



#3737

TRANSMITTAL

DATE: May 1, 1995 **PROJECT #:** 81-0602-21

TO: Barney Chan **PHONE:** (510) 567-6765

COMPANY: Alameda County Dept. of Environmental Health **FAX:**
 1131 Harbor Bay Parkway, #250
 Alameda, CA, 94502

FROM: Alison Watts, (510) 450 6000

SUBJECT: Shell Service Station WIC #204-5508-5801
 620 High Street, Oakland, CA

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COMMENTS:

Barney - Enclosed is a Proposed Future Action Plan and Request to Establish a Non-Attainment Zone at the Shell service station referenced above. Please call Alison Watts at (510) 450 6000 if you have any questions regarding this report.

Thanks,
- Alison

cc: Dan Kirk, Shell Oil Company, PO Box 4023, Concord, CA, 94524
 Brad Boshetto, Shell Oil Company, PO Box 4848, Anaheim, CA, 92803
 Kevin Graves, RWQCB, 2101 Webster Street, Ste. 500, Oakland, CA, 94612
 Tom Fojut, Weiss Associates

ENVIRONMENTAL PROTECTION AGENCY
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**PROPOSED FUTURE ACTION PLAN
AND
REQUEST TO ESTABLISH A
NON-ATTAINMENT ZONE**

at

**Shell Service Station
WIC #204-5508-5801
630 High Street
Oakland, California**

prepared for

**Shell Oil Company
P.O. Box 4023
Concord, California 94524**

May 1, 1995

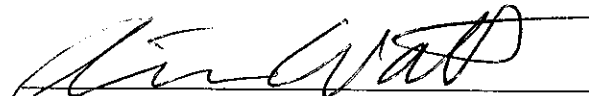
**PROPOSED FUTURE ACTION PLAN
AND
REQUEST TO ESTABLISH A
NON-ATTAINMENT ZONE**

at

**Shell Service Station
WIC #204-5508-5801
630 High Street
Oakland, California**


prepared by

Weiss Associates
5500 Shellmound Street
Emeryville, CA 94608



Alison W. Watts
Senior Staff Geologist

Weiss Associates' work for Shell Oil Company, P.O. Box 4023, Concord, California, was conducted under my supervision. To the best of my knowledge, the data contained herein are true and accurate and satisfy the specified scope of work prescribed by the client for this project. The data, findings, recommendations, specifications, or professional opinions were prepared solely for the use of Shell in accordance with generally accepted professional engineering and geological practice. We make no other warranty, either expressed or implied, and are not responsible for the interpretation by others of these data.



James W. Carmody May 1, 1995
Certified Engineering Geologist, No. 1576

CONTENTS

	Page
SUMMARY	v
INTRODUCTION	1
SITE HISTORY	2
SITE SETTING	2
SITE INVESTIGATIONS	2
EVALUATION OF NON-ATTAINMENT ZONE CRITERIA AND FUTURE ACTION PLAN	4
DISCUSSION OF NON-ATTAINMENT ZONE CRITERIA	4
FUTURE ACTION PLAN	7
CONCLUSIONS	9
REFERENCES	10

APPENDICES

APPENDIX A. FIGURES

Site Location Map

Monitoring Well Location and Ground Water Elevation Contour Map - November 18, 1992

Monitoring Well Location and Ground Water Elevation Contour Map - November 8, 1994

Monitoring Well Location and Ground Water Elevation Contour Map - February 1, 1995

Hydrogeologic Cross Section A-A' and B-B'

APPENDIX B. TABLES

Soil analytic results for SB-1 through SB-4, and MW-1 through MW-10

Ground Water Analytic Results, MW-1 through MW-8 - May and August 1989

Analytic results for ground water, MW-1 through MW-10 - January 1991 through February 1995

Analytical Results for Nutrients, Hydrocarbon Utilizing Bacteria and Dissolved Oxygen

Comparison of site characterization data to ASTM Tier 1 Risk-Based Screening Levels (RBSL).

APPENDIX C. BORING LOGS

APPENDIX D. CONTINGENCY PLAN

SUMMARY

The Shell site at 630 High Street, Oakland, California is an operating Shell service station. In 1989, an unspecified volume of soil was excavated from the eastern corner of the site, and ten monitoring wells were installed across the site. Ground water samples collected from these wells over the past five years indicate that benzene is present in ground water in the northeastern area of the site at concentrations of up to 530 parts per billion (ppb). In 1995, Weiss Associates (WA) evaluated the risk posed by the residual hydrocarbon plume using the American Society for Testing and Materials (ASTM) *Risk Based Corrective Action Applied at Petroleum Release Sites* (RBCA) guidelines. Data collected during subsurface investigations and remediation activities suggest that:

- ***The site is underlain primarily by clays with interbedded sandy and gravelly material:*** The predominately low permeability sediments present a significant technical obstacle to site remediation. However, these sediments also impede offsite migration, and have apparently contained the plume in the vicinity of the site.
- ***The plume is contained by natural processes, and hydrocarbon concentrations are stable or decreasing:*** Benzene concentrations in MW-1, located in the eastern area of the site, have decreased slightly since the well was installed in 1989. No corresponding increase has been observed in the downgradient wells, indicating that the plume is degrading onsite rather than migrating downgradient.
- ***The hydrocarbons remaining at the site do not present a risk to either human health or the environment:*** Contaminant concentrations present in the subsurface do not exceed the one in one-hundred-thousand Risk Based Screening Levels (RBSLs) presented in the ASTM RBCA guidance for identified probable exposure pathways.
- ***The plume is confined to the vicinity of the site, and has been defined to the extent possible:*** No benzene has been detected in MW-6 or MW-7, located near the downgradient, western boundary of the site. Benzene has been detected at variable concentrations in MW-5, located at the northern downgradient site boundary. It is not possible to install an additional well downgradient of MW-5, but the low concentrations detected in this well indicate that the plume does not extend far beyond the site boundary.

After review of these data, Shell and WA submit that: 1) hydrocarbons remaining in the site subsurface do not present a threat to human health or to the quality of the surrounding ground water and; 2) no technically or economically feasible remedial measures are appropriate for this site to further reduce the contaminant plume. Shell and WA request, therefore, that the Alameda County Department of Environmental Health (ACDEH) acknowledge that no additional remediation is necessary at this site, approve a reduction in well sampling, and establish a Non-Attainment Zone (NAZ) encompassing the residual hydrocarbon plume.

INTRODUCTION

At the request of Shell Oil Company, (Shell), Weiss Associates (WA) has prepared this site evaluation for Shell Service Station WIC #204-5508-5801, located at 630 High Street, Oakland, California. The objectives of this evaluation are to: 1) summarize investigative and remedial actions performed at the site to date; 2) determine whether the site meets the Regional Water Quality Control Board - San Francisco Bay Region (RWQCB) criteria for establishment of a NAZ; and 3) outline a recommended future action plan. The site-specific information presented in this evaluation was compiled from the reports listed in the References section of this report.

SITE HISTORY

SITE SETTING

Operating Shell service station WIC #204-5508-5801 is located at the southern corner of High Street, and the south-bound Highway 880 on-ramp, in an area of primarily commercial and industrial businesses in Oakland, California. The site is bounded on the northeast by Highway 880, on the west by High Street, and by industrial or commercial businesses in all other directions.

SITE INVESTIGATIONS

Source Characterization: Extensive site characterization has been completed at this site and investigative data has been provided to the ACDEH in the reports listed in the references section.

A brief summary of the site investigation activities performed at this site is presented below.

- **1989 Soil Excavation:** In January and February 1989, Armer/Norman and Associates excavated soil in the vicinity of former product dispenser pump islands, fuel lines and underground storage tanks associated with a service station previously located on the eastern portion of the site. Confirmation soil samples collected in the excavations by Blaine Tech Services (BTS) of San Jose, California, indicated that most of the hydrocarbon-impacted soil was excavated from the site. Additional soil excavation was performed after these samples were collected, and it appears that the remaining hydrocarbon-impacted soil was over-excavated. A detailed description of soil sampling activities is presented in the BTS sampling reports cited above.
- **1989 Soil Boring and Monitoring Well Installation:** In 1989, Converse Environmental West of San Francisco, California (Converse) drilled four soil borings (SB-1 through SB-4) and ten monitoring wells (MW-1 through MW-10) at the site. Selected soil samples collected from these borings were analyzed for total petroleum hydrocarbons reported as gasoline (TPH-G), total petroleum hydrocarbons reported as diesel (TPH-D), total petroleum hydrocarbons reported as motor oil (TPH-MO), total oil and grease (TOG), total lead, benzene, toluene and xylene. Benzene was detected only in samples collected from SB-2, MW-1 and MW-4, at concentrations ranging from 0.042 parts per million (ppm) to 0.046 ppm. Monitoring well locations are shown in Figure 2. Boring logs and a detailed description of well installation activities are presented in the Converse reports cited above.



- **Additional Well Installation:** In 1993, WA attempted to install an additional downgradient well to further delineate the plume. However, due to the presence of railway lines, Caltrans property and underground utilities, no appropriate location was identified.
- **Ground Water Sampling:** Quarterly ground water monitoring has been conducted since 1989. Since that time, ground water has predominately flowed towards the south. Since 1990, benzene has been detected at concentrations exceeding 100 parts per billion (ppb) only in ground water from the eastern area of the site in samples from wells MW-1, MW-3, MW-4. A benzene concentration map is included in Appendix A, and a summary of ground water analytical results is presented in Appendix B.
- **RBCA Risk Evaluation:** In January, 1995, WA performed a risk-based site assessment following the procedures outlined in the ASTM RBCA guidelines. Following the RBCA Tier 1 framework, WA determined that the existing onsite levels of petroleum hydrocarbons of concern are below target Tier 1 Risk Based Screening Levels (RBSLs) for all exposure pathways, with the exception of direct ingestion of benzene in ground water. However, ground water at the site is not used for drinking, irrigation, or any other purpose. The only identified exposure pathway is through the ground water monitoring wells, which are sealed with locking well caps, and are not accessible to unauthorized personnel. Ingestion of ground water is therefore extremely unlikely, and cannot reasonably be considered a complete exposure pathway. A table comparing site characterization data to the ASTM RBSLs is included in Appendix B.

EVALUATION OF NON-ATTAINMENT ZONE CRITERIA AND FUTURE ACTION PLAN

The distribution of the remaining hydrocarbons and the site hydrogeologic and chemical conditions indicate that this site is a candidate for reduced action and establishment of a NAZ under the RWQCB Category I criteria. In the following section, each of the Category I criterion specified by the RWQCB for establishment of a NAZ is considered for the subject site.

DISCUSSION OF NON-ATTAINMENT ZONE CRITERIA

Criterion a. The Discharger has demonstrated (e.g., pump test, ground water monitoring, transport modeling) and will verify (e.g., ground water monitoring) that no significant pollution migration will occur due to hydrogeologic or chemical characteristics.

Site Hydrogeology: The sediments beneath the site consist primarily of three to seven feet of rubble fill underlain by interbedded clay and sand sediments from 12 to 20 feet below ground surface (bgs). The clayey sandy sediments are underlain by clay to the total explored depth of 24 feet. Cross sections summarizing the site geology are included in Appendix A.

Ground Water Flow: The depth to water in site wells ranges from approximately 6 to 13 ft bgs. Review of the apparent hydraulic gradient indicates that in southeastern area of the site the gradient is consistently westward at approximately 0.05 ft/ft. But in the center of the site the gradient becomes flatter, and varies from northerly (November 8, 1994) to westerly (November 18, 1992).

These gradient fluctuations may impede offsite transport of the plume by moving the hydrocarbons back and forth across the site, allowing a greater time for natural degradation mechanisms to act before the plume reaches the site boundary. Historical ground water elevation data for monitoring wells MW-1 through MW-10 are presented in the Water Level Data and Ground Water Analytic Results table in Appendix B.

Plume Location: Hydrocarbons in ground water are present in the eastern area of the site, near MW-1. No benzene has ever been detected in MW-6 or MW-7, located near the southwestern

downgradient boundary of the site. Benzene has been detected in MW-5, located near the northwestern downgradient boundary of the site, at variable concentrations ranging from non-detectable to 86 ppb. However, concentrations have averaged less than 4 ppb over the last year, indicating that natural attenuation and biodegradation are reducing plume concentrations, and that the extent of the plume beyond MW-5 is limited. An effort was made to install an additional well downgradient of MW-5 to provide complete plume definition, however no accessible area was located.

Ground water elevations measured at the site on February 1, 1995, were higher than any elevations recorded since monitoring began in 1991. However, hydrocarbon concentrations in the site wells did not generally increase, indicating that there are no hydrocarbons present in the shallow subsurface near the water table which would provide an ongoing source to the ground water plume.

Biodegradation: In June 1993, wells MW-1, MW-4, MW-5, MW-6 and MW-9 were sampled for bacterial nutrients (potassium, phosphorous, phosphate and Kjeldahl nitrogen), oxygen and heterotrophic and hydrocarbon utilizing bacteria. These analyses indicated that both heterotrophic and hydrocarbon utilizing bacteria were present in the ground water, and that nutrients and dissolved oxygen concentrations were sufficient to sustain biological oxidation. These results indicate that biodegradation of the plume is occurring.

Criterion b. Adequate source removal and/or isolation is undertaken to limit future migration of pollutants to ground water.

In January and February 1989, Armer/Norman and Associates excavated an unspecified amount of soil in the vicinity of former product dispenser pump islands, fuel lines and underground storage tanks associated with a service station previously located on the eastern portion of the site. Confirmation soil samples collected in the excavations by Blaine Tech Services (BTS) of San Jose, California, indicated that most of the hydrocarbon impacted soil was excavated from the site. Additional soil excavation was performed after these samples were collected, and it appears that the remaining hydrocarbon-impacted soil was successfully over-excavated.

No benzene over 0.0046 ppm was detected in soil samples collected during drilling activities, indicating that the extent of hydrocarbons remaining in subsurface soils is limited. More importantly, hydrocarbon concentrations in ground water do not increase during periods of high water, indicating that no ongoing source is present near the water table in the vadose zone.

Criterion c. Dissolved phase cleanup is not cost-effective due to limited water quality impacts, environmental and human health risks and separate phases have been or are actively being removed.

Separate-phase hydrocarbons have never been detected at this site, and the dissolved phase plume is confined to the vicinity of the site. As discussed below, active remediation of the residual hydrocarbons present at the site would be difficult due to the heterogeneous, clayey sediments, and is not justified by the low risk presented by the remaining plume.

Combined Ground Water and Soil Vapor Extraction: Ground water extraction and treatment and soil vapor extraction and treatment are the most common and often the most effective technologies for controlling and remediating hydrocarbons in the subsurface. These technologies, however, would be difficult to implement due to the heterogeneous, low permeability sediments present at the site (see cross sections in Appendix A).

Air Sparging and In-Situ Biodegradation Enhancement: Air sparging and other ground water oxygenation technologies might theoretically enhance clean-up by encouraging biological degradation of hydrocarbons in both the unsaturated and saturated zones. However, adequate biodegradation appears to be occurring and additional enhancement is not necessary.

1995 RBCA: A RBCA approach was used to determine whether hydrocarbons remaining at the site present a potential threat to human health or the environment. Following the RBCA tier 1 framework, WA determined that the existing onsite levels of petroleum hydrocarbons of concern are below target Tier 1 Risk Based Screening Levels (RBSLs) for all exposure pathways, with the exception of direct ingestion of benzene in ground water. The average depth to ground water is approximately 10 ft, and the existing monitoring wells are the only known exposure route. The probability of ground water ingestion occurring is therefore very low.

Criterion d. An acceptable plan is submitted and implemented for containing and managing the remaining human health, water quality, and environmental risks, if any, posed by residual soil and ground water pollution.

Our plan for containing and managing the remaining risks posed by residual hydrocarbons at this site includes: 1) continued ground water monitoring for hydrocarbons at the downgradient edge of the plume for a specified period of time; and 2) implementing a Contingency Plan if monitoring indicates that significant offsite hydrocarbon migration is occurring.

3) *Water use restriction - no industrial or drinking water wells allowed*

Our proposed ground water monitoring schedule and Contingency Plan are presented in the Future Action Plan below.

FUTURE ACTION PLAN

Continued Ground Water Monitoring: The hydrocarbon plume at this site has remained stable since monitoring was first performed in 1989. Currently, ten site wells are monitored for hydrocarbons. In order to monitor possible offsite migration of the existing hydrocarbon plume, Shell will continue to monitor the downgradient border of the site at wells MW-5, MW-6 and MW-7 for three years. In addition, MW-1 will be monitored to track the concentrations within the plume, and to provide notification if concentrations should rise. This monitoring plan is summarized below.

- 1) Monitor wells MW-5, MW-6, and MW-7 bi-annually in the second and fourth quarters for two years, then annually for one year. Monitoring these downgradient wells will confirm that the plume is stable and is not migrating offsite.
- 2) Monitor MW-1 bi-annually for two years, then annually for one year. Monitoring this source area well will confirm that onsite concentrations continue to degrade.

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To <i>S. Long</i>	From <i>B. Chan</i>
Co. <i>Weiss Assoc</i>	Co. <i>ACEIS</i>
Dept.	Phone # <i>567-6265</i>
Fax # <i>547-5043</i>	Fax #

The info requested

Proposed Monitoring Schedule. Shell Service Station WIC #204-5508-5801

Well ID	1995				1996				1997			
	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q
MW-1	---	G&S	---	G&S	---	G&S	---	G&S	---	G&S	---	---
MW-5	---	G&S	---	G&S	---	G&S	---	G&S	---	G&S	---	---
MW-6	---	G&S	---	G&S	---	G&S	---	G&S	---	G&S	---	---
MW-7	---	G&S	---	G&S	---	G&S	---	G&S	---	G&S	---	---

G&S = Gauging and Sampling

Contingency Plan: For each of these sampling points, "baseline" and "trigger" conditions have been defined (Appendix D). Should monitoring indicate that "trigger" concentrations occur in any well, a Contingency Plan for confirmation ground water monitoring and evaluating an appropriate course of action will go into effect. This plan will ensure that "baseline" conditions are maintained in all wells. Details of the Contingency Plan are presented in Appendix D.

CONCLUSIONS

Data collected at the site demonstrate the following:

- Ground water samples have been collected at this site since 1989. During this time hydrocarbon concentrations in source area well MW-1 have gradually decreased.
- The site is underlain by clayey sediments interbedded with sandy/gravel layers. The predominantly low permeability sediments present a significant technical obstacle to site remediation. However, these sediments also impede offsite migration, and have apparently contained the plume in the vicinity of the site.
- No increase in ground water concentrations was observed in February 1995, when ground water levels were extremely high, indicating that no potential hydrocarbon source remains in the shallow soil near the water table.
- Benzene concentrations present in the subsurface do not exceed the one in one-hundred-thousand Risk Based Corrective Action Levels (RBSLs) presented in the ASTM RBCA guidance for identified probable exposure pathways.
- The hydrocarbon plume is contained in the vicinity of the site, and no benzene has ever been detected in downgradient wells MW-6 and MW-7. Benzene concentrations in MW-5 have been variable, but do not appear to be increasing. An effort to locate an additional well downgradient of MW-5 failed due to the presence of buried utility lines in the only accessible location.

Based on these findings, Shell and WA request that the ACDEH and the RWQCB accept that drinking water standards are not attainable at this site and establish a Non-Attainment Zone encompassing the residual hydrocarbon plume. The proposed monitoring and Contingency Plan will ensure that the risks posed by the residual plume are contained and managed.

REFERENCES

- ASTM ES 38-94. Emergency Standard Guide for Risk-Based Corrective Action applied at Petroleum Release Sites. American Society for Testing and Materials, Philadelphia PA, 1994.
- Blaine Tech Services, 1989, Sampling Report 89026-C-1, 7 pp.
- Blaine Tech Services, 1989, Sampling Report 89034-C-1, 8 pp.
- Converse Environmental West, 1989a, Report of Activities, Shell Oil Company Facility 630 High Street, Oakland, California, 7 pp.
- Converse Environmental West, 1989b, Shell Oil Company - Quarterly Report, 630 High Street, Oakland, California, 7 pp.
- Converse Environmental West, 1989c, Shell Oil Company - Quarterly Report, 630 High Street, Oakland, California, 12 pp.
- RWQCB, August 1994. Ground Avenue, Berkeley, California. #020203083.
- Weiss Associates, August 24, 1993 letter to Barney Chan of the Alameda County Department of Environmental Health, regarding quarterly monitoring at 630 High Street, Oakland, California.
- Weiss Associates, April 27, 1994 letter to Barney Chan of the Alameda County Department of Environmental Health, regarding quarterly monitoring at 630 High Street, Oakland, California.
- Weiss Associates, January 30, 1995 letter to Barney Chan of the Alameda County Department of Environmental Health, regarding RBCA assessment at 630 High Street, Oakland, California.

APPENDIX A

FIGURES

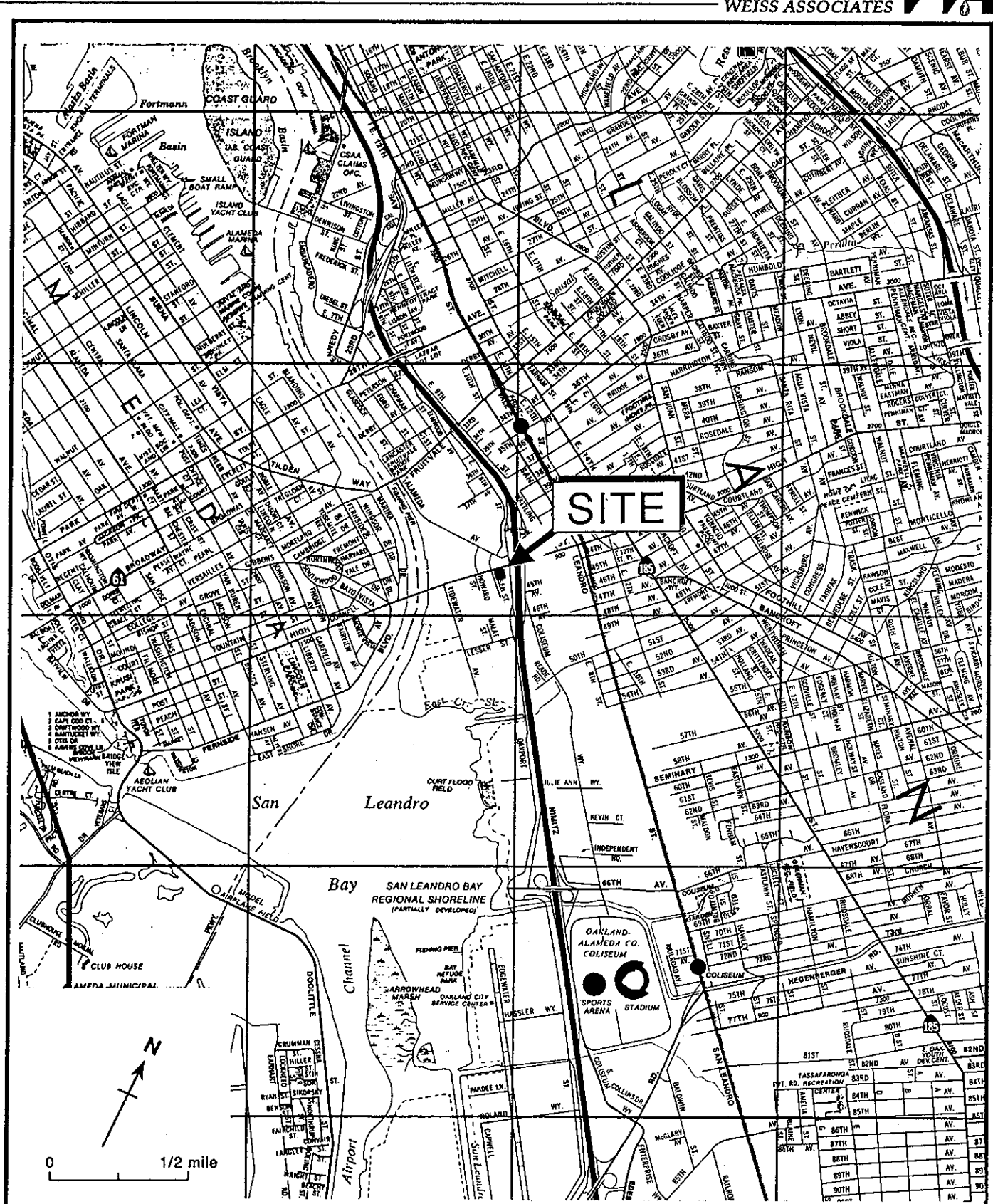


Figure 1. Site Location Map - Shell Service Station WIC #204-5508-5801, 630 High Street, Oakland, California

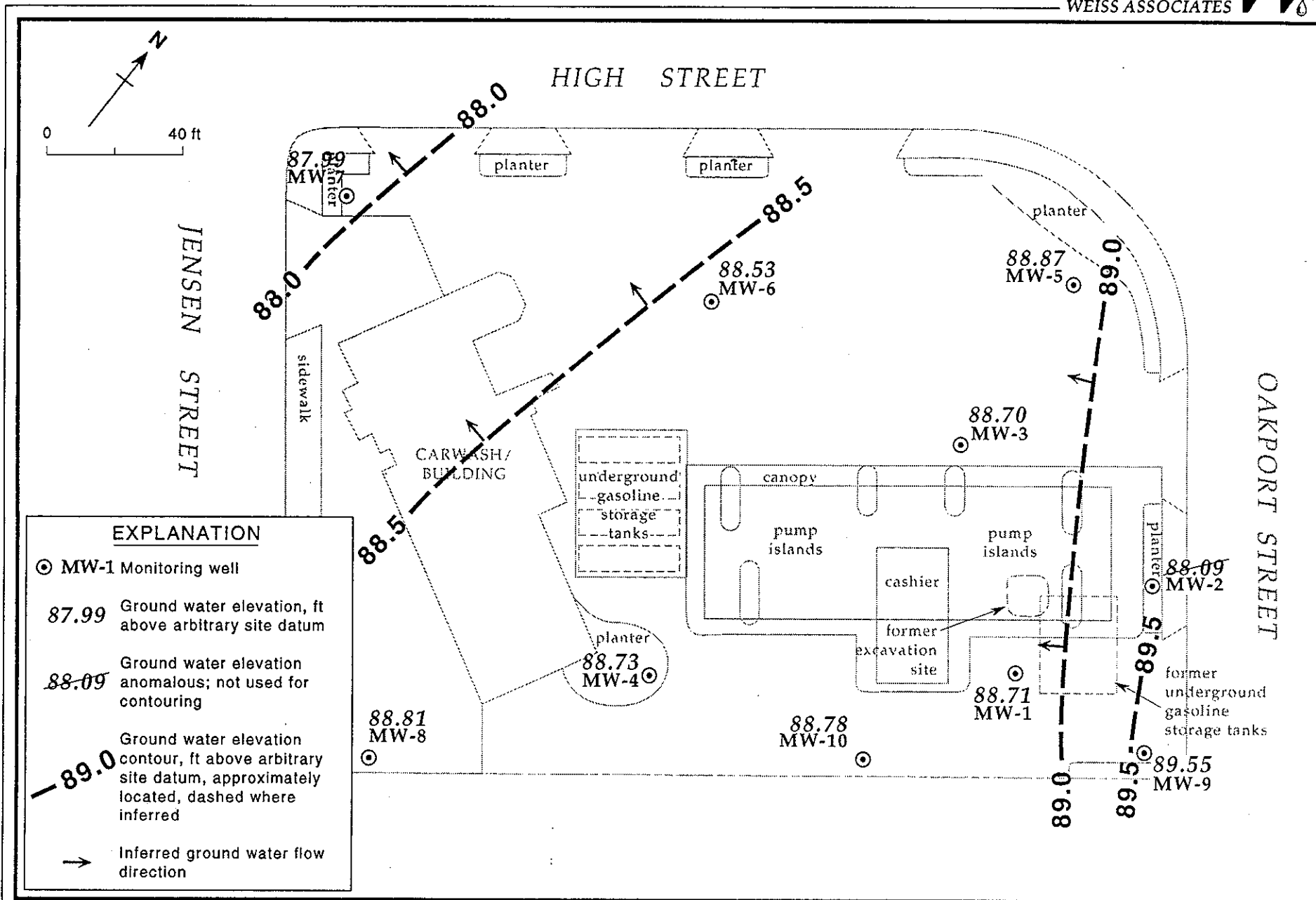


Figure 2. Monitoring Well Locations and Ground Water Elevation Contours - November 18, 1992 - Shell Service Station WIC #204-5508-5801, 630 High Street, Oakland, California

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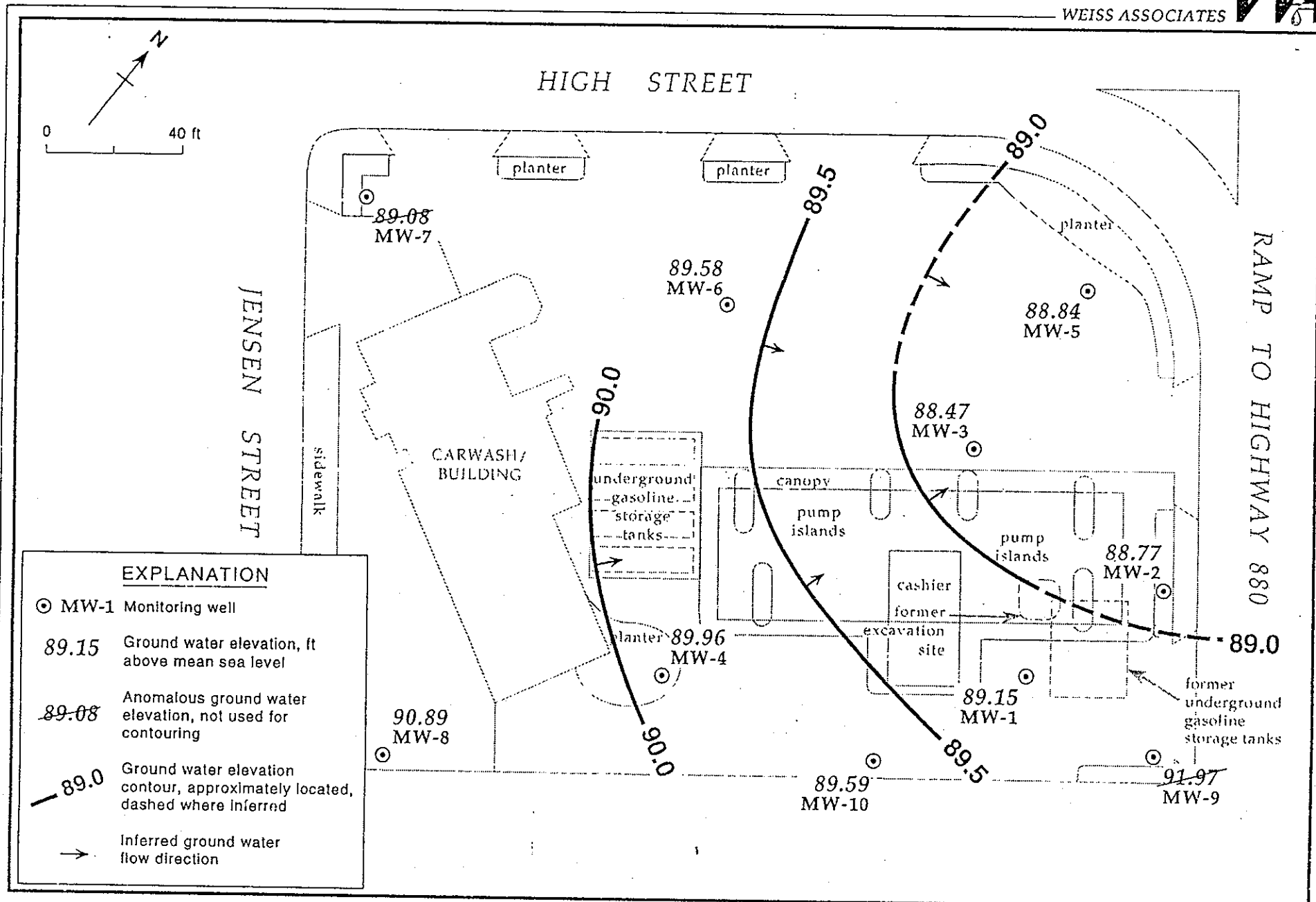
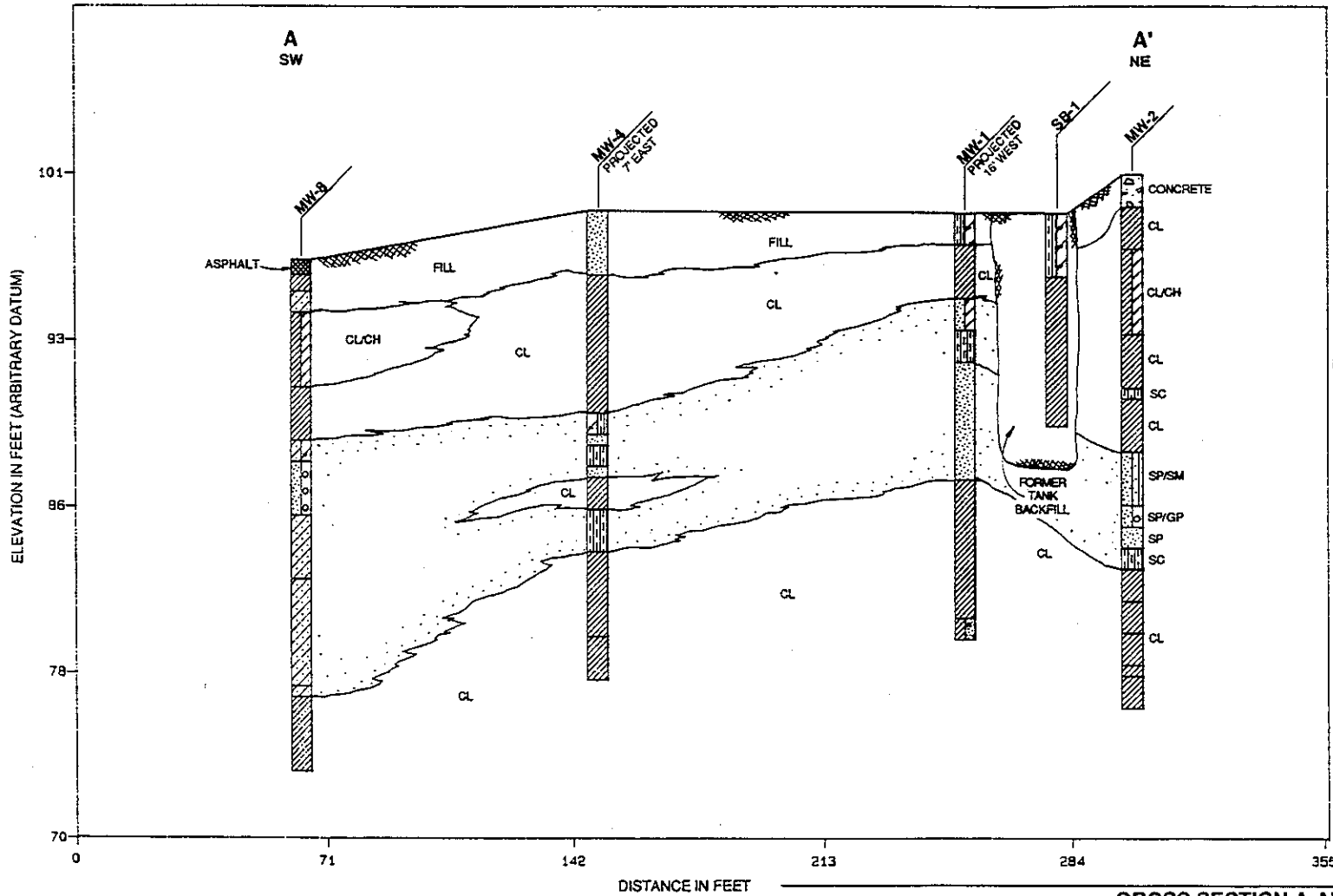





Figure 2. Monitoring Well Locations and Ground Water Elevation Contours - November 8, 1994 - Shell Service Station WIC #204-5508-5801, 630 High Street, Oakland, California



LEGEND

-  FILL: MIXED GRAVEL, SAND AND CLAY
-  SO/GC/SP RELATIVELY PERMEABLE SOIL: GRAVEL AND SAND
-  CL/CH RELATIVELY IMPERMEABLE SOIL: CLAY-RICH SOILS

NOTE: FOR EXPLANATION OF SOIL CLASSIFICATIONS SEE APPENDIX A FIGURE A-1.

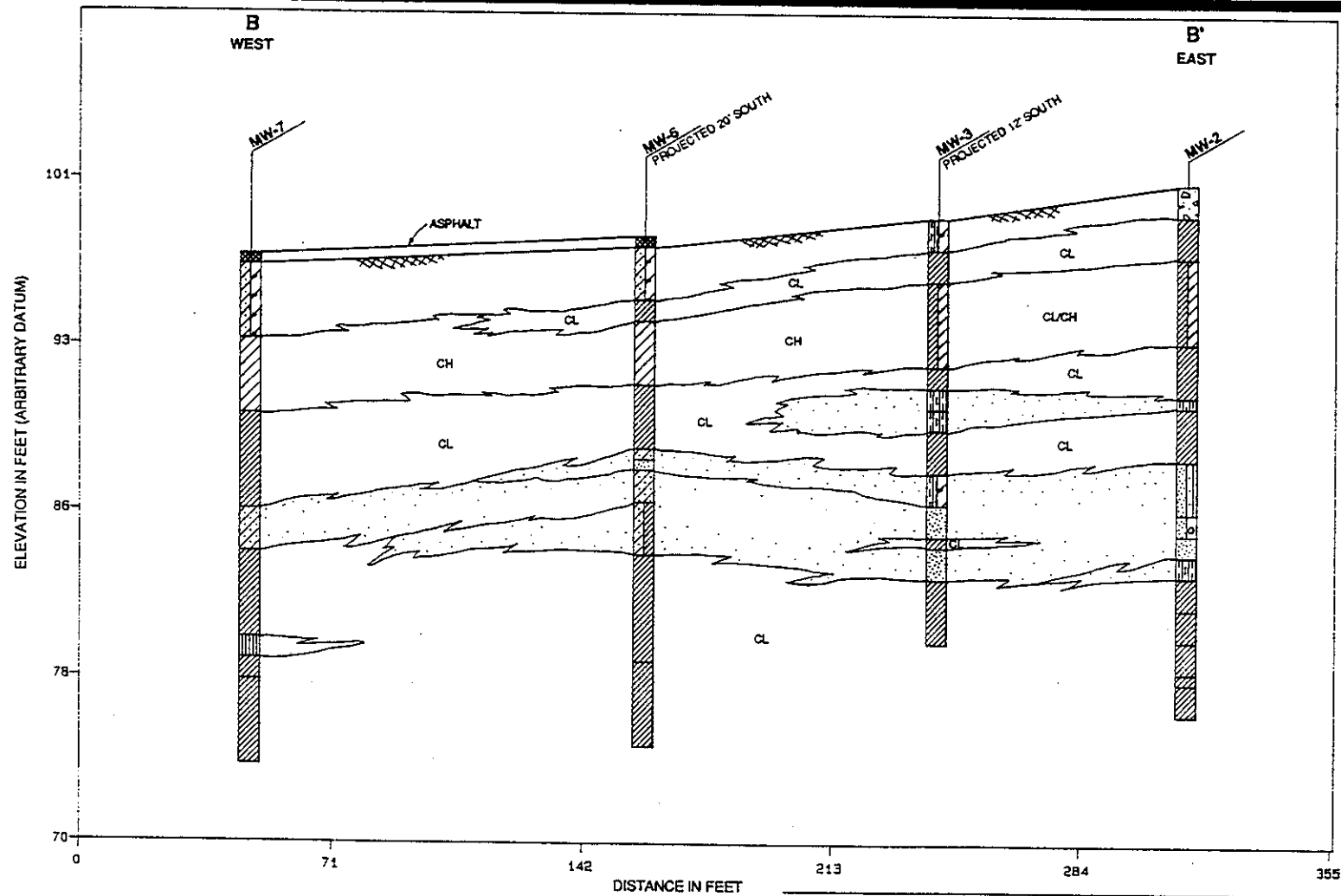
CROSS SECTION A-A'

SHELL OIL COMPANY
630 High Street
Oakland, California




Scale	AS SHOWN	Project No.	
Date	9/28/89	Drawing No.	88-44-388-06
Prepared By	MILL		
Checked By	MIY		
Approved By			



Converse Environmental Consultants California



LEGEND

-  FILL: MIXED GRAVEL, SAND AND CLAY
-  RELATIVELY PERMEABLE SOIL: GRAVEL AND SAND
-  RELATIVELY IMPERMEABLE SOIL: CLAY-RICH SOILS

NOTE: FOR EXPLANATION OF SOIL CLASSIFICATIONS SEE APPENDIX A FIGURE A-1.

CROSS SECTION B-B'

SHELL OIL COMPANY
630 High Street
Oakland, California

Scale	AS SHOWN	Project No.	
Date	9/28/89		88-44-369-01
Prepared By	MLL	Drawing No.	
Checked By	MIY		12
Approved By	DWC		

 **Converse Environmental Consultants California**

APPENDIX B

TABLES

Table 1. Soil Analytical Results - Shell Service Station WIC #204-5508-5801, 630 High Street, Oakland, California

Boring No.	Sample Depth (ft. bgs)	TPH-G	TPH-D	TPH-MO	Benzene	Toluene	TOG	Xylene	Total Lead
<-----parts per million (mg/Kg)----->									
SB-1	5	12*		85	<0.025	0.10	NA	0.14	71
SB-2	5	<10	<10	<10	0.042	0.054	NA	<0.075	16
SB-2	5,10**	<10	<10	130	<0.025	0.04	NA	<0.075	10
SB-3	5	<10	<10	<10	<0.025	0.22	290	<0.075	66
SB-3	10	<10	<10	<10	<0.025	0.045	<50	<0.075	4.2
SB-4	5	<1	16	77	<0.0025	0.032	NA	<0.0025	220
SB-4	9	<1	<1	11	<0.0025	0.056	NA	<0.0025	3.9
MW-1	5	11	<10	<10	<0.025	0.11	NA	<0.075	9.6
MW-1	5,10**	63	<10	<10	0.042	0.14	NA	0.16	7.6
MW-2	5	<10	<10	<10	<0.025	0.34	NA	<0.075	13
MW-2	5,10,15**	<10	<10	<10	<0.025	0.15	NA	<0.075	4.0
MW-3	10	<10	<10	<10	<0.025	<0.025	NA	<0.075	3.9
MW-3	5,10**	<10	<10	<10	<0.025	0.068	NA	<0.075	5.1
MW-4	5	<10	<10	<10	0.046	0.21	<50	<0.075	26
MW-4	5,10**	<10	<10	<10	<0.025	0.066	<50	<0.075	27
MW-5	5	<10	<10	<10	<0.025	<0.025	<50	<0.075	14.0
MW-5	10	<10	<10	<10	<0.025	<0.025	<50	<0.075	5.9
MW-6	5	<10	<10	<10	<0.025	0.057	220	<0.075	5.6
MW-6	10	<10	<10	<10	<0.025	<0.025	<50	<0.075	4.3
MW-7	5	<10	<10	<10	<0.025	0.040	<50	<0.075	9.8
MW-7	10	<10	<10	<10	<0.025	<0.025	<50	<0.075	3.7
MW-8	5	<10	<10	<10	<0.025	<0.025	<50	<0.075	5.1
MW-8	10	<10	<10	<10	<0.025	<0.025	<50	<0.075	2.6
MW-9	5	<1	<1	10	<0.0025	0.013	NA	<0.0025	170
MW-10	5	<1	<1	240	<0.0025	0.049	NA	<0.0025	120
MW-10	9	<1	380	3.1	<0.0025	<0.0025	NA	<0.0025	3.1

Abbreviations:

TPH-G = Total petroleum hydrocarbons as gasoline
 TPH-D = Total petroleum hydrocarbons as diesel
 TPH-MO = Total petroleum hydrocarbons as motor oil
 <n = Not detected at detection limits of n ppb
 NA Not analyzed

Notes:

- * Sample contains higher boiling point hydrocarbons not characteristic with gasoline.
- ** Composite sample

Table 2. Analytical Results for Ground Water Shell Service Station WIC #204-5508-5801, 630 High Street, Oakland, California

Well ID and Sampling Frequency	Date Sampled	Depth to Water (ft)	TPH-G	TPH-D	TPH-MO	B	E	T	X	VOCs
MW-1 Quarterly	01/29/91	10.7	11,000	21,000 ^a	<500	310	500	41	400	---
	04/30/91	9.4	8,300	2,100	<500	250	310	32	300	---
	07/22/91	10.5	11,000	3,800	<500	310	290	36	280	---
	02/24/92	8.3	7,300	8,900 ^b	800	200	340	36	270	---
	05/22/92	10.0	7,600	18,000 ^{bc}	---	140	300	<50	140	---
	07/07/92	10.0	---	---	---	---	---	---	---	---
	08/20/92	10.3	9,100	5,200 ^b	---	530	860	340	540	---
	11/18/92	10.6	15,000	4,100 ^b	---	220	790	50	340	---
	02/09/93	8.7	7,000	1,200	---	130	220	23	160	---
	06/16/93	9.7	4,800	---	---	150	320	31	130	---
	08/24/93	10.2	10,000	---	---	170	610	27	170	---
	11/23/93	10.4	7,600	---	---	190	430	<12	140	---
	11/23/93 ^{dup}	10.4	4,800	---	---	190	430	15	130	---
	02/14/94	9.1	8,000	---	---	150	210	47	68	---
	02/14/94 ^{dup}	9.1	8,900	---	---	160	230	45	76	---
	05/25/94	9.5	8,800	---	---	95	210	<10	63	---
	08/04/94	10.5	6,200	---	---	150	350	14	180	---
	08/04/94 ^{dup}	10.5	6,200	---	---	170	280	16	160	---
	11/08/94	10.2	7,600	---	---	190	480	<10	200	---
	02/01/95	6.9	8,200	---	---	130	170	21	130	---
02/01/95 ^{dup}	6.9	7,100	---	---	130	170	18	130	---	
MW-2 Bi-annual 2nd and 4th Quarter	01/29/91	13.2	<50	<50	<50	<0.5	<0.5	<0.5	<0.5	---
	04/30/91	10.9	<50	<50	<50	<0.5	<0.5	<0.5	<0.5	---
	07/22/91	12.1	<50	<50	<50	<0.5	<0.5	<0.5	<0.5	---
	02/23/92	10.0	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	05/22/92	11.5	<50	---	---	<0.5	<0.5	<0.5	<0.5	---

— Table 2 continues on next page —

Table 2. Analytical Results for Ground Water Shell Service Station WIC #204-5508-5801, 630 High Street, Oakland, California (continued)

Well ID and Sampling Frequency	Date Sampled	Depth to Water (ft)	TPH-G	TPH-D	TPH-MO	parts per billion (ug/L)				VOCs
						B	E	T	X	
	07/07/92	11.5	---	---	---	---	---	---	---	---
	08/20/92	11.7	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	11/18/92	13.0	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	02/09/93	10.0	95	---	---	<0.5	<0.5	<0.5	<0.5	---
	06/16/93	11.6	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	08/24/93	12.1	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	11/23/93	12.7	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	02/14/94	10.9	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	05/25/94	11.0	100	---	---	1.2	2.3	4.9	13	---
	11/08/94	12.3	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
MW-3	01/29/91	11.0	2,300	410 ^a	<500	17	10	14.1	230	---
Quarterly	04/30/91	9.5	<50	260	<500	22	7.0	4.0	17	---
	07/22/91	10.6	2,000	310	<500	51	<0.5	<0.5	<0.5	---
	02/24/92	8.9	2,800	640 ^d	---	15	<2.5	2.8	12	---
	05/22/92	9.3	3,700	220 ^{bc}	---	27	20	11	110	---
	07/07/92	10.2	---	---	---	---	---	---	---	---
	08/20/92	10.4	13,000	340 ^b	---	72	71	85	140	---
	11/18/92	10.7	2,100	430 ^b	---	21	11	3.6	13	---
	02/09/93	9.3	3,300	83	---	21	6.1	5.6	<0.5	---
	02/02/93 ^{dup}	9.3	3,500	130	---	18	7.2	8.8	<0.5	---
	06/16/93	9.5	3,500 ^c	---	---	66	<0.5	6	<0.5	---
	08/24/93	10.5	3,400 ^c	---	---	110	<5	<5	<5	---
	11/23/93	10.7	3,000	---	---	36	6.9	44	23	f
	02/14/94	9.6	4,700 ^g	---	---	9.9	8.8	5.2	<5.0	---
	05/25/94	10.0	1,200	---	---	<10	<10	<10	<10	---
	08/04/94	10.6	2,600	---	---	29	14	<5	11	---

— Table 2 continues on next page —

Table 2. Analytical Results for Ground Water Shell Service Station WIC #204-5508-5801, 630 High Street, Oakland, California (continued)

Well ID and Sampling Frequency	Date Sampled	Depth to Water (ft)	TPH-G	TPH-D	TPH-MO	B	E	T	X	VOCs
	11/08/94	11.0	2,600	---	---	5.5	1.9	1.5	0.9	---
	11/08/94 ^{dup}	11.0	2,700	---	---	12	6.8	5.0	3.5	---
	02/01/95	8.3	4,600	---	---	27	3.2	1.2	2.5	---
MW-4	01/29/91	10.7	2,600	1,300	<500	83	<0.5	<0.5	110	---
Quarterly	04/30/91	9.4	2,600	750	<500	22	7.0	4.0	17	---
	07/22/91	10.3	4,300	1,200	<500	120	<0.5	<0.5	10	---
	02/24/92	7.6	2,000	8,300 ^b	---	31	3.5	6.3	6.6	---
	05/22/92	9.9	3,600	3,400 ^{bc}	---	55	3	5	10	---
	07/07/92	10.0	---	---	---	---	---	---	---	---
	08/20/92	10.3	3,100	3,400	---	100	14	45	45	---
	11/18/92	10.5	2,200	1,400	---	32	4.2	12	24	---
	02/09/93	8.1	1,500	180	---	1.1	<0.5	<0.5	<0.5	---
	06/16/93	9.6	1,100	---	---	120	5.1	47	19	---
	08/24/93	10.0	2,700	---	---	46	25	11	0.97	---
	11/23/93	10.2	2,500	---	---	23	3.7	5.7	16	---
	02/14/94	8.8	1,500	---	---	12	<2.5	7.8	<2.5	---
	05/25/94	9.6	810	---	---	20	<2	<2	4.0	---
	08/04/94	10.6	2,300	---	---	99	6.3	15	24	---
	11/08/94	9.2	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	02/01/95	6.5	960	---	---	5.6	2.6	2.2	2.8	---
MW-5	01/29/91	11.7	3,100	720	<500	86	24	<0.5	28	---
Quarterly	04/30/91	10.4	<50	90	<500	46	9.0	<0.5	9	---
	07/22/91	11.4	1,700	300	<500	23	6,700	<0.5	10,000	---
	02/23/94	9.2	240	180 ^h	<0.5	1	<0.5	<0.5	1	---
	05/22/92	10.9	6,200	7,100 ^{bc}	---	6	56	95	99	---
	07/07/92	10.9	---	---	---	---	---	---	---	---

— Table 2 continues on next page —

Table 2. Analytical Results for Ground Water Shell Service Station WIC #204-5508-5801, 630 High Street, Oakland, California (continued)

Well ID and Sampling Frequency	Date Sampled	Depth to Water (ft)	TPH-G	TPH-D	TPH-MO	B	E	T	X	VOCs
			←————— parts per billion (ug/L) —————→							
	08/20/92	11.1	7,400	120 ^b	---	56	91	95	150	---
	11/18/92	11.2	3,300	320 ^b	---	27	20	<12.5	470	---
	02/09/93	10.0	160	<50	---	<0.5	<0.5	<0.5	<0.5	---
	06/16/93	11.0	140	---	---	0.8	<0.5	<0.5	<0.5	---
	08/24/93	11.3	1,000	---	---	7.9	2.2	<1	<1.5	---
	11/23/93	11.3	2,000	---	---	67	11	15	33	---
	02/14/94	10.3	660	---	---	1.3	0.5	<0.5	0.7	---
	05/25/94	10.5	670	---	---	0.65	2.6	<0.5	<0.5	---
	08/04/94	11.5	700	---	---	5.0	1.2	<0.5	<0.5	---
	11/08/94	11.2	810	---	---	4.2	1.5	<0.5	0.8	---
	02/01/95	9.0	110	---	---	7.0	<0.5	<0.5	<0.5	---
MW-6	01/29/91	10.2	<50	860	<500	<0.5	<0.5	<0.5	<0.5	---
Quarterly	04/30/91	9.1	<50	1,100	<500	<0.5	<0.5	<0.5	<0.5	---
	07/22/91	10.1	<50	1,200	<500	<0.5	<0.5	<0.5	<0.5	---
	02/23/92	7.1	<50	60 ^d	---	<0.5	<0.5	<0.5	<0.5	---
	05/22/92	9.5	<50	650 ^c	---	<0.5	<0.5	<0.5	<0.5	---
	07/07/92	9.5	---	---	---	---	---	---	---	---
	08/20/92	9.8	140 ^c	510 ^c	---	<0.5	<0.5	<0.5	<0.5	---
	11/18/92	10.0	200 ^c	350	---	<0.5	<0.5	<0.5	<0.5	---
	02/09/93	7.9	14,000	---	---	<0.5	<0.5	<0.5	<0.5	---
	06/16/93	8.7	5,700 ^c	---	---	<0.5	<0.5	22	34	---
	06/16/93 ^{dup}	8.7	5,600	---	---	<0.5	<0.5	<0.5	<0.5	---
	08/24/93	9.6	4,300 ^c	---	---	<12.5	<12.5	<12.5	<12.5	---
	08/24/93 ^{dup}	9.6	3,800 ^c	---	---	<12.5	<12.5	<12.5	<12.5	---
	11/23/93	9.8	3,300 ^c	---	---	<12	<12	<12	<12	nd
	02/14/94	8.2	14,000 ⁱ	---	---	<12.5	<12.5	<12.5	<12.5	---
	05/25/94	8.8	<1,000 ^j	---	---	<10	<10	<10	<10	---

— Table 2 continues on next page —



Table 2. Analytical Results for Ground Water Shell Service Station WIC #204-5508-5801, 630 High Street, Oakland, California (continued)

Well ID and Sampling Frequency	Date Sampled	Depth to Water (ft)	TPH-G	TPH-D	TPH-MO	B	E	T	X	VOCs
			←————— parts per billion (ug/L) —————→							
	05/25/94 ^{dup}	8.8	<1,000 ^j	---	---	<10	<10	<10	<10	---
	08/04/94	10.1	250 ^k	---	---	<0.5	<0.5	<0.5	<0.5	---
	11/08/94	8.9	4,600 ^c	---	---	<0.5	<0.5	<0.5	<0.5	---
	02/01/95	7.0	710 ^e	---	---	<0.5	<0.5	<0.5	<0.5	---
MW-7	01/28/91	8.9	<50	<50	<500	<0.5	<0.5	<0.5	<0.5	---
Bi-annual	05/01/91	8.3	<50	<50	<500	<0.5	<0.5	<0.5	<0.5	---
(2nd & 4th	07/23/91	9.1	<50	<50	<500	<0.5	<0.5	<0.5	<0.5	---
Quarters)	02/23/92	6.8	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	05/22/92	8.0	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	07/07/92	8.8	---	---	---	---	---	---	---	---
	08/20/92	8.8	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	11/18/92	9.5	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	02/09/93	7.8	72	---	---	<0.5	<0.5	<0.5	<0.5	---
	06/16/93	7.8	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	08/24/93	8.5	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	11/23/93	8.7	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	02/14/94	7.5	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	05/25/94	9.0	<50	---	---	<0.5	<0.5	0.63	0.93	---
	11/08/94	8.4	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
MW-8	01/28/91	8.4	<50	<50	<500	<0.5	<0.5	<0.5	<0.5	---
Bi-annual	05/01/91	7.6	<50	<50	<500	<0.5	<0.5	<0.5	<0.5	---
(2nd & 4th	07/23/91	8.3	<50	<50	600	<0.5	<0.5	<0.5	<0.5	---
Quarters)	02/23/92	6.5	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	05/22/92	7.6	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	07/07/92	8.1	---	---	---	---	---	---	---	---
	08/20/92	8.2	<50	---	---	<0.5	<0.5	<0.5	<0.5	---

— Table 2 continues on next page —



Table 2. Analytical Results for Ground Water Shell Service Station WIC #204-5508-5801, 630 High Street, Oakland, California (continued)

Well ID and Sampling Frequency	Date Sampled	Depth to Water (ft)	TPH-G	TPH-D	TPH-MO	B	E	T	X	VOCs
	11/18/92	8.3	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	02/09/93	5.5	63	---	---	<0.5	<0.5	<0.5	<0.5	---
	06/16/93	7.1	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	08/24/93	7.9	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	11/23/93	8.0	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	02/14/94	9.4	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	05/25/94	7.1	<50	---	---	<0.5	<0.5	1.1	2.5	---
	11/08/94	6.2	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
MW-9	01/28/91	8.2	<50	<50	<500	<0.5	<0.5	<0.5	<0.5	---
Bi-annual	05/01/91	7.6	<50	<50	<500	0.6	<0.5	<0.5	1.1	---
(2nd & 4th	07/23/91	8.4	<50	<50	800	<0.5	<0.5	<0.5	<0.5	---
Quarters)	02/23/92	6.9	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	05/22/92	8.6	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	07/07/92	7.5	---	---	---	---	---	---	---	---
	08/20/92	7.3	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	08/20/92 ^{dup}	7.3	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	11/18/92	10.1	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	11/18/92 ^{dup}	10.1	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	02/09/93	6.8	290	110	---	6	<0.5	<0.5	<0.5	---
	06/16/93	8.7	90 ^c	---	---	<0.5	<0.5	<0.5	<0.5	---
	08/24/93	8.3	50 ^c	---	---	<0.5	<0.5	<0.5	<0.5	---
	11/23/93	8.1	<50	---	---	<0.5	<0.5	<0.5	<0.5	nd
	02/14/94	7.6	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	05/25/94	7.8	56	---	---	1.3	1.4	4.0	8.3	---
	11/08/94	7.7	<50	---	---	<0.5	<0.5	<0.5	<0.5	---

— Table 2 continues on next page —

Table 2. Analytical Results for Ground Water Shell Service Station WIC #204-5508-5801, 630 High Street, Oakland, California (continued)

Well ID and Sampling Frequency	Date Sampled	Depth to Water (ft)	TPH-G	TPH-D	TPH-MO	parts per billion (ug/L)				VOCs
						B	E	T	X	
MW-10	01/28/91	10.8	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
Bi-annual	05/01/91	8.7	<50	460	<500	<0.5	<0.5	<0.5	<0.5	---
(2nd & 4th Quarter)	07/23/91	9.9	<50	<50	900	<0.5	<0.5	<0.5	<0.5	---
	02/23/92	9.1	<50	120	---	<0.5	<0.5	<0.5	<0.5	---
	05/22/92	9.1	<50	310	---	<0.5	<0.5	<0.5	<0.5	---
	07/07/92	9.8	---	---	---	---	---	---	---	---
	08/20/92	9.3	<50	460	---	<0.5	<0.5	<0.5	<0.5	---
	11/18/92	10.2	<50	470	---	<0.5	<0.5	<0.5	<0.5	---
	02/09/93	7.6	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	06/16/93	8.5	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	08/24/93	9.6	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	11/23/93	10.1	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	02/11/94	9.0	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	05/25/94	8.8	<50	---	---	<0.5	<0.5	1.1	1.4	---
	11/08/94	9.4	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
Travel Blank	02/24/92		<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	05/22/92		<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	08/20/92		<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	11/18/92		<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	02/09/93		<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	06/16/93		<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	08/24/93		<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	11/23/93		<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	02/14/94		<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	05/25/94		<50	---	---	<0.5	<0.5	<0.5	<0.5	---

— Table 2 continues on next page —

Table 2. Analytical Results for Ground Water Shell Service Station WIC #204-5508-5801, 630 High Street, Oakland, California (continued)

Well ID and Sampling Frequency	Date Sampled	Depth to Water (ft)	TPH-G	TPH-D	TPH-MO	B	E	T	X	VOCs
	08/04/94		<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	11/08/94		<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	02/01/95		<50	---	---	<0.5	<0.5	<0.5	<0.5	---
Bailer	08/20/92		<50	---	---	<0.5	<0.5	<0.5	<0.5	---
Blank	11/18/92		<50	---	---	<0.5	<0.5	<0.5	<0.5	---
DTSC MCLs			NE	NE	NE	1	680	100 ^l	1,750	---

Abbreviations:

TPH-G = Total petroleum hydrocarbons as gasoline by Modified EPA Method 8015
 TPH-D = Total petroleum hydrocarbons as diesel by Modified EPA Method 8015
 TPH-MO = Total petroleum hydrocarbons as motor oil by EPA Method 8015
 B = Benzene by EPA Method
 E = Ethylbenzene by EPA Method
 T = Toluene by EPA Method
 X = Xylenes by EPA Method
 VOC = Volatile organic compounds by EPA Method 8240
 NE = Not established
 --- = Not analyzed
 <n = Not detected at detection limits of n ppb
 DTSC MCLs = California Department of Toxic Substances Control maximum contaminant levels for drinking water
 nd = not detected at or above the reporting limit for the analysis as performed
 dup = Duplicate sample

Notes:

- a = Compounds detected and calculated as diesel do not match the diesel standard; pattern is characteristic of weathered diesel.
- b = Concentration reported as diesel is primarily due to the presence of a lighter petroleum product, possible gasoline or kerosene
- c = Concentration reported as diesel is primarily due to a heavier petroleum product, possible motor oil or aged diesel fuel
- d = Compounds detected within the diesel range are not characteristics of the standard diesel chromatographic pattern
- e = Concentration reported as gasoline is partially or primarily due to the presence of a discrete hydrocarbon peak not indicative of gasoline
- f = 26 ppb benzene detected using EPA Method 8240
- g = The concentration reported as gasoline for MW-3 is due to the presence of a combination of gasoline and a discrete peak not indicative of gasoline
- h = Compounds detected and calculated as diesel appear to be the less volatile constituents of gasoline
- i = The concentration reported as gasoline for sample MW-6 is primarily due to the presence of a discrete peak not indicative of gasoline
- j = Sample diluted due to high-non hydrocarbon peak.
- k = The positive result has an atypical pattern for gasoline analysis.
- l = DTSC recommended action level; MCL not established.



Table 3. Analytical Results for Nutrients, Hydrocarbon Utilizing Bacteria and Dissolved Oxygen for Shell Service Station WIC #204-5508-5801, 630 High Street, Oakland, California

Well	Date Sampled	Potassium (mg/L)	Phosphorous (mg/L)	Phosphate (mg/L)	Kjeldahl Nitrogen (mg/L)	Heterotrophic Bacteria Plate Count (CFU/ml)	Hydrocarbon Utilizing Bacteria (CFU/ml)	Dissolved Oxygen ^a (mg/L)
MW-1	06/17/93 08/24/93 11/23/93 02/14/94	12.0	0.80	2.4	5.4	80,000	310	1.73/1.58 1.49/1.70 1.77/2.80 6.2/2.5
MW-4	06/17/93 08/24/93 11/23/93 02/14/94	1.5	3.50	11.0	4.2	8,200	200	1.86/4.82 1.46/1.27 5.29/6.59 2.1/1.9
MW-5	06/17/93 08/24/93 11/23/93 02/14/94	8.8	0.07	0.21	1.0	3,200	490	1.53/2.72 2.69/1.41 8.20/3.09 2.0/1.9
MW-6	06/17/93 08/24/93 11/23/93 02/14/94	0.8	0.06	0.19	1.1	2,000	450	8.46/9.73 2.15/1.52 3.86/6.75 2.3/5.2
MW-9	06/17/93 08/24/93 11/23/93 02/14/94	14.0	0.22	0.66	0.8	9,200	2,300	1.51/2.17 2.86/2.74 3.41/3.78 4.6/5.2

Abbreviations and Notes:

CFU/ml = Colony forming units per milliliter

a = Field measurement of dissolved oxygen concentrations before and after well purging

Table 3. Comparison of Site Characterization Data to ASTM Tier 1 Risk-Based Screening Levels (RBSL). Shell Service Station, 630 High Street, Oakland, California.

Media	Exposure Pathway	Benzene (ppm)		Ethylbenzene (ppm)		Toluene (ppm)		Xylenes (ppm)	
		RBSL ⁽¹⁾	Max. Detected Onsite ⁽³⁾	RBSL ⁽²⁾	Max. Detected Onsite	RBSL ⁽²⁾	Max. Detected Onsite	RBSL ⁽²⁾	Max. Detected Onsite
Soil	Volatilization to Outdoor Air (mg/kg)	4.57	0.046 at 3 ft in MW-4	RES ⁽⁴⁾	NA ⁽⁵⁾	RES	0.34 at 5 ft in MW-2	RES	0.16 at 5 ft in MW-1
	Vapor Intrusion from Soil to Buildings (mg/kg)	0.169	0.046 at 3 ft in MW-4	90.8	NA	54.5	0.34 at 5 ft in MW-2	RES	0.16 at 5 ft in MW-1
	Surficial Soil (0-3 ft) Ingestion/Dermal/Inhalation (mg/kg)	10	0.046 at 3 ft in MW-4	1,150	NA	1,870	0.34 at 5 ft in MW-2	208,000	0.16 at 5 ft in MW-1
	Leachate to Protect Ground water Ingestion Target Level (mg/kg)	0.578	0.046 at 3 ft in MW-4	133	NA	361	0.34 at 5 ft in MW-2	RES	0.16 at 5 ft in MW-1
Ground Water	Volatilization to Outdoor Air (mg/L)	184	0.190 in MW-1	>S ⁽⁶⁾	0.610 in MW-1	>S	0.047 in MW-1 and MW-4	>S	0.2 in MW-1
	Vapor Intrusion from Groundwater to Buildings (mg/L)	2.56	0.190 in MW-1	>S	0.610 in MW-1	300	0.047 in MW-1 and MW-4	>S	0.2 in MW-1
	Ingestion (mg/L)	0.0987	0.190 in MW-1 ⁽⁷⁾	10.2	0.610 in MW-1	20.4	0.047 in MW-1 and MW-4	>S	0.2 in MW-1

Notes:


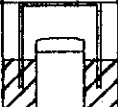
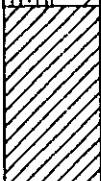
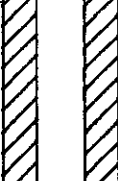
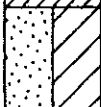
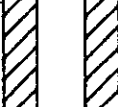

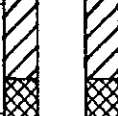
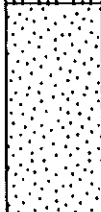
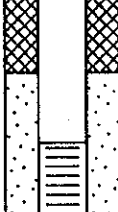

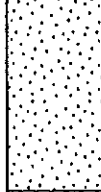
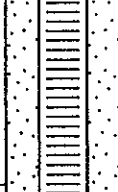
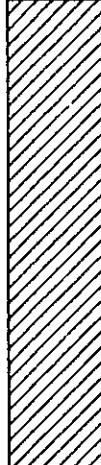
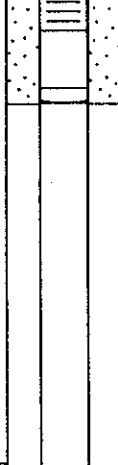


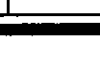
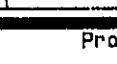


- (1) The target risk level used for benzene is a carcinogenic risk of 1 in 100,000 ($1E^{-5}$), calculated from the $1E^{-4}$ and $1E^{-6}$ Target levels listed in Table 4 of the ASTM guidelines (ASTM ES 38-94).
- (2) The target risk level used for non-carcinogenic constituents of concern is a chronic hazard quotient of 1.0.
- (3) Maximum concentration detected in soil borings reported by Converse Environmental West, 1989. Max. ground water concentration detected in site wells in 1993 and 1994 (WA quarterly reports).
- (4) RES = Selected risk level is not exceeded for pure compound present at any concentration in soil.
- (5) NA = Not Analyzed
- (6) >S = At pure component solubility (mg/l), selected risk level is not exceeded.
- (7) ASTM RBSL is exceeded only in the case of ground water ingestion of benzene. However, ground water is accessible only through the monitoring wells, which are locked, and this is considered a very unlikely exposure route.

APPENDIX C

BORING LOGS

LOG OF BORING NO. MW-1

DATE DRILLED: 4/25/89 ELEVATION: WL TAKEN: 4/25/89 EQUIPMENT: 3-3/4" x 8" & 8-1/2" x 12

DEPTH (ft)	SAMPLE	WATER LEVEL	SYMBOL	MOISTURE	PLASTICITY	COLOR	DESCRIPTION	WELL CONSTRUCTION	BLOMS/FT.	T.P.H Mg/Kg	TESTS
				slightly moist		brown	CLAYEY SAND and fine to coarse gravel-size rock fragments				
				moist		dark gray-brown	SANDY CLAY CL				
5				moist		light gray	Mix Bay Mud? Fine clean SAND (Fill) Odor SP-CH		8		
				damp to slightly moist		light gray	Pockets or layers of fine SAND, CLAYEY SAND, BAY MUD (Fill) SC		24		
				moist to very moist		dark gray	Fine SAND Trace mica, trace silt SP		9		
10				wet			Sheen of product on water Lenses sand and clayey sand Product sheen		5 59		
				very moist		mottled gray-brown-rust	SILTY CLAY Trace fine sand CL		37		
15				very moist					44		
				very moist					22		
20				very moist			Very SILTY CLAY fine SAND CL-SW		22		



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Project No.
88-44-369-01



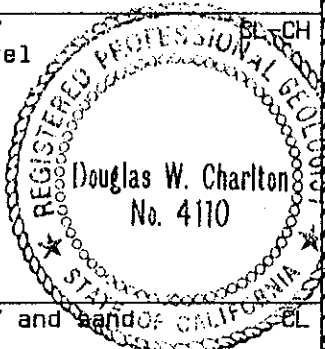
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Drawing No.
A-3

LOG OF BORING NO. MW-2

DATE DRILLED: 4/25/89 ELEVATION: WL TAKEN: 4/25/89 EQUIPMENT: 3-3/4" x 8" & 8-1/2" x 12

DEPTH (ft)	SAMPLE	WATER LEVEL	SYMBOL	MOISTURE	PLASTICITY	COLOR	DESCRIPTION	WELL CONSTRUCTION	BLOWS/FT.	T.P.H Mg/Kg	TESTS
				slightly moist	loose	brown	Top Soil with Redwood Chips				
				moist	medium	dark brown	SILTY CLAY With concrete fragments (Fill) No odor				
5				moist	stiff	black	SILTY CLAY Trace gravel		10		
				moist	very stiff	gray-mottled rust	SILTY CLAY and sand No odor		26		
10				moist	dense	gray	CLAYEY SAND		37		
				moist	very stiff	tan-mottled rust	SILTY CLAY		24		
				moist	medium dense	tan	SILTY SAND little GRAVEL		44		
15				wet.			Silty fine Sand		67		
				wet	medium	tan	GRAVELLY SAND		26		
				wet	medium dense	tan	Coarse SAND		48		
				wet			Coarse SAND some clay		60		
20				moist	stiff	tan-mottled black	SILTY CLAY		17		



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Project No.
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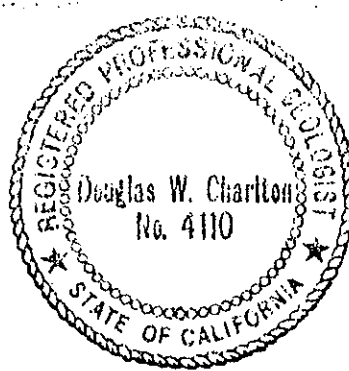
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Drawing No.
A-4

LOG OF BORING NO.MW-2

continued - page 2

DEPTH (ft)	SAMPLE	WATER LEVEL	SYMBOL	MOISTURE	PLASTICITY	COLOR	DESCRIPTION	WELL CONSTRUCTION	BLOWS/FT.	T.P.H Mg/Kg	TESTS
				moist	stiff	tan	SILTY CLAY CL		27		
				moist		gray-tan	SILTY CLAY trace gravel CL		31		
							SILTY CLAY some gravel CL				
							SILTY CLAY trace fine gravel CL				
25							Bottom of Hole at 25 ft.				
30											
35											
40											



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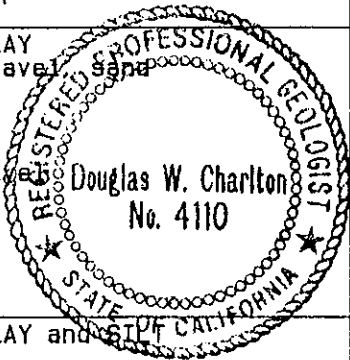


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Drawing No.
A-5

LOG OF BORING NO. MW-4

DATE DRILLED: 4/25/89		ELEVATION:		WL TAKEN: 4/25/89		EQUIPMENT: 3-3/4" x 8" & 8-1/2" x 12"					
DEPTH (ft)	SAMPLE	WATER LEVEL	SYMBOL	MOISTURE	PLASTICITY	COLOR	DESCRIPTION	WELL CONSTRUCTION	BLOWS/FT.	T.P.H Kg/Kg	TESTS
5			•••••	slightly moist	loose	brown	GRAVELLY SAND (Fill)				
			•••••	slightly moist	medium dense	gray	Sub-angular SANDY GRAVEL (Fill)				
			/ / / / /	moist	soft	dark brown	SANDY CLAY Some odor		CL		
			/ / / / /		medium	black	SILTY CLAY Trace gravel			14	
			/ / / / /				Fine gravel			34	
			/ / / / /		stiff	gray	SANDY CLAY and			51	
			/ / / / /							22	
			/ / / / /	wet	medium dense	gray	CLAYEY SAND and GRAVEL CLAYEY fine SAND		GC-SC	44	
			/ / / / /			gray	Clean coarse SAND		SP		
			/ / / / /				CLAYEY fine SAND Strong odor		SC		
			/ / / / /				Lens coarse SAND		SP		
	15			/ / / / /	moist	stiff	gray-mottled rust-brown		SILTY CLAY	CL	54
			/ / / / /	wet	loose	gray	CLAYEY SAND and GRAVEL Lenses of sandy gravel Odor	SC	59		
			/ / / / /	very moist	medium	tan mottled black	SILTY CLAY	CL	16		
20			/ / / / /			Trace fine sand with depth Less odor		18			



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Oakland, California

Project No.
88-44-369-01



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Drawing No.
A-7

LOG OF BORING NO.MW-4

continued - page 2

DEPTH (ft)	SAMPLE	WATER LEVEL	SYMBOL	MOISTURE	PLASTICITY	COLOR	DESCRIPTION	WELL CONSTRUCTION	BLOWS/FT.	T.P.H Mg/Kg	TESTS
				moist	stiff	tan- mottled black	SILTY CLAY Trace fine sand No odor	CL	30		
25							Bottom of Hole at 22 ft.				
30											
35											
40											



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Project No.
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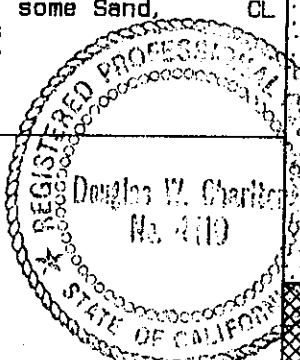
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Drawing No.
A-8

LOG OF BORING NO. MW-5

DATE DRILLED: 8-16-89 ELEVATION: 99.91 WL TAKEN: 8-17-89 EQUIPMENT: 3-3/4" x 8" Hollow Auger

DEPTH (FT.)	SAMPLE	WATER LEVEL	SYMBOL	MOISTURE	CONSISTENCY	COLOR	DESCRIPTION	WELL CONSTRUCTION	BLDN/FT.	O.V.M. (ppm)	T.P.H. (ppm)
				moist		yellow brown	ASPHALT and BASE ROCK, Clayey SAND and Rock fragments				
				very moist	medium dense	brown	Clayey SAND and fine size Rock fragments, pieces Asphalt, trace brick (Fill)				
				moist	medium		Sandy CLAY (Fill)				
15	1			slightly moist	medium dense	brown	Clayey SAND and fine crush ROCK (Fill)		17	0	
				moist	stiff	black	Silty CLAY (Native)				
20	2			moist	medium dense	yellow to brown	Sandy CLAY, grading to Clayey SAND, trace fine Gravel		8	0	
				v moist		gray	Clayey SANDS, some fine Gravel Strong odor				
				moist							
30				very moist	medium	gray mottled tan and black	Silty CLAY, some Sand, Sand lenses Strong odor		33		
				moist							
				medium to stiff		tan with mottled black	Silty CLAY Less odor				
50				very moist	medium	tan	Total Depth of Boring 20 ft.		18		



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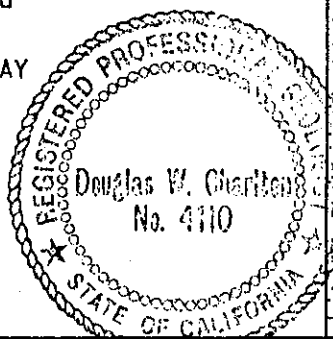
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Drawing No.
A-2

LOG OF BORING NO. MW-6

DATE DRILLED: 8-16-89		ELEVATION: 98.56		WL TAKEN: 8-16-89		EQUIPMENT: 3-3/4" x 8" Hollow Auger					
DEPTH (ft)	SAMPLE	WATER LEVEL	SYMBOL	MOISTURE	CONSISTENCY	COLOR	DESCRIPTION	MELL CONSTRUCTION	BLOWS/FT.	O.V.M. (ppm)	T.P.H. (ppm)
1			[Cross-hatched symbol]				ASPHALT 3-1/2 BASE ? red-brown Clayey SAND and crushed ROCK fine course size (Fill) SC/GC	[Well construction diagram]	7	0	
			[Diagonal lines symbol]			brown Clayey SAND and fine crushed rock (Fill)					
			[Diagonal lines symbol]			gray Very Sandy CLAY (Fill) CL					
5			[Diagonal lines symbol]	moist	stiff	black	Silty CLAY (Native) CH	[Well construction diagram]			
							dark gray to gray brown Sandy CLAY CL				
10			[Diagonal lines symbol]				mottled gray and rust Clayey medium SAND SC	[Well construction diagram]	9	0	
							Fine SAND lens 3" thick SP				
				v moist			Clayey fine and medium SAND SC				
				moist			Alternate Clayey SAND and Sandy CLAY SC/CL				
15			[Diagonal lines symbol]	wet			Silty CLAY, trace fine Sand CL	[Well construction diagram]	10	0	
				very moist	medium		Silty CLAY				
20			[Diagonal lines symbol]					[Well construction diagram]	14	0	



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630 High Street
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Project No.
88-44-369-01

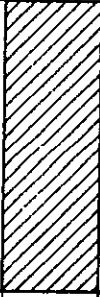
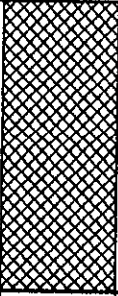


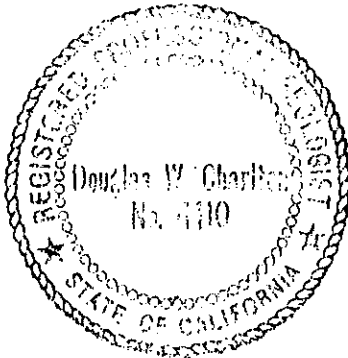
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Drawing No.
A-3

LOG OF BORING NO. MW-6

continued - page 2

SAMPLE	WATER LEVEL	SYMBOL	MOISTURE	CONSISTENCY	COLOR	DESCRIPTION	WELL CONSTRUCTION	BLMS/FT.	G.V.M. (ppm)	T.P.H. (ppm)
1			very moist	medium	mottled gray and brown	Silty CLAY CL		17		
						Fine Sandy CLAY				
						Total Depth of Boring 24 ft.				



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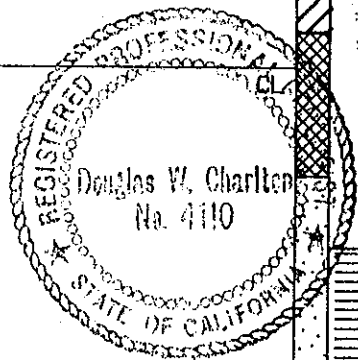
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A-4

LOG OF BORING NO. MW-7

DATE DRILLED: 8-15-89		ELEVATION: 97.64		WL TAKEN: 8-15-89		EQUIPMENT: 3-3/4" x 8" Hollow Auger				
DEPTH (FT)	SAMPLE WATER LEVEL	SYMBOL	MOISTURE	CONSISTENCY	COLOR	DESCRIPTION	WELL CONSTRUCTION	BLOWS/FT.	G.V.M. (ppm)	T.P.H. (ppm)
		[Cross-hatched symbol]				ASPHALT 3" NO BASE				
		[Diagonal lines symbol]	moist	medium dense	brwn and green	Clayey SANDS and ROCK fragments to cobble size (Fill) SC/GC				
		[Diagonal lines symbol]	very moist		dark gray	Clayey SAND, trace fine size Rock fragments (Fill)				
1		[Diagonal lines symbol]	moist	stiff	black	Silty CLAY CH		11	0	
5		[Diagonal lines symbol]								
		[Diagonal lines symbol]	moist	stiff	dark brown	Sandy CLAY CL				
2		[Diagonal lines symbol]						9	0	
10		[Diagonal lines symbol]								
		[Diagonal lines symbol]				Clayey SAND, trace fine Gravel SC				
		[Diagonal lines symbol]	moist	very stiff	mottled gray and brown	Silty CLAY CL		10	0	
3		[Diagonal lines symbol]								
15		[Diagonal lines symbol]								
		[Diagonal lines symbol]	wet			Clayey SILT, trace to little very fine Sand ML				
		[Diagonal lines symbol]				Silty CLAY, trace fine Sand CL		9	0	
4		[Diagonal lines symbol]								
20		[Diagonal lines symbol]								



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630 High Street
Oakland, California

Project No.
88-44-369-01

LOG OF BORING NO. MW-7

continued - page 2

DEPTH (ft)	SAMPLE	WATER LEVEL	SYMBOL	MOISTURE	CONSISTENCY	COLOR	DESCRIPTION	HELL CONSTRUCTION	BLOWS/FT.	G.V.M. (ppm)	T.P.H. (ppm)
				very moist	medium	mottled gray and brown	Silty CLAY CL		19		
	P				stiff						
25							Total Depth of Boring 24 ft.				
30											
35											



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Project No.

88-44-369-01



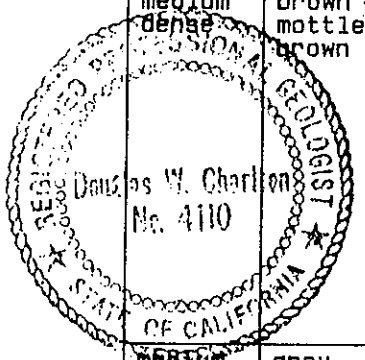
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A-6

LOG OF BORING NO. MW-8

DATE DRILLED: 8-15-89		ELEVATION: 97.14		WL TAKEN: 8-15-89		EQUIPMENT: 3-3/4" x 8" Hollow Auger					
DEPTH (ft)	SAMPLE	WATER LEVEL	SYMBOL	MOISTURE	CONSISTENCY	COLOR	DESCRIPTION	WELL CONSTRUCTION	BLOWS/FT.	O.V.H. (ppm)	T.P.H. (ppm)
5	1	P		moist	stiff	black and brown	ASPHALT 2" BASE 4" Mix of Silty and Sandy CLAY, Rock fragments	CL	13	0	
							Clayey SAND and Rock fragments	SC			
10	2	P		moist to wet	medium dense	black	Silty CLAY	CL/CH	28	0	
						gray	Fine Sandy CLAY, trace decayed organics	CL			
15	P	P		medium dense	medium dense	mottled gray and rust	Clayey SAND and GRAVEL	SC/GC	25	0	
							SAND and GRAVEL, trace Clay	SP/GP			
20	3	P		medium dense	medium dense	brown to mottled brown	Clayey fine SAND	SC	11		
							CLAY and SAND, trace fine Gravel	SC			
22				medium dense	medium dense	gray brown	Clayey fine SAND and pockets of clean SAND	SC	28		



SHELL OIL COMPANY
630 High Street
Oakland, California

Project No.
88-44-369-01

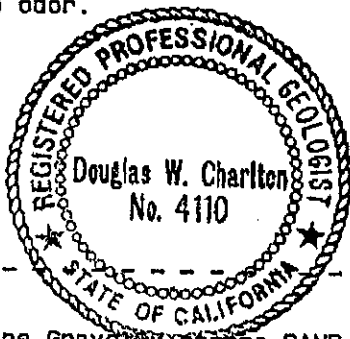


Converse Environmental Consultants California

Drawing No.
A-7

LOG OF BORING NO. MW-9

DATE DRILLED: 11-15-89		ELEVATION:		WL TAKEN: n/a		EQUIPMENT: 3 3/4" x 8" Hollow-Stem Auger						
DEPTH (ft)	SAMPLE	SYMBOL	MOISTURE	CONSISTENCY	COLOR	DESCRIPTION	WELL CONSTRUCTION	BLKS/FT.	O.V.M. (ppm)	T.P.H. (ppm)		
			slightly moist	medium dense	brown	Sandy angular GRAVEL, trace Clay. (Fill)	GW					
			moist			Increasing Sand.						
1			slightly moist	stiff	tan and gray	Silty CLAY, trace fine Sand.	CL					
			moist			medium					gray green	Silty CLAY, little Sand, trace Gravel. Black staining. No odor.
			very moist									
5			wet	medium dense	brown	Fine Gravelly coarse SAND, trace Clay.	SP					
10	2		moist	stiff	tan mottled black	Silty CLAY, little Sand, trace Gravel. Rust staining.	CL					
15			wet	dense	dark gray	SAND and GRAVEL.	SP/GP					
20						Total Depth of Boring: 16 ft Below Ground Surface.						



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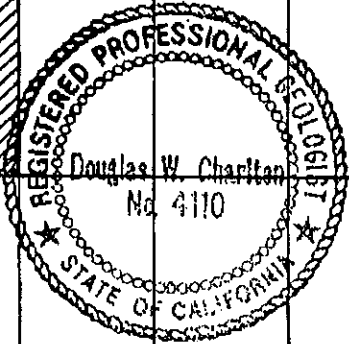


Converse Environmental West

Drawing No.
A-3

LOG OF BORING NO. MW-10

DATE DRILLED: 11-15-89		ELEVATION:		WL TAKEN: n/a		EQUIPMENT: 3 3/4" x 8" Hollow-Stem Auger					
DEPTH (ft)	SAMPLE	WATER LEVEL	SYMBOL	MOISTURE	CONSISTENCY	COLOR	DESCRIPTION	WELL CONSTRUCTION	BLOWS/FT.	O.V.M. (ppm)	T.P.H. (ppm)
1 5 10 15 20				slightly moist	medium dense	gray brown	Sandy angular GRAVEL. (Fill)	GW			
				moist		yellow brown	Gravelly SAND, trace cobble. (Fill)	SW			
				slightly moist	medium	brown	Fine Sandy SILT, trace Gravel. (Fill)	ML			
				moist		black	Silty CLAY.	CH	13	0	
						gray	Silty CLAY, trace Sand.	CL			
				very moist	medium dense	blue green	Clayey SAND. Staining. Odor.	SC	15	5	
							-- grading to -- SAND and CLAY. Thin lenses white angular Gravel. Odor.	SC/CL	14		
				wet		gray	Gravelly SAND.	SP	30	9	
				slightly moist	stiff	tan	Silty CLAY, mottled rust and black, little fine Sand.	CL			
						tan	Silty Clay, mottled rust and black, trace fine Sand.		11	0	
								23	0		
							Total Depth of Boring: 17 ft Below Ground Surface.				



SHELL OIL COMPANY
630 High Street
Oakland, California

Project No.
88-44-369-01



Converse Environmental West

Drawing No.
A-4

APPENDIX D

CONTINGENCY PLAN

APPENDIX D

Contingency Plan

This Contingency Plan will be implemented if monitoring indicates that hydrocarbon concentrations at the site have exceeded pre-established trigger concentrations at designated sampling points. These sampling points and trigger concentrations will be defined as follows:

Well MW-1 will serve as a "guard point" to monitor whether concentrations within the plume remain stable. Wells MW-5, MW-6 and MW-7 will serve as "boundary points" and will be used to confirm that the plume is not migrating. Ground water from these four wells will be sampled bi-annually through 1996, then annually for one year through 1997. In 1998, unless concentrations exceeding the specified trigger level have been detected during two consecutive sampling events in any well, monitoring will cease in all wells.

A "baseline" benzene concentration has been determined for each well based on an average concentration detected in the wells in 1994. A "trigger" concentration has been determined which represents a significant concentration increase that may indicate that the plume is migrating, or that plume concentrations are increasing. The trigger concentration for wells MW-1 and MW-5 has been set at 150% of the maximum concentration detected in the past two years. The proposed baseline and trigger concentrations are presented in Table D-1. When a trigger concentration occurs the Contingency Plan will be implemented.

*x
I don't
agree
with
this.*

When triggered, this Contingency Plan calls for three responses:

1. The ACDEH will be notified;
2. Confirmation ground water monitoring will be performed at the triggered well the next quarter; and
3. If elevated concentrations are again detected, quarterly monitoring of that well will continue until an appropriate course of action, identified by Shell and accepted by the ACDEH, is implemented.

If elevated concentrations are not detected again, the sampling plan outlined in this report will be resumed.

Table D-1. Contingency Plan for monitoring NAZ compliance at Shell Service Station WIC #204- 5508-5801, 630 High Street Oakland, California. All conditions are for benzene unless otherwise noted.

	Monitoring Well	Baseline Concentration (benzene)	Trigger Concentration (benzene)	Response to Trigger Concentration
Guard Point	MW-1	150 ppb	270 ppb	1. Notify ACDEH
Boundary Points	MW-5	5 ppb	90 ppb 2 ppb 2 ppb	2. Sample well exceeding trigger concentration during next quarter 3. If elevated concentrations are again detected, identify an appropriate course of action based upon determination of source. If elevated concentrations are not detected, resume sampling schedule outlined in the Future Action Plan.
	MW-6	< 0.5 ppb		
	MW-7	< 0.5 ppb		

Handwritten notes and scribbles:

- Handwritten "90 ppb" circled in a bubble.
- Handwritten "2.5 x 1.5" above the bubble.
- Handwritten "12p" next to the bubble.
- A large, dark scribble at the bottom of the table area.

N

WEISS ASSOCIATES



3737

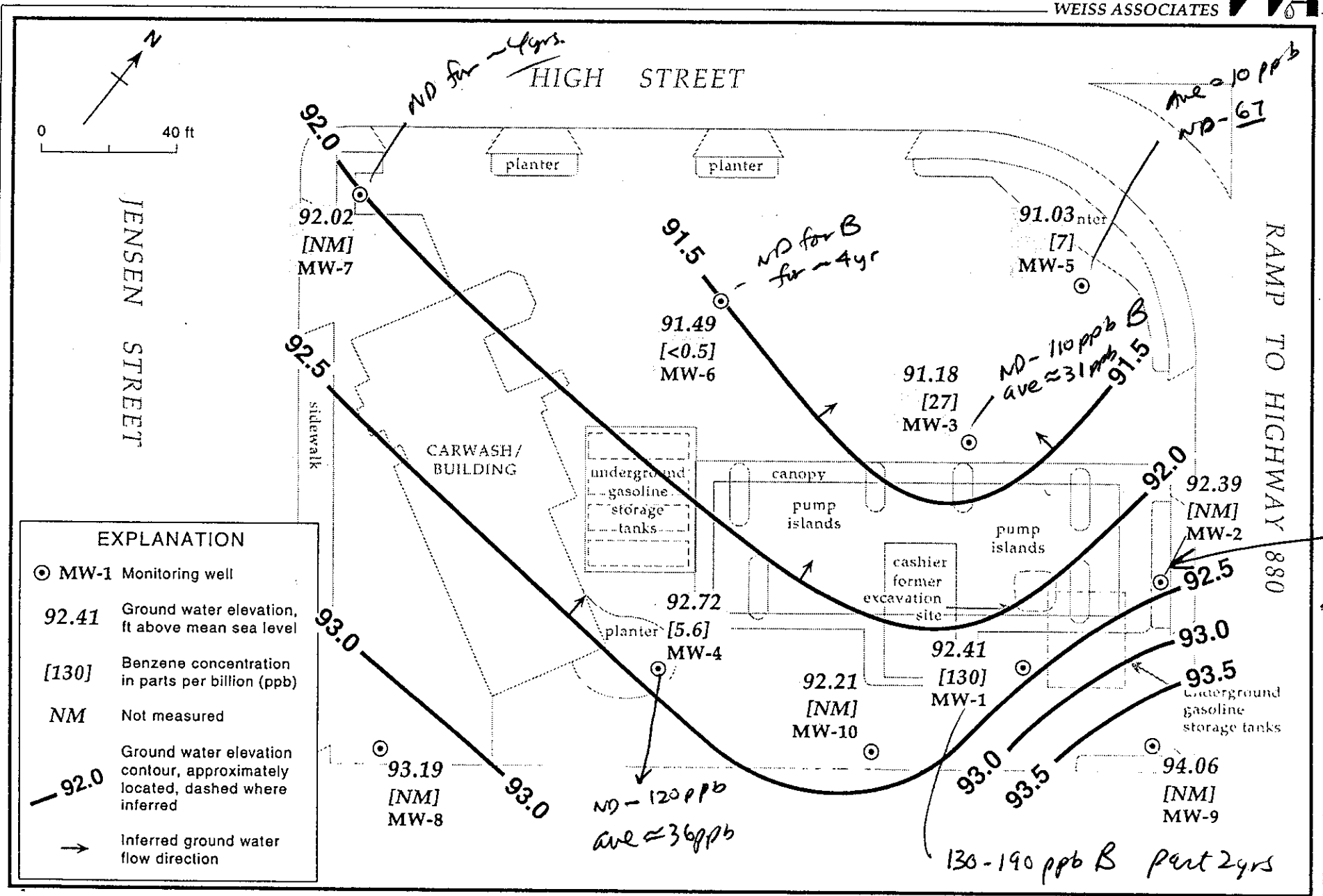
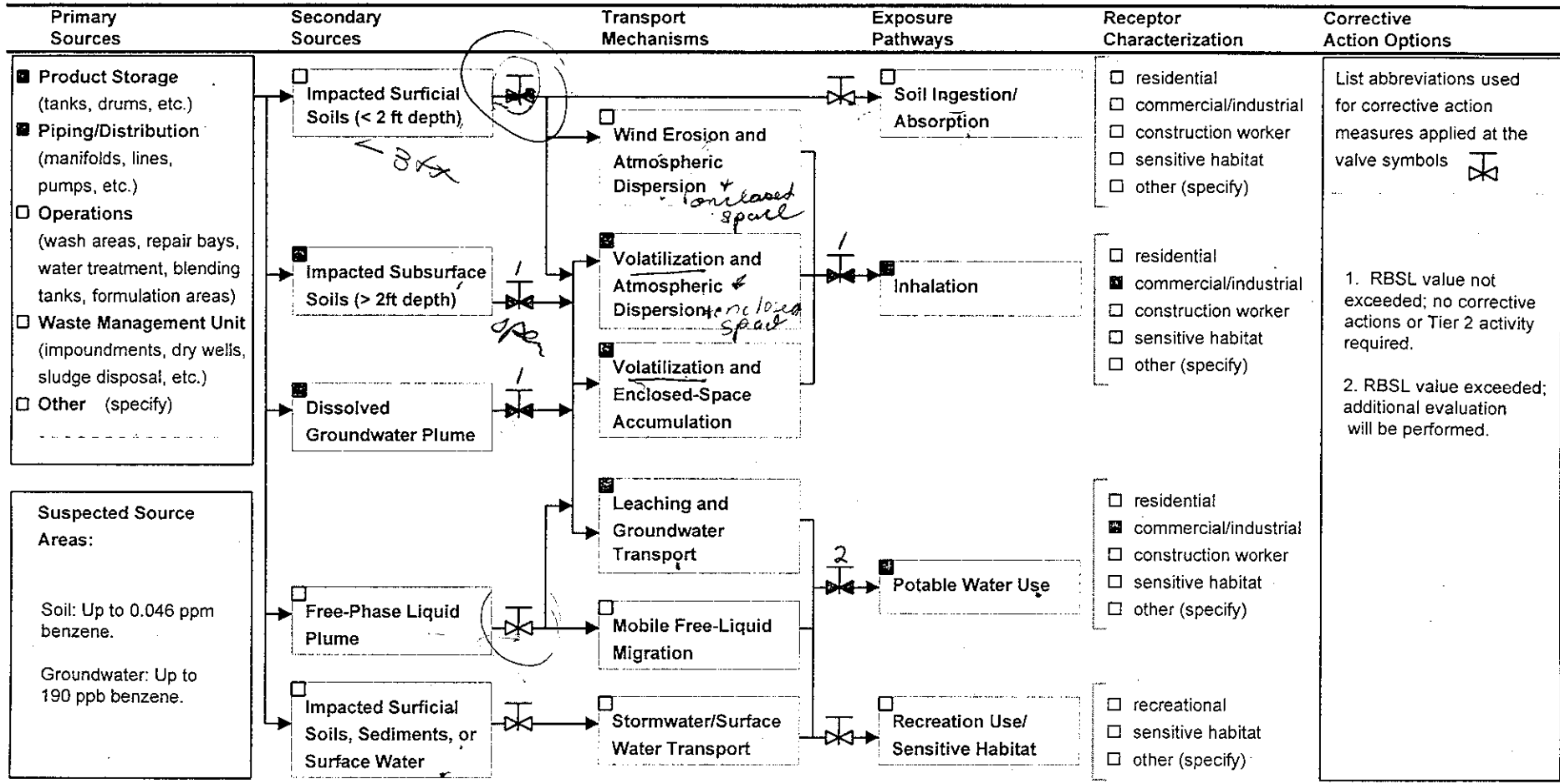


Figure 2. Monitoring Well Locations, Ground Water Elevation Contours and Benzene Concentrations in Ground Water - February 1, 1995 - Shell Service Station WIC #204-5508-5801, 630 High Street, Oakland, California

RBCA SITE ASSESSMENT

Worksheet E.2

Site Name: Shell Service Station WIC #204-5508-5801
 Site Location: 630 High Street, Oakland, California



Step 1: Characterize Site Source and Exposure Pathways

- complete Tier 1 worksheets
- fill applicable boxes for sources, release mechanisms, and actual or imminent exposure pathways (or)

Step 2: Identify Receptors, Compare Site Conditions with Tier 1 Levels

- identify receptors
- fill applicable boxes for potential receptors and RBSL value(s) exceeded (or)

Step 3: Identify Potential Corrective Measures

- complete Tier 1 summary report
- fill in exposure pathway shut-off valves (or)
- record the abbreviation for the corrective measure above the valve, and record the abbrev. on the right-hand side of the table.

Figure 3. Exposure Scenario Evaluation Flowchart

TABLES

Table 1. Soil Analytical Results - Shell Service Station WIC #204-5508-5801, 630 High Street, Oakland, California

Boring No.	Sample Depth (ft. bgs)	TPH-G	TPH-D	TPH-MO	Benzene	Toluene	TOG	Xylene	Total Lead
<-----parts per million (mg/Kg)----->									
SB-1	5	12*		85	<0.025	0.10	NA	0.14	71
SB-2	5	<10	<10	<10	0.042	0.054	NA	<0.075	16
SB-2	5,10**	<10	<10	130	<0.025	0.04	NA	<0.075	10
SB-3	5	<10	<10	<10	<0.025	0.22	290	<0.075	66
SB-3	10	<10	<10	<10	<0.025	0.045	<50	<0.075	4.2
SB-4	5	<1	16	77	<0.0025	0.032	NA	<0.0025	220
SB-4	9	<1	<1	11	<0.0025	0.056	NA	<0.0025	3.9
MW-1	5	11	<10	<10	<0.025	0.11	NA	<0.075	9.6
MW-1	5,10**	63	<10	<10	0.042	0.14	NA	0.16	7.6
MW-2	5	<10	<10	<10	<0.025	0.34	NA	<0.075	13
MW-2	5,10,15**	<10	<10	<10	<0.025	0.15	NA	<0.075	4.0
MW-3	10	<10	<10	<10	<0.025	<0.025	NA	<0.075	3.9
MW-3	5,10**	<10	<10	<10	<0.025	0.068	NA	<0.075	5.1
MW-4	5	<10	<10	<10	0.046	0.21	<50	<0.075	26
MW-4	5,10**	<10	<10	<10	<0.025	0.066	<50	<0.075	27
MW-5	5	<10	<10	<10	<0.025	<0.025	<50	<0.075	14.0
MW-5	10	<10	<10	<10	<0.025	<0.025	<50	<0.075	5.9
MW-6	5	<10	<10	<10	<0.025	0.057	220	<0.075	5.6
MW-6	10	<10	<10	<10	<0.025	<0.025	<50	<0.075	4.3
MW-7	5	<10	<10	<10	<0.025	0.040	<50	<0.075	9.8
MW-7	10	<10	<10	<10	<0.025	<0.025	<50	<0.075	3.7
MW-8	5	<10	<10	<10	<0.025	<0.025	<50	<0.075	5.1
MW-8	10	<10	<10	<10	<0.025	<0.025	<50	<0.075	2.6
MW-9	5	<1	<1	10	<0.0025	0.013	NA	<0.0025	170
MW-10	5	<1	<1	240	<0.0025	0.049	NA	<0.0025	120
MW-10	9	<1	380	3.1	<0.0025	<0.0025	NA	<0.0025	3.1

Abbreviations:

TPH-G = Total petroleum hydrocarbons as gasoline
 TPH-D = Total petroleum hydrocarbons as diesel
 TPH-MO = Total petroleum hydrocarbons as motor oil
 <n = Not detected at detection limits of n ppb
 NA Not analyzed

Notes:

* Sample contains higher boiling point hydrocarbons not characteristic with gasoline.
 ** Composite sample



Table 2. Analytical Results for Ground Water Shell Service Station WIC #204-5508-5801, 630 High Street, Oakland, California

Well ID and Sampling Frequency	Date Sampled	Depth to Water (ft)	TPH-G	TPH-D	TPH-MO	B	E	T	X	VOCs
			<-----parts per billion (ug/L)----->							
MW-1 Quarterly	01/29/91	10.79	11,000	21,000 ^a	< 500	310	500	41	400	---
	04/30/91	9.48	8,300	2,100	< 500	250	310	32	300	---
	07/22/91	10.53	11,000	3,800	< 500	310	290	36	280	---
	02/24/92	8.31	7,300	8,900 ^b	800	200	340	36	270	---
	05/22/92	10.02	7,600	18,000 ^{bc}	---	140	300	<50	140	---
	07/07/92	10.06	---	---	---	---	---	---	---	---
	08/20/92	10.32	9,100	5,200 ^b	---	530	860	340	540	---
	11/18/92	10.64	15,000	4,100 ^b	---	220	790	50	340	---
	02/09/93	8.71	7,000	1,200	---	130	220	23	160	---
	06/16/93	9.71	4,800	---	---	150	320	31	130	---
	08/24/93	10.23	10,000	---	---	170	610	27	170	---
	11/23/93	10.48	7,600	---	---	190	430	<12	140	---
	11/23/93 ^{dup}	10.48	4,800	---	---	190	430	15	130	---
	02/14/94	9.17	8,000	---	---	150	210	47	68	---
	02/14/94 ^{dup}	9.17	8,900	---	---	160	230	45	76	---
	05/25/94	9.52	8,800	---	---	95	210	<10	63	---
	08/04/94	10.51	6,200	---	---	150	350	14	180	---
08/04/94 ^{dup}	10.51	6,200	---	---	170	280	16	160	---	
	11/08/94	10.20	7,600	---	---	190	480	<10	200	---
MW-2 Bi-annual 2nd and 4th Quarter	01/29/91	13.25	< 50	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	---
	04/30/91	10.94	< 50	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	---
	07/22/91	12.14	< 50	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	---
	02/23/92	10.08	< 50	---	---	< 0.5	< 0.5	< 0.5	< 0.5	---
	05/22/92	11.52	< 50	---	---	< 0.5	< 0.5	< 0.5	< 0.5	---
	07/07/92	11.50	---	---	---	---	---	---	---	---
	08/20/92	11.72	< 50	---	---	< 0.5	< 0.5	< 0.5	< 0.5	---
	11/18/92	13.06	< 50	---	---	< 0.5	< 0.5	< 0.5	< 0.5	---
	02/09/93	10.046	95	---	---	< 0.5	< 0.5	< 0.5	< 0.5	---
	06/16/93	11.60	< 50	---	---	< 0.5	< 0.5	< 0.5	< 0.5	---
	08/24/93	12.16	< 50	---	---	< 0.5	< 0.5	< 0.5	< 0.5	---
	11/23/93	12.74	< 50	---	---	< 0.5	< 0.5	< 0.5	< 0.5	---
	02/14/94	10.91	< 50	---	---	< 0.5	< 0.5	< 0.5	< 0.5	---
	05/25/94	11.06	100	---	---	1.2	2.3	4.9	13	---
		11/08/94	12.38	< 50	---	---	< 0.5	< 0.5	< 0.5	< 0.5

---Table 2 continues on next page---

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Table 2. Analytical Results for Ground Water Shell Service Station WIC #204-5508-5801, 630 High Street, Oakland, California (continued)

Well ID and Sampling Frequency	Date Sampled	Depth to Water (ft)	TPH-G	TPH-D	TPH-MO	B	E	T	X	VOCs
			-----parts per billion (ug/L)----->							
MW-3 Quarterly	01/29/91	11.09	2,300	410 ^a	<500	17	10	14.1	230	---
	04/30/91	9.57	<50	260	<500	22	7.0	4.0	17	---
	07/22/91	10.66	2,000	310	<500	51	<0.5	<0.5	<0.5	---
	02/24/92	8.97	2,800	640 ^d	---	15	<2.5	2.8	12	---
	05/22/92	9.32	3,700	220 ^{bc}	---	27	20	11	110	---
	07/07/92	10.22	---	---	---	---	---	---	---	---
	08/20/92	10.44	13,000	340 ^b	---	72	71	85	140	---
	11/18/92	10.79	2,100	430 ^b	---	21	11	3.6	13	---
	02/09/93	9.35	3,300	83	---	21	6.1	5.6	<0.5	---
	02/02/93 ^{dup}	9.35	3,500	130	---	18	7.2	8.8	<0.5	---
	06/16/93	9.56	3,500 ^e	---	---	66	<0.5	6	<0.5	---
	08/24/93	10.51	3,400 ^e	---	---	110	<5	<5	<5	---
	11/23/93	10.77	3,000	---	---	36	6.9	44	23	f
	02/14/94	9.61	4,700 ^g	---	---	9.9	8.8	5.2	<5.0	---
	05/25/94	10.00	1,200	---	---	<10	<10	<10	<10	---
	08/04/94	10.63	2,600	---	---	29	14	<5	11	---
	11/08/94	11.02	2,600	---	---	5.5	1.9	1.5	0.9	---
	11/08/94 ^{dup}	11.02	2,700	---	---	12	6.8	5.0	3.5	---
MW-4 Quarterly	01/29/91	10.76	2,600	1,300	<500	83	<0.5	<0.5	110	---
	04/30/91	9.45	2,600	750	<500	22	7.0	4.0	17	---
	07/22/91	10.34	4,300	1,200	<500	120	<0.5	<0.5	10	---
	02/24/92	7.60	2,000	8,300 ^b	---	31	3.5	6.3	6.6	---
	05/22/92	9.90	3,600	3,400 ^{bc}	---	55	3	5	10	---
	07/07/92	10.02	---	---	---	---	---	---	---	---
	08/20/92	10.32	3,100	3,400	---	100	14	45	45	---
	11/18/92	10.51	2,200	1,400	---	32	4.2	12	24	---
	02/09/93	8.13	1,500	180	---	1.1	<0.5	<0.5	<0.5	---
	06/16/93	9.60	1,100	---	---	120	5.1	47	19	---
	08/24/93	10.05	2,700	---	---	46	25	11	0.97	---
	11/23/93	10.25	2,500	---	---	23	3.7	5.7	16	---
	02/14/94	8.83	1,500	---	---	12	<2.5	7.8	<2.5	---
	05/25/94	9.64	810	---	---	20	<2	<2	4.0	---
	08/04/94	10.62	2,300	---	---	99	6.3	15	24	---
	11/08/94	9.28	<50	---	---	<0.5	<0.5	<0.5	<0.5	---

---Table 2 continues on next page---

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Table 2. Analytical Results for Ground Water Shell Service Station WIC #204-5508-5801, 630 High Street, Oakland, California (continued)

MW-5	01/29/91	11.72	3,100	720	<500	86	24	<0.5	28	---
Quarterly	04/30/91	10.45	<50	90	<500	46	9.0	<0.5	9	---
	07/22/91	11.43	1,700	300	<500	23	6,700	<0.5	10,000	---
	02/23/94	9.24	240	180 ^h	<0.5	1	<0.5	<0.5	1	---
	05/22/92	10.97	6,200	7,100 ^{bc}	---	6	56	95	99	---
	07/07/92	10.98	---	---	---	---	---	---	---	---
	08/20/92	11.14	7,400	120 ^b	---	56	91	95	150	---
	11/18/92	11.21	3,300	320 ^b	---	27	20	<12.5	470	---
	02/09/93	10.01	160	<50	---	<0.5	<0.5	<0.5	<0.5	---
	06/16/93	11.05	140	---	---	0.8	<0.5	<0.5	<0.5	---
	08/24/93	11.32	1,000	---	---	7.9	2.2	<1	<1.5	---
	11/23/93	11.35	2,000	---	---	67	11	15	33	---
	02/14/94	10.34	660	---	---	1.3	0.5	<0.5	0.7	---
	05/25/94	10.54	670	---	---	0.65	2.6	<0.5	<0.5	---
	08/04/94	11.50	700	---	---	5.0	1.2	<0.5	<0.5	---
	11/08/94	11.24	810	---	---	4.2	1.5	<0.5	0.8	---
MW-6	01/29/91	10.23	<50	860	<500	<0.5	<0.5	<0.5	<0.5	---
Quarterly	04/30/91	9.15	<50	1,100	<500	<0.5	<0.5	<0.5	<0.5	---
	07/22/91	10.10	<50	1,200	<500	<0.5	<0.5	<0.5	<0.5	---
	02/23/92	7.15	<50	60 ^d	---	<0.5	<0.5	<0.5	<0.5	---
	05/22/92	9.55	<50	650 ^e	---	<0.5	<0.5	<0.5	<0.5	---
	07/07/92	9.53	---	---	---	---	---	---	---	---
	08/20/92	9.84	140 ^f	510 ^f	---	<0.5	<0.5	<0.5	<0.5	---
	11/18/92	10.03	200 ^f	350	---	<0.5	<0.5	<0.5	<0.5	---
	02/09/93	7.91	14,000	---	---	<0.5	<0.5	<0.5	<0.5	---
	06/16/93	8.74	5,700 ^g	---	---	<0.5	<0.5	22	34	---
	06/16/93 ^{dup}	8.74	5,600	---	---	<0.5	<0.5	<0.5	<0.5	---
	08/24/93	9.66	4,300 ^g	---	---	<12.5	<12.5	<12.5	<12.5	---
	08/24/93 ^{dup}	9.66	3,800 ^g	---	---	<12.5	<12.5	<12.5	<12.5	---
	11/23/93	9.86	3,300 ^g	---	---	<12	<12	<12	<12	nd
	02/14/94	8.27	14,000 ⁱ	---	---	<12.5	<12.5	<12.5	<12.5	---
	05/25/94	8.89	<1,000 ^j	---	---	<10	<10	<10	<10	---
	05/25/94 ^{dup}	8.89	<1,000 ^j	---	---	<10	<10	<10	<10	---
	08/04/94	10.10	250 ^t	---	---	<0.5	<0.5	<0.5	<0.5	---
	11/08/94	8.98	4,600^e	---	---	<0.5	<0.5	<0.5	<0.5	---
MW-7	01/28/91	8.91	<50	<50	<500	<0.5	<0.5	<0.5	<0.5	---
Bi-annual	05/01/91	8.38	<50	<50	<500	<0.5	<0.5	<0.5	<0.5	---
(2nd & 4th	07/23/91	9.13	<50	<50	<500	<0.5	<0.5	<0.5	<0.5	---

*Pls Review
8240*



---Table 2 continues on next page---

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Table 2. Analytical Results for Ground Water Shell Service Station WIC #204-5508-5801, 630 High Street, Oakland, California (continued)

Quarters)	02/23/92	6.87	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	05/22/92	8.08	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	07/07/92	8.82	---	---	---	---	---	---	---	---
	08/20/92	8.89	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	11/18/92	9.54	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	02/09/93	7.84	72	---	---	<0.5	<0.5	<0.5	<0.5	---
	06/16/93	7.80	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	08/24/93	8.51	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	11/23/93	8.70	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	02/14/94	7.52	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	05/25/94	9.04	<50	---	---	<0.5	<0.5	0.63	0.93	---
	11/08/94	8.45	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
MW-8	01/28/91	8.47	<50	<50	<500	<0.5	<0.5	<0.5	<0.5	---
Bi-annual	05/01/91	7.64	<50	<50	<500	<0.5	<0.5	<0.5	<0.5	---
(2nd & 4th	07/23/91	8.36	<50	<50	600	<0.5	<0.5	<0.5	<0.5	---
Quarters)	02/23/92	6.54	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	05/22/92	7.68	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	07/07/92	8.16	---	---	---	---	---	---	---	---
	08/20/92	8.25	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	11/18/92	8.32	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	02/09/93	5.58	63	---	---	<0.5	<0.5	<0.5	<0.5	---
	06/16/93	7.19	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	08/24/93	7.98	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	11/23/93	8.09	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	02/14/94	9.42	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	05/25/94	7.18	<50	---	---	<0.5	<0.5	1.1	2.5	---
	11/08/94	6.24	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
MW-9	01/28/91	8.27	<50	<50	<500	<0.5	<0.5	<0.5	<0.5	---
Bi-annual	05/01/91	7.62	<50	<50	<500	0.6	<0.5	<0.5	1.1	---
(2nd & 4th	07/23/91	8.48	<50	<50	800	<0.5	<0.5	<0.5	<0.5	---
Quarters)	02/23/92	6.91	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	05/22/92	8.64	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	07/07/92	7.55	---	---	---	---	---	---	---	---
	08/20/92	7.38	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	08/20/92 ^{dup}	7.38	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	11/18/92	10.17	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	11/18/92 ^{dup}	10.17	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	02/09/93	6.89	290	110	---	6	<0.5	<0.5	<0.5	---
	06/16/93	8.74	90 ^f	---	---	<0.5	<0.5	<0.5	<0.5	---
	08/24/93	8.32	50 ^f	---	---	<0.5	<0.5	<0.5	<0.5	---
	11/23/93	8.17	<50	---	---	<0.5	<0.5	<0.5	<0.5	nd

---Table 2 continues on next page---

J:\SHELL\0602\RDCA\TABLE2.DOC

Table 2. Analytical Results for Ground Water Shell Service Station WIC #204-5508-5801, 630 High Street, Oakland, California (continued)

	02/14/94	7.67	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	05/25/94	7.89	56	---	---	1.3	1.4	4.0	8.3	---
	11/08/94	7.75	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
MW-10	01/28/91	10.81	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
Bi-annual	05/01/91	8.79	<50	460	<500	<0.5	<0.5	<0.5	<0.5	---
(2nd & 4th	07/23/91	9.94	<50	<50	900	<0.5	<0.5	<0.5	<0.5	---
Quarter)	02/23/92	9.11	<50	120	---	<0.5	<0.5	<0.5	<0.5	---
	05/22/92	9.14	<50	310	---	<0.5	<0.5	<0.5	<0.5	---
	07/07/92	9.87	---	---	---	---	---	---	---	---
	08/20/92	9.30	<50	460	---	<0.5	<0.5	<0.5	<0.5	---
	11/18/92	10.21	<50	470	---	<0.5	<0.5	<0.5	<0.5	---
	02/09/93	7.63	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	06/16/93	8.57	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	08/24/93	9.61	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	11/23/93	10.10	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	02/11/94	9.01	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	05/25/94	8.84	<50	---	---	<0.5	<0.5	1.1	1.4	---
	11/08/94	9.40	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
Travel	02/24/92		<50	---	---	<0.5	<0.5	<0.5	<0.5	---
Blank	05/22/92		<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	08/20/92		<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	11/18/92		<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	02/09/93		<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	06/16/93		<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	08/24/93		<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	11/23/93		<50	---	---	<0.5	<0.5	<0.5	<0.5	---

---Table 2 continues on next page---

J:\SHELL\0002\RBCA\TABLE2.DOC

Table 2. Analytical Results for Ground Water Shell Service Station WIC #204-5508-5801, 630 High Street, Oakland, California (continued)

	02/14/94	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	05/25/94	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	08/04/94	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
	11/08/94	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
Bailer	08/20/92	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
Blank	11/18/92	<50	---	---	<0.5	<0.5	<0.5	<0.5	---
DTSC MCLs		NE	NE	NE	1	680	100 ^l	1,750	---

Abbreviations:

TPH-G = Total petroleum hydrocarbons as gasoline by Modified EPA Method 8015
 TPH-D = Total petroleum hydrocarbons as diesel by Modified EPA Method 8015
 TPH-MO = Total petroleum hydrocarbons as motor oil by EPA Method 8015
 B = Benzene by EPA Method
 E = Ethylbenzene by EPA Method
 T = Toluene by EPA Method
 X = Xylenes by EPA Method
 VOC = Volatile organic compounds by EPA Method 8240
 NE = Not established
 --- = Not analyzed
 <n = Not detected at detection limits of n ppb
 DTSC MCLs = California Department of Toxic Substances Control maximum contaminant levels for drinking water
 nd = not detected at or above the reporting limit for the analysis as performed
 dup = Duplicate sample

Notes:

a = Compounds detected and calculated as diesel do not match the diesel standard; pattern is characteristic of weathered diesel.
 b = Concentration reported as diesel is primarily due to the presence of a lighter petroleum product, possible gasoline or kerosene
 c = Concentration reported as diesel is primarily due to a heavier petroleum product, possible motor oil or aged diesel fuel
 d = Compounds detected within the diesel range are not characteristics of the standard diesel chromatographic pattern
e = Concentration reported as gasoline is partially or primarily due to the presence of a discrete hydrocarbon peak not indicative of gasoline
 f = 26 ppb benzene detected using EPA Method 8240
 g = The concentration reported as gasoline for MW-3 is due to the presence of a combination of gasoline and a discrete peak not indicative of gasoline
 h = Compounds detected and calculated as diesel appear to be the less volatile constituents of gasoline
 i = The concentration reported as gasoline for sample MW-6 is primarily due to the presence of a discrete peak not indicative of gasoline
 j = Sample diluted due to high-non hydrocarbon peak.
 k = The positive result has an atypical pattern for gasoline analysis.
 l = DTSC recommended action level; MCL not established.

Table 3. Comparison of Site Characterization Data to ASTM Tier 1 Risk-Based Screening Levels (RBSL). Shell Service Station, 630 High Street, Oakland, California.

Media	Exposure Pathway	Benzene (ppm)		Ethylbenzene (ppm)		Toluene (ppm)		Xylenes (ppm)	
		RBSL ⁽¹⁾	Max. Detected Onsite ⁽³⁾	RBSL ⁽²⁾	Max. Detected Onsite	RBSL ⁽²⁾	Max. Detected Onsite	RBSL ⁽²⁾	Max. Detected Onsite
Soil	Volatilization to Outdoor Air (mg/kg)	4.57	0.046 at 3 ft in MW-4	RES ⁽⁴⁾	NA ⁽⁵⁾	RES	0.34 at 5 ft in MW-2	RES	0.16 at 5 ft in MW-1
	Vapor Intrusion from Soil to Buildings (mg/kg)	0.169	0.046 at 3 ft in MW-4	90.8	NA	54.5	0.34 at 5 ft in MW-2	RES	0.16 at 5 ft in MW-1
	Surficial Soil (0-3 ft) Ingestion/Dermal/Inhalation (mg/kg)	10	0.046 at 3 ft in MW-4	1,150	NA	1,870	0.34 at 5 ft in MW-2	208,000	0.16 at 5 ft in MW-1
	Leachate to Protect Ground water Ingestion Target Level (mg/kg)	0.578	0.046 at 3 ft in MW-4	133	NA	361	0.34 at 5 ft in MW-2	RES	0.16 at 5 ft in MW-1
Ground Water	Volatilization to Outdoor Air (mg/L)	184	0.190 in MW-1	>S ⁽⁶⁾	0.610 in MW-1	>S	0.047 in MW-1 and MW-4	>S	0.2 in MW-1
	Vapor Intrusion from Groundwater to Buildings (mg/L)	2.56	0.190 in MW-1	>S	0.610 in MW-1	300	0.047 in MW-1 and MW-4	>S	0.2 in MW-1
	Ingestion (mg/L)	0.0987	0.190 in MW-1 ⁽⁷⁾	10.2	0.610 in MW-1	20.4	0.047 in MW-1 and MW-4	>S	0.2 in MW-1

Notes:

- (1) The target risk level used for benzene is a carcinogenic risk of 1 in 100,000 ($1E^{-5}$), calculated from the $1E^{-4}$ and $1E^{-6}$ Target levels listed in Table 4 of the ASTM guidelines (ASTM ES 38-94).
- (2) The target risk level used for non-carcinogenic constituents of concern is a chronic hazard quotient of 1.0.
- (3) Maximum concentration detected in soil borings reported by Converse Environmental West, 1989. Max. ground water concentration detected in site wells in 1993 and 1994 (WA quarterly reports).
- (4) RES = Selected risk level is not exceeded for pure compound present at any concentration in soil.
- (5) NA = Not Analyzed
- (6) >S = At pure component solubility (mg/l), selected risk level is not exceeded.
- (7) ASTM RBSL is exceeded only in the case of ground water ingestion of benzene. However, ground water is accessible only through the monitoring wells, which are locked, and this is considered a very unlikely exposure route.