A Report Prepared for

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

QUARTERLY TECHNICAL REPORT
THIRD QUARTER OF 1989
FORMER TEXACO STATION
2200 EAST 12TH STREET
OAKLAND, CALIFORNIA

HLA Job No. 2251,112.03

2-1-90

by

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INTRODUCTION

This quarterly technical report (QTR) presents the results of site investigation and remediation activities conducted by Harding Lawson Associates (HLA) at a service station site, formerly owned by Texaco Refining and Marketing Inc., at 2200 East 12th Street, Oakland, California (see Plate 1). Exxon U.S.A. currently owns and operates the site. HLA's work at the site, ongoing since June 1988, is summarized in this report; the recent quarter's work included additional borings and groundwater sampling, as described below.

The information in this QTR is presented in the following subsections:

- Site description
- Hydrogeologic setting
- Summary of previous work
- Work performed during the third quarter of 1989
- Discussion of results.

SITE DESCRIPTION

The site is on the southeast corner of the intersection of East 12th Street and 22nd Avenue (see the Site Plan, Plate 2). The surrounding area consists of commercial/retail businesses, including a Shell Oil Company (Shell) service station immediately across 22nd Avenue (Plate 3). The site is bordered on the west by East 12th Street, on the north by 22nd Avenue, and on the east

by a building occupied by a mattress manufacturer. Adjacent to the site on the south is a parcel owned by M.C.B. Industries; that site is currently used for automobile storage.

The site is relatively flat, sloping gently southwest toward East 12th Street and the Brooklyn Basin Tidal Canal (Plate 1). Surface elevation at the site is approximately 20 feet above Mean Sea Level, and drainage is toward East 12th Street. This area has been extensively developed, and surface water runoff is mainly controlled by the municipal storm sewer system.

At the station, leaded and unleaded gasoline are dispensed and automotive repair services are provided. Structures include a building, three fuel pump islands, one underground waste oil tank, and three underground fuel storage tanks.

HYDROGEOLOGIC SETTING

The East Bay Plain has been divided into seven ground-water subareas, defined by the California Department of Water Resources (DWR) on the basis of areal differences (i.e., faults and geologic conditions). The site lies within the Oakland Upland and Alluvial Plain subarea. The ground-water reservoir is made up of the Alameda and Temescal Formations, along with the Merritt Sand, with an aggregate thickness of more than 1,100 feet. Regional ground-water flow direction is west-southwest, toward San Francisco Bay.

Most uses of ground water in the East Bay Plain are related to irrigation or industrial needs; the majority of domestic water is supplied by the East Bay Municipal Utility District (EBMUD).

Subsurface conditions at the site to the maximum depth explored (20 feet), indicate that soils generally consist of unconsolidated, stiff, sandy clay (CL) interbedded with occasional silty sand and gravel lenses. During HLA's investigation, ground water was initially encountered between 11 and 13 feet below grade, stabilizing in the wells at approximately 6.5 feet below grade.

The tops of well casings were surveyed to a temporary datum located at the western end of the dispenser island nearest the underground storage tanks with an assumed elevation of 100.0 feet (HLA datum, see Plate 2). Well monitoring and survey data are presented in Table 1. The general direction of ground-water flow is to the west-northwest, with a gradient of 0.004 foot per foot, as shown on the Ground-water Surface Map, Plate 4. Estimates of the hydraulic conductivity of the slightly confined shallow soils range from 0.4 to 0.5 foot per day.

SUMMARY OF PREVIOUS WORK

HLA's Investigation

Since May 1988, HLA has investigated soil and ground-water conditions at this site. To date, the investigation has con-

sisted of three sequential phases, results of which were presented in reports issued on the following dates:

1. Sensitive Receptor Study May 24, 1988
2. Subsurface Investigation July 20, 1988
3. Environmental Assessment September 19, 1989

Soil-gas Survey

In September 1988, a soil-gas survey was conducted to evaluate the lateral extent of petroleum hydrocarbons in soil and ground water. Soil-gas probes were driven at 13 locations on site and in streets near the site (Plate 5).

The soil-gas testing is conducted using a mobile van. A hollow steel probe is driven 6 to 10 feet into the ground, and a vacuum pump attached to the above-ground end of the probe. Immediately upon extraction, soil-gas and/or water samples are analyzed with a portable gas chromatograph for concentrations of benzene, toluene, ethylbenzene, and xylenes (BTEX), and for total petroleum hydrocarbons (TPH).

Results of analyses, summarized in Table 2, represent the relative weight of BTEX and TPH found in a 1-liter volume of the sample matrix (soil gas or ground water). Soil-gas probe locations and associated TPH values are shown on Plate 5. Groundwater samples were obtained from Probes 2 and 10 and from MW-9A.

Soil Borings

HLA explored subsurface conditions on and off site by drilling and sampling 19 soil borings between June 1988 and September

19 soil
8 – monitoring wells

1989. Eight of the borings were completed as monitoring wells (MW-9A through MW-9H). Boring locations are shown on Plate 2.

The borings were advanced using truck-mounted, 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, stainless steel tubes. Drilling was performed under the direction of an HLA field geologist, who logged the borings.

Soil samples were screened in the field for volatile organic vapors. Selected samples were preserved and transported under chain-of-custody protocol to ChemWest Analytical Laboratories, Inc. (ChemWest), in Sacramento, California. They were analyzed for BTEX and TPH as gasoline (see Table 3)

Water Quality Sampling

Each monitoring well was developed, sampled, and surveyed by an HLA technician within two weeks after installation. All monitoring wells are resampled periodically, using the following procedures.

Ground-water samples are collected from each well with a clean, stainless steel bailer. A representative sample is decanted into laboratory-prepared, 40 milliliter, volatile organic analysis (VOA) vials after at least three well volumes have been purged. The vials are immediately sealed; placed in a cooler with ice; transported under chain-of-custody protocol to

ChemWest; and analyzed for BTEX content. Results of samplings to date are presented in Table 4.

Aquifer Hydraulic Testing

HLA performed hydraulic testing in MW-9B and MW-9E in February 1989. A volume (slug) of water was removed from each well using a centrifugal suction pump. A pressure transducer, placed near the bottom of the well, was used to measure water level recovery following slug withdrawal. The output of the transducer was recorded by a data logger for subsequent analysis. The most permeable stratum adjacent to the screen in the saturated zone was classified as hydraulically confined or unconfined by comparing well water levels to the well boring logs. Slug test results are presented in Table 5.

WORK PERFORMED DURING THE THIRD QUARTER OF 1989

HLA issued the Environmental Assessment Report to Texaco Refining and Marketing Inc. on September 20, 1989. At that time, we also began preparing a remedial plan for this site.

DISCUSSION OF RESULTS

Vadose-zone Soil Condition

The vadose-zone area in which detectable concentrations of petroleum products are found (in soils and soil-gas) is closely associated with the pump islands. Except in Borings B-4 and MW-

9E, concentrations of TPH in vadose-zone soil samples obtained between ground surface and the water table are less than 100 parts per million (ppm). Relatively high concentrations of BTEX and TPH were detected in soil-gas samples from Probe Locations SG-1 and SG-3. Spilled fuel products migrating through cold joints between concrete and asphalt may be the source of the petroleum products in near-surface soils.

Ground-water Condition

Shallow ground water in the site vicinity contains detectable quantities of BTEX. Laterally, the extent of BTEX in the ground water is well delineated and appears to be extending downgradient, toward utility lines in East 12th Street and 22nd Avenue. The bottom of the storm drain in East 12th Street is approximately 8.5 feet below grade, approximately 2 feet below the water table.

Source of Dissolved Hydrocarbons

Analyses of ground-water samples indicate that gasoline handling operations on site have produced the BTEX components found in ground water both on and off site. We understand that line and tank testing in 1988 showed that the fuel dispensing system was tight. It is therefore likely that the fuel hydrocarbons encountered have derived from surface spillage, overfilling during product delivery, or line or tank leakage that occurred prior to the 1988 testing.

LIST OF TABLES

LIST OF PLATES

Table 1. Well Monitoring and Survey Data

Well No.	Top of Casing Elevation* (feet)	Depth to Ground Water** (feet)	Ground-Water Surface Elevation+ (feet)
MW-9A	100.07	7.25	92.82
MW-9B	98.41	6.14	92.27
MW-9C	99.73	6.99	92.74
MW-9D	101.46	8.40	93.06
MW-9E	98.41	5.70	92.71
MW-9F	96.96	6.07	90.89
MW-9G	98.51	6.01	92.50
MW-9H	97.14	8.35	88.79

Notes:

* Elevation relative to HLA temporary benchmark located at the western corner of the dispenser island nearest the underground storage tanks, with an arbitrary elevation of 100.0 feet (see Plate 2).

** Depth to ground water on October 12, 1989.

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

Table 2. Results of Soil-gas Survey
Conducted on September 20, 1988
Concentrations in micrograms per liter (μg/L)

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

-- = Not able to obtain sample

N/A = Not applicable

Air = ambient air sample

Table 3. 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	4.8	0.30	ND	0.2	ND	ND
B-9-1	5.0	ND	ND	ND	ND	ND
B-9-1	9.0	ND	ND	ND	ND	ND
B-9-1	12.0	ND	ND	ND	ND	ND
B-9-2	5.0	ND	ND	ND	ND	ND
B-9-2	9.0	ND	ND	ND	ND	ND
B-9-2	10.5	ND	ND	ND	ND	ND
B-9-2	13.0	ND	ND	ND	ND	ND
B-4	4.0	1.0	2.3	0.9	5.8	160
B-4	9.0	ND	ND	ND	ND	ND
B-5	4.0	0.33	ND	ND	ND	ND
B-5	9.0	ND	ND	ND	ND	ND
B-6	5.0	ND	ND	ND	ND	ND
B-6	5.5	ND	ND	ND	ND	ND
B-7	4.0	ND	ND	ND	ND	ND
B-7	8.5	ND	ND	ND	ND	ND
B-8	5.5	0.43	ND	ND	ND	ND
B-8	9.0	ND	ND	ND	ND	ND
B-9	4.0	ND	ND	ND	ND	ND
B-9	9.0	ND	0.4	ND	1.1	39
B10-1	5.0	ND	ND	ND	ND	ND
B10-2	10.0	ND	ND	ND	ND	ND
B11-1	5.0	ND	ND	0.1	ND	ND
B11-2	10.0	ND	ND	ND	ND	ND
MW-9D	6.0	ND	ND	ND	ND	ND
MW-9D	10.5	ND	ND	ND	ND	ND
MW-9E	5.5	ND	18	ND	ND	1900
MW-9E	9.0	ND	ND	ND	ND	ND
MW-9G	4.0	ND	ND	0.2	ND	ND

ND = Not detected.

1 Detection limit 0.05 mg/kg except as noted in parentheses.

2 Detection limit 0.2 mg/kg except as noted in parentheses.

3 Detection limit 0.1 mg/kg except as noted in parentheses.

4 Detection limit 10 mg/kg except as noted in parentheses.

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

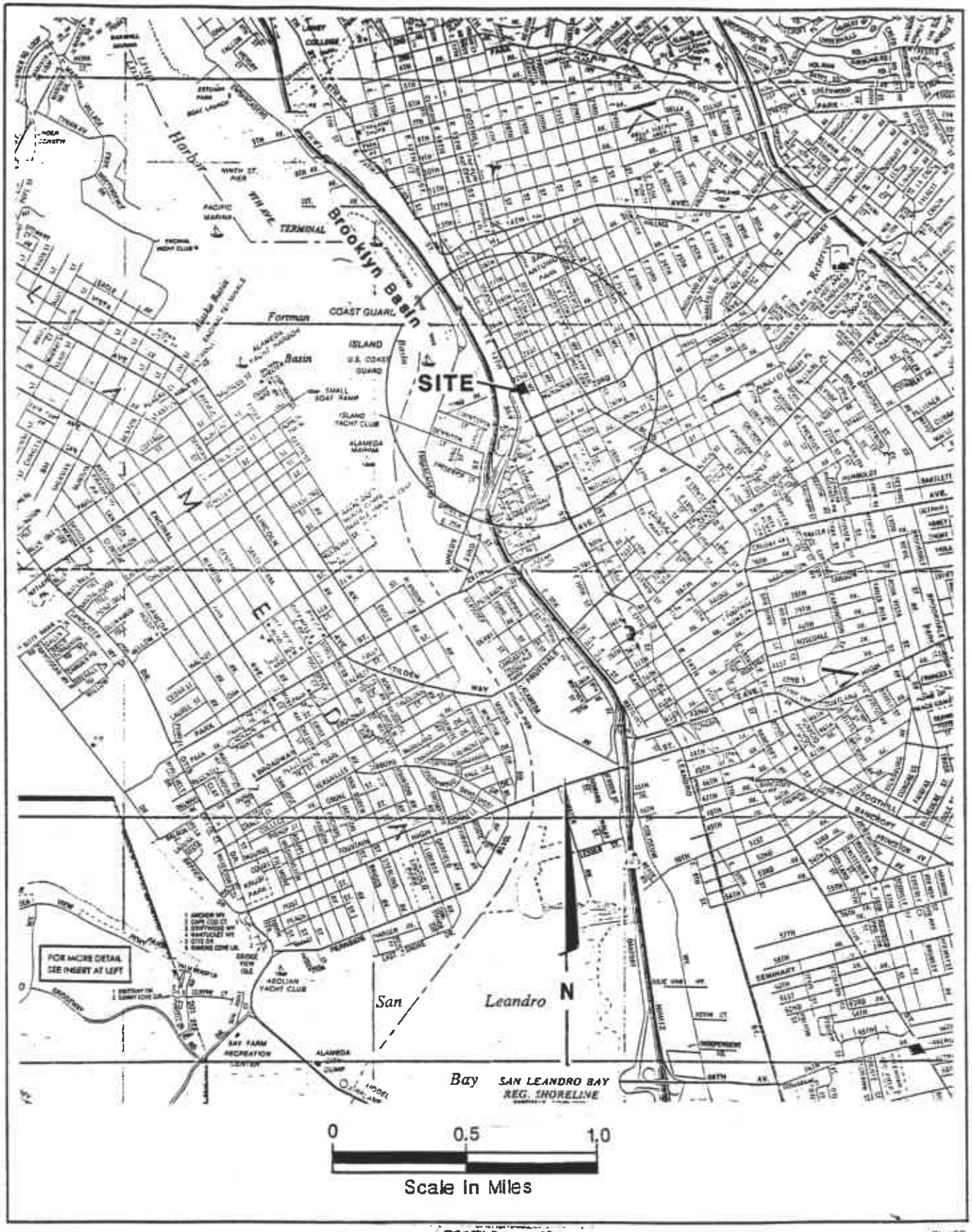
Well Number	Date Sampled	EPA TEST METHOD 602 Benzene	Ethylbenzene	Toluene	Xylenes
MW-9A	06/13/88	ND	ND	ND	ND
MW-9A	10/24/88	ND	ND	ND	ND
MW-9B	06/13/88	350	66	7.8	160
MW-9B	10/24/88	84	3.1	ND	3.2
MW-9C	06/13/88	ND	ND	ND	ND
MW-9C	10/28/88	ND	ND	ND	ND
MW-9D	10/24/88	ND	ND	ND	ND
MW-9E	10/24/88	1.3	ND	ND	ND
MW-9F	12/06/88	ND	ND	ND	ND
MW-9G	12/06/88	0.8	ND	ND	ND
MW-9H	12/06/88	ND	ND	ND	ND
Detection limits		0.5	2.0	1.0	1.0

ND = Not detected

Table 5. Slug Test Results

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

105648



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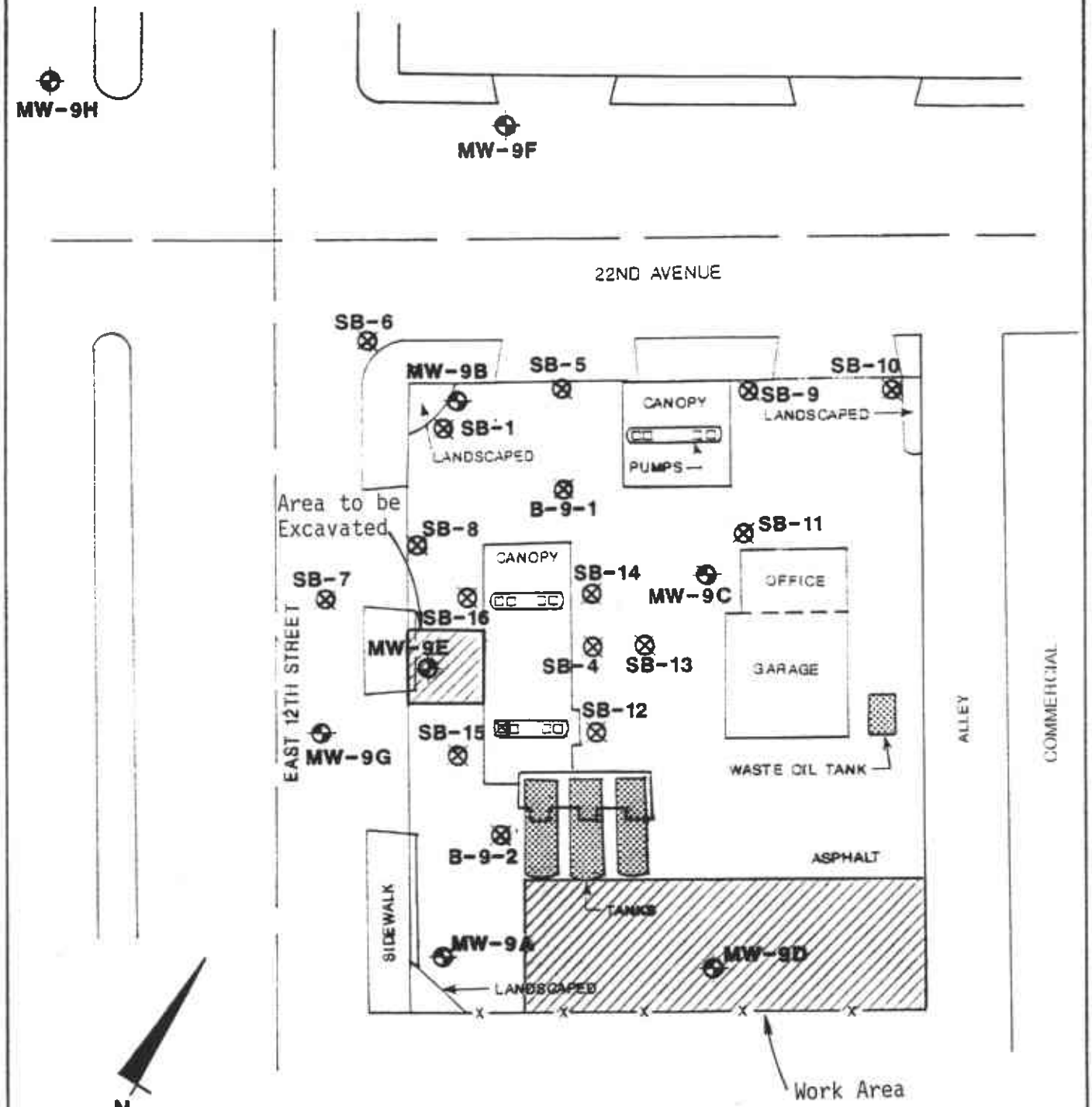
Engineers and Geoscientists

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

PLATE **1**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
	2251,112,03		6/89		



EXPLANATION

MW-9A ⊕ Monitoring well location and number

B-2 ⊠ Boring location and number

⊠ Bench mark (HLA datum El.=100 feet)

0 30
Scale in feet

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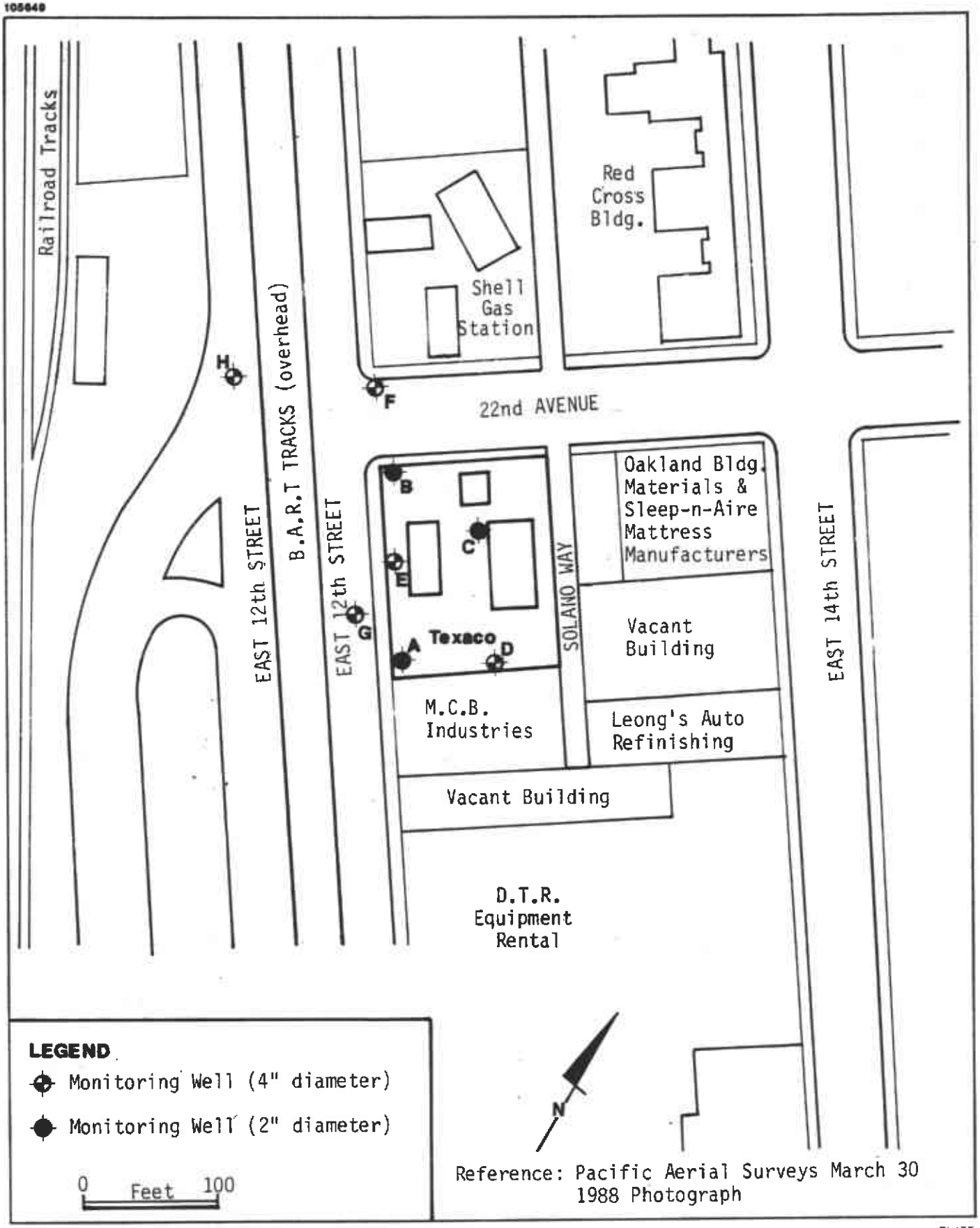
Site Plan
Former Texaco Service Station
2200 East 12th Street
Oakland, California

PLATE **2**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
YC	2251,112.03	G	6/89		

105649



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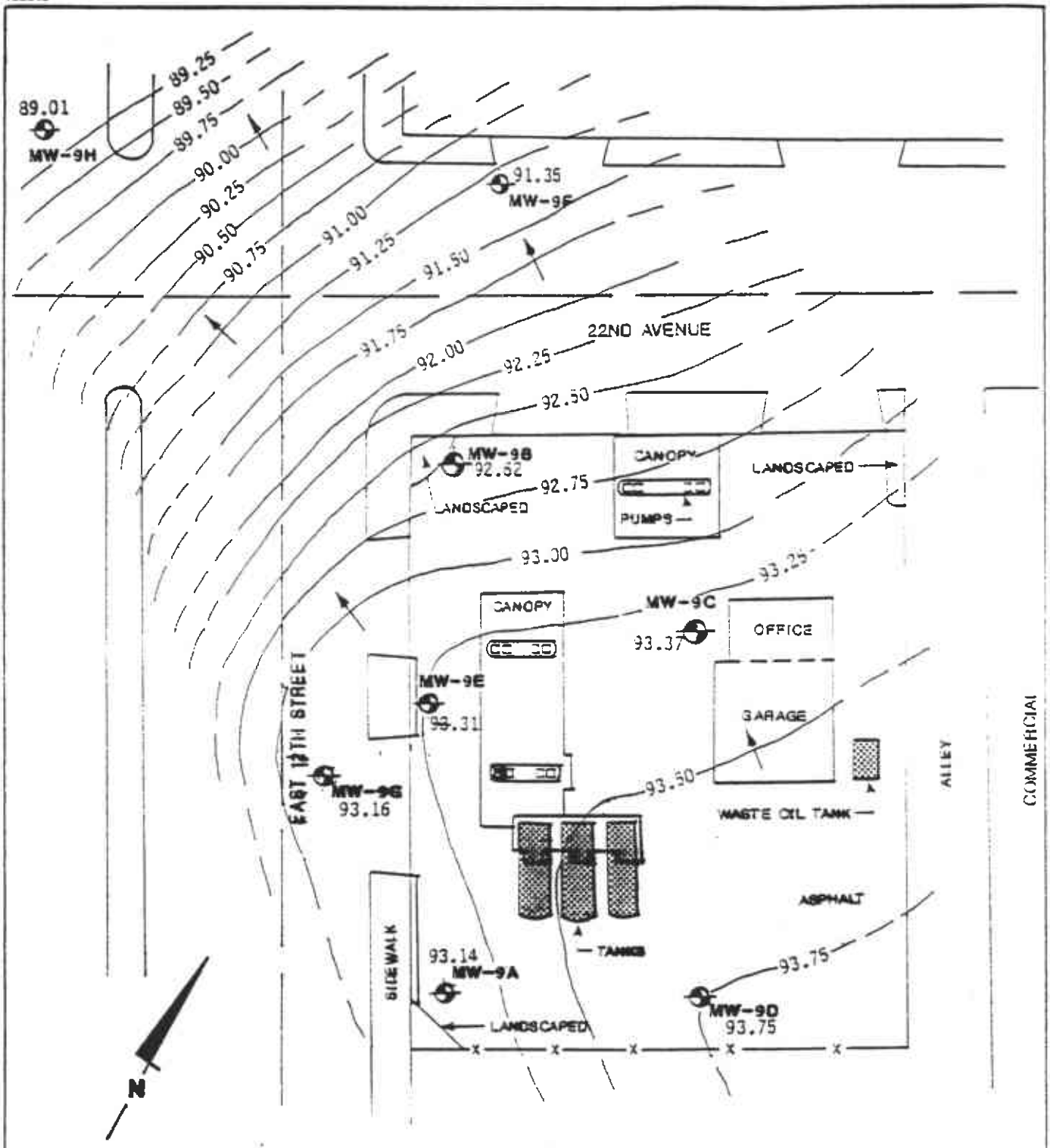
Vicinity Plan
Former Texaco Service Station
2200 East 12th Street
Oakland, California

PLATE **3**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
YC	2251,112.03	G	1/89		



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

PLATE **4**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
YC	2251,112.03	G	6/89		

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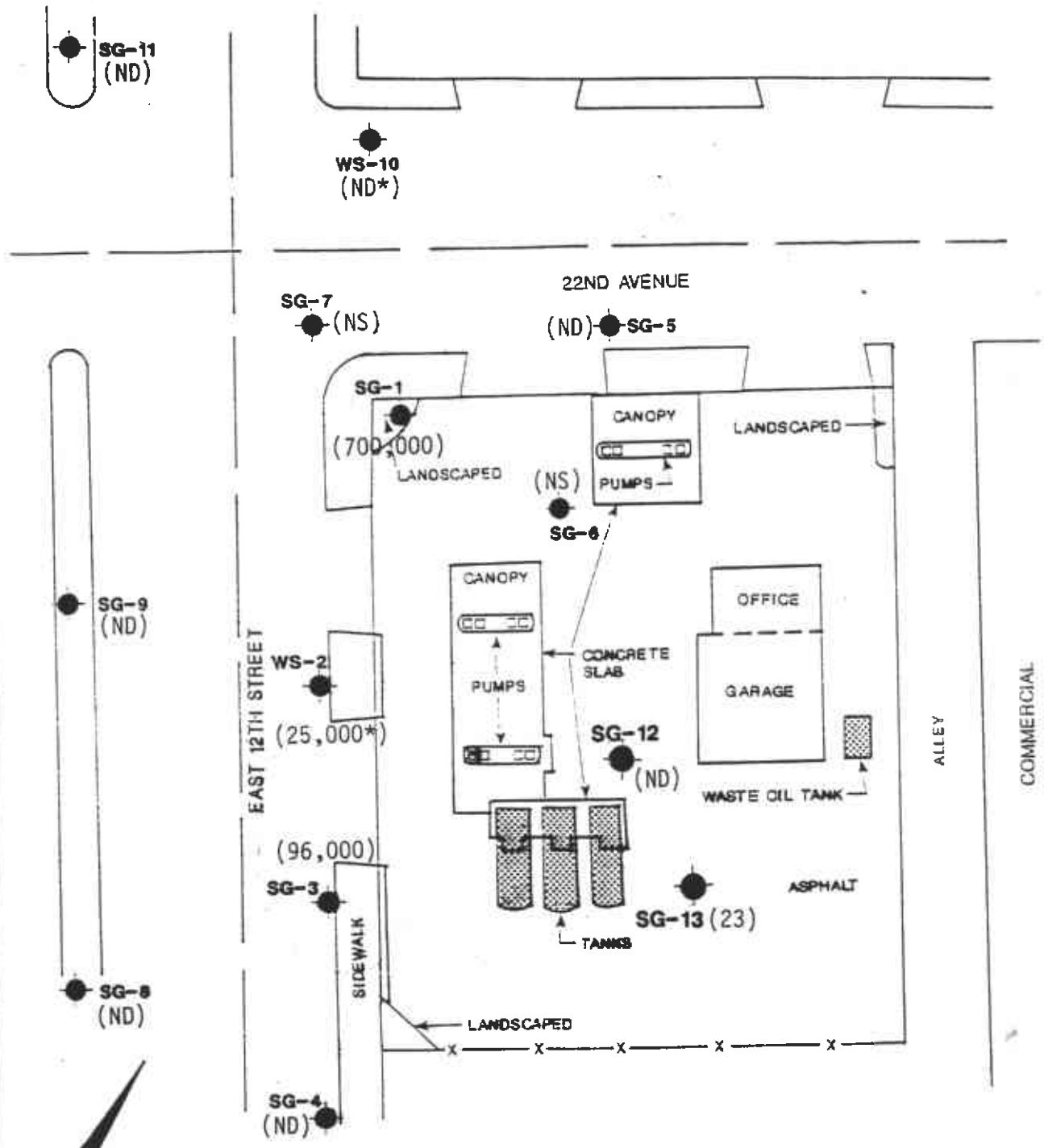

LEGEND

Soil-gas probe location

(23) TPH concentration in micrograms/liter

* Water sample (NS) Not sampled (ND) Not Detected

Bench mark (HLA datum El.=100 feet)

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

PLATE **5**

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QUALITY CONTROL REVIEWER

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