908-2475 | SB2-3 | 490 | N.D. | 0.28 | 1.3 | 1.0 |
| 908-2476 | SB3-1 | 6.6 | N.D. | 0.26 | 0.14 | 0.63 |
| 908-2477 | SB3-2 | N.D. | N.D. | N.D. | N.D. | N.D. |
| 908-2478 | SB3-3 | N.D. | 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**

Arthur G. Burton
Laboratory Director

# SEQUOIA ANALYTICAL

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


| | | | | |
|---|---|---|---|---|
| Ensco Environmental Services | Client Project ID: | #1847G, Shell, PO# 13721 | Sampled: | Aug 16, 1989 |
| 41674 Christy Street | Sample Descript: | Soil | Received: | Aug 17, 1989 |
| Fremont, CA 94538 | Analysis Method: | California LUFT Manual, 12/87 | Analyzed: | Aug 23, 1989 |
| Attention: Kay Pannell | First Sample #: | 908-2470 -72 | Reported: | Sep 5, 1989 |

## ORGANIC LEAD

| Sample Number | Sample Description<br>Composite | Sample Results<br>mg/kg (ppm) |
|---|---|---|
| 9082470-72 | SB1-1, SB1-2, SB1-3 | N.D. |
| 9082473-75 | SB2-1, SB2-2, SB2-3 | N.D. |
| 9082476-78 | SB3-1, SB3-2, SB3-3 | N.D. |

| | |
|---|---|
| **Detection Limits:** | **0.05** |

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

**SEQUOIA ANALYTICAL**

Arthur G. Burton
Laboratory Director

# SEQUOIA ANALYTICAL

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| | | | | |
|---|---|---|---|---|
| Ensco Environmental Services | Client Project ID: | #1847G, Shell, Oakland, PO#13721 | Sampled: | Aug 16, 1989 |
| 41674 Christy Street | Sample Descript: | Soil | Received: | Aug 17, 1989 |
| Fremont, CA 94538 | Analysis for: | Total Lead | Extracted: | Aug 28, 1989 |
| Attention: Kay Pannell | First Sample #: | 908-2470 -72 | Analyzed: | Aug 29, 1989 |
| | | | Reported: | Sep 5, 1989 |

## LABORATORY ANALYSIS FOR: Total Lead

| Sample Number | Sample Description Composite | Detection Limit mg/kg | Sample Result mg/kg |
|---|---|---|---|
| 8972470-72 | SB1-1, SB1-2, SB1-3 | 0.05 | 4.5 |
| 9082473-75 | SB2-1, SB2-2, SB2-3 | 0.05 | 2.5 |
| 9082476-78 | SB3-1, SB3-2, SB3-3 | 0.05 | 5.5 |

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

SEQUOIA ANALYTICAL

Arthur G. Burton
Laboratory Director

# CHAIN OF CUSTODY RECORD

| PROJECT NO | PROJECT NAME |
|---|---|
| 1847-26 | SHELL, 230 MacArthur Blvd, Oakland |

SAMPLERS (Signature): Kay Pannell

| NO. | DATE | TIME | STATION AND LOCATION | TPHG/BTEX | | Total lead | organic lead | | | | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SB1-1 | 8/16/89 | | 5.0 - 5.5 feet | X | | | | | | | Run individual samples for |
| SB1-2 | ↓ | | 10 - 10.5 | X | | | | | | | TPHG/BTEX |
| SB1-3 | ↓ | | 15 - 15.5 | X | | | | | | | composite 3 to 1 for lead |
| | | | | | | | | | | | |
| SB2-1 | 8/16/89 | | 5.5 - 6 | X | | | | | | | |
| SB2-2 | ↓ | | 10.5 - 11 | X | | | | | | | composite 3 to 1 for |
| SB2-3 | ↓ | | 15.5 - 16 | X | | | | | | | lead tests |
| | | | | | | | | | | | |
| SB3-1 | 8/16/89 | | 4.5 - 5.0 | X | | | | | | | |
| SB3-2 | ↓ | | 9.5 - 10.0 | X | | | | | | | composite 3 to 1 for |
| SB3-3 | ↓ | | 15 - 15.5 | X | | | | | | | lead tests |

| RELINQUISHED BY: | DATE: TIME: | RECEIVED BY: | RELINQUISHED BY: | DATE: TIME: | RECEIVED BY: |
|---|---|---|---|---|---|
| K Pannell | | | | | |
| RELINQUISHED BY: | DATE: TIME: | RECEIVED BY: | RELINQUISHED BY: | DATE: TIME: | RECEIVED BY: |
| | | | | | |

REMARKS: Report results in ppm, put site address on all pages of report

REPORT TO: Kay Pannell

P.O. #

LAB Sequoia Analytical

TURN AROUND TIME normal

ensco environmental services, inc.
41674 Christy Street
Fremont, C.A. 94538-3114
(415) 659-0404
Fax (415) 651-4877
Contr. Lic. No. 550205

FORM DATED 5-30-89

# SEQUOIA ANALYTICAL

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


| | | | | |
|---|---|---|---|---|
| Ensco Environmental Services | Client Project ID: | #1847G, Shell, MacArthur, Oakland, | Sampled: | Sep 7, 1989 |
| 41674 Christy Street | Matrix Descript: | Water PO#15210 | Received: | Sep 8, 1989 |
| Fremont, CA 94538 | Analysis Method: | EPA 5030/8015/8020 | Analyzed: | Sep 21, 1989 |
| Attention: Kay Pannell | First Sample #: | 909-0809 A-B | Reported: | Sep 26, 1989 |

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

| Sample Number | Sample Description | Low/Medium B.P. Hydrocarbons µg/L (ppb) | Benzene µg/L (ppb) | Toluene µg/L (ppb) | Ethyl Benzene µg/L (ppb) | Xylenes µg/L (ppb) |
|---|---|---|---|---|---|---|
| 9090809 A-B | BB-1 | N.D. | N.D. | N.D. | N.D. | N.D. |
| 9090810 A-B | MW-2 | N.D. | N.D. | N.D. | N.D. | N.D. |
| 9090811 A-B | MW-3 | N.D. | 0.65 | N.D. | N.D. | N.D. |
| 9090812 A-B | MW-1 | N.D. | N.D. | N.D. | N.D. | N.D. |
| **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**

Vickie Tague
Project Manager

# CHAIN OF CUSTODY RECORD

| PROJECT NO | PROJECT NAME | | TEST REQUESTED | P.O. # |
|---|---|---|---|---|
| 1847G | Shell MacArthur | 280 MacArthur Blvd. Oakland, CA | TPHg/BTEX | 15210 |
| SAMPLERS (Signature) | John C Bongo | | | LAB Sequoia |
| | | | | TURN AROUND TIME normal |

| NO. | DATE | TIME | STATION AND LOCATION | TPHg/BTEX | REMARKS |
|---|---|---|---|---|---|
| ~~##~~ BB-1 | 7Sept09 | 12:13 | 2 prsv Voa's each | X | |
| mw-2 | ↓ | 12:18 | ↓ ↓ ↓ | X | |
| mw-3 | | 12:55 | | X | |
| mw-1 | ↓ | 2:10 | | X | |

| RELINQUISHED BY: | DATE: | TIME: | RECEIVED BY: | RELINQUISHED BY: | DATE: | TIME: | RECEIVED BY: |
|---|---|---|---|---|---|---|---|
| Kay Pannell | 8/10/09 | 1530 | | | | | |
| RELINQUISHED BY: | DATE: | TIME: | RECEIVED BY: | RELINQUISHED BY: | DATE: | TIME: | RECEIVED BY: |
| | | | | | | | |

REMARKS: all results in ppm

REPORT TO: Kay Pannell

ensco environmental services, inc.
41674 Christy Street
Fremont, C.A. 94538-3114
(415) 659-0404
Fax (415) 651-4677
Contr. Lic. No. 550205

FORM DATED 5-30-89

# APPENDIX C

# EES SOIL AND GROUNDWATER SAMPLING PROTOCOLS

# ENSCO ENVIRONMENTAL SERVICES, INC.

# SOIL SAMPLING PROTOCOL

# SOIL SAMPLING PROTOCOL

## I. SOIL SAMPLING BY DRILLING RIG

1) Review site proposal for boring locations and special instructions. Confirm boring locations in field with client. Have Underground Service Alert (USA) mark utilities in area prior to drilling.

2) Prior to initiating an exploratory boring, all equipment to be used during drilling and sampling operation is steam cleaned. Such equipment includes, but is not limited to, augers, bits, drilling rod, samplers, and brass sampler liners. Additionally, between sampling intervals, the sampler is thoroughly cleaned with a dilute trisodium phosphate solution and rinsed with clean tap water or distilled water.

3) Each exploratory boring is drilled with a truck-mounted drilling rig using either solid flight or hollow stem augers. The boring is advanced to the desired sampling depth and the sampler is lowered to the bottom of the hole. The sampler is driven a maximum of 18 inches into the undisturbed soils ahead of the auger by a 140-pound, rig-operated hammer falling 30 inches. The number of blows required to drive the sampler the final 12 inches is recorded on the boring log. When necessary, the sampler may be pushed by the drill rig hydraulics. In this case, the pressure exerted (in pounds per square inch) is recorded. After the sampler has penetrated the full depth, it is retrieved to the surface.

4) The samplers commonly used are either a California modified sampler (3 inch or 2.5 inch O.D.) or a standard penetrometer (2 inch O.D.). The standard penetrometer does not contain sample liners and is used to determine soil strength characteristics and visually characterize the subsurface materials. If samples are collected for laboratory analysis the

## II. SOIL SAMPLING BY HAND

1) Some situations require that samples be collected by hand without the assistance of a drill rig (e.g., soil stock piles, excavation sidewall sampling, etc.). When possible, soil samples will be collected using a steel core sampler equipped with clean brass liners which is advanced into the soil with a slide hammer. In other cases, the outer surface of the soil is removed and a brass liner is driven into the soil by hand or with a hammer. To avoid damaging the liner, a block of wood is held next to the liner so that the hammer strikes the block rather than the liner. The liner is removed and handled as described above. In deep excavations where safety factors preclude the direct sampling of the bottom or side wall, soil is retrieved by a backhoe bucket and this soil is sampled.

# ENSCO ENVIRONMENTAL SERVICES, INC.

# GROUNDWATER SAMPLING PROTOCOL

# GROUNDWATER SAMPLING PROTOCOL

Sampling of groundwater is performed by Ensco Environmental Services, Inc. (EES) sampling technicians. Summarized field sampling procedures are as follows:

1. Measurements of liquid surface in the well and depth of monitoring well.

2. Field check for presence of floating product.

3. Purge well prior to collecting samples.

4. Monitor groundwater for temperature, pH, and specific conductance during purging.

5. Collect samples using Environmental Protection Agency (EPA) approved sample collection devices, i.e., teflon or stainless steel bailers or pumps.

6. Transfer samples into laboratory-supplied EPA-approved containers.

7. Label samples and log onto chain-of-custody form.

8. Store samples in a chilled ice chest for shipment to a state-certified analytical laboratory.

# GROUNDWATER SAMPLING PROCEDURES

## Equipment Cleaning

All water samples are placed in precleaned laboratory-supplied bottles. Sample bottles and caps remain sealed until actual usage at the site. All equipment which comes in contact with the well or groundwater is thoroughly cleaned with a tri sodium phosphate (TSP) solution and rinsed with deionized or distilled water before use at the site. This cleaning procedure is followed between each well sampled. Wells are sampled in approximate order of increasing contamination. If a teflon cord is used, the cord is cleaned. If a nylon or cotton cord is used, a new cord is used in each well All equipment blanks are collected prior to sampling. The blanks are analyzed periodically to ensure proper cleaning.

## Water Level Measurements

Depth to groundwater is measured in each well using a sealed sampling tape or scaled electric sounder prior to purging or sampling. If the well is known or suspected of containing free-phase petroleum hydrocarbons, an optical interface probe is used to measure the hydrocarbon thickness and groundwater level. Measurements are collected and recorded to the nearest 0.01 foot.

## Bailer Sheen Check

If no measurable free-phase petroleum hydrocarbons are detected, a clear acrylic bailer is used to determine the presence of a sheen. Any observed film as well as odor and color of the water is recorded.

## Groundwater Sampling

Prior to groundwater sampling, each well is purged of "standing" groundwater. Either a bailer, hand pump, or submersible pump is used to purge the well. The amount of purging is dependent on the well yield. In a high yield formation, samples will be collected when normal field measurement, including temperature, pH, and specific conductance stabilize, provided a minimum of three well-casing volumes of water have been removed. Field measurements will be taken after purging each well volume. In low yield formations, the well is purged such that the "standing" water is removed and the well is allowed to recharge. (Normal field measurements will be periodically recorded during the purging process.) In situations where recovery to 80% of static water level is estimated, or observed to exceed a two hour duration, a sample will be collected when sufficient volume is available for a sample for each parameter. At no time will the well be purged dry so that the recharge rate causes the formation water to cascade into the well.

In wells where free-phase hydrocarbons are detected, the free-phase portion will be bailed from the well and the volume removed recorded. A groundwater sample will be collected if bailing reduces the amount of free-phase hydrocarbons to the point where they are not present in the well. Well sampling will be conducted using one of the aforementioned methods depending on the formation yield. However, if free-phase hydrocarbons persist throughout bailing, then groundwater samples will not be collected.

Groundwater sample containers are labeled with a unique sample number, location, product name and number, and date of collection. All samples are logged onto a chain-of-custody form and placed in a chilled ice chest for shipment to a laboratory certified by the State of California Department of Health Services.