N00236_001628
NAS ALAMEDA, CA
SSIC 5000-33c

DRAFT REMEDIAL INVESTIGATION REPORT, OPERABLE UNIT 2, VOLUME 2 OF 7

06/29/1999

TETRA TECH EM, INC.

Approved for public release: distribution unlimited.

COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY (CLEAN II)
Northern and Central California, Nevada, and Utah
Contract No. N62474-94-D-7609
Contract Task Order No. 0167

Prepared for
U.S. DEPARTMENT OF THE NAVY
Patricia McFadden, Remedial Project Manager
Engineering Field Activity West
Naval Facilities Engineering Command
San Bruno, California

OU-2 REMEDIAL INVESTIGATION REPORT
DRAFT
(Chapter 6)

VOLUME II OF VII

ALAMEDA POINT
ALAMEDA, CALIFORNIA

June 29, 1999

Prepared by
TETRA TECH EM Inc.
10670 White Rock Road, Suite 100
Rancho Cordova, CA 95670
(916) 852-8300

Mukul Sharma, P.E.
Project Manager

DRAFT OU-2 REMEDIAL INVESTIGATION REPORT
ALAMEDA POINT

MASTER TABLE OF CONTENTS

VOLUME I

EXECUTIVE SUMMARY

Chapter

1 INTRODUCTION
2 INSTALLATION-WIDE SITE DESCRIPTION
3 DATA QUALITY OBJECTIVES AND DATA APPLICATION
4 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
5 RISK ASSESSMENT FATE AND TRANSPORT MODELING METHODOLOGIES
REFERENCES

VOLUME II

6 OU-2 SOUTHEASTERN AREA - SUMMARY OF REMEDIAL INVESTIGATION FINDINGS

VOLUME III

7 OU-2 EASTERN AREA - SUMMARY OF REMEDIAL INVESTIGATION FINDINGS

VOLUME IV

8 OU-2 CENTRAL AREA - SUMMARY OF REMEDIAL INVESTIGATION FINDINGS

VOLUME V

9 IR SITE 14 - SUMMARY OF REMEDIAL INVESTIGATION FINDINGS
10 IR SITE 25 - SUMMARY OF REMEDIAL INVESTIGATION FINDINGS
11 OU-2 SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

VOLUME VI

APPENDICES A – H

VOLUME VII

APPENDICES I – P

CONTENTS

Chapter **Page**

CHAPTER 6 SUMMARY OF REMEDIAL INVESTIGATION FINDINGS OU-2 SOUTHEASTERN AREA 6-1

6.1 BACKGROUND AND APPROACH FOR THE REMEDIAL INVESTIGATION 6-1

6.1.1 Physical Setting 6-1

6.1.1.1 Surface Features 6-2
6.1.1.2 Hydrogeologic Features 6-3

6.1.2 Summary of Contamination Sources, Removal Actions, and other Activities 6-6

6.1.2.1 IR Site 9: Building 410 - Paint Stripping Facility 6-7
6.1.2.2 IR Site 13: Former Oil Refinery 6-9
6.1.2.3 IR Site 19: Yard D-13 - Hazardous Waste Storage 6-14
6.1.2.4 IR Site 22: Building 547 - Former Service Station 6-15
6.1.2.5 IR Site 23: Building 530 - Missile Rework Operations 6-15

6.1.3 Remedial Investigation Activities and Treatability Studies 6-16

6.1.3.1 Remedial Investigation Activities 6-17
6.1.3.2 Treatability Studies 6-19

6.1.4 Site Conceptual Model 6-20

6.2 OU-2 SOUTHEASTERN AREA SOIL INVESTIGATION AND RISK ASSESSMENT RESULTS 6-22

6.2.1 IR Site 9: Building 410 - Paint Stripping Facility 6-22

6.2.1.1 Remedial Investigation Soil Results 6-22
6.2.1.2 Human Health Risk Assessment Soil Results 6-24
6.2.1.3 Ecological Risk Assessment Soil Results 6-25
6.2.1.4 Nature and Extent of COCs in Soil at IR Site 9 6-28

6.2.2 IR Site 13: Former Oil Refinery 6-28

6.2.2.1 Remedial Investigation Soil Results 6-29
6.2.2.2 Human Health Risk Assessment Soil Results 6-31
6.2.2.3 Ecological Risk Assessment Soil Results 6-33
6.2.2.4 Nature and Extent of COCs in Soil at IR Site 13 6-37

CONTENTS (Continued)

Chapter **Page**

6.2.3 IR Site 19: Yard D-13 Hazardous Waste Storage 6-39

6.2.3.1 Remedial Investigation Soil Results 6-39
6.2.3.2 Human Health Risk Assessment Soil Results 6-40
6.2.2.3 Ecological Risk Assessment Soil Results 6-42
6.2.3.4 Nature and Extent of COCs in Soil at IR Site 19 6-45

6.2.4 IR Site 22: Building 547 - Former Service Station 6-46

6.2.4.1 Remedial Investigation Soil Gas Survey and Soil Results 6-46
6.2.4.2 Human Health Risk Assessment Soil Results 6-49
6.2.4.3 Ecological Risk Assessment Soil Results 6-50
6.2.4.4 Nature and Extent of COCs in Soil at IR Site 22 6-54

6.2.5 IR Site 23 Building 530 - Missile Rework Operations 6-56

6.2.5.1 Remedial Investigation Soil Results 6-56
6.2.5.2 Human Health Risk Assessment Soil Results 6-57
6.2.5.3 Ecological Risk Assessment Soil Results 6-59
6.2.5.4 Nature and Extent of COCs in Soil at IR Site 23 6-62

6.3 OU-2 SOUTHEASTERN AREA GROUNDWATER INVESTIGATION AND RISK ASSESSMENT RESULTS 6-64

6.3.1 Remedial Investigation Groundwater Results 6-64
6.3.2 Human Health Risk Assessment Groundwater Results 6-67
6.3.3 Ecological Risk Assessment Groundwater Results 6-70
6.3.4 Nature and Extent of COCs in Groundwater 6-70

6.4 OU-2 SOUTHEASTERN AREA CONCLUSIONS AND RECOMMENDATIONS 6-77

6.4.1 OU-2 Southeastern Area Groundwater 6-77
6.4.2 IR Site 9: Building 410 - Paint Stripping Facility 6-84
6.4.3 IR Site 13: Former Oil Refinery 6-88
6.4.4 IR Site 19 Yard D-13 - Hazardous Waste Storage 6-94
6.4.5 IR Site 22: Building 547 - Former Service Station 6-100
6.4.6 IR Site 23: Building 530 - Missile Rework Operation 6-106
6.4.7 Summary of OU-2 Southeastern Area Conclusions and Recommendations 6-111

LIST OF TABLES
VOLUME II

ALL TABLES IN EACH CHAPTER FOLLOW THE TEXT

Tables

SITE 9

6-1 SITE 9 SUMMARY OF RI ACTIVITIES, OU-2 SOUTHEAST AREA
6-2 SITE 9 SUBSURFACE SOIL SAMPLING SUMMARY, OU-2 SOUTHEAST AREA
6-3 SITE 9 GEOTECHNICAL SOIL SAMPLING SUMMARY, OU-2 SOUTHEAST AREA
6-4 SITE 9 MONITORING WELL CONSTRUCTION DETAILS, OU-2 SOUTHEAST AREA
6-5 SITE 9 GROUNDWATER SAMPLING SUMMARY, OU-2 SOUTHEAST AREA
6-6 SITE 9 GEOTECHNICAL SAMPLE LABORATORY TEST RESULTS, OU-2 SOUTHEAST AREA
6-7 SITE 9 SOIL ANALYTICAL DATA SUMMARY (0 FEET TO < 2 FEET BGS), OU-2 SOUTHEAST AREA
6-8 SITE 9 SOIL ANALYTICAL DATA SUMMARY (2 FEET TO 10 FEET BGS), OU-2 SOUTHEAST AREA
6-9 SITE 9 SOIL ANALYTICAL DATA SUMMARY (> 10 FEET BGS), OU-2 SOUTHEAST AREA
6-10a HUMAN HEALTH COPCs IN SOIL (0 FEET TO < 2 FEET BGS), OU-2 SOUTHEAST AREA
6-10b HUMAN HEALTH COPCs IN SOIL (0 FEET TO < 10 FEET BGS), OU-2 SOUTHEAST AREA
6-11 SITE 9 ECOLOGICAL COPCs IN SOIL (0 TO 6 FEET BGS), OU-2 SOUTHEAST AREA
6-12 SITE 9 SUMMARY OF SOIL HAZARD QUOTIENTS CALIFORNIA GROUND SQUIRREL, OU-2 SOUTHEAST AREA
6-13 SITE 9 SUMMARY OF SOIL HAZARD QUOTIENTS RED-TAILED HAWK, OU-2 SOUTHEAST AREA

SITE 13

6-14 SITE 13 SUMMARY OF RI ACTIVITIES, OU-2 SOUTHEAST AREA
6-15 SITE 13 SURFACE SOIL SAMPLING SUMMARY, OU-2 SOUTHEAST AREA
6-16 SITE 13 SUBSURFACE SOIL SAMPLING SUMMARY, OU-2 SOUTHEAST AREA
6-17 SITE 13 GEOTECHNICAL SOIL SAMPLING SUMMARY, OU-2 SOUTHEAST AREA
6-18 SITE 13 MONITORING WELL CONSTRUCTION DETAILS, OU-2 SOUTHEAST AREA
6-19 SITE 13 GROUNDWATER SAMPLING SUMMARY, OU-2 SOUTHEAST AREA
6-20 SITE 13 FIELD SAMPLING PLAN VARIANCE SUMMARY, OU-2 SOUTHEAST AREA
6-21 SITE 13 GEOTECHNICAL SAMPLE LABORATORY TEST RESULTS, OU-2 SOUTHEAST AREA
6-22 SITE 13 SOIL ANALYTICAL DATA SUMMARY (0 FEET TO < 2 FEET BGS), OU-2 SOUTHEAST AREA
6-23 SITE 13 SOIL ANALYTICAL DATA SUMMARY (2 FEET TO 10 FEET BGS), OU-2 SOUTHEAST AREA

LIST OF TABLES (Continued)
VOLUME II

ALL TABLES IN EACH CHAPTER FOLLOW THE TEXT

Tables

6-24 SITE 13 SOIL ANALYTICAL DATA SUMMARY (> 10 FEET BGS), OU-2 SOUTHEAST AREA
6-25 SITE 13 ECOLOGICAL COPCs IN SOIL (0 TO 6 FEET BGS), OU-2 SOUTHEAST AREA
6-26 SITE 13 SUMMARY OF SOIL HAZARD QUOTIENTS CALIFORNIA GROUND SQUIRREL, OU-2 SOUTHEAST AREA
6-27 SITE 13 SUMMARY OF SOIL HAZARD QUOTIENTS RED-TAILED HAWK, OU-2 SOUTHEAST AREA

SITE 19

6-28 SITE 19 SUMMARY OF RI ACTIVITIES, OU-2 SOUTHEAST AREA
6-29 SITE 19 SUBSURFACE SOIL SAMPLING SUMMARY, OU-2 SOUTHEAST AREA
6-30 SITE 19 GEOTECHNICAL SOIL SAMPLING SUMMARY, OU-2 SOUTHEAST AREA
6-31 SITE 19 MONITORING WELL CONSTRUCTION DETAILS, OU-2 SOUTHEAST AREA
6-32 SITE 19 GROUNDWATER SAMPLING SUMMARY, OU-2 SOUTHEAST AREA
6-33 SITE 19 GEOTECHNICAL SAMPLE LABORATORY TEST RESULTS, OU-2 SOUTHEAST AREA
6-34 SITE 19 SOIL ANALYTICAL DATA SUMMARY (0 FEET TO < 2 FEET BGS), OU-2 SOUTHEAST AREA
6-35 SITE 19 SOIL ANALYTICAL DATA SUMMARY (2 FEET TO 10 FEET BGS), OU-2 SOUTHEAST AREA
6-36 SITE 19 SOIL ANALYTICAL DATA SUMMARY (> 10 FEET BTS), OU-2 SOUTHEAST AREA
6-37 SITE 19 ECOLOGICAL COPCs IN SOIL (0 TO 6 FEET BGS), OU-2 SOUTHEAST AREA
6-38 SITE 19 SUMMARY OF SOIL HAZARD QUOTIENTS CALIFORNIA GROUND SQUIRREL, OU-2 SOUTHEAST AREA
6-39 SITE 19 SUMMARY OF SOIL HAZARD QUOTIENTS RED-TAILED HAWK, OU-2 SOUTHEAST AREA

SITE 22

6-40 SITE 22 SUMMARY OF RI ACTIVITIES, OU-2 SOUTHEAST AREA
6-41 SITE 22 SOIL-GAS SURVEY SUMMARY, OU-2 SOUTHEAST AREA
6-42 SITE 22 SUBSURFACE SOIL SAMPLING SUMMARY, OU-2 SOUTHEAST AREA
6-43 SITE 22 GEOTECHNICAL SOIL SAMPLING SUMMARY, OU-2 SOUTHEAST AREA
6-44 SITE 22 MONITORING WELL CONSTRUCTION DETAILS, OU-2 SOUTHEAST AREA
6-45 SITE 22 GROUNDWATER SAMPLING SUMMARY, OU-2 SOUTHEAST AREA
6-46 SITE 22 GEOTECHNICAL SAMPLE LABORATORY TEST RESULTS, OU-2 SOUTHEAST AREA

LIST OF TABLES (Continued)
VOLUME II

ALL TABLES IN EACH CHAPTER FOLLOW THE TEXT

Tables

6-47 SITE 22 SOIL ANALYTICAL DATA SUMMARY (0 FEET TO < 2 FEET BGS), OU-2 SOUTHEAST AREA
6-48 SITE 22 SOIL ANALYTICAL DATA SUMMARY (2 FEET TO 10 FEET BGS), OU-2 SOUTHEAST AREA
6-49 SITE 22 SOIL ANALYTICAL DATA SUMMARY (> 10 FEET BGS), OU-2 SOUTHEAST AREA
6-50 SITE 22 ECOLOGICAL COPCs IN SOIL (0 TO 6 FEET BGS), OU-2 SOUTHEAST AREA
6-51 SITE 22 SUMMARY OF SOIL HAZARD QUOTIENTS CALIFORNIA GROUND SQUIRREL, OU-2 SOUTHEAST AREA
6-52 SITE 22 SUMMARY OF SOIL HAZARD QUOTIENTS RED-TAILED HAWK, OU-2 SOUTHEAST AREA

SITE 23

6-53 SITE 23 SUMMARY OF RI ACTIVITIES, OU-2 SOUTHEAST AREA
6-54 SITE 23 SUBSURFACE SOIL SAMPLING SUMMARY, OU-2 SOUTHEAST AREA
6-55 SITE 23 GEOTECHNICAL SOIL SAMPLING SUMMARY, OU-2 SOUTHEAST AREA
6-56 SITE 23 MONITORING WELL CONSTRUCTION DETAILS, OU-2 SOUTHEAST AREA
6-57 SITE 23 GROUNDWATER SAMPLING SUMMARY, OU-2 SOUTHEAST AREA
6-58 SITE 23 FIELD SAMPLING PLAN VARIANCE SUMARY, OU-2 SOUTHEAST AREA
6-59 SITE 23 GEOTECHNICAL SAMPLE LABORATORY TEST RESULTS, OU-2 SOUTHEAST AREA
6-60 SITE 23 SOIL ANALYTICAL DATA SUMMARY (0 FEET TO < 2 FEET BGS), OU-2 SOUTHEAST AREA
6-61 SITE 23 SOIL ANALYTICAL DATA SUMMARY (2 FEET TO 10 FEET BGS), OU-2 SOUTHEAST AREA
6-62 SITE 23 SOIL ANALYTICAL DATA SUMMARY (> 10 FEET BGS), OU-2 SOUTHEAST AREA
6-63 SITE 23 ECOLOGICAL COPCs IN SOIL (0 TO 6 FEET BGS), OU-2 SOUTHEAST AREA
6-64 SITE 23 SUMMARY OF SOIL HAZARD QUOTIENTS CALIFORNIA GROUND SQUIRREL, OU-2 SOUTHEAST AREA
6-65 SITE 23 SUMMARY OF SOIL HAZARD QUOTIENTS RED-TAILED HAWK, OU-2 SOUTHEAST AREA

SOUTHEAST AREA GROUNDWATER

6-66 HYDROPUNCH® AND MONITORING WELL ANALYTICAL DATA STATISTICAL SUMMARY FIRST WATER-BEARING ZONE OU-2 SOUTHEAST AREA
6-67 HUMAN HEALTH COPCs IN GROUNDWATER OU-2 SOUTHEAST AREA

LIST OF TABLES (Continued)
VOLUME II

ALL TABLES IN EACH CHAPTER FOLLOW THE TEXT

Tables

6-68 ECOLOGICAL COCPs IN GROUNDWATER FIRST WATER-BEARING ZONE, OU-2 SOUTHEAST AREA
6-69 GROUNDWATER ECOLOGICAL COC SELECTION FIRST WATER-BEARING ZONE, OU-2 SOUTHEAST AREA

LIST OF FIGURES
VOLUME II

ALL FIGURES IN EACH CHAPTER FOLLOW THE TABLES

Figures

6-1 GEOLOGIC CROSS SECTION A-A'-SOUTHEASTERN GEOLOGIC REGION OU-2 SOUTHEAST AREA
6-2 GEOLOGIC CROSS SECTION E-E'-SOUTHEASTERN GEOLOGIC REGION OU-2 SOUTHEAST AREA
6-3 GEOLOGIC CROSS SECTION C-C'-SOUTHEASTERN GEOLOGIC REGION OU-2 SOUTHEAST AREA
6-4 GEOLOGIC CROSS SECTION G-G'-SOUTHEASTERN GEOLOGIC REGION OU-2 SOUTHEAST AREA

SITE 9

6-5 SITE 9 SOIL AND GROUNDWATER SAMPLE LOCATION MAP OU-2 SOUTHEAST AREA
6-6 CONCEPTUAL MODEL SITE 9 BUILDING 410 PAINT STRIPPING OU-2 SOUTHEAST AREA
6-7 SITE 9 ORGANIC COMPOUNDS DETECTED IN SOIL OU-2 SOUTHEAST AREA
6-8 SITE 9 INORGANIC COPCs DETECTED IN SOIL OU-2 SOUTHEAST AREA

SITE 13

6-9 SITE 13 SOIL AND GROUNDWATER SAMPLE LOCATION MAP OU-2 SOUTHEAST AREA
6-10 SITE 13 HISTORICAL STRUCTURES PACIFIC COAST OIL REFINERY CIRCA 1897 OU-2 SOUTHEAST AREA
6-11 CONCEPTUAL MODEL SITE 13 FORMER PACIFIC COAST OIL REFINERY CIRCA 1867-1903 OU-2 SOUTHEAST AREA
6-12 SITE 13 ORGANIC COMPOUNDS DETECTED IN SOIL (3 SHEETS) OU-2 SOUTHEAST AREA
6-13 SITE 13 INORGANIC COPCs DETECTED IN SOIL (3 SHEETS) OU-2 SOUTHEAST AREA

SITE 19

6-14 SITE 19 SOIL AND GROUNDWATER SAMPLE LOCATION MAP OU-2 SOUTHEAST AREA
6-15 CONCEPTUAL MODEL SITE 19 HAZARDOUS WASTE STORAGE YARD OU-2 SOUTHEAST AREA
6-16 SITE 19 ORGANIC COMPOUNDS DETECTED IN SOIL OU-2 SOUTHEAST AREA
6-17a SITE 19 INORGANIC COPCs DETECTED IN SOIL OU-2 SOUTHEAST AREA
6-17b SITE 19 CYANIDE DETECTED IN SOIL OU-2 SOUTHEAST AREA

LIST OF FIGURES (Continued)
VOLUME II

ALL FIGURES IN EACH CHAPTER FOLLOW THE TABLES

Figures

SITE 22

6-18 SITE 22 SOIL AND GROUNDWATER SAMPLE LOCATION MAP OU-2 SOUTHEAST AREA
6-19 CONCEPTUAL MODEL SITE 22 BUILDING 547 FORMER SERVICE STATION OU-2 SOUTHEAST AREA
6-20 SITE 22 SOIL GAS SURVEY SAMPLE LOCATION MAP OU-2 SOUTHEAST AREA
6-21 SITE 22 ORGANIC COMPOUNDS DETECTED IN SOIL OU-2 SOUTHEAST AREA
6-22 SITE 22 INORGANIC COPCs DETECTED IN SOIL OU-2 SOUTHEAST AREA

SITE 23

6-23 SITE 23 SOIL AND GROUNDWATER SAMPLE LOCATION MAP OU-2 SOUTHEAST AREA
6-24 CONCEPTUAL MODEL SITE 23 MISSILE REWORK OPERATIONS OU-2 SOUTHEAST AREA
6-25 SITE 23 ORGANIC COMPOUNDS DETECTED IN SOIL OU-2 SOUTHEAST AREA
6-26 SITE 23 INORGANIC COPCs DETECTED IN SOIL OU-2 SOUTHEAST AREA

SOUTHEAST AREA GROUNDWATER

6-27 ORGANIC COMPOUNDS DETECTED IN GROUNDWATER FIRST WATER-BEARING ZONE (2 SHEETS) OU-2 SOUTHEAST AREA
6-28 INORGANIC COPCs DETECTED IN GROUNDWATER FIRST WATER-BEARING ZONE (2 SHEETS) OU-2 SOUTHEAST AREA
6-29a-t GROUNDWATER CONTAMINANTS TIME-SERIES PLOTS OU-2 SOUTHEAST AREA
6-30 ISOCONCENTRATION CONTOURS OF TPH (MOTOR OIL RANGE), TPH (GASOLINE RANGE), AND TPH (DIESEL RANGE) DETECTED IN GROUNDWATER FIRST WATER-BEARING ZONE (2 SHEETS) OU-2 SOUTHEAST AREA
6-31a ISOCONCENTRATION CONTOURS OF BENZENE AND 2-METHYLNAPHTHALENE DETECTED IN GROUNDWATER FIRST WATER-BEARING ZONE OU-2 SOUTHEAST AREA
6-31b ISOCONCENTRATION CONTOURS OF BENZENE, 2-METHYLNAPHTHALENE, AND 2,4-DIMETHYLPHENOL DETECTED IN GROUNDWATER FIRST WATER-BEARING ZONE OU-2 SOUTHEAST AREA

CHAPTER 6
SUMMARY OF REMEDIAL INVESTIGATION FINDINGS
OU-2 SOUTHEASTERN AREA

This chapter provides a summary of the RI activities associated with the OU-2 Southeastern area, which consists of IR Sites 9, 13, 19, 22, and 23. Section 6.1 provides information on the background and approach for the RI. Section 6.2 presents RI soil investigation, HHRA, and ERA results. Section 6.3 discusses groundwater for the entire OU-2 Southeastern area by presenting RI groundwater investigation, HHRA, and ERA results. Section 6.4 presents conclusions and recommendations regarding the nature and extent of all contaminated media that should be addressed in the FS, or the state's petroleum program, for the OU-2 Southeastern area.

Tables 6-1 through 6-69 and Figures 6-1 through 6-31b contain information concerning the OU-2 Southeastern area and are referred to throughout this chapter and can be found at the end of this chapter.

6.1 BACKGROUND AND APPROACH FOR THE REMEDIAL INVESTIGATION

This section presents the following:

- A description of the OU-2 Southeastern area's physical setting, including surface features, geology, and hydrogeology (see Section 6.1.1)
- A summary of contamination sources, removal actions, and other activities (including previous investigations, EBS results, storm drain status, and UST and fuel line removals) for each OU-2 Southeastern area IR site (see Section 6.1.2)
- A description of RI activities and treatability study results (see Section 6.1.3)
- A discussion of the site conceptual model (see Section 6.1.4)

6.1.1 Physical Setting

The following subsections describe the surface and hydrogeologic features of the OU-2 Southeastern area.

6.1.1.1 Surface Features

The OU-2 Southeastern area consists of five sites, three of which (IR Sites 19, 22, and 23) are located within the boundaries of IR Site 13 (See Figure 6-5). IR Site 9 is located to the west of the southern portion of IR Site 13. IR Site 9 consists of Building 410 and a paved lot on approximately 1.1 acres of land, located approximately 850 feet west of the south gate on Viking Street between West Ticonderoga and West Oriskany Avenues (see Figures 6-5 and 1-3).

IR Site 13 includes the historical location of the former Pacific Coast Oil Works refinery. The site consists of approximately 30 acres located in the southeastern corner of Alameda Point south of OU-2 Eastern area. IR Site 13 is bounded by Orion Street to the west, West Ticonderoga Avenue to the south, and Central Avenue to the east (see Figure 1-3). IR Sites 19 and 22 are located in the northern portion of IR Site 13, and IR Site 23 is located in the southern portion of the site. The western and southern boundaries of IR Site 13 roughly correspond to the location of the former shoreline of western Alameda Point before the tidal areas of Alameda Point were filled. Section 2.2.1 provides details regarding the filling of Alameda Point. Building 397 in the western portion of IR Site 13, is currently empty and was used historically as an engine test facility. Other structures currently located at IR Site 13 include large shipping containers currently used as storage containers. Much of IR Site 13 is paved; however, portions of the site north of West Oriskany Avenue and west of Skyhawk Street are unpaved.

IR Site 19 consists of Yard D-13, a former hazardous waste storage yard located east of Orion Street and north of West Pacific Avenue in an area southwest of IR Site 4 (see Figure 1-3). The site is fenced and occupies approximately 1.5 acres. Building 616 is located in the northwestern corner of the yard and a large steel-framed, open-sided building with a bermed concrete floor is located in the southwestern corner. The surface of the yard was repaved in March 1988 (see Figure 6-14). The site is currently vacant.

IR Site 22 has an area of approximately 2.3-acres and consists of Building 547, a former service station located northeast of the intersection of Skyhawk Street and Pacific Avenue, approximately 900 feet south of the east gate (see Figure 1-3). A car wash facility was located in the northeastern corner of the paved

area of IR Site 22. The service station operated between 1971 and 1980. Portions of IR Site 22 are unpaved and landscaped (see Figure 6-18). The site is currently vacant.

IR Site 23 has an area of approximately 2.0 acres and consists of Building 530, which is located west of Skyhawk Street between West Oriskany and West Ticonderoga Avenues (see Figure 1-3). The Navy used Building 530 for missile rework operations between 1972 and 1994 (PRC and MW 1996b). Tower Aviation currently occupies Building 530. Tower Aviation remodeled Building 530 for its operations, which involves of overhauling aviation components.

6.1.1.2 Hydrogeologic Features

The OU-2 Southeastern area consists of the following six geologic units, four of which are water bearing: (1) artificial fill dredged from San Francisco Bay and Oakland Inner Harbor, (2) bay sediments, (3) Merritt Sand, (4) the upper San Antonio Formation, (5) the lower San Antonio Formation (Yerba Buena Mud), and (6) the Alameda Formation. Figures 6-1 through 6-4 present geologic cross sections and the locations of the cross sections prepared for the OU-2 Southeastern area. The diagram illustrates the geologic units beneath the OU-2 Southeastern area. Appendix A provides soil boring logs and CPT logs for the OU-2 Southeastern area IR sites.

Southeastern Area (IR Sites 9, 13, 19, 22 and 23)	
Depth (bgs)	**Description of Hydrogeologic Unit**
0 to 15 feet	Artificial Fill and FWBZ; thickness ranges from 5 to 15 feet and generally increases in the western direction.
2 to 80 feet	Merritt Sand Formation and FWBZ; thickness ranges from 50 to 80 feet and is in direct contact with artificial fill over most of the area. [1]
75 to 100 feet	Upper San Antonio Formation and FWBZ
100 to ~175 feet	Lower San Antonio Formation (Yerba Buena Mud); regional aquitard
~170 to 220 feet	Top of Alameda Formation; regional aquifer

[1] The BSU is present only in the southern and western edges of the Southeastern area.

As discussed in Chapter 2, the Alameda Formation is protected by the Yerba Buena Mud, and data supports the argument that the Alameda Formation has not been affected by activities at Alameda Point. Thus, the Alameda Formation is not discussed further in this section. The following paragraphs further

describe the upper five hydrogeologic units beneath the OU-2 Southeastern area at Alameda Point. The bay sediments are discussed with the artificial fill because of their absence at most of OU-2 Southeastern area.

Artificial Fill - First Water Bearing Zone. The western and southern boundaries of the Southeastern area are located along the former shoreline of the Alameda Estuary, which existed prior to the filling of the tidal flats to the west (see Figure 1-2). Surficial deposits consist of fill material approximately 2 to 10 feet thick in the eastern portion of the OU-2 Southeastern area and approximately 10 to 15 feet thick in the western portion, the location of the former tidal flats. The fill consists of dark brown to brown, silty, fine-grained sand with minor amounts of clay and gravel. Prior to the mid- to late-1930s, before the fill material was dredged and placed, the entire OU-2 Southeastern area was submerged under San Francisco Bay. The dredged fill consists of dredge spoils from the surrounding San Francisco Bay and the Oakland Inner Harbor. These dredge spoils were contaminated with wastes from coal gasification plants located along the Oakland Inner Harbor and from the Pacific Coast Oil Works refinery, which operated from 1879 to 1903 at the current location of IR Site 13. Currently, this fill material is mostly covered with buildings and roads and is interlaced with numerous water mains, sewer pipes, steam lines, fuel lines, storm drains, and industrial waste lines.

A thin, discontinuous layer of bay sediments occurs below the artificial fill west of IR Site 9. Where present, the bay sediments are typically located between 10 and 15 feet bgs and primarily consist of dark gray, silty clay with iron oxide stains along the upper contact.

Merritt Sand Formation - First Water Bearing Zone. Where the thin discontinuous layers of bay sediments are absent, the artificial fill is underlain by the Merritt Sand. The Merritt Sand is located at approximately 10 to 15 feet bgs where bay sediments are present and approximately 2 to 10 feet bgs where the bay sediments are absent and fill is present. The Merritt Sand consists primarily of an orange-brown, silty, fine-grained, poorly graded sand. The Merritt Sand is approximately 50 to 70 feet thick in the OU-2 Southeastern area. Groundwater is encountered between approximately 2 and 8 feet bgs.

The FWBZ was the only water-bearing zone encountered in the OU-2 Southeastern area during the RI. The FWBZ is found both in the thin cover of artificial fill and the thick Merritt Sand Formation underlying the fill material. The FWBZ is subdivided into upper and lower intervals in the Southeastern

area based on the vertical gradients observed in monitoring wells (see Section 2.3). The two intervals are considered to be in hydraulic communication. A groundwater contour map for the FWBZU was prepared from groundwater levels measured in April 1998 (see Figure 2-14e). As illustrated, the general groundwater gradient is west and southwest toward the Seaplane Lagoon and San Francisco Bay. Figure 2-14f, a groundwater contour map for the FWBZL prepared from groundwater elevations measured in April 1998, shows a westerly groundwater flow direction. In general, groundwater flow is to the northeast; however, local variations exist.

Groundwater flow in the OU-2 Southeastern area appears to be locally impacted by flow paths such as storm water conveyance lines and underground utility trenches near industrial buildings. Water levels in the vicinity of industrial buildings indicate localized regions of groundwater mounding or groundwater depression. Groundwater recharge to the FWBZ is mainly attributed to vertical infiltration from precipitation; and leaking water supply, sewer, and storm water pipes both at Alameda Point and upgradient of the facility. Tidal inundation of storm water conveyance lines may also contribute recharge to the FWBZ. The storm water conveyance lines act as potential groundwater sinks at low tide, when the gradient is toward the lines.

A tidal influence study performed by PRC in 1997 demonstrated that OU-2 Southeastern area groundwater elevations are affected by diurnal tidal cycles, especially where storm drain conveyance lines allow communication with the Seaplane Lagoon. A steeper gradient occurs during low tides (in the wells near the Seaplane Lagoon) when the water level in the tidally influenced wells is the lowest (PRC 1997a). Tidally corrected water elevations (see Appendix G) were used to calculate the following summary of groundwater flow characteristics based on groundwater elevations from the April 1998 sampling event.

The following table summarizes the hydrogeologic data for the FWBZ beneath the OU-2 Southeastern area.

Groundwater Flow Characteristics	
Horizontal Hydraulic Gradient (feet/feet)	0.003 (average)
General Horizontal Flow Direction	Southwest to west (local variations occur)
Estimated Horizontal Flow Velocity (feet/year)	1 to 10 (local variations occur adjacent to storm water conveyance lines)
Vertical Hydraulic Gradient (feet/feet)	Varies from 0.03 upward to 0.001 downward

Upper San Antonio Formation - First Water Bearing Zone and Lower San Antonio Formation (Yerba Buena Mud - Regional Aquitard). The fourth and fifth geologic units encountered at the OU-2 Southeastern area are the Upper San Antonio Formation and the Lower San Antonio Formation (Yerba Buena Mud). These formations are present between approximately 70 feet bgs to the maximum depth explored, 115 feet bgs. The Upper San Antonio Formation consists of interbedded very fine silty sand and green-gray silty clay and comprises the lower portion of the FWBZ. The Lower San Antonio Formation, or the Yerba Buena Mud or Old Bay Mud, forms a regionally continuous aquitard beneath Alameda Point that separates the SWBZ from the underlying Alameda Formation. The Yerba Buena Mud is 55 to 80 feet thick.

6.1.2 Summary of Contamination Sources, Removal Actions, and Other Activities

Portions of the OU-2 Southeastern area have been investigated beginning in the early 1980s. These early studies included the Naval Air Rework Facility (NARF) industrial waste survey completed in 1981, which included collection of wastewater samples from Building 410 at IR Site 9. In 1982, the Navy contracted E&E to conduct an initial IAS under the NACIP program to identify, assess, and control environmental contaminants resulting from past activities at Alameda Point. The IAS included an investigation of IR Site 13.

In January through November 1995, an EBS was conducted at the OU-2 Southeastern area. The EBS investigation included collection and analysis of soil and groundwater samples. The goal of the EBS was to document and assess potential environmental concerns associated with real estate parcels affected by the BRAC process. However, it should be noted that the EBS focused on portions of the OU-2 Southeastern area outside the portions being investigated by the IR program.

The storm sewer system for the former Navy base consists of the storm sewer lines, manholes, and catch basins. Figure 2-21 shows the locations of the storm drains at Alameda Point. The storm sewer lines empty into the Seaplane Lagoon, Oakland Inner Harbor, and San Francisco Bay at 46 outfall locations. The status of the storm sewer repair program (as described in Section 2.7) for each IR site in the OU-2 Southeastern area is provided below.

Aboveground storage tanks (ASTs) and USTs previously located in the OU-2 Southeastern area have been removed or abandoned in place. As described in Section 2.7, a basewide underground fuel line removal and abandonment project was conducted at Alameda Point between June 1998 and January 1999.

A summary of contamination sources, removal actions, and other activities (including EBS, storm sewer, and UST activities), conducted at IR Sites 9, 13, 19, 22, and 23, are described below.

6.1.2.1 IR Site 9: Building 410 - Paint Stripping Facility

Building 410 at IR Site 9 housed the aircraft paint stripping facility for Alameda Point until 1990. This facility handled large volumes of solvents and generated industrial wastewater that was tested and treated at the wastewater treatment facility in Building 588. Building 410 was used for storage by a garbage contractor and for stockpiled soil from RIs until 1996. The building is currently empty.

Operations conducted at IR Site 9 included the use of large volumes of chlorinated solvents and other materials with the potential to affect soil and groundwater quality. Wastewater from the paint stripping operation contained oils, paints, paint skins, detergents, and paint strippers (E&E 1983). Prior to construction of the industrial waste treatment facility in 1973 (Building 588), wastewater from Building 410 was reportedly discharged directly to the industrial wastewater collection system without pretreatment (see Figure 6-5) (E&E 1983). It is also possible that contaminated materials entered the storm sewers east of Building 410.

In 1981, composite wastewater samples were collected from the Building 410 wastewater discharge as part of the NARF Survey. The IAS (E&E 1983) presented analytical data from the 1981 NARF survey, which indicated high concentrations of chromium, phenol, surfactants, and total solids, as well as high biochemical oxygen demand (BOD) and chemical oxygen demand (COD) in the wastewater. These

analyses also identified the presence of cadmium, zinc, suspended solids, oil and grease, methylene chloride, chloroform, and trichloroethane (TCA).

Results of the EBS investigation included detection of TPH, VOCs, SVOCs, and metals in soil samples collected from IR Site 9 and in groundwater samples collected from one HydroPunch® boring. EBS sampling was conducted mostly in the vicinity of underground utilities at IR Site 9. EBS sampling results indicated no significant variation in the type or concentrations of contamination detected in the portion of IR Site 9 where RI samples were collected.

Two sewer lines are located in the vicinity of IR Site 9. A north-south oriented sewer line near the southwestern corner of Building 410 runs south to Outfall "O." In 1991, this sewer line was replaced with an 8-inch diameter polyvinyl chloride (PVC) line that enters a 20-inch diameter PVC line located south of West Ticonderoga Avenue. This sewer line was not cleaned during the 1997 storm sewer cleanup program. The second sewer line, which is oriented east-west, runs parallel to the northern edge of IR Site 9. This line was cleaned and inspected in 1991 but was not cleaned during the 1997 storm sewer cleanup program.

An industrial drain line connected to a floor drain in Building 410 was inspected during the follow-on investigation using a video camera. The purpose of the inspection was to determine if the drain line had cracks or leakage points that could have served as source areas for chemical migration to groundwater and to finalize locations for six shallow HydroPunch® sampling locations along the drain line beneath the building (PRC and MW 1994b).

The video survey did not indicate cracking or leaking along the portions of the drain line that were accessible by the camera. Some portions of the drain line were inaccessible because of obstructions in the line and were not inspected (PRC and MW 1996b).

No USTs or associated fuel lines were identified at IR Site 9.

6.1.2.2 IR Site 13: Former Oil Refinery

Details regarding the chronological development and location of activities and the description of historical industrial uses at IR Site 13 are not well documented. Available historical information for IR Site 13 is summarized below.

The Pacific Coast Oil Works refinery operated in Alameda from 1879 to 1903 and formerly occupied IR Site 13. The refinery reportedly consisted of pump and lubricating houses, stills, two laboratories, agitators, and approximately 19 aboveground steel oil storage tanks, six steel USTs, and a storage area containing oil drums (see Figure 6-10). The former tanks were used to store crude oil and finished products, as well as processes such as bleaching and condensing. The majority of refinery operations occurred in the southern portion of IR Site 13. Petroleum refinery operations in the late 1800s consisted of distilling crude oil to kerosene and fuel oil. Light, short-chained hydrocarbons were by-products. Wastes from this type of operation would be expected to include heavier end hydrocarbons that weather to an asphaltic-type consistency. The type and quantity of wastes and location of disposal are not documented; however, it is reasonable to assume that the refinery wastes and asphaltic residues were disposed of at the site, the surrounding tidal lands, and the native sediments of San Francisco Bay. The Navy later paved portions of the area occupied by the refinery. IR Site 13, as well as sites contained within IR Sites 13 (IR Sites 19, 22, and 23) are expected to have been heavily impacted by refinery operations.

Shallow bay sediments were later dredged and used as fill throughout Alameda Point. An evaluation by PRC in 1991 (PRC and JMM 1992a) indicated that a distinctive suite of PAHs was detected at higher concentrations at the interface between the native sediments and the overlying fill throughout Alameda Point. Based on the distribution of chemicals, it was concluded that the majority of PAHs detected at shallow depths at Alameda Point were the result of past operations and disposal practices of the former refinery. Thus, ambient conditions at Alameda Point are represented by elevated levels of PAHs. These PAHs are also associated with saturated fill in the FWBZ and could also have detrimental effects on groundwater quality.

In the 1940s, a soil surface rupture occurred at IR Site 13 as a result of vapor pressure buildup from the presence of underground hydrocarbons and refinery wastes (E&E 1983). In response to the rupture, the Navy excavated a 30- by 30-foot area (depth and location not recorded) and placed a concrete slab in the bottom of the excavation, which was subsequently backfilled and resurfaced.

The October 1989 Loma-Prieta earthquake is believed to have damaged storm and industrial waste sewers throughout Alameda Point, and could have resulted in releases of wastes in the sewers. The industrial wastewater discharge from the jet engine test cells was plugged in response to an EBMUD cease and desist order dated December 18, 1989. This order affected Buildings 14, 272, and 397. Plugging of the lines may have resulted in waste liquids, such as jet fuel (JP-5), being trapped in industrial waste lines and backing up in the sewer line. According to Harding Lawson Associates (HLA) (1989), an oil-water separator near Building 397 may have contributed to ongoing releases at IR Site 13.

In February 1991, a JP-5 release occurred on the eastern side of the engine test facility at Building 397, which is in the northwestern portion of IR Site 13 (PRC 1992). Following a period of heavy rains, several storm drain manholes overflowed along West Pacific Avenue, resulting in a pool of water that was covered with free hydrocarbon product. Sewer lines below 12 manholes in the vicinity of Building 397 contained free hydrocarbon product. The material reportedly had the appearance of "black oil." Based on the color and other characteristics of the material, it is theorized that release may have mobilized some waste constituents from the former Pacific Coast Oil Works refinery.

The overflow condition was stopped and a vacuum truck removed the free product. The spill investigation revealed that a drain valve had been left open during start-up and operational testing of a new automatic data acquisition system for Jet Engine Test Cell 15 (JETC-15). The fuel appeared to have infiltrated through the concrete walls in the southwest end of the JETC-15 augmenter pit. It was initially estimated that up to 17,000 gallons of JP-5 were potentially released (PRC 1992). According to Navy records, of the 33,750 gallons collected from the storm sewers, 4,000 gallons of JP-5 were recovered using oil-water separators. An additional 1,310 tons of contaminated soil was excavated to 2 feet below the water table. In March 1991, additional free product was observed upon removal of the oil-water separators (PRC 1992).

A minor fuel leak is also believed to have occurred in the jet fuel supply line between Buildings 372 and 375. A pressure test was conducted in March 1991, and the line was found to be sound. Additional testing was performed in June 1991, and the line lost 15 pounds per square inch (psi) from an initial 100 psi in 20 minutes, which represents a "minor" leak. After discovery of the leak, the line was blocked and emptied. The exact location of the release and its amount were not determined (PRC 1992).

Previous investigations and other activities related to petroleum contamination at IR Site 13 are discussed below. These investigations and activities included drilling soil borings, installing of monitoring wells, and conducting several removal actions.

In 1989, the Navy contracted HLA to conduct a geotechnical investigation to prepare for the construction of two proposed buildings known as the Intermediate Maintenance Facility (IMF). The buildings were to be located south and southeast of Building 397 (see Figure 6-9). HLA drilled 18 soil borings and converted one of the borings to a monitoring well. Free hydrocarbon product was encountered in one boring, and hydrocarbon stains or odors were identified in nine borings. Nineteen soil samples were analyzed for TPH (gasoline range), and 15 soil samples were analyzed for oil and grease (O&G). TPH (gasoline range) was detected in 11 out of the 19 samples at concentrations of 51 to 76,000 mg/kg; O&G was detected in 11 soil samples at concentrations that ranged from 120 to 120,000 mg/kg. A sample from boring B-IMF-07 contained the highest concentrations of these contaminants. This sample also contained lead at a concentration of 13,000 mg/kg and had a pH of 1.6. Figure 6-9 shows the locations of the HLA borings (HLA 1989).

Boring B-IMF-07 was located in the central portion of the former refinery adjacent to the previous location of the lubricating building, and also close to the former bleaching tanks and activators. It is believed that these units were the source of the low pH, high TPH, and high lead wastes found in Boring B-7. It is also believed that historical fuel releases from the vicinity of Building 397 (located approximately 300 feet northwest of the former refinery) may have contributed to the free hydrocarbon product and mobilized some of the historical contamination from the refinery.

The Navy was directed by DTSC to initiate soil removal activities in the vicinity of boring B-IMF-07. PRC was contracted by the Navy in 1991 to conduct an investigation to confirm the presence of soil containing elevated lead concentrations, low pH, and petroleum hydrocarbons near the boring. Eight soil

borings were drilled and one monitoring well (M-IMF-01) was installed during Phase I of this investigation (see Figure 6-9). Hydrocarbon stains and odors were noted in all borings, and 0.7 foot of free hydrocarbon product was measured in the monitoring well.

Seven soil samples were also analyzed for total recoverable petroleum hydrocarbons (TRPH), and three samples were analyzed using the toxic characteristic leaching procedure (TCLP) for VOCs and SVOCs. The maximum lead concentration reported was 603 mg/kg, and none of the samples had a pH lower than 4. TRPH concentrations ranged from 37.8 to 71,200 mg/kg. No leachable VOCs or SVOCs were detected in the samples except for one that contained a low concentration of leachable benzene.

Because of discrepancies in field-screening and laboratory results for two of the samples submitted during the Phase I investigation, DTSC requested the collection and analysis of additional samples in this area. As part of a Phase II investigation, surface soil samples were collected adjacent to the eight Phase I borings and subsurface samples were collected adjacent to two Phase I borings and HLA boring B-IMF-07. Samples were field-screened for pH and tested in the laboratory. The field and laboratory results were generally consistent. Results of pH analysis of soil samples collected in the vicinity of boring B-IMF-07 continued to indicate low pH values (0.9 to 2.2).

Because the Phase I and II investigations confirmed the presence of low-pH soil in the vicinity of boring B-IMF-07 but did not fully characterize the extent of this soil, DTSC requested that an additional investigation (Phase III) be performed in the vicinity of the boring. In addition to the lead and pH evaluation, the groundwater flow regime also was to be assessed. To accomplish this task, PRC drilled three additional borings and installed one monitoring well (M-IMF-02). During the course of the investigation, oil-soaked sand and hydrocarbon odors were frequently encountered, and tar and coal-like materials were encountered.

Results of the IMF Phase I, II, and III investigations indicated that low-pH (less than 2) soil was common within a 6-foot radius of boring B-IMF-07 and that the low pH was related to the presence of a tar-like, oily material. High concentrations of lead were also encountered in the vicinity of the boring. Low pH and elevated levels of lead appear to be restricted to the vicinity of boring B-IMF-07 and have not affected regional soil or groundwater quality. In 1993, a soil removal action was undertaken in the vicinity of boring B-IMF-07.

The IR Site 13 removal action was conducted in two phases. Phase I removal action activities were conducted from September to October 1993. Confirmation samples indicated that residual total lead concentrations exceeded the interim cleanup level of 100 mg/kg. Additional excavation (Phase II) was performed from October 1994 to December 1994 to complete the removal action. The final excavation area measured approximately 25 by 30 feet and had a maximum depth of 7 feet bgs. A total of about 120 cubic yards of contaminated soil were excavated and shipped to a Class I landfill. Lead concentrations in all but one confirmation sample were below the interim cleanup goal of 100 mg/kg. The remaining soil confirmation sample had a lead concentration of 121 mg/kg.

A detailed description of the removal action is presented in the "Intermediate Maintenance Facility IR Site Non-Time Critical Removal Action Implementation Report, Final" dated September 10, 1995 (PRC and MW 1995b).

EBS sampling and analysis activities were conducted at IR Site 13. These activities included soil sampling and groundwater sampling collected from two HydroPunch® borings. EBS sampling was conducted in the vicinity of Building 397, west of Building 530, and south of the former service station (IR Site 22). EBS sampling results indicated no significant variation in the type or concentrations of TPH, SVOCs, and metals detected in the portions of IR Site 13 where RI samples were collected.

The east-west storm sewer line that parallels the southern side of West Oriskany Avenue to Outfall "J" and crosses IR Site 13 was cleaned and inspected in 1991 but was not cleaned during the storm sewer cleanup program in 1997. The north-south sewer line beneath Skyhawk Street that crosses IR Site 13 was cleaned and inspected in 1991 but was not cleaned during the storm sewer cleanup program in 1997. Two sections of storm sewer line were replaced at IR Site 13. The east-west storm sewer line located along West Pacific Avenue was replaced with PVC in 1991. This line was not cleaned during the 1997 storm sewer cleanup program. The other storm sewer line located east of Building 530 was replaced with 8-inch diameter PVC line in 1991. It was not cleaned during the 1997 storm sewer cleanup program.

In October 1998, an abandoned JP-5 fuel line that entered IR Site 13 near the Building 397 jet engine test facility was removed.

6.1.2.3 IR Site 19: Yard D-13 - Hazardous Waste Storage

Yard D-13 was used as a permitted storage area under RCRA for containers of hazardous wastes generated by Alameda Point activities. Empty 55-gallon drums and drums containing wastes were stored at Yard D-13. Drums containing wastes were organized by chemical type and stored in separate bermed areas in the open-sided building. The wastes were removed from the storage area since 1996, and the site is currently vacant.

There are no documented releases of chemicals from IR Site 19. The site is believed to have stored waste chlorinated solvents and other RCRA-regulated wastes. In February 1991 a JP-5 release occurred on the eastern side of Building 397 just to the south of IR Site 19 (see Figure 6-14). This release likely affected soil and groundwater quality at IR Site 19.

EBS sampling and analysis activities at IR Site 19 included soil sampling and groundwater sampling collected from one HydroPunch® boring. EBS sampling results indicated no significant variation in the type or concentration of TPH, SVOCs, or metals detected in the portions of IR Site 19 where RI samples were collected.

Two storm sewer lines are located in the vicinity of IR Site 19. An 18-inch diameter, paved invert corrugated iron (PIC) pipe parallels the western border of IR Site 19 beneath Orion Street. This storm sewer line was cleaned and inspected in 1991. A 24-inch diameter PIC line crosses the eastern side of IR Site 19 from north to south and connects to the storm sewer line beneath West Pacific Avenue. This storm sewer line was cleaned during the 1997 storm sewer cleanup program.

Five USTs were located at IR Site 19 (see Figure 2-22). Two USTs designated T-616-1 (5,000-gallon) and T-616-2 (10,000-gallon) were located on the northern side of Building 616. The tanks were removed in 1995, with no history of leakage. Two USTs designated T-372-1 (6,000-gallon) and T-372-2 (1,000 gallon) were located on the northern side of IR Site 19. Tank T-372-1 was removed in 1995 and identified as leaking. Tank T-372-2 was removed in December 1998. One UST identified as T-163-1 was located further north, next to Building 163. This UST was removed in 1995.

6.1.2.4 IR Site 22: Building 547 - Former Service Station

IR Site 22 contained three 12,000-gallon fiberglass USTs; one 10,000-gallon, stainless steel used-oil UST; and one 5,000-gallon, stainless steel, used-oil UST. The five USTs were reportedly installed in 1971 (Canonie 1990). The three 12,000-gallon USTs (T-547-1, T-547-2, and T-547-3) were located in the northwestern corner of IR Site 22 (see Figure 2-22). The locations of the 10,000- and 5,000-gallon USTs are not shown on available maps of Alameda Point.

In 1980, one of the USTs (tank number unknown) ruptured when a tank-measuring rod was dropped into the tank. The ruptured tank was reportedly drained and repaired between 1980 and 1987 (Canonie 1990). When the 1987 tank testing survey revealed that product lines to the same UST were leaking, the product lines were removed and replaced (Environmental Resources Management [ERM] 1987; ERM 1997). After a failed precision tightness test conducted during a 1988 tank testing survey, fuel from the ruptured tank was removed. The fiberglass USTs, associated vent piping, and product piping were removed from IR Site 22 in November 1994. Geophysical evidence indicates that the suspected 10,000- and 5,000-gallon waste oil tanks had been removed.

TPH and fuel-related chemicals were detected in samples collected between the former USTs T-547-1, T-547-2, and T-547-3 and Building 547, where a fuel supply line was formerly located (Canonie 1990). Other USTs with documented ruptures and leaks are known to have been located at IR Site 22. Thus, this site is a documented source of petroleum- related contamination such as TPH and BTEX compounds.

EBS activities at IR site 22 included soil sampling in the southwestern corner of the site. Sampling results indicated no significant variation in the type or concentration of TPH, SVOCs, or metals detected the portions of IR Site 22 where RI samples were collected.

No storm sewers were located at IR Site 22

6.1.2.5 IR Site 23: Building 530 - Missile Rework Operations

Operations historically performed in Building 530 at IR Site 23 included electrical maintenance, cleaning, grinding, welding, painting, paint stripping, drum storage, and parts fabrication. Hazardous materials

known to have been used in the building include lead-based paint, hydraulic fluid, silver solder, ethylene glycol, lead, zinc, silver, tin, chromium, nickel, mercury, trichloroethene (TCE), and petroleum. The waste streams generated by these processes were controlled, and all wastes and paint stripping bath liquids being disposed of in 55-gallon drums at an off-site facility (Canonie 1990).

EBS sampling and analysis activities at IR Site 23 included soil sampling and groundwater sampling collected from three HydroPunch® borings. EBS sampling was conducted mostly in the vicinity of the western side of Building 530. EBS sampling results indicated no significant variation in the type or concentration of contamination detected in the portions of IR Site 23 where RI samples were collected.

Three storm sewer lines are located in the vicinity of IR Site 23. A 30-inch diameter PIC line is located on the northern side of Building 530 and was cleaned and inspected in 1991 but was not cleaned during the storm sewer cleanup program in 1997. A 12-inch PVC line was installed in 1991 but was not cleaned during the storm sewer cleanup program in 1997.

No USTs or associated fuel lines were identified at IR Site 23.

6.1.3 Remedial Investigation Activities and Treatability Studies

The purpose of the RI for at the OU-2 Southeastern area was to determine whether historical waste handling practices by the Navy resulted in unacceptable potential risks to human or ecological receptors. The RI also included the following specific objectives:

- Use the DQO and DQA (data quality assurance) processes to design a sampling and analysis program that will support HHRA and ERA activities, as well as adequately characterize the nature and extent of contamination
- Produce data on the nature and extent of soil and groundwater contamination at IR Sites 9, 13, 19, 22, and 23 to support defensible decisions as to whether each site will require remedial activities in a feasibility study.

Measurement of COPC concentrations at each IR site was achieved during numerous sampling investigations in the OU-2 Southeastern area. The sampling strategies used during these investigations

involved employing information from previous reports and sampling results to add detail to the initial schematic diagram of potential contamination prepared for each site. Next, sampling plans were prepared with the goals of exploring previously identified or suspected sources of contamination and sampling in the vicinity of these areas to identify the horizontal and vertical extent of all detectable COPCs.

This section presents RI investigation activities for soil and groundwater (See Section 6.1.3.1), as well as results of several treatability studies (See Section 6.1.3.2).

6.1.3.1 Remedial Investigation Activities

Tables 6-1, 6-14, 6-28, 6-40, and 6-53 provide chronological summaries of RI activities performed at IR Sites 9, 13, 19, 22, and 23, respectively. RI activities included soil and groundwater sampling. RI activities were conducted under the Phase 1 and 2A investigations (PRC and JMM 1993a) and the follow-on investigation (PRC and MW 1996b). A tidal influence study and groundwater sampling of selected monitoring wells were also performed (TtEMI 1997b). A storm sewer repair project is being conducted to evaluate the impact of contaminated groundwater originating from the Southeastern area that has infiltrated the storm sewer system at Alameda Point and to recommend potential repairs to the system for the affected lines.

Forty-five SCAPS push borings and eight hollow-stem auger borings were also drilled during the RI. The SCAPS soil classification data profiles corresponded with field observations during drilling. Fluorescence data also correlated with laboratory analytical data. The extent of petroleum hydrocarbon contamination was identified using SCAPS and laboratory analysis for the 1,000- and 100-mg/kg levels, respectively.

Soil and groundwater investigation activities during the RI are discussed in more detail below, as well as field investigation deviations.

Soil Investigation Activities. During the Phase 1 and 2A investigations, a soil gas survey at IR Site 22 targeted BTEX and TPH compounds. Sixty-four soil gas samples were collected from a grid of sampling locations spaced 50 to 75 feet apart to assess the extent of the petroleum hydrocarbon vapors in soil and to

aid in the selection of monitoring well and soil boring locations. Figure 6-20 shows the soil gas sampling locations. A soil-gas sampling summary is presented in Table 6-41.

Data from all soil samples collected in the OU-2 Southeastern area are summarized in Tables 6-2 and 6-3 (IR Site 9), 6-15 through 6-17 (IR Site 13), 6-29 and 6-30 (IR Site 19), 6-42 and 6-43 (IR Site 22), and 6-54 and 6-55 (IR Site 23).

Surface and subsurface soil samples were collected during the Phase 1 and 2A and follow-on investigations. CPT borings were completed during the follow-on investigation. Figures 6-5, 6-9, 6-14, 6-18, and 6-23 show soil boring and CPT boring locations for IR Sites 9, 13, 19, 22, and 23, respectively. Appendix A contains soil boring lithology and CPT boring logs. Appendix E contains geotechnical information. Raw data results of the chemical analyses are presented in Appendix H.

In addition, sediment removal action conducted at Alameda Point removed a majority of the sediments from the entire storm sewer system. Details about the storm sewer sediment removal project are provided in the IR Site 18 "Storm Sewer System Solids and Debris Removal Action Closeout Report," (TtEMI and Morrison Knudsen 1998). Data associated with sediment left in place in the storm sewer systems will be discussed under IR Site 18 RI report for OU-4.

Groundwater Investigation Activities. Groundwater investigation activities at the OU-2 Southeastern area included monitoring well installation, groundwater sampling, and HydroPunch® groundwater sampling. Tables 6-4, 6-18, 6-31, 6-44, and 6-56 provide construction details of wells installed at IR Sites 9, 13, 19, 22, and 23, respectively. Figures 6-5, 6-9, 6-14, 6-18, and 6-23 show the monitoring well and HydroPunch® sampling locations.

During the Phase 1 and 2A investigations, groundwater monitoring wells were installed and sampled. During the follow-on investigation, additional wells were installed and groundwater samples were collected from monitoring wells during four quarterly sampling events between 1994 and 1995. Tables 6-5, 6-19, 6-32, 6-45, and 6-57 summarize analyses conducted on each groundwater sample collected at IR Sites 9, 13, 19, 22, and 23, respectively.

A tidal influence study and groundwater sampling of selected monitoring wells were performed between 1996 and 1998. The tidal influence study indicated tidal effects over the upper and lower FWBZ in the OU-2 Southeastern area and across OU-2. Additional quarterly monitoring was conducted at selected monitoring wells in 1997 and 1998.

Field Investigation Deviations. Field investigation activities at IR Sites 13 and 23 were implemented as planned and documented in the follow-on field sampling plan (FSP) with minor deviations (PRC and MW 1994a). These deviations are summarized in Tables 6-20 (IR Site 13) and 6-58 (IR Site 23), along with the rationale for each deviation. There were no deviations at IR Sites 9, 19, and 22; RI activities were implemented as planned and documented in the follow-on FSP (PRC and MW 1994a).

6.1.3.2 Treatability Studies

Treatability studies in the OU-2 Southeastern area have focused on TPH contamination at IR Site 13. Appropriate results of these studies will be integrated into the OU-2 FS report or into activities conducted under the state's petroleum program. Results of these studies are summarized below:

- A treatability study to evaluate the steam enhanced extraction (SEE) technology at IR Site 13 was initiated by Berkeley Environmental Restoration Center (BERC) in Spring 1995. IR Site 13 was the location of the Pacific Coast Oil Works refinery from 1879 to 1903. During this time, heavy-oil refinery residuals were buried and covered at the site that are now located 7 to 15 feet bgs. The SEE technology forces pressurized steam into soil-mobilizing, liquid-phase contaminants and dewaters the contaminated zone. Air, steam, and contaminant vapors are extracted from the recovery wells with a vacuum. Recovered contaminant liquids and vapors are collected, treated on site, and properly disposed of or recycled. Results from the treatability study show that most of the petroleum residual at IR Site 13 cannot be removed from soil by using the SEE process. The Navy has concluded that the SEE technology is not an effective remedial method for remediating soil at IR Site 13.

- A treatability study was conducted in Spring 1996 to assess intrinsic bioremediation at IR Site 13. The BERC team used several innovative laboratory and field assessment techniques for evaluating the bioremediation of contaminants. The intrinsic study evaluated both the process and the rate of bioremediation that occurs with natural microbes present in the contaminated media. This study (BERC 1998) indicated that aerobic and anaerobic biodegration are occurring in TPH-contaminated soil at IR-13, and that aerobic processes occur at a more rapid rate than anaerobic processes.

- The Navy is conducting a treatability study at IR Site 13 to demonstrate the capabilities of emulsion recycling to treat petroleum hydrocarbon- and metals-contaminated soil. The primary objective of this treatability study is to determine if emulsion recycling can immobilize TPH and lead in IR Site 13 soil to concentrations that meet action levels while creating an engineered construction product of value.

6.1.4 Site Conceptual Model

Conceptual models illustrating the features of IR Sites 9, 13, 19, 22, and 23 are shown in Figures 6-6, 6-11, 6-15, 6-19, and 6-24, respectively. The paragraphs below describe potential contamination sources as they relate to the physical setting (as described in Section 6.1.1) and potential transport mechanisms.

Alameda Point was impacted by industrial activities prior to the Navy's ownership. These activities included operation of the Pacific Coast Oil Works refinery, which resulted in extensive TPH contamination throughout IR Site 13 and dredging of contaminated sediment from San Francisco Bay and Oakland Harbor for use as fill. As explained above, placement of this contaminated fill created ambient, elevated levels of PAHs throughout Alameda Point. Based on its long history as an industrial facility, Alameda Point represents an urban environment, with most of the area being covered by pavement or buildings. This limits wildlife habitat and affects the potential exposure of human receptors to contaminated soil and groundwater.

Navy activities at the Southeastern area focused on fuel handling and aircraft maintenance. These activities led to releases of fuels, solvents, and other materials. Volatile contaminants such as chlorinated solvents generally partitioned to the groundwater (as chlorinated VOCs) in the FWBZ or volatilized to the atmosphere. Heavier contaminants, such as fuel, resulted in TPH contamination of soil, as well as partitioning of BTEX compounds to groundwater. In addition, high levels of TPH contamination in soil (greater than 1,000 mg/kg) represent a potential source of groundwater contamination.

As explained above, the FWBZ consists of fill, Merritt Sand, and the top of the San Antonio Formation. The FWBZ at the OU-2 Southeastern area has TDS concentrations ranging from 190 to 20,700 mg/L, with an average concentration of 3,805 mg/L. The flat gradient and tidal influence result in the relatively slow movement of contaminants except where the FWBZ is intercepted by storm sewers or other manmade features. The FWBZ is recharged by precipitation and leaks from utility lines such as water supply and sanitary and industrial sewers. This situation creates a relatively thin layer of fresh water

floating above a denser saline layer. Contaminant releases to the FWBZ are expected to remain fairly localized (depending on the specific nature of the release), especially if the release occurs in or around paved areas with minimal infiltration.

Overall, based on an analysis of existing data and studies, the preliminary site summaries below were developed for IR Sites 9, 13, 19, 22, and 23.

- IR Sites 13 and 22 are related to petroleum operations and fuel handling, and both sites are expected to contain petroleum contamination such as TPH and possibly BTEX compounds.
- IR Sites 19 and 23 are located within IR Site 13 and have likely been impacted by past operations of the Pacific Coast Oil Works refinery and past fuel releases from IR Site 13. Thus, these sites are also expected to contain petroleum contamination similar to IR Sites 13 and 22. IR Site 19 included handling of RCRA hazardous wastes which may have led to groundwater impacts from chlorinated VOCs.
- IR Site 9 is located to the west of IR Site 13, and past site operations included handling of solvents and other hazardous substances. Groundwater beneath IR Site 9 is expected to be impacted by releases of chlorinated VOCs, as well as historical releases from IR Site 13.
- Because many of the sites in the Southeastern area are contiguous, groundwater impacts from one site are expected to impact one or more neighboring sites. Therefore, only one groundwater unit is considered for the Southeastern area.

The residential, occupational, recreational, and construction worker exposure scenarios were evaluated for IR Sites 9, 13, 19, 22, and 23 under the HHRA. Table 5-2 summarizes the exposure scenarios and pathways for the HHRA. Figures 5-3a through 5-3c show the conceptual models for potential exposure of residential, occupational, and recreational receptors to contamination. Exposure routes include inhalation of vapors from soil in indoor and outdoor air, dermal contact with soil, ingestion of soil, inhalation of chemicals sorbed to particulates, ingestion of groundwater, dermal contact with groundwater, and inhalation of VOCs from groundwater while showering. For the residential scenario, homegrown fruit and vegetable ingestion also was assessed.

Although the majority of the OU-2 Southeastern area is currently paved (with the exception of portions that have been landscaped or where the pavement has been removed), ecological risk was evaluated under

the ERA to assess the potential impact of chemicals in soil to ecological receptors if the pavement is removed in the future.

6.2 OU-2 SOUTHEASTERN AREA SOIL INVESTIGATION AND RISK ASSESSMENT RESULTS

This section is composed of five subsections, each of which correspond to one of the five IR sites within the OU-2 Southeastern area. The following four types of information are provided for each of the sites:

- The results of the RI for soil, including statistical descriptions of all COPCs
- A description of the methods and results of an HHRA for each COPC
- A description of the methods and results of an ERA for each COPC
- A description of the nature and extent of COCs that should be considered in the FS or petroleum program for the OU-2 Southeastern area

6.2.1 IR Site 9: Building 410 - Paint Stripping Facility

This section presents RI soil results, HHRA soil results, ERA soil results, and summarizes the nature and extent of soil contamination for IR Site 9.

6.2.1.1 Remedial Investigation Soil Results

VOCs, SVOCs, and inorganic chemicals were detected in soil samples collected from IR Site 9. Each of these chemical groups is discussed below. Figure 6-7 shows sampling locations, sampling depths, and corresponding concentrations of organic compounds detected in soil at IR Site 9. Figure 6-8 shows soil boring locations and inorganic COPCs detected in soil at IR Site 9.

Geotechnical laboratory test results are presented in Table 6-6. The distribution of chemicals detected in soil samples collected from IR Site 9 is discussed below. Tables 6-7 through 6-9 present a statistical summary of all soil data collected from the following three soil intervals: shallow (0 to less than 2 feet bgs), intermediate (2 to 10 feet bgs), and deep (greater than 10 feet bgs). Appendix H presents analytical data for all IR Site 9 soil samples.

VOCs. Figure 6-7 shows the sampling locations, sampling depths, and the corresponding VOC concentrations detected at the site. None of the VOCs were detected at concentrations that exceeded their respective residential PRGs.

SVOCs. Figure 6-7 presents SVOC findings in soil from nine locations at IR Site 9. In general, the frequency of detection and concentrations of SVOCs increased with depth. Samples containing SVOCs were collected from borings located on all four sides of Building 410. PAHs were the only SVOCs that exceeded residential PRGs. The maximum detected concentrations of benzo(a)pyrene (0.31 mg/kg), benzo(a)anthracene (1 mg/kg), benzo(b)fluoranthene (0.76 mg/kg), dibenzo(a,h)anthracene (0.23 mg/kg), and indeno(1,2,3-c,d)pyrene (0.93 mg/kg) were all above their respective PRGs. PAHs were detected in samples collected from a soil boring located approximately 120 feet east of Building 410 at greater than 10 feet bgs. The source of the SVOCs (primarily PAHs) detected at IR Site 9 is likely ambient conditions within the bay sediment fill placed at the site.

Inorganic Chemicals. Figure 6-8 shows the sampling locations, sampling depths, and corresponding concentrations of inorganic COPCs detected in IR Site 9 soil samples. Beryllium was not detected at concentrations that exceeded its residential PRG. The maximum concentration of beryllium (1.5 mg/kg) was detected at 2 to 10 feet bgs. At IR Site 9, thallium was only detected at two locations northeast of Building 410. Thallium was detected at a concentration of 3.3 mg/kg at 2 to 10 feet bgs in 1 out of 27 samples and 5.3 mg/kg at greater than 10 feet bgs in 1 out of 7 samples. No PRG is available for thallium.

There do not appear to be sources or releases strongly associated with inorganic chemicals at IR Site 9. However, it is possible that industrial wastewater from paint stripping operations contained inorganic chemicals that could be the source of the beryllium and thallium detected.

6.2.1.2 Human Health Risk Assessment Soil Results

Under the HHRA potential exposure to COPCs was assessed. Findings are discussed below, followed by a summary of findings and human health COCs.

Results of the human health COPC selection for soil at IR Site 9 are presented on Tables 6-10a and 6-10b. Four exposure scenarios were evaluated for IR Site 9: residential, occupational, recreational, and construction worker. These exposure scenarios are predicted based on the Alameda Point reuse plan as shown in Table 5-2. Risks from inhalation of vapors from soil and groundwater in indoor and outdoor air, dermal contact with soil, ingestion of soil, and inhalation of chemicals sorbed to particulates were evaluated. Results of the risk characterization are presented in Appendix D. The table below summarizes the total RME and AVG risks and HI values under Navy and DTSC assumptions.

IR Site 9					
Soil Exposure Scenario		**RME**		**AVG**	
		Total Risk	**Total HI**	**Total Risk**	**Total HI**
Navy Assumptions	**Residential**	2.0×10^{-6}	<1.0	3.0×10^{-7}	<1.0
	Occupational	5.3×10^{-7}	<1.0	9.4×10^{-8}	<1.0
	Recreational	3.8×10^{-9}	<1.0	2.5×10^{-10}	<1.0
	Construction Worker	1.7×10^{-9}	<1.0	4.8×10^{-10}	<1.0
DTSC Assumptions	**Residential**	1.0×10^{-5}	<1.0	3.5×10^{-6}	<1.0
	Occupational	2.0×10^{-6}	<1.0	2.4×10^{-7}	<1.0
	Recreational	1.3×10^{-7}	<1.0	3.0×10^{-8}	<1.0
	Construction Worker	1.2×10^{-7}	<1.0	3.3×10^{-8}	<1.0

Note: < = Less than

Lead Assessment. Lead was not selected as a human health COPC in soil at IR Site 9; therefore, lead assessment is not applicable to the site.

Summary. All total RME risks were within the acceptable target risk range of 1×10^{-6} to 1×10^{-4}. All HIs associated with soil exposure were below 1.0.

Human Health COCs. Only one chemical was identified as a human health COC at IR Site 9 by the soil HHRA because its associated chemical-specific residential RME carcinogenic risk under Navy assumptions exceeded 1×10^{-6} for carcinogens. The human health COC, vinyl chloride, was identified to

focus further site evaluation (nature and extent of contamination) on the risk drivers at the site. Vinyl chloride was only detected in groundwater at IR Site 9 and the soil risk due to this compound is from the inhalation of groundwater vapor only. This chemical was not detected in soil at IR Site 9, and potential risks are based on diffusion of vapor phase vinyl chloride through the soil column, and into indoor air.

Under DTSC assumptions, the carcinogenic risk posed by beryllium in soil under the residential RME scenario exceeded 1×10^{-6}. Vinyl chloride was not identified as a COC under DTSC assumptions.

6.2.1.3 Ecological Risk Assessment Soil Results

The screening-level ERA conducted for the soil at IR Site 9 is discussed below, including the environmental setting and contaminants, assessment and measurement endpoints, exposure estimates and risk evaluation, exposure estimates and a risk evaluation, and uncertainty. A summary of the screening-level ERA is presented at the end of the section.

Environmental Setting and Contaminants. IR Site 9 is currently paved and supports no vegetation. No ecological receptors were observed at IR Site 9 during site reconnaissance activities conducted in June 1995 and June 1997. Even though the site is currently not readily accessible to ecological receptors, future use could result in the removal of the paving, resulting in higher exposure of ecological receptors. To evaluate potential exposure of ecological receptors, a screening-level ERA was conducted assuming that all pavement was removed from the site and all soil was exposed. Because some fossorial mammals can burrow to depths of 6 feet bgs, data from soil samples collected from the 0 to 6 feet-depth interval were evaluated for risk to ecological receptors.

RI analytical results were validated and determined to be of adequate quality to support the ERA process. Chemicals detected in soil from 0 to 6 feet bgs included inorganic chemicals, SVOCs, and VOCs. Soil chemical data for IR Site 9 are presented in Appendix H. These data reveal 22 inorganic and 9 organic constituents at detectable concentrations in site soil. Detected constituents were subjected to a screening process as described in Section 5.2 to focus the ERA contaminants that are site related and that pose the greatest risk to ecological receptors. Based on the criteria for selection of ecological COPCs, the following chemicals are ecological COPCs for IR Site 9: 4-chloro-3-methylphenol;

n-nitrosodiphenylamine; naphthalene; 1,2-DCE (total); ethylbenzene; and xylenes (total). Data concerning all detected constituents and the results of the screening process are presented in Table 6-11.

Assessment and Measurement Endpoints. The generic assessment and measurement endpoints described in Section 5.2 were used to evaluate the potential risk to ecological receptors associated with the IR Site 9 ecological COPCs. The potential risk to the California ground squirrel and the red-tailed hawk were evaluated as described in Section 5.2.

Exposure Estimates and Risk Evaluation. For each measurement endpoint and ecological COPC, an estimate of the exposure of the organism to the ecological COPC was developed based on life history, site contaminant concentrations, and environmental fate data. This exposure information was then compared with the chemical's TRV to develop an evaluation of the potential risk to ecological receptors. Appendix N presents detailed information concerning the TRVs used in the evaluations.

The exposure estimates for the HQ_1, HQ_2, HQ_3, HQ_4, and HQ_5 scenarios for each measurement endpoint were developed as described in Section 5.2. These exposure assumptions cover the range from most conservative to least conservative, with HQ_4 and HQ_5 scenarios representing reasonable AVG exposure assumptions. The assumptions for each scenario are presented in Appendix N.

The risk calculations were prepared for each measurement endpoint and exposure scenario based on the exposure assumptions for the individual endpoint and scenario. The risk calculations were conducted as described in Section 5.2. No significant site-specific issues are associated with the calculations of HQs for each measurement endpoint and scenario for IR Site 9.

The calculated HQs for physiological and reproductive effects for the HQ_1, HQ_2, HQ_3, HQ_4, and HQ_5 scenarios for the California ground squirrel and the red-tailed hawk are presented in Tables 6-12 and 6-13. Based on the current urban setting of the site and its anticipated future urban use, the HQ_5 scenario is believed to be appropriate to evaluate the potential risk associated with IR Site 9. The discussion below presents the results of the ecological risk evaluation based on HQ_5 exposure assumptions.

- **Physiological and Reproductive Impacts to the California Ground Squirrel.** The HQs associated with the HQ_5 exposure scenario are presented in Table 6-12. The HQs for naphthalene and xylenes (total) were less than 1.0. TRVs were not available for mammalian receptors for 4-chloro-3-methylphenol; n-nitrosodiphenylamine; 1,2-DCE (total); or ethylbenzene.

- **Physiological or Reproductive Impacts to the Red-Tailed Hawk.** TRVs were not available for avian receptors for 4-chloro-3-methylphenol; n-nitrosodiphenylamine; naphthalene; 1,2-DCE (total); ethylbenzene; or xylenes (total). Therefore, no HQs were calculated for the red-tailed hawk for IR Site 9.

Uncertainty Discussion. A number of factors used to calculate the HQs involve extrapolations or assumptions that contribute to a level of uncertainty and conservatism in the assessment. This screening-level ERA calculated risks under multiple exposure scenarios to present the potential range of risks. Major uncertainties and conservative assumptions used in this screening-level ERA are summarized below.

- The evaluations were conducted assuming that the entire surface of IR Site 9 was exposed soil that was totally accessible to ecological receptors. Under current conditions, IR Site 9 is entirely paved. This condition is likely to persist under planned future use scenario. The assumption that all of the surface area is exposed soil results in an assessment that is extremely conservative under any of the five HQ exposure scenarios.

- The SUF for the red-tailed hawk was based on using all areas equally throughout its range for feeding. Red-tailed hawks do not normally feed in urban or developed areas and prefer open fields. The area around IR Site 9 is therefore not expected to be a preferred feeding area for the species. Therefore, assuming that the red-tailed hawk feeds equally in all areas results in a conservative assessment.

- TRVs were not available for 4-chloro-3-methylphenol; n-nitrosodiphenylamine; 1,2-DCE (total); or ethylbenzene for mammalian receptors. In addition, TRVs were not available for 4-chloro-3-methylphenol; n-nitrosodiphenylamine; naphthalene, 1,2-DCE (total); ethylbenzene; and xylenes (total) for avian receptors. These ecological COPCs were therefore not quantitatively evaluated in the assessment. However, these constituents were infrequently detected at relatively low concentrations and have not been shown to bioaccumulate in higher trophic levels. Therefore, it is unlikely that these low concentrations of organic chemicals pose significant ecological risks.

- Low concentrations of n-nitrosodiphenylamine were detected in soil samples collected from the site. However, blanks also were contaminated with this chemical.

- The food-chain modeling used in the screening-level ERA (that is, the transfer of ecological COPCs from soil to plants and invertebrates, which are then eaten by the California ground squirrel, which in turn, is eaten by the red-tailed hawk) may overestimate the actual nature of trophic transfer at IR Site 9.

Summary of the Screening-Level ERA for Soil at IR Site 9. The HQs developed for IR Site 9 indicate no significant risk to the small mammal population under the HQ_5 exposure scenario from the ecological COPCs for which TRVs were available. Qualitative analysis of the ecological COPCs for which no TRVs were available indicates that these constituents are also unlikely to pose significant risks.

6.2.1.4 Nature and Extent of COCs in Soil at IR Site 9

Soil samples were collected to approximately 14 feet bgs in and around Building 410, in the vicinity of storm drains, industrial waste lines, and sanitary sewer lines located around Building 410. All detected compounds were subjected to the COPC selection process described in Section 3.1, and all COPCs were then evaluated for potential human and ecological risks. HHRA and ERA results were then used to identify which COPCs would be carried forward for evaluation as COCs.

Results of the field investigation show that no VOCs were detected at concentrations above their respective PRGs. Several PAHs were detected at concentrations above their PRGs; however, the source of these compounds is believed to be ambient conditions within the bay sediment used as fill throughout the site. Beryllium and thallium were both detected at concentrations exceeding background levels.

Beryllium did not exceed its residential PRG in soil at IR Site 9, but its associated human health carcinogenic risk did exceed 1×10^{-6} in soil under DTSC assumptions. The highest concentration of beryllium was detected in the shallow soil interval in CPT-S09-5, which is located east of Building 410. This boring contained 1.5 mg/kg of beryllium at a depth of approximately 5 feet bgs. All other detections of beryllium were below 1 mg/kg, which is well below its residential PRG of 150 mg/kg.

6.2.2 IR Site 13: Former Oil Refinery

This section presents RI soil results, HHRA soil results, ERA soil results, and summarizes the nature and extent of soil COCs for IR Site 13.

6.2.2.1 Remedial Investigation Soil Results

TPH, VOCs, SVOCs, pesticides, and PCBs, and inorganic chemicals were detected in soil samples collected from IR Site 13. Each of these chemical groups is discussed below. Figures 6-12a through 6-12c show soil boring locations and organic compounds detected in soil at IR Site 13. Figures 6-13a through 6-13c show soil boring locations and inorganic COPCs detected in soil at IR Site 13.

Geotechnical laboratory test results are presented in Table 6-21. The distribution of chemicals detected in the soil samples collected from IR Site 13 is discussed below. Tables 6-22 through 6-24 present a statistical summary of the soil data collected from the following three soil-depth intervals: shallow (0 to less than 2 feet bgs), intermediate (2 to 10 feet bgs), and deep (greater than 10 feet bgs). These tables do not include data from the previous investigations performed by HLA and others. Appendix H presents analytical data for all IR Site 13 soil samples.

TPH. Figures 6-12a, 12b, and 12c show the sampling locations, sampling depths, and corresponding TPH concentrations detected at the site. TPH was detected in soil samples from the site at all three depth intervals, with the highest frequencies of detection at 2 to 10 feet bgs. The highest concentrations of TRPH, TPH (motor oil range), and TPH (diesel range) in soil samples were detected in the area where IMF investigations took place (see Figures 6-12a through 6-12c). Of the 14 soil samples collected, 10 contained TPH (motor oil range) at concentrations greater than 1,000 mg/kg, and one surface sample contained TPH (motor oil range) at 297,000 mg/kg, the highest concentration detected at the site. TPH (gasoline range) was detected at concentrations greater than 1,000 mg/kg in samples collected from the eastern portion of IR Site 13 east of Skyhawk Street.

The high soil concentrations of TPH detected north of the abandoned fuel storage tanks at IR Site 13 indicate the potential for dissolution of fuel constituents into groundwater. Leaks from the tanks and associated fuel lines at IR Site 13, as well as residual contamination from the Pacific Coast Oil Works refinery, are the likely source of the TPH contamination.

VOCs. Figures 6-12a though 6-12c show the sampling locations, sampling depths, and corresponding VOC concentrations detected at the site. VOCs, including petroleum-related compounds (BTEX) were

detected in soil samples collected from depths greater than 2 feet bgs. The majority of the VOCs detected were petroleum-related (BTEX); toluene was the most frequently detected compound. These compounds are likely associated with leaks from tanks and fuel lines.

Benzene and toluene were the most frequently detected VOCs in soil. Benzene was detected in 22 of 145 samples, with the highest frequency of detection at 0 to 2 feet bgs. The maximum concentration of benzene detected was 1 mg/kg at 2 to 10 feet bgs in Boring 9. Benzene exceeded its residential PRG in 2 samples from Boring 9 and 1 sample from Boring EX13-009. Toluene was detected in 106 out of 145 samples, with the highest frequency of detection in the deep soil interval. The maximum concentration of toluene detected was 9.1 mg/kg at 2 to 10 feet bgs in Boring EX13-0069.

SVOCs. Figures 6-12a through 6-12c show the sampling locations, sampling depths, and the corresponding SVOC concentrations detected in soil at IR Site 13. SVOCs were detected at elevated concentrations in samples collected near the ground surface and near the soil-groundwater interface. PAHs were the only SVOCs detected at concentrations exceeding their residential PRGs for soil. SVOCs were detected in approximately 79 percent of the samples collected from IR Site 13. These samples were collected from borings located in the north-central portion of IR Site 13. PAHs were detected in 43 percent of the samples. Benzo(a)pyrene was detected in samples collected across IR Site 13 at concentrations exceeding its residential PRG. Several PAHs were detected above their respective PRGs in samples collected from the north-central portion of IR Site 13 at 2 to 10 feet bgs and greater than 10 feet bgs, respectively.

The PAHs detected at IR Site 13 are likely related to ambient conditions within the bay sediment fill placed at the site. The PAHs could also be by-products of petroleum processing performed by the Pacific Coast Oil Works refinery between 1879 and 1903 at IR Site 13.

PCBs and Pesticides. Figures 6-12a through 6-12c show the sampling locations, sampling depths, and corresponding pesticide concentrations detected at IR Site 13. PCBs were not detected in any of the soil samples submitted. Toxaphene was detected in samples collected from two locations at concentrations exceeding its soil PRG. However, toxaphene was infrequently detected. The pesticides in soil at IR Site 13 may be a result of pest control conducted at the site (see Chapter 1).

Inorganic Chemicals. Figures 6-13a through 6-13c show the sampling locations, sampling depths, and the corresponding concentrations of inorganic COPCs detected in IR Site 13 soil samples. Lead and cadmium were the only metals that exceeded their residential PRGs for soil. Lead exceeded its PRG at eight locations across IR Site 13 and was detected in 159 of 242 samples, with detection frequencies highest at 0 to 2 and 2 to 10 feet bgs. Lead was detected at a maximum concentration of 602 mg/kg at 4 feet bgs in a boring located in the northeastern portion of IR Site 13 (see Figure 6-13). Cadmium was detected in soil samples collected across IR Site 13. Cadmium was detected in a soil boring located in the central portion of IR Site 13 at a maximum concentration of 18 mg/kg at 0 to 2 feet bgs, which exceeds its residential PRG for soil. Cadmium was detected in 108 of 212 samples, with detection frequency highest at greater than 10 feet bgs.

There is not a clearly defined source for inorganic chemicals at IR Site 13; however, the presence of lead and cadmium may be related to the use of these compounds as fuel additives or present as trace metals present in fuel.

6.2.2.2 Human Health Risk Assessment Soil Results

Under the HHRA potential exposure to COPCs and lead were assessed. Findings are discussed below, followed by a summary of findings and human health COCs.

Results of the human health COPC selection for soil are presented in Tables 6-10a and 6-10b. Four exposure scenarios were evaluated for IR Site 13: residential, occupational, recreational, and construction worker. These exposure scenarios are predicted based on the Alameda Point reuse plan as shown in Table 5-2. Risks from inhalation of vapors from soil and groundwater in indoor and outdoor air, dermal contact with soil, ingestion of soil, and inhalation of chemicals sorbed to particulates were evaluated. Results of the risk characterization are presented in Appendix D. The table below summarizes the total RME and AVG risks and HI values under Navy and DTSC assumptions.

Site 13					
Soil Exposure Scenario		RME		AVG	
		Total Risk	Total HI	Total Risk	Total HI
Navy Assumptions	Residential	2.2×10^{-5}	<1.0	8.9×10^{-6}	<1.0
	Occupational	1.0×10^{-6}	<1.0	1.6×10^{-7}	<1.0
	Recreational	4.7×10^{-7}	<1.0	1.6×10^{-8}	<1.0
	Construction Worker	2.6×10^{-7}	<1.0	7.5×10^{-8}	<1.0
DTSC Assumptions	Residential	9.7×10^{-5}	<1.0	1.4×10^{-5}	<1.0
	Occupational	4.3×10^{-6}	<1.0	4.1×10^{-7}	<1.0
	Recreational	5.9×10^{-6}	<1.0	9.0×10^{-8}	<1.0
	Construction Worker	8.2×10^{-7}	<1.0	1.5×10^{-7}	<1.0

Note: < = Less than

Lead Assessment. Lead was selected as a human health COPC in soil at IR Site 13. The 95 UCL soil concentration of lead was 25 mg/kg. This concentration is below the EPA and DTSC screening values of 400 mg/kg and 130 mg/kg, respectively. Based on this value, a normal child in the 99th percentile of exposure would have a blood lead level of 5.2 micrograms per deciliter (µg/dL), which is below the Center for Disease Control and Prevention's (CDC')s level of concern of 10 µg/dL. A pica child (a child who ingests any abnormal amount of nonfood substances) could have a blood lead level of up to 8.1 µg/dL (99th percentile). Three soil samples contained lead at concentrations that exceeded the EPA screening concentration of 400 mg/kg: sample B13-41 from 7 feet bgs had a concentration of 413 mg/kg; sample B13-32 from 0.5 to 1.5 feet bgs had a concentration of 431 mg/kg; and sample IMF-06-04 from 4 feet bgs had a concentration of 602 mg/kg.

Summary. All total RME risks were within the target risk range of 1×10^{-6} to 1×10^{-4}. All HIs associated with soil exposure were below 1.0.

Human Health COCs. Four chemicals detected in soil were identified as human health COCs at IR Site 13 by the soil HHRA because their associated chemical-specific residential RME carcinogenic risks under Navy assumptions exceeded 1×10^{-6} for carcinogens. The human health COCs were identified to focus further site evaluation (nature and extent of contamination) on the risk drivers at the site. The four COCs under Navy assumptions are listed below.

VOCs

- Benzene

SVOCs

- Benzo(a)pyrene
- Benzo(b)fluoranthene
- Dibenzo(a,h)anthracene

Under DTSC assumptions, the chemical-specific residential RME carcinogenic risks posed by beryllium, benzo(a)anthracene, and indeno(1,2,3-c,d)pyrene in soil also exceeded 1×10^{-6}.

6.2.2.3 Ecological Risk Assessment Soil Results

The screening-level ERA conducted for the soils at IR Site 13 is discussed below, including the environmental setting and contaminants, assessment and measurement endpoints, exposure estimates and risk evaluation, exposure estimates and a risk evaluation, and uncertainty. A summary of the screening level ERA is presented at the end of the section.

Environmental Setting and Contaminants. IR Site 13 is currently paved and supports no vegetation with the exception of an unpaved area with disturbed habitat characterized by degradation and human activity dominated by plant species such as ryegrass (*Lolium sp.*), common plantain (*Plantago sp.*), and fennel (*Foeniculum vulgare*). The only ecological receptor observed at the site during site reconnaissance conducted in June 1995 and June 1997 was the mourning dove (*Zenaida macroura*). Table 5-5 summarizes the habitat and species observed at IR Site 13 during the site reconnaissance.

Even though the site is currently not readily accessible to ecological receptors, future use could result in the removal of the paving, resulting in higher exposure of ecological receptors. To evaluate this potential exposure to ecological receptors, a screening-level ERA was conducted assuming that all pavement was removed from the site and all soil was exposed. Because some fossorial mammals can burrow to depths of 6 feet bgs, data from soil samples collected from the 0 to 6 foot-depth interval were evaluated for risk to ecological receptors.

RI analytical results were validated and determined to be of adequate quality to support the ERA process. Chemicals detected in soil from 0 to 6 feet bgs included SVOCs, pesticides, VOCs, petroleum hydrocarbons, and inorganic chemicals. Soil chemical data for IR Site 13 are presented in Appendix H. These data revealed 25 inorganic and 28 organic constituents at detectable concentrations in site soil. Detected constituents were subjected to a screening process as described in Section 5.2 to focus the ERA contaminants that are site-related and that pose the greatest risk to ecological receptors. Based on the criteria for selection of ecological COPCs, the following chemicals are ecological COPCs for IR Site 13: mercury; selenium; zinc; 4,4-DDE (4,4-dichlorodiphenyldichloroehtylene); 4,4-dichlorodiphenyltrichloroehtane (4,4-DDT); heptachlor epoxide; toxaphene; benzo(a)anthracene; benzo(a)pyrene; benzo(b)flouranthene; benzo(g,h,i)perylene; carbazole; chrysene; fluoranthene; fluorene; indeno(1,2,3-cd)pyrene; naphthalene; n-nitrosodiphenylamine; phenanthrene; pyrene; acetone; benzene; carbon disulfide; ethylbenzene; and xylenes (total). Data concerning all detected constituents and the results of the screening process are presented in Table 6-25.

Assessment and Measurement Endpoints. The generic assessment and measurement endpoints described in Section 5.2 were used to evaluate the potential risk to ecological receptors associated with the IR Site 3 ecological COPCs. The potential risk to the California ground squirrel and the red-tailed hawk were evaluated as described in Section 5.2.

Exposure Estimates and Risk Evaluation. For each measurement endpoint and ecological COPC, an estimate of the exposure of the organism to the ecological COPC was developed based on life history, site contaminant concentrations, and environmental fate data. This exposure information was then compared with the chemical's TRV to develop an evaluation of the potential risk to ecological receptors. Appendix N presents detailed information concerning the TRVs used in the evaluations.

The exposure estimates for the HQ_1, HQ_2, HQ_3, HQ_4, and HQ_5 scenarios for each measurement endpoint were developed as described in Section 5.2. These exposure assumptions cover the range from most conservative to least conservative, with HQ_4 and HQ_5 scenarios representing reasonable AVG exposure assumptions. The assumptions for each scenario are presented in Appendix N.

The risk calculations were prepared for each measurement endpoint and exposure scenario based on the exposure assumptions for the individual endpoint and scenario. The risk calculations were conducted as

described in Section 5.2. The site-specific issues summarized below are associated with the calculations of HQs for each measurement endpoint and scenario for IR Site 13.

- No specific TRVs were available for avian receptors for 4,4'-dichlorodiphenyldichlorethane (4,4'-DDD); heptachlor; or toxaphene. The TRV for 4,4'-DDT was used as a surrogate to evaluate the effects of heptachlor and toxaphene on avian receptors.

- No specific TRVs were available for mammal receptors for the PAHs benzo(a)anthracene; benzo(a)pyrene; benzo(b)fluoranthene; benzo(g,h,i)perylene; carbazole; chrysene; fluoranthene; fluorene; indeno(1,2,3-c,d)pyrene; phenanthrene; or pyrene. The TRV for benzo(a)pyrene was used to evaluate the effects of these ecological COPCs on mammal receptors.

The calculated HQs for physiological and reproductive effects for the HQ_1, HQ_2, HQ_3, HQ_4, and HQ_5 scenarios for the California ground squirrel and the red-tailed hawk are presented in Tables 6-26 and 6-27, respectively. Based on the current urban setting for the site and the anticipated future urban use, the HQ_5 scenario is believed to be appropriate to evaluate the potential risk associated with IR Site 13. The discussion below presents the results of the ecological risk evaluation based on the HQ_5 exposure assumptions.

- **Physiological and Reproductive Impacts to the California Ground Squirrel.** The HQs associated with the HQ_5 exposure scenario are presented in Table 6-26. None of the HQs for ecological COPCs exceeded 1.0, indicating no significant risk to the small mammal population based on the HQ_5 exposure assumptions. No TRVs were available for n-nitrosodiphenylamine, carbon disulfide, or ethylbenzene.

- **Physiological or Reproductive Impacts to the Red-Tailed Hawk.** The HQs associated with the HQ_5 exposure scenario are presented in Table 6-27. The HQs for mercury; selenium; zinc; 4,4-DDE; 4,4-DDT; heptachlor epoxide; and toxaphene were less than 1.0. TRVs were not available for avian receptors for benzo(a)anthracene; benzo(a)pyrene; benzo(b)fluoranthene; benzo(g,h,i)perylene; carbazole; chrysene; fluoranthene; fluorene; indeno(1,2,3-cd)pyrene; naphthalene; n-nitrosodiphenylamine; phenanthrene; pyrene; acetone; benzene; carbon disulfide; ethylbenzene; or xylenes (total).

Uncertainty Discussion. A number of factors used to calculate the HQs involve extrapolations or assumptions that contribute to a level of uncertainty and conservatism in the assessment. This screening-level ERA calculated risks under multiple exposure scenarios to present the potential range of risks.

Major uncertainties and conservative assumptions used in this screening-level ERA are summarized below.

- The evaluations were conducted assuming that the entire surface of IR Site 13 was exposed soil that was totally accessible to ecological receptors. Under current conditions, IR Site 13 is primarily covered with asphalt and concrete, and only a small portion of the soil is exposed to ecological receptors. This condition is likely to persist under the planned future use scenario. The assumption that all of the surface area is exposed soil results in an assessment that is extremely conservative under any of the five HQ exposure scenarios.

- The SUF for the red-tailed hawk was based on using all areas equally throughout its range for feeding. Red-tailed hawks do not normally feed in urban or developed areas and prefer open fields. The area around IR Site 13 is therefore not expected to be a preferred feeding area for the species. Therefore, assuming that the red-tailed hawk feeds equally in all areas results in a conservative assessment.

- TRVs were not available for n-nitrosodiphenylamine, carbon disulfide, or ethylbenzene for mammalian or avian receptors. These ecological COPCs were, therefore, not quantitatively evaluated in the assessment. However, these constituents had detection frequencies of 20, 5, and 30 percent, respectively, at relatively low concentrations. It is unlikely that these isolated, low concentrations of organic constituents pose significant ecological risk.

- TRVs were not available for benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, carbazole, chrysene, fluoranthene, fluorene, indeno(1,2,3-c,d)pyrene, naphthalene, n-nitrosodiphenylamine, phenanthrene, pyrene, acetone, benzene, carbon disulfide, ethylbenzene, or xylenes (total) for avian receptors. These ecological COPCs were, therefore, not quantitatively evaluated in the assessment. However, these constituents had detection frequencies that ranged between 5 percent (acetone) and 33 percent (xylenes [total]), at relatively low concentrations. Therefore, it is unlikely that these isolated, low concentrations of organic constituents pose significant ecological risk.

- The food-chain modeling used in the screening-level ERA (that is, the transfer of ecological COPCs from soil to plants and invertebrates, which are then eaten by the California ground squirrel, which in turn, is eaten by the red-tailed hawk) may overestimate the actual nature of trophic transfer at IR Site 13.

Summary of the Screening-Level ERA for Soil at IR Site 13. The HQs developed for IR Site 13 indicate no significant risk to the small mammal or raptor population under the HQ_5 exposure scenario from the ecological COPCs for which TRVs were available. Qualitative analysis of the ecological

COPCs for which no TRVs were available indicates that these constituents are also unlikely to pose significant risks.

6.2.2.4 Nature and Extent of COCs in Soil at IR Site 13

Soil samples were collected to approximately 14 feet bgs throughout IR Site 13. Extensive borings were drilled throughout the area formerly proposed for the IMF (north of West Oriskany Avenue), several borings were drilled south of Building 397 (east of Orion Street), and several borings were taken around the location of the former fuel storage tanks located south of Skyhawk Street. All detected compounds were subjected to the COPC selection process described in Section 3.2, and all COPCs were then evaluated for potential human and ecological risks. HHRA and ERA results were then used to identify which COPCs would be carried forward for evaluation as COCs.

Results of the RI show that relatively low concentrations of VOCs were detected in soil throughout IR Site 13 including the BTEX compounds benzene and toluene. Benzene was detected primarily in the west-central portion of the site. The maximum concentration detected was 1 mg/kg in boring 09 at approximately 7 feet bgs located south of Building 397 in the vicinity of the 1991 JP-5 release. The low concentrations of benzene and toluene detected in soil at IR Site 13 is consistent with historical petroleum contamination.

SVOCs were also detected throughout IR Site 13. PAH contamination appeared to be most prevalent in the north-central portion of IR Site 13 at intermediate to deep depths around Building 397 and the former fuel storage tanks. Benzo(a)pyrene exceeded its residential PRG of 5.6×10^{-2} mg/kg at locations throughout IR Site 13. Other PAHs detected that exceeded their PRGs included, dibenzo(a,h)anthracene, benzo(b)fluoranthene, benzo(a)anthracene, and indeno(1,2,3-c,d)pyrene. The primary source of these PAHs is believed to be ambient conditions within the bay sediment fill placed at the site. The PAHs could also be associated with petroleum processing performed at the Pacific Coast Oil Works refinery between 1879 and 1903.

TPH contamination was detected throughout IR Site 13, especially at 2 to 10 feet bgs, with the highest concentrations in the area around the proposed location of the IMF. Several samples collected from this area contained TPH concentrations exceeding 1,000 mg/kg, with a maximum detected value of 297,000

mg/kg. However, a removal action was performed around this location (Boring B-IMF-07). High concentrations of TPH also were detected in the area north of the abandoned fuel tanks. High concentrations of TPH are consistent with former use of IR Site 13 as a refinery and releases of petroleum from fuel storage tanks and associated fuel lines.

Lead was detected throughout IR Site 13 in 159 of 242 samples analyzed. Nine samples collected contained lead at concentrations exceeding DTSC's residential PRG of 130 mg/kg. Two samples collected contained lead at concentrations exceeding the EPA Region IX residential PRG for lead of 400 mg/kg. Of the 212 samples analyzed for cadmium, one sample (at 18 mg/kg) exceeded DTSC's residential PRG of 9 mg/kg and none contained cadmium at concentrations exceeding EPA Region IX's residential PRG for cadmium of 37 mg/kg.

The field investigation and previous studies also indicate TPH and PAH contamination at IR Site 13 to depths below the water table. High soil concentrations of TPH were characterized by BERC (1998) as petroleum-derived, heavy-end hydrocarbons. The primary source of TPH contamination is presumed to be both refinery wastes left by the Pacific Coast Oil Works refinery and aged, crumbled asphalt originally used to pave the site. These types of heavy-end, relatively immobile hydrocarbons are typical of historical refinery wastes. Other sources of PAH and TPH contamination include leaks and spills of fuels from storage tanks and pipelines in IR Site 13. The BERC (1998) study also indicated that aerobic and anaerobic biodegradation of hydrocarbons was occurring at IR Site 13, with anaerobic processes most likely predominating.

Overall, contamination at IR Site 13 appears to be limited to petroleum-derived contaminants, including PAHs and TPH, with low concentrations of BTEX compounds. This contamination results from historical use of the site as a refinery, filling of the site with contaminated bay sediments, and leaks and spills from petroleum operations. Contamination appears to be heaviest in the central part of the site north of West Oriskany Avenue, which is the location of the former refinery and former fuel storage tanks. Additional contamination is present in the northern and western portions of the site associated with the 1991 JP-5 release from Building 397.

6.2.3 IR Site 19: Yard D-13 – Hazardous Waste Storage

This section presents RI soil investigation results, HHRA soil results, ERA soil results, and summarizes the nature and extent of soil COCs for IR Site 19.

6.2.3.1 Remedial Investigation Soil Results

TPH, VOCs, SVOCs, and inorganic chemicals were detected in soil samples collected from IR Site 19. Each of these chemical groups is discussed below. Figure 6-16 shows soil boring locations and organic compounds detected in soil at IR Site 19. Figures 6-17a and 6-17b present soil boring locations and inorganic COPCs detected in soil at IR Site 19.

Geotechnical laboratory test results are presented in Table 6-33. The distribution of chemicals detected in soil samples collected from IR Site 19 is discussed below. Tables 6-34 through 6-36 present a statistical summary of all soil data collected from the following three soil intervals: shallow (0 to less than 2 feet bgs), intermediate (2 to 10 feet bgs), and deep (greater than 10 feet bgs). Appendix H presents analytical data for IR Site 19 soil samples.

TPH. Figure 6-16 shows the sampling locations, sample depths, and the corresponding TPH concentrations detected at the site. Six soil samples collected at locations across the southern and central portions of IR Site 19 contained TRPH at concentrations greater than 1,000 mg/kg. TRPH was detected in 19 of 35 samples. The highest concentrations of TRPH were detected in samples collected from a boring located along the western side of Building 616 at 2 to 10 feet bgs and in a sample collected from a boring in the southern portion of IR Site 19 at 2 to 10 feet bgs. The high soil concentrations of TPH detected west and south of Building 616 at IR Site 19 indicate the potential for dissolution of fuel constituents into groundwater. Leaks and spills from the hazardous waste storage area at IR Site 19 are the likely source of the TPH contamination.

VOCs. Figure 6-16 shows the sampling locations, sampling depths, and the corresponding VOC concentrations detected at the site. VOCs were not detected at concentrations that exceeded their residential PRGs.

SVOCs. Figure 6-16 shows the sampling locations, sampling depths, and the corresponding SVOC concentrations detected at the site. PAHs were the only SVOCs detected in soil at concentrations exceeding their residential PRGs. Benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, and benzo(a)anthracene were detected at concentrations exceeding residential PRGs in soil samples collected from borings located west and south of Building 616. The maximum concentration of benzo(a) pyrene detected was 0.6 mg/kg at 2 to 10 feet bgs. Benzo(b)fluoranthene, dibenzo(a,h)anthracene, and benzo(a)anthracene were detected at concentrations below 1 mg/kg in samples collected at 0 to 2 feet bgs. The PAHs detected at IR Site 19 are likely related to ambient conditions within the bay sediment fill placed at the site. The PAHs could also be by-products of petroleum processing performed by the Pacific Coast Oil Works refinery between 1879 and 1903 at IR Site 13.

Inorganic Chemicals. Figures 6-17a and 6-17b show the sampling locations, sampling depths, and the corresponding concentrations of inorganic COPCs detected in IR Site 19 soil samples. In general, metals were most frequently detected in samples collected from the intermediate and deep soil sampling intervals from borings located in the south-central region of IR Site 19. The only metal that exceeded its residential PRG was lead at two isolated locations in the central portion of IR Site 19. Lead exceeded the DTSC PRG at a maximum concentration of 385 mg/kg in a boring located in the southern portion of IR Site 19. None of the samples collected from IR Site 19 exceeded the EPA Region IX PRG for lead.

6.2.3.2 Human Health Risk Assessment Soil Results

Under the HHRA potential exposure to COPCs and lead were assessed. Findings are discussed below, followed by a summary of findings and human health COCs.

Results of the human health COPC selection for soil at IR Site 19 are presented in Tables 6-10a and 6-10b. Four exposure scenarios were evaluated for IR Site 19: residential, occupational, recreational, and construction worker. These exposure scenarios are predicted based on the Alameda Point reuse plan as shown in Table 5-2. Risks from inhalation of vapors from soil and groundwater in indoor and outdoor air, dermal contact with soil, ingestion of soil, and inhalation of chemicals sorbed to particulates were evaluated. Results of the risk characterization are presented in Appendix D. The table below summarizes the total RME and AVG risks and HI values under Navy and DTSC assumptions.

IR Site 19					
Soil Exposure Scenario		RME		AVG	
		Total Risk	Total HI	Total Risk	Total HI
Navy Assumptions	Residential	2.2×10^{-5}	<1.0	8.7×10^{-6}	<1.0
	Occupational	1.8×10^{-6}	<1.0	3.0×10^{-7}	<1.0
	Recreational	1.3×10^{-6}	<1.0	7.0×10^{-8}	<1.0
	Construction Worker	2.5×10^{-7}	<1.0	7.4×10^{-8}	<1.0
DTSC Assumptions	Residential	9.2×10^{-5}	<1.0	1.2×10^{-5}	<1.0
	Occupational	1.3×10^{-5}	<1.0	5.6×10^{-7}	<1.0
	Recreational	2.3×10^{-5}	<1.0	2.5×10^{-7}	<1.0
	Construction Worker	7.3×10^{-7}	<1.0	1.2×10^{-7}	<1.0

Note: < = Less than

Lead Assessment. Lead was selected as a human health COPC in soil at IR Site 19. The 95 UCL concentration of lead in soil was 12.4 mg/kg, which is far below both EPA (400 mg/kg) and DTSC (130 mg/kg) lead screening values. At the exposure concentration expected, both normal and pica children would have blood lead levels below 10 µg/dL at the 99th percentile of exposure.

Summary. All total RME risks were within the acceptable target risk range of 1×10^{-6} to 1×10^{-4}. All HIs associated with soil exposure were below 1.0.

Human Health COCs. Two chemicals detected in soil were identified as human health COCs in soil at IR Site 19 because their associated chemical-specific residential RME carcinogenic risks under Navy assumptions exceeded 1×10^{-6} for carcinogens. The human health COCs were identified to focus further site evaluation (nature and extent of contamination) on the risk drivers at the site. The two COCs are listed below.

SVOCs

- Benzo(a)pyrene
- Dibenzo(a,h)anthracene

Under DTSC assumptions, chemical-specific residential RME carcinogenic risks posed by benzo(a)anthracene, benzo(b)fluoranthene, and indeno(1,2,3-c,d)pyrene also exceeded 1×10^{-6}.

6.2.2.3 Ecological Risk Assessment Soil Results

The screening-level ERA conducted for the soil at IR Site 19 is discussed below, including the environmental setting and contaminants, assessment and measurement endpoints, exposure estimates and risk evaluation, exposure estimates and a risk evaluation, and uncertainty. A summary of the screening-level ERA is presented at the end of the section.

Environmental Setting and Contaminants. IR Site 19 is currently paved and supports no vegetation. Even though the site is currently not readily accessible to ecological receptors, future use could result in the removal of the paving, resulting in higher exposure of ecological receptors. To evaluate potential exposure of ecological receptors, a screening-level ERA was conducted assuming that all pavement was removed from the site and all soil was exposed. Because some fossorial mammals can burrow to depths of 6 feet bgs, data from soil samples collected from the 0 to 6 foot-depth interval were evaluated for risk to ecological receptors.

RI analytical results validated and determined to be of adequate quality to support the ERA process. Chemicals detected in soil from 0 to 6 feet bgs included inorganic chemicals, SVOCs, and VOCs. Soil chemical data for IR Site 19 are presented in Appendix H. These data reveal 23 inorganic and 27 organic constituents at detectable concentrations in site soil. Detected constituents were subjected to a screening process as described in Section 5.2 to focus the ERA on contaminants that are site-related and that pose the greatest risk to ecological receptors. Based on the criteria for selection of ecological COPCs, the following chemicals are ecological COPCs for IR Site 19: manganese; silver; zinc; benzo(a)anthracene; benzo(b)fluoranthene; bis(2-ethylhexyl)phthalate; di-n-butylphthalate; fluoranthene; n-itrosodiphenylamine; naphthalene; phenanthrene; pyrene; 1,1,1,-trichloroethane (1,1,1-TCA); acetone; methylene chloride; tetrachloroethene; and xylenes (total). Data concerning all detected constituents and the results of the screening process are presented in Table 6-37.

Assessment and Measurement Endpoints. The generic assessment and measurement endpoints described in Section 5.2 were used to evaluate the potential risk to ecological receptors associated with the IR Site 19 ecological COPCs. The potential risk to the California ground squirrel and the red-tailed hawk were evaluated as described in Section 5.2.

Exposure Estimates and Risk Evaluation. For each measurement endpoint and ecological COPC, an estimate of the exposure of the organism to the ecological COPC was developed based on life history, site contaminant concentrations, and environmental fate data. This exposure information was then compared with the chemical's TRV to develop an evaluation of the potential risk to ecological receptors. Appendix N presents detailed information concerning the TRVs used in the evaluations.

The exposure estimates for the HQ_1, HQ_2, HQ_3, HQ_4, and HQ_5 scenarios for each measurement endpoint were developed as described in Section 5.2. These exposure assumptions cover the range from most conservative to least conservative, with HQ_4 and HQ_5 scenarios representing reasonable AVG exposure assumptions. The assumptions for each scenario are presented in Appendix N.

The risk calculations were prepared for each measurement endpoint and exposure scenario based on the exposure assumptions for the individual endpoint and scenario. The risk calculations were conducted as described in Section 5.2. The following site-specific issues are associated with the calculations of HQs for each measurement endpoint and scenario for IR Site 19:

- No specific TRVs were available for mammal receptors for benzo(a)anthracene, benzo(b)fluoranthene, fluoranthene, phenanthrene, or pyrene. The TRV for benzo(a)pyrene was used as a surrogate to evaluate the effects of these ecological COPCs on mammal receptors.

- No specific TRVs were available for avian receptors for silver; benzo(a)anthracene; benzo(b)fluoranthene; di-n-butylphthalate; fluoranthene; n-nitrosodiphenylamine; naphthalene; phenanthrene; pyrene; 1,1,1-TCA; acetone; methylene chloride; tetrachloroethene; or xylenes (total).

The calculated HQs for physiological and reproductive effects for the HQ_1, HQ_2, HQ_3, HQ_4, and HQ_5 scenarios for the California ground squirrel and the red-tailed hawk are presented in Tables 6-38 and 6-39. Based on the current urban setting of the site and its anticipated future urban use, the HQ_5 scenario is believed to be appropriate to evaluate the potential risk associated with IR Site 19. The discussion below presents the results of the ecological risk evaluation based on HQ_5 exposure assumptions.

- **Physiological and Reproductive Impacts to the California Ground Squirrel.** The HQs associated with the HQ_5 exposure scenario are presented in Table 6-38. The HQs for manganese, zinc, benzo(a)anthracene, benzo(b)fluoranthene, bis(2-

ethylhexyl)phthalate, fluoranthene, naphthalene, phenanthrene, pyrene, acetone, methylene chloride, and xylenes (total) were less than 1.0. TRVs were not available for mammalian receptors for silver; di-n-butylphthalate; n-nitrosodiphenylamine; 1,1,1-TCA; and tetrachloroethene.

- **Physiological or Reproductive Impacts to the Red-Tailed Hawk.** The HQs associated with the HQ_5 exposure scenario are presented in Table 6-39. The HQs for manganese, zinc, and bis(2-ethylhexyl)phthalate were less than 1.0. TRVs were not available for avian receptors for silver, benzo(a)anthracene, benzo(b)fluoranthene, di-n-butylphthalate, fluoranthene, n-nitrosodiphenylamine, naphthalene, phenanthrene, pyrene, 1,1,1-trichloroethane, acetone, methylene chloride, tetrachloroethene, and xylenes (total).

Uncertainty Discussion. A number of factors used to calculate HQs involve extrapolations or assumptions that contribute to a level of uncertainty and conservatism in the assessment. This screening-level ERA calculated risks under multiple exposure scenarios to present the potential range of risks. Major uncertainties and conservative assumptions used in this screening-level ERA are summarized below.

- The evaluations were conducted assuming that the entire surface of IR Site 19 was exposed soil that was totally accessible to ecological receptors. Under current conditions, IR Site 19 is entirely paved. This condition is likely to persist under the planned future-use scenario. The assumption that all of the surface area is exposed soil results in an assessment that is extremely conservative under any of the five HQ exposure scenarios.

- The SUF for the red-tailed hawk was based on using all areas equally throughout its range for feeding. Red-tailed hawks do not normally feed in urban or developed areas and prefer open fields. The area around IR Site 19 is therefore not expected to be a preferred feeding area for the species. Therefore, assuming that the red-tailed hawk feeds equally in all areas results in a conservative assessment.

- TRVs were not available for silver; di-n-butylphthalate; n-nitrosodiphenylamine; 1,1,1-TCA; or tetrachloroethene for mammalian receptors. In addition, TRVs were not available for silver; benzo(a)anthracene; benzo(b)fluoranthene; di-n-butylphthalate; fluoranthene; n-nitrosodiphenylamine; naphthalene; phenanthrene; pyrene; 1,1,1-TCA; acetone; methylene chloride; tetrachloroethene; or xylenes (total) for avian receptors. These ecological COPCs were therefore not quantitatively evaluated in the assessment. However, these constituents were detected at relatively low concentrations and have not been shown to bioaccumulate in higher trophic levels. In addition, with the exception of xylenes (total), the most frequently detected of these ecological COPCs only detected in 20 percent of the samples. Most of the compounds were detected in only 5 to 10 percent of the samples. Therefore, it is unlikely that these infrequently detected, low concentrations of organic chemicals pose significant ecological risks.

- Low concentrations of methylene chloride, n-nitrosodiphenylamine, and acetone were detected in soil samples collected from the site. However, blanks also were contaminated with these chemicals, and methylene chloride and acetone are commonly used laboratory solvents.

- The food-chain modeling used in the screening-level ERA (that is, the transfer of ecological COPCs from soil to plants and invertebrates, which are then eaten by the California ground squirrel, which in turn, is eaten by the red-tailed hawk) may overestimate the actual nature of trophic transfer at IR Site 19.

Summary of the Screening-Level ERA for Soil at IR Site 19. The HQs developed for IR Site 19 indicate no significant risk was indicated to the small mammal or raptor population under the HQ_5 exposure scenario from the ecological COPCs for which TRVs were available. Qualitative analysis of the ecological COPCs for which no TRVs were available indicates that these constituents are unlikely to pose significant risks.

6.2.3.4 Nature and Extent of COCs in Soil at IR Site 19

Soil samples were collected to approximately 15 feet bgs around the perimeter and in the central portion of the site, around Building 616, and in the area north of Building 397 (located in IR Site 13). IR Site 19 borders IR Site 13 to the north. Therefore, this site is expected to have received wastes from the former Pacific Coast Oil Works refinery. In addition, major spills and releases from IR Site 13, such as the 1991 JP-5 release at Building 397, may have also affected IR Site 19. All detected compounds were subjected to the COPC selection process described in Section 3.1, and all COPCs were then evaluated for potential human and ecological risks. HHRA and ERA results were then used to identify which COPCs would be carried forward for evaluation as COCs.

Results of the RI show that very low concentrations of VOCs primarily BTEX compounds associated with petroleum contamination were intermittently detected in soil throughout IR Site 19. None of the detected VOCs exceeded its residential PRG. SVOCs were also intermittently detected in soil throughout IR Site 19. The PAHs benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, and benzo(a)anthracene were detected at concentrations exceeding residential PRGs in soil samples collected from borings west and south of Building 616. The maximum concentration of benzo(a) pyrene detected was 0.6 mg/kg at 2 to 10 feet. Benzo(b)fluoranthene, dibenzo(a,h)anthracene, and benzo(a)anthracene were detected at concentrations below 1 mg/kg in samples collected at 0 to 2 feet bgs. Similar to IR Site

13, the source of these PAHs is believed to be ambient conditions within the bay sediment fill placed at the site. The PAHs could also be associated with petroleum processing performed at the Pacific Coast Oil Works refinery between 1879 and 1903 at Site IR 13.

TPH contamination was detected throughout IR Site 19. The highest concentration (12,800 mg/kg TRPH) was detected west and south of Building 616 at approximately 9 to 9.5 feet bgs. However, high levels of contamination (greater than 1,000 mg/kg) were also detected in borings south and west of Building 616 at depths as shallow as 0.5 to 1 foot bgs.

The only metal that exceeded its residential PRG was lead at two isolated locations in the central portion of IR Site 19. Lead exceeded its DTSC residential PRG at a maximum concentration of 385 mg/kg in a boring in the southern portion of IR Site 19. None of the IR Site 19 samples analyzed for lead contained lead at a concentration exceeding the EPA Region IX residential PRG of 400 mg/kg.

Overall, soil contamination at IR Site 19 appears to be consistent with the contamination observed at IR Site 13. Contamination is primarily limited to petroleum-derived contaminants, including PAHs and TPH, with low concentrations of BTEX compounds. This contamination results from historical use of IR Site 19 as a hazardous waste storage area, proximity to IR Site 13 (which included refinery operations and at least one major petroleum spill), and filling with contaminated bay sediments. Contamination appears to be heaviest in the southern and central parts of the site north of Building 397 (in IR Site 13) and south of Building 616.

6.2.4 IR Site 22: Building 547 - Former Service Station

This section presents RI soil gas and soil results, HHRA soil results, and ERA soil results, and summarizes the nature and extent of COCs in soil for IR Site 22.

6.2.4.1 Remedial Investigation Soil Gas Survey and Soil Results

A soil gas survey conducted under Phase 1 and 2A targeted BTEX compounds and chlorinated VOCs. Figure 6-20 show the sampling locations. During the survey, the highest concentrations of fuel

constituents were detected south of Building 547 consistent with the detections of TPH and VOCs in soil discussed below.

TPH, VOCs, SVOCs, PCBs and pesticides, and inorganic chemicals were detected in soil samples collected from IR Site 22. Each of these chemical groups is discussed below. Figure 6-21 shows soil boring locations and organic compounds detected in soil at IR Site 22. Figure 6-22 show soil boring locations and inorganic COPCs detected in soil at IR Site 22.

Geotechnical laboratory test results are presented in Table 6-46. The distribution of chemicals detected in soil gas samples and soil samples collected from IR Site 22 is discussed below. Tables 6-47 through 6-49 present a statistical summary of all soil data collected from the following three soil-depth intervals: shallow (0 to less than 2 feet bgs), intermediate (2 to 10 feet bgs), and deep (greater than 10 feet bgs). Appendix C presents the analytical results for soil gas samples collected from IR Site 22. Appendix H presents analytical data for all IR Site 22 soil samples.

TPH. Figure 6-21 shows the sampling locations, sampling depths, and the corresponding TPH concentrations detected at the site. TPH (motor oil range) was detected at the highest frequency in soil at 0 to 2 feet bgs (88 percent) and in soil at 2 to 10 feet bgs (41 percent). TPH (gasoline range) was detected in samples from 2 to 10 feet bgs at concentrations greater than 10,000 mg/kg. TPH was not detected in samples deeper than 10 feet bgs.

The high soil concentrations of TPH detected near Building 547 and near the southern perimeter of IR Site 22 indicate the potential for dissolution of fuel constituents into groundwater. Fuel leaking from USTs located at IR Site 22 is the likely source of the TPH contamination. The distribution of petroleum contamination in soil is consistent with the distribution of petroleum in soil gas at the site where free product was removed. BTEX and TPH were detected in soil at elevated concentrations on the northwestern side of Building 547.

VOCs. Figure 6-21 shows the sampling locations, sampling depths, and corresponding VOC concentrations detected at the site. BTEX compounds were the VOCs detected at the highest frequency. Benzene, ethylbenzene, and toluene were detected at concentrations exceeding their residential soil PRGs in samples collected from 2 to 10 feet bgs. The samples were collected from the source area of the

petroleum release. Samples that contained benzene, ethylbenzene, and toluene at concentrations exceeding their residential PRGs also contained TPH (gasoline range) at concentrations greater than 10,000 mg/kg. The VOCs are most likely associated with fuel releases from the USTs located at IR Site 22.

SVOCs. Figure 6-21 shows the sampling locations, sampling depths, and corresponding SVOC concentrations detected in soil samples collected from IR Site 22. Soil samples with detectable concentrations of SVOCs were collected from soil borings located throughout the site. Benzo(a)pyrene was detected at concentrations exceeding its residential PRG at four locations at IR Site 22. However, unlike the VOCs, benzo(a)pyrene did not exceed its PRG in the same area that TPH exceeded its PRG. Therefore, the PAHs detected at IR Site 22 are likely related to ambient conditions within the bay sediment fill placed at the site. The PAHs could also be by-products of petroleum processing performed by the Pacific Coast Oil Works refinery between 1879 and 1903 at IR Site 13.

In addition, a sample collected at 5 to 6 feet bgs from a boring located in the southwestern portion of the site contained naphthalene (110 mg/kg) and pentachlorophenol (9 mg/kg) at concentrations exceeding their respective PRGs. The sample was collected from the same location as where the high concentrations of VOCs and TPH were detected. Naphthalene is likely associated with fuel releases from the USTs located at IR Site 22. Pentachlorophenol was only detected in this sample, and given the depth of this sample, the source of pentachlorophenol is likely due to activities associated with the Pacific Coast Oil Works refinery.

PCBs and Pesticides. PCBs were not detected in any soil sample collected from IR Site 22. Figure 6-21 shows the sampling locations, sampling depths, and the corresponding pesticide concentrations detected at the site. None of the pesticides detected exceeded their respective residential PRGs.

Inorganic Chemicals. Figure 6-22 shows the sampling locations, sampling depths, and corresponding concentrations of inorganic COPCs detected in IR Site 22 soil samples. Lead was the only inorganic COPC detected that exceeded its residential PRG at IR Site 22. Lead exceeded its residential PRG at one location at a maximum concentration of 9,890 mg/kg in a sample collected from 0 to 2 feet bgs in a boring located in the southeastern portion of the site (Boring MW597-5). Lead was detected at concentrations of less than 90 mg/kg at various depths in other soil samples collected across the site.

6.2.4.2 Human Health Risk Assessment Soil Results

Under the HHRA potential exposure to COPCs and lead were assessed. Findings are discussed below, followed by a summary of findings and human health COCs.

Results of the human health COPC selection for soil are presented in Tables 6-10a and 6-10b. Four exposure scenarios were evaluated for IR Site 22: residential, occupational, recreational, and construction worker. These exposure scenarios are predicted based on the Alameda Point reuse plan as shown in Table 5-2. Risks from inhalation of vapors from soil and groundwater in indoor and outdoor air, dermal contact with soil, ingestion of soil, and inhalation of chemicals sorbed to particulates were evaluated. Results of the risk characterization are presented in Appendix D. The table below summarizes the total RME and AVG risks and HI values under Navy and DTSC assumptions.

IR Site 22					
Soil Exposure Scenario		RME		AVG	
		Total Risk	Total HI	Total Risk	Total HI
Navy Assumptions	Residential	1.5×10^{-5}	<1.0	4.8×10^{-6}	<1.0
	Occupational	2.4×10^{-6}	<1.0	4.1×10^{-7}	<1.0
	Recreational	1.1×10^{-6}	<1.0	5.8×10^{-8}	<1.0
	Construction Worker	1.4×10^{-7}	<1.0	3.9×10^{-8}	<1.0
DTSC Assumptions	Residential	7.4×10^{-5}	<1.0	1.1×10^{-5}	<1.0
	Occupational	1.6×10^{-5}	<1.0	1.2×10^{-6}	<1.0
	Recreational	2.3×10^{-5}	<1.0	2.8×10^{-7}	<1.0
	Construction Worker	5.7×10^{-7}	<1.0	1.2×10^{-7}	<1.0

Note: < = Less than

Lead Assessment. Lead was selected as a human health COPC in soil at IR Site 22. The 95 UCL soil concentration for lead was 47.3 mg/kg. This concentration is below the EPA and DTSC screening values of 400 and 130 mg/kg, respectively. Based on this value, a normal child in the 99th percentile of exposure would have a blood lead level of 5.7 µg/dL. A pica child in the 99th percentile of exposure could have a blood lead level of up to 11.2 µg/dL, which exceeds the acceptable blood lead level of 10 µg/dL. One soil sample contained lead at a concentrations that exceeded the EPA screening value of 400 mg/kg: sample MW547-5 from 0.5 to 1 foot bgs had a concentration of 9,890 mg/kg.

Summary. All total RME risks were within the acceptable target risk range of 1×10^{-6} to 1×10^{-4}. All HIs associated with soil exposure were below 1.0.

Human Health COCs. Two chemicals detected in soil were identified as human health COCs at IR Site 22 by the soil HHRA because their associated chemical-specific residential RME carcinogenic risks under Navy assumptions exceeded 1×10^{-6} for carcinogens. The human health COCs were identified to focus further site evaluation (nature and extent of contamination) on the risk drivers at the site. The two COCs under Navy assumptions are listed below.

VOC

- Benzene

SVOC

- Benzo(a)pyrene

Under DTSC assumptions, the chemical-specific residential RME carcinogenic risks posed by beryllium, benzo(a)anthracene, benzo(b)fluoranthene, and indeno(1,2,3-c,d)pyrene also exceeded 1×10^{-6}.

6.2.4.3 Ecological Risk Assessment Soil Results

The screening-level ERA conducted for the soil at IR Site 22 is discussed below, including the environmental setting and contaminants, assessment and measurement endpoints, exposure estimates and risk evaluation, exposure estimates and a risk evaluation, and uncertainty. A summary of the screening-level ERA is presented at the end of the section.

Environmental Setting and Contaminants. IR Site 22 is currently paved and supports no vegetation with the exception of a partially unpaved area with an existing habitat of urban ornamental landscape dominated by plant species such as perennial ryegrass (*Lolium perene*), Kentucky bluegrass (*Poa pratensis*), yellow sweet clover (*Melilotus officinalis*), cudweed (*Gnaphalium sp.*), and pine (*Pinus sp.*). Ecological receptors observed at the site during site reconnaissance conducted in June 1995 and June 1997 included squirrels (*Sciurus sp.*) and scrub jays (*Aphelocoma coerulescens*). Table 5-5 summarizes the habitat and species observed at IR Site 22 during the site reconnaissance.

Even though the site is currently not readily accessible to ecological receptors, future use could result in the removal of the paving, resulting in higher exposure of ecological receptors. To evaluate this potential exposure to ecological receptors, a screening-level ERA was conducted assuming that all pavement was removed from the site and all soil was exposed. Because some fossorial mammals can burrow to depths of 6 feet bgs, data from soil samples collected from the 0 to 6 foot-depth interval were evaluated for risk to ecological receptors.

RI analytical results were validated and determined to be of adequate quality to support the ERA process. Chemicals detected in soil from 0 to 6 feet bgs included inorganic chemicals, pesticides, VOCs, and SVOCs. Soil chemical data for IR Site 22 are presented in Appendix H. These data revealed 22 inorganic and 33 organic constituents at detectable concentrations in site soil. Detected constituents were subjected to a screening process as described in Section 5.2 to focus the ERA on contaminants that are site-related and that pose the greatest risk to ecological receptors. Based on the criteria for selection of ecological COPCs, the following chemicals are ecological COPCs for IR Site 22: aluminum; lead; manganese; mercury; selenium; zinc; 4,4'-DDD; 4,4'-DDE; 4,4'-DDT; alpha-chlordane; gamma-chlordane; methoxychlor; ethylbenzene; xylenes (total); 2-methylnaphthalene; acenaphthene; benzo(a)anthracene; benzo(a)pyrene; benzo(b)fluoranthene; benzo(k)fluoranthene; benzo(g,h,i)perylene; chrysene; fluoranthene; fluorene; indeno(1,2,3-c,d)pyrene; naphthalene; phenanthrene; and pyrene. Data concerning all detected constituents and the results of the screening process are presented in Table 6-50.

Assessment and Measurement Endpoints. The generic assessment and measurement endpoints described in Section 5.2 were used to evaluate the potential risk to ecological receptors associated with the IR Site 22 ecological COPCs. The potential risk to the California ground squirrel and the red-tailed hawk were evaluated as described in Section 5.2.

Exposure Estimates and Risk Evaluation. For each measurement endpoint and ecological COPC, an estimate of the exposure of the organism to the ecological COPC was developed based on life history, site contaminant concentrations, and environmental fate data. This exposure information was then compared with the chemicals TRV to develop an evaluation of the potential risk to ecological receptors. Appendix N presents detailed information concerning the TRVs used in the evaluations.

The exposure estimates for the HQ_1, HQ_2, HQ_3, HQ_4, and HQ_5 scenarios for each measurement endpoint were developed as described in Section 5.2. These exposure assumptions cover the range from most conservative to least conservative with HQ_4, and HQ_5 scenarios representing reasonable AVG exposure assumptions. The assumptions for each scenario are presented in Appendix N.

The risk calculations were prepared for each measurement endpoint and exposure scenario based on the exposure assumptions for the individual endpoint and scenario. The risk calculations were conducted as described in Section 5.2. The site-specific issues summarized below are associated with the calculations of HQs for each measurement endpoint and scenario for IR Site 22.

- No specific TRVs were available for avian receptors for 4,4'-DDD or 4,4'-DDE. The TRV for 4,4'-DDT was used as a surrogate to evaluate the effects of these compounds on avian receptors.

- No specific TRVs were available for mammal receptors for methoxychlor, ethylbenzene, or 2-methylnaphthalene.

- No specific TRVs were available for mammal receptors for the PAHs acenaphthene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(g,h,i)perylene, chrysene, fluoranthene, fluorene, indeno(1,2,3-c,d)pyrene, phenanthrene, or pyrene. The TRV for benzo(a)pyrene was used as a surrogate to evaluate the effects of these ecological COPCs on mammal receptors.

- No specific TRVs were available for avian receptors for methoxychlor, ethylbenzene, xylenes (total), 2-methylnaphthalene, acenaphthene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(g,h,i)perylene, chrysene, fluoranthene, fluorene, indeno(1,2,3-c,d)pyrene, naphthalene, phenanthrene, pyrene, or xylenes (total).

The calculated HQs for physiological and reproductive effects for the HQ_1, HQ_2, HQ_3, HQ_4, and HQ_5 scenarios for the California ground squirrel and the red-tailed hawk are presented in Tables 6-51 and 6-52. Based on the current urban setting for the site and the anticipated future urban use, the HQ_5 scenario is believed to be appropriate to evaluate the potential risk associated with IR Site 22. The discussion below presents the results of the ecological risk evaluation based on the HQ_5 exposure assumptions.

- **Physiological and Reproductive Impacts to the California Ground Squirrel.** The HQs associated with the HQ_5 exposure scenario are presented in Table 6-51. The HQs for aluminum and xylenes (total) exceeded 1.0, indicating potential risk to the small mammal population based on HQ_5 exposure assumptions. The HQs for lead; manganese; mercury; selenium; zinc; 4,4'-DDD; 4,4'-DDE; 4,4'-DDT; alpha-chlordane; gamma-chlordane; acenaphthene; benzo(a)anthracene; benzo(a)pyrene; benzo(b)fluoranthene; benzo(k)fluoranthene; benzo(g,h,i)perylene; chrysene; fluoranthene; fluorene; indeno(1,2,3-c,d)pyrene; naphthalene; phenanthrene; and pyrene were less than 1.0. No TRVs were available for mammalian receptors for methoxychlor, ethylbenzene, and 2-methylnaphthalene.

- **Physiological or Reproductive Impacts to the Red-Tailed Hawk.** The HQs associated with the HQ_5 exposure scenario are presented in Table 6-52. The HQs for aluminum; lead; manganese; mercury; selenium; zinc; 4,4'-DDD; 4,4'-DDE; 4,4'-DDT; alpha-chlordane; gamma-chlordane were less than 1.0. TRVs were not available for avian receptors for methoxychlor, ethylbenzene, xylenes (total), 2-methylnaphthalene, acenaphthene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(g,h,i)perylene, chrysene, fluoranthene, fluorene, indeno(1,2,3-c,d)pyrene, naphthalene, phenanthrene, or pyrene.

Uncertainty Discussion. A number of factors used to calculate HQs involve extrapolations or assumptions that contribute to a level of uncertainty and conservatism in the assessment. This screening-level ERA calculated risks under multiple exposure scenarios to present the potential range of risks. Major uncertainties and conservative assumptions used in this screening-level ERA are summarized below.

- The evaluations were conducted assuming that the entire surface of IR Site 22 was exposed soil that was totally accessible to ecological receptors. Under current conditions, IR Site 22 is primarily paved, and only a small portion of the soil is exposed to ecological receptors. This condition is likely to persist under the planned future-use scenario. The assumption that all of the surface area is exposed soil results in an assessment that is extremely conservative under any of the five HQ exposure scenarios.

- The SUF for the red-tailed hawk was based on using all areas equally throughout its range for feeding. Red-tailed hawks do not normally feed in urban or developed areas and prefer open fields. The area around IR Site 22 is not expected to be a preferred feeding area for the species. Therefore, assuming that the red-tailed hawk feeds equally in all areas results in a conservative assessment.

- TRVs were not available for methoxychlor, ethylbenzene, or 2-methylnaphthalene for mammalian receptors. TRVs were not available for methoxychlor, ethylbenzene, xylenes (total), 2-methylnaphthalene, acenaphthene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(g,h,i)perylene, chrysene,

fluoranthene, fluorene, indeno(1,2,3-c,d)pyrene, naphthalene, phenanthrene, or pyrene for avian receptors. Therefore, these ecological COPCs were not quantitatively evaluated in the assessment. The frequency of detection and concentrations of many of these ecological COPCs are elevated to an extent that the possibility of potential impacts cannot be ruled out.

- Although the concentrations of aluminum detected at the site were statistically determined to exceed area background concentrations, the EPC calculated for the site for aluminum is within range of area background levels. However, the existing ambient concentrations of aluminum in the San Francisco Bay region and site-specific background soil concentrations are high. The majority of the risk associated with aluminum at IR Site 22 is likely due to high regional levels and is not directly related to IR Site 22.

- The food-chain modeling used in the screening-level ERA (that is, the transfer of ecological COPCs from soil to plants and invertebrates, which are then eaten by the California ground squirrel, which in turn, is eaten by the red-tailed hawk) may overestimate the actual nature of trophic transfer at IR Site 22.

Summary of the Screening-Level ERA for Soil at IR Site 22. The HQs developed for IR Site 22 indicate a negligible risk to the small mammal population from aluminum under the HQ_5 exposure scenario. The HQs developed for IR Site 22 indicate a potential risk to the small mammal population from xylenes (total) under the HQ_5 exposure scenario. The HQs indicate no significant risk to the raptor population from the ecological COPCs for which TRVs were available. Qualitative analysis of the ecological COPCs for which no TRVs were available indicates that the possibility of potential impacts to ecological receptors from these ecological COPCs cannot be ruled out.

6.2.4.4 Nature and Extent of COCs in Soil at IR Site 22

Soil samples were collected to approximately 15 feet bgs around the perimeter and central portion of the site and around Building 547. The results of the soil investigation show petroleum contamination consistent with past operations of the service station, as well as with historical operations of the Pacific Coast Oil Works refinery, which was located in IR Site 13 southwest of IR Site 22. Contamination observed at IR Site 22 is similar to that observed at IR Site 13, which showed impacts from TPH, PAHs, and VOCs. All detected compounds were subjected to the COPC selection process described in Section 3.1, and all COPCs were then evaluated for potential human and ecological risks. HHRA and ERA results were then used to identify which COPCs would be carried forward for evaluation as COCs.

Results of the RI show that relatively low concentrations of VOCs were detected intermittently in soil throughout IR Site 22, including primarily BTEX compounds associated with petroleum contamination. Boring B07C-14 located south of Building 547 and north of the former waste oil tanks yielded a sample that contained ethylbenzene, toluene, and xylenes (total) at concentrations exceeding their residential PRGs for soil at 5 to 6 feet bgs. SVOCs were detected throughout IR Site 22. The PAH benzo(a)pyrene was detected at concentrations exceeding its residential soil PRG in four soil samples, three of these four samples were collected from approximately 5 to 6 feet bgs.

Boring B07C-14 (discussed above) also yielded a sample that contained naphthalene and pentachlorophenol at concentrations that exceeded their residential PRGs at 5 to 6 feet bgs. The source of the VOCs and SVOCs in Boring 07C-14 is believed to be historical petroleum releases from the historical use of the site as a service station. Similar to other sites in the Southeastern area, the source of the PAHs is believed to be the ambient conditions within the bay sediment fill placed at the site. The PAHs could also be associated with petroleum processing performed at the Pacific Coast Oil Works refinery between 1879 and 1903 at IR Site 13.

TPH contamination was detected throughout IR Site 22, especially at locations adjacent to Building 547 and near the southern perimeter of the site. Very high concentrations (greater than 1,000 mg/kg) were detected at 5 to 6 feet bgs. The high concentrations of TPH are consistent with former use of IR Site 22 as a service station and releases of petroleum from fuel storage tanks and associated fuel lines. The only metal that exceeded its residential soil PRG was lead in a sample collected from one surface soil location in the southeastern portion of IR Site 22. Lead exceeded its DTSC and EPA residential PRGs at a maximum concentration of 9,890 mg/kg in boring MW547-5 at 0.5 to 1 foot bgs.

Overall, contamination at IR Site 22 appears to be primarily limited to petroleum-derived contaminants, including TPH, PAHs, and BTEX compounds. Contamination with TPH and BTEX compounds results from historical use of the site as a service station and historical releases from USTs and fuel lines. It should be noted that the area of PAH contamination does not correlate with the area of TPH contamination. PAH contamination is believed to result from historical refinery operations at IR Site 13 and to filling of the site with contaminated bay sediments. TPH contamination appears to be heaviest in the southern and central parts of the site adjacent to Building 547.

6.2.5 IR Site 23 Building 530 - Missile Rework Operations

This section presents RI soil investigation results, HHRA soil results, ERA soil results, and summarizes the nature and extent of soil COCs for IR Site 23.

6.2.5.1 Remedial Investigation Soil Results

TPH, VOCs, SVOCs, and inorganic chemicals were detected in soil samples collected from IR Site 23. This includes soil borings located north, south, and west of Building 530. Borings were not taken from beneath the building. Each of these chemical groups is discussed below. Figure 6-25 shows soil boring locations and organic compounds detected in soil at IR Site 23. Figure 6-26 shows soil boring locations and inorganic COPCs detected in soil at IR Site 23.

Geotechnical laboratory test results are presented in Table 6-59. The distribution of chemicals detected in soil samples collected from IR Site 23 is discussed below. Tables 6-60 through 6-62 present a statistical summary of all soil data collected from the following three soil-depth intervals: shallow (0 to less than 2 feet bgs), intermediate (2 to 10 feet bgs), and deep (greater than 10 feet bgs). Appendix H presents analytical data for all IR Site 23 soil samples.

TPH. Figure 6-25 shows the sampling locations, sampling depths, and corresponding TPH concentrations detected at the site. TRPH was detected in soil samples collected from soil borings located north of Building 530. The concentration of TRPH generally increased with depth, with a maximum concentration of 7,560 mg/kg (in boring MW530-1) detected at 11.5 feet bgs. Concentrations of TPH compounds at other sampling locations did not exceed 71 mg/kg.

The high TPH concentrations detected in soil northeast of Building 530 at IR Site 23 indicate the potential for dissolution of fuel constituents into groundwater. Spills related to nearby fuel storage tanks and fuel lines are the likely cause of the TPH contamination at IR Site 23.

VOCs. Figure 6-25 shows the sampling locations, sampling depths, and the corresponding VOC concentrations detected at the site. VOCs were detected in soil samples collected from the intermediate and deep soil intervals (see Tables 6-61 and 6-62). No VOCs were detected at concentrations exceeding

their respective residential PRGs. Soil samples with detectable concentrations of fuel-related VOCs were collected from soil borings MW530-1, MW530-2, MW530-3, and BOR-12. The VOC detected at the highest frequency was toluene (71 percent). Other VOCs detected at MW530-3 include ethylbenzene and xylenes (total). Methylene chloride and acetone were also detected at low frequencies and low concentrations; these VOCs are not associated with fuels and are common laboratory contaminants.

SVOCs. Figure 6-25 shows the sampling locations, sampling depths, and corresponding SVOC concentrations detected in soil at IR Site 23. No SVOCs were detected at concentrations exceeding their respective PRGs, with the exception of the PAH benzo(a)pyrene, which was detected at a concentration of 0.38 mg/kg at greater than 10 feet bgs near Building 530.

PAHs detected at IR Site 23 are likely related to ambient conditions within the bay sediment fill placed at the site. The PAHs could also be by-products of petroleum processing performed at the Pacific Coast Oil Works refinery between 1879 and 1903 at IR Site 13.

Inorganic Chemicals. Figure 6-26 shows the sampling locations, sampling depths, and the corresponding concentrations of inorganic COPCs detected in soil at IR Site 23. No inorganic chemicals were detected above their respective PRGs.

6.2.5.2 Human Health Risk Assessment Soil Results

Under the HHRA potential exposure to COPCs and lead were assessed. Findings are discussed below, followed by a summary of findings and human health COCs.

Results of the human health COPC selection for soil are presented in Tables 6-10a and 6-10b. Four exposure scenarios were evaluated for IR Site 23: residential, occupational, recreational, and construction worker. These exposure scenarios are predicted based on the Alameda Point reuse plan as shown in Table 5-2. Risks from inhalation of vapors from soil and groundwater in indoor and outdoor air, dermal contact with soil, ingestion of soil, and inhalation of chemicals sorbed to particulates were evaluated. Results of the risk characterization are presented in Appendix D. The table below summarizes the total RME and AVG risks and HI values under Navy and DTSC assumptions.

IR Site 23					
Soil Exposure Scenario		RME		AVG	
		Total Risk	Total HI	Total Risk	Total HI
Navy Assumptions	Residential	9.8×10^{-6}	<1.0	2.0×10^{-6}	<1.0
	Occupational	2.0×10^{-6}	<1.0	3.6×10^{-7}	<1.0
	Recreational	8.3×10^{-7}	<1.0	5.4×10^{-8}	<1.0
	Construction Worker	4.8×10^{-8}	<1.0	6.9×10^{-9}	<1.0
DTSC Assumptions	Residential	1.1×10^{-4}	<1.0	2.7×10^{-5}	<1.0
	Occupational	2.1×10^{-5}	<1.0	3.7×10^{-6}	<1.0
	Recreational	2.3×10^{-5}	<1.0	2.8×10^{-7}	<1.0
	Construction Worker	7.7×10^{-7}	<1.0	1.8×10^{-7}	<1.0

Note: < = Less than

Lead Assessment. Lead was selected as a human health COPC in soil at IR Site 23. The 95 UCL soil concentration of lead was 19.6 mg/kg, and the maximum soil lead concentration was 59 mg/kg. All concentrations of lead at IR Site 23 were below EPA and DTSC screening values of 400 and 130 mg/kg, respectively. Based on the 95UCL value, the estimated blood-levels for normal and pica children are below 10 μg/dL at the 99th percentile of exposure.

Summary. All total RME risks except for the residential RME scenario under DTSC assumptions were within the acceptable target risk range of 1×10^{-6} to 1×10^{-4}. The residential risk for chromium (1.0×10^{-4}) is at the upper end of the target risk range. The risks are likely overestimated because they assume that all chromium present at IR Site 23 is in the form of hexavalent chromium. Under DTSC assumptions, chromium posed greater than 94 percent of the risk under residential RME exposure from inhalation of particulates and soil ingestion. All HIs associated with soil exposure were below 1.0.

Human Health COCs. One chemical detected in soil was identified as a human health COC at IR Site 23 by the soil HHRA because its chemical-specific residential RME carcinogenic risks under Navy assumptions exceeded carcinogenic risks of 1×10^{-6} for carcinogens. The human health COC was identified to focus further site evaluation on the risk drivers at the site. The COC under Navy assumptions is listed below.

Metal

- Chromium

Under DTSC assumptions, the chemical-specific residential RME carcinogenic risks posed by benzo(a)pyrene also exceeded 1×10^{-6}.

6.2.5.3 Ecological Risk Assessment Soil Results

The screening-level ERA conducted for the soil at IR Site 23 is discussed below, including the environmental setting and contaminants, assessment and measurement endpoints, exposure estimates and risk evaluation, exposure estimates and a risk evaluation, and uncertainty. A summary of the screening-level ERA is presented at the end of the section.

Environmental Setting and Contaminants. IR Site 23 is currently paved and supports no vegetation. No ecological receptors were observed at IR Site 23 during site reconnaissance activities conducted in June 1995 and June 1997. Pavement and buildings preclude any potential exposure to surface soil; therefore, terrestrial receptors are not expected to contact ecological COPCs at IR Site 23. Even though the site is currently not readily accessible to ecological receptors, future use could result in the removal of the paving, resulting in higher exposure of ecological receptors. To evaluate potential exposure of ecological receptors, a screening-level ERA was conducted assuming that all pavement was removed from the site and all soil was exposed. Because some fossorial mammals can burrow to depths of 6 feet bgs, data from soil samples collected from the 0 to 6 foot-depth interval were evaluated for risk to ecological receptors.

The RI analytical results were validated and determined to be of adequate quality to support the ERA process. Chemicals detected in soil from 0 to 6 feet bgs included SVOCs and inorganic chemicals. Soil chemical data for IR Site 23 are presented in Appendix H. These data reveal 19 inorganic and 11 organic constituents at detectable concentrations in site soil. Detected constituents were subjected to a screening process as described in Section 5.2 to focus the ERA on contaminants that are site-related and that pose the greatest risk to ecological receptors. Based on the criteria for selection of ecological COPCs, the following chemicals are ecological COPCs for IR Site 23: chromium, 2-methylnaphthalene, chrysene,

fluoranthene, n-nitrosodiphenylamine, naphthalene, phenanthrene, and pyrene. Data concerning all detected constituents and the results of the screening process are presented in Table 6-63.

Assessment and Measurement Endpoints. The generic assessment and measurement endpoints described in Section 5.2 were used to evaluate the potential risk to ecological receptors associated with the IR Site 23 ecological COPCs. The potential risk to the California ground squirrel and the red-tailed hawk were evaluated as described in Section 5.2.

Exposure Estimates and Risk Evaluation. For each measurement endpoint and ecological COPC, an estimate of the exposure of the organism to the ecological COPC was developed based on life history, site contaminant concentrations, and environmental fate data. This exposure information was then compared with the chemical's TRV to develop an evaluation of the potential risk to ecological receptors. Appendix N presents detailed information concerning the TRVs used in the evaluations.

The exposure estimates for the HQ_1, HQ_2, HQ_3, HQ_4, and HQ_5 scenarios for each measurement endpoint were developed as described in Section 5.2. These exposure assumptions cover the range from most conservative to least conservative, with HQ_4 and HQ_5 scenarios representing reasonable AVG exposure assumptions. The assumptions for each scenario are presented in Appendix N.

The risk calculations were prepared for each measurement endpoint and exposure scenario based on the exposure assumptions for the individual endpoint and scenario. The risk calculations were conducted as described in Section 5.2. One site-specific issue is associated with the calculations of HQs for each measurement endpoint and scenario for IR Site 23.

No TRVs were available for mammal receptors for chrysene, fluoranthene, phenanthrene, and pyrene. The TRV for benzo(a)pyrene was used as a surrogate to evaluate the effects of these ecological COPC.

The calculated HQs for physiological and reproductive effects for the HQ_1, HQ_2, HQ_3, HQ_4, and HQ_5 scenarios for the California ground squirrel and the red-tailed hawk are presented in Tables 6-64 and 6-65, respectively. Based on the current urban setting of the site and its anticipated future urban use, the HQ_5 scenario is believed to be appropriate to evaluate the potential risk associated with IR Site 23. The

discussion below presents the results of the ecological risk evaluation based on the HQ_5 exposure assumptions.

- **Physiological and Reproductive Impacts to the California Ground Squirrel.** The HQs associated with the HQ_5 exposure scenario are presented in Table 6-64. The HQs for chromium, chrysene, fluoranthene, naphthalene, phenanthrene, and pyrene were less than 1.0. No TRVs were available for 2-methylnaphthalene and n-nitrosodiphenylamine.

- **Physiological or Reproductive Impacts to the Red-Tailed Hawk.** The HQs associated with the HQ_5 exposure scenario are presented in Table 6-65. The HQ for chromium was less than 1.0. TRVs were not available for avian receptors for 2-methylnaphthalene, chrysene, fluoranthene, n-nitrosodiphenylamine, naphthalene, phenanthrene, or pyrene.

Uncertainty Discussion. A number of factors used to calculate HQs involve extrapolations or assumptions that contribute to a level of uncertainty and conservatism in the assessment. This screening-level ERA calculated risks under multiple exposure scenarios to present the potential range of risks. Major uncertainties and conservative assumptions used in this screening-level ERA are summarized below.

- The evaluations were conducted assuming that the entire surface of IR Site 23 was exposed soil that was totally accessible to ecological receptors. Under the current conditions, IR Site 23 is primarily covered with asphalt and concrete with only a small portion of the soil exposed to ecological receptors. This condition is likely to persist under the planned future-use scenario. The assumption that all of the surface area is exposed soil results in an assessment that is extremely conservative under any of the five HQ exposure scenarios.

- The SUF for the red-tailed hawk was based on using all areas equally throughout its range for feeding. Red-tailed hawks do not normally feed in urban or developed areas and prefer open fields. The area around IR Site 23 is therefore not expected to be a preferred feeding area for the species. Therefore, assuming that the Red-tailed hawk feeds equally in all areas results in a conservative assessment.

- TRVs were not available for 2-methylnaphthalene or n-nitrosodiphenylamine for mammalian or avian receptors. These ecological COPCs were therefore not quantitatively evaluated in the assessment. However, it should be noted that both of these contaminants had detection frequencies of about 7 percent. Based on the low detection frequency and low levels of these ecological COPCs, it is unlikely that 2-methylnaphthalene and n-nitrosodiphenylamine pose significant ecological risks.

- TRVs were not available for chrysene, fluoranthene, naphthalene, phenanthrene, or pyrene for avian receptors. These ecological COPCs were therefore not quantitatively evaluated in the assessment. With the exception of pyrene, these constituents had a detection frequency of 7 percent. Pyrene had a detection frequency of 18 percent. In addition, these constituents were detected at relatively low concentrations. It is unlikely that these isolated, low concentrations of organic constituents pose significant ecological risks.

- The food-chain modeling used in the screening-level ERA (that is, the transfer of ecological COPCs from soil to plants and invertebrates, which are then eaten by the California ground squirrel, which in turn, is eaten by the red-tailed hawk) may overestimate the actual nature of trophic transfer at IR Site 23.

Summary of the Screening-Level ERA for Soil at IR Site 23. The HQs developed for IR Site 23 indicate no significant risks to the small mammal or raptor populations under the HQ_5 exposure scenario from the ecological COPCs for which TRVs were available. Qualitative analysis of the ecological COPCs for which no TRVs were available indicates that these constituents are unlikely to pose significant risks.

6.2.5.4 Nature and Extent of COCs in Soil at IR Site 23

Soil samples were collected to approximately 15 feet bgs around the northern, western, and southern sides of Building 530. The results of the soil investigation show petroleum contamination consistent with past petroleum-handling operations, as well as historical operations of the Pacific Coast Oil Works refinery, which was located at IR Site 13 north, east, and west of IR Site 23. Contamination observed at IR Site 23 is similar to that observed at other petroleum-impacted sites (including IR Sites 13, 19, and 22). This includes contamination resulting from TPH and PAHs. All detected compounds were subjected to the COPC selection process described in Section 3.1, and all COPCs were then evaluated for potential human and ecological risks. HHRA and ERA results were then used to identify which COPCs would be carried forward for evaluation as COCs.

Results of the RI show that low concentrations of VOCs were detected in soil intermittently throughout IR Site 23, primarily toluene which is associated with petroleum contamination. None of the detected VOCs exceeded its residential PRG for soil. The PAH benzo(a)pyrene was detected at concentrations exceeding its residential soil PRG (0.056 mg/kg) in two soil samples, both located north of Building 530.

The sample from boring 12 (0.37 mg/kg) was collected from 11 to 11.5 feet bgs, the sample from boring B10B-07 (0.057 mg/kg) was collected from 5 to 6 feet bgs.

The source of the VOCs and SVOCs at IR Site 23 is believed to be petroleum releases from nearby fuel storage tanks and fuel lines. Similar to other sites in the Southeastern area, the source of the PAHs is believed to be ambient conditions within the bay sediment fill placed at the site. The PAHs could also be associated with petroleum processing performed at the Pacific Coast Oil Works refinery between 1879 and 1903 at IR Site 13.

TPH contamination was detected throughout IR Site 23. The highest concentrations was detected north of Building 530. The sample collected from boring MW530-1 contained a maximum concentrations of 7,560 mg/kg at 11.5 to 12 feet bgs. High concentrations of TPH are consistent with releases of petroleum from fuel storage tanks and associated fuel lines. None of the metals detected at IR Site 23 exceeded their residential soil PRGs.

Chromium was detected in four borings at IR Site 23, and the highest concentrations of chromium were found at greater than 10 feet bgs. Maximum concentrations were detected at 10 to 10.5, 10.5 to 11, 12 to 12.5, and 14.5 to 15 feet bgs, with a maximum detected value of 61 mg/kg at 10.5 to 11 feet bgs. Although these detections are statistically greater than area background levels, none of the samples contained contaminant concentrations that exceeded their residential PRGs.

Overall, contamination at IR Site 23 appears to be primarily limited to petroleum-derived contaminants, including PAHs and TPH, with low concentrations of the VOC toluene. Contamination with TPH and toluene compounds is likely due to historical releases from storage tanks and fuel lines. PAH contamination is believed to result from historic refinery operations at IR Site 13 and to filling of the site with contaminated bay sediments. TPH and PAH contamination appears to be heaviest north of Building 530.

6.3 OU-2 SOUTHEASTERN AREA GROUNDWATER INVESTIGATION AND RISK ASSESSMENT RESULTS

This section presents the results of groundwater sampling conducted during the RI and the groundwater HHRA and ERA conducted for the OU-2 Southeastern area. This section also discusses the nature and extent of groundwater COCs and the fate and transport modeling results for groundwater COCs.

6.3.1 Remedial Investigation Groundwater Results

TPH, VOCs, SVOCs, and inorganic chemicals were detected in OU-2 Southeastern area groundwater samples. Based on observations of lithology made during the installation of groundwater monitoring wells, the SWBZ (as identified for the rest of the installation) is absent in the OU-2 Southeastern area because of the absence of the bay sediments. All groundwater samples from the OU-2 Southeastern area were collected from the FWBZ.

Appendix H presents analytical data for all OU-2 Southeastern area groundwater samples. Table 6-66 presents a statistical summary of the monitoring well and HydroPunch® groundwater data collected from the FWBZ between 1990 and 1995. Figures 6-27a, 6-27b, 6-28a, and 6-28b present the four-quarter average concentrations of organic compounds and inorganic COPCs detected in the FWBZ. Based on an evaluation of the analytical results of groundwater samples collected during the four quarters, selected monitoring wells were sampled in 1997 and 1998. The analytical results and distribution of chemicals by chemical class in groundwater in the OU-2 Southeastern area is discussed below.

TPH. TPH (motor oil range), TPH (diesel range), and TPH (gasoline range) were detected in groundwater samples collected from monitoring wells in the OU-2 Southeastern area (see Figures 6-27a and 6-27b). TPH (motor oil range) and TPH (diesel range) were detected in samples from widely distributed sampling points across the OU-2 Southeastern area and at a range of concentrations up to 8,250 and 10,000 micrograms per liter (µg/L), respectively. TPH (gasoline range) was predominantly detected in samples collected primarily in the south-central areas of IR Site 13 and the southeastern portion of IR Site 22.

TPH (motor oil range) concentrations ranged from 220 to 8,250 µg/L in samples collected from groundwater monitoring wells and HydroPunch® locations across the OU-2 Southeastern area. The maximum concentration of TPH (motor oil range) was detected in a sample collected from HydroPunch® location DHP-S07C-03 at a concentration of 8,250 µg/L. This sampling location is located in the southwestern corner of IR Site 22 near the boundary of IR Site 13. In general, the TPH concentrations detected in samples from 20 to 30 feet bgs were comparable to concentrations detected in samples from 5 to 15 feet bgs. The source of the sporadic detections of TPH (motor oil range) in groundwater samples collected from monitoring wells in the OU-2 Southeastern area is likely leaks and spill from ASTs, USTs, fuel lines, the JP-5 spill, residual contamination from the former Pacific Coast Oil Works refinery, preferential migration through storm sewers, and overflow events from the Building 397 engine test facility.

TPH (diesel range) concentrations ranged from 110 to 10,000 µg/L in samples collected from groundwater monitoring wells and at HydroPunch® locations across the OU-2 Southeastern area (see Figure 6-27). The maximum concentration of TPH (diesel range) was detected in a sample collected from monitoring well MW-1 at 10,000 µg/L in December 1994. ASTs that formerly contained diesel-range hydrocarbons were located 400 feet west of this well and are the likely source of TPH (diesel range).

TPH (gasoline range) concentrations ranged from 60 to 7,900 µg/L in samples collected from groundwater monitoring wells across the OU-2 Southeastern area (see Figure 6-27). The maximum concentration of TPH (gasoline range) was detected in a sample collected from monitoring well M547-3. TPH (gasoline range) was also detected at high concentrations in samples collected from monitoring wells located in the southeastern corner of IR Site 22 and the north-central portion of IR Site 13 south of IR Site 22. Because IR Site 22 was a service station, the source of the TPH (gasoline range) detected in groundwater samples collected from these wells is likely the former USTs located at IR Site 22.

VOCs. Fifteen VOCs were detected in groundwater samples collected from monitoring wells, and 16 VOCs were detected in groundwater samples collected from HydroPunch® locations (see Figure 6-27). Analytical results of HydroPunch® samples revealed higher concentrations of VOCs compared to samples collected from monitoring wells at locations across the OU-2 Southeastern area. The VOCs most frequently detected in the FWBZ at the OU-2 Southeastern area were BTEX compounds

and chlorinated hydrocarbons. Benzene; 1,1-DCE; 1,2-DCA; terachloroethene; TCE; and vinyl chloride exceeded their respective PRGs in at least one sample collected.

The highest concentrations of BTEX compounds in the OU-2 Southeastern area were detected in samples collected from monitoring wells located in the southeastern corner of IR Site 22, in the north-central portion of IR Site 13, south of IR Site 22, and in the northeastern corner of IR Site 23, near the western boundary with IR Site 13. Benzene concentrations ranged from 0.5 to 1,600 µg/L in OU-2 Southeastern area groundwater samples. The source of the fuel-related VOCs (BTEX) detected in groundwater at IR Site 22 is likely the former USTs located at IR Site 22 and fuel releases at Building 397.

Chlorinated hydrocarbons were also detected in groundwater samples collected in the OU-2 Southeastern area but at a lower detection frequency than the BTEX compounds. Chlorinated hydrocarbons were primarily detected in HydroPunch® samples collected at IR Site 9 adjacent to the storm sewer lines located east of Building 410. The only two samples with detectable concentrations of vinyl chloride were collected from HydroPunch® locations in the northern portion of IR Site 9. The chlorinated hydrocarbons 1,2-DCE (total); 1,1-DCA; and 1-1-DCE were detected at the highest concentrations and at the highest frequencies relative to the other VOCs detected at IR Site 9 (see Figure 6-27). Concentrations of 1,2-DCA ranged from 1 to 2,400 µg/L in a sample collected from HydroPunch® SHP-S09-10. Chlorinated hydrocarbon concentrations detected in samples collected from monitoring wells with deeper screened intervals (50 to 60 feet bgs) exceeded PRGs. The likely source of VOCs in groundwater at IR Site 9 is the former paint stripping operation.

Chlorinated hydrocarbons 1,2-DCE (total); 1,1-DCA; 1-1-DCE; and other chlorinated hydrocarbons such as 1,1,1-TCA; TCE; and tetrachloroethene were detected in samples collected from monitoring wells located along the southern and western perimeters of IR Site 19. Chlorinated VOCs in groundwater at IR Site 19 likely result from RCRA wastes previously stored at the site.

SVOCs. Fifteen SVOCs were detected in groundwater samples collected from monitoring wells, and 23 SVOCs were detected in groundwater samples collected from HydroPunch® locations in the OU-2 Southeastern area (see Figures 6-27a and 6-27b). The SVOCs 4-methylphenol, naphthalene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, carbazole, pentachlorophenol,

bis(2-ethylhexyl)phthalate, and 2,2-oxybis(1-chloropropane) were detected at concentrations exceeding their respective PRGs in at least one sample collected from the FWBZ. With the exception of naphthalene (14 percent) and 2-methylnaphlene (12 percent), SVOCs were detected in a maximum of 6 percent of the samples collected from groundwater monitoring wells in the OU-2 Southeastern area, indicating their limited extent. Naphthalene and 2-methylnaphlene were the SVOCs detected most frequently and at the highest concentrations. The highest concentrations were detected in a HydroPunch® location in the eastern portion of IR Site 9 where high VOC concentrations were also detected. This included a napthalene concentration of 29,000 μg/L in HydroPunch® location SHP-S09-10.

PAHs detected in groundwater samples collected from across the OU-2 Southeastern area are likely due to the dredged bay sediments used as fill in the OU-2 Southeastern area (see Chapter 2). The SVOCs detected in groundwater samples collected at IR Site 13 also are likely due in part to the former use of IR Site 13 as a petroleum refinery.

Inorganic Chemicals. Twenty metals were detected in groundwater samples collected from monitoring wells, and twenty-one metals were detected in groundwater samples collected from HydroPunch® locations (see Figure 6-28). Barium, beryllium, cadmium, cobalt, lead, manganese, molybdenum, thallium, titanium, and zinc were selected as COPCs based on the criteria discussed in Chapter 5. Arsenic, antimony, and iron were detected at concentrations exceeding their respective PRGs but were not selected as COPCs because arsenic and antimony concentrations were below background levels and because iron is an essential nutrient.

6.3.2 Human Health Risk Assessment Groundwater Results

Results of the human health COPC selection for groundwater in the OU-2 Southeastern area are presented in Table 6-67. Residential risks from groundwater ingestion, dermal contact with groundwater, and inhalation of VOCs while showering were evaluated based on the assumption that the groundwater could be used as a domestic water supply in the OU-2 Southeastern area. Table 6-66 presents a statistical summary of analytical results of HydroPunch® and monitoring well data collected from the FWBZ used to conduct the HHRA. The following summaries discuss total RME and AVG risks and HI values under

Navy and DTSC assumptions, results of the lead assessment, and groundwater COCs selected based on HHRA results. Results of the risk characterization are presented in Appendix D.

HHRA Navy Assumptions. The RME carcinogenic risk for groundwater Navy assumptions was 4.8 x 10^{-4}. The majority of the risk results from groundwater ingestion. Chemicals posing the greatest risks were benzo(a)pyrene, pentachlorophenol, and vinyl chloride. Other chemicals posing risks above 1 x 10^{-6} were benzo(a)anthracene; benzo(b)fluoranthene; benzo(k)fluoranthene; bis(2-ethylhexyl)phthalate; indeno(1,2,3-c,d)pyrene; 1,1-DCE; 1,2-DCA; tetrachloroethene; and benzene. AVG risk from direct exposure to groundwater was 6.7 x 10^{-5}.

Noncarcinogenic HIs associated with direct exposure to groundwater were 7.7 (RME case) and 3.6 (AVG case). The HIs were associated with groundwater ingestion and mainly resulted from the COPC manganese, thallium, and naphthalene. However, only manganese and thallium resulted in chemical-specific HIs above 1.0; the RME case HI associated with naphthalene was 0.85.

HHRA DTSC Assumptions. The RME carcinogenic risk for groundwater under DTSC assumptions was 1.2 x 10^{-3}. The majority of the risk results from groundwater ingestion. Chemicals posing the greatest carcinogenic risks were beryllium, benzo(a)pyrene, and benzene. Other chemicals posing risks above 1 x 10^{-6} were 1,1-DCE; tetrachloroethene; vinyl chloride; benzo(a)anthracene; benzo(b)fluoranthene; benzo(k)fluoranthene; bis(2-ethylhexyl)phthalate; indeno(1,2,3-c,d)pyrene; and pentachlorophenol.

Noncarcinogenic HIs associated with exposure to groundwater were 7.7 (RME case) and 1.2 (AVG case). The HIs were associated with groundwater ingestion and mainly resulted from the COPCs manganese, thallium, and naphthalene. The chemical-specific HI for naphthalene did not exceed 1.0.

Lead Assessment. Lead was selected as a COC for groundwater in the OU-2 Southeastern area. Risks and HIs are not evaluated for lead in the same manner as other human health COPCs because EPA and DTSC have developed physiologically based modeling approaches to evaluate the intake and subsequent blood-lead levels of receptors based on residential exposure to groundwater. Cal/EPA's lead model estimates blood-lead levels in children and adults at the 99th percentile of exposure to specific

concentrations of lead in various media (for example, soil, water, and air). Blood lead levels are discussed separately for each OU-2 Southeastern area site.

In the OU-2 Southeastern area, the 95 UCL concentration of lead in groundwater is 1.15 μg/L. This concentration is below the EPA groundwater PRG for lead of 4 μg/L and the Alameda Point lead background concentration 3.9 μg/L. Lead was detected infrequently in 7 out of 162 groundwater samples collected from OU-2 Southeastern area monitoring wells.

Groundwater Human Health COC. Fourteen chemicals were identified as human health COCs in groundwater in the OU-2 Southeastern area because their associated chemical-specific residential RME carcinogenic risks exceeded 1×10^{-6} or their noncarcinogenic HIs exceeded 1.0 under Navy assumptions. The human health COCs in groundwater were identified to focus further site evaluation (nature and extent of contamination) on the potential risk drivers at the site. The COCs identified under Navy assumptions are listed below.

Metals

- Manganese (noncarcinogen)
- Thallium (noncarcinogen)

VOCs

- Benzene
- 1,1-DCE
- 1,2-DCA
- Vinyl chloride
- Tetrachloroethene

SVOCs

- Benzo(a)anthracene
- Benzo(a)pyrene
- Benzo(b)fluoranthene
- Benzo(k)fluoranthene
- Bis(2)ethylhexyl)phthalate
- Indeno(1,2,3-c,d)pyrene
- Pentachlorophenol

In addition to the chemicals listed above, beryllium was identified as a human health COC based on DTSC assumptions. Under Navy assumptions, beryllium was not evaluated as a COPC in groundwater because EPA has not developed oral carcinogenic slope factors for beryllium. In addition, 1,2-DCA was not identified as a human health COC in groundwater under DTSC assumptions because EPA has higher carcinogenic toxicity values than DTSC for 1,2-DCA.

6.3.3 Ecological Risk Assessment Groundwater Results

Chemicals detected in OU-2 Southeastern area were subjected to a screening process based on the following criteria to determine the ecological COPCs (see Section 5.2).

- Frequency of detection
- Essential nutrient check
- Background comparison
- Ecological reference value comparison

Results of the ecological COPC selection in groundwater in OU-2 Southeastern area are presented in Table 6-68. The only potentially significant ecological impact of contaminated groundwater would be at the exposure point where the groundwater is discharged to San Francisco Bay. The storm sewer lines may act as conduits (preferential transport pathways) for groundwater ecological COPCs to migrate to San Francisco Bay. Each upgradient monitoring well or HydroPunch® location within 50 feet of a storm sewer line was evaluated to determine if any of the ecological COPCs were detected at that sampling point. Any ecological COPC determined to have been detected at that sampling point was compared to the ERVs. If the concentration in the sampling location exceeded the ERV, the COPC was selected as an ecological COC. Table 6-69 provides the results of the evaluation and indicates which chemicals were selected as ecological COCs. The following chemicals were identified as ecological groundwater COCs in the Southeastern area: barium, beryllium, cadmium, lead, manganese, fluorene, 2-methylnaphthalene, naphthalene, phenanthrene, pyrene, ethylbenzene, xylenes (total), 1,2-DCE (total), and 1,1,1-TCA.

6.3.4 Nature and Extent of COCs in Groundwater

The nature and extent of groundwater contamination at IR Sites 9, 13, 19, 22, and 23 were determined by delineating contaminant migration from each potential contamination source. Monitoring wells were

installed around each potential source and around the perimeter of each site. HydroPunch® samples were also collected from the FWBZ, based on results of data collected from the groundwater monitoring wells. Regional groundwater flow in the FWBZ is generally west and southwest toward Seaplane Lagoon and San Francisco Bay. However, shallow groundwater flow is impacted by manmade structures including storm water conveyance lines and backfill along other utility corridors.

Results of the groundwater investigation are consistent with those of the soil investigation described in Section 6.2. Groundwater contamination at IR Sites 13, 22, and 23 consists primarily of petroleum-related compounds including TPH, BTEX compounds, and SVOCs. SVOCs at these sites consist primarily of PAHs. Groundwater contamination at IR Site 9 is consistent with its operational history of paint stripping and solvent use where contaminants include low levels of chlorinated VOCs such as 1,2-DCE and vinyl chloride. IR Site 19 also shows chlorinated VOC impacts, which is consistent with its history as a hazardous waste storage area.

Figures 6-27a and 6-27b show sampling locations and concentrations of organic compounds detected in the FWBZ from both monitoring wells and Hydropunch® samples. Concentrations shown are four-quarter averages over time for the monitoring wells or single values for the HydroPunch® samples. Figures 6-28a and 6-28b show sampling locations and concentrations of inorganic compounds detected in the FWBZ from both monitoring wells and HydroPunch® samples. Figures 6-29a through 6-29t present time-series plots for TPH (motor oil range), benzene, and 1,1-DCE detected in monitoring wells installed in the FWBZ for the time period between October 1994 and September 1995. The general trend for all wells showed a decrease in TPH, benzene, and 1,1-DCE over this time interval.

Detailed information on the nature and extent of groundwater contamination in the Southeastern area for VOCs, SVOCs, TPH, and inorganic compounds is presented below.

VOCs. VOCs that exceeded their respective PRGs in one or more samples included benzene; 1,1-DCE; 1,2-DCA; tetrachloroethene; TCE; and vinyl chloride. Benzene is representative of petroleum contamination. Figures 6-31a and 6-31b show isocontour plumes for benzene at IR Sites 9, 13, and 22. The two benzene plumes occur in the southeastern area: one at IR Site 9 and one covering the southern portion of IR Site 13 and the northern portion of IR Site 23 and are described below.

The benzene plume located in the southern portion of IR Site 13 and northern portion of IR Site 23 trends west to IR Site 9 (see Figure 6-31b). The maximum average benzene concentration of 41 μg/L was detected near the southernmost former fuel AST at the southeast corner of Oriskany and Skyhawk Streets. The estimated extent of the plume is bounded by a minimum contour of 1 μg/L. Benzene was detected at depths between 2.5 and 40 feet bgs. The source of benzene at this location may be spills and leaks from the five fuel ASTs and fuel lines formerly located in the central portion of the Southeastern area (between Oriskany Avenue, Skyhawk Street, and Pacific Avenue), as shown in Figures 6-31a and 6-31b. The concentration of benzene (41 μg/L) at this location (M13-07) has generally remained constant from 1994 to 1995. A low-concentration contour of this benzene plume (1 μg/L) may extend toward IR Site 9. Time-series plots for monitoring wells in the vicinity of the plume show that the benzene concentrations remained constant from 1994 to 1995.

A second benzene plume is located in the southwestern portion of the former service station at IR Site 22 (see Figure 6-31a) that trends southwest into IR Site 13. The likely source of the benzene in groundwater is surface spills or leaks from the three former USTs (T547-1, T547-2, and T547-3) and fuel distribution pipelines previously located at the former service station. Benzene was detected at 5 to 15 feet bgs. The plume is bounded by a minimum contour of 1 μg/L. Time-series plots indicate that the concentration of benzene at this location (MW547-3) increased from 1994 to 1995. Two TPH plumes are closely associated with this benzene plume (see Figure 6-30) and likely have the same sources as the benzene contamination discussed below. The largest maximum average concentration of benzene detected was 975 μg/L at MW547-3.

Localized benzene contamination was identified in the southern portion of IR Site 19 (see Figure 6-27). Time-series plots indicate that the concentration of benzene at this location remained relatively constant from 1994 to 1995 of concentrations of 2 to 1 μg/L. TPH contamination has also been identified at this location (see discussion below).

Fate and transport modeling based on the maximum detected concentration of benzene (1,600 μg/L) detected at monitoring well MW547-3 predicts that benzene will not be detected at concentrations exceeding its MCL beyond 675 feet downgradient of the leading edge of the benzene source after a period of 20 years. Parameters used in the fate and transport model for gradient and flow apply to the geology and hydrogeology conditions in the southwest area. Fate and transport modeling did not consider

preferential path transport due to storm water conveyance lines that have documented leaks or other utility corridors that provide a preferential transport pathway within the backfill material. As shown in Figures 6-30 and 6-31a, plumes in this area intersect several storm water conveyance lines and utility corridors.

Chlorinated hydrocarbon contamination is associated with the storm water conveyance lines located inside and adjacent to Building 410 at IR Site 9. Building 410 was used for aircraft paint stripping; the solvent from the stripping operation was discharged to storm water surface drains inside of the building. This contamination was detected to depths of 50 to 60 feet bgs in monitoring wells located along the southern and western perimeters of the site. Vinyl chloride contamination was detected in two HydroPunch® samples located in the northern area of the site. This contamination appears to originate near the storm drain system on the eastern side of Building 410 where the maximum concentration of 220 µg/L was detected at DHP-S09-06 at a depth of 8 feet bgs. Vinyl chloride was only detected in two groundwater samples collected from HydroPunch® borings at Building 410.

Fate and transport modeling based on the maximum concentration of vinyl chloride (220 µg/L) detected at HydroPunch® sampling location DHP-S09-06 predicts that the vinyl chloride will not be detected at concentrations exceeding its MCL beyond 750 feet downgradient from the source after 20 years. This is the maximum distance over which contaminant transport was simulated, indicating that vinyl chloride concentrations could exceed the MCL beyond 750 feet downgradient from the source. At the end of 100 years, vinyl chloride concentrations are predicted to decrease to less than 1 µg/L.

TCE contamination was detected under Building 410 at a depth of 8 feet bgs, at a concentration of 22 µg/L at HydroPunch® sampling location SHP-09-09. TCE was also detected east of Building 410 in monitoring well MW410-4. This contamination likely resulted from former aircraft paint stripping operations conducted in Building 410, with releases through the floor drains that discharged to storm water conveyance lines east of the building. It is expected that TCE will continue to degrade to DCE and vinyl chloride. The fate and transport of TCE was not modeled because low frequency of detection at isolated locations are not consistent with the presence of distinct plumes for this chemical.

Other VOCs detected in groundwater in the southeastern area included 1,1-DCE and tetrachloroethene in samples collected west of Building 616 at IR Site 19. However, the low frequencies of detection indicate

that the chemicals are not associated with a plume. The source of the 1,1-DCE and tetrachloroethene may be hazardous materials stored at the former waste storage yard (Yard D-13 at IR Site 19). The maximum average concentration of 1,1-DCE of 2 µg/L was detected at HydroPunch® sampling location DHP-S19-02 at 22 feet bgs. The maximum average concentration of tetrachloroethene of 5 µg/L was detected at the same location and depth. The concentration of 1,1-DCE in IR Site 19 groundwater has generally remained constant from 1994 to 1995 (see Figures 6-29a through 6-29t). The fate and transport of 1,1-DCE and tetrachloroethene were not modeled because low frequencies of detection at isolated locations are not consistent with the presence of distinct plumes for these chemicals.

The chemical 1,2-DCA was infrequently detected in monitoring wells and HydroPunch® locations at IR Sites 9, 19, and 22. The maximum concentration of 1,2-DCA of 10 µg/L was detected at HydroPunch® sampling location DHP-S07C-03 (west of IR Site 22 along a utility corridor) at 26 feet bgs. The fate and transport of 1,2-DCA was not modeled because the low frequency of detection at isolated locations are not consistent with the presence of distinct plumes for this chemical.

SVOC. SVOCs that exceeded their respective PRGs in one or more samples included 4-methylphenol, naphthalene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, carbazole, pentachlorophenol, and 2,2-oxybis(1-chloropropane). Most of these compounds are representative of petroleum contamination, the exception being pentachlorophenol. Pentachlorophenol was detected only at isolated locations in the southeastern area in only 4 of 152 samples from the FWBZ and was not selected for fate and transport modeling. The only SVOCs detected in more than 10 percent of the samples collected were naphthalene and 2-methylnaphthalene. In addition, elevated concentrations of 2,4-dimethyl phenol also were detected; however, this compound lacks a PRG. Figures 6-31a shows a contamination hot spot of naphthalene and 2-methylnaphthalene that is commingled with the benzene plume originating at IR Site 22 and discussed above. Figure 6-31b shows isocontour plumes for 2,4-dimethyl phenol and 2-methylnaphthalene beneath IR Site 9 and an isocontour plume for 2-methylnaphthalene northeast of IR Site 23 all of which are commingled with benzene plumes.

Based on the HHRA, benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, and indeno(1,2,3-c,d)pyrene were identified as COCs. The source of these compounds is likely contaminated fill material dredged from San Francisco Bay and Oakland Inner Harbor and by-products of the oil refinery formerly located at IR Site 13. Benzo(a)pyrene was selected as a surrogate to represent

the fate and transport of these PAHs in groundwater because it is expected to have similar physical and chemical properties, and has the lowest MCL. Based on the maximum concentration of benzo(a)pyrene (2 μg/L) detected at HydroPunch® sampling location SHP-S09-11, benzo(a)pyrene is not expected to be detected at concentrations exceeding its MCL beyond 20 feet downgradient of the source after 20 and 100 years.

TPH. Consistent with the Southeastern area's pre-Navy operational history of petroleum refining, and a Navy history of petroleum storage and distribution, TPH contamination of groundwater in the FWBZ was detected throughout IR Sites 13, 19, 22, and 23. The entire southern half of IR Site 13, including all of IR Site 23, appears to be underlain by several overlapping TPH plumes that include motor oil, gasoline, and diesel fractions. The highest concentrations are associated with diesel range TPH, with average concentrations as high as 7,620 μg/L in the southwest portion of IR Site 13 just northwest of IR Site 23. Groundwater immediately southeast of Building 397 at IR Site 13 contains a relatively small plume, with a maximum average concentration of diesel range TPH of 7,300 μg/L. IR Site 22 contains plumes of diesel, motor oil, and gasoline range TPH.

Motor oil, diesel, and gasoline range TPH plumes are located in the southwestern corner of the former service station at IR Site 22. TPH contamination was detected at 5 to 26 feet bgs. The maximum concentration detected was 8,250 μg/L of motor oil range TPH at HydroPunch® sampling location DHP-S07C-03 at 26 feet bgs. Motor oil range TPH was also located at elevated concentrations near the former USTs (T-547-1, T-547-2, and T-547-3) and fuel distribution pipelines previously located at IR Site 22 at 22.5 feet bgs. Other maximum average concentrations detected in groundwater at IR Site 22 included diesel range TPH at 1,135 μg/L and gasoline range TPH at 4,723 μg/L both of which are bounded by the motor oil range TPH plume.

A diffuse motor-oil grade TPH plume underlies the north-central portion IR Site 19 in the vicinity of Building 616 (see Figure 6-30a). The maximum concentration of 3,240 μg/L was detected at HydroPunch® sampling location SHP-S19-01 at 10 feet bgs. Detections associated with this plume were primarily located at 10 feet bgs. The plume is likely residual hydrocarbon from a large JP-5 spill in 1991 on the northeast end of Building 397 which is located to the south of IR Site 19.

A diesel-grade TPH plume is located in IR Site 13 southeast of Building 397 and IR Site 19 (see Figure 6-30a). It is believed that this plume is likely attributable to a large JP-5 spill in 1991. Diesel-grade TPH was detected at 3.5 to 13.5 feet bgs. The maximum average concentration is 7,300 μg/L.

A large, diffuse motor oil-grade TPH plume covers the entire southeastern portion of IR Site 13 and all of IR Site 23 (see Figure 6-30b). Motor-oil grade TPH was detected above 1,000-μg/L at various depths between 2 and 40 feet bgs, with most detections at 20 feet bgs. Separate gasoline-and diesel-grade TPH plumes are located within the motor oil grade TPH plume near IR Site 23 and the southeast corner of the intersection of Oriskany Avenue and Skyhawk Street, respectively. This diffuse motor oil plume is likely due to operations of the former oil refinery. The diesel-grade and gasoline-grade TPH plumes are likely related to leaks, spills, or other releases from the five former fuel ASTs and associated fuel lines located along Skyhawk Avenue north of IR Site 23.

Inorganic Chemicals. Several inorganic chemicals exceeded PRGs in monitoring wells and HydroPunch® locations throughout the Southeastern area of OU-2. The inorganics detected include arsenic, beryllium, lead, manganese, and thallium. Arsenic was detected at concentrations below background levels and was therefore not considered in the HHRA or ERA. Lead was detected intermittently, and HHRA results indicate that lead concentrations in Southeastern area groundwater do not pose unacceptable risk to residential receptors. Manganese was detected throughout the Southeastern area.

Beryllium was detected at concentrations ranging from 0.75 to 1.80 μg/L in samples collected from locations across the Southeastern area at a frequency of detection of 19 percent (27 of 145 samples). Beryllium concentrations were also similar in samples collected from shallow and deep sampling intervals. Fate and transport modeling based on the maximum concentration of beryllium (39.5 μg/L) detected at HydroPunch® sampling location DHP-S10B-01 predicts that the concentration of beryllium will not exceed its MCL beyond 20 feet downgradient of the source after 20 and 100 years.

Manganese was detected in 93 percent (135 of 145) of the samples collected from FWBZ monitoring wells and 97 percent (37 of 38) of the HydroPunch® locations in the Southeastern area. The maximum manganese concentration of 93,900 μg/L detected at Hydropunch® sampling location DHP-S10B-01 at IR Site 13 immediately northwest of IR Site 23. The HHRA indicates that the HQ for manganese

exceeded the threshold value of 1.0. Fate and transport modeling based on the maximum concentration of manganese (93,900 µg/L) predicts that the concentration of manganese will be 1 µg/L at a distance of 26 feet from the source at the end of 20 years and at a maximum distance of 60 feet from the source at the end of 100 years.

Thallium was detected in 6 percent (9 of 145) of the samples from monitoring wells and 11 percent (3 of 27) of the HydroPunch® locations in the Southeastern area. Fate and transport modeling based on the maximum concentration of thallium (52.7 µg/L) detected at HydroPunch® sampling location DHP-S10B-03 predicts that the concentration of thallium will not exceed its MCL beyond 20 feet downgradient of the source after 20 and 100 years.

6.4 OU-2 SOUTHEASTERN AREA CONCLUSIONS AND RECOMMENDATIONS

This section summarizes and interprets results of the OU-2 risk assessment for Southeastern area groundwater and the site-specific soil risk assessments for IR Sites 9, 13, 19, 22, and 23, including site conditions and risk management considerations. This section relies on discussions of the nature and extent of soil contamination (see Section 6.2) and the nature and extent of groundwater contamination (see Section 6.3.4). A summary of OU-2 Southeastern area conclusions and recommendations is presented at the end of this section.

6.4.1 OU-2 Southeastern Area Groundwater

This section summarizes the HHRA and ERA for groundwater and presents risk management considerations based on site conditions for OU-2 Southeastern area groundwater. Recommendations for the FS for groundwater are presented at the end of the section.

Human Health Risk Assessment

The table below summarizes HHRA results and lists risk-driving chemicals and their relative contributions to carcinogenic risk and noncarcinogenic HIs for exposure to OU-2 Southeastern area groundwater under the residential exposure scenario under both Navy and DTSC assumptions.

OU-2 Southeastern Area Groundwater						
	Carcinogenic Risk			Noncarciogenic Risk		
	Total RME Risk	Percent of Total Risk		Noncarcinogenic HI	Percent of Total HI	
	Residential	Chemical	%	Residential Scenario	Chemical	%
Navy Assumptions	4.8×10^{-4}	Benzo(a)pyrene	36	7.7	Manganese	56
		Pentachlorophenol	29		Thallium	23
		Vinyl chloride	20			
		Benzo(b)fluoranthene	4			
		Benzene	4			
		Bis(2-ethylhexyl)phthalate	2			
		Benzo(a)anthracene	2			
		Indeno(1,2,3-c,d)pyrene	2			
		Benzo(k)fluoranthene	2			
DTSC Assumptions	1.2×10^{-3}	Beryllium	61	7.7	Manganese	56
		Benzo(a)pyrene	23		Thallium	23
		Benzene	5			
		Benzo(b)fluoranthene	2			
		Pentachlorophenol	2			
		1,1-DCE	2			
		Benzo(a)anthracene	1			
		Indeno(1,2,3-c,d)pyrene	1			
		Vinyl chloride	1			

Notes:

Chemicals contributing less than 1 percent to the total risk are not included in the table, even if the chemical's risk exceeds 1×10^{-6}.

% = Percentage contribution of the chemical toward the total risk or hazard from exposure to groundwater

Under Navy assumptions, the total carcinogenic risk for groundwater in the OU-2 Southeastern area exceeds the acceptable risk management range of 1×10^{-6} to 1×10^{-4}. The carcinogenic risk for FWBZ groundwater is driven by benzo(a)pyrene (36 percent), followed by pentachlorophenol, vinyl chloride, benzo(b)fluoranthene, and benzene. Other chemicals in groundwater with potential risks greater than 1×10^{-6} include bis(2-ethylhexyl)phthalate; 1,1-DCE; and tetrachloroethene. Vinyl chloride and benzene detected in groundwater in the OU-2 Southeastern area also pose potential risks in soil through the inhalation of vapors in indoor air. The risks associated with exposure to groundwater from this exposure pathway are described in the site-specific soil HHRA results for each site (see Sections 6.4.2 through 6.4.6).

Under DTSC assumptions, the total carcinogenic risk for OU-2 Southeastern area groundwater exceeds the acceptable risk management range of 1×10^{-6} to 1×10^{-4}. The carcinogenic risk for FWBZ groundwater is driven by beryllium (61 percent), followed by benzo(a)pyrene and benzene. Additional chemicals in groundwater that have chemical-specific risks greater than 1×10^{-6} include

benzo(b)fluoranthene; pentachlorophenol; 1,1-DCE; benzo(a)anthracene; indeno(1,2,3-c,d)pyrene; vinyl chloride; benzo(k)fluoranthene; bis(2-ethylhexyl)phthalate; and tetrachloroethene. Vinyl chloride and benzene detected in groundwater in the OU-2 Southeastern area pose additional risks in soil through the inhalation of vapors in indoor air. The risks associated with exposure to groundwater from this pathway are described in the site-specific HHRA results for soil (see Sections 6.4.2 through 6.4.6).

The noncarcinogenic HI for FWBZ groundwater in the OU-2 Southeastern area under Navy and DTSC assumptions exceeds the target risk level of 1.0 and is driven by manganese (56 percent), followed by thallium.

Differences in calculated risks under Navy and DTSC assumptions are due primarily to the differences summarized below between EPA (and Navy) risk assessment assumptions and specific assumptions developed by the State of California (and used by DTSC).

- As discussed in Chapter 5, beryllium is considered a carcinogen by ingestion in the DTSC database and not a carcinogen by ingestion in the EPA database, which has been updated more recently.

- The difference in carcinogenic risk for groundwater under the two sets of assumptions results from the higher cancer slope factor (see Appendix D) for 1,2-DCA in the EPA database. EPA assumptions are updated regularly and used nationally.

Human Health Risk Management Considerations

Site-specific recommendations made at the end of this section are based on the risk management considerations discussed below.

- Chlorinated organic chemicals (such as vinyl chloride, DCE, and TCE) are found primarily in groundwater beneath IR Sites 9 and 19, while petroleum-related contamination (such as TPH and benzene) is found primarily in groundwater beneath IR Sites 13, 22, and 23.

- Pentachlorophenol comprises 29 percent of the potential carcinogenic risk, based on EPA exposure assumptions. However, it was detected in only 4 out of 152 samples, including 2 detections at IR Site 9, 1 at IR Site 13, and 1 at IR Site 22. 1,2-DCA was detected in 6 out of 171 samples, including 2 detections at IR Site 9, 3 at IR Site 13, and 1 at IR Site 22. Vinyl chloride was detected in 2 out of 171 samples, both in IR Site 9. Bis(2-

ethylhexyl)phthalate (a common plasticizer and laboratory contaminant) was detected in only 1 out of 152 samples (at IR Site 19).

- The carcinogenic risk posed by beryllium concentrations in OU-2 Southeastern area groundwater (7.5×10^{-4}) is comparable to the background level for beryllium at Alameda Point (3.1×10^{-4}) under DTSC assumptions.

- The noncarcinogenic HQ posed by thallium concentrations in OU-2 Southeastern area groundwater (1.8) is comparable to the background HQ level for thallium at Alameda Point (1.8) under Navy and DTSC assumptions.

- Manganese is widely distributed in OU-2 Southeastern area groundwater. Based on relatively similar distributions of manganese in groundwater and the history of operations, there is no apparent source of manganese in the OU-2 Southeastern area. However, the noncarcinogenic HQ posed by manganese concentrations in OU-2 Southeastern area groundwater (4.3) is greater than its background risk level at Alameda Point (0.49) under Navy and DTSC assumptions.

- According to EPA (1999), manganese is ubiquitous, found in many food sources (especially vegetables), and is an essential human nutrient. It is considered to have relatively low toxicity through the oral ingestion route. EPA (1999) quotes the National Research Council as recommending a daily dose of 2 to 5 mg/day of manganese for adults, and the World Health Organization is quoted as stating that up to 9 mg/day is perfectly safe. According to EPA (1999), the toxicity of manganese to humans through the oral ingestion route is uncertain. EPA has not developed a primary MCL for this chemical based on its human health effects. Extremely large doses can cause gastrointestinal irritation, and high concentrations of manganese in domestic water have also been associated with discoloration of laundry and other aesthetic effects. Epidemiological studies on potential neurological effects in humans are inconclusive. EPA (1999) has established a reference dose of 10 mg/day for adults or 0.14 mg/kg-day. Therefore, although available information indicates that the HQ based on RME assumptions for oral ingestion of manganese exceed 1.0, manganese should be considered a low-toxicity chemical, especially when compared to chlorinated organic chemicals such as vinyl chloride.

- The PAHs benzo(a)pyrene (3 out of 152), benzo(a)anthracene (2 out of 152), benzo(b)fluoranthene (3 out of 152), benzo(k)fluoranthene (1 out of 152), and indeno(1,2,3-c,d)pyrene (2 out of 152) were detected in less than 5 percent of the groundwater samples collected from OU-2 Southeastern area monitoring wells.

Based on site conditions and risk management considerations discussed above, the chemicals beryllium, manganese, thallium, bis(2-ethylhexyl)phthalate, and the PAHs identified above are not considered further.

Adjusted risks were developed by subtracting risks from chemicals not considered further in groundwater from the total site risks. The table below summarizes the adjusted risks and adjusted contributions to the risks posed by specific chemicals that contribute risks greater than 1×10^{-6}.

OU-2 Southeastern Area Groundwater						
	Carcinogenic Risk			Noncarcinogenic Risk		
	Total RME Risk	Percent of Total Risk		Noncarcinogenic HI	Percent of Total HI	
	Residential Scenario	Chemical	%	Residential Scenario	Chemical	%
Navy Assumptions	2.6×10^{-4}	Pentachlorophenol Vinyl chloride Benzene	55 36 7	1.6	HI < 1	
DTSC Assumptions	1.2×10^{-4}	Benzene Pentachlorophenol 1,1-DCE Vinyl chloride	50 18 16 12	1.6	HI < 1	

Notes:

Chemicals contributing less than 1 percent to the total risk are not included in the table even if the chemical's risk exceeds 1×10^{-6}

% = Percentage contribution of the chemical toward the total risk or hazard from exposure to groundwater

< = Less than

As the adjusted risk table shows, pentachlorophenol; vinyl chloride; benzene; and 1,1-DCE are the primary risk drivers after subtracting risks from chemicals whose risks are related to background and ambient conditions.

HHRA and fate and transport data verify that contamination at IR Sites 13, 22, and 23 consists primarily of petroleum-related compounds such as TPH and benzene. Based on this information, any additional action at these sites should be completed under the state's petroleum program. However, groundwater beneath IR Sites 9 and 19 indicates contamination with chlorinated VOCs. Therefore, future groundwater action for IR Sites 9 and 19 will be considered under an FS.

Potential future risks related to groundwater contamination in the OU-2 Southeastern area were quantified based on the domestic use of groundwater. However, domestic use of groundwater at Alameda Point is improbable for the reasons provided below.

- The HHRA relied entirely on data from the FWBZ, which is composed of artificial fill material (dredged from San Francisco Bay) and the Merritt Sand unit. The FWBZ is located at approximately 6 feet bgs, is up to 100 feet thick, and is underlain by the Yerba Buena Mud aquitard. The FWBZ is an unconfined unit that is naturally high in TDS.

Leaking water supply, wastewater, storm water pipes, and other artificial sources contribute to a fresh water layer that is less dense than the more saline water below. Thus, current conditions indicate a shallow lens of fresh water floating on denser saline water. In addition, removing the artificial sources of recharge and increasing pumping is expected to increase salt water intrusion in the area.

- The artificial fill throughout Alameda Point was dredged over the past 60 years and spread throughout the peninsula. This fill material is contaminated with refinery wastes placed in the bay by the Pacific Coast Oil Works refinery that operated during the late 1800s and early 1900s. As identified in this RI report and by BERC (1998), hydrocarbon wastes from the refinery are present in the saturated fill in the FWBZ used as a basis for the groundwater HHRA.

- EBMUD currently supplies low-cost, high quality potable water to the Alameda Point area. Neither EBMUD nor the Alameda Point reuse plan to use shallow groundwater as a source of drinking water at Alameda Point. The FWBZ currently contains 190 to 20,700 mg/L of TDS, with an average concentration of 1,926 mg/L. This indicates the FWBZ is undesirable as a drinking water source. In addition, current Alameda County standards prohibit the screening of municipal or domestic water supply wells in the unconfined Merritt Sand unit.

Ecological Risk Assessment

Barium, beryllium, cadmium, lead, manganese, fluorene, 2-methylnaphthalene, naphthalene, phenanthrene, pyrene, ethylbenzene, xylenes (total), 1,2-DCE, and 1,1,1-TCA, were identified as ecological groundwater COCs in the OU-2 Southeastern area. The following risk management consideration was used to identify chemicals requiring further evaluation in prioritizing storm sewer repairs.

- Barium was detected in 83 percent of the groundwater samples collected from the Southeastern area of OU-2. However, only samples from IR Site 9 exceeded background concentrations. The maximum detected concentration at IR Site 9 was 785 µg/L which is less than 2 times the background concentration. The only barium concentration exceeding background from a sampling location in proximity to the storm sewer was 675 µg/L from HydroPunch® sample SHP-S09-10. Based on the limited number of detections exceeding background levels and the fact that the highest concentrations were from HydroPunch® samples, barium is postulated to present a low risk to ecological receptors.

- Lead was detected in 6 percent of the groundwater samples collected from the Southeastern Area of OU-2. Only three samples in proximity to the storm sewers exceeded the surface water AWQC for lead. None of the concentrations in proximity to the storm sewers exceeded the surface water AWQC by a factor of 10. Because of the

low mobility of lead, the limited frequency of detection, and the low concentrations in the vicinity of the storm sewers, lead is postulated to present a low risk to ecological receptors and should not be considered further.

- Titanium was only analyzed for in one sample and was detected at a relatively high concentration at IR Site 9. However, titanium was detected in HydroPunch® sample SHP-S0-10. HydroPunch® samples are typically associated with high turbidity and are often not representative of groundwater conditions. Titanium should not be considered further.

- Fluorene, phenanthrene, and pyrene were detected in 5, 7, and 5 percent of the groundwater samples collected from the Southeastern Area of OU-2, respectively. The detected concentrations of fluorene and pyrene were less than 5 μg/L in all samples. The detected concentrations of phenanthrene were less than 5 μg/L in all samples except one. Sample SHP-S09-10 contained 1200 μg/L of phenanthrene. Because of the limited distribution of detections of fluorene, phenanthrene, and pyrene, the low concentrations, and the low solubility of the chemicals, fluorene, phenanthrene, and pyrene are postulated to present low risks to ecological receptors.

- 1,2-DCE was detected in 9 percent of the groundwater samples collected from the Southeastern Area of OU-2. Only the concentration in sample location SHP-S09-10 exceed the ERV. None of the detected concentrations exceeded 10 times the ERV. Based on the low frequency of detection, low concentrations, and lack of exceedances of the ERV, 1,2-DCE is postulated to present a low risk to ecological receptors.

- 1,1,1-TCA was detected in 9 percent of the groundwater samples collected from the Southeastern Area of OU-2. The highest concentration of 1,1,1-TCA detected was less than 3 times the ERV. The highest concentration of 1,1,1-TCA in proximity to the storm sewers was 1.4 times the ERV. Based on the low frequency of detection, low concentrations, and lack of exceedances of the ERV, 1,1,1-TCA is postulated to present low risk to ecological receptors.

Based on the above considerations, the chemicals barium; lead; fluorene; phenanthrene; pyrene; 1,2-DCE; and 1,1,1-TCA will not be considered further.

Recommendations

Based on results of the fate and transport discussion in Section 6.3.4 and the data and risk assessment results discussed above, remedial alternatives should focus on the areas of concern summarized below for Southeastern area groundwater.

- The fate and transport section (Section 6.3.4) describes several groundwater plumes of VOCs and SVOC, including TPH. This includes a benzene plume in the south-central portion of IR Site 13. A second benzene plume is located in IR Site 22 trending southwest into IR Site 13. In addition, the southern half of IR Site 13 (including most of IR Site 23) appears to be underlain by several overlapping TPH plumes. The benzene and TPH plumes that underlie portions of IR Sites 13, 22, and 23 will be addressed through the state's petroleum program. TPH plumes at Site 19 will be addressed under an FS.

- Chlorinated VOC contamination is associated with former paint stripping operations at IR Site 9 and former hazardous waste handling at IR Site 19. The FS will address groundwater contamination at these sites due to chlorinated VOCs, benzene, and SVOCs including naphthalene and 2-methylnapthalene.

- Manganese had an HQ exceeding 1.0 for the RME exposure scenario. However, based on the existing quality of groundwater in the FWBZ, the risk management information provided on manganese, EBMUD and site condition considerations discussed above, and the conservative assumptions used in the risk assessment process, it is highly unlikely that any future residential receptor would experience unacceptable health effects from the ingestion of manganese in groundwater. Therefore, manganese will not be considered any further in the FS.

- The ecological COCs beryllium, cadmium, manganese, naphthalene, ethylbenzene, and xylenes (total) will be further evaluated using criteria that include: (1) fate and transport considerations associated with storm sewers, (2) mixing zone considerations, and (3) manhole sampling results. This evaluation will then be used to prioritize storm sewer repairs in the OU-2 Southeastern area.

6.4.2 IR Site 9: Building 410 - Paint Stripping Facility

This section summarizes the sources of contamination, HHRA results and ERA results, and presents the risk management considerations based on site conditions at IR Site 9. Recommendations for conducting the FS for IR Site 9 are presented at the end of the section.

Sources of Contamination

Potential sources of contamination identified at IR Site 9 include spills and leaks from solvent storage, usage, and treatment associated with the aircraft paint stripping operation located in Building 410; leaks from the wastewater treatment plant; and leaks from storm, sanitary, and industrial sewers containing wastewater from Building 410. Wastewater generated at Building 410 was pretreated at the industrial waste treatment facility located at IR Site 9.

Human Health Risk Assessment

The table below summarizes HHRA results and lists risk-driving chemicals and their relative contributions to potential carcinogenic risk and noncarcinogenic HIs for soil exposure under the RME residential scenario for IR Site 9 under both Navy and DTSC assumptions. The table also summarizes HHRA results for groundwater exposure for the OU-2 Southeastern area as described in Section 6.4.1.

IR Site 9							
		Carcinogenic Risk			Noncarcinogenic Risk		
		Total RME	Percent of Total Risk		Noncarcinogenic HI	Percent of Total HI	
		Residential	Chemical	%	Residential Scenario	Chemical	%
Navy Assumptions	Soil	2.0×10^{-6}	Vinyl chloride [a]	56	< 1	HI < 1	
	GW	4.8×10^{-4}	Benzo(a)pyrene	36	7.7	Manganese	56
			Pentachlorophenol	29		Thallium	23
			Vinyl chloride	20			
			Benzo(b)fluoranthene	4			
			Benzene	4			
			Bis(2-ethylhexyl)phthalate	2			
			Indeno(1,2,3-c,d)pyrene	2			
			Benzo(a)anthracene	2			
			Benzo(b)fluoranthene	2			
	Total	4.8×10^{-4}			7.9		
DTSC Assumptions	Soil	1.0×10^{-5}	Beryllium	76	< 1	HI < 1	
	GW	1.2×10^{-3}	Beryllium	61	7.7	Manganese	56
			Benzo(a)pyrene	23		Thallium	23
			Benzene	5			
			Benzo(b)fluoranthene	2			
			Pentachlorophenol	2			
			1,1-DCE	2			
			Benzo(a)anthracene	1			
			Indeno(1,2,3-c,d)pyrene	1			
			Vinyl chloride	1			
	Total	1.2×10^{-3}			7.9		

Notes:

Chemicals contributing less than 1 percent to the total risk are not included in the table even if the chemical's risk exceeds 1×10^{-6}

% = Percentage contribution of the chemical toward the total risk or hazard from exposure to soil or groundwater
< = Less than
GW = Groundwater
(a) = The chemical was only detected in groundwater beneath IR Site 9 and contributed to the total RME risk for soil through the vapor inhalation pathway.

Under both Navy and DTSC assumptions, the total carcinogenic risk for IR Site 9 exceeds the acceptable risk management range of 1×10^{-6} to 1×10^{-4} and is driven by the risk of potential exposure to groundwater in the OU-2 Southeastern area as discussed in Section 6.4.1.

The carcinogenic risk for soil at IR Site 9 under Navy and DTSC assumptions is within the acceptable risk management range of 1×10^{-6} to 1×10^{-4}. The carcinogenic risk is driven by vinyl chloride under Navy assumptions and by beryllium under DTSC assumptions. Vinyl chloride was detected intermittently in groundwater at IR Site 9, and poses potential risks through the inhalation of vapors in indoor air.

The total noncarcinogenic HI for IR Site 9 under Navy and DTSC assumptions exceeds the target risk level HI of 1.0 and is driven by the risk of exposure to groundwater in the OU-2 Southeastern area as discussed in Section 6.4.1. The noncarcinogenic HI for soil at IR Site 9 under Navy and DTSC assumptions is below 1.0; therefore, the COPCs in soil at the site do not pose a significant noncarcinogenic health hazard.

The differences in calculated risks under Navy and DTSC assumptions are summarized below.

- As discussed in Chapter 5, beryllium is considered a carcinogen by ingestion in the DTSC database and not a carcinogen by ingestion under the EPA database, which has been updated more recently.
- The difference in carcinogenic risk for vinyl chloride in groundwater under the two sets of assumptions results from the higher cancer slope factor (see Appendix D) for vinyl chloride in the EPA database. EPA assumptions for these estimates are updated regularly and used nationally.

Soil Human Health Risk Management Considerations

Site-specific recommendations made at the end of this section are based on the site conditions and risk management considerations for soil discussed below.

- Beryllium concentrations in all soil samples collected from the site were below EPA PRG values.

- The carcinogenic risk posed by beryllium concentrations in soil at IR Site 9 (7.8×10^{-6}) is comparable to the site-specific background level for beryllium at Alameda Point (4.7×10^{-6}) under DTSC assumptions.

Based on the site conditions discussed above, beryllium in soil at IR Site 9 is not considered for further evaluation.

A description of site conditions and risk management considerations for OU-2 Southeastern area groundwater is presented in Section 6.4.1. Based on the risk management considerations discussed above and in Section 6.4.1, risks contributed by chemicals not considered further in soil and groundwater were subtracted from the total site risks to develop adjusted risks. The table below summarizes the adjusted risks and adjusted contributions to the risks posed by specific chemicals that contribute risks greater than 1×10^{-6}.

IR Site 9							
		Carcinogenic Risk			Noncarinogenic Risk		
		Total RME Risk	Percent of Total Risk		Noncarcinogenic HI	Percent of Total HI	
		Residential	Chemical	%	Residential Scenario	Chemical	%
Navy Assumptions	Soil	1.9×10^{-6}	Vinyl chloride [(a)]	57	< 1	HI < 1	
	GW	2.6×10^{-4}	Pentachlorophenol Vinyl chloride Benzene	55 36 7	1.7	HI < 1	
	Total	2.6×10^{-4}			1.8		
DTSC Assumptions	Soil	2.4×10^{-6}	none > 10^{-6}		< 1	HI < 1	
	GW	1.2×10^{-4}	Benzene Pentachlorophenol 1,1-DCE Vinyl chloride PCE	50 18 16 12 1	1.7	HI < 1	
	Total	1.2×10^{-4}			1.8		

Notes:

Chemicals contributing less than 1 percent to the total risk are not included in the table even if the chemical's risk exceeds 1×10^{-6}

% = Percentage contribution of the chemical toward the total risk or hazard from exposure to soil or groundwater
< = Less than
> = Greater than
GW = Groundwater
PCE = Tetrachloroethylene
(a) = The chemical was only detected in groundwater and contributed to total RME risk for soil through the vapor inhalation pathway

Soil Ecological Risk Assessment

No ecological COCs were identified in soils at IR Site 9 because no chemical had an HQ exceeding 1.0. HQ_5 values were used to identify ecological COCs because this scenario is based on typical and most realistic daily doses for TRV comparison. HQs were calculated for the California ground squirrel and red-tailed hawk, which represent different trophic levels present at the site. The considerations summarized below were used in the evaluation of ecological risks posed by chemical concentrations detected in soil at IR Site 9.

- The HQs for the ground squirrel for all chemicals are less than 1.0.
- The HQs for the red-tailed hawk for all chemicals are less than 1.0.
- Currently, IR Site 9 does not support a significant ecological habitat. The future ecological habitat potential at IR Site 9 is limited because preferred habitat is available at other locations at Alameda Point.

Based on the considerations above, chemicals in soil do not pose a risk to terrestrial ecological receptors at IR Site 9. Groundwater ERA results are summarized for the OU-2 Southeastern area in Section 6.4.1.

Recommendations

Based on the data and risk assessment results discussed above, no action is recommended for soil at IR Site 9. Recommendations for the FS for groundwater beneath IR Site 9 are presented in Section 6.4.1.

6.4.3 IR Site 13: Former Oil Refinery

This section summarizes the sources of contamination; HHRA, ERA, and fate and transport results; and presents risk management considerations based on site conditions at IR Site 13. Recommendations for further actions at IR Site 13 are presented at the end of the section.

Sources of Contamination

Potential sources of contamination identified at IR Site 13 include spills, leaks, and disposal activities related to the former Pacific Coast Oil Works refinery that operated between 1879 and 1903; artificial fill at the site that contains dredged material from San Francisco Bay and the Oakland Inner Harbor; and leaks and spills associated with Navy operations. Leaks and spills from past Navy operations include those associated with the engine test facility in Building 397; surface spills and leaks associated with hazardous materials stored at IR Site 13; spills and leaks from ASTs, USTs, and fuel lines; and a major JP-5 release that occurred in February 1991 on the eastern side of Building 397. Recoverable free product associated with the JP-5 release was removed by a vacuum truck.

Human Health Risk Assessment

The table below summarizes HHRA results and lists risk-driving chemicals and their relative contributions to carcinogenic risk and noncarcinogenic HQs for soil exposures under the residential RME scenario for IR Site 13 using both Navy and DTSC assumptions. The table also summarizes HHRA results for groundwater exposures for the OU-2 Southeastern area, as described in Section 6.4.1.

IR Site 13							
		Carcinogenic Risk			Noncarcinogenic Risk		
		Total RME Risk	Percent of Total Risk		Noncarcinogenic HI	Percent of Total HI	
		Residential Scenario	Chemical	%	Residential Scenario	Chemical	%
Navy Assumptions	Soil	2.3×10^{-5}	Benzo(a)pyrene Dibenzo(a,h)anthracene Benzo(b)fluoranthene Benzene Vinyl chloride [a]	60 13 6 5 5	< 1	HI < 1	
	GW	4.8×10^{-4}	Benzo(a)pyrene Pentachlorophenol Vinyl chloride Benzo(b)fluoranthene Benzene Bis(2-ethylhexyl)phthalate Indeno(1,2,3-c,d)pyrene Benzo(a)anthracene Benzo(b)fluoranthene	36 29 20 4 4 2 2 2 2	7.7	Manganese Thallium	56 23
	Total	5.0×10^{-4}			7.8		
	Soil	1.0×10^{-4}	Benzo(a)pyrene Dibenzo(a,h)anthracene Benzo(b)fluoranthene Beryllium Benzene Indeno(1,2,3-c,d)pyrene Benzo(a)anthracene	62 13 6 6 5 3 2	< 1	HI < 1	
DTSC Assumptions	GW	1.2×10^{-3}	Beryllium Benzo(a)pyrene Benzene Benzo(b)fluoranthene Pentachlorophenol 1,1-DCE Benzo(a)anthracene Indeno(1,2,3-c,d)pyrene Vinyl chloride	61 23 5 2 2 2 1 1 1	7.7	Manganese Thallium	56 23
	Total	1.3×10^{-3}			7.8		

Notes:

Chemicals contributing less than 1 percent to the total risk are not included in the table even if the chemical's risk exceeds 1×10^{-6}

% = Percentage contribution of the chemical toward the total risk or hazard from exposure to soil or groundwater
< = Less than
GW = Groundwater
(a) = Chemical was only detected in groundwater and contributed to the total RME risk for soil through the vapor inhalation pathway

Under both Navy and DTSC assumptions, the total carcinogenic risk for IR Site 13 exceeds the acceptable risk management range of 1×10^{-6} to 1×10^{-4} and is driven by the risk of potential exposure to groundwater in the OU-2 Southeastern area as discussed in Section 6.4.1.

The carcinogenic risk for soil at IR Site 13 under Navy and DTSC assumptions is within the acceptable risk management range of 1×10^{-6} to 1×10^{-4}. The carcinogenic risk is driven by PAHs and benzene under both assumptions. Beryllium poses additional risk under DTSC assumptions, and vinyl chloride

poses additional risk under Navy assumptions. Vinyl chloride poses risk through the inhalation of vapors in indoor air. However, vinyl chloride was not detected in soil at IR Site 13 and was only detected in groundwater at Sites 9 and 19. Therefore, risks from vinyl chloride in soil at IR Site 13 are not representative of actual site conditions.

The total noncarcinogenic HI for IR Site 13 under Navy and DTSC assumptions exceeds the target risk level HI of 1.0 and is driven by the risk of potential exposure to groundwater in the OU-2 Southeastern area as discussed in Section 6.4.1. The noncarcinogenic HI for soil at IR Site 13 under Navy assumptions is below 1.0; therefore, chemicals detected in soil at the site do not pose a significant noncarcinogenic health hazard.

The differences in calculated risks under Navy and DTSC assumptions are summarized below.

- As discussed in Chapter 5, beryllium is considered a carcinogen by ingestion in the DTSC database and not a carcinogen by ingestion under the EPA database, which has been updated more recently.
- The difference in carcinogenic risk for vinyl chloride in groundwater under the two sets of assumptions results from the higher cancer slope factor (see Appendix D) for vinyl chloride in the EPA database. EPA assumptions for these estimates are updated regularly and used nationally.
- The difference in carcinogenic risk for soil for PAHs under the two sets of assumptions results from the higher cancer slope factors (see Appendix D) under DTSC assumptions and from the fact that DTSC and EPA Region IX have different dermal assessment methodologies.

Using the Cal/EPA lead model, the estimated blood-lead levels at the 99th percentile of exposure for the normal (5.2 μg/dL) and pica child (8.1 μg/dL) were below the CDC level of concern of 10 μg/dL.

Soil Human Health Risk Management Considerations

Site recommendations made at the end of this section are based on the site conditions and risk management considerations for soil discussed below.

- The carcinogenic risk posed by benzo(a)anthracene concentrations in soil at IR Site 13 (2.3×10^{-6}) is comparable to the site-specific ambient level for benzo(a)anthracene at Alameda Point (2.2×10^{-6}) under DTSC assumptions.

- The carcinogenic risk posed by benzo(a)pyrene concentrations in soil at IR Site 13 (6.3×10^{-5}) is greater than, but comparable to, the site-specific ambient level for benzo(a)pyrene at Alameda Point (2.7×10^{-5}) under DTSC assumptions.

- The carcinogenic risk posed by benzo(b)fluoranthene concentrations in soil at IR Site 13 (6.5×10^{-6}) is less than the site-specific ambient level for benzo(b)fluoranthene at Alameda Point (1.0×10^{-5}) under DTSC assumptions.

- The potential carcinogenic risk posed by indeno(1,2,3-c,d)pyrene concentrations in soil at IR Site 13 (2.6×10^{-6}) is comparable to the site-specific ambient level at Alameda Point (2.1×10^{-6}) under DTSC assumptions.

- Although no ambient level was developed for dibenzo(a,h)anthracene because of its low detection frequency, the concentrations detected at IR Site 13 (0.080 to 0.180 mg/kg) are well within the range of the concentrations reported in regional sediment samples collected by the BPTCP (0.0139 to 0.629 mg/kg). Because Alameda Point was filled with sediment dredged from San Francisco Bay, dibenzo(a,h)anthracene concentrations detected at the site are not considered site-related.

- Beryllium concentrations in all soil samples collected from the site were below EPA PRG values.

- The carcinogenic risk posed by beryllium concentrations in soil at IR Site 13 (5.7×10^{-6}) is comparable to the background levels in the Blue Area at Alameda Point (4.7×10^{-6}) under DTSC assumptions.

Based on the site conditions discussed above, beryllium and PAHs in soil at IR Site 13 are not considered for further evaluation.

A description of risk management considerations for OU-2 Southeastern area groundwater is presented in Section 6.4.1. Based on the risk management decisions discussed above and in Section 6.4.1, risks contributed by chemicals not considered further in soil and groundwater were subtracted from the total site risks to develop adjusted risks. The table below summarizes the adjusted risks and adjusted contributions to the risks posed by specific chemicals that contribute risks greater than 1×10^{-6}.

IR Site 13							
		Carcinogenic Risk			Noncarcinogenic Risk		
		Total RME Risk	Percent of Total Risk		Noncarcinogenic HI	Percent of Total HI	
		Residential	Chemical	%	Residential Scenario	Chemical	%
Navy Assumptions	Soil	2.7×10^{-6}	Benzene	47	< 1	HI < 1	
	GW	2.6×10^{-4}	Pentachlorophenol Vinyl chloride Benzene	55 36 7	1.6	HI < 1	
	Total	2.5×10^{-5}			1.7		
DTSC Assumptions	Soil	6.2×10^{-6}	Benzene	74	< 1	HI < 1	
	GW	1.2×10^{-4}	Benzene Pentachlorophenol 1,1-DCE Vinyl chloride PCE	50 18 16 12 1	1.7	HI < 1	
	Total	8.8×10^{-5}			1.7		

Notes:

Chemicals contributing less than 1 percent to the total risk are not included in the table, even if the chemical's risk exceeds 1×10^{-6}

% = Percentage contribution of the chemical toward the total risk or hazard from exposure to soil or groundwater
< = Less than
GW = Groundwater
PCE = Tetrachlorethylene

Soil Ecological Risk Assessment

No soil ecological COCs at IR Site 13 were identified because no chemical had an HQ exceeding 1.0. HQ_5 values were used to identify ecological COCs because this scenario is based on typical and most realistic daily doses for TRV comparison. HQs were calculated for the California ground squirrel and red-tailed hawk, which represent different trophic levels present at the site. The considerations below were used in the evaluation of ecological risks posed by chemical concentrations detected in soil at IR Site 13.

- The HQs for the ground squirrel for all soil chemicals are less than 1.0.
- The HQs for the red-tailed hawk for all soil chemicals are less than 1.0.
- Currently, IR Site 13 does not support a significant ecological habitat. The future ecological habitat potential at IR Site 13 is limited because preferred habitat is available at other locations at Alameda Point.

Based on the considerations above, chemicals in soil do not pose a risk to terrestrial ecological receptors at IR Site 13. Groundwater ERA results are presented for the OU-2 Southeastern area in Section 6.4.1.

Recommendations

IR Site 13 has been impacted by petroleum-related activities including operation of the former Pacific Coast Oil Works refinery and Navy operations related to fuel handling and storage. Soil and groundwater contamination is primarily limited to petroleum-related compounds including BTEX and TPH. Therefore, IR Site 13 will be evaluated under the state's petroleum program. This includes future actions related to soil and groundwater. Based on the results of the RI the following actions are recommended for IR Site 13:

- The RI and studies by BERC (1998) indicate the presence of high levels of TPH (greater than 1,000 mg/kg) in soil throughout IR Site 13. The highest levels of TPH contamination in soil are located in the central and western portions of the site, adjacent to the former refinery and fuel storage tanks. BERC data indicate that this potential groundwater contamination source is undergoing natural bioremediation, which should be evaluated as a remedial alternative in the petroleum program.

- Groundwater beneath IR Site 13 will be addressed through the state's petroleum program. Contaminants include benzene and TPH.

6.4.4 IR Site 19 Yard D-13 - Hazardous Waste Storage

This section summarizes the sources of contamination; HHRA, ERA, and fate and transport results; and presents the risk management considerations for conducting the FS at IR Site 19.

Sources of Contamination

IR Site 19 is located in the northwest corner of IR Site 13. Potential sources of contamination at IR Site 19 include spills, leaks, and disposal from operations associated with the former Pacific Coast Oil Works refinery that operated between 1879 and 1903 at IR Site 13; artificial fill containing dredged material from San Francisco Bay and the Oakland Inner Harbor that was contaminated with historical refinery wastes; a JP-5 release that occurred in 1991 (on the eastern side of Building 397 in IR Site 13); and spills and leaks from containers stored in the hazardous waste storage yard located southwest of Building 360

and Yard D-13. Yard D-13 was used to store containers of hazardous waste that were generated by activities at Alameda Point. All containers containing hazardous waste were removed in 1996.

Soil Human Health Risk Assessment

The table below summarizes HHRA results and lists risk-driving chemicals and their relative contributions to potential carcinogenic risks and noncarcinogenic HIs for soil exposures under the residential RME scenario for IR Site 19 using both Navy and DTSC assumptions. The table also summarizes HHRA results for groundwater exposures for the OU-2 Southeastern area, as described in Section 6.4.1.

IR Site 19							
		Carcinogenic Risk			Noncarcinogenic HI		
		Total RME Risk	Percent of Total Risk		Noncarcinogenic HI	Percent of Total HI	
		Residential Scenario	Chemical	%	Residential Scenario	Chemical	%
Navy Assumptions	Soil	2.2×10^{-5}	Benzo(a)pyrene	45	< 1	HI < 1	
			Dibenzo(a,h)anthracene	34			
			Vinyl chloride [(a)]	5			
	GW	4.8×10^{-4}	Benzo(a)pyrene	36	7.7	Manganese	56
			Pentachlorophenol	29		Thallium	23
			Vinyl chloride	20			
			Benzo(b)fluoranthene	4			
			Benzene	4			
			Bis(2-ethylhexyl)phthalate	2			
			Indeno(1,2,3-c,d)pyrene	2			
			Benzo(a)anthracene	2			
			Benzo(b)fluoranthene	2			
	Total	5.0×10^{-4}			8.0		
DTSC Assumptions	Soil	9.2×10^{-5}	Benzo(a)pyrene	49	< 1	HI < 1	
			Dibenzo(a,h)anthracene	37			
			Benzo(a)anthracene	4			
			Benzo(b)fluoranthene	4			
			Indeno(1,2,3-c,d)pyrene	3			
	GW	1.2×10^{-3}	Beryllium	61	7.7	Manganese	56
			Benzo(a)pyrene	23		Thallium	23
			Benzene	5			
			Benzo(b)fluoranthene	2			
			Pentachlorophenol	2			
			1,1-DCE	2			
			Benzo(a)anthracene	1			
			Indeno(1,2,3-c,d)pyrene	1			
			Vinyl chloride	1			
	Total	1.3×10^{-3}			8.0		

Notes:

Chemicals contributing less than 1 percent to the total risk are not included in the table even if the chemical's risk exceeds 1×10^{-6}

% = Percentage contribution of the chemical toward the total risk or hazard from exposure to soil or groundwater
< = Less than
GW = Groundwater
(a) = Chemical was only detected in groundwater and contributed to total RME risk for soil via the vapor inhalation pathway

Under both the Navy and DTSC assumptions, the total carcinogenic risk for IR Site 19 exceeds the acceptable risk management range of 1×10^{-6} to 1×10^{-4}, and is driven by the risk of potential exposure to groundwater in the OU-2 Southeastern area as discussed in Section 6.4.1.

The carcinogenic risk for soil at IR Site 19 under Navy and DTSC assumptions is within the acceptable risk management range of 1×10^{-6} to 1×10^{-4}. Potential carcinogenic risk is driven by PAHs. Under Navy assumptions, vinyl chloride also contributes to potential risks. Vinyl chloride poses risks via the

inhalation of vapors in indoor air pathway. However, vinyl chloride was not detected at IR Site 19, and was only detected in groundwater at IR Site 9. Therefore, risks from vinyl chloride in soil at IR Site 19 are not representative of actual site conditions.

The total noncarcinogenic HI for IR Site 19 under Navy and DTSC assumptions exceeds the target risk level HI of 1.0, and is driven by the risk of potential exposure to manganese in groundwater in the Southeastern area as discussed in Section 6.4.1. The noncarcinogenic HI for soil at IR Site 19 under Navy and DTSC assumptions is below 1.0; therefore, chemicals detected in soil at the site do not pose a significant noncarcinogenic health hazard.

The differences in calculated risks under Navy and DTSC assumptions are summarized below.

- The difference in carcinogenic risk for vinyl chloride in groundwater under the two sets of assumptions results from the higher cancer slope factor (see Appendix D) for vinyl chloride in the EPA database. EPA assumptions for these estimates are updated regularly and used nationally.

- The difference in carcinogenic risk for soil for PAHs under the two sets of assumptions results from the higher cancer slope factors (see Appendix D) under DTSC assumptions and from the fact that DTSC and EPA Region IX have different dermal assessment methodologies.

Using the Cal/EPA lead model, the estimated blood-lead levels at the 99th percentile of exposure for normal and pica child were below the CDC's level of concern of 10 μg/dL.

Soil Human Health Risk Management Considerations

Site recommendations made at the end of this section are based on the site conditions and risk management considerations discussed below.

- The carcinogenic risk posed by benzo(a)anthracene concentrations in soil at IR Site 19 (3.8×10^{-6}) is comparable to the ambient risk levels at Alameda Point (2.2×10^{-6}) under DTSC assumptions.

- The carcinogenic risk posed by benzo(a)pyrene concentrations in soil at IR Site 19 (4.5×10^{-5}) is comparable to the ambient risk levels at Alameda Point (2.7×10^{-5}) under DTSC assumptions.

- The carcinogenic risk posed by benzo(b)fluoranthene concentrations in soil at IR Site 19 (3.5×10^{-6}) is less than the ambient risk levels at Alameda Point (1.0×10^{-5}) under DTSC assumptions.

- The carcinogenic risk posed by indeno(1,2,3-c,d)pyrene concentrations in soil at IR Site 19 (3.0×10^{-6}) is comparable to the ambient risk levels at Alameda Point (2.1×10^{-6}) under DTSC assumptions.

- Dibenzo(a,h)anthracene was detected in less than 5 percent (1 out of 48) of the groundwater samples from IR Site 19.

- Although no ambient level was developed for dibenzo(a,h)anthracene because of its low detection frequency, the concentration detected at IR Site 19 (0.670 mg/kg) is comparable to the range of the concentrations reported in regional sediment samples collected by the BPTCP (0.0139 to 0.629 mg/kg). Because Alameda Point was filled with sediments dredged from San Francisco Bay, dibenzo(a,h)anthracene concentrations detected at the site are not considered site-related.

Based on the of site conditions discussed above, PAHs in soil at IR Site 19 are not considered for further evaluation.

A description of risk management considerations made for the OU-2 Southeastern area groundwater is presented in Section 6.4.1. Groundwater at IR Site 19 was found to be impacted by localized detections of chlorinated VOCs including 1,1-DCE; 1,1-DCA; and tetrachloroethene. These chemicals likely originated from the waste storage yard at Building 616.

Based on the risk management considerations discussed above and in Section 6.4.1, risks contributed by chemicals not considered further in soil and groundwater were subtracted from the total site risks to develop adjusted risks. The table below summarizes the adjusted risks and adjusted contributions to the risks posed by specific chemicals which contribute risks greater than 1×10^{-6}.

IR Site 19							
		Carcinogenic Risk			Noncarcinogenic Risk		
		Total RME Risk	Percent of Total Risk		Noncarcinogenic HI	Percent of Total HI	
		Residential	Chemical	%	Residential	Chemical	%
Navy Assumptions	Soil	1.0×10^{-6}	none > 10^{-6}		< 1	HI < 1	
	GW	2.6×10^{-4}	Pentachlorophenol Vinyl chloride Benzene	55 36 7	1.7	HI < 1	
	Total	2.6×10^{-5}			1.9		
DTSC Assumptions	Soil	1.5×10^{-6}	none > 10^{-6}		< 1	HI < 1	
	GW	1.2×10^{-4}	Benzene Pentachlorophenol 1,1-DCE Vinyl chloride Tetrachloroethene	50 18 16 12 1	1.7	HI < 1	
	Total	1.2×10^{-4}			1.9		

Notes:

Chemicals contributing less than 1 percent to the total risk are not included in the table, even if the chemical's risk exceeds 1×10^{-6}

% = Percentage contribution of the chemical toward the total risk or hazard from exposure to soil or groundwater
< = Less than
> = Greater than
GW = Groundwater

Soil Ecological Risk Assessment

No soil ecological COCs at IR Site 19 were identified because no chemical had an HQ exceeding 1.0. HQ_5 values were used to identify ecological COCs because the scenario is based on typical and most realistic daily doses for TRV comparison. HQs were calculated for the California ground squirrel and red-tailed hawk, which represent different trophic levels present at the site. The considerations below were used in the evaluation of ecological risks posed by chemical concentrations detected in soil at IR Site 19.

- The HQs for the California ground squirrel for all soil chemicals are less than 1.0.
- The HQs for the red-tailed hawk for all soil chemicals are less than 1.0.
- Currently, IR Site 19 does not support a significant ecological habitat. The future ecological habitat potential at IR Site 19 is limited because preferred habitat is available at other locations at Alameda Point.

Based on the considerations above, chemicals in soil do not pose a risk to terrestrial ecological receptors at IR Site 19. Groundwater ERA results are presented for the OU-2 Southeastern area in Section 6.4.1.

Recommendations

Based on the data and risk assessment results discussed above, IR Site 19 will be further evaluated under an FS. Recommendations for the FS for groundwater in the OU-2 Southeastern area are presented in Section 6.4.1. Based on results of the HHRA and fate and transport analysis, the FS will focus on the issues below:

- The RI indicates high levels of TPH (greater than 1,000 mg/kg) in soils in the area south and west of Building 616. This contamination represents a potential threat to groundwater and is likely due to a combination of releases from former USTs and fuel lines, the 1991 JP-5 fuel spill, and operations of the former Pacific Coast Oil Works refinery. The FS will evaluate remedial alternatives for this contamination including bioremediation as described in BERC (1998).

- The RI indicates localized groundwater contamination with chlorinated VOCs and petroleum hydrocarbons in the central and western portion of IR Site 19. The FS will evaluate alternatives for addressing this contamination.

6.4.5 IR Site 22: Building 547 - Former Service Station

This section summarizes the sources of contamination, HHRA, ERA, and fate and transport results; and presents the risk management considerations based on site conditions at IR Site 22. Recommendations for IR Site 22 are presented at the end of the section.

Sources of Contamination

Potential sources of contamination at IR Site 22 include spills and leaks from ASTs, USTs, and fuel lines; surface spills and leaks associated with hazardous materials stored at the site; spills, leaks, and disposal from operations associated with the former Pacific Coast Oil Works refinery that operated between 1879 and 1903; and from contaminated fill containing dredged material from San Francisco Bay and the Oakland Inner Harbor.

Soil Human Health Risk Assessment

The table below summarizes HHRA results and lists risk-driving chemicals and their relative contributions to potential carcinogenic risks and noncarcinogenic HQs for soil exposures under the residential RME scenario for IR Site 22 using both Navy and DTSC assumptions. The table also summarizes HHRA results for groundwater exposures for the OU-2 Southeastern area, as described in Section 6.4.1.

IR Site 22							
		Carcinogenic Risk			Noncarcinogenic Risk		
		Total RME Risk	Percent of Total Risk		Noncarcinogenic HI	Percent of Total HI	
		Residential Scenario	Chemical	%	Residential Scenario	Chemical	%
Navy Assumptions	Soil	1.5×10^{-5}	Benzo(a)pyrene	43	HI < 1	< 1	
			Benzene	29			
			Vinyl chloride [(a)]	7			
	GW	4.8×10^{-4}	Benzo(a)pyrene	36	7.7	Manganese	56
			Pentachlorophenol	29		Thallium	23
			Vinyl chloride	20			
			Benzo(b)fluoranthene	4			
			Benzene	4			
			Bis(2-ethylhexyl)phthalate	2			
			Indeno(1,2,3-c,d)pyrene	2			
			Benzo(a)anthracene	2			
			Benzo(b)fluoranthene	2			
	Total	4.9×10^{-4}			8.3		
DTSC Assumptions	Soil	7.4×10^{-5}	Benzo(a)pyrene	41	< 1	HI < 1	
			Benzene	29			
			Beryllium	14			
			Benzo(b)fluoranthene	5			
			Indeno(1,2,3-c,d)pyrene	4			
			Benzo(a)anthracene	3			
	GW	1.2×10^{-3}	Beryllium	61	7.7	Manganese	56
			Benzo(a)pyrene	23		Thallium	23
			Benzene	5			
			Benzo(b)fluoranthene	2			
			Pentachlorophenol	2			
			1,1-DCE	2			
			Benzo(a)anthracene	1			
			Indeno(1,2,3-c,d)pyrene	1			
			Vinyl chloride	1			
	Total	1.3×10^{-3}			8.3		

Notes:

Chemicals contributing less than 1 percent to the total risk are not included in the table even if the chemical's risk exceeds 1×10^{-6}

% = Percentage contribution of the chemical toward the total risk or hazard from exposure to soil or groundwater
< = Less than
GW = Groundwater
(a) = Chemical was only detected in groundwater and contributed to total RME risk for soil via the vapor inhalation pathway

Under both Navy and DTSC assumptions, the total carcinogenic risk for IR Site 22 exceeds the acceptable risk management range of 1×10^{-6} to 1×10^{-4}, and is driven by the risk of potential exposure to groundwater in the OU-2 Southeastern area as discussed in Section 6.4.1.

The carcinogenic risk for soil at IR Site 22 under Navy assumptions is within the acceptable risk management range of 1×10^{-6} to 1×10^{-4}, while the carcinogenic risk under DTSC assumptions is above the risk management range. The carcinogenic risk is driven by benzene and benzo(a)pyrene. Beryllium also contributes to the risk under DTSC assumptions, and vinyl chloride contributes to the risk under Navy assumptions. Vinyl chloride poses potential risks through the inhalation of vapors in indoor air. However, vinyl chloride was not detected in soils at IR Site 22 and was only detected in groundwater at IR Sites 9 and 19. Therefore, potential risks from vinyl chloride at IR Site 22 are not representative of actual site conditions.

The total noncarcinogenic HI for IR Site 22 under Navy and DTSC assumptions exceeds the target risk level HI of 1.0 and is driven by the risk of potential exposure to groundwater in the OU-2 Southeastern area as discussed in Section 6.4.1. The noncarcinogenic HI for soil at IR Site 22 under Navy and DTSC assumptions is below 1.0; therefore, the chemicals detected in soil at the site do not pose a significant noncarcinogenic health hazard.

The differences in calculated risks under Navy and DTSC assumptions are summarized below.

- As discussed in Chapter 5, beryllium is considered a carcinogen by ingestion in the DTSC database and not a carcinogen by ingestion in the EPA database, which has been updated more recently.
- The difference in carcinogenic risk for vinyl chloride in groundwater under the two sets of assumptions results from the higher cancer slope factor (see Appendix D) for vinyl chloride in the EPA database. EPA assumptions for these estimates are updated regularly and used nationally.
- The difference in carcinogenic risk for soil for PAHs under the two sets of assumptions results from the higher cancer slope factors (see Appendix D) under DTSC assumptions and from the fact that DTSC and EPA Region IX have different dermal assessment methodologies.

Using the Cal/EPA lead model, the estimated blood-lead level at the 99th percentile of exposure for a pica child (11.2 μg/dL) exceeded the CDC level of concern of 10 μg/dL. However, the estimated blood lead-level at the 99th percentile of exposure for a normal child (5.7 μg/dL) was below the CDC level of concern.

Soil Human Health Risk Management Considerations

Site recommendations made at the end of this section are based on site conditions and risk management considerations for soil discussed below.

- Lead concentrations across the site are relatively uniform with the exception of a detection of 9,890 mg/kg in boring MW547-5 at 0.5 to 1 foot bgs. Deeper samples and adjacent borings were all less than 100 mg/kg, and DTSC and EPA PRGs.
- Beryllium concentrations in all soil samples collected from the site were below EPA PRG values.
- The carcinogenic risk posed by beryllium concentrations in soil at IR Site 22 (1.0×10^{-5}) is comparable to the risk (4.7×10^{-6}) due to background concentrations under DTSC assumptions.
- The carcinogenic risk posed by benzo(a)anthracene concentrations in soil at IR Site 22 (2.6×10^{-6}) is comparable to the risk due to ambient concentrations at Alameda Point (2.2×10^{-6}) under DTSC assumptions.
- The carcinogenic risk posed by benzo(a)pyrene concentrations in soil at IR Site 22 (3.0×10^{-5}) is comparable to the risk due to ambient concentrations at Alameda Point (2.7×10^{-5}) under DTSC assumptions.
- The carcinogenic risk posed by benzo(b)fluoranthene concentrations in soil at IR Site 22 (3.9×10^{-6}) is less than the risk due to ambient concentrations at Alameda Point (1.0×10^{-5}) under DTSC assumptions.
- The carcinogenic risk posed by indeno(1,2,3-c,d)pyrene concentrations in soil at IR Site 22 (3.2×10^{-6}) is comparable to the risk due to ambient concentrations at Alameda Point (2.1×10^{-6}) under DTSC assumptions.

Based on the site conditions discussed above, lead, beryllium and PAHs in soils at IR Site 22 are not considered for further evaluation.

A description of site conditions and risk management considerations for OU-2 Southeastern area groundwater is presented in Section 6.4.1. Groundwater at IR Site 22 was found to be impacted by a benzene plume and TPH.

Based on the risk management considerations discussed above and in Section 6.4.1, risks contributed by chemicals not considered further in soil and groundwater were subtracted from the total site risks to develop adjusted risks. The table below summarizes the adjusted risks and adjusted contributions to the risks posed by specific chemicals that contribute risks greater than 1×10^{-6}.

IR Site 22							
		Carcinogenic Risk			Noncarcinogenic Risk		
		Total RME Risk	Percent of Total Risk		Noncarcinogenic	Percent of Total	
		Residential	Chemical	%	Residential	Chemical	%
Navy Assumptions	Soil	5.5×10^{-6}	Benzene	80	< 1	HI < 1	
	GW	2.6×10^{-4}	Pentachlorophenol Vinyl chloride Benzene	55 36 7	1.7	HI < 1	
	Total	2.7×10^{-4}			2.3		
DTSC Assumptions	Soil	2.3×10^{-5}	Benzene	95	< 1	HI < 1	
	GW	1.2×10^{-4}	Benzene Pentachlorophenol 1,1-DCE Vinyl chloride Tetrachloroethene	50 18 16 12 1	1.7	HI < 1	
	Total	1.4×10^{-4}			2.3		

Notes:

Chemicals contributing less than 1 percent to the total risk are not included in the table, even if the chemical's risk exceeds 1×10^{-6}

GW = Groundwater
% = Percentage contribution of the chemical toward the total risk or hazard from exposure to soil or groundwater
< = Less than

Soil Ecological Risk Assessment

The following table provides a list of chemicals in soils at IR Site 22 with HQs exceeding 1.0. The HQs reported below are HQ_5 values and represent the typical and most realistic daily doses for TRV comparison. HQs were calculated for the California ground squirrel and red-tailed hawk, which represent different trophic levels present at the site.

Chemical	IR Site HQ_5	Background HQ_5
California Ground Squirrel		
Aluminum	33.6	69.1
Xylene (total)	84.1	Not applicable
Red-Tailed Hawk		
All chemicals	< 1.0	Not applicable

Note:

< = Less than

The considerations below were used in the evaluation of ecological risk posed by chemical concentrations detected in soil at IR Site 22.

- The California ground squirrel HQ for aluminum is below the HQ based on background concentrations of aluminum at the site.
- The ecological HQ for xylenes (total) (84.1) for the red-tailed hawk is driven by a detection of 2,600 mg/kg at 5 to 6 feet bgs. Other detections ranged from nondetect to 33 mg/kg.
- The HQs for the red-tailed hawk for all soil chemicals are less than 1.0.
- Currently, IR Site 22 does not support a significant ecological habitat. The future ecological habitat potential at IR Site 22 is limited because preferred habitat is available at other locations at Alameda Point.
- The food-chain modeling used in the screening-level ERA (the transfer of ecological COPCs from soils to plants and invertebrates, to the ground squirrel, and to the red-tailed hawk) may overestimate the nature of the transfer of ecological COPCs through the food chain. Conservative estimates were used that assumed 100 percent transfer of ecological COPCs from one trophic level to another.

Based on the above site considerations, aluminum and xylenes (total) are not considered to pose a significant impact on ecological receptors. However, xylenes (total) concentrations at the site will get addressed under any action taken for addressing TPH contamination at the site. Groundwater ERA results are presented for the OU-2 Southeastern area in Section 6.4.1.

Recommendations

IR Site 22 has been impacted by petroleum-related activities including operations of a former service station and the Pacific Coast Oil Works refinery. Soil and groundwater contamination is primarily limited to petroleum-related compounds including BTEX and TPH. Therefore, IR Site 22 will be further evaluated under the state's petroleum program. Based on results of the field investigation and the HHRA, remedial alternatives will focus on the issues below.

- High levels of TPH contamination were detected south of Building 547 at depths of 5 to 6 feet bgs. This contamination is likely a combination of releases from former USTs and fuel lines and possibly operations of the former Pacific Coast Oil Works refinery. Consistent with IR Site 13, remedial alternatives for this contamination will be evaluated under the state's petroleum program.

- Groundwater contamination, including benzene, 2-methylnaphthalene, and TPH, will be further evaluated under the state's petroleum program. Future actions will be combined with any actions taken for IR Site 13.

6.4.6 IR Site 23: Building 530 - Missile Rework Operation

This section summarizes the sources of contamination; HHRA, ERA, and fate and transport results, and presents the risk management considerations and recommendations based on site conditions at IR Site 23.

Sources of Contamination

Potential sources of contamination at IR Site 23 include spills, leaks, and disposal from activities related to the former Pacific Coast Oil Works refinery that operated between 1879 and 1903 at IR Site 13; artificial fill at the site that contains contaminated dredged material from San Francisco Bay and the Oakland Inner Harbor; and surface spills and leaks associated with hazardous materials used and stored in Building 530.

Human Health Risk Assessment

The table below summarizes HHRA results and lists risk-driving chemicals and their relative contributions to potential carcinogenic risks and noncarcinogenic HIs for soil exposure under the

residential RME scenario for IR Site 23 under both Navy and DTSC assumptions. The table also summarizes HHRA results for groundwater exposure for the OU-2 Southeastern area as described in Section 6.4.1.

IR Site 23							
		Carcinogenic Risk			Noncarcinogenic Risk		
		Total RME Risk	Percent of Total Risk		Noncarcinogenic HI	Percent of Total HI	
		Residential Scenario	Chemical	%	Residential Scenario	Chemical	%
Navy Assumptions	Soil	9.8×10^{-6}	Chromium	72	< 1	HI < 1	
			Vinyl chloride [(a)]	11			
	GW	4.8×10^{-4}	Benzo(a)pyrene	36	7.7	Manganese	56
			Pentachlorophenol	29		Thallium	23
			Vinyl chloride	20			
			Benzo(b)fluoranthene	4			
			Benzene	4			
			Bis(2-ethylhexyl)phthalate	2			
			Indeno(1,2,3-c,d)pyrene	2			
			Benzo(a)anthracene	2			
			Benzo(b)fluoranthene	2			
	Total	4.9×10^{-4}			7.8		
DTSC Assumptions	Soil	1.1×10^{-4}	Chromium	94	< 1	HI < 1	
			Benzo(a)pyrene	4			
	GW	1.2×10^{-3}	Beryllium	61	7.7	Manganese	56
			Benzo(a)pyrene	23		Thallium	23
			Benzene	5			
			Benzo(b)fluoranthene	2			
			Pentachlorophenol	2			
			1,1-DCE	2			
			Benzo(a)anthracene	1			
			Indeno(1,2,3-c,d)pyrene	1			
			Vinyl chloride	1			
	Total	1.3×10^{-3}			7.8		

Notes:

Chemicals contributing less than 1 percent to the total risk are not included in the table even if the chemical's risk exceeds 1×10^{-6}

GW = Groundwater
% = Percentage contribution of the chemical toward the total risk or hazard from exposure to soil or groundwater
< = Less than
(a) = Chemical was only detected in groundwater and contributed to total RME risk for soil via the vapor inhalation pathway

Under both Navy and DTSC assumptions, the total carcinogenic risk for IR Site 23 exceeds the acceptable risk management range of 1×10^{-6} to 1×10^{-4}, and is driven by the risk of potential exposure to groundwater in the OU-2 Southeastern area as discussed in Section 6.4.1.

The carcinogenic risk for soil at IR Site 23 under Navy assumptions is within the acceptable risk management range of 1×10^{-6} to 1×10^{-4}, but the carcinogenic risk under DTSC assumptions is above the

risk management range. The carcinogenic risk is driven by chromium. However, as indicated below, the carcinogenic risk attributed to chromium detected in soil at IR Site 23 is based on the assumption that chromium is entirely in the hexavalent form, an assumption that is not supported by sampling data. Most chromium at IR Site 23 is believed to be in the trivalent form, which is the noncarcinogenic and less toxic form. Therefore, risks from chromium are overestimated for all receptors at IR Site 23. Benzo(a)pyrene also contributes to the risk under DTSC assumptions, and vinyl chloride also contributes to the risk under Navy assumptions through the inhalation of vapors in indoor air. However, vinyl chloride was not detected in soils at IR Site 23 and was only detected in groundwater at IR Sites 9 and 19. Therefore risks from vinyl chloride at IR Site 23 are not representative of actual site conditions.

The total noncarcinogenic HI for IR Site 23 under Navy and DTSC assumptions exceeds the target risk level HI of 1.0 and is driven by the risk of potential exposure to manganese in groundwater in the OU-2 Southeastern area as discussed in Section 6.4.1. The noncarcinogenic HI for soil at IR Site 23 under Navy and DTSC assumptions is below 1.0; therefore, the chemicals detected in soil at the site do not pose a significant noncarcinogenic health hazard.

The differences in calculated risk under Navy and DTSC assumptions are due to the following reasons.

- The difference in carcinogenic risk for vinyl chloride in groundwater under the two sets of assumptions results from the higher cancer slope factor (see Appendix D) for vinyl chloride in the EPA database. EPA assumptions for these estimates are updated regularly and used nationally.

- The difference in carcinogenic risk for soil for PAHs under the two sets of assumptions results from the higher cancer slope factors (see Appendix D) under DTSC assumptions and the fact that DTSC and EPA Region IX have different dermal assessment methodologies.

Using the Cal/EPA lead model, the estimated blood-lead levels at the 99th percentile of exposure for the normal and pica child were below the CDC level of concern of 10 μg/dL.

Soil Human Health Risk Management Considerations

Site-specific recommendations made at the end of this section are based on the site conditions and risk management considerations for soil discussed below.

- The carcinogenic risk posed by chromium concentrations in soil at IR Site 23 (1.0×10^{-4}) is less than the risk due to background concentrations at Alameda Point (1.3×10^{-4}) under DTSC assumptions.

- The carcinogenic risk calculated for chromium is based on the assumption that all chromium detected in the soil samples is the carcinogenic hexavalent form. The actual carcinogenic risk is expected to be substantially lower because a significant portion of chromium is expected to be present in the more stable, noncarcinogenic trivalent form.

- The carcinogenic risk posed by benzo(a)pyrene concentrations in soil at IR Site 23 (4.3×10^{-6}) is less than the ambient level at Alameda Point (2.7×10^{-5}) under DTSC assumptions.

Based on the site conditions discussed above, chromium and benzo(a)pyrene in soil at IR Site 23 are not considered for further evaluation.

A description of site conditions and risk management considerations for OU-2 Southeastern area groundwater is presented in Section 6.4.1. Groundwater at IR Site 23 is impacted by benzene and TPH.

Based on the risk management decisions discussed above and in Section 6.4.1, risks contributed by chemicals not considered further in soil and groundwater were subtracted from the total site risks to develop adjusted risks. The table below summarizes the adjusted risks and adjusted contributions to the risks posed by specific chemicals that contribute risks greater than 1×10^{-6}.

IR Site 23							
		Carcinogenic Risk			Noncarcinogenic Risk		
		Total RME Risk	Percent of Total Risk		Noncarcinogenic HI	Percent of Total HI	
		Residential	Chemical	%	Residential	Chemical	%
Navy Assumptions	Soil	6.9×10^{-7}	none > 10^{-6}		< 1	HI < 1	
	GW	2.6×10^{-4}	Pentachlorophenol Vinyl chloride Benzene	55 36 7	1.7	HI < 1	
	Total	2.6×10^{-4}			1.8		
DTSC Assumptions	Soil	1.4×10^{-6}	none > 10^{-6}		< 1	HI < 1	
	GW	1.2×10^{-4}	Benzene Pentachlorophenol 1,1-DCE Vinyl chloride PCE	50 18 16 12 1	1.7	HI < 1	
	Total	1.2×10^{-4}			1.8		

Notes:

Chemicals contributing less than 1 percent to the total risk are not included in the table even if the chemical's risk exceeds 1×10^{-6}

GW = Groundwater
PCE = Tetrachlorethylene
% = Percentage contribution of the chemical toward the total risk or hazard from exposure to soil or groundwater
< = Less than
> = Greater than

Soil Ecological Risk Assessment

No soil ecological COCs at IR Site 23 were identified because no chemical had an HQ exceeding 1.0. HQ_5 values were used to identify ecological COCs because this scenario is based on typical and most realistic daily doses for TRV comparison. HQs were calculated for the California ground squirrel and red-tailed hawk, which represent different trophic levels present at the site. The considerations below were used in the evaluation of ecological risk posed by chemical concentrations detected in soil at IR Site 23.

- The HQs for the California ground squirrel all soil chemicals are less than 1.0.
- The HQs for the red-tailed hawk for all soil chemicals are less than 1.0.
- Currently, IR Site 23 does not support a significant ecological habitat. The future ecological habitat potential at IR Site 23 is limited because preferred habitat is available at other locations at Alameda Point.

- The food-chain modeling used in the quantitative screening-level ERA overestimates current trophic transfer at the site. Because future use is anticipated to be urban, it is highly probable that the food-chain modeling also overestimates future trophic transfer at the site.

Based on the considerations above, chemicals in soil do not pose a risk to terrestrial ecological receptors at IR Site 23. Groundwater ERA results are presented for the OU-2 Southeastern area in Section 6.4.1.

Recommendations

IR Site 23 has been impacted by petroleum-related activities including operations of Navy fuel handling and storage and former activities related to the Pacific Coast Oil Works refinery. Contamination is primarily limited to petroleum-related compounds. Therefore, IR Site 23 will be further evaluated under the state's petroleum program. Future activities are summarized below.

- TPH contamination of soil at concentrations exceeding 1,000 mg/kg was found north of Building 530. This contamination will be evaluated as part of the TPH contamination found throughout IR Sites 13 and 22. Therefore, no action for soils at IR Site 23 is recommended.

- Groundwater contamination includes BTEX and TPH compounds. This contamination will be evaluated as part of the groundwater contamination found throughout IR Sites 13 and 22.

6.4.7 Summary of OU-2 Southeastern Area Conclusions and Recommendations

The OU-2 Southeastern area RI included a field investigation, identified the nature and extent of contamination, and provided HHRA and ERA results for IR Sites 9, 13, 19, 22 and 23 at Alameda Point. This section summarizes conclusions and recommendations for groundwater and soil in the OU-2 Southeastern area.

Groundwater contamination at IR Sites 13, 22, and 23 primarily consists of petroleum-related compounds, including benzene and TPH. Primary groundwater contamination at IR Sites 13, 22, and 23 includes benzene plumes in the south-central portion of IR Site 13 (trending west to IR Site 23). Another plume located at IR Site 22 extends into IR Site 13. Consistent with an operational history related to

petroleum storage, distribution, and use, the southern half of IR Site 13 and portions of IR Sites 22 and 23 appear to be underlain by overlapping TPH plumes that include motor oil, gasoline, and diesel fractions.

Groundwater beneath IR Site 9, a former paint stripping facility, contains detectable concentrations of chlorinated VOCs. Groundwater beneath IR Site 19, a former hazardous waste storage area contains sporadic detections of chlorinated VOCs. Chlorinated VOC contamination at Site 19 consists of residual hot spots of contamination, rather than distinct plumes existing at Site 9 and the OU-2 Eastern area sites.

Based on available data and information, the following recommendations are made for OU-2 Southeastern area groundwater.

- Groundwater underneath IR Sites 13, 22, and 23, impacted by petroleum constituents, is recommended for further consideration under the state's petroleum program.
- Groundwater underneath IR Sites 9 and 19, impacted by petroleum constituents and chlorinated VOCs, is recommended for further consideration under an FS.

Soil in the OU-2 Southeastern area has been impacted by historical operations of the Pacific Coast Oil Works refinery, contaminated dredged materials used as fill, and Navy petroleum-related operations. Based on available data and information, the following recommendations are made for soils in OU-2 Southeastern area IR sites:

- Soils at IR Sites 13, 19, and 22, impacted by high levels of TPH, are recommended for further consideration under the state's petroleum program.
- Soils at IR Sites 9 and 23 are recommended for no action. TPH contaminated soil north of Building 530 (IR Site 23) will be addressed through any actions taken at Site 13.

Recommendation Summary

The following table summarizes recommendations for OU-2 Southeastern area IR sites.

IR Site	Soil	Groundwater
9	No action recommended	Evaluate chlorinated VOCs associated with storm sewers east and west of Building 410 under an FS
13	Evaluate TPH contamination across the site under the state's petroleum program	Evaluate TPH and benzene contamination under the state's petroleum program
19	Evaluate TPH contamination in central and western portions of site adjacent to former refinery and fuel storage tanks under an FS	Evaluate TPH contamination and chlorinated VOCs located primarily in western and central portions of the site under an FS
22	Evaluate TPH and benzene contamination located south of Building 547 under the state's petroleum program	Evaluate TPH and benzene contamination under the state's petroleum program
23	No action recommended	Evaluate TPH and benzene contamination under the state's petroleum program

TABLES

DRAFT OU-2 REMEDIAL INVESTIGATION REPORT

DATED 29 JUNE 1999

TABLE 6-1
SUMMARY OF RI ACTIVITES
SITE 9, OU-2 SOUTHEAST AREA, ALAMEDA POINT

Period	Contractor	Activities	Chemical Groups Analyzed	Reference
1991 (CTO 121, Phases 1 and 2A)	PRC and James M. Montgomery	• Nine soil borings drilled • Four monitoring wells installed • Soil samples collected • Groundwater samples collected	• Soil: VOCs, SVOCs, metals, general chemical parameters • Groundwater: VOCs, SVOCs, metals, general chemical parameters	PRC and James M. Montgomery 1993a
1994 (CTO 280)	PRC and Montgomery Watson	• Cone penetrometer tests performed • Hydropunch® samples collected • Soil borings drilled • Soil samples collected collected • Two shallow monitoring wells installed • Non-point source sampling conducted • One deep monitoring well installed • One reference boring drilled • Quarterly groundwater sampling conducted • Industrial drain line inspected	• Soil: VOCs, SVOCs, TOC, metals • Groundwater: VOCs, SVOCs, TPHPRG, TPHEXT, metals, general chemical parameters, sulfides	PRC and Montgomery Watson 1995
1997-1998 (CTO 108)	PRC	• Quarterly groundwater sampling conducted • Tidal influence study performed	• Groundwater: VOCs, SVOCs, TPH, metals, cyanide, general chemical parameters	PRC 1997a Tetra Tech 12/7/98

Notes:

CTO	Contract Task Order
PRC	PRC Environmental Management, Inc.
RI	Remedial investigation
SVOC	Semivolatile organic compound
TOC	Total organic carbon
TPH	Total petroleum hydrocarbons
TPHEXT	Total petroleum hydrocarbons - extractable
TPHPRG	Total petroleum hydrocarbons - purgeable
VOC	Volatile organic compound

TABLE 6-2
SUBSURFACE SOIL SAMPLING SUMMARY
SITE 9, OU-2 SOUTHEAST AREA, ALAMEDA POINT

Sample Location	Sample Identification	Sample Depth (ft bgs)	Total Boring Depth (ft bgs)	Sampling Method	Date Sampled	Analyses Performed					
						SVOC	VOC	pH	% Moisture	TOC	Tmetals
Soil Boring Soil Samples											
1990 Investigation by Canonie											
MW410-1	MW410-01[0.5-1.0]	0.5 to 1.0	15.0	Split spoon	07/11/90	X					X
	MW410-01[1.0-1.5]	1.0 to 1.5		Split spoon	07/11/90					X	
	MW410-01[2.0-2.5]	2.0 to 2.5		Split spoon	07/11/90	X	X				
	MW410-01[3.0-3.5]	3.0 to 3.5		Split spoon	07/11/90			X			X
	MW410-01[5.5-6.0]	5.5 to 6.0		Split spoon	07/11/90	X	X				
	MW410-01[6.5-7.0]	6.5 to 7.0		Split spoon	07/11/90						X
	MW410-01[7.0-7.5]	7.0 to 7.5		Split spoon	07/11/90	X	X				
	MW410-01[7.5-8.0]	7.5 to 8.0		Split spoon	07/11/90						X
	MW410-01[8.0-8.5]	8.0 to 8.5		Split spoon	07/11/90						X
	MW410-01[11.0-11.5]	11.0 to 11.5		Split spoon	07/11/90	X	X				
	MW410-01[11.5-12.0]	11.5 to 12.0		Split spoon	07/11/90	X					
	MW410-01[12.5-13.0]	12.5 to 13.0		Split spoon	07/11/90						X
	MW410-01[14.0-14.5]	14.0 to 14.5		Split spoon	07/11/90	X	X				
	MW410-01[14.5-15.0]	14.5 to 15.0		Split spoon	07/11/90						X
MW410-2	MW410-2[1.5-2.0]	1.5 to 2.0	16.0	Split spoon	07/16/90	X					X
	MW410-2[2.0-2.5]	2.0 to 2.5		Split spoon	07/16/90					X	
	MW410-2[3.0-3.5]	3.0 to 3.5		Split spoon	07/16/90	X	X				
	MW410-2[3.5-4.0]	3.5 to 4.0		Split spoon	07/16/90			X			X
	MW410-2[6.0-6.5]	6.0 to 6.5		Split spoon	07/16/90	X	X				
	MW410-2[6.5-7.0]	6.5 to 7.0		Split spoon	07/16/90						X
	MW410-2[9.0-9.5]	9.0 to 9.5		Split spoon	07/16/90	X	X				
	MW410-2[9.5-10.0]	9.5 to 10.0		Split spoon	07/16/90						X
	MW410-2[12.0-12.5]	12.0 to 12.5		Split spoon	07/16/90	X	X				
	MW410-2[12.5-13.0]	12.5 to 13.0		Split spoon	07/16/90						X
	MW410-2[15.0-15.5]	15.0 to 15.5		Split spoon	07/16/90	X	X				

TABLE 6-2
SUBSURFACE SOIL SAMPLING SUMMARY
SITE 9, OU-2 SOUTHEAST AREA, ALAMEDA POINT

Sample Location	Sample Identification	Sample Depth (ft bgs)	Total Boring Depth (ft bgs)	Sampling Method	Date Sampled	Analyses Performed					
						SVOC	VOC	pH	% Moisture	TOC	Tmetals
Soil Boring Soil Samples (Continued)											
1990 Investigation by Canonie (Continued)											
	MW410-2[15.5-16.0]	15.5 to 16.0		Split spoon	07/16/90						X
MW410-3	MW410-3[1.0-1.5]	1.0 to 1.5	15.5	Split spoon	07/12/90	X					X
	MW410-3[1.5-2.0]	1.5 to 2.0		Split spoon	07/12/90					X	
	MW410-3[3.0-3.5]	3.0 to 3.5		Split spoon	07/12/90	X	X				
	MW410-3[4.0-4.5]	4.0 to 4.5		Split spoon	07/12/90			X			X
	MW410-3[5.5-6.0]	5.5 to 6.0		Split spoon	07/12/90	X	X				
	MW410-3[6.0-6.5]	6.0 to 6.5		Split spoon	07/12/90						X
	MW410-3[8.5-9.0]	8.5 to 9.0		Split spoon	07/12/90	X	X				
	MW410-3[9.0-9.5]	9.0 to 9.5		Split spoon	07/12/90						X
	MW410-3[11.5-12.0]	11.5 to 12.0		Split spoon	07/12/90	X	X				
	MW410-3[12.0-12.5]	12.0 to 12.5		Split spoon	07/12/90						X
	MW410-3[14.5-15.0]	14.5 to 15.0		Split spoon	07/12/90	X	X				
	MW410-3[15.0-15.5]	15.0 to 15.5		Split spoon	07/12/90						X
MW410-4	MW410-4[1.0-1.5]	1.0 to 1.5	15.5	Split spoon	07/12/90	X					X
	MW410-4[2.5-3.0]	2.5 to 3.0		Split spoon	07/12/90					X	
	MW410-4[3.0-3.5]	3.0 to 3.5		Split spoon	07/12/90	X	X				
	MW410-4[4.0-4.5]	4.0 to 4.5		Split spoon	07/12/90			X			X
	MW410-4[5.5-6.0]	5.5 to 6.0		Split spoon	07/12/90	X	X				
	MW410-4[6.0-6.5]	6.0 to 6.5		Split spoon	07/12/90						X
	MW410-4[8.5-9.0]	8.5 to 9.0		Split spoon	07/12/90	X	X				
	MW410-4[9.0-9.5]	9.0 to 9.5		Split spoon	07/12/90						X
	MW410-4[11.5-12.0]	11.5 to 12.0		Split spoon	07/12/90	X	X				
	MW410-4[12.0-12.5]	12.0 to 12.5		Split spoon	07/12/90						X
	MW410-4[14.5-15.0]	14.5 to 15.0		Split spoon	07/12/90	X	X				
	MW410-4[15.0-15.5]	15.0 to 15.5		Split spoon	07/12/90						X

TABLE 6-2
SUBSURFACE SOIL SAMPLING SUMMARY
SITE 9, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 3 of 6)

Sample Location	Sample Identification	Sample Depth (ft bgs)	Total Boring Depth (ft bgs)	Sampling Method	Date Sampled	Analyses Performed					
						SVOC	VOC	pH	% Moisture	TOC	Tmetals
Soil Boring Soil Samples (Continued)											
1990 Investigation by Canonie (Continued)											
B410-5	B410-5[0.5-1.0]	0.5 to 1.0	15.0	Split spoon	07/11/90	X					X
	B410-5[1.0-1.5]	1.0 to 1.5		Split spoon	07/11/90					X	
	B410-5[2.0-2.5]	2.0 to 2.5		Split spoon	07/11/90	X	X				
	B410-5[2.5-3.0]	2.5 to 3.0		Split spoon	07/11/90			X			X
	B410-5[5.0-5.5]	5.0 to 5.5		Split spoon	07/11/90	X	X				
	B410-5[5.5-6.0]	5.5 to 6.0		Split spoon	07/11/90						X
	B410-5[8.0-8.5]	8.0 to 8.5		Split spoon	07/11/90	X	X				
	B410-5[8.5-9.0]	8.5 to 9.0		Split spoon	07/11/90						X
	B410-5[10.5-11.0]	10.5 to 11.0		Split spoon	07/11/90	X	X				
	B410-5[11.0-11.5]	11.0 to 11.5		Split spoon	07/11/90	X					X
	B410-5[11.5-12.0]	11.5 to 12.0		Split spoon	07/11/90						X
	B410-5[14.0-14.5]	14.0 to 14.5		Split spoon	07/11/90	X	X				
	B410-5[14.5-15.0]	14.5 to 15.0		Split spoon	07/11/90						X
B410-6	B410-6[0.5-1.0]	0.5 to 1.0	15.0	Split spoon	07/11/90	X					X
	B410-6[1.0-1.5]	1.0 to 1.5		Split spoon	07/11/90					X	
	B410-6[2.0-2.5]	2.0 to 2.5		Split spoon	07/11/90	X	X				
	B410-6[3.5-4.0]	3.5 to 4.0		Split spoon	07/11/90			X			X
	B410-6[4.0-4.5]	4.0 to 4.5		Split spoon	07/11/90						X
	B410-6[5.5-6.0]	5.5 to 6.0		Split spoon	07/11/90	X	X				
	B410-6[8.0-8.5]	8.0 to 8.5		Split spoon	07/11/90						X
	B410-6[8.5-9.0]	8.5 to 9.0		Split spoon	07/11/90	X	X				
	B410-6[10.0-10.5]	10.0 to 10.5		Split spoon	07/11/90						X
	B410-6[11.0-11.5]	11.0 to 11.5		Split spoon	07/11/90	X	X				
	B410-6[11.5-12.0]	11.5 to 12.0		Split spoon	07/11/90	X					
	B410-6[12.5-13.0]	12.5 to 13.0		Split spoon	07/11/90						X

TABLE 6-2
SUBSURFACE SOIL SAMPLING SUMMARY
SITE 9, OU-2 SOUTHEAST AREA, ALAMEDA POINT

Sample Location	Sample Identification	Sample Depth (ft bgs)	Total Boring Depth (ft bgs)	Sampling Method	Date Sampled	Analyses Performed					
						SVOC	VOC	pH	% Moisture	TOC	Tmetals
Soil Boring Soil Sample (Continued)											
1990 Investigation by Canonie (Continued)											
	B410-6[13.0-13.5]	13.0 to 13.5		Split spoon	07/11/90	X	X				
	B410-6[14.5-15.0]	14.5 to 15.0		Split spoon	07/11/90						X
B410-7	B410-7[1.0-1.5]	1.0 to 1.5	15.5	Split spoon	07/12/90	X					X
	B410-7[2.5-3.0]	2.5 to 3.0		Split spoon	07/12/90	X	X				
	B410-7[3.0-3.5]	3.0 to 3.5		Split spoon	07/12/90			X			X
	B410-7[4.0-4.5]	4.0 to 4.5		Split spoon	07/12/90					X	
	B410-7[5.5-6.0]	5.5 to 6.0		Split spoon	07/12/90	X	X				
	B410-7[6.0-6.5]	6.0 to 6.5		Split spoon	07/12/90						X
	B410-7[8.5-9.0]	8.5 to 9.0		Split spoon	07/12/90	X	X				
	B410-7[9.0-9.5]	9.0 to 9.5		Split spoon	07/12/90						X
	B410-7[11.0-11.5]	11.0 to 11.5		Split spoon	07/12/90	X	X				
	B410-7[11.5-12.0]	11.5 to 12.0		Split spoon	07/12/90						X
	B410-7[14.5-15.0]	14.5 to 15.0		Split spoon	07/12/90	X	X				
	B410-7[15.0-15.5]	15.0 to 15.5		Split spoon	07/12/90						X
B410-8	B410-8[1.0-1.5]	1.0 to 1.5	9.5	Split spoon	07/11/90	X					X
	B410-8[1.5-2.0]	1.5 to 2.0		Split spoon	07/11/90					X	
	B410-8[2.5-3.0]	2.5 to 3.0		Split spoon	07/11/90	X	X				
	B410-8[3.0-3.5]	3.0 to 3.5		Split spoon	07/11/90			X			X
	B410-8[4.0-4.5]	4.0 to 4.5		Split spoon	07/11/90	X	X				
	B410-8[4.5-5.0]	4.5 to 5.0		Split spoon	07/11/90						X
	B410-8[5.5-6.0]	5.5to 6.0		Split spoon	07/11/90	X	X				
	B410-8[6.0-6.5]	6.0 to 6.5		Split spoon	07/11/90						X
	B410-8[7.0-7.5]	7.0 to 7.5		Split spoon	07/11/90	X	X				
	B410-8[7.5-8.0]	7.5 to 8.0		Split spoon	07/11/90						X
	B410-8[8.5-9.0]	8.5 to 9.0		Split spoon	07/11/90	X	X				

TABLE 6-2
SUBSURFACE SOIL SAMPLING SUMMARY
SITE 9, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 5 of 6)

Sample Location	Sample Identification	Sample Depth (ft bgs)	Total Boring Depth (ft bgs)	Sampling Method	Date Sampled	Analyses Performed					
						SVOC	VOC	pH	% Moisture	TOC	Tmetals
Soil Boring Soil Samples (Continued)											
1990 Investigation by Canonie (Continued)											
	B410-8[9.0-9.5]	9.0 to 9.5		Split spoon	07/11/90						X
B410-9	B410-9-[1.0-1.5]	1.0 to 1.5	15.5	Split spoon	07/12/90	X					X
	B410-9[1.5-2.0]	1.5 to 2.0		Split spoon	07/12/90					X	
	B410-9[2.5-3.0]	2.5 to 3.0		Split spoon	07/12/90	X	X				
	B410-9[3.0-3.5]	3.0 to 3.5		Split spoon	07/12/90			X			X
	B410-9[5.5-6.0]	5.5 to 6.0		Split spoon	07/12/90	X	X				
	B410-9[6.0-6.5]	6.0 to 6.5		Split spoon	07/12/90						X
	B410-9[8.5-9.0]	8.5 to 9.0		Split spoon	07/12/90	X	X				
	B410-9[9.0-9.5]	9.0 to 9.5		Split spoon	07/12/90						X
	B410-9[11.5-12.0]	11.5 to 12.0		Split spoon	07/12/90	X	X				
	B410-9[12.0-12.5]	12.0 to 12.5		Split spoon	07/12/90						X
	B410-9[14.5-15.0]	14.5 to 15.0		Split spoon	07/12/90	X	X				
	B410-9[15.0-15.5]	15.0 to 15.5		Split spoon	07/12/90						X
1994-1995 Investigation by PRC and Montgomery Watson											
M09-05	280-S09-001	1.5 to 2.5	14.0	Split spoon	11/05/94		X	X	X		X
	280-S09-002	3.0 to 4.0		Split spoon	11/05/94		X	X	X		X
	280-S09-003	5.0 to 6.0		Split spoon	11/05/94		X	X	X		X
M09-06	280-S09-167	1.0 to 2.0	14.0	Split spoon	11/05/94		X	X	X		X
	280-S09-168	2.5 to 3.5		Split spoon	11/05/94		X	X	X		X
	280-S09-169	5.5 to 6.5		Split spoon	11/05/94		X	X	X		X
CPT Location Soil Samples											
1994-1995 Investigation by PRC and Montgomery Watson											
CPT-S09-05	280-S09-004	0.0 to 0.5	5.2	Hand auger	09/08/94		X	X	X		X
	280-S09-005	2.5 to 3.0		Hand auger	09/08/94		X	X	X	X	X

TABLE 6-2
SUBSURFACE SOIL SAMPLING SUMMARY
SITE 9, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 6 of 6)

Sample Location	Sample Identification	Sample Depth (ft bgs)	Total Boring Depth (ft bgs)	Sampling Method	Date Sampled	Analyses Performed					
						SVOC	VOC	pH	% Moisture	TOC	Tmetals
CPT Location Soil Samples (Continued)											
1994-1995 Investigation by PRC and Montgomery Watson (Continued)											
	280-S09-006	4.7 to 5.2		Hand auger	09/08/94		X	X	X		X
CPT-S09-06	280-S09-007	0.0 to 0.5	5.2	Hand auger	09/08/94		X	X	X		X
	280-S09-008	2.5 to 3.0		Hand auger	09/08/94		X	X	X		X
	280-S09-009	4.7 to 5.2		Hand auger	09/08/94		X	X	X		X
CPT-S09-07	280-S09-010	0.0 to 0.5	5.5	Hand auger	09/07/94		X	X	X		X
	280-S09-011	2.5 to 3.0		Hand auger	09/07/94		X	X	X		X
	280-S09-012	5.0 to 5.5		Hand auger	09/07/94		X	X	X		X
CPT-S09-08	280-S09-013	0.0 to 0.5	5.5	Hand auger	09/08/94		X	X	X		X
	280-S09-014	2.5 to 3.0		Hand auger	09/08/94		X	X	X		X
	280-S09-015	5.0 to 5.5		Hand auger	09/08/94		X	X	X		X
CPT-S09-09	280-S09-016	0.0 to 1.5	5.5	Hand auger	09/07/94		X	X	X		X
	280-S09-017	2.5 to 3.0		Hand auger	09/07/94		X	X	X		X
	280-S09-018	5.0 to 5.5		Hand auger	09/07/94		X	X	X		X
CPT-S09-10	280-S09-019	0.0 to 0.5	5.5	Hand auger	09/09/94		X	X	X		X
	280-S09-020	2.5 to 3.0		Hand auger	09/09/94		X	X	X	X	X
	280-S09-021	5.0 to 5.5		Hand auger	09/09/94		X	X	X		X

Notes:

ft bgs	Feet below ground surface	VOC	Volatile organic compounds
CPT	Cone penetrometer test	CPT	Pentrometer test
PRC	PRC Environmental Management, Inc.		
SVOC	Semivolatile organic compounds		
TMetals	Total metals		
TOC	Total organic carbon		

TABLE 6-3
GEOTECHNICAL SOIL SAMPLING SUMMARY
SITE 9, OU-2 SOUTHEAST AREA, ALAMEDA POINT

Sample Location	Sample Identification	Sample Depth (ft bgs)	Sampling Method	Date Sampled	Analyses Performed						
					Moisture Content	Dry Density	Wet Density	Grain Size Distribution	Permeability	Specific Gravity	Consolidation
MW410-1	MW410-1(2.5 - 3.0)	2.5	California sampler	07/11/90						X	
	MW410-1(3.5 - 4.0)	3.5	California sampler	07/11/90	X	X	X				X [(a)]
	MW410-1(9.5 - 10.0)	9.5	California sampler	07/11/90				X			
MW410-2	MW410-2(10.5 - 11.0)	10.5	California sampler	07/16/90				X			
	MW410-2(11.5 - 12.0)	11.0	California sampler	07/16/90	X	X	X				
MW410-3	MW410-3(4.5 - 5.0)	4.5	California sampler	07/12/90				X			
	MW410-3(7.0 - 7.5)	7.0	California sampler	07/12/90	X	X	X				
MW410-4	MW410-4(0.5 - 1.0)	0.5	California sampler	07/12/90	X	X	X				
	MW410-4(13.5 - 14.0)	13.5	California sampler	07/12/90				X			
B410-5	B410-5(3.5 - 4.0)	3.5	California sampler	07/11/90				X			
	B410-5(4.0 - 4.5)	4.0	California sampler	07/11/90	X	X	X				
B410-6	B410-6(2.5 - 3.0)	2.5	California sampler	07/11/90				X			
B410-7	B410-7(10.0 - 10.5)	10.0	California sampler	07/12/90	X	X	X		X [(b)]		

Notes:

(a) Moisture content, dry density, and wet density were determined for consolidation test.
(b) Moisture content, dry density, and wet density were determined for permeability test.
ft bgs Feet below ground surface

TABLE 6-4
MONITORING WELL CONSTRUCTION DETAILS
SITE 9, OU-2 SOUTHEAST AREA, ALAMEDA POINT

Well Identification	Screen Interval (ft below TOC)	Hydrostratigraphic Unit of Screen Interval	Top of Casing Elevation (ft MLLW)	Total Borehole Depth (ft bgs)	Total Well Depth (ft bgs)	Well Diameter (inches)	Blank Casing Interval (ft below TOC)	Filter Interval (ft below TOC)	Bentonite Seal Interval (ft below TOC)	Cement Grout Interval (ft below TOC)
MW410-1	5-15	FWBZU	12.83	15	15	2	0-5	4.5-15	3-4.5	0-3
MW410-2	5-15	FWBZU	13.57	15	15	2	0-5	4.5-15	3-4.5	0-3
MW410-3	5-15	FWBZU	12.19	15	15	2	0-5	4.5-15	3-4.5	0-3
MW410-4	5-15	FWBZU	12.74	15	15	2	0-5	4.5-15	3-4.5	0-3
M09-05	3.5-13.5	FWBZU	13.41	14	13.5	2	0-3.5	3-14	2-3	0-2
M09-06	4-14	FWBZU	13.66	14	14	2	0-4	3.5-14	2.5-3.5	0-2.5
D09-01	50-60	FWBZL	13.92	61	60.5	3	0-50	46.6-61	44.3-46.6	0-44.3

Notes:

bgs	Below ground surface
ft	feet
FWBZL	First water-bearing zone lower
FWBZU	First water-bearing zone upper
MLLW	Mean lower low water
TOC	Top of casing

TABLE 6-5
GROUNDWATER SAMPLING SUMMARY
SITE 9, OU-2 SOUTHEAST AREA, ALAMEDA POINT [a]
(Page 1 of 4)

Sample Location	Sample Identification	Sample Depth (ft bgs or ft below top of casing) [b]	Hydrostratigraphic Unit Where Sample Was Collected	Sampling Method	Date Sampled	Analyses Performed								
						VOC	SVOC	TMetals	DMetals	TPHPRG	TPHEXT	General Chemicals	Sulfide	MBAS
Hydropunch® Groundwater Samples														
1994 - 1995 Investigation by PRC and Montgomery Waston														
DHP-S09-01	280-S09-053	25.8	FWBZU	HPS	07/28/94	X	X		X			X		
DHP-S09-02	280-S09-054	30.0	SWBZU	HPS	07/28/94	X	X		X			X		
DHP-S09-03	280-S09-055	24.0	FMSU	HPS	07/29/94	X	X		X			X	X	
DHP-S09-04	280-S09-056	22.0	FWBZU	HPS	08/26/94	X	X		X			X		
SHP-S09-05	280-S09-057	10.0	FWBZU	HPS	08/24/94	X	X		X			X		
DHP-S09-05	280-S09-058	26.0	SWBZU	HPS	08/23/94	X	X		X			X		
DHP-S09-06	280-S09-059	11.0	FWBZL	HPS	09/08/94	X	X		X			X		
SHP-S09-07	280-S09-061	11.0	FWBZL	HPS	09/07/94	X	X		X			X		
DHP-S09-07	280-S09-062	24.0	SWBZU	HPS	09/07/94	X	X		X			X		
SHP-S09-08	280-S09-063	11.0	FWBZU	HPS	09/09/94	X	X		X			X		
DHP-S09-08	280-S09-064	24.0	FWBZU	HPS	09/06/94	X	X		X			X		
SHP-S09-09	280-S09-065	11.0	FWBZL	HPS	09/08/94	X	X		X			X		
DHP-S09-09	280-S09-066	25.0	SWBZU	HPS	09/12/94	X	X		X			X		
SHP-S09-10	280-S09-067	11.0	FWBZL	HPS	09/06/94	X	X		X			X [c]		
DHP-S09-10	280-S09-068	30.0	FWBZU	HPS	09/09/94	X	X		X			X		
SHP-S09-11	280-S09-093	15.0	BSU	HPS	08/25/94	X	X		X			X		
DHP-S09-11	280-S09-094	24.0	FWBZU	HPS	08/25/94	X	X		X			X		

TABLE 6-5
GROUNDWATER SAMPLING SUMMARY
SITE 9, OU-2 SOUTHEAST AREA, ALAMEDA POINT [a]
(Page 2 of 4)

Sample Location	Sample Identification	Sample Depth (ft bgs or ft below top of casing) [b]	Hydrostratigraphic Unit Where Sample Was Collected	Sampling Method	Date Sampled	Analyses Performed								
						VOC	SVOC	TMetals	DMetals	TPHPRG	TPHEXT	General Chemicals	Sulfide	MBAS
Hydropunch® Groundwater Samples (Continued)														
1994 - 1995 Investigation by PRC and Montgomery Waston (Continued)														
SHP-S09-12	280-S09-095	8.0	FWBZL	HPS	08/24/94	X	X		X			X		
DHP-S09-12	280-S09-096	26.0	FWBZU	HPS	08/25/94	X	X		X			X		
Monitoring Well Groundwater Samples														
1990 Investigation by Canonie														
MW410-1	MW410-1[08/21/90]	5.0 to 15.0	FWBZU	Bailer	08/21/90	X	X		X			X		X
MW410-2	MW410-2[08/22/90]	5.0 to 15.0	FWBZU	Bailer	08/22/90	X	X		X			X		X
MW410-3	MW410-3[08/21/90]	5.0 to 15.0	FWBZU	Bailer	08/21/90	X	X		X			X		X
MW410-4	MW410-4[08/22/90]	5.0 to 15.0	FWBZU	Bailer	08/22/90	X	X		X			X		X
1994 - 1995 Investigation by PRC and Montgomery Waston [d]														
MW410-1	280-S09-026	5.0 to 15.0	FWBZU	Bailer	10/18/94	X	X		X	X	X	X		X
	280-S09-028			Bailer	06/23/95	X	X	X	X	X	X	X	X	X
(duplicate)	280-S09-029			Bailer	06/23/95	X	X	X	X	X	X	X	X	X
	280-S09-030			Bailer	08/08/95	X	X		X	X	X	X	X	X
MW410-2	280-S09-031	5.0 to 15.0	FWBZU	Bailer	10/18/94	X	X		X	X	X	X		
	280-S09-032			Bailer	02/21/95	X	X		X	X	X	X		
	280-S09-033			Bailer	06/22/95	X	X		X	X	X	X		
	280-S09-034			Bailer	08/04/95	X	X		X	X	X	X		

TABLE 6-5
GROUNDWATER SAMPLING SUMMARY
SITE 9, OU-2 SOUTHEAST AREA, ALAMEDA POINT [a]
(Page 3 of 4)

Sample Location	Sample Identification	Sample Depth (ft bgs or ft below top of casing) [b]	Hydrostratigraphic Unit Where Sample Was Collected	Sampling Method	Date Sampled	Analyses Performed								
						VOC	SVOC	TMetals	DMetals	TPHPRG	TPHEXT	General Chemicals	Sulfide	MBAS
Monitoring Well Groundwater Samples (Continued)														
1994 - 1995 Investigation by PRC and Montgomery Waston (Continued)[d]														
MW410-3	280-S09-036	5.0 to 15.0	FWBZU	Bailer	10/18/94	X	X		X	X	X	X		
	280-S09-037			Bailer	02/21/95	X	X		X	X	X	X		
	280-S09-038			Bailer	06/22/95	X	X		X	X	X	X		
	280-S09-038			Bailer	06/23/95			X						
	280-S09-039			Bailer	08/07/95	X	X		X	X	X	X		
MW410-4	280-S09-040	5.0 to 15.0	FWBZU	Bailer	10/19/94	X	X		X	X	X	X		
	280-S09-041			Bailer	02/21/95	X	X		X	X	X	X		
	280-S09-042			Bailer	06/23/95	X	X		X	X	X	X		X
	280-S09-043			Bailer	08/07/95	X	X		X	X	X	X		
M09-05	280-S09-044	3.5 to 13.0	FWBZU	Bailer	11/30/94	X	X		X	X	X	X		
(duplicate)	280-S09-045			Bailer	11/30/94	X	X		X	X	X	X		
	280-S09-046			Bailer	02/21/95	X	X		X	X	X	X		
	280-S09-047			Bailer	06/21/95	X	X		X	X	X	X		
	280-S09-048			Bailer	08/07/95	X	X		X	X	X	X		
M09-06	280-S09-049	4.0 to 14.0	FWBZU	Bailer	11/30/94	X	X		X	X	X	X		
	280S-09-050			Bailer	02/21/95	X	X		X	X	X	X		
	280-S09-051			Bailer	06/22/95	X	X		X	X	X	X		
	280-S09-052			Bailer	08/08/95	X	X		X	X	X	X		

TABLE 6-5
GROUNDWATER SAMPLING SUMMARY
SITE 9, OU-2 SOUTHEAST AREA, ALAMEDA POINT [a]
(Page 4 of 4)

Sample Location	Sample Identification	Sample Depth (ft bgs or ft below top of casing) [b]	Hydrostratigraphic Unit Where Sample Was Collected	Sampling Method	Date Sampled	Analyses Performed								
						VOC	SVOC	TMetals	DMetals	TPHPRG	TPHEXT	General Chemicals	Sulfide	MBAS
Monitoring Well Groundwater Samples (Continued)														
1994 - 1995 Investigation by PRC and Montgomery Waston (Continued)[d]														
D09-01	280-S09-100	50.0 to 60.0	FWBZU	Bailer	12/20/94	X	X		X	X	X	X		
	280-S09-107			Bailer	02/21/95	X	X		X	X		X		
	280-S09-108			Bailer	06/22/95	X	X		X			X		
	280-S09-109			Bailer	09/14/95	X	X		X			X		

Notes:

(a) This table summarizes groundwater sampling activities at Site 9 for only CTO 121 and CTO 280. Information for CTO 108 is summarized in the "Data Summary Report for Quarterly Groundwater Monitoring, November 1997 - August 1998," dated December 7, 1998, and prepared by Tetra Tech EM Inc., and Uribe & Associates.

(b) Sample depth for groundwater samples from monitoring wells measured in feet below top of casing (refer to Table 6-4 for monitoring well construction details). Sample depth for Hydropunch® groundwater samples measured in feet below ground surface.

(c) Sample number 280-S09-067 was only analyzed for TOC, not all general chemicals.

(d) Groundwater samples were collected during four quarterly sampling events.

bgs	Below ground surface
BSU	Bay Sediments Unit
DMetals	Dissolved metals
HPS	Hydropunch® sampler
TMetals	Total metals
TOC	Total organic carbon
TPHEXT	Total petroleum hydrocarbon-extractable
TPHPRG	Total petroleum hydrocarbon-purgeable
VOC	Volatile organic compounds
FWBZL	First water-bearing zone lower
FWBZU	First water-bearing zone upper
MBAS	Methylene-blue acting substance
Pest/PCB	Pesticides and polychlorinated biphenyls
PRC	PRC Environmental Management, Inc.
SVOC	Semivolatile organic compound
SWBZU	Second water-bearing zone upper

TABLE 6-6
GEOTECHNICAL SAMPLE LABORATORY TEST RESULTS
SITE 9, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 1 of 2)

Sample Number	Sample Depth (ft bgs)	Soil Classification [a] [b]		Stratigraphic Unit	Geotechnical Test Results [a]				
								Permeability	
		Laboratory	Field		Moisture Content (%)	Dry Density (pcf)	Specific Gravity	Effective Stresses (psi)	Hydraulic Conductivity (cm/s)
1990 Investigation by Canonie (Phases 1 and 2A)									
MW410-1	2.5	SP	SM	Fill	NA	NA	2.7	NA	NA
MW410-1	7	SP	SM	Fill	12.9	109.7	NA	NA	NA
MW410-1	9.5	SP/SM	SM	Fill	NA	NA	NA	NA	NA
MW410-2	10.5	SP/SM	SM	Fill	NA	NA	NA	NA	NA
MW410-2	11	SP	SM	Fill	20	106.8	NA	NA	NA
MW410-3	4.5	SP	SM	Fill	NA	NA	NA	NA	NA
MW410-4	0.5	GP	SM	Fill	5.6	127.1	NA	NA	NA
MW410-4	13.5	SM	SC	HBM	NA	NA	NA	NA	NA
B410-5	4	SP	SM	Fill	5.1	102.6	NA	NA	NA
B410-6	2.5	SP	SM	Fill	NA	NA	NA	NA	NA
B410-7	10	SC	CL	HBM	41.1	79.5	NA	NA	5.00E-08

Notes:

(a) Samples were classified or analyzed using the following methods:
Soil classification, Unified Soil Classification System ASTM D2488
Moisure Content ASTM D2216
Dry Density ASTM D2937
Specific Gravity ASTM D854
Effective Stress EPA 9100
Hydraulic Conductivity EPA 9100

(b) Soil classification legend is as follows:

GP	Poorly graded gravels, gravel-sand mistures, little or no fines
SP	Poorly-graded sands, graelly sands, little or no fines
SM	Silty sands, sand-silt mixtures
SC	Clayey sands, sand-clay mixtures
CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays

TABLE 6-6
GEOTECHNICAL SAMPLE LABORATORY TEST RESULTS
SITE 9, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 2 of 2)

Notes (Continued):

%	Percent
CEC	Cation exchange
cm/s	Centimeters per second
ft bgs	Feet below ground surface
HBM	Holocene Bay Mud (Bay Sediments Unit)
meq/100g	Milliequivalents per 100 grams
NA	Not analyzed
pcf	Pounds per cubic foot
psi	Pounds per square inch
TOC	Total organic carbon

TABLE 6-7
SOIL ANALYTICAL DATA SUMMARY (0 FEET TO < 2 FEET BGS)
SITE 9, OU-2 SOUTHEAST AREA, ALAMEDA POINT

Chemical	Total Samples	Samples Detections	Frequency Detections (%)	Reporting Limits (mg/kg)		Data Summary Statistics (mg/kg)		Detected Concentrations (mg/kg)	
				Minimum	Maximum	Mean	Standard Deviation	Minimum	Maximum
Volatile Organic Compounds									
1,2-Dichloroethene (total)	7	2	28.6	0.01	0.12	0.03	0.05	0.001	0.13
Ethylbenzene	7	1	14.3	0.01	0.12	0.04	0.07	0.20	0.20
Toluene	7	1	14.3	0.01	0.12	0.02	0.02	0.05	0.05
Xylene (total)	7	2	28.6	0.01	0.12	0.46	1.17	0.002	3.10
Semivolatile Organic Compounds									
n-Nitrosodiphenylamine (1)	4	2	50.0	0.34	0.72	0.21	0.17	0.04	0.09
Inorganic Compounds									
Aluminum	11	11	100.0	5.60	21.00	4521.82	1216.35	3260.00	7680.00
Arsenic	11	3	27.3	0.52	11.00	2.01	2.12	0.85	4.20
Barium	11	11	100.0	1.70	21.00	67.61	45.63	24.40	153.00
Beryllium	11	8	72.7	0.22	1.10	0.53	0.31	0.09	0.92
Cadmium	11	4	36.4	0.06	1.10	0.22	0.21	0.11	0.49
Calcium	11	11	100.0	3.60	530.00	5738.18	2733.34	2300.00	10400.00
Chromium	11	11	100.0	0.08	5.30	44.47	26.81	24.10	110.00
Cobalt	11	4	36.4	1.30	6.50	3.95	2.58	3.60	11.30
Copper	11	10	90.9	0.40	5.50	9.56	9.04	5.20	36.00
Iron	11	11	100.0	1.30	11.00	7988.18	2312.90	6260.00	14500.00
Lead	11	7	63.6	0.24	5.30	3.27	1.75	1.30	6.80
Magnesium	11	11	100.0	7.30	530.00	2206.36	675.22	1700.00	4170.00
Manganese	11	11	100.0	0.24	5.30	97.48	24.85	68.00	163.00
Nickel	11	11	100.0	1.90	5.30	24.23	7.99	17.80	46.10
Potassium	11	11	100.0	71.20	530.00	780.91	476.81	390.00	2170.00
Silver	11	1	9.1	0.18	5.30	0.64	0.99	0.38	0.38
Sodium	11	9	81.8	2.30	530.00	211.16	77.72	82.70	341.00
Titanium	4	4	100.0	5.20	5.30	337.50	58.30	281.00	419.00
Vanadium	11	11	100.0	1.40	5.30	20.56	5.93	14.80	35.40
Zinc	11	11	100.0	0.80	5.30	23.76	8.25	17.90	40.00

Notes:

%	Percent
<	Less than
bgs	Below ground surface
mg/kg	Milligram per kilogram

TABLE 6-8
SOIL ANALYTICAL DATA SUMMARY (2 FEET TO 10 FEET BGS)
SITE 9, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 1 of 2)

Chemical	Total Samples	Samples Detections	Frequency Detections (%)	Reporting Limit (mg/kg)		Data Summary Statistics (mg/kg)		Detected Concentrations (mg/kg)	
				Minimum	Maximum	Mean	Standard Deviation	Minimum	Maximum
Volatile Organic Compounds									
1,2-Dichloroethene (total)	29	3	10.3	0.01	0.06	0.01	0.01	0.003	0.004
2-Butanone	28	1	3.6	0.01	0.06	0.01	0.01	0.01	0.01
Ethylbenzene	28	2	7.1	0.01	0.06	0.01	0.03	0.002	0.16
Tetrachloroethene	28	1	3.6	0.01	0.06	0.01	0.01	0.001	0.001
Toluene	29	16	55.2	0.01	0.06	0.04	0.13	0.002	0.73
Xylene (total)	28	7	25.0	0.01	0.03	0.14	0.55	0.03	2.90
Semivolatile Organic Compounds									
4-Chloro-3-Methylphenol	15	1	6.7	0.34	0.73	0.21	0.08	0.04	0.04
n-Nitrosodiphenylamine (1)	15	11	73.3	0.34	0.73	0.12	0.12	0.04	0.07
Naphthalene	15	2	13.3	0.34	0.73	0.20	0.10	0.04	0.04
Pentachlorophenol	15	1	6.7	1.60	3.50	0.98	0.32	0.43	0.43
Phenol	15	1	6.7	0.34	0.73	0.21	0.08	0.04	0.04
Pyrene	15	1	6.7	0.34	0.73	0.20	0.07	0.10	0.10
Inorganic Compounds									
Aluminum	29	29	100.0	5.60	24.00	4191.38	1941.94	2950.00	13900.00
Antimony	29	2	6.9	0.46	7.20	1.53	1.26	0.47	1.20
Arsenic	29	9	31.0	0.52	12.00	2.58	2.16	1.30	4.30
Barium	29	29	100.0	1.70	24.00	46.03	46.52	17.30	266.00
Beryllium	29	19	65.5	0.21	1.20	0.49	0.35	0.09	1.50
Cadmium	29	5	17.2	0.08	1.20	0.23	0.22	0.22	0.30
Calcium	29	29	100.0	3.60	600.00	3971.72	3854.97	1340.00	16800.00
Chromium	29	29	100.0	0.08	6.00	33.59	28.74	19.00	178.00
Cobalt	29	11	37.9	1.30	6.50	4.11	3.97	3.70	23.00
Copper	29	26	89.7	0.40	6.20	6.65	3.94	4.10	23.00
Iron	29	29	100.0	1.30	12.00	7328.62	2972.09	5370.00	21500.00
Lead	29	13	44.8	0.24	6.00	3.49	4.03	1.60	22.20
Magnesium	29	28	96.6	7.30	600.00	1965.52	704.84	1600.00	5100.00

TABLE 6-8
SOIL ANALYTICAL DATA SUMMARY (2 FEET TO 10 FEET BGS)
SITE 9, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 2 of 2)

Chemical	Total Samples	Samples Detections	Frequency Detections (%)	Reporting Limit (mg/kg)		Data Summary Statistics (mg/kg)		Detected Concentrations (mg/kg)	
				Minimum	Maximum	Mean	Standard Deviation	Minimum	Maximum
Inorganic Compounds (Continued)									
Manganese	29	29	100.0	0.24	6.00	84.68	23.26	62.50	182.00
Nickel	29	29	100.0	1.90	6.00	21.21	6.15	17.00	50.80
Potassium	29	26	89.7	71.20	600.00	657.45	321.27	455.00	2130.00
Sodium	29	21	72.4	2.30	600.00	230.18	111.05	68.00	478.00
Thallium	29	1	3.4	0.40	12.00	2.13	2.31	3.30	3.30
Titanium	15	15	100.0	5.20	6.00	338.07	50.04	249.00	428.00
Vanadium	29	29	100.0	1.40	6.00	17.93	5.45	12.70	42.30
Zinc	29	29	100.0	0.80	6.00	20.88	8.20	12.00	51.30

Notes:

%	Percent
bgs	Below ground surface
mg/kg	Milligram per kilogram

TABLE 6-9
SOIL ANALYTICAL DATA SUMMARY (>10 FEET BGS)
SITE 9, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 1 of 2)

Chemical	Total Samples	Samples Detections	Frequency Detections (%)	Reporting Limits (mg/kg)		Data Summary Statistics (mg/kg)		Detection Concentrations (mg/kg)	
				Minimum	Maximum	Mean	Standard Deviation	Minimum	Maximum
Volatile Organic Compounds									
Toluene	6	6	100.0	0.01	0.01	0.03	0.02	0.01	0.05
Semivolatile Organic Compounds									
Benzo(a)anthracene	8	3	37.5	0.40	1.10	0.21	0.11	0.07	0.18
Benzo(a)pyrene	8	3	37.5	0.40	1.10	0.26	0.08	0.17	0.29
Benzo(b)fluoranthene	8	4	50.0	0.40	1.10	0.24	0.11	0.09	0.40
Benzo(g,h,i)perylene	8	2	25.0	0.40	1.10	0.29	0.10	0.33	0.43
Benzo(k)fluoranthene	8	2	25.0	0.40	1.10	0.26	0.16	0.06	0.12
Chrysene	8	3	37.5	0.40	1.10	0.21	0.11	0.08	0.20
Fluoranthene	8	3	37.5	0.40	1.10	0.26	0.09	0.16	0.32
Indeno(1,2,3-c,d)pyrene	8	2	25.0	0.40	1.10	0.29	0.14	0.13	0.29
N-Nitrosodiphenylamine	8	5	62.5	0.40	1.10	0.17	0.16	0.05	0.13
Naphthalene	8	1	12.5	0.40	1.10	0.26	0.11	0.11	0.11
Pentachlorophenol	8	1	12.5	1.90	5.20	1.30	0.49	0.93	0.93
Phenanthrene	8	2	25.0	0.40	1.10	0.22	0.10	0.09	0.14
Pyrene	8	6	75.0	0.40	1.10	0.24	0.20	0.05	0.64
Inorganic Compounds									
Aluminum	7	7	100.0	24.00	25.00	11320.00	9396.87	3550.00	28800.00
Arsenic	7	5	71.4	12.00	13.00	6.84	2.31	3.40	10.00
Barium	7	5	71.4	24.00	25.00	47.64	33.52	17.50	91.50
Beryllium	7	5	71.4	1.20	1.30	0.50	0.24	0.16	0.81
Cadmium	7	4	57.1	0.22	1.30	0.61	0.32	0.32	0.99
Calcium	7	7	100.0	610.00	630.00	3202.86	1091.46	1600.00	4240.00
Chromium	7	7	100.0	6.10	6.30	51.53	33.78	20.00	107.00
Cobalt	7	5	71.4	6.10	6.30	9.09	6.21	5.70	18.40

TABLE 6-9
SOIL ANALYTICAL DATA SUMMARY (>10 FEET BGS)
SITE 9, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 2 of 2)

Chemical	Total Samples	Samples Detections	Frequency Detections (%)	Reporting Limits (mg/kg)		Data Summary Statistics (mg/kg)		Detection Concentrations (mg/kg)	
				Minimum	Maximum	Mean	Standard Deviation	Minimum	Maximum
Inorganic Compounds (Continued)									
Copper	7	7	100.0	6.30	6.30	27.93	18.34	9.50	58.00
Iron	7	7	100.0	12.00	13.00	17572.86	12857.84	6220.00	39000.00
Lead	7	5	71.4	4.20	6.30	8.62	5.07	8.20	16.20
Magnesium	7	7	100.0	610.00	630.00	5008.57	3514.00	1900.00	10200.00
Manganese	7	7	100.0	6.10	6.30	218.71	151.13	73.00	461.00
Nickel	7	7	100.0	6.10	6.30	52.66	37.35	20.00	111.00
Potassium	7	6	85.7	610.00	630.00	1733.57	1254.12	880.00	3740.00
Silver	7	1	14.3	0.45	6.30	1.17	1.34	0.96	0.96
Sodium	7	5	71.4	610.00	630.00	1602.14	1131.82	855.00	2900.00
Titanium	7	7	100.0	6.10	6.30	504.29	328.89	276.00	1190.00
Vanadium	7	7	100.0	6.10	6.30	33.40	21.72	15.00	70.80
Zinc	7	7	100.0	6.10	6.30	57.14	33.76	22.00	105.00

Notes:

%	Percent
>	Greater than
mg/kg	Milligram per kilogram

TABLE 6-10a
HUMAN HEALTH COPCS IN SOIL (0 TO <2 FEET BGS)
OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 1 of 2)

	COPC Screening Evaluation[a]				
Chemical	**Site 9**	**Site 13**	**Site 19**	**Site 22**	**Site 23**
Inorganic Compounds					
Aluminum	B	B	B	X	B
Antimony		X			X
Arsenic	B	B	B	B	B
Barium	B	X	B	X	B
Beryllium	X	X	B	X	B
Cadmium	B	X	X	B	X
Calcium	A	A	A	A	A
Chromium	B	B	B	B	X
Cobalt	B	B	B	B	B
Copper	B	B	X	B	X
Cyanide			X		
Iron	A	A	A	A	A
Lead	B	X	X	X	X
Magnesium	A	A	A	A	A
Manganese	B	B	X	X	B
Mercury		X			
Molybdenum		C			
Nickel	B	B	B	B	B
Potassium	A	A	A	A	A
Selenium		X		X	
Silver	C	C	X	C	
Sodium	A	A	A	A	A
Thallium		B	B		
Titanium	B	B	B	B	B
Vanadium	B	B	B	X	B
Zinc	B	X	X	X	B
Pesticides					
4,4'-DDD				X	
4,4'-DDE		C		X	
4,4'-DDT		C		X	
Alpha-Chlordane				X	
Gamma-Chlordane				X	
Heptachlor epoxide		C			
Semivolatile Organic Compounds					
2-Chlorophenol			X		
2-Methylnaphthalene				X	X
4-Chloro-3-methylphenol			X		
Acenaphthene			X	X	
Acenaphthylene				X	
Anthracene		C	X	X	
Benzo(a)anthracene		X	X	X	
Benzo(a)pyrene		X		X	
Benzo(b)fluoranthene		X	X	X	

TABLE 6-10a
HUMAN HEALTH COPCS IN SOIL (0 TO <2 FEET BGS)
OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 2 of 2)

	COPC Screening Evaluation[a]				
Chemical	**Site 9**	**Site 13**	**Site 19**	**Site 22**	**Site 23**
Semivolatile Organic Compounds (Continued)					
Benzo(g,h,i)perylene		X		X	
bis(2-Ethylhexyl)phthalate			X		
Carbazole				X	
Chrysene		X		X	X
Dibenzo(a,h)anthracene			X		
Di-n-butylphthalate		C	X		
Diethylphthalate			X		
Fluoranthene		X	X	X	X
Fluorene				X	
Indeno(1,2,3-c,d)pyrene		X		X	
Naphthalene		X	X	X	
n-Nitroso-diphenylamine	X	X	X		X
Pentachlorophenol		X	X		
Phenanthrene		C	X	X	X
Pyrene		X		X	X
Volatile Organic Compounds					
1,2-Dichloroethene	X	X		X	
1,3-Dichlorobenzene					
Acetone		X			
Benzene		X			
Carbon disulfide			X		
Ethylbenzene	X	X	X		
Toluene	X	X	X	X	
Xylene (total)	X				

Notes:

[a] Blank space indicates that the chemical was not detected at the site. Other COPC screening criteria are as follows:

A	Rejected as a COPC because chemical is an essential nutrient.
B	Rejected as a COPC based on results of background comparison.
C	Rejected as a COPC because chemical was infrequently detected and maximum concentration was below one tenth of the residential PRG (EPA 1998).
X	Retained as a COPC for the site.

<	Less than
BGS	Below ground surface
COPC	Chemical of potential concern
EPA	U.S. Environmental Protection Agency
PRG	Preliminary remediation goals

4,4'-DDD	4,4'-Dichlorodiphenyldichloroethane
4,4'-DDE	4,4'-Dichlorodiphenyltrichloroethylene
4,4'-DDT	4,4'-Dichlorodiphenyltrichloroethane

TABLE 6-10b
HUMAN HEALTH COPCS IN SOIL (0 TO <10 FEET BGS)
OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 1 of 3)

Chemical	COPC Screening Evaluation [a]				
	Site 9	Site 13	Site 19	Site 22	Site 23
Inorganic Compounds					
Aluminum	B	B	B	X	B
Antimony	C	X			X
Arsenic	B	B	B	B	B
Barium	B	X	B	X	B
Beryllium	X	X	B	X	B
Cadmium	B	X	X	B	X
Calcium	A	A	A	A	A
Chromium	B	B	B	B	X
Cobalt	B	B	B	B	B
Copper	B	B	X	B	X
Cyanide			C		
Iron	A	A	A	A	A
Lead	B	X	X	X	X
Magnesium	A	A	A	A	A
Manganese	B	B	X	X	B
Mercury		X			
Molybdenum		C	C		
Nickel	B	B	B	B	B
Potassium	A	A	A	A	A
Selenium		X		X	
Silver	C	C	C	C	
Sodium	A	A	A	A	A
Thallium	X	B	B		
Titanium	B	B	B	B	B
Vanadium	B	B	B	X	B
Zinc	B	X	X	X	B
Pesticides					
4,4'-DDD				X	
4,4'-DDE		C		X	
4,4'-DDT		X		X	
Alpha-Chlordane				X	
Gamma-Chlordane				X	
Heptachlor epoxide		C			
Methoxychlor				C	
Toxaphene		X			
Semivolatile Organic Compounds					
1,2,4-Trichlorobenzene				C	
2-Butanone	C		C		
2-Chlorophenol			C	C	
2-Hexanone		C			
2-Methylnaphthalene		X		X	X
2,4-Dimethylphenol		C			

TABLE 6-10b
HUMAN HEALTH COPCS IN SOIL (0 TO <10 FEET BGS)
OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 2 of 3)

Chemical	COPC Screening Evaluation [a]				
	Site 9	Site 13	Site 19	Site 22	Site 23
Semivolatile Organic Compounds (Continued)					
4-Chloro-3-methylphenol	C		C		
4-Methyl-2-pentanone		X		C	
Acenaphthene		C	C	X	
Acenaphthylene		X		C	
Anthracene			C	X	C
Benzo(a)anthracene		X	X	X	C
Benzo(a)pyrene		X	X	X	X
Benzo(b)fluoranthene		X	X	X	
Benzo(g,h,i)perylene		X	C	X	
Benzo(k)fluoranthene		C		X	
bis(2-Ethylhexyl)phthalate			X		
Carbazole		X		X	
Chlorobenzene		C			
Chrysene		X	X	X	C
Dibenzo(a,h)anthracene		X	X		
Dibenzofuran		C			
Di-n-butylphthalate		C	C		
Diethylphthalate			X		
Fluoranthene		X	X	X	C
Fluorene		X		X	
Indeno(1,2,3-c,d)pyrene		X	X	X	C
Methylene Chloride			X		C
Naphthalene	X	X	X	X	X
n-Nitroso-diphenylamine	X	X	X		X
Pentachlorophenol	X	X	X	X	
Phenanthrene		X	X	X	X
Phenol	C			C	
Pyrene	C	X	X	X	X
Volatile Organic Compounds					
1,1,1-Trichloroethane			C		
1,2-Dichloroethene	X				
1,3-Dichlorobenzene			C		
Acetone		C	X	C	C
Benzene		X		X	
Carbon disulfide		C			
Ethylbenzene	X	X	C	X	C
Tetrachloroethene			C		
Toluene	X	X	X	X	X
Trichloroethene			C	C	
Xylene (total)	X	X	X	X	C

TABLE 6-10b
HUMAN HEALTH COPCS IN SOIL (0 TO <10 FEET BGS)
OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 3 of 3)

Notes:

[a] Blank space indicates that the chemical was not detected at the site. Other COPC screening criteria are as follows:

A	Rejected as a COPC because chemical is an essential nutrient.
B	Rejected as a COPC based on results of background comparison.
C	Rejected as a COPC because chemical was infrequently detected and maximum concentration was below one-tenth of the residential PRG (EPA 1998).
X	Retained as a COPC for the site.

<	Less than
4,4'-DDD	4,4'-Dichlorodiphenyldichloroethane
4,4'-DDE	4,4'-Dichlorodiphenyltrichloroethylene
4,4'-DDT	4,4'-Dichlorodiphenyltrichloroethane
BGS	Below ground surface
COPC	Chemical of potential concern
EPA	U.S. Environmental Protection Agency
PRG	Preliminary remediation goal

TABLE 6-11
ECOLOGICAL COPCs IN SOIL (0 to 6 FEET BGS)
SITE 9, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 1 of 2)

Chemical	Frequency of Detection	Sample Quantitation Limit	Minimum Concentration	Maximum Concentration	95 UCL Concentration	COPC Screening Evaluation [a]	
						Rejected	Retained
Inorganic Compounds (mg/kg)							
Aluminum	33/33	NA	2,950	13,900		CSB	
Antimony	2/33	0.48-6.9	0.47	1.2		CSB	
Arsenic	11/33	0.55-12	0.85	4.3		CSB	
Barium	33/33	NA	17.3	266		CSB	
Beryllium	24/33	0.21-1.2	0.09	1.5		PRG	
Cadmium	7/33	0.06-1.2	0.11	0.49		CSB	
Calcium	33/33	NA	1,340	16,800		CSB	
Chromium	33/33	NA	22	178		CSB	
Cobalt	12/33	4.6-6.5	3.6	23		CSB	
Copper	29/33	5.5-6.1	4.1	36		CSB	
Iron	33/33	NA	5,510	21,500		CSB	
Lead	20/33	2.1-5.8	1.3	22.2		CSB	
Magnesium	32/33	520	1,600	5,100		CSB	
Manganese	33/33	NA	62.5	182		CSB	
Nickel	33/33	NA	17	50.8		CSB	
Potassium	32/33	580	390	2,170		CSB	
Silver	1/33	0.18-5.8	0.38	0.38		FOD	
Sodium	27/33	520-580	68	413		CSB	
Thallium	1/33	0.4-12	3.3	3.3		FOD	
Titanium	12/12	NA	249	428		CSB	
Vanadium	33/33	NA	12.7	42.3		CSB	
Zinc	33/33	NA	14	51.3		CSB	
Semivolatile Organic Compounds (ug/kg)							
4-chloro-3-methylphenol	1/13	340-720	43	43	284.53		X
n-Nitrosodiphenylamine (1)	8/13	340-720	38	85	330.49		X
Naphthalene	2/13	340-720	2	13	278.88		X
Phenol	1/13	340-720	42	42		PRG	
Volatile Organic Compounds (ug/kg)							
1,2-Dichloroethene (total)	3/30	5-120	1	130	22.65		X
Ethylbenzene	2/30	5-120	160	200	34.07		X
Tetrachloroethene	1/30	5-120	1	1		FOD	
Toluene	12/30	11-120	3	81		PRG	
Xylene (total)	8/30	5-120	2	3,100	502.38		X

TABLE 6-11
ECOLOGICAL COPCs IN SOIL (0 to 6 FEET BGS)
SITE 9, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 2 of 2)

Notes:

(a) COPC screening criteria are as follows:

CSB Rejected as COPC because concentrations were within statistical background or chemical is an essential nutrient

FOD Rejected as COPC because chemical was infrequently detected.

PRG Rejected as COPC because chemical maximum concentration or 95 UCL concentration was below the ecological PRG.

µg/kg Microgram per kilogram

mg/kg Milligram per kilogram

95 UCL 95 percent upper confidence limit on the arithmetic mean concentration

NA Not applicable, frequency of detection is 100 percent

TABLE 6-12
SUMMARY OF SOIL HAZARD QUOTIENTS
CALIFORNIA GROUND SQUIRREL
SITE 9, OU-2 SOUTHEAST AREA, ALAMEDA POINT

Ecological COPCs	Hazard Quotient 1	Hazard Quotient 2	Hazard Quotient 3	Hazard Quotient 4	Hazard Quotient 5
4-chloro-3-methylphenol	NRV	NRV	NRV	NRV	NRV
N-nitrosodiphenylamine (1)	NRV	NRV	NRV	NRV	NRV
Naphthalene	2.68E-07	1.85E-05	6.21E-06	1.28E-05	4.30E-06
1,2-dichloroethene (total)	NRV	NRV	NRV	NRV	NRV
Ethylbenzene	NRV	NRV	NRV	NRV	NRV
Xylene (total)	1.04E-03	2.97E-02	2.40E-02	2.06E-02	1.66E-02

Notes:

COPC Chemical of potential concern
NRV No reference value available

TABLE 6-13
SUMMARY OF SOIL HAZARD QUOTIENTS
RED-TAILED HAWK
SITE 9, OU-2 SOUTHEAST AREA, ALAMEDA POINT

Ecological COPCs	Hazard Quotient 1	Hazard Quotient 2	Hazard Quotient 3	Hazard Quotient 4	Hazard Quotient 5
4-chloro-3-methylphenol	NRV	NRV	NRV	NRV	NRV
N-nitrosodiphenylamine (1)	NRV	NRV	NRV	NRV	NRV
Naphthalene	NRV	NRV	NRV	NRV	NRV
1,2-dichloroethene (total)	NRV	NRV	NRV	NRV	NRV
Ethylbenzene	NRV	NRV	NRV	NRV	NRV
Xylene (total)	NRV	NRV	NRV	NRV	NRV

Notes:

COPC Chemical of potential concern
NRV No reference value available

TABLE 6-14
SUMMARY OF RI ACTIVITIES
SITE 13, OU-2 SOUTHEAST AREA, ALAMEDA POINT

Period	Contractor	Activities	Chemical Groups Analyzed	Reference
1990 1991, 1992, 1993 (CTO 121, Phases 1 and 2A)	Canonie; PRC and Montgomery Watson	• One surface sample collected • Twenty seven soil borings drilled • Five monitoring wells installed • Three hundred twenty six soil samples collected • Groundwater sampling conducted	• Soil: VOCs, SVOCs, EDB, Pest/PCBs, metals, general chemical parameters • Groundwater: VOCs, SVOCs, TRPH, metals, general chemical parameters	PRC and James M. Montgomery 1993 Canonie 1991
1994 (CTO 280)	PRC and Montgomery Watson	• Cone penetrometer tests performed • Four Hydropunch® samples collected • Ten soil borings drilled • Eighteen soil samples collected • Four shallow monitoring wells installed • Non-point source sampling conducted • One deep monitoring well installed • One reference boring drilled • Quarterly groundwater sampling conducted	• Surface Soil: SVOCs, Pest/PCBs, metals, cyanide • Subsurface Soil: VOCs, SVOCs, EDB, TPHPRG, TPHEXT, metals • Groundwater: VOCs, SVOCs, TPHPRG, TPHEXT, TOC, metals, general chemical parameters	PRC and Montgomery Watson 1996b
1996 (CTO 316)	PRC	• Pumping well and 3 observation wells installed	• Aquifer test parameters	PRC and Montgomery Watson 1996c
1997-1998 (CTO 108)	PRC	• Quarterly groundwater sampling conducted • Tidal influence study performed	• Groundwater: VOCs, SVOCs, TRPH, metals, cyanide, general chemical parameters	PRC 1997a Tetra Tech 12/7/98

Notes:

CTO	Contract Task Order
EDB	Ethylene dibromide
Pest/PCB	Pesticides and polychlorinated biphenyl
PRC	PRC Environmental Management, Inc
RI	Remedial investigation
SVOC	Semivolatile organic compound
TOC	Total organic carbon
TPHEXT	Total petroleum hydrocarbons - extractable
TPHPRG	Total petroleum hydrocarbons - purgeable
TRPH	Total recoverable petroleum hydrocarbons
VOC	Volatile organic compound

TABLE 6-15
SURFACE SOIL SAMPLING SUMMARY
SITE 13, OU-2 SOUTHEAST AREA, ALAMEDA POINT

Sample Location	Sample Identification	Sample Depth (ft bgs)	Sampling Method	Date Sampled	Analyses Performed								
					VOC	SVOC	Pest/PCB	TKN	TRPH	TMetals	TOC	pH	% Moisture
1990 Investigation by Canonie													
BOR-14	BOR-14 [0.0-0.5]	0.0 to 0.5	Split spoon	05/23/90		X	X	X		X		X	
1992 Investigation by PRC and Montgomery Watson													
M-IMF-02	M-IMF-02-0	0.0 to 0.5	Split spoon	04/03/92			X			X		X	

Notes:

%	Percent
ft bgs	Feet below ground surface
Pest/PCB	Pesticides and polychlorinated biphenyls
PRC	PRC Environmental Management, Inc.
SVOC	Semivolatile organic compound
TMetals	Total metals
TKN	Total Kjeldahl nitrogen
TOC	Total organic carbon
TRPH	Total recoverable petroleum hydrocarbons
VOC	Volatile organic compound

TABLE 6-16
SUBSURFACE SOIL SAMPLING SUMMARY
SITE 13, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 1 of 18)

Sample Location	Sample Identification	Sampling Method	Sample Depth (ft bgs)	Total Boring Depth (ft bgs)	Date Sampled	Analyses Performed										
						pH	SVOC	VOC	% Moisture	Pesticides	TMetals	DMetals	General Chemicals	TRPH	TOC	TPHEXT
Soil Boring Samples																
1991 Investigation by PRC and James M. Montgomery																
B-IMF-01	IMF-01-00	Soil Boring	0.0 to 0.5	10	12/5/91	X										
	IMF-01-02	Soil Boring	2.0 to 2.5		7/19/91	X			X		X					
	IMF-01-04	Soil Boring	4 to 4.5			X										
	IMF-01-06	Soil Boring	6 to 6.5			X										
	IMF-01-08	Soil Boring	8 to 8.5			X	X	X	X		X			X		
	IMF-01-10	Soil Boring	9.5 to 10.0			X			X		X					
B-IMF-02	IMF-02-00	Soil Boring	0.0 to 0.5	8.5	12/15/91	X										
	IMF-02-02	Soil Boring	2.0 to 2.5		7/18/91	X										
	IMF-02-04	Soil Boring	4 to 4.5			X	X		X					X		
	IMF-02-06	Soil Boring	6 to 6.5			X			X		X					
	IMF-02-08	Soil Boring	8 to 8.5			X			X		X					
B-IMF-03	IMF-03-00	Soil Boring	0.0 to 0.5	10	12/15/91	X										
	IMF-03-02	Soil Boring	2.0 to 2.5		7/18/91	X			X		X			X		
	IMF-03-04	Soil Boring	4 to 4.5			X										
	IMF-03-06	Soil Boring	6 to 6.5			X			X		X					
	IMF-03-08	Soil Boring	8 to 8.5			X			X		X					
	IMF-03-10	Soil Boring	9.5 to 10.0			X										
B-IMF-04	IMF-04-00	Soil Boring	0.0 to 0.5	10	12/5/91	X										
	IMF-04-02	Soil Boring	2.0 to 2.5		7/18/91	X										
	IMF-04-04	Soil Boring	4 to 4.5			X			X		X			X		
	IMF-04-06	Soil Boring	6 to 6.5			X			X		X					
	IMF-04-08	Soil Boring	8 to 8.5			X										
	IMF-04-10	Soil Boring	9.5 to 10.0			X			X		X			X		

TABLE 6-16
SUBSURFACE SOIL SAMPLING SUMMARY
SITE 13, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 2 of 18)

Sample Location	Sample Identification	Sampling Method	Sample Depth (ft bgs)	Total Boring Depth (ft bgs)	Date Sampled	Analyses Performed										
						pH	SVOC	VOC	% Moisture	Pesticides	TMetals	DMetals	General Chemicals	TRPH	TOC	TPHEXT
1991 Investigation by PRC and James M. Montgomery (Continued)																
B-IMF-05	IMF-05-00	Soil Boring	0.0 to 0.5	10	7/19/91	X										
	IMF-05-02	Soil Boring	2.0 to 2.5			X										
	IMF-05-04	Soil Boring	4 to 4.5			X			X		X					
	IMF-05-06	Soil Boring	6 to 6.5			X										
	IMF-05-08	Soil Boring	8 to 8.5			X										
	IMF-05-10	Soil Boring	9.5 to 10.0			X										
B-IMF-06	IMF-06-00	Soil Boring	0.0 to 0.5	10	12/5/91	X										
	IMF-06-02	Soil Boring	2.0 to 2.5		7/19/91	X	X		X		X			X		
	IMF-06-04	Soil Boring	4 to 4.5			X										
	IMF-06-06	Soil Boring	6 to 6.5			X										
	IMF-06-08	Soil Boring	8 to 8.5			X		X	X		X					
	IMF-06-10	Soil Boring	9.5 to 10.0			X										
	IMF-DUP4	Soil Boring	4 to 4.5	4.5	12/5/91	X										
	B7-04	Soil Boring	4 to 4.5		12/5/91	X										
B-IMF-07	IMF-07-00	Soil Boring	0.0 to 0.5	10	12/5/91	X										
	IMF-07-00	Soil Boring	0.0 to 0.5		7/19/91	X										
	IMF-07-02	Soil Boring	2.0 to 2.5			X										
	IMF-07-04	Soil Boring	4 to 4.5			X										
	IMF-07-06	Soil Boring	6 to 6.5			X			X		X					
	IMF-07-08	Soil Boring	8 to 8.5			X			X		X					
	IMF-07-10	Soil Boring	9.5 to 10.0					X								
	IMF-07-10	Soil Boring	9.5 to 10.0			X										
	IMF-DUP5	Soil Boring	4 to 4.5			X										

TABLE 6-16
SUBSURFACE SOIL SAMPLING SUMMARY
SITE 13, OU-2 SOUTHEAST AREA, ALAMEDA POINT

Sample Location	Sample Identification	Sampling Method	Sample Depth (ft bgs)	Total Boring Depth (ft bgs)	Date Sampled	Analyses Performed										
						pH	SVOC	VOC	% Moisture	Pesticides	TMetals	DMetals	General Chemicals	TRPH	TOC	TPHEXT
1991 Investigation by PRC and James M. Montgomery (Continued)																
B-IMF-08	IMF-08-00	Soil Boring	0.0 to 0.5	10	12/5/91	X										
	IMF-08-00	Soil Boring	2.0 to 2.5		7/19/91	X										
	IMF-08-02	Soil Boring	4 to 4.5			X										
	IMF-08-04	Soil Boring	6 to 6.5			X										
	IMF-08-06	Soil Boring	8 to 8.5			X										
	IMF-08-08	Soil Boring	9.5 to 10.0			X										
	IMF-08-10	Soil Boring	9.5 to 10.0			X			X		X					
B-IMF-09	B-IMF-09-.5	Soil Boring	1 to 1.5	2.5	4/3/92	X			X		X					
	B-IMF-09-000	Soil Boring	0.0 to 0.5			X			X		X					
	B-IMF-09-2	Soil Boring	2.0 to 2.5			X			X		X					
B-IMF-10	B-IMF-10-.5	Soil Boring	0.5 to 1	3.5	4/3/92	X			X		X					
	B-IMF-10-000	Soil Boring	0.0 to 0.5			X			X		X					
	B-IMF-10-1	Soil Boring	1 to 1.5			X			X		X					
	B-IMF-10-2	Soil Boring	2.0 to 2.5			X			X		X					
	B-IMF-10-3	Soil Boring	3 to 3.5			X			X		X					
	DUP-S3-1	Soil Boring	3 to 3.5			X			X		X					
B-IMF-11	B-IMF-11-0	Soil Boring	0.0 to 0.5	6	4/3/92	X			X		X					
	B-IMF-11-0.5	Soil Boring	0.5 to 1			X			X		X					
	B-IMF-11-001	Soil Boring	1 to 1.5			X			X		X					
	B-IMF-11-002	Soil Boring	2.0 to 2.5			X			X		X					
	B-IMF-11-003	Soil Boring	3 to 3.5			X			X		X					
	B-IMF-11-004	Soil Boring	4 to 4.5			X			X		X					
	B-IMF-11-5.5	Soil Boring	5.5 to 6			X			X		X					
	DUP-S3-2	Soil Boring	00 to 0.5			X		X	X		X			X		X

TABLE 6-16
SUBSURFACE SOIL SAMPLING SUMMARY
SITE 13, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 4 of 18)

Sample Location	Sample Identification	Sampling Method	Sample Depth (ft bgs)	Total Boring Depth (ft bgs)	Date Sampled	Analyses Performed										
						pH	SVOC	VOC	% Moisture	Pesticides	TMetals	DMetals	General Chemicals	TRPH	TOC	TPHEXT
1994 Investigation by PRC and Montgomery Watson																
B13-28	280-S13-001	Soil Boring	1 to 2	6	12/9/94	X		X	X		X			X		X
	280-S13-002	Soil Boring	2.5 to 3.5			X		X	X		X			X		X
	280-S13-003	Soil Boring	5.5 to 6			X		X	X		X			X		X
B13-29	280-S13-004	Soil Boring	1 to 1.5	5.5	12/9/94	X		X	X		X			X		X
	280-S13-005	Soil Boring	1.5 to 2			X		X	X		X			X		X
	280-S13-006	Soil Boring	2.5 to 3.5			X		X	X		X			X		X
	280-S13-007	Soil Boring	5 to 5.5			X		X	X		X			X		X
B13-30	280-S13-008	Soil Boring	1 to 2	5.5	12/9/94	X		X	X		X			X		X
	280-S13-009	Soil Boring	2.5 to 3.5			X		X	X		X			X		X
	280-S13-010	Soil Boring	5 to 5.5			X		X	X		X			X		X
B13-31	280-S13-011	Soil Boring	1 to 2	6.5	12/9/94	X		X	X		X			X		X
	280-S13-012	Soil Boring	2.5 to 3.5			X		X	X		X			X		X
	280-S13-013	Soil Boring	4.5 to 5.5			X		X	X		X			X		X
	280-S13-014	Soil Boring	5.5 to 6.5			X			X		X			X		X
B13-32	280-S13-015	Soil Boring	0.5 to 1.5	5	8/12/94	X		X	X		X			X		X
	280-S13-016	Soil Boring	2 to 3			X		X	X		X			X		X
	280-S13-017	Soil Boring	4 to 5			X	X		X		X		X	X		X
B13-38	ALA13B38-1	Soil Boring	0 to 1.5	16	4/4/94	X	X		X		X		X	X		X
	ALA13B38-2	Soil Boring	4.5 to 5			X	X		X		X		X	X		X
	ALA13B38-3	Soil Boring	10 to 10.5			X	X		X		X		X	X		X
	ALA13B38-4	Soil Boring	15.5 to 16			X	X		X		X		X	X		X

TABLE 6-16
SUBSURFACE SOIL SAMPLING SUMMARY
SITE 13, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 5 of 18)

Sample Location	Sample Identification	Sampling Method	Sample Depth (ft bgs)	Total Boring Depth (ft bgs)	Date Sampled	Analyses Performed										
						pH	SVOC	VOC	% Moisture	Pesticides	TMetals	DMetals	General Chemicals	TRPH	TOC	TPHEXT
1994 Investigation by PRC and Montgomery Watson (Continued)																
B13-39	ALA13B39-1	Soil Boring	3 to 3.5	16.5	4/4/94	X	X		X		X		X	X		X
	ALA13B39-2	Soil Boring	8 to 8.5			X	X		X		X		X	X		X
	ALA13B39-3	Soil Boring	11.5 to 12			X	X		X		X		X	X		X
	ALA13B39-4	Soil Boring	14 to 14.5	16.5	4/4/94	X	X		X		X		X	X		X
	ALA13B39-5	Soil Boring	16 to 16.5			X	X		X		X		X	X		X
B13-40	ALA13B40-1	Soil Boring	0.5 to 1	16	4/4/94	X	X		X		X		X	X		X
	ALA13B40-2	Soil Boring	4.5 to 5			X	X		X		X		X	X		X
	ALA13B40-3	Soil Boring	9.5 to 10			X	X		X		X		X	X		X
	ALA13B40-4	Soil Boring	13 to 13.5			X	X		X		X		X	X		X
	ALA13B40-5	Soil Boring	15.5 to 16			X	X		X		X		X	X		X
B13-41	ALA13B41-1	Soil Boring	0.5 to 1	15.5	4/5/94	X	X		X		X		X	X		X
	ALA13B41-2	Soil Boring	4.5 to 5			X	X		X		X		X	X		X
	ALA13B41-3	Soil Boring	7 to 7.5			X	X		X		X		X	X		X
	ALA13B41-4	Soil Boring	8 to 8.5			X	X		X		X		X	X		X
	ALA13B41-5	Soil Boring	8.5 to 9			X	X		X		X		X	X		X
	ALA13B41-6	Soil Boring	9 to 9.5			X	X		X		X		X	X		X
	ALA13B41-7	Soil Boring	11 to 11.5			X	X		X		X		X	X		X
	ALA13B41-8	Soil Boring	15 to 15.5			X	X		X		X		X	X		X
B13-42	ALA13B42-3	Soil Boring	6.5 to 7	21	4/5/94	X	X		X		X		X	X		X
	ALA13B42-1	Soil Boring	3 to 3.5			X	X		X		X		X	X		X
	ALA13B42-2	Soil Boring	5.5 to 6			X	X		X		X		X	X		X
	ALA13B42-4	Soil Boring	7.5 to 8			X	X		X		X		X	X		X
	ALA13B42-5	Soil Boring	9.5 to 10			X	X		X		X		X	X		X
	ALA13B42-6	Soil Boring	12.5 to 13			X	X		X		X		X	X		X
	ALA13B42-7	Soil Boring	15.5 to 16			X	X		X		X		X	X		X
	ALA13B42-8	Soil Boring	19.5 to 20			X	X		X		X		X	X		X
	ALA13B42-8D	Soil Boring	20.5 to 21			X	X		X		X		X	X		X

TABLE 6-16
SUBSURFACE SOIL SAMPLING SUMMARY
SITE 13, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 6 of 18)

Sample Location	Sample Identification	Sampling Method	Sample Depth (ft bgs)	Total Boring Depth (ft bgs)	Date Sampled	Analyses Performed										
						pH	SVOC	VOC	% Moisture	Pesticides	TMetals	DMetals	General Chemicals	TRPH	TOC	TPHEXT
1994 Investigation by PRC and Montgomery Watson (Continued)																
B13-43	ALA13B43-1	Soil Boring	3.5 to 4	15.5	4/5/94	X	X		X		X		X	X		X
	ALA13B43-2	Soil Boring	9.5 to 10			X	X		X		X		X	X		X
	ALA13B43-2D	Soil Boring	10 to 10.5			X	X		X		X		X	X		X
	ALA13B43-3	Soil Boring	12 to 12.5			X	X		X		X		X	X		X
	ALA13B43-4	Soil Boring	14.5 to 15			X	X		X		X		X	X		X
	ALA13B43-4D	Soil Boring	15 to 15.5			X	X		X		X		X	X		X
B13-44	ALA13B44-1	Soil Boring	2 to 2.5	15.5	4/6/94	X	X		X		X		X	X		X
	ALA13B44-2	Soil Boring	3.5 to 4			X	X		X		X		X	X		X
	ALA13B44-3	Soil Boring	6 to 6.5			X	X		X		X		X	X		X
	ALA13B44-4	Soil Boring	8.5 to 9			X	X		X		X		X	X		X
	ALA13B44-5	Soil Boring	11.5 to 12			X	X		X		X		X	X		X
	ALA13B44-6	Soil Boring	14.5 to 15			X	X		X		X		X	X		X
	ALA13B44-6D	Soil Boring	15 to 15.5			X	X		X		X		X	X		X
B13-45	ALA13B45-1	Soil Boring	6.5 to 7	17.5	4/6/94				X		X		X			
	ALA13B45-1DL	Soil Boring	6.5 to 7			X	X		X				X	X		X
	ALA13B45-2	Soil Boring	7.5 to 8			X	X		X		X		X	X		X
	ALA13B45-3	Soil Boring	10.5 to 11						X							
	ALA13B45-3DL	Soil Boring	11 to 11.5			X	X		X		X		X			X
	ALA13B45-4	Soil Boring	13.5 to 14			X	X		X		X		X	X		X
	ALA13B45-5	Soil Boring	17 to 17.5				X		X		X					
1990 Investigation by Canonie																
BOR-10	BOR-10[0.5-1.0]	Soil Boring	0.5-1.0	15	7/12/90								X		X	
	BOR-10[1.0-1.5]	Soil Boring	1.0-1.5				X	X						X		
	BOR-10[11.0-11.5]	Soil Boring	11.0-11.5							X	X					
	BOR-10[11.5-12.0]	Soil Boring	11.5-12.0				X	X						X		
	BOR-10[14.0-14.5]	Soil Boring	14.0-14.5	15	7/12/90					X	X					
	BOR-10[14.5-15.0]	Soil Boring	14.5-15.0				X	X						X		

TABLE 6-16
SUBSURFACE SOIL SAMPLING SUMMARY
SITE 13, OU-2 SOUTHEAST AREA, ALAMEDA POINT

Sample Location	Sample Identification	Sampling Method	Sample Depth (ft bgs)	Total Boring Depth (ft bgs)	Date Sampled	Analyses Performed										
						pH	SVOC	VOC	% Moisture	Pesticides	TMetals	DMetals	General Chemicals	TRPH	TOC	TPHEXT
1990 Investigation by Canonie (Continued)																
	BOR-10[3.5-4.0]	Soil Boring	3.5-4.0							X	X					
BOR-10	BOR-10[4.0-4.5]	Soil Boring	4.0-4.5				X	X						X		
	BOR-10[7.0-7.5]	Soil Boring	7.0-7.5							X	X					
	BOR-10[8.0-8.5]	Soil Boring	8.0-8.5				X			X	X					
BOR-11	BOR-11 [0.5-1.0]	Soil Boring	0.5-1.0	15	7/18/90			X						X		
	BOR-11 [11.0-11.5]	Soil Boring	11.0-11.5							X	X					
	BOR-11 [11.5-12.0]	Soil Boring	11.5-12.0				X	X						X		
	BOR-11 [14.0-14.5]	Soil Boring	14.0-14.5							X	X					
	BOR-11 [14.5-15.0]	Soil Boring	14.5-15.0				X	X						X		
	BOR-11 [2.5-3.0]	Soil Boring	2.5-3.0							X	X					
	BOR-11 [3.5-4.0]	Soil Boring	3.5-4.0										X		X	
	BOR-11 [4.0-4.5]	Soil Boring	4.0-4.5				X	X						X		
	BOR-11 [6.5-7.0]	Soil Boring	6.5-7.0							X	X					
	BOR-11 [7.0-7.5]	Soil Boring	7.0-7.5				X			X	X					
BOR-13	BOR-13 [0.5-1.0]	Soil Boring	0.5-1.0	15	7/3/90								X		X	
	BOR-13 [1.0-1.5]	Soil Boring	1.0-1.5				X	X						X		
	BOR-13 [11.0-11.5]	Soil Boring	11.0-11.5							X	X					
	BOR-13 [11.5-12.0]	Soil Boring	11.5-12.0				X	X						X		
	BOR-13 [14.0-14.5]	Soil Boring	14.0-14.5							X	X					
	BOR-13 [14.5-15.0]	Soil Boring	14.5-15.0				X	X						X		
	BOR-13 [2.0-2.5]	Soil Boring	2.0-2.5							X	X					
	BOR-13 [2.5-3.0]	Soil Boring	2.5-3.0				X	X						X		
	BOR-13 [6.5-7.0]	Soil Boring	6.5-7.0							X	X					
	BOR-13 [7.0-7.5]	Soil Boring	7.0-7.5				X			X	X					X

TABLE 6-16
SUBSURFACE SOIL SAMPLING SUMMARY
SITE 13, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 8 of 18)

Sample Location	Sample Identification	Sampling Method	Sample Depth (ft bgs)	Total Boring Depth (ft bgs)	Date Sampled	Analyses Performed										
						pH	SVOC	VOC	% Moisture	Pesticides	TMetals	DMetals	General Chemicals	TRPH	TOC	TPHEXT
1990 Investigation by Canonie (Continued)																
BOR-14	BOR-14 [0.0-0.5]	Soil Boring	0.0-0.5	15	5/23/90										X	
	BOR-14 [0.5-1.0]	Soil Boring	0.5-1.0										X			
	BOR-14 [1.0-1.5]	Soil Boring	1.0-1.5					X								
	BOR-14 [13.0-13.5]	Soil Boring	13.0-13.5				X			X	X					X
	BOR-14 [14.0-14.5]	Soil Boring	14.0-14.5										X		X	
	BOR-14 [14.5-15.0]	Soil Boring	14.5-15.0				X			X	X					X
	BOR-14 [4.0-4.5]	Soil Boring	4.0-4.5										X		X	
	BOR-14 [4.5-5.0]	Soil Boring	4.5-5.0					X								
	BOR-14 [6.0-6.5]	Soil Boring	6.0-6.5					X								
	BOR-14 [8.0-8.5]	Soil Boring	8.0-8.5				X			X	X					X
	BOR-14 [8.5-9.0]	Soil Boring	8.5-9.0										X		X	
	BOR-14 [9.0-9.5]	Soil Boring	9.0-9.5				X			X	X					
BOR-15	BOR-15 [0.5-1.0]	Soil Boring	0.5-1.0	15	7/18/90		X	X						X		
	BOR-15 [11.0-11.5]	Soil Boring	11.0-11.5							X	X					
	BOR-15 [11.5-12.0]	Soil Boring	11.5-12.0				X	X						X		
	BOR-15 [14.0-14.5]	Soil Boring	14.0-14.5							X	X					
	BOR-15 [14.5-15.0]	Soil Boring	14.5-15.0				X	X						X		
	BOR-15 [2.0-2.5]	Soil Boring	2.0-2.5							X	X					
	BOR-15 [2.5-3.0]	Soil Boring	2.5-3.0										X		X	
	BOR-15 [4.0-4.5]	Soil Boring	4.0-4.5				X	X			X			X		
	BOR-15 [6.5-7.0]	Soil Boring	6.5-7.0							X						
	BOR-15 [7.0-7.5]	Soil Boring	7.0-7.5				X			X	X					

TABLE 6-16
SUBSURFACE SOIL SAMPLING SUMMARY
SITE 13, OU-2 SOUTHEAST AREA, ALAMEDA POINT

Sample Location	Sample Identification	Sampling Method	Sample Depth (ft bgs)	Total Boring Depth (ft bgs)	Date Sampled	Analyses Performed										
						pH	SVOC	VOC	% Moisture	Pesticides	TMetals	DMetals	General Chemicals	TRPH	TOC	TPHEXT
1990 Investigation by Canonie (Continued)																
BOR-16	BOR-16 [0.5-1.0]	Soil Boring	0.5-1.0	15	7/23/90		X	X						X		
	BOR-16 [11.0-11.5]	Soil Boring	11.0-11.5							X	X					
	BOR-16 [11.5-12.0]	Soil Boring	11.5-12.0				X	X						X		
	BOR-16 [14.0-14.5]	Soil Boring	14.0-14.5							X	X					
	BOR-16 [14.5-15.0]	Soil Boring	14.5-15.0				X	X						X		
	BOR-16 [2.0-2.5]	Soil Boring	2.0-2.5							X	X					
	BOR-16 [2.5-3.0]	Soil Boring	2.5-3.0										X		X	
	BOR-16 [3.5-4.0]	Soil Boring	3.5-4.0				X	X						X		
	BOR-16 [6.5-7.0]	Soil Boring	6.5-7.0							X	X					
	BOR-16 [7.0-7.5]	Soil Boring	7.0-7.5				X	X						X		
BOR-17	BOR-17 [10.0-10.5]	Soil Boring	10.0-10.5	15	7/19/90					X	X					
	BOR-17 [11.0-11.5]	Soil Boring	11.0-11.5				X	X						X		
	BOR-17 [11.5-12.0]	Soil Boring	11.5-12.0							X	X					
	BOR-17 [14.5-15.0]	Soil Boring	14.5-15.0				X			X	X					
	BOR-17 [2.0-2.5]	Soil Boring	2.0-2.5				X	X						X		
	BOR-17 [2.5-3.0]	Soil Boring	2.5-3.0			X				X	X					
	BOR-17 [4.0-4.5]	Soil Boring	4.0-4.5										X			
	BOR-17 [5.0-5.5]	Soil Boring	5.0-5.5				X	X						X		
	BOR-17 [7.0-7.5]	Soil Boring	7.0-7.5							X	X					
	BOR-17 [8.0-8.5]	Soil Boring	8.0-8.5				X			X	X			X		
	BOR-17R[10.5-11.0]	Soil Boring	10.5-11.0				X	X			X					
BOR-18	BOR-18 [0.5-1.0]	Soil Boring	0.5-1.0	15	7/23/90		X							X		
	BOR-18 [11.0-11.5]	Soil Boring	11.0-11.5							X	X					
	BOR-18 [11.5-12.0]	Soil Boring	11.5-12.0				X	X						X		
	BOR-18 [14.0-14.5]	Soil Boring	14.0-14.5							X	X					
	BOR-18 [14.5-15.0]	Soil Boring	14.5-15.0										X		X	

TABLE 6-16
SUBSURFACE SOIL SAMPLING SUMMARY
SITE 13, OU-2 SOUTHEAST AREA, ALAMEDA POINT

Sample Location	Sample Identification	Sampling Method	Sample Depth (ft bgs)	Total Boring Depth (ft bgs)	Date Sampled	Analyses Performed										
						pH	SVOC	VOC	% Moisture	Pesticides	TMetals	DMetals	General Chemicals	TRPH	TOC	TPHEXT
1990 Investigation by Canonie (Continued)																
BOR-18	BOR-18 [2.5-3.0]	Soil Boring	2.5-3.0				X	X						X		
	BOR-18 [3.5-4.0]	Soil Boring	3.5-4.0			X				X	X					
	BOR-18 [4.0-4.5]	Soil Boring	4.0-4.5				X	X						X		
	BOR-18 [7.0-7.5]	Soil Boring	7.0-7.5							X	X					
	BOR-18 [7.5-8.0]	Soil Boring	7.5-8.0				X			X	X					
BOR-19	BOR-19 [0.5-1.0]	Soil Boring	0.5-1.0	15	7/18/90		X	X						X		
	BOR-19 [11.0-11.5]	Soil Boring	11.0-11.5							X	X					
	BOR-19 [11.5-12.0]	Soil Boring	11.5-12.0				X	X						X		
	BOR-19 [14.0-14.5]	Soil Boring	14.0-14.5							X	X					
	BOR-19 [14.5-15.0]	Soil Boring	14.5-15.0				X	X								
	BOR-19 [2.5-3.0]	Soil Boring	2.5-3.0			X				X	X					
	BOR-19 [3.5-4.0]	Soil Boring	3.5-4.0										X		X	
	BOR-19 [4.0-4.5]	Soil Boring	4.0-4.5				X	X						X		
	BOR-19 [7.0-7.5]	Soil Boring	7.0-7.5							X	X					
	BOR-19 [8.0-8.5]	Soil Boring	8.0-8.5							X						
	BOR-19R [7.5-8.0]	Soil Boring	7.5-8.0				X	X						X		
BOR-20	BOR-20 [10.0-10.5]	Soil Boring	10.0-10.5	15	7/17/90					X						
	BOR-20 [10.5-11.0]	Soil Boring	10.5-11.0				X	X			X					
	BOR-20 [11.5-12.0]	Soil Boring	11.5-12.0							X	X					
	BOR-20 [14.5-15.0]	Soil Boring	14.5-15.0				X			X						
	BOR-20 [2.5-3.0]	Soil Boring	2.5-3.0				X	X						X		
	BOR-20 [3.0-3.5]	Soil Boring	3.0-3.5										X		X	
	BOR-20 [4.5-5.0]	Soil Boring	4.5-5.0	15	7/17/90	X				X	X					
	BOR-20 [5.0-5.5]	Soil Boring	5.0-5.5				X	X						X		
	BOR-20 [6.0-6.5]	Soil Boring	6.0-6.5							X	X					
	BOR-20 [7.0-7.5]	Soil Boring	7.0-7.5				X			X	X					

TABLE 6-16
SUBSURFACE SOIL SAMPLING SUMMARY
SITE 13, OU-2 SOUTHEAST AREA, ALAMEDA POINT

Sample Location	Sample Identification	Sampling Method	Sample Depth (ft bgs)	Total Boring Depth (ft bgs)	Date Sampled	Analyses Performed										
						pH	SVOC	VOC	% Moisture	Pesticides	TMetals	DMetals	General Chemicals	TRPH	TOC	TPHEXT
1990 Investigation by Canonie (Continued)																
BOR-21	BOR-21 [0.5-1.0]	Soil Boring	0.5-1.0	15.5	7/19/90		X	X						X		
	BOR-21 [11.5-12.0]	Soil Boring	11.5-12.0							X	X					
	BOR-21 [12.0-12.5]	Soil Boring	12.0-12.5				X	X						X		
	BOR-21 [14.0-14.5]	Soil Boring	14.0-14.5							X	X					
	BOR-21 [15.0-15.5]	Soil Boring	15.0-15.5				X	X						X		
	BOR-21 [2.5-3.0]	Soil Boring	2.5-3.0			X				X	X					
	BOR-21 [3.0-3.5]	Soil Boring	3.0-3.5										X		X	
	BOR-21 [4.0-4.5]	Soil Boring	4.0-4.5				X	X						X		
	BOR-21 [7.0-7.5]	Soil Boring	7.0-7.5							X	X					
	BOR-21 [7.5-8.0]	Soil Boring	7.5-8.0				X			X	X					
BOR-22	BOR-22 [0.5-1.0]	Soil Boring	0.5-1.0	15	7/23/90		X	X						X		
	BOR-22 [11.0-11.5]	Soil Boring	11.0-11.5							X	X					
	BOR-22 [11.5-12.0]	Soil Boring	11.5-12.0				X	X						X		
	BOR-22 [14.0-14.5]	Soil Boring	14.0-14.5							X	X					
	BOR-22 [14.5-15.0]	Soil Boring	14.5-15.0				X	X						X		
	BOR-22 [2.5-3.0]	Soil Boring	2.5-3.0			X				X	X					
	BOR-22 [3.5-4.0]	Soil Boring	3.5-4.0										X		X	
	BOR-22 [4.0-4.5]	Soil Boring	4.0-4.5				X	X						X		
	BOR-22 [7.5-8.0]	Soil Boring	7.5-8.0							X	X					
	BOR-22 [8.0-8.5]	Soil Boring	8.0-8.5				X			X	X					
BOR-23	BOR-23 [1.0-1.5]	Soil Boring	1.0-1.5	15.5	7/20/90			X						X		
	BOR-23 [11.0-11.5]	Soil Boring	11.0-11.5							X	X					
	BOR-23 [11.5-12.0]	Soil Boring	11.5-12.0				X	X						X		
	BOR-23 [14.5-15.0]	Soil Boring	14.5-15.0							X	X					
	BOR-23 [15.0-15.5]	Soil Boring	15.0-15.5				X	X						X		

TABLE 6-16
SUBSURFACE SOIL SAMPLING SUMMARY
SITE 13, OU-2 SOUTHEAST AREA, ALAMEDA POINT

Sample Location	Sample Identification	Sampling Method	Sample Depth (ft bgs)	Total Boring Depth (ft bgs)	Date Sampled	Analyses Performed										
						pH	SVOC	VOC	% Moisture	Pesticides	TMetals	DMetals	General Chemicals	TRPH	TOC	TPHEXT
1990 Investigation by Canonie (Continued)																
BOR-23	BOR-23 [3.0-3.5]	Soil Boring	3.0-3.5			X				X	X					
	BOR-23 [3.5-4.0]	Soil Boring	3.5-4.0										X		X	
	BOR-23 [4.0-4.5]	Soil Boring	4.0-4.5				X	X						X		
	BOR-23 [8.5-9.0]	Soil Boring	8.5-9.0							X	X					
	BOR-23 [9.0-9.5]	Soil Boring	9.0-9.5				X			X	X					
BOR-24	BOR-24 [1.0-1.5]	Soil Boring	1.0-1.5	15	7/19/90			X						X		
	BOR-24 [11.0-11.5]	Soil Boring	11.0-11.5							X	X					
	BOR-24 [11.5-12.0]	Soil Boring	11.5-12.0				X	X						X		
	BOR-24 [14.0-14.5]	Soil Boring	14.0-14.5							X	X					
	BOR-24 [14.5-15.0]	Soil Boring	14.5-15.0				X	X						X		
	BOR-24 [2.5-3.0]	Soil Boring	2.5-3.0							X	X					
	BOR-24 [3.0-3.5]	Soil Boring	3.0-3.5										X		X	
	BOR-24 [4.0-4.5]	Soil Boring	4.0-4.5				X	X						X		
	BOR-24 [7.0-7.5]	Soil Boring	7.0-7.5							X	X					
	BOR-24 [7.5-8.0]	Soil Boring	7.5-8.0				X			X	X					
BOR-25	BOR-25 [0.5-1.0]	Soil Boring	0.5-1.0	15	7/20/90		X	X						X		
	BOR-25 [11.0-11.5]	Soil Boring	11.0-11.5							X	X					
	BOR-25 [11.5-12.0]	Soil Boring	11.5-12.0				X	X						X		
	BOR-25 [14.0-14.5]	Soil Boring	14.0-14.5							X	X					
	BOR-25 [14.5-15.0]	Soil Boring	14.5-15.0	15	7/20/90		X	X						X		
	BOR-25 [2.5-3.0]	Soil Boring	2.5-3.0							X	X					
	BOR-25 [3.5-4.0]	Soil Boring	3.5-4.0										X		X	
	BOR-25 [4.0-4.5]	Soil Boring	4.0-4.5				X	X						X		
	BOR-25 [6.5-7.0]	Soil Boring	6.5-7.0							X	X					
	BOR-25 [7.0-7.5]	Soil Boring	7.0-7.5				X			X						
	BOR-26 [1.0-1.5]	Soil Boring	1.0-1.5											X		

TABLE 6-16
SUBSURFACE SOIL SAMPLING SUMMARY
SITE 13, OU-2 SOUTHEAST AREA, ALAMEDA POINT

Sample Location	Sample Identification	Sampling Method	Sample Depth (ft bgs)	Total Boring Depth (ft bgs)	Date Sampled	Analyses Performed										
						pH	SVOC	VOC	% Moisture	Pesticides	TMetals	DMetals	General Chemicals	TRPH	TOC	TPHEXT
1990 Investigation by Canonie (Continued)																
BOR-26	BOR-26 [1.5-2.0]	Soil Boring	1.5-2.0	14	7/24/90		X	X						X		
	BOR-26 [10.0-10.5]	Soil Boring	10.0-10.5							X	X					
	BOR-26 [10.5-11.0]	Soil Boring	10.5-11.0				X	X						X		
	BOR-26 [13.0-13.5]	Soil Boring	13.0-13.5							X	X					
	BOR-26 [13.5-14.0]	Soil Boring	13.5-14.0			X				X	X					
	BOR-26 [2.5-3.0]	Soil Boring	2.5-3.0										X		X	
	BOR-26 [4.0-4.5]	Soil Boring	4.0-4.5				X	X						X		
	BOR-26 [5.5-6.0]	Soil Boring	5.5-6.0							X	X					
	BOR-26 [6.0-6.5]	Soil Boring	6.0-6.5				X			X	X					
BOR-27	BOR-27 [1.0-1.5]	Soil Boring	1.0-1.5	13.5	7/20/90		X	X								
	BOR-27 [10.0-10.5]	Soil Boring	10.0-10.5							X	X					
	BOR-27 [10.5-11.0]	Soil Boring	10.5-11.0				X	X						X		
	BOR-27 [12.5-13.0]	Soil Boring	12.5-13.0							X	X					
	BOR-27 [13.0-13.5]	Soil Boring	13.0-13.5				X	X						X		
	BOR-27 [2.5-3.0]	Soil Boring	2.5-3.0			X				X	X					
	BOR-27 [3.0-3.5]	Soil Boring	3.0-3.5										X		X	
	BOR-27 [4.0-4.5]	Soil Boring	4.0-4.5				X	X						X		
	BOR-27 [7.0-7.5]	Soil Boring	7.0-7.5							X	X					
	BOR-27 [7.5-8.0]	Soil Boring	7.5-8.0				X			X	X					
BOR-6	BOR-6 [0.5-1.0]	Soil Boring	0.5-1.0	15	7/5/90		X	X								
	BOR-6 [11.0-11.5]	Soil Boring	11.0-11.5			X				X	X			X		
	BOR-6 [11.5-12.0]	Soil Boring	11.5-12.0				X	X								
	BOR-6 [14.0-14.5]	Soil Boring	14.0-14.5							X	X			X		
	BOR-6 [14.5-15.0]	Soil Boring	14.5-15.0										X		X	

TABLE 6-16
SUBSURFACE SOIL SAMPLING SUMMARY
SITE 13, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 14 of 18)

Sample Location	Sample Identification	Sampling Method	Sample Depth (ft bgs)	Total Boring Depth (ft bgs)	Date Sampled	Analyses Performed										
						pH	SVOC	VOC	% Moisture	Pesticides	TMetals	DMetals	General Chemicals	TRPH	TOC	TPHEXT
1990 Investigation by Canonie (Continued)																
BOR-6	BOR-6 [2.0-2.5]	Soil Boring	2.0-2.5				X	X								
	BOR-6 [5.5-6.0]	Soil Boring	5.5-6.0								X			X		
	BOR-6 [6.0-6.5]	Soil Boring	6.0-6.5				X	X								
	BOR-6 [8.0-8.5]	Soil Boring	8.0-8.5							X	X			X		
	BOR-6 [8.5-9.0]	Soil Boring	8.5-9.0				X			X	X					
BOR-7	BOR-7 [0.5-1.0]	Soil Boring	0.5-1.0	15	7/5/90		X	X								
	BOR-7 [13.5-14.0]	Soil Boring	13.5-14.0							X	X			X		
	BOR-7 [14.5-15.0]	Soil Boring	14.5-15.0		7/10/90	X				X	X			X		
	BOR-7 [2.0-2.5]	Soil Boring	2.0-2.5				X	X								
	BOR-7 [2.5-3.0]	Soil Boring	2.5-3.0							X	X			X		
	BOR-7 [3.5-4.0]	Soil Boring	3.5-4.0		7/10/90		X	X								
	BOR-7 [4.0-4.5]	Soil Boring	4.0-4.5										X			
	BOR-7 [6.0-6.5]	Soil Boring	6.0-6.5				X	X								
	BOR-7 [8.5-9.0]	Soil Boring	8.5-9.0							X	X			X		
	BOR-7 [9.0-9.5]	Soil Boring	9.0-9.5		7/10/90		X			X						
BOR-8	BOR-8 [1.0-1.5]	Soil Boring	1.0-1.5	14.5	7/16/90					X	X					
	BOR-8 [10.5-11.0]	Soil Boring	10.5-11.0				X	X						X		
	BOR-8 [11.0-11.5]	Soil Boring	11.0-11.5	14.5	7/16/90					X	X					
	BOR-8 [12.5-13.0]	Soil Boring	12.5-13.0				X	X						X		
	BOR-8 [14.0-14.5]	Soil Boring	14.0-14.5										X		X	
	BOR-8 [2.5-3.0]	Soil Boring	2.5-3.0										X		X	
	BOR-8 [3.0-3.5]	Soil Boring	3.0-3.5			X				X	X					
	BOR-8 [3.5-4.0]	Soil Boring	3.5-4.0				X	X						X		
	BOR-8 [4.0-4.5]	Soil Boring	4.0-4.5							X	X					
	BOR-8 [6.5-7.0]	Soil Boring	6.5-7.0				X	X						X		
	BOR-8 [7.0-7.5]	Soil Boring	7.0-7.5							X	X					

TABLE 6-16
SUBSURFACE SOIL SAMPLING SUMMARY
SITE 13, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 15 of 18)

Sample Location	Sample Identification	Sampling Method	Sample Depth (ft bgs)	Total Boring Depth (ft bgs)	Date Sampled	Analyses Performed										
						pH	SVOC	VOC	% Moisture	Pesticides	TMetals	DMetals	General Chemicals	TRPH	TOC	TPHEXT
1990 Investigation by Canonie (Continued)																
BOR-9	BOR-9 [0.5-1.0]	Soil Boring	0.5-1.0	15	7/23/90		X	X						X		
	BOR-9 [11.0-11.5]	Soil Boring	11.0-11.5							X	X					
	BOR-9 [11.5-12.0]	Soil Boring	11.5-12.0				X	X						X		
	BOR-9 [14.0-14.5]	Soil Boring	14.0-14.5							X	X					
	BOR-9 [14.5-15.0]	Soil Boring	14.5-15.0				X	X						X		
	BOR-9 [2.0-2.5]	Soil Boring	2.0-2.5			X				X	X					
	BOR-9 [2.5-3.0]	Soil Boring	2.5-3.0										X			
	BOR-9 [4.0-4.5]	Soil Boring	4.0-4.5				X	X						X		
	BOR-9 [6.5-7.0]	Soil Boring	6.5-7.0							X	X					
	BOR-9 [7.0-7.5]	Soil Boring	7.0-7.5													
1993 (CTO 137) Excavation Near Boring B-7 by PRC and James M. Montgomery																
EX13-002	137-S13-002	Soil Boring	5	5	10/7/93						X			X		
	137-S13-002	Soil Boring	5													
EX13-003	137-S13-003	Soil Boring	5	5	10/7/93						X			X		
	137-S13-003	Soil Boring	5													
EX13-004	137-S13-004	Soil Boring	5	5	10/7/93						X			X		
	137-S13-004	Soil Boring	5													
EX13-006	137-S13-006	Soil Boring	4	4	10/7/93						X			X		
	137-S13-006	Soil Boring	4													
EX13-007	137-S13-007	Soil Boring	4	4	10/7/93		X	X			X			X		
	137-S13-007	Soil Boring	4		10/8/93											
	137-S13-010	Soil Boring	4				X	X			X			X		
	137-S13-010	Soil Boring	4													
EX13-008	137-S13-008	Soil Boring	4	4	10/8/93						X			X		X
	137-S13-008	Soil Boring	4													
EX13-009	137-S13-009	Soil Boring	7	7	10/8/93		X	X			X			X		X
	137-S13-009	Soil Boring	7			X			X		X					X
EX13-020	137-S13-020	Soil Boring	7	7	10/19/93	X			X		X					

TABLE 6-16
SUBSURFACE SOIL SAMPLING SUMMARY
SITE 13, OU-2 SOUTHEAST AREA, ALAMEDA POINT

Sample Location	Sample Identification	Sampling Method	Sample Depth (ft bgs)	Total Boring Depth (ft bgs)	Date Sampled	Analyses Performed										
						pH	SVOC	VOC	% Moisture	Pesticides	TMetals	DMetals	General Chemicals	TRPH	TOC	TPHEXT
1994 Investigation by PRC and Montgomery Watson																
M13-06	280-S13-018	Soil Boring	0 to 1	5	8/12/94	X		X	X		X			X		X
	280-S13-019	Soil Boring	2.5 to 3.5			X		X	X		X			X		X
	280-S13-020	Soil Boring	4 to 5			X			X		X			X		X
M13-07	280-S13-021	Soil Boring	0 to 1	5.5	8/12/94	X		X	X		X			X		X
	280-S13-022	Soil Boring	1.5 to 2.5			X		X	X		X			X		X
	280-S13-023	Soil Boring	2.5 to 3.5			X		X	X		X			X	X	X
	280-S13-024	Soil Boring	4.5 to 5.5			X		X	X		X			X		X
M13-08	280-S13-025	Soil Boring	1 to 2	2	11/19/94	X		X	X		X			X		X
	280-S13-026	Soil Boring	2.5 to 3.5	6	11/19/94	X		X	X		X			X		X
	280-S13-027	Soil Boring	5 to 6			X		X	X		X			X		X
M13-09	280-S13-028	Soil Boring	1 to 2	6	11/19/94	X		X	X		X			X		X
	280-S13-029	Soil Boring	2.5 to 3.5			X		X	X		X			X		X
	280-S13-030	Soil Boring	5 to 6												X	
1990 Investigation by Canonie																
MWOR-1	MWOR-1 [0.5-1.0]	Soil Boring	0.5-1.0	15.5	7/16/90		X				X					
	MWOR-1 [1.0-1.5]	Soil Boring	1.0-1.5				X	X						X		
	MWOR-1 [11.5-12.0]	Soil Boring	11.5-12.0							X	X					
	MWOR-1 [12.0-12.5]	Soil Boring	12.0-12.5				X	X						X		
	MWOR-1 [14.5-15.0]	Soil Boring	14.5-15.0							X	X					
	MWOR-1 [15.0-15.5]	Soil Boring	15.0-15.5				X	X						X		
	MWOR-1 [2.5-3.0]	Soil Boring	2.5-3.0			X				X	X					
	MWOR-1 [3.0-3.5]	Soil Boring	3.0-3.5										X		X	
	MWOR-1 [4.0-4.5]	Soil Boring	4.0-4.5													
	MWOR-1 [4.5-5.0]	Soil Boring	4.5-5.0				X	X						X		
	MWOR-1 [7.0-7.5]	Soil Boring	7.0-7.5							X	X					
	MWOR-1 [7.5-8.0]	Soil Boring	7.5-8.0													
	MWOR-1 [9.0-9.5]	Soil Boring	9.0-9.5				X	X						X		

TABLE 6-16
SUBSURFACE SOIL SAMPLING SUMMARY
SITE 13, OU-2 SOUTHEAST AREA, ALAMEDA POINT

Sample Location	Sample Identification	Sampling Method	Sample Depth (ft bgs)	Total Boring Depth (ft bgs)	Date Sampled	Analyses Performed										
						pH	SVOC	VOC	% Moisture	Pesticides	TMetals	DMetals	General Chemicals	TRPH	TOC	TPHEXT
1990 Investigation by Canonie (Continued)																
MWOR-2	MWOR-2 [10.0-10.5]	Soil Boring	10.0-10.5	13.5	7/17/90					X	X					
	MWOR-2 [11.0-11.5]	Soil Boring	11.0-11.5				X	X						X		
	MWOR-2 [12.0-12.5]	Soil Boring	12.0-12.5							X	X					
	MWOR-2 [13.0-13.5]	Soil Boring	3.0-13.5							X	X					
	MWOR-2 [2.0-2.5]	Soil Boring	2.0-2.5				X	X						X		
	MWOR-2 [2.5-3.0]	Soil Boring	2.5-3.0			X				X	X					
	MWOR-2 [4.0-4.5]	Soil Boring	4.0-4.5				X						X		X	
	MWOR-2 [5.0-5.5]	Soil Boring	5.0-5.5					X						X		
	MWOR-2 [7.0-7.5]	Soil Boring	7.0-7.5							X	X					
	MWOR-2 [8.0-8.5]	Soil Boring	8.0-8.5				X	X						X		
MWOR-3	MWOR-3 [10.0-10.5]	Soil Boring	10.0-10.5	13.5	7/17/90					X	X					
	MWOR-3 [11.0-11.5]	Soil Boring	11.0-11.5				X	X						X		
	MWOR-3 [11.5-12.0]	Soil Boring	11.5-12.0							X	X					
	MWOR-3 [13.0-13.5]	Soil Boring	13.0-13.5				X			X	X					
	MWOR-3 [2.0-2.5]	Soil Boring	2.0-2.5				X	X						X		
	MWOR-3 [2.5-3.0]	Soil Boring	2.5-3.0			X				X	X					
	MWOR-3 [4.0-4.5]	Soil Boring	4.0-4.5			X							X		X	
	MWOR-3 [5.0-5.5]	Soil Boring	5.0-5.5				X	X						X		
	MWOR-3 [7.0-7.5]	Soil Boring	7.0-7.5							X	X					
	MWOR-3 [8.0-8.5]	Soil Boring	8.0-8.5				X			X	X					
MWOR-4	MWOR-4 [1.5-2.0]	Soil Boring	1.5-2.0	15	7/18/90		X	X						X		
	MWOR-4 [10.0-10.5]	Soil Boring	10.0-10.5							X	X					
	MWOR-4 [10.5-11.0]	Soil Boring	10.5-11.0				X	X						X		
	MWOR-4 [14.0-14.5]	Soil Boring	14.0-14.5							X	X					
	MWOR-4 [14.5-15.0]	Soil Boring	14.5-15.0				X	X						X		

TABLE 6-16
SUBSURFACE SOIL SAMPLING SUMMARY
SITE 13, OU-2 SOUTHEAST AREA, ALAMEDA POINT

Sample Location	Sample Identification	Sampling Method	Sample Depth (ft bgs)	Total Boring Depth (ft bgs)	Date Sampled	Analyses Performed										
						pH	SVOC	VOC	% Moisture	Pesticides	TMetals	DMetals	General Chemicals	TRPH	TOC	TPHEXT
1990 Investigation by Canonie (Continued)																
MWOR-4	MWOR-4 [2.5-3.0]	Soil Boring	2.5-3.0			X				X	X					
	MWOR-4 [3.0-3.5]	Soil Boring	3.0-3.5										X		X	
	MWOR-4 [4.0-4.5]	Soil Boring	4.0-4.5				X	X						X		
	MWOR-4 [6.5-7.0]	Soil Boring	6.5-7.0							X	X					
	MWOR-4 [7.0-7.5]	Soil Boring	7.0-7.5				X			X	X					
MWOR-5	MWOR-5 [1.0-1.5]	Soil Boring	1.0-1.5	15.5	7/19/90								X			
	MWOR-5 [1.5-2.0]	Soil Boring	1.5-2.0				X	X								
	MWOR-5 [10.0-10.5]	Soil Boring	10.0-10.5							X	X					
	MWOR-5 [10.5-11.0]	Soil Boring	10.5-11.0				X	X						X		
	MWOR-5 [12.5-13.0]	Soil Boring	12.5-13.0							X	X					
	MWOR-5 [13.0-13.5]	Soil Boring	13.5 - 14.0				X	X						X		
	MWOR-5 [14.5-15.0]	Soil Boring	14.5-15.0							X	X					
	MWOR-5 [15.0-15.5]	Soil Boring	15.0-15.5				X	X						X		
	MWOR-5 [7.0-7.5]	Soil Boring	7.0-7.5			X				X	X					
	MWOR-5 [8.5-9.0]	Soil Boring	8.5-9.0					X						X		

Notes:

%	Percent
DMetals	Dissolved metals
ft bgs	Feet below ground surface
PRC	PRC Environmental Management, Inc.
SVOC	Semivolatile organic compound
TMetals	Total metals
TOC	Total organic carbon
TPHEXT	Total petroleum hydrocarbons - extractable
TRPH	Total recoverable petroleum hydrocarbons
VOC	Volatile organic compound

TABLE 6-17
GEOTECHNICAL SOIL SAMPLING SUMMARY
SITE 13, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 1 of 3)

Sample Location	Sample Identification	Sample Depth (ft bgs)	Sampling Method	Date Sampled	Analyses Performed									
					Moisture Content	Dry Density	Wet Density	Grain Size Distribution	Permeability	Liquid Limit	Plastic Limit	Plasticity Index	Specific Gravity	Consolidation
1990 Investigation by Canonie														
MWOR-1	MWOR-1 (1.5 to 2.0)	1.5 to 2.0	California sampler	07/16/90	X	X	X	X					X	
	MWOR-1 (2.0 to 2.5)	2.0 to 2.5	California sampler	07/16/90	X	X	X		X [(a), (b)]				X	
	MWOR-1 (5.0 to 5.5)	5.0	California sampler	07/16/90	X	X	X							
	MWOR-1 (5.5 to 6.0)	5.5	California sampler	07/16/90	X	X	X							
	MWOR-1 (6.5 to 7.0)	6.5 to 7.0	California sampler	07/16/90						X	X	X		
	MWOR-1 (8.5 to 9.0)	8.5	California sampler	07/16/90	X	X	X							
	MWOR-1 (10.0 to 10.5)	10.0	California sampler	07/16/90				X						
	MWOR-1 (10.0 to 10.5)	10.0 to 10.5	California sampler	07/16/90	X	X	X		X [(a), (b)]				X	
	MWOR-1 (10.5 to 11.0)	10.5	California sampler	07/16/90	X	X	X	X	X [(a), (b)]					
	MWOR-1 (12.5 to 13.0)	12.5	California sampler	07/16/90				X						
	MWOR-1 (13.5 to 14.0)	13.5	California sampler	07/16/90				X						
MWOR-3	MWOR-3 (0.5 to 1.0)	0.5	California sampler	07/17/90	X	X	X							
MWOR-4	MWOR-4 (1.0 to 1.5)	1.0	California sampler	07/19/90				X						
BOR-6	BOR-6 (1.0 to 1.5)	1.0	California sampler	07/05/90	X	X	X							
BOR-7	BOR-7 (1.0 to 1.5)	1.0	California sampler	07/05/90	X	X	X							
	BOR-7 (10.5 to 11.0)	10.5	California sampler	07/05/90				X						
BOR-8	BOR-8 (0.5 to 1.0)	0.5	California sampler	07/16/90				X						
	BOR-8 (5.0 to 5.5)	5.0	California sampler	07/16/90	X	X	X							
BOR-10	BOR-10 (2.0 to 2.5)	2.0	California sampler	07/12/90	X	X	X	X	X [(a), (b)]					
	BOR-10 (5.0 to 5.5)	5.0	California sampler	07/12/90	X	X	X							
	BOR-10 (10.0 to 10.5)	10.0	California sampler	07/12/90						X	X	X		
	BOR-10 (12.0 to 12.5)	12.0	California sampler	07/12/90	X	X	X							

TABLE 6-17
GEOTECHNICAL SOIL SAMPLING SUMMARY
SITE 13, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 2 of 3)

Sample Location	Sample Identification	Sample Depth (ft bgs)	Sampling Method	Date Sampled	Analyses Performed									
					Moisture Content	Dry Density	Wet Density	Grain Size Distribution	Permeability	Liquid Limit	Plastic Limit	Plasticity Index	Specific Gravity	Consolidation
1990 Investigation by Canonie (Continued)														
BOR-11	BOR-11 (10.5 to 11.0)	10.5	California sampler	07/18/90	X	X	X	X	X [(a), (b)]	X	X	X		X [(d)]
BOR-12	BOR-12 (1.0 to 1.5)	1.0	California sampler	07/18/90									X	
	BOR-12 (9.5 to 10.0)	9.5	California sampler	07/18/90	X	X	X							
	BOR-12 (10.0 to 10.5)	10.0	California sampler	07/18/90				X						
	BOR-12 (10.5 to 11.0)	10.5	California sampler	07/18/90	X	X	X							
BOR-13	BOR-13 (8.0 to 8.5)	8.0	California sampler	07/03/90	X	X	X			X	X	X	X	X [(d)]
	BOR-13 (8.5 to 9.0)	8.5	California sampler	07/03/90						X	X	X		
	BOR-13 (9.5 to 10.0)	9.5	California sampler	07/03/90	X	X	X	X	X [(a), (c)]	X	X	X	X	
BOR-15	BOR-15 (5.5 to 6.0)	5.5	California sampler	07/17/90				X					X	
	BOR-15 (10.5 to 11.0)	10.5	California sampler	07/17/90						X	X	X		
BOR-16	BOR-16 (10.5 to 11.0)	10.5	California sampler	07/23/90				X						
	BOR-16 (12.5 to 13.0)	12.5	California sampler	07/23/90	X	X	X							
BOR-18	BOR-18 (5.0 to 5.5)	5.0	California sampler	07/23/90						X	X	X		
	BOR-18 (9.0 to 9.5)	9.0	California sampler	07/23/90	X	X	X							
	BOR-18 (10.5 to 11.0)	10.5	California sampler	07/23/90	X	X	X	X	X [(a), (b)]				X	
BOR-19	BOR-19 (5.0 to 5.5)	5.0	California sampler	07/18/90	X	X	X						X	X [(d)]
BOR-20	BOR-20 (1.0 to 1.5)	1.0	California sampler	07/17/90				X						
	BOR-20 (15.0 to 15.5)	15.0	California sampler	07/17/90				X						
BOR-21	BOR-21 (13.0 to 13.5)	13.0	California sampler	07/19/90				X					X	
BOR-22	BOR-22 (8.5 to 9.0)	8.5	California sampler	07/23/90	X	X	X							
	BOR-22 (12.0 to 12.5)	12.0	California sampler	07/23/90				X						
BOR-23	BOR-23 (1.5 to 2.0)	1.5	California sampler	07/20/90	X	X	X	X	X [(a), (b)]				X	
	BOR-23 (10.0 to 10.5)	10.0	California sampler	07/20/90				X						
	BOR-23 (14.0 to 14.5)	14.0	California sampler	07/20/90	X	X	X							

TABLE 6-17
GEOTECHNICAL SOIL SAMPLING SUMMARY
SITE 13, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 3 of 3)

Sample Location	Sample Identification	Sample Depth (ft bgs)	Sampling Method	Date Sampled	Analyses Performed									
					Moisture Content	Dry Density	Wet Density	Grain Size Distribution	Permeability	Liquid Limit	Plastic Limit	Plasticity Index	Specific Gravity	Consolidation
1990 Investigation by Canonie (Continued)														
BOR-24	BOR-24 (13.0 to 13.5)	13.0	California sampler	07/19/90				X						
BOR-26	BOR-26 (11.5 to 12.0)	11.5	California sampler	07/24/90	X	X	X							

Notes:

(a) Moisture content, dry density, and wet density were determined for permeability test.
(b) Constant head permeability test
(c) Falling head permeability test was performed during the 1990 investigation.
(d) Moisture content, dry density, and wet density were determined for consolidation test.

ft bgs Feet below ground surface

TABLE 6-18
MONITORING WELL CONSTRUCTION DETAILS
SITE 13, OU-2 SOUTHEAST AREA, ALAMEDA POINT

Well Identification	Screen Interval (ft below TOC)	Hydrostratigraphic Unit of Screen Interval	Top of Casing Elevation (ft MLLW)	Total Borehole Depth (ft bgs)	Total Well Depth (ft bgs)	Well Diameter (inches)	Blank Casing Interval (ft below TOC)	Filter Interval (ft below TOC)	Bentonite Seal Interval (ft below TOC)	Cement Grout Interval (ft below TOC)
MW-1	3.5-13.5	FWBZU	14.24	15	13.5	2	0-3.5	3-13.5	2.5-3	0-2.5
MWOR-1	5-15	FWBZU	12.63	15	15	2	0-5	4.5-15	4-4.5	0-4
MWOR-2	5-15	FWBZU	12.4	15	15	2	0-5	4.5-15	4-4.5	0-4
MWOR-3	5-15	FWBZU	13.22	15	15	2	0-5	4.5-15	4-4.5	0-4
MWOR-4	5-15	FWBZU	11.81	15	15	2	0-5	4.5-15	4-4.5	0-4
MWOR-5	5-15	FWBZU	11.94	15	15	2	0-5	4.5-15	4-4.5	0-4
M13-06	2-9.75	FWBZU	12.61	10	9.75	2	0-2	2-9.75	1.5-2	0-1.5
M13-07	2-12.5	FWBZU	13.02	15	12.5	2	0-2	2-9.75	1.5-2	0-1.5
M13-08	22-32	FWBZU	11.63	32	32	2	0-22	21.5-32	20.5-21.5	0-20.5
M13-09	2-12.5	FWBZU	11.84	15	12.5	2	0-2	2-12.5	1.5-2	0-1.5
D13-01	50-60	FWBZL	11.91	60	60	3	0-50	48-60	45-50	0-45

Notes:

ft bgs	Feet below ground surface
ft	Feet
FWBZL	First water-bearing zone lower
FWBZU	First water-bearing zone upper
MLLW	Mean lower low water
TOC	Top of casing

TABLE 6-19
GROUNDWATER SAMPLING SUMMARY
SITE 13, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 1 of 5)

Sample Location	Sample Identification	Screened Interval (ft bgs) or ft below top of casing [b]	Hydrostratigraphic Unit Where Sample Was Collected	Sampling Method	Date Sample	Analyses Performed								
						VOC	SVOC	Pest/ PCB	DMetals	TRPH	General Chemicals[a]	TPPH	TPHEXT	MBAS Sulfide
Monitoring Well Groundwater Samples														
1990 Investigation by Canonie [c]														
MW-1	MW-1 [10/15/90]	3.5 to 13.5	FWBZU	Bailer	10/15/90	X	X	X	X	X	X			
MWOR-1	MWOR-1 [08/24/90]	5.0 to 15.0	FWBZU	Bailer	08/24/90	X	X	X	X	X	X			
MWOR-2	MWOR-2 [08/27/90]	5.0 to 15.0	FWBZU	Bailer	08/27/90	X	X	X	X	X	X			
MWOR-3	MWOR-3 [08/27/90]	5.0 to 15.0	FWBZU	Bailer	08/27/90	X	X	X	X	X	X			
MWOR-4	MWOR-4 [08/28/90]	5.0 to 15.0	FWBZU	Bailer	08/27/90	X	X	X	X	X	X			
MWOR-5	MWOR-5 [08/28/90]	5.0 to 15.0	FWBZU	Bailer	08/28/90	X	X	X	X	X	X			
1991-1992 Investigation by PRC and Montgomery Watson [d]														
B-IMF-09	B-IMF-09	6.0	FWBZU	Bailer	04/03/92				X					
B-IMF-10	B-IMF-10	10.0 to 10.5	FWBZU	Bailer	04/03/92				X					
M-IMF-01	M-IMF-01	4.0 to 13.5	FWBZU	Bailer	04/17/92				X		X			
	MIMF-01	4.0 to 13.5		Bailer	08/09/91					X	X			
	MIMF-01	4.0 to 13.5		Bailer	08/14/91				X		X			
M-IMF-02	M-IMF-02	3.0 to 13.0	FWBZU	Bailer	04/17/92				X		X			
1994-1995 Investigation by PRC and Montgomery Watson [e]														
B13-28	280-S13-106	NA	FWBZU	Bailer	12/09/94	X						X	X	
B13-29	280-S13-146	NA	FWBZU	Bailer	12/09/94	X						X	X	
B13-30	280-S13-108	NA	FWBZU	Bailer	12/09/94	X						X	X	
D13-01	280-S13-100	50.0 to 60.0	FWBZL	Bailer	12/16/94	X	X	X	X		X	X	X	
	280-S13-111			Bailer	02/23/95	X	X	X	X		X			
	280-S13-112			Bailer	06/26/95	X	X	X	X		X			
	280-S13-113			Bailer	09/19/95	X	X	X	X		X			
M13-06	280-S13-054	2.0 to 9.75	FWBZU	Bailer	10/21/94	X	X	X	X		X	X	X	
	280-S13-055			Bailer	02/24/95	X	X	X	X		X	X	X	
	280-S13-057			Bailer	06/27/95	X	X	X	X		X	X	X	
	280-S13-058			Bailer	08/11/95	X	X	X	X		X	X	X	

TABLE 6-19
GROUNDWATER SAMPLING SUMMARY
SITE 13, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 2 of 5)

Sample Location	Sample Identification	Screened Interval (ft bgs) or ft below top of casing [b]	Hydrostratigraphic Unit Where Sample Was Collected	Sampling Method	Date Sample	Analyses Performed									
						VOC	SVOC	Pest/ PCB	DMetals	TRPH	General Chemicals[a]	TPPH	TPHEXT	MBAS	Sulfide
1994-1995 Investigation by PRC and Montgomery Watson (Continued) [e]															
M13-07	280-S13-059	2.5 to 12.5	FWBZU	Bailer	11/01/94	X	X	X	X		X	X	X		
	280-S13-060			Bailer	02/28/95	X	X	X	X		X	X	X		
	280-S13-061			Bailer	06/28/95	X	X	X	X		X	X	X		
	280-S13-062			Bailer	08/16/95	X	X	X	X		X	X	X		
M13-08	280-S13-063	22.0 to 32.0	FWBZU	Bailer	02/07/95	X	X	X	X		X	X	X		
	280-S13-065			Bailer	02/24/95	X	X	X	X		X	X	X		X
	280-S13-066			Bailer	06/28/95	X	X	X	X		X	X	X		X
	280-S13-067			Bailer	08/16/95	X	X	X	X		X	X	X		X
M13-09	280-S13-068	2.5 to 12.5	FWBZU	Bailer	12/09/94	X	X	X	X		X	X	X		
	280-S13-069			Bailer	02/24/95	X	X	X	X		X	X	X		
	280-S13-070			Bailer	06/28/95	X	X	X	X		X	X	X		
	280-S13-071			Bailer	08/18/95	X	X	X	X		X	X	X		
MW-1	280-S13-099	3.5 to 13.5	FWBZU	Bailer	12/06/94	X	X	X	X		X	X	X		
	280-S13-149			Bailer	02/24/95	X	X	X	X		X	X	X		
	280-S13-150			Bailer	06/27/95	X	X	X	X		X	X	X		
	280-S13-151			Bailer	08/17/95	X	X	X	X		X	X	X		
MWOR-1	280-S13-032	5.0 to 15.0	FWBZU	Bailer	10/20/94	X	X	X	X		X	X	X		X
	280-S13-033			Bailer	02/24/95	X	X	X	X		X	X	X		
	280-S13-034			Bailer	06/27/95	X	X	X	X		X	X	X		
	280-S13-035			Bailer	08/09/95	X	X	X	X		X	X	X		
MWOR-2	280-S13-037	5.0 to 15.0	FWBZU	Bailer	10/20/94	X	X	X	X		X	X	X		
	280-S13-038			Bailer	02/24/95	X	X	X	X		X	X	X		
	280-S13-039			Bailer	06/27/95	X	X	X	X		X	X	X		
	280-S13-040			Bailer	08/09/95	X	X	X	X		X	X	X		
MWOR-3	280-S13-041	5.0 to 15.0	FWBZU	Bailer	10/20/94	X	X	X	X		X	X	X		
	280-S13-042			Bailer	02/28/95	X	X	X	X		X	X	X		
	280-S13-043			Bailer	06/27/95	X	X	X	X		X	X	X		
	280-S13-045			Bailer	08/10/95	X	X	X	X		X	X	X		

TABLE 6-19
GROUNDWATER SAMPLING SUMMARY
SITE 13, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 3 of 5)

Sample Location	Sample Identification	Screened Interval (ft bgs) or ft below top of casing [b]	Hydrostratigraphic Unit Where Sample Was Collected	Sampling Method	Date Sample	Analyses Performed								
						VOC	SVOC	Pest/ PCB	DMetals	TRPH	General Chemicals[a]	TPPH	TPHEXT	MBAS Sulfide
Monitoring Well Groundwater Samples (Continued)														
1994-1995 Investigation by PRC and Montgomery Watson (Continued) [e]														
MWOR-4	280-S13-046	5.0 to 15.0	FWBZU	Bailer	10/20/94	X	X	X	X		X	X	X	
	280-S13-047			Bailer	02/23/95	X	X	X	X		X	X	X	
	280-S13-048			Bailer	06/26/95	X	X	X	X		X	X	X	
	280-S13-049			Bailer	08/17/95	X	X	X	X		X	X	X	
MWOR-5	280-S13-050	5.0 to 15.0	FWBZU	Bailer	10/21/94	X	X	X	X		X	X	X	
	280-S13-051			Bailer	02/23/95	X	X	X	X		X	X	X	
	280-S13-052			Bailer	06/28/95	X	X	X	X		X	X	X	
	280-S13-053			Bailer	08/11/95	X	X	X	X		X	X	X	
Hydropunch® Groundwater Samples														
1994 Investigation by PRC and Montgomery Watson [e]														
DPH-S13-02	280-S13-073	17.9	FWBZU	HPS	08/02/94	X	X		X		X	X	X	
DHP-S13-03	280-S13-074	22.0	FWBZU	HPS	07/20/94	X	X		X		X	X	X	
DHP-S13-04	280-S13-075	30.0	FWBZU	HPS	07/20/94	X	X		X		X	X	X	
DHP-S13-05	280-S13-076	13.5	FWBZU	HPS	08/29/94	X	X		X		X	X	X	
Geoprobe® Groundwater Samples														
1994 Investigation by PRC and Montgomery Watson														
13GB005	GPW13-500	At water table	FWBZU	Mill-slotted well point	08/17/94	X						X	X	
	GPW13-300	At water table	FWBZU	Mill-slotted well point	08/17/94	X						X	X	
13GB100	GPW13-100	At water table	FWBZU	Mill-slotted well point	08/17/94	X						X	X	

TABLE 6-19
GROUNDWATER SAMPLING SUMMARY
SITE 13, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 4 of 5)

Sample Location	Sample Identification	Screened Interval (ft bgs) or ft below top of casing [b]	Hydrostratigraphic Unit Where Sample Was Collected	Sampling Method	Date Sample	Analyses Performed									
						VOC	SVOC	Pest/ PCB	DMetals	TRPH	General Chemicals[a]	TPPH	TPHEXT	MBAS	Sulfide
Monitoring Well Groundwater Samples (Continued)															
1994 SCAPS Investigation [d]															
B13-38	ALA13B38-W	16.0	FWBZU	SCAPS	04/04/94				X		X			X	
B13-39	ALA13B39-W	17.5	FWBZU	SCAPS	04/04/94				X		X			X	
B13-40	ALA13B40-W	17.5	FWBZU	SCAPS	04/04/94				X		X			X	
B13-41	ALA13B41-W	16.0	FWBZU	SCAPS	04/05/94				X		X			X	
B13-42	ALA13B42-W	21.0	FWBZU	SCAPS	04/05/94				X		X			X	
B13-43	ALA13B43-W	16.0	FWBZU	SCAPS	04/05/94				X		X			X	
B13-44	ALA13B44-W	15.5	FWBZU	SCAPS	04/06/94				X		X			X	
B13-45	ALA13B45-W	18.0	FWBZU	SCAPS	04/06/94				X		X			X	

Notes:

(a) This table summarizes groundwater sampling activities at Site 13 for only CTO 121, CTO 280, and CTO 316. Information for CTO 108 is summarized in the "Data Summary Report for Quarterly Groundwater Monitoring, November 1997 - August 1998," dated December 7, 1998, and prepared by Tetra Tech EM Inc., and Uribe & Associates.

(b) Sample depth for groundwater samples from monitoring wells measured in feet below top of casing (refer to Table 6-19 for monitoring well construction details). Sample depth for Hydropunch® groundwater samples measured in feet below ground surface.

(c) General chemistry analysis parameters for the 1990 investigation monitoring well groundwater samples are COD, pH, specific conductivity, TOC, TDS.

(d) General chemistry analysis parameters for the 1991 - 1992 IMF investigation are alkalinity, anions, hardness, and TDS.

(e) General chemistry analysis parameters for the 1994-1995 investigation Hydropunch® and monitoring well groundwater samples are TDS, alkalinity, acidity, COD, anions, pH, hardness, and TOC. The Hydropunch® and the first quarter monitoring well groundwater samples were also analyzed for specific conductivity.

(f) General chemistry analysis parameters for the 1994 SCAPS investigation are alkalinity, anions, dissolved organic carbon, hardness, pH, and TDS.

ft bgs	Below ground surface	PRC	PRC Environmental Management, Inc.
CLP	Contract Laboratory Program	SCAPS	Site characterization and analysis penetrometer system
COD	Chemical oxygen demand	SVOC	Semivolatile organic compound
D Metals	Dissolved metals	TDS	Total dissolved solids

TABLE 6-19
GROUNDWATER SAMPLING SUMMARY
SITE 13, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 5 of 5)

Notes (Continued)

FWBZL	First water-bearing zone Lower
IMF	Intermediate maintenance facility
MBAS	Methylene blue active substance
NA	Not applicable
Pest/PCB	Pesticides/polychlorinated biphenyls
TPHPRG	Total petroleum hydrocarbon - purgeable
TRPH	Total recoverable petroleum hydrocarbon
VOC	Volatile organic compound
HPS	Hydropunch® samples

TABLE 6-20
FIELD SAMPLING PLAN VARIANCE SUMMARY
SITE 13, OU-2 SOUTHEAST AREA, ALAMEDA POINT

Field and Location Identification	Variation from FSP	Reason for Variation	Resolution of Variation
1994 - (CTO 280) Investigation by PRC and Montgomery Watson			
Soil Sampling at Soil Borings			
B13-28 through B13-31	Soil borings moved to a different location.	Based on Geoprobe® information	Borings relocated based on Geoprobe® data
CPT-S13-01	Cancelled	Memo sent to PRC from Navy, July 11, 1994	CPT not collected
Hydropunch® sampling			
SHP-S13-01,HP-S13-01, and HP-S13-02	Geoprobe® used instead of a HydroPunch®	For convenience	Geoprobe® used for sample collection

Notes:

CTO Contract Task Order
CPT Cone penetrometer test
PRC PRC Environmental Management, Inc.
FSP Field sampling plan

TABLE 6-21
GEOTECHNICAL SAMPLE LABORATORY TEST RESULTS
SITE 13, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 1 of 3)

Sample Number	Sample Depth (ft bgs)	Soil Classification [(a), (b)]		Stratigraphic Unit	Geotechnical Tests Performed [(a)]				
								Permeability	
		Laboratory	Field		Moisture Content (%)	Dry Density (pcf)	Specific Gravity	Effective Stresses (psi)	Hydraulic Conductivity (cm/s)
1990 Investigation by Canonie (Phases 1 and 2A)									
MWOR-1	5	NA	SM	Fill	9.7	115.9	NA	NA	NA
MWOR-1	5.5	NA	SM	Fill	13.3	112.4	NA	NA	NA
MWOR-1	8.5	NA	SC	H/P-A/E	17.1	112.6	NA	NA	NA
MWOR-1	10.5	SM	SC	H/P-A/E	17.5	110.1	NA	NA	2.00E-07
MWOR-3	0.5	NA	SM	Fill	4.3	99.7	NA	NA	NA
MWOR-4	1	GP	GM	Fill	NA	NA	NA	NA	NA
BOR-6	1	NA	SM	Fill	3.5	94.8	NA	NA	NA
BOR-7	1	NA	SM	Fill	2.3	99.7	NA	NA	NA
BOR-7	10.5	SM	CL	H/P-A/E	NA	NA	NA	NA	NA
BOR-8	0.5	NA	SM	Fill	NA	NA	NA	NA	NA
BOR-8	5	NA	SM	Fill	18.9	96.1	NA	NA	NA
BOR-10	2	SP	SM	Fill	7.2	98.9	NA	NA	3.00E-03
BOR-10	5	NA	SM	Fill	14.6	104	NA	NA	NA
BOR-10	12	NA	CL/SC	HBM	21.5	100.3	NA	NA	NA
BOR-11	10.5	CH	CL/SM	HBM	NA	NA	NA	NA	NA
BOR-12	1	SP	SM	Fill	NA	NA	2.71	NA	NA
BOR-12	9.5	SP	SM/CL	HBM	31.5	86.9	NA	NA	NA
BOR-12	10.5	NA	CL	HBM	17.1	107.9	NA	NA	NA
BOR-13	8	NA	CL	HBM	NA	NA	2.62	NA	NA
BOR-13	9.5	CH	CL	HBM	NA	NA	2.51	NA	NA
BOR-15	5.5	SP	SM	Fill	NA	NA	2.65	NA	NA
BOR-16	10.5	SM	SC	H/P-A/E	NA	NA	NA	NA	NA
BOR-16	12.5	NA	SC	H/P-A/E	14.1	115.5	NA	NA	NA

TABLE 6-21
GEOTECHNICAL SAMPLE LABORATORY TEST RESULTS
SITE 13, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 2 of 3)

Sample Number	Sample Depth (ft bgs)	Soil Classification [(a), (b)]		Stratigraphic Unit	Geotechnical Tests Performed [(a)]				
		Laboratory	Field		Moisture Content (%)	Dry Density (pcf)	Specific Gravity	Permeability	
								Effective Stresses (psi)	Hydraulic Conductivity (cm/s)
1990 Investigation by Canonie (Phases 1 and 2A) (Continued)									
BOR-18	9	NA	SC	H/P-A/E	21.7	103.8	NA	NA	NA
BOR-18	10.5	SM	SC	H/P-A/E	18	109.1	2.63	NA	2.00E-08
BOR-19	5	SM	SC	Fill	NA	NA	2.63	NA	NA
BOR-20	1	SP	GP/SM	Fill	NA	NA	NA	NA	NA
BOR-20	15	SM	SM	HBM	NA	NA	NA	NA	NA
BOR-21	13	SM	SM	H/P-A/E	NA	NA	2.64	NA	NA
BOR-22	8.5	NA	SM	Fill	17.1	105.5	NA	NA	NA
BOR-22	12	SM	SM	HBM	NA	NA	NA	NA	NA
BOR-23	1.5	SP	SM	Fill	4.4	101.5	2.73	NA	1.00E-03
BOR-23	10	SP/SM	SM	HBM	NA	NA	NA	NA	NA
BOR-23	14	NA	SM	H/P-A/E	18	110.9	NA	NA	NA
BOR-24	13	SM	SM	H/P-A/E	NA	NA	NA	NA	NA
BOR-26	11.5	NA	SM/SC	HBM	18.7	107.3	NA	NA	NA

Notes:

(a) Samples were classified or analyzed using the following methods:
Soil Classification, Unified soil Classification System ASTM D2488
Moisture Content ASTM D2216
Dry Density ASTM D2937
Specific Gravity ASTM D854
Effective Stresses EPA 9100
Hydraulic Conductivity EPA 9100

TABLE 6-21
GEOTECHNICAL SAMPLE LABORATORY TEST RESULTS
SITE 13, OU-2 OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 3 of 3)

Notes (Continued):

(b) Soil Classification legend is as follows:

GP	Poorly graded gravels, gravel-sand mixtures, little or no fines
GM	Silty gravels, gravel-sand-silt mixtures
SP	Poorly-graded sands, gravelly sands, little or no fines
SM	Silty sands, sand-silt mixtures
SC	Clayey sands, sand-clay mixtures
CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
CH	Inorganic clays of high plasticity, fat clays

NA	Not Analyzed
%	Percent
pcf	Pounds per cubic foot
psi	Pounds per square inch
cm/s	Centimeters per second
ft bgs	Feet below ground surface
H/P - A/E	Holocene/Pleistocene Aluvial/Eolian Deposit (Merrit Sand)
HBM	Holocene Bay Mud (Bay Sediments Unit)

TABLE 6-22
SOIL ANALYTICAL DATA SUMMARY (0 TO < 2 FEET BGS)
SITE 13, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 1 of 2)

Chemical	Total Samples	Samples With Detections	Frequency of Detection (%)	Reporting Limits (mg/kg)		Detected Concentrations (mg/kg)		Data Summary Statistics (mg/kg)	
				Minimum	Maximum	Minimum	Maximum	Mean	Standard Deviation
Pesticides									
4,4'-DDE	22	1	4.5	0.0021	0.16	0.03	0.03	0.03	0.02
4,4'-DDT	22	2	9.1	0.0021	0.16	0.00	0.16	0.08	0.04
Heptachlor epoxide	21	1	4.8	0.001	0.08	0.01	0.01	0.01	0.01
Semivolatile Organic Compounds									
Anthracene	25	1	4.0	0.34	34.00	0.04	0.04	0.04	3.42
Benzo(a)anthracene	25	2	8.0	0.34	34.00	0.11	0.17	0.14	3.42
Benzo(a)pyrene	25	2	8.0	0.34	34.00	0.06	0.13	0.10	3.42
Benzo(b)fluoranthene	25	1	4.0	0.34	34.00	0.12	0.12	0.12	3.42
Benzo(g,h,i)perylene	25	2	8.0	0.34	34.00	0.02	0.03	0.03	3.42
Chrysene	25	4	16.0	0.34	34.00	0.02	2.30	0.68	3.40
di-n-butylphthalate	25	1	4.0	0.34	34.00	0.03	0.03	0.03	3.53
Fluoranthene	25	5	20.0	0.34	34.00	0.03	0.44	0.14	3.42
Indeno(1,2,3-c,d)pyrene	25	1	4.0	0.34	34.00	0.35	0.35	0.35	3.42
n-Nitrosodiphenylamine (1)	24	7	29.2	0.34	34.00	0.04	1.20	0.23	3.46
Naphthalene	25	4	16.0	0.34	34.00	0.04	0.04	0.04	3.42
Pentachlorophenol	25	1	4.0	1.6	170.00	0.64	0.64	0.64	17.08
Phenanthrene	25	1	4.0	0.34	34.00	0.19	0.19	0.19	3.42
Pyrene	25	4	16.0	0.34	34.00	0.02	0.38	0.15	3.42
Total Metals									
Aluminum	36	36	100.0	1.6	24.00	47.90	21900.00	5650.30	4674.12
Antimony	36	9	25.0	0.45	7.30	0.59	8.20	3.78	1.98
Arsenic	36	21	58.3	0.52	12.00	1.40	20.00	5.96	4.72
Barium	34	32	94.1	0.2	24.00	11.60	290.00	60.63	55.40
Beryllium	36	9	25.0	0.2	1.20	0.13	0.73	0.42	0.22
Cadmium	36	19	52.8	0.06	1.20	0.05	18.00	1.41	2.99
Calcium	36	36	100.0	3.6	610.00	1310.00	22300.00	4547.22	4265.93
Chromium	36	36	100.0	0.08	6.10	7.30	337.00	36.24	52.44
Cobalt	36	28	77.8	0.8	6.10	2.60	15.20	5.56	3.35
Copper	36	31	86.1	0.4	7.00	4.80	160.00	30.10	35.75
Iron	36	36	100.0	1.3	12.00	2790.00	74800.00	11054.44	12342.82
Lead	40	27	67.5	0.13	6.10	1.30	431.00	70.67	102.25
Magnesium	36	36	100.0	4.9	610.00	157.00	12000.00	2657.97	2417.98
Manganese	36	36	100.0	0.2	6.10	22.60	548.00	151.74	130.24
Mercury	14	5	35.7	0.15	0.19	0.01	0.40	0.15	0.11
Molybdenum	36	1	2.8	1	6.10	5.90	5.90	5.90	1.22
Nickel	36	34	94.4	1.2	15.80	4.70	278.00	34.99	45.69

TABLE 6-22
SOIL ANALYTICAL DATA SUMMARY (0 TO < 2 FEET BGS)
SITE 13, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 2 of 2)

Chemical	Total Samples	Samples With Detections	Frequency of Detection (%)	Reporting Limits (mg/kg)		Detected Concentrations (mg/kg)		Data Summary Statistics (mg/kg)	
				Minimum	Maximum	Minimum	Maximum	Mean	Standard Deviation
Total Metals (Continued)									
Potassium	36	28	77.8	71	654.00	390.00	2700.00	792.04	514.61
Selenium	36	7	19.4	0.53	12.00	0.22	12.00	4.45	3.00
Silver	36	1	2.8	0.18	6.10	1.60	1.60	1.60	1.16
Sodium	36	25	69.4	2.3	610.00	69.60	1830.00	331.44	298.31
Thallium	36	1	2.8	0.39	12.00	2.70	2.70	2.70	2.24
Titanium	22	22	100.0	0.2	6.10	209.00	879.00	398.64	152.23
Vanadium	36	36	100.0	0.6	6.10	10.10	82.00	24.61	15.76
Zinc	36	36	100.0	0.6	6.10	7.00	7120.00	262.72	1194.04
Total Petroleum Hydrocarbons									
Gasoline range organics	11	4	36.4	0.51	280.00	8.80	1710.00	847.20	616.76
Motor oil range organics	14	10	71.4	20	1200.00	57.00	297000.00	51119.00	80260.92
TRPH	5	5	100.0	1.8	142.00	7.30	4230.00	1353.46	1731.34
Volatile Organic Compounds									
Acetone	8	1	12.5	0.01	0.11	0.18	0.18	0.18	0.06
Benzene	8	3	37.5	0.01	0.01	0.00	0.03	0.02	0.01
Carbon disulfide	8	1	12.5	0.01	0.01	0.00	0.00	0.00	0.00
Ethylbenzene	8	3	37.5	0.01	0.01	0.01	0.10	0.05	0.03
Toluene	8	3	37.5	0.01	0.01	0.00	0.01	0.01	0.00
Xylene (total)	8	3	37.5	0.01	0.01	0.02	0.24	0.13	0.09

Notes:

mg/kg Milligram per kilogram

TRPH Total recoverable petroleum hydrocarbon

TABLE 6-23
SOIL ANALYTICAL DATA SUMMARY (2 FEET TO < 10 FEET BGS)
SITE 13, OU-2, SOUTHEAST AREA, ALAMEDA POINT
(Page 1 of 3)

Chemical	Total Samples	Samples With Detections	Frequency of Detection (%)	Reporting Limits (mg/kg)		Detected Concentrations (mg/kg)		Data Summary Statistics (mg/kg)	
				Minimum	Maximum	Minimum	Maximum	Mean	Standard Deviation
Pesticides									
Toxaphene	55	1	1.8	0.052	0.94	1.40	1.40	1.40	0.20
Semivolatile Organic Compounds									
2,4-Dimethylphenol	92	3	3.3	0	7.60	0.14	12.00	4.45	1.65
2-methylnaphthalene	92	14	15.2	0	7.60	0.04	160.00	18.26	17.20
Acenaphthene	91	2	2.2	0	1.80	0.04	0.25	0.14	3.38
Anthracene	92	10	10.9	0	1.80	0.04	4.80	1.05	0.57
Benzo(a)anthracene	92	6	6.5	0	1.80	0.05	0.31	0.11	3.36
Benzo(a)pyrene	92	9	9.8	0	1.80	0.08	0.84	0.30	3.36
Benzo(b)fluoranthene	92	9	9.8	0	1.80	0.08	5.10	0.83	1.05
Benzo(g,h,i)perylene	91	7	7.7	0	1.80	0.07	0.21	0.13	3.38
Benzo(k)fluoranthene	92	3	3.3	0	1.80	0.06	0.14	0.10	3.36
Carbazole	29	4	13.8	0	0.51	0.13	5.90	1.70	2.07
Chrysene	92	21	22.8	0	1.80	0.02	36.00	3.28	4.31
Di-n-butylphthalate	92	2	2.2	0	2.00	0.03	0.04	0.04	3.36
Dibenzo(a,h)anthracene	92	2	2.2	0	1.80	0.09	0.18	0.13	3.36
Dibenzofuran	92	4	4.3	0	1.80	0.02	6.90	2.19	1.08
Fluoranthene	92	14	15.2	0	1.80	0.02	3.90	0.72	0.47
Fluorene	92	17	18.5	0	1.80	0.04	46.00	4.45	5.02
Indeno(1,2,3-cd)pyrene	92	5	5.4	0	1.80	0.05	0.21	0.09	3.36
N-nitrosodiphenylamine (1)	92	16	17.4	0	1.80	0.04	0.17	0.06	3.37
Naphthalene	92	30	32.6	0	7.60	0.04	30.00	1.93	3.36
Pentachlorophenol	92	3	3.3	0	8.90	0.17	1.00	0.48	8.10
Phenanthrene	92	25	27.2	0	1.40	0.04	140.00	9.48	16.24
Pyrene	92	23	25.0	0	1.80	0.02	16.00	1.59	1.97
Total Metals									
Aluminum	103	103	100.0	0	26.00	45.80	17000.00	6876.66	3878.02
Antimony	104	39	37.5	0	7.70	0.37	5.80	2.20	1.57
Arsenic	101	58	57.4	0	13.00	1.10	13.90	3.44	2.21
Barium	98	94	95.9	0.08	26.00	14.30	271.00	54.84	37.06
Beryllium	104	34	32.7	0	1.30	0.08	2.00	0.58	0.39
Cadmium	103	47	45.6	0	1.30	0.02	5.80	0.45	0.69

TABLE 6-23
SOIL ANALYTICAL DATA SUMMARY (2 FEET TO < 10 FEET BGS)
SITE 13, OU-2, SOUTHEAST AREA, ALAMEDA POINT

Chemical	Total Samples	Samples With Detections	Frequency of Detection (%)	Reporting Limits (mg/kg)		Detected Concentrations (mg/kg)		Data Summary Statistics (mg/kg)	
				Minimum	Maximum	Minimum	Maximum	Mean	Standard Deviation
Total Metals (Continued)									
Calcium	103	102	99.0	0	1330.00	363.00	28800.00	2937.58	2959.48
Chromium	103	103	100.0	0	6.40	3.40	110.00	34.88	14.88
Cobalt	104	82	78.8	0	6.40	2.20	15.20	5.64	2.75
Copper	103	93	90.3	0	10.80	1.20	65.40	12.86	10.56
Iron	103	103	100.0	0	13.00	1110.00	33000.00	10773.88	5746.55
Lead	129	90	69.8	0	47.20	1.00	602.00	31.15	68.25
Magnesium	103	103	100.0	0	640.00	153.00	8420.00	2561.71	1205.59
Manganese	103	103	100.0	0	6.40	7.50	759.00	136.01	111.74
Mercury	48	18	37.5	0	0.19	0.01	0.12	0.04	0.04
Molybdenum	104	2	1.9	0	6.40	0.72	1.50	1.11	1.04
Nickel	103	103	100.0	0	6.40	1.20	121.00	30.64	16.13
Potassium	103	99	96.1	0	640.00	270.00	2940.00	847.32	443.91
Selenium	102	27	26.5	0	13.00	0.14	2.10	0.49	2.11
Silver	104	3	2.9	0	6.40	0.23	0.49	0.37	1.12
Sodium	103	81	78.6	0	640.00	69.90	2690.00	408.07	377.02
Thallium	103	1	1.0	0	13.00	2.90	2.90	2.90	2.21
Titanium	55	55	100.0	0.2	6.40	139.00	632.00	387.84	107.38
Vanadium	103	103	100.0	0	6.40	2.00	1780.00	40.18	173.34
Zinc	103	103	100.0	0	6.40	5.60	131.00	28.70	18.46
Total Petroleum Hydrocarbons									
Diesel range organics	59	18	30.5	0	570.00	15.00	35000.00	4154.22	4926.15
Gasoline range organics	32	16	50.0	0	310.00	6.60	9310.00	1220.36	1759.27
JP5 range organics	38	3	7.9	0	2400.00	200.00	5900.00	2500.00	992.37
Motor oil range organics	49	27	55.1	13	1440.00	15.00	27500.00	3480.30	5255.49
Other heavy TPH components	8	7	87.5	0	23.00	130.00	7400.00	2118.57	2603.09
Other TPH components, total	5	5	100.0	1.3	1.40	120.00	770.00	310.00	260.86
TRPH	88	53	60.2	1.7	1770.00	2.00	170000.00	8044.98	20455.91
Volatile Organic Compounds									
2-Hexanone	82	1	1.2	0	5.90	0.00	0.00	0.00	0.34
4-Methyl-2-pentanone	82	1	1.2	0	5.90	0.04	0.04	0.04	0.33
Acetone	82	3	3.6	0	5.90	0.19	0.47	0.30	0.34
Benzene	94	15	15.9	0	2.90	0.00	1.00	0.14	0.19

TABLE 6-23
SOIL ANALYTICAL DATA SUMMARY (2 FEET TO < 10 FEET BGS)
SITE 13, OU-2, SOUTHEAST AREA, ALAMEDA POINT
(Page 3 of 3)

Chemical	Total Samples	Samples With Detections	Frequency of Detection (%)	Reporting Limits (mg/kg)		Detected Concentrations (mg/kg)		Data Summary Statistics (mg/kg)	
				Minimum	Maximum	Minimum	Maximum	Mean	Standard Deviation
Volatile Organic Compounds (Continued)									
Carbon disulfide	82	2	2.4	0	2.90	0.00	0.00	0.00	0.17
Chlorobenzene	82	1	1.2	0	2.90	0.00	0.00	0.00	0.17
Ethylbenzene	94	20	21.3	0	2.90	0.00	5.10	0.44	0.56
Toluene	94	66	70.2	0	2.90	0.00	9.10	0.27	1.02
Xylene (total)	94	21	22.3	0	2.90	0.00	38.00	4.12	5.18

Notes:

mg/kg Milligram per kilogram

TRPH Total recoverable petroleum hydrocarbon

TABLE 6-24
SOIL ANALYTICAL DATA SUMMARY (> 10 FEET BGS)
SITE 13, OU-2 SOUTHEAST AREA, ALAMEDA POINT

Chemical	Total Samples	Samples With Detections	Frequency of Detection (%)	Reporting Limits (mg/kg)		Detected Concentrations (mg/kg)		Data Summary Statistics (mg/kg)	
				Minimum	Maximum	Minimum	Maximum	Mean	Standard Deviation
Pesticides									
4,4'-DDE	52	3	5.8	0.0023	0.47	0.01	0.04	0.02	0.03
4,4'-DDT	52	4	7.7	0.0023	0.47	0.00	0.07	0.02	0.03
Beta-bhc	52	2	3.8	0.0012	0.24	0.00	0.00	0.00	0.02
Toxaphene	52	2	3.8	0.058	4.70	0.40	2.50	1.45	0.47
Semivolatile Organic Compounds									
2-methylnaphthalene	65	9	13.8	0.35	7.90	0.05	26.00	7.51	4.15
Acenaphthene	65	3	4.6	0.35	7.90	0.10	0.90	0.47	0.53
Acenaphthylene	65	2	3.1	0.35	7.90	0.03	0.11	0.07	0.53
Anthracene	65	8	12.3	0.35	7.90	0.03	0.10	0.07	0.53
Benzo(a)anthracene	65	9	13.8	0.35	7.90	0.06	0.68	0.25	0.53
Benzo(a)pyrene	65	11	16.9	0.35	7.90	0.05	1.70	0.46	0.55
Benzo(b)fluoranthene	65	7	10.8	0.35	7.90	0.02	1.10	0.41	0.54
Benzo(g,h,i)perylene	65	9	13.8	0.35	7.90	0.06	1.60	0.57	0.57
Benzo(k)fluoranthene	65	7	10.8	0.35	7.90	0.15	2.10	0.60	0.57
Chrysene	65	12	18.5	0.35	7.90	0.07	1.00	0.33	0.53
Di-n-butylphthalate	65	1	1.5	0.35	7.90	0.03	0.03	0.03	0.53
Dibenzo(a,h)anthracene	65	3	4.6	0.35	7.90	0.05	0.15	0.09	0.53
Dibenzofuran	65	1	1.5	0.35	7.90	0.29	0.29	0.29	0.52
Fluoranthene	65	10	15.4	0.35	7.90	0.03	1.50	0.42	0.55
Fluorene	65	7	10.8	0.35	7.90	0.15	1.80	0.60	0.52
Indeno(1,2,3-cd)pyrene	65	7	10.8	0.35	7.90	0.19	1.20	0.48	0.54
N-nitrosodiphenylamine (1)	65	13	20.0	0.35	7.90	0.04	4.50	0.60	0.77
Naphthalene	65	22	33.8	0.35	7.90	0.04	9.50	1.21	1.59
Phenanthrene	65	18	27.7	0.35	7.90	0.05	2.80	0.59	0.67
Pyrene	65	15	23.1	0.35	7.90	0.02	3.00	0.72	0.66
Total Metals									
Aluminum	73	73	100.0	1.8	34.00	94.10	35700.00	9944.58	4822.00
Antimony	73	38	52.0	2.3	10.00	0.56	7.50	2.62	1.75
Arsenic	73	44	60.3	2.8	17.00	2.30	14.00	4.42	2.24
Barium	72	71	98.6	0.2	34.00	15.20	140.00	70.26	22.52
Beryllium	73	35	47.9	0.2	1.70	0.19	0.63	0.29	0.20
Cadmium	73	42	57.5	0.2	1.70	0.10	1.00	0.34	0.23
Calcium	73	73	100.0	11	850.00	1200.00	26500.00	2855.89	3117.12
Chromium	73	73	100.0	0.7	8.50	23.50	118.00	45.48	13.98
Cobalt	73	66	90.4	0.9	8.50	3.30	20.20	7.19	2.90
Copper	73	73	100.0	0.7	17.00	5.50	92.00	16.28	14.51
Iron	73	73	100.0	4.6	13.00	6580.00	46800.00	15234.93	5740.10

TABLE 6-24
SOIL ANALYTICAL DATA SUMMARY (> 10 FEET BGS)
SITE 13, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 2 of 2)

Chemical	Total Samples	Samples With Detections	Frequency of Detection (%)	Reporting Limits (mg/kg)		Detected Concentrations (mg/kg)		Data Summary Statistics (mg/kg)	
				Minimum	Maximum	Minimum	Maximum	Mean	Standard Deviation
Total Metals (Continued)									
Lead	73	42	57.5	5.7	850.00	1.80	59.20	10.64	11.16
Magnesium	73	73	100.0	5.5	650.00	1980.00	14400.00	3957.12	1757.45
Manganese	73	73	100.0	0.2	8.50	78.50	679.00	188.42	95.48
Mercury	21	19	90.5	0	0.00	0.01	0.38	0.05	0.09
Molybdenum	73	1	1.4	1.1	8.50	0.25	0.25	0.25	1.23
Nickel	73	73	100.0	1.4	8.50	22.00	119.00	48.66	14.53
Potassium	73	73	100.0	80	850.00	520.00	4950.00	1181.19	693.85
Selenium	73	25	34.2	4.8	17.00	0.23	26.00	3.09	3.99
Silver	73	1	1.4	0.7	8.50	0.68	0.68	0.68	1.28
Sodium	73	62	84.9	11	850.00	207.00	4680.00	994.32	794.13
Titanium	52	52	100.0	0.2	8.50	42.60	964.00	447.15	145.34
Vanadium	73	73	100.0	0.7	8.50	14.10	85.90	28.60	10.38
Zinc	73	73	100.0	0.7	8.50	18.00	118.00	38.92	20.64
Total Petroleum Hydrocarbons									
Diesel range organics	22	4	18.2	13	13.00	11.00	1000.00	372.25	661.97
JP5 range organics	6	2	33.3	0	0.00	250.00	4200.00	2225.00	1696.14
Motor Oil Range Organics	21	7	33.3	0	0.00	36.00	2500.00	453.57	541.11
TRPH	63	28	44.4	1.9	97.10	2.00	9300.00	1125.11	1733.61
Volatile Organic Compounds									
1,2-Dichloroethene (total)	43	1	2.3	0.0052	0.79	0.01	0.01	0.01	0.11
Benzene	43	4	9.3	0.0052	0.79	0.00	0.96	0.33	0.17
Ethylbenzene	43	5	11.6	0.0052	0.79	0.01	1.80	0.66	0.36
Toluene	43	37	86.0	0.0052	0.79	0.00	0.98	0.06	0.17
Xylene (total)	43	2	4.7	0.0052	0.79	0.03	4.10	2.06	0.63

Notes:

mg/kg Milligram per kilogram
TRPH Total recoverable petroleum hydrocarbon

TABLE 6-25
ECOLOGICAL COPCs IN SOIL (0-6 FEET BGS)
SITE 13, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 1 of 2)

Chemical	Frequency of Detection	Sample Quantitation Limit	Minimum Concentration	Maximum Concentration	95 UCL Concentration	COPC Screening Evaluation [a]	
						Rejected	Retained
Inorganic Compounds (mg/kg)							
Aluminum	99/99	NA	45.8	21,900		CSB	
Antimony	26/99	0.15-7.5	2.4	8.2	2.42	PRG	
Arsenic	5/98	2.5-12	1.1	20		CSB	
Barium	88/93	21-24	11.6	290	57.86	PRG	
Beryllium	27/99	0.05-1.2	0.13	2	0.48	PRG	
Cadmium	47/98	0.02-1.2	0.02	18	0.65	PRG	
Calcium	98/99	10	363	28,800		CSB	
Chromium	99/99	NA	3.4	337		CSB	
Cobalt	76/99	0.15-6.3	2.6	15.2		CSB	
Copper	85/99	4.8-9.4	1.2	160		CSB	
Iron	99/99	NA	1,110	74,800		CSB	
Lead	82/119	5.1-6.3	1	602	30.59	PRG	
Magnesium	99/99	NA	513	12,000		CSB	
Manganese	99/99	NA	7.5	702		CSB	
Mercury	12/46	0.01-0.19	0.01	0.4	0.14		X
Molybdenum	1/99	0.15-6.3	5.9	5.9		FOD	
Nickel	97/99	13.8-15.8	1.2	278		CSB	
Potassium	88/99	170-654	270	2,940		CSB	
Selenium	19/99	0.29-12	0.14	12	3.71		X
Silver	4/99	0.14-6.3	0.23	1.6		CSB	
Sodium	74/99	60.8-630	69.6	2,690		CSB	
Thallium	2/99	0.11-12	2.7	2.9		FOD	
Titanium	53/53	NA	209	879		CSB	
Vanadium	99/99	NA	2	82		CSB	
Zinc	99/99	NA	5.6	7,120	48.17		X
Pesticides (ug/kg)							
4,4'-DDE	2/52	2.1-160	3.7	31	12.48		X
4,4'-DDT	4/52	2.1-160	2.1	160	24.85		X
Heptachlor epoxide	1/48	1-82	5.4	5.4	11.55		X
Toxaphene	1/52	52-2,600	1,400	1,400	227.2		X
Semivolatile Organic Compounds (ug/kg)							
Acenaphthene	1/69	340-34,000	250	250	490	FOD	
Anthracene	3/69	340-34,000	40	1,600		FOD	
Benzo(a)anthracene	4/69	340-34,000	52	170	508		X
Benzo(a)pyrene	7/69	340-34,000	63	500	485		X
Benzo(b)fluoranthene	5/69	340-34,000	82	620	498		X

TABLE 6-25
ECOLOGICAL COPCs IN SOIL (0-6 FEET BGS)
SITE 13, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 2 of 2)

Chemical	Frequency of Detection	Sample Quantitation Limit	Minimum Concentration	Maximum Concentration	95 UCL Concentration	COPC Screening Evaluation [a]	
						Rejected	Retained
Semivolatile Organic Compounds (ug/kg) (continued)							
Benzo(g,h,i)perylene	7/69	340-34,000	18	200	503		X
Carbozole	2/16	350-1,200	130	270	661		X
Chrysene	14/69	340-34,000	20	5,700	566		X
Dibenzo(a,h)anthracene	1/69	340-34,000	180	180	489	FOD	
Fluoranthene	13/69	340-34,000	22	800	461		X
Fluorene	5/69	340-34,000	44	3,100	473		X
Indo(1,2,3-cd)pyrene	4/69	340-34,000	50	390	518		X
Naphthalene	15/69	340-34,000	360	2,000	493		X
n-Nitrosodiphenylamine (1)	14/69	340-34,000	53	1,200	507		X
Pentachlorophenol	3/69	870-170,000	270	1,000	2,184	FOD	
Phenanthrene	13/39	340-34,000	37	11,000	537		X
Pytene	14/69	340-34,000	24	3,600	508		X
Volatile Organic Compounds (ug/kg)							
Acetone	3/57	10-1,300	180	240	39.24		X
Benzene	15/67	5-630	0.4	82	12.3		X
Chlorobenzene	1/57	5-630	2	2	8.11	FOD	
Carbon disulfide	3/57	5-630	1	2	8.03		X
Ethylbenzene	20/67	0.34-630	0.66	5,100	48.54		X
Toluene	40/67	**30,437**	1	16,000	57.76	PRG	
Xylene (total)	22/67	5-630	1.1	38,000	209		X

Notes:

(a) COPC screening criteria are as follows:
- CSB Rejected as COPC because concentrations were within statistical background or chemical is an essential nutrient
- FOD Rejected as COPC because chemical was infrequently detected.
- PRG Rejected as COPC because chemical maximum concentration or 95 UCL concentration was below the ecological PRG.

4,4-DDD 4,4-Dichlorodiphenyldichlorethane
4,4-DDT 4,4-Dichlorodiphenyltrichlorethane
µg/kg Microgram per kilogram
mg/kg Milligram per kilogram
95 UCL 95 percent upper confidence limit on the arithmetic mean concentration
NA Not applicable, frequency of detection is 100 percent

TABLE 6-26
SUMMARY OF SOIL HAZARD QUOTIENTS
CALIFORNIA GROUND SQUIRREL
SITE 13, OU-2 SOUTHEAST AREA, ALAMEDA POINT

Ecological COPCs	Hazard Quotient 1	Hazard Quotient 2	Hazard Quotient 3	Hazard Quotient 4	Hazard Quotient 5
Mercury	1.22E-03	2.83E-01	2.83E-02	1.96E-01	1.96E-02
Selenium	1.73E-02	9.68E+00	4.00E-01	6.71E+00	2.77E-01
Zinc	4.04E-04	6.49E-01	9.36E-03	4.49E-01	6.48E-03
4,4'-DDE	2.32E-06	1.07E-03	5.36E-05	7.42E-04	3.71E-05
4,4'-DDT	4.61E-06	2.13E-03	1.07E-04	1.48E-03	7.39E-05
Heptachlor Epoxide	2.64E-06	3.82E-03	6.11E-05	2.64E-03	4.23E-05
Toxaphene	8.25E-06	1.91E-03	1.91E-04	1.32E-03	1.32E-04
Benzo(a)anthracene	2.77E-05	1.61E-02	6.41E-04	1.11E-02	4.44E-04
Benzo(a)pyrene	7.91E-05	4.58E-02	1.83E-03	3.17E-02	1.27E-03
Benzo(b)fluoranthene	8.12E-05	4.70E-02	1.88E-03	3.26E-02	1.30E-03
Benzo(g,h,I)perylene	3.26E-05	1.89E-02	7.54E-04	1.31E-02	5.22E-04
Carbazole	4.40E-05	2.55E-02	1.02E-03	1.77E-02	7.05E-04
Chrysene	9.23E-05	5.34E-02	2.14E-03	3.70E-02	1.48E-03
Fluoranthene	7.51E-05	4.35E-02	1.74E-03	3.01E-02	1.20E-03
Fluorene	7.71E-05	4.47E-02	1.78E-03	3.09E-02	1.24E-03
Naphthalene	1.02E-05	7.03E-04	2.36E-04	4.87E-04	1.63E-04
n-Nitrosodiphenylamine (1)	NRV	NRV	NRV	NRV	NRV
Phenanthrene	8.75E-05	5.07E-02	2.03E-03	3.51E-02	1.40E-03
Pyrene	8.28E-05	4.80E-02	1.92E-03	3.32E-02	1.33E-03
Acetone	2.28E-07	2.64E-05	5.27E-06	1.83E-05	3.65E-06
Benzene	2.50E-07	5.79E-05	5.79E-06	4.01E-05	4.01E-06
Carbon Disulfide	NRV	NRV	NRV	NRV	NRV
Ethylbenzene	NRV	NRV	NRV	NRV	NRV
Xylene (total)	4.31E-04	1.24E-02	9.98E-03	8.56E-03	6.91E-03
Indo(1,2,3-CD)pyrene	6.36E-05	3.68E-02	1.47E-03	2.55E-02	1.02E-03

Notes:

COPC Chemical of potential concern
NRV No ecological reference value

TABLE 6-27
SUMMARY OF SOIL HAZARD QUOTIENTS
RED-TAILED HAWK
SITE 13, OU-2 SOUTHEAST AREA, ALAMEDA POINT

Ecological COPCs	Hazard Quotient 1	Hazard Quotient 2	Hazard Quotient 3	Hazard Quotient 4	Hazard Quotient 5
Mercury	1.95E-06	3.22E-02	6.98E-03	5.34E-04	1.20E-04
Selenium	1.00E-05	1.45E-01	3.58E-02	2.40E-03	6.15E-04
Zinc	7.04E-07	2.51E-02	2.51E-03	4.17E-04	4.32E-05
4,4'-DDE	2.09E-08	2.02E+00	1.21E-02	3.21E-02	1.97E-04
4,4'-DDT	4.16E-08	4.03E+00	2.42E-02	6.40E-02	3.92E-04
Heptachlor Epoxide	9.05E-09	8.75E-01	5.25E-03	1.39E-02	8.52E-05
Toxaphene	3.81E-07	3.68E+01	2.21E-01	5.85E-01	3.58E-03
Benzo(a)anthracene	NRV	NRV	NRV	NRV	NRV
Benzo(a)pyrene	NRV	NRV	NRV	NRV	NRV
Benzo(b)fluoranthene	NRV	NRV	NRV	NRV	NRV
Benzo(g,h,I)perylene	NRV	NRV	NRV	NRV	NRV
Carbazole	NRV	NRV	NRV	NRV	NRV
Chrysene	NRV	NRV	NRV	NRV	NRV
Fluoranthene	NRV	NRV	NRV	NRV	NRV
Fluorene	NRV	NRV	NRV	NRV	NRV
Naphthalene	NRV	NRV	NRV	NRV	NRV
n-Nitrosodiphenylamine (1)	NRV	NRV	NRV	NRV	NRV
Phenanthrene	NRV	NRV	NRV	NRV	NRV
Pyrene	NRV	NRV	NRV	NRV	NRV
Acetone	NRV	NRV	NRV	NRV	NRV
Benzene	NRV	NRV	NRV	NRV	NRV
Carbon Disulfide	NRV	NRV	NRV	NRV	NRV
Ethylbenzene	NRV	NRV	NRV	NRV	NRV
Xylene (total)	NRV	NRV	NRV	NRV	NRV
Indo(1,2,3-CD)pyrene	NRV	NRV	NRV	NRV	NRV

Notes:

COPC Chemical of potential concern
NRV No reference value available

TABLE 6-28
SUMMARY OF RI ACTIVITIES
SITE 19, OU-2 SOUTHEAST AREA, ALAMEDA POINT

Period	Contractor	Activities	Chemical Groups Analyzed	Reference
1991 (CTO 121, Phases 1 and 2A)	PRC and James M. Montgomery 1993	• Soil borings drilled • Four monitoring wells installed • Soil samples collected • Groundwater sampling conducted	• Soil: VOCs, SVOCs, EDB, Pest/PCBs, metals, general chemical parameters • Groundwater: VOCs, SVOCs, TRPH, TPHEXT, TPHPRG, Pest/PCB, metals, general chemical parameters	PRC and James M. Montgomery 1993a
1994 (CTO 280)	PRC and Montgomery Watson	• Cone penetrometer tests performed • Hydropunch® samples collected • Soil samples collected • One shallow monitoring well installed • Non-point source sampling conducted • One deep monitoring well installed • Quarterly groundwater sampling conducted	• Soil: VOCs, SVOCs, TPHPRG, TPHEXT, metals, EDB • Groundwater: VOCs, SVOCs, TRPH, TPHPRG, TPHEXT, TOC, EBD, Pest/PCBs, metals, general chemical parameters, sulfides	PRC and Montgomery Watson 1996b
1997-1998 (CTO 108)	PRC	• Quarterly groundwater sampling conducted • Tidal influence study performed	• Groundwater: VOCs, SVOCs, TPH, metals, cyanide, general chemical parameters	PRC 1997a Tetra Tech 12/7/98

Notes:

CTO	Contract Task Order
EDB	Ethylene dibromide
Pest/PCB	Pesticides and polychlorinated biphenyl
PRC	PRC Environmental Management, Inc.
RI	Remedial investigation
SVOC	Semivolatile organic compound
TOC	Total organic carbon
TPH	Total petroleum hydrocarbons
TPHEXT	Total petroleum hydrocarbons - extractable
TPHPRG	Total petroleum hydrocarbons - purgeable
TRPH	Total recoverable petroleum hydrocarbons
VOC	Volatile organic compound

TABLE 6-29
SUBSURFACE SOIL SAMPLING SUMMARY
SITE 19, OU-2 SOUTHEAST AREA, ALAMEDA POINT

Sample Location	Sample Identification	Sampling Method	Sample Depth (ft bgs)	Total Boring Depth (ft bgs)	Date Sampled	Analyses Performed										
						SVOC	VOC	pH	Cyanide	TOC	TRPH	% Moisture	TPPH	TEPH	Pest/ PCB	TMetal
Soil Boring Samples																
1990 Investigation by Canonie																
BD13-5	BD13-5(0.5-1.0)	CS	0.5 to 1.0	15.0	07/03/90	x			x						x	x
	BD13-5(1.0-1.5)*	CS	1.0 to 1.5		07/03/90					x	x					
	BD13-5(2.0-2.5)	CS	2.0 to 2.5		07/03/90	x	x									
	BD13-5(2.5-3.0)	CS	2.5 to 3.0		07/03/90			x	x		x				x	x
	BD13-5(5.0-5.5)	CS	5.0 to 5.5		07/03/90	x										
	BD13-5(5.5-6.0)	CS	5.5 to 6.0		07/03/90	x			x		x				x	x
	BD13-5(9.5-10.0)	CS	9.5 to 10.0		07/03/90	x										
	BD13-5(10.0-10.5)	CS	10.0 to 10.5		07/03/90	x			x		x				x	x
	BD13-5(11.0-11.5)	CS	11.0 to 11.5		07/03/90	x										
	BD13-5(11.5-12.0)	CS	11.5 to12.0		07/03/90						x					
	BD13-5(14.0-14.5)	CS	14.0 to 14.5		07/03/90	x										
BD13-6	BD13-6(0.5-1.0)	CS	0.5 to 1.0	15.0	07/03/90	x			x						x	x
	BD13-6(1.0-1.5)	CS	1.0 to 1.5		07/03/90					x	x					
	BD13-6(2.0-2.5)	CS	2.0 to 2.5		07/03/90	x	x									
	BD13-6(2.5-3.0)	CS	2.5 to 3.0		07/03/90	x		x			x				x	x
	BD13-6(5.0-5.5)	CS	5.0 to 5.5		07/03/90	x	x									
	BD13-6(5.5-6.0)	CS	5.5 to 6.0		07/03/90				x		x				x	x
	BD13-6(8.0-8.5)	CS	8.0 to 8.5		07/03/90	x	x									
	BD13-6(8.5-9.0)	CS	8.5 to 9.0		07/03/90				x		x				x	x
	BD13-6(9.5-10.0)	CS	9.5 to 10.0		07/03/90				x		x				x	x
	BD13-6(11.0-11.5)	CS	11.0 to 11.5		07/03/90	x										
	BD13-6(14.0-14.5)	CS	14.0 to 14.5		07/03/90	x										

TABLE 6-29
SUBSURFACE SOIL SAMPLING SUMMARY
SITE 19, OU-2 SOUTHEAST AREA, ALAMEDA POINT

Sample Location	Sample Identification	Sampling Method	Sample Depth (ft bgs)	Total Boring Depth (ft bgs)	Date Sampled	Analyses Performed										
						SVOC	VOC	pH	Cyanide	TOC	TRPH	% Moisture	TPPH	TEPH	Pest/ PCB	TMetal
Soil Boring Samples (Continued)																
1990 Investigation by Canonie (Continued)																
BD13-7	BD13-7 [0.5-1.0]	Split spoon	0.5 to 1.0	15.0	07/03/90	x			x		x					x
	BD13-7 [1.0-1.5]	Split spoon	1.0 to 1.5		07/03/90					x	x					
	BD13-7 [1.5-2.0]	Split spoon	1.5 to 2.0		07/03/90	x	x									
	BD13-7 [2.0-2.5]	Split spoon	2.0 to 2.5		07/03/90			x	x		x				x	x
	BD13-7 [4.5-5.0]	Split spoon	4.5 to 5.0		07/03/90	x	x									
	BD13-7 [5.0-5.5]	Split spoon	5.0 to 5.5		07/03/90				x		x				x	x
	BD13-7 [8.0-8.5]	Split spoon	8.0 to 8.5		07/03/90	x	x									
	BD13-7 [8.5-9.0]	Split spoon	8.5 to 9.0		07/03/90				x		x				x	x
	BD13-7 [11.0-11.5]	Split spoon	11.0 to 11.5		07/03/90		x									
	BD13-7 [11.5-12.0]	Split spoon	11.5 to 12.0		07/03/90						x					
	BD13-7 [14.0-14.5]	Split spoon	14.0 to 14.5		07/03/90		x									
BD13-8	BD13-8 [0.5-1.0]	Split spoon	0.5 to 1.0	15.0	07/05/90	x			x		x				x	x
	BD13-8 [1.0-1.5]	Split spoon	1.0 to 1.5		07/05/90					x						
	BD13-8 [2.5-3.0]	Split spoon	2.5 to 3.0		07/03/90	x	x									
	BD13-8 [3.0-3.5]	Split spoon	3.0 to 3.5		07/05/90			x	x		x				x	x
	BD13-8 [6.0-6.5]	Split spoon	6.0 to 6.5		07/03/90	x										
	BD13-8 [8.0-8.5]	Split spoon	8.0 to 8.5		07/05/90						x					
	BD13-8 [10.5-11.0]	Split spoon	10.5 to 11.0		07/03/90	x	x									
	BD13-8 [11.0-11.5]	Split spoon	11.0 to 11.5		07/05/90				c		x				x	x
	BD13-8 [12.5-13.0]	Split spoon	12.5 to 13.0		07/03/90	x	x									
	BD13-8 [13.0-13.5]	Split spoon	13.0 to 13.5		07/05/90				x		x				x	x
	BD13-8 [14.5-15.0]	Split spoon	14.5 to 15.0		07/03/90	x										

TABLE 6-29
SUBSURFACE SOIL SAMPLING SUMMARY
SITE 19, OU-2 SOUTHEAST AREA, ALAMEDA POINT

Sample Location	Sample Identification	Sampling Method	Sample Depth (ft bgs)	Total Boring Depth (ft bgs)	Date Sampled	Analyses Performed										
						SVOC	VOC	pH	Cyanide	TOC	TRPH	% Moisture	TPPH	TEPH	Pest/ PCB	TMetal
Soil Boring Samples (Continued)																
1990 Investigation by Canonie (Continued)																
BD13-9	BD13-9 [0.5-1.0]	Split spoon	0.5 to 1.0	15.0	07/05/90	x			x		x				x	x
	BD13-9 [1.0-1.5]	Split spoon	1.0 to 1.5		07/05/90					x						
	BD13-9 [2.0-2.5]	Split spoon	2.0 to 2.5		07/05/90	x										
	BD13-9 [3.5-4.0]	Split spoon	3.5 to 4.0		07/18/90			x	x		x				x	x
	BD13-9 [5.0-5.5]	Split spoon	5.0 to 5.5		07/03/90	x	x									
	BD13-9 [8.0-8.5]	Split spoon	8.0 to 8.5		07/05/90				x		x				x	x
	BD13-9 [8.5-9.0]	Split spoon	8.5 to 9.0		07/03/90	x	x									
	BD13-9 [11.0-11.5]	Split spoon	11.0 to 11.5		07/05/90						x					
	BD13-9 [11.5-12.0]	Split spoon	11.5 to 12.0		07/03/90	x										
	BD13-9 [14.0-14.5]	Split spoon	14.0 to 14.5		07/05/90	x	x									
	BD13-9 [14.5-15.0]	Split spoon	14.5 to 15.0		07/05/90				x		x				x	x
BD13-10	BD13-10 [0.5-1.0]	Split spoon	0.5 to 1.0	15.0	07/05/90			x	x						x	x
	BD13-10 [1.5-2.0]	Split spoon	1.5 to 2.0		07/05/90					x						
	BD13-10 [2.0-2.5]	Split spoon	2.0 to 2.5		07/05/90	x	x									
	BD13-10 [3.0-3.5]	Split spoon	3.0 to 3.5		07/05/90				x		x				x	x
	BD13-10 [4.5-5.0]	Split spoon	4.5 to 5.0		07/05/90		x									
	BD13-10 [5.0-5.5]	Split spoon	5.0 to 5.5		07/05/90						x					
	BD13-10 [7.5-8.0]	Split spoon	7.5 to 8.0		07/05/90	x	x									
	BD13-10 [8.0-8.5]	Split spoon	8.0 to 8.5		07/05/90				x		x				x	x
	BD13-10 [10.5-11.0]	Split spoon	10.5 to 11.0		07/05/90		x									
	BD13-10 [11.0-11.5]	Split spoon	11.0 to 11.5		07/05/90						x					
	BD13-10 [13.5-14.0]	Split spoon	13.5 to 14.0		07/05/90	x	x									
	BD13-10 [14.0-14.5]	Split spoon	14.0 to 14.5		07/05/90				x		x				x	x

TABLE 6-29
SUBSURFACE SOIL SAMPLING SUMMARY
SITE 19, OU-2 SOUTHEAST AREA, ALAMEDA POINT

Sample Location	Sample Identification	Sampling Method	Sample Depth (ft bgs)	Total Boring Depth (ft bgs)	Date Sampled	Analyses Performed										
						SVOC	VOC	pH	Cyanide	TOC	TRPH	% Moisture	TPPH	TEPH	Pest/ PCB	TMetal
Soil Boring Samples (Continued)																
1990 Investigation by Canonie (Continued)																
BD13-11	BD13-11 [1.0-1.5]	Split spoon	1.0 to 1.5	15.5	07/09/90	x			x		x				x	x
	BD13-11 [1.5-2.0]	Split spoon	1.5 to 2.0		07/09/90					x						
	BD13-11 [2.5-3.0]	Split spoon	2.5 to 3.0		07/09/90		x									
	BD13-11 [4.0-4.5]	Split spoon	4.0 to 4.5		07/09/90	x		x	x						x	x
	BD13-11 [6.0-6.5]	Split spoon	6.0 to 6.5		07/09/90		x				x					
	BD13-11 [9.0-9.5]	Split spoon	9.0 to 9.5		07/09/90		x				x					
	BD13-11 [11.5-12.0]	Split spoon	11.5 to 12.0		07/09/90	x			x						x	x
	BD13-11 [12.5-13.0]	Split spoon	12.5 to 13.0		07/09/90		x				x					
	BD13-11 [13.0-13.5]	Split spoon	13.0 to 13.5		07/09/90	x			x						x	x
	BD13-11 [15.0-15.5]	Split spoon	15.0 to 15.5		07/10/90		x								x	
BD13-12	BD13-12 [1.5-2.0]	Split spoon	1.5 to 2.0	16.0	07/09/90	x			x						x	x
	BD13-12 [2.0-2.5]	Split spoon	2.0 to 2.5		07/09/90	x										
	BD13-12 [3.0-3.5]	Split spoon	3.0 to 3.5		07/09/90					x	x					
	BD13-12 [4.5-5.0]	Split spoon	4.5 to 5.0		07/09/90	x		x							x	x
	BD13-12 [5.0-5.5]	Split spoon	5.0 to 5.5		07/09/90		x				x					
	BD13-12 [8.5-9.0]	Split spoon	8.5 to 9.0		07/09/90		x				x					
	BD13-12 [9.5-10.0]	Split spoon	9.5 to 10.0		07/09/90	x			x						x	x
	BD13-12 [10.5-11.0]	Split spoon	10.5 to 11.0		07/09/90		x				x					
	BD13-12 [12.0-12.5]	Split spoon	12.0 to 12.5		07/09/90		x				x					
	BD13-12 [14.5-15.0]	Split spoon	14.5 to 15.0		07/09/90	x			x						x	x
	BD13-12 [15.0-15.5]	Split spoon	15.0 to 15.5		07/09/90		x				x					

TABLE 6-29
SUBSURFACE SOIL SAMPLING SUMMARY
SITE 19, OU-2 SOUTHEAST AREA, ALAMEDA POINT

Sample Location	Sample Identification	Sampling Method	Sample Depth (ft bgs)	Total Boring Depth (ft bgs)	Date Sampled	Analyses Performed										
						SVOC	VOC	pH	Cyanide	TOC	TRPH	% Moisture	TPPH	TEPH	Pest/ PCB	TMetal
Soil Boring Samples (Continued)																
1990 Investigation by Canonie (Continued)																
BD13-13	BD13-13 [2.0-2.5]	Split spoon	2.0 to 2.5	15.5	07/11/90	x			x						x	x
	BD13-13 [2.5-3.0]	Split spoon	2.5 to 3.0		07/11/90					x						
	BD13-13 [7.0-7.5]	Split spoon	7.0 to 7.5		07/09/90		x									
	BD13-13 [8.0-8.5]	Split spoon	8.0 to 8.5		07/11/90											
	BD13-13 [8.5-9.0]	Split spoon	8.5 to 9.0		07/11/90	x		x	x							x
	BD13-13 [9.5-10.0]	Split spoon	9.5 to 10.0		07/09/90		x				x					
	BD13-13 [11.0-11.5]	Split spoon	11.0 to 11.5		07/11/90	x			x						x	x
	BD13-13 [12.0-12.5]	Split spoon	12.0 to 12.5		07/09/90		x				x					
	BD13-13 [14.0-14.5]	Split spoon	14.0 to 14.5		07/11/90	x			x						x	x
	BD13-13 [14.5-15.0]	Split spoon	14.5 to 15.0		07/09/90	x										
	BD13-13 [15.0-15.5]	Split spoon	15.0 to 15.5		07/09/90		x				x					
BD13-14	BD13-14 [2.0-2.5]	Split spoon	2.0 to 2.5	16.5	07/09/90	x			x						x	x
	BD13-14 [2.5-3.0]	Split spoon	2.5 to 3.0		07/09/90					x	x					
	BD13-14 [3.5-4.0]	Split spoon	3.5 to 4.0		07/09/90		x									
	BD13-14 [4.0-4.5]	Split spoon	4.0 to 4.5		07/09/90	x		x	x						x	x
	BD13-14 [9.5-10.0]	Split spoon	9.5 to 10.0		07/09/90		x				x					
	BD13-14 [13.5-14.0]	Split spoon	13.5 to 14.0		07/09/90		x				x					
	BD13-14 [14.0-14.5]	Split spoon	14.0 to 14.5		07/09/90	x			x						x	x
	BD13-14 [14.5-15.0]	Split spoon	14.5 to 15.0		07/09/90		x				x					
	BD13-14 [15.0-15.5]	Split spoon	15.0 to 15.5		07/09/90	x			x						x	x
	BD13-14 [15.5-16.0]	Split spoon	15.5 to 16.0		07/09/90		x				x					

TABLE 6-29
SUBSURFACE SOIL SAMPLING SUMMARY
SITE 19, OU-2 SOUTHEAST AREA, ALAMEDA POINT

Sample Location	Sample Identification	Sampling Method	Sample Depth (ft bgs)	Total Boring Depth (ft bgs)	Date Sampled	Analyses Performed										
						SVOC	VOC	pH	Cyanide	TOC	TRPH	% Moisture	TPPH	TEPH	Pest/ PCB	TMetal
Soil Boring Samples (Continued)																
1990 Investigation by Canonie (Continued)																
BD13-15	BD13-15 [2.0-2.5]	Split spoon	2.0 to 2.5	15.0	07/10/90	x			x		x				x	x
	BD13-15 [2.5-3.0]	Split spoon	2.5 to 3.0		07/10/90					x						
	BD13-15 [4.0-4.5]	Split spoon	4.0 to4.5		07/10/90		x									
	BD13-15 [8.5-9.0]	Split spoon	8.5 to 9.0		07/10/90	x		x	x						x	x
	BD13-15 [10.5-11.0]	Split spoon	10.5 to 11.0		07/10/90		x				x					
	BD13-15 [11.5-12.0]	Split spoon	11.5 to 12.0		07/10/90		x				x					
	BD13-15 [12.5-13.0]	Split spoon	12.5 to 13.0		07/10/90	x			x						x	x
	BD13-15 [13.0-13.5]	Split spoon	13.0 to 13.5		07/10/90		x				x					
	BD13-15 [13.5-14.0]	Split spoon	13.5 to 14.0		07/10/90	x			x						x	x
	BD13-15 [14.5-15.0]	Split spoon	14.5 to 15.0		07/09/90		x								x	
BD13-16	BD13-16 [2.0-2.5]	Split spoon	1.5 to 2.0	14.5	07/10/90	x		x	x						x	x
	BD13-16 [2.0-2.5]	Split spoon	2.0 to 2.5		07/10/90					x						
	BD13-16 [3.0-3.5]	Split spoon	3.0 to 3.5		07/10/90		x									
	BD13-16 [5.0-5.5]	Split spoon	5.0 to 5.5		07/10/90	x		x	x						x	x
	BD13-16 [6.0-6.5]	Split spoon	6.0 to 6.5		07/10/90		x				x					
	BD13-16 [9.0-9.5]	Split spoon	9.0 to 9.5		07/10/90		x				x					
	BD13-16 [10.5-11.0]	Split spoon	10.5 to 11.0		07/10/90	x			x						x	x
	BD13-16 [12.0-12.5]	Split spoon	12.0 to 12.5		07/10/90		x				x					
	BD13-16 [13.5-14.0]	Split spoon	13.5 to 14.0		07/10/90	x			x						x	x
	BD13-16 [14.0-14.5]	Split spoon	14.0 to 14.5		07/10/90		x				x					
MWD13-1	MWD13-1 [0.5-1.0]	Split spoon	0.5 to 1.0	15.0	07/11/90	x			x		x				x	x
	MWD13-1 [1.0-1.5]	Split spoon	1.0 to 1.5		07/11/90					x						
	MWD13-1 [3.5-4.0]	Split spoon	3.5 to 4.0		07/11/90		x									
	MWD13-1 [7.0-7.5]	Split spoon	7.0 to 7.5		07/11/90	x		x	x						x	x
	MWD13-1 [8.5-9.0]	Split spoon	8.5 to 9.0		07/11/90		x				x					

TABLE 6-29
SUBSURFACE SOIL SAMPLING SUMMARY
SITE 19, OU-2 SOUTHEAST AREA, ALAMEDA POINT

Sample Location	Sample Identification	Sampling Method	Sample Depth (ft bgs)	Total Boring Depth (ft bgs)	Date Sampled	Analyses Performed										
						SVOC	VOC	pH	Cyanide	TOC	TRPH	% Moisture	TPPH	TEPH	Pest/ PCB	TMetal
Soil Boring Samples (Continued)																
1990 Investigation by Canonie (Continued)																
MWD13-1	MWD13-1 [9.5-10.0]	Split spoon	9.5 to 10.0		07/11/90		x				x					
	MWD13-1 [10.0-10.5]	Split spoon	10.0 to 10.5		07/11/90	x			x						x	x
	MWD13-1 [12.5-13.0]	Split spoon	12.5 to 13.0		07/11/90		x				x					
	MWD13-1 [13.0-13.5]	Split spoon	13.0 to 13.5		07/11/90	x			x						x	x
	MWD13-1 [14.0-14.5]	Split spoon	14.0 to 14.5		07/11/90		x				x					
MWD13-2	MWD13-2 [0.5-1.0]	Split spoon	0.5 to 1.0	15.0	07/06/90	x			x						x	x
	MWD13-2 [1.5-2.0]	Split spoon	1.5 to 2.0		07/06/90	x	x	x								
	MWD13-2 [2.0-2.5]	Split spoon	2.0 to 2.5		07/06/90				x		x				x	x
	MWD13-2 [3.5-4.0]	Split spoon	3.5 to 4.0		07/27/90				x	x						
	MWD13-2 [5.0-5.5]	Split spoon	5.0 to 5.5		07/27/90		x									
	MWD13-2 [5.5-6.0]	Split spoon	5.5 to 6.0		07/27/90						x					
	MWD13-2 [8.5-9.0]	Split spoon	8.5 to 9.0		07/27/90	x	x									
	MWD13-2 [9.0-9.5]	Split spoon	9.0 to 9.5		07/06/90				x		x				x	x
	MWD13-2 [13.0-13.5]	Split spoon	13.0 to 13.5		07/27/90	x	x		x							
	MWD13-2 [13.5-14.0]	Split spoon	13.5 to 14.0		07/06/90				x		x				x	x
	MWD13-2 [14.5-15.0]	Split spoon	14.5 to 15.0		07/06/90		x									
	MWD13-2 [15.0-15.5]	Split spoon	15.0 to 15.5		07/27/90						x					
MW13-3	MWD13-3 [0.5-1.0]	Split spoon	0.5 to 1.0	15.0	07/06/90	x			x						x	x
	MWD13-3 [2.0-2.5]	Split spoon	2.0 to 2.5		07/27/90			x			x					
	MWD13-3 [3.5-4.0]	Split spoon	3.5 to 4.0		07/27/90		x				x					
	MWD13-3 [4.0-4.5]	Split spoon	4.0 to 4.5		07/06/90	x	x									
	MWD13-3 [5.0-5.5]	Split spoon	5.0 to 5.5		07/06/90				x		x				x	x
	MWD13-3 [11.5-12.0]	Split spoon	11.5 to 12.0		07/06/90	x	x									
	MWD13-3 [12.0-12.5]	Split spoon	12.0 to 12.5		07/27/90				x		x				x	x

TABLE 6-29
SUBSURFACE SOIL SAMPLING SUMMARY
SITE 19, OU-2 SOUTHEAST AREA, ALAMEDA POINT

Sample Location	Sample Identification	Sampling Method	Sample Depth (ft bgs)	Total Boring Depth (ft bgs)	Date Sampled	Analyses Performed										
						SVOC	VOC	pH	Cyanide	TOC	TRPH	% Moisture	TPPH	TEPH	Pest/ PCB	TMetal
Soil Boring Samples (Continued)																
1990 Investigation by Canonie (Continued)																
MW13-3	MWD13-3 [14.0-14.5]	Split spoon	14.0 to 14.5		07/06/90	x	x									
	MWD13-3 [14.5-15.0]	Split spoon	14.5 to 15.0		07/27/90				x		x				x	x
1994 (CTO 280) Investigation by PRC and Montgomery Watson																
B19-17	280-S19-001	Split spoon	1.0 to 2.0	6.0	08/22/94	x		x	x			x	x	x		
	280-S19-002	Split spoon	2.5 to 3.5		08/22/94	x	x	x	x			x	x	x		
	280-S19-003	Split spoon	5.0 to 6.0		08/22/94	x	x	x	x			x	x	x		
B19-18	280-S19-004	Split spoon	1.0 to 2.0	8.0	08/22/94	x		x	x			x	x	x		
	280-S19-005	Split spoon	2.0 to 3.0		08/22/94	x	x	x	x			x	x	x		
	280-S19-006	Split spoon	4.5 to 5.5		08/22/94	x	x	x	x			x	x	x		
	280-S19-007	Split spoon	5.5 to 6.5		08/22/94	x	x	x	x			x	x	x		
B19-19	280-S19-008	Split spoon	1.0 to 2.0	6.0	08/22/94			x	x			x	x	x		
	280-S19-009	Split spoon	2.5 to 3.5		08/22/94	x		x	x			x	x	x		
	280-S19-010	Split spoon	5.0 to 6.0		08/22/94	x		x	x			x	x	x		
M19-05	280-S19-011	Split spoon	0.5 to 1.5	30.0	11/06/94	x	x	x	x			x	x	x		
	280-S19-012	Split spoon	2.5 to 3.5		11/06/94	x	x	x	x			x	x	x		
	280-S19-013	Split spoon	4.5 to5.5		11/06/94	x	x	x	x			x	x	x		

Notes:

a General chemistry analysis parameters for the 1994-1995 investigation HydroPunch and monitoring well groundwater samples are TDS, alkalinity, acidity, COD, anions, pH, hardness, and TOC. The HydroPunch and the first quarter monitoring well groundwater samples were also analyzed for specific conductivity.
General chemistry analysis parameters for the 1990 investigation monitoring well groundwater samples are COD, pH, specific conductivity, TOC, TDS.
General chemistry analysis parameters for the 1994 SCAPS investigation are alkalinity, anions, dissolved organic carbon, hardness, pH, and TDS.
General chemistry analysis parameters for the IMF investigation are alkalinity, anions, hardness, and TDS.

TABLE 6-29
SUBSURFACE SOIL SAMPLING SUMMARY
SITE 19, OU-2 SOUTHEAST AREA, ALAMEDA POINT

Notes (Continued):

CS	California sampler
ft bgs	Feet below ground surface
pest/PCB	Pesticides and polychlorinated biphenyls
% Moisture	Percent moisture
PRC	PRC Environmental Management, Inc.
SVOC	Semivolatile organic compound
TMetals	Total metals
TEPH	Total extractable petroleum hydrocarbons
TOC	Total organic carbon
TPPH	Total purgeable petroleum hydrocarbons
TRPH	Total recoverable petroleum hydrocarbons
VOC	Volatile organic compound

TABLE 6-30
GEOTECHNICAL SOIL SAMPLING SUMMARY
SITE 19, OU-2 SOUTHEAST AREA, ALAMEDA POINT

Sample Location	Sample Depth (ft bgs)	Sampling Method	Date Sampled	Analyses Performed				
				Moisture Content	Dry Density	Specific Gravity	Grain Size Distribution	Permeability
MWD13-1	2.0	CS	07/11/90	X	X	X	X	X [(a) (b)]
	2.5	CS	07/11/90	X	X			
	9.0	CS	07/11/90	X	X			
MWD13-2	7.5	CS	07/06/90	X	X			
	10.0	CS	07/06/90	X	X			
MWD13-3	10.0	CS	07/06/90	X	X			
BD13-5	0.0 to 4.5	CS	07/03/90	X	X			
BD13-6	6.0	CS	07/03/90					
	7.0	CS	07/03/90	X	X	X	X	X [(a) (b)]
BD13-7	9.5	CS	07/03/90	X	X			
	10.0	CS	07/03/90	X	X	X	X	X [(a) (b)]
BD13-8	2.0	CS	07/05/90	X	X			
BD13-9	7.0	CS	07/05/90				X	
	7.5	CS	07/05/90	X	X			
	9.5	CS	07/05/90				X	
	10.0	CS	07/05/90			X		
BD13-10	9.5	CS	07/05/90				X	
BD13-11	3.0	CS	07/10/90				X	
	7.5	CS	07/10/90				X	
	10.0	CS	07/10/90				X	
	14.5	CS	07/10/90	X	X			
BD13-12	6.5	CS	07/09/90	X	X			
	7.5	CS	07/09/90				X	
BD13-13	9.0	CS	07/11/90				X	
BD13-15	3.5	CS	07/10/90			X		
	14.0	CS	07/10/90	X	X			
BD13-16	3.5	CS	07/10/90	X	X			

Notes:

(a) Moisture content, dry density, and wet density were determined for permeability test.
(b) Constant head permeability test performed during 1990 investigation.
CS California sampler
ft bgs Feet below ground surface

TABLE 6-31
MONITORING WELL CONSTRUCTION DETAILS
SITE 19, OU-2 SOUTHEAST AREA, ALAMEDA POINT

Well Identification	Screen Interval (ft below TOC)	Hydrostratigraphic Unit of Screen Interval	Top of Casing Elevation (ft MLLW)	Total Borehole Depth (ft bgs)	Total Well Depth (ft bgs)	Well Diameter (inches)	Blank Casing Interval (ft below TOC)	Filter Interval (ft below TOC)	Bentonite Seal Interval (ft below TOC)	Cement Grount Interval (ft below TOC)
MWD13-1	5-15	FWBZU	12.8	15	15	2	0-5	4.5-15	3-4.5	0-3
MWD13-2	5-15	FWBZU	12.34	15	15	2	0-5	4.5-15	3-4.5	0-3
MWD13-3	5-15	FWBZU	12.92	15	15	2	0-5	4.5-15	3-4.5	0-3
MWD13-4	5-15	FWBZU	14.09	15	15	2	0-5	4.5-15	3-4.5	0-3
M19-05	20-30	FWBZU	12.73	30	30	2	0-20	19-30	17-19	0-17
D19-01	50-60	FWBZL	12.7	60	60	3	0-50	47-60	44-47	0-44

Notes:

ft bgs	Feet below ground surface
ft	Feet
FWBZL	First water-bearing zone lower
FWBZU	First water-bearing zone upper
MLLW	Mean lower low water
TOC	Top of casing

TABLE 6-32
GROUNDWATER SAMPLING SUMMARY
SITE 19, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 1 of 3)

Sample Location	Sample Identification	Sample Depth (ft bgs)	Hydrostratigraphic Unit Sample Collected From	Sampling Method	Date Sampled	Analyses Performed							
Hydropunch® Groundwater Samples													
1994 Investigation by PRC and Montgomery Watson						**VOC**	**SVOC**	**TPHEXT**	**TPHPRG**	**DMetals**	**General Chemicals [c]**	**Sulfide**	**O&G**
DHP-S19-01	280-S19-038	19.0	FWBZU	HPS	08/01/94	X	X	X	X	X	X	X	
DHP-S19-02	280-S19-039	22.0	FWBZU	HPS	08/01/94	X	X	X	X	X	X		
DHP-S19-03	280-S19-041	20.5	FWBZU	HPS	09/01/94	X	X	X	X	X	X	X	
DHP-S19-04	280-S19-042	21.3	FWBZU	HPS	08/18/94	X	X	X	X	X	X	X	
DHP-S19-05	280-S19-043	10.0	FWBZU	HPS	08/18/94			X	X				X
SHP-S19-01	280-S19-057	10.0	FWBZU	HPS	09/01/94			X	X				X
SHP-S19-02	280-S19-058	6.5	FWBZU	HPS	08/30/94			X	X				X
SHP-S19-03	280-S19-059	6.5	FWBZU	HPS	08/30/94			X	X				X
Monitoring Well Groundwater Samples													
1991 Investigation by PRC and Montgomery Watson						**VOC**	**SVOC**	**Pest/PCB**	**TRPH**	**TOC**	**General Chemicals[c]**	**DMetals**	**Cyanide**
MWD13-1	MWD13-1 [08/09/90]	5.0 to 15.0	FWBZU	bailer	10/18/90	X	X	X	X	X	X	X	X
MWD13-2	MWD13-2 [08/09/90]	5.0 to 15.0	FWBZU	bailer	8/9/90	X	X	X	X	X	X	X	X
MWD13-3	MWD13-3 [08/09/90]	5.0 to 15.0	FWBZU	bailer	10/18/90	X	X	X	X	X	X	X	X
MWD13-4	MWD13-4 [08/09/90]	5.0 to 15.0	FWBZU	bailer	10/17/90	X	X	X	X	X	X	X	X
1994 Investigation by PRC and Montgomery Watson						**VOC**	**SVOC**	**Pest/PCB**	**TPHEXT**	**TPHPRG**	**General Chemicals[c]**	**DMetals**	**Cyanide**
MWD13-1	280-S19-016	5.0 to 15.0	FWBZU	bailer	10/25/94	X	X	X	X	X	X	X	X
	280-S19-017			bailer	2/28/95	X	X		X	X	X	X	X
	280-S19-018			bailer	6/29/95	X	X		X	X	X	X	X
	280-S19-019			bailer	8/18/95	X	X		X	X	X	X	X
	280-S19-020			bailer	8/18/95	X	X		X	X	X	X	X
MWD13-2	280-S19-021	5.0 to 15.0	FWBZU	bailer	10/24/94	X	X	X	X	X	X	X	X
	280-S19-022			bailer	3/1/95	X	X	X	X	X	X	X	X
	280-S19-023			bailer	6/30/95	X	X	X	X	X	X	X	X
	280-S19-024			bailer	8/18/95	X	X	X	X	X	X	X	X

TABLE 6-32
GROUNDWATER SAMPLING SUMMARY
SITE 19, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 2 of 3)

Sample Location	Sample Identification	Sample Depth (ft bgs)	Hydrostratigraphic Unit Sample Collected From	Sampling Method	Date Sampled	Analyses Performed							
Monitoring Well Groundwater Samples (Continued)													
1994 Investigation by PRC and Montgomery Watson (Continued)						**VOC**	**SVOC**	**Pest/PCB**	**TPHEXT**	**TPHPRG**	**General Chemicals[c]**	**DMetals**	**Cyanide**
MWD13-3	280-S19-025	5.0 to 15.0	FWBZU	bailer	10/25/94	X	X	X	X	X	X	X	X
	280-S19-026	5.0 to 15.0	FWBZU	bailer	2/28/95	X	X		X	X	X	X	X
	280-S19-027			bailer	6/29/95	X	X		X	X	X	X	X
	280-S19-028			bailer	8/21/95	X	X		X	X	X	X	X
MWD13-4	280-S19-029	5.0 to 15.0	FWBZU	bailer	10/25/94	X	X	X	X	X	X	X	X
	280-S19-030			bailer	3/1/95	X	X		X	X	X	X	X
	280-S19-031			bailer	6/29/95	X	X		X	X	X	X	X
	280-S19-032			bailer	8/21/95	X	X		X	X	X	X	X
M19-05	280-S19-033	20.0 to 30.0	FWBZU	bailer	12/13/94	X	X	X	X	X	X	X	
	280-S19-034			bailer	12/13/94	X	X	X	X	X	X	X	
	280-S19-035			bailer	3/2/95	X	X		X	X	X	X	
	280-S19-036			bailer	6/29/95	X	X		X	X	X	X	
	280-S19-037			bailer	8/21/95	X	X		X	X	X	X	
D19-01	280-S19-060	50.0 to 60.0	FWBZL	bailer	12/16/94	X	X	X	X	X	X	X	
	280-S19-061			bailer	3/1/95	X	X		X	X	X	X	
	280-S19-062			bailer	6/30/95	X	X				X	X	X
	280-S19-063			bailer	9/15/95	X	X				X	X	X

Notes:

(a) This table summarizes groundwater sampling activities at Site 19 for only CTO 121 and CTO 280. Information for CTO 108 is summarized in the "Data Summary Report for Quarterly Groundwater Monitoring, November 1997 - August 1998," dated December 7, 1998, and prepared by Tetra Tech EM Inc. and Uribe & Associates

(b) Sample depth for groundwater samples from monitoring wells measured in feet below top of casing (refer to Table 6-32 for monitoing well construction details). Sample depth for Hydropunch® groundwater samples measured in feet below ground surface.

(c) General chemicals parameters for the 1991 and 1994 monitoring well and Hydropunch® groundwater samples are TDS, alkalinity, acidity, COD, anions, pH, hardness, and TOC.

TABLE 6-32
GROUNDWATER SAMPLING SUMMARY
SITE 19, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 3 of 3)

Notes (Continued):

COD	Chemical oxygen demand
DMetals	Dissolved metals
HPS	Hydropunch Samples
O&G	Oil and grease
Pest/PCB	Pesticides/polychlorinated biphenyls
SVOC	Semivolatile organic compounds
TDS	Total dissolved solids
TOC	Total organic carbon
TPHEXT	Total petroleum hydrocarbon - extractable
TPHPRG	Total petroleum hydrocarbon - purgeable
TRPH	Total recoverable petroleum hydrocarbon
VOC	Volatile organic compounds

TABLE 6-33
GEOTECHNICAL SAMPLE LABORATORY TEST RESULTS
SITE 19, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 1 of 2)

Sample Number	Depth (ft bgs)	Soil Classification [(a) (b)]		Stratigraphic Unit	Geotechnical Test Performed [(a)]					
					Moisure Content (%)	Dry Density (pcf)	Specific Gravity	CEC (meq/100g)	Permeability	
		Laboratory	Field						Effective Stresses (psi)	Hydraulic Conductivity (cm/s)
1990 Investigation by Canonie (Phases 1 and 2A)										
MWD13-1	2	SP/SM	SM	Fill	5.5	94.9	2.67	NA	NA	4.00E-04
MWD13-1	2.5	NA	SM	Fill	7.8	98.2	NA	NA	NA	NA
MWD13-1	9	NA	SM/SC	H/P-A/E	17.9	108.9	NA	NA	NA	NA
MWD13-2	7.5	NA	SM	Fill	18.1	107.3	NA	NA	NA	NA
MWD13-2	10	NA	SM	Fill	35.6	74.1	NA	NA	NA	NA
BD13-6	7	SP/SM	SM	Fill	16.1	109.1	2.66	NA	NA	3.00E-04
BD13-7	9.5	SM	SM/SC	H/P-A/E	17.7	110.2	NA	NA	NA	NA
BD13-7	10	SC	SM/SC	H/P-A/E	16.8	109.6	2.59	NA	NA	1.00E-07
BD13-9	7.5	SP	SM/SP	HBM	12.3	107.6	NA	NA	NA	NA
BD13-9	9.5	SP/SM	SP/SC	H/P-A/E	NA	NA	2.61	NA	NA	NA
BD13-10	9.5	SM	CL	H/P-A/E	NA	NA	NA	NA	NA	NA
BD13-11	3	SP/SM	SM	Fill	NA	NA	NA	NA	NA	NA
BD13-11	7.5	GW	SM	Fill	NA	NA	NA	NA	NA	NA
BD13-11	10	CL/SC	SM	HBM	NA	NA	NA	NA	NA	NA
BD13-11	14.5	SM	SC	H/P-A/E	14.6	115.8	NA	NA	NA	NA
BD13-12	6.5	SM	SC	HBM	20.8	98.3	NA	NA	NA	NA
BD13-12	7.5	SM/SC	SC	HBM	NA	NA	NA	NA	NA	NA
BD13-13	9	SM	SM	H/P-A/E	NA	NA	NA	NA	NA	NA
BD13-15	3.5	SP	SM	Fill	NA	NA	2.66	NA	NA	NA
BD13-15	14	SP/SM	SM	H/P-A/E	17	109.1	NA	NA	NA	NA
BD13-16	3.5	SP	SM	Fill	10.1	101.6	NA	NA	NA	NA

TABLE 6-33
GEOTECHNICAL SAMPLE LABORATORY TEST RESULTS
SITE 19, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 2 of 2)

Notes:

(a) Samples were classified or analyzed using the following methods:
Soil classification, Unified Soil Classification System ASTM D2488
Moisure Content ASTM D2216
Dry Density ASTM D2937
Specific Gravity ASTM D854
Effective Stresses EPA 9100
Hydraulic Conductivity EPA 9100

(b) Soil classification legend is as follows:

GW	Well graded gravels, gravel-sand mixtures, little or no fines
SP	Poorly-graded sands, gravelly sands, little or no fines
SM	Silty sands, sand-silt mixtures
SC	Clayey sands, sand-clay mixtures
CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
NA	Not analyzed
%	Percent
pcf	Pounds per cubic foot
psi	Pounds per square inch
cm/s	Centimeters per second
Ft bgs	Feet below ground surface
HBM	Holocene Bay Mud (Bay Sediment Units)
H/P - A/E	Holocene/Pleistocene alluvial/Eolian Deposit (Merritt Sand)

TABLE 6-34
SOIL ANALYTICAL DATA SUMMARY (0 FEET TO < 2 FEET BGS)
SITE 19, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 1 of 2)

Chemical	Total Samples	Samples With Detections	Frequency of Detection (%)	Reporting Limits (mg/kg)		Detected Concentrations (mg/kg)		Data Summary Statistics (mg/kg)	
				Minimum	Maximum	Minimum	Maximum	Mean	Standard Deviation
Semivolatile Organic Compounds									
2-Chlorophenol	15	1	6.7	0.34	11.00	1.50	1.50	1.50	0.35
4-Chloro-3-methylphenol	15	1	6.7	0.34	11.00	1.50	1.50	1.50	0.35
Acenaphthene	15	1	6.7	0.34	11.00	1.20	1.20	1.20	0.29
Anthracene	15	1	6.7	0.34	11.00	0.04	0.04	0.04	1.35
Benzo(a)anthracene	15	3	20.0	0.34	11.00	0.06	2.70	0.95	0.65
Benzo(b)fluoranthene	15	1	6.7	0.34	11.00	1.00	1.00	1.00	0.26
Bis(2-ethylhexyl)phthalate	15	1	6.7	0.34	11.00	0.89	0.89	0.89	1.34
di-n-butylphthalate	15	1	6.7	0.34	11.00	7.30	7.30	7.30	2.14
dibenzo(a,h)anthracene	15	1	6.7	0.34	11.00	0.67	0.67	0.67	0.21
Diethylphthalate	15	2	13.3	0.34	11.00	6.20	7.70	6.95	2.58
Fluoranthene	15	1	6.7	0.34	11.00	0.08	0.08	0.08	1.35
n-nitrosodiphenylamine (1)	15	3	20.0	0.34	11.00	0.08	0.08	0.08	1.36
Naphthalene	15	2	13.3	0.34	11.00	0.04	0.04	0.04	1.36
Pentachlorophenol	15	3	20.0	0.84	27.00	0.41	1.60	0.88	3.29
Phenanthrene	15	2	13.3	0.34	11.00	0.13	0.84	0.48	0.24
Total Metals									
Aluminum	12	12	100.0	1.7	21.00	3120.00	9940.00	4858.33	1750.62
Arsenic	12	2	16.7	2.5	10.00	3.10	9.50	6.30	2.33
Barium	12	10	83.3	0.2	22.30	18.20	140.00	38.25	34.27
Beryllium	12	1	8.3	0.13	1.00	0.40	0.40	0.40	0.20
Cadmium	12	4	33.3	0.2	1.00	0.20	7.40	2.09	2.02
Calcium	12	12	100.0	10	530.00	2000.00	7480.00	3511.67	1862.72
Chromium	12	12	100.0	0.6	5.30	20.90	32.80	26.17	4.02
Cobalt	12	4	33.3	0.8	5.30	3.50	9.70	5.30	2.06
Copper	12	11	91.7	0.6	5.30	5.90	138.00	35.83	46.21
Iron	12	12	100.0	4.2	10.00	5440.00	30500.00	9027.50	6813.88
Lead	12	1	8.3	3.5	5.50	28.40	28.40	28.40	7.47
Magnesium	12	12	100.0	5	530.00	1800.00	4870.00	2506.67	949.06
Manganese	12	12	100.0	0.2	5.30	72.00	830.00	154.84	213.26
Nickel	12	12	100.0	1.2	5.30	20.00	30.00	24.11	2.41
Potassium	12	11	91.7	73	530.00	540.00	1020.00	670.00	178.50
Silver	12	1	8.3	0.38	5.30	0.70	0.70	0.70	1.17
Sodium	12	5	41.7	10	530.00	153.00	359.00	229.80	52.85

TABLE 6-34
SOIL ANALYTICAL DATA SUMMARY (0 FEET TO < 2 FEET BGS)
SITE 19, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 2 of 2)

Chemical	Total Samples	Samples With Detections	Frequency of Detection (%)	Reporting Limits (mg/kg)		Detected Concentrations (mg/kg)		Data Summary Statistics (mg/kg)	
				Minimum	Maximum	Minimum	Maximum	Mean	Standard Deviation
Total Metals (Continued)									
Thallium	12	1	8.3	2.7	10.00	3.30	3.30	3.30	1.75
Titanium	12	12	100.0	0.2	5.30	260.00	535.00	381.75	98.57
Vanadium	12	12	100.0	0.6	5.30	14.00	41.50	18.95	7.47
Zinc	12	12	100.0	0.6	5.30	14.00	192.00	40.57	50.16
Total Petroleum Hydrocarbons									
Gasoline range organics	4	1	25.0	0.53	0.57	3.30	3.30	3.30	1.51
Motor oil range organics	4	2	50.0	21	110.00	330.00	4680.00	2505.00	2286.01
TRPH	8	5	62.5	1.7	173.00	2.30	5310.00	2133.04	2021.11
Volatile Organic Compounds									
1,3-Dichlorobenzene	15	1	6.7	0.34	11.00	0.59	0.59	0.59	1.34
Toluene	3	2	66.7	0.0062	0.68	0.06	1.00	0.53	0.56
Xylene (total)	3	1	33.3	0.0062	0.68	0.19	0.19	0.19	0.11

Notes:

mg/kg Milligram per kilogram
TRPH Total recoverable petroleum hydrocarbon

TABLE 6-35
SOIL ANALYTICAL DATA SUMMARY (2 FEET TO < 10 FEET BGS)
SITE 19, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 1 of 2)

Chemical	Total Samples	Samples With Detections	Frequency of Detection (%)	Reporting Limits (mg/kg)		Detected Concentrations (mg/kg)		Data Summary Statistics (mg/kg)	
				Minimum	Maximum	Minimum	Maximum	Mean	Standard Deviation
Semivolatile Organic Compounds									
Benzo(a)anthracene	33	1	3.0	0.34	6.80	0.54	0.54	0.54	0.56
Benzo(a)pyrene	33	2	6.1	0.34	6.80	0.07	0.60	0.34	0.56
Benzo(b)fluoranthene	33	3	9.1	0.34	6.80	0.02	0.92	0.35	0.57
Benzo(g,h,i)perylene	33	1	3.0	0.34	6.80	0.39	0.39	0.39	0.56
Bis(2-ethylhexyl)phthalate	33	2	6.1	0.34	6.80	0.11	0.25	0.18	0.56
Chrysene	33	2	6.1	0.34	6.80	0.02	0.64	0.33	0.56
Di-n-butylphthalate	33	1	3.0	0.34	6.80	5.20	5.20	5.20	1.01
Diethylphthalate	33	1	3.0	0.34	6.80	8.80	8.80	8.80	1.58
Fluoranthene	33	5	15.2	0.34	6.80	0.03	1.00	0.27	0.57
Indeno(1,2,3-cd)pyrene	33	2	6.1	0.34	6.80	0.06	0.40	0.23	0.56
N-nitrosodiphenylamine (1)	33	7	21.2	0.34	6.80	0.05	0.90	0.20	0.14
Naphthalene	33	2	6.1	0.34	6.80	0.04	0.06	0.05	0.56
Pentachlorophenol	33	1	3.0	0.82	33.00	0.67	0.67	0.67	2.74
Phenanthrene	33	3	9.1	0.34	6.80	0.02	0.33	0.13	0.56
Pyrene	33	4	12.1	0.34	6.80	0.10	1.70	0.60	0.61
Total Metals									
Aluminum	30	30	100.0	1.6	26.00	2740.00	19500.00	8297.67	4938.19
Arsenic	30	8	26.7	2.5	13.00	2.70	8.80	4.88	1.76
Barium	30	29	96.7	0.2	26.00	15.30	570.00	82.97	109.39
Beryllium	30	6	20.0	0.2	1.30	0.21	0.40	0.34	0.19
Cadmium	30	8	26.7	0.2	1.30	0.30	0.90	0.52	0.19
Calcium	30	30	100.0	10	640.00	1400.00	99800.00	10571.33	23765.86
Chromium	30	29	96.7	0.6	30.70	5.80	67.00	36.28	15.13
Cobalt	30	18	60.0	0.8	6.40	3.40	11.00	7.12	2.63
Copper	30	28	93.3	0.6	6.40	6.20	256.00	34.59	50.32
Iron	30	30	100.0	4.1	13.00	4670.00	32300.00	13252.67	7170.51
Lead	30	11	36.7	3.5	9.10	6.60	303.00	43.83	54.91
Magnesium	30	29	96.7	4.9	640.00	1200.00	13000.00	3443.79	2561.84
Manganese	30	30	100.0	0.2	6.40	84.00	897.00	217.53	176.30
Molybdenum	30	2	6.7	0.35	6.40	1.40	1.60	1.50	1.16
Nickel	30	29	96.7	1.2	18.30	5.50	64.00	33.34	16.03
Potassium	30	28	93.3	72	640.00	340.00	1600.00	901.89	364.10
Silver	30	1	3.3	0.25	6.40	0.43	0.43	0.43	1.29
Sodium	30	15	50.0	10	640.00	224.00	1300.00	613.53	267.03
Titanium	30	30	100.0	0.2	6.40	150.00	846.00	469.43	185.65
Vanadium	30	30	100.0	0.6	6.40	12.00	48.00	25.70	9.50
Zinc	30	30	100.0	0.6	6.40	16.00	292.00	48.26	58.71

TABLE 6-35
SOIL ANALYTICAL DATA SUMMARY (2 FEET TO < 10 FEET BGS)
SITE 19, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 2 of 2)

Chemical	Total Samples	Samples With Detections	Frequency of Detection (%)	Reporting Limits (mg/kg)		Detected Concentrations (mg/kg)		Data Summary Statistics (mg/kg)	
				Minimum	Maximum	Minimum	Maximum	Mean	Standard Deviation
Total Petroleum Hydrocarbons									
Motor oil range organics	9	2	22.2	21	30.00	36.00	97.00	66.50	27.73
TRPH	35	19	54.3	1.7	826.00	8.60	14500.00	1606.90	3210.37
Volatile Organic Compounds									
1,1,1-Trichloroethane	47	2	4.3	0.005	0.01	0.00	0.00	0.00	0.00
2-Butanone	47	1	2.1	0.01	0.02	0.00	0.00	0.00	0.00
Acetone	45	5	11.1	0.01	0.16	0.00	0.04	0.02	0.01
Ethylbenzene	47	1	2.1	0.005	0.01	0.01	0.01	0.01	0.00
Methylene chloride	45	5	11.1	0.005	0.04	0.00	0.03	0.01	0.00
Tetrachloroethene	47	2	4.3	0.005	0.01	0.00	0.00	0.00	0.00
Toluene	47	38	80.8	0.005	0.01	0.00	0.28	0.04	0.05
Trichloroethene	47	1	2.1	0.005	0.01	0.00	0.00	0.00	0.00
Xylene (total)	47	3	6.4	0.005	0.01	0.00	0.05	0.03	0.01

Notes:

mg/kg Milligram per kilogram
TRPH Total recoverable petroleum hydrocarbon

TABLE 6-36
SOIL ANALYTICAL DATA SUMMARY (> 10 FEET BGS)
SITE 19, OU-2 SOUTHEAST AREA, ALAMEDA POINT

Chemical	Total Samples	Samples With Detections	Frequency of Detection (%)	Reporting Limits (mg/kg)		Detected Concentrations (mg/kg)		Data Summary Statistics (mg/kg)	
				Minimum	Maximum	Minimum	Maximum	Mean	Standard Deviation
Semivolatile Organic Compounds									
Anthracene	19	2	10.5	0.38	0.97	0.10	0.10	0.10	0.09
Benzo(a)anthracene	19	3	15.8	0.38	0.97	0.07	0.35	0.20	0.09
Benzo(a)pyrene	19	2	10.5	0.38	0.97	0.14	0.27	0.20	0.08
Benzo(b)fluoranthene	19	3	15.8	0.38	0.97	0.08	0.42	0.26	0.09
Benzo(k)fluoranthene	19	1	5.3	0.38	0.97	0.17	0.17	0.17	0.09
Chrysene	19	3	15.8	0.38	0.97	0.15	0.44	0.29	0.10
Fluoranthene	19	4	21.1	0.38	0.79	0.12	1.00	0.45	0.20
Fluorene	19	1	5.3	0.38	0.97	0.13	0.13	0.13	0.09
N-nitrosodiphenylamine (1)	19	8	42.1	0.38	0.80	0.04	0.14	0.07	0.10
Naphthalene	19	2	10.5	0.38	0.80	0.04	0.15	0.10	0.09
Phenanthrene	19	3	15.8	0.38	0.80	0.10	0.58	0.32	0.10
Pyrene	19	5	26.3	0.38	0.79	0.10	0.93	0.35	0.18
Total Metals									
Aluminum	17	17	100.0	1.9	24.00	7230.00	13400.00	9737.06	1828.32
Arsenic	17	11	64.7	2.8	12.00	3.20	14.00	5.71	2.38
Barium	17	17	100.0	0.2	24.00	58.00	112.00	76.87	15.44
Beryllium	17	10	58.8	0.2	1.20	0.28	0.40	0.34	0.14
Cadmium	17	6	35.3	0.2	1.20	0.30	0.50	0.39	0.20
Calcium	17	17	100.0	12	610.00	1200.00	13200.00	2716.47	2728.47
Chromium	17	17	100.0	0.7	6.10	31.00	54.90	39.80	6.16
Cobalt	17	15	88.2	0.9	6.10	6.00	9.70	6.92	1.61
Copper	17	17	100.0	0.7	6.10	9.20	69.80	20.79	15.56
Iron	17	17	100.0	4.6	12.00	140.00	19500.00	13861.18	4118.57
Lead	17	3	17.6	3.9	6.10	6.20	385.00	132.70	92.60
Magnesium	17	17	100.0	5.6	610.00	2700.00	4960.00	3371.18	530.38
Manganese	17	17	100.0	0.2	6.10	128.00	272.00	182.59	39.66
Nickel	17	17	100.0	1.4	6.10	39.00	66.90	47.70	6.84
Potassium	17	17	100.0	81	610.00	760.00	1600.00	1094.94	264.26
Silver	17	1	5.9	0.42	6.10	0.32	0.32	0.32	1.37
Sodium	17	15	88.2	12	610.00	495.00	1430.00	966.47	319.27
Titanium	17	17	100.0	0.2	6.10	304.00	639.00	464.82	91.33
Vanadium	17	17	100.0	0.7	6.10	22.50	33.80	26.30	3.32
Zinc	17	17	100.0	0.7	6.10	26.00	126.00	40.09	23.37

TABLE 6-36
SOIL ANALYTICAL DATA SUMMARY (> 10 FEET BGS)
SITE 19, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 2 of 2)

Chemical	Total Samples	Samples With Detections	Frequency of Detection (%)	Reporting Limits (mg/kg)		Detected Concentrations (mg/kg)		Data Summary Statistics (mg/kg)	
				Minimum	Maximum	Minimum	Maximum	Mean	Standard Deviation
Total Petroleum Hydrocarbons									
TRPH	25	7	28.0	1.9	2.00	3.40	73.40	26.29	19.70
Volatile Organic Compounds									
1,1-Tichloroethane	35	1	2.9	0.0058	0.01	0.00	0.00	0.00	0.00
Acetone	35	1	2.9	0.011	0.10	0.01	0.01	0.01	0.01
Ethylbenzene	35	1	2.9	0.0058	0.01	0.01	0.01	0.01	0.00
Methylene chloride	35	1	2.9	0.0058	0.03	0.01	0.01	0.01	0.00
Toluene	35	34	97.1	0.0058	0.01	0.01	0.14	0.03	0.03
Xylene (total)	35	2	5.7	0.0058	0.01	0.01	0.04	0.03	0.01

Notes:

mg/kg Milligram per kilogram
TRPH Total recoverable petroleum hydrocarbon

TABLE 6-37
ECOLOGICAL COPCs IN SOIL (0-6 FEET BGS)
SITE 19, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 1 of 2)

Chemical	Frequency of Detection	Sample Quantitation Limit	Minimum Concentration	Maximum Concentration	95 UCL Concentration	COPC Screening Evaluation [a]	
						Rejected	Retained
Inorganic Compounds (mg/kg)							
Cyanide	1/43	0.49-1.3	0.59	0.59		FOD	
Aluminum	30/30	NA	2,840	10,900		CSB	
Arsenic	5/30	2.5-13	3.1	9.5		CSB	
Barium	27/30	21-22.3	15.3	570		CSB	
Beryllium	3/30	0.13-1.3	0.37	0.4		CSB	
Cadmium	7/30	0.2-1.3	0.2	7.4	0.89	PRG	
Calcium	30/30	NA	1,400	84,900		CSB	
Chromium	30/30	NA	5.8	67		CSB	
Cobalt	11/30	4.2-6.2	3.4	9.7		CSB	
Copper	27/30	5.2-5.3	5.9	138	50.18	PRG	
Iron	30/30	NA	4,670	32,300		CSB	
Lead	8/30	3.5-6.2	6.6	303	14.39	PRG	
Magnesium	29/30	5.1	1,200	13,000		CSB	
Manganese	30/30	NA	72	897	208.54		X
Molybdenum	1/30	0.31-6.4	1.6	1.6		FOD	
Nickel	30/30	NA	5.5	64		CSB	
Potassium	28/30	520-540	340	1,400		CSB	
Silver	2/30	0.38-6.4	0.43	7	2.27		X
Sodium	11/30	520-640	153	727		CSB	
Thallium	1/30	2.7-13	3.3	3.3		FOD	
Titanium	30/30	NA	220	819		CSB	
Vanadium	30/30	NA	12	41.5		CSB	
Zinc	30/30	NA	14	292	55.22		X
Semivolatile Organic Compounds (ug/kg)							
2-Chlorophenol	1/38	340-6,800	1,500	1,500		FOD	
4-Chloro-3-methylphenol	1/38	340-6-800	1,500	1,500		FOD	
Acenaphthene	1/38	340-6,800	1,200	1,200		FOD	
Anthracene	1/38	340-11,000	36	36		FOD	
Benzo(a)anthracene	3/38	340-6,800	57	2,700	452.31		X
Benzo(a)pyrene	1/38	340-11,000	71	71		FOD	
Benzo(b)fluoranthene	3/38	340-6,800	23	1,000	350.64 [b]		X
Bis(2-ethylhexyl)phthalate	2/38	340-11,000	110	890	352.78 [b]		X

TABLE 6-37
ECOLOGICAL COPCs IN SOIL (0-6 FEET BGS)
SITE 19, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 2 of 2)

	Frequency of	Sample Quantitation	Minimum	Maximum	95 UCL	COPC Screening Evaluation [a]	
Semivolatile Organic Compounds (ug/kg) (continued)							
Chrysene	1/38	340-11,000	18	18		FOD	
Di-n-butylphthalate	2/38	340-11,000	5,200	7,300	1,041.86		X
Dibenzo(a,h)anthracene	1/38	340-6,800	670	670		FOD	
Diethylphthalate	2/38	340-11,000	6,200	6,700		PRG	
Fluoranthene	5/38	340-11,000	25	200	319.02 [b]		X
Indeno(1,2,3-c,d)pyrene	1/38	340-11,000	55	55		FOD	
n-Nitrosodiphenylamine (1)	8/38	340-11,000	48	900	290.83 [b]		X
Naphthalene	4/38	340-11,000	39	56	330.53 [b]		X
Pentachlorophenol	4/38	820-33,000	410	1,600		PRG	
Phenanthrene	4/38	340-6,800	21	840	368.55 [b]		X
Pyrene	3/38	340-11,000	97	380	308.63 [b]		X
Volatile Organic Compounds (ug/kg)							
1,1,1-Trichloroethane	2.35	5-680	1	3	7.98		X
1,3-Dichlorobenzene	1/48	5-11,000	590	590		FOD	
Acetone	4/34	10-1,400	4	31	29.51		X
Methylene chloride	3/34	8-1,400	11	30	17.66		X
Tetrachloroethene	2/35	5-680	2	4	7.86		X
Toluene	25/35	10-12	2	1,000		PRG	
Trichloroethene	1/35	5-680	4	4		FOD	
Xylene (total)	3/35	5-12	3	190	7.72		X

Notes:

(a) COPC screening criteria are as follows:
- CSB Concentrations within statistical background or essential nutrient
- FOD Frequency of detection
- PRG Maximum or 95 UCL concentration is below ecological preliminary remediation goal

(b) High non-detection values were removed from dataset for calculating 95 UCL per EPA guidance

µg/kg Microgram per kilogram
mg/kg Milligram per kilogram
95 UCL 95 percent upper confidence limit on the arithmetic mean concentration
NA Not applicable, frequency of detection is 100 percent

TABLE 6-38
SUMMARY OF SOIL HAZARD QUOTIENTS
CALIFORNIA GROUND SQUIRREL
SITE 19, OU-2 SOUTHEAST AREA, ALAMEDA POINT

Ecological COPCs	Hazard Quotient 1	Hazard Quotient 2	Hazard Quotient 3	Hazard Quotient 4	Hazard Quotient 5
Manganese	7.05E-03	1.82E+00	1.63E-01	1.26E+00	1.13E-01
Silver	NRV	NRV	NRV	NRV	NRV
Zinc	4.63E-04	7.43E-01	1.07E-02	5.15E-01	7.43E-03
Benzo(a)anthracene	7.37E-05	4.27E-02	1.71E-03	2.96E-02	1.18E-03
Benzo(b)fluoranthene	5.72E-05	3.31E-02	1.32E-03	2.29E-02	9.16E-04
Bis(2-ethylhexyl)phthalate	1.03E-05	2.39E-03	2.39E-04	1.66E-03	1.66E-04
Di-n-butylphthalate	NRV	NRV	NRV	NRV	NRV
Fluoranthene	3.26E-05	1.89E-02	7.54E-04	1.31E-02	5.22E-04
N-nitrosodiphenylamine (1)	NRV	NRV	NRV	NRV	NRV
Naphthalene	1.16E-06	7.98E-05	2.68E-05	5.53E-05	1.85E-05
Phenanthrene	6.01E-05	3.48E-02	1.39E-03	2.41E-02	9.63E-04
Pyrene	5.03E-05	2.91E-02	1.16E-03	2.02E-02	8.06E-04
1,1,1-Trichloroethane	NRV	3.59E-07	NRV	2.48E-07	NRV
Acetone	1.71E-07	1.98E-05	3.97E-06	1.37E-05	2.75E-06
Methylene chloride	1.03E-06	2.03E-04	2.37E-05	1.40E-04	1.64E-05
Tetrachloroethene	NRV	NRV	NRV	NRV	NRV
Xylene (total)	1.59E-05	4.57E-04	3.69E-04	3.16E-04	2.55E-04

Notes:

COPC Chemical of potential concern
NRV No reference value available

TABLE 6-39
SUMMARY OF SOIL HAZARD QUOTIENTS
RED-TAILED HAWK
SITE 19, OU-2 SOUTHEAST AREA, ALAMEDA POINT

Ecological COPCs	Hazard Quotient 1	Hazard Quotient 2	Hazard Quotient 3	Hazard Quotient 4	Hazard Quotient 5
Manganese	3.38E-08	2.41E-02	2.41E-03	2.00E-05	2.07E-06
Silver	NRV	NRV	NRV	NRV	NRV
Zinc	4.03E-08	2.88E-02	2.88E-03	2.39E-05	2.47E-06
Benzo(a)anthracene	NRV	NRV	NRV	NRV	NRV
Benzo(b)fluoranthene	NRV	NRV	NRV	NRV	NRV
Bis(2-ethylhexyl)phthalate	4.03E-09	2.88E-03	2.88E-04	2.39E-06	2.47E-07
Di-n-butylphthalate	NRV	NRV	NRV	NRV	NRV
Fluoranthene	NRV	NRV	NRV	NRV	NRV
N-nitrosodiphenylamine (1)	NRV	NRV	NRV	NRV	NRV
Naphthalene	NRV	NRV	NRV	NRV	NRV
Phenanthrene	NRV	NRV	NRV	NRV	NRV
Pyrene	NRV	NRV	NRV	NRV	NRV
1,1,1-Trichloroethane	NRV	NRV	NRV	NRV	NRV
Acetone	NRV	NRV	NRV	NRV	NRV
Methylene chloride	NRV	NRV	NRV	NRV	NRV
Tetrachloroethene	NRV	NRV	NRV	NRV	NRV
Xylene (total)	NRV	NRV	NRV	NRV	NRV

Notes:

COPC Chemical of potential concern
NRV No reference value available

TABLE 6-40
SUMMARY OF RI ACTIVITIES
SITE 22, OU-2 SOUTHEAST AREA, ALAMEDA POINT

Period	Contractor	Activities	Chemical Groups Analyzed	Reference
1990 (CTO 121, Phases 1 and 2A)	Canonie	• Soil gas survey conducted • Soil borings drilled • Five monitoring wells installed • Soil samples collected • Groundwater sampling conducted	• Soil Gas: BTEX, THC • Soil: VOCs, SVOCs, EDB, Pest/PCBs, metals, general chemical parameters • Groundwater: VOCs, SVOCs, TRPH, metals, general chemical parameters	Canonie 1994
1994 (CTO 280)	PRC and Montgomery Watson	• Cone penetrometer tests performed • Hydropunch® samples collected • Soil samples collected • Four shallow monitoring wells installed • Non-point source sampling conducted • One deep monitoring well installed • One reference boring drilled • Quarterly groundwater sampling conducted • Geophysical survey to locate UST conducted	• Surface Soil: SVOCs, Pest/PCBs, metals, cyanide • Subsurface Soil: VOCs, SVOCs, TPHPRG, TPHEXT, EDB, metals, • Groundwater: VOCs, SVOCs, TPHPRG, TPHEXT, TOC, metals, general chemical parameters	PRC and Montgomery Watson 1996b
1997–1998 (CTO 108)	PRC and Montgomery Watson	• Quarterly groundwater Sampling conducted • Tidal influence study performed	• Groundwater: VOCs, SVOCs, TPH, metals, cyanide, general chemical parameters	PRC 1997a Tetra Tech 12/7/98

Notes:

BTEX Benzene, toluene, ethylbenzene, and total xylenes
CTO Contract Task Order
EDB Ethylene dibromide
Pest/PCB Pesticides and polychlorinated biphenyl
PRC PRC Environmental Management, Inc.
SVOC Semivolatile organic compound
THC Total hydrocarbons
TOC Total organic carbon
TPH Total petroleum hydrocarbons
TPHEXT Total petroleum hydrocarbons - extractable
TPHPRG Total petroleum hydrocarbons - purgeable
TRPH Total recoverable petroleum hydrocarbons
UST Underground storage tank
VOC Volatile organic compound

TABLE 6-41
SOIL-GAS SURVEY SUMMARY
SITE 22, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 1 of 3)

Sample Location	Sample Identification	Sample Depth (ft bgs)	Sampling Method	Date Sampled [a]	Analyses Performed [b]				
					Benzene	Toluene	Ethylbenzene	Xylene (total)	TPH
1990 Investigation by Canonie									
L0	L0-6	6.0	Hydraulic sample probe	Jun-90	X	X	X	X	X
L1	L1-4	4.0	Hydraulic sample probe	Jun-90	X	X	X	X	X
L2	L2-4	4.0	Hydraulic sample probe	Jun-90	X	X	X	X	X
L3	L3-4	4.0	Hydraulic sample probe	Jun-90	X	X	X	X	X
L4	L4-4	4.0	Hydraulic sample probe	Jun-90	X	X	X	X	X
L5	L5-4	4.0	Hydraulic sample probe	Jun-90	X	X	X	X	X
L6	L6-3	3.0	Hydraulic sample probe	Jun-90	X	X	X	X	X
L7	L7-3	3.0	Hydraulic sample probe	Jun-90	X	X	X	X	X
L8	L8-4	4.0	Hydraulic sample probe	Jun-90	X	X	X	X	X
M0	M0-5	5.0	Hydraulic sample probe	Jun-90	X	X	X	X	X
M1	M1-4	4.0	Hydraulic sample probe	Jun-90	X	X	X	X	X
M2	M2-5	5.0	Hydraulic sample probe	Jun-90	X	X	X	X	X
M3	M3-5	5.0	Hydraulic sample probe	Jun-90	X	X	X	X	X
M4	M4-5	5.0	Hydraulic sample probe	Jun-90	X	X	X	X	X
M6	M6-5	5.0	Hydraulic sample probe	Jun-90	X	X	X	X	X
M7	M7-3	3.0	Hydraulic sample probe	Jun-90	X	X	X	X	X
M8	M8-3	3.0	Hydraulic sample probe	Jun-90	X	X	X	X	X
N0	N0-4	4.0	Hydraulic sample probe	Jun-90	X	X	X	X	X
N1	N1-4	4.0	Hydraulic sample probe	Jun-90	X	X	X	X	X
N2	N2-5	5.0	Hydraulic sample probe	Jun-90	X	X	X	X	X
N3	N3-5	5.0	Hydraulic sample probe	Jun-90	X	X	X	X	X
N4	N4-4	4.0	Hydraulic sample probe	Jun-90	X	X	X	X	X
N5	N5-4	4.0	Hydraulic sample probe	Jun-90	X	X	X	X	X
N6	N6-4	4.0	Hydraulic sample probe	Jun-90	X	X	X	X	X
N7	N7-5	5.0	Hydraulic sample probe	Jun-90	X	X	X	X	X
N8	N8-3	3.0	Hydraulic sample probe	Jun-90	X	X	X	X	X
O0	O0-3	3.0	Hydraulic sample probe	Jun-90	X	X	X	X	X
O1	O1-3	3.0	Hydraulic sample probe	Jun-90	X	X	X	X	X

TABLE 6-41
SOIL-GAS SURVEY SUMMARY
SITE 22, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 2 of 3)

Sample Location	Sample Identification	Sample Depth (ft bgs)	Sampling Method	Date Sampled [a]	Analyses Performed [b]				
					Benzene	Toluene	Ethylbenzene	Xylene (total)	TPH
1990 Investigation by Canonie (Continued)									
O2	O2-5	5.0	Hydraulic sample probe	Jun-90	X	X	X	X	X
O3	O3-4	4.0	Hydraulic sample probe	Jun-90	X	X	X	X	X
O4	O4-3	3.0	Hydraulic sample probe	Jun-90	X	X	X	X	X
O5	O5-5	5.0	Hydraulic sample probe	Jun-90	X	X	X	X	X
O6	O6-5	5.0	Hydraulic sample probe	Jun-90	X	X	X	X	X
O7	O7-5	5.0	Hydraulic sample probe	Jun-90	X	X	X	X	X
O8	O8-3	3.0	Hydraulic sample probe	Jun-90	X	X	X	X	X
P0	P0-2	2.0	Hydraulic sample probe	Jun-90	X	X	X	X	X
P1	P1-3	3.0	Hydraulic sample probe	Jun-90	X	X	X	X	X
P2	P2-5	5.0	Hydraulic sample probe	Jun-90	X	X	X	X	X
P3	P3-4	4.0	Hydraulic sample probe	Jun-90	X	X	X	X	X
P4	P4-5	5.0	Hydraulic sample probe	Jun-90	X	X	X	X	X
P5	P5-5	5.0	Hydraulic sample probe	Jun-90	X	X	X	X	X
P6	P6-5	5.0	Hydraulic sample probe	Jun-90	X	X	X	X	X
P7	P7-4	4.0	Hydraulic sample probe	Jun-90	X	X	X	X	X
P8	P8-4	4.0	Hydraulic sample probe	Jun-90	X	X	X	X	X
Q0	Q0-5	5.0	Hydraulic sample probe	Jun-90	X	X	X	X	X
Q1	Q1-4	4.0	Hydraulic sample probe	Jun-90	X	X	X	X	X
Q2	Q2-5	5.0	Hydraulic sample probe	Jun-90	X	X	X	X	X
Q3	Q3-6	6.0	Hydraulic sample probe	Jun-90	X	X	X	X	X
Q4	Q4-5	5.0	Hydraulic sample probe	Jun-90	X	X	X	X	X
Q5	Q5-5	5.0	Hydraulic sample probe	Jun-90	X	X	X	X	X
Q5.5	Q5.5-5	5.0	Hydraulic sample probe	Jun-90	X	X	X	X	X
Q6	Q6-5	5.0	Hydraulic sample probe	Jun-90	X	X	X	X	X
Q7	Q7-5	5.0	Hydraulic sample probe	Jun-90	X	X	X	X	X
Q8	Q8-4	4.0	Hydraulic sample probe	Jun-90	X	X	X	X	X
R0	R0-4	4.0	Hydraulic sample probe	Jun-90	X	X	X	X	X
R1	R1-4	4.0	Hydraulic sample probe	Jun-90	X	X	X	X	X

TABLE 6-41
SOIL-GAS SURVEY SUMMARY
SITE 22, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 3 of 3)

Sample Location	Sample Identification	Sample Depth (ft bgs)	Sampling Method	Date Sampled [a]	Analyses Performed [b]				
					Benzene	Toluene	Ethylbenzene	Xylene (total)	TPH
1990 Investigation by Canonie (Continued)									
R2	R2-4	4.0	Hydraulic sample probe	Jun-90	X	X	X	X	X
R3	R3-4	4.0	Hydraulic sample probe	Jun-90	X	X	X	X	X
R4	R4-4	4.0	Hydraulic sample probe	Jun-90	X	X	X	X	X
R5	R5-4	4.0	Hydraulic sample probe	Jun-90	X	X	X	X	X
R7	R7-3	3.0	Hydraulic sample probe	Jun-90	X	X	X	X	X
R8	R8-4	4.0	Hydraulic sample probe	Jun-90	X	X	X	X	X

Notes:

(a) The soil gas survey was performed between June 18 and 26, 1990; individual sampling dates are not known.

(b) Samples were analyzed in the field using a gas chromatograph and flame ionization detector.

ft bgs Feet below ground surface

TPH Total petroleum hydrocarbons

TABLE 6-42
SUBSURFACE SOIL SAMPLING SUMMARY
SITE 22, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 1 of 7)

Sample Location	Sample Identification	Sample Depth (ft bgs)	Sampling Method	Date Sampled	Total Boring Depth (ft bgs)	Analyses Performed								
						VOC	SVOC	Pesticides	TMetals	General Chemicals	TRPH	TPHPRG	TPHEXT	pH
1990 Investigation by Canonie [(a)]														
MW547-1	MW547-1 (0.5-1.0)	0.5 to 1.0	Split spoon	06/29/90	15.0		X	X	X		X			
	MW547-1 (1.0-1.5)	1.0 to 1.5	Split spoon	06/29/90						X				
	MW547-1 (2.0-2.5)	2.0 to 2.5	Split spoon	06/29/90		X	X							
	MW547-1 (2.5-3.0)	2.5 to 3.0	Split spoon	06/29/90				X	X		X			X
	MW547-1 (4.5-5.0)	4.5 to 5.0	Split spoon	06/29/90		X	X							
	MW547-1 (5.0-5.5)	5.0 to 5.5	Split spoon	06/29/90				X	X		X			
	MW547-1 (8.0-8.5)	8.0 to 8.5	Split spoon	06/29/90		X	X							
	MW547-1 (8.5-9.0)	8.5 to 9.0	Split spoon	06/29/90				X	X		X			
	MW547-1 (11.0-11.5)	11.0 to 11.5	Split spoon	06/29/90		X	X							
	MW547-1 (11.5-12.0)	11.5 to 12.0	Split spoon	06/29/90				X	X		X			
	MW547-1 (14.0-14.5)	14.0 to 14.5	Split spoon	06/29/90		X	X							
	MW547-1 (14.5-15.0)	14.5 to 15.0	Split spoon	06/29/90				X	X		X			
MW547-2	MW547-2 (0.5-1.0)	0.5 to 1.0	Split spoon	06/29/90	15.0		X	X	X		X			
	MW547-2 (1.5-2.0)	1.5 to 2.0	Split spoon	06/29/90						X				
	MW547-2 (2.0-2.5)	2.0 to 2.5	Split spoon	06/29/90		X	X							
	MW547-2 (2.5-3.0)	2.5 to 3.0	Split spoon	06/29/90				X	X		X			X
	MW547-2 (5.0-5.5)	5.0 to 5.5	Split spoon	06/29/90		X	X							
	MW547-2 (5.5-6.0)	5.5 to 6.0	Split spoon	06/29/90		X	X							
	MW547-2 (6.0-6.5)	6.0 to 6.5	Split spoon	06/29/90				X	X		X			
	MW547-2 (6.5-7.0)	6.5 to 7.0	Split spoon	06/29/90				X	X		X			
	MW547-2 (9.5-10.0)	9.5 to 10.0	Split spoon	06/29/90		X	X							
	MW547-2 (10.0-10.5)	10.0 to 10.5	Split spoon	06/29/90				X	X		X			
	MW547-2 (12.5-13.0)	12.5 to 13.0	Split spoon	06/29/90		X	X							
	MW547-2 (13.0-13.5)	13.0 to 13.5	Split spoon	06/29/90				X	X		X			
	MW547-2 (14.0-14.5)	14.0 to 14.5	Split spoon	06/29/90		X	X							
	MW547-2 (14.5-15.0)	14.5 to 15.0	Split spoon	06/29/90				X	X		X			

TABLE 6-42
SUBSURFACE SOIL SAMPLING SUMMARY
SITE 22, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 2 of 7)

Sample Location	Sample Identification	Sample Depth (ft bgs)	Sampling Method	Date Sampled	Total Boring Depth (ft bgs)	Analyses Performed								
						VOC	SVOC	Pesticides	TMetals	General Chemicals	TRPH	TPHPRG	TPHEXT	pH
1990 Investigation by Canonie (Continued) [a]														
MW547-3	MW547-3 (1.0-1.5)	1.0 ot 1.5	Split spoon	07/02/90	15.0		X	X	X					
	MW547-3 (2.0-2.5)	2.0 to 2.5	Split spoon	07/02/90						X	X			
	MW547-3 (3.5-4.0)	3.5 to 4.0	Split spoon	07/02/90		X	X							
	MW547-3 (4.0-4.5)	4.0 to 4.5	Split spoon	07/02/90				X	X		X			X
	MW547-3 (5.0-5.5)	5.0 to 5.5	Split spoon	07/02/90		X	X							
	MW547-3 (5.5-6.0)	5.5 to 6.0	Split spoon	07/02/90				X	X		X			
	MW547-3 (8.0-8.5)	8.0 to 8.5	Split spoon	07/02/90		X	X							
	MW547-3 (8.5-9.0)	8.5 to 9.0	Split spoon	07/02/90				X	X		X			
	MW547-3 (10.5-11.0)	10.5 to 11.0	Split spoon	07/02/90		X	X							
	MW547-3 (11.0-11.5)	11.0 to 11.5	Split spoon	07/02/90				X	X		X			
	MW547-3 (11.5-12.0)	11.5 to 12.0	Split spoon	07/02/90			X	X			X			
	MW547-3 (14.0-14.5)	14.0 to 14.5	Split spoon	07/02/90		X	X							
	MW547-3 (14.5-15.0)	14.5 to 15.0	Split spoon	07/02/90				X	X		X			
MW547-4	MW547-4 (0.5-1.0)	0.5 to 1.0	Split spoon	06/28/90	15.0		X	X	X		X			
	MW547-4 (1.0-1.5)	1.0 to 1.5	Split spoon	06/28/90						X				
	MW547-4 (2.0-2.5)	2.0 to 2.5	Split spoon	06/28/90		X								
	MW547-4 (2.5-3.0)	2.5 to 3.0	Split spoon	06/28/90			X	X	X		X			X
	MW547-4 (5.0-5.5)	5.0 to 5.5	Split spoon	06/28/90		X								
	MW547-4 (5.5-6.0)	5.5 to 6.0	Split spoon	06/28/90			X	X	X		X			
	MW547-4 (8.0-8.5)	8.0 to 8.5	Split spoon	06/28/90		X								
	MW547-4 (8.5-9.0)	8.5 to 9.0	Split spoon	06/28/90			X	X	X		X			
	MW547-4 (10.5-11.0)	10.5 to 11.0	Split spoon	06/28/90		X								
	MW547-4 (11.0-11.5)	11.0 to 11.5	Split spoon	06/28/90			X	X	X		X			
	MW547-4 (14.0-14.5)	14.0 to 14.5	Split spoon	06/28/90		X					X			
	MW547-4 (14.5-15.0)	14.5 to 15.0	Split spoon	06/28/90			X	X	X		X			

TABLE 6-42
SUBSURFACE SOIL SAMPLING SUMMARY
SITE 22, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 3 of 7)

Sample Location	Sample Identification	Sample Depth (ft bgs)	Sampling Method	Date Sampled	Total Boring Depth (ft bgs)	Analyses Performed								
						VOC	SVOC	Pesticides	TMetals	General Chemicals	TRPH	TPHPRG	TPHEXT	pH
1990 Investigation by Canonie (Continued) [a]														
MW547-5	MW547-5 (0.5-1.0)	0.5 to 1.0	Split spoon	06/29/90	15.0		X	X	X		X			
	MW547-5 (1.0-1.5)	1.0 to 1.5	Split spoon	06/29/90						X				
	MW547-5 (2.0-2.5)	2.0 to 2.5	Split spoon	06/29/90		X	X							
	MW547-5 (2.5-3.0)	2.5 to 3.0	Split spoon	06/29/90				X	X		X			X
	MW547-5 (5.0-5.5)	5.0 to 5.5	Split spoon	06/29/90		X	X							
	MW547-5 (5.5-6.0)	5.5 to 6.0	Split spoon	06/29/90				X	X		X			
	MW547-5 (8.0-8.5)	8.0 to 8.5	Split spoon	06/29/90		X	X							
	MW547-5 (8.5-9.0)	8.5 to 9.0	Split spoon	06/29/90				X	X		X			
	MW547-5 (10.5-11.0)	10.5 to 11.0	Split spoon	06/29/90		X	X							
	MW547-5 (11.0-11.5)	11.0 to 11.5	Split spoon	06/29/90		X	X							
	MW547-5 (11.5-12.0)	11.5 to 12.0	Split spoon	06/29/90				X	X		X			
	MW547-5 (12.0-12.5)	12.0 to 12.5	Split spoon	06/29/90				X	X		X			
	MW547-5 (14.0-14.5)	14.0 to 14.5	Split spoon	06/29/90		X	X							
	MW547-5 (14.5-15.0)	14.5 to 15.0	Split spoon	06/29/90				X	X		X			
B547-6	B547-6 (2.0-2.5)	2.0 to 2.5	Split spoon	07/02/90	15.0		X	X	X					
	B547-6 (2.5-3.0)	2.5 to 3.0	Split spoon	07/02/90						X	X			X
	B547-6 (3.5-4.0)	3.5 to 4.0	Split spoon	07/02/90						X	X			X
	B547-6 (4.5-5.0)	4.5 to 5.0	Split spoon	07/02/90		X	X							
	B547-6 (5.0-5.5)	5.0 to 5.5	Split spoon	07/02/90				X	X		X			
	B547-6 (6.0-6.5)	6.0 to 6.5	Split spoon	07/02/90		X	X							
	B547-6 (6.5-7.0)	6.5 to 7.0	Split spoon	07/02/90				X	X		X			
	B547-6 (9.0-9.5)	9.0 to 9.5	Split spoon	07/02/90		X	X							
	B547-6 (9.5-10.0)	9.5 to 10.0	Split spoon	07/02/90				X	X		X			

TABLE 6-42
SUBSURFACE SOIL SAMPLING SUMMARY
SITE 22, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 4 of 7)

Sample Location	Sample Identification	Sample Depth (ft bgs)	Sampling Method	Date Sampled	Total Boring Depth (ft bgs)	Analyses Performed								
						VOC	SVOC	Pesticides	TMetals	General Chemicals	TRPH	TPHPRG	TPHEXT	pH
1990 Investigation by Canonie (Continued) [a]														
B547-6	B547-6 (11.0-11.5)	11.0 to 11.5	Split spoon	07/02/90	15.0	X	X							
	B547-6 (11.5-12.0)	11.5 to 12.0	Split spoon	07/02/90				X	X		X			
	B547-6 (14.0-14.5)	14.0 to 14.5	Split spoon	07/02/90		X	X							
	B547-6 (14.5-15.0)	14.5to 15.0	Split spoon	07/02/90				X	X		X			
B547-7	B547-7 (0.5-1.0)	0.5 to 1.0	Split spoon	06/28/90	15.0		X	X	X		X			
	B547-7 (1.0-1.5)	1.0 to 1.5	Split spoon	06/28/90						X				
	B547-7 (2.0-2.5)	2.0 to 2.5	Split spoon	06/28/90		X	X							
	B547-7 (2.5-3.0)	2.5 to 3.0	Split spoon	06/28/90				X	X		X			X
	B547-7 (5.0-5.5)	5.0 to 5.5	Split spoon	06/28/90		X	X							
	B547-7 (5.5-6.0)	5.5 to 6.0	Split spoon	06/28/90				X	X		X			
	B547-7 (8.0-8.5)	8.0 to 8.5	Split spoon	06/28/90		X	X							
	B547-7 (8.5-9.0)	8.5 to 9.0	Split spoon	06/28/90				X	X		X			
	B547-7 (9.0-9.5)	9.0 to 9.5	Split spoon	06/28/90				X	X		X			
	B547-7 (11.0-11.5)	11.0 to 11.5	Split spoon	06/28/90		X	X							
	B547-7 (11.5-12.0)	11.5 to 12.0	Split spoon	06/28/90				X	X		X			
	B547-7 (14.0-14.5)	14.0 to 14.5	Split spoon	06/28/90		X	X							
	B547-7 (14.5-15.0)	14.5 to 15.0	Split spoon	06/28/90				X	X		X			
B547-8	B547-8 (1.0-1.5)	1.0 to 1.5	Split spoon	07/03/90	15.0		X	X	X					
	B547-8 (2.0-2.5)	2.0 to 2.5	Split spoon	07/03/90						X	X			
	B547-8 (3.5-4.0)	3.5 to 4.0	Split spoon	07/03/90		X	X							
	B547-8 (4.0-4.5)	4.0 to 4.5	Split spoon	07/03/90				X	X		X			X
	B547-8 (5.0-5.5)	5.0 to 5.5	Split spoon	07/03/90		X	X							
	B547-8 (5.5-6.0)	5.5 to 6.0	Split spoon	07/03/90				X	X		X			
	B547-8 (8.0-8.5)	8.0 to 8.5	Split spoon	07/03/90		X	X							
	B547-8 (8.5-9.0)	8.5 to 9.0	Split spoon	07/03/90				X	X		X			

TABLE 6-42
SUBSURFACE SOIL SAMPLING SUMMARY
SITE 22, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 5 of 7)

Sample Location	Sample Identification	Sample Depth (ft bgs)	Sampling Method	Date Sampled	Total Boring Depth (ft bgs)	Analyses Performed								
						VOC	SVOC	Pesticides	TMetals	General Chemicals	TRPH	TPHPRG	TPHEXT	pH
1990 Investigation by Canonie (Continued) [a]														
B547-8	B547-8 (11.0-11.5)	11.0 to 11.5	Split spoon	07/03/90	15.0	X	X							
	B547-8 (11.5-12.0)	11.5 to 12.0	Split spoon	07/03/90				X	X		X			
	B547-8 (12.5-13.0)	12.5 to 13.0	Split spoon	07/03/90		X	X							
	B547-8 (13.0-13.5)	13.0 to 13.5	Split spoon	07/03/90				X	X		X			
B547-9	B547-9 (1.0-1.5)	1.0 to 1.5	Split spoon	07/02/90	15.0		X	X	X					
	B547-9 (2.5-3.0)	2.5 to 3.0	Split spoon	07/02/90						X	X			
	B547-9 (3.5-4.0)	3.5 to 4.0	Split spoon	07/02/90		X	X							
	B547-9 (4.0-4.5)	4.0 to 4.5	Split spoon	07/02/90				X	X		X			X
	B547-9 (5.0-5.5)	5.0 to 5.5	Split spoon	07/02/90		X	X							
	B547-9 (5.5-6.0)	5.5 to 6.0	Split spoon	07/02/90				X	X		X			
	B547-9 (8.0-8.5)	8.0 to 8.5	Split spoon	07/02/90		X	X							
	B547-9 (8.5-9.0)	8.5 to 9.0	Split spoon	07/02/90				X	X		X			
	B547-9 (11.0-11.5)	11.0 to 11.5	Split spoon	07/02/90			X							
	B547-9 (11.5-12.0)	11.5 to 12.0	Split spoon	07/02/90					X		X			
	B547-9 (14.0-14.5)	14.0 to 14.5	Split spoon	07/02/90		X	X							
	B547-9 (14.5-15.0)	14.5 to 15.0	Split spoon	07/02/90				X	X		X			
B547-10	B547-10 (0.5-1.0)	0.5 to 1.0	Split spoon	07/02/90	15.0		X	X	X					
	B547-10 (1.0-1.5)	1.0 to 1.5	Split spoon	07/02/90						X	X			
	B547-10 (2.0-2.5)	2.0 to 2.5	Split spoon	07/02/90		X	X							
	B547-10 (2.5-3.0)	2.5 to 3.0	Split spoon	07/02/90				X	X		X			X
	B547-10 (5.0-5.5)	5.0 to 5.5	Split spoon	07/02/90		X	X							
	B547-10 (5.5-6.0)	5.5 to 6.0	Split spoon	07/02/90				X	X		X			
	B547-10 (8.0-8.5)	8.0 to 8.5	Split spoon	07/02/90		X	X							
	B547-10 (8.5-9.0)	8.5 to 9.0	Split spoon	07/02/90				X	X		X			

TABLE 6-42
SUBSURFACE SOIL SAMPLING SUMMARY
SITE 22, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 6 of 7)

Sample Location	Sample Identification	Sample Depth (ft bgs)	Sampling Method	Date Sampled	Total Boring Depth (ft bgs)	Analyses Performed								
						VOC	SVOC	Pesticides	TMetals	General Chemicals	TRPH	TPHPRG	TPHEXT	pH
1990 Investigation by Canonie (Continued) [a]														
B547-10	B547-10 (11.0-11.5)	11.0 to 11.5	Split spoon	07/02/90	15.0	X	X							
	B547-10 (11.5-12.0)	11.5 to 12.0	Split spoon	07/02/90				X	X		X			
	B547-10 (14.0-14.5)	14.0 to 14.5	Split spoon	07/02/90		X	X							
	B547-10 (14.5-15.0)	14.5 to 15.0	Split spoon	07/02/90				X	X		X			
1994 Investigation by PRC and Montgomery Watson [b]														
B07C-11	280-S7C-001	0.5 to 1.5	Split spoon	08/17/94	6.0	X	X		X	X		X	X	
	280-S7C-002	2.5 to 3.5	Split spoon	08/17/94		X	X		X	X		X	X	
	280-S7C-003	5.0 to 6.0	Split spoon	08/17/94		X	X		X	X		X	X	
B07C-12	280-S7C-004	0.5 to 1.5	Split spoon	08/17/94	6.0	X	X		X	X		X	X	
	280-S7C-005	2.5 to 3.5	Split spoon	08/17/94		X	X		X	X		X	X	
	280-S7C-006	5.0 to6.0	Split spoon	08/17/94		X	X		X	X		X	X	
B07C-13	280-S7C-007	0.5 to 1.5	Split spoon	08/23/94	6.0	X	X		X	X		X	X	
	280-S7C-008	1.5 to 2.5	Split spoon	08/23/94		X	X		X	X		X	X	
	280-S7C-009	2.5 to 3.5	Split spoon	08/23/94		X	X		X	X		X	X	
	280-S7C-010	5.0 to 6.0	Split spoon	08/23/94		X	X		X	X		X	X	
B07C-14	280-S7C-011	0.5 to 1.5	Split spoon	08/17/94	6.0	X	X		X	X		X	X	
	280-S7C-012	2.5 to 3.5	Split spoon	08/17/94		X	X		X	X		X	X	
	280-S7C-013	5.0 to 6.0	Split spoon	08/17/94		X	X		X	X		X	X	
B07C-15	280-S7C-014	0.5 to 1.5	Split spoon	08/17/94	6.0	X	X		X	X		X	X	
	280-S7C-015	2.5 to 3.5	Split spoon	08/17/94		X	X		X	X		X	X	
	280-S7C-016	5.0 to 6.0	Split spoon	08/17/94		X	X		X	X		X	X	
M07C-06	280-S7C-017	0.5 to 1.5	Split spoon	08/17/94	14.0	X	X		X	X		X	X	
	280-S7C-018	2.5 to 3.5	Split spoon	08/17/94		X	X		X	X		X	X	
	280-S7C-019	5.0 to 6.0	Split spoon	08/17/94		X	X		X	X		X	X	

TABLE 6-42
SUBSURFACE SOIL SAMPLING SUMMARY
SITE 22, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 7 of 7)

Sample Location	Sample Identification	Sample Depth (ft bgs)	Sampling Method	Date Sampled	Total Boring Depth (ft bgs)	Analyses Performed								
						VOC	SVOC	Pesticides	TMetals	General Chemicals	TRPH	TPHPRG	TPHEXT	pH
1994 Investigation by PRC and Montgomery Watson (Continued) [b]														
M07C-07	280-S7C-021	0.5 to 1.5	Split spoon	08/18/94	13.5	X	X		X	X		X	X	
	280-S7C-022	3.0 to 4.0	Split spoon	08/18/94		X	X		X	X		X	X	
	280-S7C-023	5.0 to 6.0	Split spoon	08/18/94		X	X		X	X		X	X	
M07C-08	280-S7C-024	0.5 to 1.5	Split spoon	08/18/94	13.5	X	X		X	X		X	X	
	280-S7C-025	2.5 to 3.5	Split spoon	08/18/94		X	X		X	X		X	X	
	280-S7C-026	5.0 to 5.5	Split spoon	08/18/94		X	X		X	X		X	X	
	280-S7C-087	5.5 to 6.0	Split spoon	08/18/94		X	X		X	X		X	X	
M07C-09	280-S7C-095	0.5 to 1.5	Split spoon	08/17/94	14.0	X	X		X	X		X	X	
	280-S7C-096	2.5 to 3.5	Split spoon	08/17/94		X	X		X	X		X	X	
	280-S7C-097	5.0 to 6.0	Split spoon	08/17/94		X	X		X	X		X	X	

Notes:

(a) 1990 investigation general chemicals are anions, flashpoint, total Kjehdahl nitrogen, and total organic carbon.
(b) 1994 investigation general chemicals are % moisture and pH.

% Percent
SVOC Semivolatile organic compound
TMetals Total metals
TPHEXT Total petroleum hydrocarbons - extractable
TPHPRG Total petroleum hydrocarbons - purgeable
TRPH Total recoverable petroleum hydrocarbons
VOC Volatile organic compound

TABLE 6-43
GEOTECHNICAL SOIL SAMPLING SUMMARY
SITE 22, OU-2 SOUTHEAST AREA, ALAMEDA POINT

Sample Location	Sample Identification	Sample Depth (ft bgs)	Sampling Method	Date Collected	Analyses Performed					
					Moisture Content	Dry Density	Wet Density	Specific Gravity	Grain Size Distribution	Permeability
1990 Investigation by Canonie										
MW547-1	MW547-1 (3.5 - 4.0)	3.5	Split spoon	06/29/90					X	
MW547-2	MW547-2 (4.0 - 4.5)	4.0	Split spoon	06/29/90	X	X	X		X	
	MW547-2 (3.5 - 4.0)	3.5	Split spoon	06/29/90						
	MW547-2 (10.5 - 11.0)	10.5	Split spoon	06/29/90	X	X	X		X	X[a]
MW547-3	MW547-3 (0.5 - 1.0)	0.5	Split spoon	07/02/90	X	X	X		X	
	MW547-3 (1.0 - 1.5)	1.0	Split spoon	07/02/90						
MW547-4	MW547-4 (4.0 - 4.5)	4.0	Split spoon	06/28/90	X	X	X		X	
	MW547-4 (3.5 - 4.0)	3.5	Split spoon	06/28/90						
MW547-5	MW547-5 (6.0 - 6.5)	6.0	Split spoon	06/29/90	X	X	X		X	
B547-6	B547-6 (8.0 - 8.5)	8.0	Split spoon	07/02/90	X	X	X		X	
B547-7	B547-7 (4.0 - 4.5)	4.0	Split spoon	06/28/90	X	X	X		X	
	B547-7 (3.5 - 4.0)	3.5	Split spoon	06/28/90						
B547-8	B547-8 (2.5 - 3.0)	2.5	Split spoon	07/03/90					X	
B547-9	B547-9 (2.0 - 2.5)	2.0	Split spoon	07/02/90	X	X	X		X	X[a]
1994 Investigation by PRC and Montgomery Watson										
M07C-09	M07C-09 (3.5 - 5.0)	3.5 to 5.0	Split spoon	08/17/94	X	X		X	X	X[b]
	M07C-09 (10.5 - 12.0)	10.5 to 12.0	Split spoon	08/17/94	X	X		X	X	X[b]

Notes:

(a) Constant head permeability test performed during 1990 investigation.
(b) Falling head permeability test performed during 1994 investigation.

ft bgs Feet below ground surface

TABLE 6-44
MONITORING WELL CONSTRUCTION DETAILS
SITE 22, OU-2 SOUTHEAST AREA, ALAMEDA POINT

Well Identification	Screen Interval (ft below TOC)	Hydro-Stratigraphic Unit of Screen Interval	Top of Casing Elevation (ft MLLW)	Total Borehole Depth (ft bgs)	Total Well Depth (ft bgs)	Well Diameter (inches)	Blank Casing Interval (ft below TOC)	Filter Interval (ft below TOC)	Bentonite Seal Interval (ft below TOC)	Cement Grout Interval (ft below TOC)
MW547-1	5-15	FWBZU	13.09	15	15	2	0-5	4.5-15	3-4.5	0-3
MW547-2	5-15	FWBZU	12.32	15	15	2	0-5	4.5-15	3-4.5	0-3
MW547-3	5-15	FWBZU	14.01	15.5	15	2	0-5	4.5-15	3-4.5	0-3
MW547-4	5-15	FWBZU	12.98	15	15	2	0-5	4.5-15	3-4.5	0-3
MW547-5	5-15	FWBZU	13.12	15.5	15	2	0-5	4.5-15	3-4.5	0-3
M07C-06	4-14	FWBZU	13.01	14	14	2	0-4	2.5-14	1.5-2.5	0-1.5
M07C-07	3.5-13'5	FWBZU	12.39	13.5	13.5	2	0-3.5	2.0-13.5	1-2.0	0-1
M07C-08	3.5-13.5	FWBZU	12.7	13.5	13.5	2	0-3.5	2.0-13.5	1-2.0	0-1
M07C-09	4-14	FWBZU	12.42	14	14	2	0-4	2.5-14	1.5-2.5	0-1.5
D07C-01	49-59	FWBZL	13.07	60.5	59	3	0-49	46-60.5	42.6-46	0-42.6

Notes:

ft bgs	Feet below ground surface
ft	Feet
FWBZL	First water-bearing zone lower
FWBZU	First water-bearing zone upper
MLLW	Mean lower low water
TOC	Top of casing

TABLE 6-45
GROUNDWATER SAMPLING SUMMARY
SITE 22, OU-2 SOUTHEAST AREA, ALAMEDA POINT [a]
(Page 1 of 3)

Sample Location	Sample Identification	Sample Depth (ft bgs or ft below top of casing) [b]	Hydro-Stratigraphic Unit Where Sample Was Collected	Sampling Method	Date Sampled	Analyses Performed												
						VOC	SVOC	Metals	General Chemicals	DMetals	TPHPRG	TPHEXT	TRPH	EDB	Pest/ PCB	Conductivity	TOC	Sulfide
Hydropunch® Groundwater Samples																		
1994 (CTO 280) Investigation by PRC and Montgomery Watson [c]																		
DHP-S07C-01	280-S07C-066	22.5	FWBZU	HPS	07/28/94	X	X	X	X		X	X						
DHP-S07C-02	280-S07C-067	21.0	FWBZU	HPS	08/02/94	X	X	X	X		X	X					X	
(duplicate)	280-S07C-068			HPS	08/02/94	X	X	X	X		X	X					X	
DHP-S07C-03	280-S07C-069	26.0	FWBZU	HPS	07/29/94	X	X	X	X		X	X						X
DHP-S07C-04	280-S07C-070	16.0	FWBZU	HPS	08/01/94	X	X	X	X		X	X					X	
Monitoring Well Groundwater Samples																		
1990 Investigation by Canonie [d]																		
MW547-1	MW547-1	5.0 -15.0	FWBZU	Bailer	08/07/90	X	X		X	X			X		X			
MW547-2	MW547-2	5.0 -15.0	FWBZU	Bailer	08/08/90	X	X		X	X			X		X			
MW547-3	MW547-3	5.0 -15.0	FWBZU	Bailer	08/07/90	X	X		X	X			X		X			
	MW547-3			Bailer	08/20/90				X [e]									
MW547-4	MW547-4	5.0 - 15.0	FWBZU	Bailer	08/06/90	X	X		X [f]				X		X			
MW547-5	MW547-5	5.0 -15.0	FWBZU	Bailer	08/06/90	X	X		X	X			X		X			
(duplicate)	MW547-5A			Bailer	08/06/90				X [g]	X								
1994 (CTO 280) Investigation by PRC and Montgomery Watson [h]																		
MW547-1	280-S7C-028	5.0 -15.0	FWBZU	Bailer	11/08/94	X	X		X	X	X	X				X		
	280-S7C-029			Bailer	02/20/95	X			X	X	X	X		X				
	280-S7C-030			Bailer	06/20/95	X	X		X	X	X	X		X				
	280-S7C-031			Bailer	08/31/95	X			X	X	X	X		X				
MW547-2	280-S7C-032	5.0 -15.0	FWBZU	Bailer	11/08/94	X	X		X	X	X	X				X		
	280-S7C-033			Bailer	02/20/95	X			X	X	X	X		X				
	280-S7C-034			Bailer	06/20/95	X	X		X	X	X	X		X				
	280-S7C-035			Bailer	08/29/95	X			X	X	X	X		X				

TABLE 6-45
GROUNDWATER SAMPLING SUMMARY
SITE 22, OU-2 SOUTHEAST AREA, ALAMEDA POINT [a]
(Page 2 of 3)

Sample Location	Sample Identification	Sample Depth (ft bgs or ft below top of casing) [b]	Hydro-Stratigraphic Unit Where Sample Was Collected	Sampling Method	Date Sampled	Analyses Performed												
						VOC	SVOC	Metals	General Chemicals	DMetals	TPHPRG	TPHEXT	TRPH	EDB	Pest/ PCB	Conductivity	TOC	Sulfide
Monitoring Well Groundwater Samples (Continued)																		
1994 (CTO 280) Investigation by PRC and Montgomery Watson (Continued) [h]																		
MW547-3	280-S7C-036	5.0 -15.0	FWBZU	Bailer	11/07/94	X	X		X	X	X	X				X		
	280-S7C-037			Bailer	02/17/95	X			X	X	X	X		X				
	280-S7C-038			Bailer	06/21/95	X	X		X	X	X	X		X				
	280-S7C-039			Bailer	08/31/95	X			X	X	X	X		X				
MW547-4	280-S7C-040	5.0 -15.0	FWBZL	Bailer	11/07/94	X	X		X	X	X	X				X		
(duplicate)	280-S7C-041			Bailer	11/07/94	X	X		X	X	X	X						
	280-S7C-042			Bailer	02/17/94	X			X	X	X	X		X				
	280-S7C-043			Bailer	06/21/94	X	X		X	X	X	X		X				
	280-S7C-044			Bailer	08/29/94	X			X	X	X	X		X				
MW547-5	280-S7C-045	5.0 -15.0	FWBZL	Bailer	11/10/94	X	X		X	X	X	X				X		
	280-S7C-046			Bailer	02/20/95	X			X	X	X	X		X				
	280-S7C-047			Bailer	06/21/95	X	X		X	X	X	X		X				
	280-S7C-048			Bailer	08/29/95	X			X	X	X	X		X				
M07C-06	280-S7C-049	4.0 -14.0	FWBZU	Bailer	11/10/94	X	X		X	X	X	X				X		
	280-S7C-050			Bailer	02/17/95	X			X	X	X	X		X				
	280-S7C-051			Bailer	06/20/95	X	X		X	X	X	X		X				
(duplicate)	280-S7C-052			Bailer	06/20/95	X	X		X	X	X	X		X				
	280-S7C-053			Bailer	08/31/95	X			X	X	X	X		X				
M07C-07	280-S7C-054	3.5 -13.5	FWBZU	Bailer	11/08/94	X	X		X	X	X	X				X		
	280-S7C-055			Bailer	02/17/95	X			X	X	X	X		X				
	280-S7C-056			Bailer	06/20/95	X	X		X	X	X	X		X				
	280-S7C-057			Bailer	08/31/95	X			X	X	X	X		X				
M07C-08	280-S7C-058	3.5 -13.5	FWBZU	Bailer	11/07/94	X	X		X	X	X	X				X		
	280-S7C-059			Bailer	02/17/95	X			X	X	X	X		X				X
	280-S7C-060			Bailer	06/21/95	X	X		X	X	X	X		X				X
	280-S7C-061			Bailer	08/31/95	X			X	X	X	X		X				

TABLE 6-45
GROUNDWATER SAMPLING SUMMARY
SITE 22, OU-2 SOUTHEAST AREA, ALAMEDA POINT [a]
(Page 3 of 3)

Sample Location	Sample Identification	Sample Depth (ft bgs or ft below top of casing) [b]	Hydro-Stratigraphic Unit Where Sample Was Collected	Sampling Method	Date Sampled	Analyses Performed												
						VOC	SVOC	Metals	General Chemicals	DMetals	TPHPRG	TPHEXT	TRPH	EDB	Pest/ PCB	Conductivity	TOC	Sulfide
Monitoring Well Groundwater Samples (Continued) [h]																		
1994 (CTO 280) Investigation by PRC and Montgomery Watson (Continued) [h]																		
M07C-09	280-S7C-062	4.0 -14.0	FWBZU	Bailer	11/10/94	X	X		X	X	X	X				X		
	280-S7C-063			Bailer	02/20/95	X			X	X	X	X		X				
	280-S7C-064			Bailer	06/21/95	X	X		X	X	X	X		X				
	280-S7C-065			Bailer	08/30/95	X			X	X	X	X		X				
D07C-01	280-S7C-088	49.0 - 59.0	FWBZL	Bailer	12/16/94	X	X		X	X	X	X				X		
	280-S7C-089			Bailer	02/20/95	X			X	X		X		X				
	280-S7C-090			Bailer	06/22/95	X			X	X				X				
	280-S7C-091			Bailer	09/20/95	X			X	X				X				

Notes:

(a) This table summarizes groundwater sampling activities at Site 22 only for CTO 121 and CTO 280. Information for CTO 108 is summarized in the "Data Summary Report for Quarterly Groundwater Monitoring November 1997 - August 1998," dated December 7, 1998, and prepared by Tetra Tech EM Inc., and Uribe & Associates.

(b) Sample depth for groundwater samples from monitoring wells measured in feet below top of casing (refer to Table 6-44 for monitoring well construction details).
Sample depth for Hydropunch groundwater samples measured in feet below ground surface.

(c) General chemical analysis parameters for the 1994 investigation Hydropunch groundwater samples are acidity, alkalinity, anions, specific conductivity, pH, hardness, and COD.

(d) General chemical analysis parameters for the 1990 investigation monitoring well groundwater samples are hardness, COD, pH, specific conductivity, and TOC.

(e) The groundwater sample collected at MW547-3 on 08/20/90 was only analyzed for COD.

(f) The groundwater sample collected at MW547-4 was only analyzed for TOC.

(g) The duplicate groundwater sample collected at MW547-5 was only analyzed for specific conductivity, hardness, and pH.

(h) General chemical analysis parameters for the 1994 investigation monitoring well groundwater samples are alkalinity, acidity, anions, COD, hardness, pH, total dissolved solids, and TOC.

COD	Chemical oxygen demand	SVOC	Semivolatile organic compound	HPS	HydroPunch Sampler
DMetals	Dissolved metals	TOC	Total organic carbon		
Ft bgs	Feet below ground surface	TPHEXT	Total petroleum hydrocarbons - extractable		
FWBZL	First water-bearing zone lower	TPHPRG	Total petroleum hydrocarbons - purgeable		
FWBZU	First water-bearing zone upper	TRPH	Total recoverable petroleum hydrocarbons		
Pest/PCB	Pesticides/polychlorinated biphenyls	VOC	Volatile organic compound		

TABLE 6-46
GEOTECHNICAL SAMPLE LABORATORY TEST RESULTS
SITE 22, SOUTHEASTERN OU, ALAMEDA POINT
(Page 1 of 2)

Sample Number	Sample Depth (ft bgs)	Soil Classification [(a) (b)]		Stratigraphic Unit	Geotechnical Test Results [(a)]					
									Permeability	
		Laboratory	Field		Moisture Content (%)	Dry Density (pcf)	Specific Gravity	CEC (meq/100g)	Effective Stresses (psi)	Hydraulic Conductivity (cm/s)
1990 Investigation by Canonie (Phases 1 and 2A)										
MW547-1	3.5	SM	SP/SM	Fill	NA	NA	NA	NA	NA	NA
MW547-2	4	SP/SM	SM	Fill	19.4	109.9	NA	NA	NA	NA
MW547-2	10.5	SM	SC	H/P-A/E	20.1	109.5	NA	NA	NA	3.00E-07
MW547-3	0.5	SP/SM	SP	Fill	3.3	109.9	NA	NA	NA	NA
MW547-4	4	SM	SM	Fill	21.8	102.1	NA	NA	NA	NA
MW547-5	6	SM	SM	Fill	15.2	110.1	NA	NA	NA	NA
B547-6	8	SM	SC	H/P-A/E	21.6	104.4	NA	NA	NA	NA
B547-7	4	SP/SM	SP	Fill	7.8	94.2	NA	NA	NA	NA
B547-8	2.5	SP/SM	SP	Fill	NA	NA	NA	NA	NA	NA
B547-9	2	SM	SM	Fill	12.9	100.6	NA	NA	NA	1.00E-03
1994-1995 Investigation by PRC and Montgomery Watson (follow-on)										
M07C-09	3.5-5	SM	SP	Fill	15.2	118.2	2.66	NA	6.8	2.00E-06
M07C-09	10.5-12	SM	SP	Fill	18	117.3	2.63	NA	13	3.00E-07

Notes:

(a) Samples were classified or analyzxed using the following methods:

Soil classification, Unified Soil Classification system ASTM D2488
Moisture content ASTM D2216
Dry Density ASTM D2937
Specific Gravity ASTM D854

Effective Stresses EPA 9100
Hydraulic conductivity EPA 9100

TABLE 6-46
GEOTECHNICAL SAMPLE LABORATORY TEST RESULTS
SITE 22, SOUTHEASTERN OU, ALAMEDA POINT
(Page 2 of 2)

Notes (Continued):

(b) Soil classification legend is as follows:

GW	Well graded gravels, gravel-sand mixtures, little or no fines
SP	Poorly-graded sands, gravely sands, little or no fines
SM	Silty sands, sand-silt mixtures
SC	Clayey sands, sand-clay mixtures
CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays

% w/w	Percent weight per weight
NA	Not analyzed
pcf	Pounds per cubic foot
psi	Pounds per square inch
cm/s	centimeters per second
ft bgs	Feet below ground surface
H/P - A/E	Holocene/Pleistocene Aluvial/Eolian Deposit (Merritt Sand)
PRC	PRC Environmental Management, Inc.
HBM	Holocene Bay Mud (Bay Sediments Unit)

TABLE 6-47
SOIL ANALYTICAL DATA SUMMARY (0 FEET TO <2 FEET BGS)
SITE 22, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 1 of 2)

Chemical	Total Sample	Samples With Detections	Frequency of Detections (%)	Reporting Limits (mg/kg)		Data Summary Statistics (mg/kg)		Concentrations (mg/kg)	
				Minimum	Maximum	Mean	Standard Deviation	Minimum	Maximum
Volatile Organic Compounds									
Ethylbenzene	5	2	40.0	0.01	0.02	0.04	0.05	0.08	0.12
Xylene (total)	5	1	20.0	0.01	0.03	0.18	0.37	0.84	0.84
Semivolatile Organic Compounds									
2-Methylnaphthalene	14	4	28.6	0.33	3.60	0.52	0.60	0.02	0.27
Acenaphthene	14	1	7.1	0.33	3.60	0.53	0.59	0.02	0.02
Acenaphthylene	14	1	7.1	0.33	3.60	0.53	0.58	0.04	0.04
Anthracene	14	1	7.1	0.33	3.60	0.54	0.58	0.08	0.08
Benzo(a)anthracene	14	2	14.3	0.33	3.60	0.55	0.58	0.02	0.35
Benzo(a)pyrene	14	2	14.3	0.33	3.60	0.55	0.58	0.03	0.40
Benzo(b)fluoranthene	14	4	28.6	0.33	3.60	0.54	0.60	0.02	0.52
Benzo(g,h,i)perylene	14	3	21.4	0.33	3.60	0.54	0.59	0.02	0.39
Carbazole	8	1	12.5	0.34	3.60	0.65	0.75	0.02	0.02
Chrysene	14	3	21.4	0.33	3.60	0.45	0.45	0.02	0.51
Fluoranthene	14	4	28.6	0.33	3.60	0.57	0.60	0.03	0.97
Fluorene	14	1	7.1	0.33	3.60	0.53	0.59	0.04	0.04
Indeno(1,2,3-c,d)pyrene	14	3	21.4	0.33	3.60	0.54	0.59	0.02	0.42
Naphthalene	14	3	21.4	0.33	3.60	0.57	0.59	0.04	0.78
Phenanthrene	14	2	14.3	0.33	3.60	0.56	0.58	0.02	0.59
Pyrene	14	4	28.6	0.33	3.60	0.57	0.60	0.04	0.96
Total Petroleum Hydrocarbons									
Gasoline range organics	8	4	50.0	0.52	0.55	5.12	9.35	0.60	26.00
Motor oil range organics	8	7	87.5	21.00	420.00	625.69	1078.20	38.00	3000.00
TRPH	4	3	75.0	1.70	1.80	11.54	16.28	4.70	35.80
Pesticides									
4,4'-DDD	6	2	33.3	0.00	0.08	0.01	0.00	0.00	0.01
4,4'-DDE	6	3	50.0	0.00	0.08	0.01	0.01	0.01	0.02
4,4'-DDT	6	1	16.7	0.00	0.08	0.01	0.02	0.05	0.05
alpha-Chlordane	3	1	33.3	0.08	0.42	0.04	0.01	0.03	0.03
gamma-Chlordane	3	1	33.3	0.08	0.42	0.04	0.01	0.02	0.02

TABLE 6-47
SOIL ANALYTICAL DATA SUMMARY (0 FEET TO <2 FEET BGS)
SITE 22, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 2 of 2)

Chemical	Total Sample	Samples With Detections	Frequency of Detections (%)	Reporting Limits (mg/kg)		Data Summary Statistics (mg/kg)		Concentrations (mg/kg)	
				Minimum	Maximum	Mean	Standard Deviation	Minimum	Maximum
Inorganic Compounds									
Aluminum	14	14	100.0	1.60	22.00	6879.29	2669.29	3700.00	14200.00
Arsenic	14	7	50.0	0.52	11.00	3.38	2.38	1.40	8.80
Barium	14	14	100.0	0.20	22.00	98.69	84.48	42.70	376.00
Beryllium	14	10	71.4	0.20	1.10	0.80	0.54	0.20	1.90
Cadmium	14	8	57.1	0.08	1.10	0.63	1.09	0.12	4.30
Calcium	14	14	100.0	4.00	560.00	4195.71	2366.53	2500.00	11700.00
Chromium	14	14	100.0	0.08	5.60	32.94	9.62	19.90	50.80
Cobalt	14	10	71.4	0.80	6.80	5.71	2.50	4.30	10.80
Copper	14	14	100.0	0.60	5.60	19.83	9.25	7.40	39.00
Iron	14	14	100.0	1.30	11.00	11240.71	3604.74	7100.00	19300.00
Lead	14	13	92.9	0.24	5.60	728.66	2636.89	2.70	9890.00
Magnesium	14	14	100.0	4.90	560.00	2997.86	1444.66	1800.00	6190.00
Manganese	14	14	100.0	0.20	5.60	216.67	110.99	93.40	493.00
Nickel	14	14	100.0	1.20	5.60	27.96	5.22	21.50	39.40
Potassium	14	13	92.9	72.00	560.00	998.07	488.75	577.00	2130.00
Selenium	14	3	21.4	0.54	11.00	1.90	2.08	0.64	0.74
Silver	14	1	7.1	0.18	5.60	0.86	1.05	1.20	1.20
Sodium	14	11	78.6	5.00	560.00	229.94	173.25	74.60	739.00
Titanium	6	6	100.0	0.20	5.60	380.17	64.45	300.00	473.00
Vanadium	14	14	100.0	0.60	5.60	25.01	8.19	16.00	49.90
Zinc	14	14	100.0	0.60	5.60	60.89	35.85	20.60	151.00

Notes:

%	Percent
<	Less than
bgs	Below ground surface
4,4'-DDD	4,4'-Dichlorodiphenyldichloroethane
4,4'-DDE	4,4'-Dichlorodiphenyldichloroethylene
4,4'-DDT	4,4'-Dichlorodiphenyltrichloroethane
mg/kg	Milligram per kilogram

TABLE 6-48
SOIL ANALYTICAL DATA SUMMARY (2 FEET TO 10 FEET BGS)
SITE 22, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 1 of 3)

Chemcial	Total Sample	Samples With Detections	Frequency of Detections (%)	Reporting Limits (mg/kg)		Data Summary Statistics (mg/kg)		Detected Concentrations (mg/kg)	
				Minimum	Maximum	Mean	Standard Deviation	Minimum	Maximum
Total Petroleum Hydrocarbons									
Gasoline range organics	17	6	35.3	0.51	3100.00	5223.97	16303.01	1.20	66900.00
JP5 range organics	17	3	17.6	10.00	120.00	324.00	1107.60	220.00	4590.00
Motor oil range organic	17	7	41.2	20.00	294.00	155.12	298.19	36.00	990.00
TRPH	22	11	50.0	1.70	194.00	545.62	2292.91	3.80	10800.00
Volatile Organic Compounds									
4-Methyl-2-pentanone	30	1	3.3	0.01	140.00	4.91	17.98	72.00	72.00
Acetone	30	2	6.7	0.01	170.00	3.39	15.51	0.15	0.69
Benzene	30	6	20.0	0.01	140.00	2.71	12.75	0.01	3.30
Ethylbenzene	30	11	36.7	0.01	140.00	21.83	104.07	0.003	570.00
Toluene	33	20	60.6	0.01	140.00	28.84	146.00	0.002	840.00
Trichloroethene	30	1	3.3	0.01	140.00	2.63	12.76	0.002	0.002
Xylene (total)	30	12	40.0	0.01	140.00	94.15	474.21	0.02	2600.00
Semivolatile Organic Compounds									
1,2,4-Trichlorobenzene	35	1	2.9	0.34	24.00	0.29	0.34	2.00	2.00
2-Chlorophenol	35	1	2.9	0.34	24.00	0.32	0.51	3.10	3.10
2-Methylnaphthalene	35	14	40.0	0.34	24.00	4.75	18.67	0.02	110.00
4-Chloro-3-methylphenol	35	1	2.9	0.34	24.00	0.40	0.94	5.70	5.70
Acenaphthene	35	6	17.1	0.34	24.00	0.29	0.53	0.03	3.20
Anthracene	35	4	11.4	0.34	24.00	0.54	2.00	0.04	0.10
Benzo(a)anthracene	35	6	17.1	0.34	24.00	0.54	2.00	0.05	0.13
Benzo(a)pyrene	35	5	14.3	0.34	24.00	0.55	2.00	0.03	0.18
Benzo(b)fluoranthene	35	6	17.1	0.34	24.00	0.52	2.00	0.07	0.16
Benzo(g,h,i)perylene	35	3	8.6	0.34	24.00	0.55	2.00	0.07	0.16
Benzo(k)fluoranthene	35	4	11.4	0.34	24.00	0.55	2.00	0.03	0.12
Carbazole	17	1	5.9	0.34	24.00	0.92	2.86	0.02	0.02

TABLE 6-48
SOIL ANALYTICAL DATA SUMMARY (2 FEET TO 10 FEET BGS)
SITE 22, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 2 of 3)

Chemcial	Total Sample	Samples With Detections	Frequency of Detections (%)	Reporting Limits (mg/kg)		Data Summary Statistics (mg/kg)		Detected Concentrations (mg/kg)	
				Minimum	Maximum	Mean	Standard Deviation	Minimum	Maximum
Semivolatile Organic Compounds (Continued)									
Chrysene	35	6	17.1	0.34	24.00	0.54	2.00	0.06	0.22
Fluoranthene	35	10	28.6	0.34	24.00	0.23	0.21	0.07	1.40
Fluorene	35	4	11.4	0.34	24.00	0.54	2.00	0.04	0.13
Indeno(1,2,3-c,d)pyrene	35	3	8.6	0.34	24.00	0.55	2.00	0.06	0.14
Naphthalene	35	14	40.0	0.34	24.00	4.61	18.71	0.02	110.00
Pentachlorophenol	35	1	2.9	0.82	59.00	1.05	1.45	9.00	9.00
Phenanthrene	35	10	28.6	0.34	24.00	0.26	0.43	0.03	2.70
Phenol	35	2	5.7	0.34	24.00	0.57	1.99	0.10	0.30
Pyrene	35	11	31.4	0.34	24.00	0.33	0.80	0.02	4.90
Pesticides									
4,4'-DDT	19	1	5.3	0.00	0.20	0.01	0.02	0.003	0.003
alpha-Chlordane	10	1	10.0	0.09	0.99	0.10	0.15	0.001	0.001
gamma-Chlordane	10	1	10.0	0.09	0.99	0.10	0.15	0.001	0.001
Methoxychlor	19	1	5.3	0.01	0.99	0.06	0.12	0.02	0.02
Inorganic Compounds									
Aluminum	36	36	100.0	1.70	34.00	7228.61	3721.15	3120.00	15100.00
Arsenic	36	17	47.2	0.52	17.00	5.33	7.42	1.40	34.30
Barium	36	36	100.0	0.20	34.00	70.80	43.42	24.00	200.00
Beryllium	36	21	58.3	0.20	1.70	0.64	0.36	0.30	1.70
Cadmium	36	17	47.2	0.08	1.70	0.33	0.24	0.10	0.60
Calcium	36	36	100.0	4.00	840.00	2812.89	1567.45	574.00	8680.00
Chromium	36	36	100.0	0.08	8.40	34.90	12.06	20.70	67.50
Cobalt	36	23	63.9	0.80	14.90	5.61	3.09	3.60	17.00
Copper	36	36	100.0	0.60	8.40	12.69	9.66	5.60	51.20
Iron	36	36	100.0	0.70	17.00	11690.83	5676.71	5830.00	29600.00

TABLE 6-48
SOIL ANALYTICAL DATA SUMMARY (2 FEET TO 10 FEET BGS)
SITE 22, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 3 of 3)

Chemcial	Total Sample	Samples With Detections	Frequency of Detections (%)	Reporting Limits (mg/kg)		Data Summary Statistics (mg/kg)		Detected Concentrations (mg/kg)	
				Minimum	Maximum	Mean	Standard Deviation	Minimum	Maximum
Inorganic Compounds (Continued)									
Lead	36	23	63.9	0.24	8.40	10.48	17.98	2.10	89.90
Magnesium	36	36	100.0	5.00	840.00	2640.56	1281.83	1570.00	7100.00
Manganese	36	36	100.0	0.20	8.40	184.99	134.93	72.40	734.00
Mercury	17	3	17.6	0.15	0.22	0.13	0.11	0.23	0.46
Nickel	36	33	91.7	1.20	18.70	29.68	16.43	15.10	89.00
Potassium	36	35	97.2	72.00	840.00	966.19	531.61	521.00	3220.00
Selenium	36	4	11.1	0.54	17.00	2.45	2.44	0.66	1.00
Silver	36	1	2.8	0.18	8.40	0.98	1.27	0.70	0.70
Sodium	36	29	80.6	5.00	840.00	280.73	272.46	85.80	1400.00
Titanium	19	19	100.0	0.20	8.40	420.47	149.95	183.00	660.00
Vanadium	36	36	100.0	0.60	8.40	25.58	9.31	13.90	57.00
Zinc	36	36	100.0	0.60	8.40	31.98	24.59	15.80	126.00

Notes:

%	Percent
bgs	Below ground surface
4,4'-DDT	4,4'-Dichlorodiphenyltrichloroethane
mg/kg	Milligram per kilogram
TRPH	Total recoverable petroleum hydrocarbons

TABLE 6-49
SOIL ANALYTICAL DATA SUMMARY (> 10 FEET BGS)
SITE 22, OU-2 SOUTHEAST AREA, ALAMEDA POINT

Chemical	Total Sample	Samples With Detections	Frequency Of Detections (%)	Reporting Limits (mg/kg)		Data Summary Statistics (mg/kg)		Detected Concentrations (mg/kg)	
				Minimum	Maximum	Mean	Standard Deviation	Minimum	Maximum
Volaile Organic Compounds									
1,2-Dichloroethane	10	2	20.0	0.01	0.03	0.01	0.005	0.01	0.01
Benzene	9	1	11.1	0.01	0.01	0.01	0.03	0.10	0.10
Ethylbenzene	9	1	11.1	0.01	0.01	0.01	0.01	0.03	0.03
Toluene	10	9	90.0	0.01	0.03	0.05	0.12	0.003	0.39
Trichloroethene	9	2	22.2	0.01	0.01	0.004	0.003	0.002	0.01
Xylene (total)	9	2	22.2	0.01	0.01	0.003	0.001	0.002	0.01
Semivolatile Organic Compounds									
di-n-Butylphthalate	14	1	7.1	0.39	3.00	0.78	1.63	6.30	6.30
Inorganic Compounds									
Aluminum	12	12	100.0	1.90	24.00	10368.33	2337.71	8200.00	15000.00
Arsenic	12	8	66.7	2.80	12.00	6.09	5.07	3.00	17.00
Barium	12	12	100.0	0.20	24.00	72.95	11.30	60.00	91.00
Beryllium	12	7	58.3	0.20	1.20	0.45	0.14	0.30	0.40
Cadmium	12	7	58.3	0.20	1.20	0.47	0.13	0.30	0.50
Calcium	12	12	100.0	12.00	610.00	1962.11	649.99	15.30	2480.00
Chromium	12	12	100.0	0.70	6.10	42.79	7.26	36.00	58.50
Cobalt	12	9	75.0	0.90	6.10	6.00	1.91	5.70	8.20
Copper	12	12	100.0	0.70	6.10	13.46	4.31	8.80	24.10
Iron	12	12	100.0	4.70	12.00	14355.00	2491.50	8660.00	18800.00
Lead	12	3	25.0	5.80	60.00	6.31	7.71	6.70	8.30
Magnesium	12	12	100.0	5.70	610.00	3359.17	534.85	2600.00	4420.00
Manganese	12	12	100.0	0.20	6.10	159.75	37.02	100.00	240.00
Nickel	12	12	100.0	1.40	6.10	50.13	7.91	40.00	64.90
Potassium	12	11	91.7	83.00	610.00	902.50	273.39	693.00	1400.00
Sodium	12	10	83.3	12.00	610.00	698.33	314.40	270.00	1110.00
Titanium	12	12	100.0	0.20	6.10	465.67	99.58	320.00	628.00
Vanadium	12	12	100.0	0.70	6.10	26.38	4.09	17.00	32.30
Zinc	12	12	100.0	0.70	6.10	352.40	1110.92	25.00	3880.00

Notes:

% Percent

> Greater than

mg/kg - Milligram per kilogram

TA[illegible] 6-50
ECOLOGICAL COPCs IN SOIL (0-6 FEET BGS)
SITE 22, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 1 of 2)

Chemical	Frequency of Detection	Sample Quantitation Limit	Minimum Concentration	Maximum Concentration	95 UCL Concentration	COPC Screening Evaluation [a]	
						Rejected	Retained
Inorganic Compounds (mg/kg)							
Aluminum	41/41	NA	3,120.00	15,000.00	7,533.22		X
Arsenic	19/41	0.84-13	1.40	34.30	6.18	CSB	
Barium	41/41	NA	24.00	376.00	92.81	PRG	
Beryllium	26/41	0.2-1.7	0.20	1.90		PRG	
Cadmium	20/41	0.08-1.7	0.12	4.30	0.67	CSB	
Calcium	41/41	NA	574.00	11,700.00		CSB	
Chromium	41/41	NA	19.90	67.00	35.70	CSB	
Cobalt	27/41	5.2-14.9	3.60	17.00		CSB	
Copper	41/41	NA	5.60	51.20		CSB	
Iron	41/41	NA	5,830.00	29,600.00		CSB	
Lead	32/41	2.5-6.3	2.10	9,890.00	74.72		X
Magnesium	41/41	NA	1,600.00	7,100.00		CSB	
Manganese	41/41	NA	72.40	493.00	220.03		X
Mercury	2/23	0.15-0.22	0.23	0.34	0.12		X
Nickel	39/41	18.7	15.10	89.00	30.30	CSB	
Potassium	39/41	530-540	521.00	3,220.00		CSB	
Selenium	7/41	0.54-17	0.64	0.74	3.66		X
Silver	1/41	0.18-8.4	1.20	1.20		CSB	
Sodium	33/41	530-630	74.60	1,400.00		CSB	
Titanium	18/18	NA	258.00	660.00	474.88	CSB	
Vanadium	41/41	NA	13.90	57.00	26.81	CSB	
Zinc	41/41	NA	15.80	151.00	52.08		X
Pesticides and PCBs (ug/kg)							
4,4'-DDD	2/18	2.1-200	2.40	9.00	36.49		X
4,4'-DDE	3/18	2.1-200	6.10	23.00	46.59		X
4,4'-DDT	2/18	2.1-200	2.70	53.00	48.39		X
alpha-Chlordane	2/9	82-990	0.90	27.00	1,903.24		X
gamma-Chlordane	2/9	82-990	1.40	22.00	2,398.01		X
Methoxychlor	1/18	5.3-990	20.00	20.00	562.01		X
Semivolatile Organic Compounds (ug/kg)							
1,2,4-Trichlorobenzene	1/41	330-3,600	2,000.00	2,000.00		FOD	
2-Chlorophenol	1/41	330-3,600	3,100.00	3,100.00		FOD	
2-Methylnaphthalene	16/41	330-3,600	20.00	110,000.00	5,630.57[b]		X
2-Methyl-2-pentanone	1/27	5.9-140,000	72,000.00	72,000.00		FOD	
4-Chloro-3-methyphenol	1/41	330-3,600	5,700.00	5,700.00		FOD	
Acenaphthene	6/41	330-3,600	18.00	3,200.00	530.95		X
Acenaphthylene	1/41	330-24,000	44.00	44.00		FOD	

TABLE 6-50
ECOLOGICAL COPCs IN SOIL (0-6 FEET BGS)
SITE 22, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 2 of 2)

Chemical	Frequency of Detection	Sample Quantitation Limit	Minimum Concentration	Maximum Concentration	95 UCL Concentration	COPC Screening Evaluation [a]	
						Rejected	Retained
Acetone	1/27	10-170,000	150.00	150.00		FOD	
Anthracene	4/41	330-24,000	41.00	96.00	301.68[b]		
Benzene	1/27	5-140,000	87.00	87.00		FOD	
Benzo(a)anthracene	8/41	330-24,000	24.00	350.00	313.99[b]		X
Benzo(a)pyrene	7/41	330-24,000	26.00	400.00	341.76[b]		X
Benzo(b)fluoranthene	10/41	330-24,000	19.00	520.00	322.97[b]		X
Benzo(k)fluoranthene	3/41	330-24,000	47.00	120.00	302.9[b]		X
Benzo(g,h,i)perylene	6/41	330-24,000	24.00	390.00	337.73[b]		X
Carbazole	1/23	330-24,000	18.00	18.00		FOD	
Chrysene	9/41	330-24,000	24.00	510.00	323.93[b]		X
Fluoranthene	13/41	330-3,600	29.00	1,400.00	469.34		X
Fluorene	4/41	330-24,000	35.00	130.00	306.59[b]		X
Indeno(1,2,3-c, d)pyrene	6/41	330-24,000	19.00	420.00	348.51[b]		X
Naphthalene	15/41	330-3,600	22.00	110,000.00	5,151.74		X
Pentachlorophenol	1/41	820-8,800	9,000.00	9,000.00		FOD	
Phenanthrene	11/41	330-3,600	20.00	2,700.00	517.74		X
Phenol	1/41	330-24,000	300.00	300.00		FOD	
Volatile Organic Compounds (ug/kg)							
Ethylbenzene	8/27	5-6,600	42.00	570,000.00	119,330.66		X
Xylene	8/27	5.0-52.0	240.00	2,600,000.00	2,542,492.81		X

Notes:

(a) COPC screening criteria are as follows:

CSB Rejected as COPC because concentrations were within statistical background or chemical is an essential nutrient

FOD Rejected as COPC because chemical was infrequently detected.

PRG Rejected as COPC because chemical maximum concentration or 95 VCL concentration was below the ecological PRG.

(b) High non-detection values were removed from data set for calculating 95 UCL per EPA guidance

4,4-DDD 4,4-Dichlorodiphenyldichlorethane

4,4-DDT 4,4-Dichlorodiphenyltrichlorethane

µg/kg Microgram per kilogram

mg/kg Milligram per kilogram

95 UCL 95 percent upper confidence limit on the arithmetic mean concentration

NA Not applicable, frequency of detection is 100 percent

TABLE 6-51
SUMMARY OF SOIL HAZARD QUOTIENTS
CALIFORNIA GROUND SQUIRREL
SITE 22, OU-2 SOUTHEAST AREA, ALAMEDA POINT

Ecological COPCs	Hazard Quotient 1	Hazard Quotient 2	Hazard Quotient 3	Hazard Quotient 4	Hazard Quotient 5
Aluminum	2.09E+00	4.85E+02	4.85E+01	3.36E+02	3.36E+01
Lead	1.88E-03	3.81E+03	4.34E-02	2.64E+03	3.00E-02
Manganese	7.44E-03	1.92E+00	1.72E-01	1.33E+00	1.19E-01
Mercury	1.05E-03	2.43E-01	2.43E-02	1.68E-01	1.68E-02
Selenium	3.45E-03	1.93E+00	7.98E-02	1.34E+00	5.53E-02
Zinc	4.37E-04	7.01E-01	1.01E-02	4.85E-01	7.00E-03
4,4'-DDD	2.87E-06	1.33E-03	6.64E-05	9.20E-04	4.60E-05
4,4'-DDE	7.33E-06	3.39E-03	1.70E-04	2.35E-03	1.18E-04
4,4'-DDT	1.54E-05	7.14E-03	3.57E-04	4.94E-03	2.47E-04
Alpha-chlordane	2.71E-05	1.25E-03	6.26E-04	8.67E-04	4.34E-04
Gamma-chlordane	2.20E-05	1.02E-03	5.10E-04	7.07E-04	3.53E-04
Methoxychlor	NRV	NRV	NRV	NRV	NRV
Ethylbenzene	NRV	NRV	NRV	NRV	NRV
Xylene	5.25E+00	1.50E+02	1.21E+02	1.04E+02	8.41E+01
2-Methylnaphthalene	NRV	NRV	NRV	NRV	NRV
Acenaphthene	8.65E-05	5.01E-02	2.00E-03	3.47E-02	1.39E-03
Benzo(a)anthracene	5.12E-05	2.96E-02	1.18E-03	2.05E-02	8.20E-04
Benzo(a)pyrene	5.57E-05	3.23E-02	1.29E-03	2.23E-02	8.93E-04
Benzo(b)fluoranthene	5.26E-05	3.05E-02	1.22E-03	2.11E-02	8.44E-04
Benzo(k)fluoranthene	1.96E-05	1.13E-02	4.53E-04	7.84E-03	3.13E-04
Benzo(g,h,i)perylene	5.50E-05	3.19E-02	1.27E-03	2.21E-02	8.82E-04
Chrysene	5.28E-05	3.06E-02	1.22E-03	2.12E-02	8.46E-04
Fluoranthene	7.65E-05	4.43E-02	1.77E-03	3.07E-02	1.23E-03
Fluorene	2.12E-05	1.23E-02	4.90E-04	8.50E-03	3.40E-04
Indeno(1,2,3-cd)pyrene	5.68E-05	3.29E-02	1.31E-03	2.28E-02	9.10E-04
Naphthalene	1.06E-04	7.34E-03	2.46E-03	5.09E-03	1.70E-03
Phenanthrene	8.44E-05	4.89E-02	1.95E-03	3.38E-02	1.35E-03
Pyrene	9.43E-05	5.46E-02	2.18E-03	3.78E-02	1.51E-03

Notes:

COPC - Chemical of potential concern

NRV - No reference value available

DDD - Dichlorodiphenyldichloroethane

DDE - Dcholorodiphenyldichloroethylene

DDT - Dichlorodiphenyltrichloroethane

TABLE 6-52
SUMMARY OF SOIL HAZARD QUOTIENTS
RED-TAILED HAWK
SITE 22, OU-2 SOUTHEAST AREA, ALAMEDA POINT

Ecological COPCs	Hazard Quotient 1	Hazard Quotient 2	Hazard Quotient 3	Hazard Quotient 4	Hazard Quotient 5
Aluminum	1.43E-06	6.17E-01	6.76E-02	7.73E-04	8.78E-05
Lead	1.62E-06	4.79E+01	7.67E-02	6.01E-02	9.96E-05
Manganese	5.39E-08	2.55E-02	2.55E-03	3.19E-05	3.31E-06
Mercury	1.27E-07	2.76E-02	5.99E-03	3.46E-05	7.77E-06
Selenium	1.51E-07	2.89E-02	7.14E-03	3.62E-05	9.28E-06
Zinc	5.76E-08	2.72E-02	2.72E-03	3.41E-05	3.53E-06
4,4'-DDD	9.04E-08	2.51E+00	1.50E-02	3.01E-03	1.84E-05
4,4'-DDE	2.31E-07	6.40E+00	3.84E-02	7.70E-03	4.71E-05
4,4'-DDT	4.86E-07	1.35E+01	8.08E-02	1.62E-02	9.92E-05
Alpha-chlordane	3.80E-08	3.16E-02	6.32E-03	3.80E-05	7.76E-06
Gamma-chlordane	3.10E-08	2.58E-02	5.15E-03	3.10E-05	6.32E-06
Methoxychlor	NRV	NRV	NRV	NRV	NRV
Ethylbenzene	NRV	NRV	NRV	NRV	NRV
Xylene	NRV	NRV	NRV	NRV	NRV
2-Methylnaphthalene	NRV	NRV	NRV	NRV	NRV
Acenaphthene	NRV	NRV	NRV	NRV	NRV
Benzo(a)anthracene	NRV	NRV	NRV	NRV	NRV
Benzo(a)pyrene	NRV	NRV	NRV	NRV	NRV
Benzo(b)fluoranthene	NRV	NRV	NRV	NRV	NRV
Benzo(k)fluoranthene	NRV	NRV	NRV	NRV	NRV
Benzo(g,h,i)perylene	NRV	NRV	NRV	NRV	NRV
Chrysene	NRV	NRV	NRV	NRV	NRV
Fluoranthene	NRV	NRV	NRV	NRV	NRV
Fluorene	NRV	NRV	NRV	NRV	NRV
Indeno(1,2,3-cd)pyrene	NRV	NRV	NRV	NRV	NRV
Naphthalene	NRV	NRV	NRV	NRV	NRV
Phenanthrene	NRV	NRV	NRV	NRV	NRV
Pyrene	NRV	NRV	NRV	NRV	NRV

Notes:

COPC - Chemical of potential concern

NRV - No reference value available

DDD - Dichlorodiphenyldichloroethane

DDE - Dcholorodiphenyldichloroethylene

DDT - Dichlorodiphenyltrichloroethane

TABLE 6-53
SUMMARY OF RI ACTIVITIES
SITE 23, OU-2 SOUTHEAST AREA, ALAMEDA POINT

Period	Contractor	Activities	Chemical Groups Analyzed	Reference
1990; 1991 (CTO 121, Phases 1 and 2A)	Canonie; PRC and James M. Montgomery	• Three soil borings drilled • Three monitoring wells installed • Soil samples collected • Groundwater samples collected	• Soil: VOCs, SVOCs, TRPH, general metals, chemical parameters • Groundwater: VOCs, SVOCs, TRPH, oil/grease, metals, general chemistry parameters, MBAS	PRC and James M. Montgomery 1993a Canonie 1991
1994 (CTO 280)	PRC and Montgomery Watson	• Cone penetrometer tests performed • Hydropunch® samples collected • Soil samples collected • Non-point source sampling performed • One shallow monitoring well installed • Two shallow piezometers installed • Two deep monitoring wells installed • Quarterly groundwater sampling conducted	• Soil: VOCs, SVOCs, TPHPRG, TPHEXT • Groundwater: VOCs, SVOCs, TPHPRG, TPHEXT, TOC, general chemical parameters	PRC and Montgomery Watson 1996b
1997-1998 (CTO 108)	PRC	• Quarterly Groundwater Sampling conducted • Tidal influence study performed	• Groundwater: VOCs, SVOCs, TPH, metals, cyanide, general chemical parameters	PRC 1997a Tetra Tech 12/7/98

Notes:

CTO	Contract Task Order
MBAS	Methylene blue active substances
PRC	PRC Environmental Management, Inc
SVOC	Semivolatile organic compound
TOC	Total organic carbon
TPH	Total petroleum hydrocarbons
TPHEXT	Total petroleum hydrocarbons - extractable
TPHPRG	Total petroleum hydrocarbons - purgeable
TRPH	Total recoverable petroleum hydrocarbons
VOC	Volatile organic compound

TABLE 6-54
SUBSURFACE SOIL SAMPLING SUMMARY
SITE 23, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 1 of 3)

Sample Location	Sample Identification	Sample Depth (ft bgs)	Total Boring Depth (ft bgs)	Sampling Method	Date Sampled	Analyses Performed									
						VOC	SVOC	Tmetals	TRPH	TPHPRG	TPHEXT	Pest	% Moisture	pH	General Chemicals[a]
Soil Boring Soil Samples															
1990 Investigation by Canonie															
MW530-1	MW530-1 (1.0 to 1.5)	1.0 to 1.5	15.0	California sampler	07/13/90		X	X							
	MW530-1 (2.5 to 3.0)	2.5 to 3.0		California sampler	07/13/90	X			X						
	MW530-1 (3.0 to 3.5)	3.0 to 3.5		California sampler	07/13/90		X	X						X	
	MW530-1 (5.5 to 6.0)	5.5 to 6.0		California sampler	07/13/90				X						
	MW530-1 (6.0 to 6.5)	6.0 to 6.5		California sampler	07/13/90	X			X						
	MW530-1 (6.5 to 7.0)	6.5 to 7.0		California sampler	07/13/90		X	X							
	MW530-1 (7.5 to 8.0)	7.5 to 8.0		California sampler	07/13/90		X	X							
	MW530-1 (8.5 to 9.0)	8.5 to 9.0		California sampler	07/13/90	X			X						
	MW530-1 (9.0 to 9.5)	9.0 to 9.5		California sampler	07/13/90		X	X							
	MW530-1 (11.5 to 12.0)	11.5 to 12.0		California sampler	07/13/90	X			X						
	MW530-1 (12.0 to 12.5)	12.0 to 12.5		California sampler	07/13/90		X	X							
	MW530-1 (13.5 to 14.0)	13.5 to 14.0		California sampler	07/13/90	X			X						
	MW530-1 (14.0 to 14.5)	14.0 to 14.5		California sampler	07/13/90		X	X							
MW530-2	MW530-2 (0.5 to 1.0)	0.5 to 1.0	15.0	California sampler	07/13/90		X	X							
	MW530-2 (2.0 to 2.5)	2.0 to 2.5		California sampler	07/13/90	X			X						
	MW530-2 (2.5 to 3.0)	2.5 to 3.0		California sampler	07/13/90		X	X						X	
	MW530-2 (5.0 to 5.5)	5.0 to 5.5		California sampler	07/13/90	X			X						
	MW530-2 (5.5 to 6.0)	5.5 to 6.0		California sampler	07/13/90		X	X							
	MW530-2R (6.0 to 6.5)	6.0 to 6.5		California sampler	07/13/90		X	X							
	MW530-2 (8.0 to 8.5)	8.0 to 8.5		California sampler	07/13/90	X			X						
	MW530-2 (8.5 to 9.0)	8.5 to 9.0		California sampler	07/13/90		X	X							
	MW530-2 (11.0 to 11.5)	11.0 to 11.5		California sampler	07/13/90	X			X						
	MW530-2 (11.5 to 12.0)	11.5 to 12.0		California sampler	07/13/90		X	X							
	MW530-2 (14.0 to 14.5)	14.0 to 14.5		California sampler	07/13/90	X			X						
	MW530-2 (14.5 to 15.0)	14.5 to 15.0		California sampler	07/13/90		X	X							

TABLE 6-54
SUBSURFACE SOIL SAMPLING SUMMARY
SITE 23, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 2 of 3)

Sample Location	Sample Identification	Sample Depth (ft bgs)	Total Boring Depth (ft bgs)	Sampling Method	Date Sampled	Analyses Performed									
						VOC	SVOC	Tmetals	TRPH	TPHPRG	TPHEXT	Pest	% Moisture	pH	General Chemicals[a]
Soil Boring Soil Samples (Continued)															
1990 Investigation by Canonie (Continued)															
MW530-3	MW530-3 (0.5 to 1.0)	0.5 to 1.0	15.0	California sampler	07/13/90		X	X							
	MW530-3 (2.0 to 2.5)	2.0 to 2.5		California sampler	07/13/90	X			X						
	MW530-3 (2.5 to 3.0)	2.5 to 3.0		California sampler	07/13/90		X	X						X	
	MW530-3 (4.0 to 4.5)	4.0 to 4.5		California sampler	07/13/90	X			X						
	MW530-3 (5.0 to 5.5)	5.0 to 5.5		California sampler	07/13/90		X	X							
	MW530-3 (7.0 to 7.5)	7.0 to 7.5		California sampler	07/13/90	X			X						
	MW530-3 (8.0 to 8.5)	8.0 to 8.5		California sampler	07/13/90		X	X							
	MW530-3R (8.5 to 9.0)	8.5 to 9.0		California sampler	07/13/90		X	X							
	MW530-3 (10.0 to 10.5)	10.0 to 10.5		California sampler	07/13/90	X			X						
	MW530-3 (10.5 to 11.0)	10.5 to 11.0		California sampler	07/13/90		X	X							
	MW530-3 (11.5 to 12.0)	11.5 to 12.0		California sampler	07/13/90	X			X						
	MW530-3 (12.5 to 13.0)	12.5 to 13.0		California sampler	07/13/90		X	X							
BOR-12	BOR-12 (0.5 to 1.0)	0.5 to 1.0	15.0	California sampler	07/18/90		X	X				X			
	BOR-12 (3.5 to 4.0)	3.5 to 4.0		California sampler	07/18/90	X	X		X						
	BOR-12 (4.0 to 4.5)	4.0 to 4.5		California sampler	07/18/90			X				X		X	
	BOR-12 (8.0 to 8.5)	8.0 to 8.5		California sampler	07/18/90										X [a]
	BOR-12 (8.5 to 9.0)	8.5 to 9.0		California sampler	07/18/90	X	X		X						
	BOR-12 (10.0 to 10.5)	10.0 to 10.5		California sampler	07/18/90			X				X			
	BOR-12 (11.0 to 11.5)	11.0 to 11.5		California sampler	07/18/90	X	X		X						
	BOR-12 (11.5 to 12.0)	11.5 to 12.0		California sampler	07/18/90			X				X			
	BOR-12 (14.0 to 14.5)	14.0 to 14.5		California sampler	07/18/90	X	X		X						
	BOR-12 (14.5 to 15.0)	14.5 to 15.0		California sampler	07/18/90			X				X			

TABLE 6-54
SUBSURFACE SOIL SAMPLING SUMMARY
SITE 23, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 3 of 3)

Sample Location	Sample Identification	Sample Depth (ft bgs)	Total Boring Depth (ft bgs)	Sampling Method	Date Sampled	Analyses Performed									
						VOC	SVOC	Tmetals	TRPH	TPHPRG	TPHEXT	Pest	% Moisture	pH	General Chemicals[a]
Soil Boring Soil Samples (Continued)															
1994-1995 Investigation by PRC and Montgomery Watson (Continued)															
M10B-01	280-S10B-134	1.0 to 2.0	11.0	CSS	11/05/94	X	X			X	X		X	X	
	280-S10B-135	2.0 to 3.0		CSS	11/05/94	X	X			X	X		X	X	
	280-S10B-136	3.0 to 4.0		CSS	11/05/94	X	X			X	X		X	X	
	280-S10B-137	5.0 to 6.0		CSS	11/05/94	X	X			X	X		X	X	
B10B-04	280-S10B-001	0.5 to 1.5	6.0	CSS	08/19/94	X	X						X	X	
	280-S10B-002	2.0 to 3.0		CSS	08/19/94	X	X						X	X	
	280-S10B-003	5.0 to 6.0		CSS	08/19/94	X	X						X	X	
B10B-05	280-S10B-004	0.5 to 1.5	6.0	CSS	08/19/94	X	X						X	X	
	280-S10B-005	2.5 to 3.5		CSS	08/19/94	X	X						X	X	
	280-S10B-006	3.5 to 4.5		CSS	08/19/94	X	X						X	X	
	280-S10B-007	5.0 to 6.0		CSS	08/19/94	X	X						X	X	
B10B-06	280-S10B-008	0.5 to 1.5	6.0	CSS	08/19/94	X	X						X	X	
	280-S10B-009	2.5 to 3.5		CSS	08/19/94	X	X						X	X	
	280-S10B-010	5.0 to 6.0		CSS	08/19/94	X	X						X	X	
B10B-07	280-S10B-011	0.5 to 1.5	6.0	CSS	08/19/94	X	X			X	X		X	X	
	280-S10B-012	2.5 to 3.5		CSS	08/19/94	X	X			X	X		X	X	
	280-S10B-013	5.0 to 6.0		CSS	08/19/94	X	X			X	X		X	X	

Notes:

[a] General chemical analytical parameters for this sample included anions, flashpoint, total Kjeldahl nitrogen, and TOC.

bgs	Below ground surface	TOC	Total organic carbon
% Moisture	Percent moistrue	TMetals	Total metals
CSS	California split spoon	TRPH	Total recoverable petroleum hydrocarbons
VOC	Volatile organic compound	TPHEXT	Total petroleum hydrocarbons - extractable
SVOC	Semivolatile organic compound	TPHPRG	Total petroluem hydrocarbons - purgable
		Pest	Pesticides

TABLE 6-55
GEOTECHNICAL SOIL SAMPLING SUMMARY
SITE 23, OU-2 SOUTHEAST AREA, ALAMEDA POINT

Sample Location	Sample Identification	Sample Depth (ft bgs)	Sampling Method	Date Collected	Analyses Performed			
					Moisture Content	Dry Density	Wet Density	Permeability
MW530-1	NA	10	California Sampler	07/13/90	X [(a)]	X [(a)]	X [(a)]	X [(b)]
MW530-2	NA	7	California Sampler	07/13/90	X	X	X	

Notes:

(a)	Moisture content, dry density, and wet density were determined for permeability test.
(b)	A constant head permeability test performed
ft bgs	Feet below ground surface
%	Percent

TABLE 6-56
MONITORING WELL CONSTRUCTION DETAILS
SITE 23, OU-2 SOUTHEAST AREA, ALAMEDA POINT

Well Identification	Screen Interval (ft below TOC)	Hydro-Stratigraphic Unit of Screen Interval	Top of Casing Elevation (ft MLLW)	Total Borehole Depth (ft bgs)	Total Well Depth (ft bgs)	Well Diameter (inches)	Blank Casing Interval (ft below TOC)	Filter Interval (ft below TOC)	Bentonite Seal Interval (ft below TOC)	Cement Grout Interval (ft below TOC)
MW530-1	5-15	FWBZU	12.62	15	15	2	0-5	4.5-15	3-4.5	0-3
MW530-2	5-15	FWBZU	12.65	15	15	2	0-5	4.5-15	3-4.5	0-3
MW530-3	5-15	FWBZU	11.11	15	15	2	0-5	4.5-15	3-4.5	0-3
M10B-01	3-11	FWBZU	13.08	11	11	2	0-2.5	2.5-11	2-2.5	0-2
D10B-01	50-60	FWBZL	11.09	61.5	61.5	3	0-50	46.5-61.5	44-46.5	0-44
D10B-02	50-60	FWBZL	13.32	81	60.5	3	0-50	47-60.5	44-47	0-44

Notes:

ft bgs	Feet below ground surface
ft	Feet
FWBZL	First water-bearing zone lower
FWBZU	First water-bearing zone upper
MLLW	Mean lower low water
TOC	Top of casing

TABLE 6-57
GROUNDWATER SAMPLING SUMMARY
SITE 23, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 1 of 3)

Sample Location	Sample Identification	Sample Depth (ft bgs or ft below top of casing [a] [b]	Hydro-Stratigraphic Unit Sampled	Sampling Method	Date Sampled	Analyses Performed							
						VOC	SVOC	TPHPRG	MBAS	TPHEXT	DMetals	General Chemicals	Sulfide
Hydropunch Groundwater Samples													
1994-1995 Investigation by PRC and Montgomery Watson [c]													
SHP-S10B-05	280-S10B-127	8.5	FWBZU	HPS	08/22/94	X	X	X		X	X	X [g]	X
SHP-S10B-06	280-S10B-128	8.0	FWBZU	HPS	08/22/94	X	X	X		X	X	X [e]	
DHP-S10B-01	280-S10B-110	40.0	FWBZL	HPS	07/15/94	X	X	X		X	X	X	X
DHP-S10B-02	280-S10B-111	33.0	FWBZL	HPS	07/15/94	X	X	X		X	X	X	X
DHP-S10B-03	280-S10B-112	24.0	FWBZU	HPS	07/18/94	X	X	X		X	X	X [f]	
DHP-S10B-04	280-S10B-114	24.5	FWBZU	HPS	07/15/94	X	X	X		X	X	X	X
DHP-S10B-05	280-S10B-115	21.0	FWBZU	HPS	07/15/94	X	X	X		X	X	X [e]	
Monitoirng Well Groundwater Samples													
1990 Investigation by Canonie													
MW530-1	MW530-1	5.0 to 15.0	FWBZU	Bailer	08/23/90	X	X				X	X [g]	
MW530-2	MW530-2	5.0 to 15.0	FWBZU	Bailer	08/23/90	X	X				X	X [g]	
MW530-3	MW530-3	5.0 to 15.0	FWBZU	Bailer	08/24/90	X	X		X		X	X [h]	
1994-1995 Investigation by PRC and Montgomery Watson [d]													
MW530-1	280-S10B-017	5.0 to 15.0	FWBZU	Bailer	10/19/94	X	X	X		X	X	X	
	280-S10B-018			Bailer	02/22/95	X	X	X		X	X	X	
(duplicate)	280-S10B-019			Bailer	02/22/95	X	X	X		X	X	X	
	280-S10B-020			Bailer	06/26/95	X	X	X		X	X	X	
	280-S10B-021			Bailer	08/09/95	X	X	X		X	X	X	
MW530-2	280-S10B-022	5.0 to 15.0	FWBZU	Bailer	10/19/94	X	X	X		X	X	X	
	280-S10B-023			Bailer	02/22/95	X	X	X		X	X	X	
	280-S10B-024			Bailer	06/26/95	X	X	X		X	X	X	
	280-S10B-025			Bailer	08/08/95	X	X	X		X	X	X	

TABLE 6-57
GROUNDWATER SAMPLING SUMMARY
SITE 23, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 2 of 3)

Sample Location	Sample Identification	Sample Depth (ft bgs or ft below top of casing [a] [b]	Hydro-Stratigraphic Unit Sampled	Sampling Method	Date Sampled	Analyses Performed							
						VOC	SVOC	TPHPRG	MBAS	TPHEXT	DMetals	General Chemicals	Sulfide
Monitoring Well Groundwater Samples (Continued)													
1994-1995 Investigation by PRC and Montgomery Watson (Continued) [d]													
MW530-3	280-S10B-026	5.0 to 15.0	FWBZU	Bailer	10/19/94	X	X	X		X	X	X	
	280-S10B-027			Bailer	02/22/95	X	X	X		X	X	X	
	280-S10B-028			Bailer	06/26/95	X	X	X		X	X	X	
	280-S10B-029			Bailer	08/09/95	X	X	X		X	X	X	
M10B-01	280-S10B-140	3.0 to 11.0	FWBZU	Bailer	10/24/94	X	X	X		X	X	X	
	280-S10B-147			Bailer	02/28/95	X	X	X		X	X	X	
	280-S10B-148			Bailer	06/29/95	X	X	X		X	X	X	
	280-S10B-149			Bailer	08/18/95	X	X	X		X	X	X	
D10B-01	280-S10B-138	50.0 to 60.0	FWBZL	Bailer	12/15/94	X	X	X		X	X	X	X
	280-S10B-141			Bailer	02/22/95	X	X	X		X	X	X	
	280-S10B-142			Bailer	06/23/95	X	X	X		X	X	X	
	280-S10B-143			Bailer	09/14/95	X	X	X		X	X	X	
D10B-02	280-S10B-139	50.0 to 60.0	FWBZL	Bailer	12/15/94	X	X	X		X	X	X	X
	280-S10B-144			Bailer	02/22/95	X	X	X		X	X	X	X
	280-S10B-145			Bailer	06/23/95	X	X	X		X	X	X	X
	280-S10B-146			Bailer	09/14/95	X	X	X		X	X	X	X

Notes:

(a) This table summarizes groundwater sampling activities at Site 23 for only CTO 121 and CTO 280. Information for CTO 1089 is summarized in the "Data Summary Report for Quarterly Groundwater Monitoring, November 1997 - August 1998," dated December 7, 1998, and prepared by Tetra Tech EM, Inc. and Uribe & Associates

(b) Sample depth for groundwater samples from monitoring wells measured in feet below top of casing (refer to Table 6-56 for monitoring well construction details).
Sample depth for Hydropunchâ groundwater samples measured in feet beloiw ground surface.

(c) General chemical analysis parameters for the 1994 investigation HydroPunchâ groundwater samples are acidity, alkalinity, anions, hardness, COD, pH, TDS, and TOC

(d) General chemical analysis parameters for the 1994 investigation monitoring well groundwater samples are acidity, alkalinity, anions, hardness, COD, pH, TDS, and TOC.
First quarter samples were also analyzed for specific conductivity.

(e) Of the general chemicals listed this sample was only analyzed for hardness.

(f) Of the general chemicals listed this sample was only analyzed for hardness and TOC.

TABLE 6-57
GROUNDWATER SAMPLING SUMMARY
SITE 23, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 3 of 3)

Notes (Continued):

(g) This sample was only analyzed for alkalinity and anions.
(h) This sample was only analyzed for hardness.

bgs	Feet below ground surface
COD	Chemical oxygen demand
FWBZL	First water-bearing zone lower
FWBZU	First water-bearing zone upper
MBAS	Methylene blue active substances
SVOC	Semivolatile organic compound
HPS	Hydropunch sampler
TDS	Total dissolved solids
TOC	Total organic carbon
TPHEXT	Total petroleum hydrocarbons - extractable
TPHPRG	Total petroleum hydrocarbons - purgeable
TRPH	Total recoverable petroleum hydrocarbons
VOC	Volatile organic compound

TABLE 6-58
FIELD SAMPLING PLAN VARIANCE SUMMARY
SITE 23, OU-2 SOUTHEAST AREA, ALAMEDA POINT

Field and Location Identification	Variation from FSP	Reason for Variation	Resolution of Variation
1994 - (CTO 280) Investigation by PRC and Montgomery Watson			
Soil Borings			
M10B-01	M10B-01 added to original scope	To install monitoring well M10B-01	Soil boring M10B-01 drilled

Notes:

CTO Contract Task Order

FSP Field sampling plan

PRC PRC Environmental Management, Inc.

TABLE 6-59
GEOTECHNICAL SAMPLE LABORATORY TEST RESULTS
SITE 23, OU-2 SOUTHEAST AREA, ALAMEDA POINT

Sample Number	Depth (ft)	Soil Classification [a] [b]			Geotechnical Test		Permeability	
		Laboratory	Field	Stratigraphic Unit	Moisure Content (%)	Dry Density (pcf)	Effective Stresses (psi)	Hydraulic Conductivity (cm/s)
1990 Investigation by Canonie (Phases 1 and 2A)								
MW530-2	7	SP	SM	Fill	12.9	109.7	NA	NA

Notes:

(a) Samples were classified or analyzed using the following methods:

Soil classification, Unified Soil Classification System ASTM D2488
Moisure Content ASTM D2216
Dry Density ASTM D2937
Specific Gravity ASTM D854
Effective Stress EPA 9100
Hydraulic Conductivity EPA 9100

(b) Soil classification legend is as follows:

SP	Poorly-graded sands, graelly sands, little or no fines
SM	Silty sands, sand-silt mixtures
SC	Clayey sands, sand-clay mixtures
CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays

%	Percent
CEC	Cation exchange
cm/s	Centimeters per second
ft bgs	Feet below ground surface
NA	Not analyzed
pcf	Pounds per cubic foot
psi	Pounds per square inch

TABLE 6-60
SOIL ANALYTICAL DATA SUMMARY (0 FEET TO <2 FEET BGS)
SITE 23, OU-2 SOUTHEAST AREA, ALAMEDA POINT

Chemical	Total Samples	Samples with Detections	Frequency of Detection (%)	Reporting Limits (mg/kg)		Data Summary Statistics (mg/kg)		Detected Concentrations (mg/kg)	
				Minimum	Maximum	Mean	Standard Deviation	Minimum	Maximum
Semivolatile Organic Compounds									
2-Methylnaphthalene	9	1	11.1	0.34	7.00	0.63	1.09	0.12	0.12
Chrysene	9	1	11.1	0.34	7.00	0.62	1.09	0.18	0.18
Fluoranthene	9	1	11.1	0.34	7.00	0.63	1.09	0.05	0.05
n-Nitrosodiphenylamine [1]	9	1	11.1	0.34	7.00	0.63	1.09	0.22	0.22
Phenanthrene	9	1	11.1	0.34	7.00	0.62	1.09	0.14	0.14
Pyrene	9	2	22.2	0.34	7.00	0.60	1.11	0.04	0.08
Total Petroleum Hydrocarbons									
Motor oil range organics	2	1	50.0	20.00	21.00	40.00	42.43	70.00	70.00
Inorganic Compounds									
Aluminum	4	4	100.0	1.70	21.00	4707.50	1585.40	3350.00	7000.00
Antimony	4	1	25.0	2.10	6.40	3.59	0.81	4.80	4.80
Barium	4	4	100.0	0.20	21.00	62.88	26.47	34.00	88.00
Cadmium	4	2	50.0	0.20	1.10	0.68	0.36	0.40	1.20
Calcium	4	4	100.0	10.00	530.00	8367.50	2550.21	4600.00	9970.00
Chromium	4	4	100.0	0.60	5.30	27.10	3.41	23.00	31.00
Cobalt	4	2	50.0	0.80	5.30	3.75	1.41	4.10	5.60
Copper	4	4	100.0	0.60	5.30	26.28	10.54	14.00	39.10
Iron	4	4	100.0	4.10	11.00	7875.00	2495.07	5820.00	11500.00
Lead	4	3	75.0	5.20	5.30	11.69	13.01	6.40	31.00
Magnesium	4	4	100.0	5.00	530.00	1781.65	1315.75	26.60	3200.00
Manganese	4	4	100.0	0.20	5.30	135.00	60.90	82.00	210.00
Nickel	4	4	100.0	1.20	5.30	21.98	2.78	20.00	25.90
Potassium	4	3	75.0	72.00	530.00	988.75	787.45	680.00	2100.00
Sodium	4	2	50.0	10.00	530.00	379.25	159.34	392.00	600.00
Titanium	4	4	100.0	0.20	5.30	387.25	185.20	268.00	661.00
Vanadium	4	4	100.0	0.60	5.30	16.93	2.75	15.00	21.00
Zinc	4	4	100.0	0.60	5.30	43.73	24.76	23.00	79.00

Notes:

% Percent
< Less than
mg/kg Milligram per kilogram
bgs Below ground surface

TABLE 6-61
SOIL ANALYTICAL DATA SUMMARY (2 FEET TO 10 FEET BGS)
SITE 23, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 1 of 2)

Chemical	Total Samples	Samples with Detections	Frequency of Detection (%)	Reporting Limits (mg/kg)		Data Summary Statistics (mg/kg)		Detected Concentrations (mg/kg)	
				Minimum	Maximum	Mean	Standard Deviation	Minimum	Maximum
Total Petroleum Hydrocarbons									
Motor oil range organics	5	2	40.0	21.00	29.00	27.60	25.48	30.00	71.00
TRPH	13	7	53.8	1.70	192.00	601.72	2061.29	5.20	7460.00
Volatile Organic Compounds									
Acetone	24	1	4.2	0.01	0.09	0.01	0.01	0.02	0.02
Ethylbenzene	24	1	4.2	0.01	0.03	0.01	0.01	0.04	0.04
Methylene Chloride	24	1	4.2	0.01	0.05	0.01	0.01	0.01	0.01
Toluene	24	10	41.7	0.01	0.03	0.06	0.22	0.01	1.10
Xylene (total)	24	1	4.2	0.01	0.03	0.01	0.03	0.17	0.17
Semivolatile Organic Compounds									
2-Methylnaphthalene	26	1	3.8	0.34	8.50	0.82	1.95	9.40	9.40
Anthracene	26	1	3.8	0.34	8.50	0.56	0.99	0.02	0.02
Benzo(a)anthracene	26	1	3.8	0.34	8.50	0.56	0.99	0.05	0.05
Benzo(a)pyrene	26	1	3.8	0.34	8.50	0.56	0.99	0.06	0.06
Benzo(b)fluoranthene	26	1	3.8	0.34	8.50	0.56	0.99	0.07	0.07
Chrysene	26	1	3.8	0.34	8.50	0.56	0.99	0.06	0.06
Fluoranthene	26	1	3.8	0.34	8.50	0.57	0.99	0.24	0.24
Indeno(1,2,3-c,d)pyrene	26	1	3.8	0.34	8.50	0.56	0.99	0.03	0.03
n-Nitrosodiphenylamine [(1)]	26	2	7.7	0.34	8.50	0.56	0.99	0.07	0.07
Naphthalene	26	3	11.5	0.34	8.50	0.61	1.13	0.04	4.20
Phenanthrene	26	2	7.7	0.34	8.50	0.56	0.99	0.04	0.17
Pyrene	26	4	15.4	0.34	8.50	0.55	0.99	0.02	0.24
Inorganic Chemicals									
Aluminum	14	14	100.0	1.70	26.00	4391.43	2282.89	1700.00	11400.00
Antimony	14	2	14.3	2.10	8.00	3.88	1.08	4.50	7.40
Arsenic	14	1	7.1	2.50	13.00	5.33	1.49	2.60	2.60
Barium	14	10	71.4	0.20	26.00	57.03	76.08	25.00	300.00

TABLE 6-61
SOIL ANALYTICAL DATA SUMMARY (2 FEET TO 10 FEET BGS)
SITE 23, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 2 of 2)

Chemical	Total Samples	Samples with Detections	Frequency of Detection (%)	Reporting Limits (mg/kg)		Data Summary Statistics (mg/kg)		Detected Concentrations (mg/kg)	
				Minimum	Maximum	Mean	Standard Deviation	Minimum	Maximum
Inorganic Chemicals (Continued)									
Beryllium	14	1	7.1	0.20	1.30	0.53	0.15	0.30	0.30
Cadmium	14	1	7.1	0.20	1.30	0.54	0.14	0.40	0.40
Calcium	14	14	100.0	11.00	660.00	6248.57	7278.65	1400.00	25000.00
Chromium	14	14	100.0	0.60	6.60	24.91	9.37	18.00	53.90
Cobalt	14	2	14.3	0.80	6.60	3.34	1.27	3.80	7.60
Copper	14	14	100.0	0.60	6.60	19.26	12.66	6.80	42.00
Iron	14	14	100.0	4.20	13.00	8549.29	3767.70	4690.00	15500.00
Lead	14	5	35.7	5.20	6.60	10.64	15.51	9.10	59.00
Magnesium	14	13	92.9	5.00	660.00	2187.14	991.39	1600.00	4850.00
Manganese	14	14	100.0	0.20	6.60	84.09	30.26	13.00	158.00
Nickel	14	13	92.9	1.30	6.60	22.89	9.45	17.00	43.60
Potassium	14	10	71.4	74.00	660.00	672.86	374.52	550.00	1600.00
Sodium	14	6	42.9	11.00	660.00	541.71	472.47	494.00	2060.00
Titanium	14	14	100.0	0.20	6.60	504.29	590.08	280.00	2540.00
Vanadium	14	14	100.0	0.60	6.60	16.43	5.25	12.00	32.40
Zinc	14	14	100.0	0.60	6.60	30.39	15.12	17.00	56.00

Notes:

% Percent
mg/kg Milligram per kilogram
TRPH Total recoverable petroleum hydrocarbons

TABLE 6-62
SOIL ANALYTICAL DATA SUMMARY (>10 FEET BGS)
SITE 23, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 1 of 2)

Chemical	Total Samples	Samples with Detections	Frequency of Detection (%)	Reporting Limits (mg/kg)		Data Summary Statistics (mg/kg)		Detected Concentrations (mg/kg)	
				Minimum	Maximum	Mean	Standard Deviation	Minimum	Maximum
Total Petroleum Hydrocarbons									
TRPH	7	5	71.4	1.90	96.50	1091.52	2852.36	8.70	7560.00
Volatile Organic Compounds									
Ethylbenzene	7	1	14.3	0.01	0.01	0.89	2.34	6.20	6.20
Methylene Chloride	7	2	28.6	0.01	0.06	0.29	0.67	0.16	1.80
Toluene	7	5	71.4	0.01	0.01	0.11	0.14	0.01	0.23
Xylene (total)	7	2	28.6	0.01	0.01	1.72	4.53	0.01	12.00
Semivolatile Organic Compounds									
2-Methylnaphthalene	8	1	12.5	0.40	16.00	5.49	14.35	41.00	41.00
Anthracene	8	1	12.5	0.78	16.00	1.34	2.69	0.04	0.04
Benzo(a)anthracene	8	2	25.0	0.78	16.00	1.30	2.71	0.10	0.21
Benzo(a)pyrene	8	1	12.5	0.40	16.00	1.34	2.69	0.38	0.38
Benzo(b)fluoranthene	8	1	12.5	0.40	16.00	1.35	2.69	0.45	0.45
Benzo(g,h,i)perylene	8	1	12.5	0.40	16.00	1.33	2.70	0.32	0.32
Benzo(k)fluoranthene	8	1	12.5	0.40	16.00	1.31	2.71	0.17	0.17
Chrysene	8	2	25.0	0.78	16.00	1.31	2.71	0.10	0.23
Di-n-butylphthalate	8	1	12.5	0.40	16.00	3.32	4.35	12.00	12.00
Fluoranthene	8	2	25.0	0.78	16.00	1.32	2.70	0.08	0.35
Indeno(1,2,3-c,d)pyrene	8	1	12.5	0.40	16.00	1.32	2.70	0.26	0.26
N-nitrosodiphenylamine	8	2	25.0	0.78	16.00	1.30	2.71	0.09	0.22
Phenanthrene	8	2	25.0	0.78	16.00	1.30	2.71	0.05	0.20
Pyrene	8	3	37.5	0.78	16.00	1.46	2.66	0.10	0.97
Inorganic Compounds									
Aluminum	8	8	100.0	1.90	28.00	7160.00	4811.56	370.00	17000.00
Antimony	8	2	25.0	2.40	8.50	4.18	0.82	4.60	6.00
Arsenic	8	2	25.0	2.90	14.00	6.44	2.84	6.10	12.00

TABLE 6-62
SOIL ANALYTICAL DATA SUMMARY (>10 FEET BGS)
SITE 23, OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 2 of 2)

Chemical	Total Samples	Samples with Detections	Frequency of Detection (%)	Reporting Limits (mg/kg)		Data Summary Statistics (mg/kg)		Detected Concentrations (mg/kg)	
				Minimum	Maximum	Mean	Standard Deviation	Minimum	Maximum
Inorganic Compounds (Continued)									
Barium	8	7	87.5	0.20	28.00	48.53	20.64	34.00	78.00
Beryllium	8	1	12.5	0.20	1.40	0.53	0.21	0.30	0.30
Cadmium	8	2	25.0	0.20	1.40	0.56	0.14	0.30	0.40
Calcium	8	8	100.0	12.00	710.00	2826.25	1880.42	710.00	5840.00
Chromium	8	7	87.5	0.70	7.10	33.03	17.36	20.00	61.00
Cobalt	8	3	37.5	1.00	7.10	5.26	3.84	3.70	12.00
Copper	8	8	100.0	0.70	7.10	25.34	19.74	10.00	71.00
Iron	8	8	100.0	4.80	14.00	11596.25	7183.00	1500.00	26600.00
Lead	8	4	50.0	5.90	7.10	10.98	10.41	8.80	31.00
Magnesium	8	7	87.5	5.70	710.00	3108.75	2082.22	1900.00	7500.00
Manganese	8	7	87.5	0.20	7.10	119.76	91.40	54.00	300.00
Nickel	8	7	87.5	1.40	7.10	33.70	20.39	21.00	71.00
Potassium	8	7	87.5	83.00	710.00	1173.75	653.01	600.00	2500.00
Sodium	8	7	87.5	12.00	710.00	1363.63	1047.29	519.00	3400.00
Titanium	8	8	100.0	0.20	7.10	397.13	110.49	280.00	640.00
Vanadium	8	7	87.5	0.70	7.10	24.69	14.60	13.00	48.00
Zinc	8	8	100.0	0.70	7.10	45.56	39.08	10.00	130.00

Notes:

% Percent
> Greater than
mg/kg Milligram per kilogram
TRPH Total recoverable petroleum hydrocarbons

TABLE 6-63
ECOLOGICAL COPCs IN SOIL (0-6 FEET BGS)
SITE 23, OU-2 SOUTHEAST AREA, ALAMEDA POINT

Chemical	Frequency of Detection	Sample Quantitation Limit	Minimum Concentration	Maximum Concentration	95 UCL Concentration	COPC Screening Evaluation [a]	
						Rejected	Retained
Inorganic Compounds (mg/kg)							
Aluminum	11/11	NA	2,880.0	7,000.0		CSB	
Antimony	2/11	6.2-7.3	4.5	4.8		PRG	
Arsenic	1/11	2.5-12	2.6	2.6		CSB	
Barium	9/11	21-24	25.0	300.0	153.86	CSB	
Cadmium	2/11	0.2-1.2	0.4	1.2		PRG	
Calcium	11/11	NA	2,700.0	25,000.0		CSB	
Chromium	11/11	NA	18.0	31.0	26.81		X
Cobalt	3/11	5.2-6.1	3.8	5.6		CSB	
Copper	11/11	NA	7.5	39.1		PRG	
Iron	11/11	NA	4,690.0	11,500.0		CSB	
Lead	4/11	5.2-6.1	6.4	59.0	29.42	CSB	
Magnesium	11/11	NA	26.6	3,200.0		CSB	
Manganese	11/11	NA	71.0	210.0		CSB	
Nickel	11/11	NA	17.0	25.9		CSB	
Potassium	6/11	520-600	550.0	2,100.0		CSB	
Sodium	4/11	520-610	392.0	600.0		CSB	
Titanium	11/11	NA	268.0	661.0		CSB	
Vanadium	11/11	NA	12.0	21.0		CSB	
Zinc	11/11	NA	17.0	79.0		CSB	
Semivolatile Organic Compounds (ug/kg)							
2-Methylnaphthalene	2/28	340-7,000	120.0	9,400.0	624.07		X
Anthracene	1/28	340-7,000	22.0	22.0		FOD	
Benzo(a)pyrene	1/28	340-7,000	57.0	57.0		FOD	
Benzo(b)fluoranthene	1/28	340-7,000	69.0	69.0		FOD	
Chrysene	2/28	340-7,000	63.0	180.0	209.57[b]		X
Fluoranthene	2/28	340-7,000	54.0	240.0	256.21[b]		X
Indeno(1,2,3-c, d)pyrene	1/28	340-7,000	26.0	26.0		FOD	
n-Nitrosodiphenylamine	2/28	340-7,000	65.0	220.0	243.62[b]		X
Naphthalene	2/28	340-7,000	39.0	4,200.0	542.81		X
Phenanthrene	2/28	340-7,000	140.0	170.0	236.13[b]		X
Pyrene	5/28	340-7,000	21.0	240.0	281.14[b]		X

TABLE 6-63
ECOLOGICAL COPCs IN SOIL (0-6 FEET BGS)
SITE 23, OU-2 SOUTHEAST AREA, ALAMEDA POINT

Notes:

(a) COPC screening criteria are as follows:

CSB Rejected as COPC because concentrations were within statistical background or chemical is an essential nutrient

FOD Rejected as COPC because chemical was infrequently detected.

PRG Rejected as COPC because chemical maximum concentration or 95 VCL concentration was below the ecological PRG.

(b) High non-detection values were removed from dataset for calculating 95 UCL per EPA guidance

µg/kg Microgram per kilogram

mg/kg Milligram per kilogram

95 UCL 95 percent upper confidence limit on the arithmetic mean concentration

NA Not applicable, frequency of detection is 100 percent

TABLE 6-64
SUMMARY OF SOIL HAZARD QUOTIENTS
CALIFORNIA GROUND SQUIRREL
SITE 23, OU-2 SOUTHEAST AREA, ALAMEDA POINT

Ecological COPCs	Hazard Quotient 1	Hazard Quotient 2	Hazard Quotient 3	Hazard Quotient 4	Hazard Quotient 5
Chromium	2.25E-04	3.61E-01	5.21E-03	2.50E-01	3.61E-03
2-Methylnaphthalene	NRV	NRV	NRV	NRV	NRV
Chrysene	2.93E-05	1.70E-02	6.79E-04	1.18E-02	4.70E-04
Fluoranthene	3.91E-05	2.27E-02	9.05E-04	1.57E-02	6.27E-04
N-nitrosodiphenylamine (1)	NRV	NRV	NRV	NRV	NRV
Naphthalene	1.12E-05	7.74E-04	2.59E-04	5.36E-04	1.80E-04
Phenanthrene	2.77E-05	1.61E-02	6.41E-04	1.11E-02	4.44E-04
Pyrene	3.91E-05	2.27E-02	9.05E-04	1.57E-02	6.27E-04

Notes:

COPC Chemical of potential concern
NRV No reference value available

TABLE 6-65
SUMMARY OF SOIL HAZARD QUOTIENTS
RED-TAILED HAWK
SITE 23, OU-2 SOUTHEAST AREA, ALAMEDA POINT

Ecological COPCs	Hazard Quotient 1	Hazard Quotient 2	Hazard Quotient 3	Hazard Quotient 4	Hazard Quotient 5
Chromium	2.59E-08	1.40E-02	1.40E-03	1.53E-05	1.59E-06
2-Methylnaphthalene	NRV	NRV	NRV	NRV	NRV
Chrysene	NRV	NRV	NRV	NRV	NRV
Fluoranthene	NRV	NRV	NRV	NRV	NRV
N-nitrosodiphenylamine (1)	NRV	NRV	NRV	NRV	NRV
Naphthalene	NRV	NRV	NRV	NRV	NRV
Phenanthrene	NRV	NRV	NRV	NRV	NRV
Pyrene	NRV	NRV	NRV	NRV	NRV

Notes:

COPC Chemical of potential concern
NRV No reference value available

TABLE 6-66
HYDROPUNCH® AND MONITORING WELL ANALYTICAL DATA STATISTICAL SUMMARY
FIRST WATER-BEARING ZONE
OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 1 of 3)

Chemical	Total Samples	Samples with Detections	Frequency of Detection (%)	Reporting Limit (µg/L)		Detected Concentrations (µg/L)		Data Summary Statistics (a)		
				Minimum	Maximum	Minimum	Maximum	Standard Deviation (b)	Mean (c)	95 UCL[d] (µg/L)
Dissolved Metals										
Aluminum	172	18	10.5	8.4	1230	27.7	89000	7951.59	1076.71	NA
Antimony	172	14	8.1	2.2	60	3.1	30	4.62	3.94	NA
Arsenic	172	73	42.4	2.6	100	2.7	54	10.03	8.34	NA
Barium	172	144	83.7	0.9	62.9	13.7	785	106.88	101.48	NA
Beryllium	172	39	22.7	0.1	5	0.75	39.5	3.09	0.99	1.38
Cadmium	172	25	14.5	0.3	8	0.36	24.8	2.86	0.89	NA
Calcium	172	171	99.4	8.5	494	7170	1690000	278715.13	151885.55	NA
Chromium	172	28	16.3	0.4	32	1	270	28.36	5.64	NA
Cobalt	172	9	5.2	3.8	50	4.2	3560	271.23	24.71	NA
Copper	172	14	8.1	2	90.7	3.3	153	15.27	7.56	NA
Iron	172	61	35.5	3.2	429	10.1	244000	21043.60	3839.98	NA
Lead	174	11	6.3	1	20	1.1	92.2	10.68	2.63	NA
Magnesium	172	168	97.7	13.2	128	96.6	1820000	336766.72	145399.88	NA
Manganese	172	162	94.2	0.9	6.1	2.5	93900	7738.02	2634.91	NA
Mercury	171	1	0.6	0.2	0.2	0.22	0.22	0.01	0.10	0.10
Molybdenum	171	9	5.3	7.9	106	8.2	106	8.56	7.02	NA
Nickel	172	32	18.6	7.5	46.5	8.2	11400	868.82	79.49	NA
Potassium	172	164	95.3	282	3750	1820	115000	19174.73	15589.45	NA
Selenium	172	4	2.3	2.1	54	2.7	9.7	4.05	2.40	2.91
Silver	166	2	1.2	0.9	10	0.94	13	1.22	0.93	1.09
Sodium	172	172	100.0	7.2	597	351	6050000	1283971.73	644515.99	NA
Thallium	172	12	7.0	2	76	3.6	52.7	7.92	4.11	5.11
Titanium	1	1	100.0	NR	NR	2400	2400	0.00	2400.00	NA
Vanadium	172	19	11.0	3.7	35	7.2	230	20.60	7.36	NA
Zinc	172	33	19.2	2.3	50.7	4	7340	570.81	72.07	NA
Semivolatile Organic Compounds										
2,2'-Oxybis(1-chloropropane)	151	2	1.32	10	16000	0.70	1.00	650.60	59.25	146.87
2,4-Dichlorophenol	152	2	1.32	10	16000	0.50	7.00	648.46	58.93	145.98
2,4-Dimethylphenol	152	5	3.29	10	16000	2.00	140.00	648.47	59.03	146.08
2,6-Dinitrotoluene	152	1	0.66	10	16000	6.00	6.00	648.45	58.95	146.00
2-Methylnaphthalene	152	20	13.16	10	8000	0.80	6500.00	526.83	50.08	120.80
2-Methylphenol	152	2	1.32	10	16000	9.00	41.00	648.43	58.42	145.47
4,6-Dinitro-2-methylphenol	152	2	1.32	25	40000	25.00	25.00	1621.12	147.60	365.21
4-Chloro-3-methylphenol	152	1	0.66	10	16000	0.70	0.70	648.46	58.92	145.97
4-Methylphenol	152	2	1.32	10	16000	3.00	1200.00	655.01	66.01	153.93

TABLE 6-66
HYDROPUNCH® AND MONITORING WELL ANALYTICAL DATA STATISTICAL SUMMARY
FIRST WATER-BEARING ZONE
OU-2 SOUTHEAST AREA, ALAMEDA POINT
(Page 2 of 3)

Chemical	Total Samples	Samples with Detections	Frequency of Detection (%)	Reporting Limit (µg/L)		Detected Concentrations (µg/L)		Data Summary Statistics (a)		
				Minimum	Maximum	Minimum	Maximum	Standard Deviation (b)	Mean (c)	95 UCL (µg/L)
Semivolatile Organic Compounds (Continued)										
Acenaphthene	152	4	2.63	10	16000	0.50	1.00	648.46	58.84	145.89
Benzo(a)anthracene	152	2	1.32	10	16000	0.70	1.00	648.46	58.89	145.94
Benzo(a)pyrene	152	3	1.97	10	16000	0.60	2.00	648.46	58.87	145.92
Benzo(b)fluoranthene	152	3	1.97	10	16000	0.80	2.00	648.46	58.88	145.93
Benzo(g,h,i)perylene	152	2	1.32	10	16000	1.00	2.00	648.46	58.90	145.95
Benzo(k)gluoranthene	152	1	0.66	10	16000	0.80	0.80	648.46	58.92	145.97
Bis(2-ethylhexyl)phthalate	152	1	0.66	4	6400	180.00	180.00	259.65	25.34	60.19
Carbazole	151	1	0.66	10	16000	0.60	0.60	650.60	59.28	146.90
Chrysene	152	3	1.97	10	16000	0.80	1.00	648.46	58.87	145.91
Fluoranthene	152	6	3.95	10	16000	0.60	3.00	648.47	58.71	145.76
Fluorene	152	8	5.26	10	16000	0.80	5.00	648.47	58.73	145.78
Indeno(1,2,3-c,d)pyrene	152	2	1.32	10	16000	0.90	1.00	648.46	58.89	145.94
Isophorone	152	3	1.97	10	16000	2.00	7.00	648.46	58.93	145.98
n-nitrosodiphenylamine (1)	152	1	0.66	10	16000	0.70	0.70	648.46	58.92	145.97
Naphthalene	152	25	16.45	10	8000	0.80	29000.00	2351.48	201.91	517.57
Pentachlorophenol	152	4	2.63	25	40000	0.60	100.00	1621.11	147.83	365.44
Phenanthrene	152	10	6.58	10	8000	0.50	1200.00	97.41	13.95	27.03
Phenol	152	9	5.92	10	16000	0.50	54.00	648.41	58.93	145.97
Pyrene	152	8	5.26	10	16000	0.50	4.00	648.48	58.68	145.73
Total Metals										
Aluminum	2	1	50.00	20.7	41.2	195.00	195.00	123.32	107.80	NA
Arsenic	2	1	50.00	4	4	7.40	7.40	3.82	4.70	NA
Barium	2	2	100.00	6.7	6.7	47.60	110.00	44.12	78.80	NA
Calcium	2	2	100.00	89.8	89.8	24900.00	41400.00	11667.26	33150.00	NA
Iron	2	1	50.00	3.2	122	128.00	128.00	47.38	94.50	NA
Magnesium	2	2	100.00	32.4	32.4	11300.00	19200.00	5586.14	15250.00	NA
Manganese	2	2	100.00	1.2	1.2	14.30	173.00	112.22	93.65	NA
Potassium	2	2	100.00	1020	1020	14800.00	21200.00	4525.48	18000.00	NA
Sodium	2	2	100.00	19.9	19.9	55200.00	147000.00	64912.40	101100.00	NA
Zinc	2	1	50.00	5.3	5.3	13.20	13.20	7.46	7.93	NA

TABLE 6-66
HYDROPUNCH® AND MONITORING WELL ANALYTICAL DATA STATISTICAL SUMMARY
FIRST WATER-BEARING ZONE
OU-2 SOUTHEAST AREA, ALAMEDA POINT

Chemical	Total Samples	Samples with Detections	Frequency of Detection (%)	Reporting Limit (µg/L)		Detected Concentrations (µg/L)		Data Summary Statistics (a)		
				Minimum	Maximum	Minimum	Maximum	Standard Deviation (b)	Mean (c)	95 UCL (µg/L)
Total Petroleum Hydrocarbons										
Diesel range organics	156	39	25.00	100	400	110.00	10000.00	1524.92	547.82	749.88
Gasoline range organics	154	31	20.13	50	50	60.00	7900.00	851.03	240.41	353.91
Motor oil range organics	155	56	36.13	200	800	220.00	8250.00	1018.90	584.77	720.22
Oil and grease	4	1	25.00	1000	1400	1200.00	1200.00	298.26	762.50	NA
TRPH	1	1	100.00	18000	18000	350000.00	350000.00	0.00	350000.00	NA
Volatile Organic Compounds										
1,1,1-Trichloroethane	171	16	9.36	1	200	0.70	37.00	9.02	2.04	3.18
1,1-Dichloroethane	171	25	14.62	1	200	0.70	110.00	12.11	2.78	4.32
1,1-Dichloroethene	171	5	2.92	1	200	1.00	9.00	8.52	1.60	2.68
1,2-Dichloroethane	171	6	3.51	0.5	50	0.50	10.00	2.79	0.71	1.07
1,2-Dichloroethene (total)	171	16	9.36	1	200	0.70	2400.00	185.94	18.21	41.74
2-Butanone	14	3	21.43	3	300	59.00	4200.00	1118.45	314.64	841.04
2-Hexanone	159	1	0.63	2	200	2.00	2.00	11.13	2.40	3.86
4-Methyl-2-pentanone	171	2	1.17	2	200	2.00	5.00	10.77	2.46	3.82
Acetone	20	4	20.00	1	87	38.00	150.00	35.89	20.40	34.24
Benzene	170	24	14.12	0.5	100	0.50	1600.00	164.20	25.21	46.05
Carbon disulfide	171	4	2.34	1	200	4.00	170.00	15.50	2.67	4.63
Chlorobenzene	171	1	0.58	1	200	11.00	11.00	8.53	1.54	2.62
Chloroform	171	2	1.17	1	200	0.70	1.00	8.50	1.51	2.59
Ethylbenzene	171	24	14.04	1	200	0.80	910.00	86.52	13.90	24.85
Tetrachloroethene	171	10	5.85	1	200	0.70	12.00	8.57	1.71	2.79
Toluene	171	16	9.36	0.5	200	0.20	230.00	25.41	4.13	7.34
Trichloroethene	171	7	4.09	1	200	0.70	22.00	8.64	1.66	2.75
Vinyl chloride	171	2	1.17	0.5	50	18.00	220.00	17.04	2.01	4.16
Xylene (total)	171	17	9.94	1	200	0.90	1200.00	96.38	13.26	25.46

Notes:

95 UCL — 95 percent upper confidence limit of the mean concentration
% — Percent
µg/L — Microgram per liter
NA — Not applicable
NR — Not reported
TRPH — Total recoverable petroleum hydrocarbons
(a) — Statistical summaries are provided only for chemicals detected at least once in all samples collected at the site.
(b) — Standard Deviation- Standard deviation of detected concentrations and one half the reporting limit for non-detects
(c) — Mean of detected concentrations and one-half the reporting limit for non-detects.
(d) — 95 UCLs are not calculated for inorganic chemicals with lognormal concentration distribution. All other chemicals assumed to be normally distributed.

TABLE 6-67
HUMAN HEALTH COPCS IN GROUNDWATER
FIRST WATER-BEARING ZONE
OU-2 SOUTHEASTERN AREA, ALAMEDA POINT
(Page 1 of 2)

Chemical	COPC Screening Evaluation [a]
Inorganic Compounds	
Aluminum	B
Antimony	B
Arsenic	B
Barium	X
Beryllium	X
Cadmium	X
Calcium	A
Chromium	B
Cobalt	X
Copper	C
Iron	A
Lead	X
Magnesium	A
Manganese	X
Mercury	C
Molybdenum	X
Nickel	B
Potassium	A
Selenium	C
Silver	C
Sodium	A
Thallium	X
Titanium	X
Vanadium	B
Zinc	X
Semivolatile Organic Compounds	
2-Butanone	X
2-Hexanone	C
2-Methylnaphthalene	X
2-Methylphenol	C
2,2'-Oxybis(1-chloropropane)	C
2,4-Dichlorophenol	C
2,4-Dimethylphenol	X
2,6-Dinitrotoluene	X
4-Chloro-3-methylphenol	C
4-Methyl-2-pentanone	C
4-Methylphenol	X
4,6-Dinitro-2-methylphenol	C
Acenaphthene	C
Benzo(a)anthracene	X
Benzo(a)pyrene	X
Benzo(b)fluoranthene	X

TABLE 6-67
HUMAN HEALTH COPCS IN GROUNDWATER
FIRST WATER-BEARING ZONE
OU-2 SOUTHEASTERN AREA, ALAMEDA POINT
(Page 2 of 2)

Chemical	COPC Screening Evaluation [a]
Semivolatile Organic Compounds (Continued)	
Benzo(ghi)perylene	X
Benzo(k)fluoranthene	X
bis(2-Ethylhexyl)phthalate	X
Carbazole	X
Chlorobenzene	X
Chrysene	X
Fluoranthene	C
Fluorene	C
Indeno(1,2,3-c,d)pyrene	X
Isophorone	C
Naphthalene	X
n-Nitroso-diphenylamine	C
n-Nitrosodi-n-propylamine	
Pentachlorophenol	X
Phenanthrene	X
Phenol	X
Pyrene	X
Volatile Organic Compounds	
1,1-Dichloroethane	X
1,1-Dichloroethene	X
1,1,1-Trichloroethane	X
1,2-Dichloroethane	X
1,2-Dichloroethene	X
Acetone	X
Benzene	X
Chloroform	X
Ethylbenzene	X
Tetrachloroethene	X
Toluene	X
Trichloroethene	X
Vinyl chloride	X
Xylene (total)	X

Notes:

(a) COPC screening criteria are as follows:

A Rejected as a COPC because chemical is an
B Rejected as a COPC based on results of
C Rejected as COPC because chemical was
X Retained as a COPC for the site.

COPC Chemical of potential concern
EPA Environmental Protection Agency
PRG Preliminary remediation goal

TABLE 6-68
ECOLOGICAL COPCs IN GROUNDWATER
FIRST WATER-BEARING ZONE
OU-2 SOUTHEASTERN AREA, ALAMEDA POINT
(Page 1 of 2)

Chemical	Screening Evaluation
Inorganic Chemicals	
Aluminum	CSB
Antimony	CSB
Arsenic	CSB
Barium	X
Beryllium	X
Cadmium	X
Calcium	CSB
Chromium	CSB
Cobalt	ORNL
Copper	CSB
Iron	CSB
Lead	X
Magnesium	CSB
Manganese	X
Mercury	FOD
Molybdenum	ORNL
Nickel	CSB
Potassium	CSB
Selenium	FOD
Silver	FOD
Sodium	CSB
Thallium	ORNL
Titanium	X
Vanadium	CSB
Zinc	NRWQC
Semivolatile Organic Chemicals	
2,2'-Oxybis(1-chloropropane)	FOD
2,4-Dichlorophenol	FOD
2,4-Dimethylphenol	FOD
2-Butanone	ORNL
2-Hexanone	FOD
2-Methylnaphthalene	X
2-Methylphenol	FOD
4,6-Dinitro-2-methylphenol	FOD
4-Chloro-3-methylphenol	FOD
4-Methylphenol	FOD
Acenaphthene	FOD
Benzo(a)anthracene	FOD
Benzo(a)pyrene	FOD
Benzo(b)fluoranthene	FOD
Benzo(g,h,i)perylene	FOD
Benzo(k)fluoranthene	FOD
Bis(2-ethylhexyl)phthalate	FOD

TABLE 6-68
ECOLOGICAL COPCs IN GROUNDWATER
FIRST WATER-BEARING ZONE
OU-2 SOUTHEASTERN AREA, ALAMEDA POINT
(Page 2 of 2)

Chemical	Screening Evaluation
Semivolatile Organic Chemicals (Continued)	
Carbazole	FOD
Chrysene	FOD
Fluoranthene	FOD
Fluorene	X
Indeno(1,2,3-cd)pyrene	FOD
Naphthalene	X
Pentachlorophenol	
Phenanthrene	X
Phenol	FOD
Pyrene	X
Volatile Organic Chemicals	
1,1,1-Trichloroethane	X
1,1-Dichloroethane	ORNL
1,1-Dichloroethene	FOD
1,2-Dichloroethane	FOD
1,2-Dichloroethene (total)	X
2,6-Dinitrotoluene	FOD
4-Methyl-2-pentanone	FOD
Acetone	ORNL
Benzene	ORNL
Carbon disulfide	FOD
Chlorobenzene	FOD
Chloroform	FOD
Ethylbenzene	X
Isophorone	FOD
N-nitrosodiphenylamine (1)	FOD
Tetrachloroethene	ORNL
Toluene	ORNL
Trichloroethene	FOD
Vinyl chloride	FOD
Xylene (total)	X

Notes:

COPC	Chemical of potential concern
CSB	Concentrations within statistical background or an essential nutrient
FOD	Frequency of detection less than 5 percent
ORNL	ORNL WQC (Tier II)
ND	Distribution cannot be determined because of limited number of detections
NRWQC	National Recommended Water Quality Criteria
X	Selected as an ecological COPC
mg/L	Micrograms per liter
95 UCL	95 percent upper confidence limit on the arithmetic mean concentration

TABLE 6-69
GROUNDWATER ECOLGOCIAL COC SELECTION
OU-2 SOUTHEASTERN AREA, ALAMEDA POINT
(Page 1 of 5)

Well Number	Ecological COPC	Concentration (ug/L)	Background Concentration (ug/L)	Screening Value (ug/L)	Ecological COC
D09-01	1,1,1-Trichloroethane	3	NA	11[a]	
	Barium	130	574.73	4[a]	
	Cadmium	24.8	5.38	9.3[b]	X
	Lead	9	3.88	3.1[b]	X
	Manganese	14900	5212.94	120[a]	X
D10B-01	Barium	60.4	574.73	4[a]	
	Cadmium	4.8	5.38	9.3[b]	
	Manganese	11900	5212.94	120[a]	X
D10B-02	1,1,1-Trichloroethane	16	NA	11[a]	X
	Barium	141	574.73	4[a]	
	Manganese	653	5212.94	120[a]	
D19-01	1,1,1-Trichloroethane	8	NA	11[a]	
	Barium	98.2	574.73	4[a]	
	Beryllium	1.1	3.83	0.66[a]	
	Cadmium	2.1	5.38	9.3[b]	
	Manganese	10200	5212.94	120[a]	X
DHP-S07C-01	Barium	177	574.73	4[a]	
DHP-S07C-01	Manganese	12100	5212.94	120[a]	X
DHP-S07C-03	Barium	72.9	574.73	4[a]	
	Manganese	351	5212.94	120[a]	
	Ethylbenzene	0.8	NA	7.3[a]	
	Xylene (total)	6	NA	13[a]	
DHP-S09-06	1,2-Dichloroethene (total)	400	NA	590[a]	
	2-Methylnaphthalene	13	NA	2.1[a]	X
	Barium	377	574.73	4[a]	
	Beryllium	2.8	3.83	0.66[a]	
	Ethylbenzene	86	NA	7.3[a]	X
	Manganese	1640	5212.94	120[a]	
	Naphthalene	77	NA	12[a]	X
	Xylene (total)	340	NA	13[a]	X
DHP-S10B-01	Barium	143	574.73	4[a]	
	Beryllium	39.5	3.83	0.66[a]	X
	Cadmium	20.2	5.38	9.3[b]	X
	Ethylbenzene	9	NA	7.3[a]	X
	Manganese	93900	5212.94	120[a]	X
	Xylene (total)	54	NA	13[a]	X

TABLE 6-69
GROUNDWATER ECOLGOCIAL COC SELECTION
OU-2 SOUTHEASTERN AREA, ALAMEDA POINT
(Page 2 of 5)

Well Number	Ecological COPC	Concentration (ug/L)	Background Concentration (ug/L)	Screening Value (ug/L)	Ecological COC
DHP-S10B-02	2-Methylnaphthalene	0.8	NA	2.1[a]	
	Barium	164	574.73	4[a]	
	Beryllium	5.7	3.83	0.66[a]	X
	Lead	12.6	3.88	3.1[b]	X
	Manganese	1490	5212.94	120[a]	
	Phenanthrene	0.6	NA	0.014	X
DHP-S10B-03	Barium	151	574.73	4[a]	
	Beryllium	5.8	3.83	0.66[a]	X
	Cadmium	11.5	5.38	9.3[b]	X
	Lead	55.7	3.88	3.1[b]	X
	Manganese	13700	5212.94	120[a]	X
DHP-S13-02	Barium	115	574.73	4[a]	
	Manganese	1540	5212.94	120[a]	
DHP-S19-02	1,2-Dichloroethene (total)	3	NA	590[a]	
	Barium	74.1	574.73	4[a]	
	Manganese	695	5212.94	120[a]	
DHP-S19-03	Barium	45.7	574.73	4[a]	
	Beryllium	2.1	3.83	0.66[a]	
	Manganese	434	5212.94	120[a]	
M07C-09	Barium	66.6	574.73	4[a]	
	Beryllium	1.1	3.83	0.66[a]	
	Cadmium	0.64	5.38	9.3[b]	
	Manganese	789	5212.94	120[a]	
M10B-01	Barium	162	574.73	4[a]	
	Beryllium	1.8	3.83	0.66[a]	
	Manganese	739	5212.94	120[a]	
M13-07	2-Methylnaphthalene	130	NA	2.1[a]	X
	Barium	229	574.73	4[a]	
	Beryllium	1.5	3.83	0.66[a]	
	Ethylbenzene	4	NA	7.3[a]	
	Fluorene	1	NA	3.9[a]	
	Manganese	11000	5212.94	120[a]	X
	Naphthalene	200	NA	12[a]	X
	Xylene (total)	1	NA	13[a]	
MW-1	2-Methylnaphthalene	5	NA	2.1[a]	X
	Barium	75.5	574.73	4[a]	
	Beryllium	1.7	3.83	0.66[a]	

TABLE 6-69
GROUNDWATER ECOLGOCIAL COC SELECTION
OU-2 SOUTHEASTERN AREA, ALAMEDA POINT
(Page 3 of 5)

Well Number	Ecological COPC	Concentration (ug/L)	Background Concentration (ug/L)	Screening Value (ug/L)	Ecological COC
	Fluorene	0.8	NA	3.9[a]	
MW-1	Manganese	1020	5212.94	120[a]	
	Naphthalene	10	NA	12[a]	
MW410-1	Barium	57.8	574.73	4[a]	
	Lead	0.088	3.88	3.1[b]	
	Manganese	102	5212.94	120[a]	
	Titanium	2.4	NA	NA	X
MW410-2	1,2-Dichloroethene (total)	20	NA	590[a]	
	Barium	316	574.73	4[a]	
	Cadmium	0.4	5.38	9.3[b]	
	Manganese	1160	5212.94	120[a]	
MW530-1	2-Methylnaphthalene	51	NA	2.1[a]	X
	Barium	98.7	574.73	4[a]	
	Beryllium	1.4	3.83	0.66[a]	
	Ethylbenzene	15	NA	7.3[a]	X
	Fluorene	5	NA	3.9[a]	X
	Manganese	158	5212.94	120[a]	
	Naphthalene	57	NA	12[a]	X
	Phenanthrene	5	NA	0.014[a]	X
	Xylene (total)	70	NA	13[a]	X
MW547-1	Barium	28.2	574.73	4[a]	
	Beryllium	1.4	3.83	0.66[a]	
	Cadmium	0.36	5.38	9.3[b]	
	Ethylbenzene	5	NA	7.3[a]	
	Manganese	1060	5212.94	120[a]	
MW547-4	2-Methylnaphthalene	2	NA	2.1[a]	
	Barium	232	574.73	4[a]	
	Beryllium	1.1	3.83	0.66[a]	
	Ethylbenzene	12	NA	7.3[a]	X
	Manganese	4490	5212.94	120[a]	
	Naphthalene	34	NA	12[a]	X
MWD13-2	1,1,1-Trichloroethane	0.7	NA	11[a]	
	Barium	118	574.73	4[a]	
	Manganese	175	5212.94	120[a]	
MWD13-3	1,1,1-Trichloroethane	2	NA	11[a]	
	Barium	27.7	574.73	4[a]	
MWOR-1	Barium	72.4	574.73	4[a]	
	Manganese	3070	5212.94	120[a]	

TABLE 6-69
GROUNDWATER ECOLGOCIAL COC SELECTION
OU-2 SOUTHEASTERN AREA, ALAMEDA POINT
(Page 4 of 5)

Well Number	Ecological COPC	Concentration (ug/L)	Background Concentration (ug/L)	Screening Value (ug/L)	Ecological COC
MWOR-2	Barium	35.2	574.73	4[a]	
	Manganese	63	5212.94	120[a]	
SHP-S09-05	Barium	34.2	574.73	4[a]	
	Ethylbenzene	4	NA	7.3[a]	
	Manganese	794	5212.94	120[a]	
	Naphthalene	1	NA	12[a]	
	Phenanthrene	0.9	NA	0.014[a]	X
	Pyrene	2	NA	0.014[a]	X
	Xylene (total)	6	NA	13[a]	
SHP-S09-08	1,2-Dichloroethene (total)	1	NA	590[a]	
	2-Methylnaphthalene	20	NA	2.1[a]	X
	Barium	280	574.73	4[a]	
	Beryllium	2.9	3.83	0.66[a]	
	Ethylbenzene	23	NA	7.3[a]	X
	Manganese	2150	5212.94	120[a]	
	Naphthalene	250	NA	12[a]	X
	Pyrene	4	NA	0.014[a]	X
	Xylene (total)	56	NA	13[a]	X
SHP-S09-10	1,2-Dichloroethene (total)	2400	NA	590[a]	X
	2-Methylnaphthalene	6500	NA	2.1[a]	X
	Barium	675	574.73	4[a]	X
	Beryllium	2.8	3.83	0.66[a]	
	Ethylbenzene	120	NA	7.3[a]	X
	Lead	28.9	3.88	3.1[b]	X
	Manganese	1070	5212.94	120[a]	
	Naphthalene	29000	NA	12[a]	X
	Phenanthrene	1200	NA	0.014[a]	X
	Xylene (total)	1200	NA	13[a]	X
SHP-S09-11	Barium	27.7	574.73	4[a]	
	Manganese	1130	5212.94	120[a]	
	Naphthalene	0.9	NA	12[a]	
	Phenanthrene	2	NA	0.014[a]	X
	Pyrene	3	NA	0.014[a]	X
SHP-S09-12	Barium	74.9	574.73	4[a]	
	Manganese	220	5212.94	120[a]	
	Pyrene	2	NA	0.014[a]	X

TABLE 6-69
GROUNDWATER ECOLGOCIAL COC SELECTION
OU-2 SOUTHEASTERN AREA, ALAMEDA POINT
(Page 5 of 5)

Notes:

Only the maximum concentration detected at the monitoring well located within 50 feet of the storm drain line is shown in the table.

a Screening value obtained from *Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Aquatic Biota:* 1996 Revision. ES/ES/TM-96/R2. June 1996.

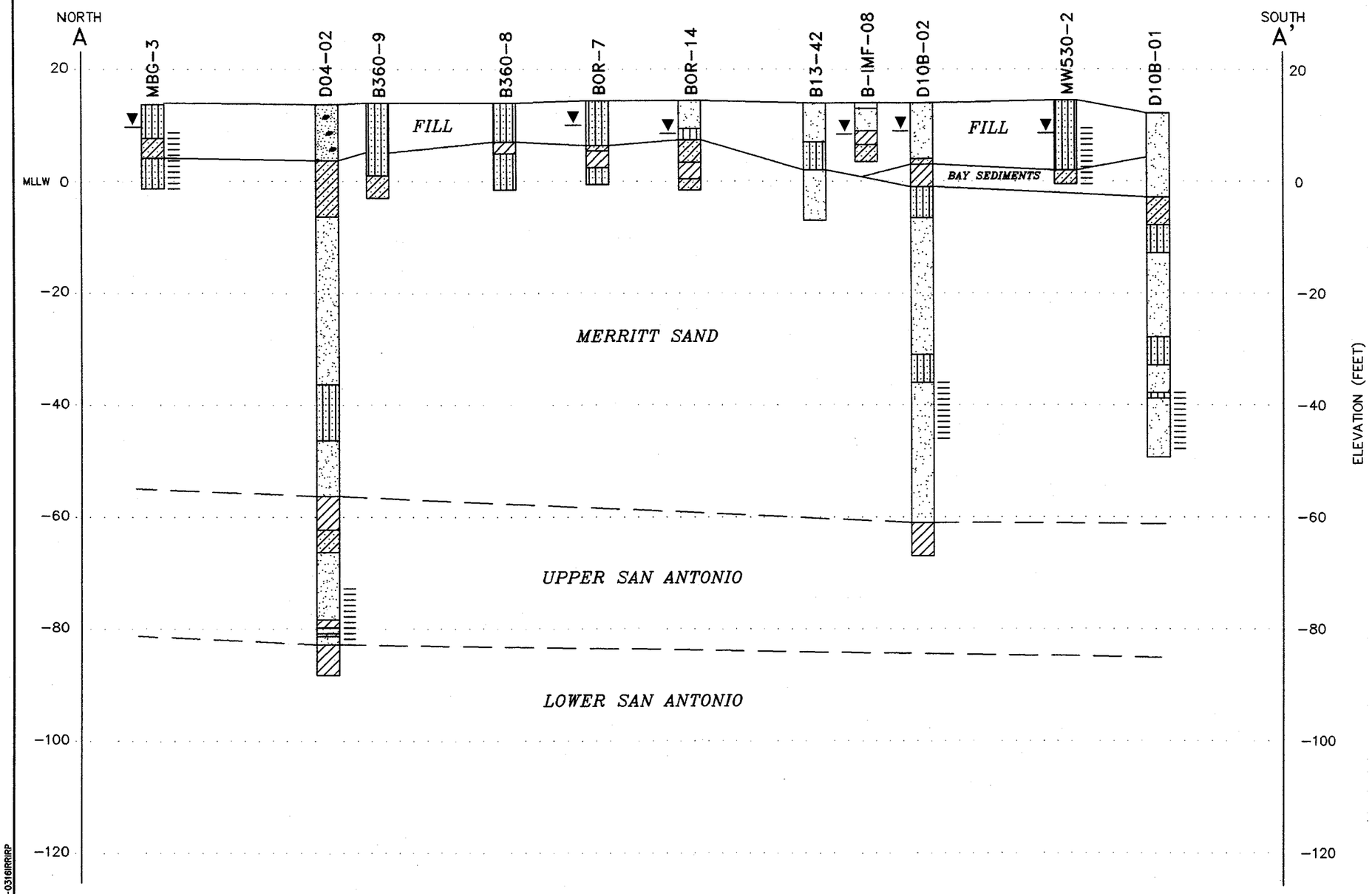
b Screening value obtained from *National Recommended Water Quality Criteria -- Correction.* EPA 822-Z-99-001. April 1999.

µg/L Microgram per liter
COC Chemical of concern
COPC Chemical of potential concern
NA Not available

FIGURES

DRAFT OU-2 REMEDIAL INVESTIGATION REPORT

DATED 29 JUNE 1999

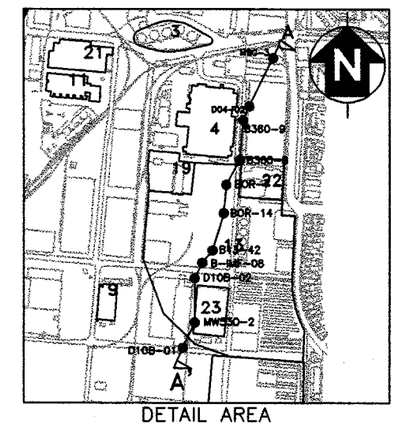


NOTE: VERTICAL EXAGGERATION IS 12.5X.

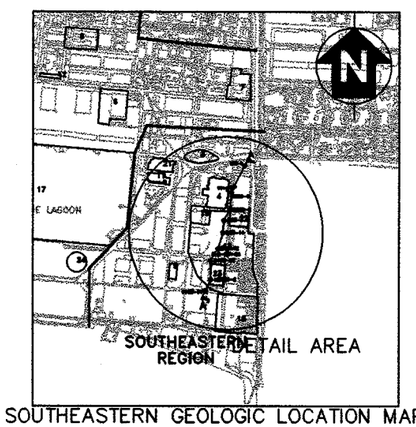
125' 0 125' 250'
HORIZONTAL SCALE: 1" = 250'

LEGEND

- GP – POORLY-GRADED GRAVELS
- SP – POORLY-GRADED SANDS
- SM – SILTY SANDS
- SC – CLAYEY SANDS
- ML – SANDY SILTS, SILTY CLAYS
- CL – SANDY CLAYS, SILTY CLAYS
- CONTACT
- INFERRED CONTACT
- APPROXIMATE WATER LEVEL MEASURED DURING DRILLING ACTIVITIES
- MONITORING WELL SCREENED INTERVAL
- MLLW MEAN LOWER LOW WATER



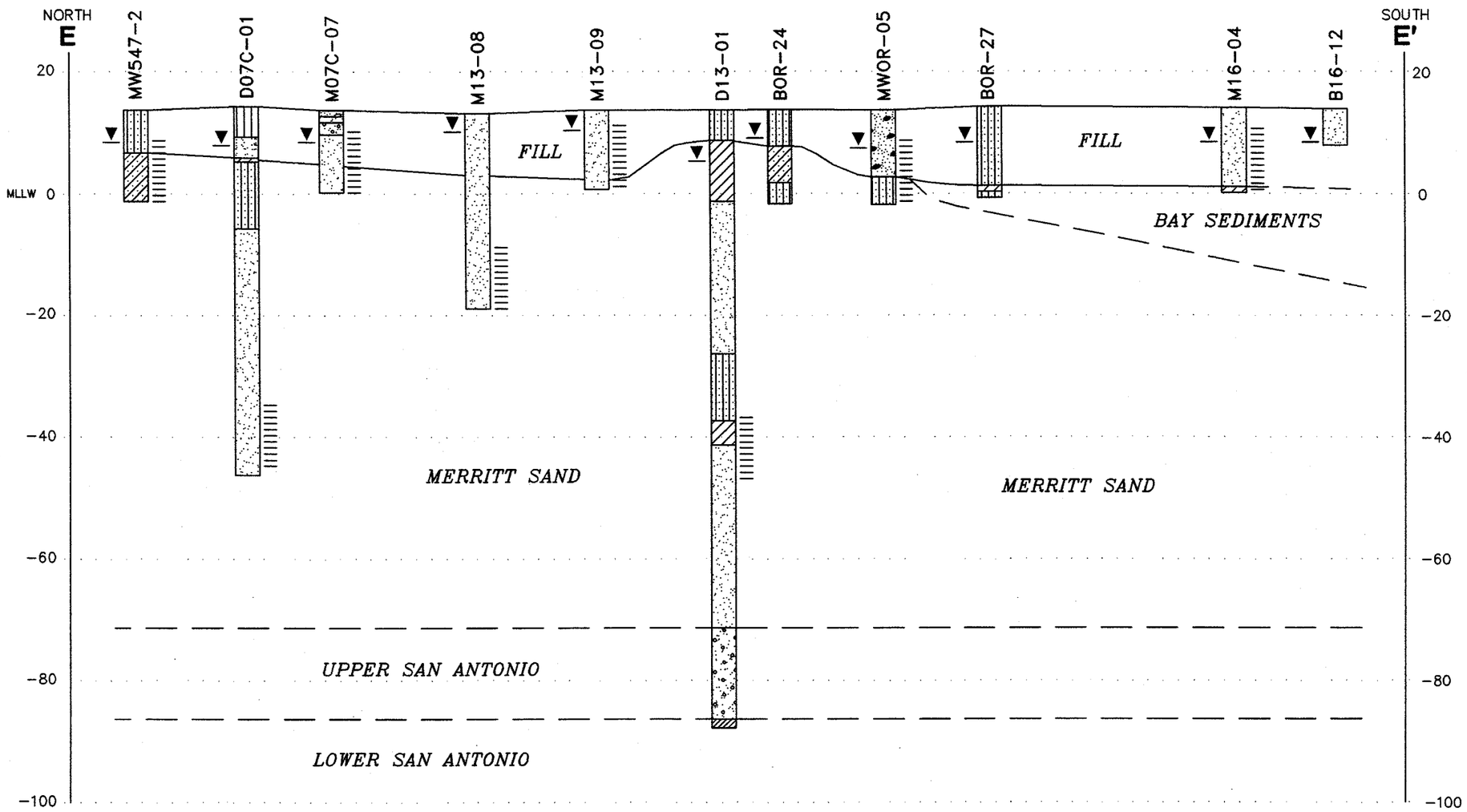
DETAIL AREA



SOUTHEASTERN GEOLOGIC LOCATION MAP

FIGURE 6-1
GEOLOGICAL CROSS SECTION A-A'
SOUTHEASTERN GEOLOGIC REGION
OU-2 SOUTHEAST AREA
ALAMEDA POINT
ALAMEDA, CALIFORNIA

4_YY.DWG – 05/15/99 – JHD – 044-0316RRIRP

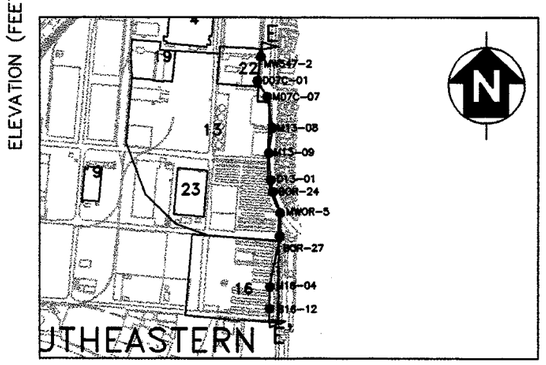


NOTE: VERTICAL EXAGGERATION IS 10X.

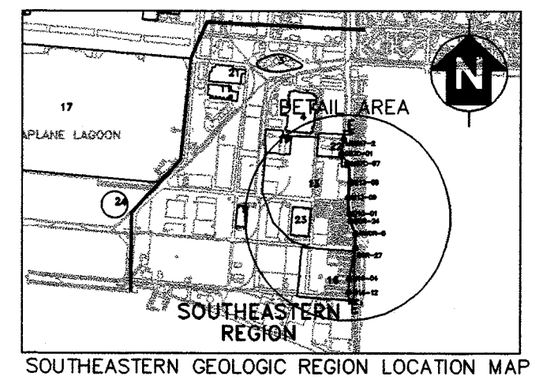
100' 0 100' 200'
HORIZONTAL SCALE: 1" = 200'

LEGEND

- GW – WELL-GRADED GRAVELS
- GP – POORLY-GRADED GRAVELS
- SW – WELL-GRADED SANDS
- SP – POORLY-GRADED SANDS
- SM – SILTY SANDS
- SC – CLAYEY SANDS
- ML – SANDY SILTS, SILTY CLAYS
- CL – SANDY CLAYS, SILTY CLAYS
- CH – ORGANIC CLAYS, HIGH PLASTICITY
- CONTACT
- INFERRED CONTACT
- APPROXIMATE WATER LEVEL MEASURED DURING DRILLING ACTIVITIES
- MONITORING WELL SCREENED INTERVAL
- MLLW MEAN LOWER LOW WATER



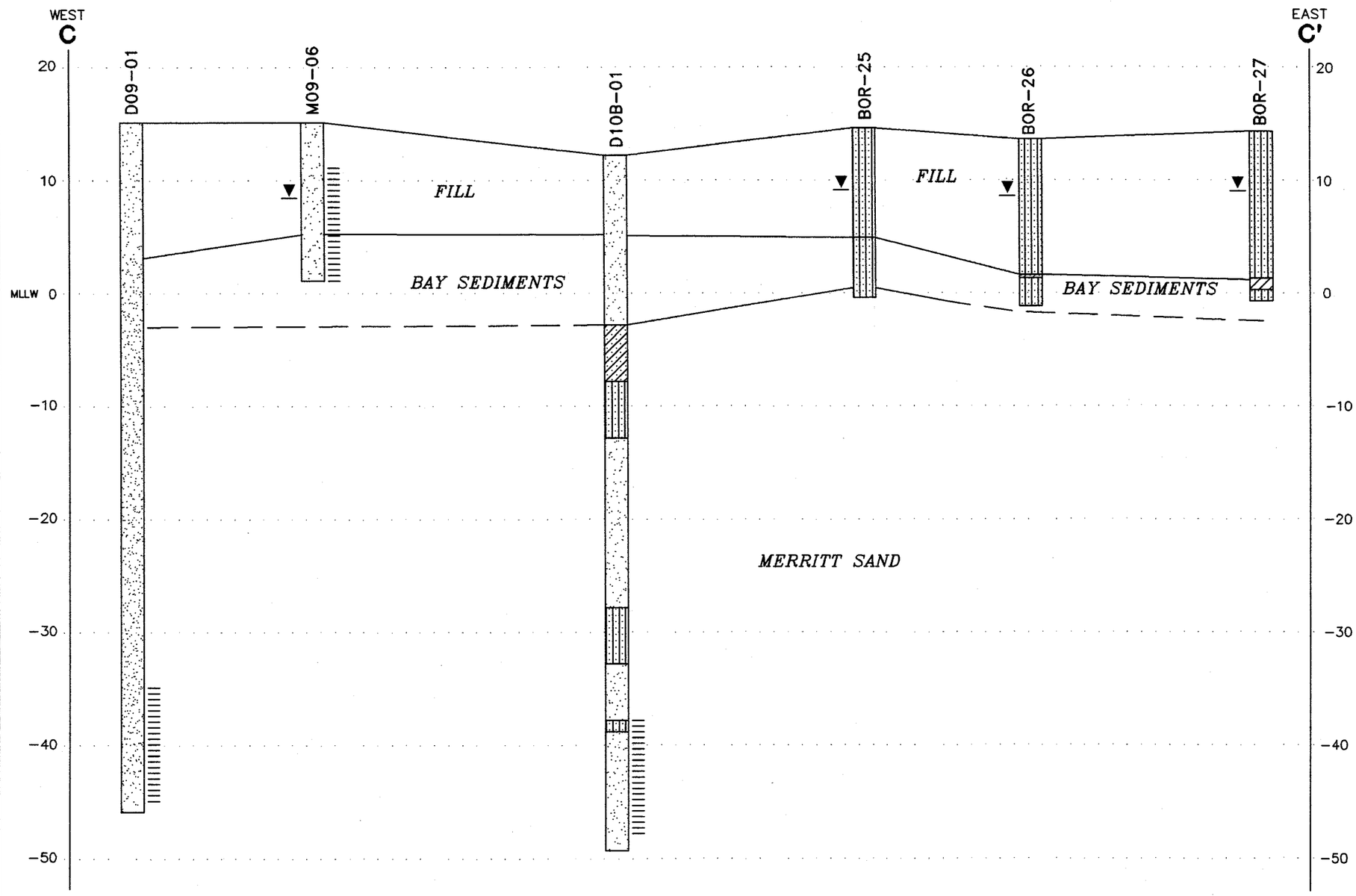
DETAIL AREA



SOUTHEASTERN GEOLOGIC REGION LOCATION MAP

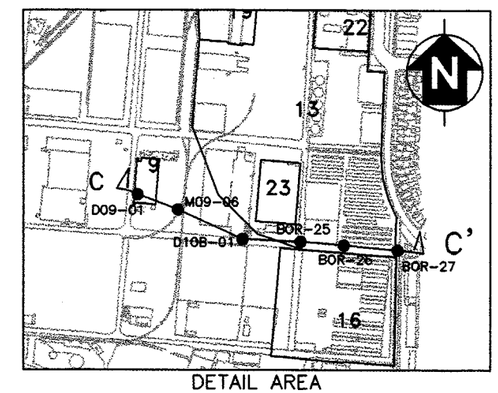
FIGURE 6-2
GEOLOGICAL CROSS SECTION E-E'
SOUTHEASTERN GEOLOGIC REGION
OU-2 SOUTHEAST AREA
ALAMEDA POINT
ALAMEDA, CALIFORNIA

4_Y2.DWG - OU_ /99 - JHD - 044-0316RRIRP

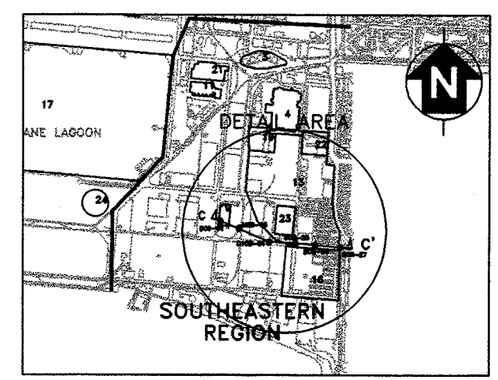


LEGEND

- SP – POORLY-GRADED SANDS
- SM – SILTY SANDS
- SC – CLAYEY SANDS
- CL – SANDY CLAYS, SILTY CLAYS
- CONTACT
- INFERRED CONTACT
- APPROXIMATE WATER LEVEL MEASURED DURING DRILLING ACTIVITIES
- MONITORING WELL SCREENED INTERVAL
- MLLW MEAN LOWER LOW WATER



DETAIL AREA



SOUTHEASTERN GEOLOGIC LOCATION MAP

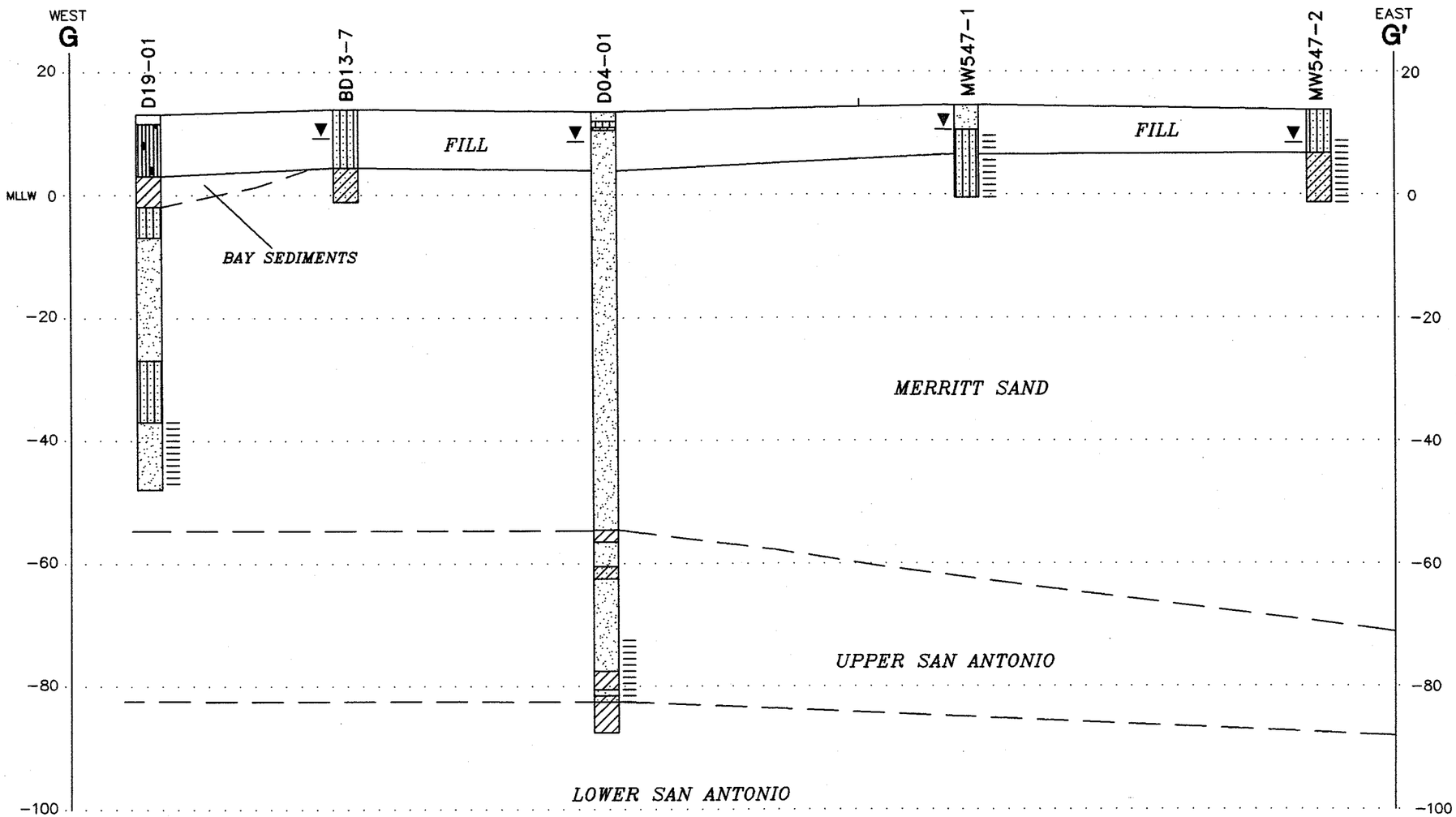
75' 0 75' 150'

HORIZONTAL SCALE: 1" = 150'

NOTE: VERTICAL EXAGGERATION IS 15X.

FIGURE 6-3
GEOLOGICAL CROSS SECTION C-C'
SOUTHEASTEN GEOLOGIC REGION
OU-2 SOUTHEAST AREA
ALAMEDA POINT
ALAMEDA, CALIFORNIA

4_X3.DWG – 05/14/99 – JHD – 044-0316IRRIRP



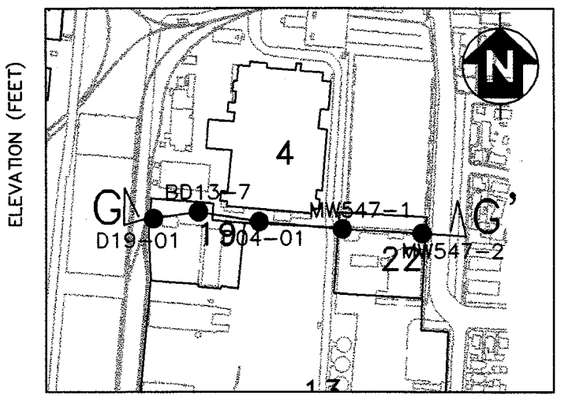
NOTE: VERTICAL EXAGGERATION IS 5X.

50' 0 50' 100'
HORIZONTAL SCALE: 1" = 100'

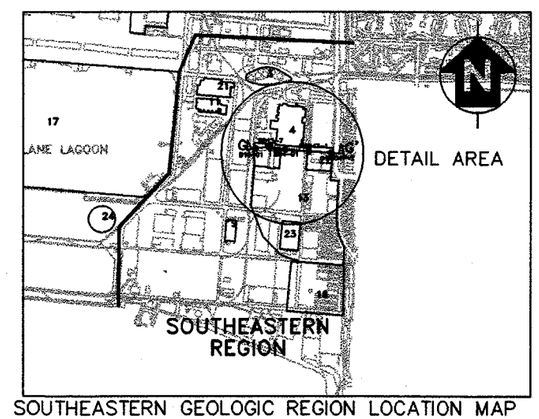
LEGEND

- GM – SILTY GRAVELS
- SP – POORLY-GRADED SANDS
- SM – SILTY SANDS
- SC – CLAYEY SANDS
- ML – SANDY SILTS, SILTY CLAYS
- CL – SANDY CLAYS, SILTY CLAYS
- CONTACT
- INFERRED CONTACT
- APPROXIMATE WATER LEVEL MEASURED DURING DRILLING ACTIVITIES
- MONITORING WELL SCREENED INTERVAL

MLLW MEAN LOWER LOW WATER



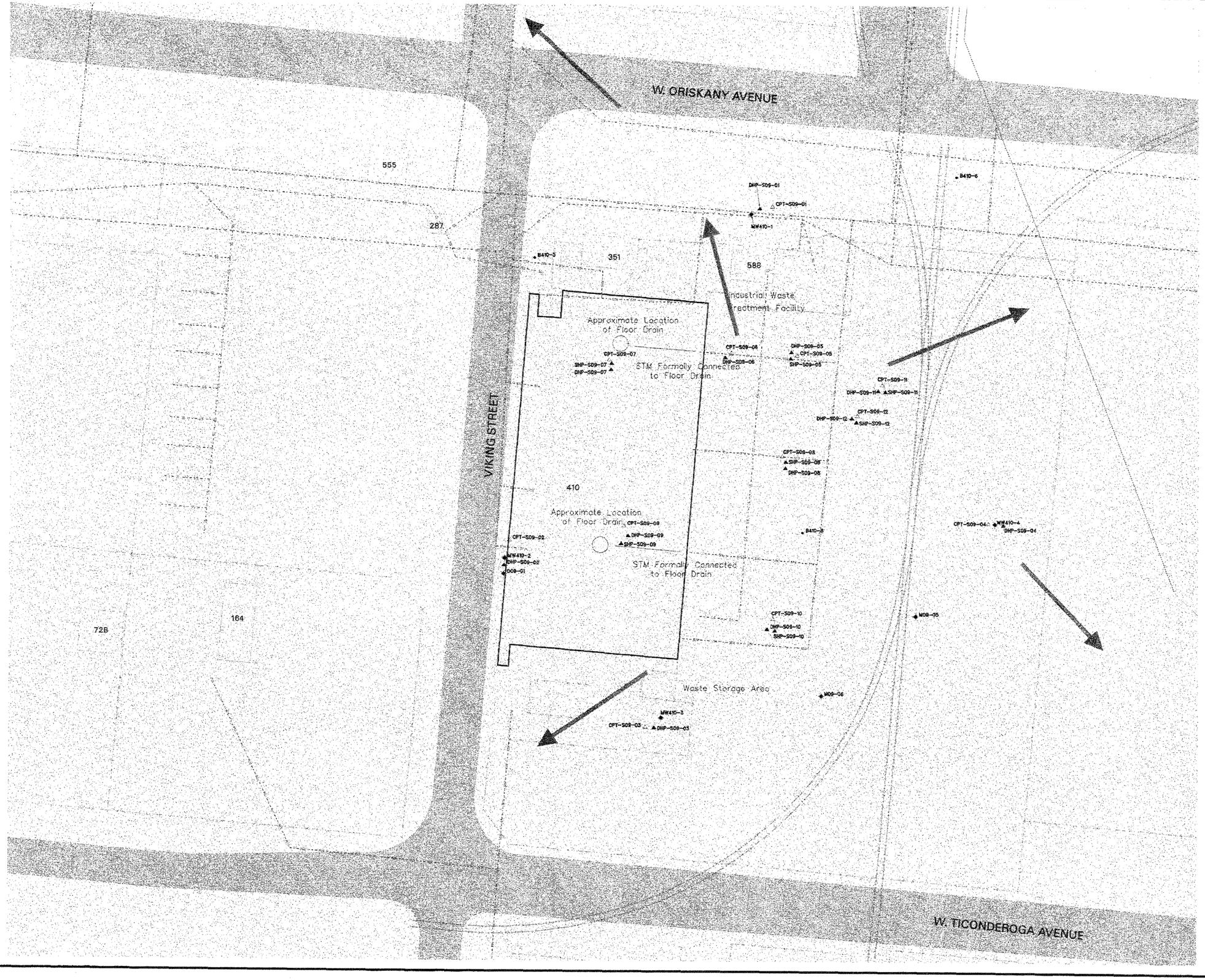
DETAIL AREA



SOUTHEASTERN GEOLOGIC REGION LOCATION MAP

FIGURE 6-4
GEOLOGICAL CROSS SECTION G-G'
SOUTHEASTERN GEOLOGIC REGION
OU-2 SOUTHEAST AREA
ALAMEDA POINT
ALAMEDA, CALIFORNIA

4_XX.DWG – 05/15/99 – JHD – 044-0316IRIRIRP



LEGEND

- MONITORING WELL LOCATION
- SOIL BORING
- HYDROPUNCH LOCATION
- CONE PENETROMETER TEST
- GEOPROBE
- SURFACE SOIL SAMPLE
- EXCAVATION SAMPLE
- STORM DRAIN LINE
- SANITARY SEWER LINE
- FUEL LINE (ABANDONED/REMOVED AS OF 12/86)
- INDUSTRIAL WASTE LINE
- FENCE
- RAILROAD
- LOCAL GROUNDWATER FLOW DIRECTION
- PAVED ROAD OR PARKING LOT
- BUILDING, CONCRETE, PAVED, OR COVERED AREA
- INSTALLATION RESTORATION SITE
- 517 BUILDING AND BUILDING NUMBER

NOTES:

1. UTILITY LOCATIONS ARE APPROXIMATE.
2. GROUNDWATER FLOW DIRECTION BASED ON APRIL 1998 WATER ELEVATION DATA.

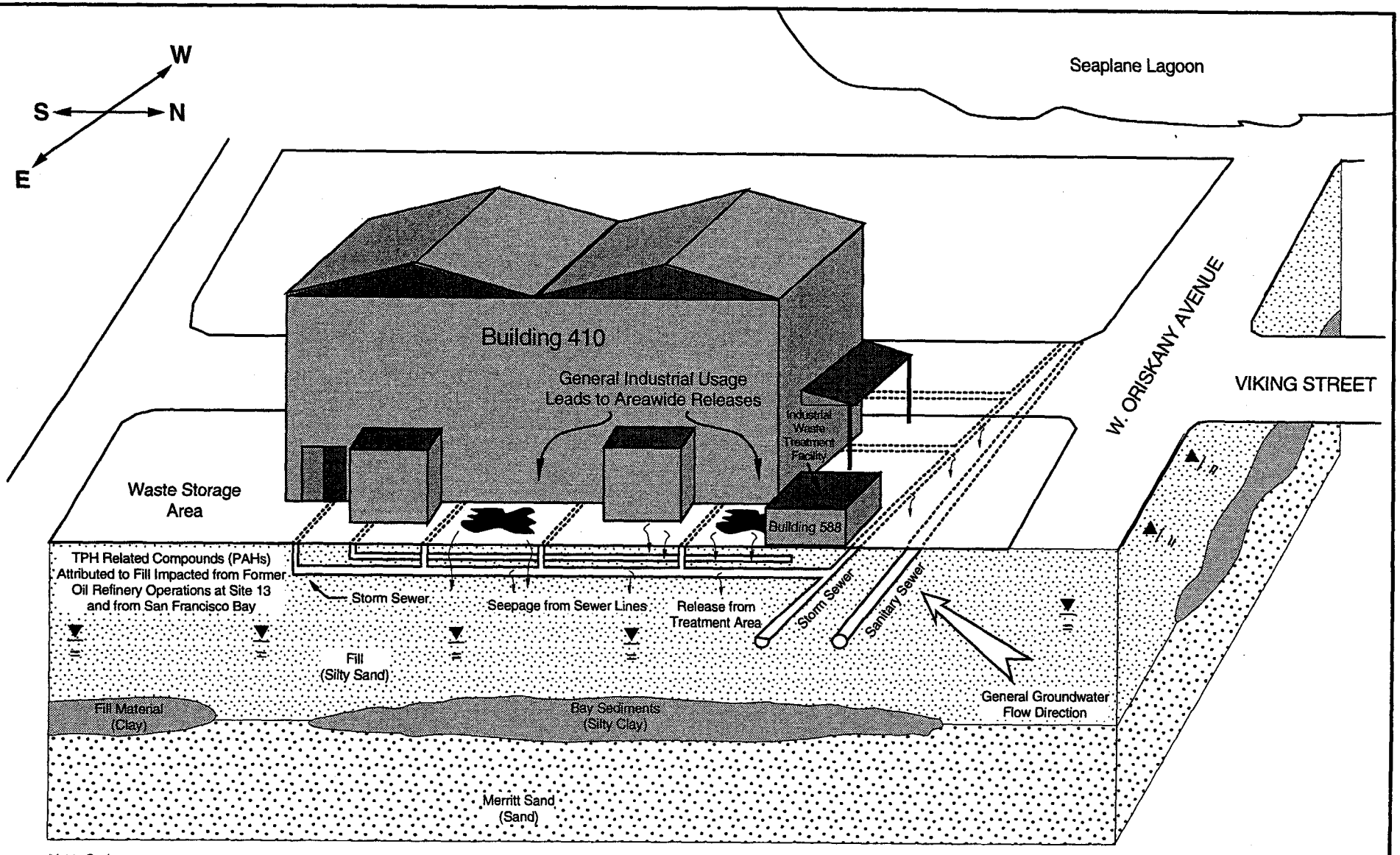
ACRONYMS:

OU-2 - OPERABLE UNIT 2

N

15 0 15 30
SCALE: 1" = 30'

FIGURE 6-5
SITE 9
SOIL AND GROUNDWATER SAMPLE LOCATION MAP
OU-2 SOUTHEAST AREA
ALAMEDA POINT
ALAMEDA, CALIFORNIA



Not to Scale

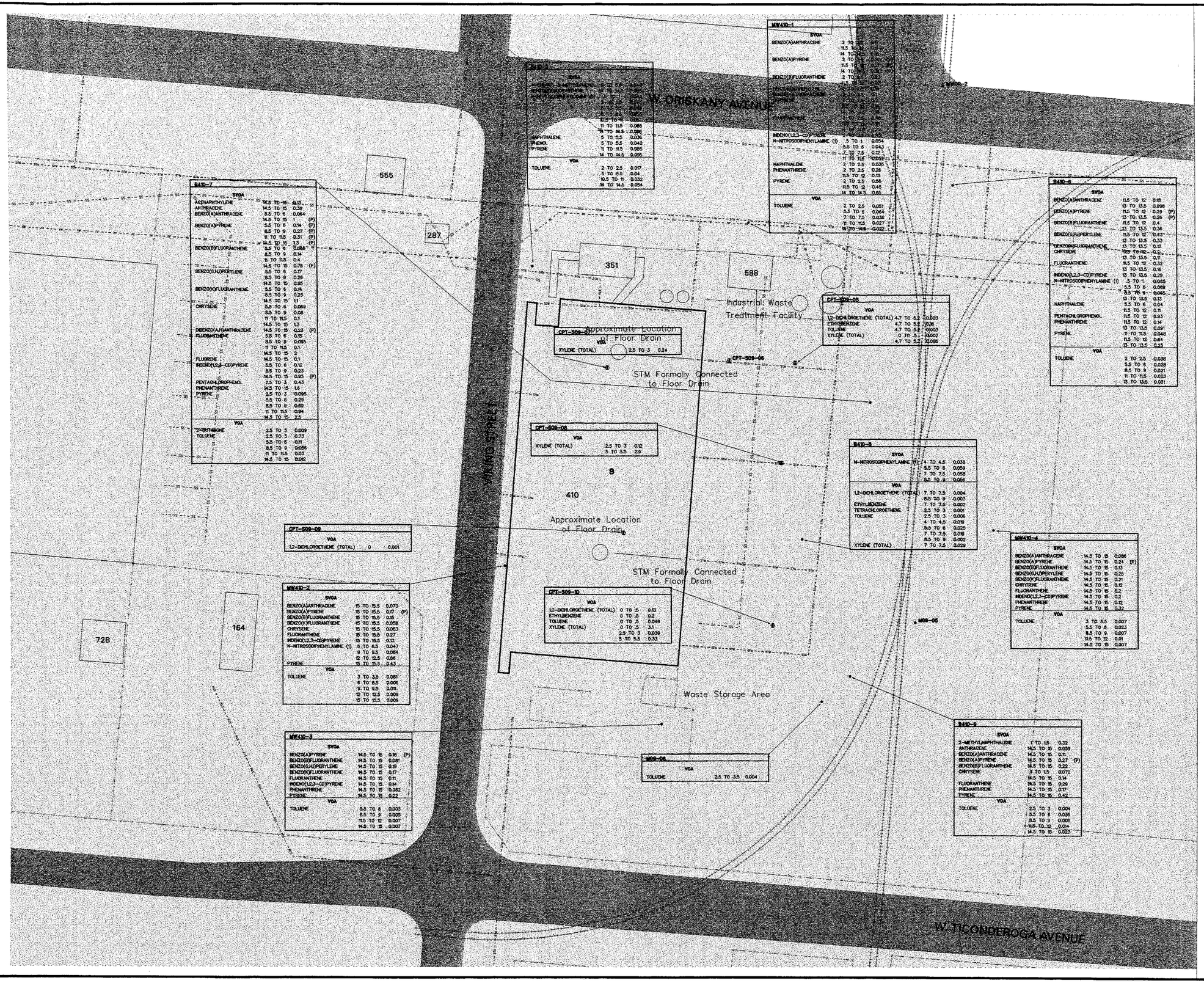
Water table elevation

TPH Total Petroleum Hydrocarbons

PAH Polycyclic Aromatic Hydrocarbons

FIGURE 6-6
CONCEPTUAL MODEL
SITE 9
BUILDING 410 PAINT STRIPPING
OU-2 SOUTHEAST AREA
ALAMEDA POINT
ALAMEDA, CALIFORNIA

G0069-167B0302 SITE9C.DSF GAS 5/17/99



LEGEND

- EXCAVATION SAMPLE LOCATION
- SURFACE SAMPLE LOCATION
- SOIL BORING LOCATION
- SOIL PUNCH
- STORM DRAIN LINE
- SANITARY SEWER LINE
- STEAM LINE
- FUEL LINE (ABANDONED/REMOVED AS OF 12/98)
- INDUSTRIAL WASTE LINE
- FENCE
- RAILROAD
- PAVED ROAD OR PARKING LOT
- BUILDING, CONCRETE, PAVED, OR COVERED AREA
- 517 BUILDING AND BUILDING NUMBER
- INSTALLATION RESTORATION SITE BOUNDARY

SAMPLE ID — B06-09
COMPOUND CLASS — SVOA — SAMPLE DEPTH (FEET BGS)
ANALYTE — BENZO(A)PYRENE 14 to 15.3 1.5 — CONCENTRATION (mg/kg)
4 to 14 9.6 (P) — QUALIFIER

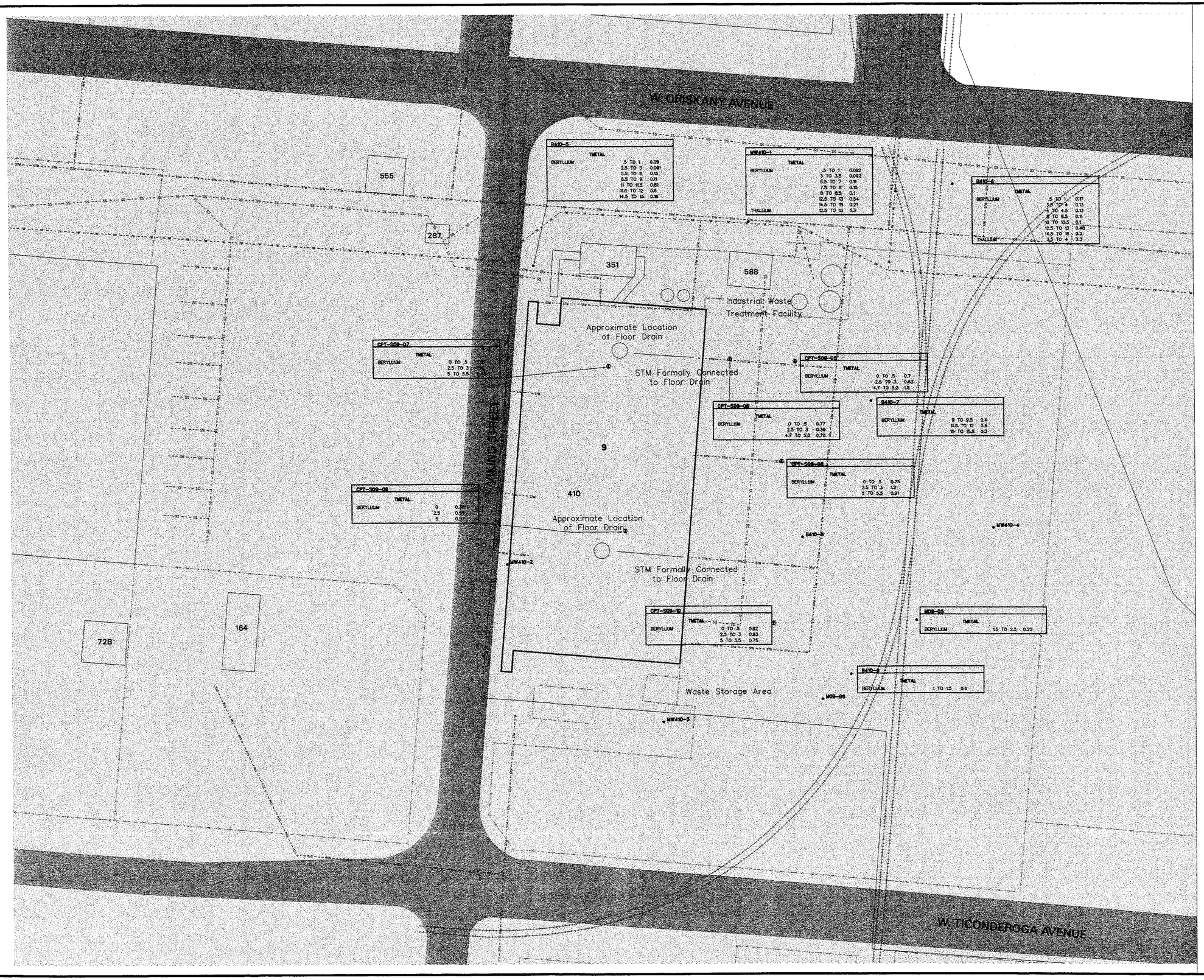
QUALIFIERS:
P – CONCENTRATION EXCEEDS RESIDENTIAL PRG FOR THE ANALYTE

NOTES:
1. ANALYTES NOT ANALYZED FOR OR NOT DETECTED ARE NOT SHOWN ON THIS MAP. A LIST OF ANALYSES PERFORMED FOR EACH SAMPLE IS PRESENTED IN THE SAMPLING SUMMARY FOLLOWING CHAPTER 6. ANALYTICAL DATA ARE PRESENTED IN APPENDIX H.
2. A SAMPLE POINT ON THE MAP WITHOUT A DATA BOX INDICATES NO DETECTIONS.

ACRONYMS:
BGS – BELOW GROUND SURFACE
mg/kg – MILLIGRAMS PER KILOGRAM
OU-2 – OPERABLE UNIT 2
PRG – PRELIMINARY REMEDIATION GOAL
SVOA – SEMIVOLATILE ORGANIC ANALYSIS
VOA – VOLATILE ORGANIC ANALYSIS

15 0 15 30
SCALE: 1" = 30'

FIGURE 6-7
SITE 9
ORGANIC COMPOUNDS DETECTED IN SOIL
OU-2 SOUTHEAST AREA
ALAMEDA POINT
ALAMEDA, CALIFORNIA



LEGEND

- EXCAVATION SAMPLE LOCATION
- SURFACE SAMPLE LOCATION
- SOIL BORING LOCATION
- SOIL PUNCH
- STORM DRAIN LINE
- SANITARY SEWER LINE
- STEAM LINE
- FUEL LINE (ABANDONED/REMOVED AS OF 12/98)
- INDUSTRIAL WASTE LINE
- FENCE
- RAILROAD
- PAVED ROAD OR PARKING LOT
- BUILDING, CONCRETE, PAVED, OR COVERED AREA
- 517 BUILDING AND BUILDING NUMBER
- INSTALLATION RESTORATION SITE BOUNDARY

SAMPLE ID — B06-09
COMPOUND CLASS — TMETAL
ANALYTE — ARSENIC 2.5 to 11 3.9 — SAMPLE DEPTH (FEET BGS)
4 to 14 9.6 (P) — CONCENTRATION (mg/kg)
QUALIFIER

QUALIFIERS:
P – CONCENTRATION EXCEEDS RESIDENTIAL PRG FOR THE ANALYTE

NOTES:
1. THIS MAP SHOWS CONCENTRATIONS OF METALS EXCEEDING AN FOD OF 5 PERCENT AND THE BACKGROUND CONCENTRATION FOR EACH METAL PRESENTED IS IN THE REPORT.
2. ANALYTES NOT ANALYZED FOR OR NOT DETERMINED TO BE COPCs ARE NOT SHOWN ON THIS MAP. A LIST OF ANALYSES PERFORMED FOR EACH SAMPLE IS PRESENTED IN THE SAMPLING SUMMARY FOLLOWING CHAPTER 6. ANALYTICAL DATA ARE PRESENTED IN APPENDIX H. A SAMPLE POINT ON THE MAP WITHOUT A DATA BOX INDICATES NO DETECTIONS OF COPCs.
3. CHEMICALS PRESENTED ARE INCLUSIVE OF HUMAN HEALTH AND ECOLOGICAL COPCs. NOT ALL CHEMICALS PRESENTED ARE ECOLOGICAL COPCs. A LIST OF ECOLOGICAL COPCs IS PRESENTED IN THE SITE-SPECIFIC ECOLOGICAL RISK ASSESSMENT.

ACRONYMS:
BGS – BELOW GROUND SURFACE
COPC – CHEMICAL OF POTENTIAL CONCERN
FOD – FREQUENCY OF DETECTION
OU-2 – OPERABLE UNIT 2
PRG – PRELIMINARY REMEDIATION GOAL
mg/kg – MILLIGRAMS PER KILOGRAM
TMETAL – TOTAL METALS

N

15 0 15 30
SCALE: 1" = 30'

FIGURE 6-8
SITE 9
INORGANIC COPCS
DETECTED IN SOIL
OU-2 SOUTHEAST AREA
ALAMEDA POINT
ALAMEDA, CALIFORNIA

LEGEND

- MONITORING WELL LOCATION
- SOIL BORING
- HYDROPUNCH LOCATION
- CONE PENETROMETER TEST
- GEOPROBE
- SURFACE SOIL SAMPLE
- EXCAVATION SAMPLE
- STORM DRAIN LINE
- SANITARY SEWER LINE
- FUEL LINE (ABANDONED/REMOVED AS OF 12/98)
- INDUSTRIAL WASTE LINE
- FENCE
- RAILROAD
- REGIONAL GROUNDWATER FLOW DIRECTION
- PAVED ROAD OR PARKING LOT
- BUILDING, CONCRETE, PAVED, OR COVERED AREA
- INSTALLATION RESTORATION SITE
- 517 BUILDING AND BUILDING NUMBER
- TANK
- APPROXIMATE HISTORICAL PROPERTY BOUNDARY OF PACIFIC COAST OIL REFINERY

NOTES:

1. UTILITY LOCATIONS ARE APPROXIMATE.
2. GROUNDWATER FLOW DIRECTION BASED ON APRIL 1998 WATER ELEVATION DATA.
3. UST LOCATIONS FROM "FUEL LINE AND UNDERGROUND STORAGE TANK MAP, DECEMBER 22, 1998, ALAMEDA POINT" FIELD CHECKED 3/29/99.
4. LOCAL GROUNDWATER FLOW DIRECTIONS MAY BE DIFFERENT FROM REGIONAL GROUNDWATER FLOW DIRECTION DUE TO TIDAL FLUCTUATION, INTERCEPTED STORM DRAINAGE LINES, AND LEAKING WATER SUPPLY LINES.

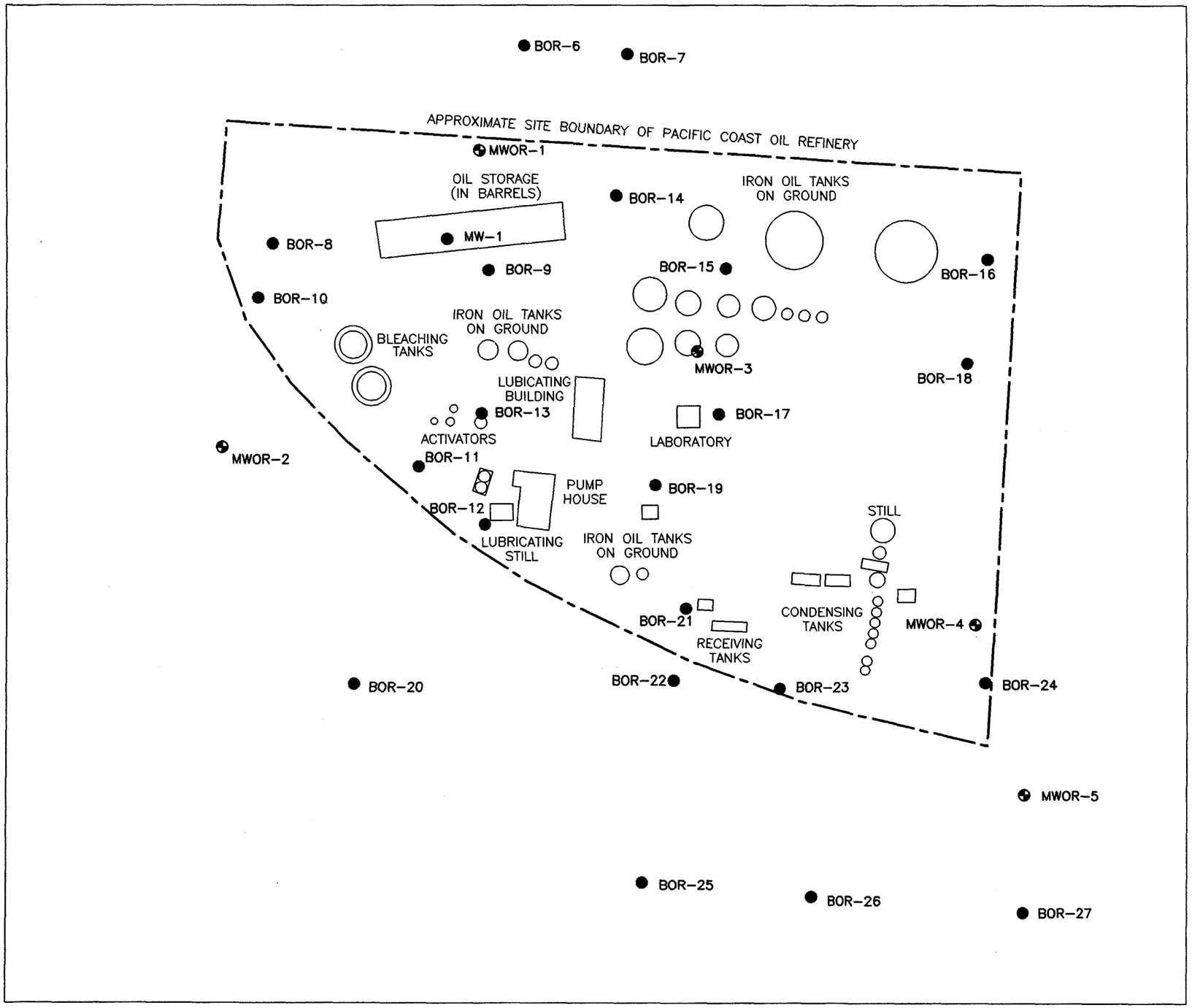
ACRONYMS:

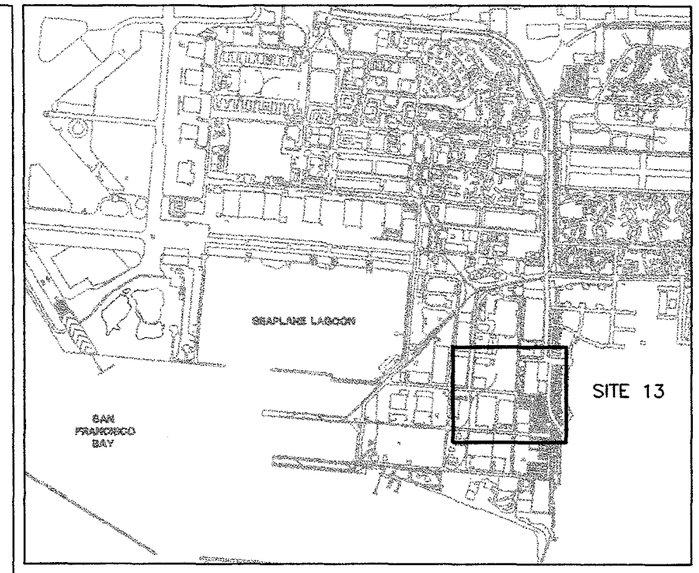
OU-2 – OPERABLE UNIT 2

AST – ABOVEGROUND STORAGE TANK

40 0 40 80
SCALE: 1" = 80'

FIGURE 6-9
SITE 13
SOIL AND GROUNDWATER SAMPLE LOCATION MAP
OU-2 SOUTHEAST AREA
ALAMEDA POINT
ALAMEDA, CALIFORNIA





LEGEND

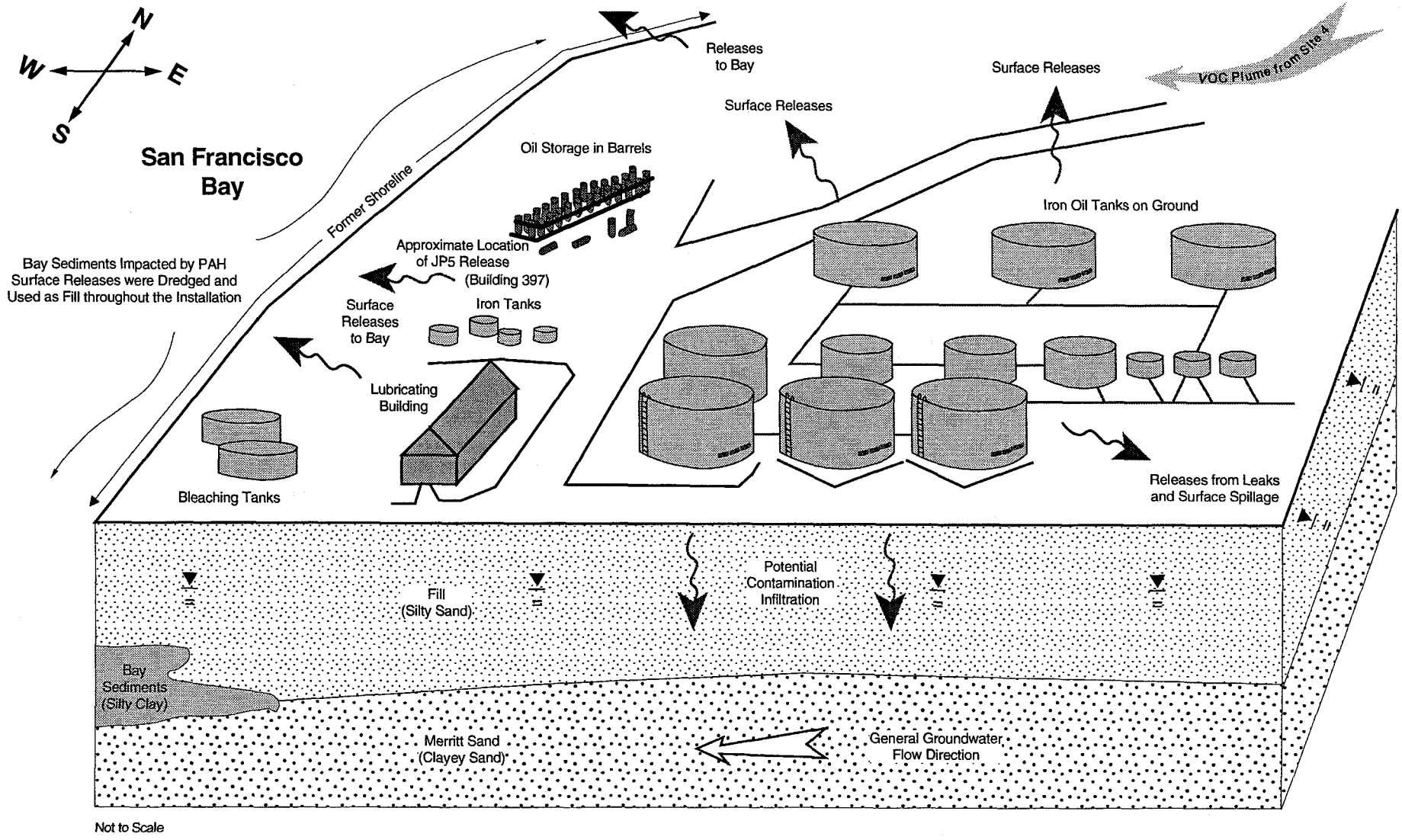
● CANONIE SOIL BORING LOCATION

⊕ CANONIE MONITORING WELL LOCATION

80' 0 80' 160'
SCALE: 1" = 160'

FIGURE 6-10
ALAMEDA POINT
ALAMEDA, CALIFORNIA
SITE 13-HISTORICAL STRUCTURES
PACIFIC COAST OIL REFINERY CIRCA 1897
OU-2 SOUTH EAST AREA

DATE: 05/20/99 MVT DN FILE NAME:R:\CAD\089\167B\HIST-STRU.DWG



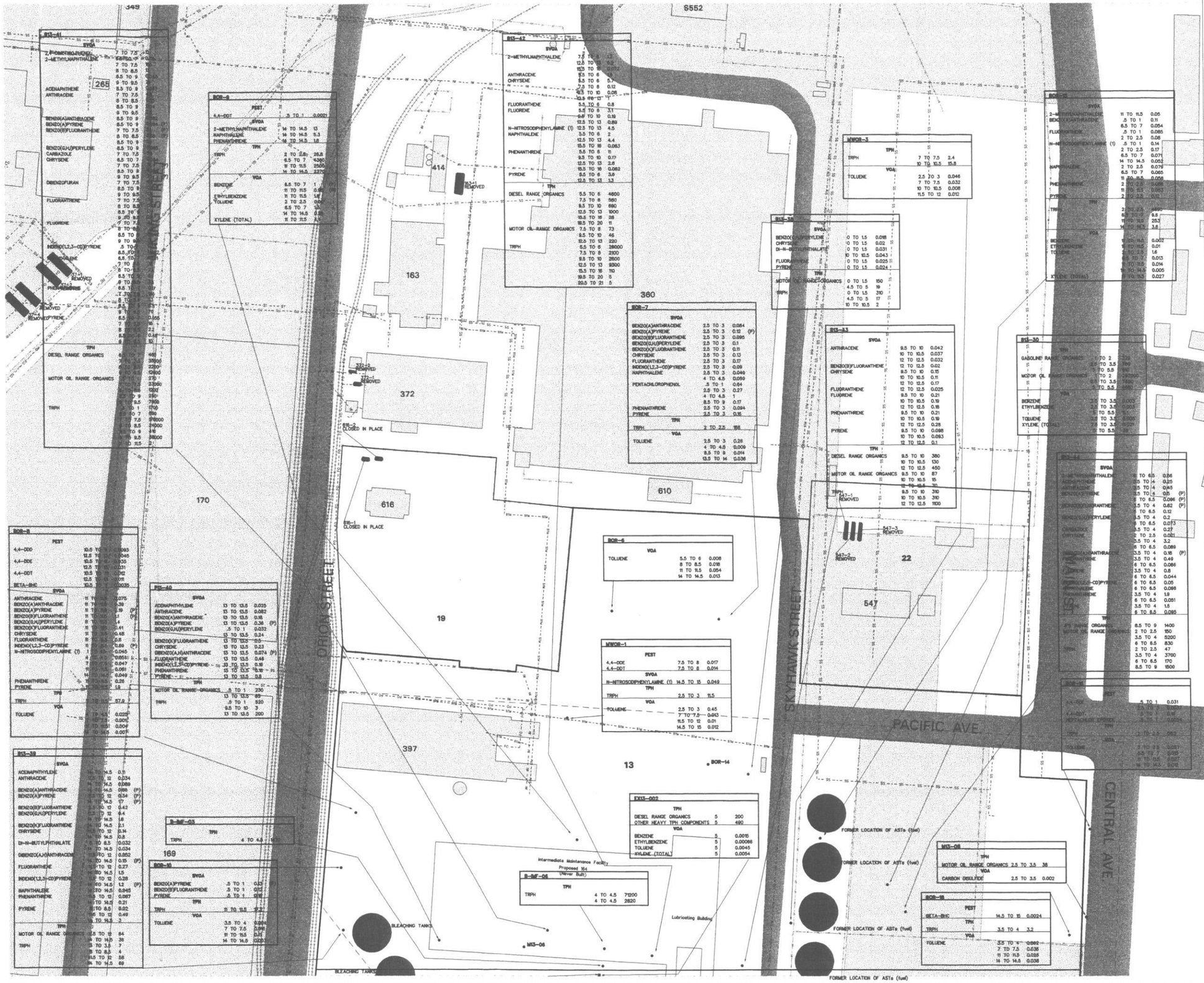
Not to Scale

Water table elevation

PAH Polycyclic Aromatic Hydrocarbons

FIGURE 6-11
CONCEPTUAL MODEL
SITE 13
FORMER PACIFIC COAST
OIL REFINERY CIRCA 1867 - 1903
OU-2 SOUTHEAST AREA
ALAMEDA POINT
ALAMEDA, CALIFORNIA

G0069-167B0302 SITE13D.DSF GAS 6/13/99



LOCATION MAP

SHEET 1 OF 3

INFORMATION OUTSIDE OF IR SITE BOUNDARY PRESENTED SEPARATELY

LEGEND

- EXCAVATION SAMPLE LOCATION
- SURFACE SAMPLE LOCATION
- SOIL BORING LOCATION
- SOIL PUNCH
- STORM DRAIN LINE
- SANITARY SEWER LINE
- STEAM LINE
- FUEL LINE (ABANDONED/REMOVED AS OF 12/98)
- INDUSTRIAL WASTE LINE
- FENCE
- RAILROAD
- PAVED ROAD OR PARKING LOT
- BUILDING, CONCRETE, PAVED, OR COVERED AREA
- 517 BUILDING AND BUILDING NUMBER
- INSTALLATION RESTORATION SITE BOUNDARY
- TANK
- APPROXIMATE HISTORICAL PROPERTY BOUNDARY OF PACIFIC COAST OIL REFINERY

SAMPLE ID — BOR-09
COMPOUND CLASS — SVOA — SAMPLE DEPTH (FEET BGS)
ANALYTE — BENZO(A)PYRENE 14 to 15.3 1.5 — CONCENTRATION (mg/kg)
4 to 14 9.6 (P) — QUALIFIER

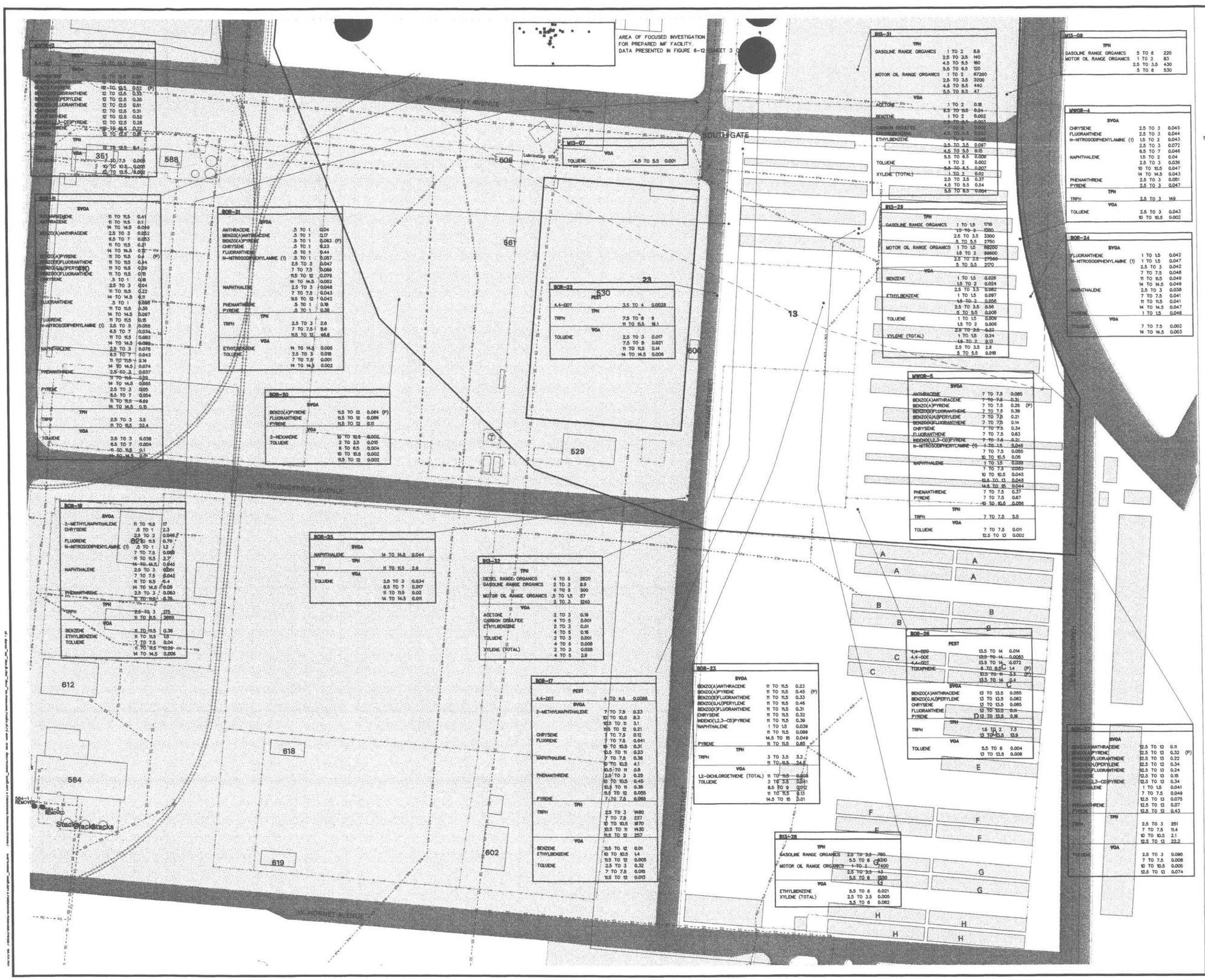
QUALIFIERS:
P – CONCENTRATION EXCEEDS RESIDENTIAL PRG FOR THE ANALYTE

NOTES:
1. ANALYTES NOT ANALYZED FOR OR NOT DETECTED ARE NOT SHOW ON THIS MAP. A LIST OF ANALYSES PERFORMED FOR EACH SAMPLE IS PRESENTED IN THE SAMPLING SUMMARY FOLLOWING CHAPTER 6. ANALYTICAL DATA ARE PRESENTED IN APPENDIX H. A SAMPLE POINT ON THE MAP WITHOUT A DATA BOX INDICATES NO DETECTIONS.
2. UST LOCATIONS FROM "FUEL LINE AND UNDERGROUND STORAGE TANK MAP, DECEMBER 22, 1998, ALAMEDA POINT" FIELD CHECKED 3/29/99.

ACRONYMS:
BGS – BELOW GROUND SURFACE
mg/kg – MILLIGRAMS PER KILOGRAM
OU-2 – OPERABLE UNIT
PEST – PESTICIDES
PRG – PRELIMINARY REMEDIATION GOAL
SVOA – SEMIVOLATILE ORGANIC ANALYSIS
TPHEXT – TOTAL PETROLEUM HYDROCARBONS (EXTRACTABLE)
TPHPRG – TOTAL PETROLEUM HYDROCARBONS (PURGEABLE)
TRPH – TOTAL RECOVERABLE PETROLEUM HYDROCARBONS
UST – UNDERGROUND STORAGE TANK
VOA – VOLATILE ORGANIC ANALYSIS

30 0 30 60
SCALE: 1" = 60'

FIGURE 6-12 (SHEET 1 OF 3)
SITE 13
ORGANIC COMPOUNDS DETECTED IN SOIL
OU-2 SOUTHEAST AREA
ALAMEDA POINT
ALAMEDA, CALIFORNIA



LOCATION MAP

INFORMATION OUTSIDE OF IR SITE BOUNDARY PRESENTED SEPARATELY

LEGEND

- EXCAVATION SAMPLE LOCATION
- SURFACE SAMPLE LOCATION
- SOIL BORING LOCATION
- SOIL PUNCH
- STORM DRAIN LINE
- SANITARY SEWER LINE
- STEAM LINE
- FUEL LINE (ABANDONED/REMOVED AS OF 12/98)
- INDUSTRIAL WASTE LINE
- FENCE
- RAILROAD
- PAVED ROAD OR PARKING LOT
- BUILDING, CONCRETE, PAVED, OR COVERED AREA
- 517 BUILDING AND BUILDING NUMBER
- INSTALLATION RESTORATION SITE BOUNDARY
- TANK
- APPROXIMATE HISTORICAL PROPERTY BOUNDARY OF PACIFIC COAST OIL REFINERY

SAMPLE ID — B06-09
COMPOUND CLASS — SVOA — SAMPLE DEPTH (FEET BGS)
ANALYTE — BENZO(A)PYRENE 14 to 15.3 1.5 — CONCENTRATION (mg/kg)
4 to 14 9.6 (P) — QUALIFIER

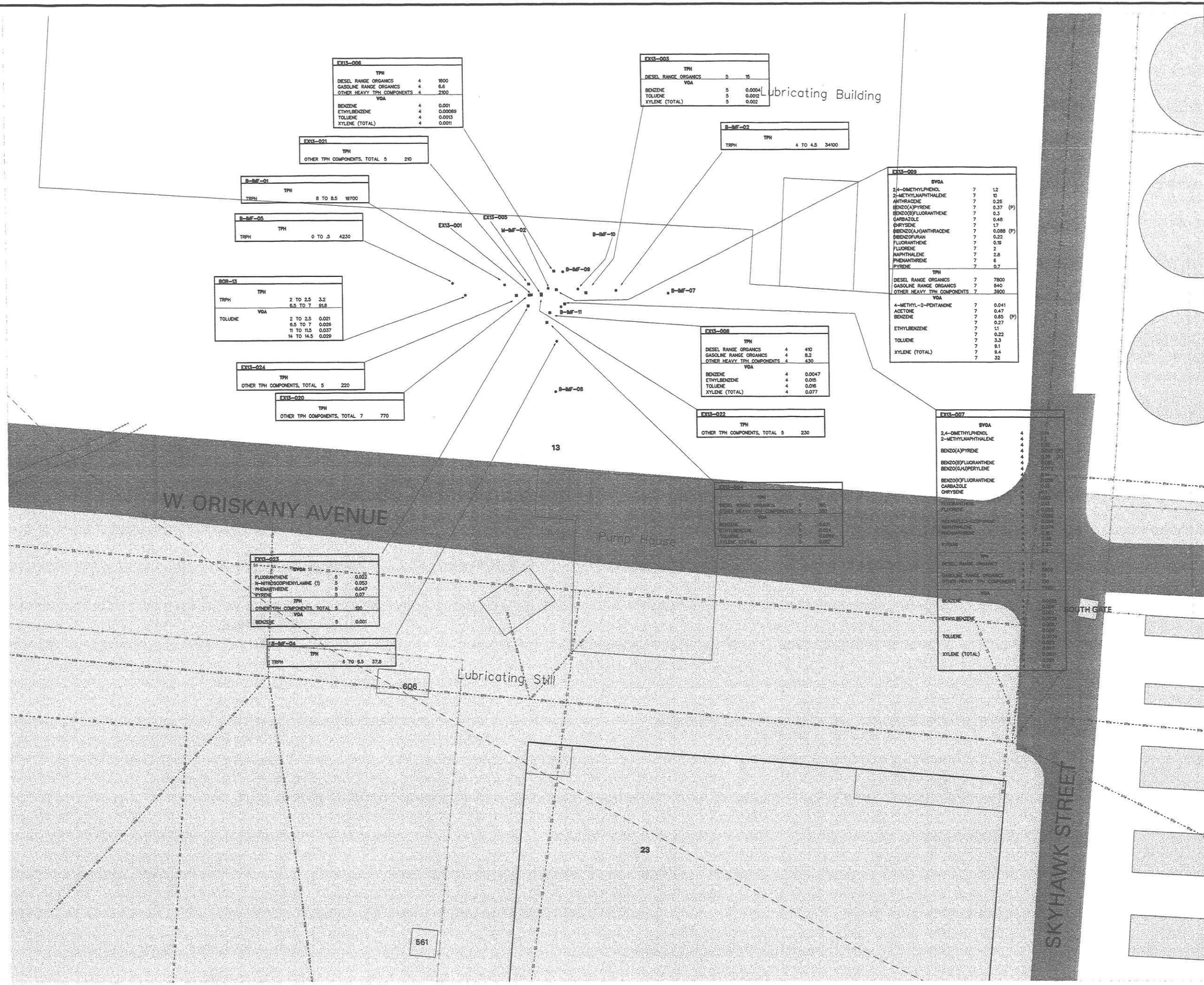
QUALIFIERS:
P – CONCENTRATION EXCEEDS RESIDENTIAL PRG FOR THE ANALYTE

NOTES:
1. ANALYTES NOT ANALYZED FOR OR NOT DETECTED ARE NOT SHOWN ON THIS MAP. A LIST OF ANALYSES PERFORMED FOR EACH SAMPLE IS PRESENTED IN THE SAMPLING SUMMARY FOLLOWING CHAPTER 6. ANALYTICAL DATA ARE PRESENTED IN APPENDIX H. A SAMPLE POINT ON THE MAP WITHOUT A DATA BOX INDICATES NO DETECTIONS.
2. UST LOCATIONS FROM "FUEL LINE AND UNDERGROUND STORAGE TANK MAP, DECEMBER 22, 1998, ALAMEDA POINT" FIELD CHECKED 3/29/99.

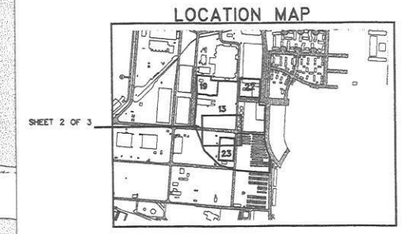
ACRONYMS:
BGS – BELOW GROUND SURFACE
mg/kg – MILLIGRAMS PER KILOGRAM
OU-2 – OPERABLE UNIT 2
PEST – PESTICIDE
PRG – PRELIMINARY REMEDIATION GOAL
SVOA – SEMIVOLATILE ORGANIC ANALYSIS
TPHEXT – TOTAL PETROLEUM HYDROCARBONS (EXTRACTABLE)
TPHPRG – TOTAL PETROLEUM HYDROCARBONS (PURGEABLE)
TRPH – TOTAL RECOVERABLE PETROLEUM HYDROCARBONS
UST – UNDERGROUND STORAGE TANK
VOA – VOLATILE ORGANIC ANALYSIS

N
30 0 30 60
SCALE: 1" = 60'

FIGURE 6-12 (SHEET 2 OF 3)
SITE 13
ORGANIC COMPOUNDS DETECTED IN SOIL
OU-2 SOUTHEAST AREA
ALAMEDA POINT
ALAMEDA, CALIFORNIA



LOCATION MAP



INFORMATION OUTSIDE OF IR SITE BOUNDARY PRESENTED SEPARATELY

LEGEND

- EXCAVATION SAMPLE LOCATION
- SURFACE SAMPLE LOCATION
- SOIL BORING LOCATION
- SOIL PUNCH
- STORM DRAIN LINE
- SANITARY SEWER LINE
- STEAM LINE
- FUEL LINE (ABANDONED/REMOVED AS OF 12/98)
- INDUSTRIAL WASTE LINE
- FENCE
- RAILROAD
- PAVED ROAD OR PARKING LOT
- BUILDING, CONCRETE, PAVED, OR COVERED AREA
- 517 BUILDING AND BUILDING NUMBER
- INSTALLATION RESTORATION SITE BOUNDARY
- APPROXIMATE HISTORICAL PROPERTY BOUNDARY OF PACIFIC COAST OIL REFINERY

SAMPLE ID	B06-09	
COMPOUND CLASS	SVOA	SAMPLE DEPTH (FEET BGS)
ANALYTE	BENZO(A)PYRENE 14 to 15.3	1.5 — CONCENTRATION (mg/kg)
	4 to 14	9.6 (P) — QUALIFIER

QUALIFIERS:
P – CONCENTRATION EXCEEDS RESIDENTIAL PRG FOR THE ANALYTE

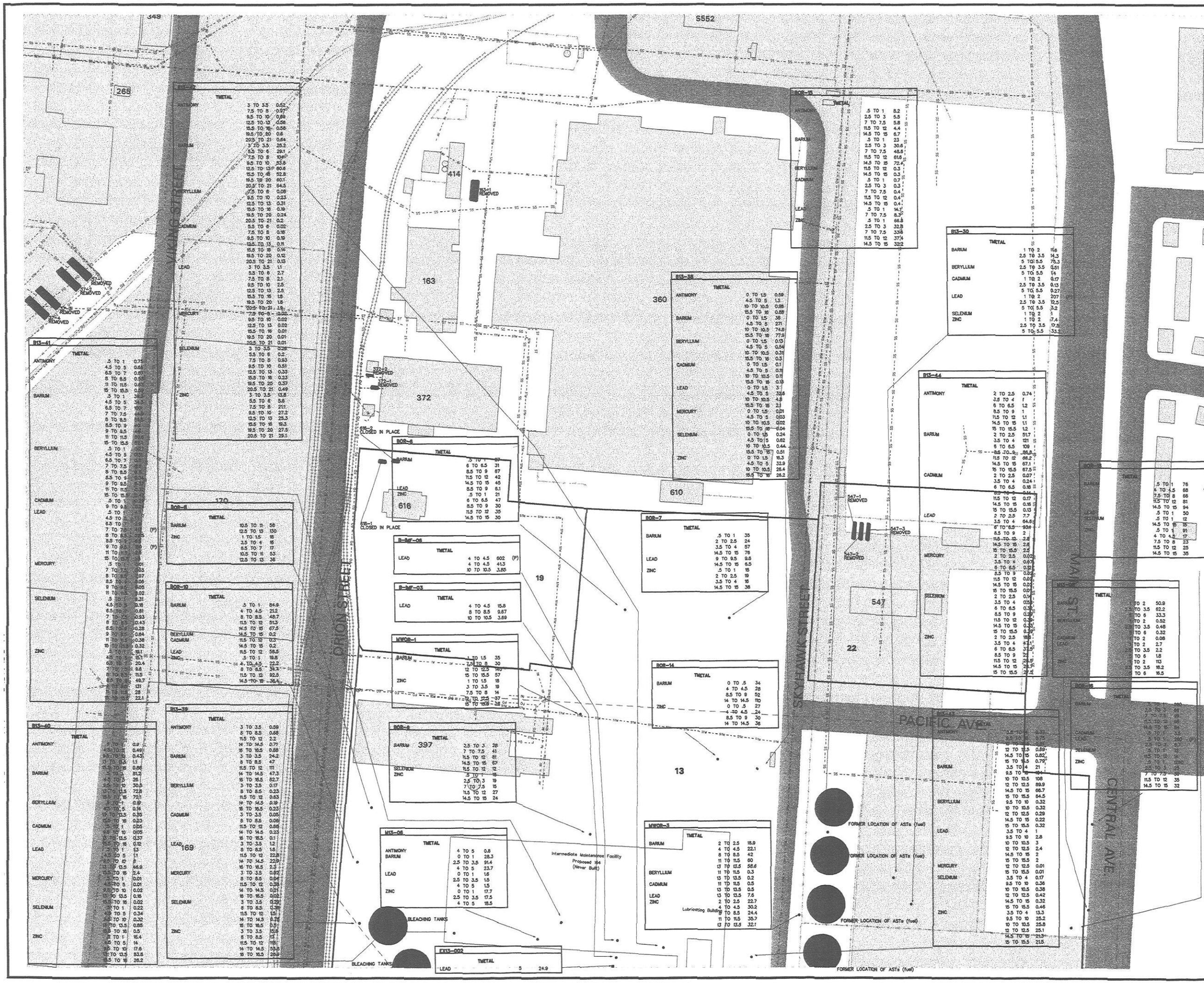
NOTES:
1. ANALYTES NOT ANALYZED FOR OR NOT DETECTED ARE NOT SHOWN ON THIS MAP. A LIST OF ANALYSES PERFORMED FOR EACH SAMPLE IS PRESENTED IN THE SAMPLING SUMMARY FOLLOWING CHAPTER 6. ANALYTICAL DATA ARE PRESENTED IN APPENDIX H. A SAMPLE POINT WITHOUT A DATA BOX INDICATES NO DETECTIONS.

ACRONYMS:
BGS – BELOW GROUND SURFACE
mg/kg – MILLIGRAMS PER KILOGRAM
OU-2 – OPERABLE UNIT 2
PRG – PRELIMINARY REMEDIATION GOAL
SVOA – SEMIVOLATILE ORGANIC ANALYSIS
TRPH – TOTAL RECOVERABLE PETROLEUM HYDROCARBONS
VOA – VOLATILE ORGANIC ANALYSIS

N

10 0 10 20
SCALE: 1" = 20'

FIGURE 6-12 (SHEET 3 OF 3)
SITE 13
ORGANIC COMPOUNDS
DETECTED IN SOIL
OU-2 SOUTHEAST AREA
ALAMEDA POINT
ALAMEDA, CALIFORNIA



LOCATION MAP

INFORMATION OUTSIDE OF IR SITE BOUNDARY PRESENTED SEPARATELY

LEGEND

- EXCAVATION SAMPLE LOCATION
- SURFACE SAMPLE LOCATION
- SOIL BORING LOCATION
- SOIL PUNCH
- STORM DRAIN LINE
- SANITARY SEWER LINE
- STEAM LINE
- FUEL LINE (ABANDONED/REMOVED AS OF 12/98)
- INDUSTRIAL WASTE LINE
- FENCE
- RAILROAD
- PAVED ROAD OR PARKING LOT
- BUILDING, CONCRETE, PAVED, OR COVERED AREA
- 517 BUILDING AND BUILDING NUMBER
- INSTALLATION RESTORATION SITE BOUNDARY
- TANK
- APPROXIMATE HISTORICAL PROPERTY BOUNDARY OF PACIFIC COAST OIL REFINERY

SAMPLE ID	B06-09			
COMPOUND CLASS	TMETAL			
ANALYTE	BARIUM	2.5 to 11	3.9	
	B06-09	4 to 14	9.6 (P)	

SAMPLE DEPTH (FEET BGS)
CONCENTRATION (mg/kg)
QUALIFIER

QUALIFIERS:

P – CONCENTRATION EXCEEDS RESIDENTIAL PRG FOR THE ANALYTE

NOTES:

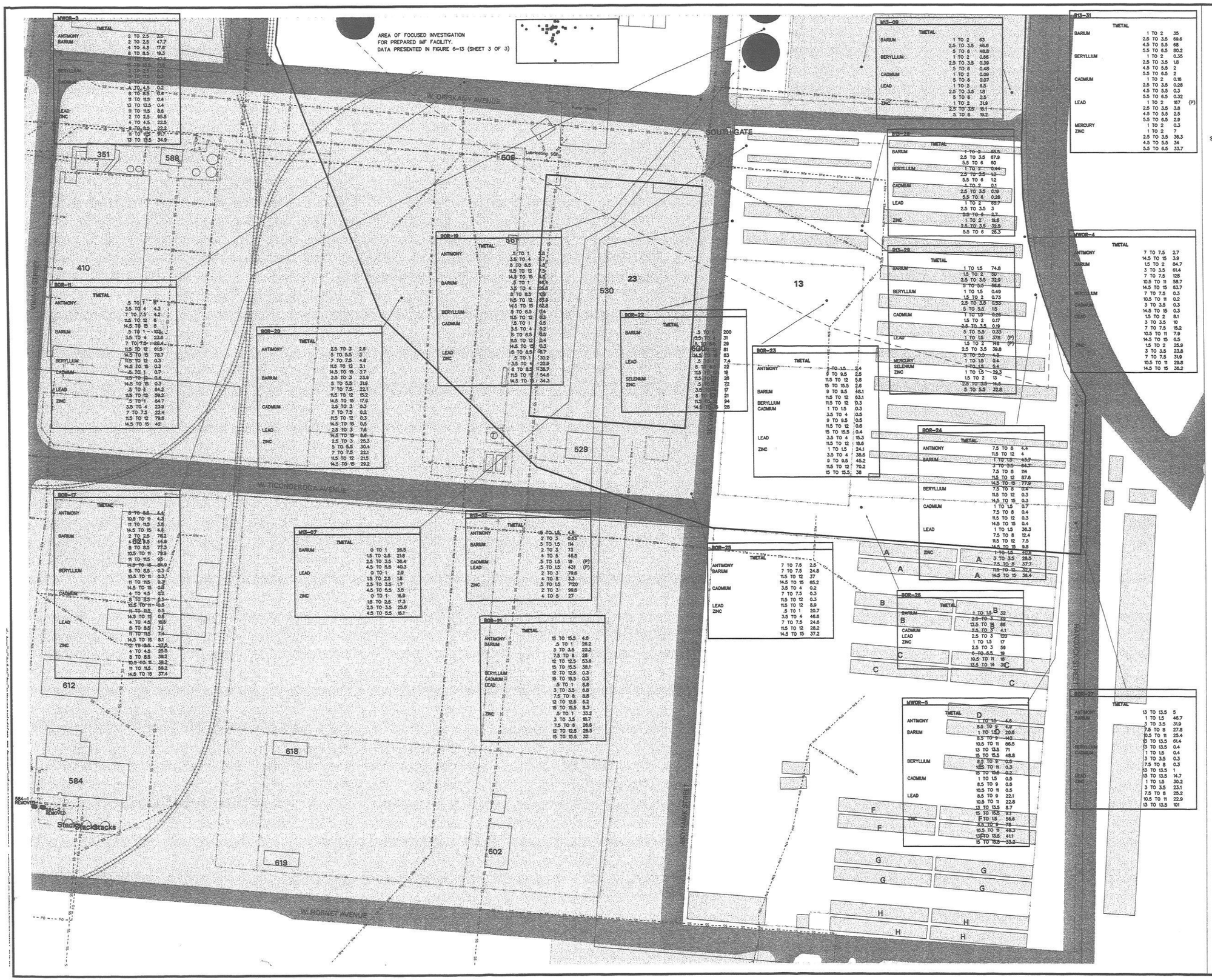
1. THIS MAP SHOWS CONCENTRATIONS OF METALS EXCEEDING AN FOD OF 5 PERCENT AND THE BACKGROUND CONCENTRATION FOR EACH METAL PRESENTED IN THE REPORT.
2. ANALYTES NOT ANALYZED FOR OR NOT DETERMINED TO BE COPCs ARE NOT SHOWN ON THIS MAP. A LIST OF ANALYSES PERFORMED FOR EACH SAMPLE IS PRESENTED IN THE SAMPLING SUMMARY FOLLOWING CHAPTER 6. ANALYTICAL DATA ARE PRESENTED IN APPENDIX H. A SAMPLE POINT ON THE MAP WITHOUT A DATA BOX INDICATES NO DETECTIONS OF COPCs.
3. UST LOCATIONS FROM "FUEL LINE AND UNDERGROUND STORAGE TANK MAP, DECEMBER 22, 1998, ALAMEDA POINT" FIELD CHECKED 3/29/99.
4. CHEMICALS PRESENTED ARE INCLUSIVE OF HUMAN HEALTH AND ECOLOGICAL COPCs. NOT ALL CHEMICALS PRESENTED ARE ECOLOGICAL COPCs. A LIST OF ECOLOGICAL COPCs IS PRESENTED IN THE SITE-SPECIFIC ECOLOGICAL RISK ASSESSMENT.

ACRONYMS:

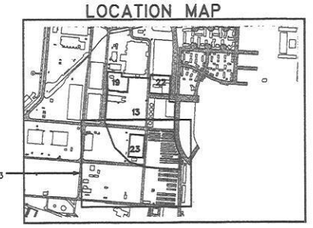
BGS – BELOW GROUND SURFACE
COPC – CHEMICAL OF POTENTIAL CONCERN
FOD – FREQUENCY OF DETECTION
mg/kg – MILLIGRAMS PER KILOGRAM
OU-2 – OPERABLE UNIT 2
PRG – PRELIMINARY REMEDIATION GOAL
TMETAL – TOTAL METALS
UST – UNDERGROUND STORAGE TANK

30 0 30 60
SCALE: 1" = 60'

FIGURE 6-13 (SHEET 1 OF 3)
SITE 13
INORGANIC COPCs DETECTED IN SOIL
OU-2 SOUTHEAST AREA
ALAMEDA POINT
ALAMEDA, CALIFORNIA



LOCATION MAP



INFORMATION OUTSIDE OF IR SITE BOUNDARY PRESENTED SEPARATELY

LEGEND

- EXCAVATION SAMPLE LOCATION
- SURFACE SAMPLE LOCATION
- SOIL BORING LOCATION
- SOIL PUNCH
- STORM DRAIN LINE
- SANITARY SEWER LINE
- STEAM LINE
- FUEL LINE (ABANDONED/REMOVED AS OF 12/98)
- INDUSTRIAL WASTE LINE
- FENCE
- RAILROAD
- PAVED ROAD OR PARKING LOT
- BUILDING, CONCRETE, PAVED, OR COVERED AREA
- 517 BUILDING AND BUILDING NUMBER
- INSTALLATION RESTORATION SITE BOUNDARY
- TANK
- APPROXIMATE HISTORICAL PROPERTY BOUNDARY OF PACIFIC COAST OIL REFINERY

SAMPLE ID	BOR-09			
COMPOUND CLASS	TMETAL			SAMPLE DEPTH (FEET BGS)
ANALYTE	BARIUM	2.5 to 11	3.9	CONCENTRATION (mg/kg)
		4 to 14	9.6 (P)	QUALIFIER

QUALIFIERS:
P – CONCENTRATION EXCEEDS RESIDENTIAL PRG FOR THE ANALYTE

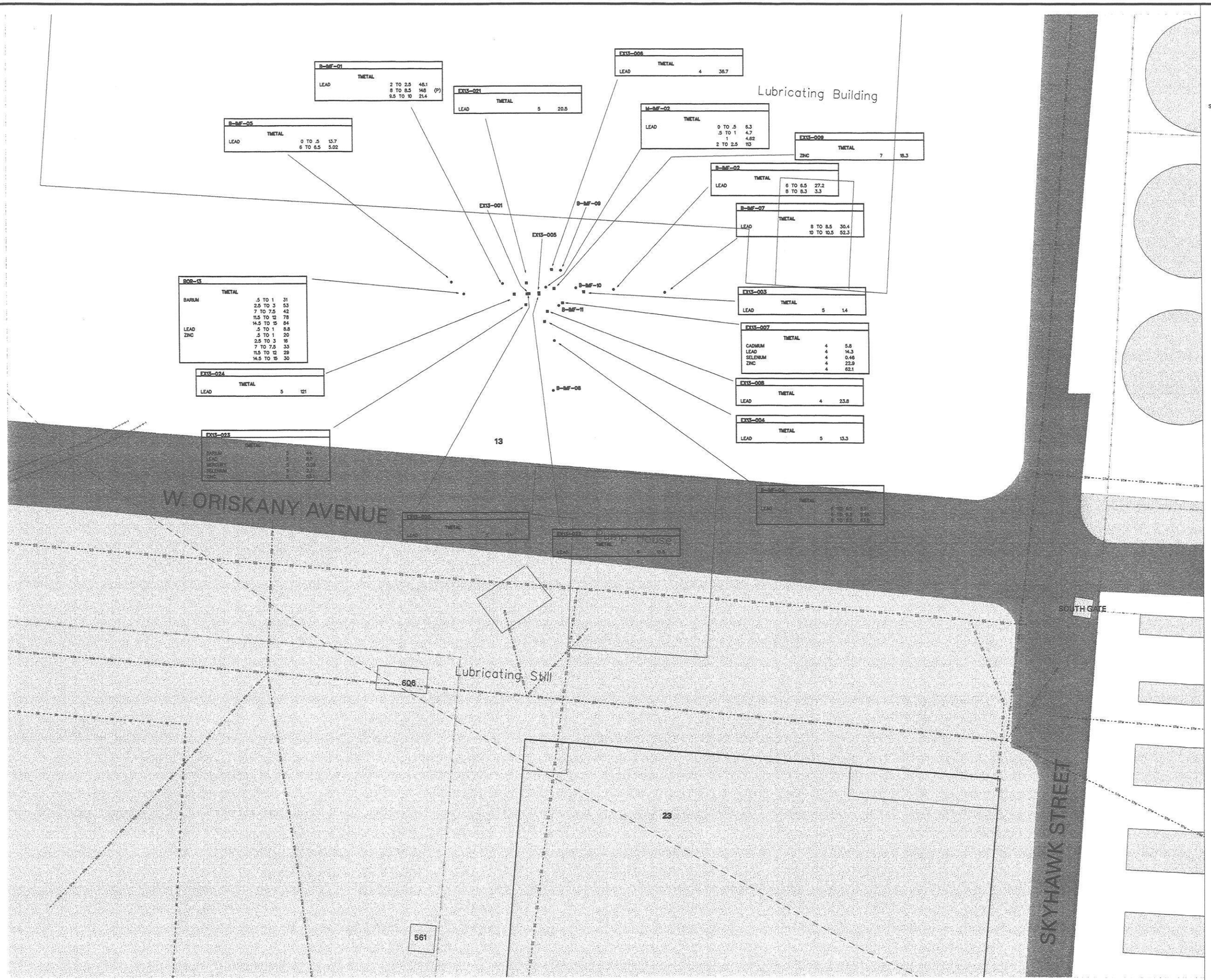
NOTES:
1. THIS MAP SHOWS CONCENTRATIONS OF METALS EXCEEDING AN FOD OF 5 PERCENT AND THE BACKGROUND CONCENTRATION FOR EACH METAL PRESENTED IN THE REPORT.
2. ANALYTES NOT ANALYZED FOR OR NOT DETERMINED TO BE COPCs ARE NOT SHOWN ON THIS MAP. A LIST OF ANALYSES PERFORMED FOR EACH SAMPLE IS PRESENTED IN THE SAMPLING SUMMARY FOLLOWING CHAPTER 6. ANALYTICAL DATA ARE PRESENTED IN APPENDIX H. A SAMPLE POINT ON THE MAP WITHOUT A DATA BOX INDICATES NO DETECTIONS OF COPCs.
3. UST LOCATIONS FROM "FUEL LINE AND UNDERGROUND STORAGE TANK MAP, DECEMBER 22, 1998, ALAMEDA POINT" FIELD CHECKED 3/29/99.
4. CHEMICALS PRESENTED ARE INCLUSIVE OF HUMAN HEALTH AND ECOLOGICAL COPCs. NOT ALL CHEMICALS PRESENTED ARE ECOLOGICAL COPCs. A LIST OF ECOLOGICAL COPCs IS PRESENTED IN THE SITE-SPECIFIC ECOLOGICAL RISK ASSESSMENT.

ACRONYMS:
BGS – BELOW GROUND SURFACE
COPC – CHEMICAL OF POTENTIAL CONCERN
FOD – FREQUENCY OF DETECTION
mg/kg – MILLIGRAMS PER KILOGRAM
OU-2 – OPERABLE UNIT 2
PRG – PRELIMINARY REMEDIATION GOAL
TMETAL – TOTAL METALS
UST – UNDERGROUND STORAGE TANK

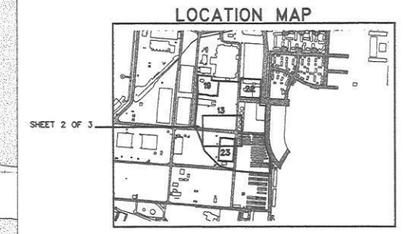
N

30 0 30 60
SCALE: 1" = 60'

FIGURE 6-13 (SHEET 2 OF 3)
SITE 13
INORGANIC COPCs DETECTED IN SOIL
OU-2 SOUTHEAST AREA
ALAMEDA POINT
ALAMEDA, CALIFORNIA



LOCATION MAP



INFORMATION OUTSIDE OF IR SITE BOUNDARY PRESENTED SEPARATELY

LEGEND

- EXCAVATION SAMPLE LOCATION
- SURFACE SAMPLE LOCATION
- SOIL BORING LOCATION
- SOIL PUNCH
- STORM DRAIN LINE
- SANITARY SEWER LINE
- STEAM LINE
- FUEL LINE (ABANDONED/REMOVED AS OF 12/98)
- INDUSTRIAL WASTE LINE
- FENCE
- RAILROAD
- PAVED ROAD OR PARKING LOT
- BUILDING, CONCRETE, PAVED, OR COVERED AREA
- 517 BUILDING AND BUILDING NUMBER
- INSTALLATION RESTORATION SITE BOUNDARY
- APPROXIMATE HISTORICAL PROPERTY BOUNDARY OF PACIFIC COAST OIL REFINERY

SAMPLE ID — 606-09
COMPOUND CLASS — TMETAL — SAMPLE DEPTH (FEET BGS)
ANALYTE — BARIUM 2.5 to 11 3.9 — CONCENTRATION (mg/kg)
4 to 14 9.6 (P) — QUALIFIER

QUALIFIERS:
P - CONCENTRATION EXCEEDS RESIDENTIAL PRG FOR THE ANALYTE

NOTES:

1. THIS MAP SHOWS CONCENTRATIONS OF METALS EXCEEDING AN FOD OF 5 PERCENT AND THE BACKGROUND CONCENTRATION FOR EACH METAL PRESENTED IN THE REPORT.
2. ANALYTES NOT ANALYZED FOR OR NOT DETERMINED TO BE COPCs ARE NOT SHOWN ON THIS MAP. A LIST OF ANALYSES PERFORMED FOR EACH SAMPLE IS PRESENTED IN THE SAMPLING SUMMARY FOLLOWING CHAPTER 6. ANALYTICAL DATA ARE PRESENTED IN APPENDIX H. A SAMPLE POINT ON THE MAP WITHOUT A DATA BOX INDICATES NO DETECTIONS OF COPCs.
3. CHEMICALS PRESENTED ARE INCLUSIVE OF HUMAN HEALTH AND ECOLOGICAL COPCs. NOT ALL CHEMICALS PRESENTED ARE ECOLOGICAL COPCs. A LIST OF ECOLOGICAL COPCs IS PRESENTED IN THE SITE-SPECIFIC ECOLOGICAL RISK ASSESSMENT.

ACRONYMS:

BGS - BELOW GROUND SURFACE
COPC - CHEMICAL OF POTENTIAL CONCERN
FOD - FREQUENCY OF DETECTION
mg/kg - MILLIGRAMS PER KILOGRAM
OU-2 - OPERABLE UNIT 2
PRG - PRELIMINARY REMEDIATION GOAL
TMETAL - TOTAL METALS

N

10 0 10 20
SCALE: 1" = 20'

FIGURE 6-13 (SHEET 3 OF 3)
SITE 13
INORGANIC COPCs
DETECTED IN SOIL
OU-2 SOUTHEAST AREA
ALAMEDA POINT
ALAMEDA, CALIFORNIA

LEGEND

- MONITORING WELL LOCATION
- SOIL BORING
- HYDROPUNCH LOCATION
- CONE PENETROMETER TEST
- GEOPROBE
- SURFACE SOIL SAMPLE
- EXCAVATION SAMPLE
- STORM DRAIN LINE
- SANITARY SEWER LINE
- FUEL LINE (ABANDONED/REMOVED AS OF 12/98)
- INDUSTRIAL WASTE LINE
- FENCE
- RAILROAD
- REGIONAL GROUNDWATER FLOW DIRECTION
- PAVED ROAD OR PARKING LOT
- BUILDING, CONCRETE, PAVED, OR COVERED AREA
- INSTALLATION RESTORATION SITE
- 517 BUILDING AND BUILDING NUMBER
- TANK

NOTES:

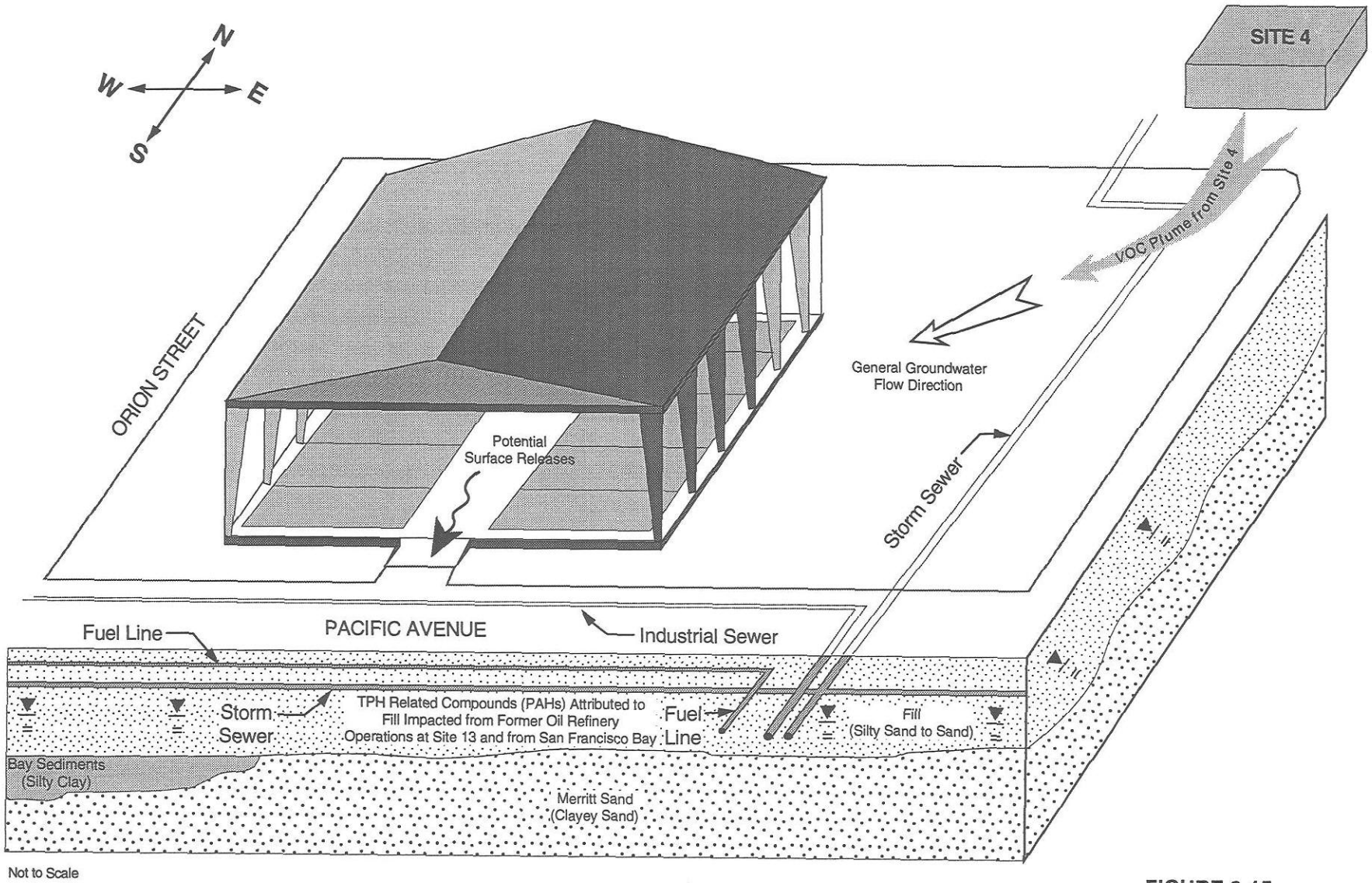
1. UTILITY LOCATIONS ARE APPROXIMATE.
2. UST LOCATIONS FROM "FUEL LINE AND UNDERGROUND STORAGE TANK MAP, DECEMBER 22, 1998, ALAMEDA POINT" FIELD CHECKED 3/29/99.
3. GROUNDWATER FLOW DIRECTION BASED ON APRIL 1998 WATER ELEVATION DATA.
4. LOCAL GROUNDWATER FLOW DIRECTIONS MAY BE DIFFERENT FROM REGIONAL GROUNDWATER FLOW DIRECTION DUE TO TIDAL FLUCTUATION, INTERCEPTED STORM DRAINAGE LINES, AND LEAKING WATER SUPPLY LINES.

ACRONYMS:

OU-2 - OPERABLE UNIT 2

15 0 15 30
SCALE: 1" = 30'

FIGURE 6-14
SITE 19
SOIL AND GROUNDWATER SAMPLE
LOCATION MAP
OU2-SOUTHEAST AREA
ALAMEDA POINT
ALAMEDA, CALIFORNIA



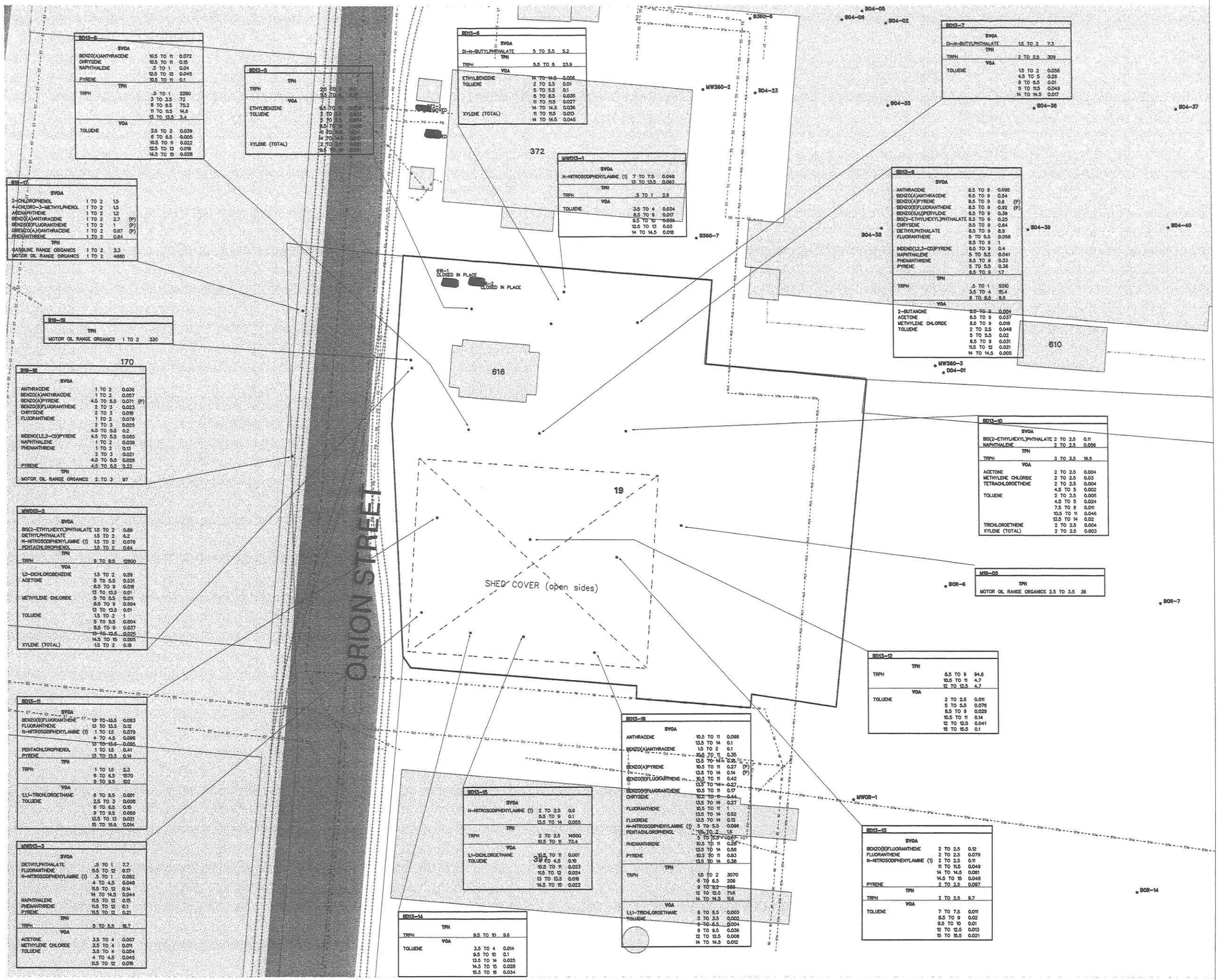
Water table elevation

TPH Total Petroleum Hydrocarbons

PAH Polycyclic Aromatic Hydrocarbons

FIGURE 6-15
CONCEPTUAL MODEL
SITE 19
HAZARDOUS WASTE STORAGE YARD
OU-2 SOUTHEAST AREA
ALAMEDA POINT
ALAMEDA, CALIFORNIA

G0069-167B0302 SITE19B.DSF GAS 5/17/99



BD13-8		
SVOA		
BENZO(A)ANTHRACENE	10.5 TO 11	0.072
CHRYSENE	10.5 TO 11	0.15
NAPHTHALENE	.5 TO 1	0.04
	12.5 TO 13	0.045
PYRENE	10.5 TO 11	0.1
TPH		
TRPH	.5 TO 1	2280
	3 TO 3.5	72
	8 TO 8.5	75.2
	11 TO 11.5	14.6
	13 TO 13.5	3.4
VOA		
TOLUENE	2.5 TO 3	0.039
	6 TO 6.5	0.005
	10.5 TO 11	0.022
	12.5 TO 13	0.019
	14.5 TO 15	0.028

BD13-5		
TPH		
TRPH	2.5 TO 3	[illegible]
	5.5 TO 6	[illegible]
VOA		
ETHYLBENZENE	13.5 TO 14	[illegible]
TOLUENE	2 TO 2.5	0.022
	5 TO 5.5	0.024
	8.5 TO 9	0.058
	11 TO 11.5	0.011
	14 TO 14.5	0.013
XYLENE (TOTAL)	12 TO 12.5	0.011
	14.5 TO 15	0.021

BD13-6		
SVOA		
DI-N-BUTYLPHTHALATE	5 TO 5.5	5.2
TPH		
TRPH	5.5 TO 6	23.9
VOA		
ETHYLBENZENE	14 TO 14.5	0.005
TOLUENE	2 TO 2.5	0.01
	5 TO 5.5	0.1
	8 TO 8.5	0.035
	11 TO 11.5	0.027
	14 TO 14.5	0.036
XYLENE (TOTAL)	11 TO 11.5	0.013
	14 TO 14.5	0.045

BD13-7		
SVOA		
DI-N-BUTYLPHTHALATE	1.5 TO 2	7.3
TPH		
TRPH	2 TO 2.5	309
VOA		
TOLUENE	1.5 TO 2	0.056
	4.5 TO 5	0.28
	8 TO 8.5	0.01
	11 TO 11.5	0.049
	14 TO 14.5	0.017

BD13-17		
SVOA		
2-CHLOROPHENOL	1 TO 2	1.5
4-CHLORO-3-METHYLPHENOL	1 TO 2	1.5
ANTHRACENE	1 TO 2	1.2
BENZO(A)ANTHRACENE	1 TO 2	2.7 (P)
BENZO(B)FLUORANTHENE	1 TO 2	1 (P)
DIBENZO(A,H)ANTHRACENE	1 TO 2	0.67 (P)
PHENANTHRENE	1 TO 2	0.84
TPH		
GASOLINE RANGE ORGANICS	1 TO 2	3.3
MOTOR OIL RANGE ORGANICS	1 TO 2	4680

BD13-19		
TPH		
MOTOR OIL RANGE ORGANICS	1 TO 2	330

BD13-18		
SVOA		
ANTHRACENE	1 TO 2	0.036
BENZO(A)ANTHRACENE	1 TO 2	0.057
BENZO(A)PYRENE	4.5 TO 5.5	0.071 (P)
BENZO(B)FLUORANTHENE	2 TO 3	0.023
CHRYSENE	2 TO 3	0.078
FLUORANTHENE	1 TO 2	0.076
	2 TO 3	0.025
	4.5 TO 5.5	0.2
INDENO(1,2,3-CD)PYRENE	4.5 TO 5.5	0.055
NAPHTHALENE	1 TO 2	0.039
PHENANTHRENE	1 TO 2	0.13
	2 TO 3	0.021
	4.5 TO 5.5	0.026
PYRENE	4.5 TO 5.5	0.23
TPH		
MOTOR OIL RANGE ORGANICS	2 TO 3	97

MWOR-1		
SVOA		
N-NITROSODIPHENYLAMINE (1)	7 TO 7.5	0.048
	13 TO 13.5	0.063
TPH		
TRPH	.5 TO 1	2.9
VOA		
TOLUENE	3.5 TO 4	0.034
	8.5 TO 9	0.017
	9.5 TO 10	0.036
	12.5 TO 13	0.03
	14 TO 14.5	0.018

BD13-9		
SVOA		
ANTHRACENE	8.5 TO 9	0.095
BENZO(A)ANTHRACENE	8.5 TO 9	0.54
BENZO(A)PYRENE	8.5 TO 9	0.6 (P)
BENZO(B)FLUORANTHENE	8.5 TO 9	0.92 (P)
BENZO(G,H,I)PERYLENE	8.5 TO 9	0.39
BIS(2-ETHYLHEXYL)PHTHALATE	8.5 TO 9	0.25
CHRYSENE	8.5 TO 9	0.64
DIETHYLPHTHALATE	8.5 TO 9	8.8
FLUORANTHENE	5 TO 5.5	0.058
	8.5 TO 9	1
INDENO(1,2,3-CD)PYRENE	8.5 TO 9	0.4
NAPHTHALENE	5 TO 5.5	0.041
PHENANTHRENE	5.5 TO 9	0.33
PYRENE	3 TO 5.5	0.36
	8.5 TO 9	1.7
TPH		
TRPH	.5 TO 1	5310
	3.5 TO 4	15.4
	8 TO 8.5	8.8
VOA		
2-BUTANONE	8.5 TO 9	0.004
ACETONE	8.5 TO 9	0.037
METHYLENE CHLORIDE	8.5 TO 9	0.018
TOLUENE	2 TO 2.5	0.048
	5 TO 5.5	0.02
	8.5 TO 9	0.031
	11.5 TO 12	0.021
	14 TO 14.5	0.005

BD13-10		
SVOA		
BIS(2-ETHYLHEXYL)PHTHALATE	2 TO 2.5	0.11
NAPHTHALENE	2 TO 2.5	0.056
TPH		
TRPH	3 TO 3.5	19.5
VOA		
ACETONE	2 TO 2.5	0.004
METHYLENE CHLORIDE	2 TO 2.5	0.03
TETRACHLOROETHENE	2 TO 2.5	0.004
	4.5 TO 5	0.002
TOLUENE	2 TO 2.5	0.005
	4.5 TO 5	0.024
	7.5 TO 8	0.011
	10.5 TO 11	0.046
	13.5 TO 14	0.02
TRICHLOROETHENE	2 TO 2.5	0.004
XYLENE (TOTAL)	2 TO 2.5	0.003

MW-05		
TPH		
MOTOR OIL RANGE ORGANICS	2.5 TO 3.5	36

MWOR-2		
SVOA		
BIS(2-ETHYLHEXYL)PHTHALATE	1.5 TO 2	0.89
DIETHYLPHTHALATE	1.5 TO 2	4.2
N-NITROSODIPHENYLAMINE (1)	1.5 TO 2	0.078
PENTACHLOROPHENOL	1.5 TO 2	0.64
TPH		
TRPH	9 TO 9.5	12800
VOA		
1,2-DICHLOROBENZENE	1.5 TO 2	0.59
ACETONE	5 TO 5.5	0.031
	8.5 TO 9	0.018
	13 TO 13.5	0.01
METHYLENE CHLORIDE	5 TO 5.5	0.011
	8.5 TO 9	0.004
	13 TO 13.5	0.01
TOLUENE	1.5 TO 2	1
	5 TO 5.5	0.004
	8.5 TO 9	0.037
	13 TO 13.5	0.025
	14.5 TO 15	0.005
XYLENE (TOTAL)	1.5 TO 2	0.19

BD13-11		
SVOA		
BENZO(B)FLUORANTHENE	13 TO 13.5	0.063
FLUORANTHENE	13 TO 13.5	0.12
N-NITROSODIPHENYLAMINE (1)	1 TO 1.5	0.079
	4 TO 4.5	0.098
	13 TO 13.5	0.095
PENTACHLOROPHENOL	1 TO 1.5	0.41
PYRENE	13 TO 13.5	0.14
TPH		
TRPH	1 TO 1.5	2.3
	6 TO 6.5	1570
	9 TO 9.5	102
VOA		
1,1,1-TRICHLOROETHANE	8 TO 8.5	0.001
TOLUENE	2.5 TO 3	0.008
	8 TO 8.5	0.15
	9 TO 9.5	0.055
	12.5 TO 13	0.021
	15 TO 15.5	0.014

MWOR-3		
SVOA		
DIETHYLPHTHALATE	.5 TO 1	7.7
FLUORANTHENE	11.5 TO 12	0.17
N-NITROSODIPHENYLAMINE (1)	.5 TO 1	0.082
	4 TO 4.5	0.048
	11.5 TO 12	0.14
	14 TO 14.5	0.044
NAPHTHALENE	11.5 TO 12	0.15
PHENANTHRENE	11.5 TO 12	0.1
PYRENE	11.5 TO 12	0.21
TPH		
TRPH	5 TO 5.5	18.7
VOA		
ACETONE	3.5 TO 4	0.007
METHYLENE CHLORIDE	3.5 TO 4	0.011
TOLUENE	3.5 TO 4	0.054
	4 TO 4.5	0.045
	11.5 TO 12	0.016

BD13-15		
SVOA		
N-NITROSODIPHENYLAMINE (1)	2 TO 2.5	0.9
	8.5 TO 9	0.1
	13.5 TO 14	0.055
TPH		
TRPH	2 TO 2.5	14500
	10.5 TO 11	73.4
VOA		
1,1-DICHLOROETHANE	13.5 TO 11	0.001
TOLUENE	3 TO 4.5	0.16
	10.5 TO 11	0.023
	11.5 TO 12	0.024
	13 TO 13.5	0.016
	14.5 TO 15	0.022

BD13-14		
TPH		
TRPH	9.5 TO 10	9.6
VOA		
TOLUENE	3.5 TO 4	0.014
	9.5 TO 10	0.1
	13.5 TO 14	0.025
	14.5 TO 15	0.028
	15.3 TO 16	0.034

BD13-16		
SVOA		
ANTHRACENE	10.5 TO 11	0.098
	13.5 TO 14	0.1
BENZO(A)ANTHRACENE	1.5 TO 2	0.1
	10.5 TO 11	0.35
	13.5 TO 14	0.32
BENZO(A)PYRENE	10.5 TO 11	0.27 (P)
	13.5 TO 14	0.14 (P)
BENZO(B)FLUORANTHENE	10.5 TO 11	0.42
	13.5 TO 14	0.27
BENZO(K)FLUORANTHENE	10.5 TO 11	0.17
CHRYSENE	10.5 TO 11	0.44
	13.5 TO 14	0.27
FLUORANTHENE	10.5 TO 11	1
	13.5 TO 14	0.52
FLUORENE	13.5 TO 14	0.13
N-NITROSODIPHENYLAMINE (1)	5 TO 5.5	0.066
PENTACHLOROPHENOL	15 TO 2	1.6
	5 TO 5.5	0.097
PHENANTHRENE	10.5 TO 11	0.28
	13.5 TO 14	0.58
PYRENE	10.5 TO 11	0.93
	13.5 TO 14	0.38
TPH		
TRPH	1.5 TO 2	3070
	6 TO 6.5	206
	9 TO 9.5	586
	12 TO 12.5	71.6
	14 TO 14.5	11.6
VOA		
1,1,1-TRICHLOROETHANE	5 TO 5.5	0.003
TOLUENE	3 TO 3.5	0.002
	6 TO 6.5	0.004
	9 TO 9.5	0.036
	12 TO 12.5	0.008
	14 TO 14.5	0.012

BD13-12		
TPH		
TRPH	8.5 TO 9	94.6
	10.5 TO 11	4.7
	12 TO 12.5	4.7
VOA		
TOLUENE	2 TO 2.5	0.011
	5 TO 5.5	0.076
	8.5 TO 9	0.029
	10.5 TO 11	0.14
	12 TO 12.5	0.041
	15 TO 15.5	0.1

BD13-13		
SVOA		
BENZO(B)FLUORANTHENE	2 TO 2.5	0.12
FLUORANTHENE	2 TO 2.5	0.079
N-NITROSODIPHENYLAMINE (1)	2 TO 2.5	0.11
	11 TO 11.5	0.049
	14 TO 14.5	0.061
	14.5 TO 15	0.048
PYRENE	2 TO 2.5	0.067
TPH		
TRPH	2 TO 2.5	9.7
VOA		
TOLUENE	7 TO 7.5	0.011
	8.5 TO 9	0.02
	9.5 TO 10	0.01
	12 TO 12.5	0.013
	15 TO 15.5	0.021

LEGEND

- EXCAVATION SAMPLE LOCATION
- SURFACE SAMPLE LOCATION
- SOIL BORING LOCATION
- SOIL PUNCH
- STORM DRAIN LINE
- SANITARY SEWER LINE
- STEAM LINE
- FUEL LINE (ABANDONED/REMOVED AS OF 12/98)
- INDUSTRIAL WASTE LINE
- FENCE
- RAILROAD
- PAVED ROAD OR PARKING LOT
- BUILDING, CONCRETE, PAVED, OR COVERED AREA
- 517 BUILDING AND BUILDING NUMBER
- INSTALLATION RESTORATION SITE
- TANK

SAMPLE ID — B06-09
COMPOUND CLASS — SVOA — SAMPLE DEPTH (FEET BGS)
ANALYTE — BENZO(A)PYRENE 14 to 15.3 1.5 — CONCENTRATION (mg/kg)
4 to 14 9.6 (P) — QUALIFIER

QUALIFIERS:
P – CONCENTRATION EXCEEDS RESIDENTIAL PRG FOR THE ANALYTE

NOTES:

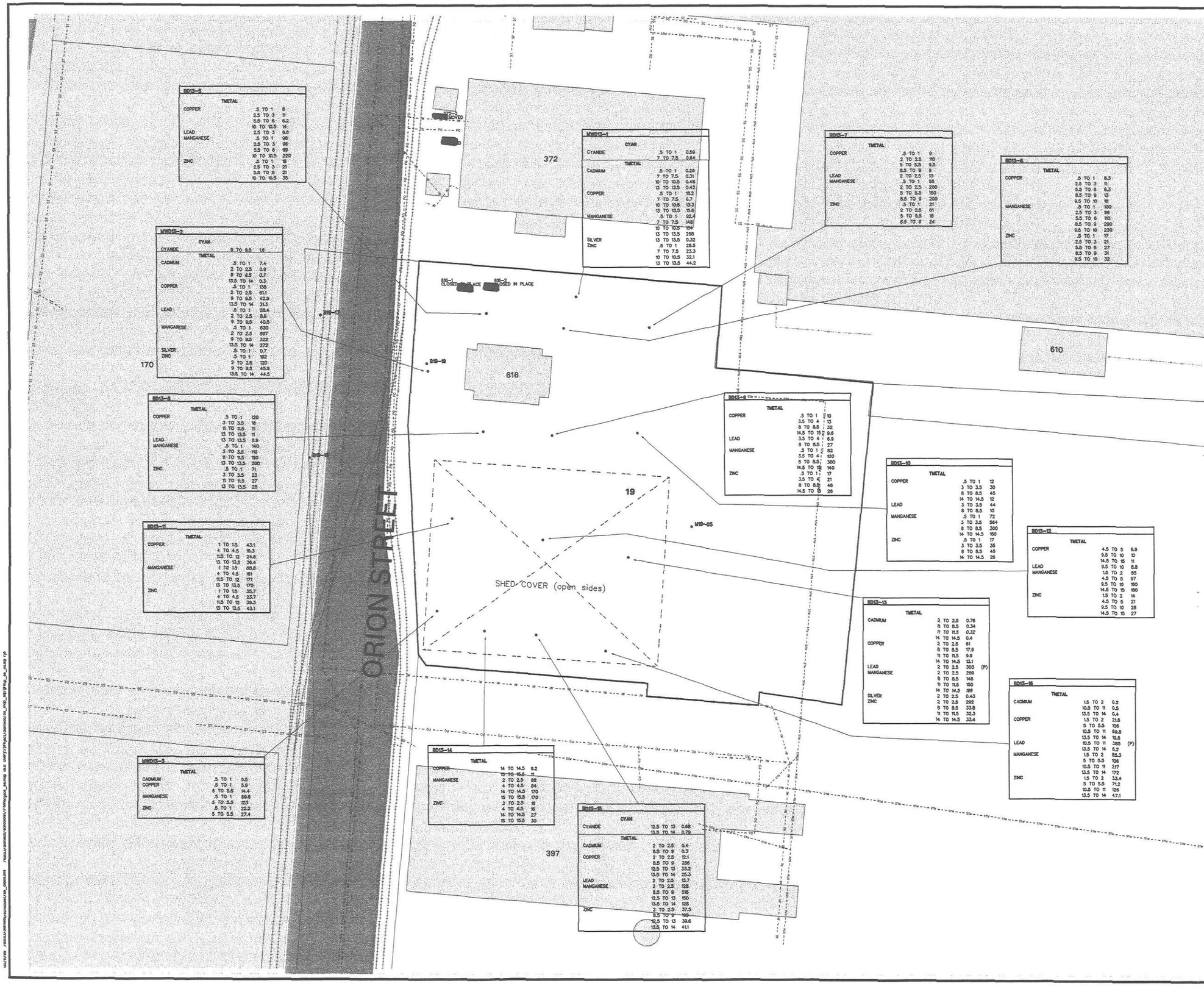
1. ANALYTES NOT ANALYZED FOR OR NOT DETECTED ARE NOT SHOWN ON THIS MAP. A LIST OF ANALYSES PERFORMED FOR EACH SAMPLE IS PRESENTED IN THE SAMPLING SUMMARY FOLLOWING CHAPTER 6. ANALYTICAL DATA ARE PRESENTED IN APPENDIX H. A SAMPLE POINT ON THE MAP WITHOUT A BOX INDICATES NO DETECTIONS.
2. UST LOCATIONS FROM "FUEL LINE AND UNDERGROUND STORAGE TANK MAP, DECEMBER 22, 1998, ALAMEDA POINT," FIELD CHECKED 3/29/99.

ACRONYMS:

BGS – BELOW GROUND SURFACE
mg/kg – MILLIGRAMS PER KILOGRAM
OU-2 – OPERABLE UNIT 2
PRG – PRELIMINARY REMEDIATION GOAL
SVOA – SEMIVOLATILE ORGANIC ANALYSIS
TPHEXT – TOTAL PETROLEUM HYDROCARBONS (EXTRACTABLE)
TPHPRG – TOTAL PETROLEUM HYDROCARBONS (PURGEABLE)
TRPH – TOTAL RECOVERABLE PETROLEUM HYDROCARBONS
UST – UNDERGROUND STORAGE TANK
VOA – VOLATILE ORGANIC ANALYSIS

15 0 15 30
SCALE: 1" = 30'

FIGURE 6-16
SITE 19
ORGANIC COMPOUNDS
DETECTED IN SOIL
OU-2 SOUTHEAST AREA
ALAMEDA POINT
ALAMEDA, CALIFORNIA



LEGEND

- EXCAVATION SAMPLE LOCATION
- SURFACE SAMPLE LOCATION
- SOIL BORING LOCATION
- SOIL PUNCH
- STORM DRAIN LINE
- SANITARY SEWER LINE
- STEAM LINE
- FUEL LINE (ABANDONED/REMOVED AS OF 12/98)
- INDUSTRIAL WASTE LINE
- FENCE
- RAILROAD
- PAVED ROAD OR PARKING LOT
- BUILDING, CONCRETE, PAVED, OR COVERED AREA
- 517 BUILDING AND BUILDING NUMBER
- INSTALLATION RESTORATION SITE BOUNDARY
- TANK

SAMPLE ID — BD6-09
COMPOUND CLASS — TMETAL
ANALYTE — COPPER 2.5 to 11 3.9 / 4 to 14 9.6 (P)
SAMPLE DEPTH (FEET BGS)
CONCENTRATION (mg/kg)
QUALIFIER

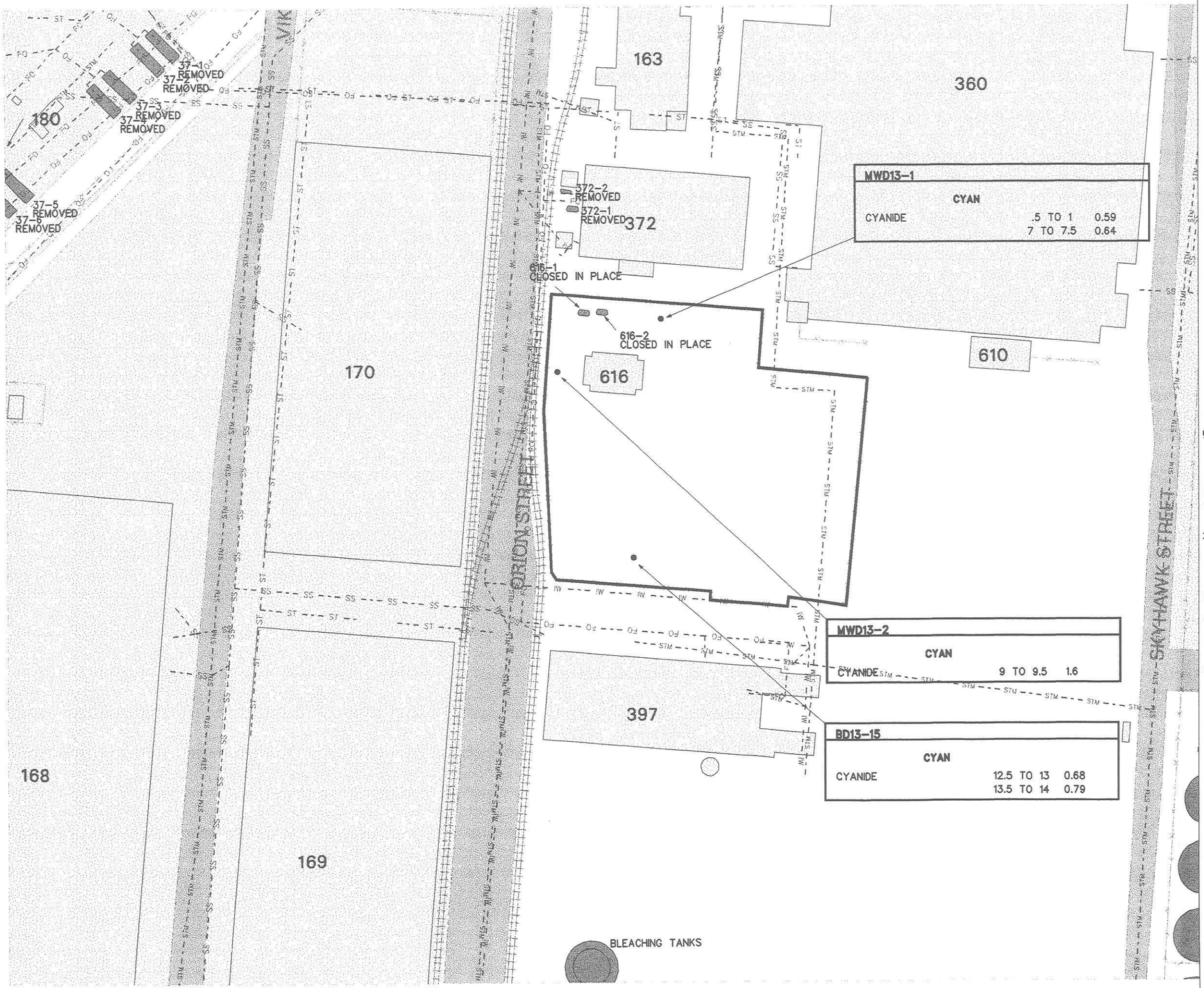
QUALIFIERS:
P – CONCENTRATION EXCEEDS RESIDENTIAL PRG FOR THE ANALYTE

NOTES:
1. THIS MAP SHOWS THE CONCENTRATIONS OF METALS EXCEEDING AN FOD OF 5 PERCENT AND THE BACKGROUND CONCENTRATIONS FOR EACH METAL PRESENTED IN THIS REPORT.
2. ANALYTES NOT ANALYZED FOR OR NOT DETERMINED TO BE COPCs ARE NOT SHOWN ON THIS MAP. A LIST OF ANALYSES PERFORMED FOR EACH SAMPLE IS PRESENTED IN THE SAMPLING SUMMARY FOLLOWING CHAPTER 6. ANALYTICAL DATA ARE PRESENTED IN APPENDIX H. A SAMPLE POINT ON THE MAP WITHOUT A DATA BOX INDICATES NO DETECTIONS OF COPCs.
3. UST LOCATIONS FROM "FUEL LINE AND UNDERGROUND STORAGE TANK MAP, DECEMBER 22, 1998, *ALAMEDA POINT*" FIELD CHECKED 3/29/99.
4. CHEMICALS PRESENTED ARE INCLUSIVE OF HUMAN HEALTH AND ECOLOGICAL COPCs. NOT ALL CHEMICALS PRESENTED ARE ECOLOGICAL COPCs. A LIST OF ECOLOGICAL COPCs IS PRESENTED IN THE SITE-SPECIFIC ECOLOGICAL RISK ASSESSMENT.

ACRONYMS:
BGS – BELOW GROUND SURFACE
COPC – CHEMICAL OF POTENTIAL CONCERN
FOD – FREQUENCY OF DETECTION
mg/kg – MILLIGRAMS PER KILOGRAM
OU-2 – OPERABLE UNIT 2
PRG – PRELIMINARY REMEDIATION GOALS
TMETAL – TOTAL METALS
UST – UNDERGROUND STORAGE TANK

15 0 15 30
SCALE: 1" = 30'

FIGURE 6-17a
SITE 19
INORGANIC COPCs
DETECTED IN SOIL
OU-2 SOUTHEAST AREA
ALAMEDA POINT
ALAMEDA, CALIFORNIA



LEGEND

- EXCAVATION SAMPLE LOCATION
- SURFACE SAMPLE LOCATION
- SOIL BORING LOCATION
- SOIL PUNCH LOCATION
- STORM DRAIN LINE
- SANITARY SEWER LINE
- STEAM LINE
- FUEL LINE
- INDUSTRIAL WASTE LINE
- FENCE
- RAILROAD
- EXCAVATION AREAS
- PAVED ROAD OR PARKING LOT
- BUILDING, CONCRETE, PAVED, OR COVERED AREA
- 517 BUILDING AND BUILDING NUMBER
- INSTALLATION RESTORATION SITE
- TANK

SAMPLE ID — M07A-09 — SAMPLE DEPTH (FEET BGS)
COMPOUND CLASS — CYAN
ANALYTE — CYANIDE 5 TO 5.5 3.9 — CONCENTRATION (mg/kg)
10 TO 10.5 9.6 (P) — QUALIFIER

QUALIFIERS:
α – CONCENTRATION EXCEEDS PROPOSED CALIFORNIA TOXICS RULE CRITERIA
β – CONCENTRATION EXCEEDS NATIONAL TOXICS RULE LOEL
P – CONCENTRATION EXCEEDS RESIDENTIAL PRG FOR THE ANALYTE

NOTES:
1. THIS MAP SHOWS CONCENTRATIONS OF METALS EXCEEDING AN FOD OF 5 PERCENT AND THE BACKGROUND CONCENTRATIONS FOR EACH METAL PRESENTED IN THE REPORT.
2. ANALYTES NOT ANALYZED FOR OR NOT DETERMINED TO BE COPCs ARE NOT SHOWN ON THIS MAP. A LIST OF ANALYSES PERFORMED FOR EACH SAMPLE IS PRESENTED IN THE SAMPLING SUMMARY FOLLOWING CHAPTER 6. ANALYTICAL DATA ARE PRESENTED IN APPENDIX H. A SAMPLE POINT ON THE MAP WITHOUT A DATA BOX INDICATES NO DETECTIONS OF COPCs.
3. UST LOCATIONS FROM "FUEL LINE AND UNDERGROUND STORAGE TANK MAP, DECEMBER 22, 1998, ALAMEDA POINT" FIELD CHECKED 3/29/99.
4. CHEMICALS PRESENTED ARE INCLUSIVE OF HUMAN HEALTH AND ECOLOGICAL COPCs. NOT ALL CHEMICALS PRESENTED ARE ECOLOGICAL COPCs. A LIST OF ECOLOGICAL COPCs IS PRESENTED IN THE SITE-SPECIFIC ECOLOGICAL RISK ASSESSMENT.

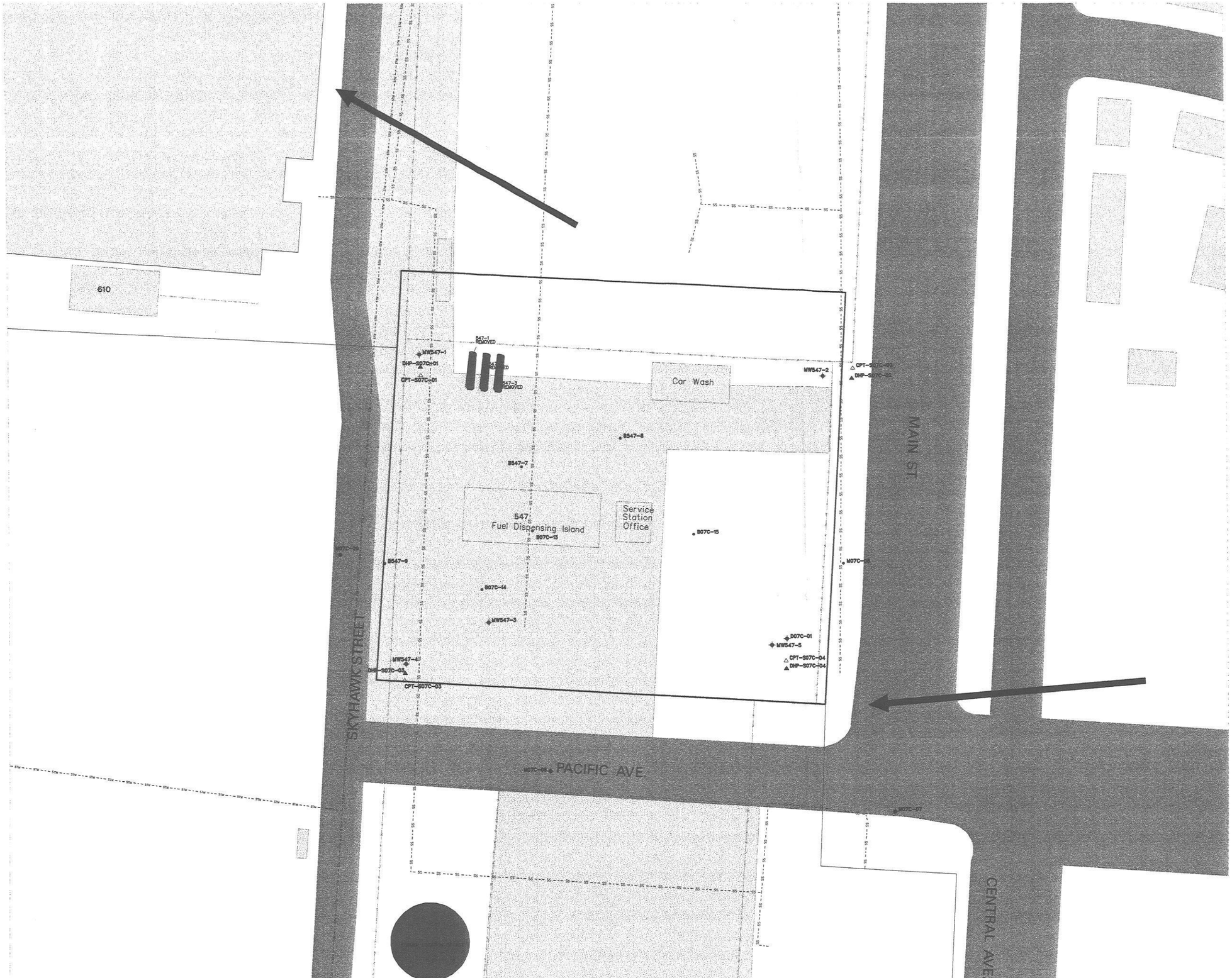
ACRONYMS:
BGS – BELOW GROUND SURFACE
COPC – CHEMICAL OF POTENTIAL CONCERN
FOD – FREQUENCY OF DETECTION
CYAN – CYANIDE
LOEL – LOWEST OBSERVED EFFECT LEVEL
mg/kg – MILLIGRAMS PER KILOGRAM
OU-2 – OPERABLE UNIT 2
PRG – PRELIMINARY REMEDIATION GOAL
UST – UNDERGROUND STORAGE TANK

N

50 0 50 100
SCALE: 1" = 100'

FIGURE 6-17b
SITE 19
CYANIDE
DETECTED IN SOIL
OU-2 SOUTHEAST AREA
ALAMEDA POINT
ALAMEDA, CALIFORNIA

04/07/99 /data3/alameda/schooldist/secyan_sm.aml /data3/alameda/schooldist /ir19inorgsoil/METALNONE_cy_sm.map MKM Query- s:/project/alameda/ou_map_sql/site_mw_inorg_NONE_cvg_sql RJDgroup_mw_ou



LEGEND

- MONITORING WELL LOCATION
- SOIL BORING
- HYDROPUNCH LOCATION
- CONE PENETROMETER TEST
- GEOPROBE
- SURFACE SOIL SAMPLE
- EXCAVATION SAMPLE
- STORM DRAIN LINE
- SANITARY SEWER LINE
- FUEL LINE (ABANDONED/REMOVED AS OF 12/98)
- INDUSTRIAL WASTE LINE
- FENCE
- RAILROAD
- REGIONAL GROUNDWATER FLOW DIRECTION
- PAVED ROAD OR PARKING LOT
- BUILDING, CONCRETE, PAVED, OR COVERED AREA
- INSTALLATION RESTORATION SITE
- 517 BUILDING AND BUILDING NUMBER
- TANK

NOTES:

1. UTILITY LOCATIONS ARE APPROXIMATE.
2. UST LOCATIONS FROM "FUEL LINE AND UNDERGROUND STORAGE TANK MAP, DECEMBER 22, 1998, ALAMEDA POINT" FIELD CHECKED 3/29/99.
3. GROUNDWATER FLOW DIRECTION BASED ON APRIL 1998 WATER ELEVATION DATA.
4. LOCAL GROUNDWATER FLOW DIRECTIONS MAY BE DIFFERENT FROM REGIONAL GROUNDWATER FLOW DIRECTION DUE TO TIDAL FLUCTUATION, INTERCEPTED STORM DRAINAGE LINES, AND LEAKING WATER SUPPLY LINES.

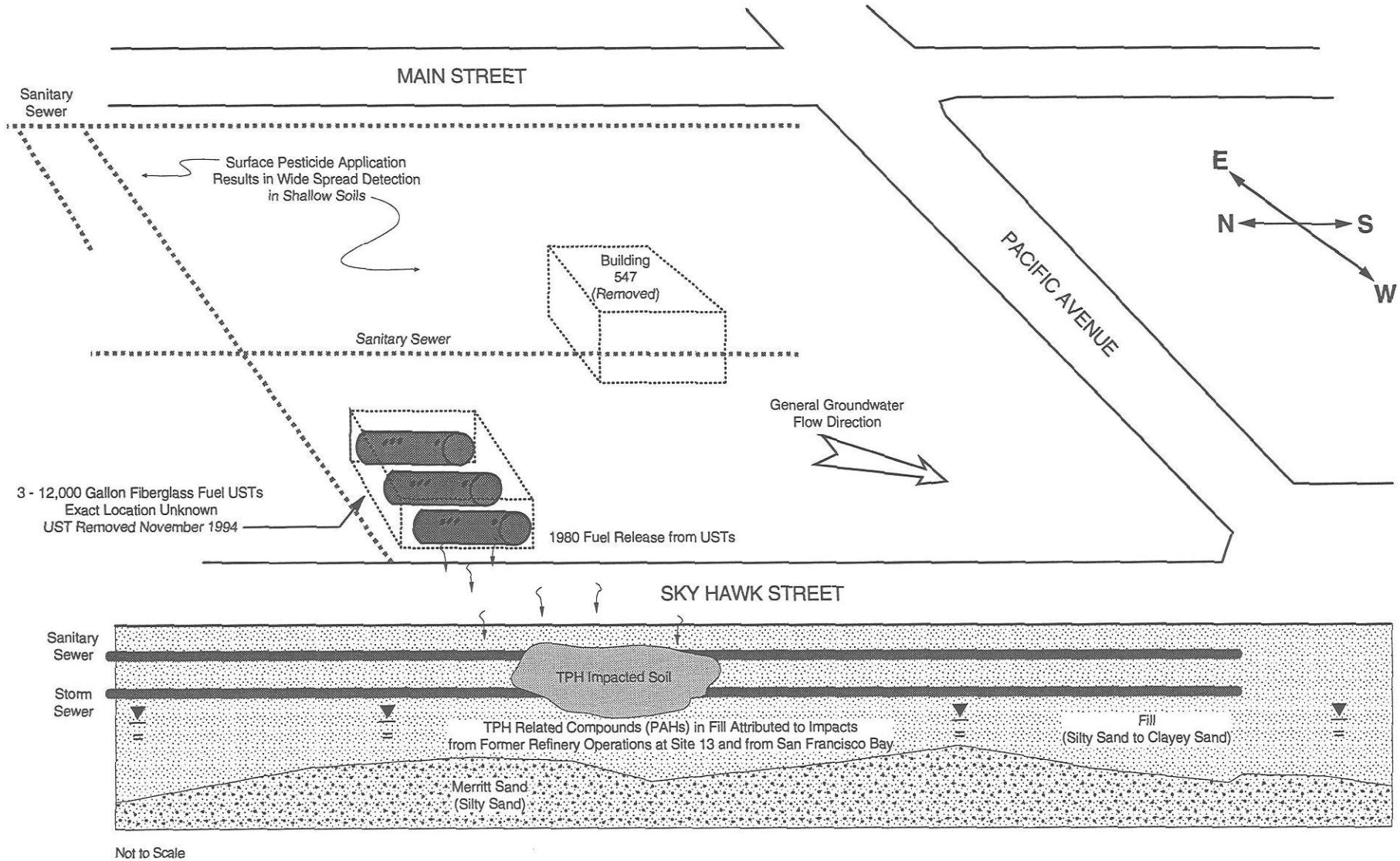
ACRONYMS:

AST – ABOVEGROUND STORAGE TANK

OU-2 – OPERABLE UNIT 2

15 0 15 30
SCALE: 1" = 30'

FIGURE 6-18
SITE 22
SOIL AND GROUNDWATER SAMPLE LOCATION MAP
OU-2 SOUTHEAST AREA
ALAMEDA POINT
ALAMEDA, CALIFORNIA



Water table elevation

TPH Total Petroleum Hydrocarbons

PAH Polycyclic Aromatic Hydrocarbons

UST Underground Storage Tanks

VOC Volatile Organic Compounds

FIGURE 6-19
CONCEPTUAL MODEL
SITE 22
BUILDING 547
FORMER SERVICE STATION
OU-2 SOUTHEAST AREA
ALAMEDA POINT
ALAMEDA, CALIFORNIA

G0069-167B0302 SITE22D.DSF GAS 6/13/99

LEGEND

- SOIL GAS SURVEY SAMPLE LOCATION
- STORM DRAIN CATCH BASIN
- STORM DRAIN MANHOLE
- STORM DRAIN SYSTEM
- SANITARY SEWER SYSTEM
- FUEL LINE
- INDUSTRIAL SEWER LINE
- RAILROAD
- FENCE
- PAVED ROAD OR PARKING LOT
- BUILDING, CONCRETE, PAVED, OR COVERED AREA
- 22 INSTALLATION RESTORATION SITE
- 517 BUILDING AND BUILDING NUMBER
- TANK

NOTE: UTILITY LOCATIONS ARE APPROXIMATE

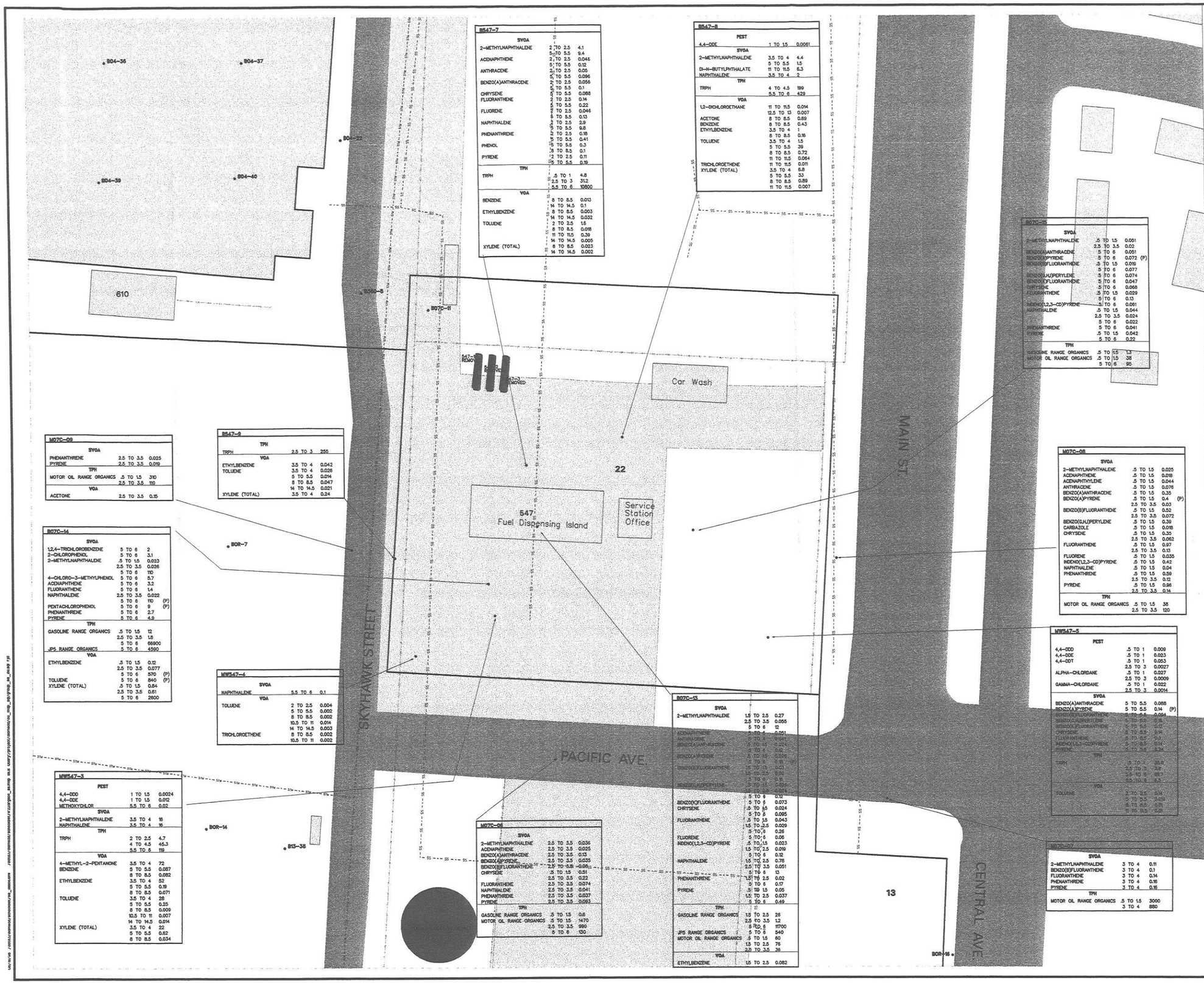
N

50 0 50 100

SCALE: 1" = 100'

FIGURE 6-20
SITE 22
SOIL GAS SURVEY
SAMPLE LOCATION MAP
OU-2 SOUTHEAST AREA
ALAMEDA POINT
ALAMEDA, CALIFORNIA

10/08/97 ata3/alameda/outri/ir22gas.map soilgasbyir.aml bellb



B547-7		
SVOA		
2-METHYLNAPHTHALENE	2 TO 2.5	4.1
	5 TO 5.5	9.4
ACENAPHTHENE	2 TO 2.5	0.046
	5 TO 5.5	0.12
ANTHRACENE	2 TO 2.5	0.05
	5 TO 5.5	0.096
BENZO(A)ANTHRACENE	2 TO 2.5	0.056
	5 TO 5.5	0.1
CHRYSENE	5 TO 5.5	0.088
FLUORANTHENE	2 TO 2.5	0.14
	5 TO 5.5	0.22
FLUORENE	2 TO 2.5	0.046
	5 TO 5.5	0.13
NAPHTHALENE	2 TO 2.5	2.9
	5 TO 5.5	9.8
PHENANTHRENE	2 TO 2.5	0.18
	5 TO 5.5	0.41
PHENOL	5 TO 5.5	0.3
	8 TO 8.5	0.1
PYRENE	2 TO 2.5	0.11
	5 TO 5.5	0.19
TPH		
TRPH	.5 TO 1	4.8
	2.5 TO 3	31.2
	5.5 TO 6	10800
VOA		
BENZENE	8 TO 8.5	0.013
	14 TO 14.5	0.1
ETHYLBENZENE	8 TO 8.5	0.003
	14 TO 14.5	0.032
TOLUENE	2 TO 2.5	1.6
	8 TO 8.5	0.018
	11 TO 11.5	0.39
	14 TO 14.5	0.005
XYLENE (TOTAL)	8 TO 8.5	0.023
	14 TO 14.5	0.002

B547-8		
PEST		
4,4-DDE	1 TO 1.5	0.0061
SVOA		
2-METHYLNAPHTHALENE	3.5 TO 4	4.4
	5 TO 5.5	1.5
DI-N-BUTYLPHTHALATE	11 TO 11.5	6.3
NAPHTHALENE	3.5 TO 4	2
TPH		
TRPH	4 TO 4.5	199
	5.5 TO 6	429
VOA		
1,2-DICHLOROETHANE	11 TO 11.5	0.014
	12.5 TO 13	0.007
ACETONE	8 TO 8.5	0.69
BENZENE	8 TO 8.5	0.43
ETHYLBENZENE	3.5 TO 4	1
	8 TO 8.5	0.16
TOLUENE	3.5 TO 4	1.5
	5 TO 5.5	39
	8 TO 8.5	0.72
	11 TO 11.5	0.064
TRICHLOROETHENE	11 TO 11.5	0.011
XYLENE (TOTAL)	3.5 TO 4	6.8
	5 TO 5.5	33
	8 TO 8.5	0.89
	11 TO 11.5	0.007

B07C-09		
SVOA		
PHENANTHRENE	2.5 TO 3.5	0.025
PYRENE	2.5 TO 3.5	0.019
TPH		
MOTOR OIL RANGE ORGANICS	.5 TO 1.5	310
	2.5 TO 3.5	110
VOA		
ACETONE	2.5 TO 3.5	0.15

B547-9		
TPH		
TRPH	2.5 TO 3	255
VOA		
ETHYLBENZENE	3.5 TO 4	0.042
TOLUENE	3.5 TO 4	0.026
	5 TO 5.5	0.014
	8 TO 8.5	0.047
	14 TO 14.5	0.021
XYLENE (TOTAL)	3.5 TO 4	0.24

B07C-14		
SVOA		
1,2,4-TRICHLOROBENZENE	5 TO 6	2
2-CHLOROPHENOL	5 TO 6	3.1
2-METHYLNAPHTHALENE	.5 TO 1.5	0.023
	2.5 TO 3.5	0.026
	5 TO 6	110
4-CHLORO-3-METHYLPHENOL	5 TO 6	5.7
ACENAPHTHENE	5 TO 6	3.2
FLUORANTHENE	5 TO 6	1.4
NAPHTHALENE	2.5 TO 3.5	0.022
	5 TO 6	110 (P)
PENTACHLOROPHENOL	5 TO 6	9 (P)
PHENANTHRENE	5 TO 6	2.7
PYRENE	5 TO 6	4.9
TPH		
GASOLINE RANGE ORGANICS	.5 TO 1.5	12
	2.5 TO 3.5	18
	5 TO 6	66900
JP5 RANGE ORGANICS	5 TO 6	4590
VOA		
ETHYLBENZENE	.5 TO 1.5	0.12
	2.5 TO 3.5	0.077
	5 TO 6	570 (P)
TOLUENE	5 TO 6	840 (P)
XYLENE (TOTAL)	.5 TO 1.5	0.84
	2.5 TO 3.5	0.61
	5 TO 6	2600

MW547-4		
SVOA		
NAPHTHALENE	5.5 TO 6	0.1
VOA		
TOLUENE	2 TO 2.5	0.004
	5 TO 5.5	0.002
	8 TO 8.5	0.002
	10.5 TO 11	0.014
	14 TO 14.5	0.003
TRICHLOROETHENE	8 TO 8.5	0.002
	10.5 TO 11	0.002

MW547-3		
PEST		
4,4-DDD	1 TO 1.5	0.0024
4,4-DDE	1 TO 1.5	0.012
METHOXYCHLOR	5.5 TO 6	0.02
SVOA		
2-METHYLNAPHTHALENE	3.5 TO 4	16
NAPHTHALENE	3.5 TO 4	16
TPH		
TRPH	2 TO 2.5	4.7
	4 TO 4.5	45.3
	5.5 TO 6	119
VOA		
4-METHYL-2-PENTANONE	3.5 TO 4	72
BENZENE	5 TO 5.5	0.087
	8 TO 8.5	0.082
ETHYLBENZENE	3.5 TO 4	52
	5 TO 5.5	0.19
	8 TO 8.5	0.071
TOLUENE	3.5 TO 4	28
	5 TO 5.5	0.25
	8 TO 8.5	0.009
	10.5 TO 11	0.007
	14 TO 14.5	0.014
XYLENE (TOTAL)	3.5 TO 4	22
	5 TO 5.5	0.62
	8 TO 8.5	0.034

B07C-06		
SVOA		
2-METHYLNAPHTHALENE	2.5 TO 3.5	0.036
ACENAPHTHENE	2.5 TO 3.5	0.025
BENZO(A)ANTHRACENE	2.5 TO 3.5	0.13
BENZO(A)PYRENE	2.5 TO 3.5	0.025
BENZO(B)FLUORANTHENE	2.5 TO 3.5	0.09
CHRYSENE	.5 TO 1.5	0.51
	2.5 TO 3.5	0.22
FLUORANTHENE	2.5 TO 3.5	0.074
NAPHTHALENE	2.5 TO 3.5	0.041
PHENANTHRENE	2.5 TO 3.5	0.037
PYRENE	2.5 TO 3.5	0.093
TPH		
GASOLINE RANGE ORGANICS	.5 TO 1.5	0.6
MOTOR OIL RANGE ORGANICS	.5 TO 1.5	1470
	2.5 TO 3.5	990
	5 TO 6	130

B07C-13		
SVOA		
2-METHYLNAPHTHALENE	1.5 TO 2.5	0.27
	2.5 TO 3.5	0.055
	5 TO 6	12
ACENAPHTHENE	5 TO 6	0.051
ANTHRACENE	5 TO 6	0.047
BENZO(A)ANTHRACENE	5 TO 6	0.224
	8 TO 8.5	0.06
BENZO(A)PYRENE	5 TO 6	0.198
	8 TO 8.5	0.08 (P)
BENZO(B)FLUORANTHENE	5 TO 6	0.09
	11 TO 11.5	0.01
BENZO(G,H,I)PERYLENE	5 TO 6	0.12
BENZO(K)FLUORANTHENE	5 TO 6	0.064
	8 TO 8.5	0.024
BENZO(Q)FLUORANTHENE	5 TO 6	0.12
CHRYSENE	5 TO 6	0.073
	8 TO 8.5	0.024
FLUORANTHENE	5 TO 6	0.095
	8 TO 8.5	0.043
	11 TO 11.5	0.029
FLUORENE	5 TO 6	0.26
INDENO(1,2,3-CD)PYRENE	5 TO 6	0.08
	8 TO 8.5	0.023
NAPHTHALENE	1.5 TO 2.5	0.019
	5 TO 6	0.12
PHENANTHRENE	1.5 TO 2.5	0.78
	2.5 TO 3.5	0.051
	5 TO 6	13
PYRENE	1.5 TO 2.5	0.02
	5 TO 6	0.17
	8 TO 8.5	0.05
	11 TO 11.5	0.037
	5 TO 6	0.49
TPH		
GASOLINE RANGE ORGANICS	1.5 TO 2.5	26
	2.5 TO 3.5	1.2
	5 TO 6	11700
JP5 RANGE ORGANICS	5 TO 6	540
MOTOR OIL RANGE ORGANICS	1.5 TO 2.5	60
	2.5 TO 3.5	76
	5 TO 6	38
VOA		
ETHYLBENZENE	1.5 TO 2.5	0.082

B07C-05		
SVOA		
2-METHYLNAPHTHALENE	.5 TO 1.5	0.051
	2.5 TO 3.5	0.02
BENZO(A)ANTHRACENE	5 TO 6	0.051
BENZO(A)PYRENE	5 TO 6	0.072 (P)
BENZO(B)FLUORANTHENE	.5 TO 1.5	0.019
	5 TO 6	0.077
BENZO(G,H,I)PERYLENE	5 TO 6	0.074
BENZO(K)FLUORANTHENE	5 TO 6	0.047
CHRYSENE	5 TO 6	0.068
FLUORANTHENE	.5 TO 1.5	0.029
	5 TO 6	0.13
INDENO(1,2,3-CD)PYRENE	5 TO 6	0.061
NAPHTHALENE	.5 TO 1.5	0.044
	2.5 TO 3.5	0.024
	5 TO 6	0.022
PHENANTHRENE	5 TO 6	0.041
PYRENE	.5 TO 1.5	0.042
	5 TO 6	0.22
TPH		
GASOLINE RANGE ORGANICS	.5 TO 1.5	1.3
MOTOR OIL RANGE ORGANICS	.5 TO 1.5	38
	5 TO 6	95

M07C-08		
SVOA		
2-METHYLNAPHTHALENE	.5 TO 1.5	0.025
ACENAPHTHENE	.5 TO 1.5	0.018
ACENAPHTHYLENE	.5 TO 1.5	0.044
ANTHRACENE	.5 TO 1.5	0.076
BENZO(A)ANTHRACENE	.5 TO 1.5	0.35
BENZO(A)PYRENE	.5 TO 1.5	0.4 (P)
	2.5 TO 3.5	0.03
BENZO(B)FLUORANTHENE	.5 TO 1.5	0.52
	2.5 TO 3.5	0.072
BENZO(G,H,I)PERYLENE	.5 TO 1.5	0.39
CARBAZOLE	.5 TO 1.5	0.018
CHRYSENE	.5 TO 1.5	0.35
	2.5 TO 3.5	0.062
FLUORANTHENE	.5 TO 1.5	0.97
	2.5 TO 3.5	0.13
FLUORENE	.5 TO 1.5	0.035
INDENO(1,2,3-CD)PYRENE	.5 TO 1.5	0.42
NAPHTHALENE	.5 TO 1.5	0.04
PHENANTHRENE	.5 TO 1.5	0.59
	2.5 TO 3.5	0.12
PYRENE	.5 TO 1.5	0.96
	2.5 TO 3.5	0.14
TPH		
MOTOR OIL RANGE ORGANICS	.5 TO 1.5	38
	2.5 TO 3.5	120

MW547-5		
PEST		
4,4-DDD	.5 TO 1	0.009
4,4-DDE	.5 TO 1	0.023
4,4-DDT	.5 TO 1	0.053
	2.5 TO 3	0.0027
ALPHA-CHLORDANE	.5 TO 1	0.027
	2.5 TO 3	0.0009
GAMMA-CHLORDANE	.5 TO 1	0.022
	2.5 TO 3	0.0014
SVOA		
BENZO(A)ANTHRACENE	5 TO 5.5	0.088
BENZO(A)PYRENE	5 TO 5.5	0.14 (P)
BENZO(B)FLUORANTHENE	5 TO 5.5	0.094
BENZO(G,H,I)PERYLENE	5 TO 5.5	0.16
BENZO(K)FLUORANTHENE	5 TO 5.5	0.07
CHRYSENE	5 TO 5.5	0.09
FLUORANTHENE	5 TO 5.5	0.1
INDENO(1,2,3-CD)PYRENE	5 TO 5.5	0.09
PYRENE	5 TO 5.5	0.24
TPH		
TRPH	2 TO 2.5	38.2
	2.5 TO 3	48.1
	5.5 TO 6	98.7
	8.5 TO 9	8.3
VOA		
TOLUENE	2 TO 2.5	0.14
	5 TO 5.5	0.03
	8 TO 8.5	0.01
	11 TO 11.5	0.01

M07C-07		
SVOA		
2-METHYLNAPHTHALENE	3 TO 4	0.11
BENZO(B)FLUORANTHENE	3 TO 4	0.1
FLUORANTHENE	3 TO 4	0.14
PHENANTHRENE	3 TO 4	0.16
PYRENE	3 TO 4	0.16
TPH		
MOTOR OIL RANGE ORGANICS	.5 TO 1.5	3000
	3 TO 4	880

LEGEND

- EXCAVATION SAMPLE LOCATION
- SURFACE SAMPLE LOCATION
- SOIL BORING LOCATION
- SOIL PUNCH
- STORM DRAIN LINE
- SANITARY SEWER LINE
- STEAM LINE
- FUEL LINE (ABANDONED/REMOVED AS OF 12/98)
- INDUSTRIAL WASTE LINE
- FENCE
- RAILROAD
- PAVED ROAD OR PARKING LOT
- BUILDING, CONCRETE, PAVED, OR COVERED AREA
- 517 BUILDING AND BUILDING NUMBER
- INSTALLATION RESTORATION SITE BOUNDARY
- TANK

SAMPLE ID — B06-09
COMPOUND CLASS — SVOA
ANALYTE — BENZO(A)PYRENE 14 to 15.3 1.5
4 to 14 9.6 (P)

SAMPLE DEPTH (FEET BGS)
CONCENTRATION (mg/kg)
QUALIFIER

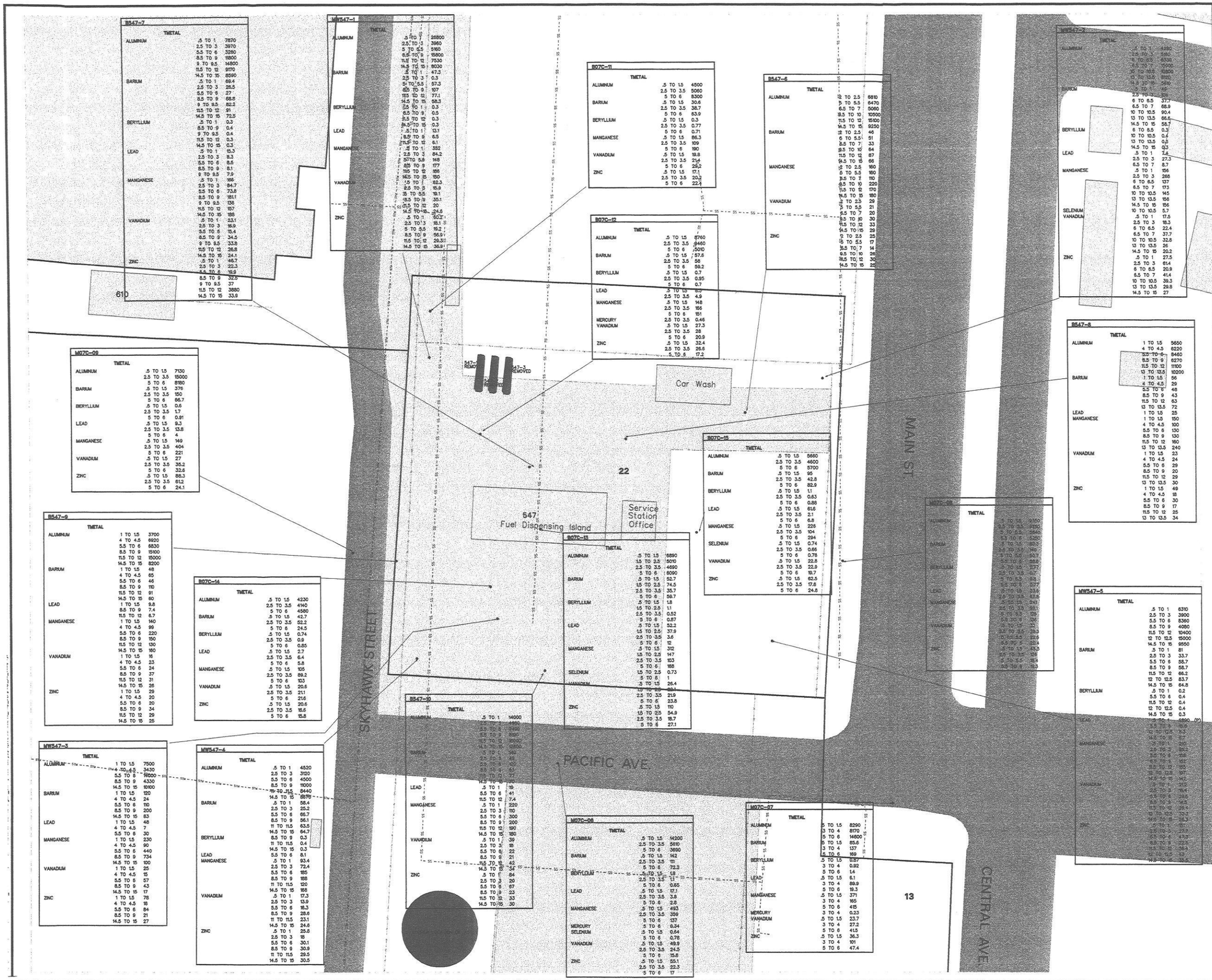
QUALIFIERS:
P – CONCENTRATION EXCEEDS RESIDENTIAL PRG FOR THE ANALYTE

NOTES:
1. ANALYTES NOT ANALYZED FOR OR NOT DETECTED ARE NOT SHOWN ON THIS MAP. A LIST OF ANALYSES PERFORMED FOR EACH SAMPLE IS PRESENTED IN THE SAMPLING SUMMARY FOLLOWING CHAPTER 6. ANALYTICAL DATA ARE PRESENTED IN APPENDIX H. A SAMPLE POINT ON THE MAP WITHOUT A DATA BOX INDICATES NO DETECTIONS.
2. UST LOCATIONS FROM "FUEL LINE AND UNDERGROUND STORAGE TANK MAP, DECEMBER 22, 1998, ALAMEDA POINT" FIELD CHECKED 3/29/99.

ACRONYMS:
AST – ABOVEGROUND STORAGE TANK
BGS – BELOW GROUND SURFACE
mg/kg – MILLIGRAMS PER KILOGRAM
OU-2 – OPERABLE UNIT 2
PEST – PESTICIDES
PRG – PRELIMINARY REMEDIATION GOAL
SVOA – SEMIVOLATILE ORGANIC ANALYSIS
TPHEXT – TOTAL PETROLEUM HYDROCARBONS (EXTRACTABLE)
TPHPRG – TOTAL PETROLEUM HYDROCARBONS (PURGEABLE)
TRPH – TOTAL RECOVERABLE PETROLEUM HYDROCARBONS
UST – UNDERGROUND STORAGE TANK
VOA – VOLATILE ORGANIC ANALYSIS

15 0 15 30
SCALE: 1" = 30'

FIGURE 6-21
SITE 22
ORGANIC COMPOUNDS DETECTED IN SOIL
OU-2 SOUTHEAST AREA
ALAMEDA POINT
ALAMEDA, CALIFORNIA



LEGEND

- EXCAVATION SAMPLE LOCATION
- SURFACE SAMPLE LOCATION
- SOIL BORING LOCATION
- SOIL PUNCH
- STORM DRAIN LINE
- SANITARY SEWER LINE
- STEAM LINE
- FUEL LINE (ABANDONED/REMOVED AS OF 12/98)
- INDUSTRIAL WASTE LINE
- FENCE
- RAILROAD
- PAVED ROAD OR PARKING LOT
- BUILDING, CONCRETE, PAVED, OR COVERED AREA
- 517 BUILDING AND BUILDING NUMBER
- INSTALLATION RESTORATION SITE BOUNDARY
- TANK

SAMPLE ID → B06-09
COMPOUND CLASS → TMETAL
ANALYTE → BARIUM 2.5 to 11 3.9 / 4 to 14 9.6 (P)
SAMPLE DEPTH (FEET BGS)
CONCENTRATION (mg/kg)
QUALIFIER

QUALIFIERS:
P – CONCENTRATION EXCEEDS RESIDENTIAL PRG FOR THE ANALYTE

NOTES:

1. THIS MAP SHOWS CONCENTRATIONS OF METALS EXCEEDING AN FOD OF 5 PERCENT AND THE BACKGROUND CONCENTRATION FOR EACH METAL PRESENTED IN THE REPORT.
2. ANALYTES NOT ANALYZED FOR OR NOT DETERMINED TO BE COPCs ARE NOT SHOWN ON THIS MAP. A LIST OF ANALYSES PERFORMED FOR EACH SAMPLE IS PRESENTED IN THE SAMPLING SUMMARY FOLLOWING CHAPTER 6. ANALYTICAL DATA ARE PRESENTED IN APPENDIX H. A SAMPLE POINT ON THE MAP WITHOUT A DATA BOX INDICATES NO DETECTIONS OF COPCs.
3. UST LOCATIONS FROM "FUEL LINE AND UNDERGROUND STORAGE TANK MAP, DECEMBER 22, 1998, ALAMEDA POINT" FIELD CHECKED 3/29/99.
4. CHEMICALS PRESENTED ARE INCLUSIVE OF HUMAN HEALTH AND ECOLOGICAL COPCs. NOT ALL CHEMICALS PRESENTED ARE ECOLOGICAL COPCs. A LIST OF ECOLOGICAL COPCs IS PRESENTED IN THE SITE-SPECIFIC ECOLOGICAL RISK ASSESSMENT.

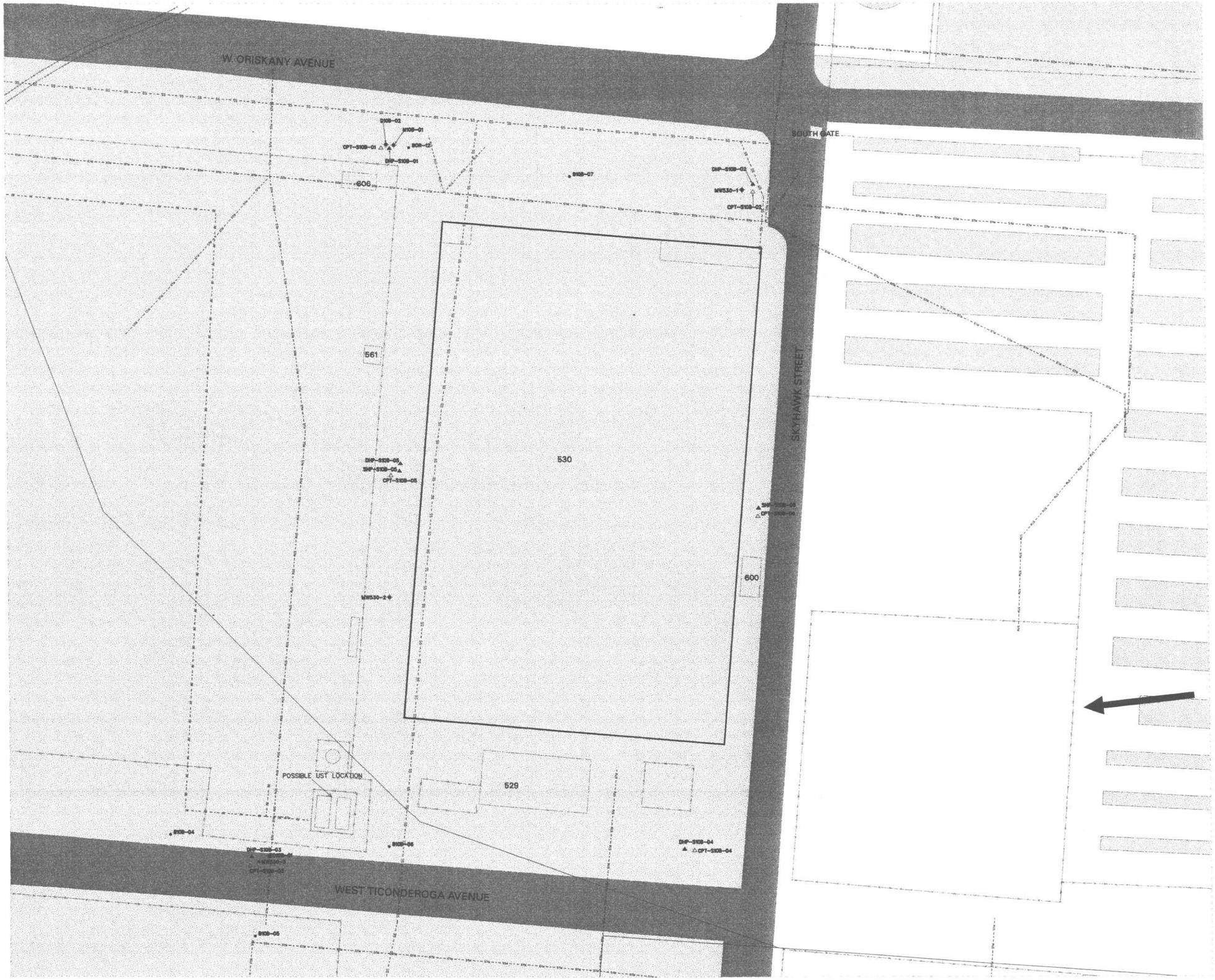
ACRONYMS:

AST – ABOVEGROUND STORAGE TANK
BGS – BELOW GROUND SURFACE
COPC – CHEMICAL OF POTENTIAL CONCERN
FOD – FREQUENCY OF DETECTION
mg/kg – MILLIGRAMS PER KILOGRAM
OU-2 – OPERABLE UNIT 2
PRG – PRELIMINARY REMEDIATION GOAL
TMETAL – TOTAL METALS
UST – UNDERGROUND STORAGE TANK

N

15 0 15 30
SCALE: 1" = 30'

FIGURE 6-22
SITE 22
INORGANIC COPCs
DETECTED IN SOIL
OU-2 SOUTHEAST AREA
ALAMEDA POINT
ALAMEDA, CALIFORNIA



LEGEND

- MONITORING WELL LOCATION
- SOIL BORING
- HYDROPUNCH LOCATION
- CONE PENETROMETER TEST
- GEOPROBE
- SURFACE SOIL SAMPLE
- EXCAVATION SAMPLE
- STORM DRAIN LINE
- SANITARY SEWER LINE
- FUEL LINE (ABANDONED/REMOVED AS OF 12/98)
- INDUSTRIAL WASTE LINE
- FENCE
- RAILROAD
- REGIONAL GROUNDWATER FLOW DIRECTION
- PAVED ROAD OR PARKING LOT
- BUILDING, CONCRETE, PAVED, OR COVERED AREA
- INSTALLATION RESTORATION SITE
- 517 BUILDING AND BUILDING NUMBER

NOTES:

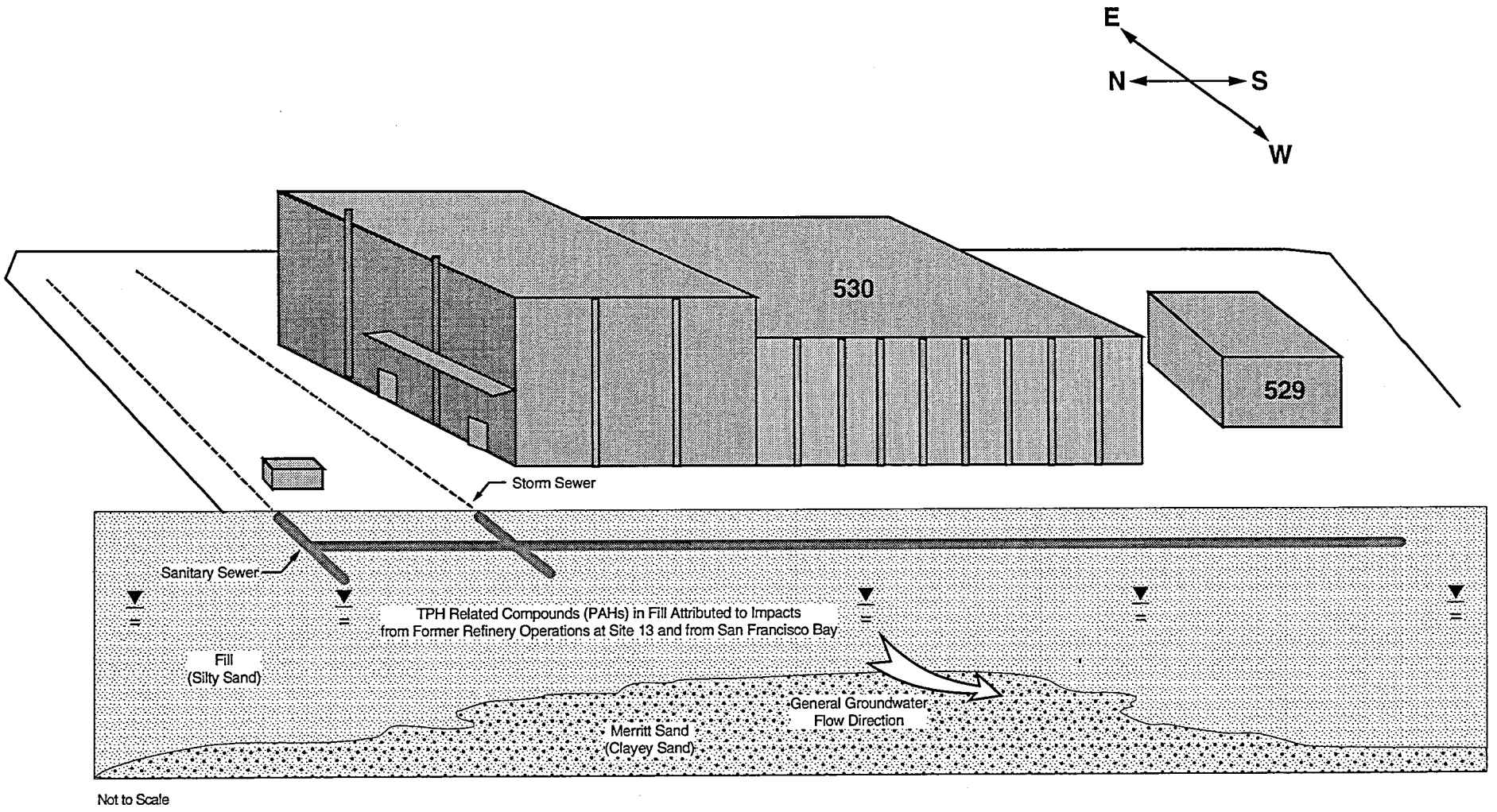
1. UTILITY LOCATIONS ARE APPROXIMATE.
2. UST LOCATIONS FROM "FUEL LINE AND UNDERGROUND STORAGE TANK MAP, DECEMBER 22, 1998, ALAMEDA POINT" FIELD CHECKED 3/29/99.
3. GROUNDWATER FLOW DIRECTION BASED ON APRIL 1998 WATER ELEVATION DATA.

ACRONYMS:

OU-2 – OPERABLE UNIT 2

15 0 15 30
SCALE: 1" = 30'

FIGURE 6-23
SITE 23
SOIL AND GROUNDWATER SAMPLE LOCATION MAP
OU-2 SOUTHEAST AREA
ALAMEDA POINT
ALAMEDA, CALIFORNIA



No documented or significant releases from on-site usage at Site 23.

Water table elevation

TPH Total Petroleum Hydrocarbons

PAH Polycyclic Aromatic Hydrocarbons

FIGURE 6-24
CONCEPTUAL MODEL
SITE 23
MISSLE REWORK OPERATIONS
OU-2 SOUTHEAST AREA
ALAMEDA POINT
ALAMEDA, CALIFORNIA

G0069-167B0302 SITE23C.DSF GAS 5/17/99

LEGEND

- EXCAVATION SAMPLE LOCATION
- SURFACE SAMPLE LOCATION
- SOIL BORING LOCATION
- SOIL PUNCH
- STORM DRAIN LINE
- SANITARY SEWER LINE
- STEAM LINE
- FUEL LINE (ABANDONED/REMOVED AS OF 12/98)
- INDUSTRIAL WASTE LINE
- FENCE
- RAILROAD
- PAVED ROAD OR PARKING LOT
- BUILDING, CONCRETE, PAVED, OR COVERED AREA
- 517 BUILDING AND BUILDING NUMBER
- INSTALLATION RESTORATION SITE BOUNDARY

SAMPLE ID — B06-09
COMPOUND CLASS — SVOA — SAMPLE DEPTH (FEET BGS)
ANALYTE — BENZO(A)PYRENE 14 to 15.5 1.5 — CONCENTRATION (mg/kg)
4 to 14 9.6 (P) — QUALIFIER

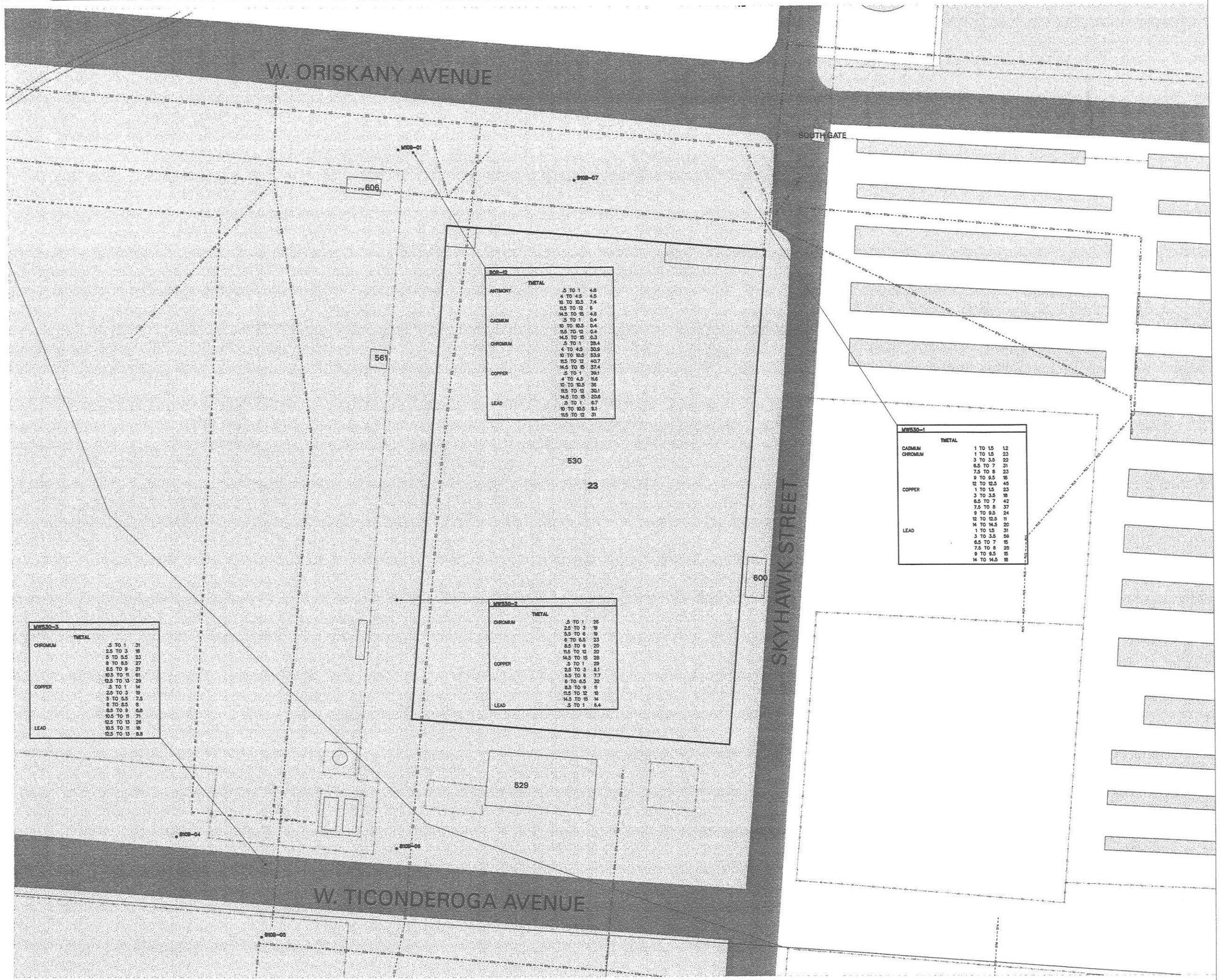
QUALIFIERS:
P – CONCENTRATION EXCEEDS RESIDENTIAL PRG FOR THE ANALYTE

NOTES:
1. ANALYTES NOT ANALYZED FOR OR NOT DETECTED ARE NOT SHOWN ON THIS MAP. A LIST OF ANALYSES PERFORMED FOR EACH SAMPLE IS PRESENTED IN THE SAMPLING SUMMARY FOLLOWING CHAPTER 6. ANALYTICAL DATA ARE PRESENTED IN APPENDIX H. A SAMPLE POINT ON THE MAP WITHOUT A BOX INDICATES NO DETECTIONS.

ACRONYMS:
BGS – BELOW GROUND SURFACE
mg/kg – MILLIGRAMS PER KILOGRAM
OU-2 – OPERABLE UNIT 2
PRG – PRELIMINARY REMEDIATION GOAL
SVOA – SEMIVOLATILE ORGANIC ANALYSIS
TPHEXT – TOTAL PETROLEUM HYDROCARBONS (EXTRACTABLE)
TRPH – TOTAL RECOVERABLE PETROLEUM HYDROCARBONS
VOA – VOLATILE ORGANIC ANALYSIS

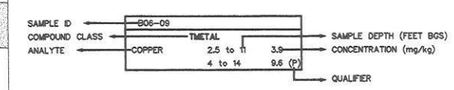
15 0 15 30
SCALE: 1" = 30'

FIGURE 6-25
SITE 23
ORGANIC COMPOUNDS
DETECTED IN SOIL
OU-2 SOUTHEAST AREA
ALAMEDA POINT
ALAMEDA, CALIFORNIA



LEGEND

- EXCAVATION SAMPLE LOCATION
- SURFACE SAMPLE LOCATION
- SOIL BORING LOCATION
- SOIL PUNCH
- STORM DRAIN LINE
- SANITARY SEWER LINE
- STEAM LINE
- FUEL LINE (ABANDONED/REMOVED AS OF 12/98)
- INDUSTRIAL WASTE LINE
- FENCE
- RAILROAD
- PAVED ROAD OR PARKING LOT
- BUILDING, CONCRETE, PAVED, OR COVERED AREA
- 517 BUILDING AND BUILDING NUMBER
- INSTALLATION RESTORATION SITE BOUNDARY



QUALIFIERS:

P – CONCENTRATION EXCEEDS RESIDENTIAL PRG FOR THE ANALYTE

NOTES:

1. THIS MAP SHOWS CONCENTRATIONS OF METALS EXCEEDING AN FOD OF 5 PERCENT AND THE BACKGROUND CONCENTRATION FOR EACH METAL PRESENTED IN THE REPORT.
2. ANALYTES NOT ANALYZED FOR OR NOT DETERMINED TO BE COPCs ARE NOT SHOWN ON THIS MAP. A LIST OF ANALYSES PERFORMED FOR EACH SAMPLE IS PRESENTED IN THE SAMPLING SUMMARY FOLLOWING CHAPTER 6. A SAMPLE POINT ON THE MAP WITHOUT A DATA BOX INDICATES NO DETECTIONS OF COPCs.
3. CHEMICALS PRESENTED ARE INCLUSIVE OF HUMAN HEALTH AND ECOLOGICAL COPCs. NOT ALL CHEMICALS PRESENTED ARE ECOLOGICAL COPCs. A LIST OF ECOLOGICAL COPCs IS PRESENTED IN THE SITE-SPECIFIC ECOLOGICAL RISK ASSESSMENT.

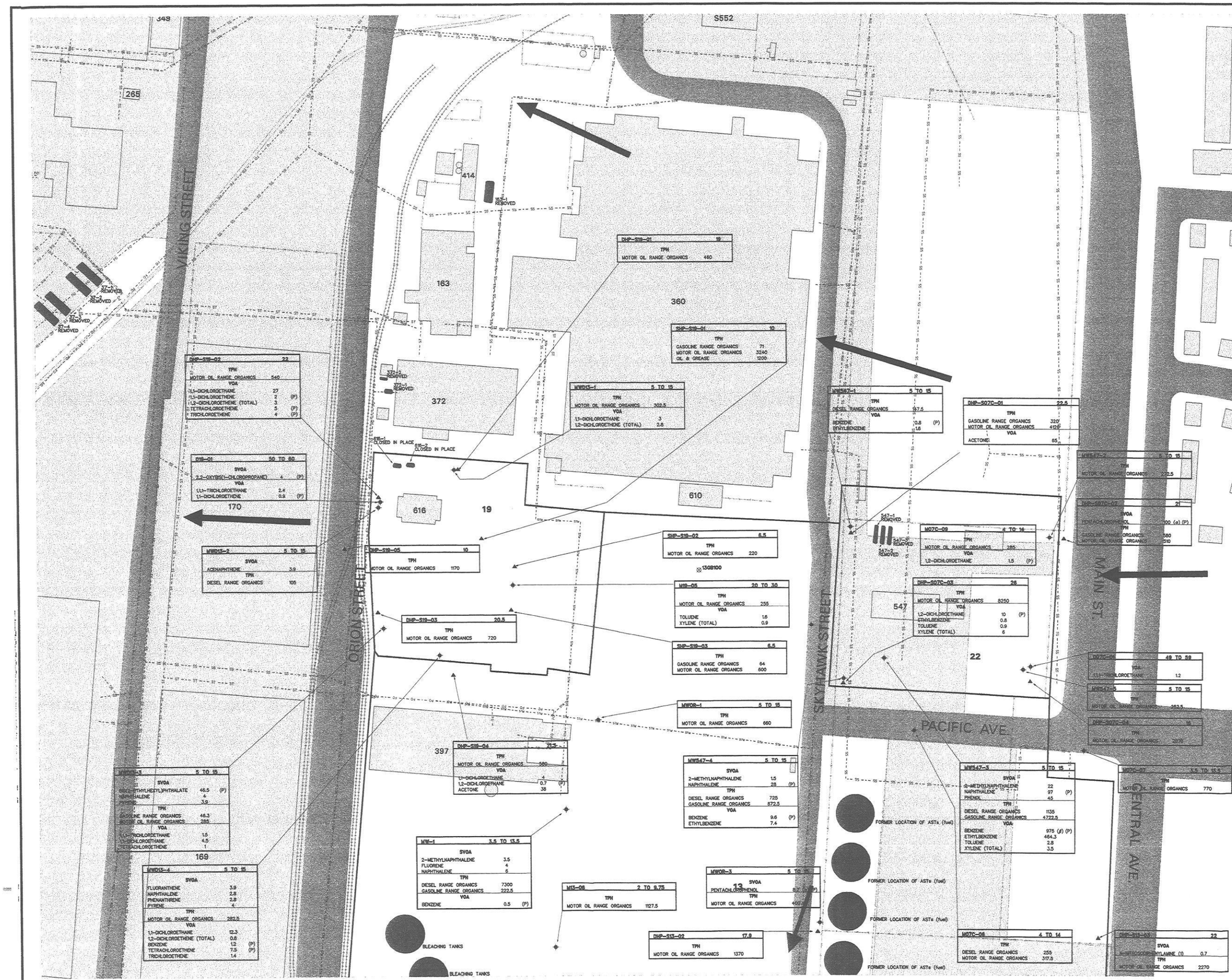
ACRONYMS:

BGS – BELOW GROUND SURFACE
COPC – CHEMICAL OF POTENTIAL CONCERN
FOD – FREQUENCY OF DETECTION
mg/kg – MILLIGRAMS PER KILOGRAM
OU-2 – OPERABLE UNIT 2
PRG – PRELIMINARY REMEDIATION GOALS
TMETAL – TOTAL METALS
UST – UNDERGROUND STORAGE TANK

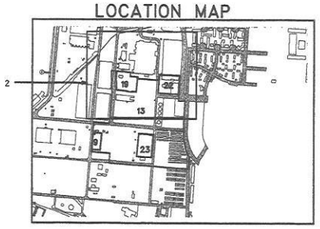
N

15 0 15 30
SCALE: 1" = 30'

FIGURE 6-26
SITE 23
INORGANIC COPCs
DETECTED IN SOIL
OU-2 SOUTHEAST AREA
ALAMEDA POINT
ALAMEDA, CALIFORNIA



LOCATION MAP



INFORMATION OUTSIDE SITE OU-2 BOUNDARY NOT PRESENTED

LEGEND

- MONITORING WELL LOCATION
- HYDROPUNCH LOCATION
- GEOPROBE
- STORM DRAIN LINE
- SANITARY SEWER LINE
- STEAM LINE
- FUEL LINE (ABANDONED/REMOVED AS OF 12/98)
- INDUSTRIAL WASTE LINE
- FENCE
- RAILROAD
- REGIONAL GROUNDWATER FLOW DIRECTION
- PAVED ROAD OR PARKING LOT
- BUILDING, CONCRETE, PAVED, OR COVERED AREA
- INSTALLATION RESTORATION SITE
- 517 BUILDING AND BUILDING NUMBER
- TANK

SAMPLE ID — M07A-09 — 2.5 to 11 — SAMPLE DEPTH (SEE NOTES)
COMPOUND CLASS — SVOA
ANALYTE — FLUORANTHENE 3.9 — CONCENTRATION (μg/L)
PENTACHLOROPHENOL 9.6 (P) — QUALIFIER

QUALIFIERS:

α – CONCENTRATION EXCEEDS PROPOSED CALIFORNIA TOXICS RULE CRITERIA
β – CONCENTRATION EXCEEDS NATIONAL TOXICS RULE LOEL
P – CONCONTRATION EXCEEDS RESIDENTIAL PRG FOR THE ANALYTE

NOTES:

1. ANALYTES NOT ANALYZED FOR OR ANALYTES NOT DETECTED IN ALL SAMPLING EVENTS ARE NOT SHOWN ON THIS MAP. A LIST OF ANALYSES PERFORMED FOR EACH SAMPLE IS PRESENTED IN THE SAMPLING SUMMARY FOLLOWING CHAPTER 6. ANALYTICAL DATA ARE PRESENTED IN APPENDIX H. A SAMPLE POINT ON THE MAP WITHOUT A DATA BOX INDICATES NO DETECTIONS.
2. CONCENTRATIONS INDICATED FOR MONITORING WELLS ARE AVERAGE VALUES BASED ON SAMPLING EVENTS CONDUCTED BETWEEN 1994 AND 1998. FOR NON-DETECTIONS, ONE-HALF OF THE DETECTION LIMIT WAS USED FOR CALCULATING THE AVERAGE VALUE.
3. SAMPLE DEPTH FOR HYDROPUNCH SAMPLES INDICATES SAMPLE COLLECTION DEPTH BELOW GROUND SURFACE IN FEET. SAMPLE DEPTH FOR MONITORING WELL SAMPLES INDICATES THE SCREEN INTERVAL DEPTH BELOW THE TOP OF THE CASING OF THE MONITORING WELL.
4. UST LOCATIONS FROM "FUEL LINES AND UNDERGROUND STORAGE TANK MAP, DECEMBER 22, 1998, ALAMEDA POINT" FIELD CHECKED 3/29/99.
5. GROUNDWATER FLOW DIRECTION BASED ON APRIL 1998 WATER ELEVATION DATA.
6. LOCAL GROUNDWATER FLOW DIRECTIONS MAY BE DIFFERENT FROM REGIONAL GROUNDWATER FLOW DIRECTION DUE TO TIDAL FLUCTUATION, INTERCEPTED STORM DRAINAGE LINES, AND LEAKING WATER SUPPLY LINES.

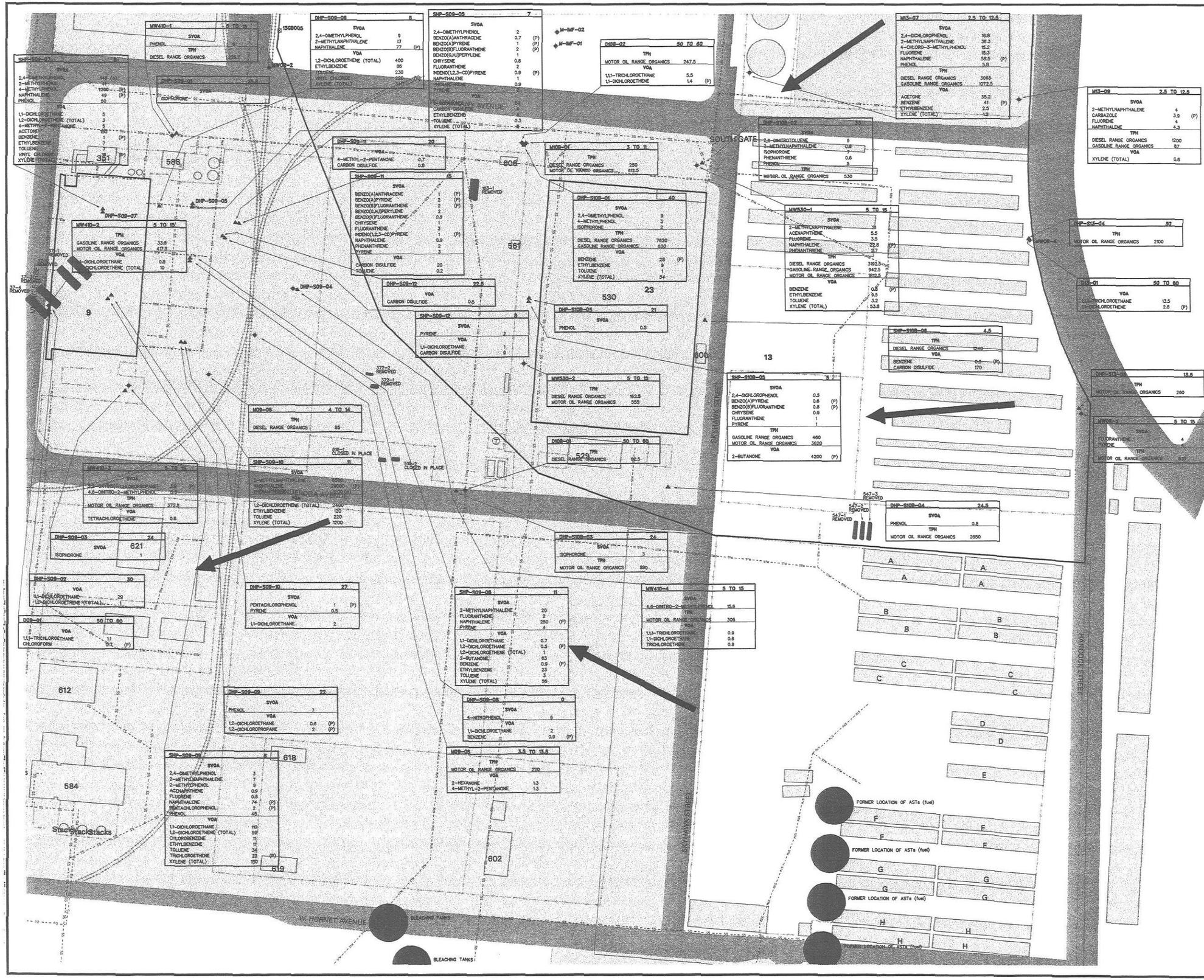
ACRONYMS:

AST – ABOVEGROUND STORAGE TANK
LOEL – LOWEST OBSERVED EFFECT LEVEL
PRG – PRELIMINARY REMEDIATION GOAL
SVOA – SEMIVOLATILE ORGANIC ANALYSIS
TPHEXT – TOTAL PETROLEUM HYDROCARBONS (EXTRACTABLE)
TPHPRG – TOTAL PETROLEUM HYDROCARBONS (PURGEABLE)
VOA – VOLATILE ORGANIC ANALYSIS
μg/L – MICROGRAMS PER LITER
UST – UNDERGROUND STORAGE TANK

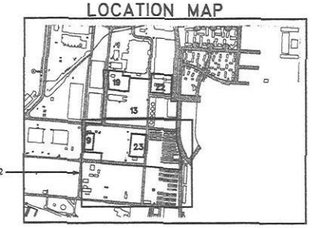
N

30 0 30 60
SCALE: 1" = 60'

FIGURE 6-27 (SHEET 1 OF 2)
ORGANIC COMPOUNDS DETECTED IN GROUNDWATER FIRST WATER-BEARING ZONE OU-2 SOUTHEAST AREA
ALAMEDA POINT
ALAMEDA, CALIFORNIA



LOCATION MAP



INFORMATION OUTSIDE SITE OU-2 BOUNDARY NOT PRESENTED

LEGEND

- MONITORING WELL LOCATION
- HYDROPUNCH LOCATION
- GEOPROBE
- STORM DRAIN LINE
- SANITARY SEWER LINE
- STEAM LINE
- FUEL LINE (ABANDONED/REMOVED AS OF 12/98)
- INDUSTRIAL WASTE LINE
- FENCE
- RAILROAD
- REGIONAL GROUNDWATER FLOW DIRECTION
- PAVED ROAD OR PARKING LOT
- BUILDING, CONCRETE, PAVED, OR COVERED AREA
- INSTALLATION RESTORATION SITE
- 517 BUILDING AND BUILDING NUMBER
- TANK

QUALIFIERS:

α – CONCENTRATION EXCEEDS PROPOSED CALIFORNIA TOXICS RULE CRITERIA
β – CONCENTRATION EXCEEDS NATIONAL TOXICS RULE LOEL
P – CONCONTRATION EXCEEDS RESIDENTIAL PRG FOR THE ANALYTE

NOTES:

1. ANALYTES NOT ANALYZED FOR OR ANALYTES NOT DETECTED IN ALL SAMPLING EVENTS ARE NOT SHOWN ON THIS MAP. A LIST OF ANALYSES PERFORMED FOR EACH SAMPLE IS PRESENTED IN THE SAMPLING SUMMARY FOLLOWING CHAPTER 6. ANALYTICAL DATA ARE PRESENTED IN APPENDIX H. A SAMPLE POINT ON THE MAP WITHOUT A DATA BOX INDICATES NO DETECTIONS.
2. CONCENTRATIONS INDICATED FOR MONITORING WELLS ARE AVERAGE VALUES BASED ON SAMPLING EVENTS CONDUCTED BETWEEN 1994 AND 1996. FOR NON-DETECTIONS, ONE-HALF OF THE DETECTION LIMIT WAS USED FOR CALCULATING THE AVERAGE VALUE.
3. SAMPLE DEPTH FOR HYDROPUNCH SAMPLES INDICATES SAMPLE COLLECTION DEPTH BELOW GROUND SURFACE IN FEET. SAMPLE DEPTH FOR MONITORING WELL SAMPLES INDICATES THE SCREEN INTERVAL DEPTH BELOW THE TOP OF THE CASING OF THE MONITORING WELL.
4. UST LOCATIONS FROM "FUEL LINES AND UNDERGROUND STORAGE TANK MAP, DECEMBER 22, 1998, ALAMEDA POINT" FIELD CHECKED 3/29/99.
5. GROUNDWATER FLOW DIRECTION BASED ON APRIL 1998 WATER ELEVATION DATA.
6. LOCAL GROUNDWATER FLOW DIRECTIONS MAY BE DIFFERENT FROM REGIONAL GROUNDWATER FLOW DIRECTION DUE TO TIDAL FLUCTUATION, INTERCEPTED STORM DRAINAGE LINES, AND LEAKING WATER SUPPLY LINES.

ACRONYMS:

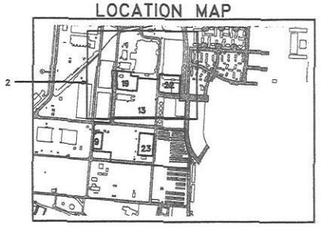
AST – ABOVEGROUND STORAGE TANK
LOEL – LOWEST OBSERVED EFFECT LEVEL
PRG – PRELIMINARY REMEDIATION GOAL
SVOA – SEMIVOLATILE ORGANIC ANALYSIS
TPHEXT – TOTAL PETROLEUM HYDROCARBONS (EXTRACTABLE)
TPHPRG – TOTAL PETROLEUM HYDROCARBONS (PURGEABLE)
VOA – VOLATILE ORGANIC ANALYSIS
µg/L – MICROGRAMS PER LITER
UST – UNDERGROUND STORAGE TANK

30 0 30 60
SCALE: 1" = 60'

FIGURE 6-27 (SHEET 2 OF 2)
ORGANIC COMPOUNDS DETECTED IN GROUNDWATER FIRST WATER-BEARING ZONE OU-2 SOUTHEAST AREA
ALAMEDA POINT
ALAMEDA, CALIFORNIA

LOCATION MAP

SHEET 1 OF 2



INFORMATION OUTSIDE SITE OU-2 BOUNDARY NOT PRESENTED

LEGEND

- MONITORING WELL LOCATION
- HYDROPUNCH LOCATION
- GEOPROBE
- STORM DRAIN LINE
- SANITARY SEWER LINE
- STEAM LINE
- FUEL LINE (ABANDONED/REMOVED AS OF 12/98)
- INDUSTRIAL WASTE LINE
- FENCE
- RAILROAD
- REGIONAL GROUNDWATER FLOW DIRECTION
- PAVED ROAD OR PARKING LOT
- BUILDING, CONCRETE, PAVED, OR COVERED AREA
- INSTALLATION RESTORATION SITE
- BUILDING AND BUILDING NUMBER
- TANK

SAMPLE ID — M07A-09 — 2.5 to 11 — SAMPLE DEPTH (SEE NOTES)
COMPOUND CLASS — METALS
ANALYTE — ARSENIC 3.9 — CONCENTRATION (µg/L)
BARIUM 9.6 (P) — QUALIFIER

QUALIFIERS:

α – CONCENTRATION EXCEEDS PROPOSED CALIFORNIA TOXICS RULE CRITERIA
β – CONCENTRATION EXCEEDS NATIONAL TOXICS RULE LOEL
P – CONCENTRATION EXCEEDS RESIDENTIAL PRG FOR THE ANALYTE

NOTES:

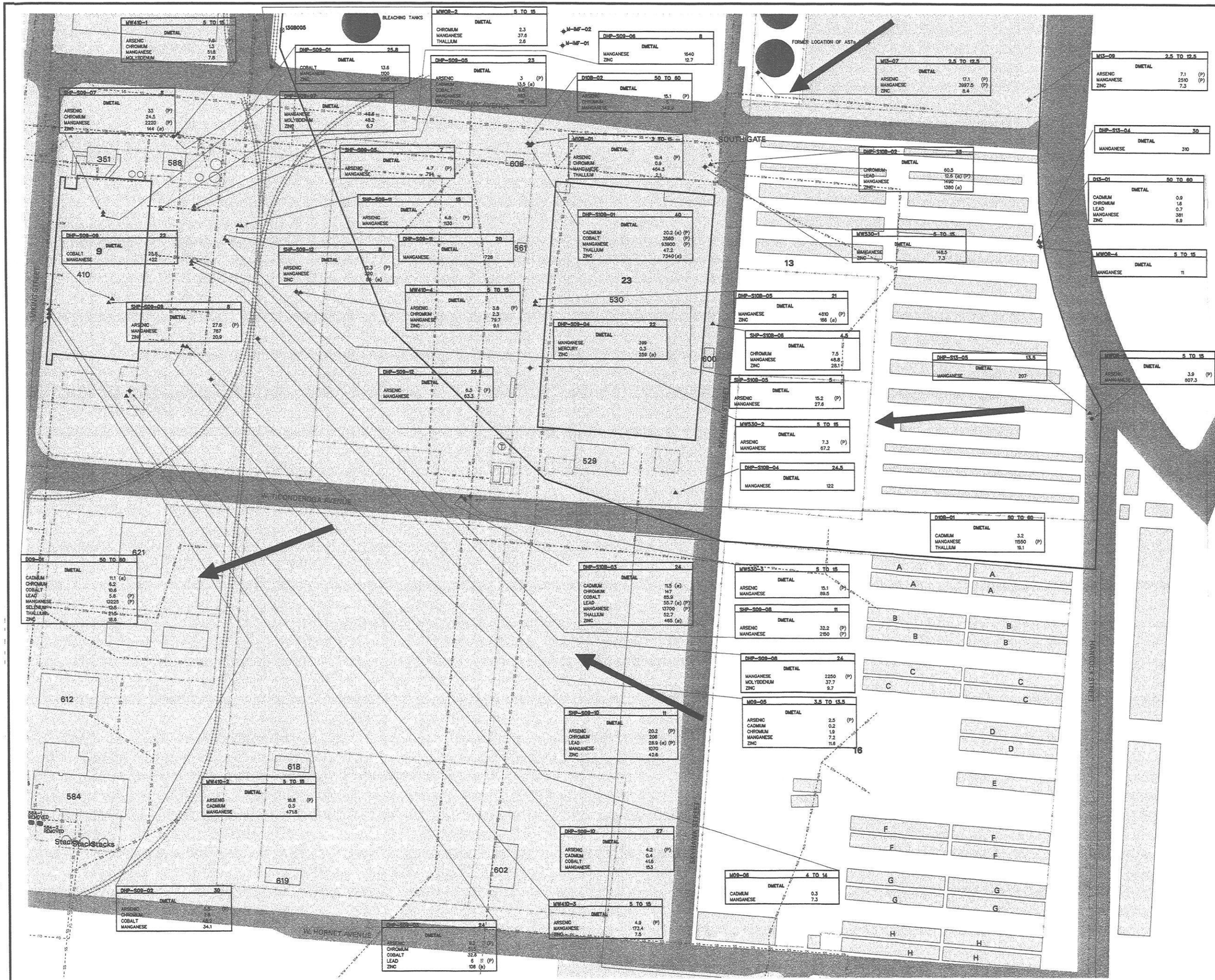
1. ANALYTES NOT ANALYZED FOR OR ANALYTES NOT DETECTED IN ALL SAMPLING EVENTS ARE NOT SHOWN ON THIS MAP. A LIST OF ANALYSES PERFORMED FOR EACH SAMPLE IS PRESENTED IN THE SAMPLING SUMMARY FOLLOWING CHAPTER 6. ANALYTICAL DATA ARE PRESENTED IN APPENDIX H. A SAMPLE POINT ON THE MAP WITHOUT A DATA BOX INDICATES NO DETECTIONS.
2. CONCENTRATIONS INDICATED FOR MONITORING WELLS ARE AVERAGE VALUES BASED ON SAMPLING EVENTS CONDUCTED BETWEEN 1994 AND 1996. FOR NON-DETECTIONS, ONE-HALF OF THE DETECTION LIMIT WAS USED FOR CALCULATING THE AVERAGE VALUE.
3. SAMPLE DEPTH FOR HYDROPUNCH SAMPLES INDICATES SAMPLE COLLECTION DEPTH BELOW GROUND SURFACE IN FEET. SAMPLE DEPTH FOR MONITORING WELL SAMPLES INDICATES THE SCREEN INTERVAL DEPTH BELOW THE TOP OF THE CASING OF THE MONITORING WELL.
4. UST LOCATIONS FROM "FUEL LINES AND UNDERGROUND STORAGE TANK MAP, DECEMBER 22, 1998, ALAMEDA POINT" FIELD CHECKED 3/29/99.
5. GROUNDWATER FLOW DIRECTION BASED ON APRIL 1998 WATER ELEVATION DATA.
6. LOCAL GROUNDWATER FLOW DIRECTIONS MAY BE DIFFERENT FROM REGIONAL GROUNDWATER FLOW DIRECTION DUE TO TIDAL FLUCTUATION, INTERCEPTED STORM DRAINAGE LINES, AND LEAKING WATER SUPPLY LINES.
7. CHEMICALS PRESENTED ARE INCLUSIVE OF HUMAN HEALTH AND ECOLOGICAL COPCs. NOT ALL CHEMICALS PRESENTED ARE ECOLOGICAL COPCs. A LIST OF ECOLOGICAL COPCs IS PRESENTED IN THE SITE-SPECIFIC ECOLOGICAL RISK ASSESMENT.

ACRONYMS:

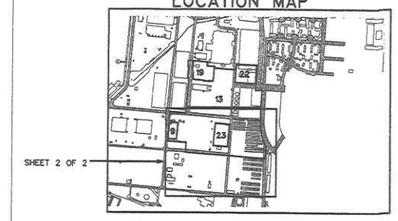
COPC – CHEMICAL OF POTENTIAL CONCERN
LOEL – LOWEST OBSERVED EFFECT LEVEL
PRG – PRELIMINARY REMEDIATION GOAL
µg/L – MICROGRAMS PER LITER
UST – UNDERGROUND STORAGE TANK

30 0 30 60
SCALE: 1" = 60'

FIGURE 6-28 (SHEET 1 OF 2)
INORGANIC COPCs DETECTED IN GROUNDWATER FIRST WATER-BEARING ZONE OU-2 SOUTHEAST AREA
ALAMEDA POINT
ALAMEDA, CALIFORNIA



LOCATION MAP



INFORMATION OUTSIDE SITE OU-2 BOUNDARY NOT PRESENTED

LEGEND

- MONITORING WELL LOCATION
- HYDROPUNCH LOCATION
- GEOPROBE
- STORM DRAIN LINE
- SANITARY SEWER LINE
- STEAM LINE
- FUEL LINE (ABANDONED/REMOVED AS OF 12/98)
- INDUSTRIAL WASTE LINE
- FENCE
- RAILROAD
- REGIONAL GROUNDWATER FLOW DIRECTION
- PAVED ROAD OR PARKING LOT
- BUILDING, CONCRETE, PAVED, OR COVERED AREA
- INSTALLATION RESTORATION SITE
- 517 BUILDING AND BUILDING NUMBER
- TANK

SAMPLE ID — M07A-09 — 2.5 to 11 — SAMPLE DEPTH (SEE NOTES)
COMPOUND CLASS — DMETAL
ANALYTE — ARSENIC 3.9 — CONCENTRATION (µg/L)
BARIUM 9.6 (P) — QUALIFIER

QUALIFIERS:

α – CONCENTRATION EXCEEDS PROPOSED CALIFORNIA TOXICS RULE CRITERIA
β – CONCENTRATION EXCEEDS NATIONAL TOXICS RULE LOEL
P – CONCONTRATION EXCEEDS RESIDENTIAL PRG FOR THE ANALYTE

NOTES:

1. ANALYTES NOT ANALYZED FOR OR ANALYTES NOT DETECTED IN ALL SAMPLING EVENTS ARE NOT SHOWN ON THIS MAP. A LIST OF ANALYSES PERFORMED FOR EACH SAMPLE IS PRESENTED IN THE SAMPLING SUMMARY FOLLOWING CHAPTER 6. ANALYTICAL DATA ARE PRESENTED IN APPENDIX H. A SAMPLE POINT ON THE MAP WITHOUT A DATA BOX INDICATES NO DETECTIONS.
2. CONCENTRATIONS INDICATED FOR MONITORING WELLS ARE AVERAGE VALUES BASED ON SAMPLING EVENTS CONDUCTED BETWEEN 1994 AND 1996. FOR NON-DETECTIONS, ONE-HALF OF THE DETECTION LIMIT WAS USED FOR CALCULATING THE AVERAGE VALUE.
3. SAMPLE DEPTH FOR HYDROPUNCH SAMPLES INDICATES SAMPLE COLLECTION DEPTH BELOW GROUND SURFACE IN FEET. SAMPLE DEPTH FOR MONITORING WELL SAMPLES INDICATES THE SCREEN INTERVAL DEPTH BELOW THE TOP OF THE CASING OF THE MONITORING WELL.
4. UST LOCATIONS FROM "FUEL LINES AND UNDERGROUND STORAGE TANK MAP, DECEMBER 22, 1998, ALAMEDA POINT" FIELD CHECKED 3/26/99.
5. GROUNDWATER FLOW DIRECTION BASED ON APRIL 1998 WATER ELEVATION DATA.
6. LOCAL GROUNDWATER FLOW DIRECTIONS MAY BE DIFFERENT FROM REGIONAL GROUNDWATER FLOW DIRECTION DUE TO TIDAL FLUCTUATION, INTERCEPTED STORM DRAINAGE LINES, AND LEAKING WATER SUPPLY LINES.
7. CHEMICALS PRESENTED ARE INCLUSIVE OF HUMAN HEALTH AND ECOLOGICAL COPCs. NOT ALL CHEMICALS PRESENTED ARE ECOLOGICAL COPCs. A LIST OF ECOLOGICAL COPCs IS PRESENTED IN THE SITE-SPECIFIC ECOLOGICAL RISK ASSESMENT.

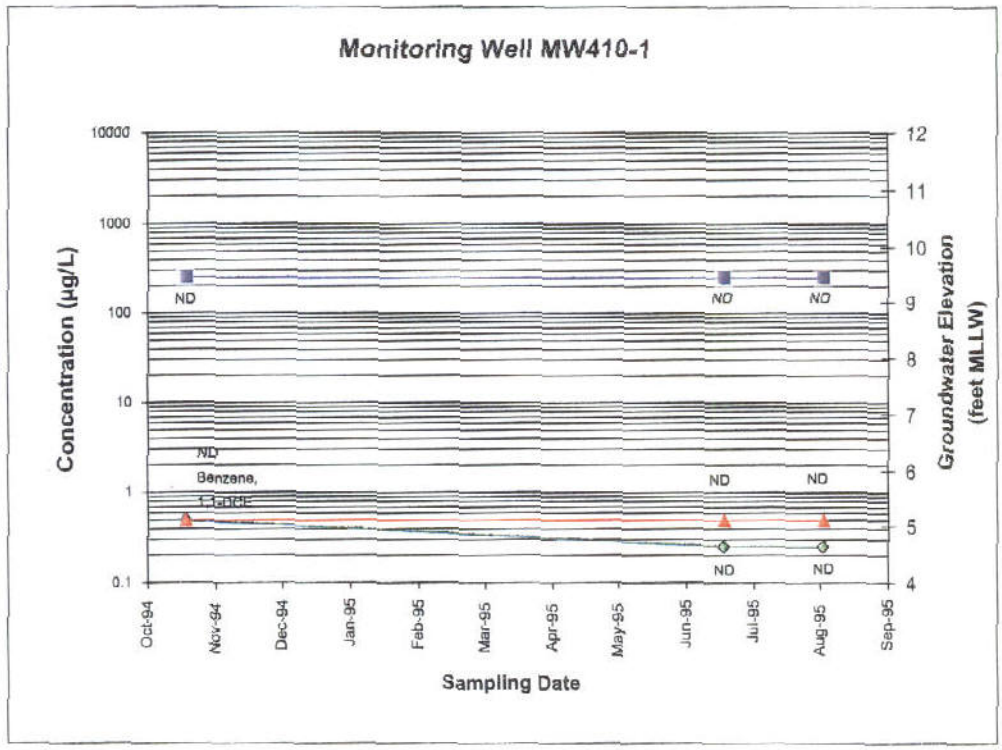
ACRONYMS:

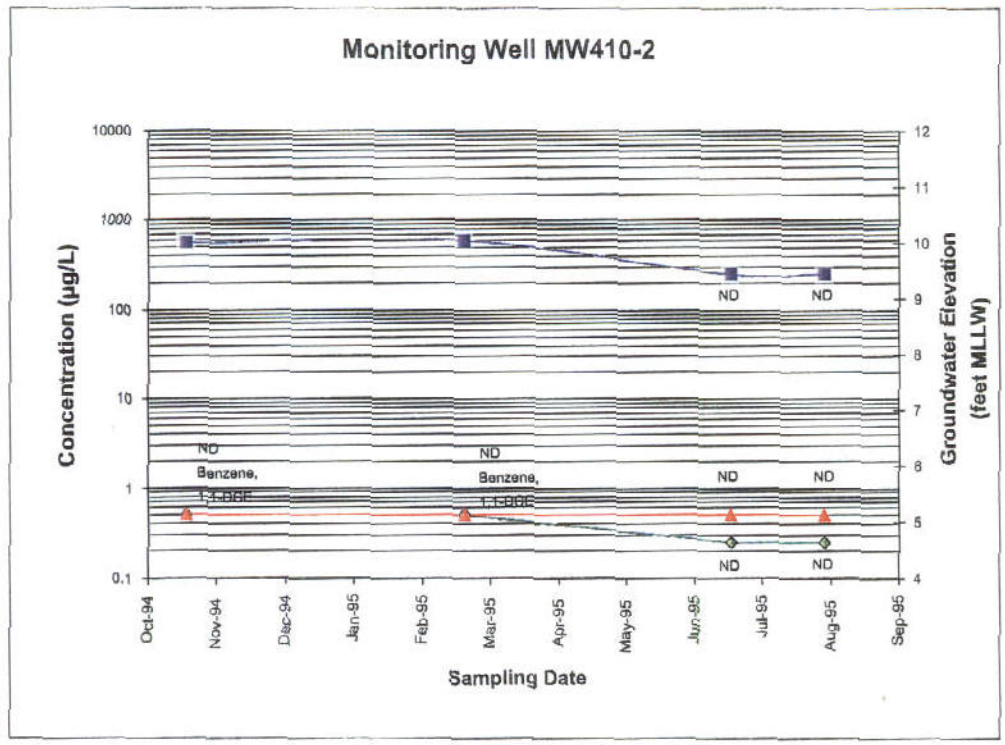
COPC – CHEMICAL OF POTENTIAL CONCERN
LOEL – LOWEST OBSERVED EFFECT LEVEL
PRG – PRELIMINARY REMEDIATION GOAL
µg/L – MICROGRAMS PER LITER
UST – UNDERGROUND STORAGE TANK
DMETAL – DISSOLVED METALS

N

30 0 30 60
SCALE: 1" = 60'

FIGURE 6-28 (SHEET 2 OF 2)
INORGANIC COPCs DETECTED IN GROUNDWATER FIRST WATER-BEARING ZONE OU-2 SOUTHEAST AREA
ALAMEDA POINT
ALAMEDA, CALIFORNIA





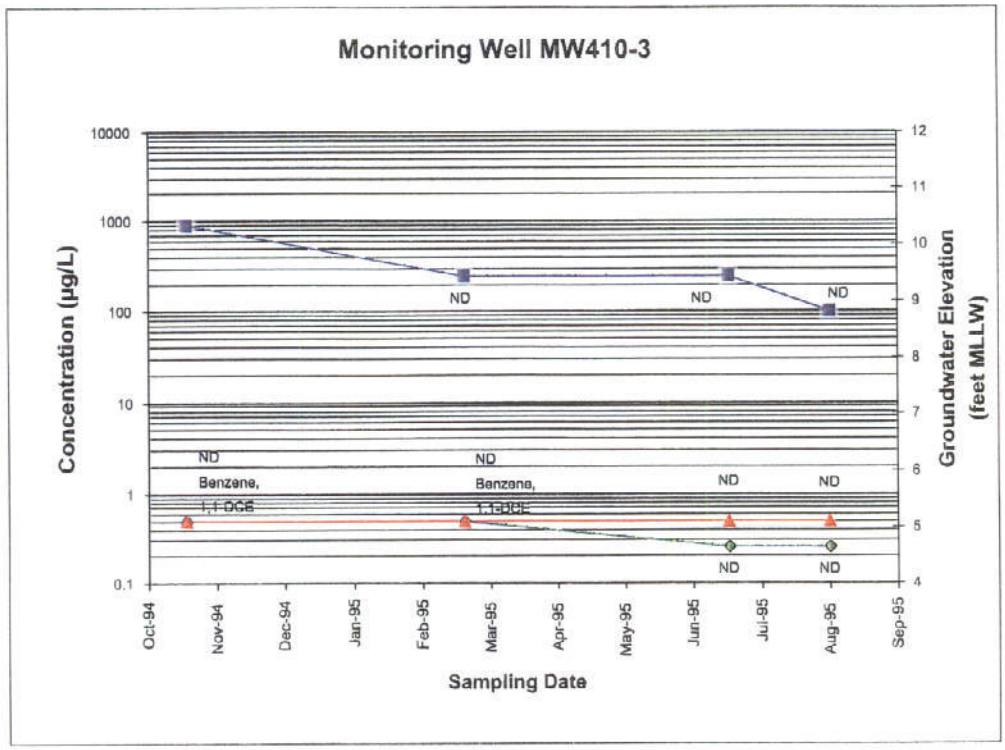
- Benzene
- TPH Motor Oil
- 1,1-DCE
- Water Level

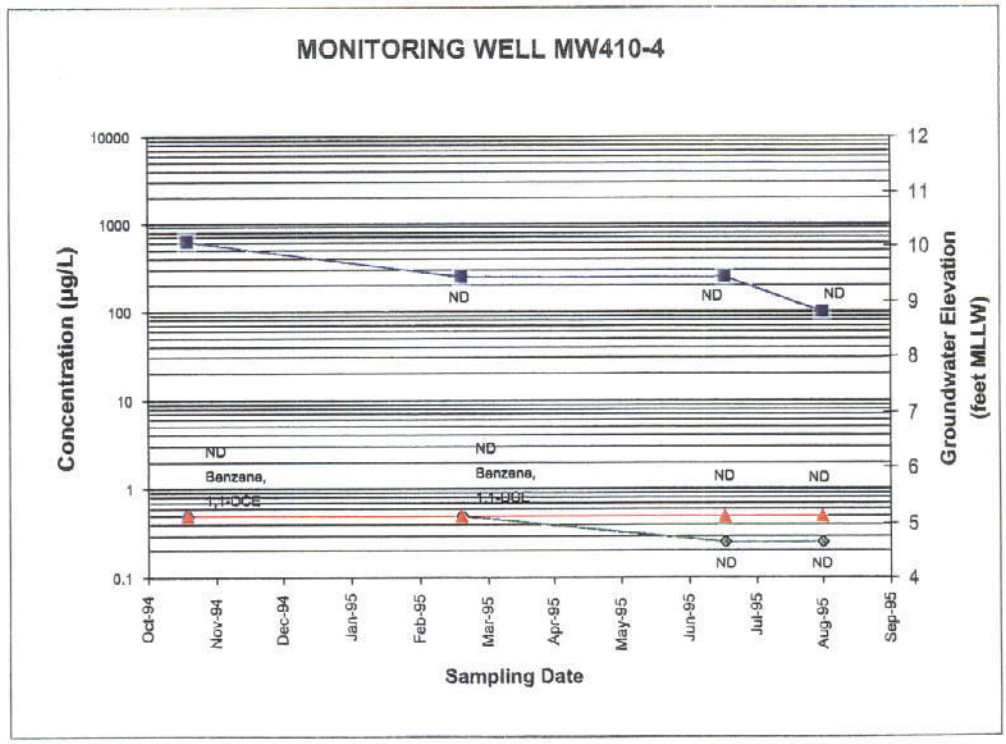
NOTES:

TPH Motor Oil	- Total petroleum hydrocarbon motor oil
1,1-DCE	- 1,1-Dichloroethene
ND	- Non-detect; concentration posted for non-detect results is one-half of the detection limit for the sample.
µg/L	- Micrograms per liter.
MLLW	- Feet above mean lower low water.

FIGURE 6-29a
SITE 9
GROUNDWATER CONTAMINANTS
TIME-SERIES PLOTS
OU-2 SOUTHEAST AREA
ALAMEDA POINT
ALAMEDA, CALIFORNIA

G0069-167B0202 MW410-1.DSF GAS 5/18/99





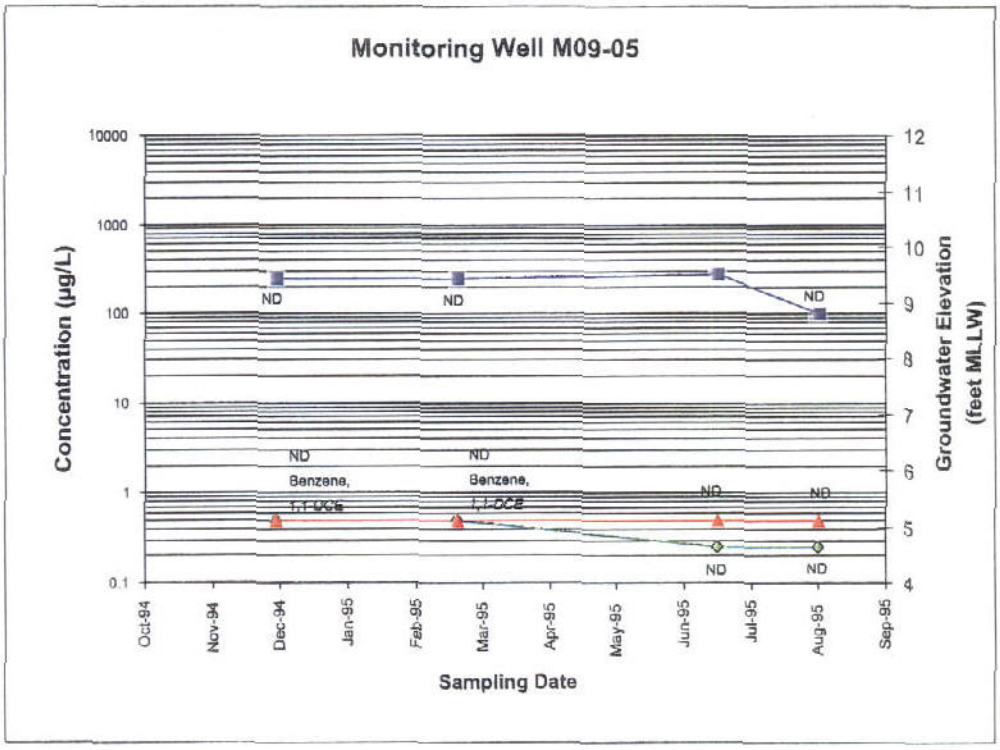
- Benzene
- TPH Motor Oil
- 1,1-DCE
- Water Level

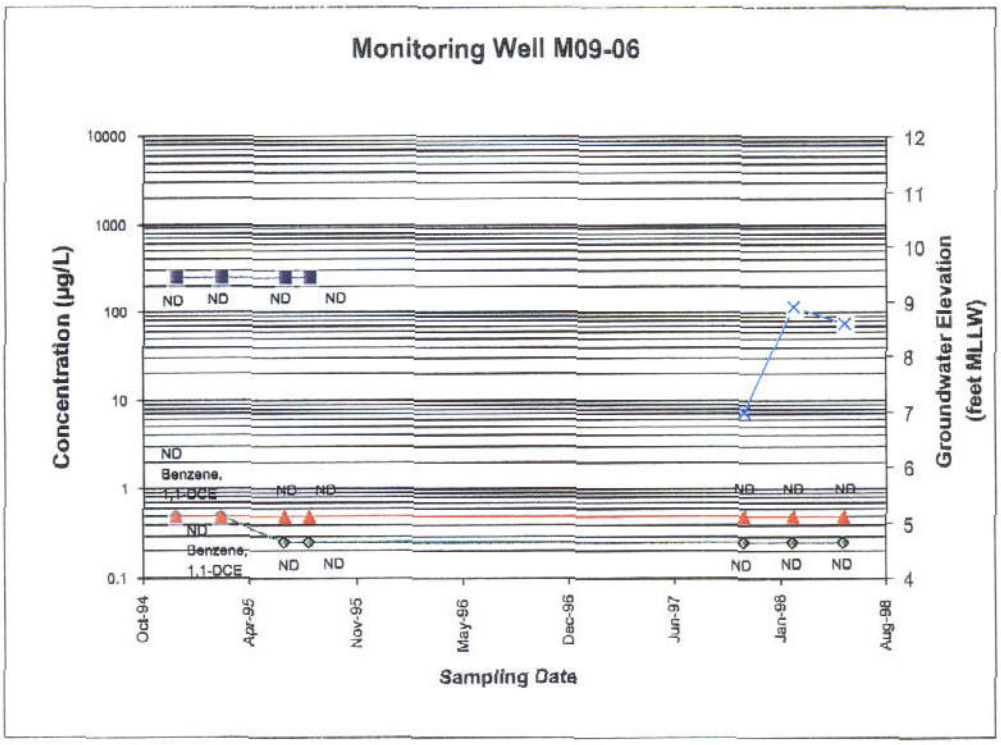
NOTES:

TPH Motor Oil	- Total petroleum hydrocarbon motor oil
1,1-DCE	- 1,1-Dichloroethene
ND	- Non-detect; concentration posted for non-detect results is one-half of the detection limit for the sample.
µg/L	- Micrograms per liter.
MLLW	- Feet above mean lower low water.

FIGURE 6-29b
SITE 9
GROUNDWATER CONTAMINANTS
TIME-SERIES PLOTS
OU-2 SOUTHEAST AREA
ALAMEDA POINT
ALAMEDA, CALIFORNIA

G0069-167B/202 MW410-3.DSF GAS 5/18/99





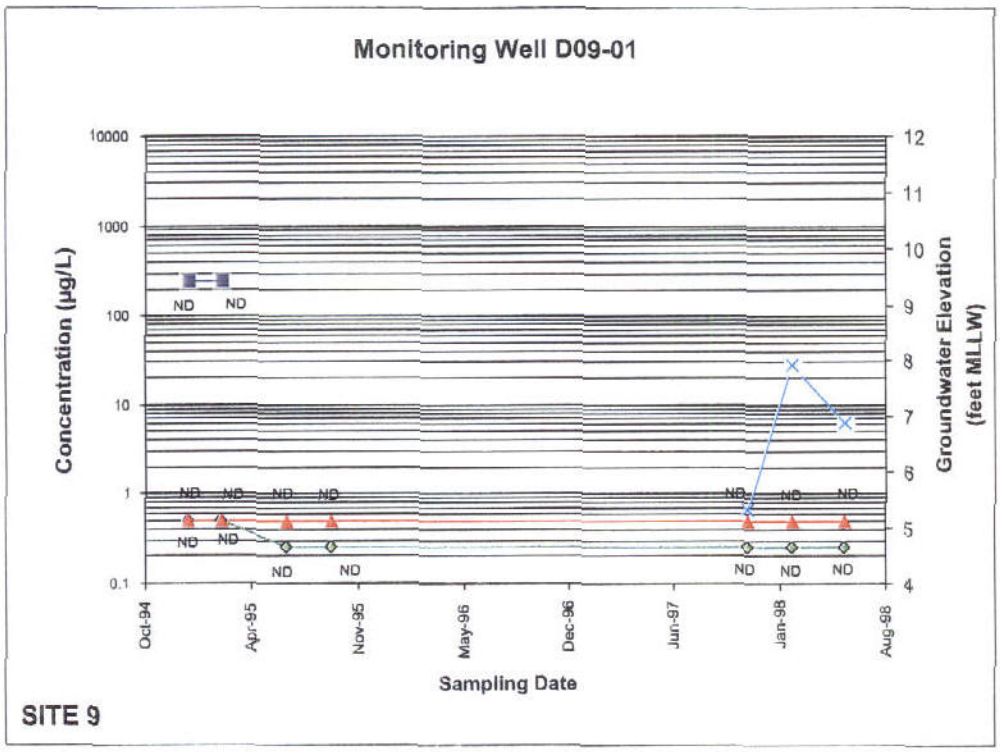
- Benzene
- TPH Motor Oil
- 1,1-DCE
- Water Level

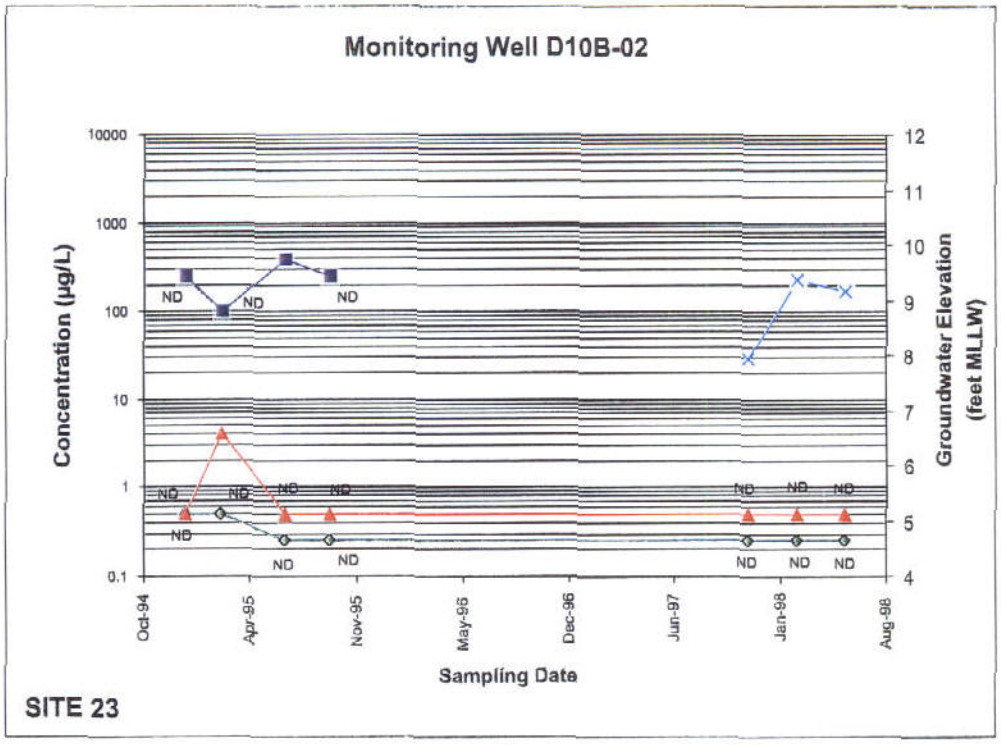
NOTES:

TPH Motor Oil	- Total petroleum hydrocarbon motor oil
1,1-DCE	- 1,1-Dichloroethene
ND	- Non-detect; concentration posted for non-detect results is one-half of the detection limit for the sample.
µg/L	- Micrograms per liter.
MLLW	- Feet above mean lower low water.

FIGURE 6-29c
SITE 9
GROUNDWATER CONTAMINANTS
TIME-SERIES PLOTS
OU-2 SOUTHEAST AREA
ALAMEDA POINT
ALAMEDA, CALIFORNIA

G0069-167B0202 M09-05.DSF GAS 5/18/99





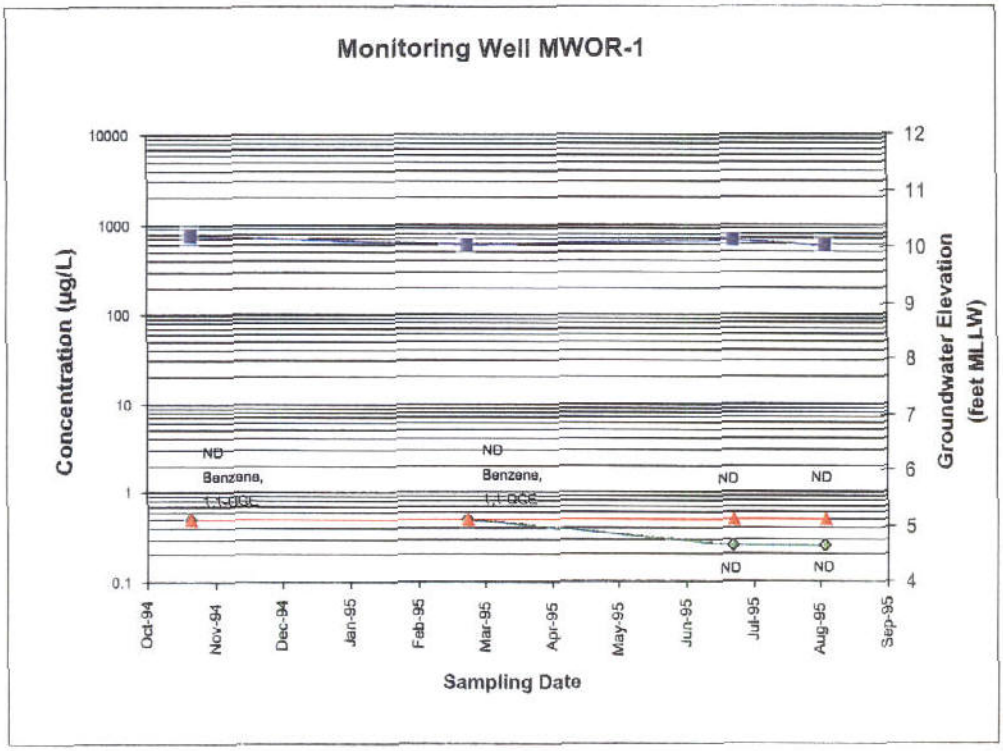
- Benzene
- TPH Motor Oil
- 1,1-DCE
- Water Level

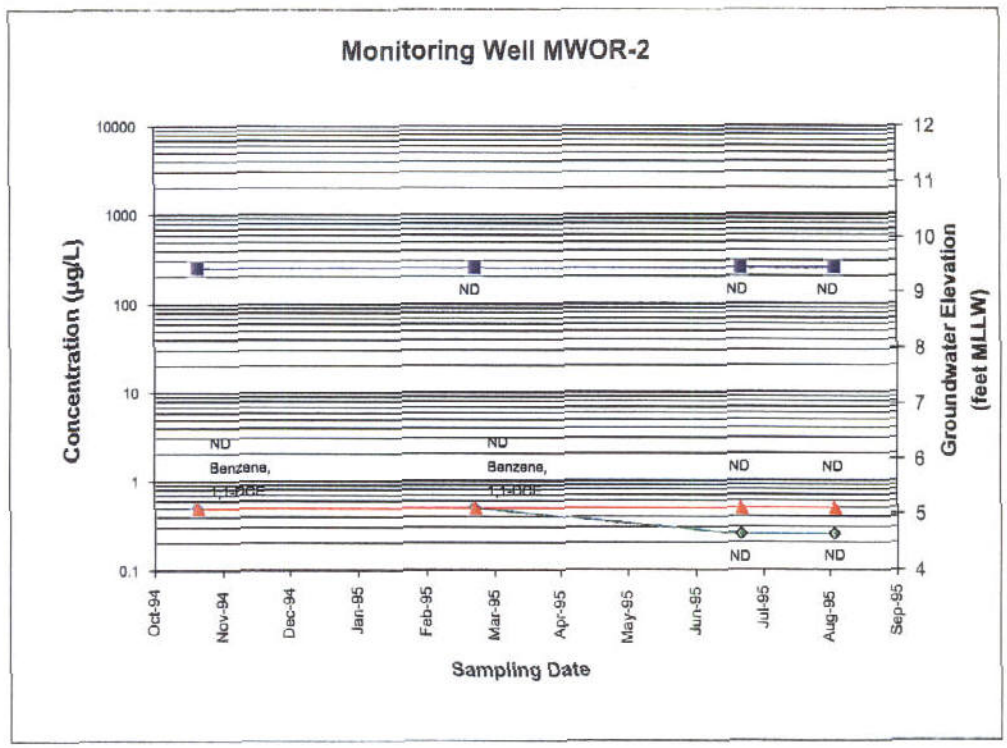
NOTES:

TPH Motor Oil	- Total petroleum hydrocarbon motor oil
1,1-DCE	- 1,1-Dichloroethene
ND	- Non-detect; concentration posted for non-detect results is one-half of the detection limit for the sample.
µg/L	- Micrograms per liter.
MLLW	- Feet above mean lower low water.

FIGURE 6-29d
SITE 9 AND SITE 23
GROUNDWATER CONTAMINANTS
TIME-SERIES PLOTS
OU-2 SOUTHEAST AREA
ALAMEDA POINT
ALAMEDA, CALIFORNIA

G0069-167B0202 LU9-01.DSF GAS 5/18/99





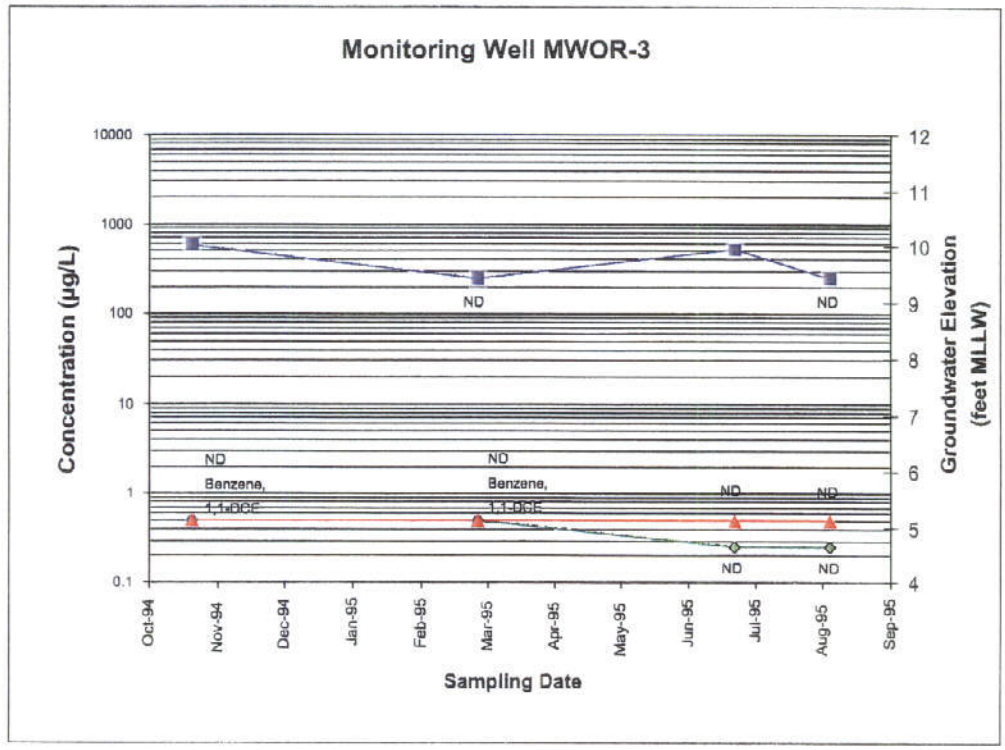
- Benzene
- TPH Motor Oil
- 1,1-DCE
- Water Level

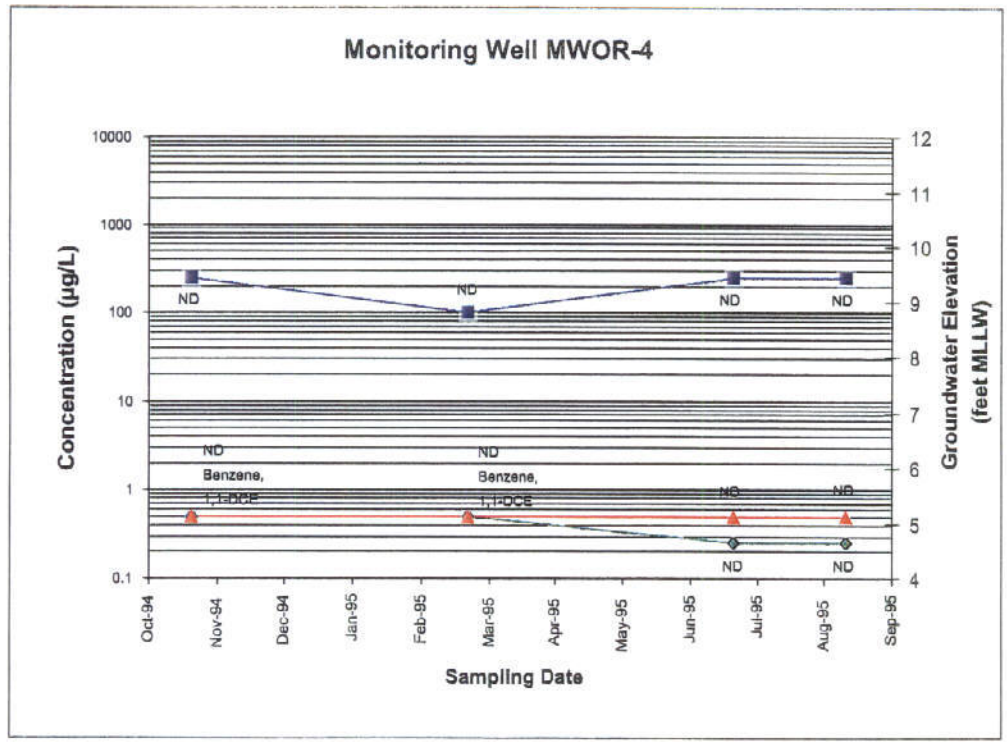
NOTES:

TPH Motor Oil	- Total petroleum hydrocarbon motor oil
1,1-DCE	- 1,1-Dichloroethene
ND	- Non-detect; concentration posted for non-detect results is one-half of the detection limit for the sample.
µg/L	- Micrograms per liter.
MLLW	- Feet above mean lower low water.

FIGURE 6-29e
SITE 13
GROUNDWATER CONTAMINANTS
TIME-SERIES PLOTS
OU-2 SOUTHEAST AREA
ALAMEDA POINT
ALAMEDA, CALIFORNIA

G0069-167B0202 MWOR-1.DSF GAS 5/18/99





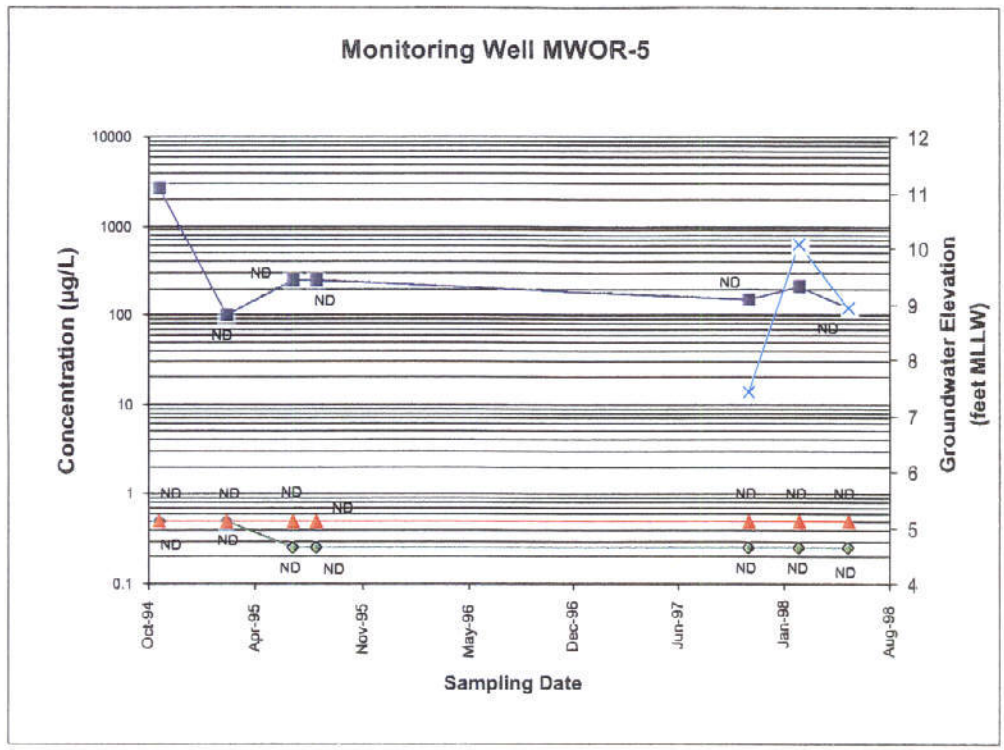
- Benzene
- TPH Motor Oil
- 1,1-DCE
- Water Level

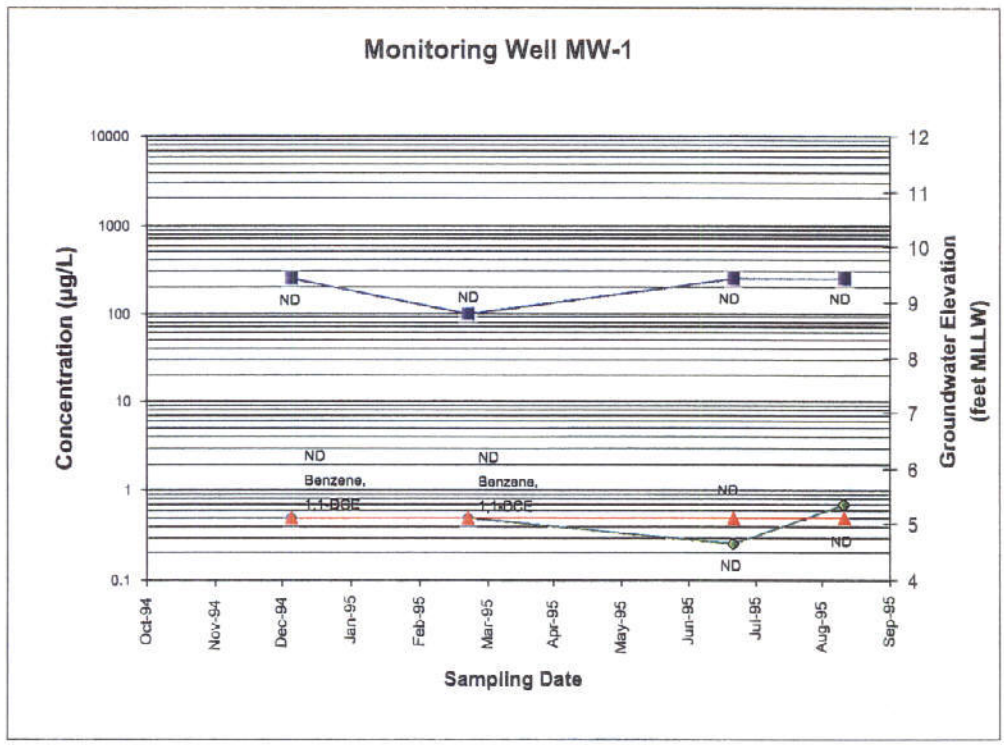
NOTES:

TPH Motor Oil	- Total petroleum hydrocarbon motor oil
1,1-DCE	- 1,1-Dichloroethene
ND	- Non-detect; concentration posted for non-detect results is one-half of the detection limit for the sample.
µg/L	- Micrograms per liter.
MLLW	- Feet above mean lower low water.

FIGURE 6-29f
SITE 13
GROUNDWATER CONTAMINANTS
TIME-SERIES PLOTS
OU-2 SOUTHEAST AREA
ALAMEDA POINT
ALAMEDA, CALIFORNIA

G0069-167B0202 ...wWOR-3.DSF GAS 5/18/99





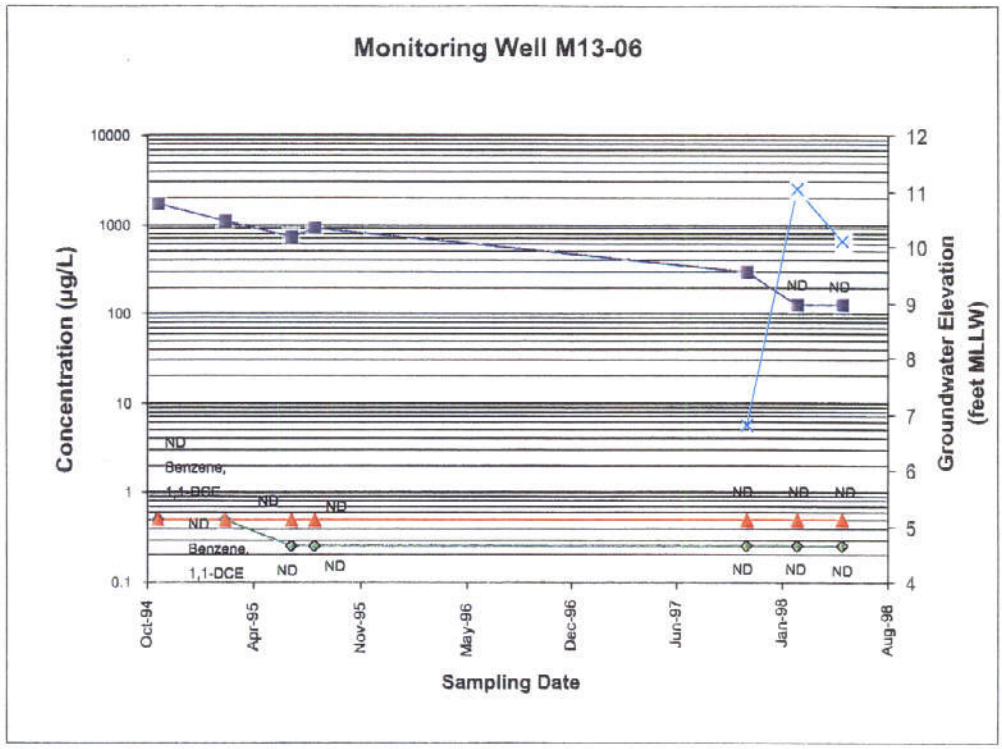
- Benzene
- TPH Motor Oil
- 1,1-DCE
- Water Level

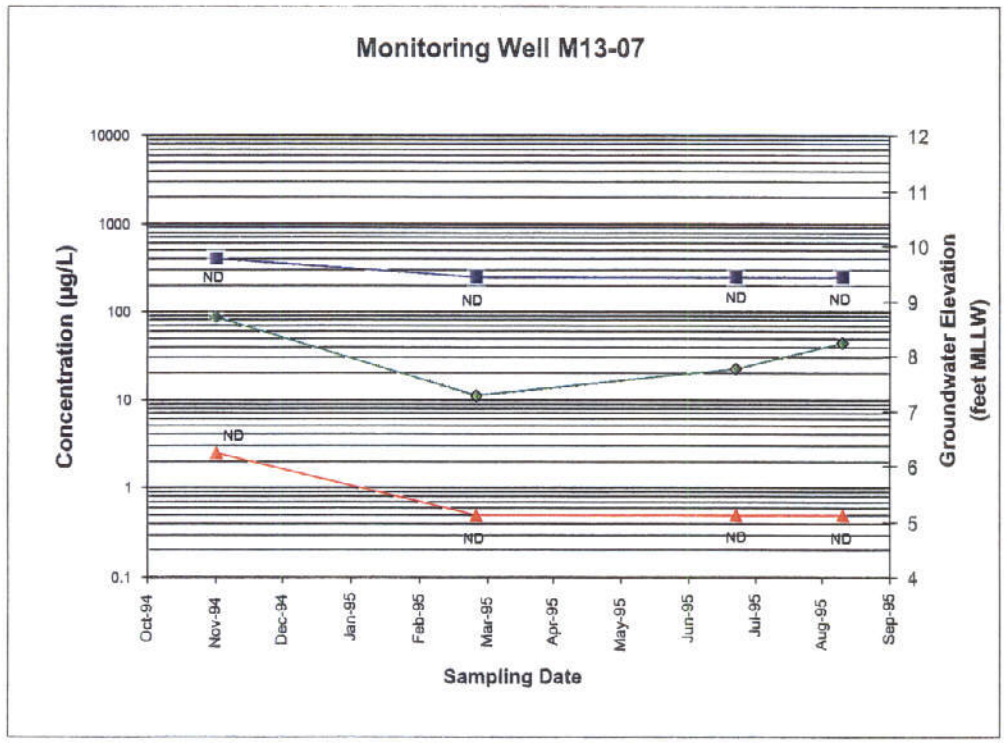
NOTES:

TPH Motor Oil	- Total petroleum hydrocarbon motor oil
1,1-DCE	- 1,1-Dichloroethene
ND	- Non-detect; concentration posted for non-detect results is one-half of the detection limit for the sample.
µg/L	- Micrograms per liter.
MLLW	- Feet above mean lower low water.

FIGURE 6-29g
SITE 13
GROUNDWATER CONTAMINANTS
TIME-SERIES PLOTS
OU-2 SOUTHEAST AREA
ALAMEDA POINT
ALAMEDA, CALIFORNIA

G0069-167B0202 MWOR-5.DSF GAS 5/18/99





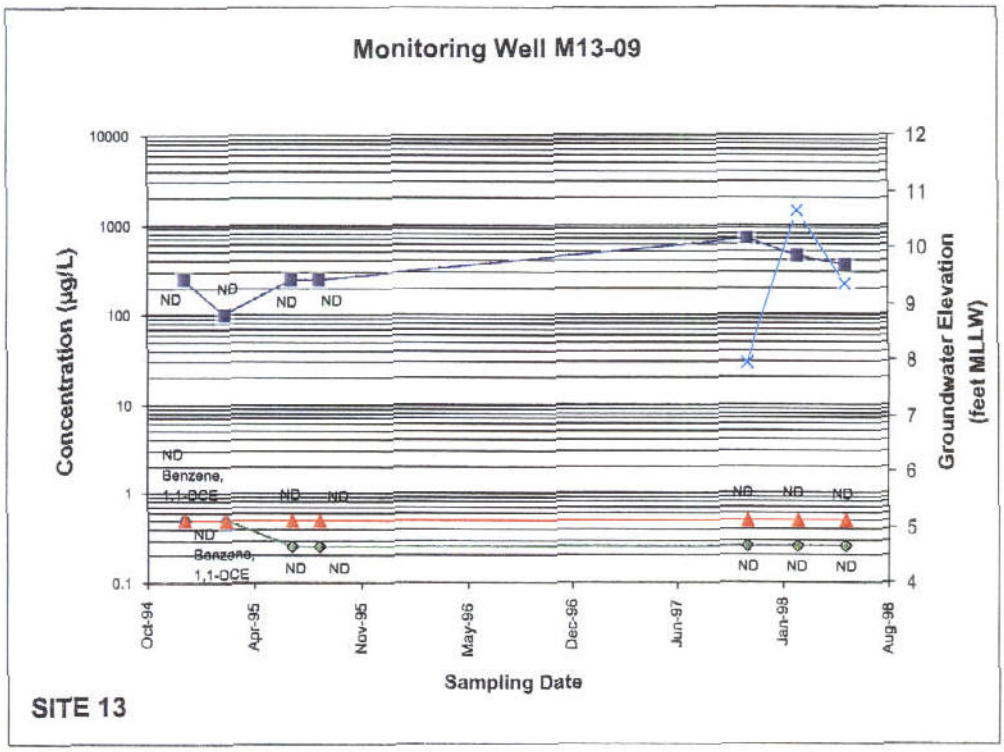
- Benzene
- TPH Motor Oil
- 1,1-DCE
- Water Level

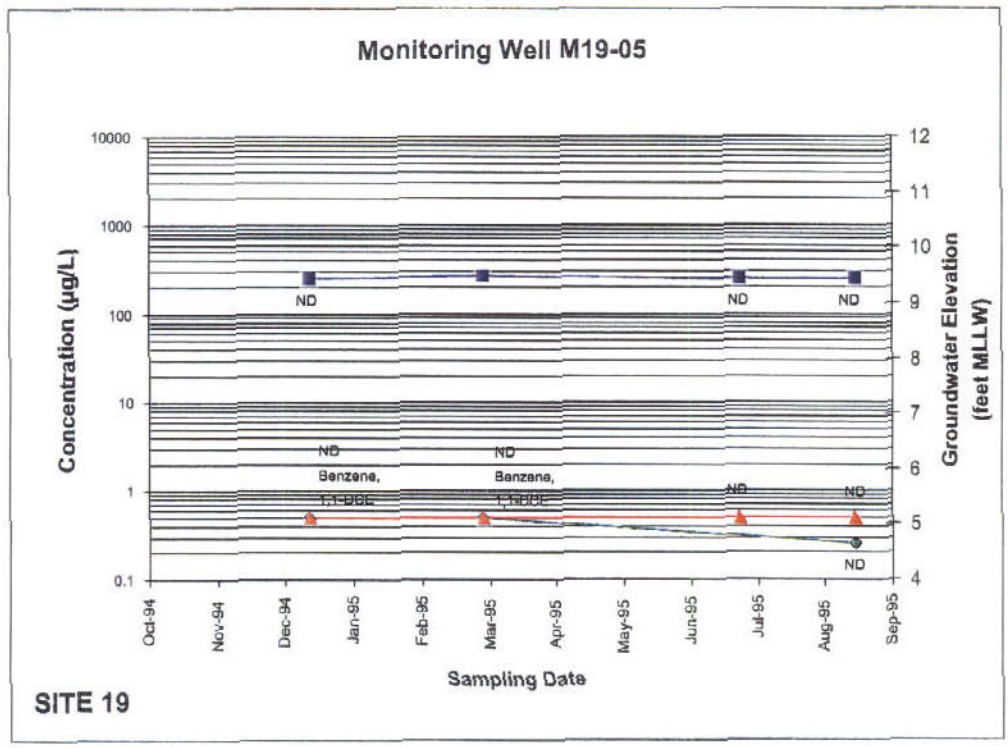
NOTES:

TPH Motor Oil	- Total petroleum hydrocarbon motor oil
1,1-DCE	- 1,1-Dichloroethene
ND	- Non-detect; concentration posted for non-detect results is one-half of the detection limit for the sample.
µg/L	- Micrograms per liter.
MLLW	- Feet above mean lower low water.

FIGURE 6-29h
SITE 13
GROUNDWATER CONTAMINANTS
TIME-SERIES PLOTS
OU-2 SOUTHEAST AREA
ALAMEDA POINT
ALAMEDA, CALIFORNIA

G0069-167/B0202 M13-06.DSF GAS 5/18/99





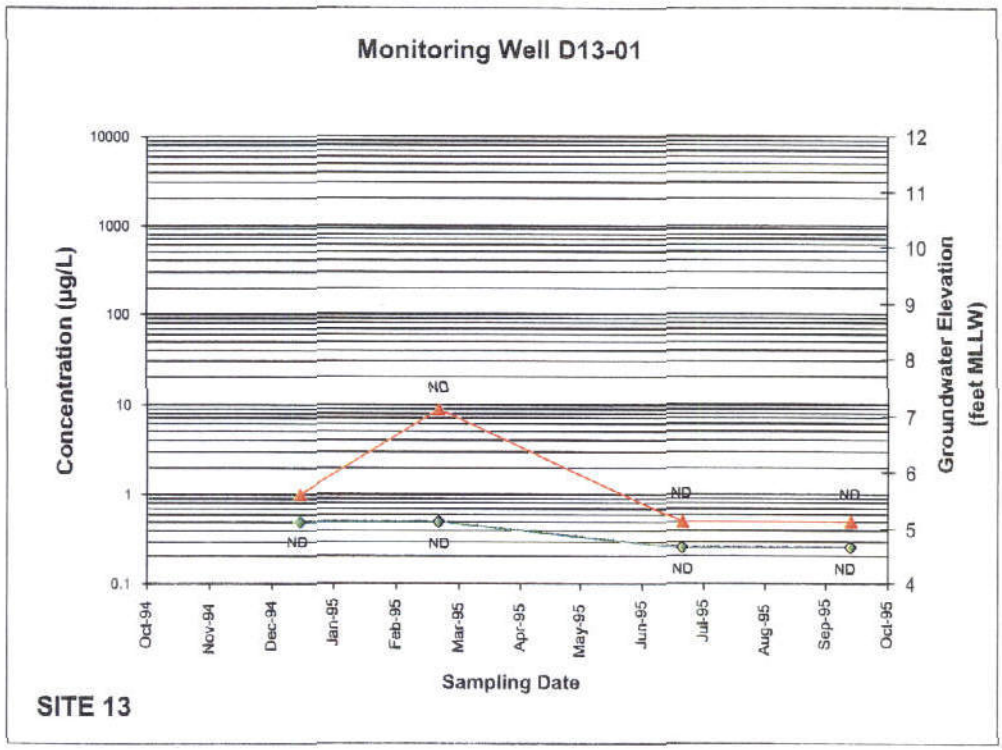
- Benzene
- TPH Motor Oil
- 1,1-DCE
- Water Level

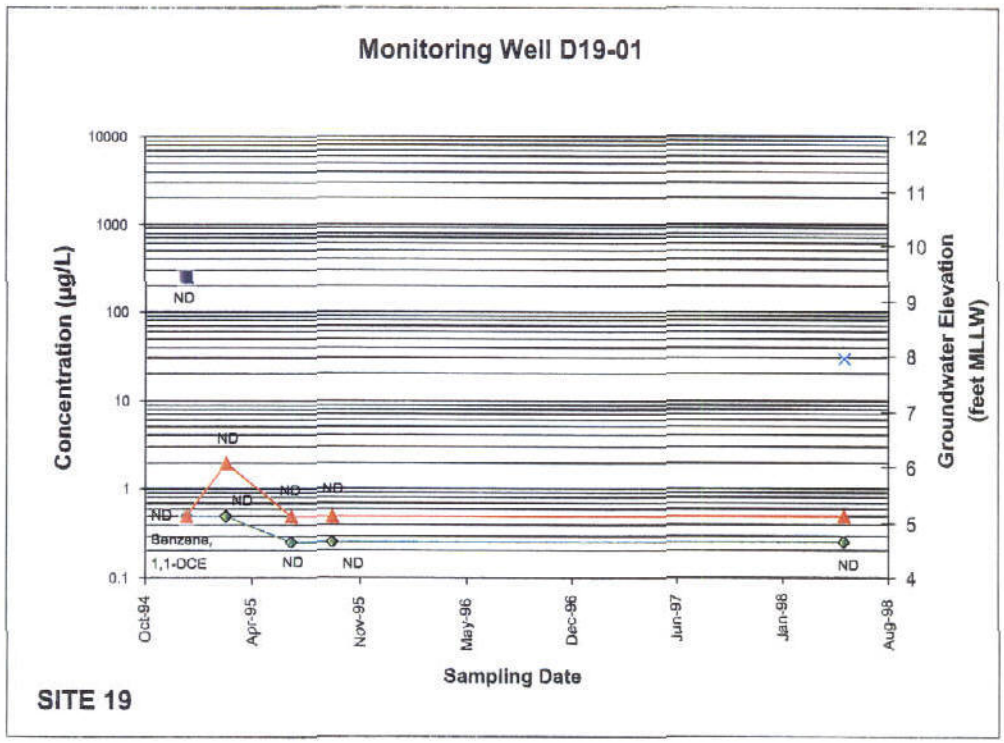
NOTES:

TPH Motor Oil	- Total petroleum hydrocarbon motor oil
1,1-DCE	- 1,1-Dichloroethene
ND	- Non-detect; concentration posted for non-detect results is one-half of the detection limit for the sample.
µg/L	- Micrograms per liter.
MLLW	- Feet above mean lower low water.

FIGURE 6-29i
SITE 13 AND SITE 19
GROUNDWATER CONTAMINANTS
TIME-SERIES PLOTS
OU-2 SOUTHEAST AREA
ALAMEDA POINT
ALAMEDA, CALIFORNIA

G0069-167B0202 M13-09.DSF GAS 5/18/99





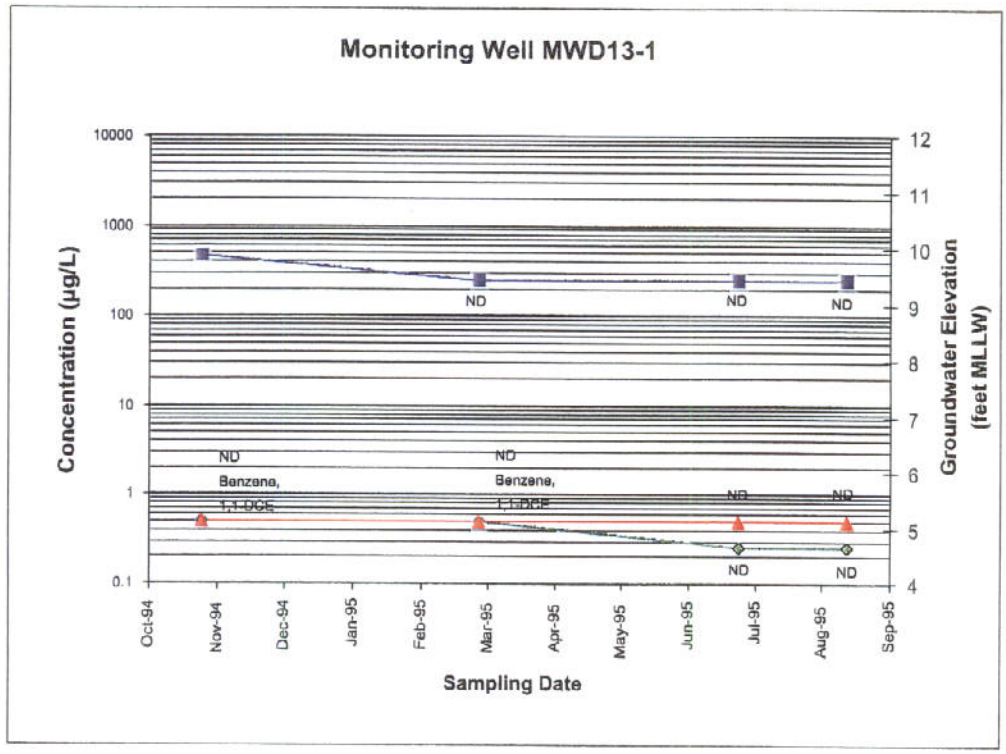
- Benzene
- TPH Motor Oil
- 1,1-DCE
- Water Level

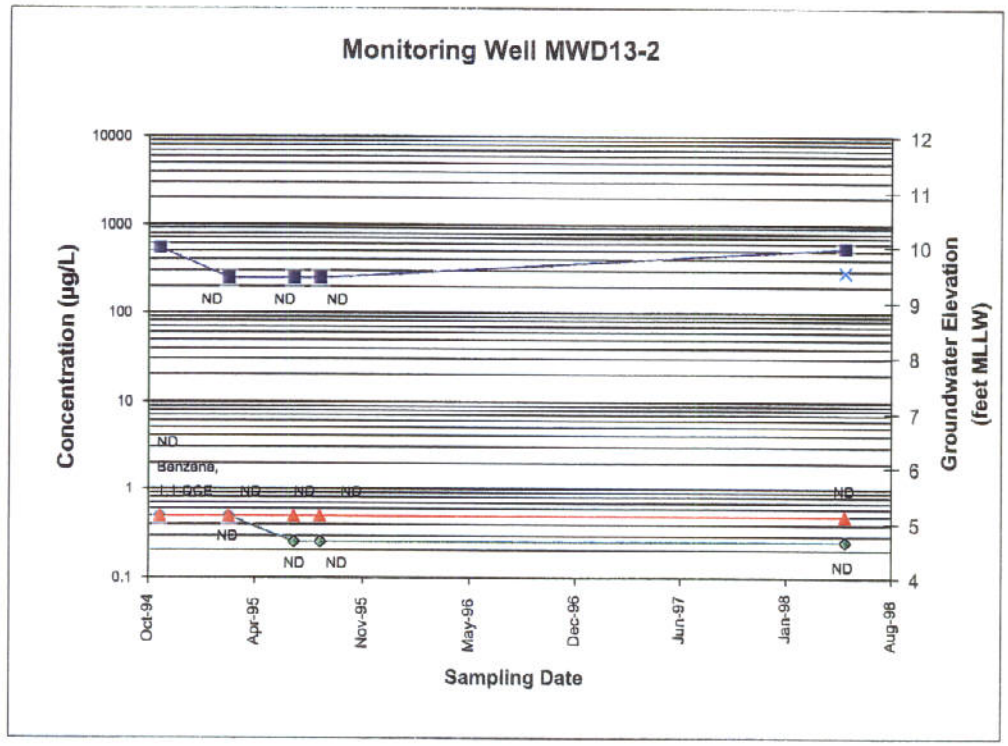
NOTES:

TPH Motor Oil	- Total petroleum hydrocarbon motor oil
1,1-DCE	- 1,1-Dichloroethene
ND	- Non-detect; concentration posted for non-detect results is one-half of the detection limit for the sample.
µg/L	- Micrograms per liter.
MLLW	- Feet above mean lower low water.

FIGURE 6-29j
SITE 13 AND SITE 19
GROUNDWATER CONTAMINANTS
TIME-SERIES PLOTS
OU-2 SOUTHEAST AREA
ALAMEDA POINT
ALAMEDA, CALIFORNIA

G0069-167B0202 ...3-01.DSF GAS 5/18/99





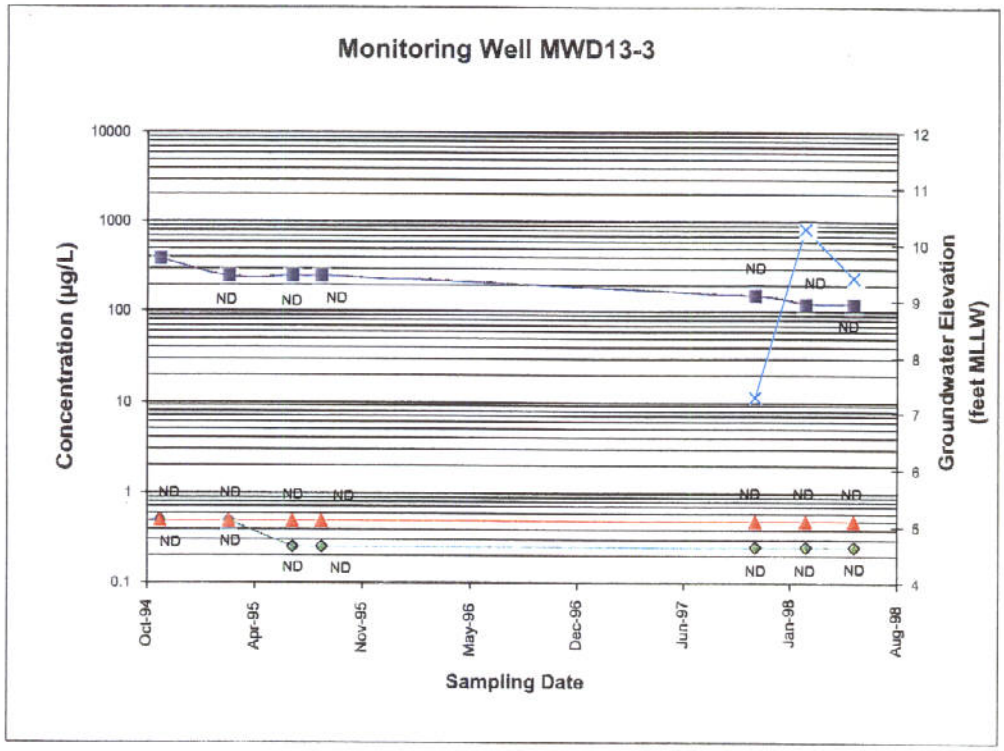
- Benzene
- TPH Motor Oil
- 1,1-DCE
- Water Level

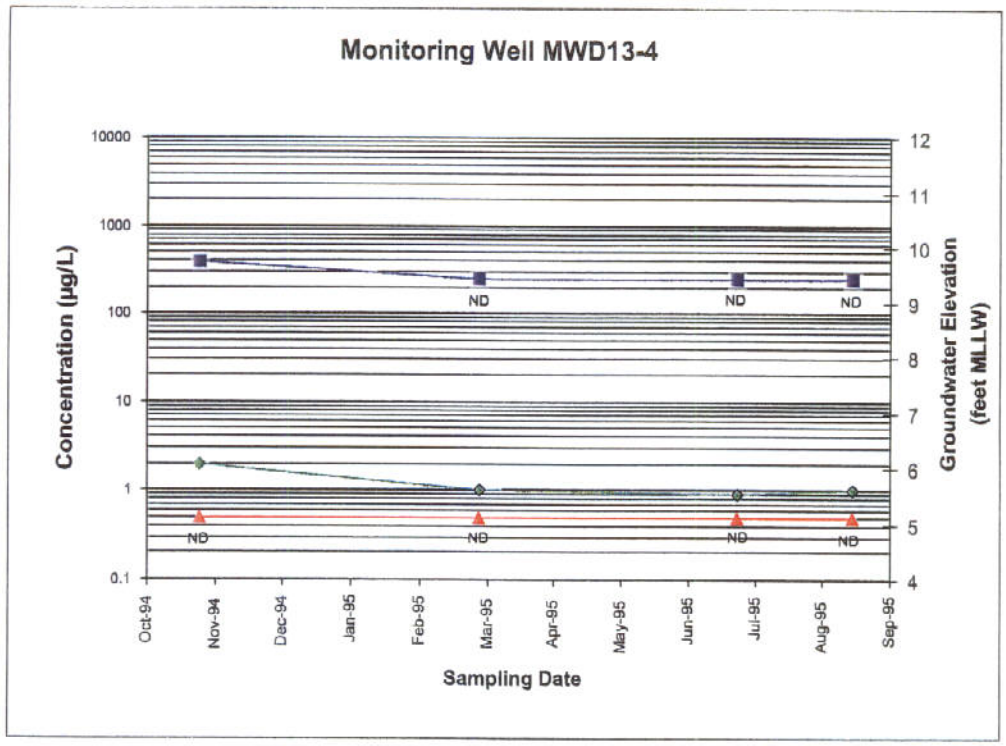
NOTES:

TPH Motor Oil	- Total petroleum hydrocarbon motor oil
1,1-DCE	- 1,1-Dichloroethene
ND	- Non-detect; concentration posted for non-detect results is one-half of the detection limit for the sample.
µg/L	- Micrograms per liter.
MLLW	- Feet above mean lower low water.

FIGURE 6-29k
SITE 19
GROUNDWATER CONTAMINANTS
TIME-SERIES PLOTS
OU-2 SOUTHEAST AREA
ALAMEDA POINT
ALAMEDA, CALIFORNIA

G0069-167B0202 MWD13-1.DSF GAS 5/18/99





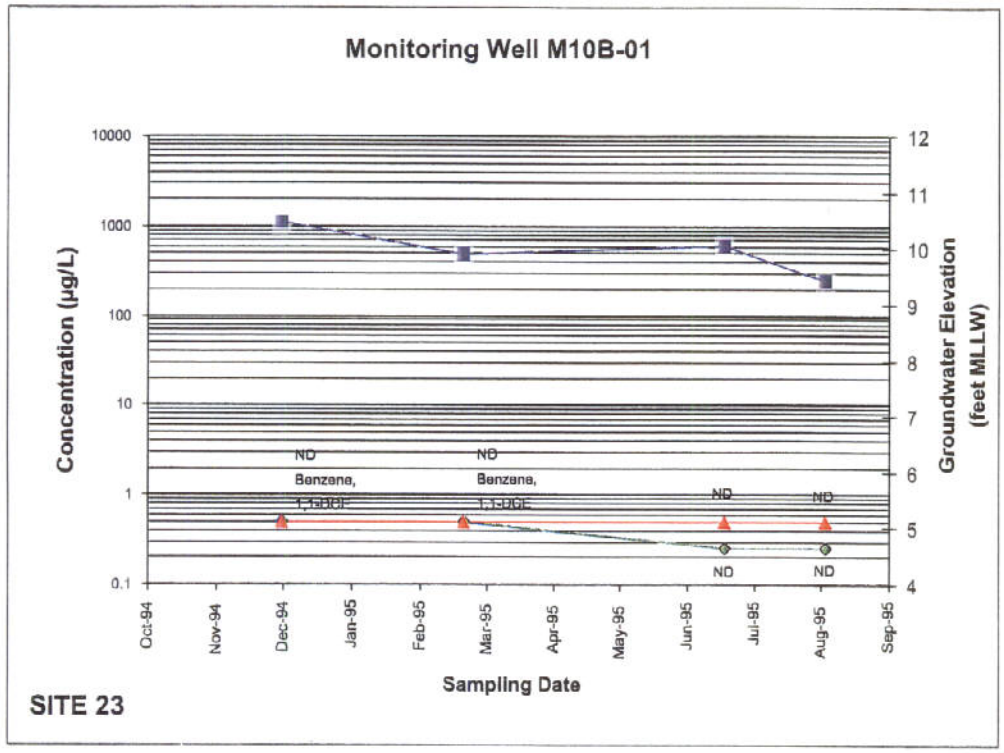
- Benzene
- TPH Motor Oil
- 1,1-DCE
- Water Level

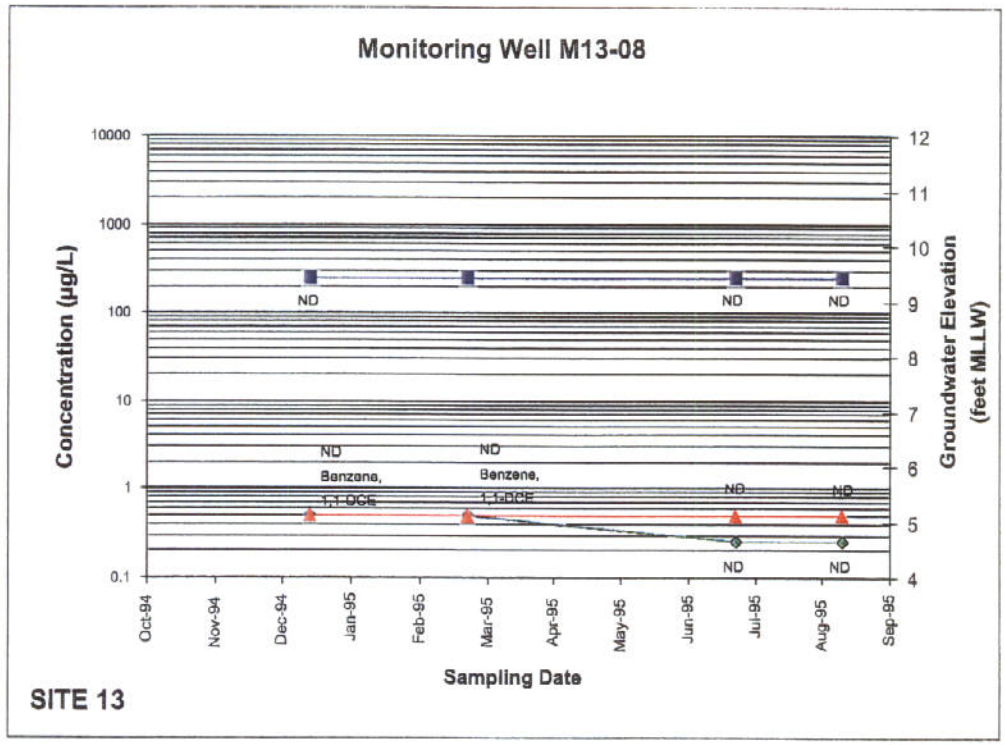
NOTES:

TPH Motor Oil	- Total petroleum hydrocarbon motor oil
1,1-DCE	- 1,1-Dichloroethene
ND	- Non-detect; concentration posted for non-detect results is one-half of the detection limit for the sample.
µg/L	- Micrograms per liter.
MLLW	- Feet above mean lower low water.

FIGURE 6-29I
SITE 19
GROUNDWATER CONTAMINANTS
TIME-SERIES PLOTS
OU-2 SOUTHEAST AREA
ALAMEDA POINT
ALAMEDA, CALIFORNIA

G0069-167B0202 MWD13-3.DSF GAS 5/18/99





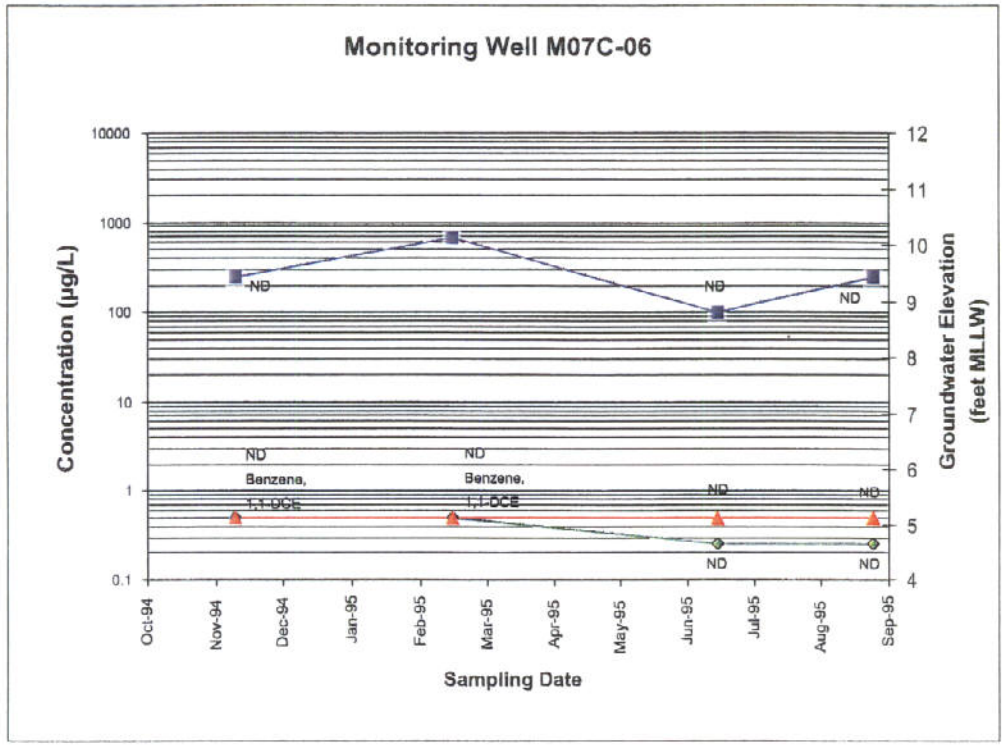
- Benzene
- TPH Motor Oil
- 1,1-DCE
- Water Level

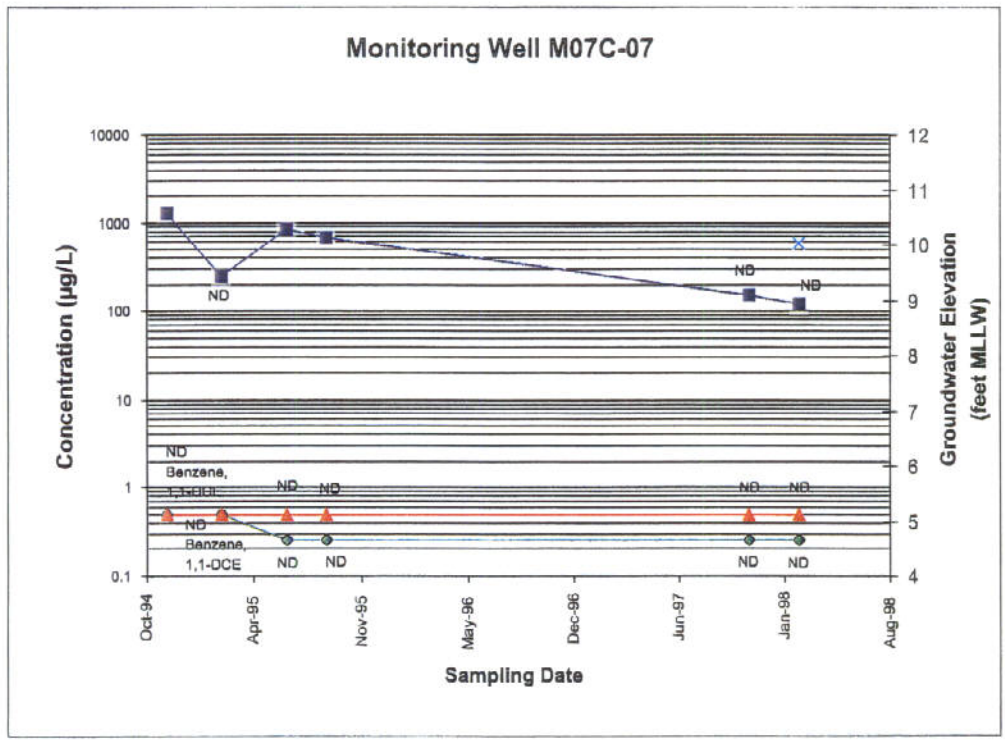
NOTES:

TPH Motor Oil	- Total petroleum hydrocarbon motor oil
1,1-DCE	- 1,1-Dichloroethene
ND	- Non-detect; concentration posted for non-detect results is one-half of the detection limit for the sample.
µg/L	- Micrograms per liter.
MLLW	- Feet above mean lower low water.

FIGURE 6-29m
SITE 13 AND SITE 23
GROUNDWATER CONTAMINANTS
TIME-SERIES PLOTS
OU-2 SOUTHEAST AREA
ALAMEDA POINT
ALAMEDA, CALIFORNIA

G0069-167/B0202 M10B-01.DSF GAS 5/18/99





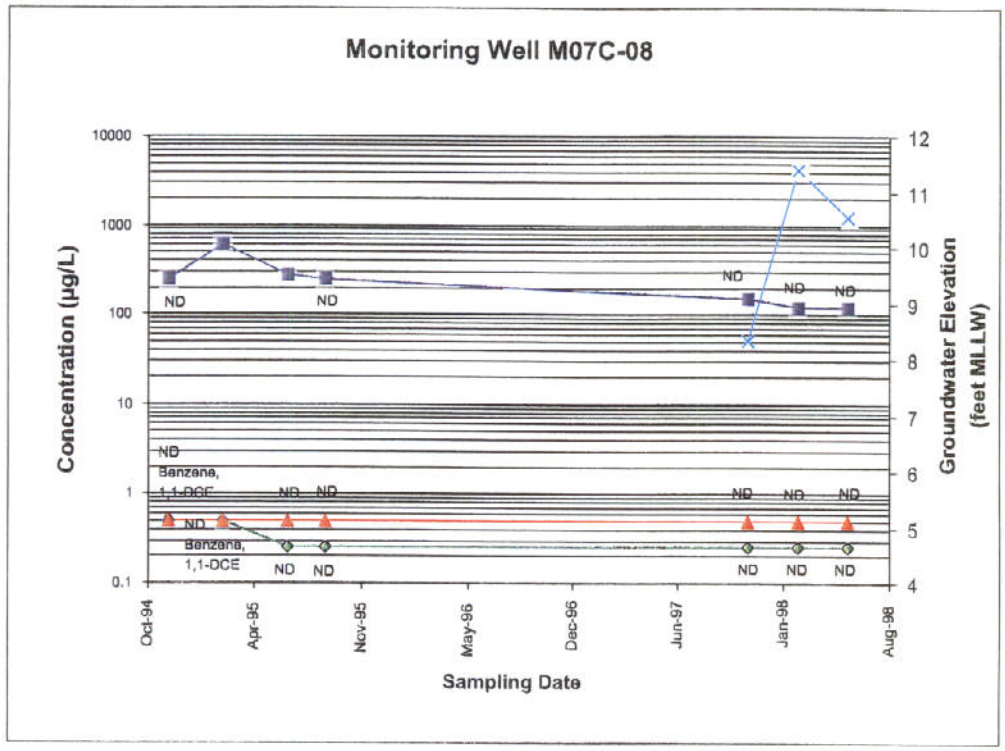
- Benzene
- TPH Motor Oil
- 1,1-DCE
- Water Level

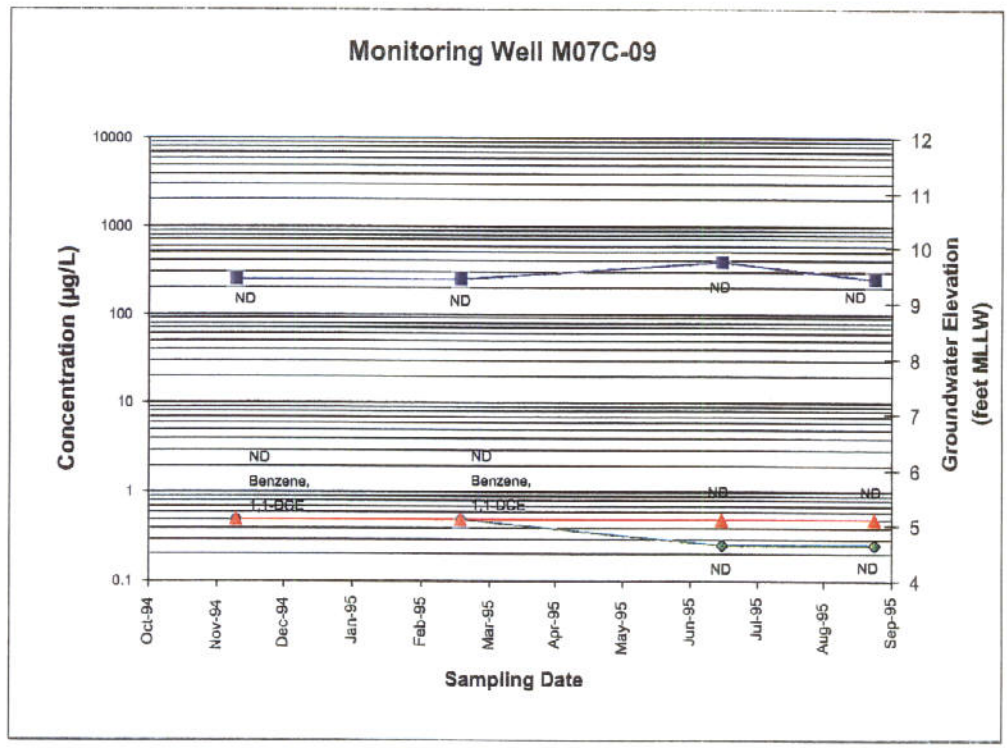
NOTES:

TPH Motor Oil	- Total petroleum hydrocarbon motor oil
1,1-DCE	- 1,1-Dichloroethene
ND	- Non-detect; concentration posted for non-detect results is one-half of the detection limit for the sample.
µg/L	- Micrograms per liter.
MLLW	- Feet above mean lower low water.

FIGURE 6-29n
SITE 22
GROUNDWATER CONTAMINANTS
TIME-SERIES PLOTS
OU-2 SOUTHEAST AREA
ALAMEDA POINT
ALAMEDA, CALIFORNIA

G0069-167B0202 ...7C-06.DSF GAS 5/18/99





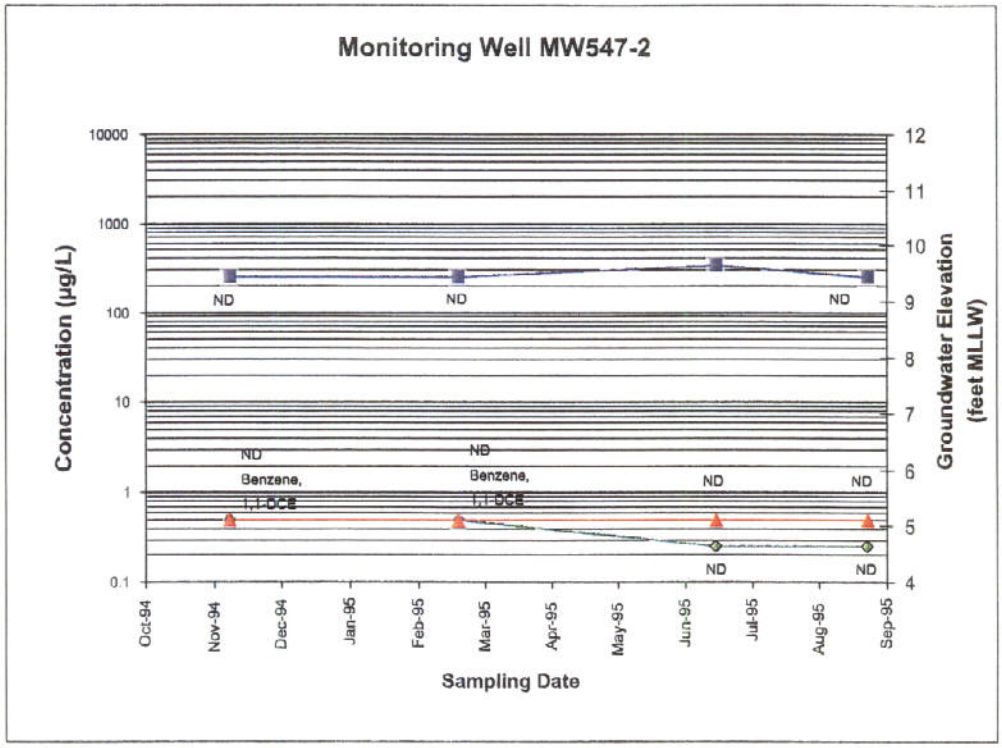
- Benzene
- TPH Motor Oil
- 1,1-DCE
- Water Level

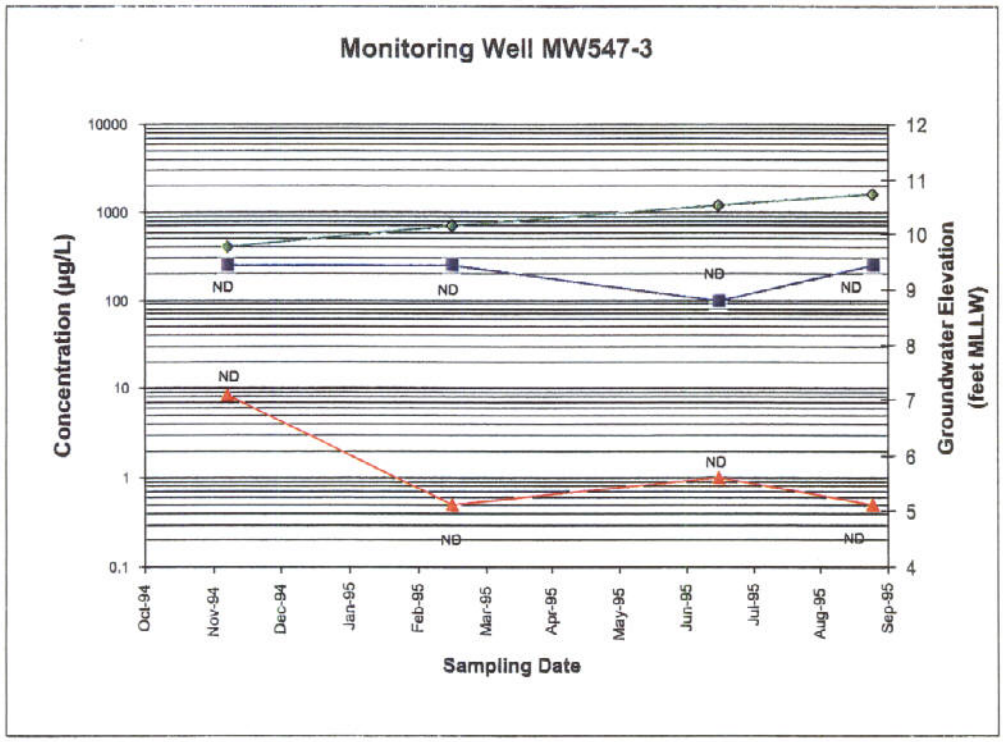
NOTES:

TPH Motor Oil	- Total petroleum hydrocarbon motor oil
1,1-DCE	- 1,1-Dichloroethene
ND	- Non-detect; concentration posted for non-detect results is one-half of the detection limit for the sample.
µg/L	- Micrograms per liter.
MLLW	- Feet above mean lower low water.

FIGURE 6-29o
SITE 22
GROUNDWATER CONTAMINANTS
TIME-SERIES PLOTS
OU-2 SOUTHEAST AREA
ALAMEDA POINT
ALAMEDA, CALIFORNIA

G0069-167B0202 M07C-08.DSF GAS 5/18/99





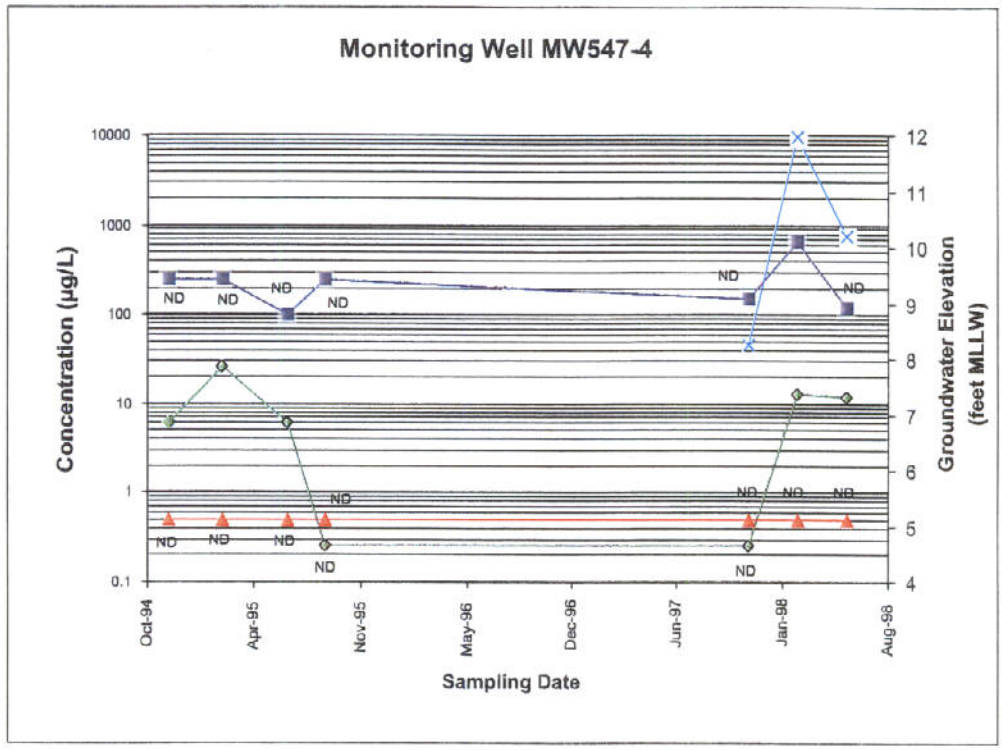
- Benzene
- TPH Motor Oil
- 1,1-DCE
- Water Level

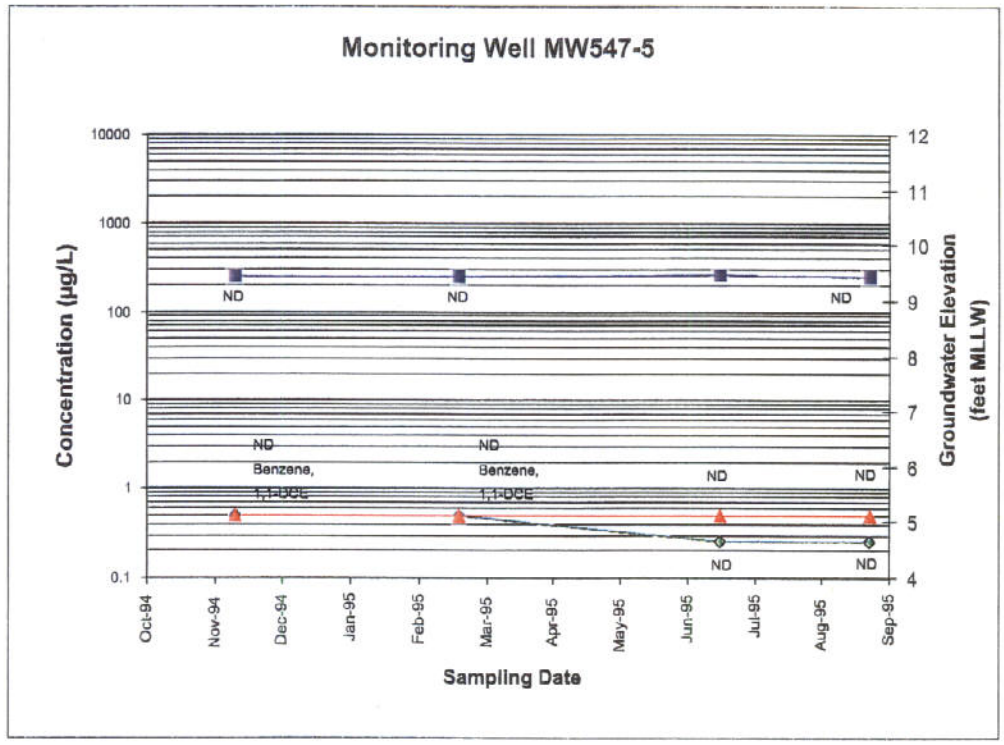
NOTES:

TPH Motor Oil	- Total petroleum hydrocarbon motor oil
1,1-DCE	- 1,1-Dichloroethene
ND	- Non-detect; concentration posted for non-detect results is one-half of the detection limit for the sample.
µg/L	- Micrograms per liter.
MLLW	- Feet above mean lower low water.

FIGURE 6-29p
SITE 22
GROUNDWATER CONTAMINANTS
TIME-SERIES PLOTS
OU-2 SOUTHEAST AREA
ALAMEDA POINT
ALAMEDA, CALIFORNIA

G0069-167B0202 MW547-2.DSF GAS 5/18/99





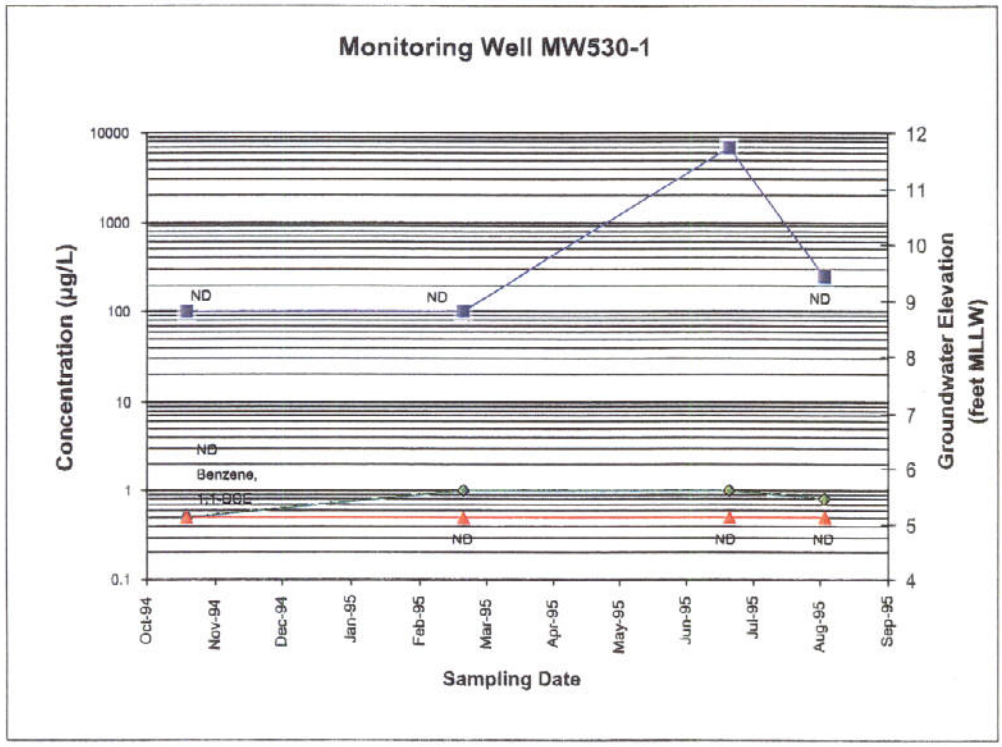
- Benzene
- TPH Motor Oil
- 1,1-DCE
- Water Level

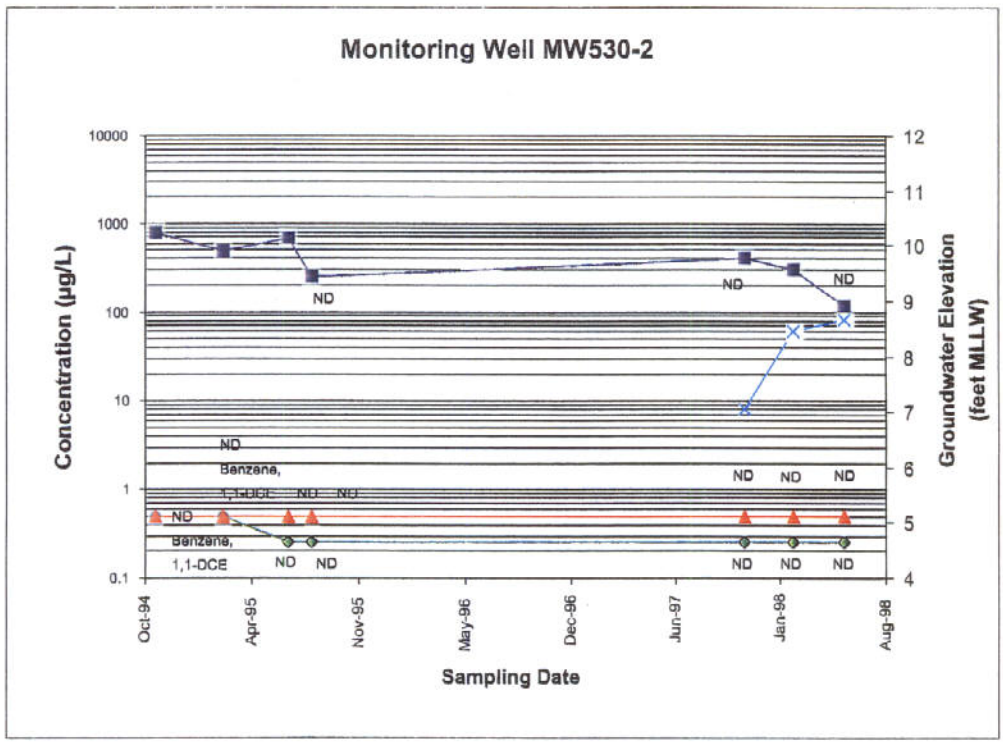
NOTES:

TPH Motor Oil	- Total petroleum hydrocarbon motor oil
1,1-DCE	- 1,1-Dichloroethene
ND	- Non-detect; concentration posted for non-detect results is one-half of the detection limit for the sample.
µg/L	- Micrograms per liter.
MLLW	- Feet above mean lower low water.

FIGURE 6-29q
SITE 22
GROUNDWATER CONTAMINANTS
TIME-SERIES PLOTS
OU-2 SOUTHEAST AREA
ALAMEDA POINT
ALAMEDA, CALIFORNIA

G0069-167B0202 MW547-4.DSF GAS 5/18/99





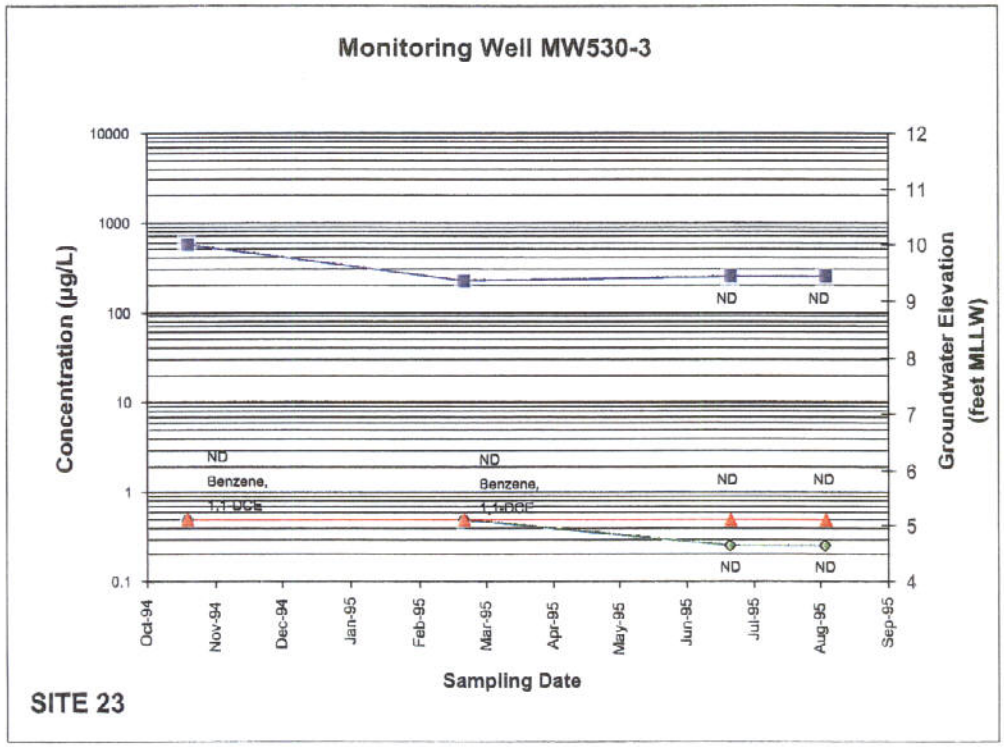
- Benzene
- TPH Motor Oil
- 1,1-DCE
- Water Level

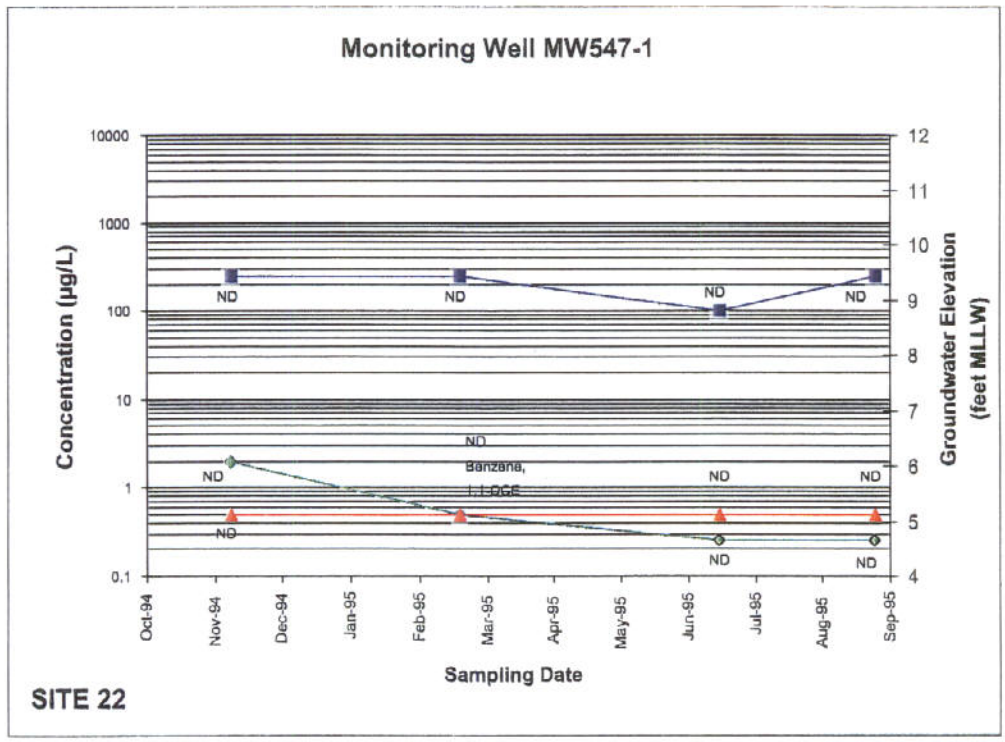
NOTES:

TPH Motor Oil	- Total petroleum hydrocarbon motor oil
1,1-DCE	- 1,1-Dichloroethene
ND	- Non-detect; concentration posted for non-detect results is one-half of the detection limit for the sample.
µg/L	- Micrograms per liter.
MLLW	- Feet above mean lower low water.

FIGURE 6-29r
SITE 23
GROUNDWATER CONTAMINANTS
TIME-SERIES PLOTS
OU-2 SOUTHEAST AREA
ALAMEDA POINT
ALAMEDA, CALIFORNIA

G0069-167B0202 MW530-1.DSF GAS 5/18/99





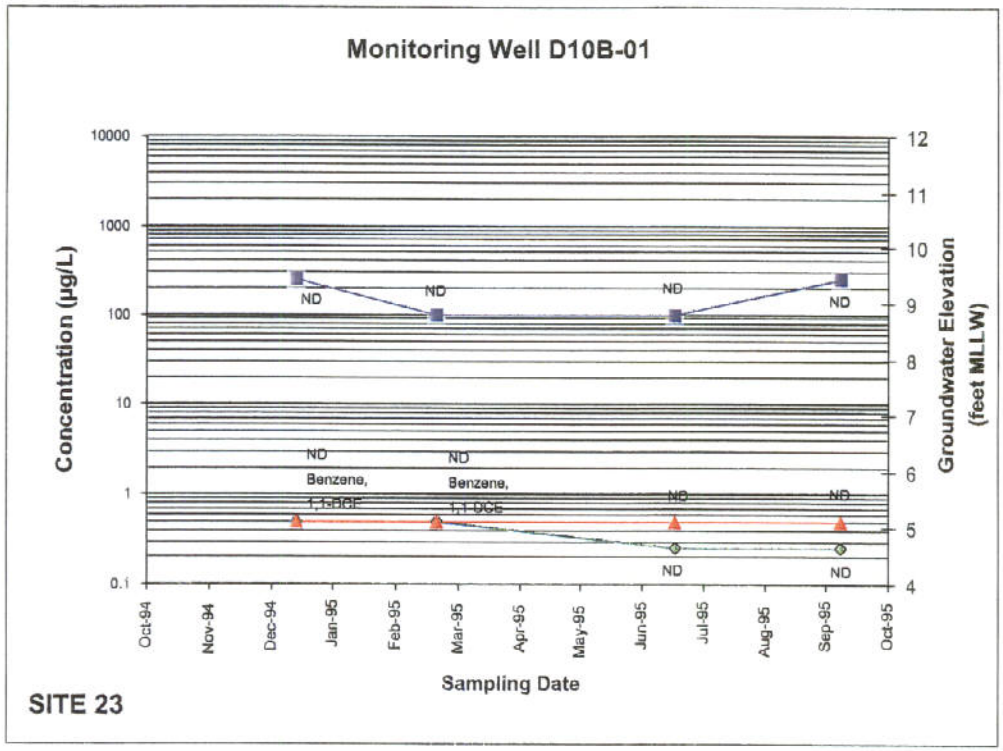
- Benzene
- TPH Motor Oil
- 1,1-DCE
- Water Level

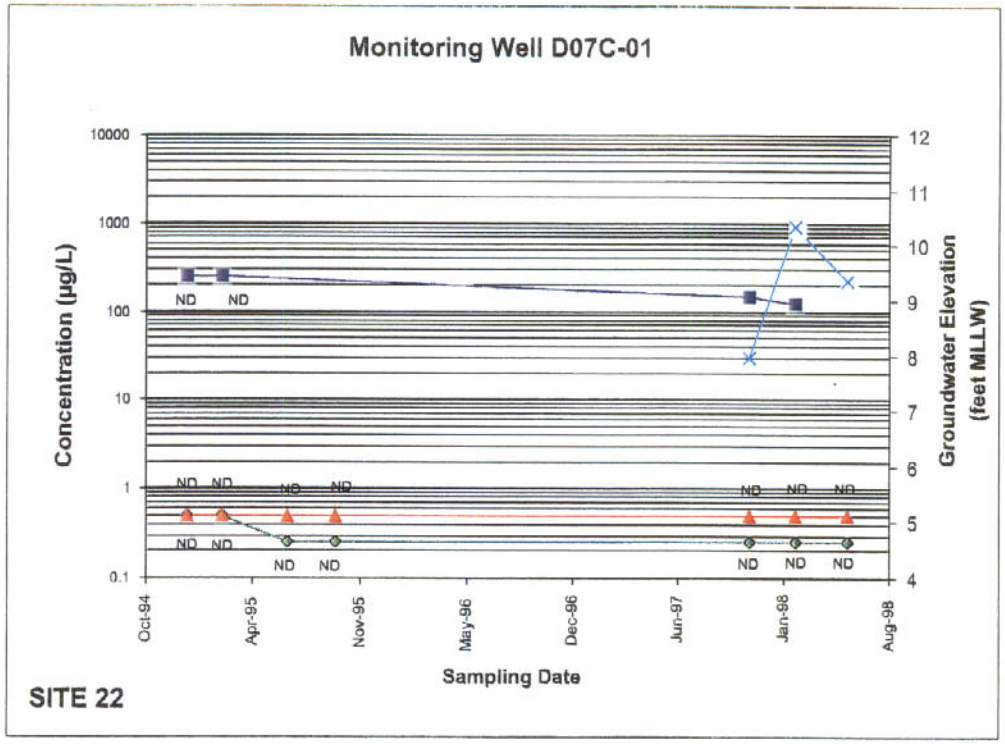
NOTES:

TPH Motor Oil	- Total petroleum hydrocarbon motor oil
1,1-DCE	- 1,1-Dichloroethene
ND	- Non-detect; concentration posted for non-detect results is one-half of the detection limit for the sample.
µg/L	- Micrograms per liter.
MLLW	- Feet above mean lower low water.

FIGURE 6-29s
SITE 22 AND SITE 23
GROUNDWATER CONTAMINANTS
TIME-SERIES PLOTS
OU-2 SOUTHEAST AREA
ALAMEDA POINT
ALAMEDA, CALIFORNIA

G0069-167/B0202 mw530-3.DSF GAS 5/18/99





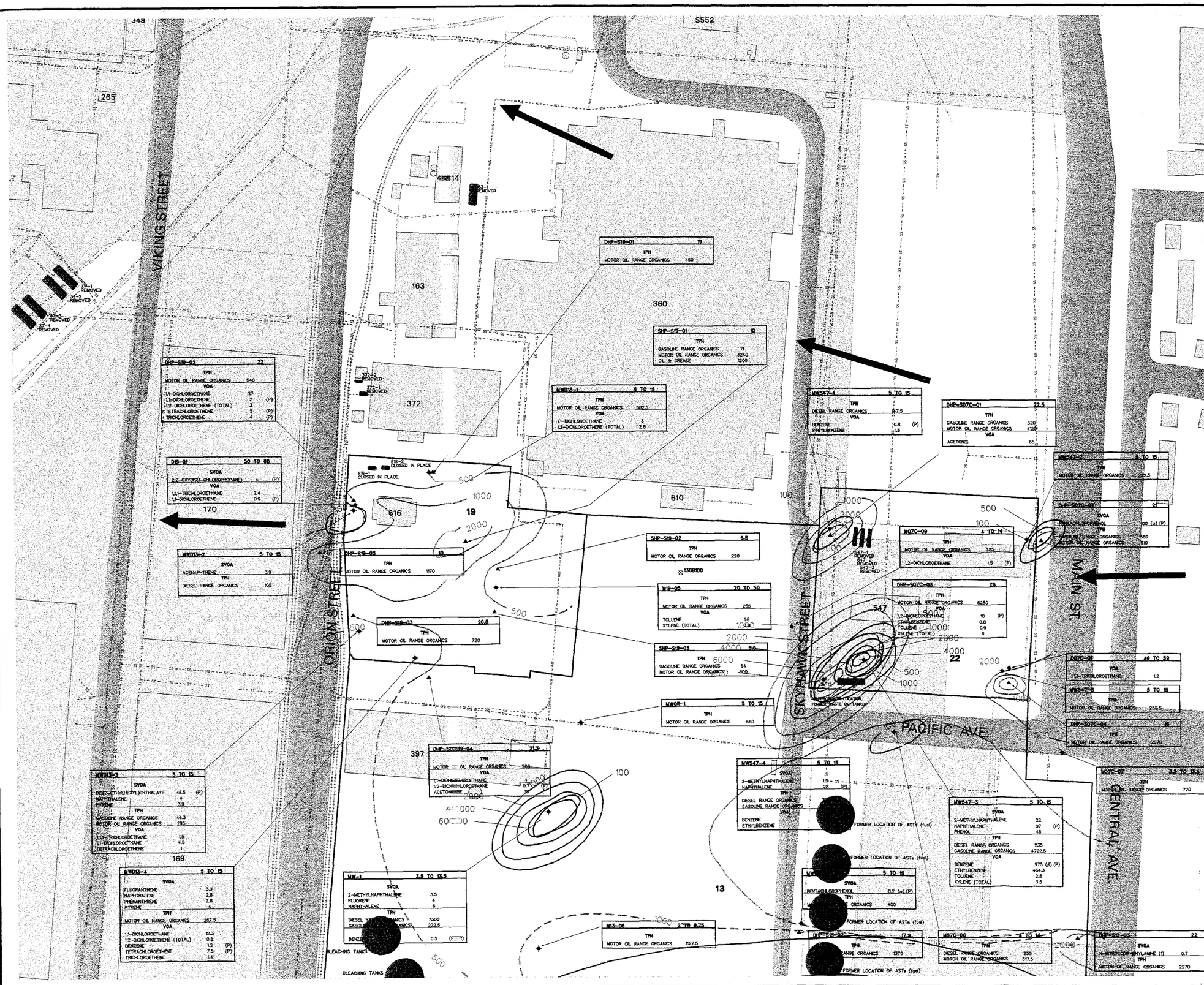
- Benzene
- TPH Motor Oil
- 1,1-DCE
- Water Level

NOTES:

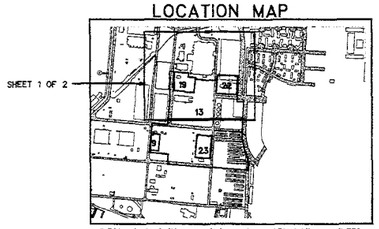
TPH Motor Oil	- Total petroleum hydrocarbon motor oil
1,1-DCE	- 1,1-Dichloroethene
ND	- Non-detect; concentration posted for non-detect results is one-half of the detection limit for the sample.
µg/L	- Micrograms per liter.
MLLW	- Feet above mean lower low water.

FIGURE 6-29t
SITE 22 AND SITE 23
GROUNDWATER CONTAMINANTS
TIME-SERIES PLOTS
OU-2 SOUTHEAST AREA
ALAMEDA POINT
ALAMEDA, CALIFORNIA

G0069-167B0202 D10b-01.DSF GAS 5/18/99



LOCATION MAP



INFORMATION OUTSIDE SITE OU-2 BOUNDARY NOT PRESENTED

LEGEND

- MONITORING WELL LOCATION
- HYDROPUNCH LOCATION
- GEOPROBE
- STORM DRAIN LINE
- SANITARY SEWER LINE
- STEAM LINE
- FUEL LINE (ABANDONED/REMOVED AS OF 12/98)
- INDUSTRIAL WASTE LINE
- FENCE
- RAILROAD
- REGIONAL GROUNDWATER FLOW DIRECTION
- PAVED ROAD OR PARKING LOT
- BUILDING, CONCRETE, PAVED, OR COVERED AREA
- INSTALLATION RESTORATION SITE
- 517 BUILDING AND BUILDING NUMBER
- TANK
- TPH-MOTOR OIL CONTOUR (DASHED WHERE INFERRED)
- TPH-GASOLINE CONTOUR (DASHED WHERE INF
- TPH-DIESEL CONTOUR (DASHED WHERE INFERRED)

SAMPLE ID — M07A-09 2.5 to 11 — SAMPLE DEPTH (SEE NOTES)
COMPOUND CLASS — SVOA
ANALYTE — FLUORANTHENE 3.9 — CONCENTRATION (µg/L)
PENTACHLOROPHENOL 9.6 (P) — QUALIFIER

QUALIFIERS:

α – CONCENTRATION EXCEEDS PROPOSED CALIFORNIA TOXICS RULE CRITERIA

β – CONCENTRATION EXCEEDS NATIONAL TOXICS RULE LOEL

P – CONCENTRATION EXCEEDS RESIDENTIAL PRG FOR THE ANALYTE

NOTES:

1. ANALYTES NOT ANALYZED FOR OR NOT DETECTED ARE NOT SHOWN ON THIS MAP. A LIST OF ANALYSES PERFORMED FOR EACH SAMPLE IS PRESENTED IN THE SAMPLING SUMMARY FOLLOWING CHAPTER 6. ANALYTICAL DATA ARE PRESENTED IN APPENDIX H. A SAMPLE POINT WITHOUT A DATA BOX INDICATES NO DETECTIONS.
2. CONCENTRATIONS INDICATED FOR MONITORING WELLS ARE AVERAGE VALUES BASED ON SAMPLING EVENTS CONDUCTED BETWEEN 1994 AND 1996. FOR NON-DETECTIONS, ONE-HALF OF THE DETECTION LIMIT WAS USED FOR CALCULATING THE AVERAGE VALUE.
3. SAMPLE DEPTH FOR HYDROPUNCH SAMPLES INDICATES SAMPLE COLLECTION DEPTH BELOW GROUND SURFACE IN FEET. SAMPLE DEPTH FOR MONITORING WELL SAMPLES INDICATES THE SCREEN INTERVAL DEPTH BELOW THE TOP OF THE CASING OF THE MONITORING WELL.
4. UST LOCATIONS FROM "FUEL LINE AND UNDERGROUND STORAGE TANK MAP, DECEMBER 22, 1998, ALAMEDA POINT" FIELD CHECKED 3/29/99.
5. GROUNDWATER FLOW DIRECTION BASED ON APRIL 1998 WATER ELEVATION DATA.
6. LOCAL GROUNDWATER FLOW DIRECTIONS MAY BE DIFFERENT FROM REGIONAL GROUNDWATER FLOW DIRECTION DUE TO TIDAL FLUCTUATION, INTERCEPTED STORM DRAINAGE LINES, AND LEAKING WATER SUPPLY LINES.

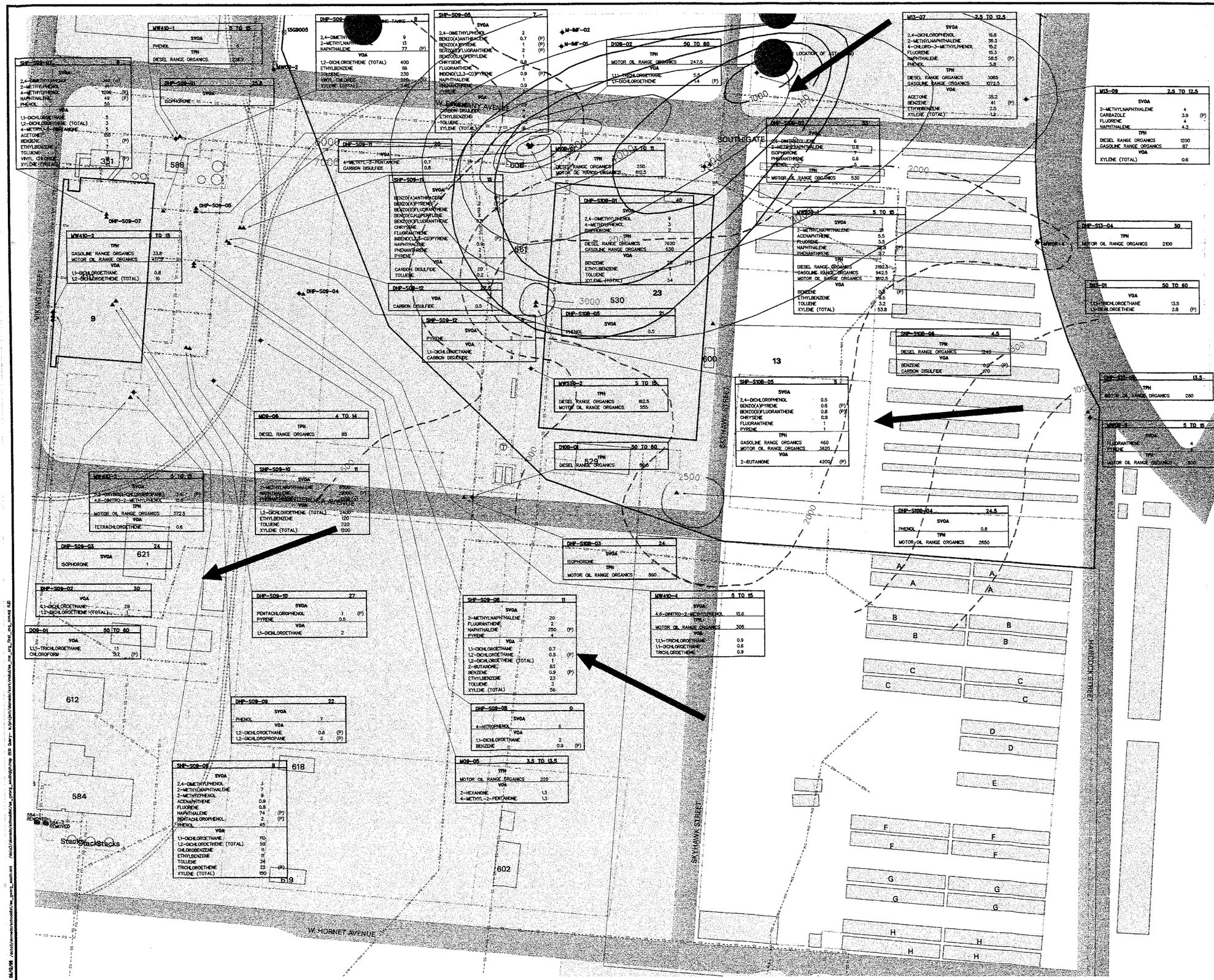
ACRONYMS:

AST – ABOVEGROUND STORAGE TANK
LOEL – LOWEST OBSERVED EFFECT LEVEL
PRG – PRELIMINARY REMEDIATION GOAL
SVOA – SEMIVOLATILE ORGANIC ANALYSIS
TPHEXT – TOTAL PETROLEUM HYDROCARBONS (EXTRACTABLE)
TPHPRG – TOTAL PETROLEUM HYDROCARBONS (PURGEABLE)
UST – UNDERGROUND STORAGE TANK
VOA – VOLATILE ORGANIC ANALYSIS
µg/L – MICROGRAMS PER LITER

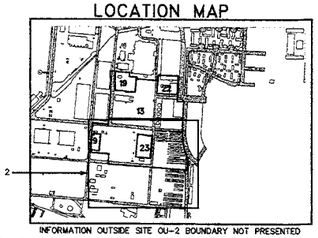
N

30 0 30 60
SCALE: 1" = 60'

FIGURE 6-30 (SHEET 1 OF 2)
ISOCONCENTRATION CONTOURS OF TPH (MOTOR OIL RANGE), TPH (GASOLINE RANGE), AND TPH (DIESEL RANGE)
DETECTED IN GROUNDWATER
FIRST WATER-BEARING ZONE
OU-2 SOUTHEAST AREA
ALAMEDA POINT
ALAMEDA, CALIFORNIA



LOCATION MAP



INFORMATION OUTSIDE SITE OU-2 BOUNDARY NOT PRESENTED

LEGEND

- MONITORING WELL LOCATION
- HYDROPUNCH LOCATION
- GEOPROBE
- STORM DRAIN LINE
- SANITARY SEWER LINE
- STEAM LINE
- FUEL LINE (ABANDONED/REMOVED AS OF 12/98)
- INDUSTRIAL WASTE LINE
- FENCE
- RAILROAD
- REGIONAL GROUNDWATER FLOW DIRECTION
- PAVED ROAD OR PARKING LOT
- BUILDING, CONCRETE, PAVED, OR COVERED AREA
- INSTALLATION RESTORATION SITE
- 517 BUILDING AND BUILDING NUMBER
- TANK
- TPH-MOTOR OIL CONTOURS (DASHED WHERE INFERRED)
- TPH-GASOLINE CONTOURS (DASHED WHERE INFERRED)
- TPH-DIESEL CONTOURS (DASHED WHERE INFERRED)

SAMPLE ID — M07A-09 — 2.5 to 1 — SAMPLE DEPTH (SEE NOTES)
COMPOUND CLASS — SVOA
ANALYTE — FLUORANTHENE 3.9 — CONCENTRATION (µg/L)
PENTACHLOROPHENOL 9.6 (P) — QUALIFIER

QUALIFIERS:

α – CONCENTRATION EXCEEDS PROPOSED CALIFORNIA TOXICS RULE CRITERIA

β – CONCENTRATION EXCEEDS NATIONAL TOXICS RULE LOEL

P – CONCENTRATION EXCEEDS RESIDENTIAL PRG FOR THE ANALYTE

NOTES:

1. ANALYTES NOT ANALYZED FOR OR NOT DETECTED IN ALL SAMPLING EVENTS ARE NOT SHOWN ON THIS MAP. A LIST OF ANALYSES PERFORMED FOR EACH SAMPLE IS PRESENTED IN THE SAMPLING SUMMARY FOLLOWING CHAPTER 6. ANALYTICAL DATA ARE PRESENTED IN APPENDIX H. A SAMPLE POINT ON THE MAP WITHOUT A DATA BOX INDICATES NO DETECTIONS.
2. CONCENTRATIONS INDICATED FOR MONITORING WELLS ARE AVERAGE VALUES BASED ON SAMPLING EVENTS CONDUCTED BETWEEN 1994 AND 1998. FOR NON-DETECTIONS, ONE-HALF OF THE DETECTION LIMIT WAS USED FOR CALCULATING THE AVERAGE VALUE.
3. SAMPLE DEPTH FOR HYDROPUNCH SAMPLES INDICATES SAMPLE COLLECTION DEPTH BELOW GROUND SURFACE IN FEET. SAMPLE DEPTH FOR MONITORING WELL SAMPLES INDICATES THE SCREEN INTERVAL DEPTH BELOW THE TOP OF THE CASING OF THE MONITORING WELL.
4. UST LOCATIONS FROM "FUEL LINES AND UNDERGROUND STORAGE TANK MAP, DECEMBER 22, 1998, ALAMEDA POINT" FIELD CHECKED 3/29/99.
5. GROUNDWATER FLOW DIRECTION BASED ON APRIL 1998 WATER ELEVATION DATA.
6. LOCAL GROUNDWATER FLOW DIRECTIONS MAY BE DIFFERENT FROM REGIONAL GROUNDWATER FLOW DIRECTION DUE TO TIDAL FLUCTUATION, INTERCEPTED STORM DRAINAGE LINES, AND LEAKING WATER SUPPLY LINES.

ACRONYMS:

AST – ABOVEGROUND STORAGE TANK

LOEL – LOWEST OBSERVED EFFECT LEVEL

PRG – PRELIMINARY REMEDIATION GOAL

SVOA – SEMIVOLATILE ORGANIC ANALYSIS

TPHEXT – TOTAL PETROLEUM HYDROCARBONS (EXTRACTABLE)

TPHPRG – TOTAL PETROLEUM HYDROCARBONS (PURGEABLE)

VOA – VOLATILE ORGANIC ANALYSIS

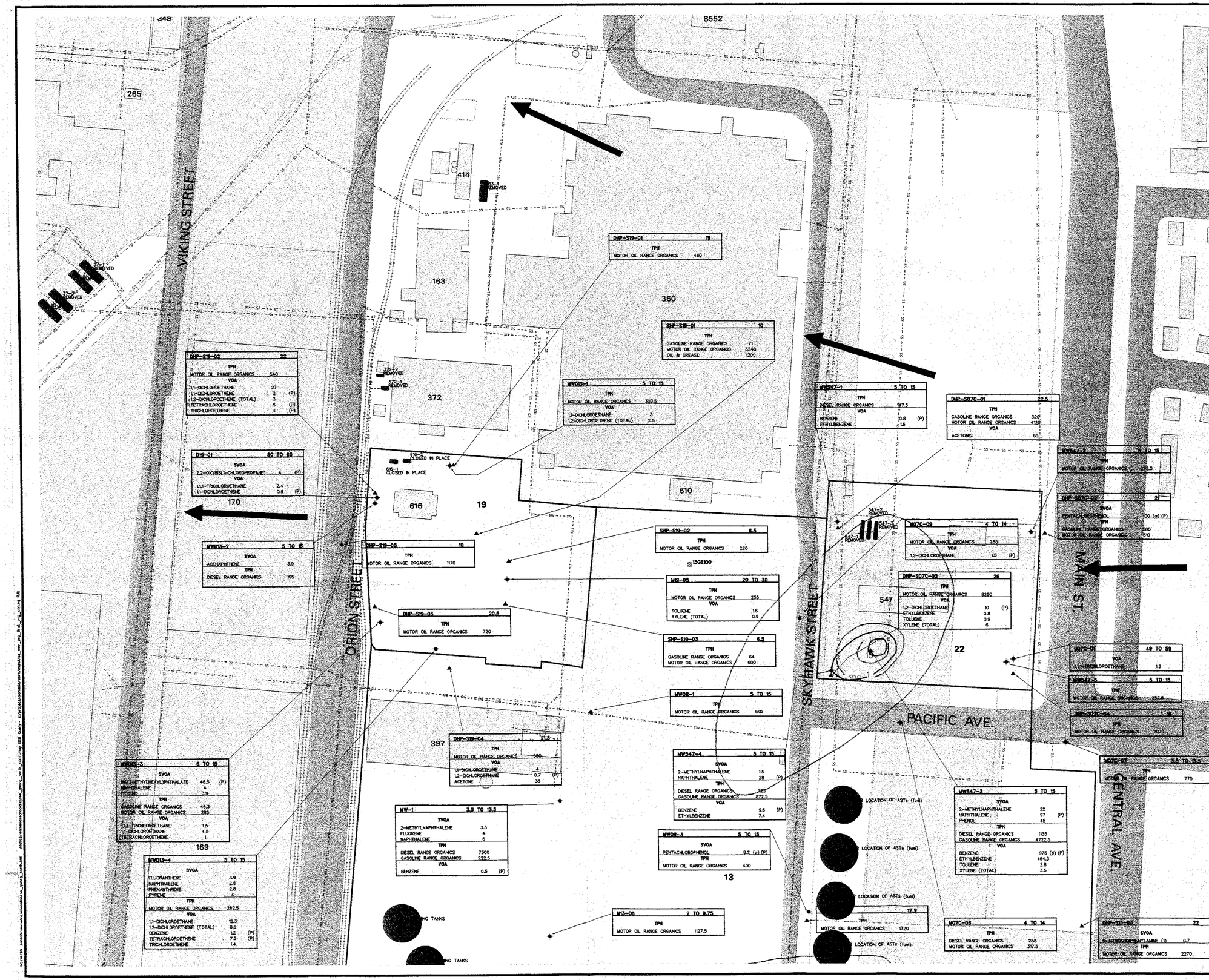
µg/L – MICROGRAMS PER LITER

UST – UNDERGROUND STORAGE TANK

N

30 0 30 60
SCALE: 1" = 60'

FIGURE 6-30 (Sheet 2 of 2)
ISOCONCENTRATION CONTOURS OF TPH (MOTOR OIL RANGE), TPH (GASOLINE RANGE), AND TPH (DIESEL RANGE) DETECTED IN GROUNDWATER FIRST WATER-BEARING ZONE OU-2 SOUTHEAST AREA
ALAMEDA POINT
ALAMEDA, CALIFORNIA



LOCATION MAP

INFORMATION OUTSIDE SITE OU-2 BOUNDARY NOT PRESENTED

LEGEND

- MONITORING WELL LOCATION
- HYDROPUNCH LOCATION
- GEOPROBE
- STORM DRAIN LINE
- SANITARY SEWER LINE
- STEAM LINE
- FUEL LINE (ABANDONED/REMOVED AS OF 12/98)
- INDUSTRIAL WASTE LINE
- FENCE
- RAILROAD
- REGIONAL GROUNDWATER FLOW DIRECTION
- PAVED ROAD OR PARKING LOT
- BUILDING, CONCRETE, PAVED, OR COVERED AREA
- INSTALLATION RESTORATION SITE
- 517 BUILDING AND BUILDING NUMBER
- TANK
- BENZENE CONTOUR (DASHED WHERE INFERRED)
- 2-METHYLNAPTHALENE CONTOUR (DASHED WHERE INFERRED)

SAMPLE ID — M07A-09 2.5 to 11 — SAMPLE DEPTH (SEE NOTES)
COMPOUND CLASS — SVOA
ANALYTE — FLUORANTHENE 3.9 — CONCENTRATION (μg/L)
PENTACHLOROPHENOL 9.6 (P) — QUALIFIER

QUALIFIERS:

α – CONCENTRATION EXCEEDS PROPOSED CALIFORNIA TOXICS RULE CRITERIA

β – CONCENTRATION EXCEEDS NATIONAL TOXICS RULE LOEL

P – CONCENTRATION EXCEEDS RESIDENTIAL PRG FOR THE ANALYTE

NOTES:

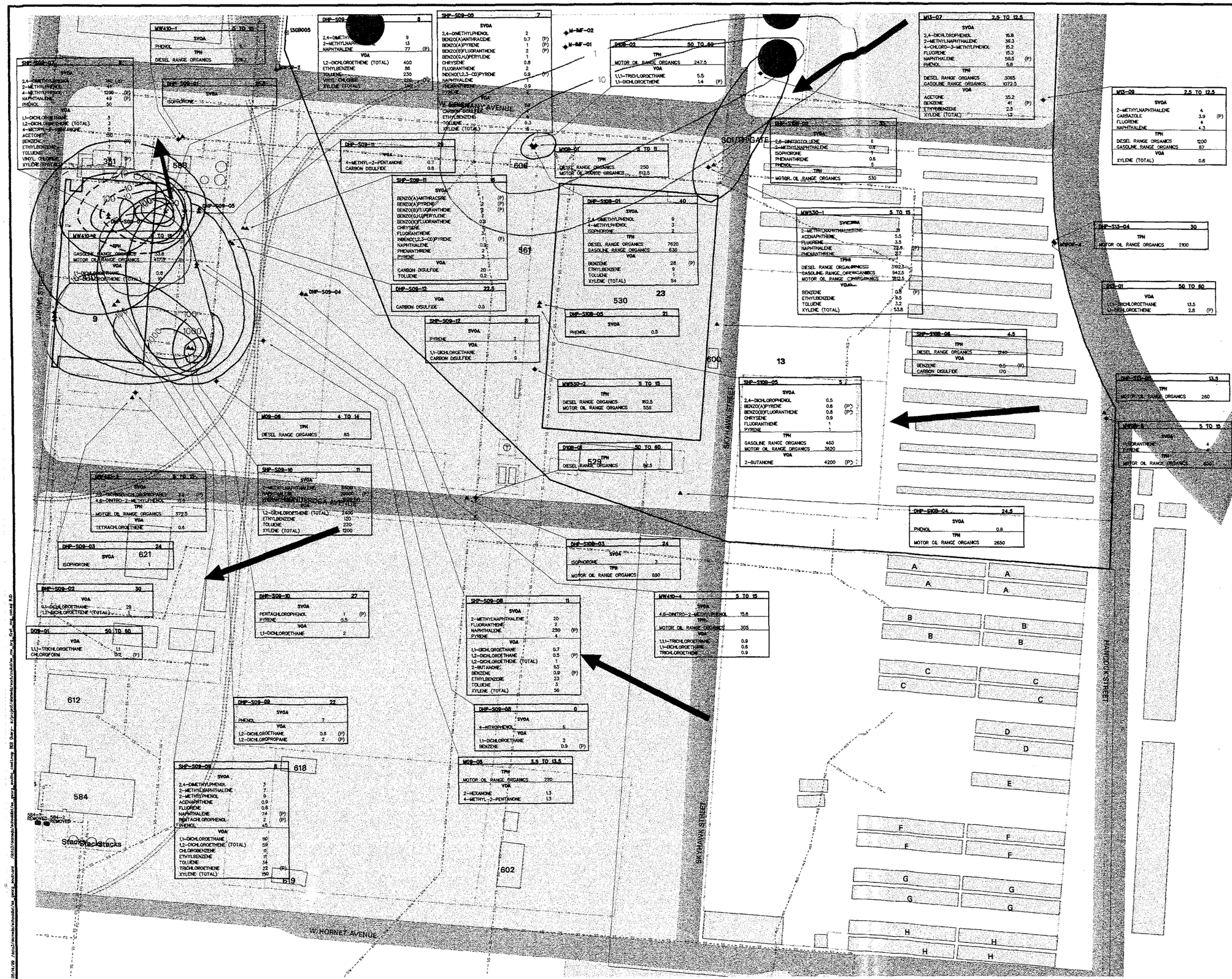
1. ANALYTES NOT ANALYZED FOR OR NOT DETECTED ARE NOT SHOWN ON THIS MAP. A LIST OF ANALYSIS PERFORMED FOR EACH SAMPLE IS PRESENTED IN THE SAMPLING SUMMARY FOLLOWING CHAPTER 6. ANALYTICAL DATA ARE PRESENTED IN APPENDIX H. A SAMPLE POINT WITHOUT A DATA BOX INDICATES NO DETECTIONS.
2. CONCENTRATIONS INDICATED FOR MONITORING WELLS ARE AVERAGE VALUES BASED ON SAMPLING EVENTS CONDUCTED BETWEEN 1994 AND 1996. FOR NON-DETECTIONS, ONE-HALF OF THE DETECTION LIMIT WAS USED FOR CALCULATING THE AVERAGE VALUE.
3. SAMPLE DEPTH FOR HYDROPUNCH SAMPLES INDICATES SAMPLE COLLECTION DEPTH BELOW GROUND SURFACE IN FEET. SAMPLE DEPTH FOR MONITORING WELL SAMPLES INDICATES THE SCREEN INTERVAL DEPTH BELOW THE TOP OF THE CASING OF THE MONITORING WELL.
4. UST LOCATIONS FROM "FUEL LINE AND UNDERGROUND STORAGE TANK MAP, DECEMBER 22, 1998, ALAMEDA POINT" FIELD CHECKED 3/29/99.
5. GROUNDWATER FLOW DIRECTION BASED ON APRIL 1998 WATER ELEVATION DATA.
6. LOCAL GROUNDWATER FLOW DIRECTIONS MAY BE DIFFERENT FROM REGIONAL GROUNDWATER FLOW DIRECTION DUE TO TIDAL FLUCTUATION, INTERCEPTED STORM DRAINAGE LINES, AND LEAKING WATER SUPPLY LINES.

ACRONYMS:

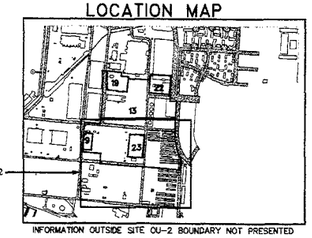
AST – ABOVEGROUND STORAGE TANKS
LOEL – LOWEST OBSERVED EFFECT LEVEL
PRG – PRELIMINARY REMEDIATION GOAL
SVOA – SEMIVOLATILE ORGANIC ANALYSIS
TPHEXT – TOTAL PETROLEUM HYDROCARBONS (EXTRACTABLE)
TPHPRG – TOTAL PETROLEUM HYDROCARBONS (PURGEABLE)
UST – UNDERGROUND STORAGE TANK
VOA – VOLATILE ORGANIC ANALYSIS
μg/L – MICROGRAMS PER LITER

30 0 30 60
SCALE: 1" = 60'

FIGURE 6-31a (Sheet 1 of 2)
ISOCONCENTRATION CONTOURS OF BENZENE AND 2-METHYLNAPHTHALENE DETECTED IN GROUNDWATER FIRST WATER-BEARING ZONE OU-2 SOUTHEAST AREA
ALAMEDA POINT
ALAMEDA, CALIFORNIA



LOCATION MAP



INFORMATION OUTSIDE SITE OU-2 BOUNDARY NOT PRESENTED

LEGEND

- MONITORING WELL LOCATION
- HYDROPUNCH LOCATION
- GEOPROBE
- STORM DRAIN LINE
- SANITARY SEWER LINE
- STEAM LINE
- FUEL LINE (ABANDONED/REMOVED AS OF 12/98)
- INDUSTRIAL WASTE LINE
- FENCE
- RAILROAD
- REGIONAL GROUNDWATER FLOW DIRECTION
- PAVED ROAD OR PARKING LOT
- BUILDING, CONCRETE, PAVED, OR COVERED AREA
- INSTALLATION RESTORATION SITE
- 517 BUILDING AND BUILDING NUMBER
- TANK
- BENZENE CONTOUR (DASHED WHERE INFERRED)
- 2,4-DIMETHYLPHENOL CONTOUR (DASHED WHERE INFERRED)
- 2-METHYLNAPTHALENE CONTOUR (DASHED WHERE INFERRED)
- VINYL CHLORIDE (DASHED WHERE INFERRED)
- 1,2-DICHLOROETHENE (TOTAL)

SAMPLE ID	M07A-09	2.5 to 1	SAMPLE DEPTH (SEE NOTES)
COMPOUND CLASS	SVOA		
ANALYTE	FLUORANTHENE	3.9	CONCENTRATION (µg/L)
	PENTACHLOROPHENOL	9.6 (P)	QUALIFIER

QUALIFIERS:

α – CONCENTRATION EXCEEDS PROPOSED CALIFORNIA TOXICS RULE CRITERIA
β – CONCENTRATION EXCEEDS NATIONAL TOXICS RULE LOEL
P – CONCONTRATION EXCEEDS RESIDENTIAL PRG FOR THE ANALYTE

NOTES:

1. ANALYTES NOT ANALYZED FOR OR ANALYTES NOT DETECTED IN ALL SAMPLING EVENTS ARE NOT SHOWN ON THIS MAP. A LIST OF ANALYSES PERFORMED FOR EACH SAMPLE IS PRESENTED IN THE SAMPLING SUMMARY FOLLOWING CHAPTER 6. ANALYTICAL DATA ARE PRESENTED IN APPENDIX H. A SAMPLE POINT ON THE MAP WITHOUT A DATA BOX INDICATES NO DETECTIONS.
2. CONCENTRATIONS INDICATED FOR MONITORING WELLS ARE AVERAGE VALUES BASED ON SAMPLING EVENTS CONDUCTED BETWEEN 1994 AND 1998. FOR NON-DETECTIONS, ONE-HALF OF THE DETECTION LIMIT WAS USED FOR CALCULATING THE AVERAGE VALUE.
3. SAMPLE DEPTH FOR HYDROPUNCH SAMPLES INDICATES SAMPLE COLLECTION DEPTH BELOW GROUND SURFACE IN FEET. SAMPLE DEPTH FOR MONITORING WELL SAMPLES INDICATES THE SCREEN INTERVAL DEPTH BELOW THE TOP OF THE CASING OF THE MONITORING WELL.
4. UST LOCATIONS FROM "FUEL LINES AND UNDERGROUND STORAGE TANK MAP, DECEMBER 22, 1998, ALAMEDA POINT" FIELD CHECKED 3/29/99.
5. GROUNDWATER FLOW DIRECTION BASED ON APRIL 1998 WATER ELEVATION DATA.
6. LOCAL GROUNDWATER FLOW DIRECTIONS MAY BE DIFFERENT FROM REGIONAL GROUNDWATER FLOW DIRECTION DUE TO TIDAL FLUCTUATION, INTERCEPTED STORM DRAINAGE LINES, AND LEAKING WATER SUPPLY LINES.

ACRONYMS:

AST – ABOVEGROUND STORAGE TANK
LOEL – LOWEST OBSERVED EFFECT LEVEL
PRG – PRELIMINARY REMEDIATION GOAL
SVOA – SEMIVOLATILE ORGANIC ANALYSIS
TPHEXT – TOTAL PETROLEUM HYDROCARBONS (EXTRACTABLE)
TPHPRG – TOTAL PETROLEUM HYDROCARBONS (PURGEABLE)
VOA – VOLATILE ORGANIC ANALYSIS
µg/L – MICROGRAMS PER LITER
UST – UNDERGROUND STORAGE TANK

30 0 30 60
SCALE: 1" = 60'

FIGURE 6-31b (Sheet 2 of 2)
ISOCONCENTRATION CONTOURS OF BENZENE, 2-METHYLNAPHTHALENE, 2,4-DIMETHYLPHENOL, 1,2-DICHLOROETHENE, AND VINYL CHLORIDE DETECTED IN GROUNDWATER
FIRST WATER-BEARING ZONE
OU-2 SOUTHEAST AREA
ALAMEDA POINT
ALAMEDA, CALIFORNIA