A Report Prepared for

Texaco Refining and Marketing, Inc.
10 Universal City Plaza
Universal City, California 91608

SUBSURFACE INVESTIGATION
TEXACO STATION NO. 62488000235
500 GRAND AVENUE
OAKLAND, CALIFORNIA

HLA Job No. 2251,054.04

by

James Ordons
Project Geologist

Stephen J. Osborne
Civil Engineer

REGISTERED PROFESSIONAL ENGINEER
STEPHEN J. OSBORNE
No. 656
Exp. 03/31/91
GEOTECHNICAL
STATE OF CALIFORNIA

Harding Lawson Associates
666 Howard Street
San Francisco, California 94105
415/543-8422

INTRODUCTION

This report presents the results of the subsurface investigation performed by Harding Lawson Associates (HLA) at Texaco Service Station No. 62488000235, located at 500 Grand Avenue, Oakland, California (see Plate 1). The work was verbally authorized by Mr. Robert Robles, Environmental Conservation Coordinator for Texaco Refining and Marketing, Inc. Our scope of services was provided by Texaco Refining and Marketing, Inc., and it included the following tasks:

1. Obtain utility clearances and well permits
2. Install, develop, and sample three monitoring wells
3. Survey wells and measure water levels
4. Calculate the direction of ground-water flow; if required, install a fourth monitoring well at the downgradient property corner
5. Analyze one ground-water sample from each monitoring well for benzene, ethylbenzene, toluene, and xylenes (BETX)
6. Document the results of our investigation in a report.

FIELD INVESTIGATION

Drilling and Sampling

HLA explored subsurface conditions at the site by drilling and sampling five soil borings on June 6 and 7, 1988. The boring locations are shown on Plate 2. The borings were advanced using truck-mounted, 8-inch-diameter hollow-stem auger drilling equipment. They were sampled using a Standard Penetration Test split-barrel sampler. An HLA field geologist directed the drilling and logged the borings. The boring logs are presented on Plates 3 through 6, and the soils have been described in accordance with the Unified Soil Classification System shown on Plate 7. The logs include the blow

counts obtained during sampling; the blow counts have been converted to standard penetration blow counts (N-values).*

The soil samples were screened in the field with a photoionization detector (PID). The PID readings were used to indicate relative concentrations of volatile organic compounds in the soil; they are presented on the logs. One soil sample was retained from MW-8D for chemical testing, as discussed in the following subsection.

All drill cuttings were placed in Department of Transportation-approved (DOT) drums for subsequent disposal by Texaco Refining and Marketing, Inc. Sampling equipment was washed with a trisodium phosphate (TSP) solution and rinsed with clean water between samples. All drilling equipment was steam-cleaned before and after each boring.

Boring B-8A' was advanced to a depth of 32 feet; at approximately 23 feet a saturated sand layer containing free water was encountered. Because Boring B-8A' extended through two ground water zones (the brown clayey sand at 12 feet and the brown clayey sand at 23 feet), we abandoned the boring by backfilling it with a cement-bentonite grout. MW-8A was placed 5 feet to the east of B-8A' and was constructed to intercept water within the upper water zone.

Monitoring Well Installation

We installed a monitoring well in four of the five borings under a permit issued by the Alameda County Flood Control District. Monitoring Wells MW-8A, MW-8B, MW-8C, and MW-8D were completed to depths of 15, 19.5, 24, and 4.5 feet below grade, respectively. The wells were constructed of steam-cleaned, 2-inch-diameter,

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* Standard penetration N-values are defined as the number of blows of a 140-pound hammer falling 30 inches required to advance a standard sampler (2 inches O.D. and 1.5 inches I.D.) the final 12 inches of an 18-inch drive. The standard hammer driving mechanism utilizes a cathead-drum and rope and pulley system.

Schedule 40 PVC casing, as shown on the well construction details, Plates 8 through 11. The annular space between the casing and the borehole wall was filled with No. 3 Monterey sand to approximately [redacted] above the top of the screened casing.

A 2-foot-thick bentonite seal was placed above the sand pack at MW-8A, -8B, and -8C, and the remainder of the annulus was filled with a 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 watertight caps to prevent the inflow of surface water, and a [redacted] traffic box, set slightly above the surrounding grade, was installed over each well.

Monitoring [redacted] completed following the authorization of Mr. Robert Robles on June 7, 1988 because a saturated gravel layer was encountered just below the asphalt. Texaco Refining and Marketing, Inc. requested that before well completion, a soil sample near the zone of saturation be tested for total petroleum hydrocarbons (TPH) and benzene, ethylbenzene, toluene, and xylenes (BETX). Because of the shallow water level in this well, an [redacted]

Well Development and Sampling

On June 14 and 21, 1988, Monitoring Wells MW-8A, MW-8B, and MW-8C were developed, sampled, and surveyed by an HLA technician. MW-8D was not sampled, at the request of Texaco Refining and Marketing, Inc. Prior to and after development, a clear lucite bailer was lowered into the wells to check for free product. Each well was developed by bailing [redacted] Water was removed from the wells until they no longer produced water. The water level was allowed to recover [redacted] The temperature, pH, and conductivity of the purged water were monitored during the development of the well.

Purged water was placed in DOT-approved drums for subsequent disposal by Texaco Refining and Marketing, Inc.

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

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 and preservation, and chain-of-custody.

Well Surveying

The tops of the well casings for MW-8A, MW-8B, and MW-8C were surveyed to a temporary datum located at the northwest corner of the dispenser island nearest Grand Avenue with an assumed elevation of 100 feet (HLA datum, Plate 2). The top of the casing for MW-8D was not surveyed. Well monitoring and survey data are presented in Table 1.

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-8A	99.72	2.92	96.80	No petroleum odors were noticed in any of the water samples.
MW-8B	101.11	1.91	99.20	
MW-8C	98.41	7.43	90.98	
MW-8D	Not Surveyed			Not Sampled

* HLA datum.
** On June 14, 1988.

RESULTS AND CONCLUSIONS

Surface and Subsurface Conditions

The site is relatively flat and paved with asphaltic concrete. Four relatively continuous strata were identified, and they are briefly summarized below.

Stratum A - Silty Clay (CL). Black grading to greenish gray, stiff, silty clay (CL) underlies the pavement section to a depth of 7 feet at MW-8A and to 3.5 feet at MW-8B. This stratum was not encountered at MW-8C. Slight petroleum odors were detected in this layer.

Stratum B - Silty Clay (CL) and Clayey Sand (SC). Brown to grayish brown, very stiff to hard silty clay (CL) and dense clayey sand (SC), with occasional sand (SP and SW) lenses, underlie Stratum A and extend to depths ranging from 7.5 feet to 23 feet at MW-8B and MW-8C, respectively.

Stratum C - Silty Clay (CL). White, very stiff to hard, silty clay (C) underlies Stratum B and extends to depths ranging from 14 feet to the maximum depth explored, 26.5 feet, at MW-8C.

Stratum D - Silty Clay (CL) and Clayey Sand (SC). Brown, very stiff to hard silty clay (CL) and very dense clayey sand (SC) underlie Stratum C. This layer was encountered to the maximum depths explored at MW-8A and MW-8B, but it was not encountered at MW-8C.

Ground Water

Free-flowing ground water was not encountered during drilling; however, the wells were designed to intercept water within saturated soil of low permeability, and MW-8D was designed to intercept perched water just below the pavement.

The stabilized water levels in MW-8A, -8B, and -8C ranged from depths of approximately 2 to 7.5 feet below the ground surface. The estimated ground-water flow is toward the south-southwest, toward Lake Merritt. The ground-water gradient is 0.111 feet per foot, based on the information in Table 1.

Chemical Analysis

Ground-water samples from the wells sampled were analyzed for BETX using EPA Method 602. The results of the analyses are summarized in Table 2. The laboratory reports are presented in the Appendix. The drinking water action levels* (DWAL) for benzene, ethylbenzene, toluene, and xylenes are 0.7, 680, 100, and 620 parts per billion (ppb), respectively. As indicated, the concentrations measured in the samples are below the DWALs, except for the concentration of benzene from MW-8C, which does exceed the DWAL.

One soil sample was collected from MW-8D at 1.3 feet below the ground surface and analyzed for BETX and TPH. The results of the analyses are summarized in Table 3. The detected BETX concentrations are below the designated concentrations for protection of ground water.** The detected TPH concentrations, according to the California Regional Water Quality Control Board, San Francisco Bay Region, do not constitute a threat to ground water.

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* Drinking water action levels were recommended by the State Department of Health Services in their letter dated October 1987.

** *Water Quality Objectives and Hazardous and Designated Levels for Chemical Constituents*, Jon B. Marshack, California Regional Water Quality Control Board, Central Valley Region, July 1985.

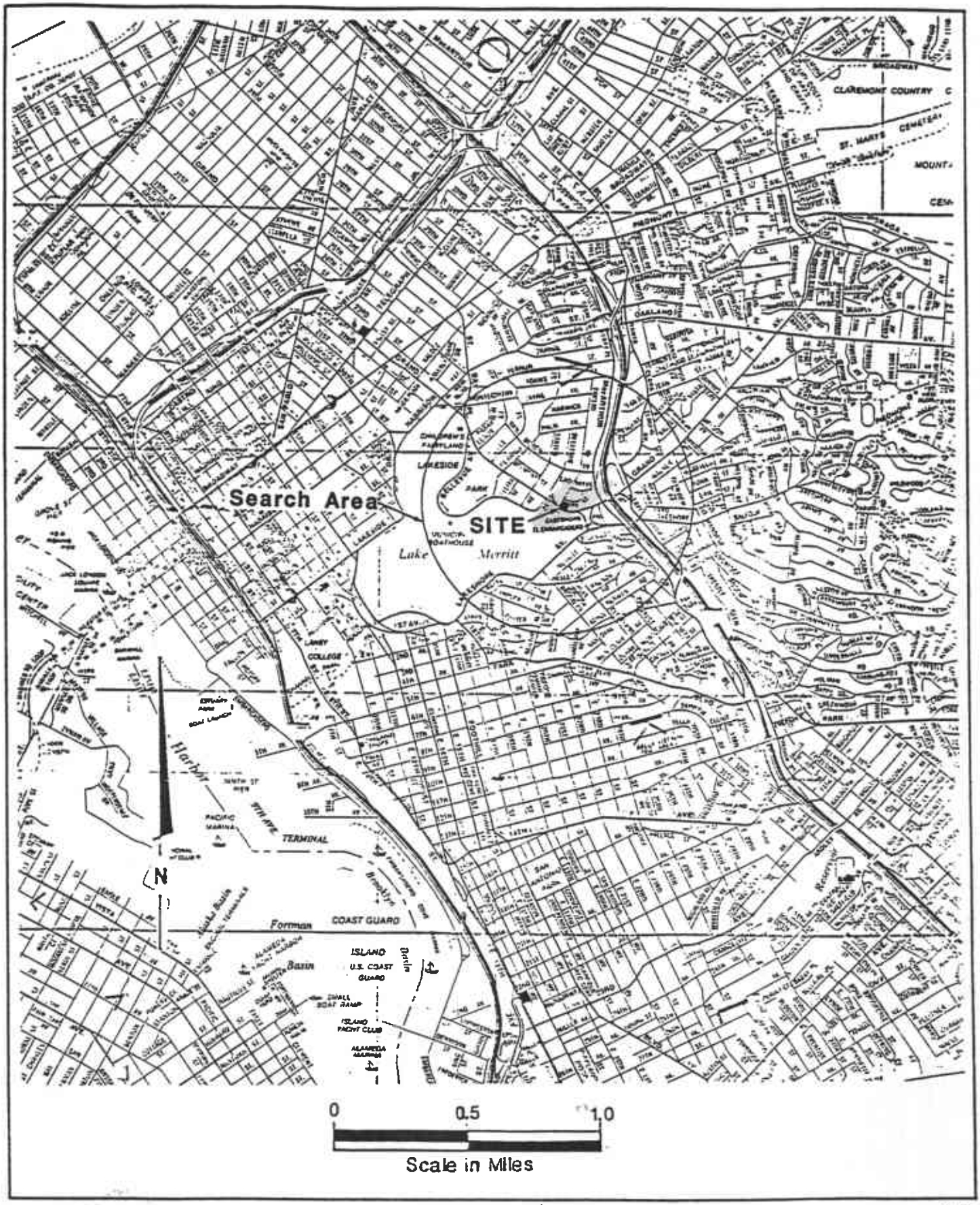
Table 2. Results of Ground-Water Analyses (concentrations in micrograms per liter [μg/l])

Well No.	Benzene	Ethyl-benzene	Toluene	Xylenes
MW-8A	ND (0.5)	ND (2)	1.5	6.6
MW-8B	ND (0.5)	ND (2)	ND (1)	ND (1)
MW-8C	5.3	2.6	3.5	13
MW-8D	Not Sampled			
DWAL	0.70	680	100	620

Table 3. Results of Soil Analyses (concentrations in milligrams per kilograms [mg/kg])

Sample ID	Benzene	Ethyl-benzene	Toluene	Xylenes	TPH
MW-8D-1.3	ND (0.05)	ND (0.1)	0.4	0.5	10

ND = Nondetectable.
Detection limits are given in parentheses.



Harding Lawson Associates
Engineers and Geoscientists

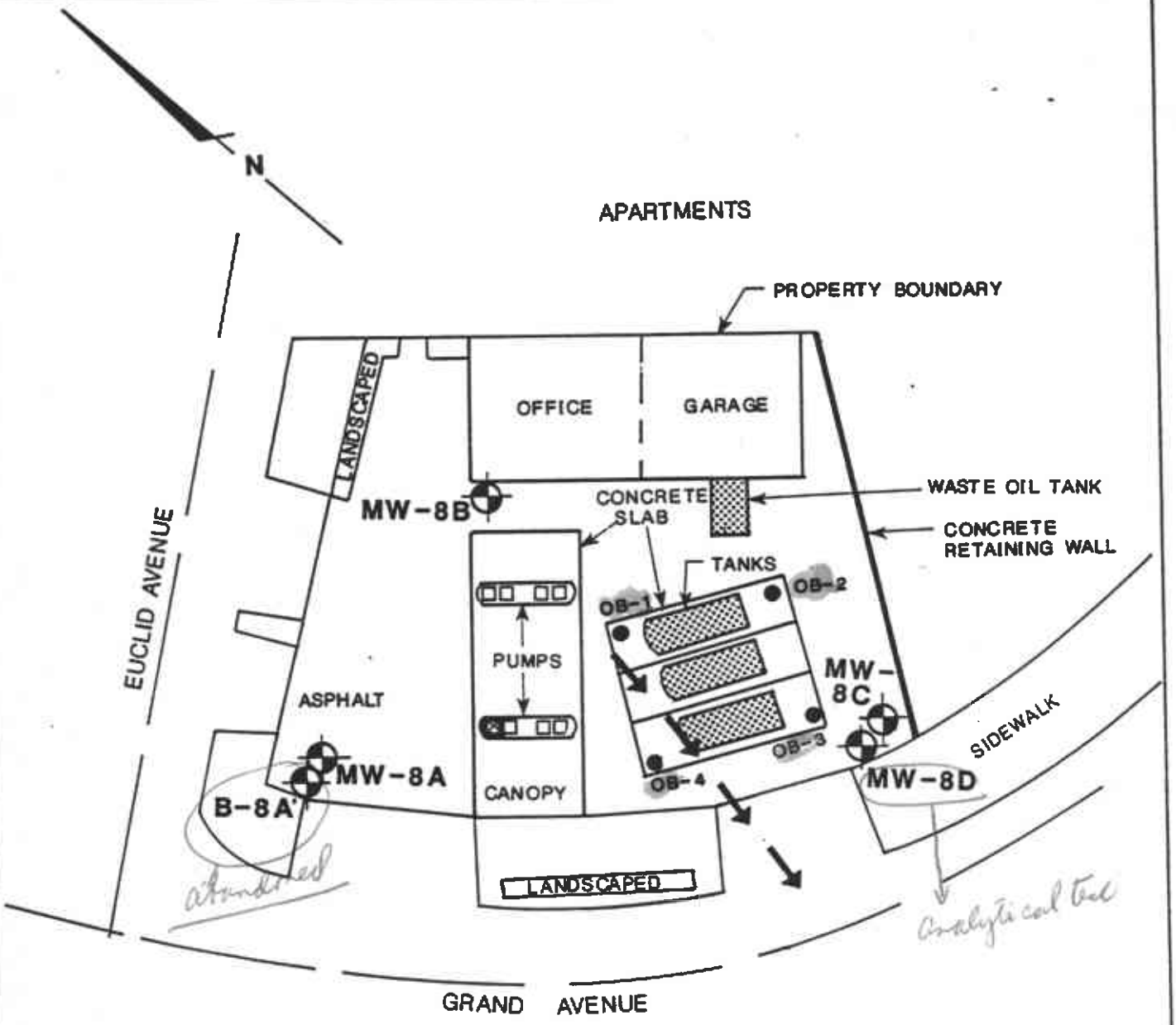
Vicinity Map

Texaco Station-62488000235
500 Grand Ave.
Oakland, California

PLATE **1**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
	2251.054.04	AO	5/88		

106848



EXPLANATION

MW-8B — Monitoring Well Location and Number

OB-1 ● Observation Well and Number

Ground-water Flow Direction

Bench Mark (HLA Datum El. = 100 feet)

0 30
Scale in feet

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Site Plan

Texaco Station-62488000235
500 Grand Avenue
Oakland, California

PLATE 2

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
AG	2251,054.04	JO	5/88		

Equipment 8-inch Hollow Stem Auger

Elevation **100 feet Date 6/6/88

Laboratory Tests	Blows/foot	PID * Reading (ppm)	Depth (ft)	Sample	
			0		asphaltic pavement
					BLACK SILTY CLAY (CL) trace sand stiff, moist, slight petroleum
	19	70	5		GREENISH GRAY SILTY CLAY with sand (CL) stiff, moist, slight petroleum
					BROWN SILTY CLAY (CL) very stiff, moist
	27	30	10		
					BROWN CLAYEY SAND (SC) dense, wet
	30	5 5	15		WHITE SILTY CLAY (CL) hard, moist
					BROWN SILTY CLAY with sand (CL) hard, moist
	55	5	20		
					BROWN CLAYEY SAND (SC) very dense,
	30/6"	5	25		
					the lithology between 15 and 32 feet is inferred from a boring 5-feet to the west of well MW-8A
			30		
					bottom of boring
					stabilized water level at 3 feet on 6/14/88
			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-8A
Texaco Station - 62488000235
500 Grand Avenue
Oakland, California

PLATE 3

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
RS	2251,054.04	AO	7/88		

Equipment 8-inch Hollow Stem Auger

Elevation ***101.5 feet Date 6/7/88

Laboratory Tests	Blows/foot **	PID * Reading (ppm)	Depth (ft)	Sample
			0	asphaltic pavement
				GREENISH GRAY SILTY CLAY (CH) stiff, moist
				water seep
	17/6"	70	5	GRAYISH BROWN SILTY CLAY (CL) hard, moist
				WHITE SILTY CLAY trace sand (CL) very stiff, moist
	28		10	
				BROWN CLAYEY SAND (SC) very dense, moist
	27/6"		15	
				BROWN MOTTLED GRAY SILTY CLAY (CL) very stiff, moist
	15	20	20	
				bottom of boring 20 feet
				stabilized water level at 2 feet on 6/14/88
			25	
			30	
			35	
			40	

*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)

Harding Lawson Associates
Engineers, Geologists & Geophysicists

Log of Boring MW-8B

Texaco Station - 62488000235
500 Grand Avenue
Oakland, California

PLATE 4

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
RS	2251,054.04	JO	7/88		

Equipment 8-inch Hollow Stem Auger

Elevation ***98.7 feet Date 6/7/88

Laboratory Tests	Blows/foot	PID * Reading (ppm)	Depth (ft)	Sample
	**21	100	0	
	** 22	50	5	
	32	50	10	
	26		15	
	27	10	20	
			25	
			30	
			35	
			40	

asphaltic pavement

GRAYISH BROWN CLAYEY SAND (SC)
dense, moist

GRAY GRAVELLY SAND (SW)
dense, saturated

GRAYISH BROWN CLAYEY SAND (SC)
dense, moist

GRAYISH BROWN SILTY CLAY
trace sand (CL)
very stiff, moist

BROWN SILTY CLAY (CL)
hard, moist

BROWN CLAYEY SAND (SC)
dense, moist

BROWN MOTTLED GRAY SILTY CLAY (CL)
moist, hard, with 1 to 2 inches
brown sand lenses (SP)

BROWN SILTY CLAY (CL)
very stiff, moist

GRAY SILTY CLAY (CH)
very stiff, dry, intermixed
with WHITE SILTY CLAY (CL)
very stiff, dry

bottom of boring [redacted] t

stabilized water level at
7.5 feet on 6/14/88

*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)

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Log of Boring MW-8C

Texaco Station - 62488000235
500 Grand Avenue
Oakland, California

PLATE 5

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
RS	2251,054.04	JO	7/88		

Equipment 8-inch Hollow Stem Auger

Elevation ***98± feet Date 6/7/88

Laboratory Tests	Blows/foot **	PID * Reading (ppm)	Depth (ft)	Sample
			0	
	21	170		
			5	
			10	
			15	
			20	
			25	
			30	
			35	
			40	

asphaltic pavement

GRAY GRAVELLY SAND (SW)
dense, saturated

GRAYISH BROWN CLAYEY SAND (SC)
dense, moist

GRAYISH BROWN SILTY CLAY
with sand (CL)
very stiff, moist

bottom of boring 5 feet

water level at 0.8 feet on 6/7/88

■ Sample kept for testing

*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)

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Log of Boring MW-8D

Texaco Station - 62488000235
500 Grand Avenue
Oakland, California

PLATE 6

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
RS	2251.054.04	AO	7/88		

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

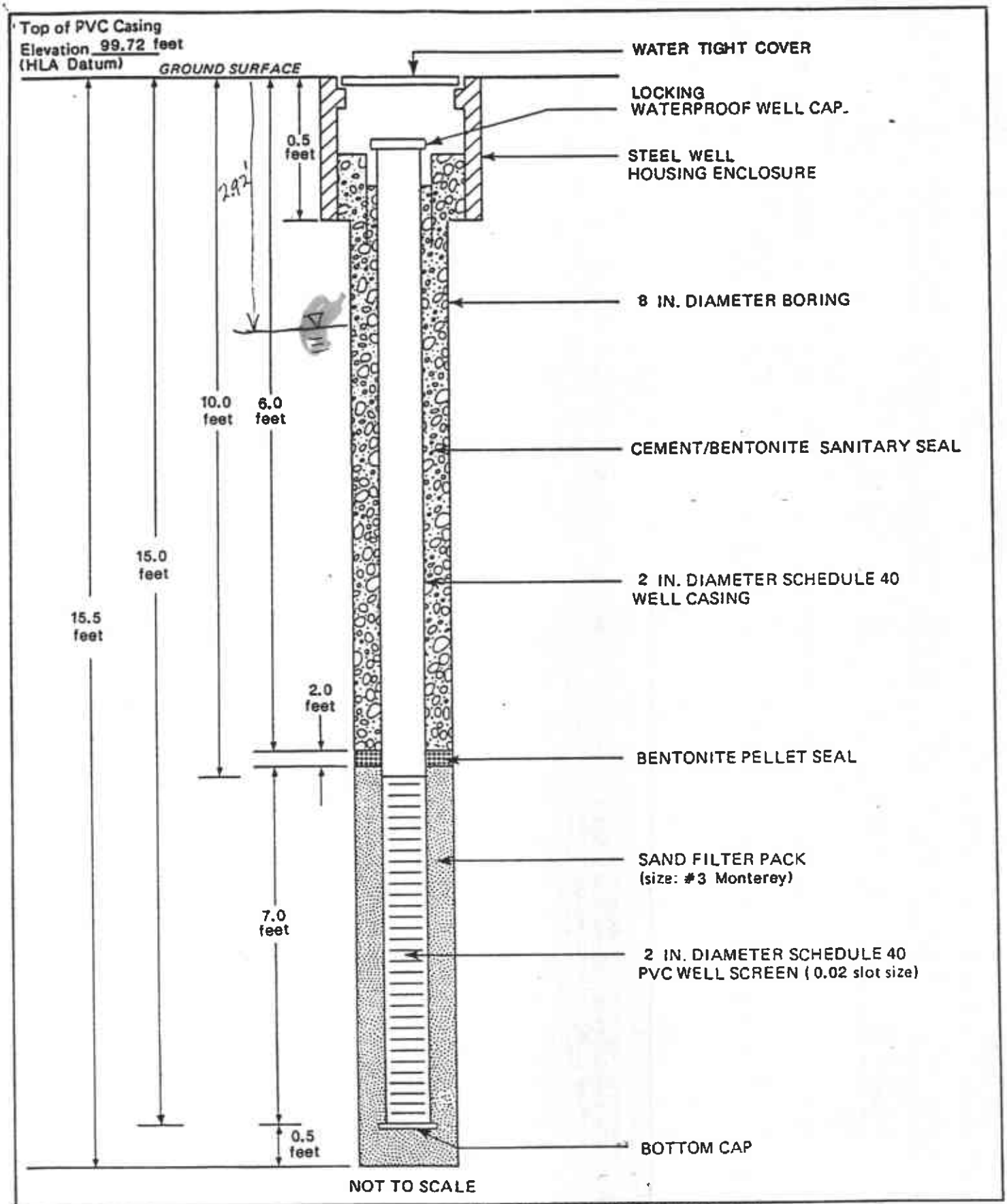
Harding Lawson Associates
Engineers and Geoscientists

Soil Classification Chart and Key to Test Data

Texaco Station – 62488000235
500 Grand Avenue
Oakland, California

PLATE 7

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
RS	2251,054.04	JO	7/88		



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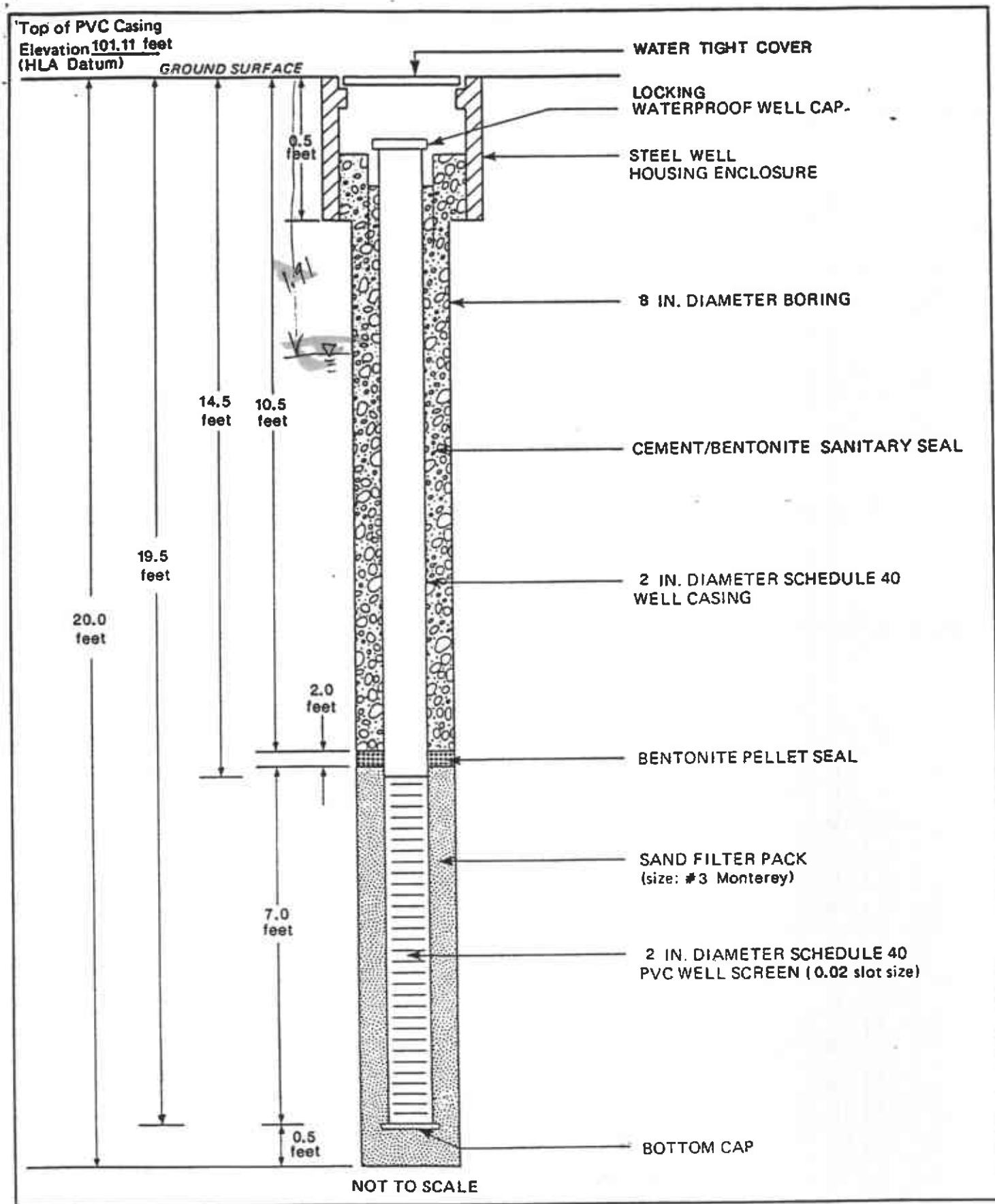
Monitoring Well MW-8A Completion Detail

Texaco Station - 62488000235
500 Grand Avenue
Oakland, California

PLATE **8**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
RS	2251,054.04	JO	7/88		

FORM GW3



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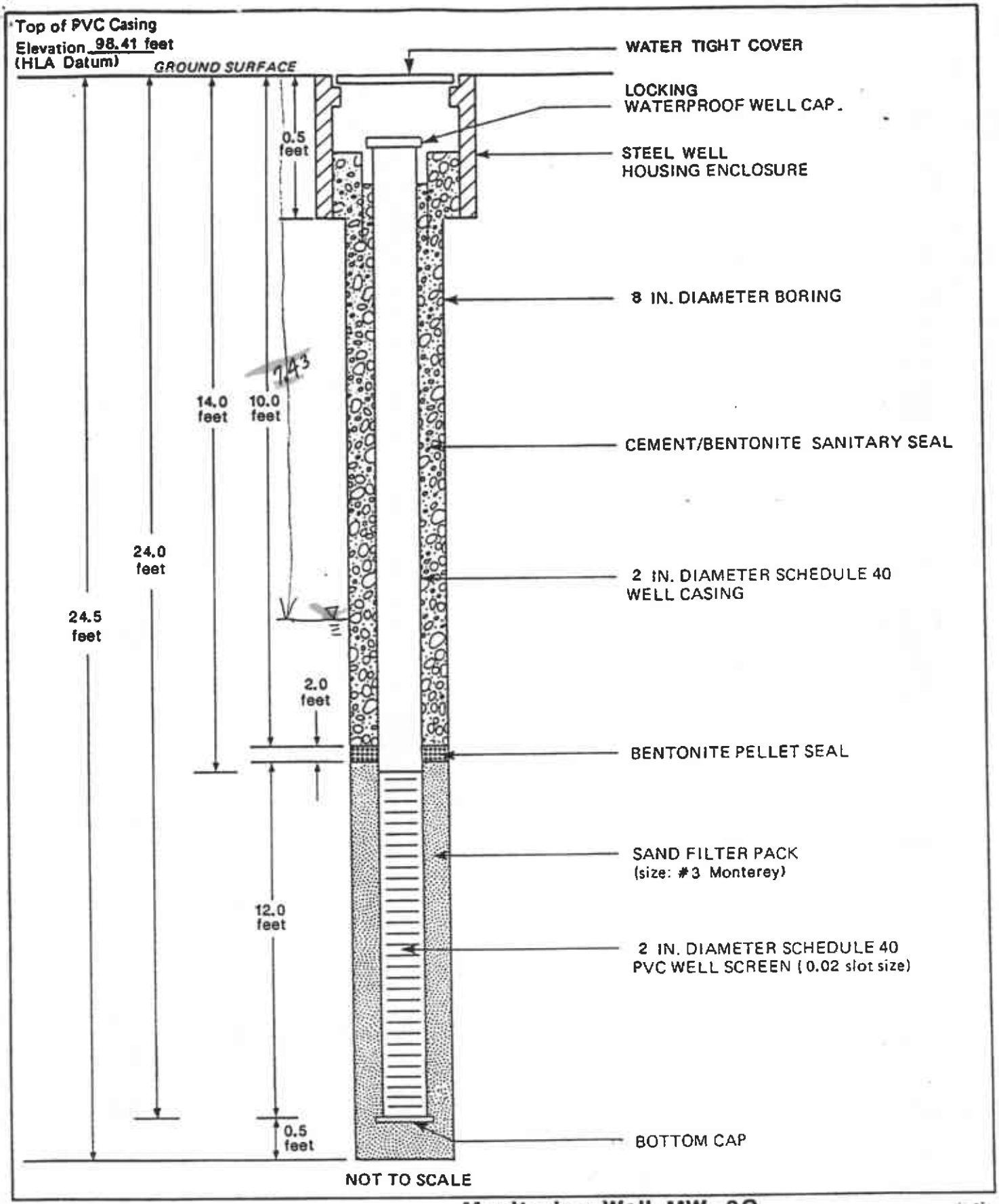
Monitoring Well MW-8B Completion Detail

Texaco Station - 62488000235
500 Grand Avenue
Oakland, California

PLATE **9**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
RS	2251.054.04	40	7/88		

FORM GW3



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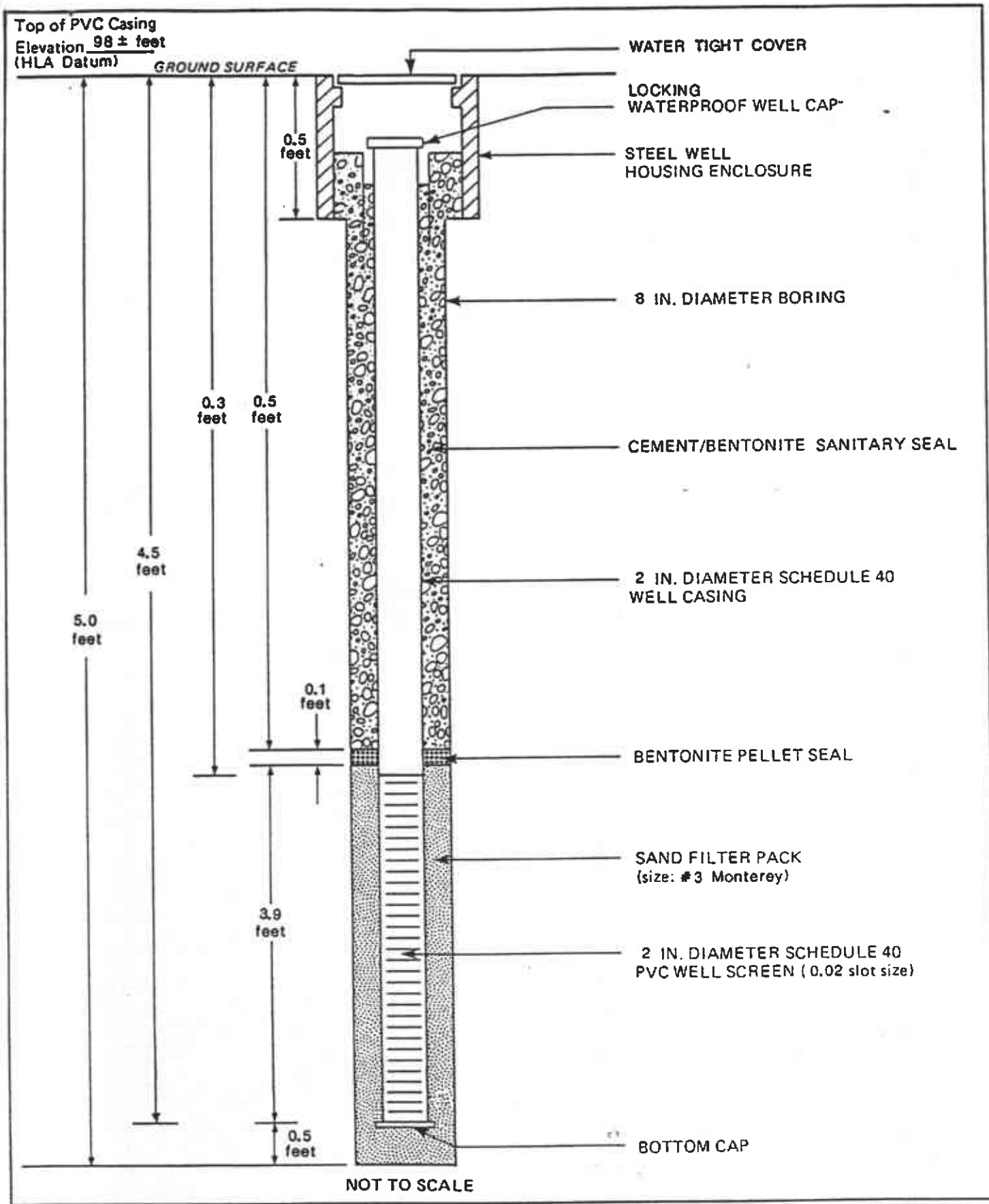
Monitoring Well MW-8C Completion Detail

Texaco Station - 62488000235
500 Grand Avenue
Oakland, California

10

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
RS	2251,054.04	AO	7/88		

FORM GW3



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Monitoring Well MW-8D Completion Detail

Texaco Station - 62488000235
500 Grand Avenue
Oakland, California

PLATE
11

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
RS	2251,054.04	JO	7/88		

FORM GW3

Appendix

LABORATORY ANALYSIS REPORTS

CHEMWEST
ANALYTICAL LABORATORIES, INC.

June 16, 1988

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

Attention: Mr. Jim Ordons

Subject: Report of Data - Case Number 1635

Dear Mr. Ordons:

The technical staff at CHEMWEST is pleased to provide our report for the analyses you requested: BTEX - EPA Method 8020; and Total Petroleum Hydrocarbons (gasoline) - DHS Method, LUFT Field Manual.

One soil sample for Project number 2251-054-04 was received June 8, 1988 in good condition. Results of the analyses, 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 Margie Namba, our sales 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

Joel C. Bird
Project Manager

JB:ds

cc: File

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

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 Fuel Hydrocarbons by Purge & Trap and GC-FID

WATER - DHS Method - Luft Field Manual, Dec. 1987

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, Dec. 1987

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 FUEL HYDROCARBONS - PURGEABLE

Client I.D.: TEX-008-D-1.3
Date(s) Analyzed: 06/14/88

CHEMWEST I.D.: 1635-1
Matrix : Soil

Compound	Amount Detected (mg/kg)	RL (mg/kg)
Benzene	BRL	0.05
Toluene	0.40	0.1
Ethyl Benzene	BRL	0.2
Total-Xylenes (1)	0.50	0.1
Total Fuel Hydrocarbons (Purgeable)	10	10

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

BRL: Below Reporting Limit.
RL: Reporting Limit.

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

Approved by: KF

REV2:1.88

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

CLIENT

Order No. 1635
Date Rec'd. 10/8/88 1435
Compl. Date
Section Diane Wong

CLIENT: Harding Lawson Associates
1646 N. Gerard Street, Suite 150
San Francisco CA 94105

Project Name: Texaco #8
Project No. 2251.054.04
P.O. NO.
Contact Jim Ordona
Phone (415) 777-9706

ANALYSIS: One soil sample received under chain of custody in 6' Brass core tubes (1) to be analyzed for BTEX, and TPHE(M)/GC-FID. (7 day TAT)

Sample I.D.	Date	Matrix	Container
1635	MW-4	10/7/88	Soil	1-6' core tube

MT
GC, PI
M.T. MICHELLE TOLIVER

CHEMWEST COURIER

Harding Lawson Associates
666 Howard Street, Third Floor
San Francisco, California 94105
415/543-8422
Telecopy: 415/777-9706

CHAIN OF CUSTODY FORM

Lab: Chem West

Job Number: 2251.054.04
Name/Location: TEXACO #8
Project Manager: Jim Ordons

Samplers: Jim Ordons

Recorder: Jim Ordons
(Signature Required)

SOURCE CODE	MATRIX: Water	Sediment	Soil	Oil	#CONTAINERS & PRESERV.: Unpres.	H_2SO_4	HNO_3	ICE	SAMPLE NUMBER OR LAB NUMBER (Yr / Wk / Seq)	DATE: Yr	Mo	Dy	Time	STATION DESCRIPTION/ NOTES
			X					X	MW-3@13	88	06	07	1021	7 day turnaround

ANALYSIS REQUESTED

EPA 601/8010	EPA 602/8020	EPA 624/8240	EPA 625/8270	Priority Pllnt. Metals	Benzene/Toluene/Xylene	Total Petrol. Hydrocarb. as gasoline
					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
Jim Ordons	[signature]	6/8/88 1400
[signature]	[signature]	6/8/88 165[illegible]
[signature]		6/8/88 193[illegible]

DISPATCHED BY: (Signature)	DATE/TIME	RECEIVED FOR LAB BY: (Signature)	DATE/TIME
		[signature]	6/8 193[illegible]

METHOD OF SHIPMENT

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

CHEMWEST
ANALYTICAL LABORATORIES, INC.

June 24, 1988

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

Attention: Mr. Steve Osborne

Subject: Report of Data - Case Number 1689

Dear Mr. Osborne:

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

Two water samples for Project number 2251 054.04 were received June 15, 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 Margie Namba, our sales 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

Joel Bird
Project Manager

JB:ds

cc: File

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

CHEMWEST ANALYTICAL LABORATORIES
BENZENE, TOLUENE, ETHYL BENZENE, XYLENES

Client I.D.: TEX 088-B-1 and TEX 008-B-2 CHEMWEST I.D.: 1689-1
Date(s) Analyzed: 06/21/88 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	105%	50-150%

BRL: Below Reporting Limit.
RL: Reporting Limit.

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

Approved by: KP

REV2:1.88

CHEMWEST ANALYTICAL LABORATORIES
BENZENE, TOLUENE, ETHYL BENZENE, XYLENES

Client I.D.: TEX 088-C-1 and TEX 008-C-2 CHEMWEST I.D.: 1689-2
Date(s) Analyzed: 06/21/88 Matrix : Water

Compound	Amount Detected (ug/L)	RL (ug/L)
Benzene	5.3	0.5
Toluene	3.5	1
Ethyl Benzene	2.6	2
Total-Xylenes (1)	13.0	1

Surrogate	% Recovery	Acceptance Window
ortho-Chlorotoluene	105%	50-150%

BRL: Below Reporting Limit.
RL: Reporting Limit.

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

Approved by: YP

REV2:1.88

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

CLIENT

Order No. 1689
Date Rec'd. 6/15/88 @ 0900
Compl. Date
Section Joel Bird

CLIENT: HARDING LAWSON ASSOCIATES
1355 WILLOW WAY SUITE 109
CONCORD, CA 94520

Project Name: Texaco - station #8
Project No. 2251 054.04
P.O. NO.
Contact Steve Osborne
Phone (415) 687-9660

ANALYSIS:

TWO water samples (2) received under chain of custody in four (4) 40ml voa vials to be analyzed for BTEX/TEH

*NOTE: SEVEN DAY TURN AROUND

Sample ID	Time	Location	Date	Analysis	Matrix	Containers
1689-1 TEX 008-B-1 TEX 008-B-2	1630	Grand Ave. Oakland	6/14/88	BTEX/TEH	WATER	2-40ml voa.
1689-2 TEX 008-C-1 TEX 008-C-2	1635	" ↓ "	6/14/88	BTEX/TEH	WATER	↓

GC
MJ - MARINA JAMES

CHEMWEST
COURIER

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. Hoge

o Number: 2251.054.04

me/Location: Texaco - Station #8

oject Manager: _____

Recorder: David R. Hoge (Signature Required)

COMP.	MATRIX: Water	Sediment	Soil	Oil	#CONTAINERS & PRESERV.: Unpres.	H_2SO_4	HNO_3	VOA	HCL	Liters	SAMPLE NUMBER OR LAB NUMBER: Yr	Wk	Seq	DATE: Yr	Mo	Dy	Time	STATION DESCRIPTION/ NOTES	EPA 601/8010	EPA 602/8020	EPA 624/8240	EPA 625/8270	Priority Pllnt. Metals	Benzene/Toluene/Xylenes	Total Petrol. Hydrocarb.	AS Gas - 8015
S	X							X	X		T	X	008810	88	06	14	1630						X			
S	X							X	X		T	X	008812				1630						X			
S	X									X	T	X	008813				1630						X		X	
S	X							X	X		T	X	008C01				1655						X			
S	X							X	X		T	X	008C02				1655	4 day Turnaround					X			
S	X									X	T	X	008C03				1655						X		X	

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

CHAIN OF CUSTODY RECORD

RELINQUISHED BY: (Signature) David R. Hoge	RECEIVED BY: (Signature) [illegible]	DATE/TIME 6/15
RELINQUISHED BY: (Signature) [illegible]	RECEIVED BY: (Signature)	DATE/TIME
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)	DATE/TIME
METHOD OF SHIPMENT		

Laboratory Copy Project Office Copy Field or Office Copy

6533

CHEMWEST
ANALYTICAL LABORATORIES, INC.

June 30, 1988

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

Attention: Mr. Steve Osborne

Subject: Report of Data - Case Number 1761

Dear Mr. Osborne:

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 number 2251 054.04 was received June 22, 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 Margie Namba, our sales 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

Joel Bird
Project Manager

JB:ds

cc: File

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

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.: 8A
Date(s) Analyzed: 06/28/88
thru : 06/29/88

CHEMWEST I.D.: 1761
Matrix : Water

Compound	Amount Detected (ug/L)	RL (ug/L)
Benzene	BRL	0.5
Toluene	1.5	1
Ethyl Benzene	BRL	2
Total-Xylenes (1)	6.6	1

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: ____

REV2:1.88

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

CLIENT

Order No. 1761
Date Rec'd. 6/22/89 1850
Compl. Date
Section Lab Bld

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

Project Name: Texaco S.L. 8
Project No. 22510544.04
P.O. NO.
Contact Steve Osborne
Phone (415) 1687-9160

ANALYSIS: One water sample rec'd under chain of custody in 40ml VOA vials (2) to be analyzed for BTEX (7 Day T/A)

	Sample Id	Date	Time	Matrix	Containers
17611	EA	6/21	1630	water	2-40ml VOA

GC
M.T. MICHELLE TOLIVER

CHEMWest Courier GTC

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

CHAIN OF CUSTODY FORM

Lab: _____

Samplers: Pamela Lassiter

Job Number: 2251 054 04

Name/Location: Texaco Sta 8

Project Manager: Corey Fariano

Recorder: _____ (Signature Required)

SOURCE CODE	MATRIX: Water	Sediment	Soil	Oil	#CONTAINERS & PRESERV.: Unpres.	H_2SO_4	HNO_3	VOAs	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.
23	X							2	8A			88	06	21	1630	7 DAY T.A.						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 4/22/88 1640
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME 4/22/88 1855
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
DISPATCHED BY: (Signature) DATE/TIME	RECEIVED FOR LAB BY: (Signature) Michelle Sartain	DATE/TIME 4/22 1855
METHOD OF SHIPMENT		

Laboratory Copy Project Office Copy Field or Office Copy

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