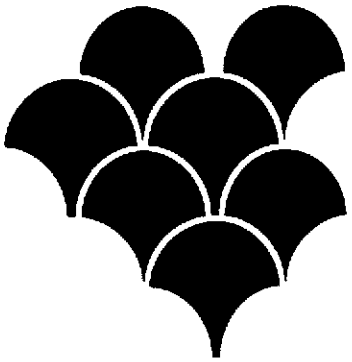


ensco
environmental
services, inc.

JULY QUARTERLY REPORT
GROUNDWATER SAMPLING
AND ANALYSES

FOR

SHELL OIL COMPANY
230 MACARTHUR BOULEVARD
OAKLAND, CALIFORNIA

Project No. 1847G
July 1989

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

August 1, 1989

Alameda County Health Department
Department of Environmental Health
80 Swan Way, Room 200
Oakland, California 94607

Attention: Mr. Lowell Miller

Subject: July Quarterly Report
Groundwater Sampling and Analyses
Shell Gas Station, 230 MacArthur Boulevard, Oakland, California
EES Project No. 1847G

Dear Mr. Miller:

This report presents the results of groundwater sampling and analyses performed at the above referenced site since April 1989. It includes all current and past analytical data acquired during the course of this ongoing investigation.

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/sw
Enclosure

CONTENTS

JULY QUARTERLY REPORT
GROUNDWATER SAMPLING AND ANALYSES

FOR

SHELL OIL COMPANY
230 MACARTHUR BOULEVARD
OAKLAND, CALIFORNIA

INTRODUCTION

This report presents the results of 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 April through June 1989. The program objectives 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), benzene, toluene, ethyl benzene, and total xylenes (BTEX). At Shell's request, EES has also collected groundwater samples from one well on the property for total dissolved solids (TDS) analysis.

BACKGROUND

The station currently utilizes two dispensing islands and three recently replaced underground gasoline storage tanks (installed 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. Irwin, 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 PVC pipe. The slotted intervals (slot size 0.02-inch) extended from three feet below ground surface to the bottom of the borings. A soil venting system, utilizing an activated carbon scrubber, was operated on the site between April and November, 1987. Gas vapors were analyzed using a Foxboro 128 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 technical report preparation. The field work was performed in July, 1988. Beginning in October 1988, EES initiated a monthly sampling program to monitor depth, flow direction, gradient, and quality of the groundwater beneath the site.

Monthly groundwater sampling was discontinued after March 1989. Samples were next taken in June 1989 and will be taken quarterly thereafter. Monthly water level measurements will continue.

The soil and groundwater samples collected during this supplemental investigation were analyzed for TPHG with BTEX distinction. Laboratory analyses revealed that the soil sample 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 278 ppm. No TPHG or BTEX contamination was detected in any of the other soil samples submitted for analysis. This information was presented in an EES report issued in November 1988.

GROUNDWATER SAMPLING

Sampling of the monitoring wells was performed in accordance with the attached EES protocol (Appendix A). Prior to sampling, all wells were field-checked for the presence of floating product. No floating product was observed in the wells. 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.

SITE CONDITIONS

The results of the quarterly monitoring program are summarized on Table 1. Only minor quantities of dissolved hydrocarbons had been detected in the groundwater over the previous quarter. Groundwater samples collected from MW-3 contained TPHG concentrations of 0.07 ppm (February 6, 1989) and 0.15 ppm (March 10, 1989). No hydrocarbon contamination was detected in the groundwater samples collected from MW-1, MW-2, or MW-3 during this quarter. 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 2, 3, and 4. The apparent groundwater surface was inclined to the northwest throughout the quarter except for June, when the inclination was apparently toward the southwest. It is possible that this inclination is spurious, and may be due to incorrect measurements. The groundwater flow direction will be evaluated carefully over the next quarter to verify the directional changes. The calculated gradient has increased over the past quarter from 0.0083 feet per foot in April to 0.0053 feet per foot in May to 0.0057 feet per foot in June.

LONG-TERM MONITORING

EES will continue to monitor the wells on the property. The monitoring will include monthly depth-to-water measurements and quarterly sample collection for laboratory analysis. The next quarterly report summarizing the results of this monitoring program will be issued in October 1989.

CONCLUSIONS AND RECOMMENDATIONS

1. Groundwater at the subject site was measured at elevations ranging between 59.8 and 61.6 feet above mean sea level during the last quarter. Gradient determinations have shown that the groundwater flow has typically been to the northwest over the past quarter. The June groundwater direction may have been erroneous and future measurements will determine if directional changes have occured.

2. No dissolved hydrocarbons were detected in the groundwater beneath the subject property. No free product was observed in the groundwater monitoring wells at the site.

3. EES will continue to monitor the wells on the site. The next quarterly groundwater monitoring report will be submitted in October 1989, and will include analytical results of samples collected in September as well as monthly groundwater surface elevation data. This schedule will continue until reviewed by the San Francisco Bay Regional Water Quality Control Board (SFBRWQCB). In general, the SFBRWQCB requires a minimum of one year of monitoring with "clean" results to discontinue site groundwater monitoring.

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
Attn: Mr. Craig Mayfield

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

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

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.

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 ordinarily 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.

230 MacArthur Blvd; 1847G

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
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
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

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

LEGEND:

SITE LOCATION

BASE: USGS 7.5 MINUTE TOPOGRAPHIC SHEET

ensco environmental services, Inc.

SITE LOCATION MAP

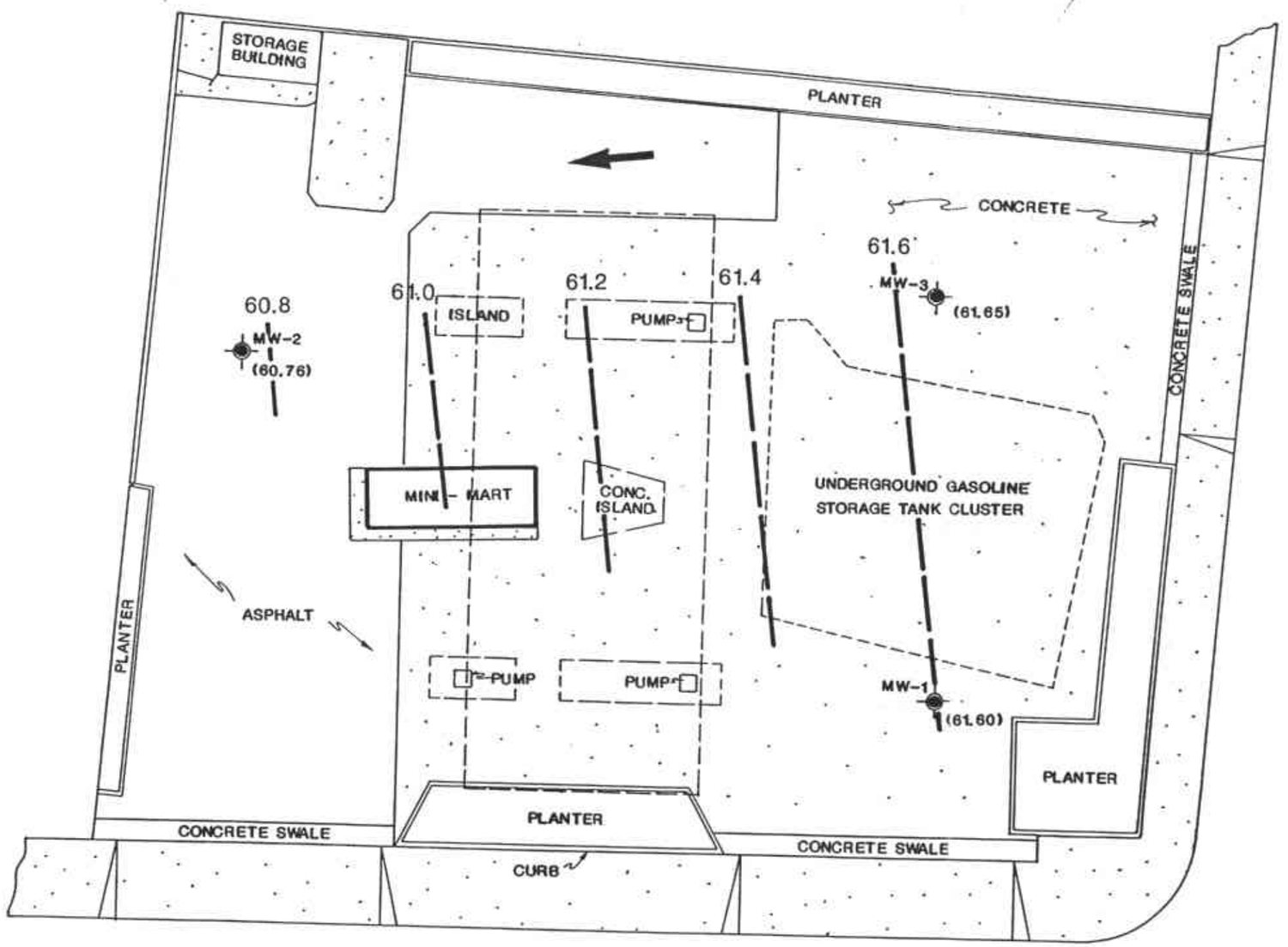
SHELL SERVICE STATION

230 MacARTHUR BOULEVARD

OAKLAND, CALIFORNIA

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

A-1847G-1



LEGEND

- MW-1 — GROUNDWATER MONITORING WELL
- (60.76) — GROUNDWATER ELEVATION IN FEET (DATUM: M.S.L.)
- 60.1 — 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.

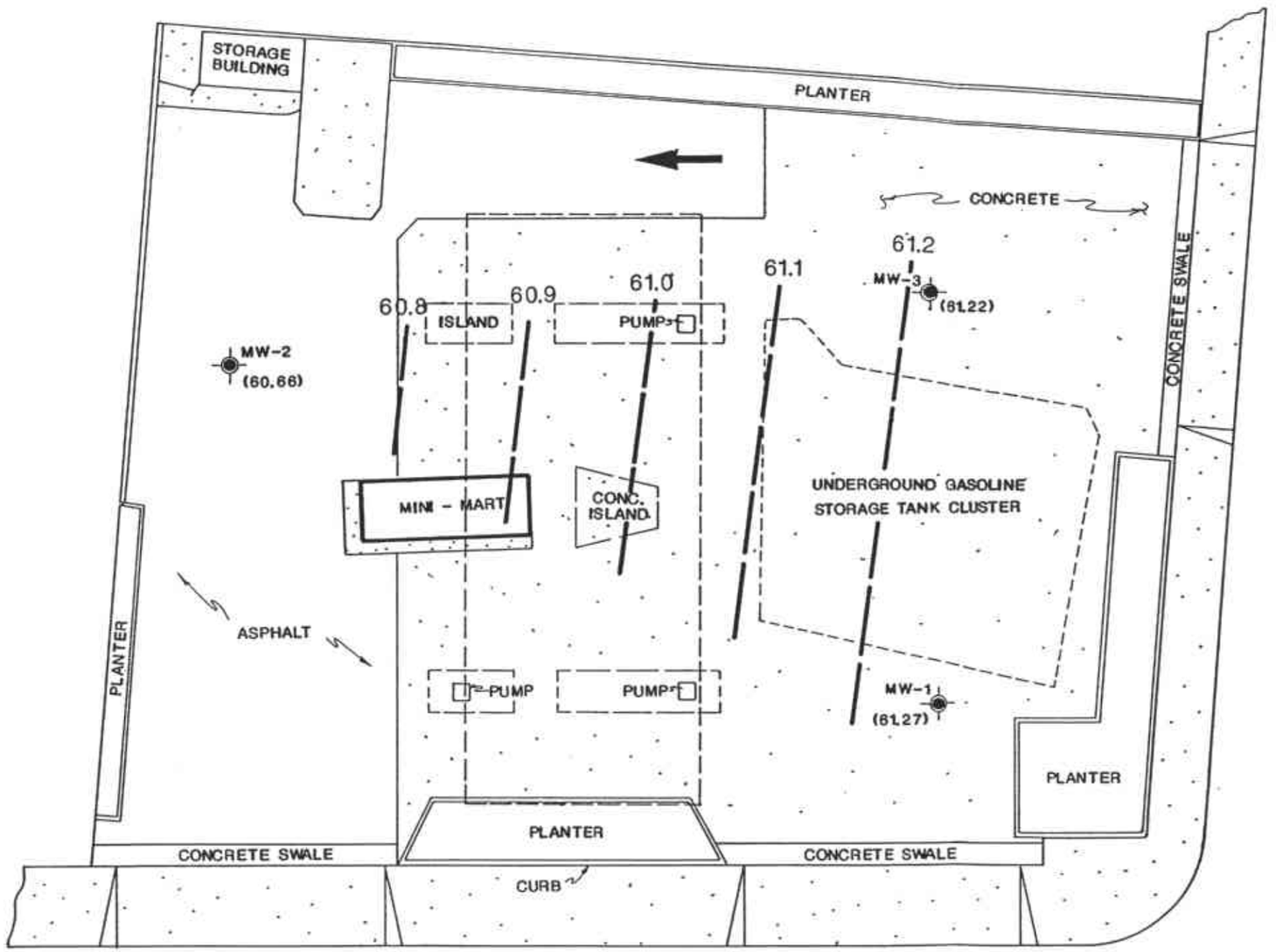
GROUNDWATER ELEVATION MAP (4/5/89)

SHELL SERVICE STATION

230 MAC ARTHUR BOULEVARD

OAKLAND, CALIFORNIA

REVIEWED BY:	APPROVED BY:
K.R.	MHP
JOB #: 1847G	DRAWN BY: J.C.
DATE: 7-12-89	DRAWING #: FIG. 2



LEGEND

- MW-1 — GROUNDWATER MONITORING WELL
- (60.66) — GROUNDWATER ELEVATION IN FEET (DATUM: M.S.L.)
- 60.1 — 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.

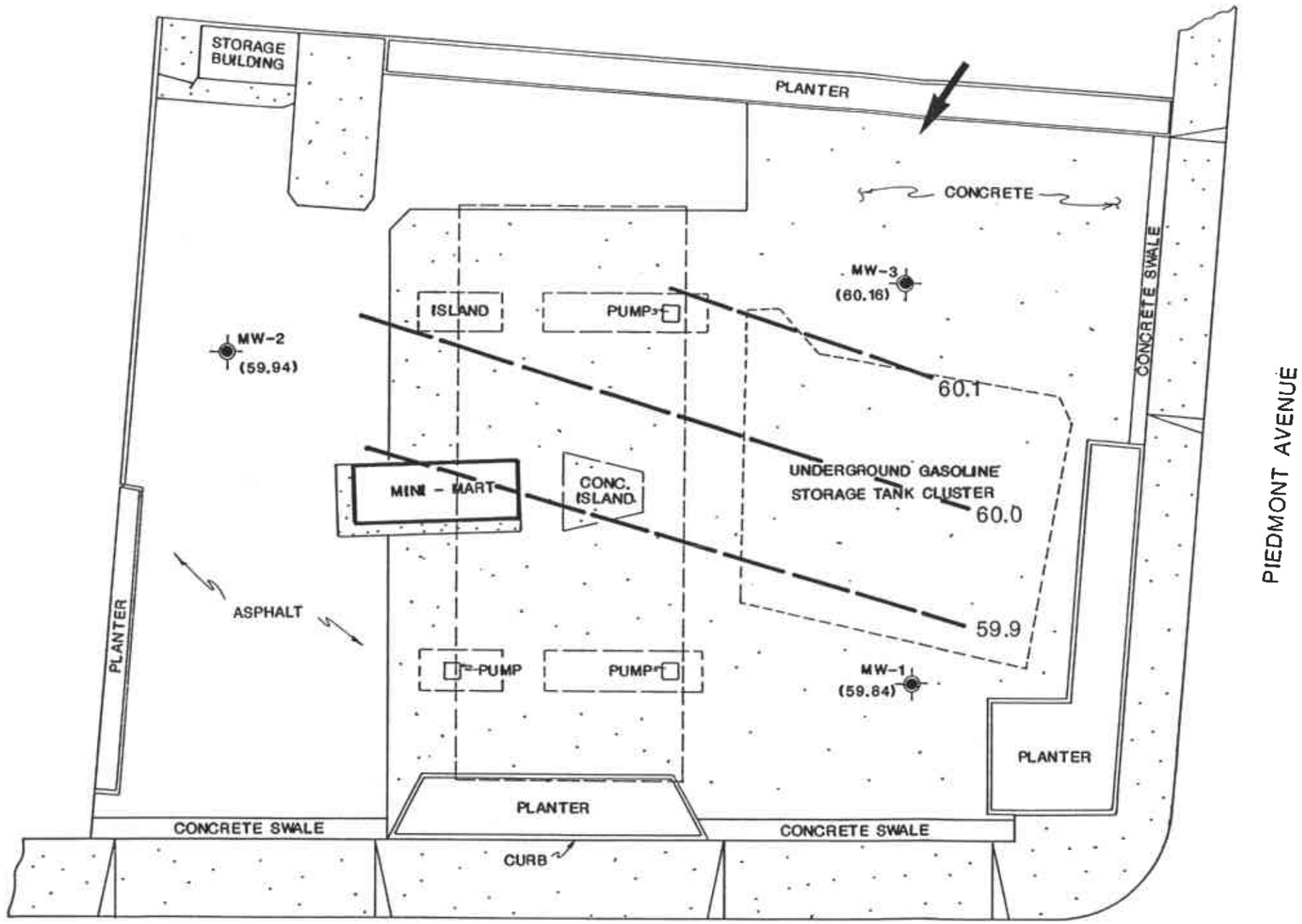
GROUNDWATER ELEVATION MAP (5/2/89)

SHELL SERVICE STATION

230 Mac ARTHUR BOULEVARD

OAKLAND, CALIFORNIA

REVIEWED BY:	APPROVED BY:
K.P.	MTB
JOB #: 1847G	DRAWN BY: J.C.
DATE: 7-12-89	DRAWING #: FIG. 3



LEGEND

- MW-1 — GROUNDWATER MONITORING WELL
- (59.94) — GROUNDWATER ELEVATION IN FEET (DATUM: M.S.L.)
- 60.1 — 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 (6/6/89)	REVIEWED BY: K.P.	APPROVED BY: TMG
SHELL SERVICE STATION		
230 Mac ARTHUR BOULEVARD	JOB #: 1847G	DRAWN BY: J.C.
OAKLAND, CALIFORNIA	DATE: 7-12-89	DRAWING #: FIG. 4

APPENDIX A

LABORATORY ANALYTICAL DATA

NET NATIONAL ENVIRONMENTAL TESTING, INC.

NET Pacific, Inc.
435 Tesconi Circle
Santa Rosa, CA 95401
Tel: (707) 526-7200
Fax: (707) 526-9623

Formerly: ANATEC Labs, Inc.

Steve Costello
ENSCO
41674 Christy St
Fremont, CA 94538

06-23-89
NET Pacific Log No: 6706
Series No: 509
Client Ref: PO #13868

Subject: Analytical Results for "Shell Oakland, 230 MacArthur Blvd"
Received 06-08-89

Dear Mr. Costello:

Sample analysis in support of the project referenced above has been completed and results are presented on following pages. Should you have questions regarding procedures or results, please feel welcome to contact Client Services.

Submitted by:

Susan Joy Griffin
Group Leader
Gas Chromatography

Approved by:

Sue J. Long
Group Leader
Classical Chemistry

/ml
Enc: Sample Custody Document

KEY TO ABBREVIATIONS

mean	:	Average; the sum of the measurements divided by the total number of measurements.
mg/Kg (ppm)	:	Concentration in units of milligrams of analyte per kilogram of sample, wet-weight basis (parts per million).
mg/L	:	Concentration in units of milligrams of analyte per liter of sample, unless noted otherwise.
mL/L/hr	:	Milliliters per liter per hour.
MPN/100 mL	:	Most probable number of bacteria per one hundred milliliters of sample.
N/A	:	Not applicable.
ND	:	Not detected; the analyte concentration is less than the listed reporting limit.
NR	:	Not requested.
NTU	:	Nephelometric turbidity units.
RL	:	Reporting limit.
RPD	:	Relative percent difference, $[V^1-V^2/V \text{ mean}]x100$.
SNA	:	Standard not available.
ug/Kg (ppb)	:	Concentration in units of micrograms of analyte per kilogram of sample, wet-weight basis (parts per billion).
ug/L	:	Concentration in units of micrograms of analyte per liter of sample.
ug/filter	:	Concentration in units of micrograms of analyte per filter.
umhos/cm	:	Micromhos per centimeter.
*	:	See cover letter for details.

THE COVER LETTER AND KEY TO ABBREVIATIONS ARE AN INTEGRAL PART OF THIS REPORT

Parameter	Reporting Limit (ppm)	Descriptor, Lab No. and Results (ppm) BB-1 06-06-89 1001 (-28851)	MW-1 06-06-89 1013 (-28852)	MW-3 06-06-89 1100 (-28853)	MW-2 06-06-89 1140 (-28854)
PETROLEUM HYDROCARBONS					
Volatile, as Gasoline	0.05	ND	ND	ND	ND
DATE ANALYZED		06-15-89	06-15-89	6-16-89	6-16-89
METHOD 8015/5030					

Parameter	Reporting Limit (ppm)	Descriptor, Lab No. and Results (ppm) BB-1 06-06-89 1001 (-28851)	MW-1 06-06-89 1013 (-28852)	MW-3 06-06-89 1100 (-28853)	MW-2 06-06-89 1140 (-28854)
Benzene	0.0005	ND	ND	ND	ND
Ethylbenzene	0.0015	ND	ND	ND	ND
Toluene	0.0005	ND	ND	ND	ND
Xylenes, total	0.0015	ND	ND	ND	ND
METHOD 602					

NET Pacific

CHAIN OF CUSTODY RECORD

P.U. #135866

PROJECT NO	PROJECT NAME
1847G	Shell Oakland 230 MacArthur Blvd

SAMPLERS: (Signature)
John Monroe

NO	DATE	TIME	DRIVE	GRAB	STATION AND LOCATION	TEST REQUESTED: TPH/BTEX	REMARKS
BB-1	6/6/89	10:01			2 preserved VOA	X	Normal TAT
MW-1		10:13			"	X	
MW-3		11:00			"	X	
MW-2	↓	11:40			"	X	

RELINQUISHED BY	DATE	TIME	RECEIVED BY:	RELINQUISHED BY:	DATE	TIME	RECEIVED BY
	6/7/89	1345	Diane Krueger	Diane Krueger	6-8-89	0240	
RELINQUISHED BY	DATE	TIME	RECEIVED BY:	RELINQUISHED BY: (via NCS)	DATE 6/8/89	TIME 0710	RECEIVED BY LABORATORY

REMARKS
Report to Steve Costello 6706 - 509

DISTRIBUTION

ensco environmental services, inc.
41674 Christy Stree
Fremont, CA 94538-311
(415) 659-040
Fax: (415) 651-467
Contr. Lic. No. 46432

FORM DATED 1-28-87

APPENDIX B

EES PROTOCOLS

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 trisodium 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 into 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.

SHELL STATUS LOG

Project Number 1847G
230 MacArthur Boulevard
Oakland, CA

Date Mailed	Report Dated	Description
9/30/88		Preliminary Soil and Groundwater Report to
		Stan Roller
11/7/88		Preliminary Soil and Groundwater Report to
		Alameda County Health Department and Alameda
		County Water-Zone 7 (Craig Mayfield)
2/6/89		January Quarterly Report to Diane Lundquist
4/7/89	4/5/89	April Quarterly Report to Diane Lundquist
5/3/89	5/3/89	April Quarterly Report to Alameda County
		Health Department, Alameda County Water-
		Zone 7 (Craig Mayfield), and CRWQCB
7/21/89	7/21/89	July Quarterly Report, Groundwater Sampling
		and Analyses: Shell Oil Company-Diane Lundquist