Shell Oil Company

EAST BAY
MARKETING DISTRICT

P.O. Box 4023
Concord, CA 94524
(415) 676-1414

September 29, 1989

10/3/89

Mr. Lester Feldman
Regional Water Quality Control Board
1111 Jackson Street, Room 6000
Oakland, CA 94607

SUBJECT: SHELL STATION
WIC #204-6001-0109
29 WILDWOOD AVENUE
PIEDMONT, CA

Dear Mr. Feldman:

Enclosed is a report on a subsurface investigation conducted in July 1989 by Weiss Associates (WA) for the Shell Oil Company Service Station at 29 Wildwood Avenue, Piedmont, California, and a WA work plan for additional work at the site. As indicated in the WA subsurface investigation report, hydrocarbons were detected in soil samples from four of nine borings drilled on site, and two of the on site four wells contain benzene above the California Department of Health Services Recommended Action Level of 0.7 parts per billion. The westward ground water flow direction indicated by ground water elevation data is somewhat uncertain due to the strong upward hydraulic gradient at the site.

Based on the results of the WA and previous investigations, Shell Oil intends to install additional wells down gradient of this site to further define the extent of hydrocarbons in ground water and the ground water flow direction. The scope of work for this additional investigation is presented in the attached WA work plan.

If you have any questions, please contact me at (415) 676-1414, Ext. 127.

Very truly yours,

Diane M. Lundquist

Diane M. Lundquist
District Environmental Engineer

Enclosures

cc + Encls: Mr. Gil Wistar, Alameda County Environmental Health
Mr. Craig Mayfield, Alameda County Flood Control and Water Conservation District

JM9277201

WEISS ASSOCIATES
Geologic and Environmental Services
Fax: 415-547-5043 Phone: 415-547-5420
5500 Shellmound Street, Emeryville, CA 94608

SUBSURFACE INVESTIGATION AND GROUND WATER MONITORING,

at

Shell Service Station
WIC #204-6001-0109
29 Wildwood Avenue
Piedmont, California

prepared for

Shell Oil Company
P.O. Box 4848
Anaheim, CA 92803

June 21, 1990

WEISS ASSOCIATES

SUBSURFACE INVESTIGATION
AND
GROUND WATER MONITORING,

at

Shell Service Station
WIC #204-6001-0109
29 Wildwood Avenue
Piedmont, California

prepared by

Weiss Associates
5500 Shellmound Street
Emeryville, California

N. Scott MacLeod
Senior Staff Geologist

Joseph P. Theisen
Senior Project Hydrogeologist

I certify that Weiss Associates' work on Shell Service Station WIC #204-6001-0109, 29 Wildwood Avenue, Piedmont, California was conducted under my supervision. To the best of my knowledge, the data contained herein are true and correct and satisfy the specified scope of work for this project.

REGISTERED GEOLOGIST
RICHARD B. WEISS
No. EG 1112
CERTIFIED ENGINEERING GEOLOGIST
STATE OF CALIFORNIA

Richard B. Weiss Date
Certified Engineering Geologist
No. EG1112

CONTENTS

TABLES

FIGURES

APPENDICES

SUMMARY

On January 23 and 24, 1990, Weiss Associates (WA) drilled three soil borings and installed two ground water monitoring wells for a Phase II subsurface investigation at Shell Service Station WIC #204-6001-0109, located at 29 Wildwood Avenue in Piedmont, California. No total petroleum hydrocarbons as gasoline (TPH-G) or benzene, ethylbenzene, toluene and xylenes (BETX) were detected in soil samples collected from the three borings.

On January 30 and 31, 1990, WA collected ground water from the two new wells and the four previously installed wells. TPH-G and/or BETX were only detected in two onsite wells at a maximum of 5,500 and 440 parts per billion, respectively.

Ground water flows westward beneath the site and south-southwestward downgradient of the site. Previously installed well E-4 is a flowing artesian well that screens a deeper water-bearing zone.

Hydrocarbons in ground water are well characterized by the six existing on- and offsite wells.

On April 27, 1990 WA collected ground water samples from all six on and off-site wells, as part of the quarterly ground water monitoring at the site. The chemical analytic results for the water samples and the ground water flow direction were consistent with historic results.

1 INTRODUCTION

The results of the Weiss Associates (WA) Phase II subsurface investigation at Shell Service Station WIC #204-6001-0109 located at 29 Wildwood Avenue in Piedmont, California (Figure 1) are presented below. The objective of this investigation was to determine the extent of hydrocarbons in ground water downgradient of the site.

1.1 SCOPE OF WORK

The scope of work for this investigation was to:

1). Prepare a site safety plan;

2) Review previous reports to estimate the distribution of hydrocarbons beneath the site and the most likely direction of ground water flow;

3) Drill three soil borings and collect soil samples for hydrogeologic description, and for possible chemical analysis;

4) Survey the soil samples in the field with a portable photoionization detector (PID) to determine whether the samples contain volatile hydrocarbons;

5) Analyze selected soil samples for total petroleum hydrocarbons as gasoline (TPH-G) and benzene, ethylbenzene, toluene and xylenes (BETX);

6) Complete the borings as 4-inch diameter ground water monitoring wells;

7) Develop and sample the wells and analyze the ground water samples for TPH-G and BETX;

8) Arrange for the disposal of soil cuttings and ground water produced during drilling, well development and water sampling;

9) Survey the well top-of-casing elevations referenced to mean sea level, measure ground water depths and calculate the ground water elevations, gradient and flow direction; and

10) Report the results.

These tasks are described below.

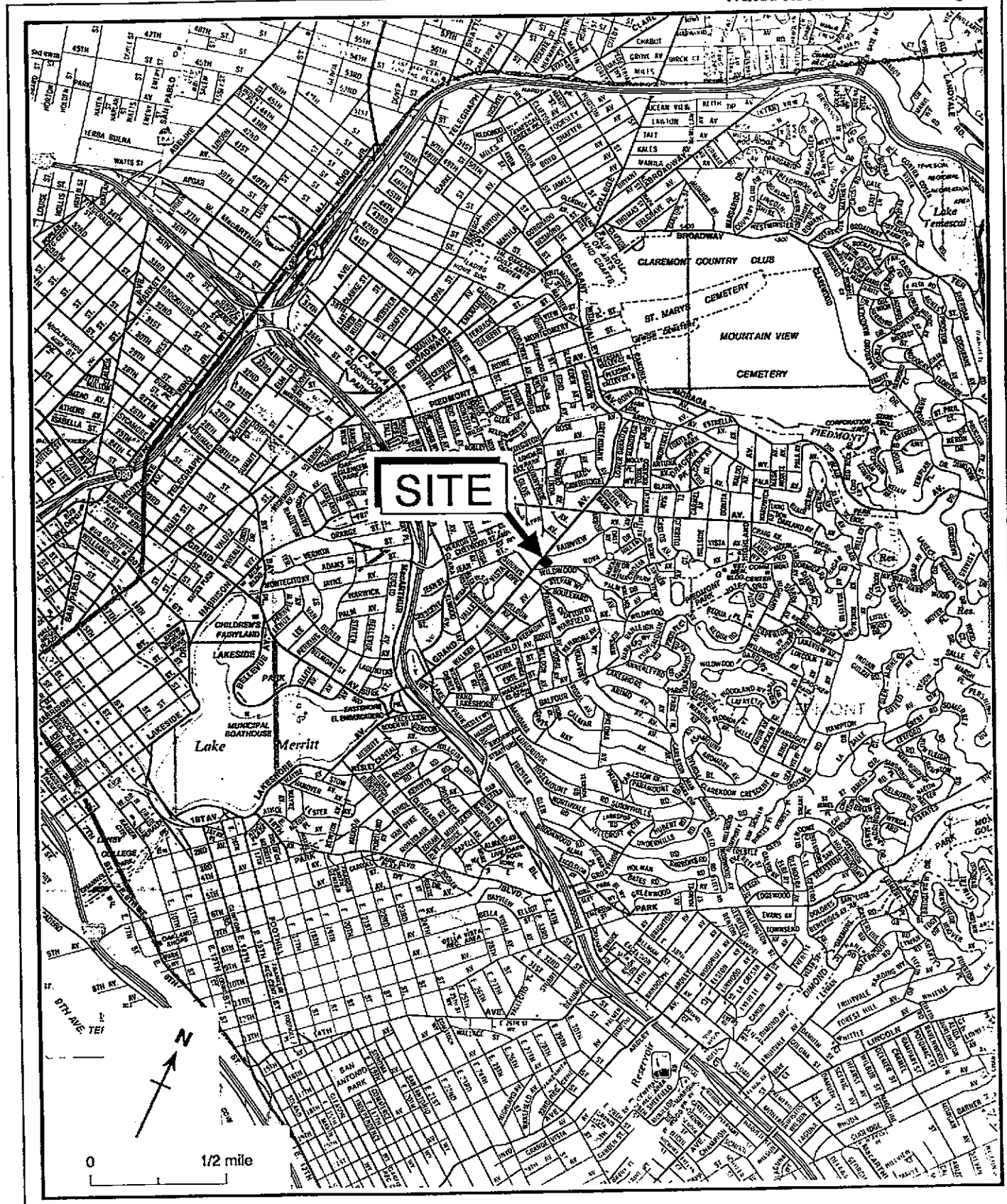

Figure 1. Site Location Map - Shell Service Station WIC #204-6001-0109, 29 Wildwood Avenue, Piedmont, California

1.2 SITE SETTING AND LOCAL GEOLOGY

The Shell Service Station is located at the intersection of Grand and Wildwood Avenues in Oakland, California, approximately one mile west of the Hayward Fault Zone. The site lies in hilly topography at the confluence of surface water drainages that coincide with the trends of Grand and Wildwood Avenues. The station is built on Quaternary alluvial deposits underlain by the Pleistocene San Antonio Formation and the Jurassic/Cretaceous Franciscan Formation (Radbruch, 1969).

1.3 BACKGROUND

In August 1984, Gettler Ryan Inc. of Hayward, California contracted EMCON, Inc. of San Jose, California to drill four soil borings around the existing steel underground gasoline storage tanks and install groundwater monitoring well E-4 to assess the extent of hydrocarbons along the western site boundary. Although the Shell engineering files reported no historical product loss at the site, the EMCON soil sample analytic results indicated hydrocarbons in soil surrounding the gasoline storage tanks. Monitoring well E-4, a flowing artesian well, was apparently completed in the second water-bearing zone. This well is screened from 23 to 35 ft below grade, with a sand pack from 20 to 35 ft below grade (EMCON, 1984).

In September 1984, new fuel lines and three new single-walled fiberglass underground tanks were installed to replace the existing steel fuel storage tanks (Shell, 1988).

In October 1988, Pacific Telephone Company encountered contaminated soil while excavating adjacent to the sidewalk along Grand Avenue northwest of the Shell Service Station fuel storage tanks (Shell, 1988).

In October 1988, Ensco Environmental Services (ENSCO) of Fremont, California, drilled five soil borings to determine whether soils adjacent to the existing fiberglass gasoline storage tanks contained hydrocarbons. Analytic results indicated up to 6,500 parts per million (ppm) TPH-G in 10 ft depth soil samples from the east end of the tanks (Ensco, 1988).

In July 1989, WA drilled nine soil borings and installed ground water monitoring wells MW-1, MW-2 and MW-3 at the site for a Phase I subsurface investigation (WA, 1989). TPH-G were detected in soil samples from four of the borings at a maximum of 710 ppm in a sample from 3.5 ft depth in a boring drilled immediately west of the tanks. Ground water samples were collected from wells MW-1, MW-2, MW-3 and E-4. Hydrocarbons were detected in water samples from wells MW-2 and MW-3 at a maximum of 3,900 parts per billion (ppb) TPH-G and 380 ppb benzene in the MW-3 sample. No hydrocarbons were detected in water samples from wells MW-1 and E-4.

2 SUBSURFACE INVESTIGATION

On January 23 and 24, 1990, Soils Exploration Services, Inc. of Vacaville, California drilled three soil borings using a CME-55 hollow-stem auger drill rig (Figure 2). WA Senior Staff Geologist N. Scott MacLeod directed the drilling, working under the supervision of Richard B. Weiss, Certified Engineering Geologist. The objective of the drilling was to determine the extent of hydrocarbons in ground water down- and crossgradient of the site.

2.1 SOIL BORINGS AND SAMPLING

Borings BH-J and BH-L were drilled cross-gradient and BH-K was drilled down-gradient of the site as shown on Figure 2. Soil samples were collected in each boring at least every 5 ft to characterize the subsurface sediments and for possible chemical analysis. Samples were collected with a washed split-barrel sampler lined with steam-cleaned, 2-inch brass tubes. After removal from the sampler, the tubes were immediately trimmed, capped with Teflon tape and plastic end caps, hermetically sealed with duct tape, and labeled and refrigerated for delivery under chain-of-custody to National Environmental Testing, Inc. (NET) of Santa Rosa, California. Boring logs are presented in Appendix A and chain-of-custody forms for the soil samples are included in Appendix B.

Sediments encountered during drilling consisted of interbedded clay, silt and sand. In borings BH-J and BH-K low permeability sediments occurred to about 7 ft depth. These sediments were underlain by moderate permeability sand to about 16 ft depth. Low permeability sediments were found in boring BH-L to the total boring depth of 25.5 ft. The site stratigraphy is shown by the geologic cross-sections presented as Figure 3.

Since ground water was encountered during drilling, monitoring wells MW-4 and MW-5 were installed in borings BH-J and BH-K, respectively. No ground water was encountered in boring BH-L, therefore this boring was backfilled with Portland type I-II cement to the ground surface. A high density of underground and overhead utilities on the southeast side of Wildwood Avenue, adjacent to boring BH-L, prevented installation of an additional boring or well in this region.

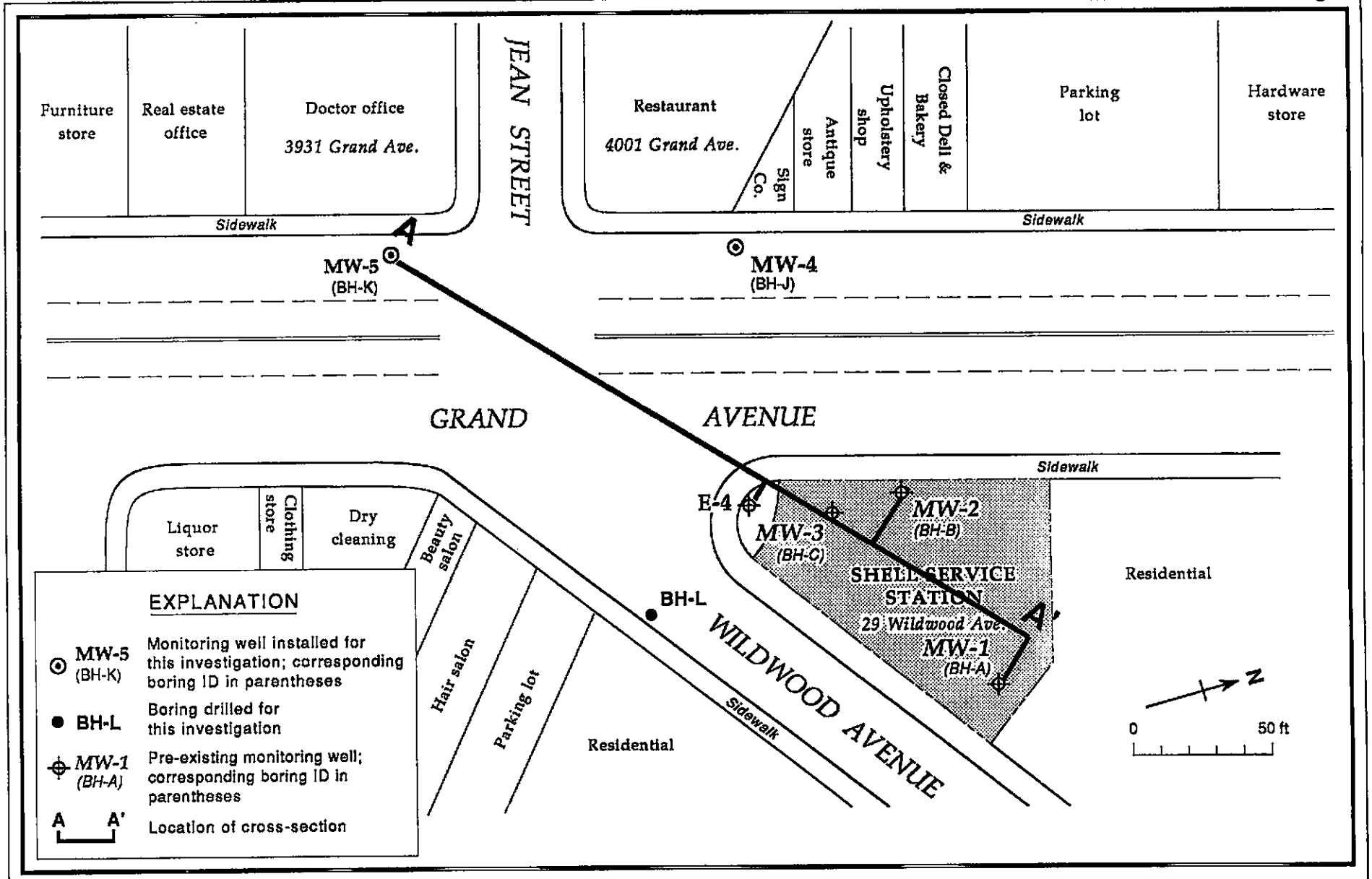

Figure 2. Soil Boring, Monitoring Well and Cross-Section Locations - Shell Service Station, WIC #204-6001-0109, 29 Wildwood Avenue, Piedmont, California

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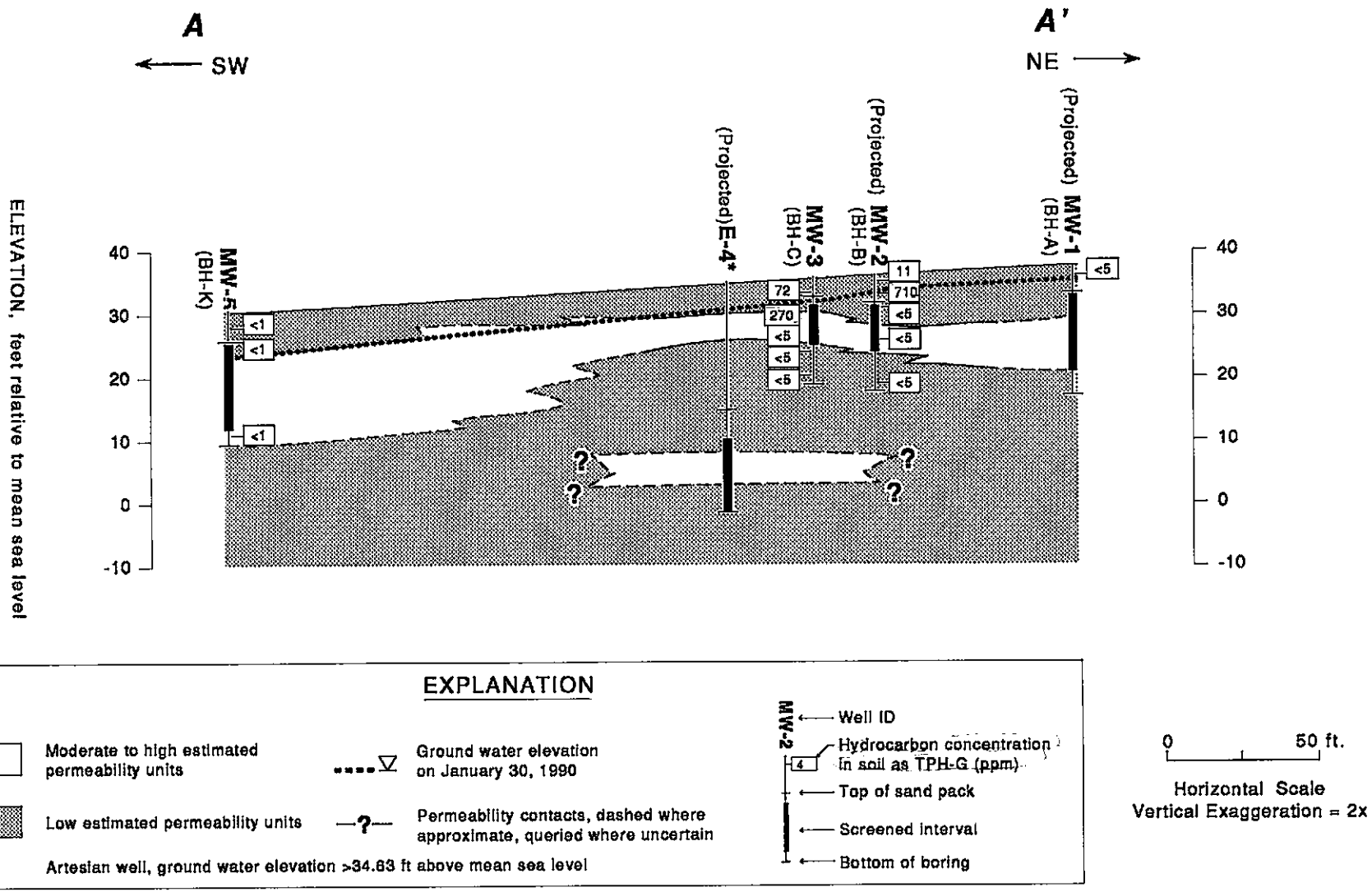

Figure 3. Geologic Cross-Section A-A' - Shell Service Station WIC #204-6001-0109, 29 Wildwood Avenue, Piedmont, California

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Soil cuttings from the borings were contained in Department of Transportation (DOT)-approved 55-gallon drums with plastic liners and stored pending analytic results for the borehole soil samples. Based on the analytic results, soil from all borings was disposed of at West Contra Costa Sanitary Landfill by Crosby and Overton, Inc. (C&O) of Oakland, California.

2.2 ANALYTIC RESULTS FOR SOIL

Soil samples were surveyed in the field with a PID to qualitatively determine the presence of volatile hydrocarbons. The PID measures vapor concentrations in parts per million by volume and is used for qualitative, not quantitative, assessment. This is because the correlation between the volume measurement of the PID and mass measurement of the analytical tests is not well defined, and because field measurement procedures are not as rigorous as laboratory measurement procedures. PID readings are shown on the boring logs presented in Appendix A.

Based on field observations and PID measurements, ten soil samples were analyzed by NET for TPH-G by modified EPA Method 8015, gas chromatography with flame ionization detection (GC/FID) and for BETX by EPA Method 8020, gas chromatography with photoionization detection (GC/PID). No TPH-G or BETX were detected in any soil sample. Analytic results for soil samples are compiled in Table 1 and laboratory analytic reports and chain-of-custody documents are presented in Appendix B.

2.3 MONITORING WELL INSTALLATION, DEVELOPMENT AND SAMPLING

Ground water was first encountered during drilling of borings BH-J and BH-K at about 8 ft depth and rose to about 5.5 ft depth after well completion. Monitoring wells MW-4 and MW-5 screen sediments from about 4 ft to 16 ft depth to monitor the first water-bearing zone. The wells are constructed with 4-inch diameter, 0.020-inch slotted, flush threaded Schedule 40 PVC well screen and blank casing. Lonestar #3 Monterey sand was tremied into the annular space to about 1 ft above the well screen. A 1/2 ft thick bentonite layer separates the sand from overlying cement grout. The wellheads are secured with locking well-plugs beneath at-grade traffic-rated vaults.

TABLE 1. Analytic Results for Soil - Shell Service Station WIC #204-6001-0109, 29 Wildwood Avenue, Piedmont, California

Soil Boring (Well ID)	Sample Depth (ft)	Date Sampled	Analytic Method	Sat/ Unsat	TPH-G	B	E	T	X
					<---------- parts per million (mg/kg) ---------->				
BH-J	2.4	1/23/90	8015/8020	Unsat	<1	<0.0025	<0.0025	<0.0025	<0.0025
(MW-4)	5.2	1/23/90	8015/8020	Unsat	<1	<0.0025	<0.0025	<0.0025	<0.0025
	18.2	1/23/90	8015/8020	Sat	<1	<0.0025	<0.0025	<0.0025	<0.0025
BH-K	3.2	1/23/90	8015/8020	Unsat	<1	<0.0025	<0.0025	<0.0025	<0.0025
(MW-5)	5.2	1/23/90	8015/8020	Unsat	<1	<0.0025	<0.0025	<0.0025	<0.0025
	18.0	1/23/90	8015/8020	Sat	<1	<0.0025	<0.0025	<0.0025	<0.0025
BH-L	3.2	1/24/90	8015/8020	Unsat	<1	<0.0025	<0.0025	<0.0025	<0.0025
	6.4	1/24/90	8015/8020	Unsat	<1	<0.0025	<0.0025	<0.0025	<0.0025
	15.2	1/24/90	8015/8020	Sat (?)	<1	<0.0025	<0.0025	<0.0025	<0.0025
	25.2	1/24/90	8015/8020	Sat (?)	<1	<0.0025	<0.0025	<0.0025	<0.0025

Abbreviations:

TPH-G = Total petroleum hydrocarbons as gasoline
B = Benzene
E = Ethylbenzene
T = Toluene
X = Xylenes

Sat = Saturated soil sample
Unsat = Unsaturated soil sample
<n = not detected at detection limit of n parts per million

Analytical Laboratory:

National Environmental Testing, Inc. (NET), Santa Rosa, California

Analytic Methods:

8015 = Modified EPA Method 8015 for TPH-G
8020 = EPA Method 8020 for BETX

Wells MW-4 and MW-5 were developed on January 30, 1990 by WA environmental technicians using surge block agitation and airlift evacuation. After development, air lift evacuation yielded 0.25 gallons per minute (gpm) from well MW-4 and 3.0 gpm from well MW-5.

Ground water samples were collected from wells MW-1 through MW-3 on January 30, 1990, and from wells MW-4 and MW-5 on January 31, 1990. Samples were collected in steam-cleaned Teflon bailers after evacuating at least three well-casing volumes of water from each well. The water samples were decanted into 40 ml glass volatile organic analysis (VOA) vials, preserved with hydrochloric acid, and labeled and refrigerated for transport under chain-of-custody to NET. Well development and sampling purge water and rinseate generated during steam-cleaning of the drilling equipment was contained in DOT-approved 55-gallon drums and transported by C&O to the Shell Refinery in Martinez, California for recycling.

2.4 ANALYTIC RESULTS FOR GROUND WATER

Ground water samples from all wells were analyzed for TPH-G and BETX by modified EPA Method 8015, and EPA Method 602, respectively. Analytic results for water samples are summarized in Table 2 and the laboratory analytic reports and chain-of-custody forms are included in Appendix C.

No TPH-G or BETX were detected in ground water from new monitoring wells MW-4 and MW-5 or in samples from previously installed wells MW-1 and E-4. Hydrocarbons were detected in ground water samples from wells MW-2 and MW-3, which are both adjacent to the underground storage tanks, at a maximum of 5,500 ppb TPH-G and 440 ppb benzene in the MW-3 sample.

2.5 GROUND WATER ELEVATIONS

Top-of-casing elevations for wells MW-4 and MW-5 were surveyed referenced to mean sea level by John E. Koch of Berkeley, California (California Land Surveyor, License No. LS4811) on February 8, 1990. The datum elevation for the survey was a City of Oakland benchmark located on the eastern side of Grand Avenue opposite 3794 Grand Avenue. Table

TABLE 2. Analytic Results for Ground Water, Shell Service Station WIC #204-6001-0109, 29 Wildwood, Piedmont, California.

Well ID	Date Sampled	Analytical Laboratory	Analytic Methods	TPH-G	B	E	T	X	VOCs
				<---------- parts per billion (µg/L) ---------->					
MW-1	7/12/89	IT	8015/8020/624	<50	<0.5	<1	<1	<3	ND
	1/30/90	NET	8015/8020	<50	<0.5	<0.5	<0.5	<0.5	---
	4/27/90	NET	8015/8020	<50	<0.5	<0.5	<0.5	<0.5	---
MW-2	7/12/89	IT	8015/8020/624	60	2.7	<1	<1	<3	ND
	1/30/90	NET	8015/8020	<50	6.6	0.54	<0.5	0.93	---
	4/27/90	NET	8015/8020	60	2.1	<0.5	<0.5	<0.5	---
MW-3	7/12/89	IT	8015/8020/624	3,900	380	99	41	30	a
	1/30/90	NET	8015/8020	5,500	440	79	35	130	---
	4/27/90	NET	8015/8020	4,500	310	37	26	110	---
MW-4	1/31/90	NET	8015/8020	<50	<0.5	<0.5	<0.5	<0.5	---
	4/27/90	NET	8015/8020	130[b]	<0.5	<0.5	<0.5	<0.5	---
MW-5	1/31/90	NET	8015/8020	<50	<0.5	<0.5	<0.5	<0.5	---
	4/27/90	NET	8015/8020	210[b]	<0.5	<0.5	<0.5	<0.5	---
E-4	7/12/89	IT	8015/8020/624	<50	<0.5	<1	<1	<3	ND
	1/31/90	NET	8015/8020	<50	<0.5	<0.5	<0.5	<0.5	---
	4/27/90	NET	8015/8020	120[b]	<0.5	<0.5	<0.5	<0.5	---
Trip Blank	7/12/89	IT	8015/8020/624	<50	<0.5	<1	<1	<3	---
	1/31/90	NET	8015/8020	<50	<0.5	<0.5	<0.5	<0.5	---
	4/27/90	NET	8015/8020	<50	<0.5	<0.5	<0.5	<0.5	---
Bailer Blank	4/27/90	NET	8015/8020	110[b]	<0.5	<0.5	<0.5	<0.5	---
DHS MCLs				NE	1	680	100[c]	1,750	

--Table 2 continued on next page--

TABLE 2. Analytic Results for Ground Water, Shell Service Station WIC #204-6001-0109, 29 Wildwood, Piedmont, California (continued)

Abbreviations:

TPH-G = Total Petroleum Hydrocarbons as Gasoline
B = Benzene
E = Ethylbenzene
T = Toluene
X = Xylenes
VOCs = Volatile Organic Compounds
ND = Not detected at detection limits of 5 to 10 parts per billion (ppb)
--- = Not Analyzed
DHS MCLs = California Department of Health Services Maximum Contaminant Levels for drinking water
NE = DHS MCL not established
<n = Not detected at detection limit of n ppb

Notes:

a = BETX detected at 410, 97, 36 and 300 parts per billion, respectively by EPA Method 624

[b] = Non-fuel peak reported as TPH-G as required by EPA Method 8015

[c] = DHS Recommended Drinking Water Action Level, MCL not established

Analytical Laboratory:

IT = International Technology Corporation, Inc., San Jose, California
NET = National Environmental Testing, Inc., Santa Rosa, California

Analytic Methods:

624 = EPA Method 624 for VOCs
8015 = Modified EPA Method 8015 for TPH-G
8020 = EPA Method 8020 for BETX

3 presents measured water depths and ground water elevations for all wells. On January 30, ground water flowed westward beneath the site and south-southwestward downgradient of the site with a gradient of about 0.04 ft/ft (Figure 4).

Table 3. Ground Water Elevation Data, Shell Service Station WIC #204-6001-0109, 29 Wildwood Avenue, Piedmont, California

Well ID	Date	Top-of-Casing Elevation (ft above msl)	Depth to Water (ft)	Ground water Elevation (ft above msl)
MW-1	7/12/89	37.96	2.76	35.20
	1/30/90		3.10	34.86
	4/27/90		3.24	34.72
MW-2	7/12/89	34.89	3.66	31.23
	1/30/90		3.49	31.40
	4/27/90		3.79	31.10
MW-3	7/12/89	35.00	3.83	31.17
	1/30/90		3.24	31.76
	4/27/90		4.02	30.98
MW-4	1/30/90	33.73	4.50	29.23
	4/27/90		3.62	30.11
MW-5	1/30/90	31.38	7.12	24.26
	4/27/90		4.19	27.19
E-4	7/12/89	34.63	[a]	>39.1
	1/30/90		[b]	>34.63
	4/27/90		[b]	>34.63

[a] = Well E-4 is a flowing artesian well. The potentiometric surface was greater than 4.5 ft above ground surface.

[b] = Well E-4 water elevation not measured.

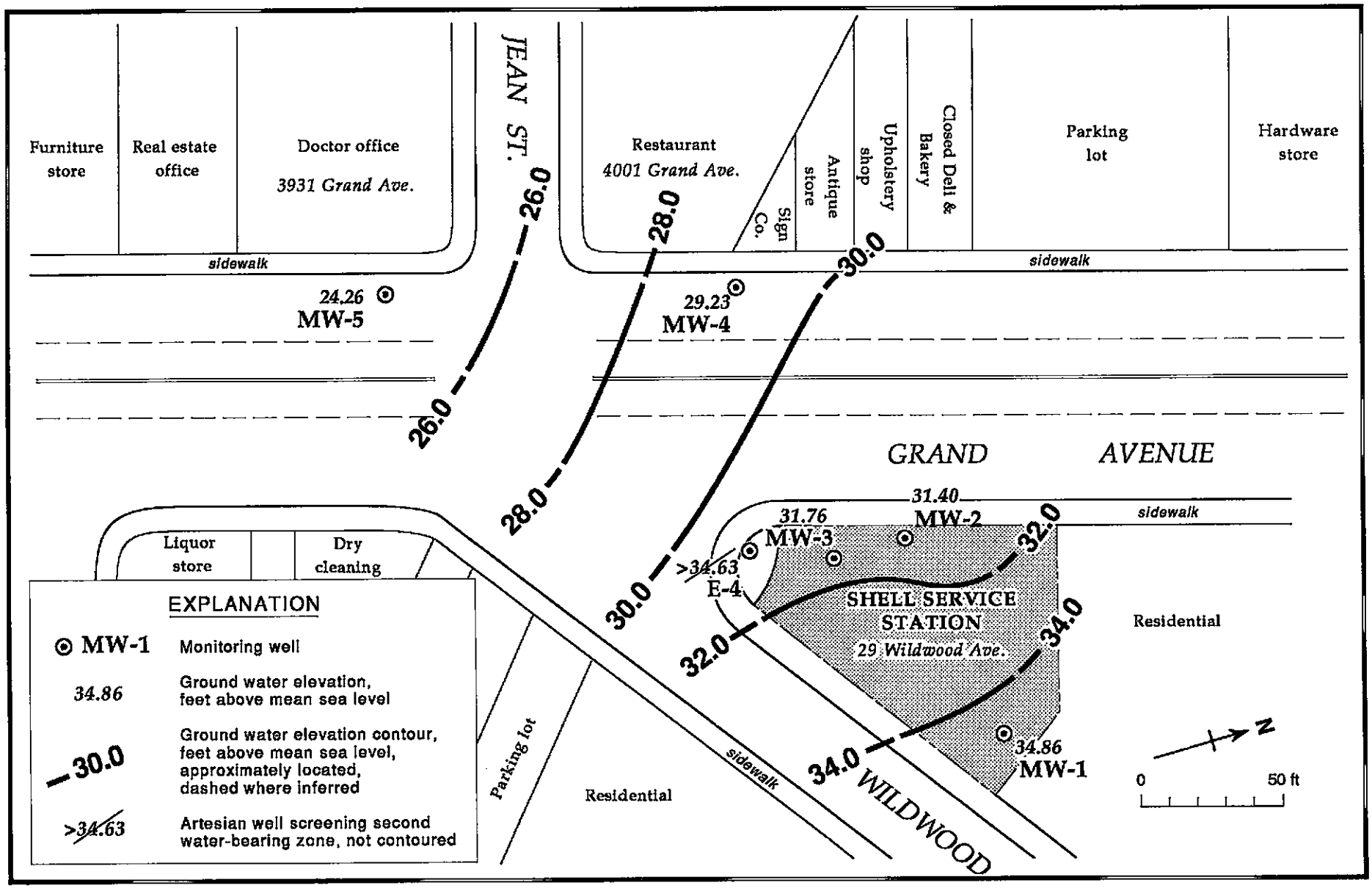

Figure 4. Ground Water Elevation Contours - January 30, 1990 - Shell Service Station, WIC #204-6001-0109, 29 Wildwood Avenue, Piedmont, California

6/21/90

3 SECOND QUARTER 1990 GROUND WATER MONITORING

Weiss Associates (WA) collected ground water samples from the six site monitoring wells on April 27, 1990 as part of the quarterly ground water monitoring program at the site. The results of the sampling are presented below.

3.1 GROUND WATER SAMPLING

Personnel: Jim Martin
WA Position: Environmental Technician
Date of sampling: April 27, 1990

Monitoring wells sampled: MW-1 through MW-5 and E-4

Method of purging wells:

- Steam-cleaned PVC bailers

Volume of water purged prior to sampling:

- Wells that were purged of about three well-casing volumes, approximately 14 to 32 gallons: MW-1, MW-3 and MW-5

- Wells that were purged dry; water level was allowed to recover to within 80 percent of static water level or for at least two hours prior to sampling: MW-2, MW-4 and E-4

Method of ground water sample collection:

- Decanted from steam-cleaned Teflon bailer

Method of containing ground water samples:

- 40 ml glass, volatile organic analysis (VOA) vials, preserved with hydrochloric acid and sealed in plastic guard bottles containing activated carbon pellets

All samples were refrigerated and transported under chain-of-custody to the analytical laboratory.

Water samples transported to:

- NET Pacific, Santa Rosa, California

Samples were received by the laboratory on May 1, 1990.

Quality assurance/quality control:

- A bailer blank was submitted for analysis.
- A travel blank was submitted for analysis.

Water sample collection records are included in Attachment D.

3.2 GROUND WATER ELEVATIONS

Water levels were measured in: all wells

Water levels were measured on April 27, 1990.

Direction of ground water flow: Westward beneath the site and south-southwestward downgradient of the site.

Water levels and ground water elevations are presented in Table 3. Ground water elevation contours for April 27, 1990 are plotted on Figure 5. The site lies at the confluence of surface drainages that coincide with Wildwood and Grand Avenue. The potentiometric surface of flowing artesian well E-4 was greater than 4.5 above ground surface in July 1989. This well is screened in a deeper water-bearing zone.

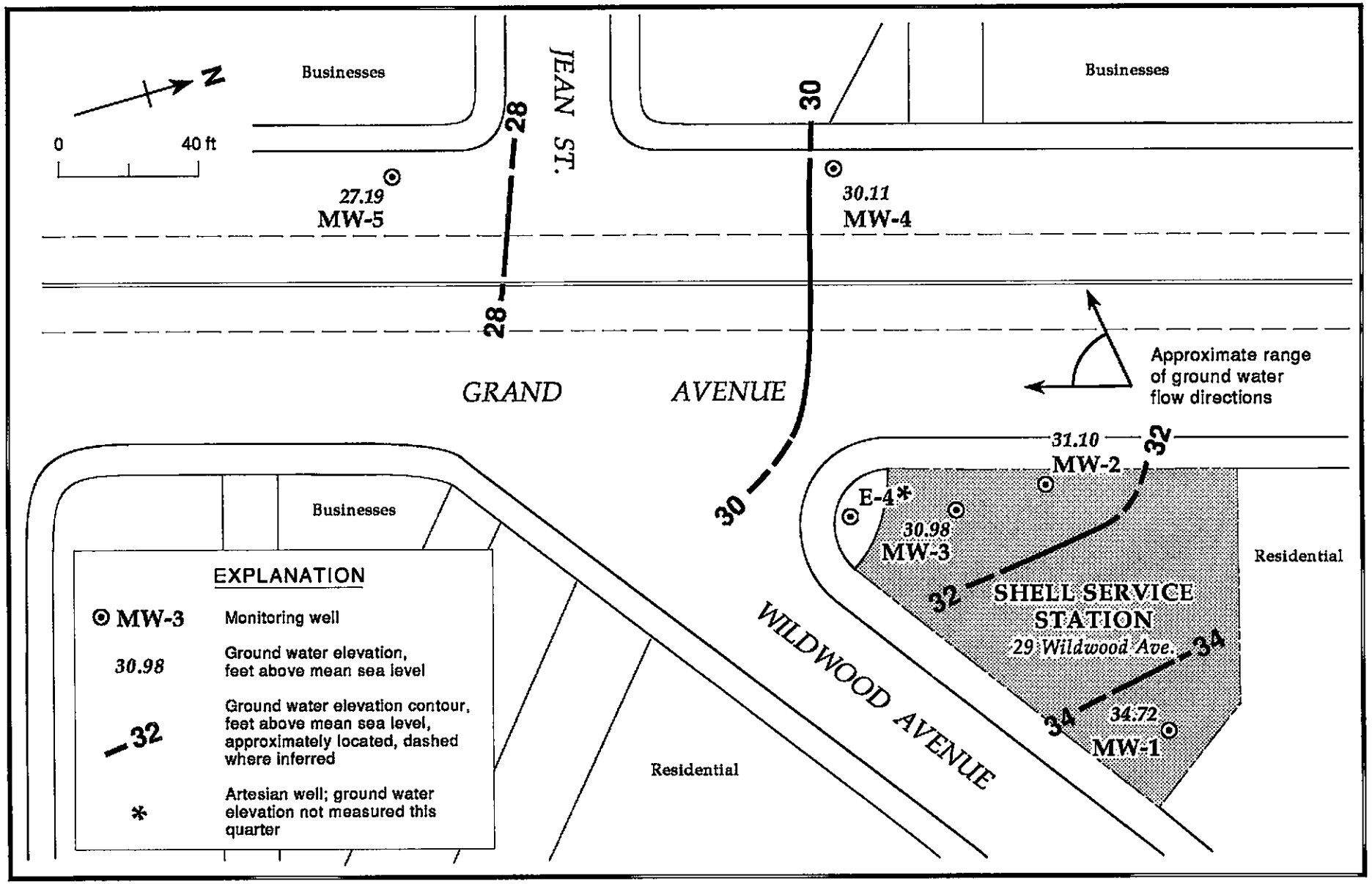

Figure 5. Ground Water Elevation Contours - April 27, 1990 - Shell Service Station, WIC #204-6001-0109, 29 Wildwood Avenue, Piedmont, California

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3.3 CHEMICAL ANALYSES

The ground water samples were analyzed for:

- Total petroleum hydrocarbons as gasoline (TPH-G) by modified EPA Method 8015
- Benzene, ethylbenzene, toluene and xylenes (BETX) by EPA Method 8020

Samples were analyzed by the laboratory on May 2 and 3, 1990. The results of the water analyses are presented in Table 2 and the analytic reports and the chain of custody forms for water are included in Attachment C.

Discussion of analytic results of ground water for this quarter:

- Hydrocarbons have not been detected in monitoring well MW-1 since sampling began.
- Hydrocarbon concentrations in monitoring wells MW-2 and MW-3 are consistent with historical results.
- TPH-G detected in monitoring wells MW-4, MW-5, E-4 and the bailer blank are non-fuel compounds[1]. These non-fuel compounds were indicated by chromatogram retention times. However, the analytical laboratory could not specifically identify them. According to the analytical laboratory, the detected non-fuel compounds did not result from laboratory contamination. Since these compounds were detected at similar concentrations in water samples from wells screening distinct water-bearing zones and from the bailer blank, and because they have not been detected before, they may indicate field equipment contamination.

[1]Personal communications between Eric Anderson, WA Staff Geologist and NET Pacific personnel May 22 through 30, 1990

4 CONCLUSIONS

The results of the subsurface investigation include:

- No TPH-G or BETX were detected in soil samples collected from borings BH-J, BH-K and BH-L;

- No TPH-G or BETX were detected in water samples collected from existing onsite wells MW-1 and E-4, new crossgradient well MW-4, or new downgradient well MW-5.

- Hydrocarbons were detected in water samples from onsite wells MW-2 and MW-3 at a maximum at 5,500 ppb TPH-G and 440 ppb benzene in the MW-3 sample. Both of these wells are adjacent to the underground fuel storage tanks.

- Ground water flows westward beneath the site and south-southwestward downgradient of the site. Hydrocarbons in ground water are well characterized by the six on- and off-site monitoring wells;

- The flowing artesian condition of existing well E-4, which screens a deeper water-bearing zone than the other wells, suggests an upward hydraulic gradient beneath the site. This gradient may inhibit the downward migration of hydrocarbons in ground water.

- Although a ground water monitoring well was not installed southeast of the site in Wildwood Avenue, hydrocarbons in ground water should not extend significantly beyond the Wildwood Avenue property line. Evidence supporting this conclusion includes:

    - The anticipated ground water flow direction near boring BH-L is westward;

    - Only low permeability sediments were encountered in boring BH-L, and

    - No hydrocarbons were detected in soil samples from boring BH-L.

The results of the Second Quarter, 1990 monitoring include:

- Benzene in wells MW-2 and MW-3 exceeded the California Department of Health Services (DHS) maximum contaminant level (MCL) for drinking water.

- No hydrocarbons have ever been detected in well MW-1.

- Consistent with previous results, the ground water flow direction is westward beneath the site and south-southwestward downgradient of the site.

- The compound detected in wells MW-4, MW-5 and E-4 is probably from field equipment contamination.

REFERENCES

EMCON Associates, 1984, Subsurface Hydrogeologic Investigation, Shell Service Station, 29 Wildwood Avenue, Piedmont, California, consultant's report prepared for Gettler Ryan, Inc., September 20, 1984, 2 p. plus attachments.

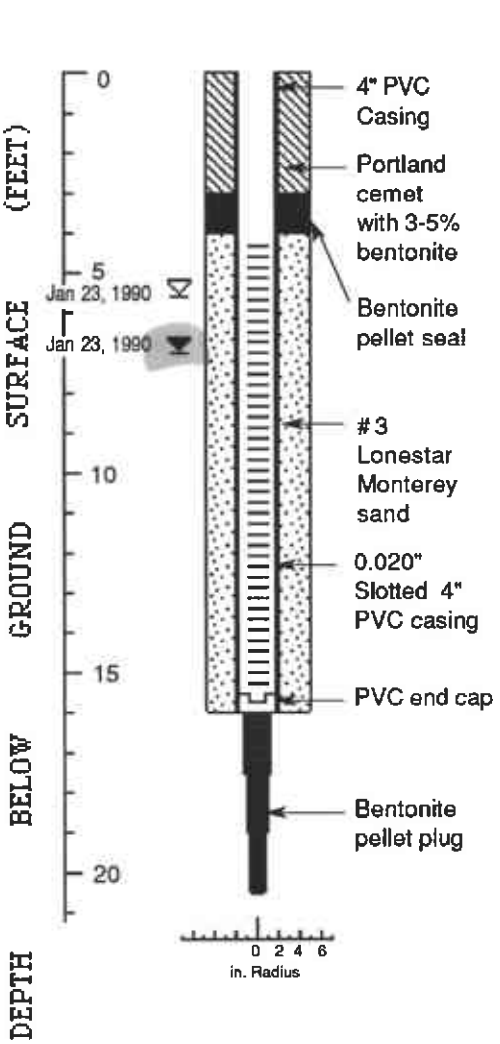
Ensco Environmental Services, Inc., 1988, Soil Investigation, consultant's report prepared for Shell Oil Company, October 3, 1988, 6 p. plus appendices.

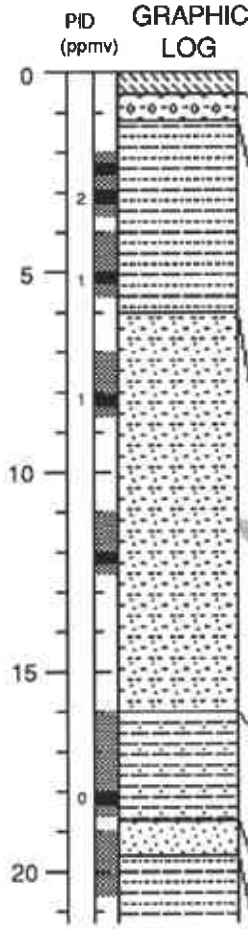
Radbruch, D., 1969, Areal and Engineering Geology of the Oakland East Quadrangle, California, U.S. Geological Survey Map GQ-769, Scale 1:24,000, 1 sheet plus tables.

Shell Oil Company, 1988, interoffice memorandum on the 29 Wildwood Avenue site assessment, from R. G. Newsome, Senior District Engineer, to W. Urban, District Real Estate Representative, November 9, 1988.

Weiss Associates, 1989, Phase 1 Subsurface Investigation, Shell Service Station, WIC #204-6001-0109, 29 Wildwood Avenue, Piedmont, California, consultant's report prepared for Shell Oil Company, August 16, 1989, 21 p. plus 3 appendices.

WELL MW-4 (BH-J)





DESCRIPTION

Asphaltic concrete

Silty GRAVEL (GM); gray-black; medium dense; damp; 10% clay; 20% silt; 70% subangular to subrounded pebbles to 3" diameter; moderate plasticity; moderate K; no odor [Roadbed]

Silty CLAY (CH); dark gray mottled orange; stiff; moist; 60-65% clay; 30% silt; <5% fine sand;<5% subangular pebbles to 3/8" diameter; moderate to high plasticity; very low K; no odor

Gray- green mottled orange at 4.0-5.5'; no odor

Contact - driller

Silty SAND (SM); light brown; medium dense; wet; 30% silt; 60% fine to coarse sand; 10% subangular pebbles to 1" diameter; moderate to high K; no odor

3/4" Pebbles at 10'

Subangular to subrounded pebbles at 5/8" diameter at 11'

Contact - driller

Sandy CLAY/gravelly CLAY (CH); brown; very stiff; moist; 35-50% clay; 20% silt;15-25% fine to coarse sand; 15-20% subangular to subrounded pebbles to 3/4" diameter; high plasticity; very low to low K;

SAND (SP); brown; loose; wet;<5% silt; 95-100% fine to medium sand; high K; no odor

Silty CLAY (CH); brown; very stiff; moist; 50-55% clay; 40% silt; 5-10% fine to coarse sand; moderate to high plasticity; very low K; no odor

EXPLANATION

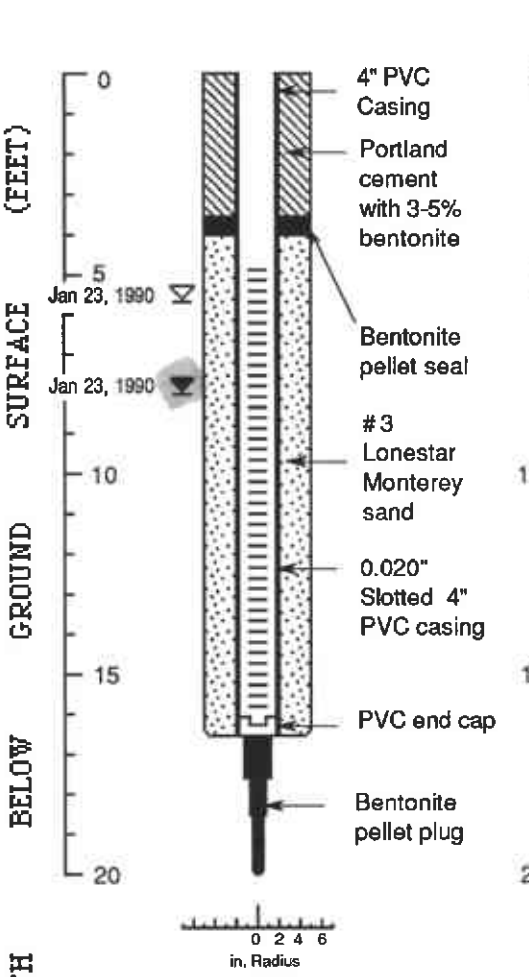
- Water level during drilling (date)
- Water level (date)
- Contact (dotted where approx.)
- Uncertain contact
- Location of recovered drive sample
- Location of drive sample sealed for chemical analysis
- Cutting sample
- K = Estimated hydraulic conductivity

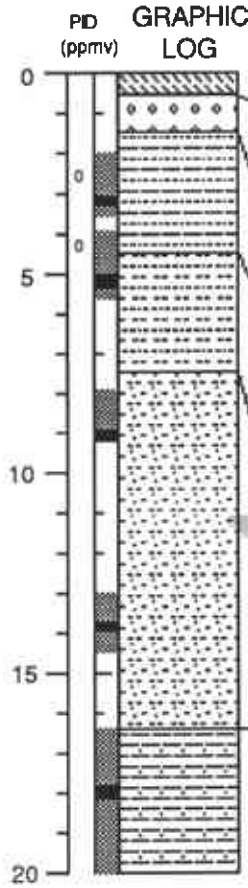
Logged by:	N. Scott MacLeod
Supervisor:	Richard Weiss; EG 1112
Drilling Company:	Soil Exploration Services, Vacaville, CA
Driller:	Russ Ellis
Drilling Method:	Hollow stem auger
Date Drilled:	January 23, 1990
Well Head Completion:	Locking wellcap, traffic-rated vault
Type of Sampler:	Split barrel (1.5", 2.0", 2.5" I.D.)
Ground Surface Elevation:	34.03'

Well Construction and Boring Log - Well MW-4 (BH-J)

Shell Service Station
WIC #204-6001-0109
Piedmont, California

WELL MW-5 (BH-K)





DESCRIPTION

Asphaltic concrete

GRAVEL (GP); gray;dense; damp; 10-20% silt;10-20% fine to coarse sand; 60-80% subanguler pebbles to 3" diameter; high K; no odor [Roadbed]

Silty CLAY (CH); dark gray-green; stiff; moist; 55-65% clay; 10-20% silt; 25% fine sand; high plasticity; very low K; no odor

Clayey SILT (MH); light brown mottled orange; firm; moist to wet; 20-30% clay; 50-60% silt;10-20% fine sand; moderate plasticity; very low to low K; no odor

Contact - driller

(SM); orange brown; medium dense; wet; 20-30% silt; 50-60% fine to coarse sand; 20% subangular pebbles to 1" diameter; moderate to high K; no odor

Contact - driller

Sandy CLAY (CH); red-brown mottled varicolored; stiff; moist;10% silt; 65-80% clay; 5-15% fine to coarse sand; 5-10% pebbles to 3/4" diameter; high plasticity; very low to low K; no

EXPLANATION

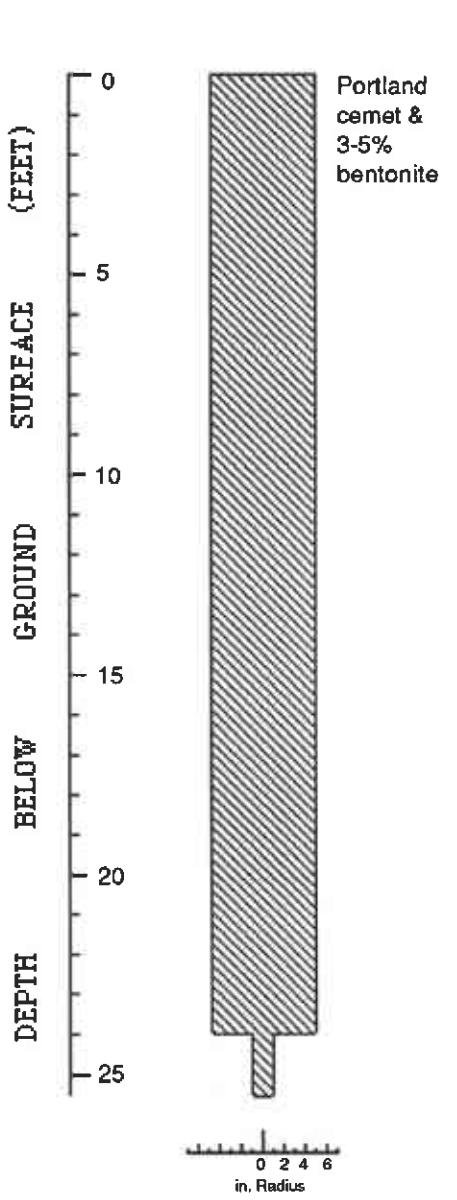
- Water level during drilling (date)
- Water level (date)
- Contact (dotted where approx.)
- Uncertain contact
- Location of recovered drive sample
- Location of drive sample sealed for chemical analysis
- Cutting sample
- K = Estimated hydraulic conductivity

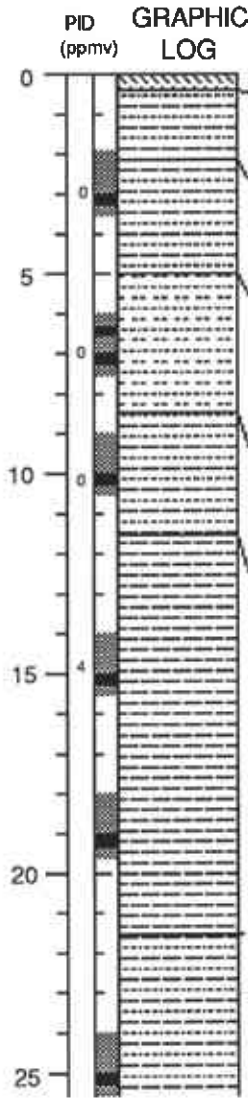
Logged by:	N. Scott MacLeod
Supervisor:	Richard Weiss; EG 1112
Drilling Company:	Soils Exploration Services, Vacaville, CA
Driller:	Russ Ellis
Drilling Method:	Hollow stem auger
Date Drilled:	January 23, 1990
Well Head Completion:	Locking wellcap, traffic-rated vault
Type of sampler:	Split barrel (1.5", 2.0", 2.5" I.D.)
Ground Surface Elevation:	31.61'

Well Construction and Boring Log - Well MW-5 (BH-K)

Shell Service Station
WIC #204-6001-0109
Piedmont, California

BORING BH-L





DESCRIPTION

Asphaltic concrete

Silty CLAY (CH); brown; stiff; moist; 65-70% clay; 30% silt; <5% fine to coarse sand; moderate to high plasticity; very low K; no odor

Clayey SILT (MH); brown varicolored; firm; damp to moist; 30% clay; 50-65% silt; 5-20% fine to coarse sand; moderate plasticity ; very low to low K; no odor

Silty SAND/clayey SAND (SM/SC); red & brown varicolored; dense; moist; 15-20% clay; 15-20% silt; 40% fine to coarse sand; 20-30% subangular to subrounded pebbles to 1" diameter; moderate plasticity; low to moderate K; no odor

Silty CLAY/Clayey SILT (CH/MH); brown; stiff; damp to moist; 45% clay; 50% silt; 5% fine sand; moderate plasticity; very low K; no odor

CLAY (CH); brown; very stiff to hard; damp; high plasticity; very low K; no odor

Hard at 18-19.5'
Light gray-green at 18.6' to 19.5'

Silty CLAY/CLAY (CH); light gray-green mottled orange; hard; moist; 80-90% clay; 10-20% silt; high plasticity; very low K; no odor

EXPLANATION

- Water level during drilling (date)
- Water level (date)
- Contact (dotted where approx.)
- Uncertain contact
- Location of recovered drive sample
- Location of drive sample sealed for chemical analysis
- Cutting sample
- K = Estimated hydraulic conductivity

Logged by:	N. Scott MacLeod
Supervisor:	Richard Weiss; EG 1112
Drilling Company:	Soils Exploration Services, Vacaville, CA
Driller:	Russ Ellis
Drilling Method:	Hollow stem auger
Date Drilled:	January 24, 1990
Type of sampler:	Split barrel (2.0" I.D.)

Boring Log - BH-L

Shell Service Station
WIC #204-6001-0109
Piedmont, California

APPENDIX B
ANALYTIC REPORTS AND CHAIN OF CUSTODY FOR SOIL

APPENDIX C
ANALYTIC REPORTS AND CHAIN OF CUSTODY FOR WATER

NET NATIONAL ENVIRONMENTAL TESTING, INC.

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

Jack Gardner
Weiss Associates
2938 McClure St.
Oakland, CA 94609

Date: 02-09-90
NET Client Acct No: 18.09
NET Pacific Log No: 9558
Received: 02-02-90 0700

Client Reference Information

SHELL; Project: 81-463-03

Sample analysis in support of the project referenced above has been completed and results are presented on following pages. Please refer to the enclosed "Key to Abbreviations" for definition of terms. Should you have questions regarding procedures or results, please feel welcome to contact Client Services.

Approved by:

Jules Skamarack
Laboratory Manager

Enclosure(s)

Parameter	Reporting Limit	Descriptor, Lab No. and Results #1 01-30-90 45277	#2 01-30-90 45278	#3 01-30-90 45279	#4 01-31-90 45280	Units
PETROLEUM HYDROCARBONS		—	—	—	—	
VOLATILE (WATER)		—	—	—	—	
DILUTION FACTOR *		1	1	5	1	
DATE ANALYZED		02-07-90	02-07-90	02-08-90	02-07-90	
METHOD GC FID/5030		—	—	—	—	
as Gasoline	0.05	ND	ND	5.5	ND	mg/L
METHOD 602		—	—	—	—	
Benzene	0.5	ND	6.6	440	ND	ug/L
Ethylbenzene	0.5	ND	0.54	79	ND	ug/L
Toluene	0.5	ND	ND	35	ND	ug/L
Xylenes, total	0.5	ND	0.93	130	ND	ug/L

Parameter	Reporting Limit	Descriptor, Lab No. and Results #5 01-31-90 45281	#E-4 01-31-90 45282	#21 01-31-90 45283	Units
PETROLEUM HYDROCARBONS		—	—	—	
VOLATILE (WATER)		—	—	—	
DILUTION FACTOR *		1	1	1	
DATE ANALYZED		02-07-90	02-07-90	02-07-90	
METHOD GC FID/5030		—	—	—	
as Gasoline	0.05	ND	ND	ND	mg/L
METHOD 602		—	—	—	
Benzene	0.5	ND	ND	ND	ug/L
Ethylbenzene	0.5	ND	ND	ND	ug/L
Toluene	0.5	ND	ND	ND	ug/L
Xylenes, total	0.5	ND	ND	ND	ug/L

SHELL

WEISS ASSOCIATES

~~338 McCl... St. Oakland CA 94609 415-465-1100~~

5500 Shellmound St
Emeryville, CA 94608

415-547-5420
FAX # (415) (547-5043)

9558

SEND RESULTS TO: JACK GARDNER

CHAIN-OF-CUSTODY RECORD AND ANALYTIC INSTRUCTIONS

WA Personnel: Be sure to include copy of this form in the field sampling files

Shuttle Inventory Number: N/A

Project ID: 81-463-03

Shipping Seal No. N/A

NOTES TO LAB:
1) Specify analytic method and detection limit in report.
2) Notify us if there are any anomalous peaks on GC or other scans.
3) ANY QUESTIONS/CLARIFICATIONS: CALL US.

Sampled by: DC/MD

Laboratory Name: NET

No. of Containers	Sample ID	Sampling Date	Container Type[A]	Sample/ Analyze/ Hold[B]	Turn-around[C]	Analyze For:	Analytic Method/ Detection Limit	Comments
3	1	1/30/90	W/G	A	N	BETX - THF - GASOLINE	8015 / 602	
↓	2	↓	↓	↓	↓	↓	↓	
↓	3	↓	↓	↓	↓	↓	↓	
↓	4	1/31/90	↓	↓	↓	↓	↓	
↓	5	↓	↓	↓	↓	↓	↓	
↓	E-4	↓	↓	↓	↓	↓	↓	
3	21	1/31/90	W/G	A	N	BETX THF-GASOLINE	8015 / 602	

1/31/90 Stored overnight in locked office

1 Matthew W. Daly — Released by (Signature), Date

3 [signature] 2/1/90 — Released by (Signature), Date

5 [signature] 2/1 19:00 — Released by (Signature), Date

2 [signature] 2/1/90 — Received by (Signature), Date

4 [signature] 2/1/90 15:15 — Shipping Carrier, Method, Date

6 [signature] 2/2/90 0700 — Received by Lab Personnel, Date, Telephone

x ____ Seal intact?, Number

A Sample Type Codes: W = Water, S = Soil, O = Other (Specify) Container Type Codes: P = Plastic bottles, G = Glass bottle, T = Brass tube, O = Other (Specifiy)
B Analyze/Hold: A = Analyze; HOLD (spell out) = DO NOT ANALYZE UNLESS NECESSARY OR REQUESTED.
C N = Normal Turnaround, F = 1-Week Turnaround, R = 24-hour Turnaround

NATIONAL ENVIRONMENTAL TESTING, INC.

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

Eric Anderson
Weiss Associates
5500 Shell Mound Rd.
Emeryville, CA 94524

Date: 05-07-90
NET Client Acct No: 18.09
NET Pacific Log No: 1769
Received: 05-01-90 0800
REVISED 06-01-90

Client Reference Information

SHELL, 29 Wildwood, Piedmont; Project: 81-463-01

Sample analysis in support of the project referenced above has been completed and results are presented on following pages. Please refer to the enclosed "Key to Abbreviations" for definition of terms. Should you have questions regarding procedures or results, please feel welcome to contact Client Services.

Approved by:

Jules Skamarack
Laboratory Manager

JS:rct
Enclosure(s)

Client No: 18.09 Date: 05-07-90
Client Name: Weiss Associates
NET Log No: 1769 Page: 2

Ref: SHELL, 29 Wildwood, Piedmont; Project: 81-463-01

			Descriptor, Lab No. and Results		
			040-1 04-27-90	040-2 04-27-90	
Parameter	Method	Reporting Limit	51834	51835	Units
PETROLEUM HYDROCARBONS			--	--	
VOLATILE (WATER)			--	--	
DILUTION FACTOR *			1	1	
DATE ANALYZED			05-02-90	05-02-90	
METHOD GC FID/5030			--	--	
as Gasoline		0.05	ND	0.06	mg/L
METHOD 602			--	--	
DILUTION FACTOR *			1	1	
DATE ANALYZED			05-02-90	05-02-90	
Benzene		0.5	ND	2.1	ug/L
Ethylbenzene		0.5	ND	ND	ug/L
Toluene		0.5	ND	ND	ug/L
Xylenes, total		0.5	ND	ND	ug/L

Client No: 18.09 Date: 05-07-90
Client Name: Weiss Associates
NET Log No: 1769 Page: 3

Ref: SHELL, 29 Wildwood, Piedmont; Project: 81-463-01

			Descriptor, Lab No. and Results		
			040-3 04-27-90	040-4 04-27-90	
Parameter	Method	Reporting Limit	51836	51837	Units
PETROLEUM HYDROCARBONS			--	--	
VOLATILE (WATER)			--	--	
DILUTION FACTOR *			10	1	
DATE ANALYZED			05-03-90	05-02-90	
METHOD GC FID/5030			--	--	
as Gasoline		0.05	4.5	0.13[a]	mg/L
METHOD 602			--	--	
DILUTION FACTOR *			10	1	
DATE ANALYZED			05-03-90	05-02-90	
Benzene		0.5	310	ND	ug/L
Ethylbenzene		0.5	37	ND	ug/L
Toluene		0.5	26	ND	ug/L
Xylenes, total		0.5	110	ND	ug/L

[a] Although quantified as gasoline, the chromatogram indicates several unidentified peaks uncharacteristic of fuels.

Client No: 18.09 Date: 05-07-90
Client Name: Weiss Associates
NET Log No: 1769 Page: 4

Ref: SHELL, 29 Wildwood, Piedmont; Project: 81-463-01

			Descriptor, Lab No. and Results		
			040-5 04-27-90	040-E4 04-27-90	
Parameter	Method	Reporting Limit	51838	51839	Units
PETROLEUM HYDROCARBONS			--	--	
VOLATILE (WATER)			--	--	
DILUTION FACTOR *			1	1	
DATE ANALYZED			05-03-90	05-02-90	
METHOD GC FID/5030			--	--	
as Gasoline		0.05	0.21[a]	0.12[a]	mg/L
METHOD 602			--	--	
DILUTION FACTOR *			1	1	
DATE ANALYZED			05-03-90	05-02-90	
Benzene		0.5	ND	ND	ug/L
Ethylbenzene		0.5	ND	ND	ug/L
Toluene		0.5	ND	ND	ug/L
Xylenes, total		0.5	ND	ND	ug/L

[a] Although quantified as gasoline, the chromatogram indicates several unidentified peaks uncharacteristic of fuels.

Client No: 18.09 Date: 05-07-90
Client Name: Weiss Associates
NET Log No: 1769 Page: 5

Ref: SHELL, 29 Wildwood, Piedmont; Project: 81-463-01

Parameter	Method	Reporting Limit	Descriptor, Lab No. and Results 040-21 04-27-90 51840	040-22 04-27-90 51841	Units
PETROLEUM HYDROCARBONS			--	--	
VOLATILE (WATER)			--	--	
DILUTION FACTOR *			1	1	
DATE ANALYZED			05-02-90	05-02-90	
METHOD GC FID/5030			--	--	
as Gasoline		0.05	ND	0.11[a]	mg/L
METHOD 602			--	--	
DILUTION FACTOR *			1	1	
DATE ANALYZED			05-02-90	05-02-90	
Benzene		0.5	ND	ND	ug/L
Ethylbenzene		0.5	ND	ND	ug/L
Toluene		0.5	ND	ND	ug/L
Xylenes, total		0.5	ND	ND	ug/L

[a] Although quantified as gasoline, the chromatogram indicates several unidentified peaks uncharacteristic of fuels.

Ref: SHELL, 29 Wildwood, Piedmont; Project: 81-463-01

QUALITY CONTROL DATA

Parameter	Reporting Limits	Units	Cal Verf Stand % Recovery	Blank Data	Spike % Recovery	Duplicate Spike % Recovery	RPD
Gasoline	0.05	mg/L	105	ND	97	102	5
Benzene	0.5	ug/L	96	ND	87	87	<1
Toluene	0.5	ug/L	98	ND	91	90	1

QUALITY CONTROL DATA

Parameter	Reporting Limits	Units	Cal Verf Stand % Recovery	Blank Data	Spike % Recovery	Duplicate Spike % Recovery	RPD
Gasoline	0.05	mg/L	101	ND	92	93	2
Benzene	0.5	ug/L	94	ND	93	93	<1
Toluene	0.5	ug/L	96	ND	92	94	1

WEISS ASSOCIATES
5500 Shellmound St., Emeryville, CA 94608
Phone: 415-547-5420 FAX: 415-547-5043

1769

Shell Service Station Address: 29 Wild wood Piedmont, CA
Shell Contact: Diane Lundquist
WIC #: 204600101 09
AFE #: 986698

Please send analytic results and a copy of the signed chain of custody form to:
Eric Anderson
Project ID: 91-463-01

CHAIN-OF-CUSTODY RECORD AND ANALYTIC INSTRUCTIONS

Lab Personnel:
1) Specify analytic method and detection limit in report.
2) Notify us if there are any anomalous peaks on GC or other scans.
3) ANY QUESTIONS/CLARIFICATIONS: CALL US.

Sampled by: Jim Martin
Laboratory Name: NET Pacific

No. of Containers	Sample ID	Container Type	Sample Date	Vol[2]	Fil[3]	Ref[4]	Preservative (specify)	Analyze for	Analytic Method	Turn[5]	COMMENTS
3	040-1	W/CV	4/27/90	40ml	N	Yes	None	GAS/BETX	EPA 8015/8020	N	
	040-2										
	040-3										
	040-4										
	040-5										
	040-E4										
	040-21										
	040-22										

1 Jim Martin 4/30/90
Released by (Signature), Date

1 Weiss Assoc
Affiliation

2 A. J. Dk 4/30/90
Received by (Signature), Date

2 Weiss Assx.
Affiliation

3 A. J. Dk 4/30/90
Released by (Signature), Date

3 Weiss Assoc.
Affiliation

4 Jeff Wickle
Shipping Carrier, Method, Date

4 NET 4/30/90 16:00
Affiliation

5 Manitte Shin 4/30/90 3:30
Released by: Manitte Shin 4/30/90 3:50
Released by (Signature), Date
Jeff Wickle 4/30/90 19:00

5 NET
Affiliation

6 Schwartz 5/1/90 0800
Received by Lab Personnel, Date

6 NET
Affiliation, Telephone

x YES
Seal intact?

1 Sample Type Codes: W = Water, S = Soil, Describe Other; Container Type Codes: V = VOA/Teflon Septa, P = Plastic, C or B - Clear/Brown Glass, Describe Other; Cap Codes: PT = Plastic, Teflon Lined 2 = Volume per container; 3 = Filtered (Y/N); 4 = Refrigerated (Y/N)
5 Turnaround [N = Normal, W = 1 Week, R = 24 Hour, HOLD (write out)]

ADDITIONAL COMMENTS, CONDITIONS, PROBLEMS:
Stored in locked room over weekend. (Refrigerated)

F:\ALL\ADMIN\FORMS\COCSHELL.WP2

APPENDIX D
WATER SAMPLE COLLECTION RECORDS

WEISS ASSOCIATES

WATER SAMPLING DATA

Well Name MW-1 Date 4/27/90 Time of Sampling 1615
Job Name Shell Piedmont Job Number 381-463-01 Initials CM
Sample Point Description M (M = Monitoring Well)
Location NE corner of site

WELL DATA: Depth to Water 3.24 ft (static, pumping) @ 930 Depth to Product / ft.
Product Thickness / Well Depth 15 ft (spec) Well Depth 13.18 ft(sounded) Well Diameter 4 in
Initial Height of Water in Casing 9.94 ft. = volume 6.49 gal.
4 Casing Volumes to be Evacuated. Total to be evacuated 24.96 gal.

EVACUATION METHOD: Pump # and type / Hose # and type /
Bailer# and type 3" PVC #LL Dedicated NO (Y/N)
Other /

Evacuation Time: Stop 1542
Start 1525
Total Evacation Time 17 min
Total Evacuated Prior to Sampling 25 gal.
Evacuation Rate 1.5 gal. per minute

Depth to Water during Evacuation ____ ft. ____ time
Depth to Water at Sampling 3.60 ft. 1621 time
Evacuated Dry? NO After / gal. Time /
80% Recovery = DTW 5.23 /
% Recovery at Sample Time 96% Time 1621

Formulas/Conversions
r = well radius in ft.
h = ht of water col in ft.
vol. in cyl. = $\pi r^2 h$
7.48 gal/ft^3
V_2" casing = 0.163 gal/ft
V_3" casing = 0.367 gal/ft
V_4" casing = 0.653 gal/ft
$V_{4.5}$" casing = 0.826 gal/ft
V_6" casing = 1.47 gal/ft
V8 casing = 2.61 gal/ft

CHEMICAL DATA: Meter Brand/Number /
Calibration: / 4.0 / 7.0 / 10.0

Measured:	SC/μmhos	pH	T°C	Time	Volume Evacuated (gal.)

SAMPLE: Color None Odor None
Description of matter in sample: Very trace amount of off white silt
Sampling Method: END of TEFLON BAILER # LL
Sample Port: Rate / gpm Totalizer / gal.
Time /

# of Cont.	Sample ID	Cont. Type[1]	Vol[2]	Fil[3]	Ref[4]	Preservative (specify)	Analytic Method	Turn[5]	LAB
3	040-1	W/CV	40ml	N	Y	None	EPA 8015/8020	N	NET

1 Sample Type Codes: W = Water, S = Soil, Describe Other
Container Type Codes: V = VOA/Teflon Septa, P = Plastic, C or B = Clear/Brown Glass, Describe Other
Cap Codes: PT = Plastic, Teflon lined;
2 = Volume per container; 3 = Filtered (Y/N); 4 = Refrigerated (Y/N)
5 Turnaround [N = Normal, W = 1 week, R = 24 hour, HOLD (spell)]

ADDITIONAL COMMENTS, CONDITIONS, PROBLEMS:

WEISS ASSOCIATES

WATER SAMPLING DATA

Well Name MW-2 Date 9/27/90 Time of Sampling 1656
Job Name Shell Piedmont Job Number 81-963-01 Initials fm
Sample Point Description M (M = Monitoring Well)
Location W. Side of site, near gas pumps

WELL DATA: Depth to Water 3.79 ft (static, pumping) @ 9/6 Depth to Product / ft.
Product Thickness / Well Depth 12 ft (spec) Well Depth 11.58 ft(sounded) Well Diameter 4 in
Initial Height of Water in Casing 7.79 ft. = volume 5.09 gal.
4 Casing Volumes to be Evacuated. Total to be evacuated 20.35 gal.

EVACUATION METHOD: Pump # and type / Hose # and type /
Bailer# and type 3" PVC # AF Dedicated NO (Y/N)
Other /

Evacuation Time: Stop 1504
Start 1459
Total Evacuation Time 5 min
Total Evacuated Prior to Sampling 9 gal.
Evacuation Rate 1.8 gal. per minute
Depth to Water during Evacuation / ft. / time
Depth to Water at Sampling 3.95 ft. 1659 time
Evacuated Dry? Yes After 9 gal. Time 1504
80% Recovery = /
% Recovery at Sample Time 98% Time 1659

Formulas/Conversions
r = well radius in ft.
h = ht of water col in ft.
vol. in cyl. = $\pi r^2 h$
7.48 gal/ft^3
V_2" casing = 0.163 gal/ft
V_3" casing = 0.367 gal/ft
V_4" casing = 0.653 gal/ft
$V_{4.5}$" casing = 0.826 gal/ft
V_6" casing = 1.47 gal/ft
V8 casing = 2.61 gal/ft

CHEMICAL DATA: Meter Brand/Number /
Calibration: / 4.0 / 7.0 / 10.0

Measured:	SC/µmhos	pH	T°C	Time	Volume Evacuated (gal.)
	/	/	/	/	/

SAMPLE: Color None Odor None
Description of matter in sample: None
Sampling Method: End of Teflon Bailer # MM
Sample Port: Rate / gpm Totalizer / gal.
Time /

# of Cont.	Sample ID	Cont. Type[1]	Vol[2]	Fil[3]	Ref[4]	Preservative (specify)	Analytic Method	Turn[5]	LAB
3	CAO-2	w/cv	40ml	N	Y	None	Epa 8015/8020	W	NET

1 Sample Type Codes: W = Water, S = Soil, Describe Other
Container Type Codes: V = VOA/Teflon Septa, P = Plastic, C or B = Clear/Brown Glass, Describe Other
Cap Codes: PT = Plastic, Teflon lined;
2 = Volume per container; 3 = Filtered (Y/N); 4 = Refrigerated (Y/N)
5 Turnaround [N = Normal, W = 1 week, R = 24 hour, HOLD (spell)]

ADDITIONAL COMMENTS, CONDITIONS, PROBLEMS:

WEISS ASSOCIATES

WATER SAMPLING DATA

Well Name MW-3 Date 4/27/90 Time of Sampling 1642

Job Name Shell Piedmont Job Number 61-463.01 Initials drg

Sample Point Description M (M = Monitoring Well)

Location SE corner of site

WELL DATA: Depth to Water 4.02 ft (static, pumping) @ 920 Depth to Product / ft.

Product Thickness / Well Depth 9 ft (spec) Well Depth 9.14 ft (sounded) Well Diameter 4 in

Initial Height of Water in Casing 6.12 ft. = volume 3.39 gal.

4 Casing Volumes to be Evacuated. Total to be evacuated 13.4 gal.

EVACUATION METHOD: Pump # and type / Hose # and type /

Bailer# and type 3" PVC #QQ Dedicated NO (Y/N)

Other /

Evacuation Time: Stop 1434 1451

Start ~~1349~~ 1427 1447

Total Evacation Time 11 min

Total Evacuated Prior to Sampling 14 gal.

Evacuation Rate 1.3 gal. per minute

Depth to Water during Evacuation / ft. / time

Depth to Water at Sampling 4.06 ft. 1643 time

Evacuated Dry? Almost After 5 gal. Time

80% Recovery =

% Recovery at Sample Time 99% Time 1643

Formulas/Conversions

r = well radius in ft.

h = ht of water col in ft.

vol. in cyl. = $\pi r^2 h$

7.48 gal/ft^3

V_2" casing = 0.163 gal/ft

V_3" casing = 0.367 gal/ft

V_4" casing = 0.653 gal/ft

$V_{4.5}$" casing = 0.826 gal/ft

V_6" casing = 1.47 gal/ft

V8 casing = 2.61 gal/ft

CHEMICAL DATA: Meter Brand/Number /

Calibration: / 4.0 / 7.0 / 10.0

Measured:	SC/µmhos	pH	T°C	Time	Volume Evacuated (gal.)

SAMPLE: Color NONE Odor NONE

Description of matter in sample: None

Sampling Method: End of Teflon bailer #5

Sample Port: Rate / gpm Totalizer / gal.

Time /

# of Cont.	Sample ID	Cont. Type[1]	Vol[2]	Fil[3]	Ref[4]	Preservative (specify)	Analytic Method	Turn[5]	LAB
3	040-3	w/cv	40ml	N	Y	None	EPA 8015/8020	N	NET

1 Sample Type Codes: W = Water, S = Soil, Describe Other
Container Type Codes: V = VOA/Teflon Septa, P = Plastic, C or B = Clear/Brown Glass, Describe Other
Cap Codes: PT = Plastic, Teflon lined;
2 = Volume per container; 3 = Filtered (Y/N); 4 = Refrigerated (Y/N)
5 Turnaround [N = Normal, W = 1 week, R = 24 hour, HOLD (spell)]

ADDITIONAL COMMENTS, CONDITIONS, PROBLEMS:

WEISS ASSOCIATES

WATER SAMPLING DATA

Well Name MW-4 Date 4/27/90 Time of Sampling 1226
Job Name Shell Piedmont Job Number 81-963-01 Initials VM
Sample Point Description M (M = Monitoring Well)
Location E/ Grand Ave; N of Vernon St

WELL DATA: Depth to Water 3.62 ft (static, pumping) @ 949 Depth to Product — ft.
Product Thickness — Well Depth 16 ft (spec) Well Depth 11.87 ft(sounded) Well Diameter 4 in
Initial Height of Water in Casing 8.25 ft. = volume 5.39 gal.
4 Casing Volumes to be Evacuated. Total to be evacuated 21.6 gal.

EVACUATION METHOD: Pump # and type — Hose # and type —
Bailer# and type 3" PVC # AG Dedicated NO (Y/N)
Other —

Evacuation Time: Stop 1012 — —
Start 1008 — —
Total Evacation Time 4 mn
Total Evacuated Prior to Sampling 7 gal.
Evacuation Rate 1.8 gal. per minute
Depth to Water during Evacuation — ft. — time
Depth to Water at Sampling 3.76 ft. 1229 time
Evacuated Dry? Yes After 7 gal. Time 1012
80% Recovery = —
% Recovery at Sample Time 98% Time 1227

Formulas/Conversions
r = well radius in ft.
h = ht of water col in ft.
vol. in cyl. = $\pi r^2 h$
7.48 gal/ft^3
$V_{2"}$ casing = 0.163 gal/ft
$V_{3"}$ casing = 0.367 gal/ft
$V_{4"}$ casing = 0.653 gal/ft
$V_{4.5"}$ casing = 0.826 gal/ft
$V_{6"}$ casing = 1.47 gal/ft
V8 casing = 2.61 gal/ft

CHEMICAL DATA: Meter Brand/Number —
Calibration: — 4.0 — 7.0 — 10.0

Measured:	SC/μmhos	pH	T°C	Time	Volume Evacuated (gal.)

SAMPLE: Color cloudy white Odor none
Description of matter in sample: none
Sampling Method: End of Teflon bailer top # NN body # AM
Sample Port: Rate — gpm Totalizer — gal
Time —

# of Cont.	Sample ID	Cont. Type[1]	Vol[2]	Fil[3]	Ref[4]	Preservative (specify)	Analytic Method	Turn[5]	LAB
3	040-4	w/cv	40ml	N	Y	None	EPA 8015/8020	N	NET

1 Sample Type Codes: W = Water, S = Soil, Describe Other
Container Type Codes: V = VOA/Teflon Septa, P = Plastic, C or B = Clear/Brown Glass, Describe Other
Cap Codes: PT = Plastic, Teflon lined;
2 = Volume per container; 3 = Filtered (Y/N); 4 = Refrigerated (Y/N)
5 Turnaround [N = Normal, W = 1 week, R = 24 hour, HOLD (spell)]

ADDITIONAL COMMENTS, CONDITIONS, PROBLEMS:

WEISS ASSOCIATES

WATER SAMPLING DATA

Well Name MW-5 Date 4/27/90 Time of Sampling 1122

Job Name Shell Piedmont Job Number 81-463-01 Initials JM

Sample Point Description M (M = Monitoring Well)

Location E/W Grand Ave; S of Jean

WELL DATA: Depth to Water 4.19 ft (static/pumping) @ 9:54 Depth to Product / ft.

Product Thickness / Well Depth 16.5 ft (spec) Well Depth 16.13 ft (sounded) Well Diameter 4 in

Initial Height of Water in Casing 11.94 ft. = volume 7.79 gal.

4 Casing Volumes to be Evacuated. Total to be evacuated 31.2 gal.

EVACUATION METHOD: Pump # and type / Hose # and type /

Bailer# and type 3" PVC #VV Dedicated NO (Y/N)

Other /

Evacuation Time: Stop 1122 1046 ____

Start 1026 1040 ____

Total Evacation Time 12 6 ____

Total Evacuated Prior to Sampling 32 gal.

Evacuation Rate 2.7 gal. per minute

Depth to Water during Evacuation / ft. / time

Depth to Water at Sampling 4.40 ft. 1126 time

Evacuated Dry? NO After / gal. Time /

80% Recovery = /

% Recovery at Sample Time 98.8 Time 1126

Formulas/Conversions

r = well radius in ft.

h = ht of water col in ft.

vol. in cyl. = $\pi r^2 h$

7.48 gal/ft^3

V_2" casing = 0.163 gal/ft

V_3" casing = 0.367 gal/ft

V_4" casing = 0.653 gal/ft

$V_{4.5}$" casing = 0.826 gal/ft

V_6" casing = 1.47 gal/ft

V8 casing = 2.61 gal/ft

CHEMICAL DATA: Meter Brand/Number /

Calibration: / 4.0 / 7.0 / 10.0

Measured:	SC/µmhos	pH	T°C	Time	Volume Evacuated (gal.)

SAMPLE: Color Cloudy - tan Odor none

Description of matter in sample: trace of tan silt

Sampling Method: End of Teflon Bailer #VV

Sample Port: Rate / gpm Totalizer / gal.

Time /

# of Cont.	Sample ID	Cont. Type[1]	Vol[2]	Fil[3]	Ref[4]	Preservative (specify)	Analytic Method	Turn[5]	LAB
3	MW-5	W/CV	40ml	N	Y	NONE	EPA 8015/8020	N	NET

1 Sample Type Codes: W = Water, S = Soil, Describe Other
Container Type Codes: V = VOA/Teflon Septa, P = Plastic, C or B = Clear/Brown Glass, Describe Other
Cap Codes: PT = Plastic, Teflon lined;
2 = Volume per container; 3 = Filtered (Y/N); 4 = Refrigerated (Y/N)
5 Turnaround [N = Normal, W = 1 week, R = 24 hour, HOLD (spell)]

ADDITIONAL COMMENTS, CONDITIONS, PROBLEMS:

WEISS ASSOCIATES

WATER SAMPLING DATA

Well Name E-9 Date 9/27/90 Time of Sampling 17:19

Job Name Shell Piedmont Job Number 81-463-01 Initials JM

Sample Point Description M (M = Monitoring Well)

Location SE corner of site; nearest corner of Wildwood & Grand

WELL DATA: Depth to Water 0 ft (static) pumping) Depth to Product / ft.

Product Thickness / Well Depth ___ ft (spec) Well Depth 34.26 ft(sounded) Well Diameter 4 in

Initial Height of Water in Casing 34.26 ft. = volume/~~9.26~~ 12.57 gal.

4 Casing Volumes to be Evacuated. Total to be evacuated ~~90.43~~ gal. 50.3

EVACUATION METHOD: Pump # and type / Hose # and type /

Bailer# and type 2" PVC Dedicated NO (Y/N)

Other /

Evacuation Time: Stop 2:34 *

Start ~~PM~~ 2:16

Total Evacation Time 18 min

Total Evacuated Prior to Sampling 20 gal.

Evacuation Rate 1.1 gal. per minute

Depth to Water during Evacuation / ft. / time

Depth to Water at Sampling 14.58 ft. 1720 time

Evacuated Dry? ~~YES~~ After ~~20~~ gal. Time 234

80% Recovery = /

% Recovery at Sample Time ~~57%~~ Time 1720

Formulas/Conversions

r = well radius in ft.

h = ht of water col in ft.

vol. in cyl. = $\pi r^2 h$

7.48 gal/ft^3

V_2" casing = 0.163 gal/ft

V_3" casing = 0.367 gal/ft

V_4" casing = 0.653 gal/ft

$V_{4.5}$" casing = 0.826 gal/ft

V_6" casing = 1.47 gal/ft

V8 casing = 2.61 gal/ft

CHEMICAL DATA: Meter Brand/Number /

Calibration: / 4.0 / 7.0 / 10.0

Measured:	SC/µmhos	pH	T°C	Time	Volume Evacuated (gal.)

SAMPLE: Color None Odor None

Description of matter in sample: None

Sampling Method: End of Teflon bailer #1 (unmarked 1½" x 12")

Sample Port: Rate / gpm Totalizer / gal.

Time /

# of Cont.	Sample ID	Cont. Type[1]	Vol[2]	Fil[3]	Ref[4]	Preservative (specify)	Analytic Method	Turn[5]	LAB
3	040-E4	w/cv	40ml	N	Y	None	EPA 8015/8020	N	NET

1 Sample Type Codes: W = Water, S = Soil, Describe Other
Container Type Codes: V = VOA/Teflon Septa, P = Plastic, C or B = Clear/Brown Glass, Describe Other
Cap Codes: PT = Plastic, Teflon lined;
2 = Volume per container; 3 = Filtered (Y/N); 4 = Refrigerated (Y/N)
5 Turnaround [N = Normal, W = 1 week, R = 24 hour, HOLD (spell)]

ADDITIONAL COMMENTS, CONDITIONS, PROBLEMS:

* Watch was in the stop watch mode - time of sampling 3 hrs later - 5:40 = 17:19

WEISS ASSOCIATES

WATER SAMPLING DATA — Bailer Blanks

Well Name _____ Date 4/27/90 Time of Sampling 1115
Job Name Shell Piedmont Job Number 81-463-01 Initials _____
Sample Point Description _____ (M = Monitoring Well)
Location _____

WELL DATA: Depth to Water _____ ft (static, pumping) Depth to Product _____ ft.
Product Thickness _____ Well Depth _____ ft (spec) Well Depth _____ ft(sounded) Well Diameter _____ in
Initial Height of Water in Casing _____ ft. = volume _____ gal.
_____ Casing Volumes to be Evacuated. Total to be evacuated _____ gal.

EVACUATION METHOD: Pump # and type _____ Hose # and type _____
Bailer# and type _____ Dedicated _____ (Y/N)
Other _____

Evacuation Time: Stop _____ _____ _____
Start _____ _____ _____
Total Evacation Time _____
Total Evacuated Prior to Sampling _____ gal.
Evacuation Rate _____ gal. per minute
Depth to Water during Evacuation _____ ft. _____ time
Depth to Water at Sampling _____ ft. _____ time
Evacuated Dry? _____ After _____ gal. Time _____
80% Recovery = _____
% Recovery at Sample Time _____ Time _____

Formulas/Conversions
r = well radius in ft.
h = ht of water col in ft.
vol. in cyl. = $\pi r^2 h$
7.48 gal/ft^3
V_2" casing = 0.163 gal/ft
V_3" casing = 0.367 gal/ft
V_4" casing = 0.653 gal/ft
$V_{4.5}$" casing = 0.826 gal/ft
V_6" casing = 1.47 gal/ft
V8 casing = 2.61 gal/ft

CHEMICAL DATA: Meter Brand/Number _____
Calibration: _____ 4.0 _____ 7.0 _____ 10.0

Measured:	SC/µmhos	pH	T°C	Time	Volume Evacuated (gal.)

Arrowhead distilled Water

SAMPLE: Color None Odor None
Description of matter in sample: None
Sampling Method: End of teflon bailer # K
Sample Port: Rate ____ gpm Totalizer _____ gal.
Time

# of Cont.	Sample ID	Cont. Type[1]	Vol[2]	Fil[3]	Ref[4]	Preservative (specify)	Analytic Method	Turn[5]	LAB
3	040-22	W/cv	40ml	N	Y	None	EPA 8015/8020	N	NET

1 Sample Type Codes: W = Water, S = Soil, Describe Other
Container Type Codes: V = VOA/Teflon Septa, P = Plastic, C or B = Clear/Brown Glass, Describe Other
Cap Codes: PT = Plastic, Teflon lined;
2 = Volume per container; 3 = Filtered (Y/N); 4 = Refrigerated (Y/N)
5 Turnaround [N = Normal, W = 1 week, R = 24 hour, HOLD (spell)]

ADDITIONAL COMMENTS, CONDITIONS, PROBLEMS:

WEISS ASSOCIATES

WATER SAMPLING DATA TRAVEL BLANKS

Well Name _____ Date 4/27/90 Time of Sampling 1235

Job Name Shell Piedmont Job Number 81-463-01 Initials _____

Sample Point Description _____ (M = Monitoring Well)

Location _____

WELL DATA: Depth to Water _____ ft (static, pumping) Depth to Product _____ ft.

Product Thickness _____ Well Depth ____ ft (spec) Well Depth _____ ft(sounded) Well Diameter ____ in

Initial Height of Water in Casing _____ ft. = volume _____ gal.

_____ Casing Volumes to be Evacuated. Total to be evacuated _____ gal.

EVACUATION METHOD: Pump # and type _____ Hose # and type _____

Bailer# and type _____ Dedicated _____ (Y/N)

Other _____

Evacuation Time: Stop _____ _____ _____

Start _____ _____ _____

Total Evacation Time _____

Total Evacuated Prior to Sampling _____ gal.

Evacuation Rate _____ gal. per minute

Depth to Water during Evacuation _____ ft _____ time

Depth to Water at Sampling _____ ft _____ time

Evacuated Dry? _____ After _____ gal. Time _____

80% Recovery = _____

% Recovery at Sample Time _____ Time _____

Formulas/Conversions

r = well radius in ft.

h = ht of water col in ft.

vol. in cyl. = $\pi r^2 h$

7.48 gal/ft^3

V_2" casing = 0.163 gal/ft

V_3" casing = 0.367 gal/ft

V_4" casing = 0.653 gal/ft

$V_{4.5}$" casing = 0.826 gal/ft

V_6" casing = 1.47 gal/ft

V8 casing = 2.61 gal/ft

CHEMICAL DATA: Meter Brand/Number _____

Calibration: _____ 4.0 _____ 7.0 _____ 10.0

Measured:	SC/µmhos	pH	T°C	Time	Volume Evacuated (gal.)

SAMPLE: Color None Odor _____

Description of matter in sample: 1 of 3 w/ AIR bubbles

Sampling Method: _____

Sample Port: Rate ____ gpm Totalizer _____ gal.

Time _____

# of Cont.	Sample ID	Cont. Type[1]	Vol[2]	Fil[3]	Ref[4]	Preservative (specify)	Analytic Method	Turn[5]	LAB
3	040-21	W/cv	40ml	N	Y	None	EPA 8015/8020	N	NET

1 Sample Type Codes: W = Water, S = Soil, Describe Other
Container Type Codes: V = VOA/Teflon Septa, P = Plastic, C or B = Clear/Brown Glass, Describe Other
Cap Codes: PT = Plastic, Teflon lined;
2 = Volume per container; 3 = Filtered (Y/N); 4 = Refrigerated (Y/N)
5 Turnaround [N = Normal, W = 1 week, R = 24 hour, HOLD (spell)]

ADDITIONAL COMMENTS, CONDITIONS, PROBLEMS:

WEISS ASSOCIATES
Geologic and Environmental Services
Fax: 415-547-5043 Phone: 415-547-5420
5500 Shellmound Street, Emeryville, CA 94608

90 JUN 22 PM 12:00

TRANSMITTAL LETTER

FROM: J.P. Theisen JPT

DATE: June 21, 1990

TO: Mr. Gil Wistar
Alameda County Health Care Services
80 Swan Way, Room 200
Oakland, CA 94621

VIA:
- [X] First Class Mail
- [ ] Fax _____ pages
- [ ] UPS (Surface)
- [ ] Federal Express
- [ ] Courier

SUBJECT: Shell Service Station
29 Wildwood Avenue
Piedmont, CA

JOB: 81-463-03

AS:
- [ ] We discussed on the telephone on _____
- [ ] You requested _____
- [ ] We believe you may be interested
- [X] Is required

WE ARE SENDING:
- [X] Enclosed
- [ ] Under Separate Cover Via _____

Subsurface Investigation and Ground Water Monitoring Report

FOR:
- [ ] Your information
- [X] Your use
- [ ] Your review & comments
- [ ] Return to you

PLEASE:
- [X] Keep this material
- [ ] Return within 2 weeks
- [ ] Acknowledge receipt

cc: D. Lundquist, Shell Oil, P.O. Box 4023, Concord, CA 94524
Lester Feldman, RWQCB, 1800 Harrison Street, Suite 700, Oakland, CA 94612