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. 385

Prepared For

U.S. DEPARTMENT OF THE NAVY
Greg Lorton, Remedial Project Manager
Engineering Field Division, Southwest
Naval Facilities Engineering Command
San Diego, California

ADDENDUM A
FINAL FIELD SAMPLING PLAN
SUPPLEMENTAL REMEDIAL INVESTIGATION
DATA GAP SAMPLING FOR
OPERABLE UNITS 1 AND 2

ALAMEDA POINT
ALAMEDA, CALIFORNIA
DS.0385.17292
August 23, 2001

Prepared By

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Chris Jennessy
for Neal Hutchison, Project Manager

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TtEMI QA Manager: for Date: 8-3.01
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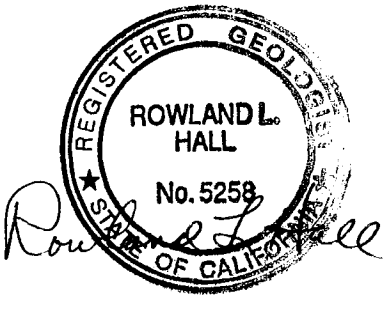

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August 15, 2001

Ms. Anna-Marie Cook
Project Manager
U.S. EPA
Region IX
75 Hawthorne Street, (SFD-8-2)
San Francisco, CA 94105-3901

Dear Ms. Cook:

Subj: ALAMEDA POINT OU-1 AND OU-2 DATA GAP SAMPLING ADDENDUM

Enclosed is a copy of Addendum A, Field Sampling Plan, Supplemental Remedial Investigation, Data Gap Sampling for Operable Units 1 and 2.

Please call me at (619) 532-0953, if you have any questions.

Sincerely,

GREGORY A. LORTON, P.E., R.E.A.
Remedial Project Manager

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Contracting Officer
Naval Facilities Engineering Command
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1230 Columbia Street, Suite 1100
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DATE: 08/22/01
CTO: 0385
LOCATION:
Alameda Point, California

FROM: Barna Szabo

Daniel Chow, Program Manager

DOCUMENT TITLE AND DATE:

Addendum A - Final Field Sampling Plan
Supplemental Remedial Investigation Data Gap Sampling For Operable Units 1 and 2
August 23, 2001

TYPE: ☐ Contractual Deliverable ☒ Technical Deliverable (DS) ☐ Other (TC)

VERSION: NA (e.g., Draft, Draft Final, Final) REVISION #: NA

ADMIN RECORD: Yes ☒ No ☐ CATEGORY: Confidential ☐

SCHEDULED DELIVERY DATE: 08/13/01 ACTUAL DELIVERY DATE: 08/23/01

NUMBER OF COPIES SUBMITTED TO NAVY: O/7C/7E

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DRAFT FINAL
FIELD SAMPLING PLAN/QUALITY ASSURANCE PROJECT PLAN
SUPPLEMENTAL REMEDIAL INVESTIGATION DATA GAP SAMPLING

DATED 14 MAY 2001

IS ENTERED IN THE DATABASE AND FILED AT ADMINISTRATIVE RECORD NO. **N00236.000187**

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CONTENTS (CONTINUED)

CONTENTS (CONTINUED)

APPENDICES (No Changes)

ATTACHMENTS

Attachment

QUALITY ASSURANCE PROJECT PLAN FOR DRAFT FIELD SAMPLING PLAN, SUPPLEMENTAL REMEDIAL INVESTIGATION, DATA GAP SAMPLING FOR OPERABLE UNITS 1 AND 2, ALAMEDA POINT, ALAMEDA, CALIFORNIA

FIGURES

ABBREVIATIONS, ACRONYMS, AND SYMBOLS

2,4-D	-	2,4-Dichlorophenoxyacetic acid
µg/L	-	**micrograms per liter**
Army	-	U.S. Department of the Army
AST	-	Aboveground storage tank
ASTM	-	American Society for Testing and Materials
AVGAS	-	Aviation gasoline
BCT	-	Base Realignment and Closure Cleanup Team
BCP	-	Base Realignment and Closure Plan
BERC	-	Berkeley Environmental Restoration Center
bgs	-	Below ground surface
BRAC	-	Base Realignment and Closure
BSU	-	Bay Sediments Unit
BTEX	-	Benzene, toluene, ethylbenzene, and total xylenes
° C	-	Degrees Celsius
CAA	-	**Corrective Action Area**
CA LUFT	-	California Leaking Underground Storage Tank Program
CANS	-	Container Storage Area
CAP	-	Corrective action plan
CBU	-	Construction Battalion Unit
CERCLA	-	**Comprehensive Response, Compensation, and Liability Act**
CES	-	Canonie Environmental Services
CLP	-	Contract Laboratory Program
cm^2	-	Square centimeters
cm/sec	-	**centimeters per second**
COC	-	Chain-of-custody
CPT	-	Cone penetrometer test
Cr (VI)	-	Hexavalent chromium
Cr (III)	-	Trivalent chromium
CSM	-	Conceptual site model
CTO	-	Contract task order
DCA	-	Dichloroethane
DCE	-	Dichloroethene
DDT	-	Dichlorodiphenyltrichloroethane
DNAPL	-	Dense, nonaqueous-phase liquid
DQO	-	Data quality objective
DTSC	-	California Department of Toxic Substances Control
E&E	-	Ecology and Environment Inc.
EBMUD	-	East Bay Municipal Utilities District
EBS	-	Environmental baseline survey
ECP	-	**Environmental Condition of Property**
EE/CA	-	Engineering evaluation/cost analysis
EPA	-	U.S. Environmental Protection Agency
ERV	-	Ecological reference value

FS	-	Feasibility study
FSP	-	Field sampling plan
FTA	-	Fire Training Area
ft/ft	-	**feet per foot**
FTL	-	Field team leader
ft/sec	-	**feet per second**
FWBZ	-	**First Water Bearing Zone**
GAP	-	Generation accumulation point
GPS	-	Global positioning system
HCl	-	Hydrochloric acid
HNO_3	-	Nitric acid
HHRA	-	Human health risk assessment
IAS	-	Initial assessment study
ID	-	Identification
IDW	-	Investigation-derived waste
IR	-	Installation restoration
IT	-	International Technology Corporation
IWTP	-	Industrial waste treatment plant
JMM	-	James M. Montgomery
L	-	Liter
LDPE	-	Low-density polyethylene
LNALP	-	**Light, nonaqueous-phase liquid**
MCL	-	Maximum contaminant level
mg/kg	-	Milligrams per kilogram
mg/L	-	Milligram per liter
MLLW	-	Mean lowest low water
MNA	-	Monitored natural attenuation
MTBE	-	Methyl tertiary butyl ether
MW	-	Montgomery Watson Consulting Engineers
NAD	-	North American Datum
NaOH	-	Sodium hydroxide
NAPL	-	Nonaqueous-phase liquid
NAS	-	Naval Air Station
NACIP	-	Naval Assessment and Control of Installation Pollutants
Navy	-	U.S. Department of the Navy
NGVD	-	National Geodetic Vertical Datum
OD	-	Outer diameter
OU	-	Operable unit
OWS	-	**Oil-water separator**

PAH	-	Polynuclear aromatic hydrocarbon
PCB	-	Polychlorinated biphenyl
PCE	-	Tetrachloroethene
PDB	-	Passive diffusion bag
PID	-	Photoionization detector
PPE	-	Personal protective equipment
PRC	-	**Preliminary remediation criteria**
PRG	-	Preliminary remediation goal
PVC	-	Polyvinyl chloride
PWC	-	**U.S. Navy, Public Works Center**
QA/QC	-	Quality assurance and quality control
QAPP	-	Quality assurance project plan
Radian	-	Radian International, LLC
RCRA	-	Resource Conservation and Recovery Act
RI	-	Remedial investigation
RI/FS	-	Remedial investigation and feasibility study
RNS	-	Ribbon NAPL sampler
ROD	-	Record of decision
RPM	-	Remedial project manager
RWQCB	-	**Regional Water Quality Control Board, San Francisco Bay Region**
SOP	-	Standard operating procedure
SOW	-	Statement of work
SSO	-	Site safety officer
SVOC	-	Semivolatile organic compound
TCA	-	Trichloroethane
TCE	-	Trichloroethene
TCDD	-	2, 3, 7, 8-tetrachlorodibenzo-p-dioxin
TPH	-	Total petroleum hydrocarbons
TEPH	-	Total petroleum hydrocarbon-extractable
TOC	-	Top of casing
TPPH	-	Total petroleum hydrocarbon-purgeable
TtEMI	-	Tetra Tech EM Inc.
U&A	-	Uribe and Associates
USA	-	Underground Service Alert
USACE	-	U.S. Army Corps of Engineers
USCS	-	Unified Soil Classification System
UST	-	Underground storage tank
VOA	-	**Volatile organic analysis**
VOC	-	Volatile organic compound
WBZ	-	Water-bearing zone

1.0 INTRODUCTION

The Navy is conducting a remedial investigation (RI) and feasibility study (FS) in conformance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) for 29 sites at Alameda Point, Alameda, California. Data gaps were identified during regulatory review of the draft FS report for Operable Unit (OU)-1, dated April 8, 1999 (Tetra Tech EM Inc. [TtEMI] 1999a) and the draft RI report for OU-2, dated June 29, 1999 (TtEMI 1999b). Subsequently, a field sampling plan (FSP)/quality assurance project plan (QAPP) was prepared and is being implemented at Alameda Point (see Figure AA-1).

Several data gap categories were identified and classified into the following groups:

(1) Data gaps identified in regulatory agency comments on the Draft OU-1 FS and Draft OU-2 RI reports

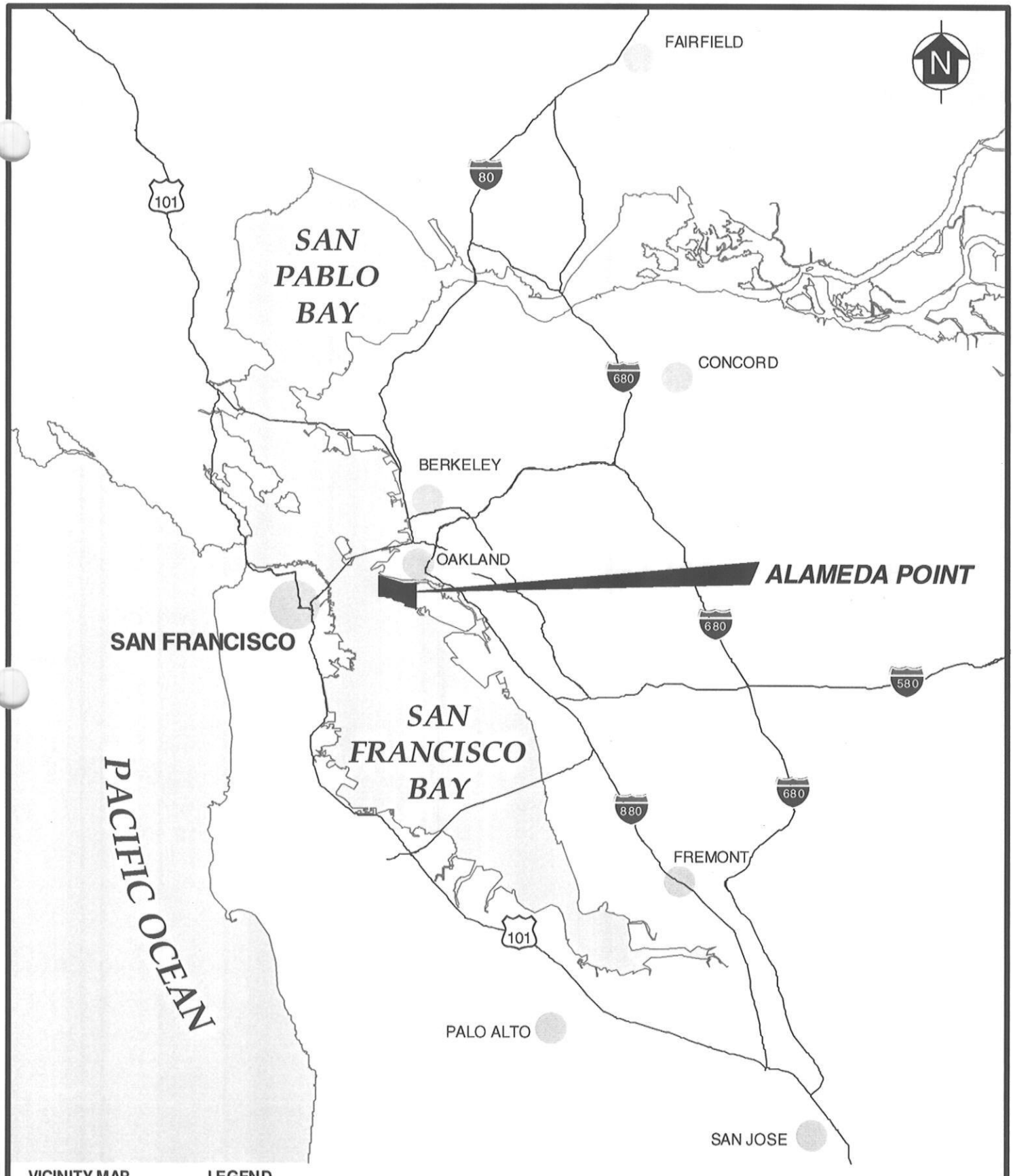
(2) Sources recommended by the Environmental Baseline Survey (EBS) program for additional sampling under the Installation Restoration (IR) Program

(3) Data gaps for non time-critical removal actions proposed by the U.S. Department of Navy (Navy) for soil and groundwater contamination, including possible dense, nonaqueous-phase liquid (DNAPL) at OU-1 and -2 sites

(4) Groundwater contaminant plumes at several sites that have not been delineated sufficiently because of inadequate monitoring points for evaluating groundwater quality and changes in depths to groundwater over time

Since the start of the field sampling program, additional data gaps have been identified. The additional data gaps were identified during evaluation of the recently adopted total petroleum hydrocarbon (TPH) strategy and review of the recently submitted final EBS report.

As a first step toward resolution of these data gaps, this addendum (Addendum A to the FSP, Supplemental RI Data Gap Sampling for OU-1 and -2 [TtEMI, 2001b]) has been prepared. Changes made to the FSP are listed by the corresponding Section number in the FSP, starting with the changes to Section



ALAMEDA POINT
ALAMEDA, CALIFORNIA

FIGURE AA-1
ALAMEDA POINT
REGIONAL LOCATION MAP
AUGUST 22, 2001

Tetra Tech EM Inc.

U:\GEORGIES\PROJECTS\MISC\NEW3.APR FIGURE 1 LAYOUT 2/26/01

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1.0 as presented above. If no changes were required to a specific section of the FSP, "No Changes" has been inserted into the table of contents. Because the original FSP lists the chapters by operable unit, a new chapter (Chapter 10) has been added to discuss the non-CERCLA Sites.

1.1 BACKGROUND OF THE INSTALLATION RESTORATION PROGRAM AND OPERABLE UNITS

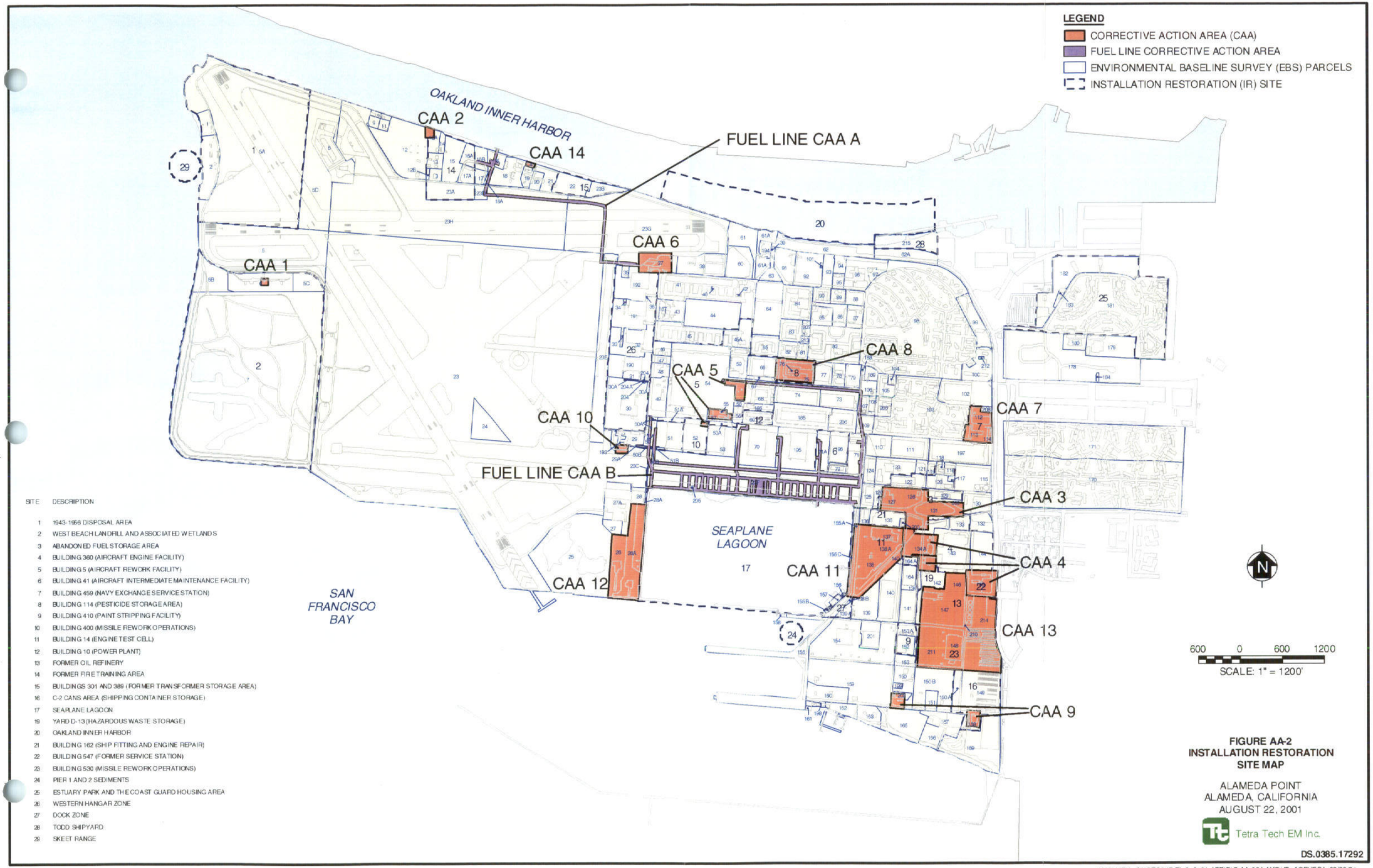
Currently, three types of environmental investigations are being conducted at Alameda Point: EBS parcel investigations, corrective action area (CAA) investigations, and CERCLA site investigations. Figure AA-2 delineates EBS parcels, CAAs, and CERCLA sites.

Several EBS parcel investigations have been conducted at Alameda Point. These investigations are being used to evaluate the environmental condition of property (ECP). If the EBS parcel investigation reveals that soil or groundwater is impacted by chemicals used during activities performed at the parcel, the parcel is converted to a CERCLA site. During the review of the final EBS, several data gaps were identified that require resolution prior to finalizing the ECP for each parcel.

CAA investigations are necessary to evaluate the environmental condition of petroleum hydrocarbon-impacted sites. A TPH strategy recently has been developed and approved by the Regional Water Quality Control Board, San Francisco Region (RWQCB) and the Department of Toxic Substances Control (DTSC) for Alameda Point. Once a CAA meets the requirements of the TPH strategy, the area will be closed.

Currently 29 CERCLA sites exist at Alameda Point. These sites have been grouped into 10 OUs (OU-1, -2A, -2B, -2C, -3, -4A, -4B, -4C, -5, and -6) for ease of management. Several CERCLA site investigations have been conducted at Alameda Point. The data obtained from these investigations are used in the RI reports to determine if remedial actions are necessary. Prior to the development and approval of the TPH strategy for Alameda Point, petroleum hydrocarbon contamination was not addressed in these RI reports. Each CERCLA site must now address petroleum hydrocarbon contamination.

This addendum addresses investigation requirements for the additional data gaps within OU-1 and -2A CERCLA sites as well as data gaps identified for CAAs and EBS parcels.



SITE	DESCRIPTION
1	1943-1956 DISPOSAL AREA
2	WEST BEACH LANDFILL AND ASSOCIATED WETLANDS
3	ABANDONED FUEL STORAGE AREA
4	BUILDING 360 (AIRCRAFT ENGINE FACILITY)
5	BUILDING 5 (AIRCRAFT REWORK FACILITY)
6	BUILDING 41 (AIRCRAFT INTERMEDIATE MAINTENANCE FACILITY)
7	BUILDING 459 (NAVY EXCHANGE SERVICE STATION)
8	BUILDING 114 (PESTICIDE STORAGE AREA)
9	BUILDING 410 (PAINT STRIPPING FACILITY)
10	BUILDING 400 (MISSILE REWORK OPERATIONS)
11	BUILDING 14 (ENGINE TEST CELL)
12	BUILDING 10 (POWER PLANT)
13	FORMER OIL REFINERY
14	FORMER FIRE TRAINING AREA
15	BUILDINGS 301 AND 389 (FORMER TRANSFORMER STORAGE AREA)
16	C-2 CANS AREA (SHIPPING CONTAINER STORAGE)
17	SEAPLANE LAGOON
19	YARD D-13 (HAZARDOUS WASTE STORAGE)
20	OAKLAND INNER HARBOR
21	BUILDING 162 (SHIP FITTING AND ENGINE REPAIR)
22	BUILDING 547 (FORMER SERVICE STATION)
23	BUILDING 530 (MISSILE REWORK OPERATIONS)
24	PIER 1 AND 2 SEDIMENTS
25	ESTUARY PARK AND THE COAST GUARD HOUSING AREA
26	WESTERN HANGAR ZONE
27	DOCK ZONE
28	TODD SHIPYARD
29	SKEET RANGE

FIGURE AA-2
INSTALLATION RESTORATION SITE MAP

ALAMEDA POINT
ALAMEDA, CALIFORNIA
AUGUST 22, 2001

Tetra Tech EM Inc.

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U:\ALMDA_SA\CTO245\RI_8_3_01.APR\FIG AA-02 LAYOUT ACEVEDJ 08/03/01

1.1.3 Additional Data Gaps

The Navy recently received concurrence from the RWQCB and DTSC on the Navy's TPH strategy for addressing sites, that are impacted by petroleum products only. These sites are not usually considered to be part of the CERCLA RI/FS investigation and subsequently were not considered in the preparation of the original FSP/QAPP. The TPH strategy contains a decision tree, which is used to evaluate data from a certain location to determine if corrective action is necessary to remediate petroleum products. During an evaluation of the petroleum data for each parcel at Alameda Point, several locations were identified that require additional data to determine if corrective action is necessary.

One of the decisions contained within the TPH strategy is to determine if the concentration of benzene in the subsurface will create a risk to human health from inhalation of benzene vapors in indoor air. The TPH strategy indicates that a concentration of 10 micrograms per liter (µg/L) or higher of benzene in groundwater may cause an unacceptable risk to human health if it migrates into indoor air. Soil gas sampling is necessary to determine if the benzene present in the groundwater plume beneath the site does migrate into indoor air; therefore, at locations where the concentration of benzene in groundwater is greater than or equal to 10 µg/L and no soil gas data are available, soil gas sampling is proposed. Twelve additional soil gas data points are proposed in this addendum to provide this necessary information to complete the TPH strategy evaluation and determine if corrective action is necessary.

According to the TPH strategy, if the concentration of TPH detected in a soil sample exceeds the preliminary remediation criterion (PRC) for soils, a determination of whether TPH-impacted soil is isolated or widespread needs to be made prior to determining if corrective action is necessary. Three locations where samples contained concentrations of TPH greater than the PRCs did not have sufficient data to determine if corrective action is necessary. Six soil borings are proposed in this addendum to investigate these three locations.

The TPH strategy requires an investigation for light, nonaqueous-phase liquids (LNAPL) when the total TPH (TTPH) concentrations at a given location exceed 20 mg/L in groundwater or 14,000 milligrams per kilogram (mg/kg) in soil. A review of TPH sites revealed two possible locations where potential exists for LNAPL. Two piezometers will be installed to investigate if LNAPL is present at either of these locations.

During review of the EBS, it was noted that chlorinated hydrocarbons, specifically 1,2-dichloroethane (DCA) and cis-1,2-dichloroethene (DCE), were detected in groundwater at concentrations above the maximum concentration level (MCL) in the vicinity of underground storage tanks (UST) 594-1 and 594-2 (EBS Parcel 8). DTSC has stated that they will not approve transfer of this property until the nature and extent of the chlorinated hydrocarbons are determined. A total of four sampling locations are proposed to investigate the chlorinated hydrocarbons in groundwater.

In addition, the review of the EBS revealed a former gas station site on the eastern end of EBS Parcel 23G. The gas station reportedly was closed in 1962; however, no regulatory sampling requirements were in effect at that time. In order to determine if closure is appropriate for this site, the Navy must sample the soil beneath the gas station to determine if a release occurred from the former USTs. For this purpose, one soil boring is proposed in this addendum to be placed in the location of the former gas station.

4.0 DATA GAP SAMPLING FOR OPERABLE UNIT 1

The following sections outline the rationale, proposed sampling locations, and analyses for each additional data gap investigation at CERCLA Site 8.

4.5 INSTALLATION RESTORATION SITE 8

This section summarizes the additional data gap sampling associated with CERCLA Site 8. Section 4.5 provides background information, including site location and history, local geology and hydrogeology, previous investigations, and soil gas sampling objectives and design.

4.5.1 Site Description and History

CERCLA Site 8 is almost entirely paved and consists of Buildings 114 and 191. Building 114 was constructed in 1944 and was used as a center for weed and pest control until 1974 and as a maintenance and storage center, appliance repair shop and administrative offices from 1974 to 1997. Building 191 was used for storage. Three oil-water separators (OWS) were present near Building 114 and received drainage from the storage yard of the building. Two grease traps were located near the southern wing of Building 114 and separated sludge and floating scum from wastewater.

4.5.2 Local Geology and Hydrogeology

Three geologic units have been encountered in soil borings at CERCLA Site 8: fill material, bay sediments (also known as Bay Sediments Unit or [BSU]), and the Merritt Sand Formation. The fill material ranged from 5.5 to 12.5 feet below ground surface (bgs) at CERCLA Site 8. The thickness of the fill material generally increases to the west. The fill material is comprised of yellow-brown sands and silty sands. The BSU is classified as dark olive clay to sandy clay and clayey sand to silty sand. The lower boundary of the BSU is 40 feet bgs. The Merritt Sand Formation is classified as yellowish-brown clayey sands, silty sand, and poorly and fine-graded sands. The lower boundary of the Merritt Sand Formation is not known.

In situ permeability tests indicated that the fill material hydraulic conductivity ranged from 1.2×10^{-3} centimeters per second (cm/sec) to 2.6×10^{-4} cm/sec. Vertical permeability tests indicated that the BSU hydraulic conductivity ranged of 2.7×10^{-6} to 7.1×10^{-8} cm/sec.

Fill material comprises the first water bearing zone (FWBZ) at CERCLA Site 8. In April 1988, depth to groundwater was 6 feet bgs in monitoring wells at CERCLA Site 8. Groundwater flow direction was towards the west-northwest in the northeastern area and towards the east-northeast in the southwestern area. The hydraulic gradient at CERCLA Site 8 was 0.0021 foot per feet (ft/ft) and 0.0028 ft/ft at the northeastern and southwestern areas, respectively.

4.5.3 Investigation History

Between July and September 1991, eight monitoring wells were installed and multiple soil and groundwater samples were collected to assess possible TPH contamination from the OWSs and grease traps. Based on the results of the initial RI, four groundwater sampling events were conducted between June 1994 and May 1995 and additional soil and groundwater samples were collected in the vicinity of CERCLA Site 8.

Low concentrations of TPH have been detected in soil and groundwater near the OWS. Benzene has been detected in groundwater at M08-05 and M08-06 at a maximum concentration of 0.038 milligrams per liter (mg/L), which exceeds the PRC for inhalation of vapors from groundwater to indoor air.

4.5.4 Soil Gas Sampling to Support Risk Assessment

Benzene was identified at concentrations above 10 µg/L in groundwater samples collected from M08-05 at the location shown on Figure AA-3. One additional soil gas sampling location is proposed in this addendum to be collected at or near the location where the benzene contamination was identified. This sample is required to provide the necessary information to evaluate the inhalation pathway and complete the risk assessment for CERCLA Site 8. To refine the risk calculation associated with this exposure route, multidepth soil gas samples will be collected.

Two direct-push borings will be advanced at CERCLA Site 8 at the location shown on Figure AA-4. The first boring, a continuous core soil boring, will be advanced to determine the specific groundwater depth and evaluate physical soil parameters required for the risk assessment model. One soil sample from this boring (the depth corresponding with the near-surface soil gas sampling depth) will be collected and analyzed for the following geotechnical properties: particle size, soil texture, volumetric moisture, soil total porosity, and soil dry bulk density, as described in Section 8.5 of the original FSP.

A second boring will be advanced to collect soil samples following completion of the continuous core soil boring. At the second boring location, two soil gas samples will be collected. The first sample will be collected near the ground surface at 1.5 feet bgs. The second sample will be collected just above the water table; therefore, the depth to groundwater needs to be established with the first boring.

Soil gas samples will be collected for analysis of target volatile organic compounds (VOC), including benzene. Near-surface soil gas concentrations for VOCs will be used as input to the indoor air model, because they are most representative of vapor concentrations likely to enter the building. Soil gas sampling procedures are described in Section 8.5 of the original FSP. Sample identification numbers, depth intervals, and analyses are presented in Appendix A, Table A3-8.

5.0 OPERABLE UNIT 2A

This section summarizes the additional data gap sampling associated with CERCLA Site 22. Section 5.1 provides background information, including site location and history, local geology and hydrogeology, and previous investigations. Section 5.2 summarizes the data quality objectives (DQO) process and presents sampling objectives, proposed sampling locations, and analytical parameters.

SITE 8

M08-03
M08-04
M08-06
M08-05
M08-02
D08-01
HP-S08-01
191
76
114
75
HP-S08-04
M08-01
HP-S08-05
HP-S08-03

LEGEND
- EXCAVATION
- GEOPROBE
- HYDROPUNCH
- MONITORING WELL
- SOIL BORING
- SURFACE LOCATION
- EBS PARCEL BOUNDARY
- INSTALLATION RESTORATION SITES
- LAND COVER

TEXT : SITE LABEL
TEXT : POINT LABEL
TEXT : PARCEL LABEL
TEXT : BUILDING LABEL

BLACK POINTS HAVE BENZENE CONCENTRATIONS OVER 10 µg/L

GREY POINTS HAVE BENZENE CONCENTRATIONS EQUAL OR LESS THAN10 µg/L

N

25 0 25 50

Scale: 1" = 50'

FIGURE AA-3
CERCLA SITE 8
PREVIOUS GROUNDWATER SAMPLING LOCATIONS

ALAMEDA POINT
ALAMEDA, CALIFORNIA
AUGUST 22, 2001

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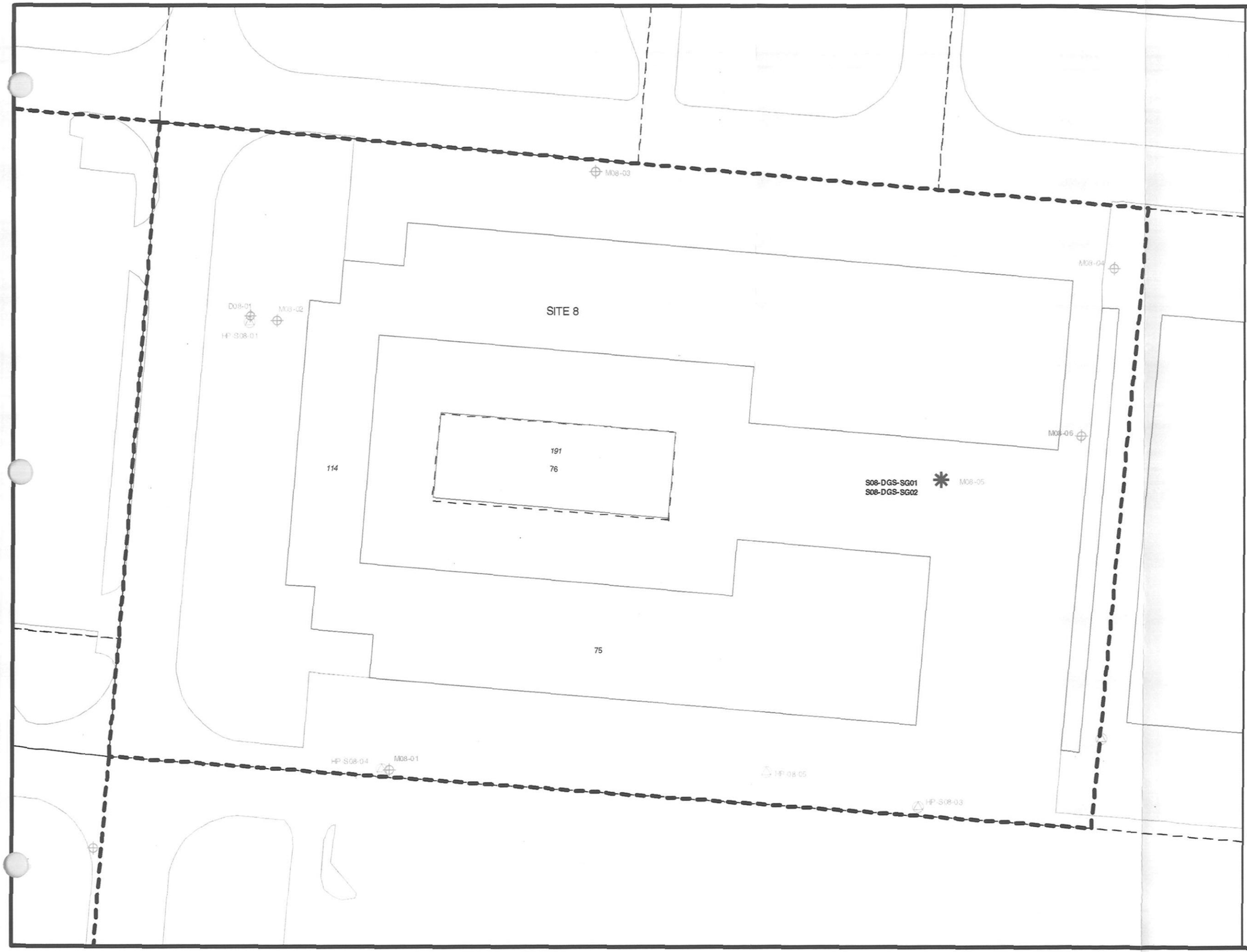
U:\ALMDA_SA\CTO245\RI_8_3_01.APR\FIG AA-03 LAYOUT ACEVEDJ 08/03/01



LEGEND

- EXCAVATION
- GEOPROBE
- HYDROPUNCH
- MONITORING WELL
- SOIL BORING
- SURFACE LOCATION

PROPOSED SAMPLES

- SOIL GAS
- EBS PARCEL BOUNDARY
- INSTALLATION RESTORATION SITES
- LAND COVER

TEXT : SITE LABEL

TEXT : POINT LABEL

TEXT : PARCEL LABEL

TEXT : BUILDING LABEL

N

25 0 25 50

Scale: 1" = 50'

FIGURE AA-4
CERCLA SITE 8
PROPOSED SAMPLING LOCATIONS

ALAMEDA POINT
ALAMEDA, CALIFORNIA
AUGUST 22, 2001

Tetra Tech EM Inc.

DS.0385.17292

U:\ALMDA_SA\CTO245\RI_DGS.APR\FIG AA-04 LAYOUT ACEVEDJ 08/03/01

5.1 BACKGROUND AND HISTORY OF OPERABLE UNIT 2A

OU-2A, the Southeastern Area, consists of CERCLA sites 9, 13, 19, 22, and 23, identified in the following list:

- CERCLA Site 9: Building 410 - Aircraft Paint Stripping Facility
- CERCLA Site 13: Building 397 - Historical Oil Refinery, Aviation Gasoline (AVGAS) Storage, Jet Engine Test Facility
- CERCLA Site 19: Building 615 - Hazardous Waste Storage Facility
- CERCLA Site 22: Building 547 – Former Service Station
- CERCLA Site 23: Building 530 - Missile Rework Facility, Aircraft Defueling Area

Historically, the land use at OU-2A has been heavy industrial. Based on the reuse plan, the intended future use of the area may include mixed residential, commercial, and industrial (TtEMI 1998a). RI activities were conducted over several phases and included soil gas, groundwater, and soil sampling throughout OU-2A. A detailed description of the RI Program conducted at OU-2A is presented in Chapter 6 of the Draft OU-2 RI Report (TtEMI 1999b).

5.1.1 Site Descriptions and History

Historical uses of OU-2A have included aircraft taxiways, aircraft defueling and maintenance, jet engine testing, equipment storage and repair, storage of hazardous material, hazardous waste and fuel, and automobile refueling and maintenance. The following sections provide further description and history of CERCLA Site 22.

5.1.1.5 CERCLA Site 22, Building 547 – Former Service Station

CERCLA Site 22 included former Building 547, a gasoline service station, which consisted of a car wash and pumping islands. The service station was operated from 1971 through 1980. Five USTs, 547-1 through 547-5, were associated with the service station.

USTs 547-1 through 547-3, were removed by the Navy's Public Works Center (PWC) in 1994. Each of these 12,000-gallon USTs stored gasoline, and the associated fuel lines were removed in 1995. USTs

547-4 (5,000-gallon capacity) and 547-5 (10,000-gallon capacity) contained waste oil and were located on the northwestern corner of Building 547. The date of waste oil tank removal is unknown.

Elevated concentrations of TPH and benzene, toluene, ethylbenzene, and total xylenes (BTEX) have been detected in soil and groundwater near the former USTs, former pump islands, and south of the former pump islands, indicating a release associated with either the USTs or associated fuel lines. Benzene has been detected in groundwater at Location 547-L1 at a concentration of 2.2 mg/L, which is above the PRC for inhalation of vapors from groundwater to indoor air.

5.2 SUMMARY OF DATA QUALITY OBJECTIVES PROCESS

The following subsections discuss additional data gap sampling activities planned for CERCLA Site 22.

5.2.4 Soil Gas Sampling to Support Risk Assessment

Benzene was identified at CERCLA Site 22 at concentrations above 10 µg/L in groundwater samples collected from 547-L1, MW547-3, MW547-4, and MW547-5 shown on Figure AA-5. Current data gap sampling activities include soil gas sampling in the vicinity of MW547-3, MW547-4, and MW547-5. One additional soil gas sample is proposed in this addendum to be collected in the vicinity of 547-L1. This sample is required to provide the necessary information to evaluate the inhalation pathway and complete the risk assessment for CERCLA Site 8. To refine the risk calculation associated with this exposure route, multi-depth soil gas samples will be collected.

Two direct-push borings will be advanced at CERCLA Site 22 at the location shown on Figure AA-6. The first boring, a continuous core soil boring, will be advanced to determine the specific groundwater depth and evaluate physical soil parameters required for the risk assessment model. One soil sample from this boring (the depth corresponding with the near-surface soil gas sampling depth) will be collected and analyzed for the following geotechnical properties: particle size, soil texture, volumetric moisture, soil total porosity, and soil dry bulk density, as described in Section 8.5 of the original FSP.

A second boring will be advanced to collect soil gas samples following completion of the continuous core soil boring. At the second boring location, two soil gas samples will be collected. The first sample will be collected near the ground surface at 1.5 feet bgs, and the second sample will be collected just above the water table; therefore, the depth to groundwater needs to be established with the first boring.

DHP-S07C-01

MW547-1

MW547-2

DHP-S07C-02

547-L8

SITE 22

547

145

M07C-09

M07C-09

MW547-3

MW547-4

DHP-S07C-03

D07C-01

MW547-5

DHP-S07C-04

POINT TYPE
- EXCAVATION
- GEOPROBE
- HYDROPUNCH
- MONITORING WELL
- SOIL BORING
- SURFACE LOCATION
- INSTALLATION RESTORATION SITES
- EBS PARCEL BOUNDARY
- LAND COVER

TEXT : SITE LABEL

TEXT : POINT LABEL

TEXT : PARCEL LABEL

TEXT : BUILDING LABEL

BLACK POINTS HAVE BENZENE CONCENTRATIONS OVER 10 µg/L

GREY POINTS HAVE BENZENE CONCENTRATIONS EQUAL OR LESS THAN10 µg/L

N

15 0 15 30

Scale: 1" = 30'

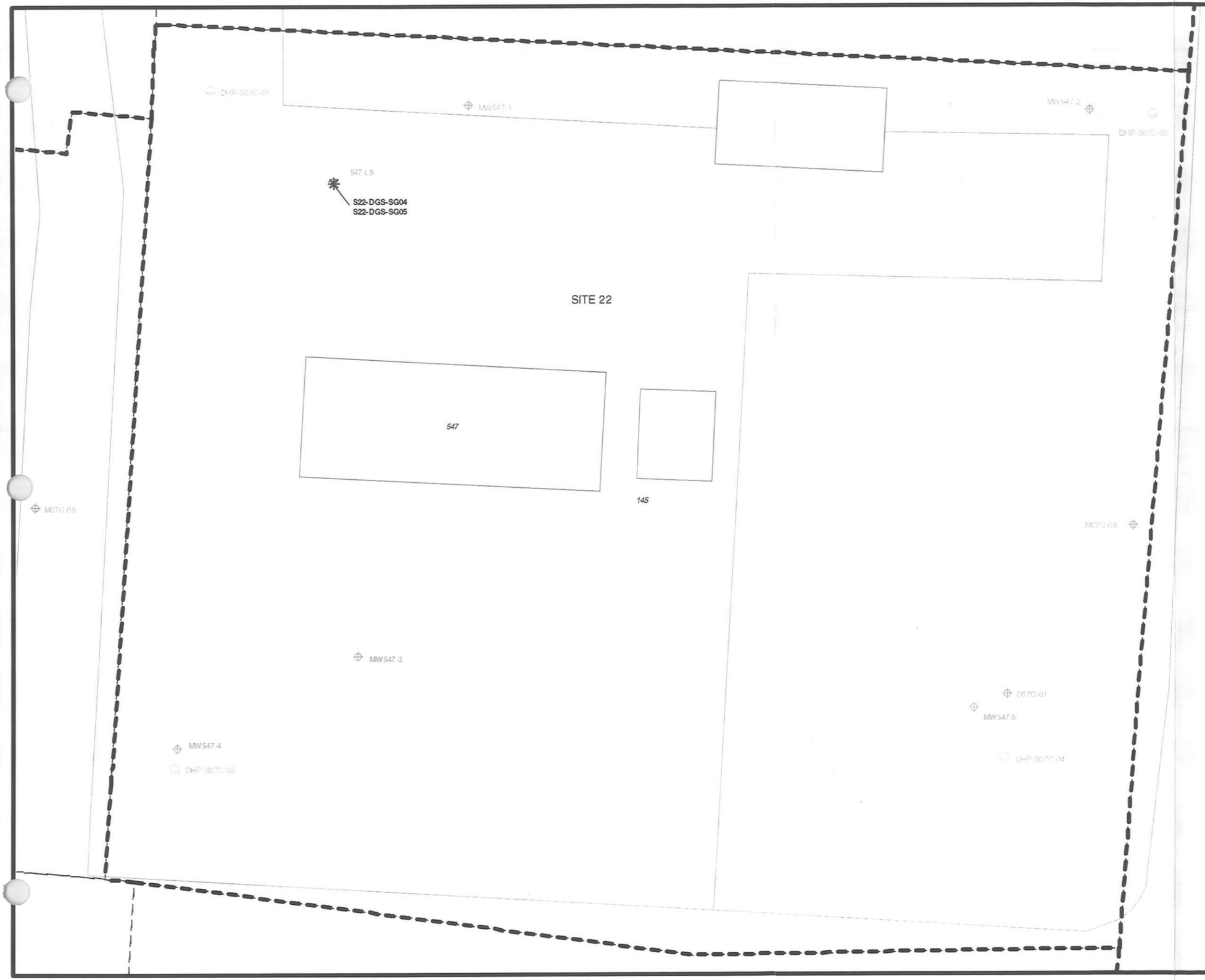
FIGURE AA-5
CERCLA SITE 22
PREVIOUS GROUNDWATER SAMPLING LOCATIONS

ALAMEDA POINT
ALAMEDA, CALIFORNIA
AUGUST 22, 2001

Tetra Tech EM Inc.

DS.0385.17292

U:\ALMDA_SA\CTO245\RI_8_3_01.APR\FIG AA-05 LAYOUT ACEVEDJ 08/03/01



LEGEND

POINT TYPE
- EXCAVATION
- GEOPROBE
- HYDROPUNCH
- MONITORING WELL
- SOIL BORING
- SURFACE LOCATION

PROPOSED SAMPLES
- SOIL GAS

INSTALLATION RESTORATION SITES

EBS PARCEL BOUNDARY

LAND COVER

TEXT : SITE LABEL

TEXT : POINT LABEL

TEXT : PARCEL LABEL

TEXT : BUILDING LABEL

N

15 0 15 30

Scale: 1" = 30'

FIGURE AA-6
CERCLA SITE 22
PROPOSED SAMPLING LOCATIONS

ALAMEDA POINT
ALAMEDA, CALIFORNIA
AUGUST 22, 2001

Tetra Tech EM Inc.

DS.0385.17292

U:\ALMDA_SA\CTO245\RI_DGS.APR\FIG AA-06 LAYOUT ACEVEDJ 08/03/01

Soil gas samples will be collected for analysis of target VOCs, including benzene. Near-surface soil gas concentrations for VOCs will be used as input to the indoor air model, because they are most representative of vapor concentrations likely to enter the building. Soil gas sampling procedures are described in Section 8.5 of the original FSP. Sample identification numbers, depth intervals, and analyses are presented in Appendix A, Table A3-8.

6.0 OPERABLE UNIT 2B

This section summarizes the additional data gap sampling associated with CERCLA Sites 3 and 4. Section 6.1 provides background information, including site location and history, local geology and hydrogeology, and previous investigations. Section 6.2 summarizes the DQO process and presents sampling objectives, proposed sampling locations, and analytical parameters.

6.2 SUMMARY OF DATA QUALITY OBJECTIVES PROCESS

The following subsections discuss additional data gap sampling activities planned for CERCLA Sites 3 and 4.

6.2.5 Soil Gas Sampling to Support Risk Assessment

Benzene, at concentrations greater than 10 µg/L, was detected in 398-2-MOJ, 097-010, 372-5-ERM, 03GB017, and CA03-02 at CERCLA Site 3 and at multiple locations at CERCLA Site 4 (see Figure AA-7). Current data gap sampling activities include soil gas sampling in the vicinity of 03GB017 and CA03-02 at CERCLA Site 3. Two additional soil gas sampling locations at CERCLA Site 3 and one soil gas sampling location at CERCLA Site 4 are proposed in this addendum. These samples are required to provide the necessary information to evaluate the inhalation pathway and complete the risk assessment for CERCLA Sites 3 and 4. To refine risk calculations associated with this exposure route, multidepth soil gas samples will be collected.

Soil gas samples will be collected from two sampling locations at Site 3 and one sampling location at Site 4 (see Figure AA-8). At each location, two direct-push borings will be advanced. The first boring, a single, continuous core soil boring, will be completed to determine the specific groundwater depth and evaluate physical soil parameters required for the risk assessment model. One soil sample from this boring (the depth corresponding with the near-surface soil gas sampling depth) will be collected and

LEGEND

- TTPH GREATER THAN 20 mg/L
- BENZENE GREATER THAN 10 µg/L
- DATA POINTS NOT EXCEEDING PRC'S
- EBS PARCEL BOUNDARY
- INSTALLATION RESTORATION SITES
- LAND COVER

TEXT : SITE LABEL

TEXT : POINT LABEL

TEXT : PARCEL LABEL

TEXT : BUILDING LABEL

PRC: PRELIMINARY REMEDIATION CRITERIA

60 0 60 120

Scale: 1" = 120'

FIGURE AA-7
CERCLA SITES 3 AND 4
PREVIOUS GROUNDWATER SAMPLING LOCATIONS

ALAMEDA POINT
ALAMEDA, CALIFORNIA
AUGUST 22, 2001

Tetra Tech EM Inc.

DS.0385.17292

U:\ALMDA_SA\CTO245\RI_8_3_01..APR\FIG AA-07 LAYOUT ACEVEDO 08/03/01

LEGEND

PREVIOUS SAMPLING LOCATIONS

PROPOSED SAMPLES

FLOATING PRODUCT

SOIL GAS

EBS PARCEL BOUNDARY

INSTALLATION RESTORATION SITES

LAND COVER

TEXT : SITE LABEL

TEXT : POINT LABEL

TEXT : PARCEL LABEL

TEXT : BUILDING LABEL

S03-DGS-SG13
S03-DGS-SG14
S03-DGS-DP14
S03-DGS-SG15
S03-DGS-SG16
S04-DGS-SG19
S04-DGS-SG20

SITE 3
SITE 4
SITE 11
SITE 21
SITE 19

60 0 60 120

Scale: 1" = 120'

FIGURE AA-8
CERCLA SITES 3 AND 4
PROPOSED SAMPLING LOCATIONS

ALAMEDA POINT
ALAMEDA, CALIFORNIA
AUGUST 22, 2001

Tetra Tech EM Inc.

DS.0385.17292

U:\ALMDA_SA\CTO245\RI_DGS.APR\FIG AA-08 LAYOUT ACEVEDJ 08/03/01

analyzed for the following geotechnical properties: particle size, soil texture, volumetric moisture, soil total porosity, and soil dry bulk density, as described in Section 8.5 of the original FSP.

A second boring will be advanced to collect soil gas samples following completion of the continuous core soil boring. At the second boring location, two soil gas samples will be collected. The first sample will be collected near the ground surface at 1.5 feet bgs, and the second sample will be collected just above the water table; therefore, the depth to groundwater needs to be established with the first boring.

Soil gas samples will be collected for analysis of target VOCs, including benzene. Near-surface soil gas concentrations for VOCs will be used as input to the indoor air model, because they are most representative of vapor concentrations likely to enter the building. Soil gas sampling procedures are described in Section 8.5. Sample identification numbers, depth intervals, and analyses are presented in Appendix A, Table A3-8.

6.2.6 Light, Nonaqueous-Phase Liquid Investigation to Support Corrective Action Decision at CERCLA Site 3

The concentration of TTPH exceeded 20 milligrams per liter (mg/L) in groundwater at multiple locations at CERCLA Site 3 (see Figure AA-7). According to the TPH strategy, if the concentration of TTPH exceeds 20 mg/L, an investigation for LNAPL must be conducted. The presence of LNAPL will be evaluated by installing one temporary, slotted piezometer. The locations of temporary piezometers will be positioned using a mobile geographical positioning system (GPS). Once located, a slotted piezometer will be installed at the location shown on Figure AA-8.

The piezometer will be installed using a direct-push, soil-coring device. If the ground surface is unpaved or covered by asphalt, then a 3.5-inch-diameter drive casing and inner sample barrel will be advanced into the ground using the direct-push rig. If the ground surface is covered by concrete, then concrete coring will be conducted prior to advancing the direct-push drive casing. The drive casing will be advanced about 10 feet bgs. Continuous soil cores will be collected at 3-foot intervals in acetate sleeves for logging lithology, identifying the top of the capillary fringe and water table, and logging any product observed in the soil core. The lithological information can be used to correlate and locate geologic horizons with poor recovery. Photographs of the soil cores will be taken.

If LNAPL is visible in the soil, a qualitative evaluation of the degree of product saturation will be conducted on soil samples from the soil core. Using a stainless-steel trowel, samples of soil core material will be collected from the soil core at 1.5-foot intervals and at intervals along the soil core where apparent product is observed. Soil samples will be placed in a volatile organic analysis (VOA) vial until the vial is one-third full of soil. Deionized water will be added to the vial until the vial is two-thirds full of soil and deionized water, and the vial will be shaken. The VOA vial will be labeled and allowed to equilibrate for 4 hours. The sharpness of the meniscus will be noted for each sample and logged for clarity and presence of free product.

Once the drive casing has been advanced to about 10 feet bgs, a 2-inch-diameter slotted piezometer (0.010-inch slots) with an end cap will be installed in the borings as the drive casing is withdrawn. The piezometer will be factory-slotted from 1 to 10 feet bgs (9 feet of screened interval) to ensure that the groundwater table is within the screened interval. This screened interval also ensures that the potential smear zone of the floating product caused by tidal fluctuations in the water table is taken into account. The piezometer will be left in the borehole for a 24-hour period in order to allow groundwater to recharge.

After 24 hours, a product interface probe will be used to measure the depth to the groundwater table and the thickness of any LNAPL in the piezometer. The information will be recorded in the field logbook. A 3-foot-long, small-diameter clear bailer will be inserted into the piezometer to about 2 feet below the water table to collect a sample. The bailer will be retracted, and the presence and thickness of LNAPL in the bailer will be noted in the field logbook. If LNAPL is detected with either the interface probe or the bailer, a sample of the product will be collected and submitted to a fixed laboratory for petroleum hydrocarbon speciation.

After all investigation activities are completed, the temporary piezometers will be removed and the borehole will be grouted using cement-bentonite slurry. Investigation-derived waste (IDW) will be handled and disposed of in accordance with TtEMI's IDW management plan.

10.0 DATA GAP SAMPLING FOR NON-CERCLA SITES

This section is being added to the FSP because of the need to investigate several data gaps in areas outside of OU-1 and -2. In these areas, data gaps were identified during evaluation of the recently

adopted TPH strategy and review of the recently submitted EBS report. Work in these areas will consist of the following:

- At locations where elevated concentrations of TTPH have been detected, but a limited amount of information is available to evaluate the nature and extent of the impacted soil, subsurface soil samples will be collected to determine if the impacted soil is localized or widespread.
- At locations where the concentration of TTPH exceeds 20 mg/L in groundwater, a piezometer will be installed to evaluate if LNAPL is present.
- Groundwater samples will be collected from multiple locations to evaluate the nature and extent of the chlorinated solvents detected in groundwater at EBS Parcel 8.
- At locations where the concentration of benzene in groundwater exceeds 10 µg/L, a soil gas sample will be collected to assist the human health risk assessment team in evaluating the inhalation pathway.
- The former gas station (located at the eastern end of EBS Parcel 23G) will be investigated by drilling one soil boring below the former gas station footprint and collecting soil samples from multiple depths.

The field work at these sites will be conducted in accordance with the approved FSP/QAPP. Additional data gaps were identified in three CAAs and five EBS parcels, as follows.

10.1 CORRECTIVE ACTION AREA 9A

This section summarizes the additional data gap sampling associated with CAA-9A. The following subsections provide background information, including site location and history, local geology and hydrogeology, previous investigations, and sampling objectives and design.

10.1.1 Site Description and History

CAA-9A, located in the Dock Support Services Zone (Zone 19), is entirely paved and consists of Building 584. Two USTs, 584-1 and 584-2 were located south of Building 584 and were used to store diesel fuel for a boiler in Building 584.

USTs 584-1 and 584-2 each had a capacity of 4,000 gallons and were constructed of fiberglass. The date of installation of USTs 584-1 and 584-2 is unknown. The USTs were removed by PWC in October and November 1994, along with an associated fuel line (PWC 1996).

10.1.2 Local Geology and Hydrogeology

Two geologic units were encountered in soil borings at CAA 9A: fill material and the BSU. The fill material, which is composed of a light olive to gray, medium-grained, silty sand, was found at depths up to 12.5 feet bgs. The BSU is classified as silty sands, sandy clays, and dark clayey silt, with traces of shell fragments. The lower boundary of the BSU is not clearly defined.

Vertical permeability tests indicated that the fill material has a hydraulic conductivity of 4.0×10^{-3} cm/sec at CAA 9A.

Fill material comprises the FWBZ at CAA 9. In April 1999, depth to groundwater in monitoring wells ranged from 1.95 to 4 feet bgs. Groundwater flow direction was toward the southwest. The hydraulic gradient ranged from 0.002 to 0.006 ft/ft between February and September 1997.

10.1.3
~~10.1.2~~ **Investigation History**

During removal, UST 584-1 was observed to be in good condition and contained about 0.5 inch of diesel fuel. However, a hole was punctured through the top of UST 584-2 during removal, causing the tank contents (mostly water) to spill into the excavation. Visibly stained soil and a strong diesel odor were observed in both UST excavations, and groundwater was encountered at about 5 feet bgs. A sheen was visible on the water surface in the excavation of UST 584-1, and floating product was visible in the excavation of UST 584-2. PWC collected one groundwater sample, two soil samples at the soil-groundwater interface in the excavation, and four soil samples from points along the piping removal trenches.

In general, TPH levels in groundwater samples collected in the immediate vicinity of former UST 584-1 indicated that floating product may have been present. Analytical results indicated that concentrations greater than 20 mg/L (TTPH) and 10 ug/L (benzene) were detected in groundwater samples in the vicinity of UST 584-1. TtEMI investigated three monitoring wells near former USTs 584-1 and 584-2 for floating product (TtEMI 2000b). Floating product was not found in any of the monitoring wells. The concentration of benzene in groundwater is greater than the TPH strategy PRCs; therefore, additional investigation is necessary to evaluate inhalation pathway for the human health risk assessment.

TPH-motor oil was detected in surface soil sample (150-219-017) at a concentration of 50,000 mg/kg based on mobile laboratory data and 6,200 mg/kg based on fixed laboratory data. Insufficient information exists to determine whether the TTPH-impacted soil is isolated or widespread.

10.1.4
~~10.1.3~~ **Sampling Objectives and Design**

The following subsections discuss data gap sampling activities planned for CAA-9A.

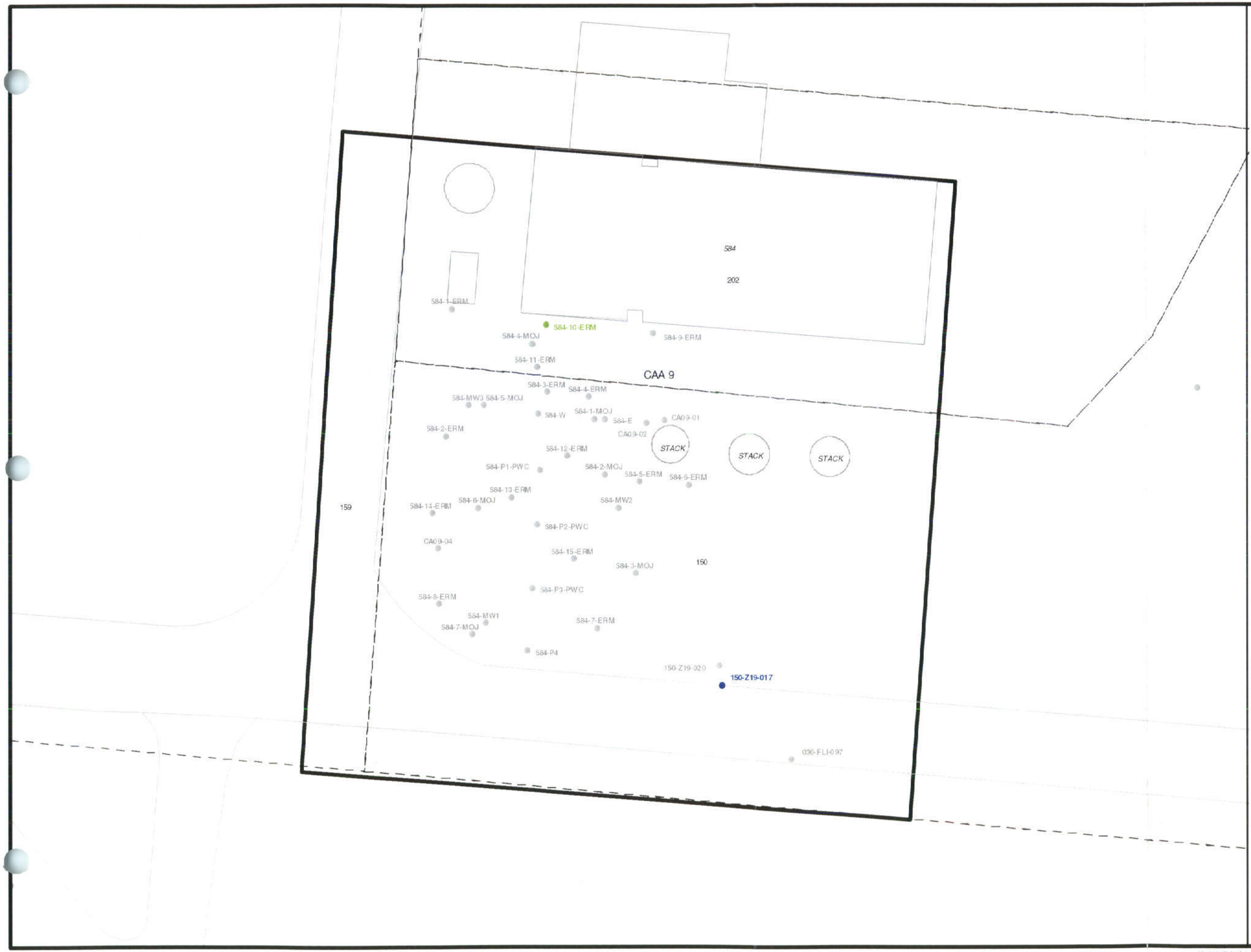
10.1.4.1 Soil Gas Sampling to Support Risk Assessment

Benzene was identified at concentrations above 10 µg/L in groundwater samples collected from 584-10-ERM at CAA-9A (see Figure AA-9). One soil gas sampling location is proposed in this addendum to be collected at the location shown on Figure AA-10. This sample is required to provide the necessary information to evaluate the inhalation pathway and complete the risk assessment for CAA-9A. To refine the risk calculation associated with this exposure route, multidepth soil gas samples will be collected.

Two direct-push borings will be advanced at the soil gas sampling location. The first boring, a continuous core soil boring, will be advanced to determine the specific groundwater depth and evaluate physical soil parameters required for the risk assessment model. One soil sample from this boring (the depth corresponding with the near-surface soil gas sampling depth) will be collected and analyzed for the following geotechnical properties: particle size, soil texture, volumetric moisture, soil total porosity, and soil dry bulk density, as described in Section 8.5 of the original FSP.

A second boring will be advanced to collect soil samples following completion of the continuous core soil boring. At the second boring location, two soil gas samples will be collected. The first sample will be collected near the ground surface at 1.5 feet bgs. The second sample will be collected just above the water table; therefore, the depth to groundwater needs to be established with the first boring.

Soil gas samples will be collected for analysis of target VOCs, including benzene. Near-surface soil gas concentrations for VOCs will be used as input to the indoor air model, because they are most representative of vapor concentrations likely to enter the building. Soil gas sampling procedures are described in Section 8.5 of the original FSP. Sample identification numbers, depth intervals, and analyses are presented in Appendix A, Table A3-8.



LEGEND

- TTPH GREATER THAN 14,000 MG/KG
- BENZENE GREATER THAN 10 µg/L
- EBS PARCEL BOUNDARY
- LAND COVER
- CORRECTIVE ACTION AREA

TEXT : CAA LABEL

TEXT : POINT LABEL

TEXT : PARCEL LABEL

TEXT : BUILDING LABEL

N

15 0 15 30

Scale: 1" = 30'

FIGURE AA-9
CAA 9A
PREVIOUS SOIL AND GROUNDWATER SAMPLING LOCATIONS

ALAMEDA POINT
ALAMEDA, CALIFORNIA
AUGUST 22, 2001

Tetra Tech EM Inc.

DS.0385.17292

U:\ALMDA_SA\CTO245\RI_8_3_01.APR\FIG AA-03 LAYOUT ACEVEDO 08/03/01

LEGEND

- EXCAVATION
- GEOPROBE
- HYDROPUNCH
- MANHOLE
- MONITORING WELL
- PIEZOMETER
- SOIL BORING
- SURFACE LOCATION

PROPOSED SAMPLES

- SOIL GAS
- SOIL
- EBS PARCEL BOUNDARY
- LAND COVER
- CORRECTIVE ACTION AREA

TEXT : CAA LABEL

TEXT : POINT LABEL

TEXT : PARCEL LABEL

TEXT : BUILDING LABEL

N

15 0 15 30

Scale: 1" = 30'

FIGURE AA-10
CAA 9A
PROPOSED SAMPLING LOCATIONS

ALAMEDA POINT
ALAMEDA, CALIFORNIA
AUGUST 22, 2001

Tetra Tech EM Inc.

DS.0385.17292

U:\ALMDA_SA\CTO245\RI_DGS.APR\FIG AA-10 LAYOUT ACEVEDJ 08/03/01

10.1.4.2 Soil Sampling to Support Corrective Action Decision at CAA-9A

One soil sample (150-Z19-017) contained TTPH at a concentration greater than the PRC developed for the TPH strategy. The location of this sample is shown on Figure AA-9. Insufficient information exists to determine whether the TTPH-impacted soil is isolated or widespread. One soil boring, from which four soil samples will be collected, will be drilled to investigate this area.

One direct-push boring will be advanced at the location shown on Figure AA-10. A total of four soil samples will be collected from this boring: one soil sample will be collected near the surface, one at 4.5 to 5 feet bgs, one at the soil-groundwater interface, and one at a depth of 10 feet bgs. Samples will be analyzed at a fixed laboratory for TPPH, total extractable petroleum hydrocarbons (TEPH), and VOCs. If TTPH is detected at concentrations greater than the PRCs at multiple depths, then CAA-9A will be recommended for corrective action.

10.2 CORRECTIVE ACTION AREA 10

This section summarizes the additional data gap sampling associated with CAA-10. The following subsections provide background information, including site location and history, local geology and hydrogeology, previous investigations, and soil sampling objectives and design.

10.2.1 Site Description and History

CAA 10 is located in the central region of Alameda Point and is composed primarily of paved open space used for vehicle parking and Buildings 518, 19, and 491. Building 518 was a weather station, Building 19 served as an aircraft control tower and fire station, and Building 491 was used for fueling and maintenance operations. UST 491-1 was a 500-gallon gasoline tank located southeast of Building 491. PWC removed UST 491-1 and associated vent and product lines in August 1994 (PWC 1997).

10.2.2 Local Geology and Hydrogeology

Fill material encountered at CAA 10 is composed of yellowish-brown to dark greenish-gray silty sands from the surface to a depth of at least 12 feet bgs. Laterally continuous clay and silt layers were not encountered in the monitoring wells. Deeper geologic units were not encountered during

investigations at CAA 10; however, based on regional geology, the BSU and Merritt Sand Formation underlie the fill material.

Permeability of the shallow soil fill material was determined to be 4.0×10^{-5} cm/sec.

The fill material comprises the FWBZ at CAA 10. Groundwater was first encountered between 0.5 and 3 feet bgs during monitoring well installation. Groundwater elevation data indicate that groundwater flows toward the east, and the hydraulic gradient at the site is relatively flat at approximately 0.001 ft/ft. Groundwater is not likely tidally influenced because of a steel sheet pile wall along the northern boundary of the Seaplane Lagoon.

10.2.3 Investigation History

PWC removed UST 491-1 and associated vent and product lines in August 1994. During tank removal, several holes were observed in UST 491-1 and petroleum hydrocarbons were detected in the soil excavation sample.

In general, TPH levels in groundwater samples collected in the immediate vicinity of former UST 491-1 indicated that floating product may have been present. Analytical results indicated that concentrations greater than 20 mg/L (TTPH) and 10 ug/L (benzene) were detected in groundwater samples in the vicinity of UST 584-1. TtEMI investigated three monitoring wells near former USTs 491-1 for floating product (TtEMI 2000e). Floating product was not found in any of the monitoring wells. The highest concentration of benzene (11.5 mg/L) in groundwater is greater than the TPH strategy PRCs; therefore, additional investigation is necessary to evaluate inhalation pathway for the human health risk assessment.

10.2.4 Soil Gas Sampling to Support Risk Assessment

Benzene was identified at concentrations above 10 µg/L in multiple groundwater samples collected at CAA-10 (see Figure AA-11). Two soil gas sampling locations at CAA-10 are proposed in this addendum to be collected at the locations shown on Figure AA-12. These samples are required to provide the necessary information to evaluate the inhalation pathway and complete the risk assessment for CAA-10. To refine the risk calculation associated with this exposure route, multidepth soil gas samples will be collected.

193

19

491-1-ERM

491-2-ERM

CA10-03

491-25-ERM

491-6-ERM

491-14-ERM

491-15-ERM

491-26-ERM

491-7-ERM

491-3-ERM

491-13-ERM

491-24-ERM

491-MW3

491-4-ERM

491-5-ERM

CAA 10

491-8-ERM

29

491-MW1

491-16-ERM

491-23-ERM

491-27-ERM

491MJ-MW1

491-1-MOJ

491-12-ERM

491-2-MOJ

491-9-ERM

491-10-ERM

491-22-ERM

491-11-ERM

491-17-ERM

491-28-ERM

491-21-ERM

491-18-ERM

491-20-ERM

491-19-ERM

491-MW2

491-29-ERM

LEGEND

- Geoprobe
- Monitoring Well
- EBS PARCEL BOUNDARY
- CORRECTIVE ACTION AREA
- LAND COVER

TEXT : CAA LABEL

TEXT : POINT LABEL

TEXT : PARCEL LABEL

TEXT : BUILDING LABEL

BLACK POINTS HAVE BENZENE CONCENTRATIONS OVER 10 µg/L

GREY POINTS HAVE BENZENE CONCENTRATIONS EQUAL OR LESS THAN10 µg/L

N

10 0 10 20

Scale: 1" = 20'

FIGURE AA-11
CAA 10
PREVIOUS GROUNDWATER SAMPLING LOCATIONS

ALAMEDA POINT
ALAMEDA, CALIFORNIA
AUGUST 22, 2001

Tetra Tech EM Inc.

DS.0385.17292

U:\ALMDA_SA\CTO245\RI_8_3_01.APR\FIG AA-11 LAYOUT ACEVEDJ 08/03/01

LEGEND

- ▲ Geoprobe
- ⊕ Monitoring Well

PROPOSED SAMPLES

- ✱ SOIL GAS
- EBS PARCEL BOUNDARY
- CORRECTIVE ACTION AREA
- LAND COVER

TEXT : CAA LABEL
TEXT : POINT LABEL
TEXT : PARCEL LABEL
TEXT : *BUILDING LABEL*

N

10 0 10 20

Scale: 1" = 20'

FIGURE AA-12
CAA 10
PROPOSED SAMPLING LOCATIONS

ALAMEDA POINT
ALAMEDA, CALIFORNIA
AUGUST 22, 2001

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DS.0385.17292

U:\ALMDA_SA\CTO245\RI_7_30_01B.APR\FIG CAA 12 LAYOUT ACEVEDJ 08/03/01

At each soil gas sampling location, two direct-push borings will be advanced. The first boring, a continuous core soil boring, will be advanced to determine the specific groundwater depth and evaluate physical soil parameters required for the risk assessment model. One soil sample from this boring (the depth corresponding with the near-surface soil gas sampling depth) will be collected and analyzed for the following geotechnical properties: particle size, soil texture, volumetric moisture, soil total porosity, and soil dry bulk density, as described in Section 8.5 of the original FSP.

A second boring will be advanced to collect soil samples following completion of the continuous core soil boring. At the second boring location, two soil gas samples will be collected. The first sample will be collected near the ground surface at 1.5 feet bgs. The second sample will be collected just above the water table; therefore, the depth to groundwater needs to be established with the first boring.

Soil gas samples will be collected for analysis of the target VOCs, including benzene. Near-surface soil gas concentrations for VOCs will be used as input to the indoor air model, because they are most representative of vapor concentrations likely to enter the building. Soil gas sampling procedures are described in Section 8.5 of the original FSP. Sample identification numbers, depth intervals, and analyses are presented in Appendix A, Table A3-8.

10.3 CORRECTIVE ACTION AREA 12

This section summarizes the additional data gap sampling associated with CAA-12. The following subsections provide background information, including site location and history, local geology and hydrogeology, previous investigations, and soil sampling objectives and design.

10.3.1 Site Description and History

CAA-12 is located along the western shore of the Seaplane Lagoon in the Corrosion Control and Aircraft Testing Zone (Zone 7). CAA-12 consists of Building 29; Building 38; Facilities 461A, 461B, and 461C; and three open space areas. Building 29 was an aircraft weapons overhaul and testing facility; Building 38 served as an acoustical enclosure for aircraft engines; and Facilities 461A, B, and C served as aircraft run-up areas.

10.3.2 Local Geology and Hydrogeology

Three geologic units were encountered in soil borings at CAA-12: fill material, BSU, and the Merritt Sand Formation. The fill material was found at depths up to 15 feet bgs. The fill material at CAA-12 is composed of olive-brown fine to medium-grained sand, with lenses of silty sand, gravelly sand, or sandy gravel. The BSU was found at depths up to 55 to 90 feet bgs. The BSU in CAA-12 is classified as clay and clayey sands. The Merritt Sand Formation at CAA-12 is composed of yellow-brown clayey sand, silty sand, and fine-grained, poorly-graded sand, with traces of shell fragments.

Vertical permeability tests indicated that the fill material hydraulic conductivity ranged from 7.8×10^{-4} to 2.1×10^{-4} cm/sec. Vertical permeability tests indicated that the BSU hydraulic conductivity ranged from 3.9×10^{-5} to 3.2×10^{-8} cm/sec.

The fill material comprises the FWBZ at CAA 12. During previous investigations, the depth to groundwater ranged from 4 to 8 feet bgs in monitoring wells around CAA 12. Groundwater flow direction was towards the southeast. The hydraulic gradient was 0.003 ft/ft.

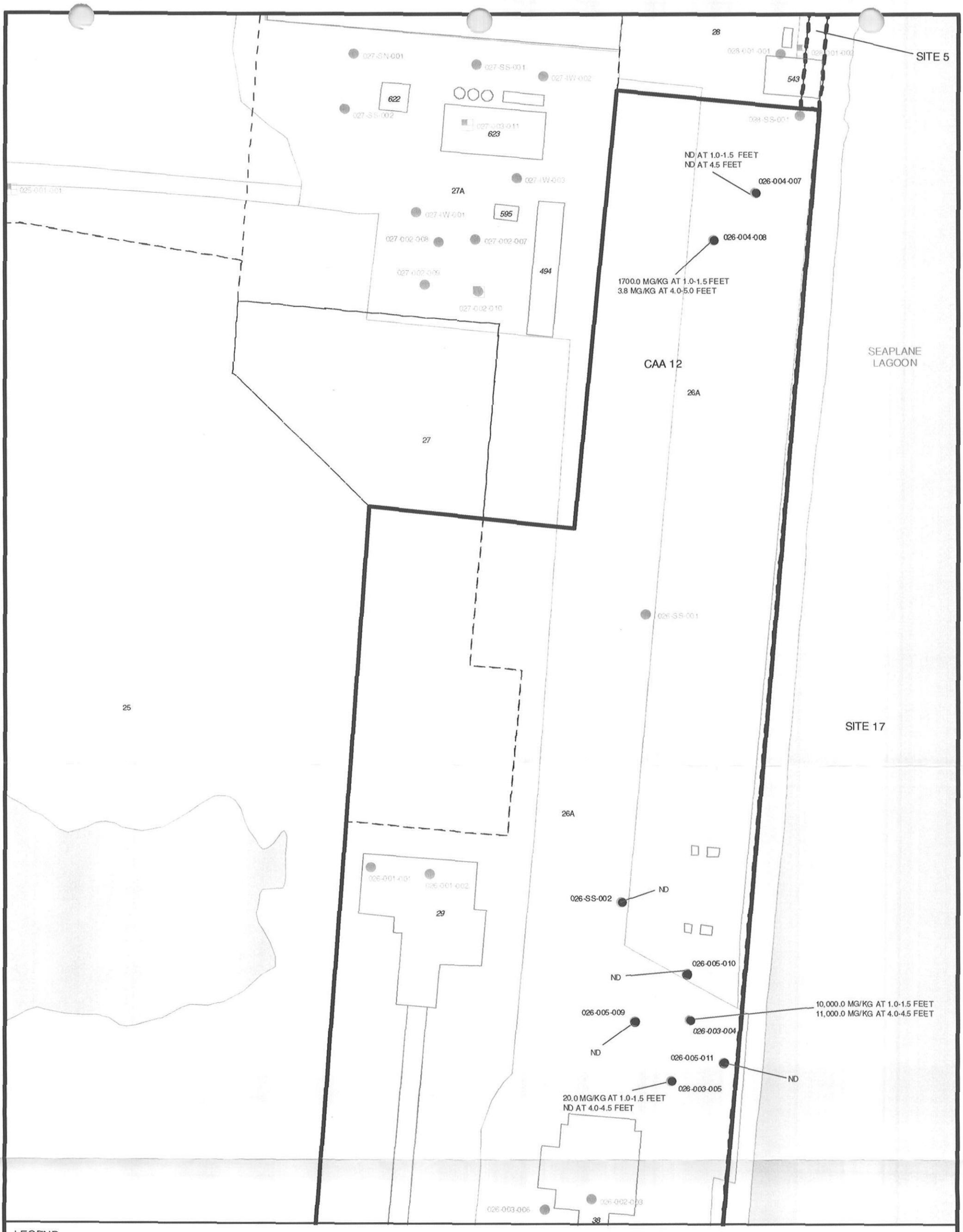
10.3.3 Investigation History

From May 1995 to July 1995, International Technology Corporation (IT) conducted an EBS Phase IIa investigation in EBS Parcel 26 (CAA-12) (IT 2001b). IT collected 16 soil samples in the vicinity of CAA 12. Based on the analytical results of the soil samples, IT collected additional soil samples and three groundwater Hydropunch® samples in November 1995.

Analytical results indicated that soil in the southwestern portion of CAA-12 contained elevated concentrations (greater than 5,000 mg/kg) of TTPH. TPH-diesel and TPH-gasoline were the only fractions. In addition, one sample (026-004-008), collected from the northern portion of CAA-12, had a TTPH concentration of 2,220 mg/kg; TPH-diesel and TPH-gasoline were the only fractions.

10.3.4 Soil Sampling to Support Corrective Action Decision at CAA-12

Two soil samples (024-004-008 and 026-003-004), collected from the vicinity of CAA-12, contained elevated concentrations of TPH-diesel. The sampling locations are shown on Figure AA-13. Insufficient information exists to determine whether the TPH-diesel-impacted soil is isolated or widespread. At each



LEGEND

- EXCAVATION
- GEOPROBE
- HYDROPUNCH
- MANHOLE
- MONITORING WELL
- MW OLD
- PIEZOMETER
- SOIL BORING
- SURFACE LOCATION
- EBS PARCEL BOUNDARY
- INSTALLATION RESTORATION SITES
- CORRECTIVE ACTION AREA
- LAND COVER

TEXT : CAA LABEL
TEXT : POINT LABEL
TEXT : PARCEL LABEL
TEXT : BUILDING LABEL
TEXT : CONCENTRATION OF TPH-DIESEL IN SOIL

N

50 0 50 100
Scale: 1" = 100'

FIGURE AA-13
CAA 12
DIESEL CONCENTRATIONS
IN SOIL

ALAMEDA POINT
ALAMEDA, CALIFORNIA
AUGUST 22, 2001

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U:\ALMDA_SA\CTO245\RI_8_3_01.APR\FIG AA-13 LAYOUT ACEVEDJ 08/03/01

location, two soil borings will be drilled. A total of eight soil samples (four from each boring) will be collected.

Two direct-push borings will be advanced at the locations shown on Figure AA-14. A total of four soil samples will be collected from each boring: one soil sample will be collected near the surface, one at 4.5 to 5 feet bgs, one at the soil-groundwater interface, and one at a depth of 10 feet bgs. Samples will be analyzed at a fixed laboratory for TPPH, TEPH, and VOCs. If TTPH concentrations greater than the PRCs are determined to be widespread, then CAA-12 will be recommended for corrective action.

10.4 FUEL LINE CORRECTIVE ACTION AREA A

This section summarizes the additional data gap sampling associated with Fuel Line CAA-A. The following subsections provide background information, including site location and history, local geology and hydrogeology, previous investigations, and LNAPL sampling objectives and design.

10.4.1 Site Description and History

Fuel Line CAA-A is located north of Runway 7-25 at Alameda Point and consisted of the main east-west pipelines (two 10-inch-diameter pipes) used to transport JP-5 from two previously removed, 500,000-gallon USTs to the fuel loading station near the corner of Monarch Street and Redline Road (TtEMI 2000f). These pipelines were removed in December 1998.

10.4.2 Local Geology and Hydrogeology

Six geologic units, three of which are water-bearing, were identified in the vicinity of EBS Parcel 23G. This investigation will focus on the first geologic unit; therefore, the other five units will not be discussed in this section. This local geology and hydrogeology section will be used to describe the local geology and hydrogeology for EBS Parcels 23H and 8.

The first geologic unit encountered at CERCLA Site 14 consists of fill material beneath the FTA and outlying buildings. Before the mid- to late 1930s, before the fill material was dredged and placed at CERCLA Site 14, the entire area was submerged under San Francisco Bay. The fill material extends about 15 feet bgs and is composed of dredge spoils from the surrounding San Francisco Bay and Oakland Inner Harbor. The material consists primarily of silty sand and clay. Trace shell and clay fragments

623
027-MW-003
27A
CAA12-DGS-DP04
026-004-007
027-MW-001
595
027-002-008
027-002-007
026-004-008
027-002-009
494
CAA12-DGS-DP03
027-002-010
SEAPLANE LAGOON
CAA 12
26A
27
025-SS-001
25
SITE 17
26A
026-001-001
026-001-002
026-SS-002
29
026-005-010
CAA12-DGS-DP01
026-005-009
026-003-004
CAA12-DGS-DP02
026-005-011
026-003-005
026-003-006
026-002-003
38

LEGEND
- EXCAVATION
- GEOPROBE
- HYDROPUNCH
- MANHOLE
- MONITORING WELL
- MW OLD
- PIEZOMETER
- SOIL BORING
- SURFACE LOCATION

PROPOSED SAMPLES
- SOIL
- EBS PARCEL BOUNDARY
- INSTALLATION RESTORATION SITES
- CORRECTIVE ACTION AREA
- LAND COVER

TEXT : CAA LABEL
TEXT : POINT LABEL
TEXT : PARCEL LABEL
TEXT : BUILDING LABEL

N

50 0 50 100
Scale: 1" = 100'

FIGURE AA-14
CAA 12
PROPOSED SAMPLING LOCATIONS

ALAMEDA POINT
ALAMEDA, CALIFORNIA
AUGUST 22, 2001

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U:\ALMDA_SA\CTO245\RI_DGS.APR\FIG AA-14 LAYOUT ACEVEDJ 08/03/01

present throughout the fill confirm that it is composed of dredging spoils and other marine-derived material.

Groundwater is encountered between about 4 and 7 feet bgs, and the flow direction is generally toward Oakland Inner Harbor. The overall direction of groundwater in the FWBZ at CERCLA Site 14 flows to the northwest; however, local variations exist. Groundwater in the vicinity of CERCLA Site 14 is influenced by tidal fluctuations. During periods of low tide, groundwater at the FTA flows toward the Oakland Inner Harbor. During periods of high tide, groundwater at the FTA flows away from the Oakland Inner Harbor.

Vertical permeability was tested using geotechnical samples collected in a clayey sand portion of the fill material. Hydraulic conductivities determined from these tests ranged from 4.9×10^{-5} to 8.6×10^{-4} cm/sec. In situ permeability (slug) tests were conducted on the wells at CERCLA Site 14. Hydraulic conductivities of the fill material, as determined by the rising-head method of Bouwer and Rice, ranged from 1.3×10^{-3} to 1.7×10^{-3} cm/sec.

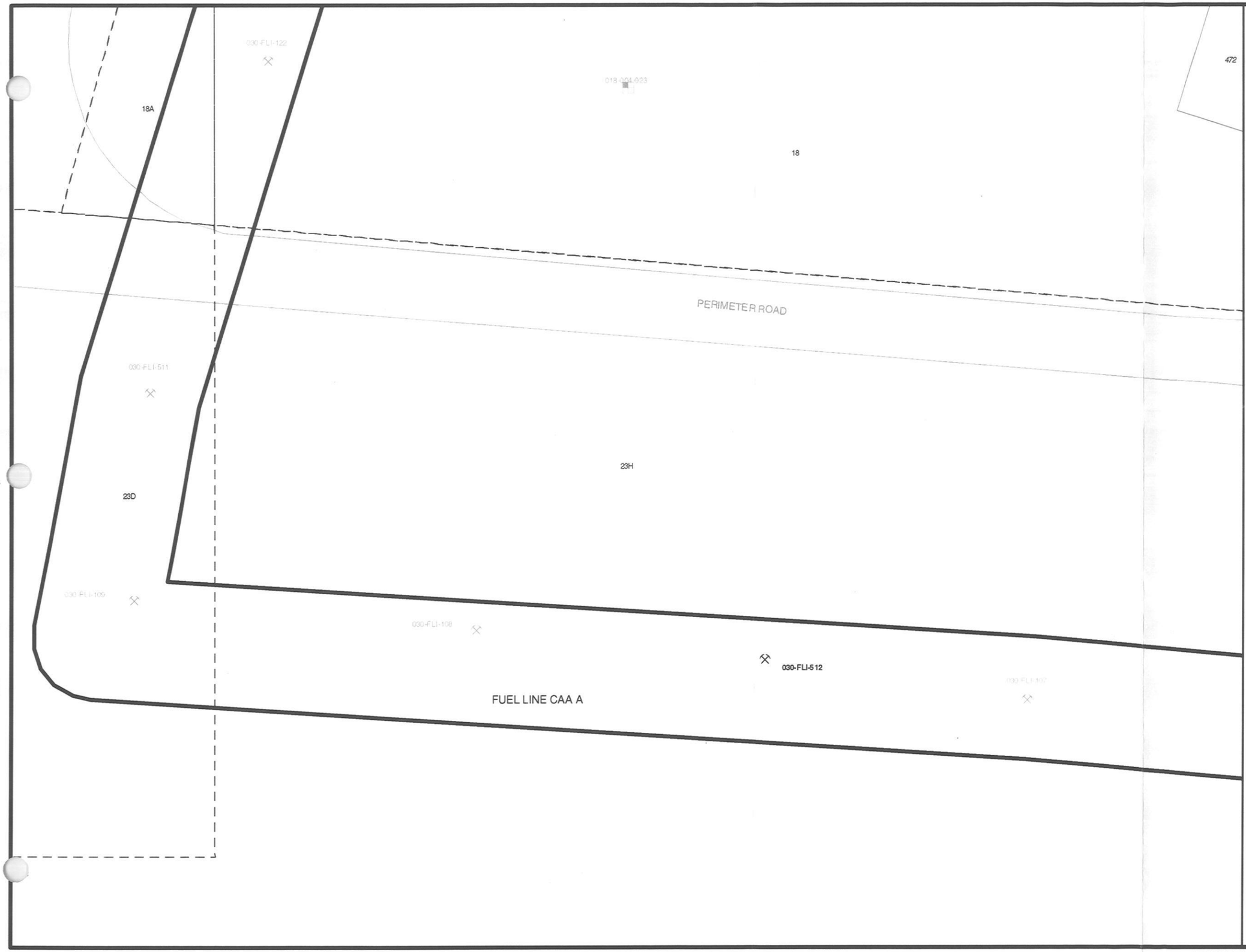
10.4.3 Investigation History

About 34,500 linear feet of fuel pipelines were excavated and removed (including the piping at Fuel Line CAA-A in 1998), and about 24,100 linear feet of underground fuel pipelines that could not be cost-effectively removed were closed in place. The pipelines removed consisted of 1-1/2- to 8-inch-diameter steel pipelines that carried jet fuel (JP-5), gasoline, or diesel oil.

Before any backfilling, soil and groundwater samples were collected to document the contaminant concentrations in trenches and excavations. A groundwater sample (030-FL-512) collected during oversight of the fuel line removal detected TTPH at a concentration of 32.56 mg/L, which indicated potential free product.

10.4.4 Light, Nonaqueous-Phase Liquid Investigation to Support Corrective Action Decision at Fuel Line CAA-A

The concentration of TTPH exceeded 20 mg/L in groundwater at one location (030-FLI-512) at Fuel Line CAA-A (see Figure AA-15). According to the TPH strategy, if the concentration of TTPH exceeds 20 mg/L, an investigation for LNAPL must be conducted. The presence of LNAPL will be



LEGEND

- EXCAVATION
- GEOPROBE
- HYDROPUNCH
- MANHOLE
- MONITORING WELL
- MW OLD
- PIEZOMETER
- SOIL BORING
- SURFACE LOCATION
- CORRECTIVE ACTION AREA
- EBS PARCEL BOUNDARY
- LAND COVER

TEXT : SITE LABEL

TEXT : POINT LABEL

TEXT : PARCEL LABEL

TEXT : BUILDING LABEL

BLACK POINTS HAVE TTPH CONCENTRATIONS GREATER THAN 20 mg/L

GREY POINTS HAVE TTPH CONCENTRATIONS EQUAL OR LESS THAN 20 mg/L

N

15 0 15 30

Scale: 1" = 30'

FIGURE AA-15
FUEL LINE
CORRECTIVE ACTION AREA A
PREVIOUS GROUNDWATER
SAMPLING LOCATIONS

ALAMEDA POINT
ALAMEDA, CALIFORNIA
AUGUST 22, 2001

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U:\ALMDA_SA\CTO245\RI_8_3_01.APR\FIG AA-15 LAYOUT ACEVEDJ 08/03/01

evaluated by installing one temporary, slotted piezometer. The locations of temporary piezometers will be positioned using a GPS. Once located, a slotted piezometer will be installed at the location shown on Figure AA-16.

The piezometer will be installed using a direct-push, soil-coring device. If the ground surface is unpaved or covered by asphalt, then a 3.5-inch-diameter drive casing and inner sample barrel will be advanced into the ground using the direct-push rig. If the ground surface is covered by concrete, then concrete coring will be conducted prior to advancing the direct-push drive casing. The drive casing will be advanced about 10 feet bgs. Continuous soil cores will be collected at 3-foot intervals in acetate sleeves for logging lithology, identifying the top of the capillary fringe and water table, and logging any product observed in the soil core. The lithological information can be used to correlate and locate geologic horizons with poor recovery. Photographs of the soil cores will be taken.

If LNAPL is visible in the soil, a qualitative evaluation of the degree of product saturation will be conducted on soil samples from the soil core. Using a stainless-steel trowel, samples of soil core material will be collected from the soil core at 1.5-foot intervals and at intervals along the soil core where apparent product is observed. Soil samples will be placed in a VOA vial until the vial is one-third full of soil. Deionized water will be added to the vial until the vial is two-thirds full of soil and deionized water, and the vial will be shaken. The VOA vial will be labeled and allowed to equilibrate for 4 hours. The sharpness of the meniscus will be noted for each sample and logged for clarity and presence of free product.

Once the drive casing has been advanced to about 10 feet bgs, a 2-inch-diameter slotted piezometer (0.010-inch slots) with an end cap will be installed in the borings as the drive casing is withdrawn. The piezometer will be factory slotted from 1 to 10 feet bgs (9 feet of screened interval) to ensure that the groundwater table is within the screened interval. This screened interval also ensures that the potential smear zone of the floating product caused by tidal fluctuations in the water table is taken into account. The piezometer will be left in the borehole for a 24-hour period in order to allow groundwater to recharge.

After 24 hours, a product interface probe will be used to measure the depth to the groundwater table and the thickness of any LNAPL in the piezometer. The information will be recorded in the field logbook. A 3-foot-long, small-diameter clear bailer will be inserted into the piezometer to about 2 feet

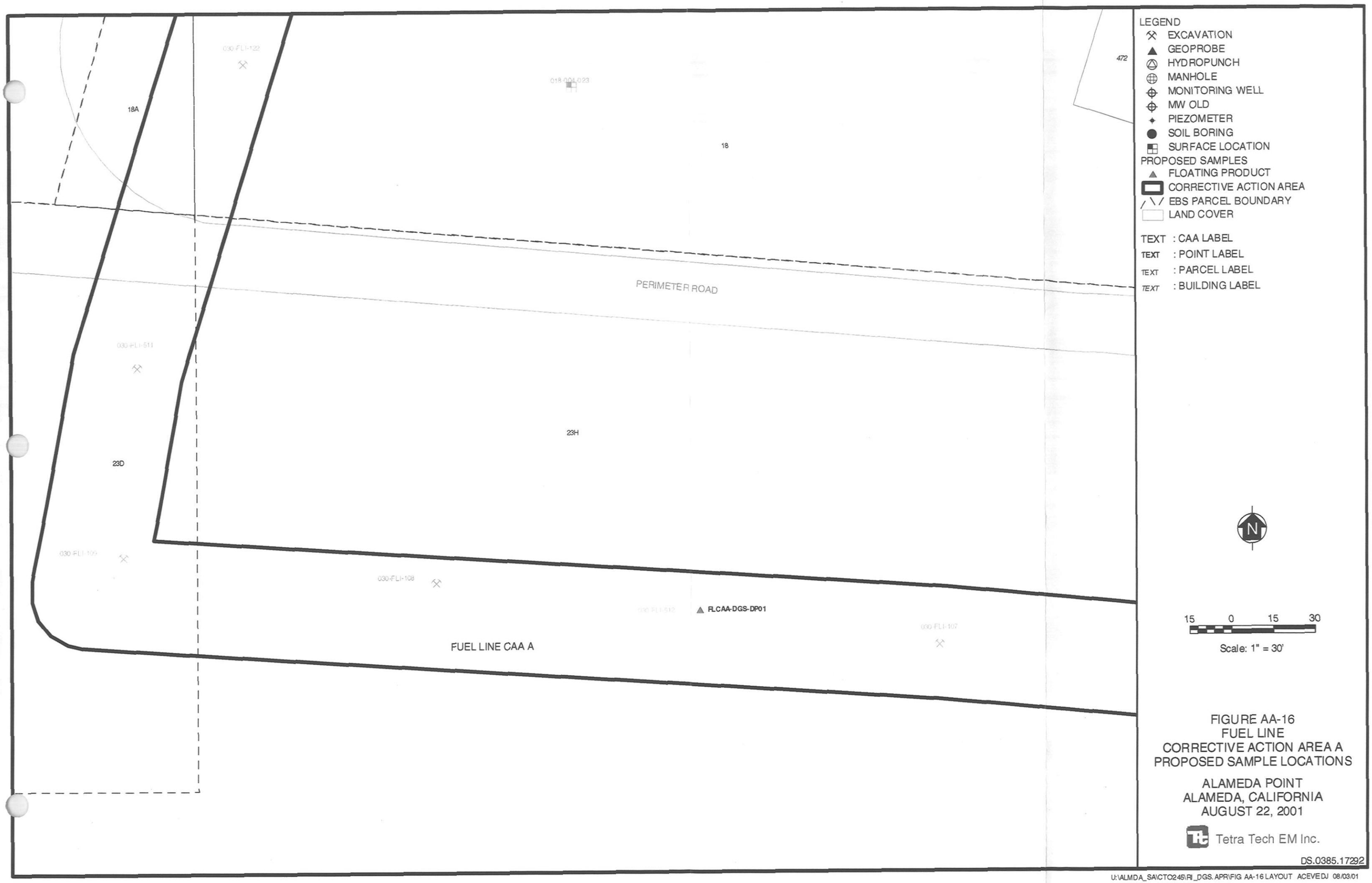

FIGURE AA-16
FUEL LINE
CORRECTIVE ACTION AREA A
PROPOSED SAMPLE LOCATIONS

ALAMEDA POINT
ALAMEDA, CALIFORNIA
AUGUST 22, 2001

Tetra Tech EM Inc.

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U:\ALMDA_SA\CTO245\RI_DGS.APR\FIG AA-16 LAYOUT ACEVEDJ 08/03/01

below the water table to collect a sample. The bailer will be retracted, and the presence and thickness of LNAPL in the bailer will be noted in the field logbook. If LNAPL is detected with either the interface probe or the bailer, a sample of the product will be collected and submitted to a fixed laboratory for petroleum hydrocarbon speciation.

After all investigation activities are completed, the temporary piezometers will be removed and the borehole will be grouted using cement-bentonite slurry. IDW will be handled and disposed of in accordance with TtEMI's IDW management plan.

10.5 FUEL LINE CORRECTIVE ACTION AREA B

This section summarizes the additional data gap sampling associated with Fuel Line CAA-B. The following subsections provide background information, including site location and history, local geology and hydrogeology, previous investigations, and sampling objectives and design.

10.5.1 Site Description and History

Fuel Line CAA B is located within Parcel 23F and includes a portion of CERCLA Site 6. CERCLA Site 6 was used as a hangar for seaplanes. CERCLA Site 6 was later converted to an aircraft component repair facility. An equipment wash pad and paint stripping area were located in the southwestern corner of CERCLA Site 6. Fuel Line CAA B includes underground fuel transfer lines and lines to transport discharge from equipment washing. Fuel Line CAA B contains three east-west, parallel fuel lines running about 3,000 feet in length, with multiple crossing fuel lines (about 22,500 feet in total length) that tie together a series of fueling pits. The approximate diameter of the lines ranged from 2 to 6 inches. The fuel transfer lines transported jet fuel and were abandoned in place in 1998.

10.5.2 Local Geology and Hydrogeology

The three geological units that were identified from soil borings and cone penetrometer test (CPT) logs at in the vicinity of EBS Parcel 23F: artificial fill, the BSU, and the Merritt Sand Formation. Artificial fill is present from the ground surface to about 7.5 to 10 feet bgs. Field observations describe the artificial fill as containing fine silty sand and medium dense sand. The BSU ranges from 12 to 15 feet in thickness and underlies the artificial fill. The BSU consists of interbedded clay and clayey sand. The Merritt Sand

Formation is present beneath the BSU at a depth of about 20 to 25 feet bgs. The formation consists of mottled, clayey fine sand with abundant iron-oxide stains, and poorly graded sands.

Three hydrogeologic units, including two water bearing zones and a semi-confining layer (aquitard), were identified at in the vicinity of EBS Parcel 23F. The FWBZ lies in the artificial fill; the second water bearing zone lies in the Merritt Sand Formation, and the BSU acts as a semi-confining layer separating these two water bearing zones.

Water level data collected quarterly from four monitoring wells between 1991 and 1998 show that depth to groundwater ranges from 3.33 to 8.77 feet bgs. Based on the groundwater elevation data collected during the April 1998 sampling round, groundwater in the FWBZ appears to flow generally in a northeast direction, which is consistent with the regional flow direction within the FWBZ in the central region of Alameda Point (TtEMI 1998b). Water level data from some wells are inconsistent with the general flow direction; however, data collected from northern portion of the site show an apparently southwesterly flow direction, and groundwater elevation data collected from near the storm sewer in the southern part of the site show an apparent easterly flow direction near the storm sewer.

10.5.3 Investigation History

From 1998 to 1999, about 34,000 linear feet of inactive and 9,000 feet of active fuel pipelines were excavated and removed and approximately 21,000 linear feet of underground fuel pipelines that could not be cost-effectively removed were closed in place (TtEMI 2000f). Nearly all of the pipelines that were closed in place were in the tarmac area (Fuel Line CAA B), where thick, reinforced concrete pavement made removal by excavation prohibitively expensive. The pipeline closure protocol consisted of potholing for access, tapping and removing residual fuel in the pipelines, pressure washing the pipelines, videotaping the pipelines, and pumping grout under pressure into the pipelines. Liquids encountered inside of pipes were removed through existing valves and fittings using a vacuum truck, and in some places, by forcing polystyrene pigs through the line (IT 1999). Soil and groundwater samples were collected to document contaminant concentrations in trenches and excavations.

TTPH has been detected in soil collected from 007-004-026 above the PRC at a maximum concentration of 34,200 mg/kg at 0 to 0.5 feet bgs (see Figure AA-17). Benzene in groundwater has been detected

above the PRC for inhalation of vapors from groundwater to indoor air in several locations (030-IPC-339, 030-IPC-343, 030-IPC-351, and 13-9), with concentrations from 11.2 to 549 µg/L.

10.5.4 Sampling Objectives and Design

The following subsections discuss data gap sampling activities planned for Fuel Line CAA-B.

10.5.4.1 Soil Gas Sampling to Support Risk Assessment

Benzene was identified at concentrations above 10 µg/L in multiple groundwater samples collected in the vicinity of Fuel Line CAA-B (see Figure AA-17). Four soil gas sampling locations at Fuel Line CAA-B are proposed in this addendum to be collected at the location shown on Figure A-18. These samples are required to provide the necessary information to evaluate the inhalation pathway and complete the risk assessment for Fuel Line CAA-B. To refine the risk calculation associated with this exposure route, multidepth soil gas samples will be collected.

At each soil gas sampling location, two direct-push borings will be advanced. The first boring, a continuous core soil boring, will be advanced to determine the specific groundwater depth and evaluate physical soil parameters required for the risk assessment model. One soil sample from this boring (the depth corresponding with the near-surface soil gas sampling depth) will be collected and analyzed for the following geotechnical properties: particle size, soil texture, volumetric moisture, soil total porosity, and soil dry bulk density, as described in Section 8.5 of the original FSP.

A second boring will be advanced to collect soil samples following completion of the continuous core soil boring. At the second boring location, two soil gas samples will be collected. The first sample will be collected near the ground surface at 1.5 feet bgs. The second sample collected just above the water table; therefore, the depth to groundwater needs to be established with the first boring.

Soil gas samples will be collected for analysis of target VOCs, including benzene. Near-surface soil gas concentrations for VOCs will be used as input to the indoor air model, because they are most representative of vapor concentrations likely to enter the building. Soil gas sampling procedures are described in Section 8.5 of the original FSP. Sample identification numbers, depth intervals, and analyses are presented in Appendix A, Table A3-8.

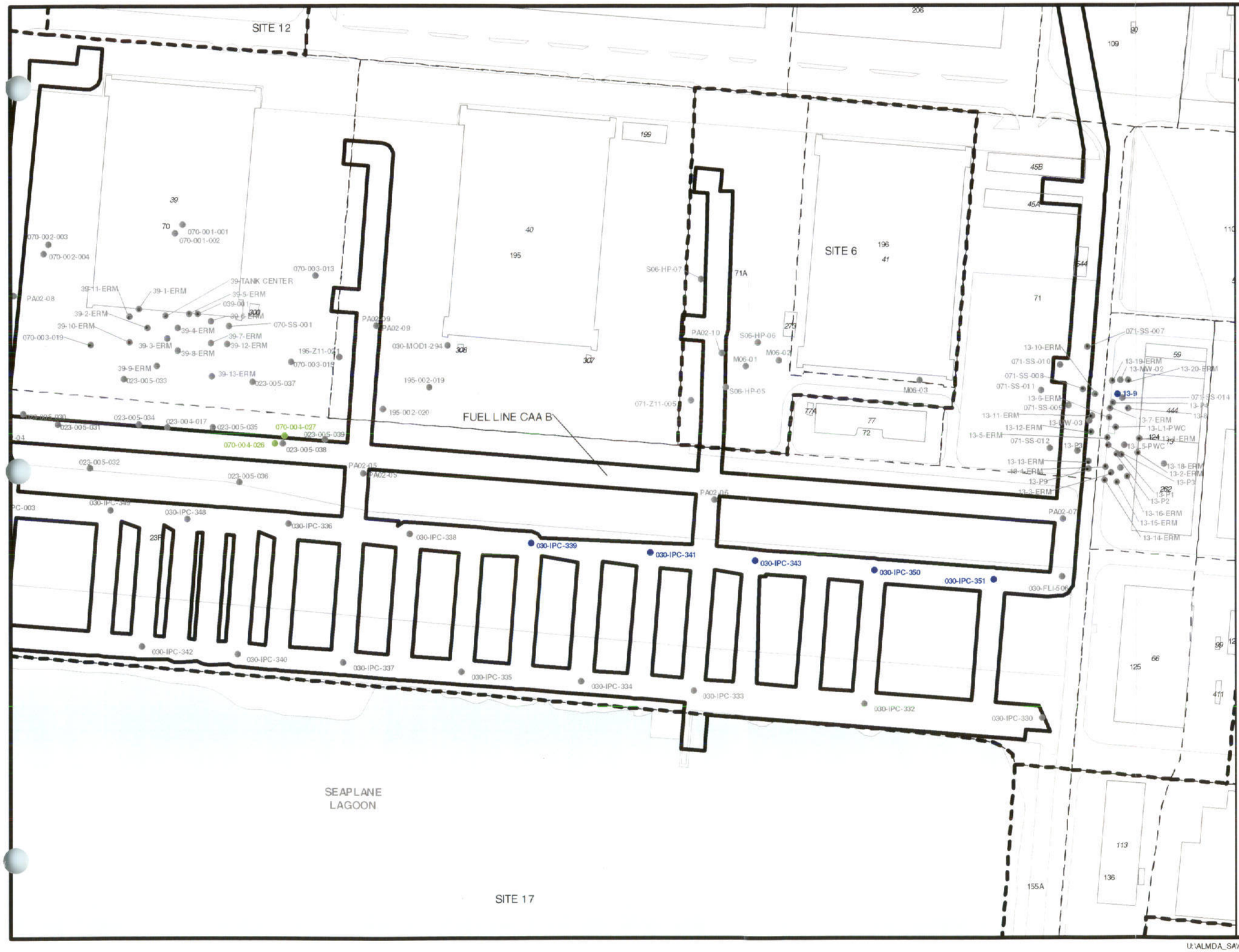

FIGURE AA-17
FUEL LINE
CORRECTIVE ACTION AREA B
PREVIOUS SOIL AND
GROUNDWATER SAMPLING
LOCATIONS

ALAMEDA POINT
ALAMEDA, CALIFORNIA
AUGUST 22, 2001

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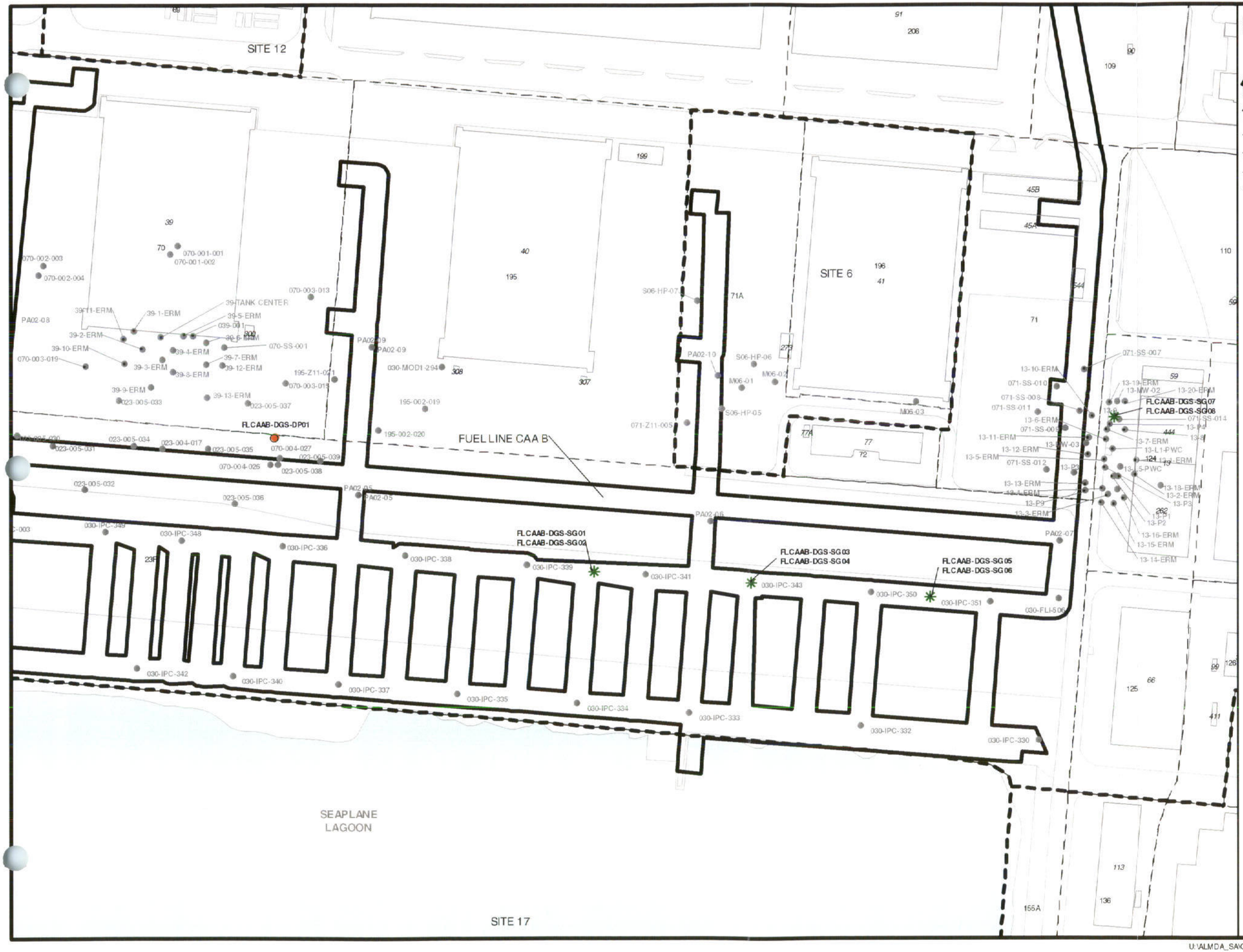
U:\ALMDA_SA\CTO245\RI_8_3_01.APR\FIG AA-17 LAYOUT ACEVEDO 08/03/01



LEGEND
PROPOSED SAMPLES
- SOIL GAS
- SOIL
- DATA POINTS NOT EXCEEDING PRC'S
- INSTALLATION RESTORATION SITES
- CORRECTIVE ACTION AREA
- EBS PARCEL BOUNDARY
- LAND COVER

TEXT : SITE LABEL
TEXT : POINT LABEL
TEXT : PARCEL LABEL
TEXT : BUILDING LABEL

50 0 50 100 150
Scale: 1" = 150'

FIGURE AA-18
FUEL LINE
CORRECTIVE ACTION AREA B
PROPOSED SAMPLING LOCATIONS

ALAMEDA POINT
ALAMEDA, CALIFORNIA
AUGUST 22, 2001

Tetra Tech EM Inc.

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U:\ALMDA_SA\CTO245\RI_DGS.APR\FIG AA-18 LAYOUT ACEVEDJ 08/03/01

10.5.4.2 Soil Sampling to Support Corrective Action Decision at Fuel Line Corrective Action Area B

Two soil samples (070-004-026 and 070-004-027) contained TTPH at a concentration greater than the PRC developed for the TPH strategy. The locations of these samples are shown on Figure A-17. Insufficient information exists to determine whether the TTPH-impacted soil is isolated or widespread. One soil boring, from which four soil samples will be collected, will be drilled to investigate this area.

One direct-push boring will be advanced at the location shown on Figure A-18. A total of four soil samples will be collected from this boring. One soil sample will be collected near the surface, one at 4.5 to 5 feet bgs, one at the soil-groundwater interface, and one at a depth of 10 feet bgs. Samples will be analyzed at a fixed laboratory for TPPH, TEPH, and VOCs. If TTPH is detected at concentrations greater than the PRCs at multiple depths, then Fuel Line CAA-B will be recommended for corrective action.

10.6 ENVIRONMENTAL BASELINE SURVEY PARCEL 8

This section summarizes the additional data gap sampling associated with EBS Parcel 8. The following subsections provide background information, including site location and history, local geology and hydrogeology, previous investigations, and groundwater sampling objectives and design.

10.6.1 Site Description and History

EBS Parcel 8 is located in the northwestern portion of Alameda Point and consists of about 7 acres. This parcel had been used as a marine weapons storage and repair facility. Eight buildings and structures were located in EBS Parcel 8. Three buildings were demolished: Buildings 82 (Barracks), 440 (Guard Watch Tower), and 596 (Sewage Lift Station). The five remaining buildings are: 420 (Ammunitions Storage and Repair, formerly Torpedo Repair and Storage), 439 (Sewage Pump Station), 497 (Special Weapons Magazine), 498 (Guard Watch Tower), and 594 (Offices and Living Space, previously Underwater Weapons Shop).

Generation-accumulation point 7 was located on EBS Parcel 8 and was used to store solvents and thinners in 5-gallon containers northeast of Building 420 (DTSC 1992).

Three USTs were located on EBS Parcel 8. Two 1000-gallon, diesel USTs (T-594-1 and T-420-1) and one 1,000-gallon, gasoline UST (T-594-2) were removed in October and November 1994.

10.6.2 Local Geology and Hydrogeology

See section 10.4.2 of this addendum for a description of the geology and hydrogeology in the vicinity of EBS Parcel 8.

10.6.3 Investigation History

In 1994 and 1995, soil and groundwater samples were collected and analyzed by the PWC during removal of USTs 594-1 and 594-1 and in the area surrounding the excavation of the two USTs (four soil samples and two groundwater samples, followed by two more groundwater samples after recharge). Two additional soil samples were collected from the pipe trenches.

Although TPH has been detected in soil and groundwater, based on TPH concentrations, the UST site has received closure and requires no further action. However, chlorinated compounds have been detected above the respective MCLs in two groundwater samples collected in 1999 at the following maximum concentrations: 28.0 µg/L cis 1,2 DCE, and 13.0 µg/L 1,2 DCA.

10.6.4 Delineation of Volatile Organic Compound Plume

During review of the EBS, it was noted that chlorinated hydrocarbons, specifically 1,2-DCA and cis-1,2-DCE, were detected in groundwater samples collected from 594-002 and 594-001 at concentrations above the MCL in the vicinity of USTs 594-1 and 594-2 (see Figure A-19). Prior to determining if transfer of EBS Parcel 8 is appropriate, the Navy must evaluate the nature and extent of the chlorinated hydrocarbons.

A total of four direct-push borings will be advanced at the locations shown on Figure A-20. Three groundwater samples will be collected from each boring. Groundwater samples will be collected at 5, 10, and 15 feet bgs. Groundwater samples will be analyzed for VOCs using a fixed laboratory.

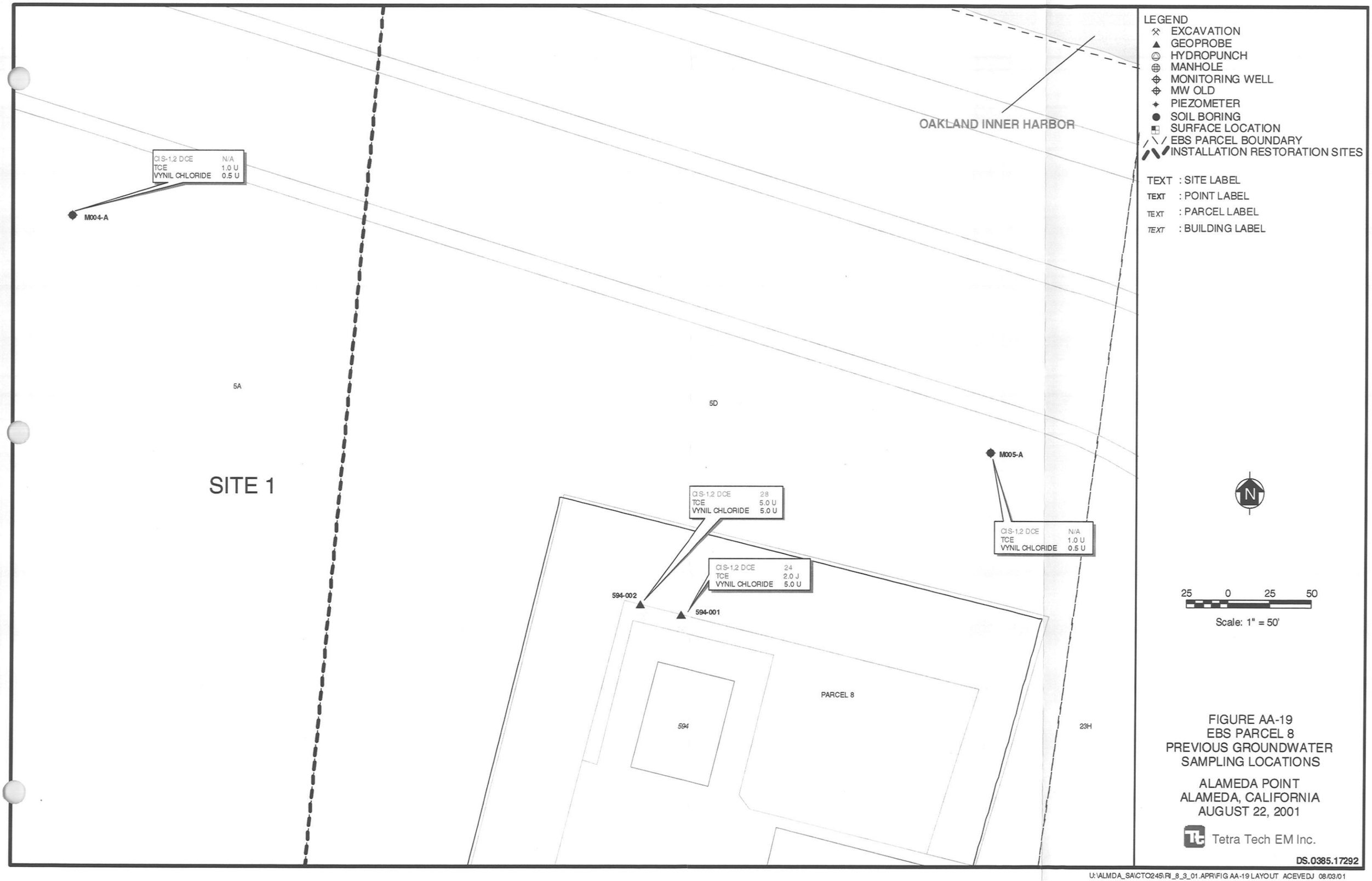

FIGURE AA-19
EBS PARCEL 8
PREVIOUS GROUNDWATER
SAMPLING LOCATIONS

ALAMEDA POINT
ALAMEDA, CALIFORNIA
AUGUST 22, 2001

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U:\ALMDA_SA\CTO245\RI_8_3_01.APR\FIG AA-19 LAYOUT ACEVEDJ 08/03/01

FIGURE AA-20
EBS PARCEL 8
PROPOSED SAMPLE
LOCATIONS

ALAMEDA POINT
ALAMEDA, CALIFORNIA
AUGUST 22, 2001

Tetra Tech EM Inc.

DS.0385.17292

U:\ALMDA_SA\CTO245\RI_DGS.APR\FIG AA-20 LAYOUT ACEVEDJ 08/03/01

10.7 ENVIRONMENTAL BASELINE SURVEY PARCEL 23G

This section summarizes the additional data gap sampling associated with EBS Parcel 23G. The following subsections provide background information, including site location and history, local geology and hydrogeology, previous investigations, and soil sampling objectives and design.

10.7.1 Site Description and History

EBS Subparcel 23G is located in the north-central portion of Alameda Point. Prior to 1963, EBS Subparcel 23G was used for automobile repair and maintenance and as a gasoline filling station. Two structures were located on EBS Subparcel 23G: Building 71, the Gasoline Filling Station, and Building 332, the Navy Exchange Garage. These buildings were located in the area now occupied by the eastern end of Runway 25 and were demolished in 1962. Historical records indicate that at least four USTs existed near former Buildings 71 and 332. Because the USTs were associated with the former gasoline filling station, the USTs were presumed to contain petroleum products such as gasoline or diesel. No further information on these USTs, such as location or size, is available. Vehicle fueling activities and vehicle repair activities at former Buildings 71 and 332 are potential sources of releases of petroleum products.

10.7.2 Local Geology and Hydrogeology

See Section 10.4.2 of this addendum for a description of the geology and hydrogeology in the vicinity of EBS Parcel 23G.

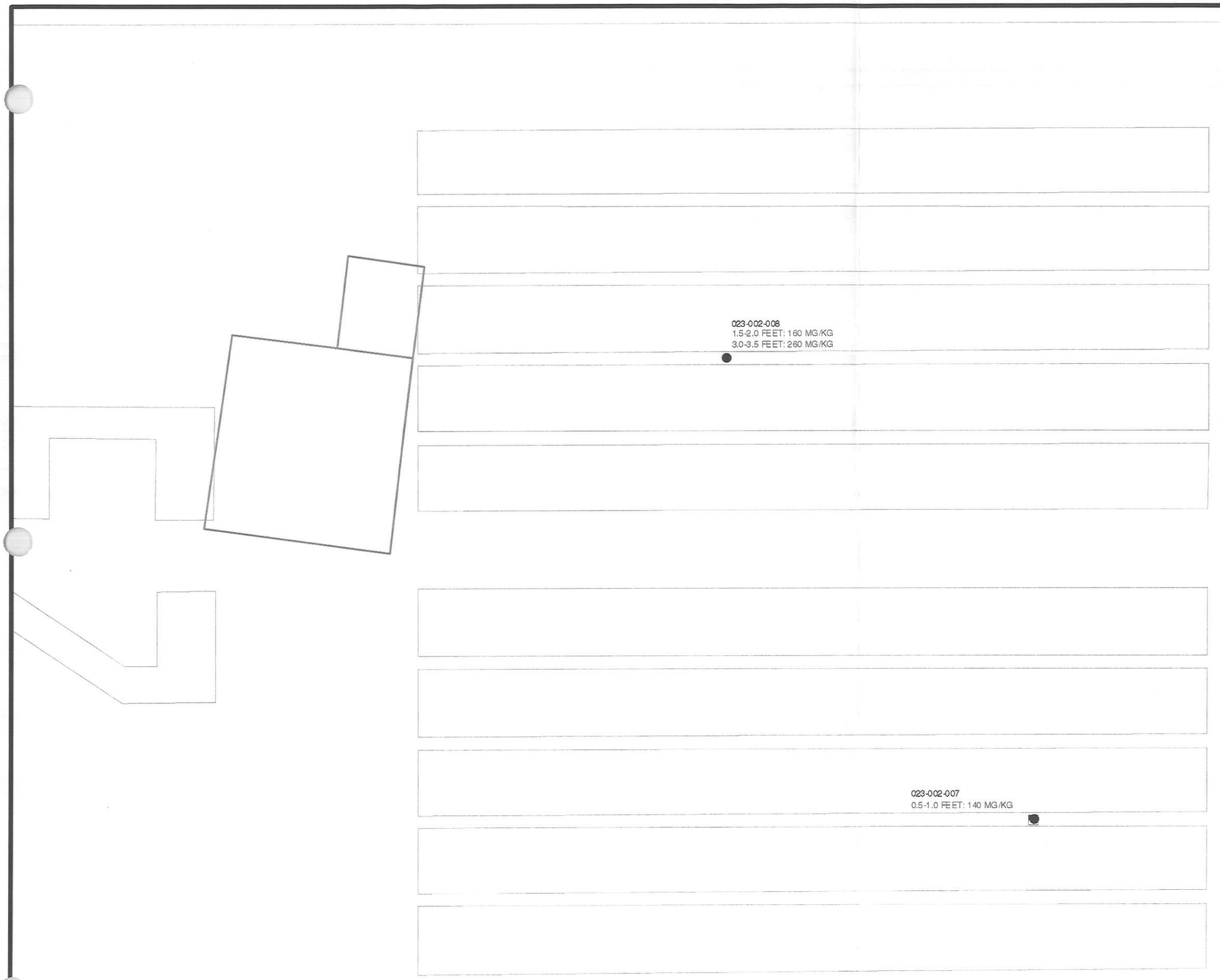
10.7.3 Investigation History

Soil samples were collected in 1995 during EBS Phase IIA and IIB sampling by IT at two locations (IT 2001b). Soil samples were analyzed for TPH, BTEX, and lead. TPH (2,600 mg/kg [motor oil] and 52 mg/kg [diesel]) was detected in soil samples collected from 023-002-008 at a depth of 0 to 4 feet bgs. BTEX was non-detect for these two soil boring locations. Lead was detected at 8.1 mg/kg. Groundwater samples have not been collected at this location.

10.7.4 Soil Sampling to Support Corrective Action Decision at EBS Parcel 23G

The former gas station identified during review of the EBS was closed prior to development of UST soil sampling requirements. Two soil samples (023-002-008 and 023-002-007) have been collected in the vicinity (see Figure A-21); however, a determination of the environmental impacts from gas station operations has not been made. In order to determine if closure is appropriate for this site, the Navy must sample the soil beneath the footprint of the former gas station to determine if a release occurred from the former USTs. One soil boring, from which four soil samples will be collected, will be drilled to evaluate if the former gas station has impacted the environment.

One direct-push boring will be advanced at the location shown on Figure A-22. A total of four soil samples will be collected from this boring. One soil sample will be collected near the surface, one at 4.5 to 5 feet bgs, one at the soil-groundwater interface, and one at a depth of 10 feet bgs. Samples will be analyzed at a fixed- based laboratory for TPPH, TEPH, and VOCs. If TTPH is detected at concentrations greater than the PRCs at multiple depths, then EBS Parcel 23G will be recommended for corrective action.



LEGEND

POINT TYPE
- ● SOIL BORING
- ▪ SURFACE LOCATION
- ▭ GAS STATION SITE

N

10 0 10 20

Scale: 1" = 20'

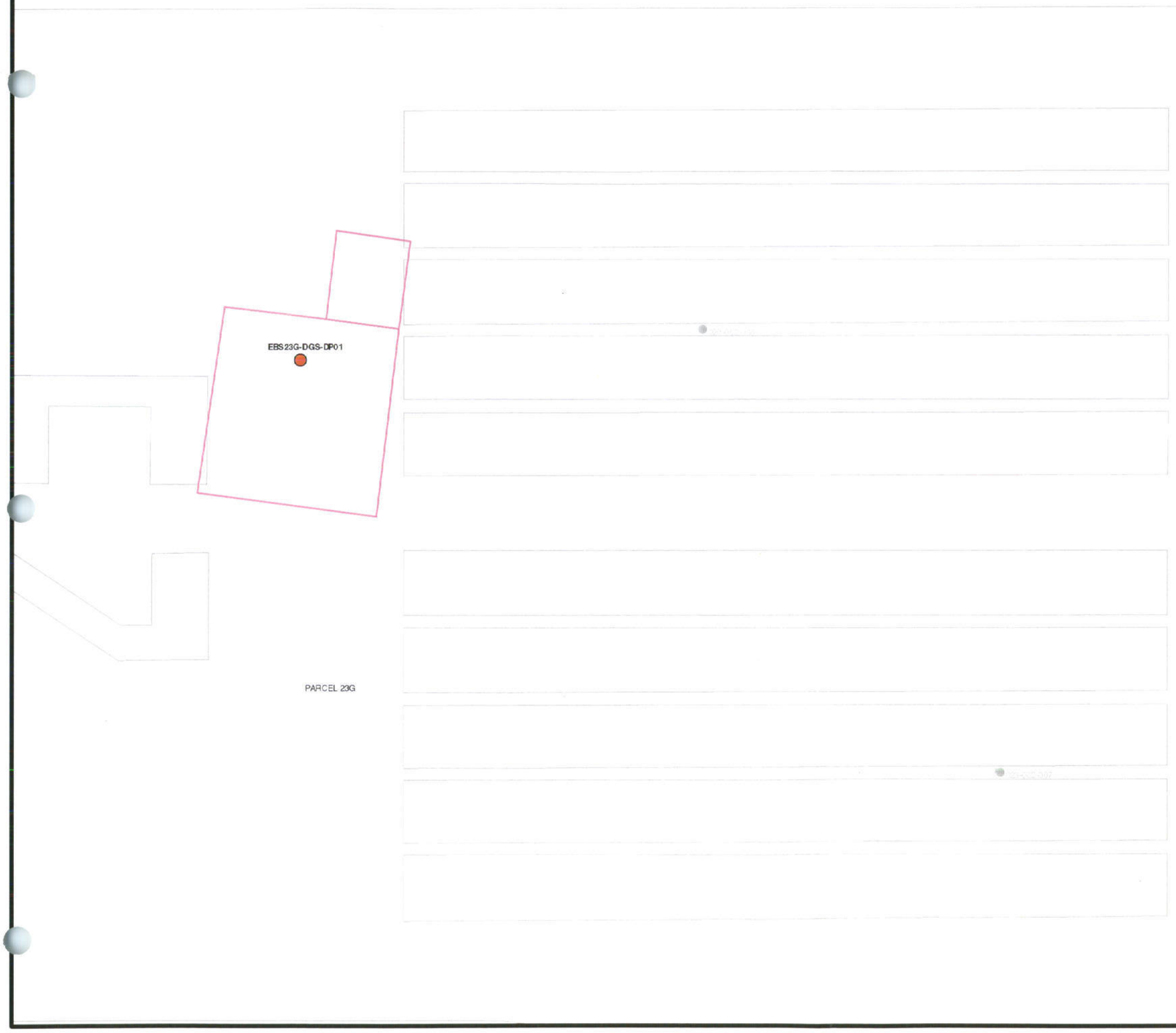
FIGURE AA-21
EBS PARCEL 23G
FORMER GAS STATION
MOTOR OIL CONCENTRATIONS
DETECTED IN SOIL

ALAMEDA POINT
ALAMEDA, CALIFORNIA
AUGUST 22, 2001

Tetra Tech EM Inc.

DS.0385.17292

U:\ALMDA_SA\CTO245\RI_8_3_01.APR\FIG AA-21 LAYOUT ACEVEDJ 08/03/01



LEGEND

POINT TYPE
- SOIL BORING
- SURFACE LOCATION

PROPOSED SAMPLES
- SOIL
- GAS STATION SITE

N

10 0 10 20

Scale: 1" = 20'

FIGURE AA-22
EBS PARCEL 23G
PROPOSED SAMPLING LOCATIONS

ALAMEDA POINT
ALAMEDA, CALIFORNIA
AUGUST 22, 2001

Tetra Tech EM Inc.

DS.0385.17292

U:\ALMDA_SA\CTO245\RI_DGS.APR\FIG AA-22 LAYOUT ACEVEDJ 08/03/01

REFERENCES

AGS, Inc. 1998. "Draft Additional Environmental Sampling Investigation, Building 410 Industrial Wastewater Treatment Plant (IWTP), Naval Air Station (NAS) Alameda, Alameda, California." March.

American Society of Agronomy Inc./Soil Science Society of America, Inc. 1986. "Methods of Soil Analysis, Part 1 - Physical and Mineralogical Methods." Book Series No. 5, Edited by A. Klute. Second Edition.

American Society for Testing and Materials (ASTM). 1998. "Method D3441-98: Standard Test Method for Deep, Quasi-static, Cone and Friction-cone Penetration Tests of Soil."

ASTM. 2000. "Method D2488-00: Description and Identification of Soils (Visual-Manual Procedure)."

Berkeley Environmental Restoration Center. 1998. "Draft Treatability Study Work Plan Steam Enhanced Extraction IR Site 5, Alameda Point." Contract No. N62474-94-D-7430. D.O. 009. November 9.

Canonie Environmental Services. 1992. Remedial Investigation/Feasibility Study (RI/FS) Work Plan, NAS Alameda, Alameda California. Volumes 1 through 8, prepared for Engineering Field Activity (EFA) West, San Bruno, California. February.

Department of Toxic Substances Control. 1990. RCRA Facility Assessment for NAS Alameda.

Ecology and Environment, Inc. (E&E). 1983. "Initial Assessment Study of NAS Alameda, California, Final Report." Prepared under Navy Assessment and Control of Installation Pollutants for Naval Energy and Environmental Support Activity, Port Hueneme,

E&E. 1997. Letter Report Regarding Soil Sampling at the Building 410 IWTP, NAS Alameda. Prepared by Ralph Lambert, R.G. of E&E for York So, Navy Public Works Center, San Francisco Bay. January 13.

Environmental Quality Management, Inc. 1997. *User's Guide for The Johnson and Ettinger (1991) Model for Subsurface Vapor Intrusion into Buildings*. Prepared for E.H. Pechan & Associates, Inc. for Submittal to U.S. Environmental Protection Agency's Office of Emergency and Remedial Response, Toxics Integration Branch. September.

Hickenbottom, Kelvin and Muir, Kenneth. 1988. Geohydrology and Groundwater Quality Overview of the East Bay Plain Area, Alameda County, California. Prepared for the Alameda County Flood Control and Water Conservation District.

Hydro-Search, Inc. 1977. "Well Performance Evaluation, Pan American Well, NAS Alameda." Prepared for Navy Public Works Center, San Francisco Bay.

International Technology Corporation (IT). 1998. "Environmental Baseline Survey, Parcel Evaluation Data Summary, NAS Alameda, Alameda, California."

IT. 1999. "Removal of Fuel Lines and Underground Storage Tanks, Alameda Point, Alameda, California. Draft As-Built Report." December.

IT. 2001a. "Facility Closure Report, Building 360 Industrial Waste Treatment Plant, Alameda Point, Alameda, California." April 16.

IT. 2001b. "Environmental Baseline Survey, Data Evaluation Summaries – Final, Alameda Point, Alameda, Califorina (Volumes I through XVI)." January.

Johnson, P.C. and R.A. Ettinger. 1991. Heuristic Model for Predicting the Intrusion Rate of Contaminant Vapors into Buildings. Environmental Science and Technology. Volume 25, pages 1445-1452.

Johnson, P.C., Kemblowski, M.W., and R. L. Johnson. 1998. Assessing the Significance of Subsurface Contaminant Vapor Migration to Enclosed Spaces, Site-Specific Alternative to Generic Estimates. API Publication Number 4674. December.

Kennedy Engineers. 1980. Final Report, Subsurface Fuel Contamination Study for United States Navy, NAS Alameda, California. Prepared for EFA West, San Bruno, California.

Miscellaneous Geological Investigations MAP GQ-768. U.S. Geological Survey.

Moju Environmental Technologies. 1998. "Remedial Investigation (RI)/Corrective Measures Study Report, USTs at Selected UST Sites/Buildings, Draft." April.

Moju Environmental Technologies. 1999. "Groundwater Monitoring Reports at Selected UST Sites/Buildings – 4th Round (April 99), Draft." June

Munsell, A.H. 1923. A Color Notation. Munsell Color Company, Baltimore, MD.

Ogiso Environmental. 1997. "Final Report for Geochemical Profiling for Definition of Chlorinated Solvent Plumes, IR Sites 4 and 5, NAS Alameda, Alameda, California." May.

Perry. 1991. Personal Communication from Fire Chief Perry. NAS Alameda, Alameda, California.

PRC Environmental Management, Inc. and James. M. Montgomery (PRC and JMM). 1992. "Data Summary Report RI/FS Phases 2B and 3." Prepared EFA West, San Bruno, California. October.

PRC and JMM. 1993. "Data Summary Report RI/FS Phases 1 and 2A." Prepared for EFA West, San Bruno, California. August.

PRC and Montgomery Watson (MW). 1995. "Intermediate Maintenance Facility Site, Non-time Critical Removal Action, Removal Action Implementation Report." August 10.

PRC and MW. 1996a. "RI/FS Data Transmittal Memorandum, IR Sites 4, 5, 8, 10A, 12, and 14 - CTO 260." Prepared for EFA West, San Bruno, California. April.

PRC and MW. 1996b. "RI/FS Data Transmittal Memorandum, IR Sites 1, 2, 3, Runway Area, 6, 7A, 7B, 7C, 9, 10B, 11, 13, 15, 16, and 19 - CTO 280." Prepared for EFA West, San Bruno, California. May.

PRC. 1994. CLEAN Program Waste Management Plan for Investigation-Derived Waste, Revision 0. January 31.

PRC. 1995 "Navy CLEAN II Health and Safety Plan." June.

PRC. 1997. "Tidal Influence Study Letter Report, NAS Alameda, California." June.

U.S. Department of Navy, Public Works Center (PWC). 1996. Final Summary Report, USTs 584-1 and 584-2." December.

PWC. 1997. "Final Summary Report, UST 491-1." January

Radbruch, D.H. 1957. "Areal and Engineering Geology of the Oakland West Quadrangle, California." Miscellaneous Geological Investigations MAP I-239. U.S. Geological Survey.

Radbruch, D.H. 1969. "Areal and Engineering Geology of the Oakland West Quadrangle, California."

Radian International LLC. 1997. "Storm Water Annual Report."

Regional Water Quality Control Board (RWQCB). 1997. "Interim Guidance for Active Soil Gas Investigation." Los Angeles RWQCB. February 25.

Robertson, P.K. and Campanella, R.G. 1984. "Guidelines for the Use and Interpretation of the Electronic Cone Penetrometer Test." University of British Columbia Soil Series Number 69.

Rogers, J.D. and Figuers, S.H. 1991. Engineering Geologic Site Characterization of the Greater Oakland-Alameda Area, Alameda and San Francisco Counties, California. December 30.

Sanborn-Ferris Map Co. (Sanborn). 1897. Map of Alameda, California. September.

Serfes, Michael E. 1991. "Determining the Mean Hydraulic Gradient of Ground Water Affected by Tidal Fluctuations", Vol. 29, No. 4 - Ground Water, July - August.

Sloan, Doris. 1992. "The Yerba Buena Mud: Record of Last Interpreted Predecessor of San Francisco Bay." Geological Society of America. Vol. 104, No. 6, pp. 716-727.

Tetra Tech EM Inc. (TtEMI). 1998a. "Base Realignment and Closure Cleanup Plan for Alameda Point, Revision 03." December.

TtEMI. 1998b. "Quarterly Groundwater Monitoring Data Summary Report, November 1997 – August 1998." December.

TtEMI. 1998c. "Base-wide Health and Safety Plan, Alameda Point, Alameda, California." Final. July.

TtEMI and Einerson, Fowler, and Watson. 1998. "Data Transmittal Memorandum for IR Sites 4 and 5 Chlorinated Solvent Plume Definition and IR Site 14 Sump Investigation, Alameda Point, Alameda, California." June 26.

TtEMI. 1999a. "Operable Unit (OU)-1 Feasibility Study Report, Alameda Point, Alameda, California." April 8.

TtEMI. 1999b. "OU-2 RI Report, Alameda Point, Alameda, California, Draft." June 29.

REFERENCES (Continued)

TtEMI. 1999c. "OU-1 RI Report, Alameda Point, Alameda, California, Final." March 23.

TtEMI. 2000a. "Draft Final Storm Sewer Study Report, Alameda Point, Alameda, California." December 4.

TtEMI. 2000b. "Revised Draft Final Remedial Action Plan/Record of Decision for the Marsh Crust and Groundwater at Fleet and Industrial Supply Center Oakland, Alameda Facility/Alameda Annex and for the Marsh Crust and Former Subtidal Area at Alameda Point." October.

TtEMI. 2000c. "UST Summary Report, Alameda Point, Alameda, California." June 30.

TtEMI. 2000d. "Determination of the Beneficial Uses of Groundwater, Alameda Point, Alameda, California." Final. July 17.

TtEMI. 2000e. "Free-Phase Floating Product Investigation, Alameda Point, Alameda, California." March 6.

TtEMI. 2000f. "Fuel Pipeline Removal Oversight and Sampling Report, Alameda Point, Alameda California." February 24.

TtEMI. 2000g. "Surfactant-enhanced Dense Nonaqueous Phase Liquid Removal Treatability Study Report for IR Site 5, Alameda Point, Alameda, California." February 7.

TtEMI. 2001a. "Wetlands Delineation of Low-lying Area North of IR Site 15 Facility Fence Line, Alameda Point, Alameda, California." May.

TtEMI. 2001b. "TPH Program Data Gap Summary Report, Alameda Point, Alameda, California." May.

U.S. Army Corps of Engineers. 1996. "Engineer Manual, Safety and Health Requirements." Document Number EM 385-1-1. September 3.

U.S. Department of the Navy (Navy). 1992. "International Station Meteorological Climate Summary - 1950 to 1985. Year/Month Total Precipitation (Inches) from Daily Observations, Division OPS, Building 19, NAS Alameda, California."

Navy. 1996a. "Final Summary Report UST-357-1." Prepared by Navy Public Works Center, San Francisco Bay.

Navy. 1996b. "Navy Health and Safety Plan Review Guidance." Navy Environmental Health Center, Environmental Programs Directorate. February.

U.S. Environmental Protection Agency (EPA). 1987. "A Compendium of Superfund Field Operations Methods." Office of Emergency and Remedial Response. December.

EPA. 1988. "Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air." EPA/600/4-89/017. June.

EPA. 1996. "Test Methods for Evaluating Solid Waste." Office of Solid Waste and Emergency Response. SW-846. Third Edition.

REFERENCES (Continued)

EPA. 1999a. "EPA Requirements for Quality Assurance Project Plans for Environmental Data Operations." Interim Final. EPA QA/R-5. November.

EPA. 1999b. "EPA Region 9 Preliminary Remediation Goals."

EPA. 2000. "Guidance for the Data Quality Objectives Process." EPA QA/G-4, 2000 update.

Wahler Associates. 1985. "Draft Report, Verification Step Confirmation Study of Naval Air Station Alameda." Prepared for EFA West, San Bruno, California.

ATTACHMENT A

ADDENDUM A
FINAL
QUALITY ASSURANCE PROJECT PLAN

SUPPLEMENTAL REMEDIAL INVESTIGATION
DATA GAP SAMPLING FOR
OPERABLE UNITS 1 AND 2

ALAMEDA POINT
ALAMEDA, CALIFORNIA

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. 385

Prepared for

U.S. DEPARTMENT OF THE NAVY
Greg Lorton, Remedial Project Manager
Engineering Field Division, Southwest
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ATTACHMENT A

ADDENDUM A
FINAL
QUALITY ASSURANCE PROJECT PLAN

SUPPLEMENTAL REMEDIAL INVESTIGATION
DATA GAP SAMPLING FOR
OPERABLE UNITS 1 AND 2

ALAMEDA POINT
ALAMEDA, CALIFORNIA

August 23, 2001

Prepared by

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for Neal Hutchison, Project Manager

A1 APPROVAL PAGE

ADDENDUM
FINAL
QUALITY ASSURANCE PROJECT PLAN

SUPPLEMENTAL REMEDIAL INVESTIGATION
DATA GAP SAMPLING FOR
OPERABLE UNITS 1 AND 2

ALAMEDA POINT
ALAMEDA, CALIFORNIA

Prepared for
U.S. DEPARTMENT OF THE NAVY

REVIEWS AND APPROVALS

TtEMI Program QA Manager: _____ Date: 8.3.01
Greg Swanson
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Navy QA Officer: _____ Date: 8/23/01
Narciso A. Ancog

A2 CONTENTS

Appendix

FIGURES (No Changes)

TABLES (No Changes)

A3 ABBREVIATIONS AND ACRONYMS

°C	Degrees Celsius
%D	Percent difference
µg/kg	Micrograms per kilogram
µg/L	Micrograms per liter
APHA	American Public Health Association
ASTM	American Society for Testing and Materials
BCT	Base Realignment and Closure Cleanup Team
BFB	Bromofluorobenzene
BRAC	Base Realignment and Closure
Cal-EPA	California Environmental Protection Agency
CCV	Continuing calibration verification
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CF	Calibration factor
CLEAN II	Comprehensive Long-term Environmental Action Navy Contract N62474-94-D-7609
CLP	Contract Laboratory Program
COC	Chain of custody
CPR	Cardiopulmonary resuscitation
CPT	Cone Penetrometer Test
CSM	Conceptual site model
CTO	Contract task order
CVAA	Cold vapor atomic absorption
DCA	**1,2-dichloroethane**
DCE	**cis-1,2-dichloroethene**
DNAPL	Dense non-aqueous phase liquid
DOT	U.S. Department of Transportation
DQO	Data quality objective
DTSC	California Department of Toxic Substances Control
EBS	Environmental Baseline Survey
EE/CA	Engineering evaluation and cost analysis
EDD	Electronic data deliverable
EFD	Engineering Field Division
ELAP	Environmental Laboratory Accreditation Program
EPA	U.S. Environmental Protection Agency
ERV	Ecological risk value
EWI	Environmental Work Instruction
FS	Feasibility study
FTL	Field team leader
FSP	Field sampling plan
FWBZ	First water-bearing zone

ABBREVIATIONS AND ACRONYMS (Continued)

GC/MS	Gas chromatography/mass spectrometry
GFAA	Graphite furnace atomic absorption
GIS	Geographic information system
HHRA	Human health risk assessment
HSP	Health and safety plan
HSPM	Health and Safety Program Manager
IC	Installation Coordinator
ICP	Inductively coupled plasma
ICV	Initial calibration verification
IDL	Instrument detection limit
IR	Installation restoration
IS	Internal standard
IT	International Technologies Corporation
LCS	Laboratory control sample
LIMS	Laboratory information management system
LNAPL	**Light, nonaqueous-phase liquid**
LUFT	Leaking underground fuel tank
MCL	Maximum Contaminant Level
MCCAW	Methods for Chemical Analysis of Water and Wastes
MDL	Method detection limit
mg/kg	Milligrams per kilogram
mg/L	Milligrams per liter
MS/MSD	Matrix spike and matrix spike duplicate
NAS	Naval Air Station
NEDTS	Navy environmental data transfer standards
OU	Operable unit
PARCC	Precision, accuracy, representativeness, completeness, and comparability
PCB	Polychlorinated biphenyl
PDF	Portable document format
PPE	Personal protective equipment
PQL	Practical quantitation limit
PRC	Preliminary remediation criterion
QA	Quality assurance
QC	Quality control
QAPP	Quality assurance project plan
QAO	Quality Assurance Officer
QCSR	Quality control summary report
QMP	Quality management plan

ABBREVIATIONS AND ACRONYMS (Continued)

RF	Response factor
RI	Remedial investigation
RPD	Relative percent difference
RPM	Remedial Project Manager
RSD	Relative standard deviation
RWQCB	California Regional Water Quality Control Board
SOP	Standard operating procedures
SS	Surrogate standard
SSO	Site Safety Officer
SWDIV	U.S. Navy Southwest Division
SWRCB	California State Water Resources Control Board
SVOC	Semivolatile organic compound
TAL	Target analyte list
TCL	Target compound list
TDS	Total dissolved solids
TEPH	Total extractable petroleum hydrocarbons
TOC	Total organic carbon
TPH	Total petroleum hydrocarbons
TPPH	Total purgeable petroleum hydrocarbons
TtEMI	Tetra Tech EM Inc.
TTPH	**Total TPH**
UST	Underground storage tank
VOC	Volatile organic compound
WBZ	Water-bearing zone

A6 PROBLEM STATEMENT AND BACKGROUND

The following sections discuss the modifications to the FSP and QAPP. Modifications include providing background information regarding the additional data gaps and an update to the sample identification table.

A6.1 INTRODUCTION

The Navy is conducting a remedial investigation (RI) and feasibility study (FS) in conformance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) for 29 sites at Alameda Point, Alameda, California. Data gaps were identified during regulatory review of the draft FS report for operable unit (OU)-1, dated April 8, 1999 (Tetra Tech EM Inc. [TtEMI] 1999a) and the draft RI report for OU-2, dated June 29, 1999 (TtEMI 1999b). Subsequently, a field sampling plan (FSP)/quality assurance project plan (QAPP) was prepared and is currently being implemented at Alameda Point (see Figure AA-1).

Since the start of the field sampling program, additional data gaps have been identified. The additional data gaps were identified during evaluation of the recently adopted total petroleum hydrocarbon (TPH) strategy and review of the recently submitted final EBS report.

The additional soil, soil gas, and groundwater sampling described in this addendum will address these data gaps and provide the necessary information and data to evaluate these sites and ultimately facilitate transfer of the land to the City of Alameda.

As a first step toward resolution of these data gaps, this addendum (Addendum A to the QAPP, Supplemental RI Data Gap Sampling for OU-1 and -2 [TtEMI, 2001]) has been prepared. Changes made to the QAPP are listed by the corresponding Section number in the QAPP, starting with the changes to Section A6 as presented above. If no changes were required to a specific section of the QAPP, "No Changes" has been inserted into the table of contents.

A6.3 Background for Additional Data Gaps

The Navy recently received concurrence from the RWQCB and DTSC on the Navy's TPH strategy for addressing sites, that are impacted by petroleum products only. These sites are not usually considered to be part of the CERCLA RI/FS investigation and subsequently were not considered in the preparation of the original FSP/QAPP. The TPH strategy contains a decision tree, which is used to evaluate data from a certain location to determine if corrective action is necessary to remediate petroleum products. During an evaluation of the petroleum data for each parcel at Alameda Point, several locations were identified that require additional data to determine if corrective action is necessary.

One of the decisions contained within the TPH strategy is to determine if the concentration of benzene in the subsurface will create a risk to human health from inhalation of benzene vapors in indoor air. The TPH strategy indicates that a concentration of 10 micrograms per liter (µg/L) or higher of benzene in groundwater may cause an unacceptable risk to human health if it migrates into indoor air. Soil gas sampling is necessary to determine if the benzene does migrate into indoor air; therefore, at locations where the concentration of benzene in groundwater is greater than or equal to 10 µg/L and no soil gas data are available, soil gas sampling is proposed. Twelve additional soil gas data points are proposed in this addendum to provide this necessary information to complete the TPH strategy evaluation and determine if corrective action is necessary.

According to the TPH strategy, if the concentration of TPH detected in a soil sample exceeds the preliminary remediation criterion (PRC) for soils, a determination of whether TPH-impacted soil is isolated or widespread needs to be made prior to determining if corrective action is necessary. Three locations where samples contained concentrations of TPH greater than the PRCs did not have sufficient data to determine if corrective action is necessary. Six soil borings are proposed in this addendum to investigate these three locations.

The TPH strategy requires an investigation for light, nonaqueous-phase liquids (LNAPL) when the total TPH (TTPH) concentrations at a given location exceed 20 mg/L in groundwater or 14,000 milligrams per kilogram (mg/kg) in soil. A review of TPH sites revealed two possible locations where potential exists for LNAPL. Two piezometers will be installed to investigate if LNAPL is present at either of these locations.

During review of the EBS, it was noted that chlorinated hydrocarbons, specifically 1,2-dichloroethane (DCA) and cis-1,2-dichloroethene (DCE), were detected in groundwater at concentrations above the maximum concentration level (MCL) in the vicinity of underground storage tanks (UST) 594-1 and 594-2 (EBS Parcel 8). DTSC has stated that they will not approve transfer of this property until the nature and extent of the chlorinated hydrocarbons are determined. A total of four sampling locations are proposed to investigate the chlorinated hydrocarbons in groundwater.

In addition, the review of the EBS revealed a former gas station site on the eastern end of EBS Parcel 23G. The gas station reportedly was closed in 1962; however, no regulatory sampling requirements were in effect at that time. In order to determine if closure is appropriate for this site, the Navy must sample the soil beneath the gas station to determine if a release occurred from the former USTs. For this purpose, one soil boring is proposed in this addendum to be placed in the location of the former gas station.

APPENDIX A3

SAMPLE IDENTIFICATION TABLE

(Table A3-8 was added to address additional data gaps)

TABLE A3-8

SAMPLE IDENTIFICATION NUMBERS
FOR SOIL, GROUNDWATER, STORMWATER AND SOIL GAS SAMPLES
ADDITIONAL DATA GAP SAMPLING LOCATIONS
ALAMEDA POINT

Laboratory Identification	Point Name	Field Identification	Matrix	VOC Mobile Lab	VOC Fixed Lab	TPPH Mobile Lab	TPPH Fixed Lab	TEPH Mobile Lab	TEPH Fixed Lab	SVOC	TO-14	CN^-	T-Metals	Dissolved Metals	Lead	Cr (VI)	PCBs	Dioxins	pH	Field Parameters	Geotechnical Analysis
CERCLA Site 8																					
Soil Gas Investigation																					
385-S08-001	S08-DGS-SG01	S08-DGS-SG01-SO-1.5	Soil																		X[2]
385-S08-002	S08-DGS-SG02	S08-DGS-SG02-SG-1.5	Soil Gas								X										
385-S08-003	S08-DGS-SG02	S08-DGS-SG02-SG-4.0	Soil Gas								X										
CERCLA Site 22																					
Soil Gas Investigation																					
385-S22-015	S22-DGS-SG04	S22-DGS-SG04-SO-1.5	Soil																		X[2]
385-S22-016	S22-DGS-SG05	S22-DGS-SG05-SG-1.5	Soil Gas								X										
385-S22-017	S22-DGS-SG05	S22-DGS-SG05-SG-4.0	Soil Gas								X										
CERCLA Site 3																					
Soil Gas Investigation																					
385-S03-069	S03-DGS-SG13	S03-DGS-SG13-SO-1.5	Soil																		X[2]
385-S03-070	S03-DGS-SG14	S03-DGS-SG14-SG-1.5	Soil Gas								X										
385-S03-071	S03-DGS-SG14	S03-DGS-SG14-SG-4.0	Soil Gas								X										
385-S03-072	S03-DGS-SG15	S03-DGS-SG15-SO-1.5	Soil																		X[2]
385-S03-073	S03-DGS-SG16	S03-DGS-SG16-SG-1.5	Soil Gas								X										
385-S03-074	S03-DGS-SG16	S03-DGS-SG16-SG-4.0	Soil Gas								X										
LNAPL Investigation																					
385-S03-075	S03-DGS-DP14	S03-DGS-DP14-GW-6	Water				X		X												X[2]
CERCLA Site 4																					
Soil Gas Investigation																					
385-S04-173	S04-DGS-SG19	S04-DGS-SG19-SO-1.5	Soil																		X[2]
385-S04-174	S04-DGS-SG20	S04-DGS-SG19-SG-1.5	Soil Gas								X										
385-S04-175	S04-DGS-SG21	S04-DGS-SG19-SG-4.0	Soil Gas								X										

TABLE A3-8

SAMPLE IDENTIFICATION NUMBERS
FOR SOIL, GROUNDWATER, STORMWATER AND SOIL GAS SAMPLES
ADDITIONAL DATA GAP SAMPLING LOCATIONS
ALAMEDA POINT

Laboratory Identification	Point Name	Field Identification	Matrix	VOC Mobile Lab	VOC Fixed Lab	TPPH Mobile Lab	TPPH Fixed Lab	TEPH Mobile Lab	TEPH Fixed Lab	SVOC	TO-14	CN^-	T-Metals	Dissolved Metals	Lead	Cr (VI)	PCBs	Dioxins	pH	Field Parameters	Geotechnical Analysis
CAA-9A																					
Soil Investigation for Corrective Action Decision (Direct Push)																					
385-CAA9A-001	CAA9A-DGS-DP01	CAA9A-DGS-DP01-SO-1.5	Soil		X		X		X												
385-CAA9A-002	CAA9A-DGS-DP01	CAA9A-DGS-DP01-SO-4.5	Soil		X		X		X												
385-CAA9A-002	CAA9A-DGS-DP01	CAA9A-DGS-DP01-SO-7.0	Soil		X		X		X												
385-CAA9A-003	CAA9A-DGS-DP01	CAA9A-DGS-DP01-SO-10	Soil		X		X		X												
Soil Gas Investigation																					
385-CAA9A-001	CAA9A-DGS-SG01	CAA9A-DGS-SG01-SO-1.5	Soil																		X[2]
385-CAA9A-002	CAA9A-DGS-SG02	CAA9A-DGS-SG02-SG-1.5	Soil Gas								X										
385-CAA9A-003	CAA9A-DGS-SG02	CAA9A-DGS-SG02-SG-4.0	Soil Gas								X										
CAA-10																					
Soil Gas Investigation																					
385-CAA10-001	CAA10-DGS-SG01	CAA10-DGS-SG01-SO-1.5	Soil																		X[2]
385-CAA10-002	CAA10-DGS-SG02	CAA10-DGS-SG02-SG-1.5	Soil Gas								X										
385-CAA10-003	CAA10-DGS-SG02	CAA10-DGS-SG02-SG-4.0	Soil Gas								X										
385-CAA10-004	CAA10-DGS-SG03	CAA10-DGS-SG03-SG-1.5	Soil																		X[2]
385-CAA10-005	CAA10-DGS-SG04	CAA10-DGS-SG04-SG-1.5	Soil Gas								X										
385-CAA10-006	CAA10-DGS-SG04	CAA10-DGS-SG04-SG-4.0	Soil Gas								X										

TABLE A3-8

SAMPLE IDENTIFICATION NUMBERS
FOR SOIL, GROUNDWATER, STORMWATER AND SOIL GAS SAMPLES
ADDITIONAL DATA GAP SAMPLING LOCATIONS
ALAMEDA POINT

Laboratory Identification	Point Name	Field Identification	Matrix	VOC Mobile Lab	VOC Fixed Lab	TPPH Mobile Lab	TPPH Fixed Lab	TEPH Mobile Lab	TEPH Fixed Lab	SVOC	TO-14	CN^-	T-Metals	Dissolved Metals	Lead	Cr (VI)	PCBs	Dioxins	pH	Field Parameters	Geotechnical Analysis
CAA-12																					
Soil Gas Investigation																					
385-CAA12-001	CAA12-DGS-DP01	CAA12-DGS-DP01-SO-1.5	Soil		X		X		X												
385-CAA12-002	CAA12-DGS-DP01	CAA12-DGS-DP01-SO-5.0	Soil		X		X		X												
385-CAA12-003	CAA12-DGS-DP01	CAA12-DGS-DP01-SO-10	Soil		X		X		X												
385-CAA12-004	CAA12-DGS-DP01	CAA12-DGS-DP01-SO-15	Soil		X		X		X												
385-CAA12-005	CAA12-DGS-DP02	CAA12-DGS-DP02-SO-1.5	Soil		X		X		X												
385-CAA12-006	CAA12-DGS-DP02	CAA12-DGS-DP02-SO-5.0	Soil		X		X		X												
385-CAA12-007	CAA12-DGS-DP02	CAA12-DGS-DP02-SO-10	Soil		X		X		X												
385-CAA12-008	CAA12-DGS-DP02	CAA12-DGS-DP02-SO-15	Soil		X		X		X												
385-CAA12-009	CAA12-DGS-DP03	CAA12-DGS-DP03-SO-1.5	Soil		X		X		X												
385-CAA12-010	CAA12-DGS-DP03	CAA12-DGS-DP03-SO-5.0	Soil		X		X		X												
385-CAA12-011	CAA12-DGS-DP03	CAA12-DGS-DP03-SO-10	Soil		X		X		X												
385-CAA12-012	CAA12-DGS-DP03	CAA12-DGS-DP03-SO-15	Soil		X		X		X												
385-CAA12-013	CAA12-DGS-DP04	CAA12-DGS-DP04-SO-1.5	Soil		X		X		X												
385-CAA12-014	CAA12-DGS-DP04	CAA12-DGS-DP04-SO-5.0	Soil		X		X		X												
385-CAA12-015	CAA12-DGS-DP04	CAA12-DGS-DP04-SO-10	Soil		X		X		X												
385-CAA12-016	CAA12-DGS-DP04	CAA12-DGS-DP04-SO-15	Soil		X		X		X												
FUEL LINE CAA-A																					
LNAPL Investigation																					
385-FLCAAA-001	FLCAAA-DGS-DP01	FLCAA-DGS-DP01-GW-1	Water				X		X												X^2

TABLE A3-8

SAMPLE IDENTIFICATION NUMBERS
FOR SOIL, GROUNDWATER, STORMWATER AND SOIL GAS SAMPLES
ADDITIONAL DATA GAP SAMPLING LOCATIONS
ALAMEDA POINT

Laboratory Identification	Point Name	Field Identification	Matrix	VOC Mobile Lab	VOC Fixed Lab	TPPH Mobile Lab	TPPH Fixed Lab	TEPH Mobile Lab	TEPH Fixed Lab	SVOC	TO-14	CN^-	T-Metals	Dissolved Metals	Lead	Cr (VI)	PCBs	Dioxins	pH	Field Parameters	Geotechnical Analysis
FUEL LINE CAA-B																					
Soil Investigation for Corrective Action Decision (Direct Push)																					
385-FLCAAB-001	FLCAAB-DGS-DP01	FLCAAB-DGS-DP01-SO-1.5	Soil		X		X		X												
385-FLCAAB-002	FLCAAB-DGS-DP01	FLCAAB-DGS-DP01-SO-4.5	Soil		X		X		X												
385-FLCAAB-003	FLCAAB-DGS-DP01	FLCAAB-DGS-DP01-SO-7.0	Soil		X		X		X												
385-FLCAAB-004	FLCAAB-DGS-DP01	FLCAAB-DGS-DP01-SO-10	Soil		X		X		X												
Soil Gas Investigation																					
385-FLCAAB-005	FLCAAB-DGS-SG01	FLCAAB-DGS-SG01-SO-1.5	Soil																		X[2]
385-FLCAAB-006	FLCAAB-DGS-SG02	FLCAAB-DGS-SG02-SG-1.5	Soil Gas								X										
385-FLCAAB-007	FLCAAB-DGS-SG02	FLCAAB-DGS-SG02-SG-4.0	Soil Gas								X										
385-FLCAAB-008	FLCAAB-DGS-SG03	FLCAAB-DGS-SG03-SO-1.5	Soil																		X[2]
385-FLCAAB-009	FLCAAB-DGS-SG04	FLCAAB-DGS-SG04-SG-1.5	Soil Gas								X										
385-FLCAAB-010	FLCAAB-DGS-SG04	FLCAAB-DGS-SG04-SG-4.0	Soil Gas								X										
385-FLCAAB-011	FLCAAB-DGS-SG05	FLCAAB-DGS-SG05-SO-1.5	Soil																		X[2]
385-FLCAAB-012	FLCAAB-DGS-SG06	FLCAAB-DGS-SG06-SG-1.5	Soil Gas								X										
385-FLCAAB-013	FLCAAB-DGS-SG06	FLCAAB-DGS-SG06-SG-4.0	Soil Gas								X										
385-FLCAAB-014	FLCAAB-DGS-SG07	FLCAAB-DGS-SG07-SO-1.5	Soil																		X[2]
385-FLCAAB-015	FLCAAB-DGS-SG08	FLCAAB-DGS-SG08-SG-1.5	Soil Gas								X										
385-FLCAAB-016	FLCAAB-DGS-SG08	FLCAAB-DGS-SG08-SG-4.0	Soil Gas								X										

TABLE A3-8

SAMPLE IDENTIFICATION NUMBERS
FOR SOIL, GROUNDWATER, STORMWATER AND SOIL GAS SAMPLES
ADDITIONAL DATA GAP SAMPLING LOCATIONS
ALAMEDA POINT

Laboratory Identification	Point Name	Field Identification	Matrix	VOC Mobile Lab	VOC Fixed Lab	TPPH Mobile Lab	TPPH Fixed Lab	TEPH Mobile Lab	TEPH Fixed Lab	SVOC	TO-14	CN^-	T-Metals	Dissolved Metals	Lead	Cr (VI)	PCBs	Dioxins	pH	Field Parameters	Geotechnical Analysis
EBS PARCEL 8																					
Plume Delineation (Direct Push)																					
385-EBS8-001	EBS8-DGS-DP01	EBS8-DGS-DP01-GW-5.0	Water		X																
385-EBS8-002	EBS8-DGS-DP01	EBS8-DGS-DP01-GW-10	Water		X																
385-EBS8-003	EBS8-DGS-DP01	EBS8-DGS-DP01-GW-15	Water		X																
385-EBS8-004	EBS8-DGS-DP02	EBS8-DGS-DP02-GW-5.0	Water		X																
385-EBS8-005	EBS8-DGS-DP02	EBS8-DGS-DP02-GW-10	Water		X																
385-EBS8-006	EBS8-DGS-DP02	EBS8-DGS-DP02-GW-15	Water		X																
385-EBS8-007	EBS8-DGS-DP03	EBS8-DGS-DP03-GW-5.0	Water		X																
385-EBS8-008	EBS8-DGS-DP03	EBS8-DGS-DP03-GW-10	Water		X																
385-EBS8-009	EBS8-DGS-DP03	EBS8-DGS-DP03-GW-15	Water		X																
385-EBS8-010	EBS8-DGS-DP04	EBS8-DGS-DP04-GW-5.0	Water		X																
385-EBS8-011	EBS8-DGS-DP04	EBS8-DGS-DP04-GW-10	Water		X																
385-EBS8-016	EBS8-DGS-DP04	EBS8-DGS-DP04-GW-15	Water		X																
EBS PARCEL 23G																					
Soil Investigation for Corrective Action Decision (Direct Push)																					
385-EBS23G-001	EBS23G-DGS-DP01	EBS23G-DGS-DP01-GW-15	Soil		X		X		X												
385-EBS23G-002	EBS23G-DGS-DP01	EBS23G-DGS-DP01-GW-5.0	Soil		X		X		X												
385-EBS23G-003	EBS23G-DGS-DP01	EBS23G-DGS-DP01-GW-7.5	Soil		X		X		X												
385-EBS23G-004	EBS23G-DGS-DP01	EBS23G-DGS-DP01-GW-10	Soil		X		X		X												

TABLE A3-8

SAMPLE IDENTIFICATION NUMBERS
FOR SOIL, GROUNDWATER, STORMWATER AND SOIL GAS SAMPLES
ADDITIONAL DATA GAP SAMPLING LOCATIONS
ALAMEDA POINT

CB	= Catch Basin
DGS	= Data Gap Sample
DP	= Direct Push
GW	= Ground Water Sample
GWI	= Ground Water Infiltration
HA	= Hand Auger
MH	= Manhole
MW	= Monitoring Well
N/A	= Not Applicable
RNS	= Ribbon NAPL Sample
SG	= Soil Gas
VE	= Vacuum Extraction

VOC	= Volatile Organic Compounds
SVOC	= Semivolatile Organic Hydrocarbons
CN^-	= Cyanide
PCBs	= Polychlorinated Biphenyls
SVOC	= Semi volatile Organic Compounds
TO-14	= VOCs in air
TPPH	= Total Purgeable Petroleum Hydrocarbons
TEPH	= Total Extractable Petroleum Hydrocarbon
D-Metals	= Dissolved Metals
T-Metals	= Total Metals
Cr (VI)	= Hexavalent Chromium

Field Parameters
Temperature
Conductivity
Dissolved Oxygen
Redox Potential
Turbidity
pH

Geotechnical Analysis (X^1)
Particle Size
Permeability
Soil Total Porosity
Soil Dry Bulk Density

Geotechnical Analysis (X^2)
Particle size
Soil Texture
Volumetric Moisture
Soil Total Porosity
Soil Dry Bulk Density

Notes:
Vertical step-down hydropunch samples are included in this table.
Field duplicates, trip blank, and fixed laboratory confirmation samples are not included in this table. Horizontal step-out locations will be determined by site managers using field observations and are not included in this table.
Sample depth intervals are approximate. Actual depth of samples will be determined by site managers using field observations.
* Groundwater samples from monitoring wells submitted for SVOC analysis will be extracted for full-scan GC/MS (8270C) and selected ion monitoring GC/MS (8270SIM). If results for benzo(a)pyrene (BaP) by full-scan GC/MS are reported as non-detect at the 10 ug/L detection limit, then the 8270SIM extract will be analyzed in an attempt to meet the residential PRG of 0.2 ug/L for BaP.