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July 19,1999

Ms. Susan Hugo
Senior Hazardous Materials Specialist
Alameda County Health Agency
1131 Harbor Bay Parkway, 2nd Floor
Alameda, CA 94502

Subject: Emeryville Materials Facility, Aboveground and Underground Storage Tank Summary Report and Remedial Action Plan

Dear Ms. Hugo:

The report titled "*Emeryville materials Facility, Aboveground and Underground Storage Tank Summary Report and Remedial Action Plan*" is attached for your review. This report summarizes historical remedial measures taken during the removal of three underground storage tanks (USTs) and four aboveground storage tanks (ASTs) at the facility. USTs included a 500-gallon tank, probably containing kerosene, and two 5,000-gallon tanks which contained non-polychlorinated biphenyl (PCB) mineral oil. Three 10,000-gallon and one 11,000-gallon ASTs also were used to store mineral oil. Following removal of the USTs and ASTs, site investigations were initiated to determine the impact of products stored in the tanks in the surrounding soil.

Based on available information, the 500-gallon UST was overexcavated, and resampling indicated that soil concentrations of petroleum products were below method-reporting limits. No further action is required regarding this tank. After over-excavation of the two 5,000-gallon USTs, concentrations of petroleum products remain in soil at detectable quantities and further investigation may be necessary. A limited groundwater investigation is proposed in this area to determine if product stored in the former USTs has affected the surrounding groundwater.

Several investigations of the AST area have determined that the soils in the immediate area are affected by PCBs. Excavation of all soils containing PCBs in excess of 25mg/kg will reduce soil concentrations, such that remaining soils meet EPA standards for industrial settings.

In addition, the monitoring-well network associated with the AST area, as well as the series of wells located throughout the facility, should be destroyed per state well standards. These wells no longer serve a regulatory purpose and act as a potential conduit for pollution to reach the groundwater table.

Please let me know if the remedial action proposed in this report satisfies Alameda County Department of Environmental Health standards for closure of the ASTs and USTs. You can reach me at (415) 972-5719.

Sincerely,

Susan Fandel

Susan M. Fandel
Environmental Specialist

SMF:jc

cc: Mr. Derek Lee
San Francisco Regional Water Quality Control Board

Enclosure

bpc: Pete DeMartini
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TES

SJC 65
LOP 355

Emeryville Materials Facility

Aboveground and Underground

Storage Tank Summary Report and

Remedial Action Plan

Prepared by

Technical and Environmental Services

Prepared for

Environmental Field Services

July 1999

Report No.: 402.331-99.88

Pacific Gas and Electric Company
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Legal Notice

Prepared by:

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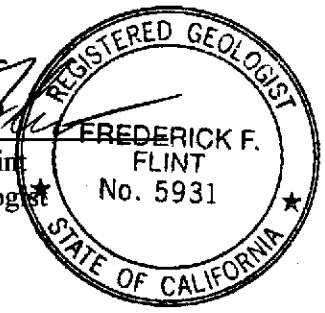

Approved by:

Korbin D. Creek
Acting Land and Water Quality Unit Supervisor

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Section 1

INTRODUCTION

Since 1991, several subsurface investigations have been conducted at Pacific Gas and Electric Company's (PG&E) Emeryville Materials Facility (EMF) to determine the presence of materials associated with past operations. The areas of investigation include underground storage tanks (USTs) located at 4227 Hollis Street and 4525 Hollis Street, and an aboveground storage tank (AST) farm located along 53rd Street.

All USTs have been removed, followed by confirmation sampling. At both locations, overexcavation and resampling occurred based on analytical results. The ASTs were removed and several subsurface investigations were conducted consisting of soil borings, the installation of monitoring wells and a risk based corrective action (RBCA) analysis.

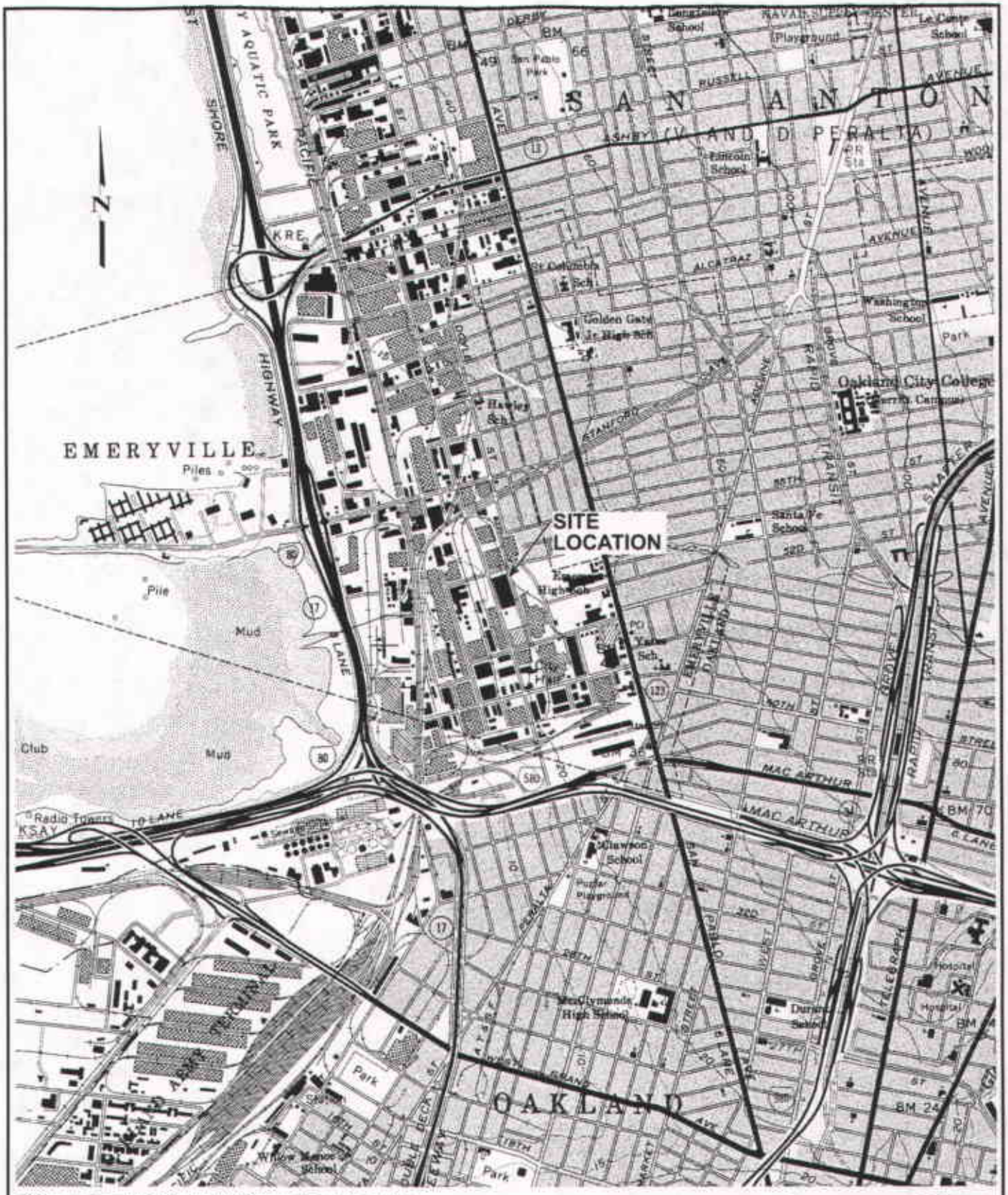
The purpose of this report is to summarize clean-up efforts undertaken at each area to date, and to present the results of any investigations. This report includes summaries of all analytical data and risk-based analysis. Recommendations for remedial actions necessary for mitigating each area to acceptable regulatory levels are included with appropriate remedial work plans. This report includes information regarding field procedures, quality assurance/quality control, waste disposal, report preparation, schedule, health and safety precautions and emergency contacts and procedures.

Site Location and Land Use

The EMF is located at 4525 Hollis Street in the city of Emeryville, and extends from an area south of 45th Street to 53rd Street (Figure 1). The property occupies approximately 16.5 acres in an area zoned for industrial use.

The site was constructed on artificial fill ranging from three to eight feet above the natural ground surface at an elevation of approximately 25 feet above mean sea level (USGS 1980). The nearest drainage is Temescal Creek, which flows through an underground culvert toward San Francisco Bay. Figure 2 is a layout of the EMF showing the approximate location of the former UST and AST areas. Also shown in Figure 2 are a series of seven monitoring wells installed at the facility in 1984 (E&E 1984).

Since construction in the early 1920s, the EMF has been a warehouse, repair shop, and storage yard. Transformers, capacitors, oil circuit breakers and other miscellaneous equipment used in the electrical transmission and distribution system are brought to the facility for repair and storage.



Base map from U.S. Geological Survey 7.5 minute series
Quadrangle: Oakland West, Calif.

0 2000 Feet

Figure 1. Topographic map of Emeryville Materials Facility.

990423/EMV-topo/pc19

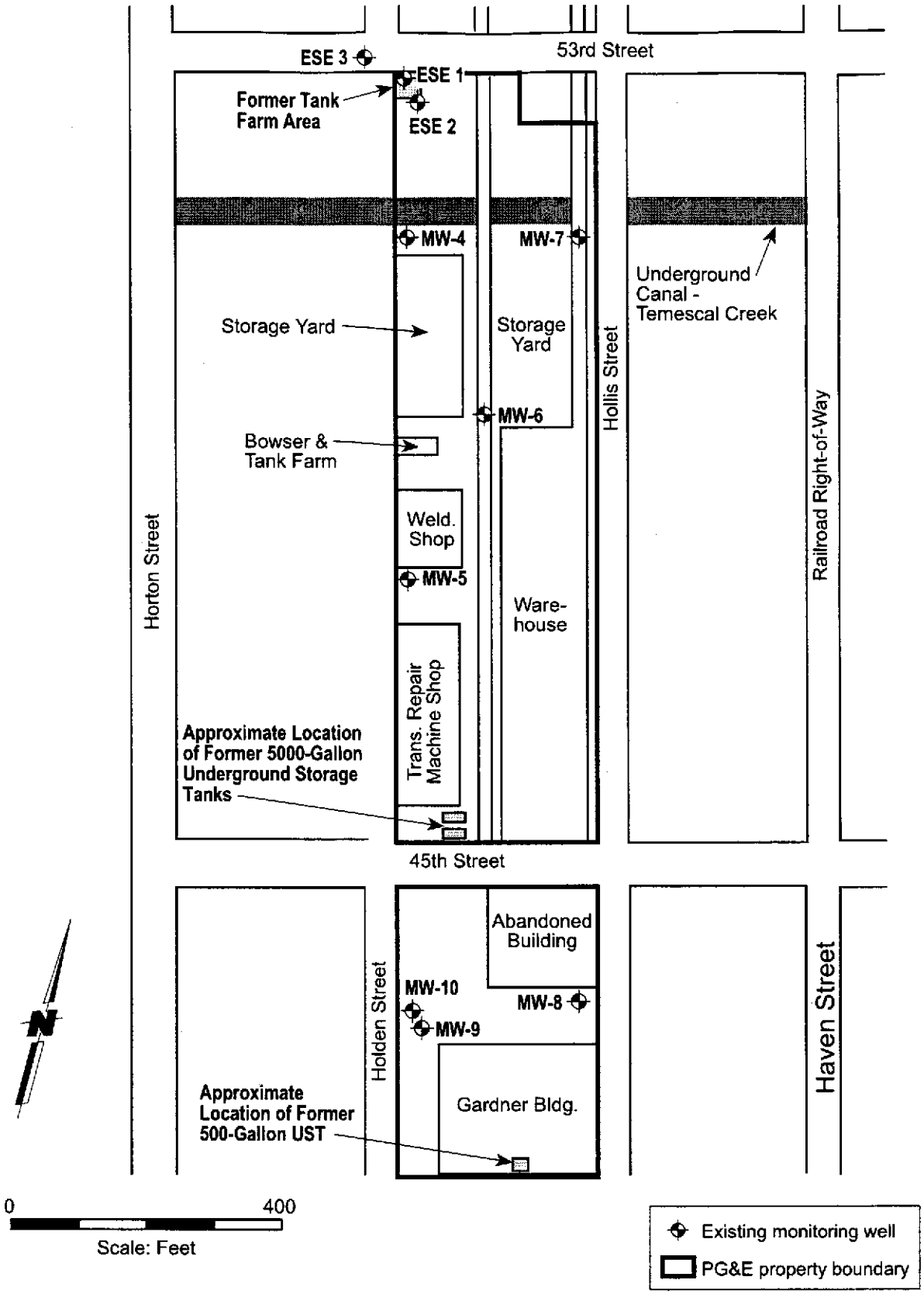


Figure 2. Layout of Emeryville Materials Facility showing former tank farm area, underground storage tank sites and existing monitoring well locations.

Geology and Hydrogeology

The facility is located in a lowland area along the eastern shore of San Francisco Bay, a flooded river valley in a northwest trending structural trough formed in Franciscan bedrock. Tectonic forces in place during the Pleistocene epoch (approximately 2 million years ago) created the San Francisco Bay depression, as the Oakland/Berkeley hills were undergoing uplift. Erosion and deposition of material from the Oakland/Berkeley hills created coalescing alluvial fan deposits along the east shore of the bay.

Alluvial deposits along the East Bay margin include:

- Pleistocene alluvial fan deposits consisting of silty and sandy clays with gravely lenses which grade laterally into margin sediments (Alameda Formation).
- Upper Pleistocene Merrit Sand consisting of fine grained lenticular sands and silty sands that occur irregularly and vary in thickness from a few inches to 65 feet.
- Late Pleistocene to Holocene alluvial deposits consisting of interbedded clayey gravels, sand and silty clays, and sand-silt-clay mixtures that grade laterally into Merrit Sand (Temescal Formation).
- Holocene stream deposits.

Previous investigations indicate that the facility is underlain by approximately 3 to 8 feet of fill (PG&E 1994a). This fill is underlain by Pleistocene alluvial fan deposits consisting of thick sequences of silty and sandy clay with thinly interbedded and discontinuous gravel lenses. Shallow groundwater occurs at an elevation of about 6 to 8 feet above sea level, 12.5 to 14.5 feet below ground surface (ft bgs). Groundwater flow-direction is generally westerly toward the bay. Previously issued reports are listed in Appendix A

Section 2

UNDERGROUND STORAGE TANK INVESTIGATION

In October 1991, one 500-gallon underground storage tank (UST) was removed at 4227 Hollis Street at the EMF. The tank was probably used to store kerosene. Two 5,000-gallon, steel, single-wall tanks, used for storing non-PCB mineral oil were located near Hollis Street (Figure 3). Excavation of these tanks, which were decommissioned in 1986, occurred on December 22, 1993. The former tank sites were filled following an excavation audit, and capped with concrete. Locations of each tank are shown in Figure 3.

500-Gallon UST

PG&E acquired the property in 1955 and, with the purchase, an undocumented 500-gallon UST presumed to have had kerosene. PG&E never used the UST and removed the tank once discovered.

Following excavation of the single 500-gallon UST in October 1991, a soil sample was collected from the west bottom end. The materials of concern included total petroleum hydrocarbons (TPH) as -gasoline, and kerosene; total oil and grease (TOG); polychlorinated biphenyls (PCBs); and metals (cadmium, chromium, lead, nickel, and zinc). Following a limited overexcavation in November 1991, additional soil samples were collected from the bottom and side walls of the excavation. Approximate sample locations are shown in Figure 3.

Table 1 is a summary of the soils analytical data collected near the former 500-gallon UST. The confirmation soil samples of November 1991, showed no detectable levels of PCB, TPH-gasoline, TPH-kerosene, or TOG. Metals present in the confirmation samples were below threshold limit concentrations and are considered representative of background concentrations. Appendix B contains a completed tank closure form.

Two 5,000-Gallon USTs

Removal of the two, 5,000-gallon USTs occurred on December 22, 1993, and four soil samples were collected from the ends of the tanks at a depth of ten feet below grade. On December 29, 1993, additional excavation at the site extended the UST vault depth to 12 feet. Soil samples collected after the overexcavation were used to determine the effectiveness of source removal. Figure 3 shows the approximate soil sampling locations for the two investigations.

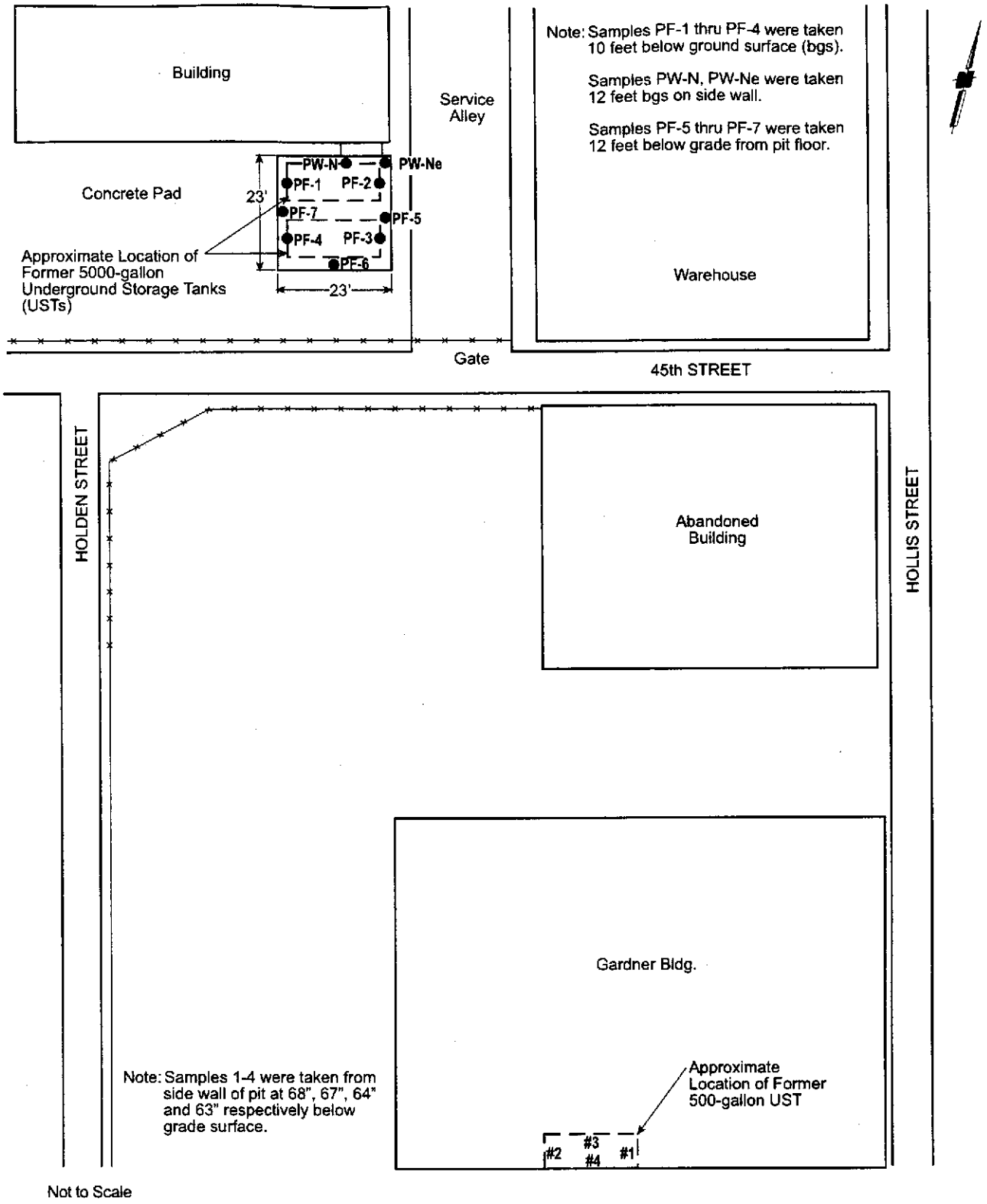


Figure 3. Soil sampling locations at former underground storage tank sites, Emeryville Materials Facility.

Table 1
Emeryville Materials Facility
Former 500-Gallon Underground Storage Tank Area
Soils Analytical Data
(all concentration units are in mg/kg)

	After Excavation on October 24, 1991			After Over-excavation on November 11, 1991			
ANALYSES	Sample Location			Sample Location			
	West End	East End	Composite	West wall	East wall	North wall	South wall
PCB's[a] by EPA 8080	0.1	<0.1	0.2	<0.5	<0.5	<0.5	<0.5
Oil & Grease by EPA 9071	115	<50	<50	<10	<10	<10	<10
TPH as Kerosene[b,c]	6230	<10	<10	<1.0	<1.0	<1.0	<1.0
TPH as Gasoline: EPA 5030	460	<1.0	1.9	<1.0	<1.0	<1.0	<1.0
Metals by EPA 6010							
Zinc	88	115.3	193.5	43.0	32.8	45.7	35.2
Cadmium	1.43	1.0	2.0	3.5	2.94	2.85	2.78
Lead	21.3	6.1	300	2.0	1.37	2.28	1.62
Nickel	<1.5	28.7	39.6	28.0	25.5	25.2	29.2
Chromium	27.5	16.5	26.5	28.5	26.5	27.1	26.8
Semi-Volatile Organics: EPA 8270							
2-methyl napthalene	0.40	<0.20	<0.20	na	na	na	na
Acenaphthene	<0.04	<0.04	0.30	na	na	na	na
Bis-(2-ethylhexyl phthalate)	0.30	<0.10	<0.10	na	na	na	na
Phenanthrene	<0.10	<0.10	0.40	na	na	na	na
Benzo(a)pyrene	<0.09	<0.09	0.12	na	na	na	na
Benzo(b)fluoranthene	<0.20	<0.20	0.30	na	na	na	na

Notes:

na = not available

< = not detected at or above the indicated reporting limit

[a] = Only Aroclor 1260 was detected above the reporting limit

[b] = Samples collected on 10/24/91 were analyzed according to Department of Health Extraction Methods

[c] = Samples collected on 11/11/91 were analyzed according to EPA Method 3550

Results of soil samples collected after the December 22, 1993 excavation (Table 2) indicate that the site was impacted by TPH-diesel (2,600 mg/kg), oil and grease (2,400 mg/kg), PCBs (1.4 mg/kg), cadmium (2.2 mg/kg) chromium (51 mg/kg), lead (47mg/kg), nickel (110 mg/kg) and zinc (57 mg/kg).

Following the overexcavation of December 29, 1993, remaining soil concentrations were: TPH-diesel (300 mg/kg), oil and grease (310 mg/kg), PCBs (0.086 mg/kg), cadmium (1.6 mg/kg), chromium (48 mg/kg), lead (11 mg/kg), nickel (220 mg/kg) and zinc (50 mg/kg). Metals concentrations are well below total threshold limit concentrations and are considered background levels. The analytical results are summarized in Table 2.

Table 2
Emeryville Materials Facility
Two 5000-Gallon Underground Storage Tank Site
Soil Analytical Data
(all concentration units are in mg/kg)

	After Excavation on December 22, 1993				After Over-Excavation on December 29, 1993				
ANALYSES	Sample Number				Sample Number				
	PF-1	PF-2	PF-3	PF-4	PF-5	PF-6	PF-7	PW-n	PW-ne
Benzene	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Toluene	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Ethylbenzene	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Xylene	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
TPH as Gasoline	<0.50	0.97	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
TPH as Diesel	< 10	2,600	< 10	< 10	36	< 10	41	300	210
TPH as Motor Oil	< 10	< 50	< 10	10	< 10	< 10	< 10	< 10	< 10
Oil & Grease	< 50	2,400	< 50	< 50	< 50	< 50	80	310	90
(EPA 8270)[a]	<0.70	<0.70	<0.70	<0.70	<0.70	<0.70	<0.70	<0.70	<0.70
(EPA 8010)[b]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
(EPA 8080) PCBs[c]	<0.033	1.4	0.23	0.17	<0.033	<0.033	<0.033	0.086	0.036
Five Metals:									
Cadmium	1.8	2.2	1.7	2	1.4	1.6	0.99	1.5	1.4
Chromium	51	44	41	51	48	39	30	45	47
Lead	< 10	47	< 10	< 10	11	< 10	< 10	< 10	< 10
Nickel	73	110	61	61	110	80	83	210	220
Zinc	46	57	40	43	42	47	32	47	50

Note:
< = not detected at or above the indicated reporting limit
[a] = This analysis is for Semi-Volatile Organic compounds
[b] = This analysis is for Halogenated Volatile Organic compounds
[c] = Only Aroclor 1260 was detected above the reporting limit

Section 3

ABOVEGROUND STORAGE TANK INVESTIGATION

An above ground tank farm used for the storage of mineral oil was located along the western edge of the property adjacent to 53rd Street. This corner of the property contained a lowered 4 foot concrete pad (40' x 40'), that supported four aboveground storage tanks (ASTs) and an oil transfer pump. Three of the tanks had a capacity of 10,000 gallons each, while the fourth had a capacity of 11,000 gallons. These tanks were removed between March and September 1993, and the site is now inactive under an impermeable plastic cover.

Three subsurface investigations, two soil and one groundwater, have been conducted at the site as well as quarterly groundwater monitoring and a RBCA analysis. Results of the three soil investigations conducted on the site between 1993 and 1996 are summarized in Table 3.

October 1993 Soil Investigation

A preliminary soil investigation was performed in October 1993 to determine the presence of mineral oil in subsurface soils beneath the ASTs (PG&E 1994a). During this soil investigation nine soil borings were installed within the AST area (B1, B2, B4, B7, B9, B10, B12, B14 and B16) (Figure 4). Results of the preliminary investigation indicated that:

1. Shallow soils beneath the site consist of sand, clayey sand, silt, and clay.
2. Groundwater was not encountered to a depth of 9 feet.
3. PCBs, characterized as Aroclor 1260, were present at concentrations ranging from non-detection (<1 mg/kg) to 385 mg/kg.
4. Total extractable petroleum hydrocarbons (TEPH) was present at concentrations ranging from 640 mg/kg to 16,000 mg/kg.

March 1994 Groundwater Investigation

The second investigation assessed the impact to groundwater by mineral oil (PG&E 1994b). The groundwater investigation consisted of the installation of four monitoring wells to the first water bearing zone (ESE 1-4) (Figure 4). This groundwater investigation determined:

1. The site is underlain by silt and clay with small lenses of gravel to depths of 18 to 20 feet. Beneath the silt and clay is gravel ranging in thickness from 10 to 15 feet to depths of 35 feet below ground level (ft bgs).
2. Groundwater beneath the site exists under confining conditions at depths from 10 to 11.8 ft bgs.

Table 3

Emeryville Materials Facility - Former Aboveground Storage Tanks
Summary of Results - 1993-1996
Soil Analytical Data

Boring Designation	Sampling Date	Approximate Sample Depth (ft bgs)	Approximate Sample Elevation (feet)	Benzene (ug/kg)	Toluene (ug/kg)	Ethyl-Benzene (ug/kg)	Total Xylenes (ug/kg)	TPH-MinO (mg/kg)	Polychlorinated Biphenyls - Aroclor[a] 1016 (mg/kg)	1221 (mg/kg)	1232 (mg/kg)	1242 (mg/kg)	1248 (mg/kg)	1254 (mg/kg)	1260 (mg/kg)
B1	10/06/93	0-1.5	23.7-22.2	---	---	---	---	---	<1	<1	<1	<1	<1	<1	38
B1	10/06/93	1.5-3.0	22.2-20.7	---	---	---	---	---	<1	<1	<1	<1	<1	<1	<1
B1	10/06/93	3.0-4.5	20.7-19.2	---	---	---	---	---	<1	<1	<1	<1	<1	<1	385
B1	10/06/93	4.5-6.0	19.2-17.7	---	---	---	---	---	<1	<1	<1	<1	<1	<1	350
B1	10/06/93	6.0-7.5	17.7-16.2	---	---	---	---	---	<1	<1	<1	<1	<1	<1	295
B1	10/06/93	7.5-9.0	16.2-14.7	---	---	---	---	---	<1	<1	<1	<1	<1	<1	2
B2	10/06/93	1.0-2.0	22.7-21.7	---	---	---	---	---	<1	<1	<1	<1	<1	<1	4
B2	10/06/93	2.0-3.0	21.7-20.0	---	---	---	---	---	<1	<1	<1	<1	<1	<1	<1
B2	10/06/93	4.0-6.0	19.7-17.7	---	---	---	---	---	<1	<1	<1	<1	<1	<1	<1
B2	10/06/93	6.0-6.5	17.7-17.2	---	---	---	---	---	<1	<1	<1	<1	<1	<1	19
B4	10/06/93	0-1.5	23.7-22.2	---	---	---	---	---	<1	<1	<1	<1	<1	<1	<1
B4	10/06/93	1.5-3.0	22.2-20.7	---	---	---	---	---	<1	<1	<1	<1	<1	<1	<1
B4	10/06/93	3.0-4.5	20.7-19.2	---	---	---	---	---	<1	<1	<1	<1	<1	<1	<1
B4	10/06/93	4.5-6.0	19.2-17.7	---	---	---	---	---	<1	<1	<1	<1	<1	<1	<1
B4	10/06/93	6.0-7.5	17.7-16.2	---	---	---	---	---	<1	<1	<1	<1	<1	<1	11
B4	10/06/93	7.5-9.0	16.2-14.7	---	---	---	---	---	<1	<1	<1	<1	<1	<1	8
B7	10/06/93	1.5-3.0	22.2-20.7	---	---	---	---	1950	<1	<1	<1	<1	<1	<1	<1
B7	10/06/93	4.5-6.0	19.2-17.7	---	---	---	---	640	<1	<1	<1	<1	<1	<1	<1
B7	10/06/93	7.5-9.0	16.2-14.7	---	---	---	---	7700	<1	<1	<1	<1	<1	<1	<1
B9	10/06/93	0-1.5	23.7-22.2	---	---	---	---	---	<1	<1	<1	<1	<1	<1	2
B9	10/06/93	1.5-3.0	22.2-20.7	---	---	---	---	---	<1	<1	<1	<1	<1	<1	1
B9	10/06/93	3.0-4.5	20.7-19.2	---	---	---	---	---	<1	<1	<1	<1	<1	<1	2
B9	10/06/93	4.5-6.0	19.2-17.7	---	---	---	---	---	<1	<1	<1	<1	<1	<1	4
B9	10/06/93	6.0-7.5	17.7-16.2	---	---	---	---	---	<1	<1	<1	<1	<1	<1	93
B9	10/06/93	7.5-9.0	16.2-14.7	---	---	---	---	---	<1	<1	<1	<1	<1	<1	13
B10	10/06/93	1.5-3.0	22.2-20.7	---	---	---	---	5200	<1	<1	<1	<1	<1	<1	<1
B10	10/06/93	4.5-6.0	19.2-17.7	---	---	---	---	10000	<1	<1	<1	<1	<1	<1	<1

Table 3

Emeryville Materials Facility - Former Aboveground Storage Tanks
Summary of Results - 1993-1996
Soil Analytical Data

Boring Designation	Sampling Date	Approximate Sample Depth (ft bgs)	Approximate Sample Elevation (feet)	Benzene (ug/kg)	Toluene (ug/kg)	Ethyl-Benzene (ug/kg)	Total Xylenes (ug/kg)	TPH-MinO (mg/kg)	Polychlorinated Biphenyls - Aroclor[a] 1016 (mg/kg)	1221 (mg/kg)	1232 (mg/kg)	1242 (mg/kg)	1248 (mg/kg)	1254 (mg/kg)	1260 (mg/kg)
B10	10/06/93	7.5-9.0	16.2-14.7	---	---	---	---	1600	<1	<1	<1	<1	<1	<1	<1
B12	10/06/93	1.5-3.0	22.2-20.7	---	---	---	---	11000	<1	<1	<1	<1	<1	<1	<1
B12	10/06/93	4.5-6.0	19.2-17.7	---	---	---	---	8400	<1	<1	<1	<1	<1	<1	<1
B12	10/06/93	7.5-9.0	16.2-14.7	---	---	---	---	16000	<1	<1	<1	<1	<1	<1	<1
B14	10/06/93	2.5-3.0	21.2-20.7	---	---	---	---	---	<1	<1	<1	<1	<1	<1	<1
B14	10/06/93	3.0-4.5	20.7-19.2	---	---	---	---	---	<1	<1	<1	<1	<1	<1	5
B14	10/06/93	4.5-6.0	19.2-17.7	---	---	---	---	---	<1	<1	<1	<1	<1	<1	15
B14	10/06/93	6.0-7.5	17.7-16.2	---	---	---	---	---	<1	<1	<1	<1	<1	<1	12
B14	10/06/93	7.5-9.0	16.2-14.7	---	---	---	---	---	<1	<1	<1	<1	<1	<1	16
B16	10/06/93	0-1.5	23.7-22.2	---	---	---	---	---	<1	<1	<1	<1	<1	<1	185
B16	10/06/93	1.5-3.0	22.2-20.7	---	---	---	---	---	<1	<1	<1	<1	<1	<1	10
B16	10/06/93	3.0-4.5	20.7-19.2	---	---	---	---	---	<1	<1	<1	<1	<1	<1	32
B16	10/06/93	4.5-6.0	19.2-17.7	---	---	---	---	---	<1	<1	<1	<1	<1	<1	0.5
B16	10/06/93	6.0-7.5	17.7-16.2	---	---	---	---	---	<1	<1	<1	<1	<1	<1	18
B16	10/06/93	7.5-9.0	16.2-14.7	---	---	---	---	---	<1	<1	<1	<1	<1	<1	9
ESE-1	03/22/94	5	18.66	6	29	<3	21	270	<1	<1	<1	<1	<1	<1	<1
ESE-1	03/22/94	10	13.66	10	29	3	25	1800	<1	<1	<1	<1	<1	<1	<1
ESE-1	03/22/94	16	8.66	<3	<3	<3	<3	<5	<1	<1	<1	<1	<1	<1	<1
ESE-1	03/22/94	19	3.66	<3	<3	<3	<3	<5	<1	<1	<1	<1	<1	<1	<1
ESE-2	03/22/94	5	22.8	<3	<3	<3	<3	8	<1	<1	<1	<1	<1	<1	<1
ESE-2	03/22/94	9	18.8	9	28	3	21	2100	<1	<1	<1	<1	<1	<1	<1
ESE-2	03/22/94	10	17.8	<3	<3	<3	<3	<5	<1	<1	<1	<1	<1	<1	<1
ESE-2	03/22/94	15	12.8	<3	<3	<3	<3	1900	<1	<1	<1	<1	<1	<1	<1
ESE-3	03/22/94	5	18.91	<3	<3	<3	<3	<5	<1	<1	<1	<1	<1	<1	<1
ESE-3	03/22/94	10	13.91	<3	<3	<3	<3	<5	<1	<1	<1	<1	<1	<1	<1
ESE-3	03/22/94	13	10.91	<3	<3	<3	<3	<5	<1	<1	<1	<1	<1	<1	<1
ESE-3	03/22/94	19	4.91	<3	<3	<3	<3	<5	<1	<1	<1	<1	<1	<1	<1

Table 3

Emeryville Materials Facility - Former Aboveground Storage Tanks
Summary of Results - 1993-1996
Soil Analytical Data

Boring Designation	Sampling Date	Approximate Sample Depth (ft bgs)	Approximate Sample Elevation (feet)	Benzene (ug/kg)	Toluene (ug/kg)	Ethyl-Benzene (ug/kg)	Total Xylenes (ug/kg)	TPH-MinO (mg/kg)	Polychlorinated Biphenyls - Aroclor[a] 1016 (mg/kg)	1221 (mg/kg)	1232 (mg/kg)	1242 (mg/kg)	1248 (mg/kg)	1254 (mg/kg)	1260 (mg/kg)
ESE-4	03/22/94	5	19.33	<3	<3	<3	<3	<5	<1	<1	<1	<1	<1	<1	<1
ESE-4	03/22/94	10	14.33	<3	<3	<3	<3	<5	<1	<1	<1	<1	<1	<1	<1
ESE-4	03/22/94	15	9.33	<3	<3	<3	<3	<5	<1	<1	<1	<1	<1	<1	<1
ESE-4	03/22/94	20	4.33	<3	<3	<3	<3	<5	<1	<1	<1	<1	<1	<1	<1
G1	07/25/96	11.5-12	15.8-16.3	<5	<5	<5	<5	1200	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
G2	07/25/96	14-14.5	13.3-13.8	<5	<5	<5	<5	<10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
G3	07/25/96	14-14.5	13.3-13.8	<5	<5	<5	<5	<10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
G4	07/25/96	14-14.5	13.3-13.8	<5	<5	<5	<5	<10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
G5	07/25/96	11-11.5	12.5-13.0	<5	<5	<5	<5	<10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
G6	07/25/96	11.5-12	13.5-14.0	<5	<5	<5	<5	13000	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.26
G7	07/25/96	13-13.5	13.0-13.5	<5	<5	<5	<5	1400	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
G8	07/25/96	11-11.5	12.5-13.0	<5	<5	<5	<5	1100	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
G9	07/25/96	11.5-12	13.5-14.0	<5	<5	<5	<5	3100	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.13
G10	07/25/96	11.5-12	14.5-15.0	<5	<5	<5	<5	2200	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
G11	07/25/96	11.5-12	15.8-16.3	<5	<5	<5	<5	<10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
G12	07/25/96	13-13.5	14.3-14.8	<5	<5	<5	<5	2400	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

bgs = below ground surface
mg/kg = milligrams per kilogram
ug/kg = micrograms per kilogram

TPH-MinO = Total Petroleum Hydrocarbons as Mineral Oil
< = not detected at or above the indicated reporting limit
--- = not analyzed
[a] = All the PCBs measured in samples from borings B1 through B16 and ESE-1 through ESE-4 were characterized as Aroclor 1260.

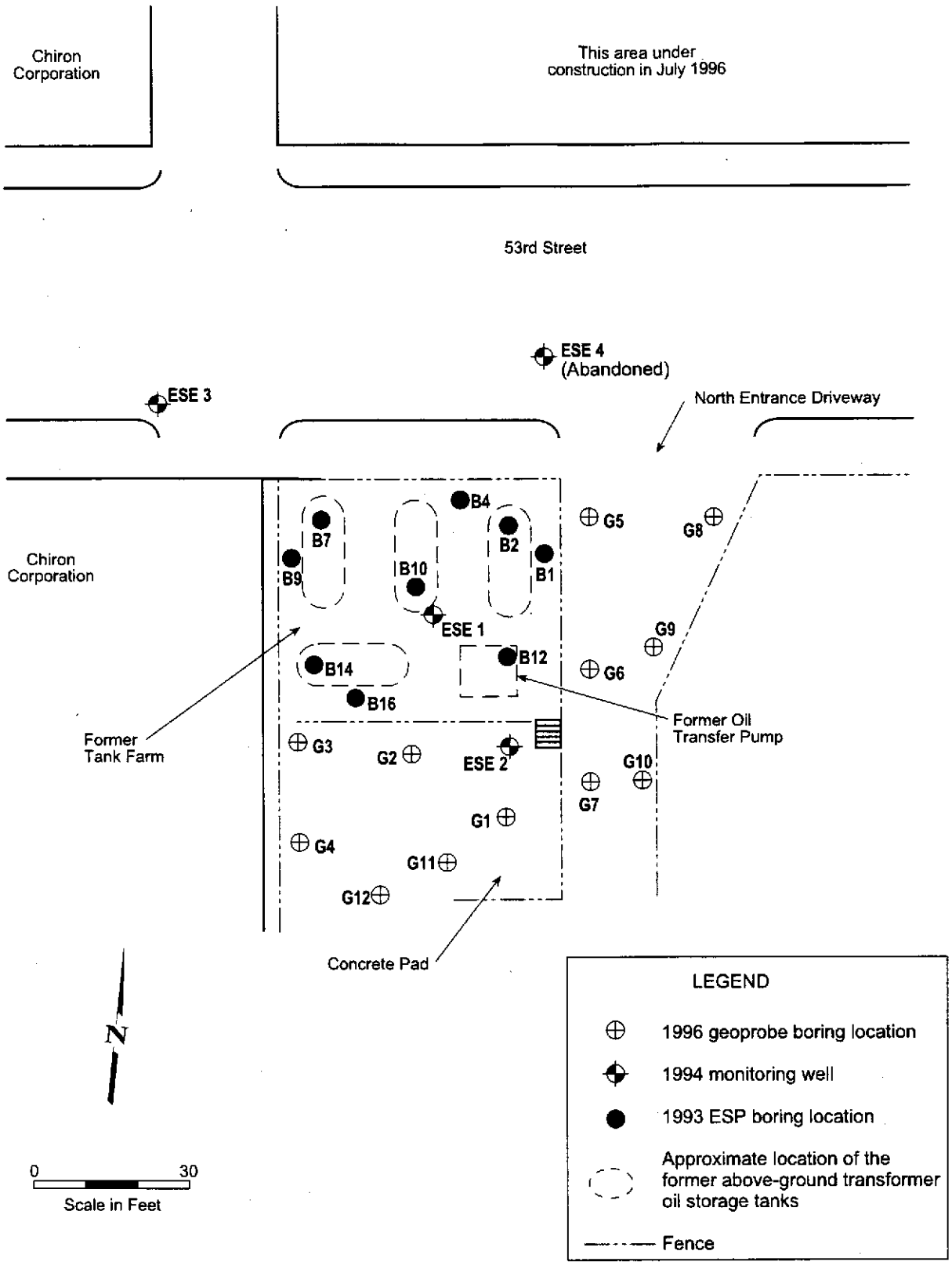


Figure 4. Site map showing test boring and monitoring well locations, Emeryville Materials Facility.

3. Groundwater beneath the site generally flows north with a gradient of 0.04 ft/ft. In the vicinity of the tank farm, groundwater flows west with a gradient of 0.02 ft/ft.
4. PCBs were not reported in soil or groundwater samples.
5. TEPH as mineral oil was present in soil from borings ESE-1 and ESE-2 at concentrations up to 2,100 mg/kg and in groundwater in wells ESE-1 and ESE-2 up to a concentration of 340 µg/l.
6. Volatile organic compounds as benzene, toluene, ethylbenzene and xylenes (BTEX) were present in soil borings ESE-1 and ESE-2. The highest concentrations were present in soils obtained from ESE-1 from a depth of 10 feet, which contained benzene (10 µg/kg), toluene (29 µg/kg), ethylbenzene (3 µg/kg), and xylenes (25 µg/kg). Groundwater from well ESE-2 contained benzene (0.8 µg/l), toluene (1.5 µg/l) and xylenes (2.7 µg/l).

October 1996 Soil Investigation

An additional investigation to determine the horizontal extent of soils impacted by past transformer operations was performed in October 1996. Twelve borings (G1-G12) were advanced around the former AST area, as shown in Figure 4. Six of the borings were advanced on a concrete pad south of the former AST, and six were advanced in the facility's north entrance driveway east of the former AST. The results of this investigation were:

1. The area of investigation is underlain by a variable thickness of heterogenous, clayey to gravely fill ranging from four to nine feet deep, and mixtures of alluvial silt, sand, and gravel soils.
2. Concentrations of mineral oil was found present in subsurface soils up to 2000 mg/kg. The presence of detectable mineral oil generally coincided with soils which exhibited oily product odor, discolored soils, or both.
3. BTEX was not detected in any of the tested samples, and TEPH-Mineral Oil was present at seven locations at concentrations of up to 13,000 mg/kg. PCB Aroclor 1260 was detected at two locations in concentrations of 0.13 to 0.26 mg/kg, and no PCBs were detected in any other samples.
4. The highest concentrations of TEPH were in the southeastern quadrant of the former AST, near the former oil transfer pump.

Groundwater Monitoring Program

Quarterly sampling commenced at the former AST site on March 18, 1994. Table 4 is a summary of quarterly groundwater data collected through February 11, 1999. Since November 1997, no petroleum compounds or PCBs have been present above the detection limit in any of the wells. TEPH as mineral oil was present in well ESE-1 from March 1994 through November 1997, with the highest concentration occurring in February 1997 at 1,600 µg/l. TEPH as mineral oil was present intermittently in well ESE-2

Table 4
Historical Groundwater Analytical Data
Emeryville Materials Facility
1994 - 1998
(µg/L) [1]

Sample Designation	Sampling Date	Polychlorinated Biphenyls	TEPH[2]	Benzene	Toluene	Ethylbenzene	Xylenes
ESE-1	03/28/94	<1	340	<0.3	<0.3	<0.3	<0.3
ESE-1	12/12/94	<0.5	80	<0.5	<0.5	<0.5	<0.5
ESE-1	03/13/95	1.3	500 [3]	<0.5	<0.5	<0.5	<0.5
ESE-1	06/15/95	<0.5	350 [3]	<0.5	<0.5	<0.5	<0.5
ESE-1	09/15/95	<0.5	470 [3]	<0.5	<0.5	<0.5	<0.5
ESE-1	12/15/95	<0.5	440 [3]	<0.5	<0.5	<0.5	<0.5
ESE-1	03/15/96	<0.5	277	<0.5	<0.5	<0.5	<0.5
ESE-1	06/14/96	<0.5	<500	<0.5	<0.5	<0.5	<0.5
ESE-1	10/07/96	<0.5	110 [4]	<0.5	<0.5	<0.5	<0.5
ESE-1	12/04/96	<0.5	430 [4]	<0.5	<0.5	<0.5	<0.5
ESE-1	02/14/97	<0.5	1,600	<0.5	<0.5	<0.5	<0.5
ESE-1	05/16/97	<0.5	510 [8]	<0.5	<0.5	<0.5	<0.5
ESE-1	08/22/97	<0.5	740 [8]	<0.5	<0.5	<0.5	<0.5
ESE-1	11/14/97	<0.5	410 [8]	<0.5	<0.5	<0.5	<0.5
ESE-1	02/13/98	<0.5	<100 [8]	<0.5	<0.5	<0.5	<0.5
ESE-1	05/15/98	<0.5	<500	<0.5	<0.5	<0.5	<0.5
ESE-1	08/21/98	<0.5	<500	<0.5	<0.5	<0.5	<0.5
ESE-1	12/01/98	<0.50 / <0.54 [A]	180 / <100 [A]	<0.50	<0.50	<0.50	<0.50
ESE-1	02/11/99	<0.5	<100	<0.5	<0.5	<0.5	<0.5
ESE-2	03/28/94	<1	250	0.8	1.5	<0.3	2.7
ESE-2	12/12/94	<0.5	<50	<0.5	<0.5	<0.5	<0.5
ESE-2	03/13/95	<0.5	120 [5]	<0.5	<0.5	<0.5	<0.5
ESE-2	06/15/95	<0.5	<50	<0.5	<0.5	<0.5	<0.5
ESE-2	09/15/95	<0.5	<50	<0.5	<0.5	<0.5	<0.5
ESE-2	12/15/95	<0.5	<50	<0.5	<0.5	<0.5	<0.5
ESE-2	03/15/96	<0.5	<59	<0.5	<0.5	<0.5	<0.5
ESE-2	06/14/96	<0.5	<500	<0.5	<0.5	<0.5	<0.5
ESE-2	10/07/96	<0.5	150 [4]	<0.5	<0.5	<0.5	<0.5

Table 4
Historical Groundwater Analytical Data
Emeryville Materials Facility
1994 - 1998
(µg/L) [1]

Sample Designation	Sampling Date	Polychlorinated Biphenyls	TEPH[2]	Benzene	Toluene	Ethylbenzene	Xylenes
ESE-2	12/04/96	<0.5	380 [4]	<0.5	<0.5	<0.5	<0.5
ESE-2	02/14/97	<0.5	510	<0.5	<0.5	<0.5	<0.5
ESE-2	05/16/97	<0.5	190 [8]	<0.5	<0.5	<0.5	<0.5
ESE-2	08/22/97	<0.5	<100 [8]	<0.5	<0.5	0.51	<0.5
ESE-2	11/14/97	<0.52	<100 [8]	<0.5	<0.5	<0.5	<0.5
ESE-2	02/13/98	<0.5	<100 [8]	<0.5	<0.5	<0.5	<0.5
ESE-2	05/15/98	<0.5	<500	<0.5	<0.5	<0.5	<0.5
ESE-2	08/21/98	<0.5	<500	<0.5	<0.5	<0.5	<0.5
ESE-2	12/01/98	<0.50 / <0.54 [A]	<100 / <100 [A]	<0.50	<0.50	<0.50	<0.50
ESE-2	02/11/99	<0.5	<100	<0.5	<0.5	<0.5	<0.5
ESE-3	03/28/94	<1	<50	<0.3	<0.3	<0.3	<0.3
ESE-3	12/12/94	<0.5	<50	<0.5	<0.5	<0.5	<0.5
ESE-3	03/13/95	<0.5	<50	<0.5	<0.5	<0.5	<0.5
ESE-3	06/15/95	<0.5	<50	<0.5	<0.5	<0.5	<0.5
ESE-3	09/15/95	<0.5	<50	<0.5	<0.5	<0.5	<0.5
ESE-3	12/15/95	<0.5	<50	<0.5	<0.5	<0.5	<0.5
ESE-3	03/15/96	<0.5	<59	<0.5	<0.5	<0.5	<0.5
ESE-3	06/14/96	<0.5	<500	<0.5	<0.5	<0.5	<0.5
ESE-3	10/07/96	<0.5	<100	<0.5	<0.5	<0.5	<0.5
ESE-3	12/04/96 [6]	NA [7]	NA	NA	NA	NA	NA
ESE-3	02/14/97	<0.5	<100	<0.5	<0.5	<0.5	<0.5
ESE-3	05/16/97	<0.5	<110 [8]	<0.5	<0.5	<0.5	<0.5
ESE-3	08/22/97	<0.5	<100 [8]	<0.5	<0.5	<0.5	<0.5
ESE-3	11/14/97	<0.5	<100 [8]	<0.5	<0.5	<0.5	<0.5
ESE-3	02/13/98	<0.5	<100 [8]	<0.5	<0.5	<0.5	<0.5
ESE-3	05/15/98	<0.5	<500	<0.5	<0.5	<0.5	<0.5
ESE-3	08/21/98	<0.5	<500	<0.5	<0.5	<0.5	<0.5
ESE-3	12/01/98	<0.50 / <0.53 [A]	<100 / <100 [A]	<0.50	<0.50	<0.50	<0.50
ESE-3	02/11/99	<0.5	<100	<0.50	<0.50	<0.50	<0.50

Table 4
Historical Groundwater Analytical Data
Emeryville Materials Facility
1994 - 1998
(µg/L) [1]

Sample Designation	Sampling Date	Polychlorinated Biphenyls	TEPH[2]	Benzene	Toluene	Ethylbenzene	Xylenes
ESE-4	03/28/94	<1	<50	<0.3	<0.3	<0.3	<0.3
ESE-4	12/12/94	<0.5	<50	<0.5	<0.5	<0.5	<0.5
ESE-4	03/13/95	<0.5	56 [5]	<0.5	<0.5	<0.5	<0.5
ESE-4	06/15/95	<0.5	<50	<0.5	<0.5	<0.5	<0.5
ESE-4	09/15/95	<0.5	<50	<0.5	<0.5	<0.5	<0.5
ESE-4	12/15/95	<0.5	57 [5]	<0.5	<0.5	<0.5	<0.5
ESE-4	03/15/96	<0.5	<59	<0.5	<0.5	<0.5	<0.5
ESE-4	06/14/96	<0.5	<500	<0.5	<0.5	<0.5	<0.5
ESE-4	10/07/96	<0.5	<100	<0.5	<0.5	<0.5	<0.5
ESE-4	12/04/96 [6]	NA	NA	NA	NA	NA	NA
ESE-4	02/14/97	<0.5	270 [4]	<0.5	<0.5	<0.5	<0.5
ESE-4	05/16/97	<0.5	<110 [8]	<0.5	<0.5	<0.5	<0.5
ESE-4	08/22/97 [6]	NA	NA	NA	NA	NA	NA
ESE-4	11/14/97	<0.5	<100 [8]	<0.5	<0.5	<0.5	<0.5
ESE-4	02/13/98 [9]	NA	NA	NA	NA	NA	NA
ESE-4	05/15/98 [9]	NA	NA	NA	NA	NA	NA
ESE-4	08/21/98 [9]	NA	NA	NA	NA	NA	NA
ESE-4	12/1/98 [9]	NA	NA	NA	NA	NA	NA
ESE-4	02/11/99 [9]	NA	NA	NA	NA	NA	NA
Trip Blank	03/28/94	<1	<50	<0.3	<0.3	<0.3	<0.3
Trip Blank	12/12/94	NA	NA	<0.5	<0.5	<0.5	<0.5
Trip Blank	03/13/95	NA	NA	<0.5	<0.5	<0.5	<0.5
Trip Blank	06/15/95	NA	NA	<0.5	<0.5	<0.5	<0.5
Trip Blank	09/15/95	NA	NA	<0.5	<0.5	<0.5	<0.5
Trip Blank	12/15/95	NA	NA	<0.5	<0.5	<0.5	<0.5
Field Blank	03/28/94	NA	NA	NA	NA	NA	NA
Field Blank	12/12/94	NA	NA	<0.5	<0.5	<0.5	<0.5
Field Blank	03/13/95	NA	NA	<0.5	<0.5	<0.5	<0.5

Table 4
Historical Groundwater Analytical Data
Emeryville Materials Facility
1994 - 1998

(µg/L) [1]

Sample Designation	Sampling Date	Polychlorinated Biphenyls	TEPH[2]	Benzene	Toluene	Ethylbenzene	Xylenes
Field Blank	06/15/95	NA	NA	<0.5	<0.5	<0.5	<0.5
Field Blank	09/15/95	NA	NA	<0.5	<0.5	<0.5	<0.5
Field Blank	12/15/95	NA	NA	<0.5	<0.5	<0.5	<0.5
Field Blank	03/15/96	NA	NA	<0.5	<0.5	<0.5	<0.5
Field Blank	06/14/96	NA	NA	<0.5	<0.5	<0.5	<0.5
Field Blank	10/07/96	NA	NA	<0.5	<0.5	<0.5	<0.5
Field Blank	12/04/96	NA	NA	<0.5	<0.5	<0.5	<0.5
Field Blank	02/14/97	NA	NA	<0.5	<0.5	<0.5	<0.5
Field Blank	05/16/97	NA	NA	<0.5	<0.5	<0.5	<0.5
Field Blank	08/22/97	NA	NA	<0.5	<0.5	<0.5	<0.5
Field Blank	11/14/97	NA	NA	<0.5	<0.5	<0.5	<0.5
Field Blank	02/13/98	NA	NA	<0.5	<0.5	<0.5	<0.5
Field Blank	05/15/98	NA	NA	<0.5	<0.5	<0.5	<0.5
Field Blank	08/21/98	NA	NA	<0.5	<0.5	<0.5	<0.5
Field Blank	12/01/98	NA	NA	<0.5	<0.5	<0.5	<0.5

[1] µg/L = micrograms per liter.
[2] TEPH = total extractable petroleum hydrocarbons.
[3] Compounds similar to client-supplied transformer oil were found.
[4] Hydrocarbon reported does not match the pattern of laboratory standard for mineral oil.
[5] Compounds in diesel range not similar to laboratory standard for transformer oil.
[6] Wells not sampled due to construction in the area resulting in heavy traffic.
[7] NA = not analyzed.
[8] Quantitation for mineral oil is based on the response factor of diesel.
[9] Unable to locate well. Well area covered with mud and crushed rock from road construction.
[A] Analyses run on both unfiltered and filtered (silica gel) samples. Results reported as unfiltered / filtered.

from March 1994 through May 1997, with the highest concentration occurring in February 1997 at 510 µg/l. TEPH as mineral oil was present intermittently in well ESE-4 from March 1995 through February 1997, with the highest concentration occurring in February 1997 at 270 µg/l. On March 28, 1994, benzene (0.8µg/l), toluene (1.5 µg/l), and xylene (2.7 µg/l) were detected in the groundwater from well ESE-2. On March 13, 1995, the PCB concentration in the groundwater sample from well ESE-1 was 1.3 µg/l.

As shown in Figure 5, the groundwater gradient on February 11, 1999, was 0.12 ft/ft to the north-northeast between monitoring wells ESE-2 and ESE-1.

Lateral and Vertical Distribution of TEPH and PCBs in Soils

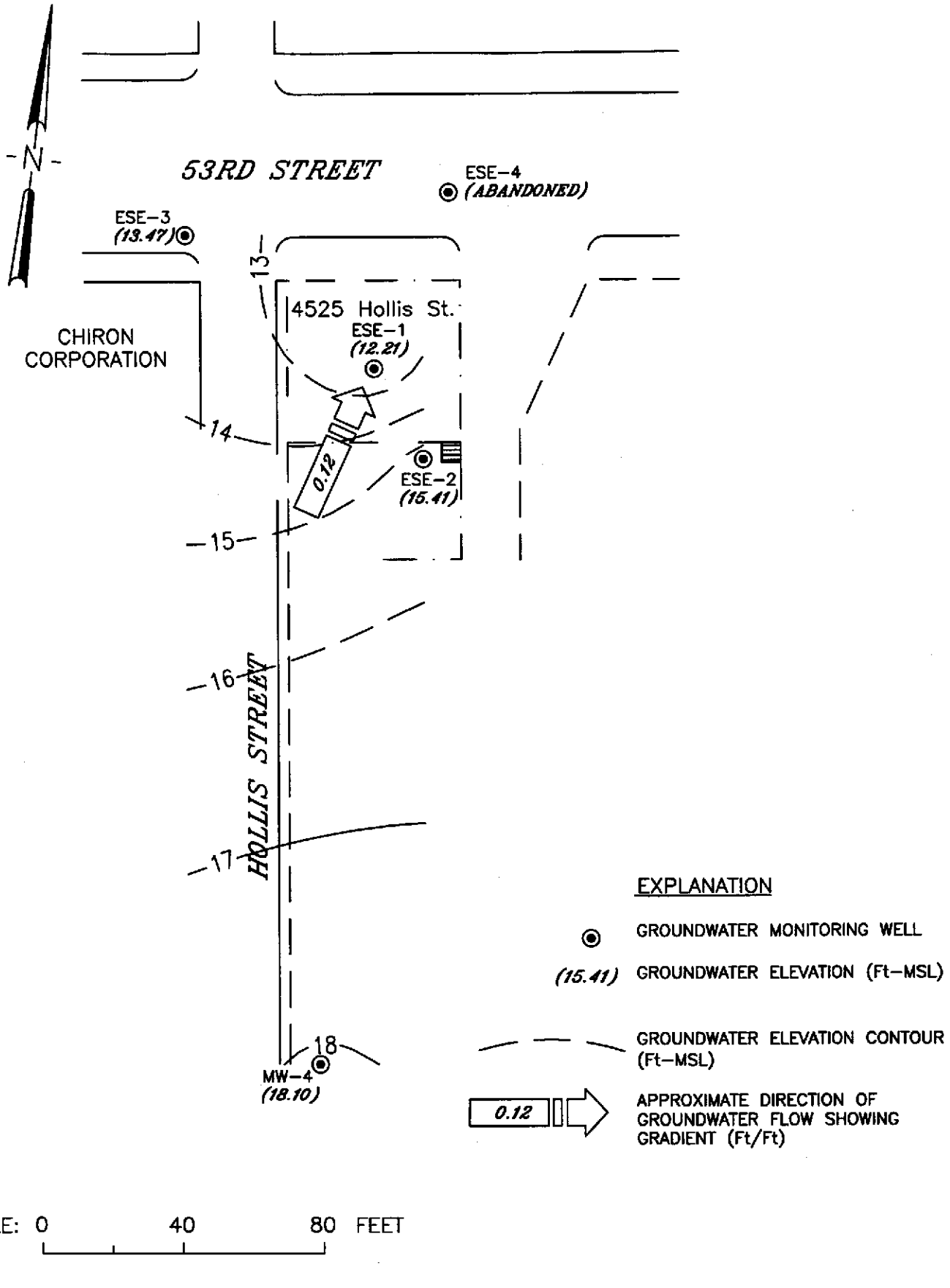
Soils data collected in 1993, 1994, and 1996 were used to construct the lateral and vertical distribution of TEPH as mineral oil and PCBs around the former AST farm.

Figure 6 shows the maximum concentration of TEPH as mineral oil measured at the EMF. The highest concentrations were in the vicinity of the oil transfer pump, boring B12 (16,000 mg), with decreasing concentrations toward the north, east, and south.

The lateral and vertical distribution of PCBs in soils at the site is depicted in Figure 7. Elevated PCB concentrations are in isolated areas surrounding borings B1, B9 and B16. The maximum PCB concentrations at these locations were 385, 93 and 185 mg/kg, respectively. Outside of the AST area, only two borings, G6 and G9, indicate the presence of PCBs at 0.26 and 0.13 mg/kg, respectively.

Risk Based Corrective Action (RBCA) Analysis

A RBCA was conducted on the available data in 1997. The RBCA evaluation of the soil and groundwater contaminants consisted of two stages: Tier 1 and Tier 2. The Tier 1 risk based screening levels (RBSLs) used were the USEPA Region IX table of Preliminary Remediation Goals (PRGs) (USEPA, 1996a), except as noted. Where applicable, Cal-EPA modified PRGs were used. PRGs are available for exposure by resident or commercial receptors to chemicals in soil, and for domestic use of groundwater. For soil PRGs, potential pathways include incidental ingestion, dermal contact, and inhalation of dusts (for nonvolatile chemicals) or vapors (for volatile chemicals).



Emeryville Maintenance Facility
Groundwater Contour Map - February 11, 1999

TECHNICAL AND ECOLOGICAL SERVICES – LWQU

DRN:EMK	DATE : 6-7-99
CHK:F. Flint	SCALE: As Shown
APR:KDC	SHEET Emeryville

FIGURE 5 REV. 0

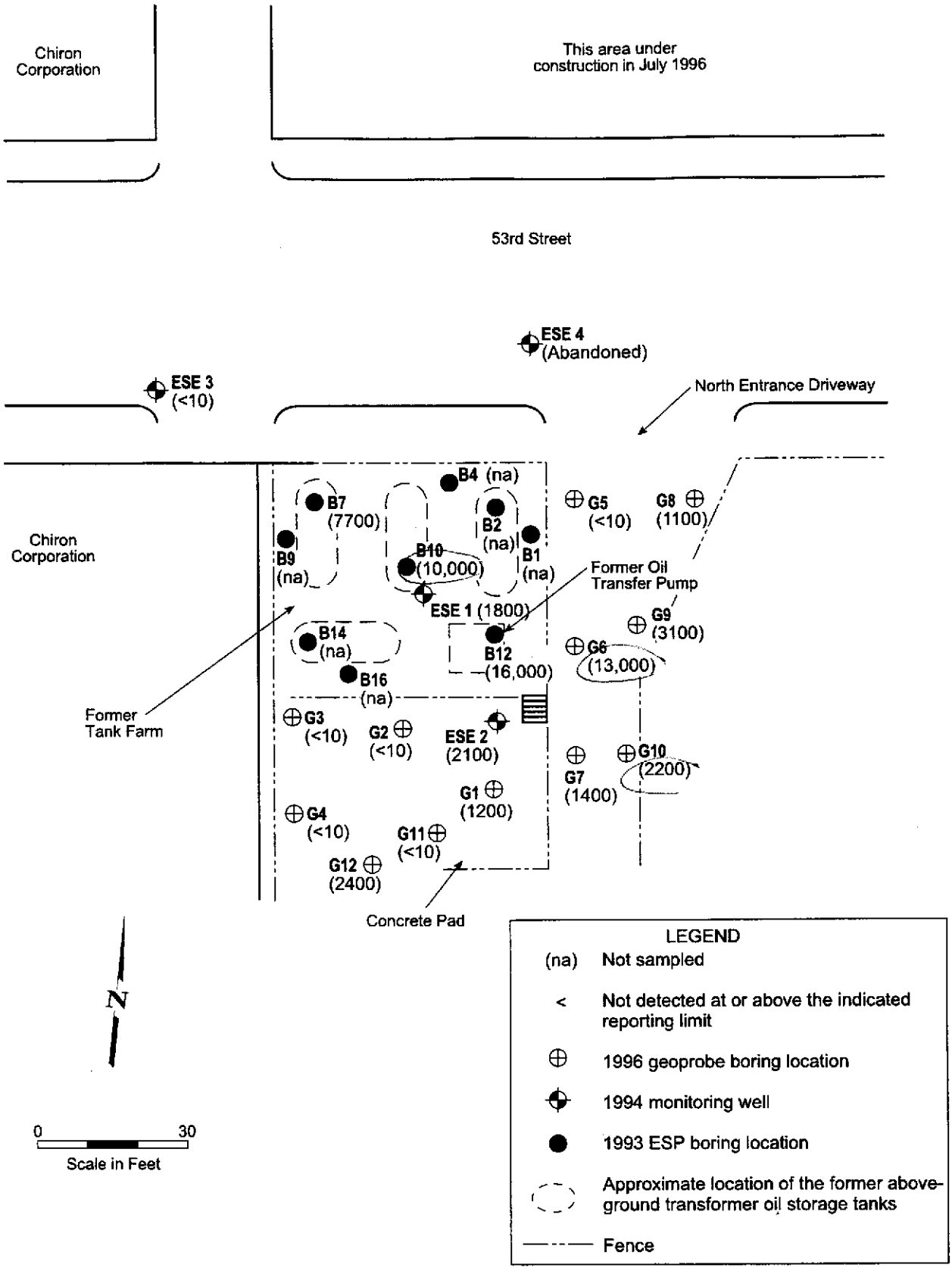


Figure 6. Site map showing test boring and monitoring well locations with the maximum concentration of TEPH as mineral oil (mg/kg), Emeryville Materials Facility.

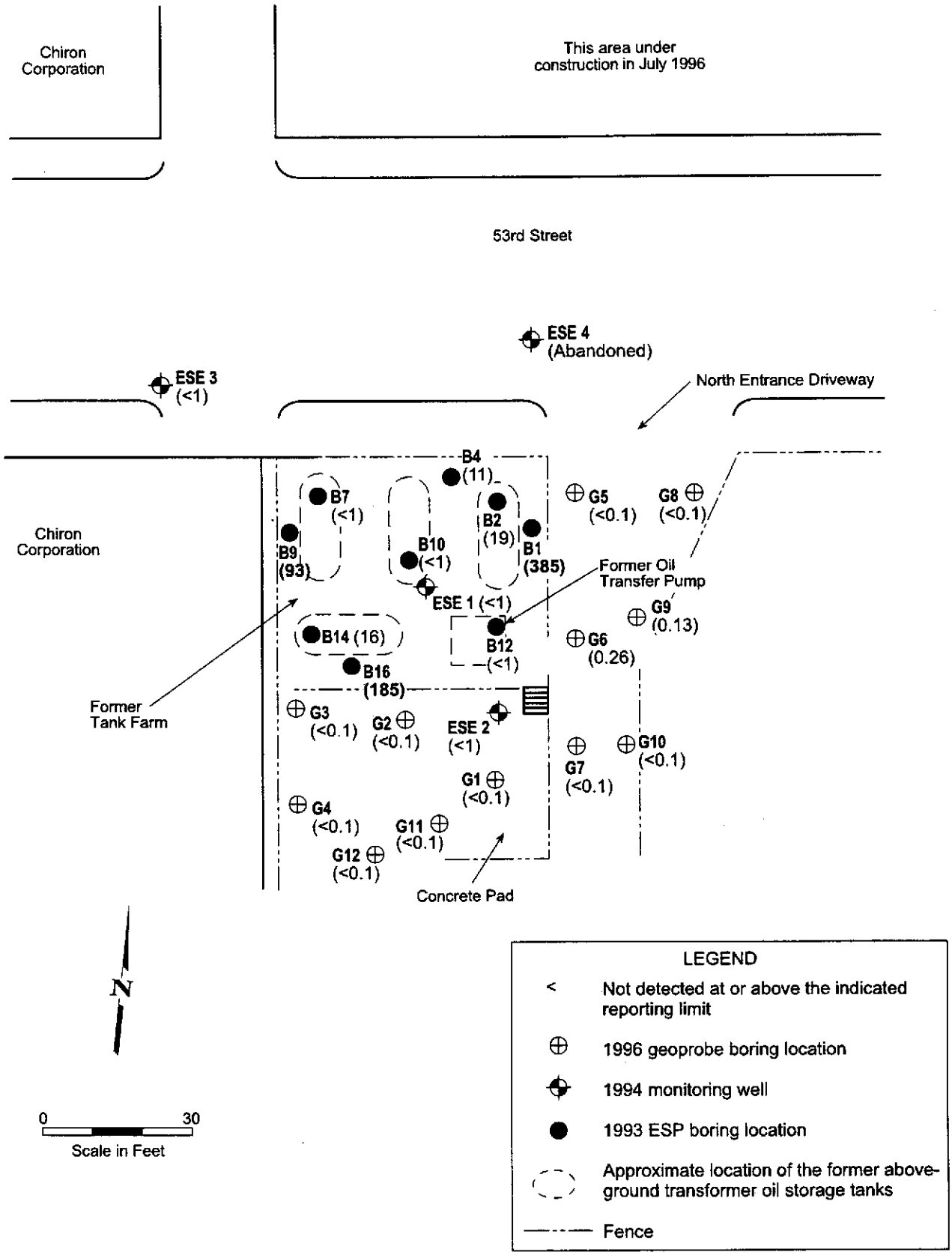


Figure 7. Site map showing test boring and monitoring well locations with the maximum concentration of PCBs (mg/kg), Emeryville Materials Facility.

As Table 5 shows, the maximum historic detected concentrations for all chemicals except PCBs were significantly less than commercial-based PRGs. PRGs are not available for TEPH. The Electric Power Research Institute (EPRI) recently completed a comprehensive field and lab study of mineral oils, which involved chemical testing, fate and transport evaluations, and a preliminary screening-level risk evaluation. EPRI concluded that the hazardous constituents of mineral oil are present at extremely low concentrations (EPRI, 1996). Therefore, the TEPH detected in the soil at the site likely poses no significant health hazards for potentially-exposed receptors.

Table 5
Tier 1 Lookup Table for Soil[1]
Risk Based Corrective Action Report
Former Aboveground Storage Tank Farm Area
Emeryville Materials Facility

Chemical Compound	Maximum detected soil concentration (mg/kg)[2]	Tier 1 Lookup value/EPA Region IX PRG[3] (mg/kg)
Benzene[4]	0.01	4.1
Ethylbenzene	0.003	230
PCB[5]	**385**	3.4
TEPH	16000	NA
Toluene	0.029	880
Xylenes	0.025	320

NA = Not Available
mg/kg = milligrams per kilogram
Concentration in bold is greater than Tier 1 Lookup Values
[1] Based on ASTM 1995.
[2] Based on soils data (see Table 3) collected between October 6, 1993 and July 25, 1996 at borings B1 through B16, borings ESE-1 through ESE-4, and borings G1 through G12.
[3] Industrial Preliminary Remediation goals form USEPA, 1996a.
[4] Adjusted for California cancer slope factor of 0.1 $(mg/kg\text{-}day)^{-1}$ (California, 1994) and California commercial target risk of 1×10^{-5}.
[5] Polychlorinated biphenyls; only Aroclor- 1260 was detected. Adjusted for California commercial risk of 1×10^{-5}.

The maximum historic PCB concentration measured in the soil exceeded the recommended PRG. Therefore, a more site-specific assessment was necessary to evaluate possible exposures to PCBs in soil using a Tier 2 RBCA evaluation.

In general, PCBs sorb strongly to soils, have low vapor pressures and thus have low soil volatilization. Also, dust generation at the site is also not expected to lead to significant exposures because of moist soil conditions. Therefore, only direct contact with site soils (i.e., ingestion and dermal contact) was quantitatively evaluated in Tier 2.

Because the EMF is in an area zoned for commercial use, three types of workers were considered as receptors in the Tier 2 analysis: construction workers, utility line workers, and industrial workers. For this analysis, it was assumed that future construction and utility workers would come into contact with site soils as deep as 10 feet below grade. For future on-site industrial workers, the assumption was that portions of the site will be unpaved and they might be in direct contact with soils down to 2 feet below grade.

Under Tier 2, the site specific threshold level (SSTL) results for the three receptor types are compared with arithmetic mean PCB concentrations calculated using subsets of the data, in addition to the maximum detected concentrations. As Table 6 shows, the site, as it currently exists, is acceptable for construction and utility worker receptors. The mean PCB concentration in soils from 0 to 10 ft bgs was only 30 mg/kg, and the SSTLs computed for these two receptors were 88 and 106 mg/kg, respectively.

Without a cap at the site, the mean PCB concentration from 0 to 2 ft bgs (28 mg/kg), would not be acceptable for an industrial worker due to long term exposures.

The site would be suitable for the industrial receptor if the soils in the vicinity of borings B1, B9 and B16 are excavated to a depth of nine feet from the bottom of the pit. Following the excavation, the area around these borings including adjacent soils near B2, B4 and B14 will be filled with clean base rock to existing site elevation. Under these conditions the mean PCB soil concentration would be <1.3 mg/kg for depths of 0 to 2 ft bgs.

Table 6
Tier 2 Results for Soil
Risk Based Corrective Action Report
Former Aboveground Storage Tank Farm Area
Emeryville Materials Facility

Receptor	Site Specific Threshold Level (mg/kg)	Maximum detected PCB soil concentration (mg/kg)	Mean detected PCB soil concentration	
			Full Data Site Undisturbed (ft bgs)[1]	Full Data Site Undisturbed (ft bgs)[2]
Construction worker	88	385	30	NA
Utility worker	106	385	30	NA
Industrial worker	13	385	NA	28

mg/kg = milligrams per kilograms
ft bgs = feet below ground level
NA = not applicable

1 All data down to 10 ft bgs is used for the calculation of the mean exposure concentration for the construction and utility worker at the undisturbed site.

2 All data down to 2 ft bgs is used for the calculation of the mean exposure concentration for the industrial worker at the undisturbed site.

Section 4

CONCLUSIONS AND RECOMMENDATIONS

Underground Storage Tanks

Confirmation soil samples taken after the over-excavation of the 500-gallon UST site showed no detectable levels of PCB, TPH-gasoline, TPH-kerosene, or TOG. Also, metals detected in the confirmation samples were at background levels. An application for permanent closure of the 500-gallon UST is included in Appendix B.

The materials impacting the site of the two 5,000-gallon tanks are still at detectable levels. These are: TPH-diesel (300 mg/kg), oil and grease (310 mg/kg), and PCBs (0.086 mg/kg). PG&E proposes a limited groundwater investigation to determine if mineral oil found in the soils have impacted groundwater in the area.

Aboveground Storage Tanks

The maximum PCB concentrations on the former AST site were 385, 93, 185, and mg/kg at borings B1, B9, and B16, respectively. These borings are near the actual locations of the former ASTs. Outside the tank farm area, only two borings, G6 and G9, indicate the presence of PCBs at 0.26 and 0.13 mg/kg, respectively.

The Tier 1 RBCA analysis of the soil data available through 1996 showed that the maximum historical PCB concentration (385 mg/kg) measured in the soil exceeded the recommended EPA threshold level. The site specific analyses of the data showed that the mean PCB concentration (28 mg/kg) at depths between 0 and 2 feet would exceed the site specific threshold concentration (1.3 mg/kg) for the industrial worker if no remediation or capping is performed at the site when the plastic liner is removed.

PG&E proposes partial excavation of areas containing elevated PCB concentrations in the AST area. Specifically, the soils in the vicinity of borings Bl (9.0 ft), B2, B4, B9 (9.0 ft), B14 and B16 (9.0 ft), should be excavated in the AST area. Replacement of the excavated soils and efforts to raise the grade at these borings to existing site elevation will reduce the mean concentration below industrial PRGs for PCBs in soil (1.3 mg/kg) for 0-2 ft bgs.

The material impact of past operations at the AST site has been minimal. In the last five quarters since November 1997, no petroleum compounds or PCBs have been present above the detection limit in any of

the wells. The EMF is in a non-attainment zone, and potential exposure to groundwater by direct contact is unlikely. PG&E proposes to close all the monitoring wells located at the EMF.

Section 5

PROPOSED FIELD ACTIVITIES

Overview

The purpose of the proposed field activities is to assess the possible impact to groundwater from materials stored in the two former USTs, abandon existing monitoring wells present at the EMF site and to remove soils in the AST area where PCB concentrations exceed 25 mg/kg.

Personnel and Procedures

All work described in this workplan will be performed under the supervision of a California Registered Geologist. An experienced geologist will log soil borings; collect subsurface samples, and if necessary, oversee installation and development of the monitoring wells, and coordinate delivery of the soil and groundwater samples to a State of California certified analytical laboratory.

Push Technology Soil Sampling

A truck-mounted Geoprobe® sampling system or similar push-point device will be used to collect soil samples in the vicinity of the two 5,000-gallon USTs (Figure 8). To evaluate the smear zone, the drive rods will be retracted and a 4-foot macro-core sampler with a polyacetate-lined core will be collected at or near source location(s). Soil samples for analysis will be collected in a split-spoon sampler lined with stainless steel sleeves. The initial location will be continuously cored from below the concrete to the top of the low groundwater elevation.

The core will be inspected to assess the occurrence of petroleum residues. The following procedures will be used during soil sample collection and handling:

1. Before sampling, the sampler and sample liners will be thoroughly washed with a trisodium phosphate solution and rinsed with potable water.
2. The samples will be retained in the sample liners with the ends covered with aluminum foil or Teflon® sheets and plastic end caps will be attached.
3. Each sample will be labeled using waterproof ink with the job name, job number, boring number, sample depth, and date collected.
4. The soil sample will be described on a boring log by the field geologist. This description will include soil classification (ASTM D-2487-83), color, moisture content and consistency (in relative terms), and estimated degree of hydrocarbon content (i.e., organic vapor analyzer measurements).

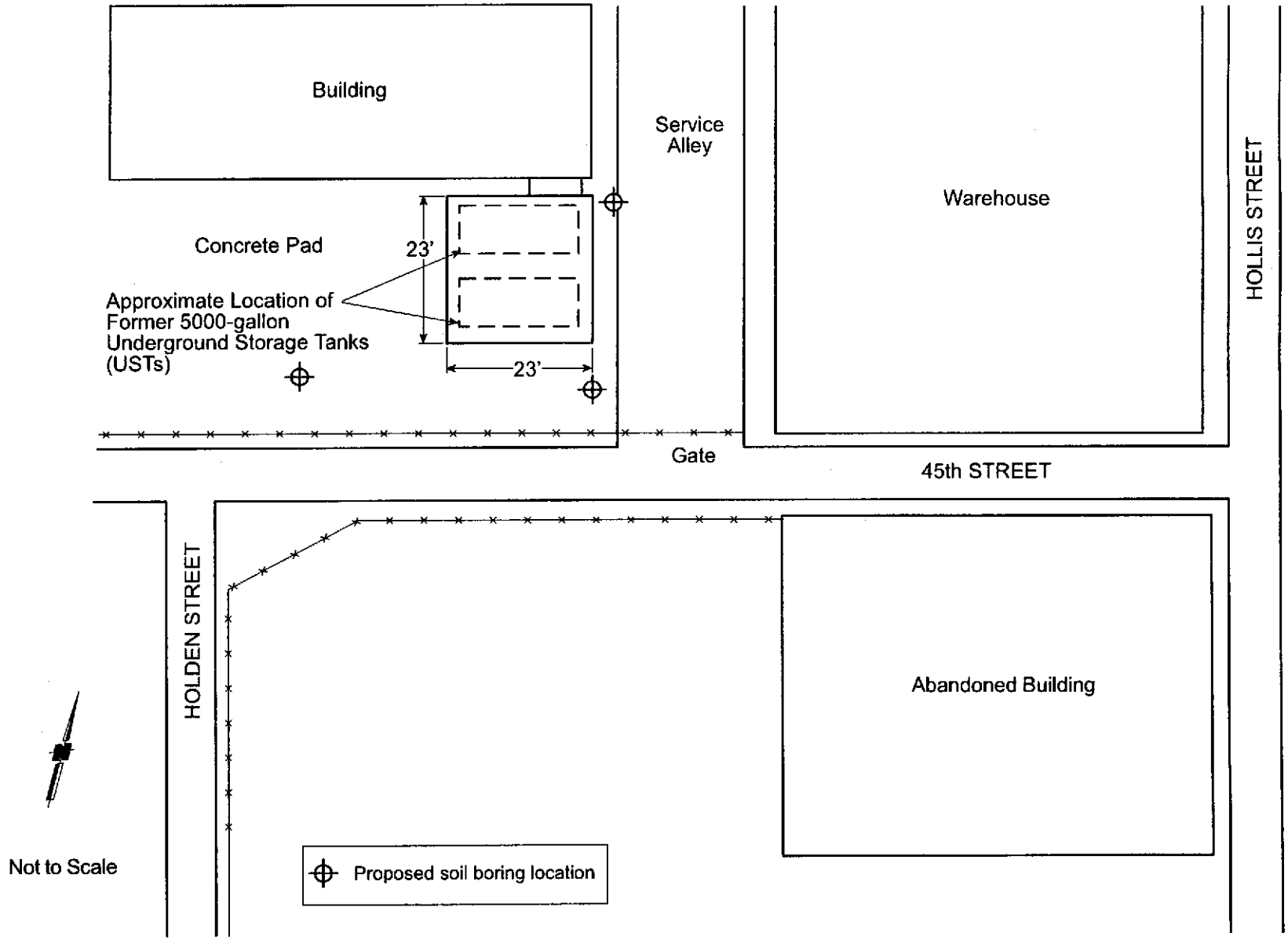


Figure 8. Proposed soil boring locations at former 5000-gallon underground storage tank site, Emeryville Materials Facility.

Immediately after sample collection and labeling, the samples will be sealed in a plastic bag and placed in a sturdy ice chest containing either "blue" or dry ice. The temperature in the ice chest will be maintained at or below 4 degrees C.

5. When the ice chest is full (or contains all the samples that will be stored in it), a completed chain-of-custody form will be inserted and the chest will be closed and sealed.
6. The ice chest(s) will be transferred to PG&E's Technical and Ecological Services (TES), San Ramon, where samples will be selected for chemical analyses. All remaining samples will be placed in a freezer for storage for no fewer than 14 days.

Available soil material will be described using the Unified Soil Classification System. The description will also include visible staining and Munsell Soil Chart color. Upon completion of sampling, the hole will be backfilled with bentonite.

Direct-Push Technology Groundwater Sampling

The Geoprobe® sampling system will be used to collect groundwater samples. The Geoprobe® uses a direct-push technology to advance hollow rods into the ground. The rods are advanced to a minimum of three feet below the water table and then retracted six inches to expose a screen through which groundwater is allowed to pass. The top rod is then removed to allow access to the rod core. A disposable bailer will then be used to remove water from the rods. Groundwater will be discharged directly into the sample containers.

Groundwater Monitoring Wells

If conditions warrant, monitoring wells will be installed in each soil boring described above and shown in Figure 8. Monitoring wells will only be installed if grab groundwater samples indicate that groundwater is affected by compounds previously stored in the USTs. The proposed monitoring wells will be utilized to characterize groundwater elevation and flow direction and determine if PCBs or TPH as mineral oil are present in the uppermost water-bearing zone. At least one downgradient and one upgradient monitoring well will be installed to characterize groundwater quality. A previous study has determined that depth to groundwater is approximately 12-14 feet below the ground surface and that the groundwater gradient is to the west (PG&E 1994b). All borings will be drilled to 10 feet below groundwater; however, if a laterally extensive clay layer exists below the water table, which is at least 5 feet in thickness and does not appear to contain petroleum hydrocarbons, the wells will be terminated 1 to 2 feet into the clay. If possible, direct-push well installation will be conducted at the site. The Geoprobe® will be used to advance a pilot hole. A 3/4-inch pre-packed screen well point with risers will be installed in the hole.

Each 5-foot screen section is comprised of #2/16 silica sand filter media, housed by a #65 stainless steel mesh exterior, wrapped around 3/4-inch schedule 40 PVC 0.010-inch screen.

In the event geologic conditions prevent the direct-push method, groundwater wells will be installed using a drill rig. The well will be constructed using a 2-inch PVC, 0.010-inch slotted screen with a #2/16 silica sand pack.

Following installation, the wells will be developed by bailing. The wells will be allowed to recover for at least three days prior to sampling. Wells will be bailed to purge three volumes and then sampled for specific analytes. During the purging of each groundwater monitoring well, at least one set of water quality measurements will be checked. Water quality measurements will include pH, temperature, conductivity, turbidity, dissolved oxygen and redox. Physical parameters will be recorded in the field log book. Notes on static groundwater elevation, drawdown height, stabilized water level elevation, and visual observations about clarity and odor of the groundwater will also be recorded in the field log book.

Appendix C presents procedures which will be followed for groundwater level measurements and groundwater sample collection.

Well Destruction

The three existing monitoring wells (ESE 1-3) near the AST site, as well as the well network (MW4-10) installed in 1987, will be destroyed per DWR Bulletin 74-90. Each well will be destroyed by overdrilling and removing all well material within the original borehole, including well casing, filter pack from the well annulus, and the annular seal. The cleared annulus will then be filled with appropriate sealing material under pressure using a tremie pipe.

Aboveground Storage Tank Excavation

Selected soils within the AST area will be excavated and disposed of at an appropriate facility authorized to accept PCB-laden waste. The existing plastic liner will be excavated and selected soils within the former AST area will be removed (Figure 9). Confirmation soil samples will be collected to determine that remedial objectives are achieved. Once remedial objectives are met, the area will be filled with clean base rock to existing site elevation. Fill will be placed in 18" lifts and compacted to 95%. The site will then be capped with either asphalt or concrete.

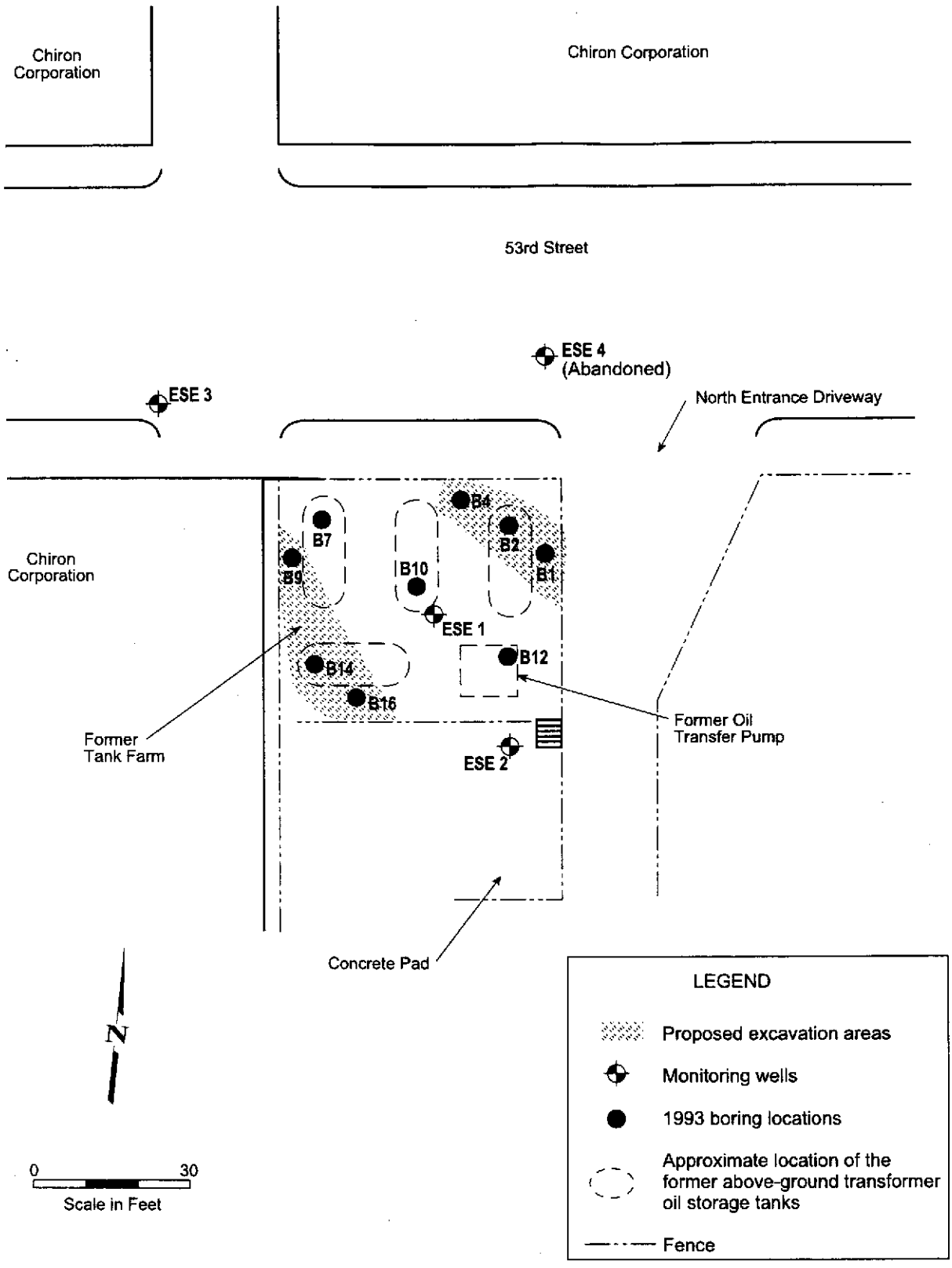


Figure 9. Proposed areas of excavation at former aboveground storage tank site, Emeryville Repair Facility.

Field and Laboratory Analysis Procedures

Selected samples collected from the UST area, will be analyzed for TEPH as mineral oil by EPA Method 3510/8015 and polychlorinated biphenyls (PCBs) by EPA method 8080. Samples collected from the AST area will be analyzed for PCBs by EPA Method 8080. All analysis will be conducted by an analytical laboratory certified by the state of California (Chromalab Inc., Pleasanton).

Quality Assurance/Quality Control and Chain-of-Custody Procedures

Quality assurance samples will be used to evaluate the quality and accuracy of data obtained from the field program. Established QA/QC procedures for the analyses will include sample custody procedures, analyses of matrix spikes and method blanks, data reduction, verification of raw analytical data, and maintenance of control charts to monitor analytical performance. These procedures are outlined in the laboratory's Quality Assurance/Quality Control Plan and Standard Operating Procedures which are available upon request. Organic chemical analyses will be performed in conformance with the standard procedures established by the United States Environmental Protection Agency (EPA) in "Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act" (40 CFR Part 136, October 1984).

Chain-of-custody procedures will be used to identify and ensure the traceability and integrity of the samples collected. These procedures also will be used to document the handling and shipping procedures of the samples. The procedures will trace the samples from collection, through all custody transfers, and finally to the storage facility or the analytical laboratory, where the laboratory's internal procedures will govern until final disposition of the samples. This information will be recorded on the chain-of-custody form, which will remain with the samples at all times. The chain-of-custody forms will be used for a packaged lot of samples (i.e., information on more than one sample will be recorded on a single form). If all the samples in a given lot cannot be recorded on a single chain-of-custody form, additional forms will be used and sequentially numbered indicating the total number of pages (e.g., page 2 of 4).

Health and Safety Plan

Guidelines and procedures for field operations have been prepared to protect the work crew and the public. Details of the Health and Safety Plan are included in Appendix D. In event of an emergency, directions are provided for contacts in Appendix E.

Section 6

WASTE DISPOSAL PLAN

This section provides guidelines for handling potentially contaminated materials generated during the field portion of this investigation. All soils generated during soil boring and well installation will be stored in approved Department of Transportation (DOT) containers. All drums will remain on-site until analytical results are returned from the laboratory. Soils will be appropriately disposed of based on the analytical results.

All drilling equipment will be steam cleaned between boreholes. The water collected during steam cleaning, as well as water removed from the wells during development and sampling, will be stored on-site in sealed DOT containers. All drummed liquids will be sampled and properly disposed of based on analytical results.

California Uniform Hazardous Waste manifests will be completed by PG&E as required for the transport and disposal of any hazardous waste that may be generated during the investigation. Disposal of all wastes will be conducted in accordance with federal, state, and local regulations.

Section 7

EVALUATION AND REMEDIAL ACTION REPORT

Upon completion of the investigation, a report will be prepared to document test methods, procedures, and results, as well as present geologic logs and well construction details generated from soil boring, sampling, and well installation. The hydrogeology and chemical characteristics of the uppermost water bearing zone in the vicinity of the former 5,000-gallon UST area will be described. Formal laboratory reports will be appended to the report.

Section 8

SCHEDULE

The proposed investigation will be initiated once authorization from the regulatory agency, and management approval of this workplan is obtained. Field work will be scheduled based on personnel availability and weather conditions. Field activities are estimated to take approximately four weeks and will be initiated after any permitting requirements are met. Laboratory results should be available within two weeks of sample collection. The evaluation and investigation report will be submitted approximately 15 weeks following the project commencement date.

Section 9

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Appendix A

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Appendix B

TANK CLOSURE FORM

CASE CLOSURE SUMMARY
Leaking Underground Fuel Storage Tank Program

I. AGENCY INFORMATION Date:
Agency name: **Alameda County-HazMat** Address: **1131 Harbor Bay Parkway**
City/State/Zip: **Alameda, CA 94502** Phone: **(510) 567-6700**
Responsible staff person: **Susan Hugo** Title: **Sr. Hazardous Materials Spec.**

II. CASE INFORMATION
Site facility name: PG&E EMERYVILLE MATERIALS FACILITY
Site facility address: 4227 HOLLIS STREET
RB LUSTIS Case No: **N/A** Local Case No./LOP Case No.:
URF filing date: SWEEPS No: **N/A**

Responsible Parties:	Addresses:	Phone Numbers:
SUSAN FANDEL	77 BEALE ST., B24A SAN FRANCISCO, CA 94105	415/972-5719

Tank No:	Size in gal.:	Contents:	Closed in-place or removed?:	Date:
1	500	KEROSENE (?)	REMOVED	10/91
2				
3				
4				

III. RELEASE AND SITE CHARACTERIZATION INFORMATION

Cause and type of release:
Site characterization complete? (YES) NO
Date approved by oversight agency:
Monitoring Wells installed? YES (NO) Number:
Proper screened interval? YES NO
Highest GW depth below ground surface: NOT KNOWN Lowest depth:
Flow direction:
Most sensitive current use:
Are drinking water wells affected? YES (NO) Aquifer name:
Is surface water affected? YES (NO) Nearest affected SW name:
Off-site beneficial use impacts (addresses/locations):

Report(s) on file? **YES** Where is report(s) filed? **Alameda County**
1131 Harbor Bay Parkway
Alameda, CA 94502-6577

Treatment and Disposal of Affected Material:

Material	Amount (include units)	Action (Treatment of Disposal w/destination)	Date
Tank	500 GALLON	ERICKSON - RICHMOND, CA	10/81
Piping	NONE		
Free Product	NONE		
Soil	32 CU YDS	CHEM WASTE - KETTLEMAN, CA	11/91
Groundwater	NONE		
Barrels	NONE		

III. RELEASE AND SITE CHARACTERIZATION INFORMATION (Continued)
Maximum Documented Contaminant Concentrations - - Before and After Cleanup

Contaminant	Soil (ppm) Before	Soil (ppm) After	Water (ppb) Before	Water (ppb) After
TPH (Gas)	460	<1.0		
TPH (~~Diesel~~) KEROSENE	6230	<1.0		
Benzene	N/A	N/A		
Toluene	N/A	N/A		
Xylene	N/A	N/A		
Ethylbenzene	N/A	N/A		
Oil & Grease	115	<50		
Heavy metals	BACKGROUND			
Other				

Comments (Depth of Remediation, etc.):

IV. CLOSURE

Does completed corrective action protect existing beneficial uses per the Regional Board Basin Plan? (YES) NO
Does completed corrective action protect potential beneficial uses per the Regional Board Basin Plan? (YES) NO
Does corrective action protect public health for current land use? (YES) NO
Site management requirements:

Should corrective action be reviewed if land use changes? YES (NO)
Monitoring wells Decommissioned: YES NO
Number Decommissioned: Number Retained:
List enforcement actions taken:

List enforcement actions rescinded:

V. LOCAL AGENCY REPRESENTATIVE DATA

Name: **Susan L. Hugo** Title: **Sr. Hazardous Materials Specialist**
Signature: Date:
Reviewed by
Name: Title:
Signature: Date:
Name: Title:
Signature: Date:

VI. RWQCB NOTIFICATION

Date Submitted to RB: RB Response:
RWQCB Staff Name: DEREK LEE Title: Water Resources Control Engineer
Date:

VII. ADDITIONAL COMMENTS, DATA, ETC.

Appendix C

WATER SAMPLING PROCEDURES

WATER SAMPLING PROCEDURES

Before purging or sampling the monitoring wells, the depth to water (using a well sounder) and, if present, the floating product thickness (using an interface probe or clean bailer), will be measured and recorded. Groundwater in the monitoring wells will be sampled according to the following methodology:

1. Prior to sampling, each well will be purged until at least three well volumes have been removed or until conductivity, pH and temperature have stabilized. If the well is evacuated during purging, the water level will be allowed to recover to 80 percent of the initial static level before samples of the groundwater are collected.

2. Groundwater samples will be collected using a clean disposable bailer. The bailer will be cleaned between wells to avoid cross contamination of the samples. The bailer line will be replaced between well samplings.

3. Samples will be transferred from the bailer to appropriately prepared 1-liter bottles with caps that have Teflon® septums. Care will be taken when transferring the water from the bailer to the containers to avoid turbulence and bubbling as much as possible. The containers will be filled and capped so that no air bubbles are trapped. Each sample container will be labeled with the following information: Sample Identification (i.e., well number), Site Location, Date, Time, and Initials of the person collecting the samples. Samples will then be placed on ice and chilled to less than 4° C.

Appendix D

HEALTH AND SAFETY PLAN

HEALTH AND SAFETY PLAN

PG&E is dedicated to ensuring that its employees and contractors work within a safe and healthy environment at potentially hazardous sites. All field personnel working on the project will be SARA-trained in a Hazardous Waste Site Operations 40-hour training class and 8-hour annual refresher. This Health and Safety Plan is prepared in accordance with OSHA regulations contained in 29 CFR 1910.120 and will be implemented during the soil sampling portion of the subsurface investigation described in this work plan. The requirements, specifications, and procedures presented in this plan will apply to all personnel working in the exclusion zone, including employees, contractors, subcontractors, site visitors, and regulatory agency personnel.

Key Personnel

The Site Safety Coordinator will train site personnel in the use of safety and personal protection equipment and will manage the on-site monitoring program. The Site Safety Coordinator will have the authority to deny access to any individual without the proper training or protective equipment required for the site conditions or individuals disregarding site safety procedures. All site personnel will be under the direction of the Site Safety Coordinator.

Hazard Analysis

The activities addressed by this health and safety plan include subsurface soil collection to depths of approximately 10 feet below the existing ground surface. Although exposure at hazardous levels are unlikely, these activities could expose workers to potentially hazardous materials via dermal contact and inhalation.

The most significant risks associated with polychlorinated biphenyls are dermal absorption and ingestion with inhalation risk minimized due to low volatility of the compounds. Skin contact will be eliminated by use of clothing and gloves. The inhalation hazard will be minimized by use of appropriate respiratory protective devices as determined by on-site air monitoring using a photoionization detector (PID) calibrated with isobutylene gas (100 ppm).

Site Security

The Site Safety Coordinator will establish an exclusion zone around the work area. Restricted activities inside the exclusion zone may be allowed depending on the results of field measurements taken during the course of the activities. Access within this zone will be limited to authorized personnel. All personnel and authorized visitors must contact the Site Safety Coordinator prior to entering and exiting the exclusion zone.

Personal Protective Equipment

A minimum of US EPA Level D protection will be required within the exclusion zone for any workers engaged in sample collection or other similar activities. Level D protection will include:

1. Hard-hat
2. Boots with steel toe
3. Chemical-resistant inner and outer gloves (when workers handle soil samples or sampling equipment).
4. Disposable Tyvek coverall (when workers handle soil samples or sampling equipment).

Level C protection will be required if organic vapor measurements (OVMs) exceed 50 ppm in the worker's breathing zone. Level C protection will consist of:

1. Hard-hat
2. Boots with steel toe
3. Disposable Tyvek coverall
4. Safety glasses, splash goggles, or face shield
5. Chemical-resistant inner and outer gloves
6. MSHA/NIOSH-approved half-face or full face dust respirator with organic vapor cartridges.

If the OVMs exceed 200 ppm in the worker's breathing zone, all work shall stop and the exclusion zone shall be evacuated.

Record Keeping

All site safety records pertaining to this site investigation will be maintained by the Site Safety Officer throughout the project.

Air Monitoring

The Site Safety Officer (or another qualified person designated by the Site Safety Officer) will conduct periodic air monitoring, using direct-reading, real-time sampling equipment.

The direct-reading photoionization organic vapor meter (Thermo-Environmental Model 580A or equivalent) will be used to monitor the concentrations of organic vapors in the work area. Organic vapors will be monitored periodically during the collection of soil and/or groundwater samples. The meter will be calibrated at the start of each work period with isobutylene gas. Total organic vapor measurements will be used to determine the appropriate levels of respiratory protection, and identify conditions that would require site evacuation. Total organic concentrations in the worker's breathing zone in excess of 50 PPM will require Level C personal protective equipment: Total organic concentrations in the worker's breathing zone in excess of 200 PPM will require evacuation of the work area until the organic concentrations subside to below 200 PPM.

Additional Training and Information

Prior to any on-site activities, the Site Safety Officer will conduct training on any health and safety related items which are unique or specifically germane to the project. This will at least include the following:

1. Summarize the physical and chemical health and safety hazards which can be expected at the site.
2. Personal protective equipment rationale, use, and maintenance.
3. Exclusion zone entry, exit, and decontamination procedures.
4. Emergency response procedures (i.e., emergency phone numbers, hospital route, procedures to be followed in the event of a chemical spill, fire, or explosion, evacuation routes, mustering areas, etc.).

Appendix E

EMERGENCY CONTACTS AND PROCEDURES

EMERGENCY CONTACTS AND PROCEDURES

Contacts: Should any situation or unplanned occurrence require outside or support services, the appropriate agency shall be contacted.

Agency	Person to Contact	Telephone
Police	Dispatcher	911
Fire	Dispatcher	911
Ambulance	Dispatcher	911
Hospital*	Dispatcher	(510) 655-4000
Summit Hospital		
PG&E Project Coordinator	Sue Fandel	(Work) (415) 972-5719
Emeryville Materials Facility		(Page) (510) 801-4911
PG&E Project Manager	Fred Flint	(Work) 925-866-5808
		(Pager) 510-442-8820

* Direction to the hospital: See Map, Figure E-1.

Procedures: In the event that an emergency develops on-site, the procedures described below are to be immediately followed. Emergency conditions are considered to exist if:

- Any member of the field crew is involved in an accident or experiences any adverse effects or symptoms of exposure while on-site; or,
- A condition is discovered that suggests the existence of a situation more hazardous than anticipated.

The following emergency procedures should be followed:

1. The on-site Safety Officer will establish emergency evacuation routes and will make all project personnel aware of these routes prior to the first on-site activities. In the event of an emergency, selection of the emergency route will be based on the nature of the emergency and wind direction.
2. In the event that any member of the field crew experiences any adverse effects or symptoms of exposure while on-site, the entire field crew shall immediately halt work and act according to the instructions provided by the on-site Safety Officer.
3. The discovery of any condition that would suggest the existence of a situation more hazardous than anticipated shall result in the shut down of activities and evacuation of the field team and re-evaluation of the hazard and the level of protection required.

One of two designated routes to Summit Hospital in Oakland will be used in the case of an emergency or the need for immediate medical treatment. The on-site Safety Officer will determine if an ambulance is required or if the person(s) requiring medical aid can be transported by PG&E personnel. Professional medical transport will be used in cases of unknown or obvious immediate medical attention. Figure E-1 shows the preferred and alternate emergency routes to the hospital.


Maintenance Facility
Summit Hospital
Primary route
Secondary route