A Report Prepared for

Texaco Refining and Marketing Inc.
100 Cutting Boulevard
Richmond, California 94804

ENVIRONMENTAL ASSESSMENT
FORMER TEXACO STATION NO. 62488000088
2200 EAST 12TH STREET
OAKLAND, CALIFORNIA

HLA Job No. 2251,082.03 9-28-89

by

Gregory L. Fasiano/RA
Gregory L. Fasiano
Project Geologist

Randolph Stone
Randolph Stone
Associate Hydrogeologist

Harding Lawson Associates
1355 Willow Way, Suite 109
Concord, California 94520
415/687-9660

September 19, 1989

10/3/89
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TEXACO REFINING AND MARKETING INC.
100 CUTTING BOULEVARD
RICHMOND CA 94804

September 28, 1989

Ms. Dyan Whyte
San Francisco Regional Water
Quality Control Board
1111 Jackson Street, Room 6000
Oakland, CA 94607

Dear Ms. Whyte:

Enclosed is a copy of our Environmental Assessment Report dated September 19, 1989 for our former Texaco Service Station located at 2200 East 12th Street, Oakland, CA. 606

Our soil and ground-water investigation at this site has revealed that the water table is from 5 to 8 feet below the surface in sandy clay. There are some petroleum hydrocarbons in the vadose zone soil in the vicinity of the pump islands. Spilled fuel products that migrated through cold joints between concrete and asphalt may be the source of the hydrocarbons in near-surface soil.

Shallow ground water beneath a part of the western portion of the site contains dissolved petroleum hydrocarbons in low to moderate concentrations. The off-site extent of ground water with dissolved petroleum hydrocarbons is apparently limited.

Please contact me at (415) 236-1770 if you have any questions.

Very truly yours,

R.R. ZIELINSKI
Field Environmental
Supervisor

RRZ:cz

Enclosure

cc: Mr. Rafat Shahid
Alameda County Environmental
Health Department
80 Swan Way, Room 200
Oakland, CA 94621

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1.0 INTRODUCTION

On behalf of Texaco Refining and Marketing Inc. Harding Lawson Associates (HLA) has evaluated the extent of a suspected impact to subsurface soils and shallow ground water at the former Texaco service station (No. 62488000088) located at 2200 East 12th Street in Oakland, California (Plate 1). The investigation findings and description of the environmental assessment program are detailed in this report.

2.0 PREVIOUS INVESTIGATION

In May 1988, Texaco Refining and Marketing Inc. retained HLA to conduct a Sensitive Receptor Survey (SRS) for the Texaco station at 2200 East 12th Street in Oakland, California. The purpose of the survey was to acquire and provide the following site-specific information:

- Proximity of wells for:
  - public water supply
  - private water supply
  - observation or monitoring
- Proximity of subways, basements and schools
- Proximity of surface-water bodies
- Types of local water supply
- Local aquifer classification
- Site and area maps

The information collected during the SRS is summarized on a fact sheet included in Appendix A.

In June 1988, following the SRS, Texaco Refining and Marketing Inc. requested that HLA proceed with a limited subsurface investigation to evaluate whether petroleum hydrocarbons had affected the shallow soil or ground water. The subsurface investigation included the following tasks:

1. Drill, develop, and sample three 2-inch-diameter, shallow ground-water monitoring wells (MW-9A, MW-9B, and MW-9C)
2. Survey wells and gauge water levels

3. Determine the direction of ground-water flow

4. Analyze one ground-water sample from each monitoring well for benzene, toluene, ethylbenzene, and xylenes (BTEX)

The subsurface investigation results (documented in a report issued to Texaco on July 20, 1988) suggested that the ground water contained minor concentrations of petroleum hydrocarbons. Water from well MW-9B contained benzene concentrations of 350 parts per billion (ppb), ethylbenzene at 66 ppb, toluene at 8 ppb, and xylenes at 160 ppb. Water from MW-9C contained 3 ppb xylenes. Water from MW-9A contained no detectable concentrations of BTEX. The soil boring logs, well completion details and a summary of the chemical test results associated with these three wells are included in Appendix A.

3.0 LOCATION AND TOPOGRAPHY

The former Texaco (now Exxon) service station is located approximately 3.0 miles east of San Francisco Bay near the main business district of Oakland, California (Plate 1). The facility utilizes three underground storage tanks to store gasoline products and one underground waste oil tank. No diesel products are stored on-site. The surrounding area consists of commercial and light industrial establishments, including a Shell service station immediately across 22nd Avenue which borders the site to the north (Plate 2). South of the site is a parcel owned by M.C.B. Industries and is currently used to store old automobiles. The site is bordered to the west by East 12th Street. Bay Area Rapid Transit (B.A.R.T.) overhead tracks run parallel down the center of East 12th Street. East of the site is a building which is occupied by a mattress manufacturer.

Surface elevation at the site is approximately 15 feet above mean sea level. The land surface slopes gently to the southwest towards the Brooklyn Basin Tidal Canal (Plate 1). The immediate site vicinity has been extensively developed, and surface water runoff is mainly controlled by the municipal storm sewer system.

3.1 Regional Geology

The site lies within the East Bay Plain which is an alluvial plain that covers approximately 114 square miles in Western Alameda County. Most of the sediments that make up the unconsolidated deposits beneath the East Bay Plain were derived from

the Diablo Range. The site lies very near the contact between the Temescal Formation and artificial fill. The Temescal Formation is an alluvial fan deposit comprising interfingering lenses of clayey gravel, sandy silty clay, and sand-clay-silt mixtures. The fill consists largely of silt, sand and clay mixtures dredged from the bay along the shore of Alameda. Most of this fill material was placed in the late 1920's. The fill material overlies soft bay mud deposits.

4.0 HYDROGEOLOGY

The East Bay Plain has been divided into seven ground-water subareas on the basis of areal differences (i.e., faults and geologic conditions). The site lies within the Oakland Upland and Alluvial Plain subarea as defined by the California Department of Water Resources (DWR). Most ground water in the East Bay Plain is used for irrigation or industrial purposes. The majority of domestic water is supplied by the East Bay Municipal Utility District (EBMUD). Little ground water is pumped for domestic purposes. The alluvial deposits in this area, with an aggregate thickness of more than 1100 feet, constitute the ground-water reservoir. The regional ground-water flow direction is to the west-southwest towards the San Francisco Bay.

Ground-water recharge occurs as infiltration of rain, seepage of streams, and subsurface inflow from adjacent areas. Recharge to the east at higher elevations contributes to artesian conditions throughout the East Bay Plain.

The older alluvium (Alameda Formation) is the major ground-water reservoir in the Oakland Upland subarea. Wells that utilize water found within this zone typically range from 100 to 500 feet in depth.

5.0 FIELD INVESTIGATION

HLA used several tools to investigate the presence of organic chemicals in the soil and ground water at, and adjacent to, the site. This section discusses the uses and applications of these tools to the site.

5.1 Soil-Gas Survey

A soil-gas survey involves sampling and analyzing the soil gas from the pore spaces of the unsaturated soils (vadose zone) above the water table. This reconnaissance tool helps measure the distribution of organic chemicals in soil and ground water. Because many petroleum hydrocarbons exhibit significant vapor pressures, their introduction into subsurface soil results in vapor-phase permeation and transport. If they reach the water table and travel with ground water, vapors can emanate into the overlying soil. Thus, measuring the concentrations of organic compounds in the soil gas can give some indication of their presence in soil or ground water.

Because of complex interactions between organic compounds and subsurface materials, it is seldom possible to quantitatively estimate concentrations of such compounds in soil or ground water from soil-gas data alone. These interactions are a function of soil particle size and mineralogy, natural soil organic content, soil moisture, temperature, lithology, and heterogeneity. However, a soil-gas survey can be an excellent relative indicator or screening tool.

On September 21, 1988, under the supervision of HLA, a soil-gas survey was conducted by Tracer Research Company (TRC) to assess the near-surface distribution of selected organic compounds. TRC's standard sample collection and analyses methods, described in Appendix B, were used. Each soil-gas sample was analyzed in the field using gas chromatography for the following compounds: total petroleum hydrocarbons (TPH), benzene, toluene, ethylbenzene, and xylenes (BTEX). These compounds are common constituents of gasoline, and they exhibit relatively high vapor pressure and therefore can be quantified by soil-gas measurements. Soil-gas probe locations are shown on Plate 3A.

5.2 Soil-Sample Collection

HLA explored subsurface conditions on and off site by drilling and sampling eight soil borings during October and November, 1988. Five of the borings were completed as monitoring wells (MW-9D through MW-9H). Eight additional shallow borings were drilled on site in January and March, 1989, to evaluate the lateral extent of vadose zone soil contamination. Boring locations are shown on Plate 3, and logs are presented on Plates 4 through 16.

The borings were advanced using truck-mounted, 8-inch (borings), and 12-inch (wells) diameter hollow-stem auger drilling equipment and sampled using a 2.5-inch-diameter (I.D.) Sprague and Henwood (S&H) split-barrel sampler, lined with three 6-inch-long, brass tubes. Drilling was performed under the

direction of an HLA field geologist, who logged the borings in accordance with the Unified Soil Classification System presented on Plate 17. Soil samples were screened in the field with either a Photovac TIP-I photoionization detector (PID) or a Johnson Gas Detector (Gastech), Model 1314. Vapor readings, which indicate relative concentrations of volatile organic compounds in soil, are presented on the logs.

All drill cuttings were placed in 55-gallon drums for subsequent disposal. Sampling equipment was washed with a phosphate-free detergent solution and rinsed with clean water between sampling intervals. All drilling equipment was cleaned using a high-pressure, hot-water wash (steam-cleaned) before and after each boring.

5.3 Monitoring Well Construction

The monitoring wells were constructed with steam-cleaned 4-inch-diameter, Schedule 80, flush-threaded PVC casing and screen (see Well Construction Details, Plates 18 through 22). The wells were constructed under permit from the Alameda County Flood Control and Water Conservation District. The annular space between the screened casing and the borehole wall was filled with No. 3 Monterey sand to approximately 2 feet above the top of the screen. A bentonite seal was placed above the sand pack, and the remainder of the annulus was filled with cement/bentonite grout to just below the ground surface. The top of each well was placed slightly below the ground surface. The wells were

equipped with locking, water-tight caps (OPW 634-TTM) to minimize intrusion of surface water. Over each well, a locking, water-tight traffic box (EMCO Wheaton A-721) was installed, which extends slightly above the surrounding grade.

5.4 Water Quality Sampling

On October 19, 1988, the recently installed Monitoring Wells MW-9D and MW-9E were developed, sampled, and surveyed by an HLA technician. All other existing on-site wells were also sampled at this time. On December 6, 1988, Monitoring Wells MW-9F through MW-9H were developed, sampled, and surveyed by an HLA technician. Before and after development, a clear lucite bailer was lowered into each well to check for free product. Each well was developed by purging and bailing with a PVC bailer; at least six well volumes were removed from each well. After development, we purged three additional well volumes, while monitoring temperature, pH, and conductivity, and then sampled the ground water. Purged water was placed in 55-gallon drums for subsequent disposal as requested by Texaco Refining and Marketing Inc.

Ground-water samples were collected from each well with a clean, stainless steel bailer. A representative sample was decanted into laboratory-prepared, 40-milliliter volatile organic analysis (VOA) vials. The vials were immediately sealed, labeled, and placed in a cooler with blue ice until delivery for chemical testing to ChemWest Analytical Laboratories, Inc., in Sacramento, California. All sampling equipment was washed with a

phosphate-free detergent solution and rinsed in clean water and distilled water between wells.

Appropriate quality assurance and quality control (QA/QC) measures were employed during the field investigation. HLA maintains an internal QA/QC program that includes provisions for avoiding cross-contamination during site investigation and procedures for decontamination, sample handling, preservation, and chain-of-custody.

6.0 SUBSURFACE CONDITIONS

6.1 Geologic Profile

All soils encountered within the borings were described in accordance with the USCS (Plate 17). All borings, with the exception of SB-6 and SB-7 and Monitoring Wells MW-9F through MW-9H, were located on site within paved areas. The off-site borings and wells were located within East 12th Street and 22nd Avenue. As shown on Plates 4 through 16 and in Appendix A, subsurface materials generally consist of unconsolidated stiff, sandy clay (CL) often underlain by silty sand and gravel. During drilling operations, ground water was initially encountered in the borings between 11 and 13 feet below grade. Ground water stabilized in the wells at approximately 6.5 feet below grade.

Relatively strong gasoline odors were observed in Borings SB-1, and SB-4, SB-5, and SB-8, and in Monitoring Wells MW-9B and MW-9E in the upper six feet of soils. Soils encountered in all other borings had only trace amounts of gasoline vapors in vadose zone soils. Two soil samples from each boring, and one soil sample from each boring where a well was installed, were submitted for chemical testing. No soil samples from Wells MW-9F and MW-9H were analyzed. The laboratory results are discussed in Section VII of this report.

6.2 Ground-Water Flow Patterns

The tops of well casings were surveyed to a temporary datum located at the western corner of the dispenser island nearest the

underground storage tanks with an assumed elevation of 100.0 feet (HLA datum, see Plate 3). Well monitoring and survey data are presented in Table 1. The estimated direction of ground-water flow is to the west, with a gradient of 0.004 feet per foot as shown on the Ground-water Surface Elevation Map, Plate 23. A slight variation in the ground-water flow direction is observed near the southwestern portion of the site. At this location, ground water appears to flow to the southwest.

Table 1. Well Monitoring and Survey Data

Well No.	Top of Casing Elevation* (feet)	Depth to Ground Water** (feet)	Ground-Water Surface Elevation+ (feet)	Comments
MW-9A	100.07	7.06	93.01	no odor
MW-9B	98.41	6.07	92.34	hydrocarbon odor
MW-9C	99.73	6.85	92.88	no odor
MW-9D	101.46	8.28	93.18	no odor
MW-9E	98.41	5.61	92.80	slight odor
MW-9F	96.96	5.53	91.43	no odor
MW-9G	98.51	5.21	93.30	no odor
MW-9H	97.14	8.04	89.10	no odor

Notes:

* Elevation relative to HLA temporary benchmark located at the western corner of the dispenser island nearest the Underground Storage Tanks with an arbitrary elevation of 100.0 feet (see Plate 3).

** Depth to ground water on December 15, 1988.

\+ Ground-water surface elevation = top of casing elevation - depth to water.

7.0 DISCUSSION OF CHEMICAL TEST RESULTS

7.1 Chemical Test Methods

Soil-gas, and/or ground-water samples obtained from soil-gas probes, were chemically analyzed in the on-site mobile laboratory for their concentration of TPH and BTEX. Ambient air samples were also obtained at the start and finish of work and were tested for the same compounds.

To evaluate the presence of petroleum products in the vadose zone soils and the ground water, we scheduled the following chemical analyses:

Soil - TPH as gasoline, using DHS Method-LUFT Field Manual, and BTEX, using EPA Test Method 8020.

Ground water - BTEX, using EPA Test Method 602.

7.2 Distribution of Chemicals in Soil Gas

Detectable concentrations of petroleum products in soil-gas samples were limited to probe locations SG-1, WS-2, SG-3, and SG-13 (Plate 3A). At these locations, with the exception of SG-13, relatively high concentrations of BTEX and TPH were detected in soil-gas samples obtained from depths of approximately 5 feet. Ground-water samples were obtained from probe locations WS-2 and WS-10, and from MW-9A. The sample from WS-2 contained relatively high concentrations of BTEX and TPH. BTEX and TPH was not detected in ground water from WS-10 nor from MW-9A.

Concentrations of petroleum products were less than the detection limit at all other probe locations with the exception

of SG-13 where 23 micrograms per liter (ug/L) TPH was detected. Because of tight clays encountered at probe locations SG-6 and SG-7, we were not able to obtain a soil-gas sample. A summary of the analytical results of the soil-gas survey is presented in Table 2.

Table 2. Analytical Results of Soil-gas Survey Conducted on September 20, 1988

Concentrations in micrograms per liter (ug/L)

Sample	Depth (ft)	Benzene	Ethyl-benzene	Toluene	Xylenes	Total Petroleum Hydrocarbons
Air	N/A	<0.8	<0.8	<0.7	<0.8	<0.8
SG-01	5.0	320,000	620	1	2,200	700,000
WS-02	5.0	12,000	<80	<73	<80	25,000
SG-03	4.0	32,000	<8	<28,000	800	96,000
SG-04	5.0	<0.8	<0.8	<0.7	<0.8	<0.8
MW-9A	6.0	<76	<80	<73	<80	<76
SG-05	2.0	<0.8	<0.8	<0.7	<0.8	<0.8
SG-06	--	--	--	--	--	--
SG-07	--	--	--	--	--	--
SG-08	5.0	<0.8	<0.8	<0.7	<0.8	<0.8
SG-09	6.0	<0.8	<0.8	<0.7	<0.8	<0.8
WS-10	6.0	<76	<80	<73	<80	<76
SG-11	4.0	<0.8	<0.8	<0.7	<0.8	<0.8
SG-12	5.0	<0.8	<0.8	<0.7	<0.8	<0.8
SG-13	5.0	<0.8	<0.8	<0.7	<0.8	23
Air	N/A	<0.7	<0.8	<0.8	<0.8	<0.7

-- = Not able to obtain sample
NA = Not Applicable
Air = ambient air sample
* WS-02 and WS-10 were samples of ground water.

7.3 Soil Sample Test Results

Soil samples were obtained for chemical testing from on and off-site borings at the sample depth intervals with the highest

PID vapor readings. Laboratory results of chemical analyses on soil are presented in Table 3.

Table 3. Laboratory Results of Soil Analyses
Concentrations in milligrams per kilogram (mg/kg)

Sample Number	Depth (ft)	Benzene[1]	Ethyl-benzene[2]	Toluene[3]	Xylenes[3]	TPH as Gasoline[4]
SB-1	4.8	0.30	ND	0.2	ND	ND
B-9-1	5.0	ND	ND	ND	ND	ND
B-9-1	9.0	ND	ND	ND	ND	ND
B-9-1	12.0	ND	ND	ND	ND	ND
B-9-2	5.0	ND	ND	ND	ND	ND
B-9-2	9.0	ND	ND	ND	ND	ND
B-9-2	10.5	ND	ND	ND	ND	ND
B-9-2	13.0	ND	ND	ND	ND	ND
SB-4	4.0	1.0	2.3	0.9	5.8	160
SB-4	9.0	ND	ND	ND	ND	ND
SB-5	4.0	0.33	ND	ND	ND	ND
SB-5	9.0	ND	ND	ND	ND	ND
SB-6	5.0	ND	ND	ND	ND	ND
SB-6	5.5	ND	ND	ND	ND	ND
SB-7	4.0	ND	ND	ND	ND	ND
SB-7	8.5	ND	ND	ND	ND	ND
SB-8	5.5	0.43	ND	ND	ND	ND
SB-8	9.0	ND	ND	ND	ND	ND
SB-9	4.0	ND	ND	ND	ND	ND
SB-9	9.0	ND	0.4	ND	1.1	39
SB10-1	5.0	ND	ND	ND	ND	ND
SB10-2	10.0	ND	ND	ND	ND	ND
SB11-1	5.0	ND	ND	0.1	ND	ND
SB11-2	10.0	ND	ND	ND	ND	ND
MW-9D	6.0	ND	ND	ND	ND	ND
MW-9D	10.5	ND	ND	ND	ND	ND
MW-9E	5.5	ND	18	ND	ND	1900
MW-9E	9.0	ND	ND	ND	ND	ND
MW-9G	4.0	ND	ND	0.2	ND	ND

ND = Not detected.

1 Detection limit 0.05 mg/kg except as noted in parentheses.
2 Detection limit 0.2 mg/kg except as noted in parentheses.
3 Detection limit 0.1 mg/kg except as noted in parentheses.
4 Detection limit 10 mg/kg except as noted in parentheses.

BTEX and TPH were detected in the upper four to nine feet of soils in SB-1, SB-4, SB-5, SB-8, SB-9, SB-11, MW-9E, and MW-9G. Detectable concentrations of hydrocarbons found in these locations are relatively low with the exception of the samples from 4.0 feet in SB-4 (160 parts per million [ppm] TPH)*, 9.0 feet in SB-9 (39 ppm TPH), and 5.5 feet in MW-9E (1,900 ppm TPH).

7.4 Water Quality Results

Monitoring wells MW-9A through MW-9E were sampled on October 24, 1988 and wells MW-9F through MW-9H were sampled on December 6, 1988 using the procedures described in Section V. Results of chemical analyses of ground water samples are summarized in Table 4. Laboratory reports are presented in Appendix E.

Table 4. Laboratory Results of Ground-water Analyses
Concentrations in micrograms per liter (ug/L)

Well Number	Date Sampled	EPA TEST METHOD 602 Benzene	Ethyl-benzene	Toluene	Xylenes
MW-9A	10/24/88	ND(0.5)	ND(2)	ND(1)	ND(1)
MW-9B	10/24/88	84(0.5)	3.1(2)	ND(1)	3.2(1)
MW-9C	10/28/88	ND(0.5)	ND(2)	ND(1)	ND(1)
MW-9D	10/24/88	ND(0.5)	ND(2)	ND(1)	ND(1)
MW-9E	10/24/88	1.3(0.5)	ND(2)	ND(1)	ND(1)
MW-9F	12/06/88	ND(0.5)	ND(2)	ND(1)	ND(1)
MW-9G	12/06/88	0.8(0.5)	ND(2)	ND(1)	ND(1)
MW-9H	12/06/88	ND(0.5)	ND(2)	ND(1)	ND(1)
Detection Limits		0.5	2.0	1.0	1.0

ND = Not detected
Detection limits given in parentheses.

* Indicated on Table 3 as milligrams per kilogram

Detectable concentrations of BTEX were found in ground water samples from MW-9B and MW-9E located on-site. Detectable concentrations of BTEX were also found in off-site well MW-9G. No BTEX was detected in off-site wells MW-9F and MW-9H.

8.0 AQUIFER TESTING

The hydraulic conductivity of shallow, saturated earth materials was estimated from the results of tests using two monitoring wells located generally downgradient of the underground fuel tanks on-site. Two single-well slug tests were performed using monitoring wells MW-9B and MW-9E. At the time of the slug tests, the equilibrium water levels in the wells were 5.5 and 4.9 feet below the top of casing in each well, respectively. The water levels were compared to the stratigraphic log of the wells to classify the most permeable stratum adjacent to the screen in the saturated zone as hydraulically confined or unconfined.

A centrifugal suction pump was used to rapidly remove a volume (slug) of water from the wells. Table 5 summarizes the conditions of the slug tests at this site.

Table 5. Slug Test Conditions

Well Number	Test Type	Pump Type	Approximate Slug Volume (gallons)	Initial Water Level (feet)	Classification of Stratum
MW-9B	Withdrawal	Suction	3	5.5	Confined
MW-9E	Withdrawal	Suction	7	4.9	Confined

A pressure transducer, placed near the bottom of the wells was used to measure the water level recoveries following the slug withdrawals. The output of the transducer was interpreted and recorded by a data logger for subsequent analysis. The method of slug test analysis is discussed in Appendix F.

The slug-test recovery hydrographs are shown in Plates 25 and 26 for tests in MW-9B and MW-9E, respectively. Table 6 lists the hydraulic conductivity estimates derived from the tests. The materials tested are only moderately permeable. Ground water would be expected to move relatively slowly through them.

Table 6. Slug Test Results

Well Number	Lithology of Tested Zone	Thickness of Zone (feet)	Estimated Hydraulic Conductivity of Zone (feet/day)
MW-9B	Clayey Sand	2.5	0.42
MW-9E	Sandy Clay with gravel	13.0	0.52

9.0 SUMMARY OF FINDINGS

Conclusions and observations are summarized as follows:

1. The shallow subsurface soils consist generally of unconsolidated stiff, sandy clay often underlain by silty sand and gravel. The water table surface is approximately 6.5 feet below the ground surface. The silty sand and gravel exists under slightly confined conditions. Water is initially encountered during drilling between 11 and 13 feet below grade.

2. The ground water flow direction is to the west with a gradient of 0.004 feet per foot. A slight variation in the ground-water flow pattern is observed near the southwestern portion of the site. At this location, ground water appears to flow to the southwest.

3. The hydraulic conductivity of the shallow saturated earth materials beneath the site is estimated to range from 0.4 to 0.5 feet per day.

4. BTEX and TPH (as gasoline) have been detected exclusively in the upper 4 to 9 feet of soils in SB-1, SB-4, SB-5, SB-8, SB-9, SB-11, MW-9E, and MW-9G. The region where detectable concentrations of petroleum products are found in the vadose zone soils is closely associated with the pump islands. Spilled fuel products migrating through cold joints between concrete and asphalt may be the source of the petroleum products in near-surface soils.

5. As shown on Plate 24, shallow ground water beneath the site contains detectable quantities of BTEX. BTEX has also been detected in the ground water off-site in the down gradient direction. The lateral extent of BTEX in the ground water has been well evaluated and appears to be bounded in the down gradient direction by utility lines in East 12th Street and 22nd Avenue. The invert of the storm drain that exists in East 12th Street is approximately 8.5 feet below grade; approximately 2 feet below the static water level.

6. The investigation suggests that gasoline handling operations on site have resulted in the BTEX components found in ground water both on and off-site. We understand that line and tank testing in 1988 showed that the fuel storage and dispensing system was tight. It is therefore likely that the fuel hydrocarbons encountered have resulted either from surface spillage, overfilling during product delivery, or line or tank leakage that occurred prior to the 1988 testing.

10.0 REFERENCES

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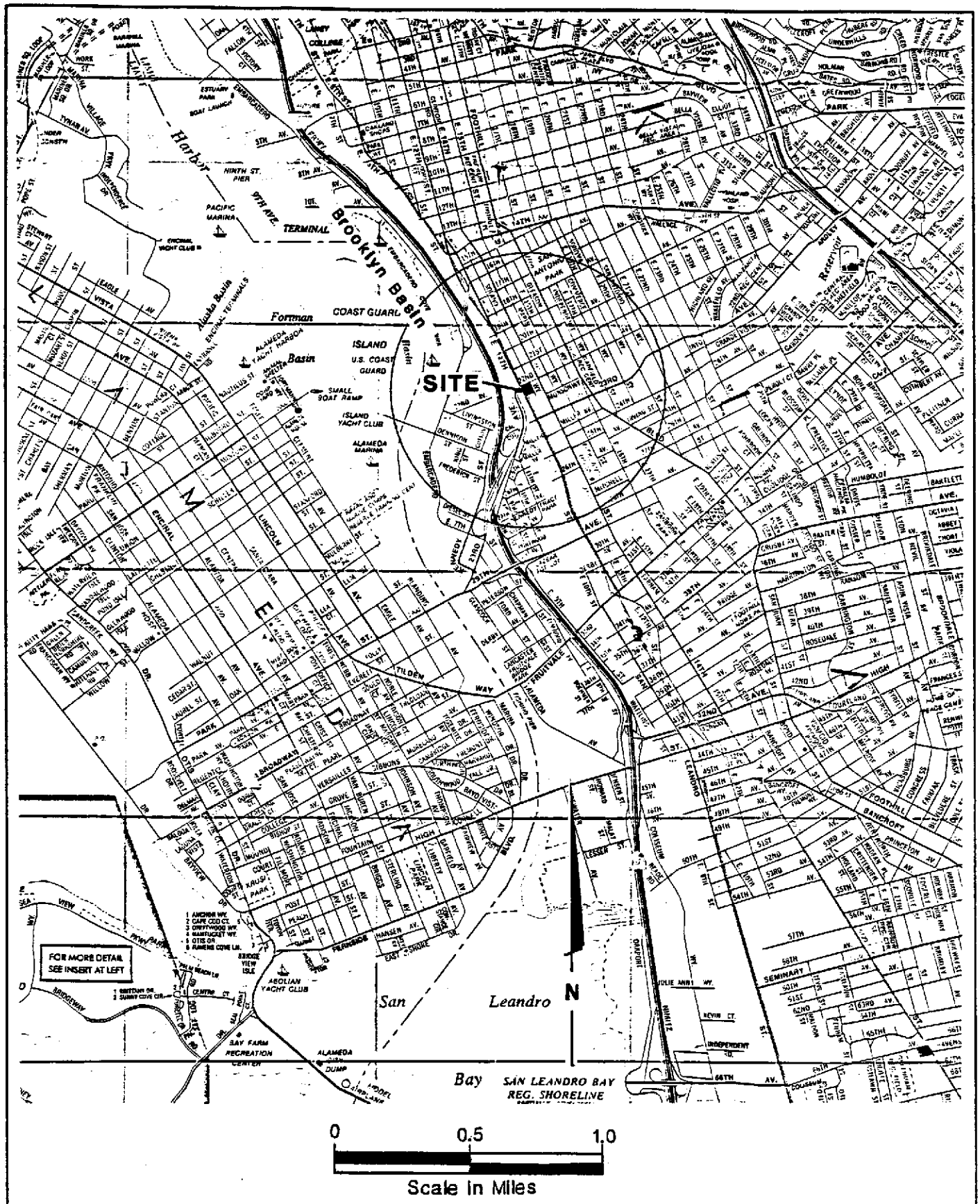


Harding Lawson Associates
Engineers and Geoscientists

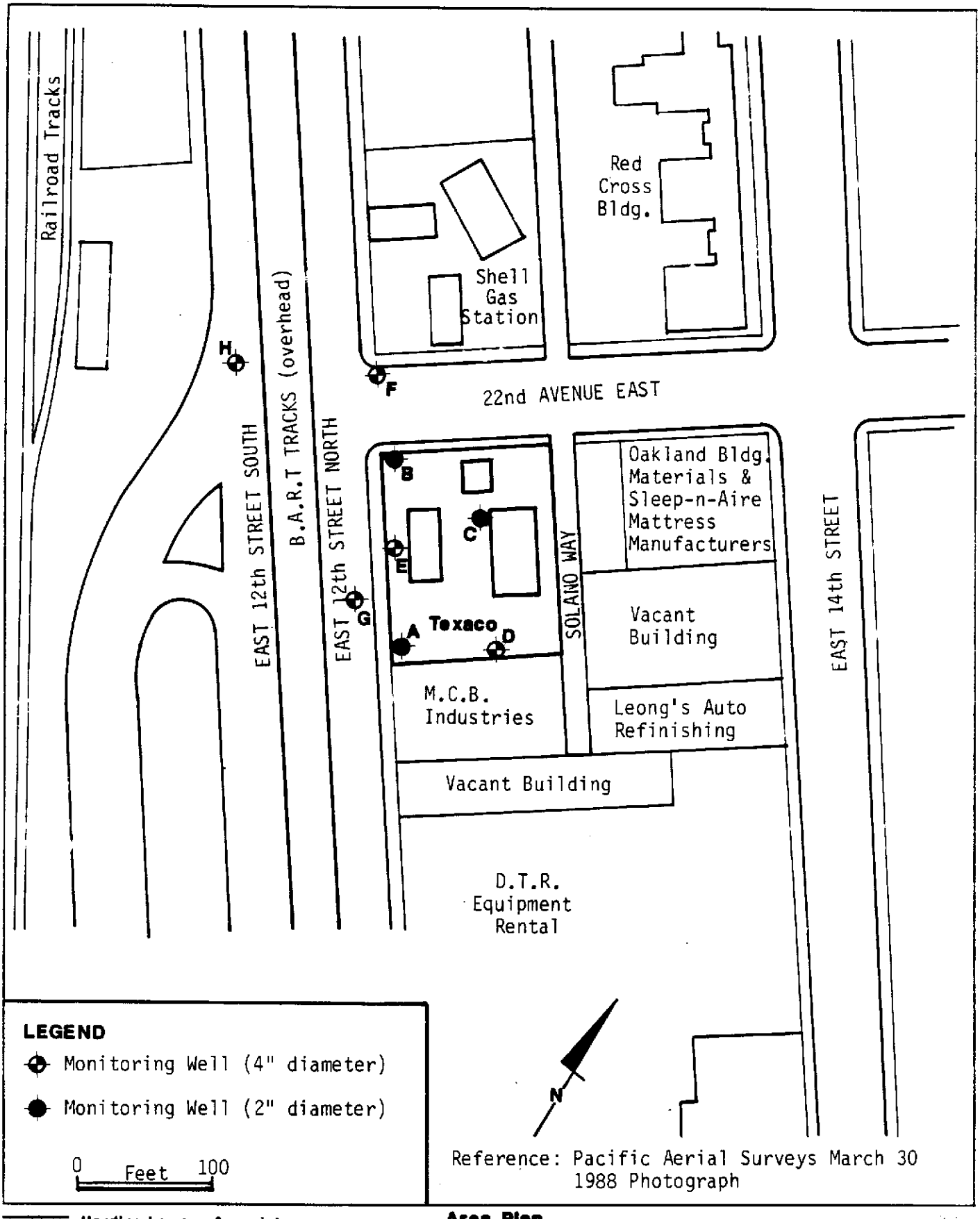
Vicinity Map

Former Texaco Service Station
2200 East 12th Street
Oakland, California

PLATE **1**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
	2251,082.03		6/89		

105649

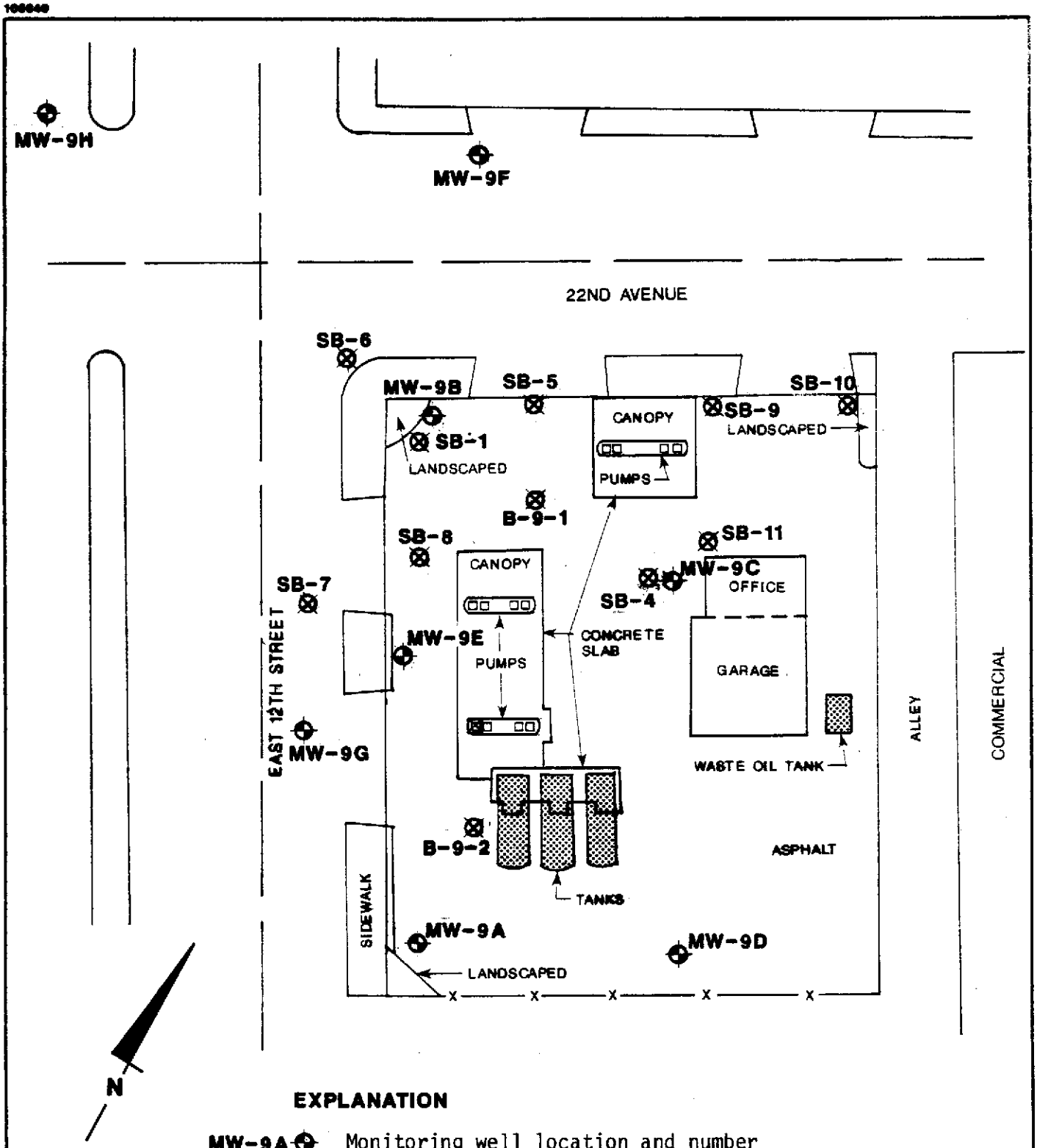


Harding Lawson Associates
Engineers and Geoscientists

Area Plan
Former Texaco Service Station
2200 East 12th Street
Oakland, California

2

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
YC	2251,082.03	G	1/89		

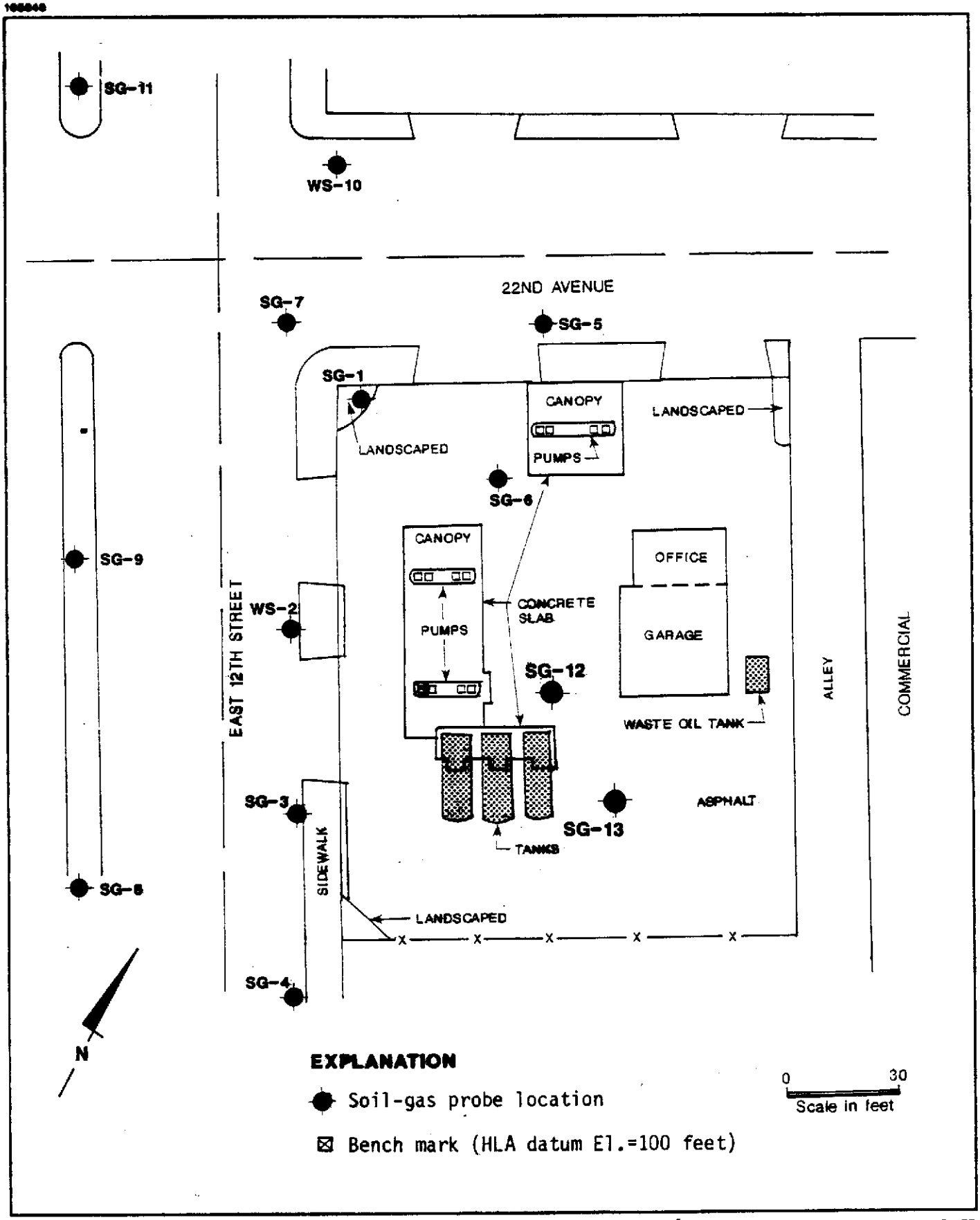


Harding Lawson Associates
Engineers and Geoscientists

Site Plan
Former Texaco Service Station
2200 East 12th Street
Oakland, California

PLATE **3**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
YC	2251,082.03		6/89		



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Soil-Gas Probe Location
Former Texaco Service Station
2200 East 12th Street
Oakland, California

PLATE
3A

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
YC	2251,082.03	G	6/89		

Equipment 12" Hollow Stem Auger

Elevation **101.46' Date 10/05/88

Laboratory Tests	Blows/foot	GAS TECH (ppm)*	Well Screen Interval	Depth (ft)	Sample
				0	
					Asphalt
					Baserock
					DARK BROWN LEAN CLAY WITH SAND (CL), Stiff, Moist
				5	
					Occasional Sand Lenses & Pebbles
	10	ND			
					Water Level 10/24/88
	5				
	9	ND			DARK GRAYISH BROWN INTERMIXED SANDY CLAY & CLAYEY SAND (CL-SC), Medium Dense to Stiff, Wet to Saturated
	6			10	
					Water Level 10/05/88
					LIGHT BROWN POORLY GRADED SAND WITH CLAY (SP), Dense, Saturated, Medium Grained
		ND		15	
					Bottom of Boring at 16.5 feet
				20	
				25	
				30	
				35	
				40	

* Gas-Tech Model 1314, Calibrated to Hexane
ppm - Parts per Million
** Reference Elevation (Arbitrary Datum)
ND Non-Detectable

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Log of Boring MW-9D
Former Texaco Service Station
2200 East 12th Street
Oakland, California

PLATE **4**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
YC	2251,082.03	G	12/88		

Equipment 12" Hollow Stem Auger

Elevation **98.41' Date 10/05/88

Laboratory Tests	Blows/foot	GAS TECH (ppm)*	Depth (ft)	Sample
			0	Asphalt / Baserock
		400		BLACK LEAN CLAY WITH SILT (CL), Soft, Moist, Trace Coarse Sand
	6	>500	5	Becomes Gray, Stiff
				▽ Water Level 10/24/88
	11	20		Becomes Mottled Gray & Brown
	10			▽ Water Level 10/05/88
	10	ND	10	LIGHT BROWN CLAY WITH SAND (CL), Stiff, Saturated
		ND	15	Layer of Cobbles up to 2-inch Diameter
				Bottom of Boring at 18.5 feet
			20	
			25	
			30	
			35	
			40	

Well Screen Interval

* Gas-Tech Model 1314, Calibrated to Hexane
ppm - Parts per Million
** Reference Elevation (Arbitrary Datum)
ND Non-Detectable

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Log of Boring MW-9E
Former Texaco Service Station
2200 East 12th Street
Oakland, California

PLATE 5

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
YC	2251,082.03		12/88		

Equipment 8" Hollow Stem Auger

Elevation *96.96 Date 11/23/88

Laboratory Tests	Blows/foot	Odor	Well Screen Interval	Depth (ft) Sample	
				0	Concrete — Baserock — Fill
					BROWN WELL-GRADED GRAVEL WITH SAND AND CLAY (GW), Medium Dense, Wet (fill)
	10	None		5	DARK BROWN FAT CLAY (CH), Medium Stiff, Moist
					▽ Water Level 12/06/88
					MOTTLED GRAY BROWN LEAN CLAY WITH SAND (CL), Medium Stiff, Moist, Fine-Grained Sand
	22	None		10	Becomes Stiffer
					Sand Becomes Coarse-Grained, Saturated
					▽ Water Level 11/23/88
					Becomes Light Brown, Medium- to Fine-Grained Sand
	23	None		15	Bottom of Boring at 16.0 feet
				20	
				25	
				30	
				35	
				40	

* Reference Elevation (Arbitrary Datum)

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Log of Boring MW-9F
Former Texaco Service Station
2200 East 12th Street
Oakland, California

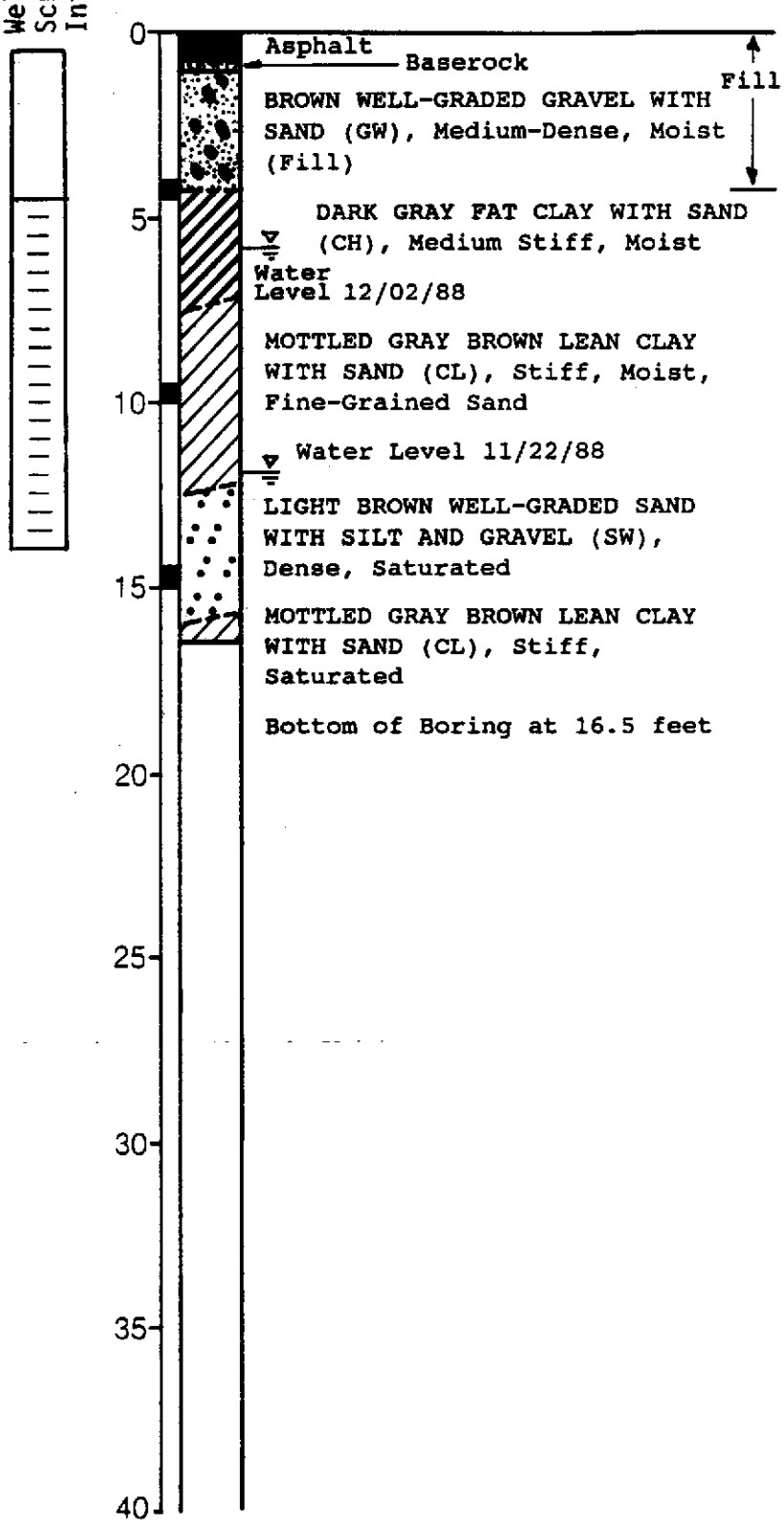
PLATE **6**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
YC	2251,082.03		12/88		

Equipment 8" Hollow Stem Auger

Elevation *98.51' Date 11/22/88

Laboratory Tests	Blows/foot	Odor	Well Screen Interval	Depth (ft)	Sample
				0	
		None		5	
		None		10	
	27			15	
				20	
				25	
				30	
				35	
				40	



* Reference Elevation (Arbitrary Datum)

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Log of Boring MW-9G
Former Texaco Service Station
2200 East 12th Street
Oakland, California

PLATE **7**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
YC	2251,082.03		12/88		

Equipment 8" Hollow Stem Auger

Elevation **97.14' Date 11/23/88

Laboratory Tests	Blows/foot	PID (ppm)*	Well Screen Interval	Depth (ft)	Sample	
				0		Concrete
						BROWN WELL-GRADED GRAVEL WITH SAND (GW), Medium Dense, Moist
	20	ND		5		DARK GRAY FAT CLAY WITH SILT (CH), Medium Stiff, Moist
						Trace Gravel
						∇ Water Level 12/06/88
	9	ND		10		MOTTLED GRAY BROWN LEAN CLAY WITH SAND (CL), Soft, Wet
						Increasing Fine Sand Content
						∇ Water Level 11/23/88
	25	ND		15		BROWN WELL-GRADED SAND WITH GRAVEL (SW), Dense, Saturated
						Grades to BROWN LEAN CLAY WITH SAND AND GRAVEL (CL), Stiff, Saturated
				20		Bottom of Boring at 16.5 feet
				25		
				30		
				35		
				40		

* Photovac Tip-1 with 10.6 Electron Volt Lamp

** Reference Elevation (Arbitrary Datum)

ppm - Parts Per Million

Harding Lawson Associates
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Log of Boring MW-9H
Former Texaco Service Station
2200 East 12th Street
Oakland, California

PLATE 8

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
YC	2251,082.03	G	12/88		

Equipment 8" Hollow Stem Auger

Elevation *~99.0' Date 11/22/88

Laboratory Tests	Blows/foot	Odor	Depth (ft) Sample
			0
			Asphalt
			Baserock
			BLACK FAT CLAY WITH SILT (CH), Medium Stiff, Moist
	15	Strong Gas Odor	5
			No Free Water Encountered
			Bottom of Boring at 5.5 feet
			10
			15
			20
			25
			30
			35
			40

* Reference Elevation (Arbitrary Datum)

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Log of Boring SB-1
Former Texaco Service Station
2200 East 12th Street
Oakland, California

PLATE 9

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
YC	2251,082.03		12/88		

Equipment 8" Hollow Stem Auger

Elevation **99.10' Date 10/06/88

Laboratory Tests	Blows/foot	GAS TECH (ppm)*	Depth (ft)	Sample	
			0		Asphalt Baserock
					DARK BROWN LEAN CLAY WITH SILT (CL), Stiff, Moist
	12	50	5		
		ND			Trace Pebbles at 9.0 feet
	9	ND			
			10		LIGHT BROWN MOTTLED LEAN CLAY WITH SAND (CL), Stiff, Moist
	8	ND			
	14				Increase in Sand and Pebble Content
	21	ND			▽ Water Level 10/06/88
	36		15		Lenses of Angular Cobbles
					Bottom of Boring at 16.0 feet
			20		
			25		
			30		
			35		
			40		

* Gas-Tech Model 1314, Calibrated to Hexane
ppm - Parts per Million
** Reference Elevation (Arbitrary Datum)
ND Non-Detectable

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Log of Boring B-9-1
Former Texaco Service Station
2200 East 12th Street
Oakland, California

PLATE 10

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
YC	2251,082.03		12/88		

Equipment 8" Hollow Stem Auger

Elevation **99.20' Date 10/06/88

Laboratory Tests	Blows/foot	GAS TECH (ppm)*	Depth (ft)	Sample	
			0		Asphalt
					Baserock
		10			DARK BROWN TO BLACK LEAN CLAY WITH SILT (CL), Stiff, Moist
	12	110	5		Lenses of Angular Pebbles and Cobbles
		25			
	13	10	10		Becomes Light Brown
	14	10			Occasional Angular Pebbles and Cobbles
	15				
	22	10			▽ Water Level 10/6/88
	18		15		Bottom of Boring at 15.5 feet
			20		
			25		
			30		
			35		
			40		

* Gas-Tech Model 1314 Calibrated to Hexane

** Reference Elevation (Arbitrary Datum)

ppm - Parts per Million

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Log of Boring B-9-2

Former Texaco Service Station
2200 East 12th Street
Oakland, California

PLATE 11

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
YC	2251,082.03	G	12/88		

LOG OF BORING SB-4

Equipment 6" Hollow Stem Auger

Elevation 99.80 ** Date 1/12/89

Depth (ft)	Sample	Blows/foot	Gas * Tech (ppm)	
0				Asphalt Baserock
				DARK BROWN LEAN CLAY WITH SILT (CL), stiff, moist
		14	300	
5				Light green staining, strong gas odor
				BLUE LEAN CLAY WITH GRAVEL (CL), stiff, moist, very fine gravel
		13	175	
10				▽ Water level 01/12/89
				BROWN LEAN CLAY WITH SAND (CL), stiff, moist, very fine-grained sand
15				Bottom of boring at 13.0 feet

LOG OF BORING SB-5

Equipment 6" Hollow Stem Auger

Elevation 99.08 ** Date 1/12/89

Depth (ft)	Sample	Blows/foot	Gas * Tech (ppm)	
0				Asphalt and baserock
				BLACK LEAN CLAY WITH SAND AND GRAVEL (CL), stiff, moist
		12	200	Becomes dark brown
5				
				Becomes very stiff, strong gas odor, wet
		7	75	▽ Water level 01/12/89
10				Bottom of boring at 10.5 feet
15				

* Gas-Tech Model 1314, calibrated to hexane
ppm - parts per million
** Reference elevation (arbitrary datum)

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Logs of Borings SB-4 and SB-5
Former Texaco Service Station
2200 East 12th Street
Oakland, California

PLATE **12**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
YC	2251,082.03	G	6/89		

LOG OF BORING SB-6

Equipment 6" Hollow Stem Auger

Elevation 98.05 Date 1/12/89

Depth (ft)	Sample	Blows/foot	Gas Tech (ppm)	
0				Asphalt and baserock
				BROWN LEAN CLAY WITH SILT (CL), stiff, moist
5		6	60	GRAY SAND (SW), well graded, loose, moist, medium grained
				BLUE FAT CLAY (CL), very stiff, moist
10				Bottom of boring at 6.0 feet
15				

LOG OF BORING SB-7

Equipment 6" Hollow Stem Auger

Elevation 98.42 Date 1/12/89

Depth (ft)	Sample	Blows/foot	Gas Tech (ppm)	
0				Asphalt and baserock
				DARK BROWN LEAN CLAY WITH SILT (CL), stiff, moist, sample contains blue-gray staining
5		12	50	Becomes mottled brown-blue sand, very stiff, very fine-grained sand
		8	100	▽ Water level 01/12/89
10				Bottom of boring at 9.5 feet
15				

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Logs of Borings SB-6 and SB-7
Former Texaco Service Station
2200 East 12th Street
Oakland, California

PLATE **13**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
YC	2251,082.03	G	6/89		

LOG OF BORING SB-8

Equipment 6" Hollow Stem Auger

Elevation 98.69 Date 1/12/89

Depth (ft)	Sample	Blows/foot	Gas Tech (ppm)	Well Screen Interval	
0					Asphalt and baserock
					BLACK LEAN CLAY WITH SILT (CL), stiff, moist
		11			
5		5	350		Becomes green brown with poorly graded sand lenses, green staining and strong gas odor
					Occasional gravels
		9	50		▽ Water level 01/12/89
10					Bottom of boring at 9.5 feet
15					

LOG OF BORING SB-9

Equipment 6" Hollow Stem Auger

Elevation 99.49 Date 1/12/89

Depth (ft)	Sample	Blows/foot	Gas Tech (ppm)	Well Screen Interval	
0					Asphalt and baserock
					DARK BROWN LEAN CLAY WITH SILT (CL), stiff, moist
		14	50		Occasional gravels
5					Becomes blue gray with sand, very stiff, wet, strong gas odor
		9	>500		▽ Water level 01/12/89
10					Bottom of boring at 9.5 feet
15					

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Logs of Borings SB-8 and SB-9
Former Texaco Service Station
2200 East 12th Street
Oakland, California

PLATE **14**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
YC	2251,082.03		6/89		

Equipment 6" Hollow Stem Auger

Elevation _____ Date 03/02/89

Laboratory Tests	Blows/foot	HNU(ppm)	Odor	Depth (ft)	Sample	
				0		Asphalt Baserock
						MOTTLED GRAY BROWN SANDY LEAN CLAY (CL), medium stiff, moist
	10	ND		5		
						MOTTLED GRAY SILTY SAND (SM), medium dense, moist, fine-grained
	10	ND		10		Bottom of boring at 11.5 feet No free water encountered
				15		
				20		
				25		
				30		
				35		
				40		

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Log of Boring SB-10
Former Texaco Service Station
2200 East 12th Street
Oakland, California

PLATE **15**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
YC	2251,082.03	G	4/89		

Equipment 6" Hollow Stem Auger

Elevation _____ Date 03/02/89

Laboratory Tests	Blows/foot	HNU(ppm)	Odor	Depth (ft)	Sample	
				0		Asphalt Baserock DARK GRAY FAT CLAY (CH), stiff, moist
	13	ND		5		DARK GRAY SANDY LEAN CLAY (CL), medium stiff, moist
				10		MOTTLED GRAY BROWN CLAYEY SAND (SC), medium dense, moist
	13	ND				Bottom of boring at 11.5 feet No free water encountered
				15		
				20		
				25		
				30		
				35		
				40		

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Log of Boring SB-11
Former Texaco Service Station
2200 East 12th Street
Oakland, California

PLATE **16**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
YC	2251,082.03		4/89		

MAJOR DIVISIONS					TYPICAL NAMES
COARSE—GRAINED SOILS MORE THAN HALF IS COARSER THAN NO. 200 SIEVE	GRAVELS MORE THAN HALF COARSE FRACTION IS LARGER THAN No. 4 SIEVE SIZE	CLEAN GRAVELS WITH LITTLE OR NO FINES	GW		WELL GRADED GRAVELS WITH OR WITHOUT SAND, LITTLE OR NO FINES
			GP		POORLY GRADED GRAVELS WITH OR WITHOUT SAND, LITTLE OR NO FINES
		GRAVELS WITH OVER 12% FINES	GM		SILTY GRAVELS, SILTY GRAVELS WITH SAND
			GC		CLAYEY GRAVELS, CLAYEY GRAVELS WITH SAND
	SANDS MORE THAN HALF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE SIZE	CLEAN SANDS WITH LITTLE OR NO FINES	SW		WELL GRADED SANDS WITH OR WITHOUT GRAVEL, LITTLE OR NO FINES
			SP		POORLY GRADED SANDS WITH OR WITHOUT GRAVEL, LITTLE OR NO FINES
		SANDS WITH OVER 12% FINES	SM		SILTY SANDS WITH OR WITHOUT GRAVEL
			SC		CLAYEY SANDS WITH OR WITHOUT GRAVEL
FINE—GRAINED SOILS MORE THAN HALF IS FINER THAN NO. 200 SIEVE	SILTS AND CLAYS LIQUID LIMIT 50% OR LESS		ML		INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTS WITH SANDS AND GRAVELS
			CL		INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, CLAYS WITH SANDS AND GRAVELS, LEAN CLAYS
			OL		ORGANIC SILTS OR CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50%		MH		INORGANIC SILTS, MICACEOUS OR DIATOMACIOUS, FINE SANDY OR SILTY SOILS, ELASTIC SILTS
			CH		INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH		ORGANIC SILTS OR CLAYS OF MEDIUM TO HIGH PLASTICITY
HIGHLY ORGANIC SOILS			Pt		PEAT AND OTHER HIGHLY ORGANIC SOILS

UNIFIED SOIL CLASSIFICATION - ASTM D2487-85

Perm	—	Permeability
Consol	—	Consolidation
LL	—	Liquid Limit (%)
PI	—	Plastic Index (%)
G_s	—	Specific Gravity
MA	—	Particle Size Analysis
■	—	"Undisturbed" Sample
☒	—	Bulk or Classification Sample

Shear Strength (psf)		Confining Pressure		
TxUU (FM) or (S)	3200	(2600)	—	Unconsolidated Undrained Triaxial Shear (field moisture or saturated)
TxCU (P)	3200	(2600)	—	Consolidated Undrained Triaxial Shear (with or without pore pressure measurement)
TxCD	3200	(2600)	—	Consolidated Drained Triaxial Shear
SSCU (P)	3200	(2600)	—	Simple Shear Consolidated Undrained (with or without pore pressure measurement)
SSCD	3200	(2600)	—	Simple Shear Consolidated Drained
DSCD	2700	(2000)	—	Consolidated Drained Direct Shear
UC	470		—	Unconfined Compression
LVS	700		—	Laboratory Vane Shear

KEY TO TEST DATA

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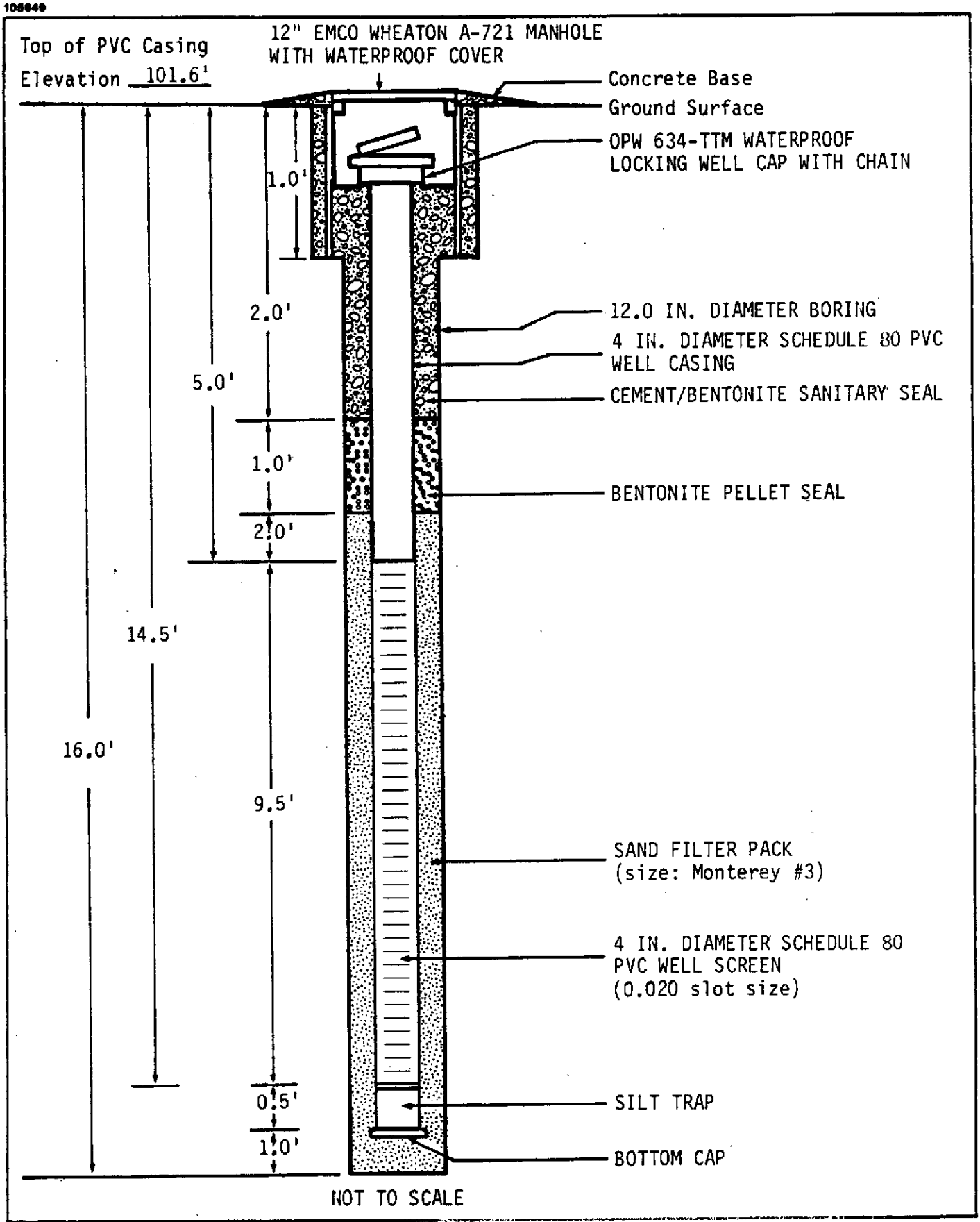
Soil Classification and Test Data Key
Former Texaco Service Station
2200 East 12th Street
Oakland, California

PLATE **17**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
YC	2251,082.03	G	6/89		



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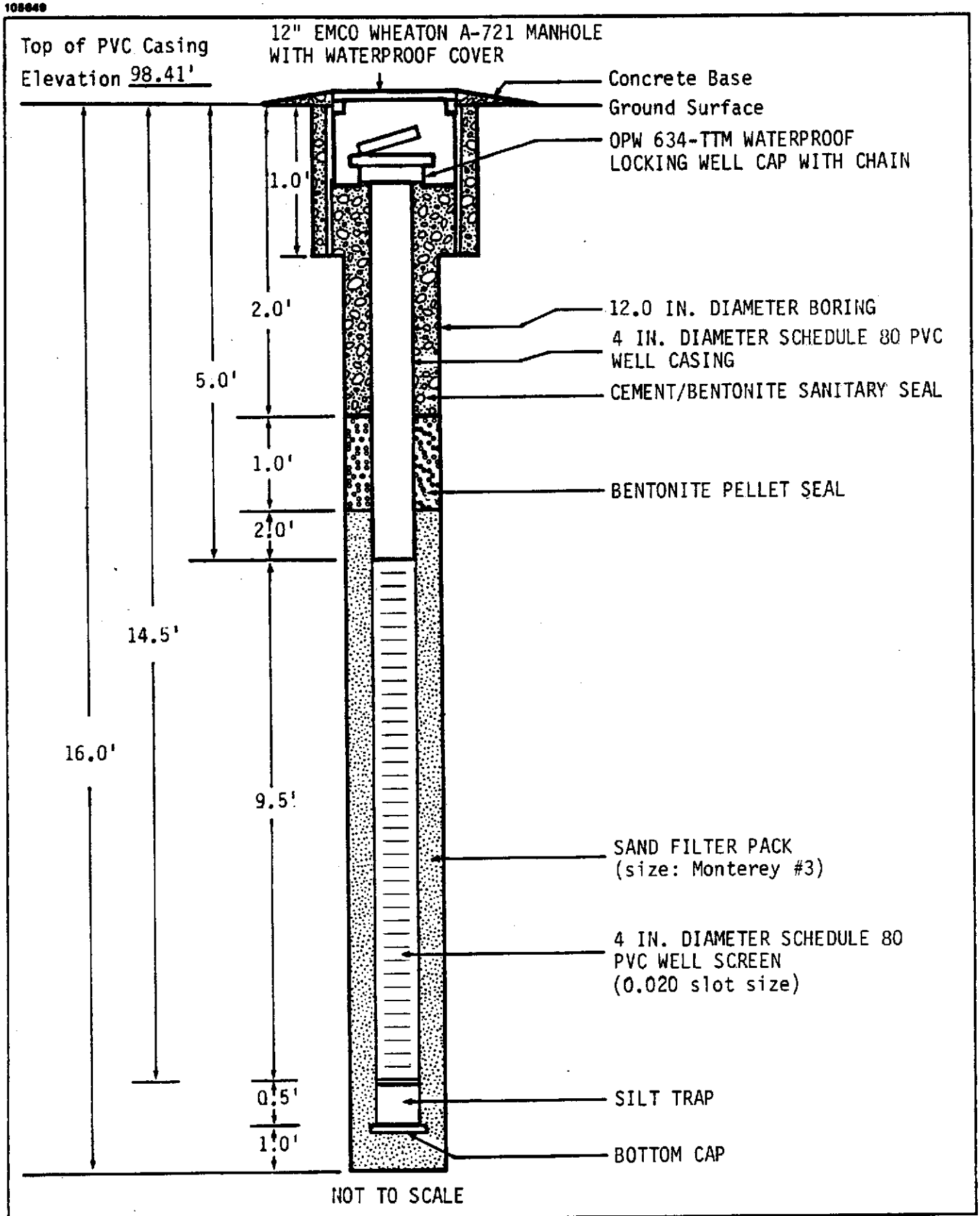
Monitoring Well MW-9D - Construction Detail
Former Texaco Service Station
2200 East 12th Street
Oakland, California

PLATE **18**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
YC	2251,082.03	G	1/89		



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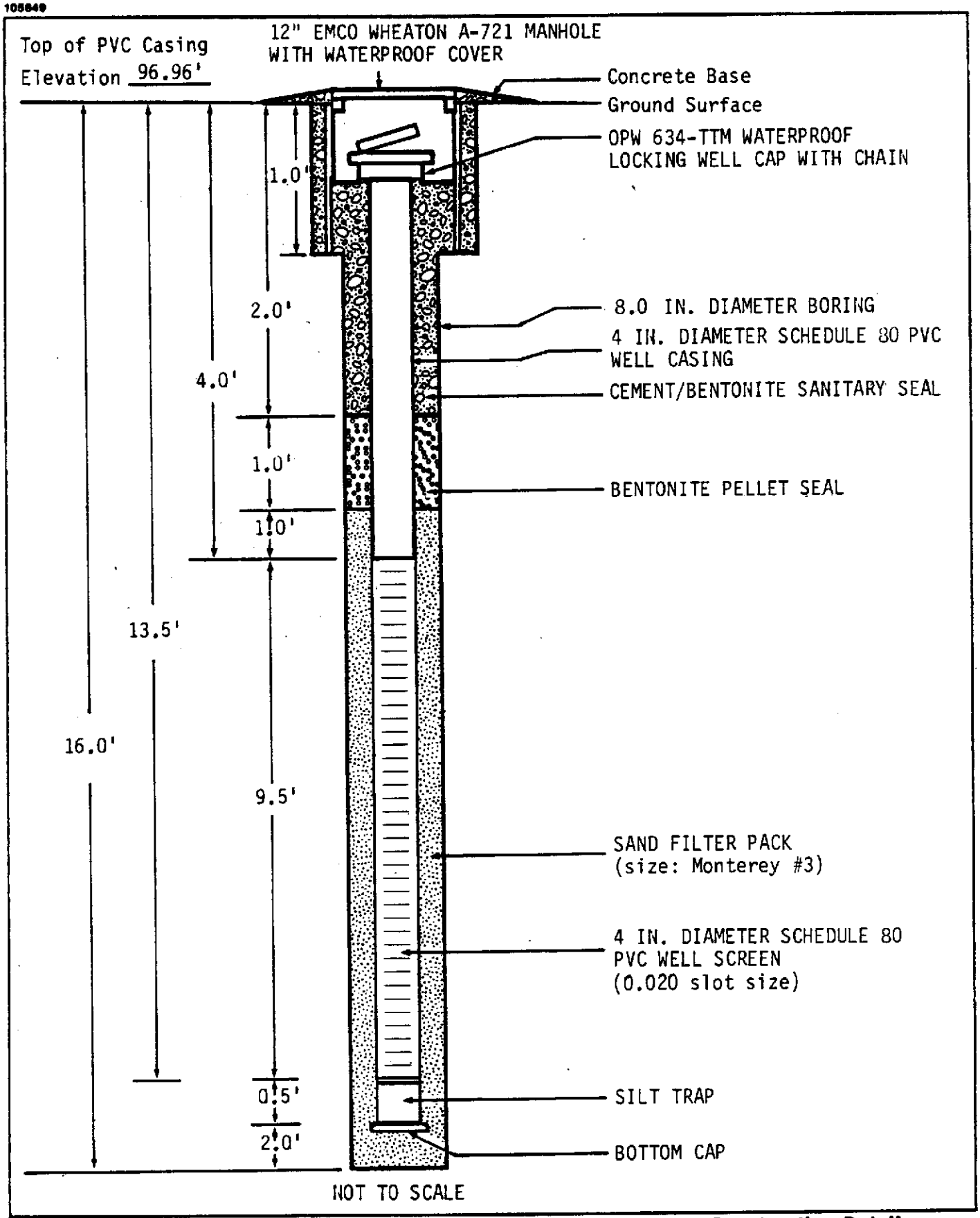
Monitoring Well MW-9E – Construction Detail
Former Texaco Service Station
2200 East 12th Street
Oakland, California

PLATE **19**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
	2251,082.03	G	1/89		

105849



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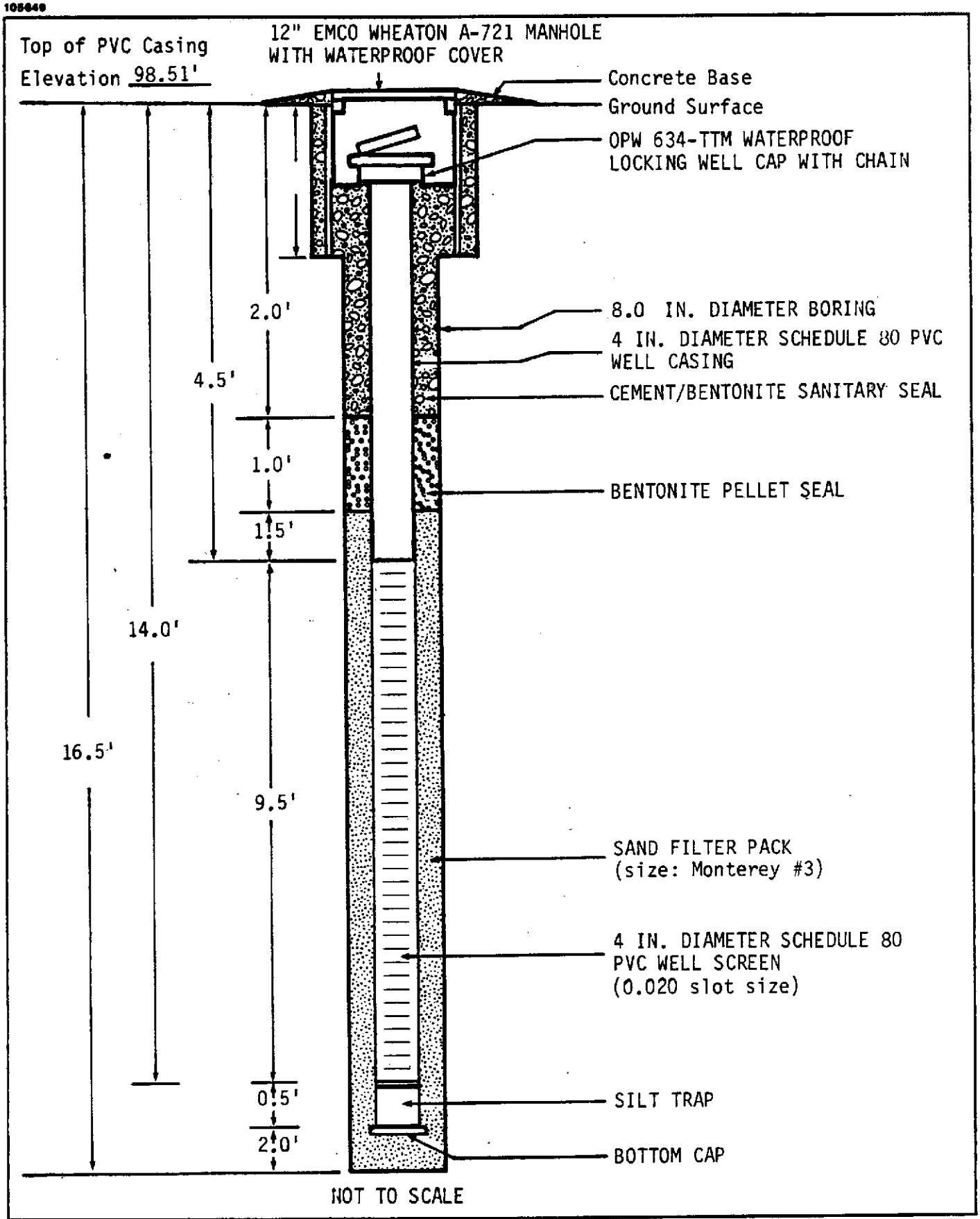
Monitoring Well MW-9F - Construction Detail
Former Texaco Service Station
2200 East 12th Street
Oakland, California

PLATE **20**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
YC	2251,082.03	G	1/89		



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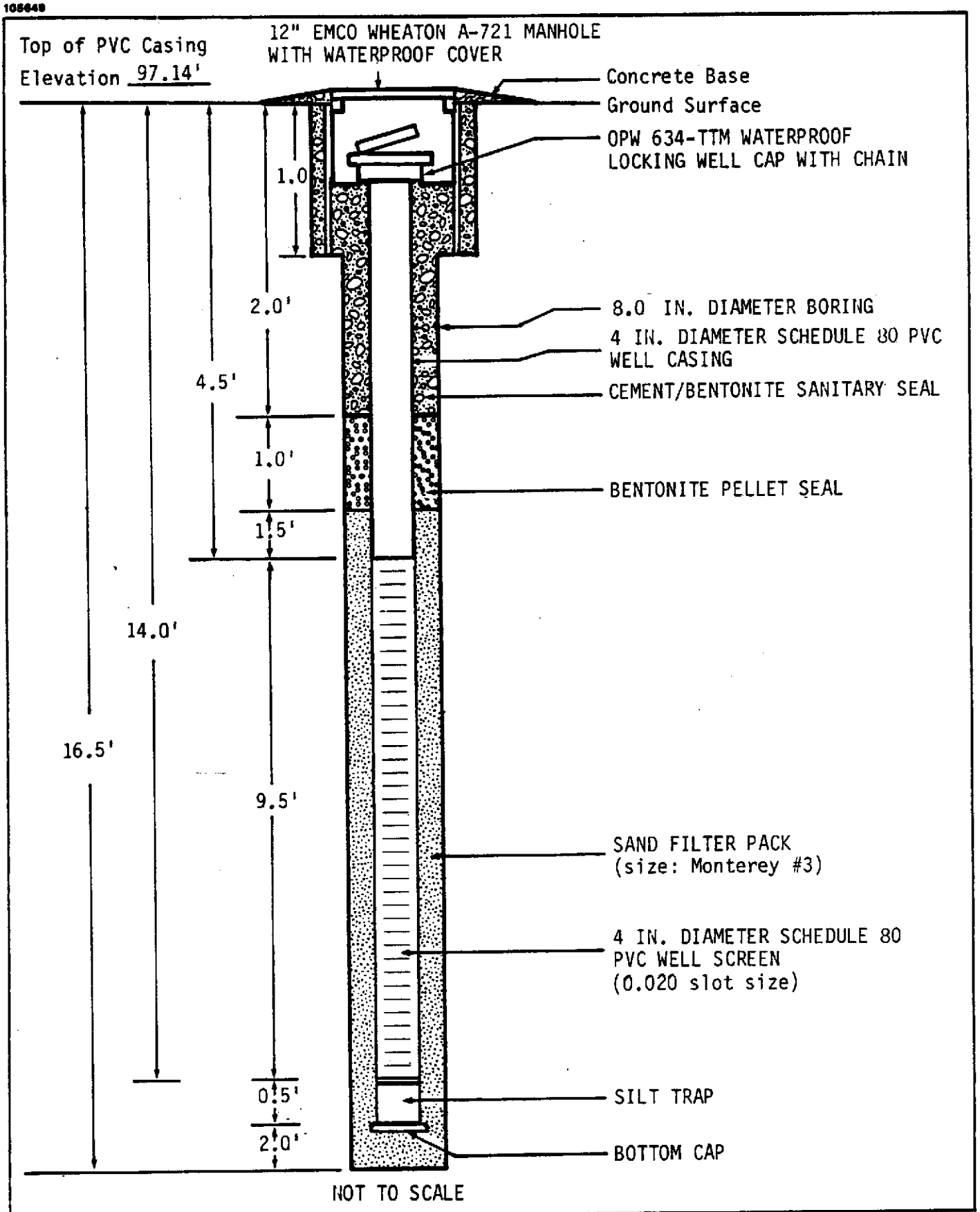
Monitoring Well MW-9G - Construction Detail
Former Texaco Service Station
2200 East 12th Street
Oakland, California

PLATE **21**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
YC	2251,082.03	G	1/89		

105649



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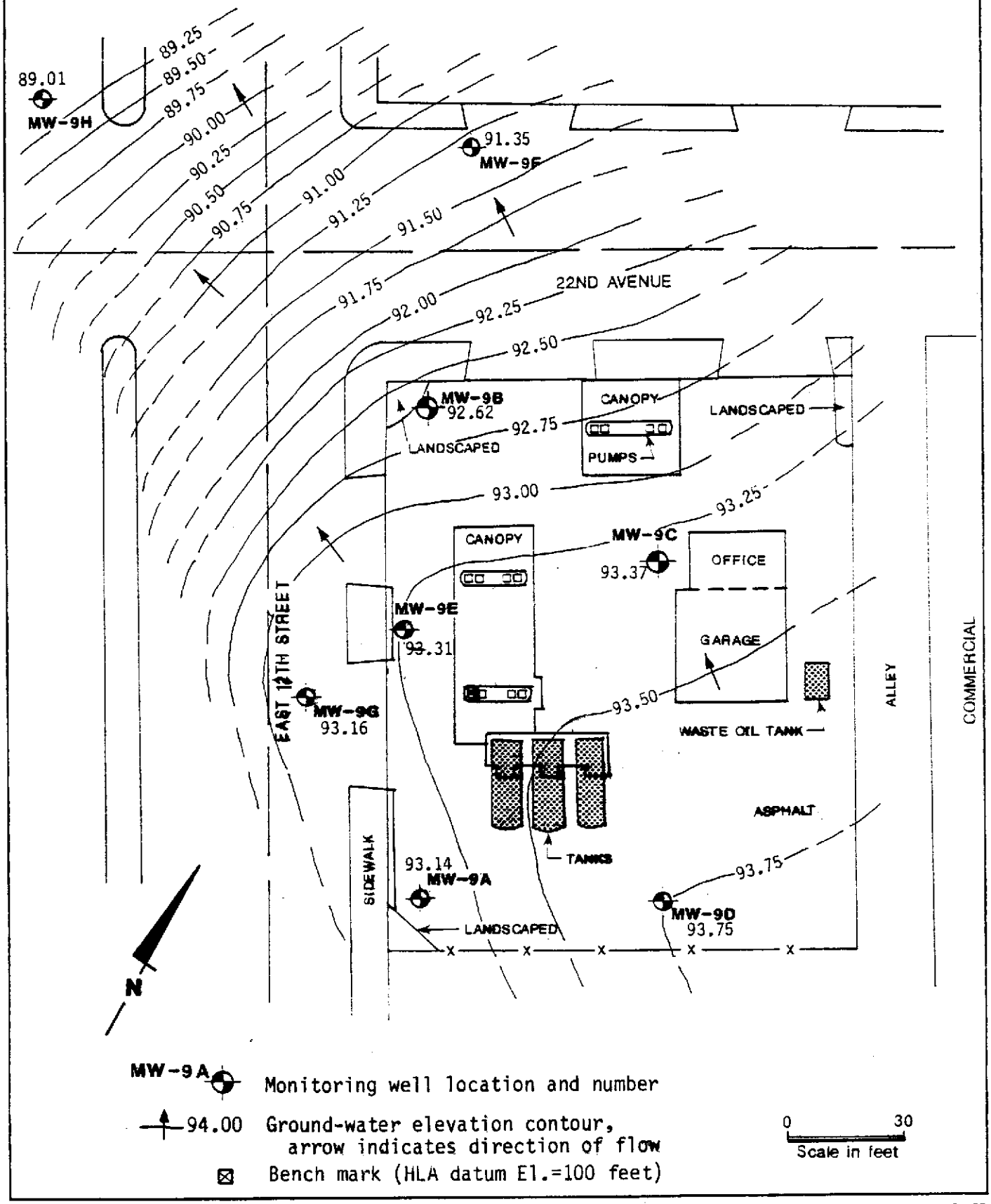
Monitoring Well MW-9H - Construction Detail
Former Texaco Service Station
2200 East 12th Street
Oakland, California

PLATE **22**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
YC	2251,082.03	G	1/89		

105849



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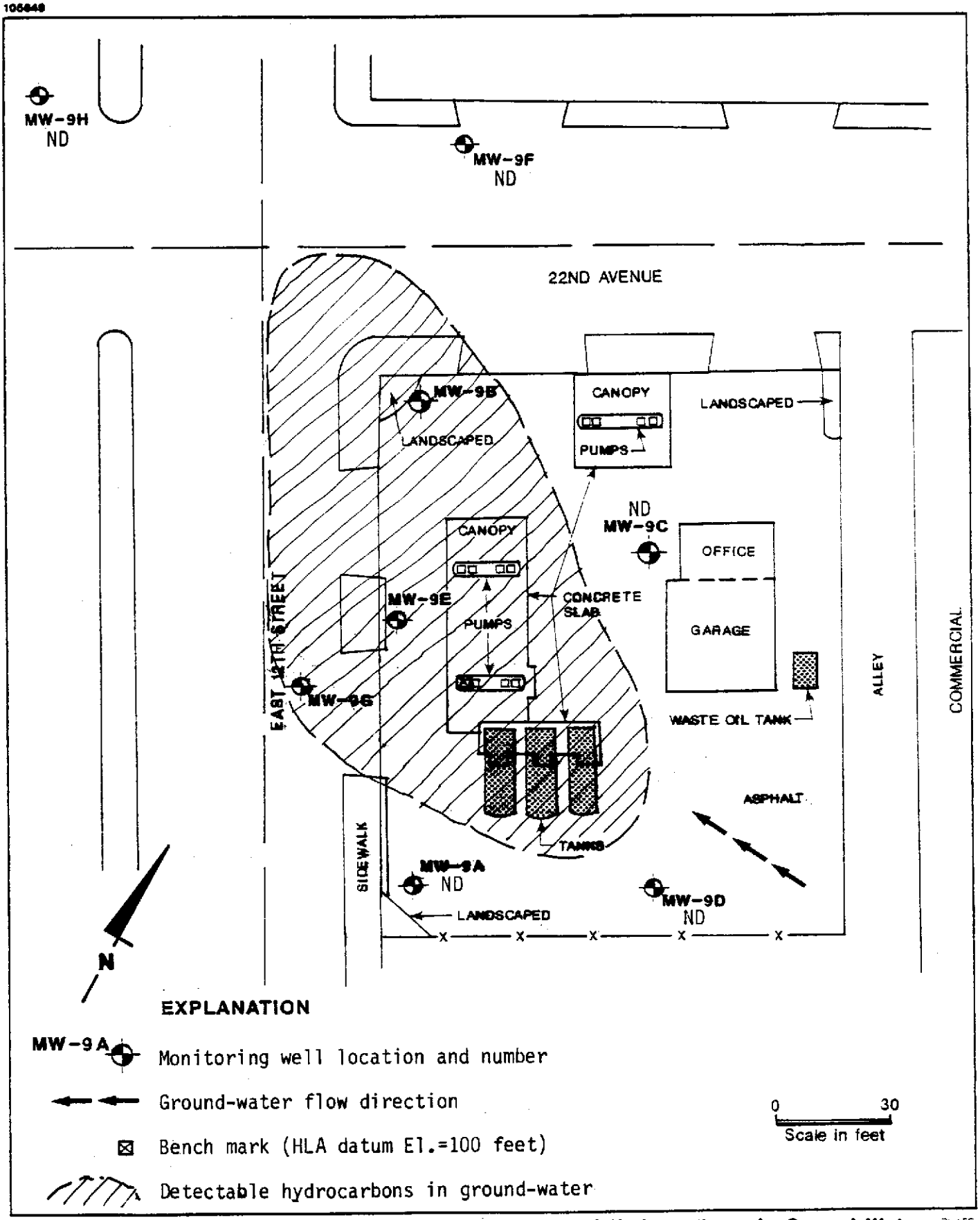
Ground-Water Surface Map
Former Texaco Service Station
2200 East 12th Street
Oakland, California

PLATE
23

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
YC	2251,082.03	G	6/89		



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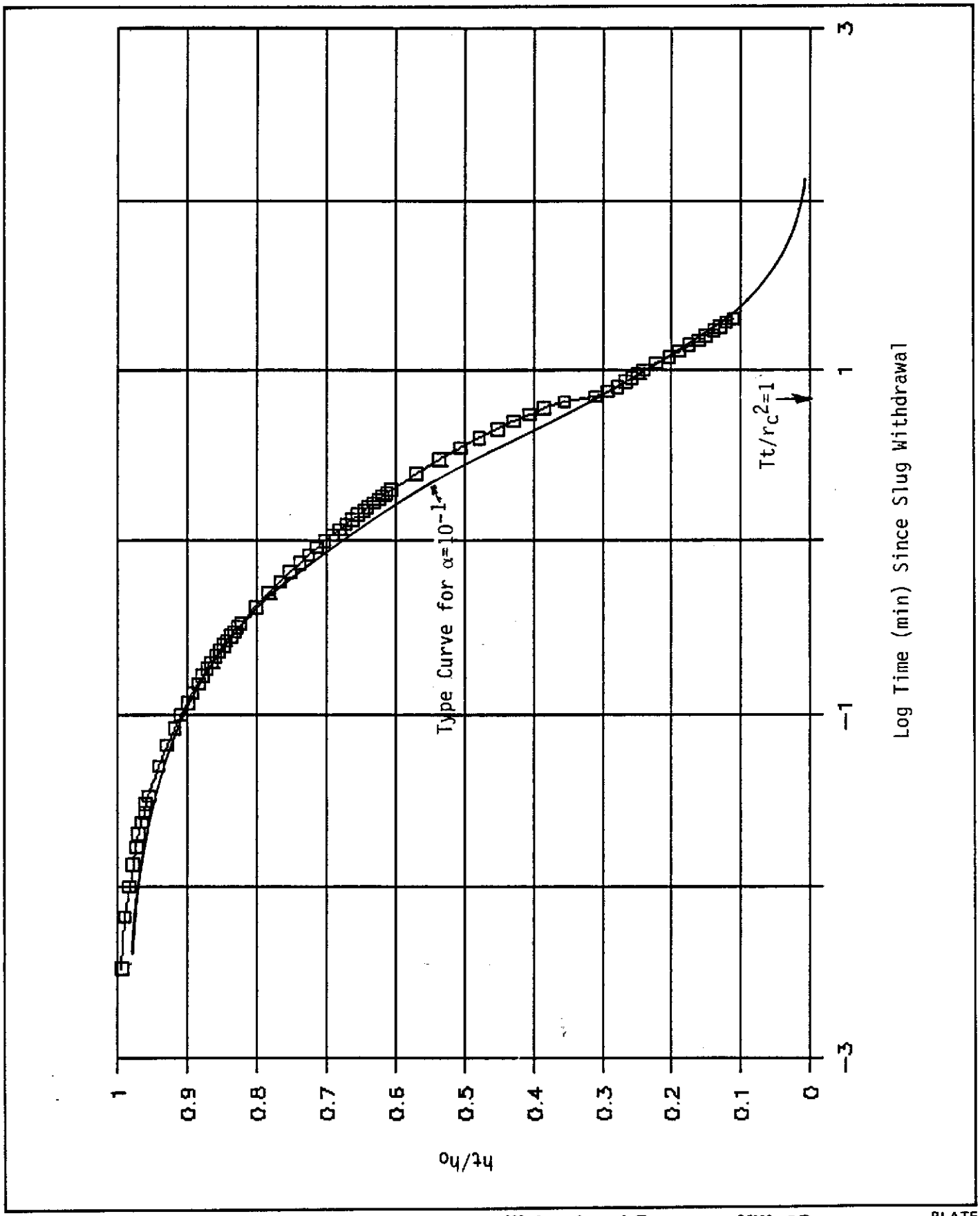
Distribution of Hydrocarbons in Ground Water
Former Texaco Service Station
2200 East 12th Street
Oakland, California

PLATE **24**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
YC	2251,082.03	G	6/89		



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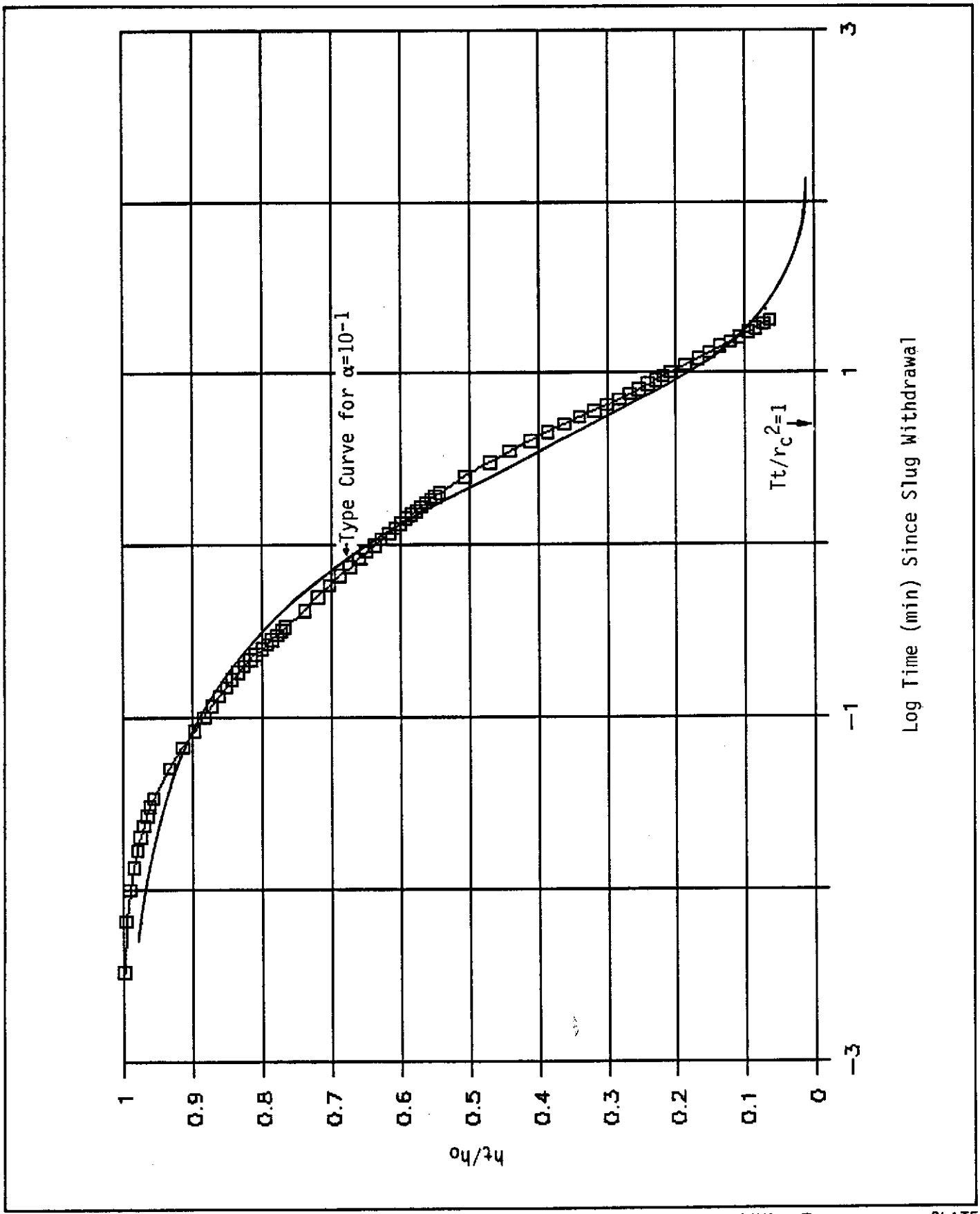
Engineering and
Environmental Services

Water-Level Recovery MW-9B
Former Texaco Service Station
2200 East 12th Street
Oakland, California

PLATE **25**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
YC	2251,082.03		9/89	



Harding Lawson Associates
Engineering and
Environmental Services

Water-Level Recovery MW-9E
Former Texaco Service Station
2200 East 12th Street
Oakland, California

PLATE
26

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
YC	2251,082.03		9/89	

APPENDIX A

Sensitive Receptor Survey Fact Sheet, Results of Ground-water Analyses (June, 1988), Boring Logs & Well Construction Details from Previous Investigation

Attachment A to Environmental Testing Procedures

SENSITIVE RECEPTORS - SITE INVESTIGATION AND RISK ASSESSMENT

Location #: 62488000888
Address: 2200 E 12th Street
City/State: Oakland CA
County: Alameda

I Provide answers to the following questions to the extent reasonably known:

A. Is there a public water supply well within 2500'? (Y/N) No
If Yes, distance (FT) _____

B. Is there a private water supply well within 1000'? (Y/N) No
If Yes, distance (FT) _____

C. Is there a subway within 1000'? (Y/N) No
If Yes, distance (FT) _____

D. Is there a basement within 500'? (Y/N) No
If Yes, distance (FT) _____

E. Is there a school within 1000'? (Y/N) Yes
If Yes, distance (FT) 800

F. Is there a surface body of water within 500'? (Y/N) No
(i.e., lake, river, ocean) If Yes, distance (FT) _____

II Describe type of local water supply:

Public X
- Suppliers' Name East Bay Mud
- Suppliers' Source Mokelumne Aqueduc
- Distance to Site 30 mile NE

Private _____

III Aquifer Classification, if available:

Class I - Special Ground Waters _____
- Irreplaceable Drinking Water Source
- Ecologically Vital
Class II - Current and Potential Drinking Water Sources X
Class III - Not Potential Source of Drinking Water _____

IV Describe observation wells, if any:

Number No
Free Product (Y/N) N/A

V Provide a site diagram or a local/topographic (USGS) map of the area.

I Report should consist of this fact sheet, the site or area map, and a cover letter.

II Signature of Preparer: _____ Date: 5/24/88

Table 2. Results of Ground-Water Analyses (concentrations in micrograms per liter [μg/l])

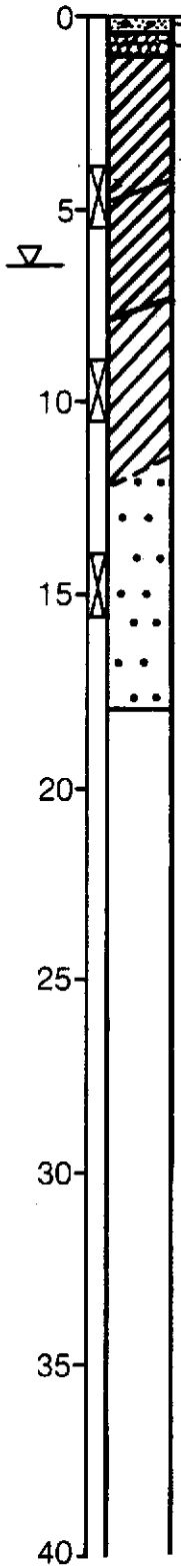
Well No.	Benzene	Ethyl-benzene	Toluene	Xylenes
MW-9A	ND (0.5)	ND (2)	ND (1)	ND (1)
MW-9B	350	66	7.8	160
MW-9C	ND (0.5)	ND (2)	ND (1)	2.6
DWAL	0.7	680	100	620

ND = Nondetectable.
Detection limits are given in parentheses.

Equipment 8-inch Hollow Stem Auger

Elevation **100.2 feet Date 6/10/88

Laboratory Tests	Blows/foot	PID * Reading (ppm)	Depth (ft)	Sample
		12	0	
	12	5	5	
	10	3	10	
	36	2	15	
			20	
			25	
			30	
			35	
			40	



asphaltic pavement
aggregate baserock

BLACK SILTY CLAY (CH)
stiff, moist, very slight petroleum odor

VERY DARK GREENISH GRAY SILTY CLAY (CH)
stiff, moist

DARK GRAYISH BROWN INTERMIXED SANDY CLAY AND CLAYEY SAND (CL-SC)
medium dense to stiff, wet to saturated

LIGHT OLIVE BROWN SAND
trace clay (SP) with lenses of sandy clay (CL)
dense, moist to wet

bottom of boring 18 feet

stabilized water level at 6.5 feet on 6/13/88

*PID = photo ionization detector, HNU PI 101
ppm = parts per million

**Reference Elevation (arbitrary datum)

Harding Lawson Associates
Engineers, Geologists & Geophysicists

Log of Boring MW-9A

Texaco Station - 62488000088
2200 East 12th Street
Oakland, California

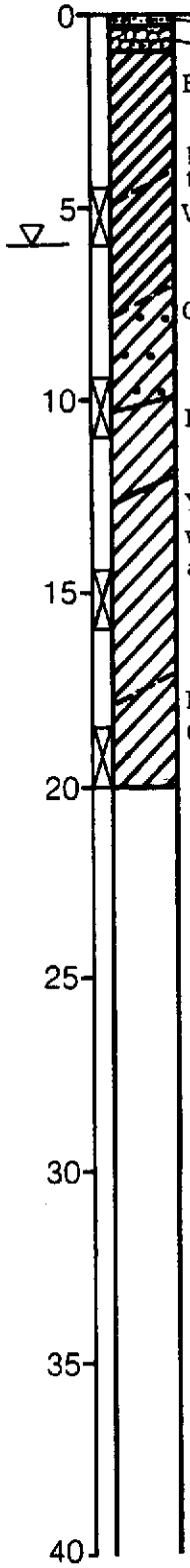
PLATE 3

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
RS	2251.055.04		7/88		

Equipment 8-inch Hollow Stem Auger

Elevation **98.6 feet Date 6/10/88

Laboratory Tests	Blows/foot	PID * Reading (ppm)	Depth (ft)	Sample
		7	0	
	11	34	5	
	10	20	10	
	17	3	15	
	20	3	20	
			25	
			30	
			35	
			40	



asphaltic pavement
aggregate baserock
BLACK SILTY CLAY (CH)
stiff, moist
petroleum odors were detected in the upper most 10-feet of soil
VERY DARK GRAY SILTY CLAY (CH)
stiff, moist
GRAY MOTTLED BROWN CLAYEY SAND (SC)
loose, saturated
BROWN SILTY CLAY (CL)
stiff, moist
YELLOWISH BROWN SANDY CLAY (CL)
with clayey sand lenses (SC)
and occasional gravels
very stiff, moist to saturated
LIGHT YELLOWISH BROWN SILTY CLAY (CL)
very stiff, moist
bottom of boring 20 feet
boring cleaned out to 18.5 feet
stabilized water level at 6 feet on 6/13/88

*PID = photo ionization detector, HNU PI 101
ppm = parts per million

**Reference Elevation (arbitrary datum)

Harding Lawson Associates
Engineers, Geologists & Geophysicists

Log of Boring MW-9B

Texaco Station - 62488000088
2200 East 12th Street
Oakland, California

PLATE 4

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
RS	2251,055.04	AO	7/88		

Equipment 8-inch Hollow Stem Auger

Elevation ** 99.9 feet Date 6/10/88

Laboratory Tests	Blows/foot	PID * Reading (ppm)	Depth (ft)	Sample
		2	0	
	12	2	5	
	14	1	10	
	42/10"	4	15	
			20	
			25	
			30	
			35	
			40	

asphaltic pavement
aggregate baserock
BLACK SILTY CLAY (CH)
stiff, moist

DARK GREENISH GRAY SILTY CLAY
trace fine sand (CH)
stiff, moist

LIGHT YELLOWISH BROWN CLAYEY SAND (SC)
medium dense, wet

BROWNISH YELLOW SAND
trace clay (SP)
dense, saturated

bottom of boring 17 feet

stabilized water level at 6.5 feet on 6/13/88

*PID = photo ionization detector, HNU PI 101
ppm = parts per million

**Reference Elevation (arbitrary datum)

Harding Lawson Associates
Engineers, Geologists & Geophysicists

Log of Boring MW-9C

Texaco Station - 62488000088
2200 East 12th Street
Oakland, California

PLATE 5

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
RS	2251,055.04	JO	7/88		

MAJOR DIVISIONS					TYPICAL NAMES
COARSE–GRAINED SOILS MORE THAN HALF IS COARSER THAN NO. 200 SIEVE	GRAVELS MORE THAN HALF COARSE FRACTION IS LARGER THAN No. 4 SIEVE SIZE	CLEAN GRAVELS WITH LITTLE OR NO FINES	GW		WELL GRADED GRAVELS WITH OR WITHOUT SAND, LITTLE OR NO FINES
			GP		POORLY GRADED GRAVELS WITH OR WITHOUT SAND, LITTLE OR NO FINES
		GRAVELS WITH OVER 12% FINES	GM		SILTY GRAVELS, SILTY GRAVELS WITH SAND
			GC		CLAYEY GRAVELS, CLAYEY GRAVELS WITH SAND
	SANDS MORE THAN HALF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE SIZE	CLEAN SANDS WITH LITTLE OR NO FINES	SW		WELL GRADED SANDS WITH OR WITHOUT GRAVEL, LITTLE OR NO FINES
			SP		POORLY GRADED SANDS WITH OR WITHOUT GRAVEL, LITTLE OR NO FINES
		SANDS WITH OVER 12% FINES	SM		SILTY SANDS WITH OR WITHOUT GRAVEL
			SC		CLAYEY SANDS WITH OR WITHOUT GRAVEL
FINE–GRAINED SOILS MORE THAN HALF IS FINER THAN NO. 200 SIEVE	SILTS AND CLAYS LIQUID LIMIT 50% OR LESS		ML		INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTS WITH SANDS AND GRAVELS
			CL		INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, CLAYS WITH SANDS AND GRAVELS, LEAN CLAYS
			OL		ORGANIC SILTS OR CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50%		MH		INORGANIC SILTS, MICACEOUS OR DIATOMACIOUS, FINE SANDY OR SILTY SOILS, ELASTIC SILTS
			CH		INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH		ORGANIC SILTS OR CLAYS OF MEDIUM TO HIGH PLASTICITY
HIGHLY ORGANIC SOILS			Pt		PEAT AND OTHER HIGHLY ORGANIC SOILS

UNIFIED SOIL CLASSIFICATION - ASTM D2487-85

Perm — Permeability
Consol — Consolidation
LL — Liquid Limit (%)
PI — Plastic Index (%)
G_s — Specific Gravity
MA — Particle Size Analysis
■ — "Undisturbed" Sample
⊠ — Bulk or Classification Sample

Shear Strength (psf) ↓ | Confining Pressure ↓

TxUU (FM) or (S)	3200	(2600)	— Unconsolidated Undrained Triaxial Shear (field moisture or saturated)
TxCU (P)	3200	(2600)	— Consolidated Undrained Triaxial Shear (with or without pore pressure measurement)
TxCD	3200	(2600)	— Consolidated Drained Triaxial Shear
SSCU (P)	3200	(2600)	— Simple Shear Consolidated Undrained (with or without pore pressure measurement)
SSCD	3200	(2600)	— Simple Shear Consolidated Drained
DSCD	2700	(2000)	— Consolidated Drained Direct Shear
UC	470		— Unconfined Compression
LVS	700		— Laboratory Vane Shear

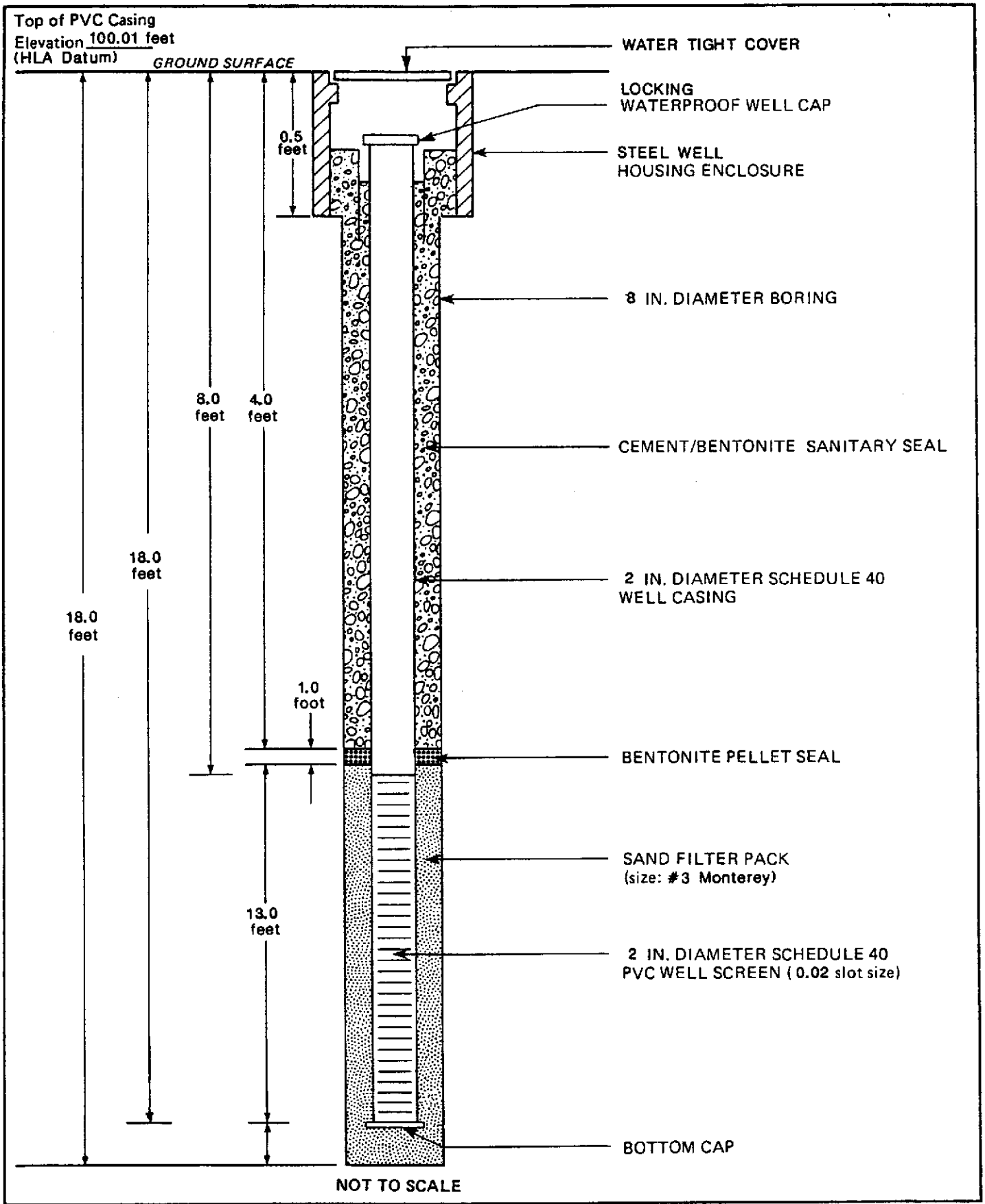
KEY TO TEST DATA

Harding Lawson Associates
Engineers and Geoscientists

Soil Classification Chart and Key to Test Data
Texaco Station - 62488000088
2200 East 12th Street
Oakland, California

PLATE **6**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
RS	2251,055.04	[signature]	7/88		



Harding Lawson Associates
Engineers, Geologists
& Geophysicists

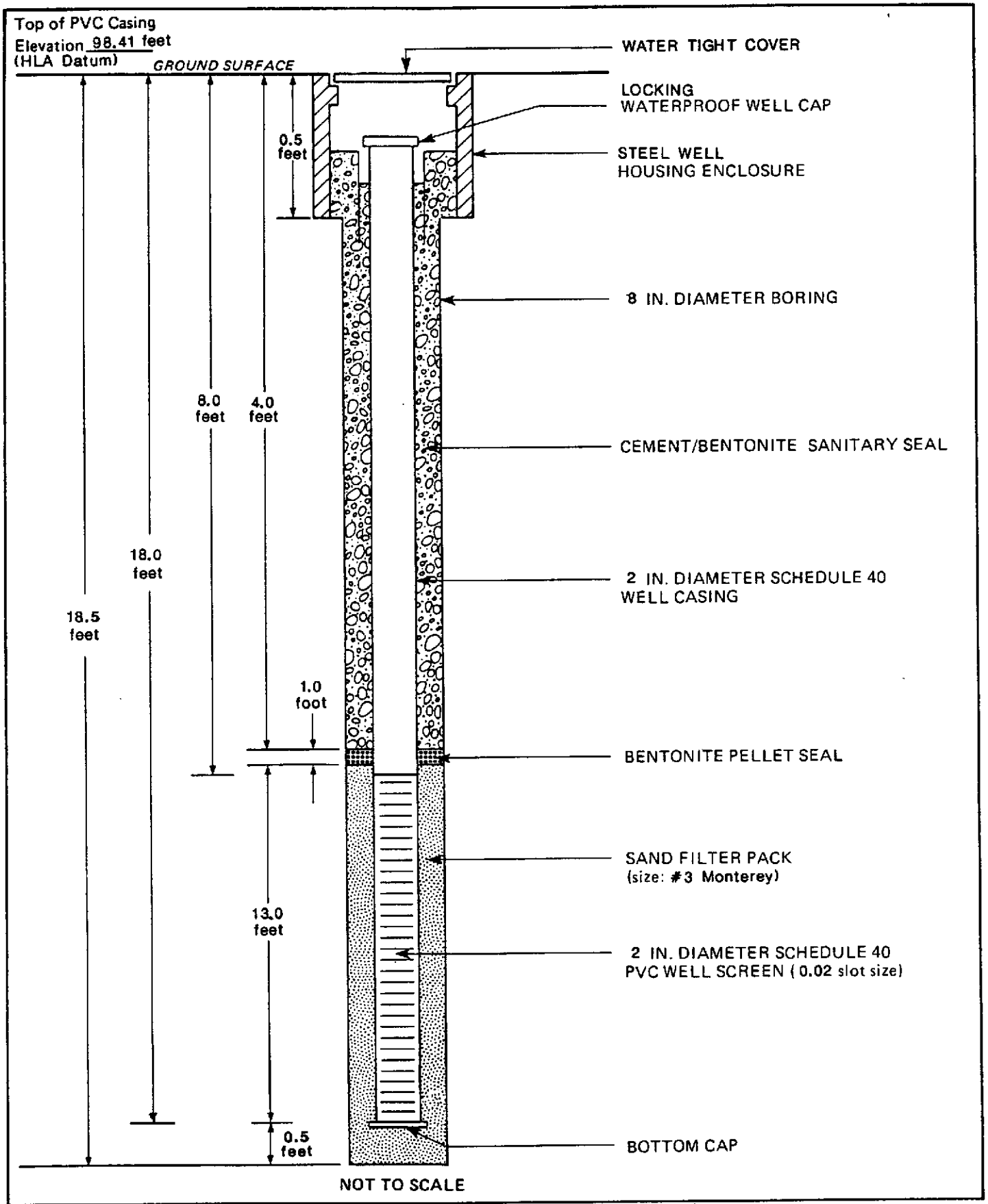
Monitoring Well MW-9A Completion Detail

Texaco Station - 62488000088
2200 East 12th Street
Oakland, California

PLATE **7**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
	2251,055.04	JO	7/88		

FORM GW3



Harding Lawson Associates
Engineers, Geologists
& Geophysicists

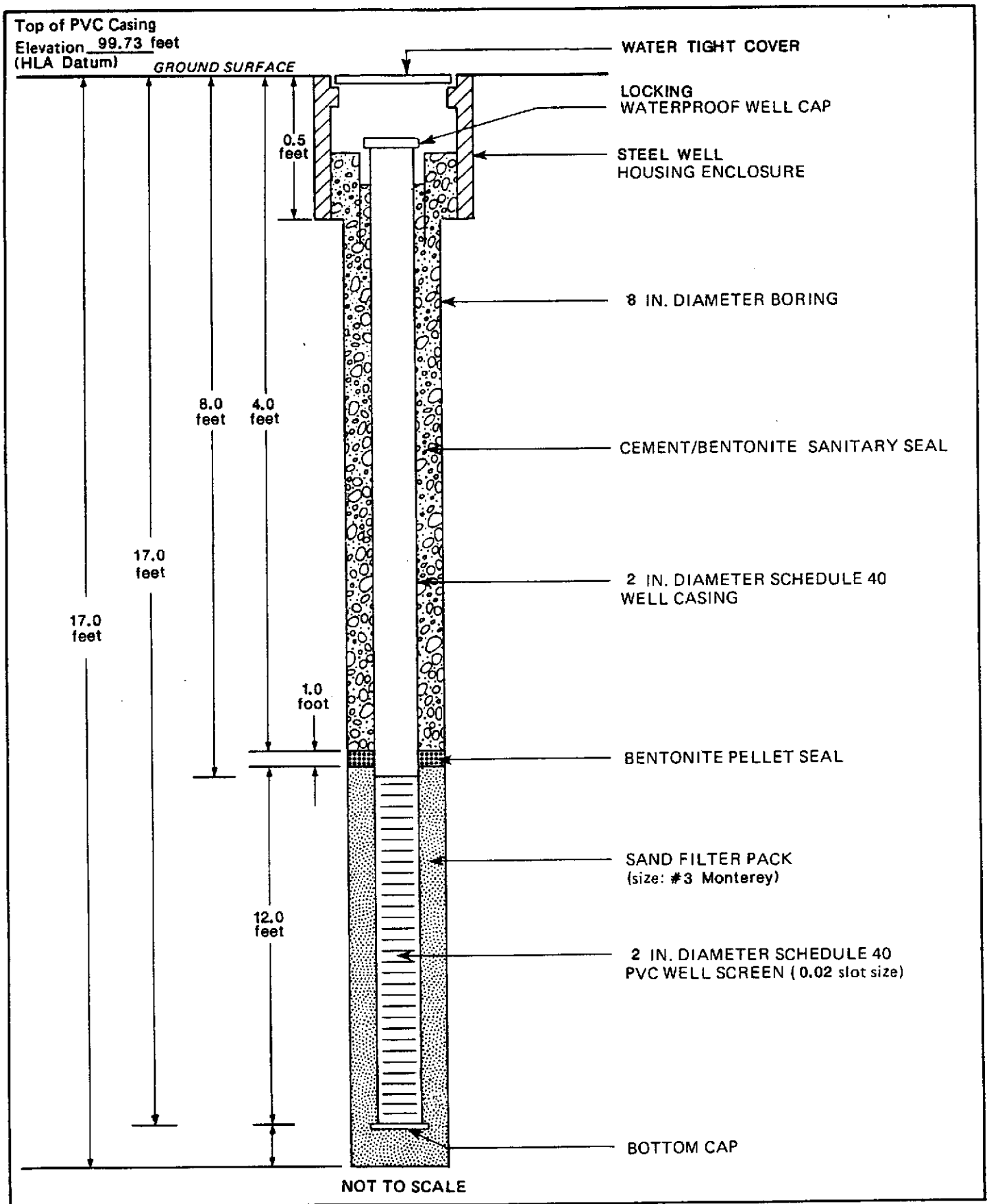
Monitoring Well MW-9B Completion Detail

Texaco Station - 62488000088
2200 East 12th Street
Oakland, California

PLATE
8

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
	2251,055.04	AO	7/88		

FORM GW3



Harding Lawson Associates
Engineers, Geologists
& Geophysicists

Monitoring Well MW-9C Completion Detail

Texaco Station - 62488000088
2200 East 12th Street
Oakland, California

PLATE
9

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
	2251,055.04	JO	7/88		

FORM GW3

APPENDIX B

Aerial Photograph

105648

Photo from Pacific Aerial Survey

Harding Lawson Associates
Engineers and Geoscientists

Aerial Photograph
Former Texaco Service Station
2200 East 12th Street
Oakland, California

PLATE

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
YC	2251,082.03	G	9/89		

APPENDIX C

Tracer Research Report - Soil-gas Investigation

Tracer Research Corporation

SHALLOW SOIL GAS/GROUNDWATER INVESTIGATION AT THE TEXACO SITES NORTHERN, CALIFORNIA

SEPTEMBER/OCTOBER 1988

PREPARED FOR:

Harding Lawson Associates
1355 Willow Way, Suite 109
Concord, California 94520

SUBMITTED BY:

Tracer Research Corporation

TABLE OF CONTENTS

INTRODUCTION

Several shallow soil gas/groundwater investigations were performed by Tracer Research Corporation (TRC) at the following Texaco gas station sites in the Northern California:

2225 Telegraph Ave., Oakland, CA
2200 E. Twelth St., Oakland, CA
500 Grand Ave., Oakland, CA
495 El Camino Real, San Carlos, CA
800 El Camino Real, San Bruno, CA
196 Main St., Half Moon Bay, CA
595 Munras St., Monterey, CA
1550 Fremont St., Seaside, CA
334 San Antonio Rd., Mountain View, CA
975 Stierlin Rd., Mountain View, CA
5153 Redwood Hwy., Petaluma, CA

The investigation was conducted between September 19 and October 19, 1988 under contract to Harding Lawson Associates. The purpose of the investigation was to determine the possible presence of volatile organic compounds (VOCs) in the subsurface and groundwater as part of an environmental site assement.

For this survey, a total of 126 soil gas samples and 11 groundwater samples were collected and analyzed in the field. The samples were analyzed for the following compounds:

benzene
toluene
ethyl benzene
xylenes
total hydrocarbons (THC)

The compounds in this suite were chosen because of their extensive use at the sites and their suspected presence in the subsurface.

SHALLOW SOIL GAS INVESTIGATION - METHODOLOGY

Soil gas contaminant investigation refers to a method developed by TRC for investigating underground contamination from volatile organic chemicals (VOCs) such as industrial solvents, cleaning fluids and petroleum products by looking for their vapors in the shallow soil gas. The method involves pumping a small amount of soil gas out of the ground through a hollow probe driven into the ground and analyzing the gas for the presence of volatile contaminants. The presence of VOCs in shallow soil gas indicates the observed compounds may either be in the vadose zone near the probe or in groundwater below the probe. The soil gas technology is most effective in mapping low molecular weight halogenated solvent chemicals and petroleum hydrocarbons possessing high vapor pressures and low aqueous solubilities. These compounds readily partition out of the groundwater and into the soil gas as a result of their high gas/liquid partitioning coefficients. Once in the soil gas, VOCs diffuse vertically and horizontally through the soil to the ground surface where they dissipate into the atmosphere. The contamination acts as a source and the above ground atmosphere acts as a sink, and typically a concentration gradient develops between the two. The concentration gradient in soil gas between the source and ground surface may be locally distorted by hydrologic and geologic anomalies (e.g. clays, perched water); however, soil gas mapping generally remains effective because distribution of the contamination is usually broader in areal extent than the local geologic barriers and is defined using a large data base. The presence of geologic obstructions on a small scale tends to create anomalies in the soil gas-groundwater correlation, but generally does not obscure the broader areal picture of the contaminant distribution.

EQUIPMENT

Tracer Research Corporation utilized a one ton Ford analytical field van which was equipped with one gas chromatograph and two Spectra Physics SP4270 computing integrators. In addition, the van has two built-in gasoline powered generators which provide the electrical power (110 volts AC) to operate all of the gas chromatographic instruments and field equipment. A specialized hydraulic mechanism consisting of two cylinders and a set of jaws was used to drive and withdraw the sampling probes. A hydraulic hammer was used to assist in driving probes past cobbles and through unusually hard soil.

SAMPLING PROCEDURES

Sampling probes consist of 7-foot lengths of 3/4 inch diameter hollow steel pipe which are fitted with detachable drive points. Soil gas samples were collected after driving the steel probe to a depth between 2 and 15 feet into the ground. The above-ground end of the sampling probes were fitted with a steel reducer and a length of polyethylene tubing leading to a vacuum pump. To adequately purge the volume of air within the probe, 5 to 10 liters of gas were evacuated with a vacuum pump. During the soil gas evacuation, samples were collected in a glass syringe by inserting a syringe needle through a silicone rubber segment in the evacuation line and down into the steel probe. Ten milliliters of gas were collected for immediate analysis in the TRC analytical field van. Soil gas was subsampled (duplicate injections) in volumes ranging from 1 µL to 2 mL, depending on the VOC concentration at any particular location.

Groundwater samples were collected by driving a hollow steel probe to a depth between 5 and 12 into the ground or by direct sampling of an observation or monitoring well. A length of polyethylene tubing was inserted to the bottom of the probe. The

tubing was attached to a peristaltic pump. Approximately 40 mL of water was collected in bottles with teflon lined septum caps so as to exclude air. Any sediment collected with the groundwater was allowed to settle. The water was subsampled (duplicate injections) in volumes ranging from 1 µL to 10 µL.

ANALYTICAL PROCEDURES

A Varian 3300 gas chromatograph equipped with a flame ionization detector (FID) was used for the soil gas analyses. The FID was used to analyze for benzene, toluene, ethyl benzene, xylenes and total hydrocarbons. Xylenes are reported as the total of the three xylene isomers and total hydrocarbons are approximately C4-C9 aliphatic, alicyclic and aromatic compounds. Nitrogen was used as the carrier gas.

Detection limits for the compounds of interest are a function of the injection volume as well as the detector sensitivity for individual compounds. Thus, the detection limit varies with the sample size. Generally, the larger the injection size the greater the sensitivity. However, peaks for compounds of interest must be kept within the linear range of the analytical equipment. If any compound has a high concentration, it is necessary to use small injections, and in some cases to dilute the sample to keep it within linear range. This may cause decreased detection limits for other compounds in the analyses. For example, during this investigation, a few of the soil gas samples had high concentrations of benzene, toluene and xylenes. To bring the peak for these compounds within linear range, it was necessary to make small injections. This had the effect of decreasing the detection limits for ethyl benzene in these samples.

The detection limits range down to 0.08 µg/L for compounds such as benzene and toluene depending on the conditions of the

measurement, in particular, the sample size. If any component being analyzed is not detected, the detection limit for that compound in that analysis is given as a "less than" value (e.g. <0.08 µg/L). Detection limits obtained from GC analyses are calculated from the current response factor, the sample size, and the estimated minimum peak size (area) that would have been visible under the conditions of the measurement.

QUALITY ASSURANCE/QUALITY CONTROL PROCEDURES

Tracer Research Corporation's normal quality assurance procedures were followed in order to prevent any cross-contamination of soil gas samples.

- Steel probes are used only once during the day and then washed with high pressure soap and hot water spray or steam-cleaned to eliminate the possibility of cross-contamination. Enough probes are carried on each van to avoid the need to reuse any during the day.

- Probe adaptors (steel reducer and tubing) are used once during the course of the day and cleaned at the end of each working day by baking in the GC oven. The tubing is replaced periodically as needed during the job to insure cleanliness and good fit.

- Silicone tubing (connecting the adaptor to the vacuum pump) is replaced as needed to insure proper sealing around the syringe needle. This tubing does not directly contact soil gas samples.

- Glass syringes are usually used for only one sample per day and are washed and baked out at night. If they must be used twice, they are purged with carrier gas (nitrogen) and baked out between probe samplings.

- Septa through which soil gas samples are injected into the chromatograph are replaced on a daily basis to prevent possible gas leaks from the chromatographic column.

- Analytical instruments are calibrated each day by the use of chemical standards prepared in water by serial dilution from commercially available pure chemicals. Calibration checks are also run after approximately every five soil gas sampling locations.

- 2 cc subsampling syringes are checked for contamination prior to sampling each day by injecting nitrogen carrier gas into the gas chromatograph.

- Prior to sampling each day, system blanks are run to check the sampling apparatus (probe, adaptor, 10 cc syringe) for contamination by drawing ambient air from above ground through the system and comparing the analysis to a concurrently sampled air analysis.

- All sampling and 2 cc subsampling syringes are decontaminated each day and no such equipment is reused before being decontaminated. Microliter size subsampling syringes are reused only after a nitrogen carrier gas blank is run to insure it is not contaminated by the previous sample.

- Soil gas pumping is monitored by a vacuum gauge to insure that an adequate gas flow from the vadose zone is maintained. A negative pressure (vacuum) of 2 in. Hg less than the maximum capacity of the pump (evacuation rate >0.02 cfm) usually indicates that a reliable gas sample cannot be obtained because the soil has a very low air permeability.

HARDING LAWSON ASSOCIATES/2200 12TH/OAKLAND, CALIFORNIA

Sample	Depth	Date	Benzene (ug/l)	Toluene (ug/l)	Ethyl Benzene (ug/l)	Xylenes (ug/l)	Total Hydroc. (ug/l)
Air		09/20	<0.8	<0.7	<0.8	<0.8	<0.8
SG-01	5'	09/20	320,000	I	620	2,200	700,000
WS-02	5'	09/20	12,000	<73	<80	<80	25,000
SG-03	4'	09/20	32,000	28,000	<8	800	96,000
SG-04	5'	09/20	<0.8	<0.7	<0.8	<0.8	<0.8
MW-9A		09/20	<76	<73	<80	<80	<76
SG-05	2'	09/20	<0.8	<0.7	<0.8	<0.8	<0.8
SG-08	5'	09/20	<0.8	<0.7	<0.8	<0.8	<0.8
SG-09	6'	09/20	<0.8	<0.7	<0.8	<0.8	<0.8
WS-10	6'	09/20	<76	<73	<80	<80	<76
SG-11	4'	09/20	<0.8	<0.7	<0.8	<0.8	<0.8
SG-12	5'	09/20	<0.8	<0.7	<0.8	<0.8	<0.8
SG-13	5'	09/20	<0.8	<0.7	<0.8	<0.8	23
Air		09/20	<0.8	<0.7	<0.8	<0.8	<0.8

Tracer Research Corporation

Notations:
I interference with adjacent peaks
NA not analyzed

Analyzed by K. Tolman

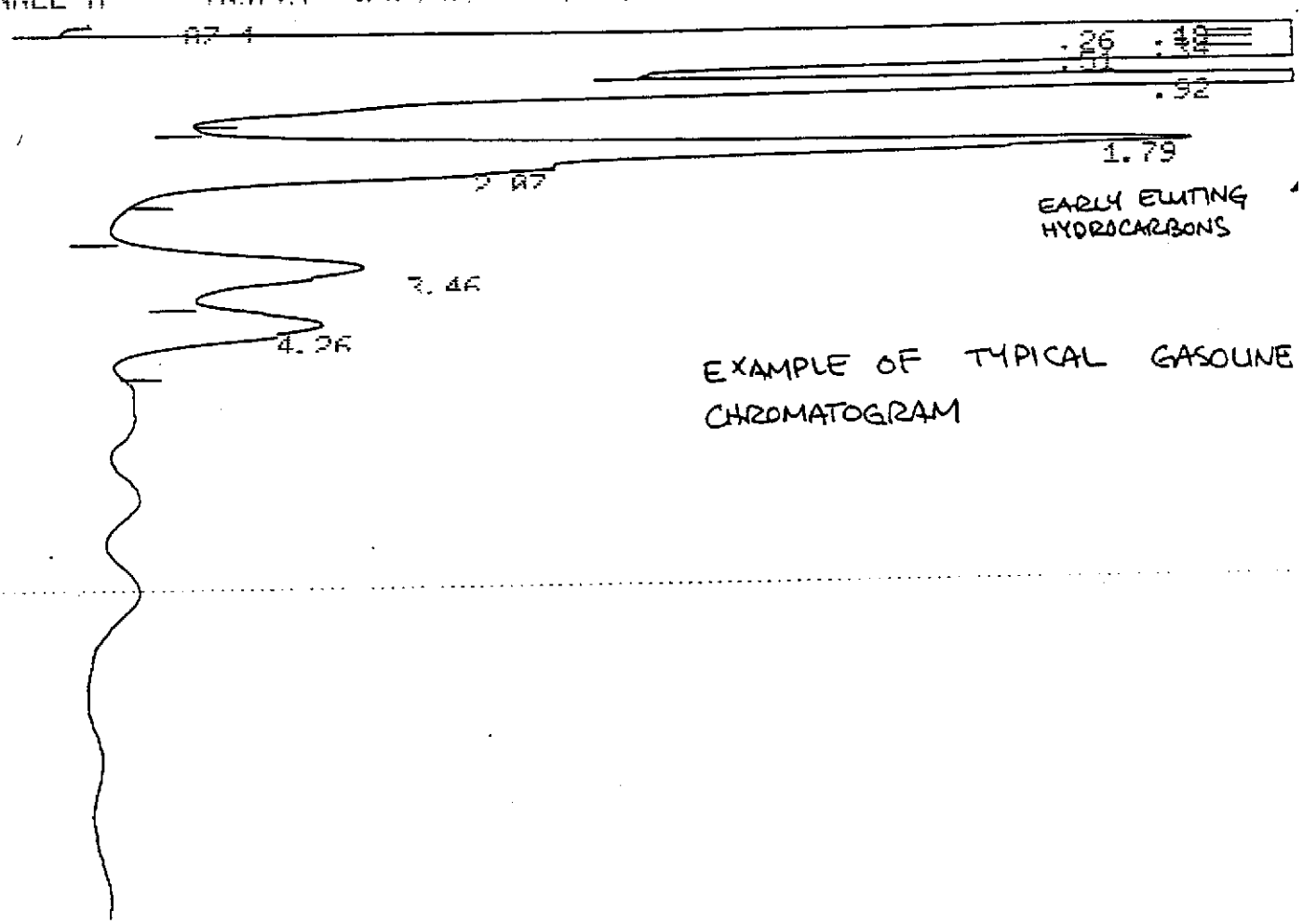
Checked by R. Sheldrake

Proofed by [signature]

PEAK#	AREA%	RT	AREA RC
1	14.374	0.38	115711 01
2	12.495	0.65	100239 01
3	18.241	1.06	146333 02
4	20.977	1.4	168667 03
5	34.613	2.8	277677 01
TOTAL	100.		802993

GENERATOR EXAM
500

CHANNEL A INJECT 09/19/88 11:05:30



EARLY ELUTING HYDROCARBONS

EXAMPLE OF TYPICAL GASOLINE CHROMATOGRAM

HLA TELEGRAPH NAK CA 09/19/88 11:05:30 CH= "A" PS= 1.

FILE 1. METHOD 0. RUN 10 INDEX 10

PEAK#	AREA%	RT	AREA RC
1	43.369	0.19	2525776 02
2	10.557	0.26	614797 02
3	8.961	0.34	521790 02
4	13.251	0.51	771624 02
5	10.558	0.92	614774 03
6	6.265	1.79	364812 02
7	1.869	2.07	108887 03
8	2.955	3.46	172077 02
9	2.214	4.26	128945 03
TOTAL	100.		5822934

SG03-12

500

CHANNEL A INJECT 09/19/88 11:55:30

HLA TELAGRAPH NAK CA 09/19/88 11:05:30 CH= "A" PS= 1.

FILE 1. METHOD 0. RUN 10 INDEX 10

PEAK#	AREA%	RT	AREA RC
1	43.369	0.18	2505726 02
2	10.557	0.26	614727 02
3	8.961	0.34	521793 02
4	13.251	0.51	771624 02
5	10.558	0.92	614774 03
6	6.265	1.79	364813 02
7	1.869	2.07	108807 03
8	2.955	3.46	172077 02
9	2.214	4.26	128945 03
TOTAL	100.		5822974

S403-12 500

CHANNEL A INJECT 09/19/88 11:55:30

.07 .19 .64 1.22 1.65 2.14 3.13 3.96 2487

EXAMPLE OF HYDROCARBON CHROMATOGRAM MINUS EARLY ELUTING COMPOUNDS. NOT TYPICAL OF GASOLINE.

HLA TELAGRAPH NAK CA 09/19/88 11:55:30 CH= "A" PS= 1.

FILE 1. METHOD 0. RUN 11 INDEX 11

PEAK#	AREA%	RT	AREA RC
1	7.843	0.19	648655 01
2	0.312	0.64	25718 02
3	1.166	1.14	107415 02
4	1.559	1.22	143609 02
5	5.559	1.65	511999 02
6	38.182	2.14	3516375 02
7	25.198	3.13	2320581 02
8	20.98	3.96	1932198 03
TOTAL	100.		9206550

S403-12 1000

APPENDIX D

Soil Sample Chemical Test Data

CHEMWEST
ANALYTICAL LABORATORIES, INC.

October 14, 1988

Harding Lawson Associates
1355 Willow Way, Suite 109
Concord, CA 94520

Attention: Mr. Greg Fasiano

Subject: Report of Data - Case Number 2399

Dear Mr. Greg Fasiano:

The technical staff at CHEMWEST is pleased to provide our report for the analyses you requested: Total Petroleum Hydrocarbons, Purgeable (gasoline) - DHS Method, LUFT Field Manual; and BTEX - EPA Method 602.

Seven soil samples for Project Texaco Assessment #9, Project Number 02251,082,03 were received October 7, 1988 in good condition. Results of the analyses, along with the analytical methodology and appropriate reporting limits, are presented on the following pages.

Thank you for choosing CHEMWEST Laboratories. Should you have questions concerning this data report or the analytical methods employed, please do not hesitate to contact Toni Weeks, our Technical Service Representative, or your project manager. We hope that you will consider CHEMWEST Laboratories for your future analytical support and service requirements.

Sincerely,

Jill B. Henes, Ph.D.
Vice President of Technical Services

and

Kirk Pocan
Project Manager

KP:bw

cc: Joel Bird, President
File

600W North Market Boulevard • Sacramento, CA 95834 • Phone (916) 923-0840 • FAX (916) 923-1938

A Subsidiary of CompuChem Corporation

ANALYTICAL METHODOLOGY

BTEX (Benzene, Toluene, Ethyl Benzene, and Xylenes) by Purge & Trap and GC-PID

WATER - Method 602 or 8020

A 5 ml sample volume, or 5 ml of a suitable dilution, is purged on a suitable purge and trap system with helium. The purged sample is analyzed on a Gas Chromatograph equipped with a Photoionization Detector (PID). A packed column is used to separate the compounds.

SOIL - Method 8020

A 10 gram, or other appropriate aliquot of soil, is weighed into a clean VOA vial. Soils received in brass core tubes are sampled by discarding 2-5 centimeters of soil from each end of the tubes (this is done to reduce the possibility of analyzing a portion of soil that has been exposed to sampling technique contamination). Equal aliquots of soil are then removed from each end of the tube and combined in the VOA vial. Soil in jars or bags is aliquoted using a similar technique, which discards exposed sample surfaces. A 10 ml, or other appropriate volume of methanol, is added to the soil and the soil is shaken with the solvent. 100 ul of the extract, or a reduced aliquot or volume of a suitable dilution, is injected into 5 ml of laboratory blank water and analyzed by the same technique used for water samples.

ANALYTICAL METHODOLOGY

Total Petroleum Hydrocarbons by Purge & Trap and GC-FID

WATER - DHS Method - Luft Field Manual

A 5 ml sample volume, or 5 ml of a suitable dilution, is purged on a suitable purge and trap system with helium. The purged sample is analyzed on a Gas Chromatograph equipped with a Flame Ionization Detector (FID). A packed column is used to separate the compounds.

SOIL - DHS Method - Luft Field Manual

A 10 gram, or other appropriate aliquot of soil, is weighed into a clean VOA vial. Soils received in brass core tubes are sampled by discarding 2-5 centimeters of soil from each end of the tubes (this is done to reduce the possibility of analyzing a portion of soil that has been exposed to sampling technique contamination). Equal aliquots of soil are then removed from each end of the tube and combined in the VOA vial. Soil in jars or bags is aliquoted using a similar technique, which discards exposed sample surfaces. A 10 ml, or other appropriate volume of methanol, is added to the soil and the soil is shaken with the solvent. 100 ul of the extract, or a reduced aliquot or volume of a suitable dilution, is injected into 5 ml of laboratory blank water and analyzed by the same technique used for water samples.

CHEMWEST ANALYTICAL LABORATORIES
BENZENE, TOLUENE, ETHYL BENZENE, XYLENES
AND TOTAL PETROLEUM HYDROCARBONS - PURGEABLE

Client I.D. : B91 5.0-5.5
Date Analyzed : 10/10/88
Date Extracted: 10/10/88

CHEMWEST I.D.: 2399-1
Matrix : Soil

Compound	Amount Detected (mg/Kg)	RL (mg/Kg)
Benzene	BRL	0.05
Toluene	BRL	0.1
Ethyl Benzene	BRL	0.2
Total-Xylenes (1)	BRL	0.1
Total Petroleum Hydrocarbon (Purgeable)	BRL	10

Surrogate	% Recovery	Acceptance Window
ortho-Chlorotoluene	79%	50-150%

BRL: Below Reporting Limit.
RL: Reporting Limit.

(1): Total of P-, M-, and O- Xylenes.

Approved by: 

CHEMWEST ANALYTICAL LABORATORIES
BENZENE, TOLUENE, ETHYL BENZENE, XYLENES
AND TOTAL PETROLEUM HYDROCARBONS - PURGEABLE

Client I.D. : B91 9.0-9.5
Date Analyzed : 10/10/88
Date Extracted: 10/10/88

CHEMWEST I.D.: 2399-2
Matrix : Soil

Compound	Amount Detected (mg/Kg)	RL (mg/Kg)
Benzene	BRL	0.05
Toluene	BRL	0.1
Ethyl Benzene	BRL	0.2
Total-Xylenes (1)	BRL	0.1
Total Petroleum Hydrocarbon (Purgeable)	BRL	10

Surrogate	% Recovery	Acceptance Window
ortho-Chlorotoluene	77%	50-150%

BRL: Below Reporting Limit.
RL: Reporting Limit.

(1): Total of P-, M-, and O- Xylenes.

Approved by: _____

CHEMWEST ANALYTICAL LABORATORIES
BENZENE, TOLUENE, ETHYL BENZENE, XYLENES
AND TOTAL PETROLEUM HYDROCARBONS - PURGEABLE

Client I.D. : B91 12.0-12.5
Date Analyzed : 10/10/88
Date Extracted: 10/10/88

CHEMWEST I.D.: 2399-3
Matrix : Soil

Compound	Amount Detected (mg/Kg)	RL (mg/Kg)
Benzene	BRL	0.05
Toluene	BRL	0.1
Ethyl Benzene	BRL	0.2
Total-Xylenes (1)	BRL	0.1
Total Petroleum Hydrocarbon (Purgeable)	BRL	10

Surrogate	% Recovery	Acceptance Window
ortho-Chlorotoluene	73%	50-150%

BRL: Below Reporting Limit.
RL: Reporting Limit.

(1): Total of P-, M-, and O- Xylenes.

Approved by: _____

CHEMWEST ANALYTICAL LABORATORIES
BENZENE, TOLUENE, ETHYL BENZENE, XYLENES
AND TOTAL PETROLEUM HYDROCARBONS - PURGEABLE

Client I.D. : B92 5.0-5.5
Date Analyzed : 10/10/88
Date Extracted: 10/10/88

CHEMWEST I.D.: 2399-4
Matrix : Soil

Compound	Amount Detected (mg/Kg)	RL (mg/Kg)
Benzene	BRL	0.05
Toluene	BRL	0.1
Ethyl Benzene	BRL	0.2
Total-Xylenes (1)	BRL	0.1
Total Petroleum Hydrocarbon (Purgeable)	BRL	10

Surrogate	% Recovery	Acceptance Window
ortho-Chlorotoluene	69%	50-150%

BRL: Below Reporting Limit.
RL: Reporting Limit.

(1): Total of P-, M-, and O- Xylenes.

Approved by: _____

CHEMWEST ANALYTICAL LABORATORIES
BENZENE, TOLUENE, ETHYL BENZENE, XYLENES
AND TOTAL PETROLEUM HYDROCARBONS - PURGEABLE

Client I.D. : B92 9.0-9.5
Date Analyzed : 10/10/88
Date Extracted: 10/10/88

CHEMWEST I.D.: 2399-5
Matrix : Soil

Compound	Amount Detected (mg/Kg)	RL (mg/Kg)
Benzene	BRL	0.05
Toluene	BRL	0.1
Ethyl Benzene	BRL	0.2
Total-Xylenes (1)	BRL	0.1
Total Petroleum Hydrocarbon (Purgeable)	BRL	10

Surrogate	% Recovery	Acceptance Window
ortho-Chlorotoluene	68%	50-150%

BRL: Below Reporting Limit.
RL: Reporting Limit.

(1): Total of P-, M-, and O- Xylenes.

Approved by: _____

CHEMWEST ANALYTICAL LABORATORIES
BENZENE, TOLUENE, ETHYL BENZENE, XYLENES
AND TOTAL PETROLEUM HYDROCARBONS - PURGEABLE

Client I.D. : B92 10.5-11.0
Date Analyzed : 10/10/88
Date Extracted: 10/10/88

CHEMWEST I.D.: 2399-6
Matrix : Soil

Compound	Amount Detected (mg/Kg)	RL (mg/Kg)
Benzene	BRL	0.05
Toluene	BRL	0.1
Ethyl Benzene	BRL	0.2
Total-Xylenes (1)	BRL	0.1
Total Petroleum Hydrocarbon (Purgeable)	BRL	10

Surrogate	% Recovery	Acceptance Window
ortho-Chlorotoluene	70%	50-150%

BRL: Below Reporting Limit.
RL: Reporting Limit.

(1): Total of P-, M-, and O- Xylenes.

Approved by: _____

CHEMWEST ANALYTICAL LABORATORIES
BENZENE, TOLUENE, ETHYL BENZENE, XYLENES
AND TOTAL PETROLEUM HYDROCARBONS - PURGEABLE

Client I.D. : B92 13.0-13.5
Date Analyzed : 10/10/88
Date Extracted: 10/10/88

CHEMWEST I.D.: 2399-7
Matrix : Soil

Compound	Amount Detected (mg/Kg)	RL (mg/Kg)
Benzene	BRL	0.05
Toluene	BRL	0.1
Ethyl Benzene	BRL	0.2
Total-Xylenes (1)	BRL	0.1
Total Petroleum Hydrocarbon (Purgeable)	BRL	10

Surrogate	% Recovery	Acceptance Window
ortho-Chlorotoluene	68%	50-150%

BRL: Below Reporting Limit.
RL: Reporting Limit.

(1): Total of P-, M-, and O- Xylenes.

Approved by: _____

CHEM WEST ANALYTICAL LABORATORIES,INC.
600 West North Market Blvd.
Sacramento, California 95834
(916) 923-0840 FAX (916) 923-1938

Client

Order No. 2399
Date Rec'd. 10/7/88@ 1830
Compl. Date
Section KIRK POGAN

CLIENT: Harding Lawson Associates
1355 Willow Way
Suite 109
Concord CA 94520

Project Name: Texaco Assessment #9
Project No. 02251, 082, 03
P.O. NO.
Contact Greg Fusino
Phone (415) 687-9660

ANALYSIS:
Seven (7) soil samples rec'd under chain of custody in 6" brass core tubes (7) to be analyzed for BTEX and total petroleum hydrocarbons (TPH) - EXTN/GC-FID (GAS).

Note: * Seven (7) day T.A.T.

Sample	I.D.	Depth	Date	Analysis	Matrix	Container
2399-1	B91	5.0-5.5	10/6/88	BTEX ~~TPH EXTN/GC-FID (GAS)~~	SOIL	1-6" BC Core Tube
-2	B91	9.0-9.5		BTEX/TPH		
-3	B91	12.0-12.5				
-4	B92	5.0-5.5				
-5	B92	9.0-9.5				
-6	B92	10.5-11.0				
-7	B92	13.0-13.5				

mg mg mg mg

R.I
MJ - Martina Jarvis

Chemwest
Courier

SAMPLE WILL BE HELD 30 DAYS UNLESS LONGER TIME IS ARRANGED

Harding Lawson Associates
1355 Willow Way, Suite 109
Concord, California 94520
415/687-9660
Telecopy: 415/687-9673

CHAIN OF CUSTODY FORM

Lab: Chem West

Samplers: David R. Hose

Job Number: 02251,082,03

Name/Location: Tesoro Assessment #9

Project Manager: G. Fasiano

Recorder: David R. Hose (Signature Required)

SOURCE CODE	MATRIX: Water	Sediment	Soil	Oil	#CONTAINERS & PRESERV.: Unpres.	H_2SO_4	HNO_3	Tube	SAMPLE NUMBER OR LAB NUMBER: Yr	Wk	Seq	DATE: Yr	Mo	Dy	Time	STATION DESCRIPTION/ NOTES	ANALYSIS REQUESTED: EPA 601/8010	EPA 602/8020	EPA 624/8240	EPA 625/8270	Priority Pllnt. Metals	Benzene/Toluene/Xylene + E	Total Petrol. Hydrocarb. Gas
50			X					X	391			881006				5.0-5.5					X	X
50			X					X	391							9.0-9.5					X	X
50			X					X	391							12.0-12.5					X	X
50			X					X	392							5.0-5.5					X	X
50			X					X	392							9.0-9.5					X	X
50			X					X	392							10.5-11.0					X	X
56			X					X	392							13.0-13.5					X	X

LAB NUMBER: Yr	Wk	Seq	DEPTH IN FEET	COL MTD CD	QA CODE	MISCELLANEOUS
						C.W. # 2399

SAMPLES REC'D IN GOOD CONDITION
CHAIN OF CUSTODY RECORD

RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
David R. Hose	Thomas D. Wirth	10/07 1210
Thomas D. Wirth		10/07 1830

DISPATCHED BY: (Signature) DATE/TIME

RECEIVED FOR LAB BY: (Signature) DATE/TIME: 10/7/88 1830

METHOD OF SHIPMENT: Chemwest Courier

Laboratory Copy White — Project Office Copy Yellow — Field or Office Copy Pink

CHEMWEST LAB

6533

CHEMWEST
ANALYTICAL LABORATORIES, INC.

October 17, 1988

Harding Lawson
1355 Willow Way, Suite 109
Concord, CA 94520

Attention: Mr. Randy Stone

Subject: Report of Data - Case Number 2383

Dear Mr. Stone:

The technical staff at CHEMWEST is pleased to provide our report for the analyses you requested: Total Petroleum Hydrocarbons, Purgeable (gasoline) - DHS Method, LUFT Field Manual; and BTEX - EPA Method 602.

Four soil samples for Project Texaco - Station #9, Project Number 02251,082.03 were received October 6, 1988 in good condition. Results of the analyses, along with the analytical methodology and appropriate reporting limits, are presented on the following pages.

Thank you for choosing CHEMWEST Laboratories. Should you have questions concerning this data report or the analytical methods employed, please do not hesitate to contact Toni Weeks, our Technical Service Representative, or your project manager. We hope that you will consider CHEMWEST Laboratories for your future analytical support and service requirements.

Sincerely,

Jill B. Henes, Ph.D.
Vice President of Technical Services

and

Kirk Pocan
Project Manager

KP:bw

cc: Joel Bird, President
File

CHEMWEST ANALYTICAL LABORATORIES
BENZENE, TOLUENE, ETHYL BENZENE, XYLENES
AND TOTAL PETROLEUM HYDROCARBONS - PURGEABLE

Client I.D. : MW9E 5.5-6.0
Date Analyzed : 10/11/88
Date Extracted: 10/08/88

CHEMWEST I.D.: 2383-1
Matrix : Soil

Compound	Amount Detected (mg/Kg)	RL (mg/Kg)
Benzene	BRL	5
Toluene	BRL	10
Ethyl Benzene	18	15
Total-Xylenes (1)	BRL	10
Total Petroleum Hydrocarbon (Purgeable)	1900	1000

Surrogate	% Recovery	Acceptance Window
ortho-Chlorotoluene	85%	50-150%

BRL: Below Reporting Limit.
RL: Reporting Limit.

(1): Total of P-, M-, and O- Xylenes.

Approved by: KP

CHEMWEST ANALYTICAL LABORATORIES
BENZENE, TOLUENE, ETHYL BENZENE, XYLENES
AND TOTAL PETROLEUM HYDROCARBONS - PURGEABLE

Client I.D. : 2383-2 MW9E 9.0-9.5
Date Analyzed : 10/16/88
Date Extracted: 10/08/88

CHEMWEST I.D.: 2383-2
Matrix : Soil

Compound	Amount Detected (mg/Kg)	RL (mg/Kg)
Benzene	BRL	0.05
Toluene	BRL	0.1
Ethyl Benzene	BRL	0.2
Total-Xylenes (1)	BRL	0.1
Total Petroleum Hydrocarbon (Purgeable)	BRL	10

Surrogate	% Recovery	Acceptance Window
ortho-Chlorotoluene	61%	50-150%

BRL: Below Reporting Limit.
RL: Reporting Limit.

(1): Total of P-, M-, and O- Xylenes.

Approved by: _____

CHEMWEST ANALYTICAL LABORATORIES
BENZENE, TOLUENE, ETHYL BENZENE, XYLENES
AND TOTAL PETROLEUM HYDROCARBONS - PURGEABLE

Client I.D. : 2383-3 MW9D 6.0-6.5 CHEMWEST I.D.: 2383-3
Date Analyzed : 10/16/88 Matrix : Soil
Date Extracted: 10/08/88

Compound	Amount Detected (mg/Kg)	RL (mg/Kg)
Benzene	BRL	0.05
Toluene	BRL	0.1
Ethyl Benzene	BRL	0.2
Total-Xylenes (1)	BRL	0.1
Total Petroleum Hydrocarbon (Purgeable)	BRL	10

Surrogate	% Recovery	Acceptance Window
ortho-Chlorotoluene	67%	50-150%

BRL: Below Reporting Limit.
RL: Reporting Limit.

(1): Total of P-, M-, and O- Xylenes.

Approved by: _____

CHEMWEST ANALYTICAL LABORATORIES
BENZENE, TOLUENE, ETHYL BENZENE, XYLENES
AND TOTAL PETROLEUM HYDROCARBONS - PURGEABLE

Client I.D. : MW9D 10.5-11.0
Date Analyzed : 10/11/88
Date Extracted: 10/08/88

CHEMWEST I.D.: 2383-4
Matrix : Soil

Compound	Amount Detected (mg/Kg)	RL (mg/Kg)
Benzene	BRL	0.05
Toluene	BRL	0.1
Ethyl Benzene	BRL	0.2
Total-Xylenes (1)	BRL	0.1
Total Petroleum Hydrocarbon (Purgeable)	BRL	10

Surrogate	% Recovery	Acceptance Window
ortho-Chlorotoluene	77%	50-150%

BRL: Below Reporting Limit.
RL: Reporting Limit.

(1): Total of P-, M-, and O- Xylenes.

Approved by: _____

CHEM WEST ANALYTICAL LABORATORIES, INC.
600 West North Market Blvd.
Sacramento, California 95834
(916) 923-0840 FAX (916) 923-1938

CLIENT

2383

Order No.
Date Rec'd. 10/6/88 @ 1700
Compl. Date
Section KIRK POCAN

CLIENT: Harding Lawson Associates
1355 Willow Way
Suite 109
Concord, CA 94520

Project Name: Texaco - station #9
Project No. 02251.082.03
P.O. NO.
Contact Randy Stone
Phone (415) 687-9660

ANALYSIS: Four (4) soil samples recd under chain of custody in 6" brass core tubes (4) to be analyzed for BTEX and Total Petroleum Hydrocarbons (TPH) - EXTN/ GC-FID (GAS).

*NOTE: 7 Day turn around time

Sample Id	Date	Depth	Analysis	Matrix	Containers
2383-1 - MW9E	10/5/88	5.5-6.0	BTEX, TPH (EXTN'S & GAS)	SOIL	1-6" Brass Core Tube
2383-2 MW9E	10/5/88	9.0-9.5		SOIL	
2383-3 MW9D	10/5/88	6.0-6.5		SOIL	
2383-4 MW9D	10/5/88	10.5-11.0		SOIL	

mg/kg

mg

F-1
MJ- Martinez Jevis

CHEMWEST COURIER

SAMPLE WILL BE HELD 30 DAYS UNLESS LONGER TIME IS ARRANGED

HLA
1355 Willow Way, Suite 109
Concord, California 94520
415/687-9660
Telecopy: 415/687-9673

CHAIN OF CUSTODY FORM

Lab: Chem West #2383

Samplers: David R. Hose

Job Number: 02251,082.03

Name/Location: Texaco Ass. - Station #9

Project Manager: G. Fasiano

Recorder: David R. Hose
(Signature Required)

SOURCE CODE	MATRIX: Water	Sediment	Soil	Oil	#CONTAINERS & PRESERV.: Unpres.	H_2SO_4	HNO_3	Tube	SAMPLE NUMBER OR LAB NUMBER: Yr	Wk	Seq	DATE: Yr	Mo	Dy	Time	STATION DESCRIPTION/ NOTES	EPA 601/8010	EPA 602/8020	EPA 624/8240	EPA 625/8270	Priority Pllint. Metals	Benzene/Toluene/Xylene+E	Total Petrol. Hydrocarb. Gas
50			X					X	MW	E	9E	88	10	05		5.5-6.0						X	X
50			X					X	MW	E	9E	↓	↓	↓		9.0-9.5						X	X
50			X					X	MW	D	9D	↓	↓	↓		~~9.0-9.5~~ 6.0-6.5						X	X
50			X					X	MW	D	9D	↓	↓	↓		10.5-11.0						X	X
~~50~~			~~X~~					~~X~~	~~MW~~	~~[illegible]~~	~~[illegible]~~	~~88~~	~~10~~	~~05~~		~~[illegible]~~						~~X~~	~~X~~

SAMPLES REC'D IN GOOD CONDITION

LAB NUMBER: Yr	Wk	Seq	DEPTH IN FEET	COL MTD CD	QA CODE	MISCELLANEOUS

CHAIN OF CUSTODY RECORD

RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
David R. Hose	[signature]	10/06/88 1350
[signature]		10/06/88 1700

DISPATCHED BY: (Signature)	DATE/TIME	RECEIVED FOR LAB BY: (Signature)	DATE/TIME
		BILL McBENCE / Bill McBence	10/6/88 17:00

METHOD OF SHIPMENT: CHEMWEST COURIER

Laboratory Copy White | Project Office Copy Yellow | Field or Office Copy Pink

6533

CHEMWEST
ANALYTICAL LABORATORIES, INC.

December 12, 1988

Harding Lawson Associates
1355 Willow Way, Suite 109
Concord, CA 94520

Attention: Mr. Greg Fasiano

Subject: Report of Data - Case Number 2736

Dear Mr. Fasiano:

The technical staff at CHEMWEST is pleased to provide our report for the analyses you requested: Total Petroleum Hydrocarbons, Purgeable (gasoline) - DHS Method, LUFT Field Manual; and BTEX - EPA Method 602.

Two soil samples for Project Texaco #9 Oakland, Project Number 2251.082.03 were received November 23, 1988 in good condition. Results of the analyses, along with the analytical methodology and appropriate reporting limits, are presented on the following pages.

Thank you for choosing CHEMWEST Laboratories. Should you have questions concerning this data report or the analytical methods employed, please do not hesitate to contact Toni Weeks, our Technical Service Representative, or your project manager. We hope that you will consider CHEMWEST Laboratories for your future analytical support and service requirements.

Sincerely,

Jill B. Henes, Ph.D.
Vice President of Technical Services

and

Kirk Pocan
Project Manager

KP:bw

cc: Joel Bird, President
File

ANALYTICAL METHODOLOGY

Total Petroleum Hydrocarbons by Purge & Trap and GC-FID

WATER - DHS Method - Luft Field Manual

A 5 ml sample volume, or 5 ml of a suitable dilution, is purged on a suitable purge and trap system with helium. The purged sample is analyzed on a Gas Chromatograph equipped with a Flame Ionization Detector (FID). A packed column is used to separate the compounds.

SOIL - DHS Method - Luft Field Manual

A 10 gram, or other appropriate aliquot of soil, is weighed into a clean VOA vial. Soils received in brass core tubes are sampled by discarding 2-5 centimeters of soil from each end of the tubes (this is done to reduce the possibility of analyzing a portion of soil that has been exposed to sampling technique contamination). Equal aliquots of soil are then removed from each end of the tube and combined in the VOA vial. Soil in jars or bags is aliquoted using a similar technique, which discards exposed sample surfaces. A 10 ml, or other appropriate volume of methanol, is added to the soil and the soil is shaken with the solvent. 100 ul of the extract, or a reduced aliquot or volume of a suitable dilution, is injected into 5 ml of laboratory blank water and analyzed by the same technique used for water samples.

ANALYTICAL METHODOLOGY

BTEX (Benzene, Toluene, Ethyl Benzene, and Xylenes) by Purge & Trap and GC-PID

WATER - Method 602 or 8020

A 5 ml sample volume, or 5 ml of a suitable dilution, is purged on a suitable purge and trap system with helium. The purged sample is analyzed on a Gas Chromatograph equipped with a Photoionization Detector (PID). A packed column is used to separate the compounds.

SOIL - Method 8020

A 10 gram, or other appropriate aliquot of soil, is weighed into a clean VOA vial. Soils received in brass core tubes are sampled by discarding 2-5 centimeters of soil from each end of the tubes (this is done to reduce the possibility of analyzing a portion of soil that has been exposed to sampling technique contamination). Equal aliquots of soil are then removed from each end of the tube and combined in the VOA vial. Soil in jars or bags is aliquoted using a similar technique, which discards exposed sample surfaces. A 10 ml, or other appropriate volume of methanol, is added to the soil and the soil is shaken with the solvent. 100 ul of the extract, or a reduced aliquot or volume of a suitable dilution, is injected into 5 ml of laboratory blank water and analyzed by the same technique used for water samples.

CHEMWEST ANALYTICAL LABORATORIES
BENZENE, TOLUENE, ETHYL BENZENE, XYLENES
AND TOTAL PETROLEUM HYDROCARBONS - PURGEABLE

Client I.D.: MW-9G-1
Date Analyzed : 12/03/88
Date Extracted: 11/30/88

CHEMWEST I.D.: 2736-1
Matrix : Soil

Compound	Amount Detected (mg/Kg)	RL (mg/Kg)
Benzene	BRL	0.05
Toluene	0.2	0.1
Ethyl Benzene	BRL	0.2
Total-Xylenes (1)	BRL	0.1
Total Petroleum Hydrocarbon (Purgeable)	BRL	10

Surrogate	% Recovery	Acceptance Window
ortho-Chlorotoluene	84%	50-150%

BRL: Below Reporting Limit.
RL: Reporting Limit.

(1): Total of P-, M-, and O- Xylenes.

Approved by: YP

REV2.9.88

CHEMWEST ANALYTICAL LABORATORIES
BENZENE, TOLUENE, ETHYL BENZENE, XYLENES
AND TOTAL PETROLEUM HYDROCARBONS - PURGEABLE

Client I.D.: SB-1
Date Analyzed : 12/03/88
Date Extracted: 11/30/88

CHEMWEST I.D.: 2736-2
Matrix : Soil

Compound	Amount Detected (mg/Kg)	RL (mg/Kg)
Benzene	0.30	0.05
Toluene	0.2	0.1
Ethyl Benzene	BRL	0.2
Total-Xylenes (1)	BRL	0.1
Total Petroleum Hydrocarbon (Purgeable)	BRL	10

Surrogate	% Recovery	Acceptance Window
ortho-Chlorotoluene	70%	50-150%

BRL: Below Reporting Limit.
RL: Reporting Limit.

(1): Total of P-, M-, and O- Xylenes.

Approved by: _____

REV2.9.88

CHEM WEST ANALYTICAL LABORATORIES,INC.
600 West North Market Blvd.
Sacramento, California 95834
(916) 923-0840 FAX (916) 923-1938

CLIENT

2736
Order No.
Date Rec'd. 11/23/88 @ 2130
Compl. Date
Section H. Pram

CLIENT: Harding Lawson Assoc.
1355 Willow Way Suite 109
Concord, CA 94520

Project Name: Texaco #9 Oakland
Project No. 2251 082.03
P.O. NO.
Contact Greg ~~Fasiano~~ Fasiano
Phone (415) 687-9600

ANALYSIS: Two soil samples Rec'd under chain of custody in 10" brass core tubes(2) to be analyzed for TPH EPA/EC-FID, and BTEX.

	Sampled	Date	@ analysis	Matrix	Containers
2736-1	MW-9G-1	11/22	~~TPH EPA~~ BTEX-G	Soil	1-10" Core tube
-2	SB-1	"/22	~~TPH EPA~~ BTEX-G	Soil	1-6" Core tube

AMENDED

Per conversation w/ Greg Fasiano 12/2/88 @ 0915 hrs, these samples should be analyzed for BTEX/TFH only.

TCW
12/2/88

RH
MT MICHELLE TOLIVER

CHEM WEST COURIER

SAMPLE WILL BE HELD 30 DAYS UNLESS LONGER TIME IS ARRANGED

CHEM WEST ANALYTICAL LABORATORIES,INC.
600 West North Market Blvd.
Sacramento, California 95834
(916) 923-0840 FAX (916) 923-1938

CLIENT

2736
Order No.
Date Rec'd. 11/23/88 @ 2130
Compl. Date
Section VH. Doan

CLIENT: Harding Lawson Assoc.
1355 Willow Way Suite 109
Concord, CA 94520

Project Name: Texaco #9 Oakland
Project No. 2251.082.03
P.O. NO.
Contact Greg Saxiona
Phone (415) 687-9600

ANALYSIS: Two soil samples Rec'd under chain of custody in 10" brass sleeves (2) to be analyzed for TPH EPA/GC-FID, and BTEX.

	Sample Id	Date	analysis	matrix	containers
2736-1	MW-9G-1	11/22	TPH EPA, BTEX	Soil	1-6" core tube
-2	SB-1	"/22	TPH EPA, BTEX	Soil	1-6" core tube

RI
MI · MICHELLE TOLIVER

CHEM WEST COURIER

SAMPLE WILL BE HELD 30 DAYS UNLESS LONGER TIME IS ARRANGED

Harding Lawson Associates
1355 Willow Way, Suite 109
Concord, California 94520
415/687-9660
Telecopy: 415/687-9673

CHAIN OF CUSTODY FORM

Lab: CHEMWEST

Samplers: GLENN S. YOUNG

Job Number: 2251.082.03

Name/Location: TEXACO #9, OAKLAND

Project Manager: G. L. FASIANO

Recorder: _____ (Signature Required)

SOURCE CODE	MATRIX: Water	Sediment	Soil	Oil	#CONTAINERS & PRESERV.: Unpres.	H_2SO_4	HNO_3	Ice	SAMPLE NUMBER OR LAB NUMBER: Yr	Wk	Seq	DATE: Yr	Mo	Dy	Time	STATION DESCRIPTION/ NOTES	ANALYSIS REQUESTED: EPA 601/8010	EPA 602/8020	EPA 624/8240	EPA 625/8270	Priority Pllnt. Metals	Benzene/Toluene/Xylene	Total Petrol. Hydrocarb.	GAS
48			X					X	M	46	- 96 - 1	88	11	22	1200						X	X	X	
48			X					X	SB	- 1		88	11	22	1440						X	X	X	
																SAMPLES REC'D IN GOOD CONDITION								

LAB NUMBER: Yr	Wk	Seq	DEPTH IN FEET	COL MTD CD	QA CODE	MISCELLANEOUS

CHAIN OF CUSTODY RECORD

RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME 11/23/88 1505
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME 11/23/88 2130
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
DISPATCHED BY: (Signature) DATE/TIME	RECEIVED FOR LAB BY: (Signature) MICHELLE TOLIVER	DATE/TIME 2130
METHOD OF SHIPMENT: CHEM WEST COURIER		

Laboratory Copy Project Office Copy Field or Office Copy

6533

CHEMWEST
ANALYTICAL LABORATORIES, INC.

February 2, 1989

Harding Lawson Associates
1355 Willow Way, Suite 109
Concord, CA 94520

Attention: Mr. Randy Stone

Subject: Report of Data - Case Number 3128

Dear Mr. Stone:

The technical staff at CHEMWEST is pleased to provide our report for the analyses you requested: Total Petroleum Hydrocarbons, Purgeable (gasoline) - DHS Method, LUFT Field Manual; and BTEX - EPA Method 602.

Twelve soil samples for Project Texaco Assessment #9, Project Number 0225,082.03 were received January 17, 1989 in good condition. Results of the analyses, along with the analytical methodology and appropriate reporting limits, are presented on the following pages.

Thank you for choosing CHEMWEST Laboratories. Should you have questions concerning this data report or the analytical methods employed, please do not hesitate to contact Toni Weeks, our Technical Service Representative, or your project manager. We hope that you will consider CHEMWEST Laboratories for your future analytical support and service requirements.

Sincerely,

Jill B. Henes, Ph.D.
Vice President of Technical Services

and

Kirk Pocan
Project Manager

KP:bw

cc: Joel Bird, President
File

ANALYTICAL METHODOLOGY

BTEX (Benzene, Toluene, Ethyl Benzene, and Xylenes) by Purge & Trap and GC-PID

WATER - Method 602 or 8020

A 5 ml sample volume, or 5 ml of a suitable dilution, is purged on a suitable purge and trap system with helium. The purged sample is analyzed on a Gas Chromatograph equipped with a Photoionization Detector (PID). A packed column is used to separate the compounds.

SOIL - Method 8020

A 10 gram, or other appropriate aliquot of soil, is weighed into a clean VOA vial. Soils received in brass core tubes are sampled by discarding 2-5 centimeters of soil from each end of the tubes (this is done to reduce the possibility of analyzing a portion of soil that has been exposed to sampling technique contamination). Equal aliquots of soil are then removed from each end of the tube and combined in the VOA vial. Soil in jars or bags is aliquoted using a similar technique, which discards exposed sample surfaces. A 10 ml, or other appropriate volume of methanol, is added to the soil and the soil is shaken with the solvent. 100 ul of the extract, or a reduced aliquot or volume of a suitable dilution, is injected into 5 ml of laboratory blank water and analyzed by the same technique used for water samples.

ANALYTICAL METHODOLOGY

Total Petroleum Hydrocarbons by Purge & Trap and GC-FID

WATER - DHS Method - Luft Field Manual

A 5 ml sample volume, or 5 ml of a suitable dilution, is purged on a suitable purge and trap system with helium. The purged sample is analyzed on a Gas Chromatograph equipped with a Flame Ionization Detector (FID). A packed column is used to separate the compounds.

SOIL - DHS Method - Luft Field Manual

A 10 gram, or other appropriate aliquot of soil, is weighed into a clean VOA vial. Soils received in brass core tubes are sampled by discarding 2-5 centimeters of soil from each end of the tubes (this is done to reduce the possibility of analyzing a portion of soil that has been exposed to sampling technique contamination). Equal aliquots of soil are then removed from each end of the tube and combined in the VOA vial. Soil in jars or bags is aliquoted using a similar technique, which discards exposed sample surfaces. A 10 ml, or other appropriate volume of methanol, is added to the soil and the soil is shaken with the solvent. 100 ul of the extract, or a reduced aliquot or volume of a suitable dilution, is injected into 5 ml of laboratory blank water and analyzed by the same technique used for water samples.

CHEMWEST ANALYTICAL LABORATORIES
BENZENE, TOLUENE, ETHYL BENZENE, XYLENES
AND TOTAL PETROLEUM HYDROCARBONS - PURGEABLE

Client I.D.: 4.0-4.5 (SB-4)
Date Extracted: 01/19/89
Date Analyzed : 01/21/89

CHEMWEST I.D.: 3128-1
Matrix : Soil

Compound	Amount Detected (mg/Kg)	RL (mg/Kg)
Benzene	1.00	0.05
Toluene	0.9	0.1
Ethyl Benzene	2.3	0.2
Total-Xylenes (1)	5.8	0.1
Total Petroleum Hydrocarbon (Purgeable)	160	10

Surrogate	% Recovery	Acceptance Window
Bromofluorobenzene	104%	50-150%

BRL: Below Reporting Limit.
RL: Reporting Limit.

(1): Total of P-, M-, and O- Xylenes.

Approved by: YP

REV2.9.88

CHEMWEST ANALYTICAL LABORATORIES
BENZENE, TOLUENE, ETHYL BENZENE, XYLENES
AND TOTAL PETROLEUM HYDROCARBONS - PURGEABLE

Client I.D.: 9.0-9.5 (SB-4)
Date Extracted: 01/19/89
Date Analyzed : 01/21/89

CHEMWEST I.D.: 3128-2
Matrix : Soil

Compound	Amount Detected (mg/Kg)	RL (mg/Kg)
Benzene	BRL	0.05
Toluene	BRL	0.1
Ethyl Benzene	BRL	0.2
Total-Xylenes (1)	BRL	0.1
Total Petroleum Hydrocarbon (Purgeable)	BRL	10

Surrogate	% Recovery	Acceptance Window
Bromofluorobenzene	105%	50-150%

BRL: Below Reporting Limit.
RL: Reporting Limit.

(1): Total of P-, M-, and O- Xylenes.

Approved by: _____

REV2.9.88

CHEMWEST ANALYTICAL LABORATORIES
BENZENE, TOLUENE, ETHYL BENZENE, XYLENES
AND TOTAL PETROLEUM HYDROCARBONS - PURGEABLE

Client I.D.: 4.0-4.5 (SB-5)
Date Extracted: 01/19/89
Date Analyzed : 01/21/89

CHEMWEST I.D.: 3128-3
Matrix : Soil

Compound	Amount Detected (mg/Kg)	RL (mg/Kg)
Benzene	0.33	0.05
Toluene	BRL	0.1
Ethyl Benzene	BRL	0.2
Total-Xylenes (1)	BRL	0.1
Total Petroleum Hydrocarbon (Purgeable)	BRL	10

Surrogate	% Recovery	Acceptance Window
Bromofluorobenzene	109%	50-150%

BRL: Below Reporting Limit.
RL: Reporting Limit.

(1): Total of P-, M-, and O- Xylenes.

Approved by: KP

REV2.9.88

CHEMWEST ANALYTICAL LABORATORIES
BENZENE, TOLUENE, ETHYL BENZENE, XYLENES
AND TOTAL PETROLEUM HYDROCARBONS - PURGEABLE

Client I.D.: 9.0-9.5 (SB-5)
Date Extracted: 01/19/89
Date Analyzed : 01/21/89

CHEMWEST I.D.: 3128-4
Matrix : Soil

Compound	Amount Detected (mg/Kg)	RL (mg/Kg)
Benzene	BRL	0.05
Toluene	BRL	0.1
Ethyl Benzene	BRL	0.2
Total-Xylenes (1)	BRL	0.1
Total Petroleum Hydrocarbon (Purgeable)	BRL	10

Surrogate	% Recovery	Acceptance Window
Bromofluorobenzene	100%	50-150%

BRL: Below Reporting Limit.
RL: Reporting Limit.

(1): Total of P-, M-, and O- Xylenes.

Approved by: _____

REV2.9.88

CHEMWEST ANALYTICAL LABORATORIES
BENZENE, TOLUENE, ETHYL BENZENE, XYLENES
AND TOTAL PETROLEUM HYDROCARBONS - PURGEABLE

Client I.D.: 5.0-5.5 (SB-6)
Date Extracted: 01/19/89
Date Analyzed : 01/21/89

CHEMWEST I.D.: 3128-5
Matrix : Soil

Compound	Amount Detected (mg/Kg)	RL (mg/Kg)
Benzene	BRL	0.05
Toluene	BRL	0.1
Ethyl Benzene	BRL	0.2
Total-Xylenes (1)	BRL	0.1
Total Petroleum Hydrocarbon (Purgeable)	BRL	10

Surrogate	% Recovery	Acceptance Window
Bromofluorobenzene	100%	50-150%

BRL: Below Reporting Limit.
RL: Reporting Limit.

(1): Total of P-, M-, and O- Xylenes.

Approved by: _____

REV2.9.88

CHEMWEST ANALYTICAL LABORATORIES
BENZENE, TOLUENE, ETHYL BENZENE, XYLENES
AND TOTAL PETROLEUM HYDROCARBONS - PURGEABLE

Client I.D.: 5.5-6.0 (SB-6)
Date Extracted: 01/19/89
Date Analyzed : 01/21/89

CHEMWEST I.D.: 3128-6
Matrix : Soil

Compound	Amount Detected (mg/Kg)	RL (mg/Kg)
Benzene	BRL	0.05
Toluene	BRL	0.1
Ethyl Benzene	BRL	0.2
Total-Xylenes (1)	BRL	0.1
Total Petroleum Hydrocarbon (Purgeable)	BRL	10

Surrogate	% Recovery	Acceptance Window
Bromofluorobenzene	99%	50-150%

BRL: Below Reporting Limit.
RL: Reporting Limit.

(1): Total of P-, M-, and O- Xylenes.

Approved by: JP

REV2.9.88

CHEMWEST ANALYTICAL LABORATORIES
BENZENE, TOLUENE, ETHYL BENZENE, XYLENES
AND TOTAL PETROLEUM HYDROCARBONS - PURGEABLE

Client I.D.: 4.0-4.5 (SB-7)
Date Extracted: 01/19/89
Date Analyzed : 01/21/89

CHEMWEST I.D.: 3128-7
Matrix : Soil

Compound	Amount Detected (mg/Kg)	RL (mg/Kg)
Benzene	BRL	0.05
Toluene	BRL	0.1
Ethyl Benzene	BRL	0.2
Total-Xylenes (1)	BRL	0.1
Total Petroleum Hydrocarbon (Purgeable)	BRL	10

Surrogate	% Recovery	Acceptance Window
Bromofluorobenzene	92%	50-150%

BRL: Below Reporting Limit.
RL: Reporting Limit.

(1): Total of P-, M-, and O- Xylenes.

Approved by: KP

REV2.9.88

CHEMWEST ANALYTICAL LABORATORIES
BENZENE, TOLUENE, ETHYL BENZENE, XYLENES
AND TOTAL PETROLEUM HYDROCARBONS - PURGEABLE

Client I.D.: 8.5-9.0 (SB-7)
Date Extracted: 01/19/89
Date Analyzed : 01/21/89

CHEMWEST I.D.: 3128-8
Matrix : Soil

Compound	Amount Detected (mg/Kg)	RL (mg/Kg)
Benzene	BRL	0.05
Toluene	BRL	0.1
Ethyl Benzene	BRL	0.2
Total-Xylenes (1)	BRL	0.1
Total Petroleum Hydrocarbon (Purgeable)	BRL	10

Surrogate	% Recovery	Acceptance Window
Bromofluorobenzene	95%	50-150%

BRL: Below Reporting Limit.
RL: Reporting Limit.

(1): Total of P-, M-, and O- Xylenes.

Approved by: YP

REV2.9.88

CHEMWEST ANALYTICAL LABORATORIES
BENZENE, TOLUENE, ETHYL BENZENE, XYLENES
AND TOTAL PETROLEUM HYDROCARBONS - PURGEABLE

Client I.D.: 5.5-6.0 (SB-8)
Date Extracted: 01/19/89
Date Analyzed : 01/21/89

CHEMWEST I.D.: 3128-9
Matrix : Soil

Compound	Amount Detected (mg/Kg)	RL (mg/Kg)
Benzene	0.43	0.05
Toluene	BRL	0.1
Ethyl Benzene	BRL	0.2
Total-Xylenes (1)	BRL	0.1
Total Petroleum Hydrocarbon (Purgeable)	19	10

Surrogate	% Recovery	Acceptance Window
Bromofluorobenzene	93%	50-150%

BRL: Below Reporting Limit.
RL: Reporting Limit.

(1): Total of P-, M-, and O- Xylenes.

Approved by: YP

REV2.9.88

CHEMWEST ANALYTICAL LABORATORIES
BENZENE, TOLUENE, ETHYL BENZENE, XYLENES
AND TOTAL PETROLEUM HYDROCARBONS - PURGEABLE

Client I.D.: 9.0-9.5 (SB-8)
Date Extracted: 01/19/89
Date Analyzed : 01/21/89

CHEMWEST I.D.: 3128-10
Matrix : Soil

Compound	Amount Detected (mg/Kg)	RL (mg/Kg)
Benzene	BRL	0.05
Toluene	BRL	0.1
Ethyl Benzene	BRL	0.2
Total-Xylenes (1)	BRL	0.1
Total Petroleum Hydrocarbon (Purgeable)	BRL	10

Surrogate	% Recovery	Acceptance Window
Bromofluorobenzene	91%	50-150%

BRL: Below Reporting Limit.
RL: Reporting Limit.

(1): Total of P-, M-, and O- Xylenes.

Approved by: _____

REV2.9.88

CHEMWEST ANALYTICAL LABORATORIES
BENZENE, TOLUENE, ETHYL BENZENE, XYLENES
AND TOTAL PETROLEUM HYDROCARBONS - PURGEABLE

Client I.D.: 4.0-4.5 (SB-9)
Date Extracted: 01/19/89
Date Analyzed : 01/23/89

CHEMWEST I.D.: 3128-11
Matrix : Soil

Compound	Amount Detected (mg/Kg)	RL (mg/Kg)
Benzene	BRL	0.05
Toluene	BRL	0.1
Ethyl Benzene	BRL	0.2
Total-Xylenes (1)	BRL	0.1
Total Petroleum Hydrocarbon (Purgeable)	BRL	10

Surrogate	% Recovery	Acceptance Window
Bromofluorobenzene	95%	50-150%

BRL: Below Reporting Limit.
RL: Reporting Limit.

(1): Total of P-, M-, and O- Xylenes.

Approved by: _____

REV2.9.88

CHEMWEST ANALYTICAL LABORATORIES
BENZENE, TOLUENE, ETHYL BENZENE, XYLENES
AND TOTAL PETROLEUM HYDROCARBONS - PURGEABLE

Client I.D.: 9.0-9.5 (SB-9)
Date Extracted: 01/19/89
Date Analyzed : 01/23/89

CHEMWEST I.D.: 3128-12
Matrix : Soil

Compound	Amount Detected (mg/Kg)	RL (mg/Kg)
Benzene	BRL	0.05
Toluene	BRL	0.1
Ethyl Benzene	0.4	0.2
Total-Xylenes (1)	1.1	0.1
Total Petroleum Hydrocarbon (Purgeable)	39	10

Surrogate	% Recovery	Acceptance Window
Bromofluorobenzene	83%	50-150%

BRL: Below Reporting Limit.
RL: Reporting Limit.

(1): Total of P-, M-, and O- Xylenes.

Approved by: _____

REV2.9.88

CHEM WEST ANALYTICAL LABORATORIES, INC.
600 West North Market Blvd.
Sacramento, California 95834
(916) 923-0840 FAX (916) 923-1938

CLIENT

Order No. 3128
Date Rec'd. 1/17/89 @ 1635
Compl. Date:
Section Kiki Pocan

CLIENT: Harding Lawson Assoc.
1355 Willow Way Suite 109
Concord, CA 94520

Project Name: Texaco Assessment #9
Project No. 0225,082.03
P.O. NO.
Contact Randy Stone
Phone (415) 687-9160

ANALYSIS: Twelve soil samples rec'd under chain of Custody in 6" metal core tubes (12) to be analyzed for BTEX and TPH/GAS.

* Seven Day Turnaround Time

	Sample Id	Date	analysis	Matrix	Containers
3128-1	M.0-M.5 (SB-M)	1/12/89	See above	Soil	1-6" tube
-2	9.0-9.5 (SB-M)				
-3	M.0-M.5 (SB-5)				
-M	9.0-9.5 (SB-5)				
-5	5.0-5.5 (SB-6)				
-6	5.5-6.0 (SB-6)				
-7	M.0-M.5 (SB-7)				
-8	8.5-9.0 (SB-7)				
-9	5.5-6.0 (SB-8)				
-10	9.0-9.5 (SB-8)				
-11	M.0-M.5 (SB-9)				
-12	9.0-9.5 (SB-9)				

RI
M/ · MICHELLE TOLIVER

CHEM WEST COURIER

SAMPLE WILL BE HELD 30 DAYS UNLESS LONGER TIME IS ARRANGED

[redacted]
1355 Willow Way, Suite 109
Concord, California 94520
415/687-9660
Telecopy: 415/687-9673

CHAIN OF CUSTODY FORM

Lab: Chem-West

Samplers: David R. Hoss

Job Number: 02251.082.03

Name/Location: Tosco Assessment #9

Project Manager: E. Fosiano

Recorder: David R. Hoss (Signature Required)

SOURCE CODE	MATRIX: Water	Sediment	Soil	Oil	#CONTAINERS & PRESERV.: Unpres.	H_2SO_4	HNO_3	S.S. Tube	Ice	SAMPLE NUMBER OR LAB NUMBER: Yr	Wk	Seq	DATE: Yr	Mo	Dy	Time	STATION DESCRIPTION/ NOTES
SO			X					X	X	5	B	4	8	9	0	1	4.0-4.5'
SO			X					X	X	5	B	4					9.0-9.5'
SO			X					X	X	5	B	5					4.0-4.5'
SO			X					X	X	5	B	5					9.0-9.5'
SO			X					X	X	5	B	6					5.0-5.5'
SO			X					X	X	5	B	6					5.5-6.0'
SO			X					X	X	5	B	7					4.0-4.5'
SO			X					X	X	5	B	7					8.5-9.0'
SO			X					X	X	5	B	8					5.5-6.0'
SO			X					X	X	5	B	8					9.0-9.5'

ANALYSIS REQUESTED

EPA 601/8010	EPA 602/8020	EPA 624/8240	EPA 625/8270	Priority Pllmt. Metals	Benzene/Toluene/Xylene	Total Petrol. Hydrocarb. gas/s.
					X	X
					X	X
					X	X
					X	X
					X	X
					X	X
					X	X
					X	X
					X	X
					X	X

LAB NUMBER: Yr	Wk	Seq	DEPTH IN FEET	COL MTD CD	QA CODE	MISCELLANEOUS
						SAMPLES REC'D IN GOOD CONDITION

CHAIN OF CUSTODY RECORD

RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
David R. Hoss	Randolph Stone	1/17/89 0800
Randolph Stone	Gary Biasi G.B.	1/17/89 1120
	Gary Biasi GARY BIASI	1/17/89 1130
Gary Biasi GARY BIASI		1/17/89 1635

DISPATCHED BY: (Signature) Randolph Stone DATE/TIME

RECEIVED FOR LAB BY: (Signature) Michelle Bevier DATE/TIME 1635

METHOD OF SHIPMENT CHEM WEST COURIER

Laboratory Copy White — Project Office Copy Yellow — Field or Office Copy Pink

6533

[redacted]
1355 Willow Way, Suite 109
Concord, California 94520
415/687-9660
Telecopy: 415/687-9673

CHAIN OF CUSTODY FORM

Lab: Chem-West

Samplers: David R. Hoke

Job Number: 02751,082.03

Name/Location: Texaco Assessment #9

Project Manager: G. Fasano

Recorder: David R. Hoke (Signature Required)

SOURCE CODE	MATRIX: Water	Sediment	Soil	Oil	#CONTAINERS & PRESERV.: Unpres.	H_2SO_4	HNO_3	5.5 Tube Ice	SAMPLE NUMBER OR LAB NUMBER: Yr	Wk	Seq	DATE: Yr	Mo	Dy	Time	STATION DESCRIPTION/ NOTES
SO			X						SB	9		89	01	12		4.0-4.5'
SO			X						SB	9			↓			9.0-9.5'

SAMPLES REC'D IN GOOD CONDITION

ANALYSIS REQUESTED

EPA 601/8010	EPA 602/8020	EPA 624/8240	EPA 625/8270	Priority Pllnt. Metals	Benzene/Toluene/Xylene	Total Petrol. Hydrocarb. gas
					X	X
					X	X

LAB NUMBER: Yr	Wk	Seq	DEPTH IN FEET	COL MTD CD	QA CODE	MISCELLANEOUS

CHAIN OF CUSTODY RECORD

RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
David R. Hoke	Randolph Stone	1/13/89 0800
RELINQUISHED BY: (Signature) Randolph Stone	RECEIVED BY: (Signature) Gary Biase GB	1/17/89 1120
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature) Gary Biase GARY BIA	1/17/89 1130
RELINQUISHED BY: (Signature) Gary Biase GARY BIASE	RECEIVED BY: (Signature)	1/17/89 1635
DISPATCHED BY: (Signature) Randolph Stone	DATE/TIME	RECEIVED FOR LAB BY: (Signature) Michelle Johnson 1/17 1685

METHOD OF SHIPMENT: CHEM WEST COURIER

Laboratory Copy White — Project Office Copy Yellow — Field or Office Copy Pink

6533

CHEMWEST
ANALYTICAL LABORATORIES, INC.

March 15, 1989

Harding Lawson
1355 Willow Way, Suite 109
Concord, CA 94520

Attention: Mr. Randy Stone

Subject: Report of Data - Case Number 3405

Dear Mr. Stone:

The technical staff at CHEMWEST is pleased to provide our report for the analyses you requested: Total Petroleum Hydrocarbons, Purgeable (gasoline) - DHS Method, LUFT Field Manual; and BTEX - EPA Method 602.

Five soil samples for Project Texaco #9, E. 12th were received March 3, 1989 in good condition. Results of the analyses, along with the analytical methodology and appropriate reporting limits, are presented on the following pages.

Thank you for choosing CHEMWEST Laboratories. Should you have questions concerning this data report or the analytical methods employed, please do not hesitate to contact Toni Weeks, our Technical Service Representative, or your project manager. We hope that you will consider CHEMWEST Laboratories for your future analytical support and service requirements.

Sincerely,

Robert T. Hart
Data Control Manager

and Kirk Pocan
Project Manager

KP:bw

cc: Joel Bird, President
File

ANALYTICAL METHODOLOGY

BTEX (Benzene, Toluene, Ethyl Benzene, and Xylenes) by Purge & Trap and GC-PID

WATER - Method 602 or 8020

A 5 ml sample volume, or 5 ml of a suitable dilution, is purged on a suitable purge and trap system with helium. The purged sample is analyzed on a Gas Chromatograph equipped with a Photoionization Detector (PID). A packed column is used to separate the compounds.

SOIL - Method 8020

A 10 gram, or other appropriate aliquot of soil, is weighed into a clean VOA vial. Soils received in brass core tubes are sampled by discarding 2-5 centimeters of soil from each end of the tubes (this is done to reduce the possibility of analyzing a portion of soil that has been exposed to sampling technique contamination). Equal aliquots of soil are then removed from each end of the tube and combined in the VOA vial. Soil in jars or bags is aliquoted using a similar technique, which discards exposed sample surfaces. A 10 ml, or other appropriate volume of methanol, is added to the soil and the soil is shaken with the solvent. 100 ul of the extract, or a reduced aliquot or volume of a suitable dilution, is injected into 5 ml of laboratory blank water and analyzed by the same technique used for water samples.

ANALYTICAL METHODOLOGY

Total Petroleum Hydrocarbons by Purge & Trap and GC-FID

WATER - DHS Method - Luft Field Manual

A 5 ml sample volume, or 5 ml of a suitable dilution, is purged on a suitable purge and trap system with helium. The purged sample is analyzed on a Gas Chromatograph equipped with a Flame Ionization Detector (FID). A packed column is used to separate the compounds.

SOIL - DHS Method - Luft Field Manual

A 10 gram, or other appropriate aliquot of soil, is weighed into a clean VOA vial. Soils received in brass core tubes are sampled by discarding 2-5 centimeters of soil from each end of the tubes (this is done to reduce the possibility of analyzing a portion of soil that has been exposed to sampling technique contamination). Equal aliquots of soil are then removed from each end of the tube and combined in the VOA vial. Soil in jars or bags is aliquoted using a similar technique, which discards exposed sample surfaces. A 10 ml, or other appropriate volume of methanol, is added to the soil and the soil is shaken with the solvent. 100 ul of the extract, or a reduced aliquot or volume of a suitable dilution, is injected into 5 ml of laboratory blank water and analyzed by the same technique used for water samples.

CHEMWEST ANALYTICAL LABORATORIES
BENZENE, TOLUENE, ETHYL BENZENE, XYLENES AND TOTAL PETROLEUM HYDROCARBONS - PURGEABLE

Client I.D.: SB-10-1
Date Extracted: 03/06/89
Date Analyzed : 03/07/89

CHEMWEST I.D.: 3405-1
Matrix : Soil

Compound	Amount Detected (mg/Kg)	RL (mg/Kg)
Benzene	BRL	0.05
Toluene	BRL	0.1
Ethyl Benzene	BRL	0.2
Total-Xylenes (1)	BRL	0.1
Total Petroleum Hydrocarbon (Purgeable)	BRL	10

Surrogate	% Recovery	Acceptance Window
Bromofluorobenzene	88%	50-150%

BRL: Below Reporting Limit.
RL: Reporting Limit.

(1): Total of P-, M-, and O- Xylenes.

Approved by: KP

REV2.9.88

CHEMWEST ANALYTICAL LABORATORIES
BENZENE, TOLUENE, ETHYL BENZENE, XYLENES
AND TOTAL PETROLEUM HYDROCARBONS - PURGEABLE

Client I.D.: SB-10-2
Date Extracted: 03/06/89
Date Analyzed : 03/07/89

CHEMWEST I.D.: 3405-2
Matrix : Soil

Compound	Amount Detected (mg/Kg)	RL (mg/Kg)
Benzene	BRL	0.05
Toluene	BRL	0.1
Ethyl Benzene	BRL	0.2
Total-Xylenes (1)	BRL	0.1
Total Petroleum Hydrocarbon (Purgeable)	BRL	10

Surrogate	% Recovery	Acceptance Window
Bromofluorobenzene	87%	50-150%

BRL: Below Reporting Limit.
RL: Reporting Limit.

(1): Total of P-, M-, and O- Xylenes.

Approved by: YP

REV2.9.88

CHEMWEST ANALYTICAL LABORATORIES
BENZENE, TOLUENE, ETHYL BENZENE, XYLENES
AND TOTAL PETROLEUM HYDROCARBONS - PURGEABLE

Client I.D.: SB-11-1
Date Extracted: 03/06/89
Date Analyzed : 03/07/89

CHEMWEST I.D.: 3405-3
Matrix : Soil

Compound	Amount Detected (mg/Kg)	RL (mg/Kg)
Benzene	BRL	0.05
Toluene	0.1	0.1
Ethyl Benzene	BRL	0.2
Total-Xylenes (1)	BRL	0.1
Total Petroleum Hydrocarbon (Purgeable)	BRL	10

Surrogate	% Recovery	Acceptance Window
Bromofluorobenzene	93%	50-150%

BRL: Below Reporting Limit.
RL: Reporting Limit.

(1): Total of P-, M-, and O- Xylenes.

Approved by: _____

REV2.9.88

CHEMWEST ANALYTICAL LABORATORIES
BENZENE, TOLUENE, ETHYL BENZENE, XYLENES
AND TOTAL PETROLEUM HYDROCARBONS - PURGEABLE

Client I.D.: SB-11-2
Date Extracted: 03/06/89
Date Analyzed : 03/07/89

CHEMWEST I.D.: 3405-4
Matrix : Soil

Compound	Amount Detected (mg/Kg)	RL (mg/Kg)
Benzene	BRL	0.05
Toluene	BRL	0.1
Ethyl Benzene	BRL	0.2
Total-Xylenes (1)	BRL	0.1
Total Petroleum Hydrocarbon (Purgeable)	BRL	10

Surrogate	% Recovery	Acceptance Window
Bromofluorobenzene	85%	50-150%

BRL: Below Reporting Limit.
RL: Reporting Limit.

(1): Total of P-, M-, and O- Xylenes.

Approved by: YL

REV2.9.88

CHEMWEST ANALYTICAL LABORATORIES
BENZENE, TOLUENE, ETHYL BENZENE, XYLENES
AND TOTAL PETROLEUM HYDROCARBONS - PURGEABLE

Client I.D.: DS-1-1
Date Extracted: Ø3/Ø6/89
Date Analyzed : Ø3/Ø7/89

CHEMWEST I.D.: 34Ø5-5
Matrix : Soil

Compound	Amount Detected (mg/Kg)	RL (mg/Kg)
Benzene	BRL	Ø.Ø5
Toluene	BRL	Ø.1
Ethyl Benzene	BRL	Ø.2
Total-Xylenes (1)	BRL	Ø.1
Total Petroleum Hydrocarbon (Purgeable)	BRL	1Ø

Surrogate	% Recovery	Acceptance Window
Bromofluorobenzene	85%	5Ø-15Ø%

BRL: Below Reporting Limit.
RL: Reporting Limit.

(1): Total of P-, M-, and O- Xylenes.

Approved by: _____

REV2.9.88

CHEM WEST ANALYTICAL LABORATORIES, INC.
600 West North Market Blvd.
Sacramento, California 95834
(916) 923-0840 FAX (916) 923-1938

CLIENT

Order No. 3405
Date Rec'd. 3/3/89 17:55
Compl. Date
Section Kirk Pocan

CLIENT: Harding Lawson Associates
1355 Willow Way, Suite 109
Concord, CA 94520

Project Name: TEXACO #9, E. 12th.
Project No. 2251.082.03
P.O. NO.
Contact Randy Stone
Phone (415) 687-9660

ANALYSIS: Five soil samples recid under chain of custody in 6" Metal Core tubes (5) to be analyzed for BTEX & TPH-Gas. Seven Day Turn Around. Chain of custody does not agree; See C of C

	SAMPLE I.D.	DEPTH	DATE	ANALYSIS	MATRIX	CONTAINER
3405-1	SB-10-1	5.3	3/2/89	BTEX, TPH-G	Soil	6" Core Tube
-2	SB-10-2	11.0	"	" "	"	6" " "
-3	SB-11-1	5.0	"	" "	"	6" " "
-4	SB-11-2	11.0	"	" "	"	6" " "
-5	DS-1-1	COMPOSITE DRUM SAMPLE	"	" "	"	6" " "

Copy of Results to: Harding Lawson Associates
Invoice: 10324 Placer Lane
Sacramento, CA 95827
Attn: Greg Fasiano

B-1
BME
BILL MCKENNCE

CHEM WEST COURIER

SAMPLE WILL BE HELD 30 DAYS UNLESS LONGER TIME IS ARRANGED

HLA Harding Lawson Associates
7655 Willow Way, Suite 1
Concord, California 94520
415/687-9660
Telecopy: 415/687-9673

CHAIN OF CUSTODY FORM

Lab: CHEM WEST

Samplers: GLENN S. YOUNG

Job Number: 2251,082.03

Name/Location: TEXACO #9, E. 12TH

Project Manager: GL. FASIANO

Recorder: Glenn S Young (Signature Required)

SOURCE CODE	MATRIX: Water	Sediment	Soil	Oil	#CONTAINERS & PRESERV.: Unpres.	H_2SO_4	HNO_3	ICE	SAMPLE NUMBER OR LAB NUMBER: Yr	Wk	Seq	DATE: Yr	Mo	Dy	Time	STATION DESCRIPTION/ NOTES	EPA 601/8010	EPA 602/8020	EPA 624/8240	EPA 625/8270	Priority Pllnt. Metals	Benzene/Toluene/Xylene/E	Total Petrol. Hydrocarb.	AS GAS
48			X					X	SB	10	1	89	03	03	0900							X		X
48			X					X	SB	10	2				0915	X						X		X
48			X					X	SB	11	1				1020	7 Day Turnaround!						X		X
48			X					X	SB	11	2				1030							X		X
48			X					X	DS	1	1				1100	Mail invoice & results to: HLA 10324 Placer Ln. Sacto, CA 95827 ATTN: Greg Fasiano						X		X

LAB NUMBER: Yr	Wk	Seq	DEPTH IN FEET	COL MTD CD	QA CODE	MISCELLANEOUS
						* Chain of custody does not agree. Date on samples 3/2/89 - date on C of C 3/3/89. B.McG

CHAIN OF CUSTODY RECORD

RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
Glenn S Young	Gary Brase GARY BRASE	3-3-89 / 1240
Gary Brase GARY BRASE		3-3-89 / 1755

DISPATCHED BY: (Signature)	DATE/TIME	RECEIVED FOR LAB BY: (Signature)	DATE/TIME
		Bill McBerge BILL McBERGE	3/3/89 17:55

METHOD OF SHIPMENT: CHEM WEST COURIER

Laboratory Copy White — Project Office Copy Yellow — Field or Office Copy Pink

6533

APPENDIX E

Water Sample Chemical Test Data

CHEMWEST
ANALYTICAL LABORATORIES, INC.

November 8, 1988

Harding Lawson Associates
1355 Willow Way, Suite 109
Concord, CA 94520

Attention: Mr. Randy Stone

Subject: Report of Data - Case Number 2563

Dear Mr. Stone:

The technical staff at CHEMWEST is pleased to provide our report for the analysis you requested: BTEX - EPA Method 602.

One water sample for Project Texaco Assessment-Station #9, Project Number 02251,082.03 was received October 31, 1988 in good condition. Results of the analysis, along with the analytical methodology and appropriate reporting limits, are presented on the following pages.

Thank you for choosing CHEMWEST Laboratories. Should you have questions concerning this data report or the analytical methods employed, please do not hesitate to contact Toni Weeks, our Technical Service Representative, or your project manager. We hope that you will consider CHEMWEST Laboratories for your future analytical support and service requirements.

Sincerely,

Jill B. Henes, Ph.D.
Vice President of Technical Services

and

Kirk Pocan
Project Manager

KP:bw

cc: Joel Bird, President
File

ANALYTICAL METHODOLOGY

BTEX (Benzene, Toluene, Ethyl Benzene, and Xylenes) by Purge & Trap and GC-PID

WATER - Method 602 or 8020

A 5 ml sample volume, or 5 ml of a suitable dilution, is purged on a suitable purge and trap system with helium. The purged sample is analyzed on a Gas Chromatograph equipped with a Photoionization Detector (PID). A packed column is used to separate the compounds.

SOIL - Method 8020

A 10 gram, or other appropriate aliquot of soil, is weighed into a clean VOA vial. Soils received in brass core tubes are sampled by discarding 2-5 centimeters of soil from each end of the tubes (this is done to reduce the possibility of analyzing a portion of soil that has been exposed to sampling technique contamination). Equal aliquots of soil are then removed from each end of the tube and combined in the VOA vial. Soil in jars or bags is aliquoted using a similar technique, which discards exposed sample surfaces. A 10 ml, or other appropriate volume of methanol, is added to the soil and the soil is shaken with the solvent. 100 ul of the extract, or a reduced aliquot or volume of a suitable dilution, is injected into 5 ml of laboratory blank water and analyzed by the same technique used for water samples.

CHEMWEST ANALYTICAL LABORATORIES
BENZENE, TOLUENE, ETHYL BENZENE, XYLENES

Client I.D.: MW-9-C
Date Analyzed: 11/2/88

CHEMWEST I.D.: 2563
Matrix : Water

Compound	Amount Detected (ug/L)	RL (ug/L)
Benzene	BRL	0.5
Toluene	BRL	1
Ethyl Benzene	BRL	2
Total-Xylenes (1)	BRL	1

Surrogate	% Recovery	Acceptance Window
ortho-Chlorotoluene	91%	50-150%

BRL: Below Reporting Limit.
RL: Reporting Limit.

(1): Total of P-, M-, and O- Xylenes.

Approved by: _____

REV2.9.88

CHEM WEST ANALYTICAL LABORATORIES,INC.
600 West North Market Blvd.
Sacramento, California 95834
(916) 923-0840 FAX (916) 923-1938

CLIENT

Order No. 2563
Date Rec'd. 10/31/98@1630
Compl. Date
Section K. Doran

CLIENT: Harding Lawson Assoc.
1355 Willow Way Suite 109
Concord, CA 94520

Project Name: Texaco assessment - SS #9
Project No. 02251, 082.03
P.O. NO.
Contact
Phone (415) 687-9200

ANALYSIS: One water sample, received under chain of custody in 40ml VOA vials (2) to be analyzed for BTEX.

*Note: Seven Day Turnaround

	Sampled	Date	Time	analysis	Matrix	Containers
25163	MW 9-C	10/28	16:19	BTEX	water	2-40ml VOA

GC
M.T. MICHELLE TOLIVER

Chem West Courier

SAMPLE WILL BE HELD 30 DAYS UNLESS LONGER TIME IS ARRANGED

Harding Lawson Associates
1355 Willow Way, Suite 109
Concord, California 94520
415/687-9660
Telecopy: 415/687-9673

CHAIN OF CUSTODY FORM

Lab: ChemWest

Samplers: David R. Hosé
Glenn S. Young

Job Number: 02251,082.03
Name/Location: Texaco Assessment - Station #9
Project Manager: G. Fasano
Recorder: David R. Hosé (Signature Required)

SOURCE CODE	MATRIX: Water	Sediment	Soil	Oil	#CONTAINERS & PRESERV.: Unpres.	H_2SO_4	HNO_3	VOA(2)	SAMPLE NUMBER OR LAB NUMBER: Yr	Wk	Seq	DATE: Yr	Mo	Dy	Time	STATION DESCRIPTION/ NOTES
23	X							X	1	W	9C	88	10	28	1619	

SAMPLES REC'D IN GOOD CONDITION
H.T.

ANALYSIS REQUESTED

EPA 601/8010	EPA 602/8020	EPA 624/8240	EPA 625/8270	Priority Pltnt. Metals	Benzene/Toluene/Xylene (BTX&E)	Total Petrol. Hydrocarb.
					X	

LAB NUMBER: Yr	Wk	Seq	DEPTH IN FEET	COL MTD CD	QA CODE	MISCELLANEOUS

CHAIN OF CUSTODY RECORD

RELINQUISHED BY: (Signature) David R. Hosé	RECEIVED BY: (Signature)	DATE/TIME 10/31/88 1815
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME 10/31/88 1630
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
DISPATCHED BY: (Signature)	DATE/TIME	RECEIVED FOR LAB BY: (Signature) Michael Sullivan — DATE/TIME 10/31 1630
METHOD OF SHIPMENT	ChemWest Courier	

Laboratory Copy White — Project Office Copy Yellow — Field or Office Copy Pink

6533

CHEMWEST
ANALYTICAL LABORATORIES, INC.

November 10, 1988

Harding Lawson Associates
1355 Willow Way, Suite 109
Concord, CA 94520

Attention: Mr. Randy Stone

Subject: Report of Data - Case Number 2533

Dear Mr. Stone:

The technical staff at CHEMWEST is pleased to provide our report for the analysis you requested: BTEX - EPA Method 602.

Four water samples for Project Texaco Assessment-#9, Project Number 02251,082.03 were received October 26, 1988 in good condition. Results of the analysis, along with the analytical methodology and appropriate reporting limits, are presented on the following pages.

Thank you for choosing CHEMWEST Laboratories. Should you have questions concerning this data report or the analytical methods employed, please do not hesitate to contact Toni Weeks, our Technical Service Representative, or your project manager. We hope that you will consider CHEMWEST Laboratories for your future analytical support and service requirements.

Sincerely,

Jill B. Henes, Ph.D.
Vice President of Technical Services

and

Kirk Pocan
Project Manager

KP:bw

cc: Joel Bird, President
File

ANALYTICAL METHODOLOGY

BTEX (Benzene, Toluene, Ethyl Benzene, and Xylenes) by Purge & Trap and GC-PID

WATER - Method 602 or 8020

A 5 ml sample volume, or 5 ml of a suitable dilution, is purged on a suitable purge and trap system with helium. The purged sample is analyzed on a Gas Chromatograph equipped with a Photoionization Detector (PID). A packed column is used to separate the compounds.

SOIL - Method 8020

A 10 gram, or other appropriate aliquot of soil, is weighed into a clean VOA vial. Soils received in brass core tubes are sampled by discarding 2-5 centimeters of soil from each end of the tubes (this is done to reduce the possibility of analyzing a portion of soil that has been exposed to sampling technique contamination). Equal aliquots of soil are then removed from each end of the tube and combined in the VOA vial. Soil in jars or bags is aliquoted using a similar technique, which discards exposed sample surfaces. A 10 ml, or other appropriate volume of methanol, is added to the soil and the soil is shaken with the solvent. 100 ul of the extract, or a reduced aliquot or volume of a suitable dilution, is injected into 5 ml of laboratory blank water and analyzed by the same technique used for water samples.

CHEMWEST ANALYTICAL LABORATORIES
BENZENE, TOLUENE, ETHYL BENZENE, XYLENES

Client I.D.: MW9-A
Date Analyzed: 11/01/88

CHEMWEST I.D.: 2533-1
Matrix : Water

Compound	Amount Detected (ug/L)	RL (ug/L)
Benzene	BRL	0.5
Toluene	BRL	1
Ethyl Benzene	BRL	2
Total-Xylenes (1)	BRL	1

Surrogate	% Recovery	Acceptance Window
ortho-Chlorotoluene	68%	50-150%

BRL: Below Reporting Limit.
RL: Reporting Limit.

(1): Total of P-, M-, and O- Xylenes.

Approved by: KP

REV2.9.88

CHEMWEST ANALYTICAL LABORATORIES
BENZENE, TOLUENE, ETHYL BENZENE, XYLENES

Client I.D.: MW9-B
Date Analyzed: 11/01/88

CHEMWEST I.D.: 2533-2
Matrix : Water

Compound	Amount Detected (ug/L)	RL (ug/L)
Benzene	84	0.5
Toluene	BRL	1
Ethyl Benzene	3.1	2
Total-Xylenes (1)	3.2	1

Surrogate	% Recovery	Acceptance Window
ortho-Chlorotoluene	67%	50-150%

BRL: Below Reporting Limit.
RL: Reporting Limit.

(1): Total of P-, M-, and O- Xylenes.

Approved by: KP

REV2.9.88

CHEMWEST ANALYTICAL LABORATORIES
BENZENE, TOLUENE, ETHYL BENZENE, XYLENES

Client I.D.: MW9-D
Date Analyzed: 11/01/88

CHEMWEST I.D.: 2533-3
Matrix : Water

Compound	Amount Detected (ug/L)	RL (ug/L)
Benzene	BRL	0.5
Toluene	BRL	1
Ethyl Benzene	BRL	2
Total-Xylenes (1)	BRL	1

Surrogate	% Recovery	Acceptance Window
ortho-Chlorotoluene	61%	50-150%

BRL: Below Reporting Limit.
RL: Reporting Limit.

(1): Total of P-, M-, and O- Xylenes.

Approved by: XP

REV2.9.88

CHEMWEST ANALYTICAL LABORATORIES
BENZENE, TOLUENE, ETHYL BENZENE, XYLENES

Client I.D.: MW9-E
Date Analyzed: 11/01/88

CHEMWEST I.D.: 2533-4
Matrix : Water

Compound	Amount Detected (ug/L)	RL (ug/L)
Benzene	1.3	0.5
Toluene	BRL	1
Ethyl Benzene	BRL	2
Total-Xylenes (1)	BRL	1

Surrogate	% Recovery	Acceptance Window
ortho-Chlorotoluene	67%	50-150%

BRL: Below Reporting Limit.
RL: Reporting Limit.

(1): Total of P-, M-, and O- Xylenes.

Approved by: _____

REV2.9.88

CHEM WEST ANALYTICAL LABORATORIES,INC.
600 West North Market Blvd.
Sacramento, California 95834
(916) 923-0840 FAX (916) 923-1938

CLIENT

Order No. 2533
Date Rec'd. 10/26/88 @ 1905
Compl. Date
Section Kunk Pocan

CLIENT: Harding Lawson Assoc.
1355 Willow Way Suite 109
Concord, CA 94526

Project Name: Texaco Assessment #9
Project No. 02261,082.03
P.O. NO.
Contact
Phone (415) 687-9600

ANALYSIS: Four water samples rec'd under chain of custody in 40ml Vea vials (7) to be analyzed for BTEX.

* Seven day turnaround.

	Sample I.D.	Date analysis	Matrix	Containers
2533-1	MW9-A	10/24	BTEX	Water	2-40ml VOAs
-2	MW9-B	"	"	"	1-40ml VOAs
-3	MW9-D	"	"	"	2-40ml VOAs
-4	MW9-E	"	"	"	2-40ml VOAs

GC
M.T. MICHELLE TOLIVER

SAMPLE WILL BE HELD 30 DAYS UNLESS LONGER TIME IS ARRANGED

[redacted]
HLA
1355 Willow Way, Suite 109
Concord, California 94520
415/687-9660
Telecopy: 415/687-9673

CHAIN OF CUSTODY FORM

Lab: CHEM WEST

Samplers: David R. Hose
Glenn S. Young

Job Number: 02251, 082.03
Name/Location: Texaco Assessment - #9
Project Manager: G. Fasiano

Recorder: David R. Hose
(Signature Required)

SOURCE CODE	MATRIX: Water	Sediment	Soil	Oil	#CONTAINERS & PRESERV.: Unpres.	H_2SO_4	HNO_3	VOA (2)	SAMPLE NUMBER OR LAB NUMBER: Yr	Wk	Seq	DATE: Yr	Mo	Dy	Time	STATION DESCRIPTION/ NOTES	EPA 601/8010	EPA 602/8020	EPA 624/8240	EPA 625/8270	Priority Pllnt. Metals	Benzene/Toluene/Xylene +E	Total Petrol. Hydrocarb.
23	X							X	MW	9	A	88	10	24	1255							X	
23	X							X	MW	9	B				1500	1 VOA A.a Bubble Left at HLA Concord						X	
~~23~~	~~X~~							~~X~~	~~MW~~	~~9~~	~~C~~				~~1355~~							~~X~~	
23	X							X	MW	9	D				1530							X	
23	X							X	MW	9	E				1615							X	

LAB NUMBER: Yr	Wk	Seq	DEPTH IN FEET	COL MTD CD	QA CODE	MISCELLANEOUS

CHAIN OF CUSTODY RECORD

RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
David R. Hose	[signature]	10/24/88 1245
[signature]		10/24/88 1905

DISPATCHED BY: (Signature)	DATE/TIME	RECEIVED FOR LAB BY: (Signature)	DATE/TIME
		MICHELLE TOUVER [signature]	10/20 1905

METHOD OF SHIPMENT

6533

Laboratory Copy White | Project Office Copy Yellow | Field or Office Copy Pink

CHEMWEST
ANALYTICAL LABORATORIES, INC.

December 19, 1988

Harding Lawson Associates
1355 Willow Way, Suite 109
Concord, CA 94520

Attention: Mr. Greg Fasiano

Subject: Report of Data - Case Number 2820

Dear Mr. Fasiano:

The technical staff at CHEMWEST is pleased to provide our report for the analysis you requested: BTEX - EPA Method 602.

Three water samples for Project Texaco #9, Project Number 2251-082-03 were received December 7, 1988 in good condition. Results of the analysis, along with the analytical methodology and appropriate reporting limits, are presented on the following pages.

Thank you for choosing CHEMWEST Laboratories. Should you have questions concerning this data report or the analytical methods employed, please do not hesitate to contact Toni Weeks, our Technical Service Representative, or your project manager. We hope that you will consider CHEMWEST Laboratories for your future analytical support and service requirements.

Sincerely,

Jill B. Henes, Ph.D.
Vice President of Technical Services

and

Kirk Pocan
Project Manager

KP:bw

cc: Joel Bird, President
File

600W North Market Boulevard • Sacramento, CA 95834 • Phone (916) 923-0840 • FAX (916) 923-1938

A Subsidiary of CompuChem Corporation

ANALYTICAL METHODOLOGY

BTEX (Benzene, Toluene, Ethyl Benzene, and Xylenes) by Purge & Trap and GC-PID

WATER - Method 602 or 8020

A 5 ml sample volume, or 5 ml of a suitable dilution, is purged on a suitable purge and trap system with helium. The purged sample is analyzed on a Gas Chromatograph equipped with a Photoionization Detector (PID). A packed column is used to separate the compounds.

SOIL - Method 8020

A 10 gram, or other appropriate aliquot of soil, is weighed into a clean VOA vial. Soils received in brass core tubes are sampled by discarding 2-5 centimeters of soil from each end of the tubes (this is done to reduce the possibility of analyzing a portion of soil that has been exposed to sampling technique contamination). Equal aliquots of soil are then removed from each end of the tube and combined in the VOA vial. Soil in jars or bags is aliquoted using a similar technique, which discards exposed sample surfaces. A 10 ml, or other appropriate volume of methanol, is added to the soil and the soil is shaken with the solvent. 100 ul of the extract, or a reduced aliquot or volume of a suitable dilution, is injected into 5 ml of laboratory blank water and analyzed by the same technique used for water samples.

CHEMWEST ANALYTICAL LABORATORIES
BENZENE, TOLUENE, ETHYL BENZENE, XYLENES

Client I.D.: MW-9-F-2
Date Analyzed: 12/13/88

CHEMWEST I.D.: 2820-1
Matrix : Water

Compound	Amount Detected (ug/L)	RL (ug/L)
Benzene	BRL	0.5
Toluene	BRL	1
Ethyl Benzene	BRL	2
Total-Xylenes (1)	BRL	1

Surrogate	% Recovery	Acceptance Window
ortho-Chlorotoluene	70%	50-150%

BRL: Below Reporting Limit.
RL: Reporting Limit.

(1): Total of P-, M-, and O- Xylenes.

Approved by: _____

REV2.9.88

CHEMWEST ANALYTICAL LABORATORIES
BENZENE, TOLUENE, ETHYL BENZENE, XYLENES

Client I.D.: MW-9-H-1
Date Analyzed: 12/13/88

CHEMWEST I.D.: 2820-2
Matrix : Water

Compound	Amount Detected (ug/L)	RL (ug/L)
Benzene	BRL	0.5
Toluene	BRL	1
Ethyl Benzene	BRL	2
Total-Xylenes (1)	BRL	1

Surrogate	% Recovery	Acceptance Window
ortho-Chlorotoluene	78%	50-150%

BRL: Below Reporting Limit.
RL: Reporting Limit.

(1): Total of P-, M-, and O- Xylenes.

Approved by: YC

REV2.9.88

CHEMWEST ANALYTICAL LABORATORIES
BENZENE, TOLUENE, ETHYL BENZENE, XYLENES

Client I.D.: MW-9-~~0~~G
Date Analyzed: 12/13/88

CHEMWEST I.D.: 2820-3
Matrix : Water

Compound	Amount Detected (ug/L)	RL (ug/L)
Benzene	0.8	0.5
Toluene	BRL	1
Ethyl Benzene	BRL	2
Total-Xylenes (1)	BRL	1

Surrogate	% Recovery	Acceptance Window
ortho-Chlorotoluene	79%	50-150%

BRL: Below Reporting Limit.
RL: Reporting Limit.

(1): Total of P-, M-, and O- Xylenes.

Approved by: YP

REV2.9.88

CHEM WEST ANALYTICAL LABORATORIES INC.
600 West North Market Blvd.
Sacramento, California 95834
(916) 923-0840 FAX (916) 923-1938

CLIENT

2820

Order No.
Date Rec'd. 12/7/88 @ 1855
Compl. Date
Section Mark Pecan

CLIENT: Harding Lawson Assoc.
1355 Willow Way Suite 109
Concord, CA 94520

Project Name: Texaco #9
Project No. 2251-082-03
P.O. NO.
Contact Greg Iasiano
Phone (415) 687-9600

ANALYSIS: Three water samples received under chain of custody in 40ml VOA vials (2) to be analyzed for BTEX.

* Seven Day Turnaround

		Completed Date	analysis	Matrix	Container
2820-1	MW-9-F-2	12/6	BTEX	Water	2-40ml VOA Vials
-2	MW9-M-1	"	"	"	" " "
-3	MW9-6	12/2	"	"	" " "

GC
M.T. MICHELLE TOUVER

CHEM WEST COURIER

SAMPLE WILL BE HELD 30 DAYS UNLESS LONGER TIME IS ARRANGED

[redacted]
1555 Willow Way, Suite 109
Concord, California 94520
415/687-9660
Telecopy: 415/687-9673

CHAIN OF CUSTODY FORM

Lab: Chem West

Samplers: Herb Steffe / Dave Hosa

Job Number: 2251-082-03

Name/Location: Texaco #9

Project Manager: Greg Pasiano

Recorder: Herb Steffe (Signature Required)

SOURCE CODE	MATRIX: Water	Sediment	Soil	Oil	#CONTAINERS & PRESERV.: Unpres.	H_2SO_4	HNO_3	HCl/VOA	HCl	SAMPLE NUMBER OR LAB NUMBER: Yr	Wk	Seq	DATE: Yr	Mo	Dy	Time	STATION DESCRIPTION/ NOTES	EPA 601/8010	EPA 602/8020	EPA 624/8240	EPA 625/8270	Priority Pllmt. Metals	Benzene/Toluene/Xylene	Total Petrol. Hydrocarb.
W	X							X	X	MW	9	F 1	88	12	06	1344	7 day turnaround						X	
W	X							X	X	MW	9	F 2	88	12	06	1346							X	
W	X							X	X	MW	9	H 1	88	12	06	1605							X	
W	X							X	X	MW	9	H 2	88	12	06	1605							X	
																	SAMPLES REC'D IN GOOD CONDITION							

LAB NUMBER: Yr	Wk	Seq	DEPTH IN FEET	COL MTD CD	QA CODE	MISCELLANEOUS

CHAIN OF CUSTODY RECORD

RELINQUISHED BY: (Signature) Herb Steffe	RECEIVED BY: (Signature) [illegible]	DATE/TIME 12/07/88 1435
RELINQUISHED BY: (Signature) [illegible]	RECEIVED BY: (Signature)	DATE/TIME 12/07/88 1855
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
DISPATCHED BY: (Signature) DATE/TIME	RECEIVED FOR LAB BY: (Signature) [illegible]	DATE/TIME 12/7 1855
METHOD OF SHIPMENT: CHEM WEST COURIER		

Laboratory Copy White — Project Office Copy Yellow — Field or Office Copy Pink

6533

[redacted]rding[redacted]son [redacted]ciate[redacted]
1355 Willow Way, Suite 109
Concord, California 94520
415/687-9660
Telecopy: 415/687-9673

CHAIN OF CUSTODY FORM

Lab: Chem·West

Samplers: David R. Hose
Herb W. Stuffle

Job Number: 02251,082.03
Name/Location: Texaco Assessment #9
Project Manager: G. Fosiano
Recorder: David R. Hose
(Signature Required)

SOURCE CODE	MATRIX: Water	Sediment	Soil	Oil	#CONTAINERS & PRESERV.: Unpres.	H_2SO_4	HNO_3	VOA(3)	HCL	SAMPLE NUMBER OR LAB NUMBER: Yr	Wk	Seq	DATE: Yr	Mo	Dy	Time	STATION DESCRIPTION/ NOTES
23	X							X	X	M	W	96	88	12	02		7 day Turnaround

ANALYSIS REQUESTED

EPA 601/8010	EPA 602/8020	EPA 624/8240	EPA 625/8270	Priority Pllnt. Metals	Benzene/Toluene/Xylene	Total Petrol. Hydrocarb.
					X	

LAB NUMBER: Yr	Wk	Seq	DEPTH IN FEET	COL MTD CD	QA CODE	MISCELLANEOUS

CHAIN OF CUSTODY RECORD

RELINQUISHED BY: (Signature) David R. Hose	RECEIVED BY: (Signature)	DATE/TIME 12/07/88 1435
RELINQUISHED BY: (Signature) Thom S. Whistler TOM WHISTLER	RECEIVED BY: (Signature)	DATE/TIME 12/07/88 1855
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
DISPATCHED BY: (Signature) DATE/TIME	RECEIVED FOR LAB BY: (Signature) MICHELLE TOLVER	DATE/TIME 12/7 1855
METHOD OF SHIPMENT CHEM WEST COURIER		

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APPENDIX F

Method Of Slug Test Analysis

The slug tests were analyzed according to the method of Cooper et al. (1967). The water level recovery data were matched to a recovery-type curve, and the value of time on the data graph where $Tt/r_c^2 = 1$ on the type curve was noted. Here T is transmissivity (L^2/t), t is time after slug withdrawal, and r_c is the equivalent interior radius of the well casing (L).

Transmissivity was then estimated from

$$T = \frac{1.0 r_c^2}{t}$$

where t is the value of time on the data graph where $Tt/r_c^2 = 1$ on the type curve. The hydraulic conductivity, K, of the tested zone was calculated from

$$K = \frac{T}{b}$$

where b is the thickness of the zone.

DISTRIBUTION

3 copies: Texaco Refining and Marketing Inc.
100 Cutting Boulevard
Richmond, California 94804

Attention: R. R. Zielinski

GLF/RS/ly 031197L/R26

QUALITY CONTROL REVIEWER

Stephen J. Osborne
Principal Engineer