8·24·89

TEXACO REFINING AND MARKETING INC.
100 CUTTING BOULEVARD
RICHMOND CA 94804

August 10, 1989

Mr. Rafat Shahid
Alameda County Environmental Health Department
Hazardous Materials Division
80 Swan Way, Room 200
Oakland, CA 94621

Dear Mr. Shahid:

Enclosed is a copy of our environmental assessment report dated June 22, 1989 for the former Texaco service station located at 2225 Telegraph Avenue, Oakland, California.

We know of no particular hydrocarbon leaks or spills at the site. No petroleum hydrocarbons were found in vadose zone soils at or near the site. Detectable quantities of benzene, toluene, ethylbenzene, and xylenes (BTEX), however, were found in water from all on-site wells. There is BTEX in water from one of three nearby off-site monitoring wells. The complete lateral extent of BTEX in ground water is not presently known because of restricted access into the bordering city streets.

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

Very truly yours,

R.R. ZIELINSKI
Field Environmental
Supervisor

RRZ:kn

Enclosure

cc: Ms. Leslie Ferguson
San Francisco Bay Regional
Water Quality Control Board
1111 Jackson Street, Room 6040
Oakland, CA 94607

RR

DISTRIBUTION

ENVIRONMENTAL ASSESSMENT
FORMER TEXACO STATION NO. 62488000195
2225 TELEGRAPH AVENUE
OAKLAND, CALIFORNIA
April 6, 1989

June 22, 1989
Env. Assesment

		Copy No.
2 copies:	Texaco Refining and Marketing, Inc. 100 Cutting Boulevard Richmond, California 94804 Attention: Mr. R.R. Zelinski	1-2
1 copy:	Corporate Record Copy	3
1 copy:	Job File	4

GLF/SJO/cf/GF046aa

QUALITY CONTROL REVIEWER

Randolph Stone

Randolph Stone
Associate Hydrogeologist

Harding Lawson Associates

A Report Prepared for

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

ENVIRONMENTAL ASSESSMENT
FORMER TEXACO STATION NO. 62488000195
2225 TELEGRAPH AVENUE
OAKLAND, CALIFORNIA

HLA Job No. 02251,080.03

by

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June 22, 1989

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I 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. 62488000195) located at 2225 Telegraph Avenue in Oakland, California (Plate 1). The investigation findings and description of the environment assessment program are detailed in this report.

II PREVIOUS INVESTIGATION

In May 1988, Texaco Refining and Marketing Inc. retained HLA to conduct a Sensitive Receptor Survey (SRS) for the Texaco station at 2225 Telegraph Avenue 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 presented 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 four 2-inch-diameter, shallow ground-water monitoring wells (MW-6A, MW-6B, MW-6C, and MW-6D)
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 hydrocarbon in two wells, MW-6C and MW-6D. Water from MW-6C and MW-6D contained benzene concentrations of 7400 and 220 parts per billion (ppb) respectively. Water from MW-6C also contained 2300 ppb total xylenes. Water from MW-6A and MW-6B contained no detectable concentrations of BTEX. The soil boring logs, well completion details and a summary of the chemical test results are included in Appendix A.

III 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 surrounding area consists of commercial/retail businesses, including a Chevron service station immediately across Telegraph Avenue, and a Beacon service station northeast of the site (Plate 2). Adjacent south of the site is the 1st Baptist Church of Oakland. There is an apartment building immediately west of the site which is currently occupied. The aerial photograph, presented in Appendix B, shows the immediate site vicinity.

Surface elevation at the site is approximately 20 feet above mean sea level. **The land surface slopes gently to the southeast towards Lake Merritt,** and the Oakland/Alameda Inner Harbor, to an area of old tidal flats that have been recently filled. This area has been extensively developed, and surface water runoff is mainly controlled by the municipal storm sewer system.

A. 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. Local shallow subsurface geology consists of the Alameda formation overlain by the Temescal Formation. Both are alluvial deposits laid down in early to middle Pleistocene time. **Surface geology in the site vicinity is mapped as being within the Temescal Formation. The Temescal Formation is an alluvial fan deposit comprising interfingering lenses of clayey gravel, sandy silty clay, and sand-clay-silt mixtures.**

Approximately 1000 feet west of the site is an outcrop of the Merritt Sand. The Merritt Sand is a beach or near-shore Pleistocene deposit of slightly clayey, silty sand.

IV HYDROGEOLOGY

The East Bay Plain has been divided into seven ground water subareas on the basis of areal differences (ie, 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 Alameda and Temescal Formations along with the Merritt Sand, 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 results in slightly confined 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.

V 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.

A. 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 19, 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 C, 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 high vapor pressure and therefore can be quantified by soil-gas measurements. Soil-gas probe locations are shown on Plate 3.

B. Soil-Sample Collection

HLA explored subsurface conditions on and off site by drilling and sampling nine soil borings during October an November, 1988. Five of the borings were completed as monitoring wells (MW-6E through MW-6I). Boring locations are shown on Plate 3, and logs are presented on Plates 4 through 12. Off site exploration was not conducted to the north and east of the site because of restricted access into Telegraph and West Grand Avenues imposed by the City of Oakland and the existing underground Bay Area Rapid Transit (BART) tunnel (see Plate 2).

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 13. 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.

C. 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 14 through 18). The wells were constructed under permit from the Alameda County Flood Control and Water Conservation District. The annular space between the screen 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.

D. Water Quality Sampling

new wells developed / sampled on same day!

On October 19, 1988, the recently installed Monitoring Wells MW-6E and MW-6F were developed, sampled, and surveyed by an HLA technician. All other existing onsite wells were also sampled at this time. On December 7, 1988, Monitoring Wells MW-6G through MW-6I 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.

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.

VI SUBSURFACE CONDITIONS

A. Geologic Profile

All soils encountered within the borings were described in accordance with the USCS (Plate 13). Borings B-1 through B-3 and Monitoring Wells MW-6A through MW-6F were located on site within paved areas. Borings B-4 and wells MW-6G through MW-6I were located off-site in the adjacent sidewalks. As shown on Plates 4 through 12, subsurface materials generally consist of stiff, silty clay underlain by a dense silty sand layer of variable thickness. The top of the sand occurs at between 10 and 15 feet deep. In some borings, the sand layer is in turn underlain by more silty clay or silt. Ground water was initially encountered in the borings at approximately 13 feet below grade.

Relatively strong gasoline odors were observed in Borings B-1 and B-3 and MW-6H in soils very near the water table. In all other borings only trace amounts of gasoline vapors were found 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. The laboratory results are discussed in Section VII of this report.

The BART right-of-way is located beneath the intersection of Telegraph Avenue and West Grand Avenue. This portion of the BART system is underground. A small portion of this right-of-way encompasses the extreme eastern corner of the site.

B. Ground-Water Flow Patterns

The tops of well casings were surveyed to a temporary datum located at the western end of the dispenser island nearest West Grand Avenue 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 southwest, with a gradient of 0.004 feet per foot. As shown on the groundwater surface map, Plate 19, a slight variation in the ground-water flow direction is observed near the northern portion of the site. At this location, groundwater appears to flow to the west.

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-6A	98.99	13.40	85.59	no odor
MW-6B	98.81	12.94	85.87	no odor
MW-6C	99.89	14.10	85.79	hydrocarbon odor and sheen
MW-6D	98.78	13.44	85.34	hydrocarbon odor and sheen
MW-6E	98.99	13.70	85.29	no odor
MW-6F	99.91	14.48	85.43	no odor
MW-6G	99.16	12.22	86.94	no odor
MW-6H	97.93	12.36	85.57	hydrocarbon odor
MW-6I	97.60	12.83	84.77	no odor

Notes:

* Elevation relative to HLA temporary benchmark located at the western end of the dispenser island nearest West Grand Avenue 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.

VII DISCUSSION OF CHEMICAL TEST RESULTS

A. 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 BTEX and TPH. 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, procedures, and BTEX, using EPA Test Method 8020.
Ground Water -	BTEX, using EPA Test Method 602.

B. Distribution of Chemicals in Soil-gas

Detectable concentrations of petroleum products in soil-gas samples were limited to probe locations SG-3 and SG-4 (Plate 3). At these locations relative high concentrations of xylenes and TPH were detected in soil-gas samples obtained from depths of 12 and 13 feet at probe locations SG-3 and SG-4, respectively. Both SG-3 and SG-4 were located along the edge of Telegraph Avenue which possesses underground sewer and storm drain lines. The chromatograph resulting from these samples did not match that of gasoline. The on-site chemist informed us that it more closely resembled the pattern that a paint or varnish would produce. An example of a typical chromatograph produced by gasoline, and the chromatograph produced from samples obtained from SG-3 and SG-4 is presented in Appendix C.

Concentrations of petroleum products were less than the detection limit at probe locations SG-2, WS-5 and SG-6. Because of tight clays encountered at probe locations SG-1 and SG-7, we were not able to obtain soil-gas samples. 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 19, 1988

Concentrations in micrograms per liter (ug/L)

Sample	Depth (ft)	Benzene	Ethyl-Benzene	Toluene	Xylenes	Total Petroleum Hydrocarbons
Air	N/A	<0.7	<0.8	<0.8	<0.8	<0.7
SG-01	--	--	--	--	--	--
SG-02	5.0	<0.7	<0.8	<0.8	<0.8	<0.7
SG-03	12.0	10	4	<0.8	2,800	6,100
SG-04	13.0	<0.7	<0.8	<0.8	140	780
WS-05*	12.0	<75	<76	<77	<77	<75
SG-06	13.0	<0.7	<0.8	<0.8	<0.8	<0.7
SG-07	--	--	--	--	--	--
Air	N/A	<0.7	<0.8	<0.8	<0.8	<0.7

-- -Not able to obtain sample
N/A -not applicable
Air -ambient air sample
* -WS-05 was a sample of ground water

C. Soil Sample Test Results

Soil samples were obtained for chemical testing from on and off-site borings at the sample depths with the highest PID vapor readings. Laboratory results of chemical analyses on soil are presented in Table 3. Laboratory reports are presented in Appendix D.

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]
B-1	8.0	0.05	ND	ND	ND	ND
B-1	13.0	ND(5)	10(10)	16(10)	41(10)	2,000(1,000)
B-2	7.0	ND	ND	ND	ND	ND
B-2	13.5	ND	ND	ND	ND	ND
B-3	7.0	0.06	ND	ND	ND	ND
B-3	13.5	40(25)	84(50)	390(50)	370(50)	11,000(5,000)
B-4	13.5	ND	ND	ND	ND	ND
MW-6E	13.0	ND	ND	ND	ND	ND
MW-6F	13.0	ND	ND	ND	ND	ND
MW-6G	13.5	ND	ND	ND	ND	5.2
MW-6H	13.5	11(0.5)	3.8(2)	3.2(1)	19(1)	1,000(495)
MW-6I	13.5	ND	ND	ND	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 notes in parentheses.
4 Detection limit 10 mg/kg except as noted in parentheses.

Test results indicate the absence of BTEX or TPH in the vadose zone soils at the locations sampled. Relatively high concentrations of BTEX and TPH are found in soils very near the water table. The soil sample from boring B-3, from a depth of 13.5 feet, had the highest concentrations of BTEX (11,000 parts per million [ppm] TPH)*.

Soil from the same depth (approximately 13 feet) in B-1 and MW-6H also contained relatively high concentrations of TPH at 2,000 and 1,000 ppm respectively. Soil obtained from all other boring locations had either nondetectable concentrations, or concentrations very near the detection limit for BTEX and TPH.

D. Water Quality Results

Monitoring wells MW-6A through MW-6F were sampled on October 19, 1988 and wells MW-6G through MW-6I were sampled on December 7, 1988 using the procedures described in Section V. Results of chemical analyses on ground water samples are summarized in Table 4. Laboratory reports are presented in Appendix E.

*Indicated on Table 3 as milligrams per kilogram

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

EPA TEST METHOD 602

Well Number	Date Sampled	Benzene	Ethyl-Benzene	Toluene	Xylenes
MW-6A	10/20/88	0.6(0.5)	ND(2)	ND(1)	ND(1)
MW-6B	10/20/88	4.1(0.5)	ND(2)	2.5(1)	ND(1)
MW-6C	10/20/88	9,500(50)	170(2)	65(100)	850(1)
MW-6D	10/20/88	710(5)	22(20)	74(10)	110(10)
MW-6E	10/20/88	1.1(0.5)	ND(2)	ND(1)	3.4(1)
MW-6F	10/25/88	ND(0.5)	ND(2)	ND(1)	2.4(1)
MW-6G	12/07/88	ND(0.5)	ND(2)	ND(1)	ND(1)
MW-6H	12/07/88	1200(25)	110(20)	320(10)	220(10)
MW-6I	12/07/88	ND(0.5)	ND(2)	ND(1)	ND(1)

ND = Not detected.

Detection limits given in parentheses.

Detectable concentrations of BTEX were found in ground water samples from all on-site wells. Detectable concentrations of BTEX were also found in off-site well MW-6H. No BTEX was detected in off-site wells MW-6G and MW-6I.

VIII AQUIFER TESTING

The hydraulic conductivity of shallow saturated earth materials was estimated from the results of tests using three monitoring wells located generally downgradient of the underground fuel tanks on-site. Three single-well slug tests were performed using monitoring wells MW-6H, MW-6D, and MW-6E. At the time of the slug tests, the equilibrium water levels in the wells were 11.88, 12.59, and 12.58 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 statum adjacent to the screen in the saturated zone as hydraulically confined or unconfined.

Various techniques were used to rapidly remove from or inject into the wells a volume (slug) of water. Depending on the circumstances, slugs were removed by pumping them out of the wells with either a centrifugal suction pump or a submersible turbine pump. Slug injection was accomplished by rapidly releasing a volume of clean drinking water into the well. 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-6D	Injection	--	2	12.59	Confined
MW-6E	Withdrawal	Submersible	3	12.58	Confined
MW-6H	Withdrawal	Suction	1.5	11.88	Unconfined

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

The slug-test recovery hydrographs are shown in Plates 21, 22, and 23 for tests in MW-6D, MW-6E, and MW-6H, respectively. Table 6 lists the hydraulic conductivity estimates derived from the tests.

Table 6. Slug Test Results

Well Number	Lithology of Most Permeable Stratum	Thickness of Stratum (feet)	Estimated Hydraulic Conductivity of Stratum (feet/day)
MW-6D	sand	2	5.9
MW-6E	sand, fine-grained	2.5	1.2
MW-6H	sand, medium-grained	6	4.8

IX SUMMARY OF FINDINGS

Conclusions and observations are summarized as follows:

1. The shallow subsurface soils consist of 12 to 14 feet of silty and sandy clay underlain by 2 to 8 feet of sand. Clay was again encountered beneath the sand unit where the sand was relatively thin. The water table surface is approximately 12 to 13 feet below the ground surface.

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

3. The hydraulic conductivity of shallow fine-to medium-grained saturated sand beneath the site is estimated to range from 1.2 to 5.9 feet per day.

4. BTEX and TPH (as gasoline) have been detected exclusively in soils at 12 to 13 feet below the ground surface. This interval is within the zone of fluctuation of the groundwater table.

5. Elevated concentration of TPH and xylenes detected in SG-3 and SG-4 can most likely be attributed to the close proximity of these probe locations to the sanitary sewer and storm drain lines beneath Telegraph Avenue. The resulting chromatograph from vapor samples collected from these two probes more closely resembles the pattern a paint product or varnish would produce, neither of which would have commonly been stored or used on site.

6. As shown on Plate 20, shallow groundwater 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 is not known at this time because of restricted access into Telegraph and West Grand Avenues imposed by the city of Oakland. Subsurface exploration north of the site, into West Grand Avenue, was also restricted because of the existing BART tunnel.

7. The highest concentrations of BTEX in the ground water from onsite wells is found in MW-6C and MW-6D, which are very near the underground fuel tanks or directly downgradient of them. The underground tank complex most likely represented an onsite source. The relatively high concentrations of BTEX found in MW-6H, and at lower concentrations in MW-6B, may represent an unidentified off-site source, MW-6B is upgradient of the tanks and MW-6H is crossgradient.

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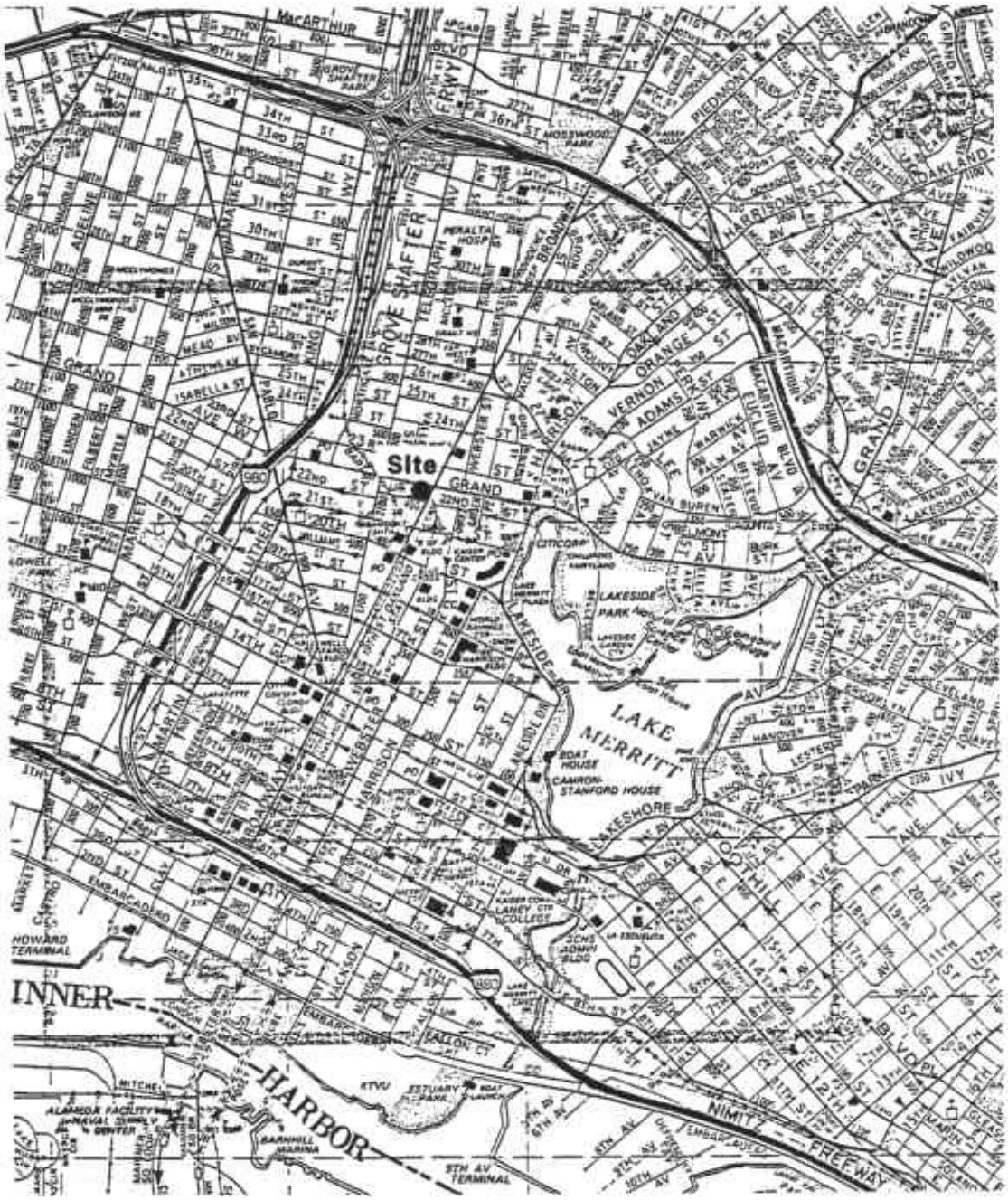
105649



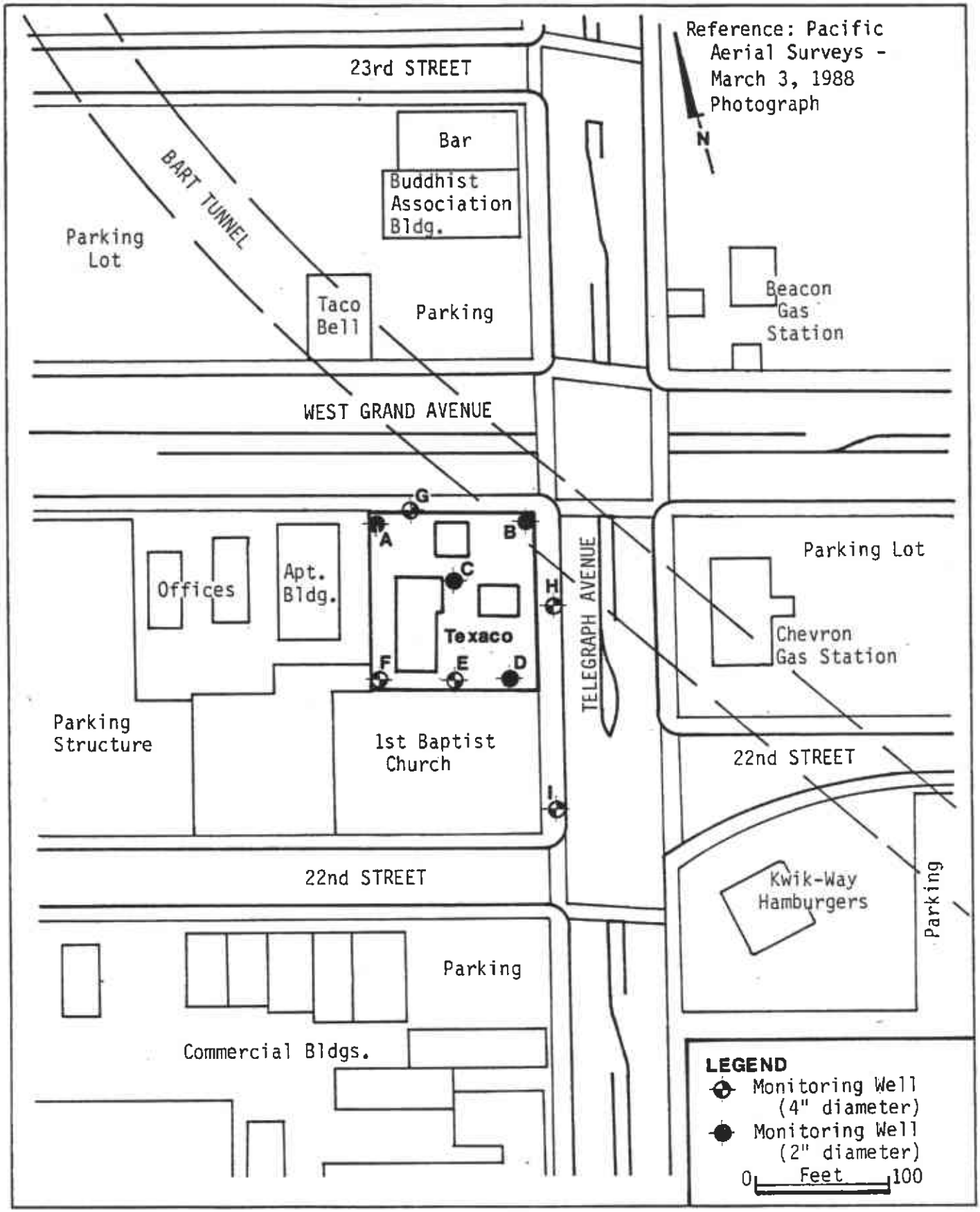
Harding Lawson Associates
Engineers and Geoscientists

Vicinity Map
Former Texaco Service Station
2225 Telegraph Avenue
Oakland, California

PLATE
1

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
YC	2251,080.03		2/89		

105649



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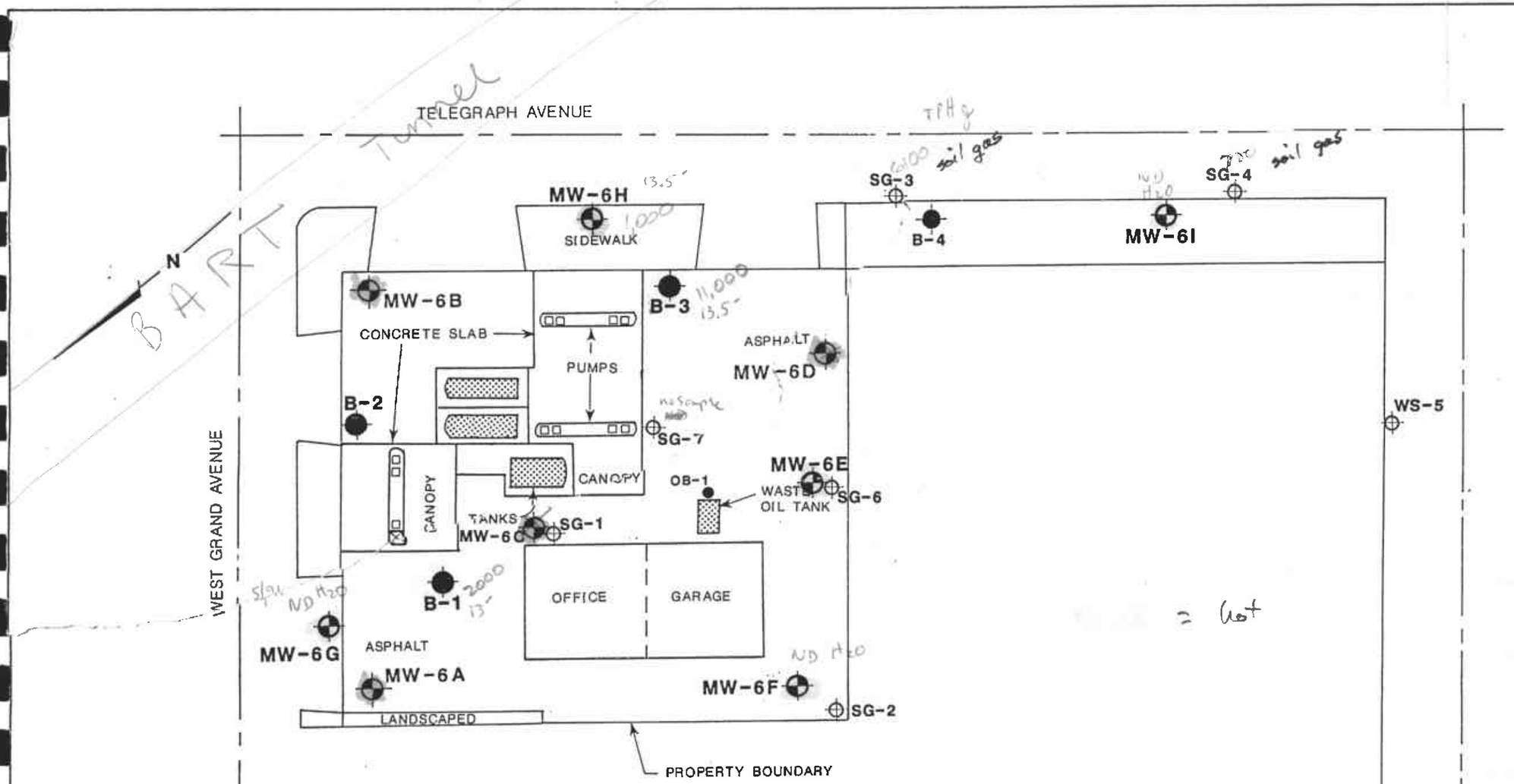
Engineers and Geoscientists

Area Map
Former Texaco Service Station
2225 Telegraph Avenue
Oakland, California

PLATE **2**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
YC	2251,080.03		12/88		



EXPLANATION

MW-6A ⊕ Monitoring Well Location and Number

OB-1 ● Observation Well Location and Number

B-2 ● Boring Locations

SG-1 ⊕ Soil-Gas Probe Location

30 60

SCALE IN FEET

⊠ Bench Mark (HLA Datum El. = 100 feet)

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Engineers and Geoscientists

Site Plan
Former Texaco Service Station
2225 Telegraph Avenue
Oakland, California

PLATE 3

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
YC	2251,080.03		2/89		

Equipment 8" Hollow Stem Auger

Elevation **~99.40' Date 10/04/88

Laboratory Tests	Blows/foot	GAS TECH (ppm)*	Depth (ft)	Sample	
		10	0		Asphalt Baserock up to 1-Inch Diameter GRAY BROWN LEAN CLAY WITH SILT (CL), Stiff, Moist
			5		Becomes Brown Becomes Very Stiff, Trace Very Fine Sand
	19	35			
			10		Becomes Very Sandy
	20	>500			BROWN GRAY POORLY GRADED SAND WITH CLAY (SP), Dense, Wet
	39	200	15		▽ Water Level 10/04/88 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

Harding Lawson Associates
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Log of Boring B-1
Former Texaco Service Station
2225 Telegraph Avenue
Oakland, California

PLATE **4**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
YC	2251,080.03		12/88		

Equipment 8" Hollow Stem Auger

Elevation ** 98.80' Date 10/04/88

Laboratory Tests	Blows/foot	GAS TECH (ppm)*	Depth (ft)	Sample	
			0		Asphalt Baserock GREENISH GRAY LEAN CLAY WITH SILT (CL), Stiff, Moist
			5		
	16	35			Fine Sand Lens Becomes Mottled Greenish Gray & Brown
			10		GREENISH GRAY POORLY GRADED SAND WITH SILT (SP), Dense, Moist, Medium-Grained
	41	30			▽ Water Level 10/04/88
			15		BROWN LEAN CLAY WITH SAND (CL), Very Stiff, Wet
	10	20			Absence of Sand Bottom of Boring at 19.5 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 B-2
Former Texaco Service Station
2225 Telegraph Avenue
Oakland, California

PLATE 5

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
YC	2251,080.03		12/88		

Equipment 8" Hollow Stem Auger

Elevation ** -98.0' Date 10/04/88

Laboratory Tests	Blows/foot	GAS TECH (ppm)*	Depth (ft)	Sample	
			0		Asphalt Baserock LIGHT BROWN LEAN CLAY WITH SILT (CL), Stiff, Dry
			5		Becomes Brown, Very Stiff, Trace Organics
	30	125			
			10		
	39	>500			▽ Water Level 10/04/88
			15		MOTTLED GRAY BROWN POORLY GRADED SAND (SP), Dense, Wet, Medium Grained With Silt
					MOTTLED GREENISH BLUE BROWN LEAN CLAY WITH SILT (CL), Stiff, Wet
	12	200	20		Bottom of Boring at 20.5 feet
			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-3
Former Texaco Service Station
2225 Telegraph Avenue
Oakland, California

PLATE **6**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
YC	2251,080.03		12/88		

Equipment 8" Hollow Stem Auger

Elevation ** 97.80' Date 11/17/88

Laboratory Tests	Blows/foot	PID(ppm)*	Depth (ft)	Sample
		ND	0	
		ND	5	
	27	ND	10	
	46	70	15	
			20	
			25	
			30	
			35	
			40	

Concrete

Baserock

MOTTLED BROWN LEAN CLAY WITH SILT (CL), Hard, Dry

GREENISH GRAY WELL GRADED SAND WITH SILT (SW), Very Dense, Moist, Medium-Grained

▽ Water Level 11/17/88

Bottom of Boring at 15.0 feet

* Photovac TIP I with 10.6 Electron Volt Lamp

** Reference Elevation (Arbitrary Datum)

ppm - Parts per Million

Harding Lawson Associates
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Log of Boring B-4
Former Texaco Service Station
2225 Telegraph Avenue
Oakland, California

PLATE 7

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
YC	2251,080.03		12/88		

Equipment 10.5" Hollow Stem Auger

Elevation **98.99' Date 10/04/88

Laboratory Tests	Blows/foot	GAS TECH (ppm)*	Depth (ft)	Sample	
			0		Asphalt Baserock up to 1-Inch Diameter
		ND			YELLOW BROWN LEAN CLAY WITH SAND (CL), Stiff, Moist; Very Fine Grained Sand
		ND			
	20	ND	5		Becomes Light Brown, Increase in Fine Sand Content
					Becomes Very Stiff
			10		Becomes Grayish Brown
					Greenish Staining
	34	75			▽ Water Level 10/04/88
			15		GREENISH GRAY WELL GRADED SAND (SW), Very Dense, Wet, Fine-Grained Sand
					LIGHT BROWN AND TAN SILT WITH CLAY (ML), Stiff, Saturated
	9	ND	20		Bottom of Boring at 21.5 feet
			25		
			30		
			35		
			40		

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

Harding Lawson Associates
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Log of Boring MW-6E
Former Texaco Service Station
2225 Telegraph Avenue
Oakland, California

PLATE 8

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
YC	2251,080.03		12/88		

Equipment 10.5" Hollow Stem Auger

Elevation **99.91' Date 10/05/88

Laboratory Tests	Blows/foot	GAS TECH (ppm)*	Depth (ft)	Sample	
			0		Asphalt Baserock
					BROWN LEAN CLAY WITH SILT (CL), Stiff, Moist, Trace Very Fine Sand
	32	ND	5		Becomes Light Brown, Very Stiff
	25	ND	10		Absence of Very Fine Sand Abundant Fine Sand
	23	ND			▽ Water Level 10/5/88
			15		GRAY BROWN POORLY GRADED SAND WITH SILT (SP), Dense, Wet, Fine-Grained
					LIGHT BROWN LEAN CLAY WITH SAND (CL), Stiff, Wet, Fine Sand
	18	ND	20		Bottom of Boring at 22.0 feet
			25		
			30		
			35		
			40		

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

Harding Lawson Associates
Engineers and Geoscientists

Log of Boring MW-6F
Former Texaco Service Station
2225 Telegraph Avenue
Oakland, California

PLATE 9

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
YC	2251,080.03		12/88		

Equipment 8" Hollow Stem Auger

Elevation **99.16' Date 11/16/88

Laboratory Tests	Blows/foot	PID(ppm)*	Depth (ft)	Sample	
			0		Concrete / Baserock
		ND			MOTTLED BROWN-BLUE LEAN CLAY WITH SILT AND SAND (CL), Stiff, Dry, Medium Grained
		5	5		
					Becomes Very Stiff
	12	1			
			10		
					GRAY BROWN POORLY SORTED SAND WITH SILT (SP), Dense, Wet, Medium Grained Sand
	38	ND			
			15		
					▽ Water Level 11/16/88
			20		Bottom of Boring at 20.0 feet
			25		
			30		
			35		
			40		

* Photovac TIP I with 10.6 Electron Volt Lamp

** Reference Elevation (Arbitrary Datum)

ppm - Parts per Million

Harding Lawson Associates
Engineers and Geoscientists

Log of Boring MW-6G
Former Texaco Service Station
2225 Telegraph Avenue
Oakland, California

PLATE **10**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
YC	2251,080.03		12/88		

Equipment 8" Hollow Stem Auger

Elevation **97.93' Date 11/16/88

Laboratory Tests	Blows/foot	PID(ppm)*	Depth (ft)	Sample	
		ND	0		Concrete Baserock
					MOTTLED BROWN-BLUE LEAN CLAY WITH SILT (CL), Stiff, Dry
			5		Becomes Moist
	13	13			
			10		GREENISH POORLY GRADED SAND WITH CLAY (SP), Dense, Wet, Medium-Grained
	6	350			▽ Water Level 11/16/88
			15		
					BROWN FAT CLAY WITH SILT (CL), Stiff, Wet
			20		Bottom of Boring at 21.0 feet
			25		
			30		
			35		
			40		

* Photovac TIP I 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-6H
Former Texaco Service Station
2225 Telegraph Avenue
Oakland, California

PLATE 11

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
YC	2251,080.03		12/88		

Equipment 8" Hollow Stem Auger

Elevation **97.60' Date 11/17/88

Laboratory Tests	Blows/foot	PID(ppm)*	Depth (ft)	Sample	
			0		Concrete / Baserock
	Hand Driven	ND			BROWN LEAN CLAY WITH SILT AND SAND (CL), Hard, Coarse Sand
		ND			Absence of Sand
			5		Becomes Sandy
	19	ND			Becomes Mottled Brown
			10		Becomes Medium Stiff
	29	ND			BROWNISH-GREEN WELL SORTED SAND (SW), Very Dense, Moist, Medium Grained
			15		▽ Water Level 11/17/88
					Becomes Silty, Saturated
			20		Becomes Clayey
					Bottom of Boring at 21.0 feet
			25		
			30		
			35		
			40		

* Photovac TIP I with 10.6 Electron Volt Lamp

** Reference Elevation (Arbitrary Datum)

ppm - Parts per Million

6196

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

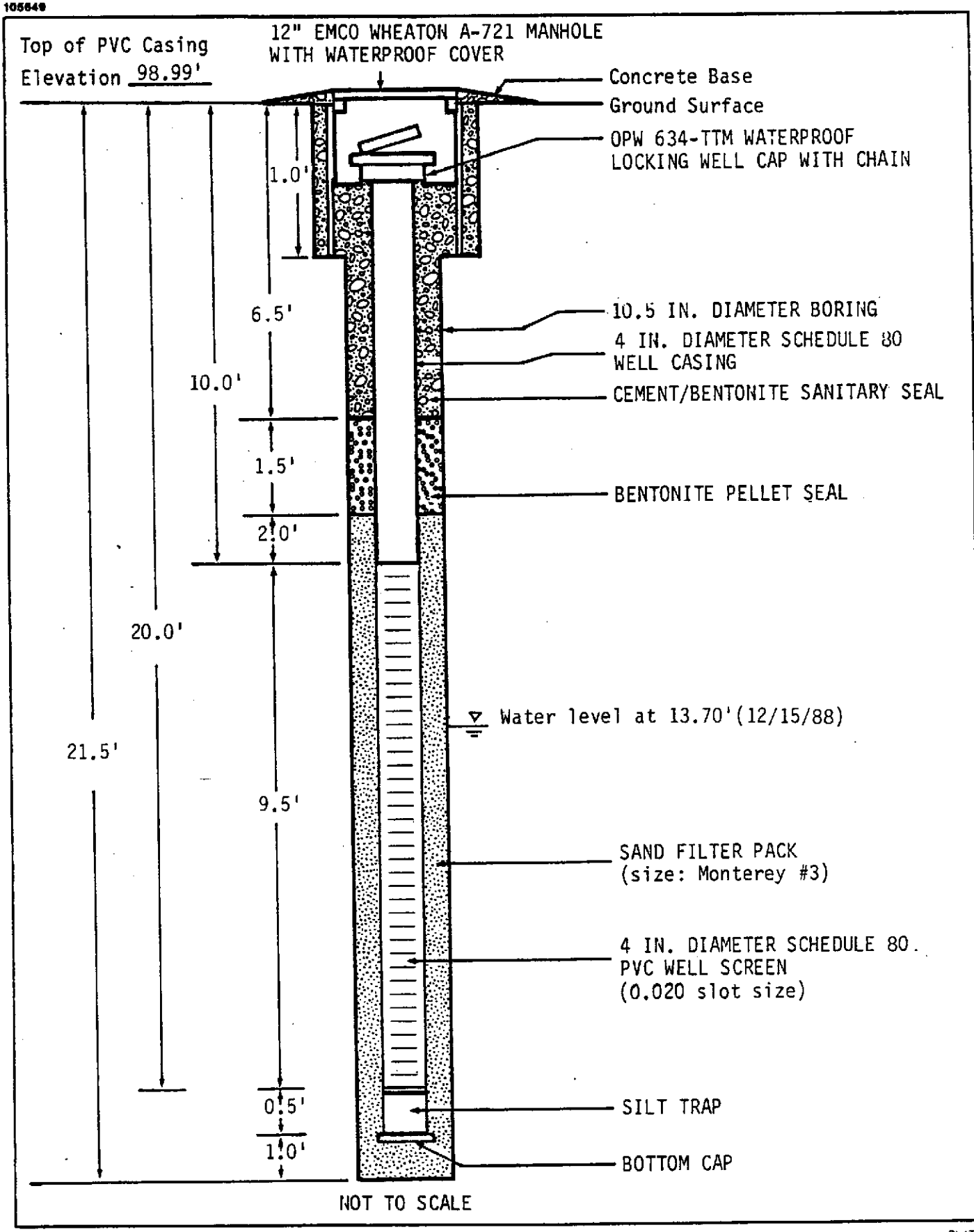
Harding Lawson Associates
Engineers and Geoscientists

Soil Classification and Test Data Key
Former Texaco Service Station
2225 Telegraph Avenue
Oakland, California

PLATE **13**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
	2251,080.03	[illegible]	2/89		

105649



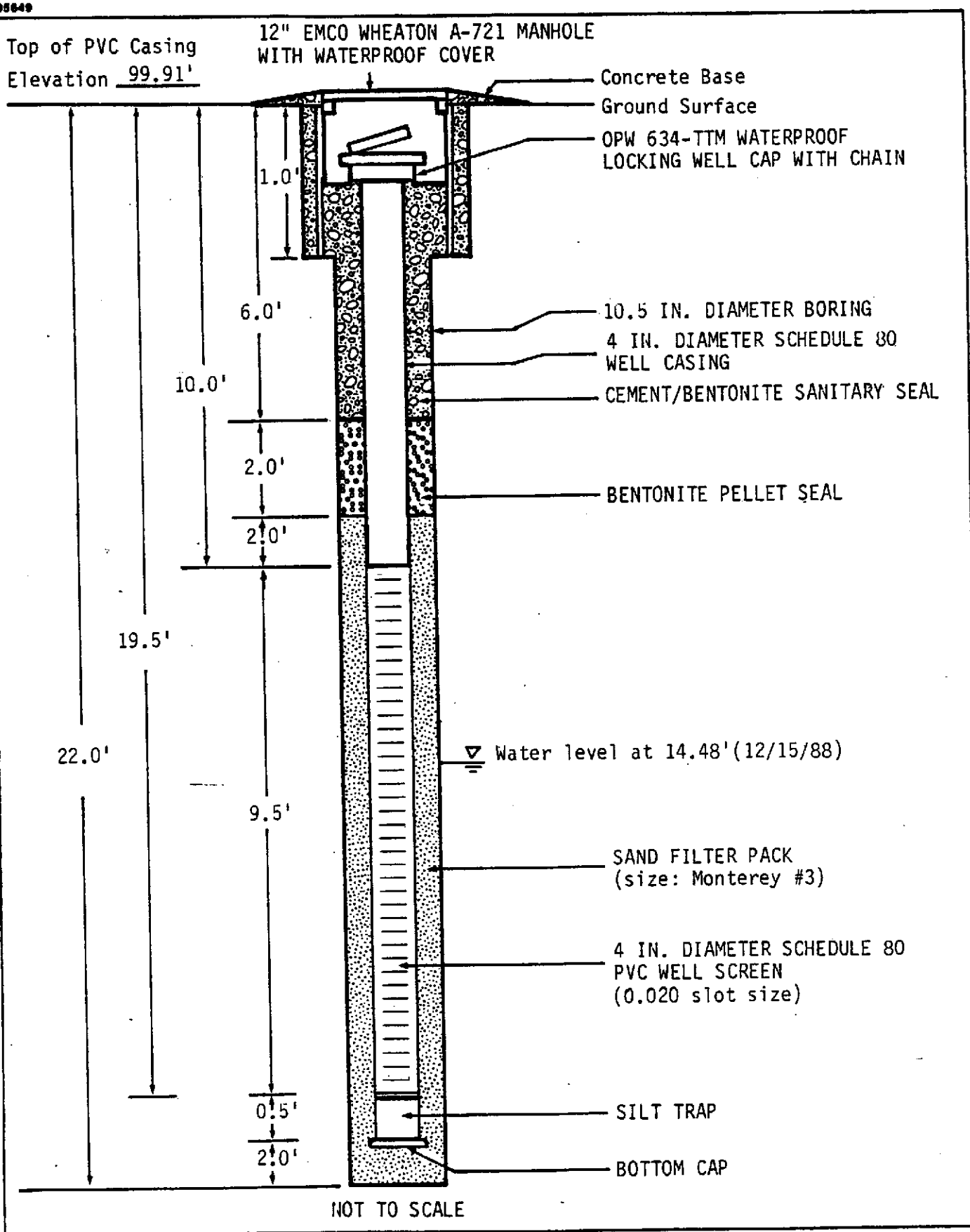
Harding Lawson Associates
Engineers and Geoscientists

Well Construction Diagram MW-6E
Former Texaco Service Station
2225 Telegraph Avenue
Oakland, California

PLATE
14

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
YC	2251,080.03		12/88		

105649



Harding Lawson Associates
Engineers and Geoscientists

Well Construction Diagram MW-6F
Former Texaco Service Station
2225 Telegraph Avenue
Oakland, California

PLATE **15**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
YC	2251,080.03		12/88		

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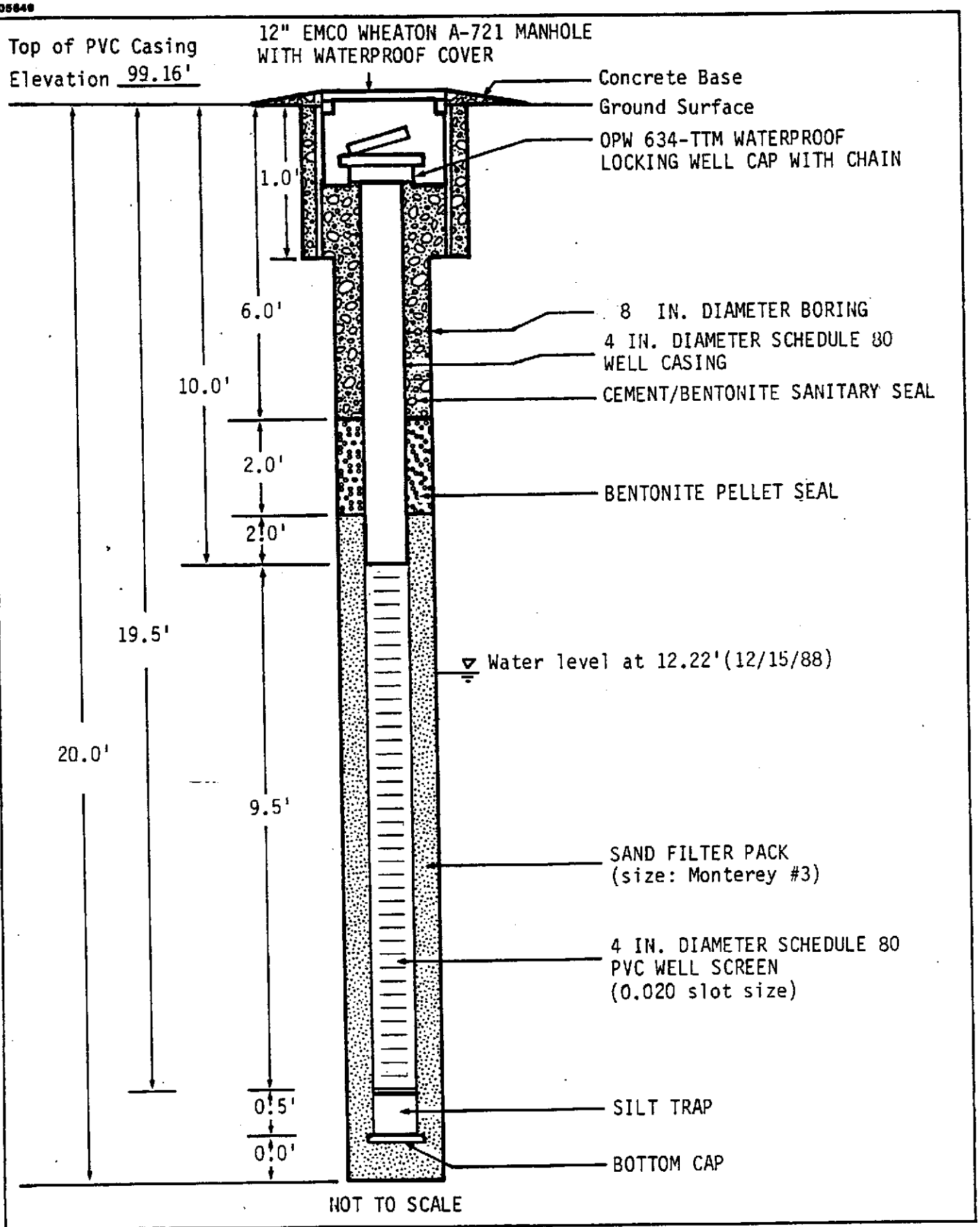


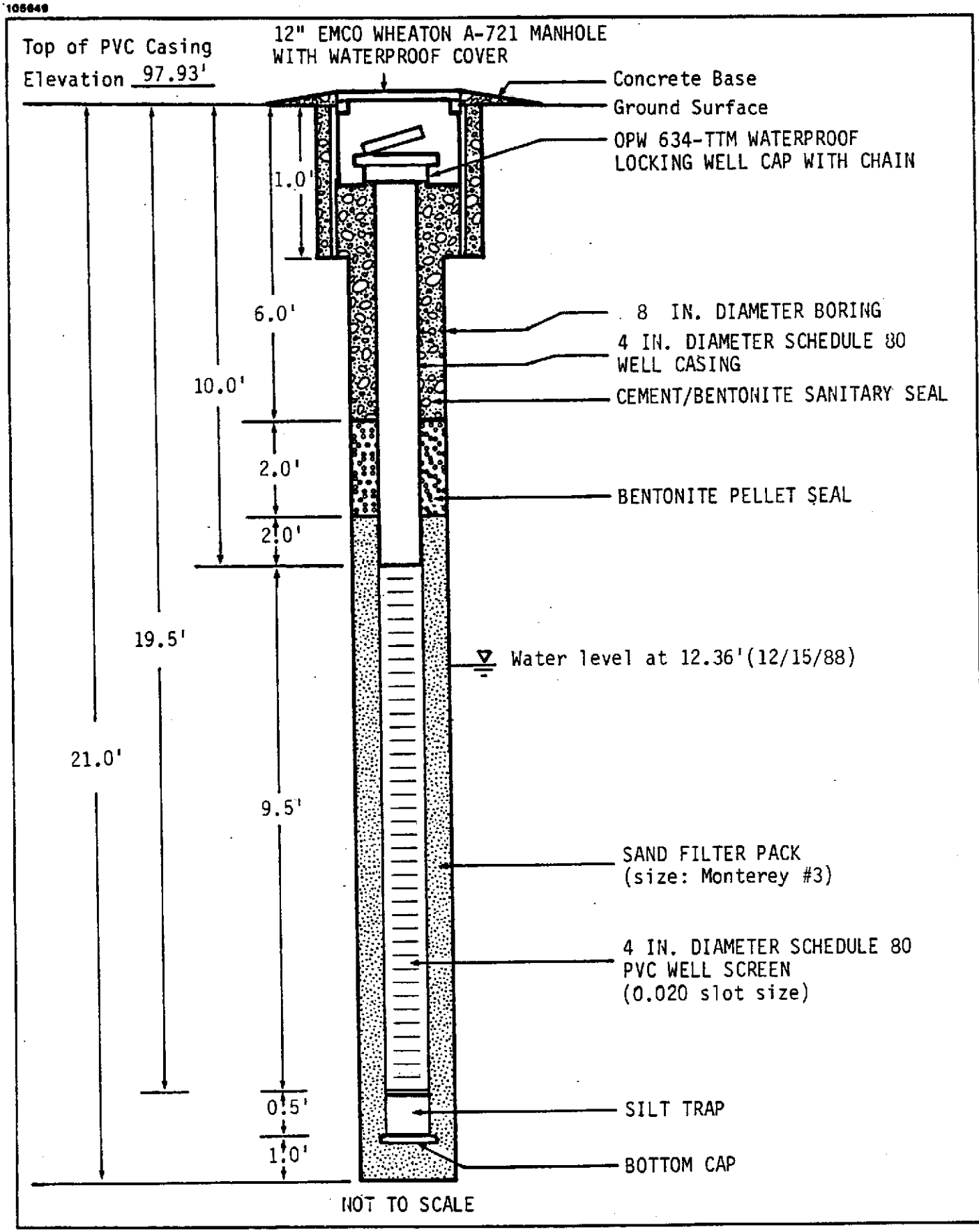
Harding Lawson Associates
Engineers and Geoscientists

Well Construction Diagram MW-6G
Former Texaco Service Station
2225 Telegraph Avenue
Oakland, California

PLATE
16

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
YC	2251,080.03		12/88		

105649



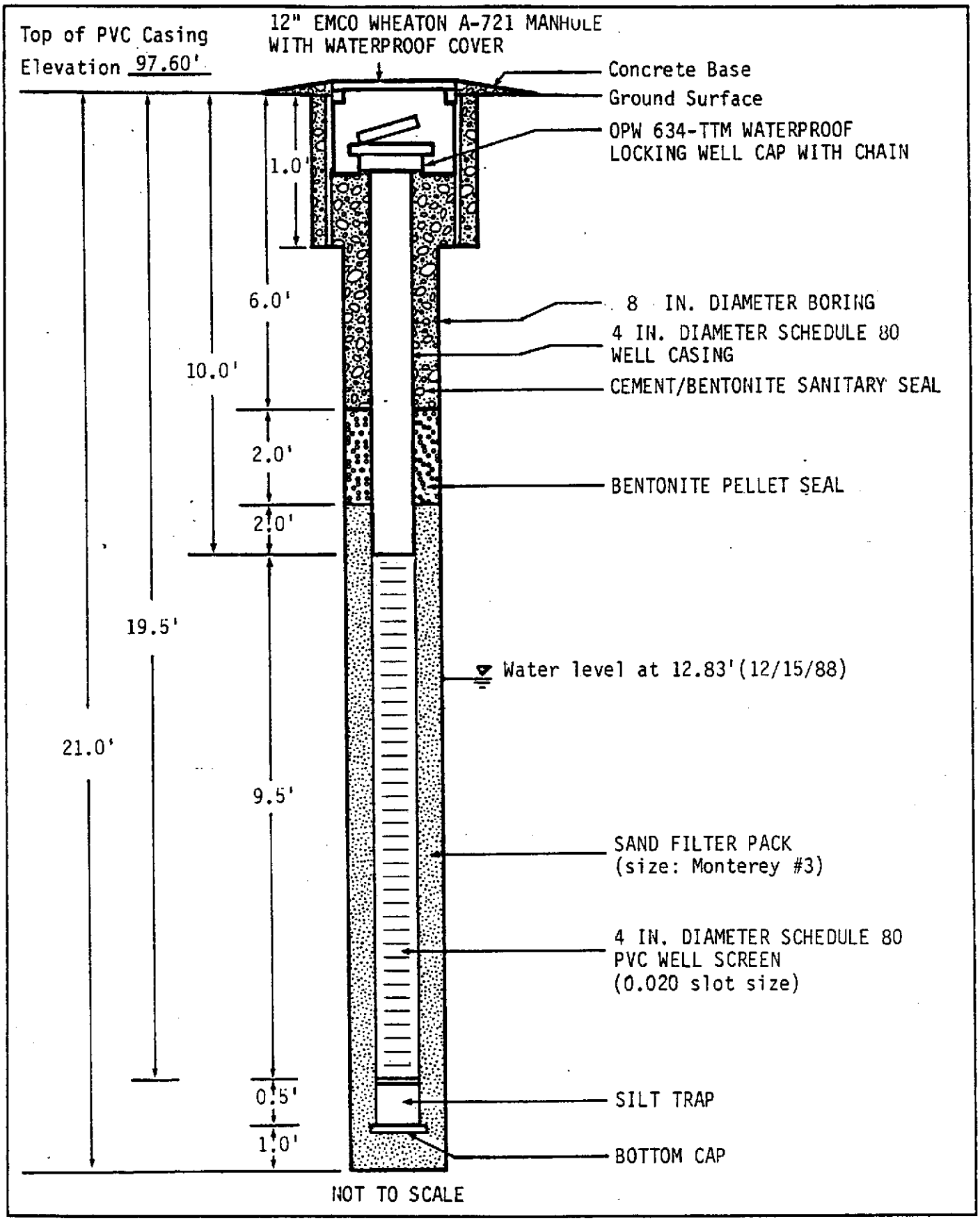
Harding Lawson Associates
Engineers and Geoscientists

Well Construction Diagram MW-6H
Former Texaco Service Station
2225 Telegraph Avenue
Oakland, California

PLATE **17**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
YC	2251,080.03		12/88		

105649



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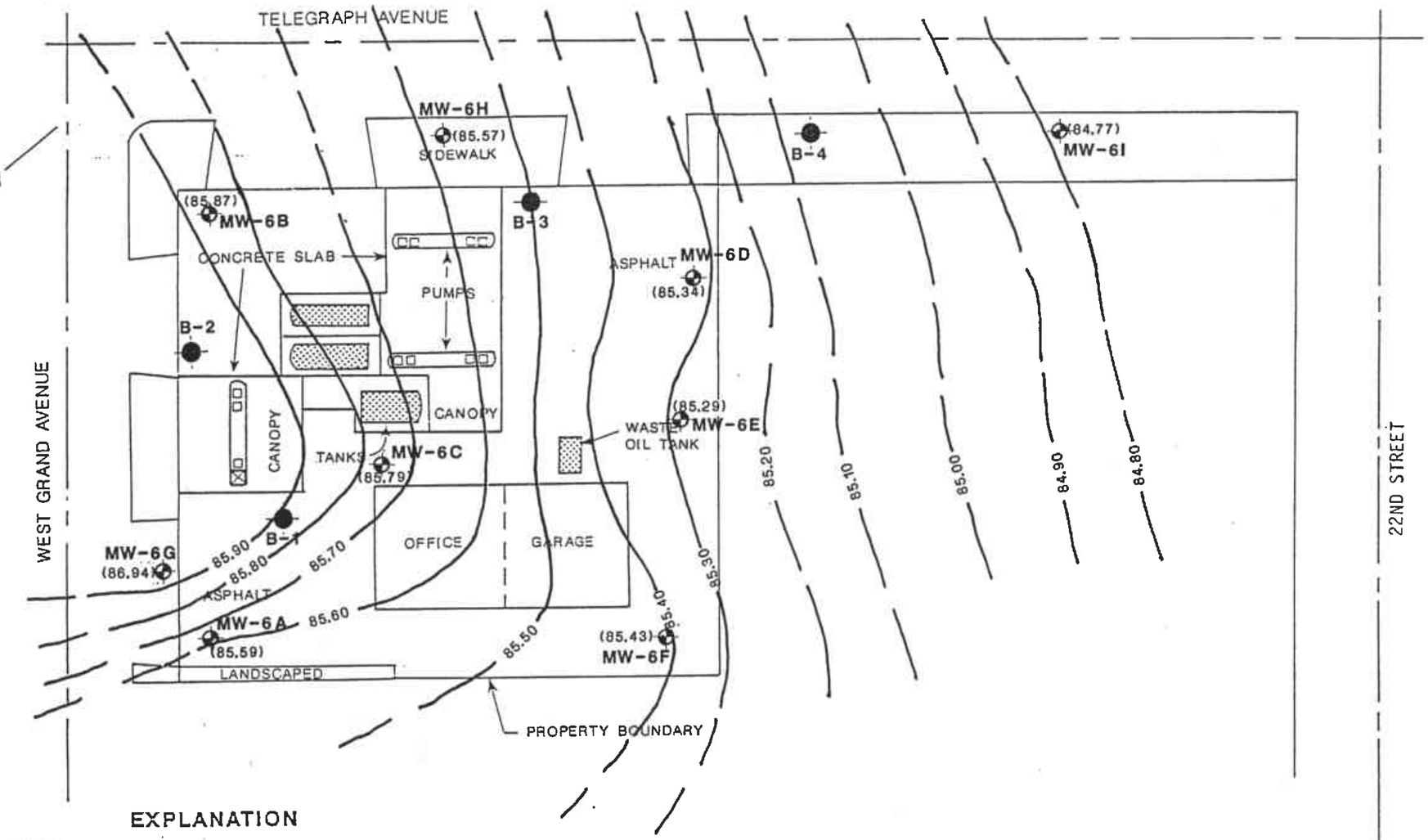
Engineers and Geoscientists

Well Construction Diagram MW-6I
Former Texaco Service Station
2225 Telegraph Avenue
Oakland, California

PLATE
18

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
	2251,080.03		12/88		



EXPLANATION

B-2 — Boring Locations

(85.59) MW-6J — Monitoring Well Location and Groundwater Surface Elevation on December 15, 1988

0 30 60
SCALE IN FEET

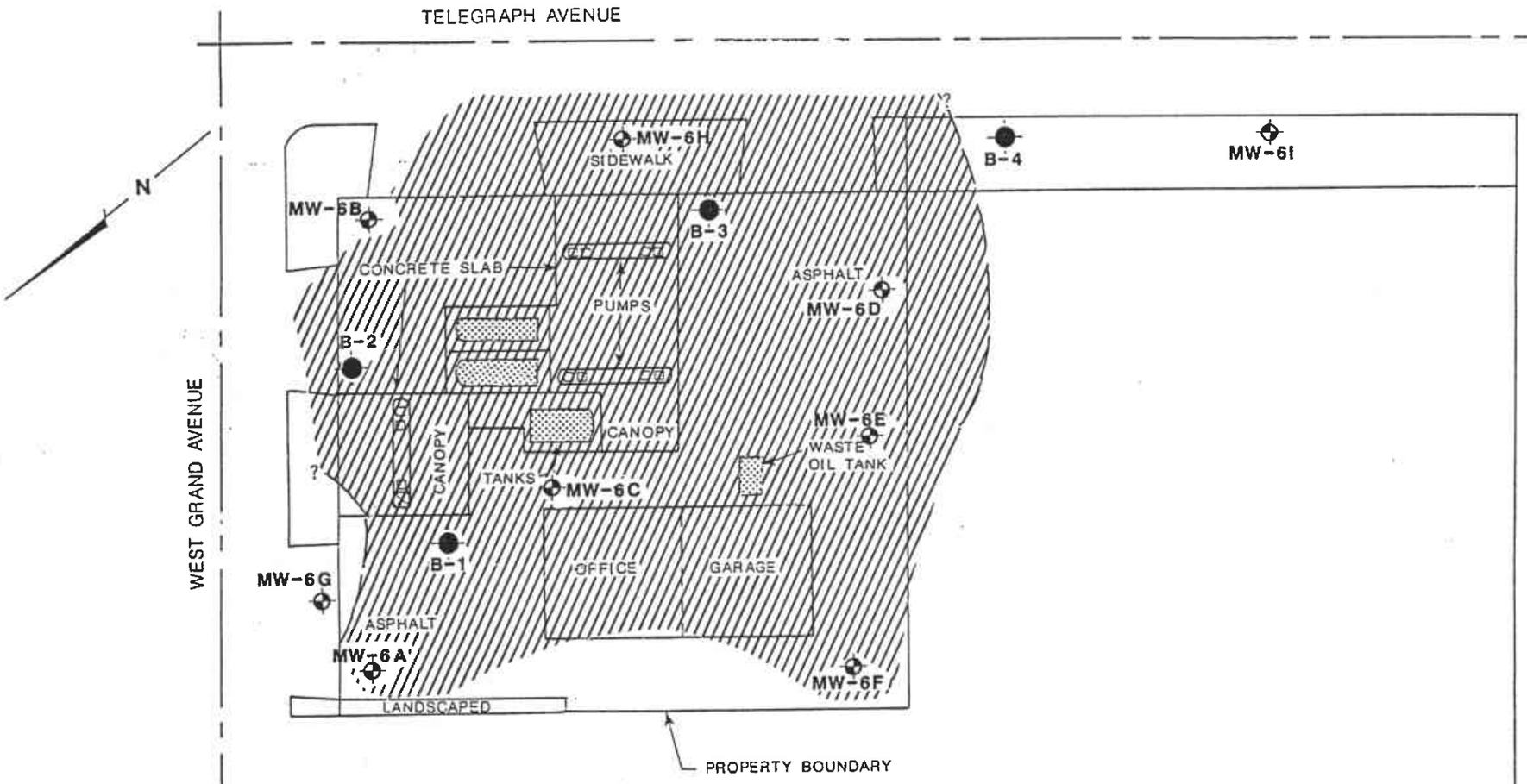
☒ Bench Mark (HLA Datum El. = 100 feet)

Harding Lawson Associates
Engineers and Geoscientists

Groundwater Surface
Former Texaco Service Station
2225 Telegraph Avenue
Oakland, California

PLATE 19

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
YC	2251,080.03		2/89		



EXPLANATION

B-1 Boring Location

Detectable Dissolved Hydrocarbons in Ground-Water

MW-6J Monitoring Well Location

0 30 60

SCALE IN FEET

Bench Mark (HLA Datum El. = 100 feet)

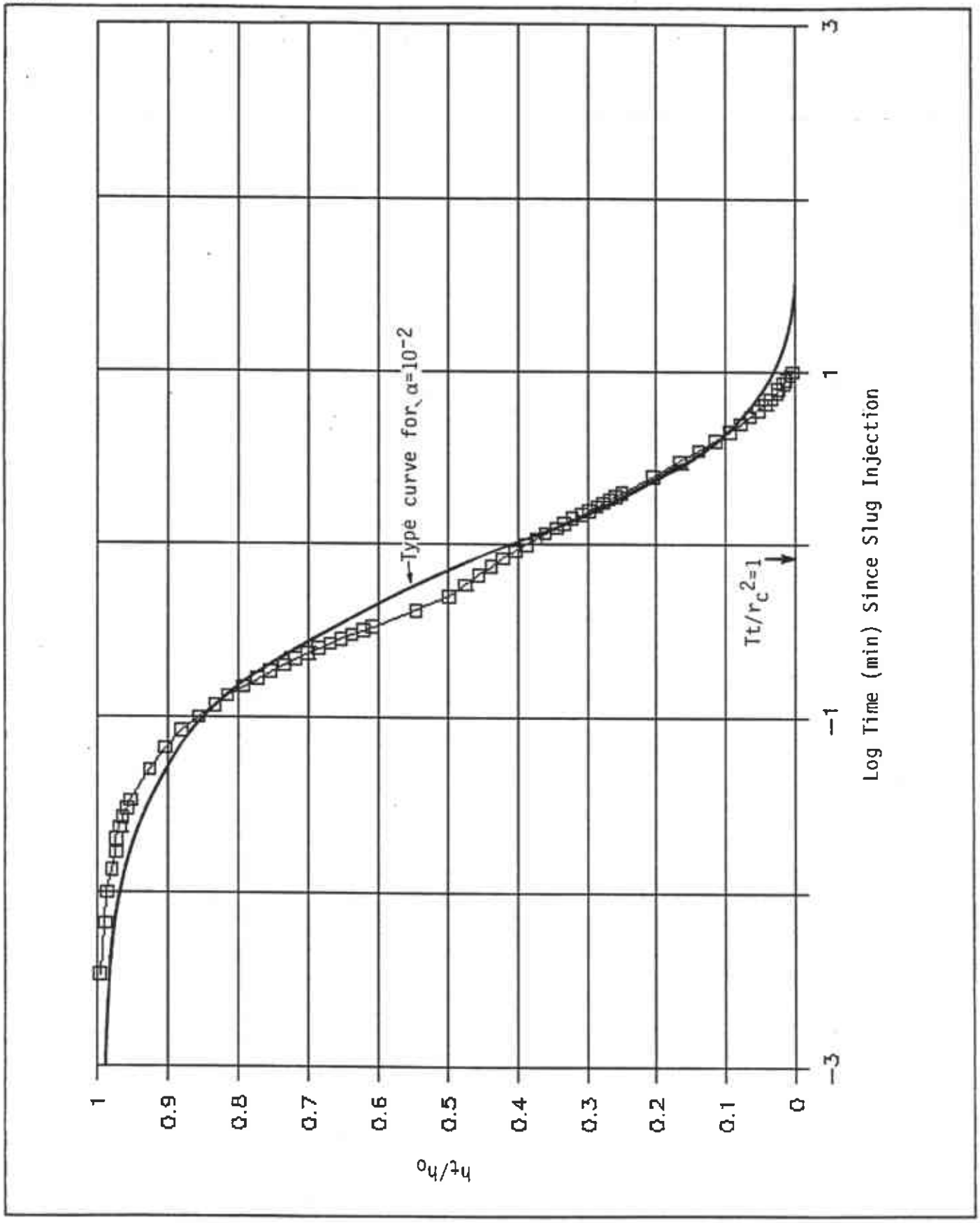
Harding Lawson Associates
Engineers and Geoscientists

Distributon of Hydrocarbons in Ground-Water
Former Texaco Service Station
2225 Telegraph Avenue
Oakland, California

PLATE **20**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
YC	2251,080.03		2/89		

105649



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Water Level Recovery MW-6D
Former Texaco Service Station
2225 Telegraph Avenue
Oakland, California

PLATE
21

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
YC	2251,080.03		5/89		

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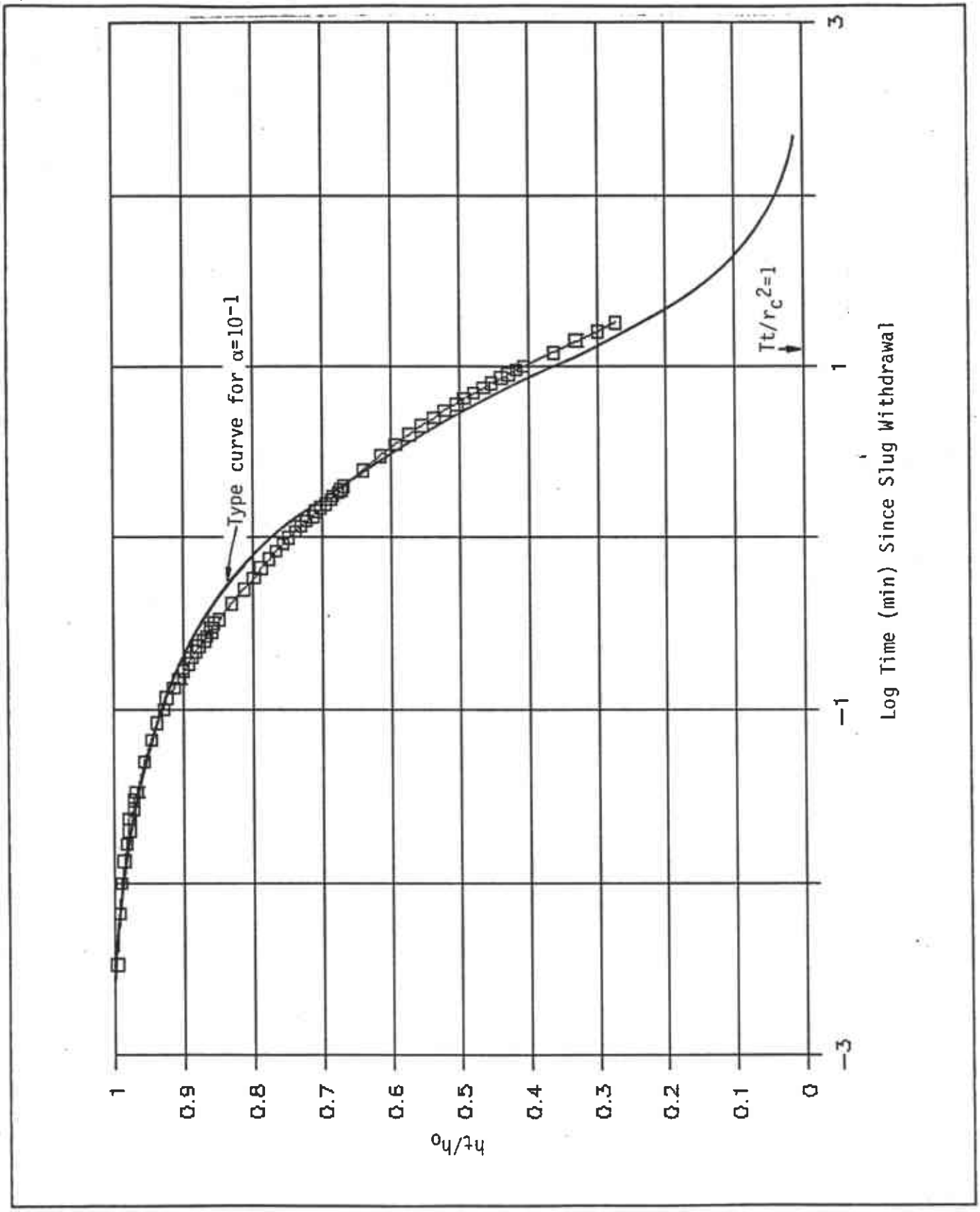

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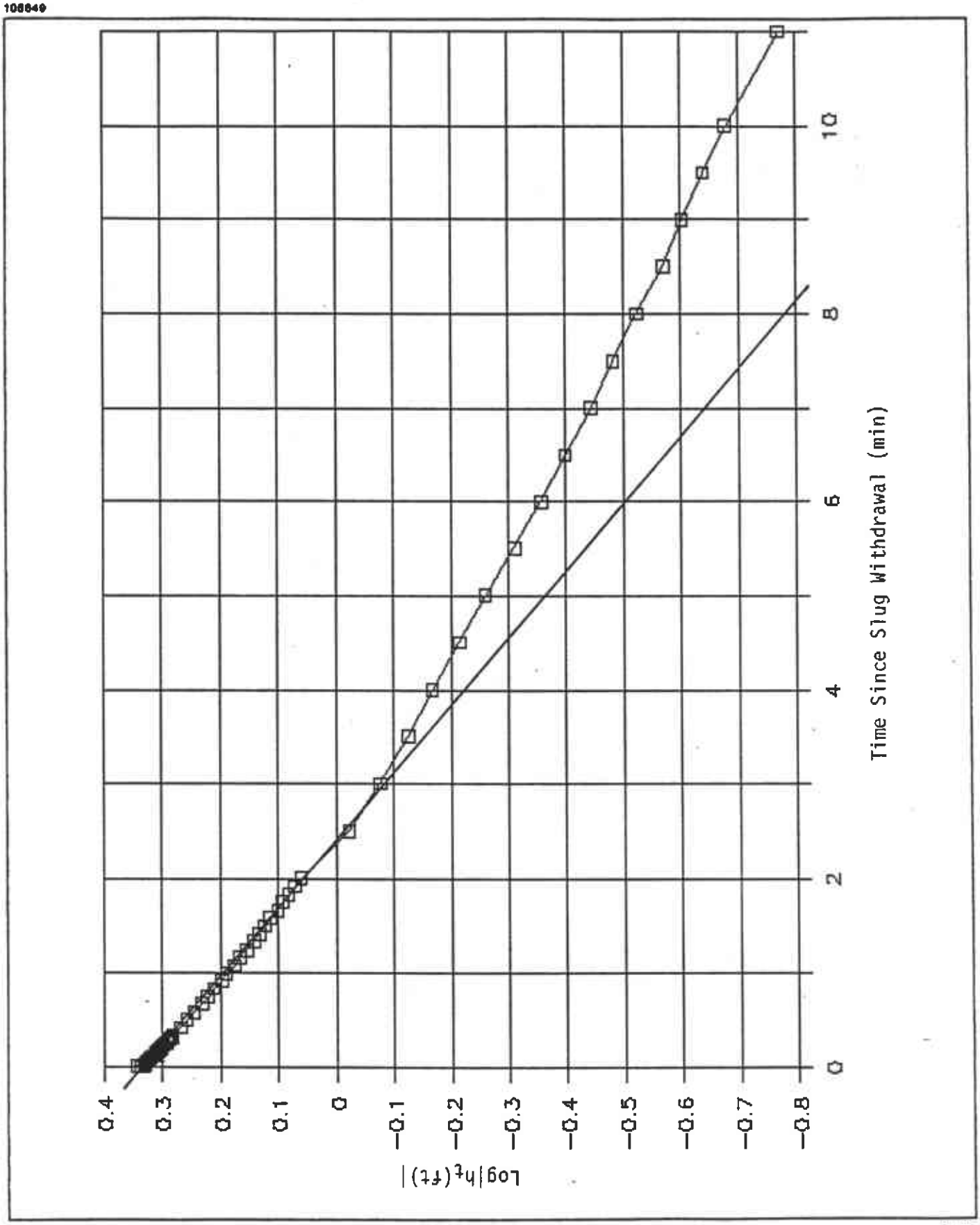
Water Level Recovery MW-6E
Former Texaco Service Station
2225 Telegraph Avenue
Oakland, California

PLATE
22

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
YC	2251,080.03		5/89		

108649



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Water Level Recovery MW-6H
Former Texaco Service Station
2225 Telegraph Avenue
Oakland, California

PLATE
23

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
YC	2251,080.03		5/89		

APPENDIX A

SENSITIVE RECEPTOR SURVEY FACT SHEET, RESULTS OF GROUND-WATER ANALYSES (JUNE, 1988), BORING LOGS & WELL CONSTRUCTION DETAILS

Attachment A to Environmental Testing Procedures

H-2L

SENSITIVE RECEPTORS - SITE INVESTIGATION AND RISK ASSESSMENT

Location #: 62488000195
Address: 2225 Telegraph
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) Yes
If Yes, distance (FT) 600

D. Is there a basement within 500'? (Y/N) Yes
If Yes, distance (FT) 25

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 miles 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 _____

V Describe observation wells, if any:

Number 1
Free Product (Y/N) No

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

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

VII 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-6A	ND (0.5)	ND (2)	ND (1)	ND (1)
MW-6B	ND (0.5)	ND (2)	ND (1)	5.0
MW-6C	7400	170	7.1	2300
MW-6D	220	ND (20)	27	ND (10)
DWAL	0.7	680	100	620

ND = Nondetectable.
Detection limits are given in parentheses.
* Samples obtained June,1988

Equipment 8-inch Hollow Stem Auger

Elevation 99.4 feet*** Date 6/15/88

Laboratory Tests	** Blows/foot	PID * Reading (ppm)	Depth (ft)	Sample
		1	0	
	21	1	5	
	14	<1	10	
	20/5"	<1	15	
	11	<1	20	
			25	
			30	
			35	
			40	

asphaltic concrete pavement
aggregate baserock
GRAY SILTY CLAY WITH SAND (CH)
stiff, moist

GRAY SILTY SAND TRACE CLAY (SM)
dense, moist

BROWN SILTY CLAY (CL)
stif, moist

▽

BROWN SAND (SP)
very dense, saturated

GRAYISH BROWN CLAYEY SAND (SC)
medium dense, saturated

BLUISH GRAY SILTY CLAY (CH)
very stiff, moist

bottom of boring 21.5 feet

boring cleaned out to 20 feet

stabilized water level at 13.5 feet on 7/11/88

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

**S&H Sampler blow counts converted to SPT blow counts

***Reference Elevation (arbitrary datum)

PLATE

Harding Lawson Associates
Engineers, Geologists & Geophysicists

Log of Boring MW-6A

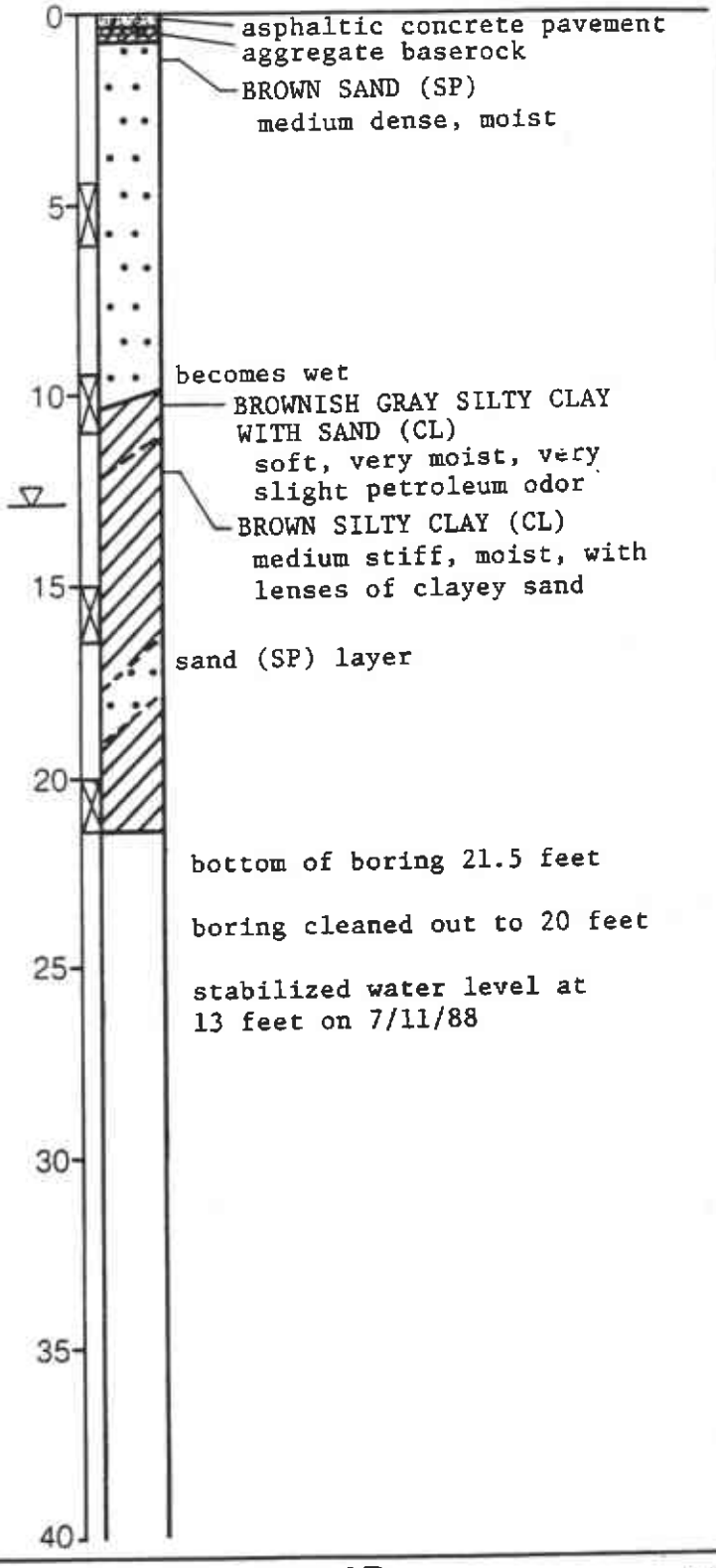
Texaco Station - 62488000195
2225 Telegraph Avenue
Oakland, California

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
RS	2251,080.03		2/89		

Equipment 8-inch Hollow Stem Auger

Elevation 99.2 feet** Date 6/15/88

Laboratory Tests	Blows/foot	PID* Reading (ppm)	Depth (ft) Sample
			0
	12	<1	5
	4	1	10
	8	<1	15
	9	<1	20
			25
			30
			35
			40



*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-6B

Texaco Station - 62488000195
2225 Telegraph Avenue
Oakland, California

PLATE

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
RS	2251,080.03	AD	2/89		

Equipment 8-inch Hollow Stem Auger

Elevation 100.2 feet** Date 6/15/88

Laboratory Tests	Blows/foot	PID * Reading (ppm)	Depth (ft)	Sample
			0	
		2		
		<1		
	35	1	5	
	28	25	10	
	48	60	15	
	30	10	20	
			25	
			30	
			35	
			40	

asphaltic concrete pavement
aggregate baserock

GRAYISH BROWN SILTY CLAY WITH SAND (CL)
very moist, with slight petroleum odor
stained gray between 2 and 2-1/2 feet, with petroleum odor
becomes brown

GRAY MOTTLED BROWN SANDY CLAY (CL)
very stiff, moist, very slight petroleum odor

BROWN SILTY CLAY TRACE SAND (CL)
very stiff, moist, very slight petroleum odor

GRAY CLAYEY SAND (SC)
dense,

GRAY SILTY SAND (SM)
dense, moist

GRAYISH BROWN SILTY CLAY (CL)
hard, moist

bottom of boring 21.5 feet

boring cleaned out to 20 feet

stabilized water level at 14.5 feet on 7/11/88

*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-6C

Texaco Station - 62488000195
2225 Telegraph Avenue
Oakland, California

PLATE

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
RS	2251,080.03	[illegible]	2/89		

Equipment 6-inch Flight Auger

Elevation 99 feet** Date 7/6/88

Laboratory Tests	Blows/foot	PID * Reading (ppm)	Depth (ft)	Sample
			0	
				asphaltic concrete pavement
				aggregate baserock
				YELLOW BROWN CLAY (CL) stiff, moist
				LIGHT BROWN CLAY TRACE SAND (CL) very stiff, moist
	22	<1	5	
				GRAYISH BROWN CLAY TRACE SAND (CL) very stiff, moist
	14	5	10	
				strong petroleum odors between 12.5 and 15.5 feet
				SAND (SP) dense, saturated
	--	70	15	
				GRAYISH BROWN SILTY CLAY (CL) WITH SAND very stiff, moist no petroleum odors
	12	3	20	
				bottom of boring 20 feet
			25	
				stabilized water level at 13.5 feet on 7/11/88
			30	
			35	
			40	

*PID = photo ionization detector, HNU PI 101

**Reference Elevation (arbitrary datum)

HLA

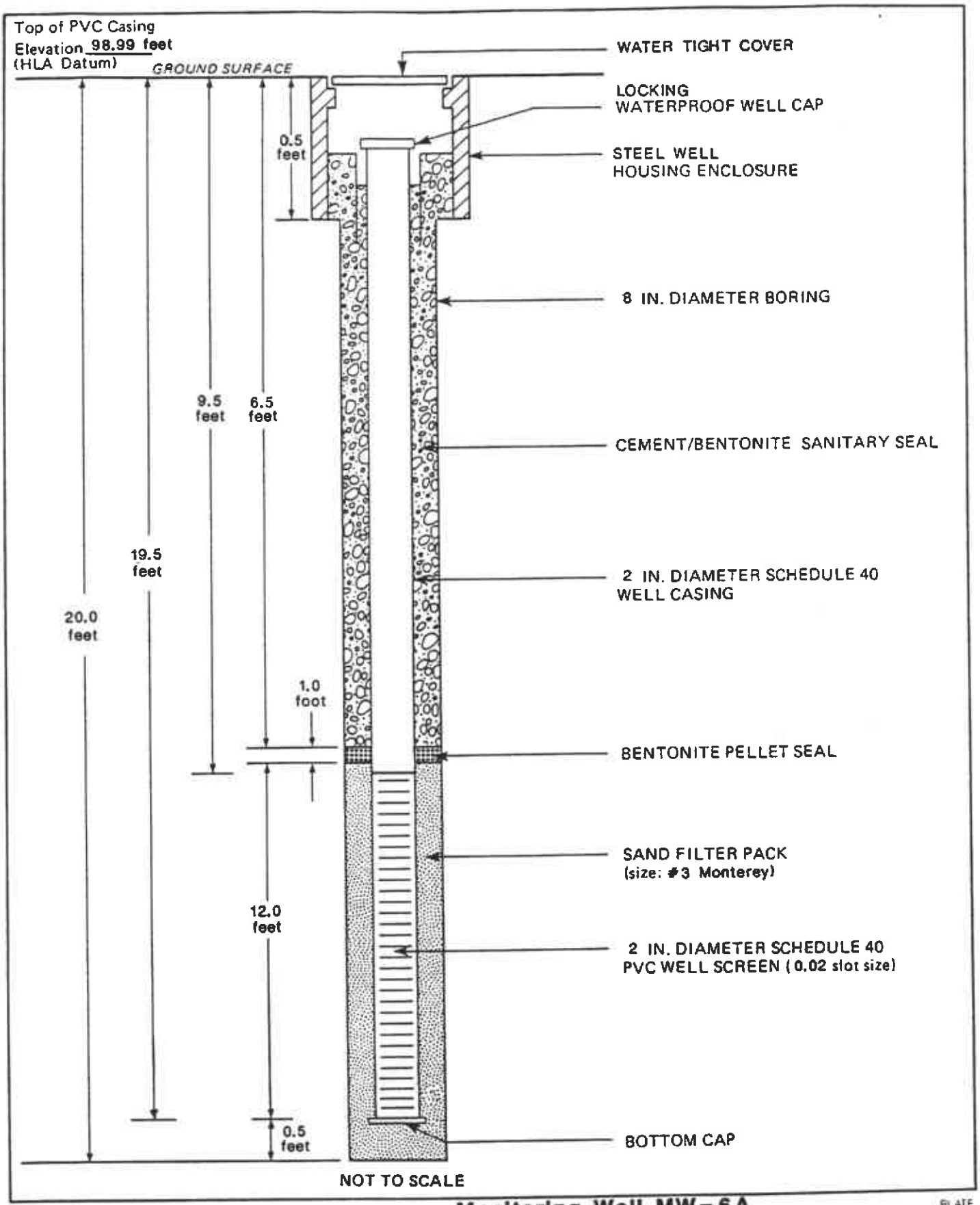
Harding Lawson Associates
Engineers, Geologists & Geophysicists

Log of Boring MW-6D

Texaco Station - 62488000195
2225 Telegraph Avenue
Oakland, California

PLATE

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
RS	2251,080.03	[illegible]	2/89		



Harding Lawson Associates
Engineers, Geologists
& Geophysicists

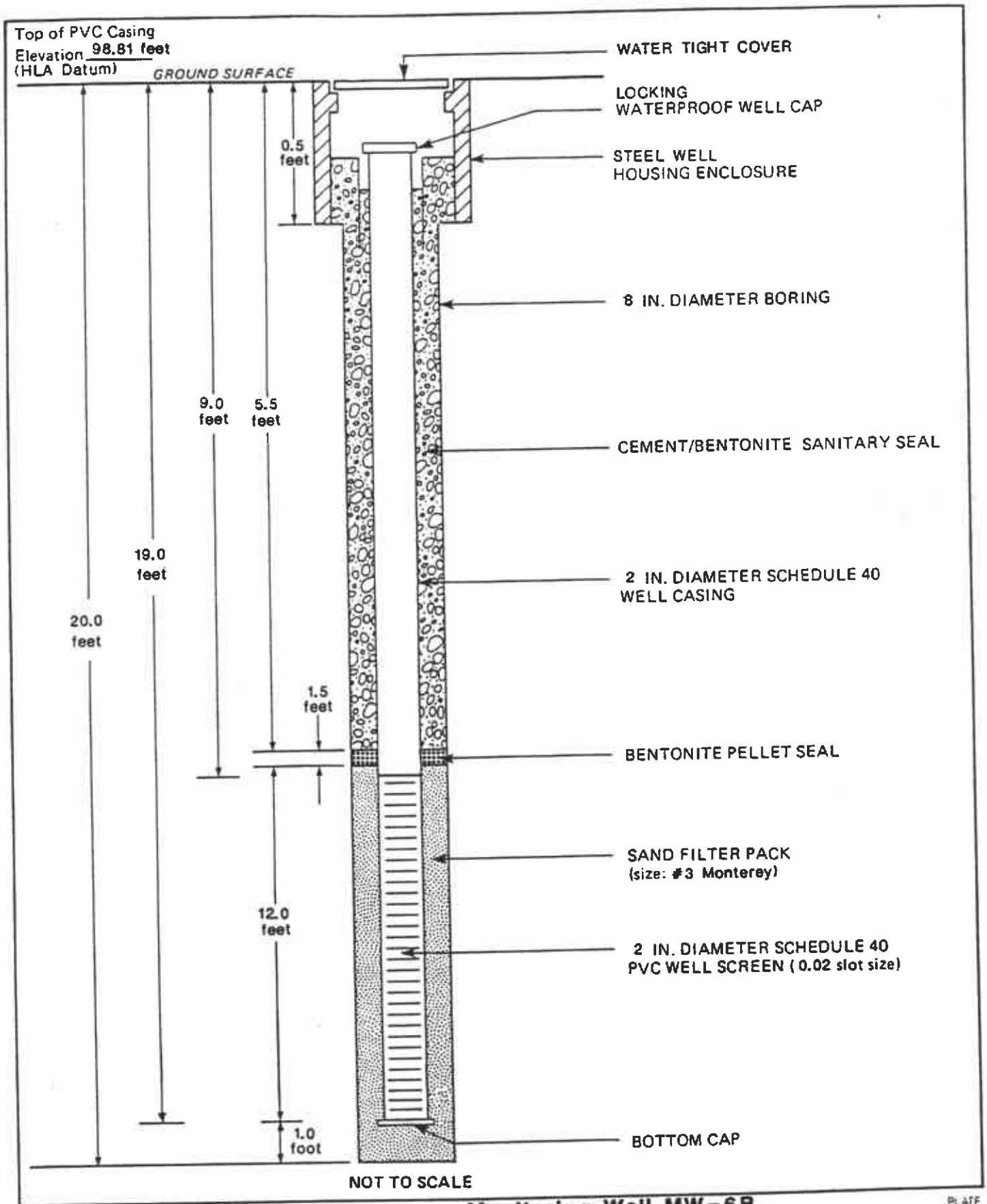
Monitoring Well MW-6A Completion Detail

Texaco Station - 62488000195
2225 Telegraph Avenue
Oakland, California

PLATE

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
	2251,080.03	JO	2/89		

FORM GW3



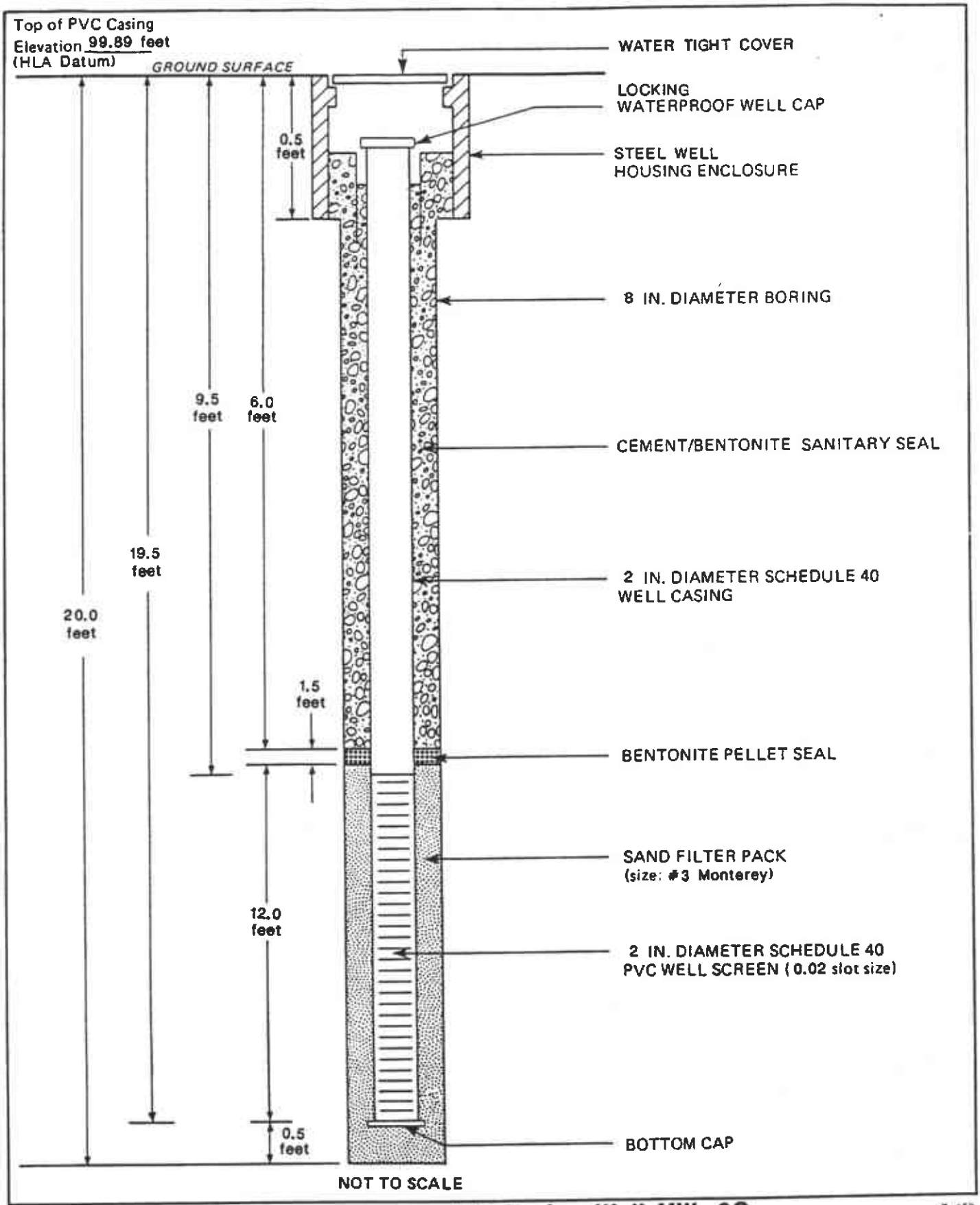
Harding Lawson Associates
Engineers, Geologists
& Geophysicists

Monitoring Well MW-6B
Completion Detail
Texaco Station - 62488000195
2225 Telegraph Avenue
Oakland, California

PLATE

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
	2251,080.03	[illegible]	2/89		

FORM GW3



Harding Lawson Associates
Engineers, Geologists
& Geophysicists

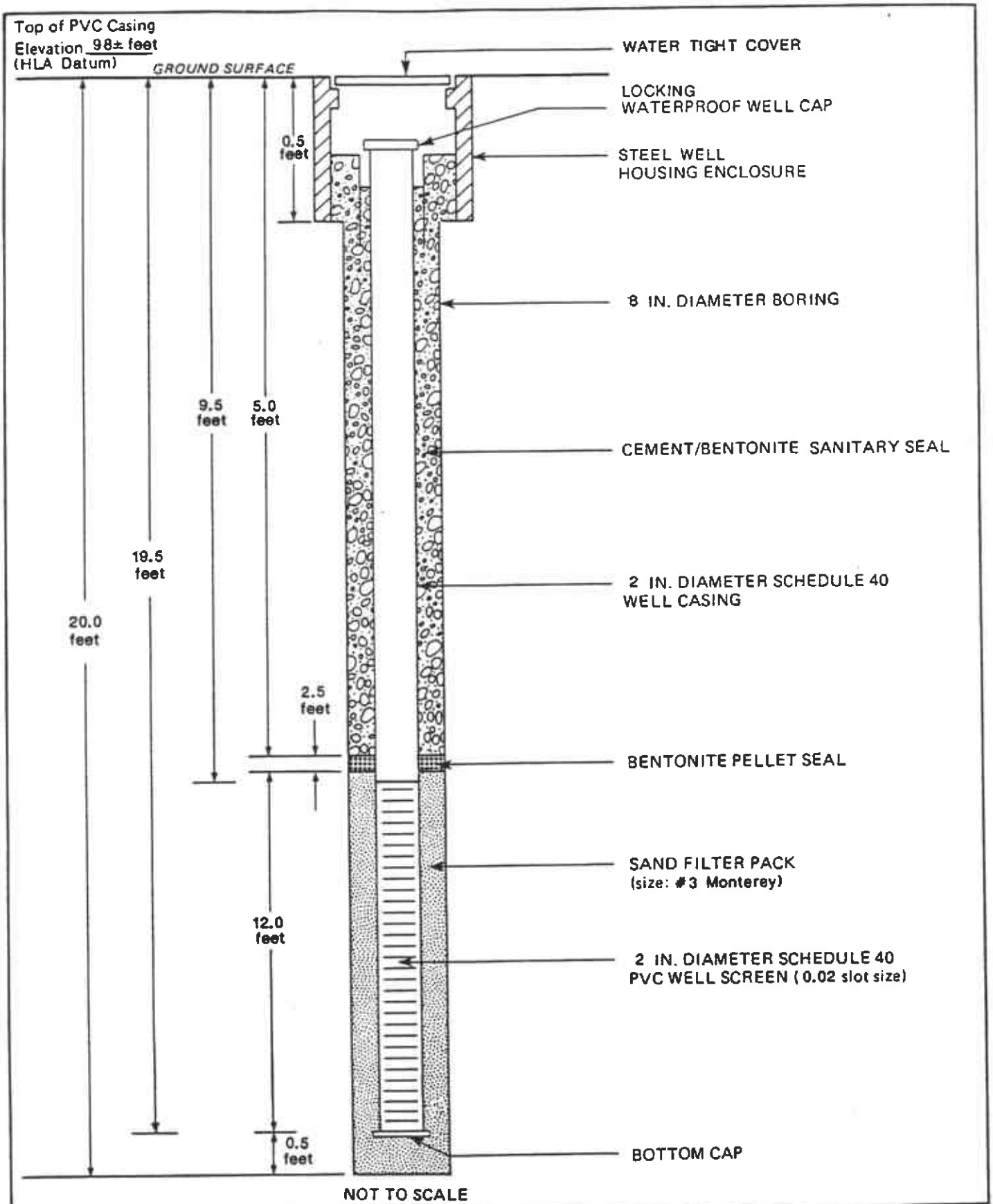
Monitoring Well MW-6C Completion Detail

Texaco Station - 62488000195
2225 Telegraph Avenue
Oakland, California

PLATE

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
	2251,080.03		2/89		

FORM GW3



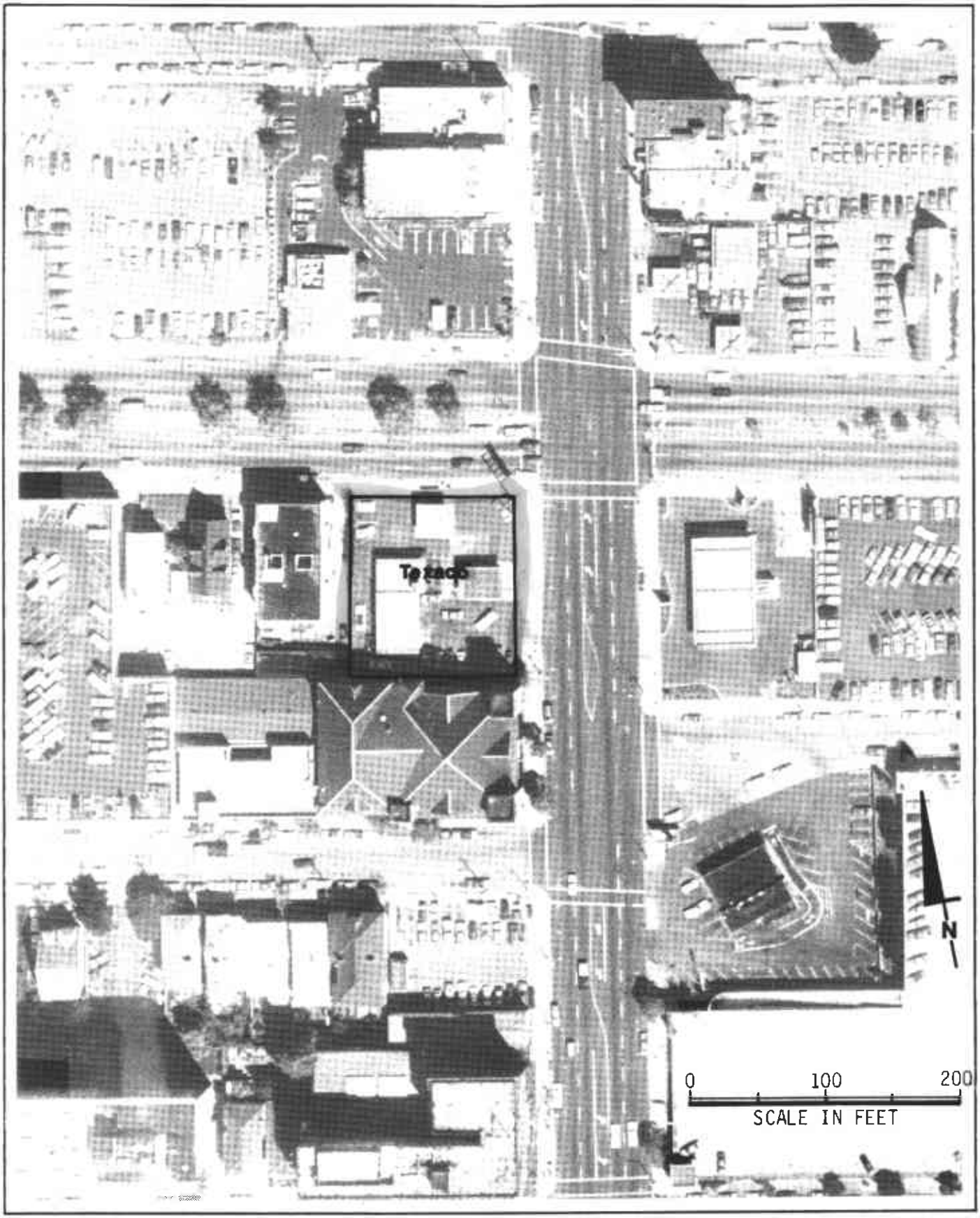
Harding Lawson Associates
Engineers, Geologists
& Geophysicists

Monitoring Well MW-6D
Completion Detail
Texaco Station - 62488000195
2225 Telegraph Avenue
Oakland, California

PLATE

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
	2251,080.03	40	2/89		

FORM GW3



Harding Lawson Associates
Engineers and Geoscientists

Aerial Photograph
Former Texaco Service Station
2225 Telegraph Avenue
Oakland, California

PLATE

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
YC	2251,080.03		6/89		

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

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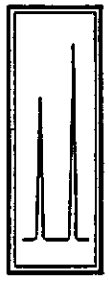


INTRODUCTION

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.

APPENDIX A: CONDENSED DATA

HARDING LAWSON ASSOCIATES/2225 TELEGRAPH AVENUE/OAKLAND, CALIFORNIA

Sample	Depth	Date	Benzene (ug/l)	Toluene (ug/l)	Ethyl Benzene (ug/l)	Xylenes (ug/l)	Total Hydroc. (ug/l)
Air		09/19	<0.7	<0.8	<0.8	<0.8	<0.7
SG-02	5'	09/19	<0.7	<0.8	<0.8	<0.8	<0.7
SG-03	12'	09/19	10	4	<0.8	2,800	6,100
SG-04	13'	09/19	<0.7	<0.8	<0.8	140	780
WS-05	12'	09/19	<75	<76	<77	<77	<75
SG-06	13'	09/19	<0.7	<0.8	<0.8	<0.8	<0.7
Air		09/19	<0.7	<0.8	<0.8	<0.8	<0.7

Notations:
I interference with adjacent peaks
NA not analyzed

Analyzed by K. Tolman

Checked by R. Sheldrake

Proofed by H. Holander

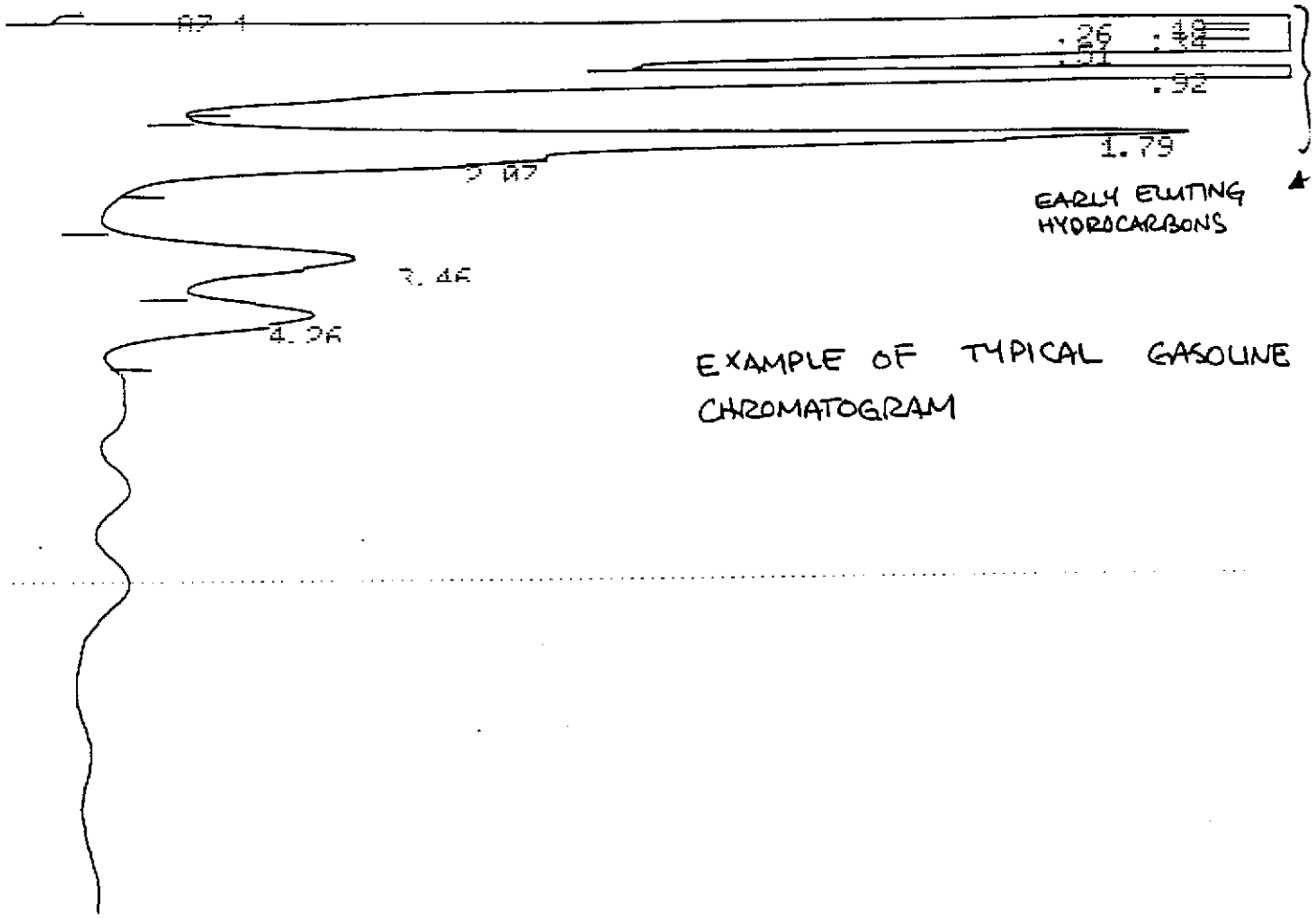
Tracer Research Corporation

APPENDIX B: CHROMATOGRAMS

PEAK#	AREA%	RT	AREA AC	
1	14.374	0.38	115211	01
2	12.495	0.65	100239	01
3	18.241	1.06	146333	02
4	29.277	1.4	162667	03
5	34.613	2.8	277673	01
TOTAL	100.		802223	

GENERATOR EXAUST SOOT

CHANNEL A INJECT 09/19/88 11:05:38



EARLY ELUTING HYDROCARBONS

EXAMPLE OF TYPICAL GASOLINE CHROMATOGRAM

HLA TELAGRAPH OAK CA 09/19/88 11:05:38 CH= "A" PS= 1.

FILE 1. METHOD A. RUN 10 INDEX 10

PEAK#	AREA%	RT	AREA AC	
1	43.369	0.18	2525376	02
2	10.557	0.26	614727	02
3	8.961	0.34	521792	02
4	13.251	0.51	771624	02
5	10.558	0.92	614774	02
6	6.265	1.79	364812	02
7	1.869	2.07	108887	02
8	2.955	3.46	172077	02
9	2.214	4.26	128945	02
TOTAL	100.		5822934	

SG03-12 SOOT

CHANNEL A INJECT 09/19/88 11:55:38

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

FILE 1. METHOD A. RUN 10 INDEX 10

PEAK#	AREA%	RT	AREA RF
1	43.769	0.18	2525726 02
2	10.557	0.26	614727 02
3	8.961	0.34	521790 02
4	13.251	0.51	771604 02
5	10.558	0.92	614774 02
6	6.265	1.79	364812 02
7	1.869	2.07	108807 02
8	2.955	3.46	172077 02
9	2.214	4.26	128945 02
TOTAL	100.		5822934

8403-12 500

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

02 1

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

FILE 1. METHOD A. RUN 11 INDEX 11

PEAK#	AREA%	RT	AREA RF
1	7.043	0.19	648655 01
2	0.312	0.64	28718 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 02
TOTAL	100.		9209550

8403-12 100

APPENDIX D

SOIL SAMPLE CHEMICAL TEST DATA

CHEMWEST
ANALYTICAL LABORATORIES, INC.

October 24, 1988

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

Attention: Mr. Randy Stone

Subject: Report of Data - Case Number 2382

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.

Eight soil samples for Project Texaco #6; Telegraph Oakland, Project Number 02251,080.03 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

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. : MW-6E @ 13.0
Date Analyzed : 10/09/88
Date Extracted: 10/09/88

CHEMWEST I.D.: 2382-1
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	72%	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. : B1 13.0
Date Analyzed : 10/16/88
Date Extracted: 10/09/88

CHEMWEST I.D.: 2382-2
Matrix : Soil

Compound	Amount Detected (mg/Kg)	RL (mg/Kg)
Benzene	BRL	5
Toluene	16	10
Ethyl Benzene	10	10
Total-Xylenes (1)	41	10
Total Petroleum Hydrocarbon (Purgeable)	2000	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. : B1 8.0
Date Analyzed : 10/14/88
Date Extracted: 10/09/88

CHEMWEST I.D.: 2382-3
Matrix : Soil

Compound	Amount Detected (mg/Kg)	RL (mg/Kg)
Benzene	0.05	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	65%	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. : B2 7.0-7.5
Date Analyzed : 10/09/88
Date Extracted: 10/09/88

CHEMWEST I.D.: 2382-4
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	67%	50-150%

BRL: Below Reporting Limit.
RL: Reporting Limit.

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

Approved by: YP

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

Client I.D. : B2 13.5-14.0
Date Analyzed : 10/14/88
Date Extracted: 10/09/88

CHEMWEST I.D.: 2382-5
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	66%	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. : B3 7.0-7.5
Date Analyzed : 10/09/88
Date Extracted: 10/09/88

CHEMWEST I.D.: 2382-6
Matrix : Soil

Compound	Amount Detected (mg/Kg)	RL (mg/Kg)
Benzene	0.06	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	66%	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. : B3 13.5-14.0
Date Analyzed : 10/14/88
Date Extracted: 10/09/88

CHEMWEST I.D.: 2382-7
Matrix : Soil

Compound	Amount Detected (mg/Kg)	RL (mg/Kg)
Benzene	40	25
Toluene	390	50
Ethyl Benzene	84	50
Total-Xylenes (1)	370	50
Total Petroleum Hydrocarbon (Purgeable)	11000	5000

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: YO

REV2.9.88

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

Client I.D. : MW 6F
Date Analyzed : 10/09/88
Date Extracted: 10/09/88

CHEMWEST I.D.: 2382-8
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
ortho-Chlorotoluene	73%	50-150%

BRL: Below Reporting Limit.
RL: Reporting Limit.

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

Approved by: _____

2382

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

CLIENT

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

CLIENT: Harding Lawson Associates
1255 Willow Way
Suite 109
Concord, CA 94520

Project Name: Pacific #6 - Telegraph Oakland
Project No. 02255.080.03
P.O. NO.
Contact Randy Stone
Phone (415) 687-9660

ANALYSIS: Eight (8) soil samples received under chain of custody in 6" brass core tubes (8) to be analyzed for BTEX and total petroleum hydrocarbons EXTN/ GC-FID (Gas).

Sample Id	Depth	Date Analysis	Matrix	Container
2382-1 MW6E	13'	10/4/88	BTEX/TPH-EXTN/ GAS-FID/BTEX	soil 1-6" brass core tube
-2 B-1	13'	"		
-3 B-1	8'	"		
-4 B-2	7.0-7.5	"		
-5 B-2	13.5-14.0	"		
-6 B-3	7.0-7.5	"		
-7 B-3	13.5-14.0	"		
-8 MW6F	13'	10/5/88		

mg mg mg

#NOTE: SEVEN (7) DAY TURN AROUND TIME

F-1
MJ - Martina Jarvis

CHEMWEST COURIER

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 #2382

Samplers: GREG FISIANO / DAVE HESE

Job Number: 02251.080.03

Name/Location: TEXACO #6 - TELEGRAPH OAKLAND

Project Manager: GREG FISIANO

Recorder: _____ (Signature Required)

SOURCE CODE	MATRIX: Water	Sediment	Soil	Oil	#CONTAINERS & PRESERV.: Unpres.	H_2SO_4	HNO_3	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.
GW			X					MW-6	91	3	88	10	04		Donna T.A. PLEASE					X	X	X
								B-1	10	13												
								B-1	10	8												
								B-2	10	7												
								B-2	10	13												
								B-3	10	7												
								B-3	10	13												
								MW-6	FB	13	88	10	05									

HLA Texaco Phase

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
		10/6/88 1135
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
		10/6/88 1700
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) BILL MCBENGE	DATE/TIME
	Bill McBenge	10/6/88 17:00

METHOD OF SHIPMENT: CHEMWEST COURIER

Laboratory Copy Project Office Copy Field or Office Copy

6533

Soil

CHEMWEST
ANALYTICAL LABORATORIES, INC.

November 30, 1988

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

Attention: Mr. Randy Stone

Subject: Report of Data - Case Number 2708

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 Assessment #6, Project Number 02251,080.03 were received November 18, 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.: MW-G
Date Analyzed : 11/23/88
Date Extracted: 11/21/88

CHEMWEST I.D.: 2708-1
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)	5.2	10

Surrogate	% Recovery	Acceptance Window
ortho-Chlorotoluene	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.: MW-H
Date Analyzed : 11/23/88
Date Extracted: 11/21/88

CHEMWEST I.D.: 2708-2
Matrix : Soil

Compound	Amount Detected (mg/Kg)	RL (mg/Kg)
Benzene	11	0.5
Toluene	3.2	1
Ethyl Benzene	8.8	2
Total-Xylenes (1)	19	1
Total Petroleum Hydrocarbon (Purgeable)	1000	495

Surrogate	% Recovery	Acceptance Window
ortho-Chlorotoluene	147%	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.: MW-I
Date Analyzed : 11/23/88
Date Extracted: 11/21/88

CHEMWEST I.D.: 2708-3
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	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
AND TOTAL PETROLEUM HYDROCARBONS - PURGEABLE

Client I.D.: B-4
Date Analyzed : 11/23/88
Date Extracted: 11/21/88

CHEMWEST I.D.: 2708-4
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	80%	50-150%

BRL: Below Reporting Limit.
RL: Reporting Limit.

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

Approved by: JL

REV2.9.88

2708

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

CLIENT

Order No.
Date Rec'd. 11/18/88 18:20
Compl. Date
Section [illegible] POCAN

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

Project Name: TEXACO Assessment #6
Project No. 02251, 080.03
P.O. NO.
Contact Randy Stone
Phone (415) 687-9660

ANALYSIS: Four soil samples rec'd under chain of custody in 6" Metal core tubes to be analyzed for TPH EXTN/ GC-FID & BTEX. Seven day T/A.

	SAMPLE I.D.	DEPTH	DATE	ANALYSIS	MATRIX	CONTAINER
2708-1	MW-G	13.5' - 14.0'	11/16/88	~~TPH~~, BTEX/TPH	Soil	6" Core Tube
-2	MW-H	13.5' - 14.0'	"	✓	"	"
-3	MW-I	13.5' - 14.0'	11/17/88	✓	"	"
-4	B-4	13.5' - 14.0'	"	✓	"	"

AMENDED

Per Randy Stone of HLA on 11/21/88 @ 1630 hrs, change the analyses to BTEX/TPH only on all 4 samples.
TCW 11/21/88

R-1
BMC
BILL MCBENCE

CHEMWEST COURIER

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

CLIENT

2708

Order No.
Date Rec'd. 11/18/88 18:20
Compl. Date
Section

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

Project Name: TEXACO Assessment #6
Project No. 02251, 080.03
P.O. NO.
Contact Randy Stone
Phone (415) 687-9660

ANALYSIS: Four soil samples rec'd under chain of custody in 6" Metal core tubes to be analyzed for TPH EXTN/ GC-FID & BTEX. Seven day T/A.

	SAMPLE I.D	DEPTH	DATE	ANALYSIS	MATRIX	CONTAINER
2708-1	MW-G	13.5' - 14.0'	11/16/88	TPH, BTEX	Soil	6" Core Tube
-2	MW-H	13.5' - 14.0'	"	"	"	"
-3	MW-I	13.5' - 14.0'	11/17/88	"	"	"
-4	B-4	13.5' - 14.0'	"	"	"	"

R-1
BMS

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. Hosler

Job Number: 02251,080.03

Name/Location: Texaco Assessment - #6

Project Manager: G. Fasiano

Recorder: David R. Hosler (Signature Required)

SOURCE CODE	MATRIX: Water	Sediment	Soil	Oil	#CONTAINERS & PRESERV.: Unpres.	H_2SO_4	HNO_3	S. Steel Tube	SAMPLE NUMBER OR LAB NUMBER: Yr	Wk	Seq	DATE: Yr	Mo	Dy	Time	STATION DESCRIPTION/ NOTES
SO			X					X	M	W	G	88	11	16		13.5 - 14.0 FT
SO			X					X	M	W	H	88	11	16		13.5 - 14.0 FT
SO			X					X	M	W	I	88	11	17		13.5 - 14.0 FT
SO			X					X	B	4		88	11	17		19.5 - 14.0 FT

ANALYSIS REQUESTED

EPA 601/8010	EPA 602/8020	EPA 624/8240	EPA 625/8270	Priority Pllnt. Metals	Benzene/Toluene/Xylene (BTEX)	Total Petrol. Hydrocarb. (Gas)
					X	X
					X	X
					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. Hosler	Gary Brasil	11-8-88 1330
RELINQUISHED BY: (Signature) Gary Brasil	RECEIVED BY: (Signature)	DATE/TIME 11-9-88 0820
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) LILLY McDENGE Bill McBenge	DATE/TIME 11/9/88 13:20

METHOD OF SHIPMENT: CHEMWEST 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 10, 1988

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

Attention: Mr. Randy Stone

Subject: Report of Data - Case Number 2535

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 #6; Telegraph, Project Number 02251,080.03 was 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.: MW-6F-1&2
Date Analyzed: 11/01/88

CHEMWEST I.D.: 2535-1
Matrix : Water

Compound	Amount Detected (ug/L)	RL (ug/L)
Benzene	BRL	0.5
Toluene	BRL	1
Ethyl Benzene	BRL	2
Total-Xylenes (1)	2.4	1

Surrogate	% Recovery	Acceptance Window
ortho-Chlorotoluene	57%	50-150%

BRL: Below Reporting Limit.
RL: Reporting Limit.

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

Approved by: KP

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. 2535
Date Rec'd. 10/26/88 @ 1900
Compl. Date
Section Kurt Doran

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

Project Name: 2251,080.03
Project No. Texaco #6, Telegraph
P.O. NO.
Contact
Phone (415) 687-96100

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

	Sampled	Date	Time	analysis	Matrix	Container
2535	MW-6F1&2	10/25	10:20	BTEX	water	2-40ml VOAs

GC
M.T. MICHELLE TOLIVER

Chem West Courier

SAMPLE WILL BE HELD 30 DAYS UNLESS LONGER TIME IS ARRANGED

[redacted] Harding Lawson Associates
[redacted] Willow Way, Suite [redacted]
Concord, California 94520
415/687-9660
Telecopy: 415/687-9673

[redacted] CHAIN OF CUSTODY FORM [redacted]

Lab: CAL WEST

Samplers: DAVID R. HOSE
GLENN S. YOUNG

Job Number: 2257,080.03

Name/Location: TEXACO #6 ; TELEGRAPH

Project Manager: G. L. FASIANO

Recorder: *(Signature Required)*

SOURCE CODE	MATRIX: Water	Sediment	Soil	Oil	#CONTAINERS & PRESERV.: Unpres.	H_2SO_4	HNO_3	HCL	SAMPLE NUMBER OR LAB NUMBER: Yr	Wk	Seq	DATE: Yr	Mo	Dy	Time	STATION DESCRIPTION/ NOTES
23	X							X	[redacted]	-	F6-1	88	10	25	1020	
23	X							X	H[redacted]	-	F6-2	88	10	25	1020	

ANALYSIS REQUESTED

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

LAB NUMBER: Yr	Wk	Seq	DEPTH IN FEET	COL MTD CD	QA CODE	MISCELLANEOUS
						Chain of Custody documentation with containers
						COFC - # HW-F6-1&2
						location - 2257,080.03
						Texaco #6
						container - # HW-F-1&2
						location Texaco #6

CHAIN OF CUSTODY RECORD

RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
	[redacted] Klaaths	10-25-88 11:40
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
[redacted] Klaaths	[redacted]	10/26/88 1245
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
[redacted]		10/26/88 1905
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME

DISPATCHED BY: (Signature) DATE/TIME

RECEIVED FOR LAB BY: (Signature) MICHELLE TOLIVER DATE/TIME
[redacted] 10/26/88 1905

METHOD OF SHIPMENT

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

6533

CHEMWEST
ANALYTICAL LABORATORIES, INC.

November 11, 1988

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

Attention: Mr. Randy Stone

Subject: Report of Data - Case Number 2498

Dear Mr. Stone:

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

Five water samples for Project Texaco #6; 2225 Telegraph, Project Number 2251,080.03 were received October 21, 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-6A
Date Analyzed: 10/25/88

CHEMWEST I.D.: 2498-1
Matrix : Water

Compound	Amount Detected (ug/L)	RL (ug/L)
Benzene	0.6	0.5
Toluene	BRL	1
Ethyl Benzene	BRL	2
Total-Xylenes (1)	BRL	1

Surrogate	% Recovery	Acceptance Window
ortho-Chlorotoluene	66%	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

Client I.D.: MW-6B
Date Analyzed: 10/25/88

CHEMWEST I.D.: 2498-2
Matrix : Water

Compound	Amount Detected (ug/L)	RL (ug/L)
Benzene	4.1	0.5
Toluene	BRL	1
Ethyl Benzene	2.5	2
Total-Xylenes (1)	BRL	1

Surrogate	% Recovery	Acceptance Window
ortho-Chlorotoluene	58%	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.: MW-6C
Date Analyzed: 10/27/88

CHEMWEST I.D.: 2498-3
Matrix : Water

Compound	Amount Detected (ug/L)	RL (ug/L)
Benzene	9500	50
Toluene	170	100
Ethyl Benzene	65	2
Total-Xylenes (1)	850	1

Surrogate	% Recovery	Acceptance Window
ortho-Chlorotoluene	94%	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.: MW-6D
Date Analyzed: 10/25/88

CHEMWEST I.D.: 2498-4
Matrix : Water

Compound	Amount Detected (ug/L)	RL (ug/L)
Benzene	710	5
Toluene	22	10
Ethyl Benzene	74	20
Total-Xylenes (1)	110	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: _____

REV2.9.88

CHEMWEST ANALYTICAL LABORATORIES
BENZENE, TOLUENE, ETHYL BENZENE, XYLENES

Client I.D.: MW-6E
Date Analyzed: 10/25/88

CHEMWEST I.D.: 2498-5
Matrix : Water

Compound	Amount Detected (ug/L)	RL (ug/L)
Benzene	1.1	0.5
Toluene	BRL	1
Ethyl Benzene	BRL	2
Total-Xylenes (1)	3.4	1

Surrogate	% Recovery	Acceptance Window
ortho-Chlorotoluene	74%	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

2498

Order No.
Date Rec'd. 10/21/88@1810
Compl. Date
Section Kirk Foran

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

Project Name: Texaco #16; 2225 Taraval
Project No. 2251.080.03
P.O. NO.
Contact
Phone (415) 2687-9160

ANALYSIS: Five water samples were received under chain of custody in 40ml VOA vials (10) to be analyzed for BTEX.

	Sample Id	Date	Time	analysis	Matrix	Container
2498-1	MW-16A	10/20	10:49	BTEX	water	2-40ml VOC
-2	MW-16B		10:28			
-3	MW-16C		11:13			
-4	MW-16D		11:40			
-5	MW-16E		16:00			

GC
MICHELLE TOUVER:
Chem West Courier

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 HOSE
GLENN S. YOUNG

Job Number: 2251,080

Name/Location: TEXACO #6 ; 2225 TELEGRAPH

Project Manager: G.L. FARIAND

Recorder: *(Signature Required)*

SOURCE CODE	MATRIX: Water	Sediment	Soil	Oil	#CONTAINERS & PRESERV.: Unpres.	H_2SO_4	HNO_3	HCl ice (2 vials)	SAMPLE NUMBER OR LAB NUMBER: Yr	Wk	Seq	DATE: Yr	Mo	Dy	Time
23	X							X	M	M	6 - A	8	8	10	20 1037
23	X							X	M	M	6 - B				10 28
23	X							X	M	M	6 - C				11 11
23	X							X	M	M	6 - D				11 40
23	X							X	M	M	6 - E				16 00
23															

STATION DESCRIPTION/ NOTES

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/E	Total Petrol. Hydrocarb.
				X	X	
				X	X	
				X	X	
				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 10/21/88 1240
RELINQUISHED BY: *(Signature)*	RECEIVED BY: *(Signature)*	DATE/TIME 10/21/88 1815
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 Hines	DATE/TIME 10/21 1810
METHOD OF SHIPMENT		

6533

Laboratory Copy Project Office Copy Field or Office Copy

CHEMWEST
ANALYTICAL LABORATORIES, INC.

December 23, 1988

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

Attention: Mr. Randy Stone

Subject: Report of Data - Case Number 2849

Dear Mr. Stone:

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 Assessment #6 Project # 02251,080.03 were received December 9, 1988 in good condition. Results of the analysis, along with the analytical methodology and appropriate reporting limits, are presented on the following page(s).

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:pjg

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.: MW6G1/MW6G2
Date(s) Analyzed: 12/14/88

CHEMWEST I.D.: 2849-1
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	100%	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.: MW6H1/MW6H2
Date(s) Analyzed: 12/20/88

CHEMWEST I.D.: 2849-2
Matrix : Water

Compound	Amount Detected (ug/L)	RL (ug/L)
Benzene	1200	25
Toluene	110	10
Ethyl Benzene	320	20
Total-Xylenes (1)	220	10

Surrogate	% Recovery	Acceptance Window
ortho-Chlorotoluene	95%	50-150%

BRL: Below Reporting Limit.
RL: Reporting Limit.

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

Approved by: NP

REV2.9.88

APPENDIX F

METHODS OF SLUG TEST ANALYSIS

APPENDIX F

METHODS OF SLUG TEST ANALYSIS

The slug tests of the confined strata 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 or injection, 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 stratum tested was estimated from

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

where b is the thickness of the stratum.

The slug tests of the unconfined strata were analyzed according to the method of Bouwer and Rice (1976). The hydraulic conductivity is estimated directly from the relationship

$$K = \frac{r_c^2 \ln (R_e/r_w)}{2L} \frac{1}{t} \ln \frac{h_o}{h_t}$$

where R_e is the radial distance over which the head change h is dissipated in the flow system, r_w is the radial distance between the undisturbed stratum (aquifer) and the well center, L is the height of the portion of well through which water enters, h_0 is the initial vertical distance between the water level in the well and the equilibrium water table (hydraulic head) in the tested stratum immediately after slug withdrawal or injection, and h_t is that vertical distance at some time after slug withdrawal or injection.

The term $1/t \ln \frac{h_0}{h_t}$ is evaluated from the early straight-line portion of a graph of the logarithm of h_t as a function of time. For the case where D, the vertical distance from the water table to the bottom of the permeable stratum, is equal to H, the vertical distance from the water table to the bottom of the interval through which water enters the well, the term $\ln R_e/r_w$ is evaluated from the empirical relation

$$\ln R_e/r_w = \left(\frac{1.1}{\ln (H/r_w)} + \frac{C}{L/r_w} \right)^{-1}$$

Here C is an empirical coefficient that depends on L/r_w. Bouwer and Rice (1976) provide a graphical representation of the dependency of C on values of L/r_w.

CHEMWEST ANALYTICAL LABORATORIES
BENZENE, TOLUENE, ETHYL BENZENE, XYLENES

Client I.D.: MW6I1/MW6I2
Date(s) Analyzed: 12/14/88

CHEMWEST I.D.: 2849-3
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	99%	50-150%

BRL: Below Reporting Limit.
RL: Reporting Limit.

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

Approved by: _____

REV2.9.88

[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
Glenn S. Young

Job Number: 02251,080.03
Name/Location: Texaco Assessment #6
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	HCl	SAMPLE NUMBER OR LAB NUMBER: Yr	Wk	Seq	DATE: Yr	Mo	Dy	Time	STATION DESCRIPTION/ NOTES
23	X							X	X	MW	6	G1	88	12	07	1100	Turnaround
23	X							X	X	MW	6	G2				1100	
23	X							X	X	MW	6	H1				1230	
23	X							X	X	MW	6	H2				1230	
23	X							X	X	MW	6	I1				1505	
23	X							X	X	MW	6	I2		↓		1505	
																	1 day
																	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/Xylenes	Total Petrol. Hydrocarb.
					X	
					X	
					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) David R. Hose	RECEIVED BY: (Signature) TOM MUSTLER	DATE/TIME 12/09/88 1100
RELINQUISHED BY: (Signature) TOM MUSTLER	RECEIVED BY: (Signature)	DATE/TIME 12/09/88 1600
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) MARGIE NAMBA	DATE/TIME 12/09/88 1600
METHOD OF SHIPMENT		

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

6533

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

CLIENT

Order No. 2849
Date Rec'd. 12/9/88
Compl. Date
Section KIRK FOGAN

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

Project Name: Texaco Assessment #6
Project No. 02251,080.03
P.O. NO.
Contact Randy Stone
Phone (415)687-9660

ANALYSIS: Three water samples are rec'd under chain of custody in 40 ml VOA vials (6) to be analyzed for BTEX. (7-Day T/A)

	SAMPLE ID	DATE	TIME	ANALYSIS	MATRIX	CONTAINER
2849-1	MW6G1/MW6G2	12/7/88	1100	BTEX	water	2-40 ml VOA
-2	MW6H1/MW6H2	↓	1230	↓	↓	↓
-3	MW6I1/MW6I2	↓	1505	↓	↓	↓

G.C.
M.N. [illegible]

CHEM WEST COURIER

SAMPLE WILL BE HELD 30 DAYS UNLESS LONGER TIME IS ARRANGED