Reports 1989

WEISS ASSOCIATES

SUBSURFACE INVESTIGATION

PHASE III

at

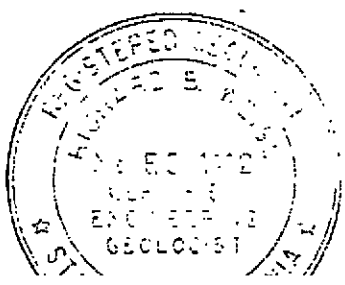
Operating Chevron Station #90260
21995 Foothill Boulevard
Hayward, California

by

Weiss Associates
2938 McClure Street
Oakland, California 94607

James W. Carmody 8-3-89
James W. Carmody Date
Project Geologist

I certify that Weiss Associates' work on Chevron Station #90260, 21995 Foothill Boulevard, Hayward, 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 for this project.



Richard B. Weiss Date
Certified Engineering Geologist
No. EG1112

CONTENTS

FIGURES

TABLES

ATTACHMENTS

SUMMARY

Three additional ground water monitoring wells were installed to further define the extent of petroleum hydrocarbons in subsurface materials at operating Chevron Service Station #90260, located at 21995 Foothill Boulevard, Hayward, California. Total purgeable petroleum hydrocarbons (TPPH) range from 6 to 360 parts per million (ppm) in soil samples from borings BH-A, BH-B and BH-C. Benzene, ethylbenzene, toluene and xylenes were detected in soil from these borings in concentrations between 0.2 and 82 ppm.

Quarterly monitoring of ground water wells MW-4 through MW-10 coincided with the sampling of new wells MW-11, MW-12 and MW-13. TPPH exceeded 1,000 ppb in all ground water samples except MW-10, benzene, ethylbenzene and xylene exceeded California Department of Health Services maximum contaminant levels, and toluene exceeded DHS recommended action levels in these same wells.

Ground water elevations measured in the monitoring wells show ground water flow to the southwest.

1. INTRODUCTION

This report presents the results of the Phase III subsurface investigation conducted by Weiss Associates (WA) at operating Chevron Service Station #90260, located at 21995 Foothill Boulevard, Hayward, California (Figure 1). The purpose of the Phase III investigation was to define the extent of hydrocarbons in soil and ground water down gradient and cross gradient of the site.

1.1. SCOPE OF WORK

The scope of work for the Phase III investigation was to:

1) Review previous reports to estimate the distribution of hydrocarbons beneath the site, and the most likely direction of ground water flow.

2) Drill three soil borings and collect soil samples for subsurface sediment and hydrogeologic description, and for possible chemical analysis.

3) Survey the soil samples in the field with a portable photoionization detector (PID) to determine whether volatile hydrocarbons were present in the samples.

4) Analyze selected soil samples for total purgeable petroleum hydrocarbons (TPPH), benzene, ethylbenzene, toluene, and xylenes (BETX).

5) Complete the three borings as 4-inch diameter ground water monitoring wells.

6) Develop the three newly installed wells and analyze water samples from 10 ground water monitoring wells for TPPH, BETX, and volatile organic compounds (VOCs).

7) Survey the top-of-casing elevations of the newly installed wells referenced to mean sea level to calculate the ground water elevation, gradient and flow direction.

8) Report the results.

This report describes each task and presents the results of the investigation.

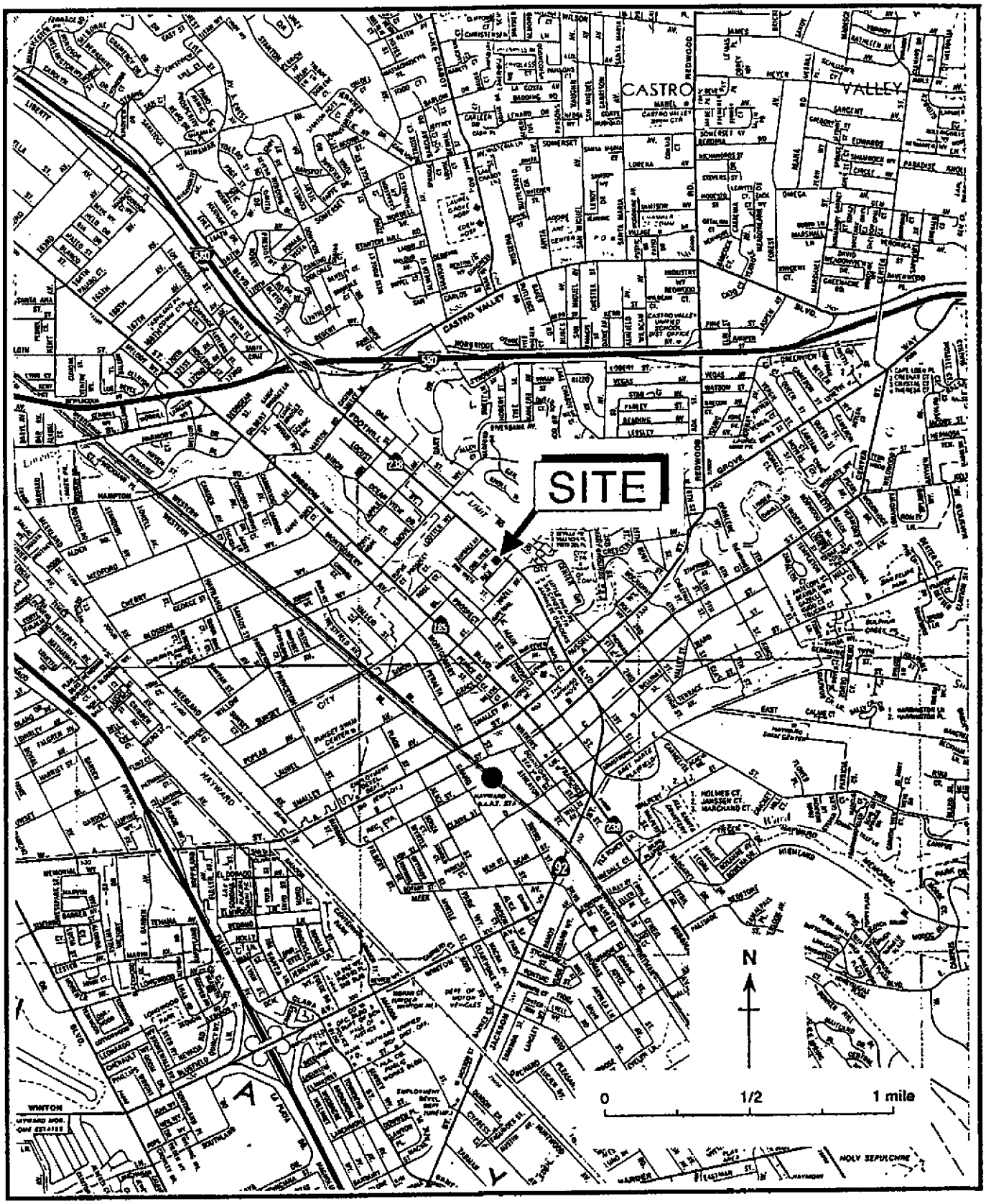


Figure 1. Site Location Map - Chevron Service Station #90260, Hayward, California

1.2. BACKGROUND

Chevron Service Station #90260 is located in a commercial and residential area, at the northwest corner of Foothill Boulevard and Rex Road, in Hayward, California. Previous site investigations by WA included the Phase I investigation that detected total fuel hydrocarbons in ground water monitoring wells MW-4 through MW-7 in concentrations between 53,000 and 88,000 parts per billion (ppb) and BETX in concentrations between 1,700 and 36,000 ppb (Weiss, 1988a). In WA's Phase II investigation, TPPH and benzene were detected in cross gradient wells MW-8 and MW-9 in concentrations between 50,000 and 190,000 ppb and between 13 and 43,000 ppb, respectively (Weiss, 1988b). No down gradient wells have ever been installed northwest of the site as this property owner will not grant Chevron permission to install wells on his site.

Documents on file with the City of Hayward Fire Department indicate that a former Chevron service station was located at 22211 Foothill Boulevard and was abandoned in 1974. This service station, #3-1230, was located just southeast and across Rex Road from the existing Chevron station at the existing Golden Bay Title Company building. Three underground fuel tanks and one waste oil tank were removed from this site in August 1974. At that time, laboratory analysis of soil samples from beneath the excavated tanks were not required and hence, no samples were collected. It is unknown if hydrocarbons have ever been released at this former site.

1.3. TOPOGRAPHIC AND GEOLOGIC SETTING

The topographic gradient in the vicinity of the site is to the west. Surface water drainage is controlled by the grading of the site and by the storm water system. The closest surface water is San Lorenzo Creek, about 900 ft southwest of the site (Figure 1). This ephemeral canal, maintained by the Alameda County Flood Control and Water Conservation District, flows into San Francisco Bay.

The site is located within the Coast Range physiographic province. The sediments underlying the site are Quaternary alluvial deposits derived from Mesozoic marine sediments and intrusives and Pleistocene volcanics of the Diablo Range (G.D. Robinson, 1956). The site is located about 1,000 ft northeast of the Hayward fault, a regional, right lateral, strike-slip fault trending northwest-southeast near the site.

2. SUBSURFACE INVESTIGATION

HEW Drilling Company, Inc. of Palo Alto, California drilled three soil borings, BH-A, BH-B and BH-C with a CME-75 hollow-stem auger drill rig, on June 6 and 7, 1989 (Figure 2). The drilling was directed by WA Project Geologist James Carmody, working under the supervision of Richard B. Weiss, Certified Engineering Geologist. The borings were sited to further assess the extent of hydrocarbons in subsurface materials along the property's southwest property line and further south along Rex Road.

2.1. SOIL BORING AND SAMPLING

Borings BH-A and BH-B are located along the stations's southwest property line, directly in front of the debris box enclosure and midway between the enclosure and Rex Road. Boring BH-C is located about 80 ft southwest of MW-8 and within the planter area along the sidewalk of Rex Road.

Soil samples were collected from the borings at intervals of 5 ft or less for lithologic and hydrogeologic description, and for possible chemical analysis. The boring logs are included as Attachment A. Samples were collected in steam-cleaned brass tubes with a washed 2-inch ID split barrel sampler. After removal from the sampler, the tubes were immediately trimmed, capped with aluminum foil and plastic caps, hermetically sealed with duct tape and labeled and refrigerated for delivery under chain of custody to Superior Analytical Laboratory, Inc. (SUP) of San Francisco, California. The samplers were washed between sampling depths with a solution of aquinox and water, and rinsed with de-ionized water. The soil samples were also surveyed in the field with a PID to qualitatively determine the presence or absence of volatile hydrocarbons in the samples. These measurements were recorded on the boring logs presented in Appendix A.

The subsurface material primarily consists of interbedded clayey silts and silty clays to about 15 ft below grade. This material is underlain by the water bearing zone which consists of a dense fine to very fine sand that extends to about 18 to 20 ft below the surface. The water bearing zone is underlain by a hard clayey silt to the total depth of the borings. The clayey silt was sampled with progressively smaller samplers to confirm the layer is a competent confining layer at least five ft thick. This sampling methodology reduces smearing clay onto the walls of more permeable saturated formations which may restrict ground water recharge to the well. It also produces a smaller diameter hole to regrout than drilling.

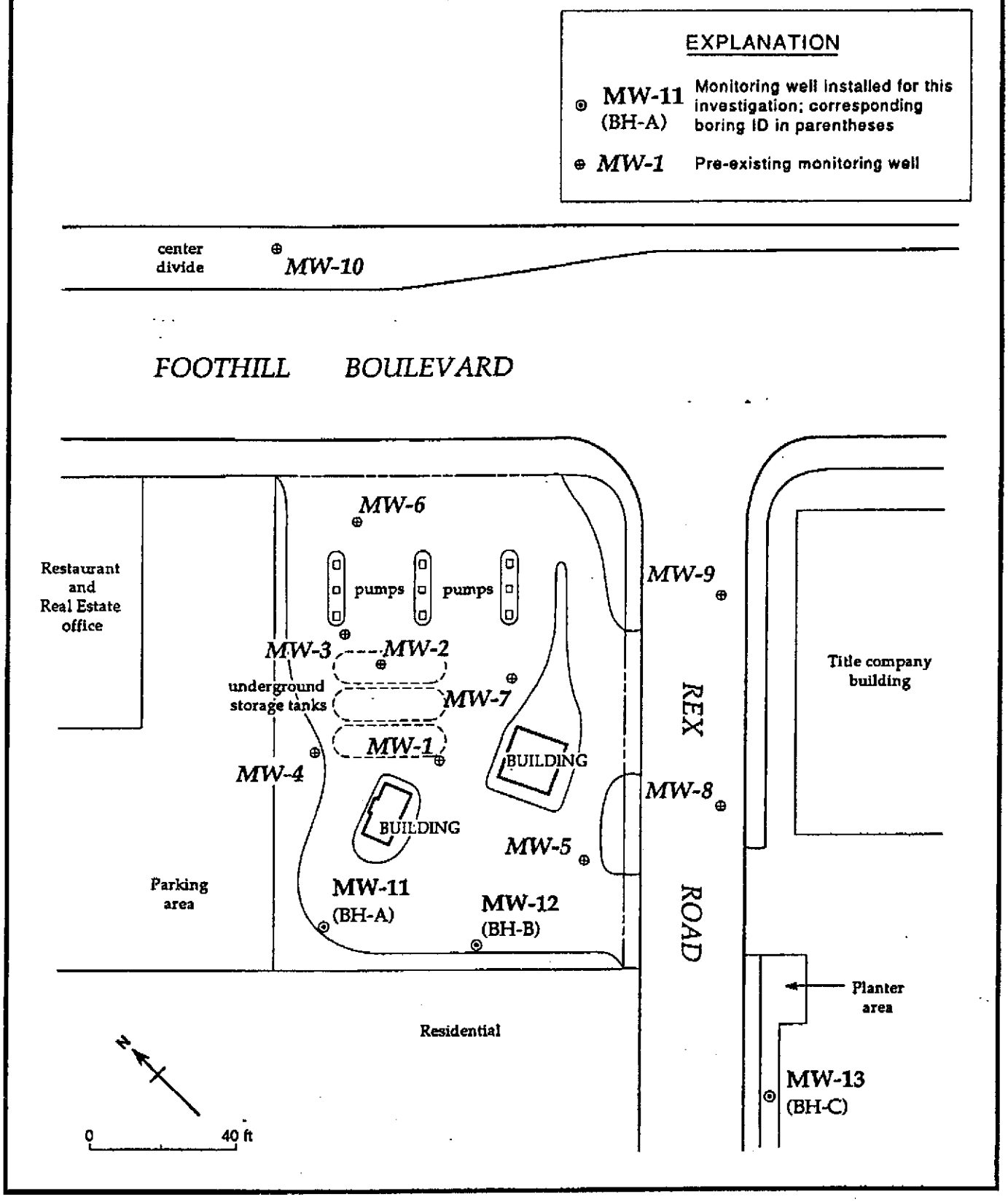


Figure 2. Monitoring Well Locations - Chevron Service Station #90260, Hayward, California

2.2 ANALYTIC RESULTS FOR SOIL

Based on field observations and PID readings, ten soil samples were analyzed for TPPH by 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). The analytic results are shown in Table 1 and the laboratory analytic reports and chain of custody documents are included as Attachment B.

TPPH were detected in soil samples from borings BH-A, BH-B and BH-C in concentrations between 6 and 360 ppm. BETX was detected in these same borings in concentrations between 0.09 and 11 ppm.

2.3. WELL INSTALLATION, DEVELOPMENT, AND SAMPLING

Borings BH-A, BH-B and BH-C were completed as ground water monitoring wells MW-11, MW-12 and MW-13, respectively. Ground water was encountered in the borings for these wells at about 15 ft below grade. The static water level was subsequently measured between 14.1 and 14.3 ft below the top of casing of each well.

The wells are constructed with 4-inch diameter, 0.010-inch slotted, flush threaded PVC well screen and blank casing. Lonestar #2/16 Monterey sand was tremied into the annular space to approximately 2 ft above the well screen. A bentonite pellet layer I ft thick was installed to separate the sand from the sanitary seal. Portland type I, II cement mixed with 3-5% bentonite powder was used as a sanitary surface seal. The well heads are secured beneath locking stovepipes and inside flush-mounted concrete vaults.

On June 27, 1989, WA environmental technicians Andy Rogers and Todd Pearson developed wells MW-11, MW-12 and MW-13 by surge block agitation and bailing. Almost 115 gallons of ground water were removed from these wells and temporarily stored on-site in 55-gallon metal drums, pending the results of the ground water analyses. The estimated flow rate for each well, using bailing, was between 0.5 and 1 gallon per minute (gpm).

TABLE 1. Analytic Results for Soil - Chevron Service Station #90260, Hayward, California

Soil Boring (Well ID)	Sample Depth	Date Sampled (ft)	Analytic Lab	Analytic Method	Sat/ Unsat	TPPH	B	E	T	X
						<---------- parts per million (mg/kg) ----------				
BH-A (MW-11)	5.8	06-06-89	SUP	8015/8020	Unsat	<1	<0.05	<0.05	<0.05	<0.05
	10.8	06-06-89	SUP	8015/8020	Unsat	<1	<0.05	<0.05	<0.05	<0.05
	15.8	06-06-89	SUP	8015/8020	Sat	11	1.1	0.12	0.11	0.65
	20.5	06-06-89	SUP	8015/8020	Sat	8	2.9	0.15	1.1	0.58
BH-B (MW-12)	5.8	06-07-89	SUP	8015/8020	Unsat	<1	<0.05	<0.05	<0.05	<0.05
	10.8	06-07-89	SUP	8015/8020	Unsat	360	0.20	1.8	1.6	11
	15.5	06-07-89	SUP	8015/8020	Sat	58	0.20	0.30	0.18	1.7
BH-C (MW-13)	5.8	06-06-89	SUP	8015/8020	Unsat	<1	<0.05	<0.05	<0.05	<0.05
	10.8	06-06-89	SUP	8015/8020	Unsat	88	<0.05	0.16	0.15	2.5
	15.8	06-06-89	SUP	8015/8020	Sat	6	0.59	0.09	0.82	0.43

Abbreviations:

TPPH = Total Purgeable Petroleum Hydrocarbons
B = Benzene
E = Ethylbenzene
T = Toluene
X = Xylenes
<n = Not detected at detection limit of n ppm
Sat = Saturated soil sample
Unsat = Unsaturated soil sample

Analytic Laboratory:

SUP = Superior Analytic Laboratory, Inc.,
San Francisco, California

Analytic Methods:

8015 = EPA Method 8015, Non-Halogenated Volatile Organics
8020 = EPA Method 8020, Aromatic Volatile Organics

Ground water samples were collected from wells MW-4 through MW-13 on June 28, 1989. All 10 ground water monitoring wells were sampled at this time because the development and sampling of the newly installed wells coincided with the facility's scheduled quarterly ground water monitoring. Each well was purged a minimum of 4 wellbore volumes using a steam-cleaned 3-inch diameter PVC bailer. Each sample was decanted from a steam-cleaned Teflon sampling bailer into a 40 ml glass volatile organic analysis vial (VOA) with a Teflon septum, preserved with sodium bisulfate, and refrigerated for transport to SUP for analysis. To reduce the possibility of sample contamination during transport or storage, each sample was sealed within a plastic guard bottle containing granular activated carbon.

2.4. ANALYTIC RESULTS FOR WATER

The analytic results for the water samples are summarized in Table 2, and the laboratory analytic reports and chain of custody documents are included as Attachment C. Ground water samples were analyzed for TPPH by EPA Method 8015, BETX by EPA 8020 and VOCs by EPA Method 8240. The analytic results indicate that TPPH were detected in all ground water wells, except up-gradient well MW-10, in concentrations between 54,000 and 120,000 ppb. BETX was detected in these same wells in concentrations between 510 and 36,000 ppb. TPPH isoconcentrations in ground water are contoured in Figure 3.

2.5. GROUND WATER GRADIENT

Table 3 shows the top-of casing elevations, depths to water and the ground water elevations on June 28, 1989 for monitoring wells MW-4 through MW-13. A ground water elevation contour map for wells MW-4 through MW-13 indicates that ground water flows towards the southwest with a gradient of about 0.0154 ft/ft (Figure 4).

The top-of-casing elevations for wells MW-11 through MW-13 were surveyed by John E. Koch, of Berkeley, California (California Land Surveyor, License No. LS4811) on July 6, 1989. The datum elevation for the survey was a USGS benchmark located on top of the fire hydrant at the northwest corner of Foothill Boulevard and Rex Road.

TABLE 2. Analytic Results for Ground Water - Chevron Service Station #90260, Hayward, California

Sample ID	Date Sampled	Analytic Lab	Analytic Method	TPPH	B	E	T	X	VOCs
				<---------- parts per billion (µg/L) ---------->					
MW-4	06-28-89	SUP	8015/8020	110,000	34,000	2,400	24,000	13,000	---
MW-5	06-28-89	SUP	8015/8020	80,000	36,000	2,300	29,000	12,000	---
MW-6	06-28-89	SUP	8015/8020	80,000	7,000	2,000	4,100	9,700	---
MW-7	06-28-89	SUP	8015/8020	110,000	31,000	2,600	30,000	16,000	---
MW-8	06-28-89	SUP	8015/8020	120,000	22,000	2,900	35,000	16,000	---
MW-9	06-28-89	SUP	8015/8020	100,000	510	2,600	4,500	13,000	---
MW-10	06-28-89	SUP	8015/8020	<500	<0.5	<0.5	<0.5	<0.5	---
MW-11	06-28-89	SUP	8015/8240	60,000	36,000	2,500	13,000	12,000	<500-2,000
MW-12	06-28-89	SUP	8015/8240	55,000	30,000	2,900	21,000	19,000	<500-2,000
MW-13	06-28-89	SUP	8015/8240	54,000	12,000	1,900	10,000	15,000	<500-2,000
DHS MCL's	NA	NA	NA	NE	1	680	100*	1,750	NA

Abbreviations:

TPPH = Total Purgeable Petroleum Hydrocarbons
B = Benzene
E = Ethylbenzene
T = Toluene
X = Xylenes
VOCs = Volatile Organic Compounds other than BETX
<n = Not detected at detection of limit of n ppb
DHS MCL's = Department of Health Services Maximum contaminant levels
NA = Not Applicable
NE = Not established
* = DHS recommended drinking water action level

Analytic Laboratory:

SUP = Superior Analytical Laboratory, Inc.
San Francisco, California

Analytic Methods:

8015 = Total Purgeable Petroleum Hydrocarbons by Modified EPA Method

8020 = Aromatic Volatile Hydrocarbons by EPA Method 602

8240 = Volatile Organics by EPA Method 8240

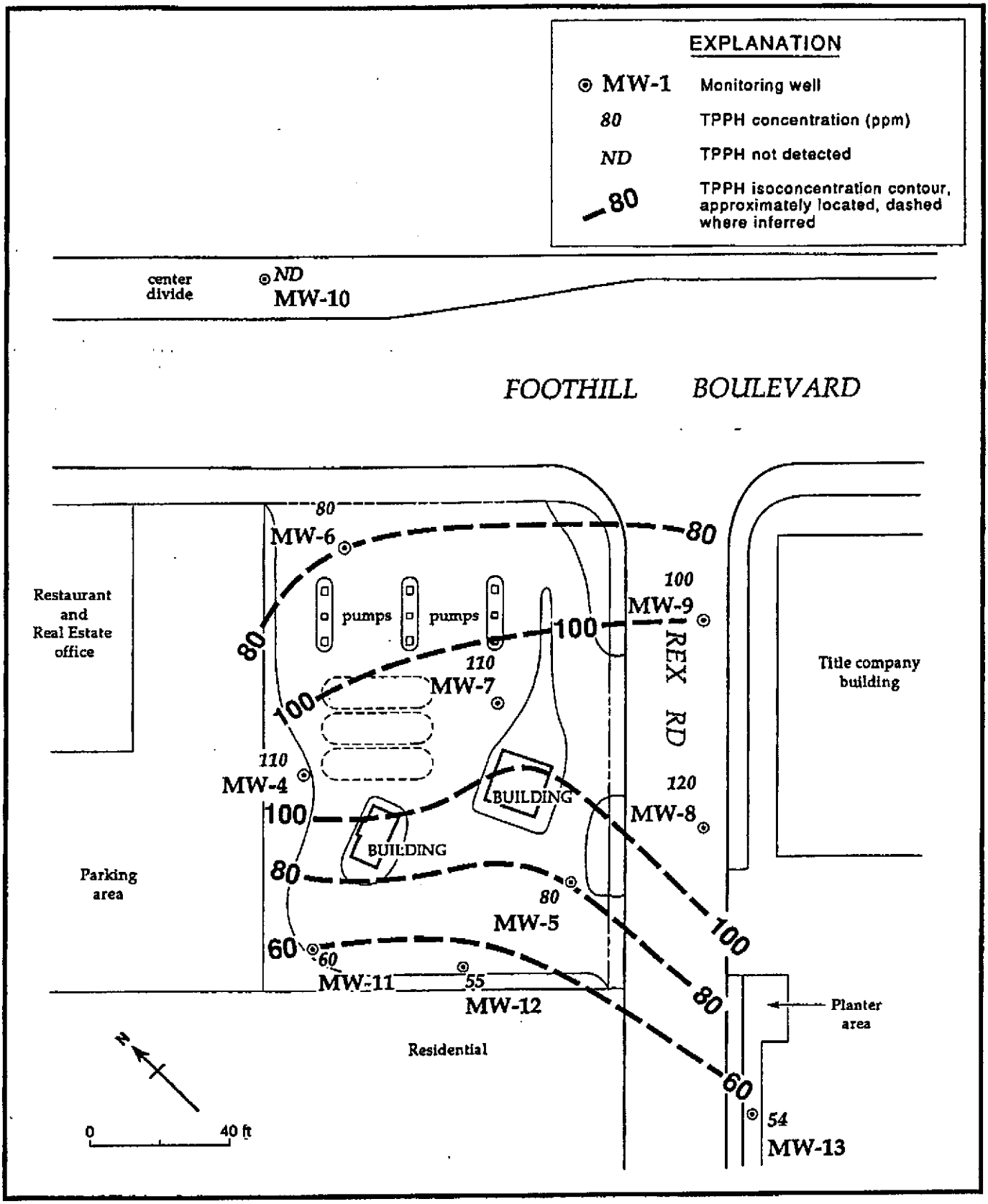


Figure 3. TPPH Isoconcentration Contours - June 28, 1989 - Chevron Service Station #90260, Hayward, California

TABLE 3. Ground Water Elevation Data, June 28, 1989 - Chevron Service Station #90260, Hayward, California

Well ID	Top-of-Casing Elevation (ft above msl)	Depth to Water (ft)	Water Elevation (ft above msl)
MW-4	100.75	14.25	86.50
MW-5	99.97	13.81	86.16
MW-6	101.43	14.58	86.85
MW-7	100.91	14.08	86.83
MW-8	99.67	13.40	86.27
MW-9	101.15	14.04	87.11
MW-10	102.36	13.64	88.72
MW-11	99.97	14.33	85.64
MW-12	99.64	14.10	85.54
MW-13	98.47	13.22	85.25

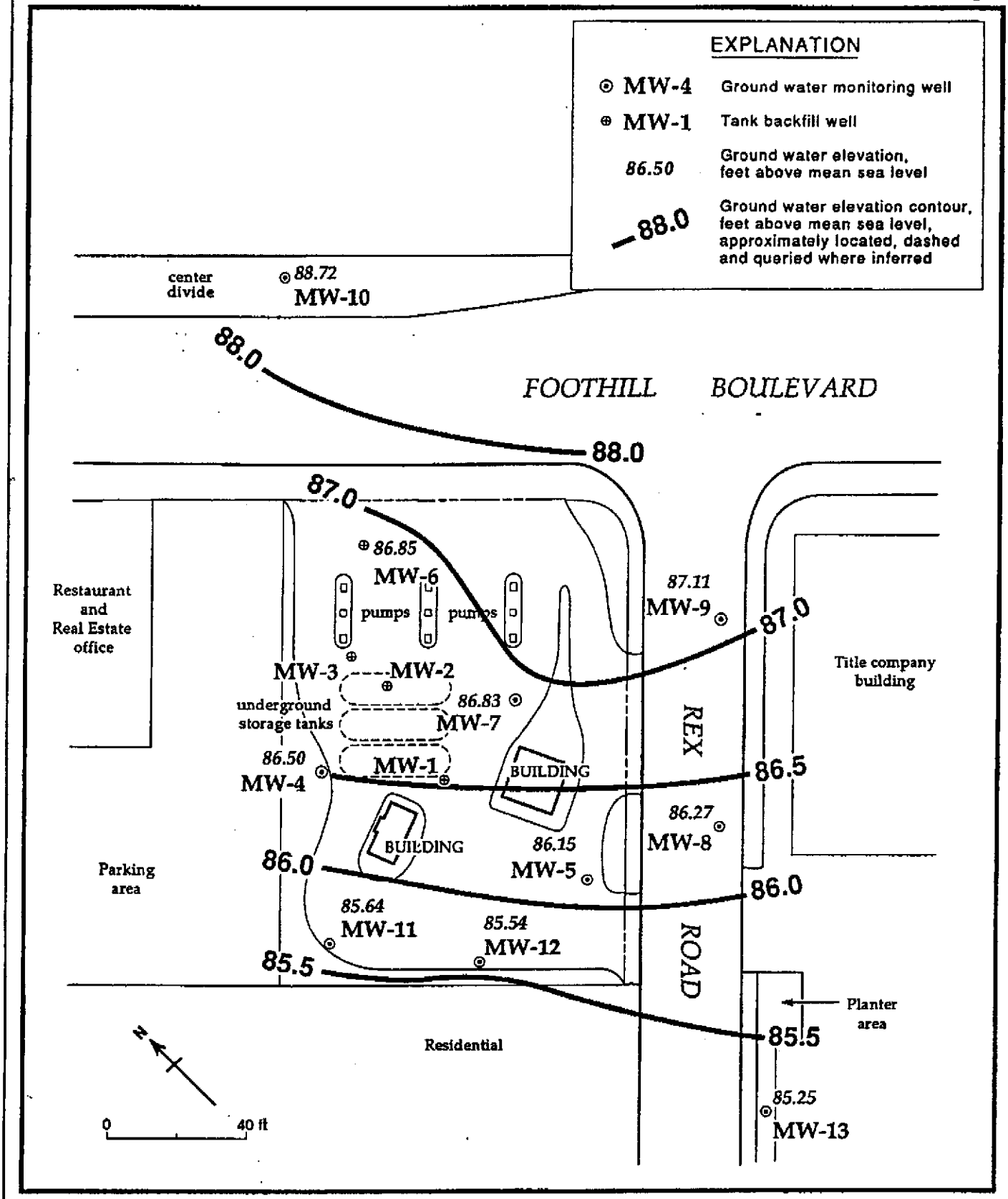


Figure 4. Ground Water Elevation Contours - June 28, 1989 - Chevron Service Station #90260, Hayward, California

3. CONCLUSIONS

TPPH was detected in concentrations up to 360 ppm in the soil samples from borings BH-A, BH-B, and BH-C. BETX was detected in these same borings in concentrations between 0.09 and 11 ppm. Water samples were collected from ground water monitoring wells MW-4 through MW-13. TPPH exceeded 1,000 ppb in water from each well except MW-10, and BETX concentrations exceeded DHS MCL's and action levels in these same wells.

Ground water flow is southwesterly.

REFERENCES CITED

Robinson, G.D., 1956, Geologic Map of the Hayward Quadrangle, California, U.S. Geologic Survey, Map GQ 88, Scale 1:24,000.

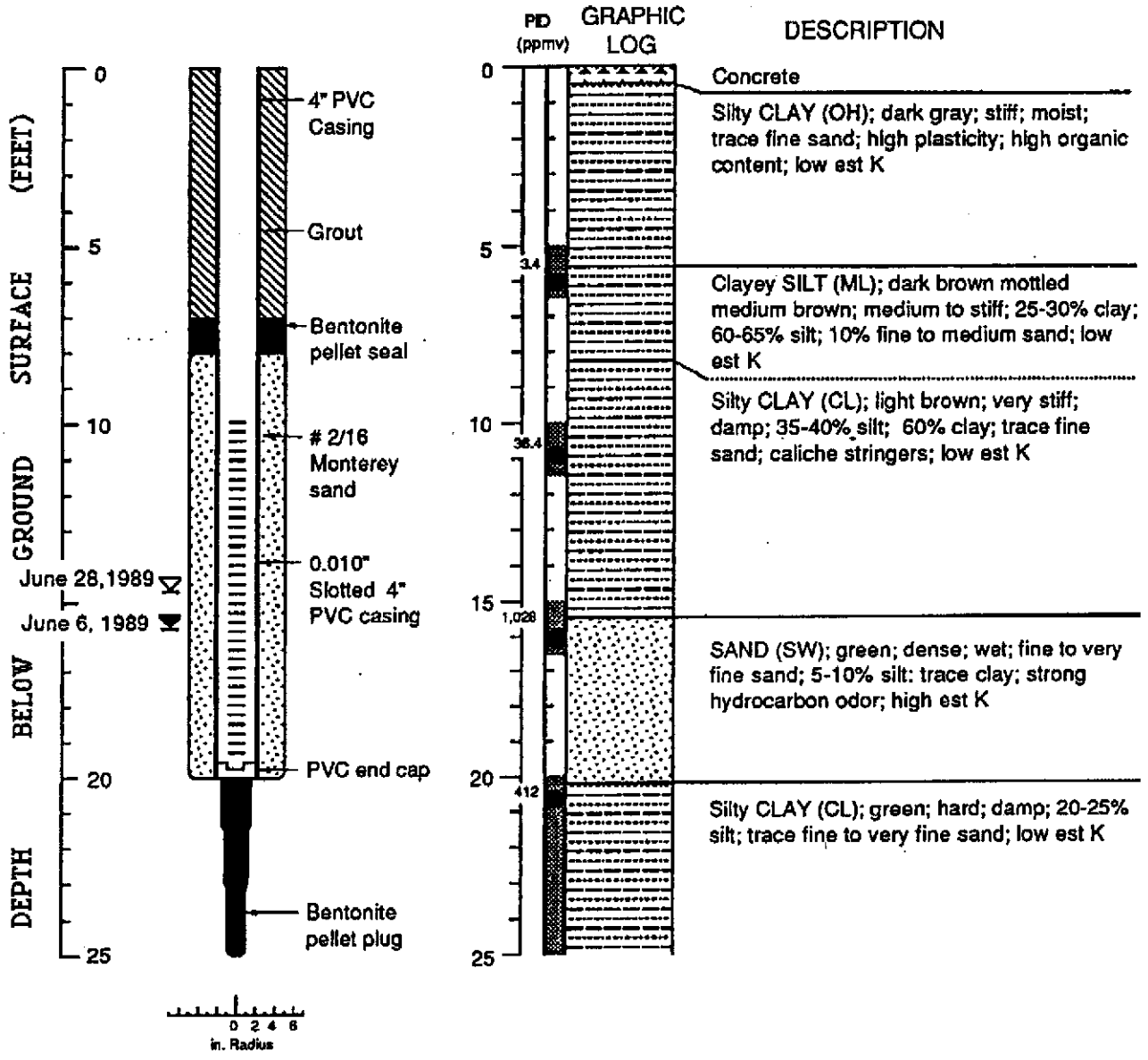
Weiss Associates, 1988a, Subsurface Investigation, consultant's report prepared for Chevron USA, Inc., March 31, 1988, 9 pp, + 3 appendices.

Weiss Associates, 1988b, Phase II Subsurface Investigation, consultant's report prepared for Chevron USA, Inc., December 14, 1988, 18 pp, + 4 appendices.

ATTACHMENT A

BORING LOGS BH-A, BH-B and BH-C

WELL MW-11 (BH-A)



EXPLANATION

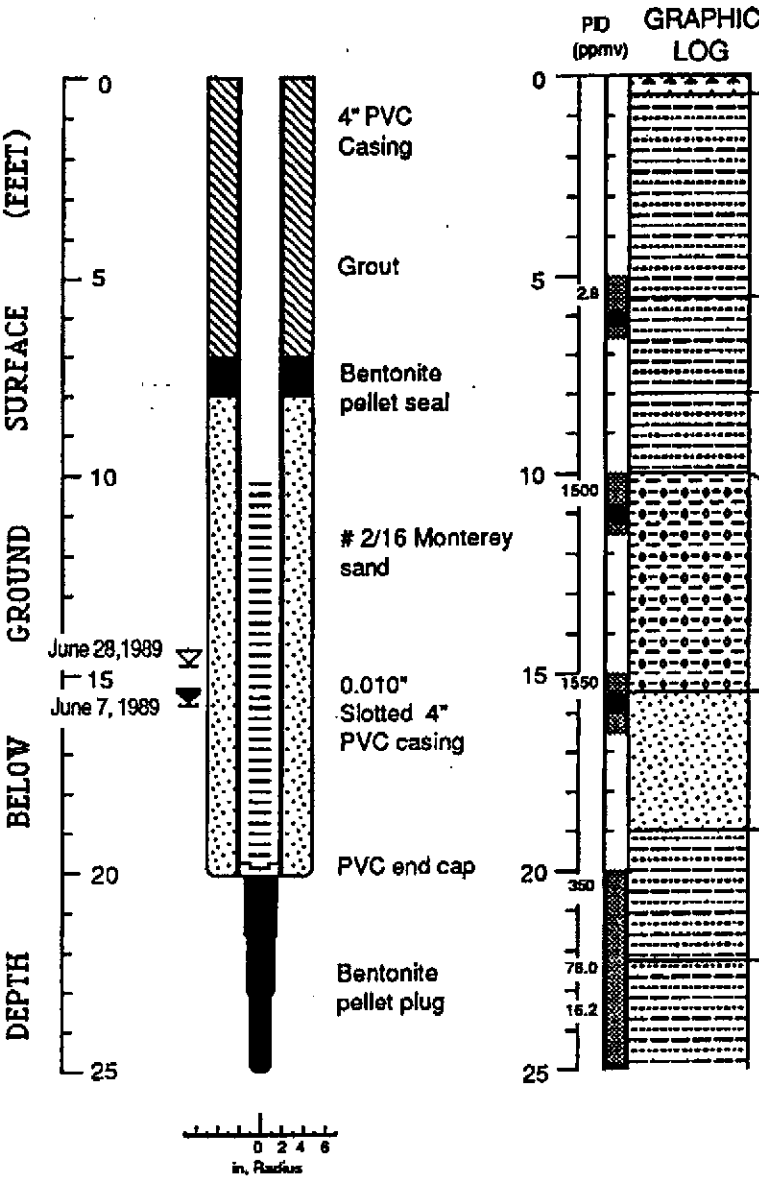
- Water level during drilling (date)
- Water level (date)
- Contact (dotted where approx.)
- Uncertain contact
- Location of recovered drive sample
- Location of drive sample sealed for chemical analysis
- Cutting sample
- K = Estimated permeability (hydraulic conductivity)

Logged by:	Jim Carmody
Supervisor:	Richard Weiss; EG 1112
Drilling Company:	HEW Drilling Co.
Driller:	Tomas Jaime
Drilling Method:	Hollow stem auger
Dates Drilled:	June 6, 1989
Well Head Completion:	Locking stovepipe in concrete vault
Type of sampler:	Split barrel (1.4", 2.0", 2.5" ID)

Well Construction and Boring Log - Well MW-11 (BH-A)

Chevron Service Station #90260
Hayward, California

WELL MW-12 (BH-B)



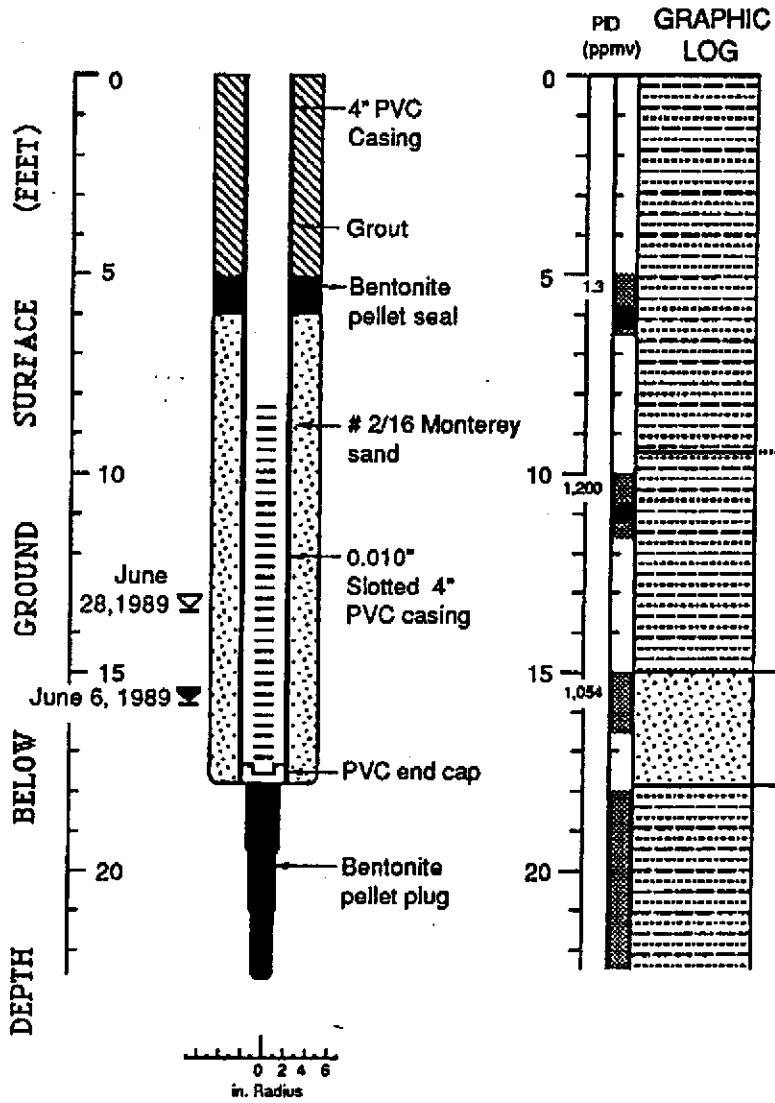
EXPLANATION

- 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 permeability (hydraulic conductivity)

Logged by:	Jim Carmody
Supervisor:	Richard Weiss; EG 1112
Drilling Company:	HEW Drilling Co.
Driller:	Tomas Jaime
Drilling Method:	Hollow stem auger
Dates Drilled:	June 7, 1989
Well Head Completion:	Locking stovepipe concrete vault
Type of sampler:	Split barrel (1.4",2.0",2.5" ID)

Well Construction and Boring Log - Well WM-12 (BH-B) Chevron Service Station #90260 Hayward, California

WELL MW-13 (BH-C)



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 permeability (hydraulic conductivity)

Logged by: Jim Carmody
Supervisor: Richard Weiss; EG 1112
Drilling Company: HEW Drilling Co.
Driller: Tomas Jaime
Drilling Method: Hollow stem auger
Dates Drilled: June 6, 1989
Well Head Completion: Locking stovepipe in concrete vault
Type of sampler: Split barrel (1.4", 2.0", 2.5" ID)

Well Construction and Boring Log - Well MW-13 (BH-C)

Chevron Service Station #90260
Hayward, California