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FINAL
CORRECTIVE ACTION WORK PLAN
HYDROCARBON PLUME DELINEATION, REMEDIATION, AND SITE CLOSURE MEASURES
CORRECTIVE ACTION AREAS 7, 11, AND 13
ALAMEDA POINT
ALAMEDA, CALIFORNIA

Environmental Remedial Action
Contract No. N62474-98-D-2076
Contract Task Order 0037

Document Control Number 1518
Revision 1

July 20, 2001

Submitted to:

U.S. Department of the Navy
Southwest Division
Naval Facilities Engineering Command
1220 Pacific Highway
San Diego, California 92132-5190

Submitted by:

IT Corporation
4005 Port Chicago Highway
Concord, California 94520-1120

Issued to: ______________________________ Date: _____________

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FINAL
CORRECTIVE ACTION WORK PLAN
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CORRECTIVE ACTION AREAS 7, 11, AND 13
ALAMEDA POINT
ALAMEDA, CALIFORNIA

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July 20, 2001

Approved by: ____________________ Date: 7-19-01
Mary Louise Moise
IT Project Manager

Approved by: ____________________ Date: 7/19/01
Eric Watabayashi
IT Project QC Manager

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The IT Group

November 8, 2001

Subject: CTO 37, Final Corrective Action Project Plans
Document Control Number 1518.1
Transmittal dated July 23, 2001

The attached pages were inadvertently omitted from subject project plans.

Please remove the following pages from you binder and replace with their respective updates, as follows:

Work Plan

- Section 6.0, CAA 13, Mini-Storage Area Corrective Action

  Replace Page 6-3

Site Health and Safety Plan

- Section 11, Emergency Response Plan and Contingency Procedures

  Replace Pages 11-2 through 11-4

I apologize for the inconvenience.

Document Production
(925) 288-2145

Copy of original IT Transmittal Letter enclosed.

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WORK PLAN - REPLACEMENT PAGE

Section 6.0, CAA 13, Mini-Storage Area Corrective Action

Replace Page 6-3

SITE HEALTH AND SAFETY PLAN - REPLACEMENT PAGES

Section 11, Emergency Response Plan and Contingency Procedures

Replace Pages 11-2 through 11-4

DEPARTMENT OF THE NAVY
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NAVAL FACILITIES ENGINEERING COMMAND
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SAN DIEGO, CA 92132-5190

5090
Ser 06CA.GL\0756
July 23, 2001

Mr. Brad Job, P.E.
Regional Water Quality Control Board
San Francisco Bay Region
1515 Clay Street, Suite 1400
Oakland, CA 94612

Dear Mr. Job:

Subj: **FINAL WORK PLANS – CORRECTIVE ACTION WORK PLAN HYDROCARBON PLUME DELINEATION, REMEDIATION, AND SITE CLOSURE MEASURES, CORRECTIVE ACTION AREAS 7, 11, AND 13; ALAMEDA POINT, ALAMEDA, CALIFORNIA**

Enclosed is one copy of the above-titled document. This document includes the work plan, quality control plan, sampling and analysis plan, and site health and safety plan. We appreciate your comments and believe that we have fully incorporated them.

If you have any questions or additional comments, please feel free to call me at (619) 532-0953 or e-mail me at lortonga@efdsw.navfac.navy.mil.

Sincerely,

Gregory A. Lorton, P.E., R.E.A
Remedial Project Manager

Copy to:
Ms.Anna-Marie Cook, U.S EPA Region IX
Mr. Dan Murphy, Cal/EPA DTSC
Ms. Dina Tasini, City of Alameda
Mr. Michael John Torrey, RAB Co-chair
Ms. Karla Brasaemle, TechLawInc.
Mr. Ted Splitter, Northgate Environmental
Mr. Steve Edde, Alameda Point
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Ms. Diane Silva, SWDIV

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Corrective Action Work Plan

- Title page, signature page, and two-page Table of Contents
- Section 2.0 Site Background—replace pages 2-4 through 2-12
- Section 4.0 Plume Delineation Activities—replace page 4-1
- Section 6.0 CAA 13, Mini-Storage Area Corrective Action—replace page 6-2
- Following the Figures flysheet—replace Figure 3, Figure 6, and Figure 10
- Following the Tables flysheet—replace Table 1 and Table 2

Project Quality Control Plan

- Replace entire plan

Sampling and Analysis Plan

- Cover and signature pages

Field Sampling Plan

- Cover and signature pages
- Following the Figures flysheet—replace Figure 5
- Following the Tables flysheet—replace Table 1A and Table 1B

Quality Assurance Project Plan

- Cover and signature pages
- Following the Figures flysheet—replace Figure 1

Site Health and Safety Plan

- Cover and signature pages
- Section 11 Emergency Response Plan and Contingency Procedures—replace Page 11-1
- Following the Appendix B flysheet—replace Emergency Phone Numbers

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CONTRACT : N62474-98-D-2076 **DOCUMENT CONTROL NUMBER : 1518.1**

TO: Administrative Contract Officer
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NAVFACENGCOM-SWDIV
Michelle Crook, 02R1.MC
1230 Columbia St., Suite 1100
San Diego, CA 92101

Date : July 23, 2001

CTO : 0037

Location: Alameda Point

FROM: for Vincent Kelm
Mary Louise Moise
Project Manager

DESCRIPTION OF ENCLOSURE ***Final Corrective Action Project Plans, Hydrocarbon Plume Delineation, Remediation, and Site Closure Measures, Corrective Action Areas 7, 11, and 13, Alameda Point, Dated July 20, 2001***
Insert the attached pages in the Project Plans. Please see the attached cover letter for instructions for placement of insert pages.

Appendices:
Work Plan
Quality Control Plan
Health and Safety Plan
Sampling and Analysis Plan

TYPE : CTO Deliverable

VERSION : Final

REVISION No : 1

ADMIN RECORD : Yes

SCHEDULED DELIVERY DATE July 24, 2001

ACTUAL DELIVERY DATE July 23, 2001

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CTO : 0037

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June 11, 2001

Mr. Brad Job, P.E.
Regional Water Quality Control Board
San Francisco Bay Region
1515 Clay Street, Suite 1400
Oakland, California 94612

Subject: **DRAFT WORK PLANS – CORRECTIVE ACTION WORK PLAN; HYDROCARBON PLUME DELINEATION, REMEDIATION, AND SITE CLOSURE MEASURES, CORRECTIVE ACTION AREAS 7, 11, AND 13; ALAMEDA POINT, ALAMEDA, CALIFONIA**

Dear Mr. Job:

Enclosed is one copy of the above-titled document. This document includes the work plan, quality control plan, sampling and analysis plan, and site health and safety plan. We appreciate your review of this document, and hope to receive your comments by July 11.

If you have any questions or comments, please feel free to call me at (619) 532-0953 or E-mail me at lortonga@efdsw.navfac.navy.mil.

Sincerely,

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

Copy to:
Ms. Anna-Marie Cook, U.S EPA Region IX
Ms. Mary Rose Cassa, Cal/EPA DTSC
Ms. Dina Tasini, City of Alameda
Mr. Michael John Torrey, RAB Co-chair
Ms. Karla Brasaemle, TechLawInc.
Mr. Ted Splitter, Northgate Environmental
Mr. Steve Edde, Alameda Point
Mr. Chris Fennessy, Tetra Tech EMI
Ms. Diane Silva, SWDIV

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IT TRANSMITTAL/DELIVERABLE RECEIPT

CONTRACT : N62474-98-D-2076 **DOCUMENT CONTROL NUMBER : 1518**

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Michelle Crook, 02R1.MC
1230 Columbia St., Suite 1100
San Diego, CA 92101

Date : June 13, 2001

CTO : 0037

Location: Alameda

FROM: [signature] FOR
Mary Louise Moise
Project Manager

DESCRIPTION OF ENCLOSURE : ***Corrective Action Work Plan, Hydrocarbon Plume Delineation, Remediation, and Site Closure Measures, Corrective Action Areas 7, 11, and 13, Alameda Point, Dated June 11, 2001***

E : CTO Deliverable

VERSION : Draft Final **REVISION No :** 0

ADMIN RECORD : No

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Mary Rose Cassa, California Environmental Protection Agency (1C/1E)

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List of Acronyms and Abbreviations

AST	aboveground storage tank
ASTM	American Society for Testing and Materials
AWQC	Ambient Water Quality Criteria
BAAQMD	Bay Area Air Quality Management District
bgs	below ground surface
BSU	bay sediment unit
BTEX	benzene, toluene, ethylbenzene, and total xylenes
CAA	corrective action area
CSO	Caretaker Site Office
CTO	Contract Task Order
DPT	direct push technology
DVE	Dual Vacuum Extraction
EBMUD	East Bay Municipal Utility District
EBS	Environmental Baseline Survey
EPA	U.S. Environmental Protection Agency
EPP	Environmental Protection Plan
ERM	Environmental Resource Management-West, Inc.
FSP	Field Sampling Plan
ft/ft	feet per foot
FWBZ	first water-bearing zone
GAC	granular activated carbon
GIS	Geographic Information System
IR	Installation Restoration
IT	IT Corporation
JP-5	jet propellant no. 5
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MTBE	methyl tertiary butyl ether
NGVD29	National Geodetic Vertical Datum of 1929
PID	photoionization detector
ppm	parts per million
POTW	publicly-owned treatment works
PRC-EMI	PRC Environmental Management, Inc.
PRC	preliminary remediation criteria
PVC	polyvinyl chloride
PWC	Public Works Center
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
RPM	Remedial Project Manager
RWQCB	Regional Water Quality Control Board
SAP	Sampling and Analysis Plan
SOP	standard operating procedure
SWBZ	second water-bearing zone

Acronyms and Abbreviations (continued)

TPH	total petroleum hydrocarbons
TtEMI	Tetra Tech Environmental Management, Inc.
TTPH	total total petroleum hydrocarbon
USA	Underground Service Alert
USCS	Unified Soil Classification System
UST	underground storage tank
VOC	volatile organic compound

1.0 Introduction

This Corrective Action Work Plan has been prepared for petroleum hydrocarbon corrective actions at four sites at the former Naval Air Station Alameda, Alameda Point, Alameda, California (Figure 1, "Site Location Map,"). The four sites, located within three corrective action areas (CAAs), are designated as follows:

- CAA 7 - Exchange Service Station
- CAA 11 - Area 37
- CAA 13 - Building 530/Defueling Area
- CAA 13 - Mini-Storage Area

This plan has been prepared on behalf of the United States Department of the Navy (Navy) under Environmental Remedial Action Contract N62474-98-D-2076, Contract Task Order (CTO) 0037.

The Navy has developed a site closure strategy for petroleum fuel-impacted areas in conjunction with the San Francisco Regional Water Quality Control Board (RWQCB) and Department of Toxic Substances Control (DTSC). The Alameda Point Total Petroleum Hydrocarbon Strategy specifies that if total total petroleum hydrocarbon (TTPH) concentrations exceed 14,000 milligrams per kilogram (mg/kg) in soil or 20 milligrams per liter (mg/L) in groundwater, a floating product investigation will be conducted (Section 1.1) (Navy, 2001). If floating product is found, an interim corrective action will be implemented. Based on the results of previous investigations, free-product investigations and/or corrective actions have been proposed for the Exchange Service Station (CAA 7), Area 37 (CAA 11), the Building 530/Defueling Area (CAA 13), and the Mini-Storage Area (CAA 13) (IT Corporation [IT], 2001a; Tetra Tech Environmental Management, Inc. [TtEMI], 2001).

Under this CTO, IT will conduct investigations and, as necessary, perform corrective actions at four sites. The degree and extent of the petroleum hydrocarbon contamination at the four sites requires further delineation. As part of the corrective actions, the Navy has contracted IT to further evaluate the degree and extent of petroleum hydrocarbon contamination, as well as to design, build, and operate recovery and treatment systems. While the distribution of petroleum hydrocarbon contamination requires further delineation for these sites, reasonable assumptions about the contaminant distribution have been made. Based on the contaminants and assumed plume distributions, general approaches for vacuum-enhanced extraction and treatment systems have been considered.

This Work Plan constitutes one of five planning documents that address the corrective action at each of the four sites. The other planning documents are the Quality Control Plan, the Sampling and Analysis Plan (SAP), the Site Health and Safety Plan, and the Environmental Protection Plan (EPP). The EPP is provided as Appendix A to this Work Plan.

1.1 Overview of Total Petroleum Hydrocarbon Strategy for Corrective Action Areas

The corrective action program for petroleum-impacted areas at Alameda Point is under the regulatory jurisdiction of the RWQCB, in cooperation with the DTSC and the Region 9 U.S. Environmental Protection Agency (EPA). The strategy for petroleum-impacted sites is based on the RWQCB's guidance on closure of low-risk fuel sites in the San Francisco Bay Region (RWQCB, 1996). RWQCB guidance presents strategies for closing low-risk soil-only sites and managing low-risk groundwater-impacted sites using monitored natural attenuation as the preferred remedial alternative.

To meet RWQCB criteria for low-risk fuel site closure, total petroleum hydrocarbon (TPH) strategies and PRCs have been developed for soil and groundwater at Alameda Point. PRCs are screening levels that have been determined to be protective of human health or marine ecological receptors. If TPH-related constituent concentrations exceed PRCs, risk management considerations are used to determine if a corrective action is warranted. The proposed CAA TPH strategies and PRCs for Alameda Point are detailed in a letter, Preliminary Remediation Criteria and Closure Strategy for Petroleum-Contaminated Sites at Alameda Point, Alameda, California, issued by the Navy to RWQCB for concurrence in May 2001. The PRCs presented in this set of plans are considered interim until final remediation goals are issued by the RWQCB.

The CAA TPH strategy has been developed for sites already in the Corrective Action Program. The CAA TPH strategy involves an initial evaluation of each CAA to assess the potential for floating product. The removal of floating product is a high priority throughout Alameda Point because it is considered to be a continuing source of groundwater contamination and may pose a potential explosion hazard if encountered during excavation or during transport through storm drains (Navy, 2001). TTPH concentrations of 14,000 mg/kg in soil and 20 mg/L in groundwater have been chosen as the screening levels for floating product (Navy, 2001). TTPH is defined as the sum of all TPH fractions, i.e., TPH gasoline-range, TPH diesel-range, TPH motor oil range, and TPH jet fuel-range. The TPH strategy specifies that if TTPH concentrations exceed the floating product screening levels at a given site, a floating product investigation will be conducted. If floating product is present, the floating product will be removed to the extent practical.

If TTPH concentrations are below screening levels, then concentrations of individual TPH fractions and TPH-associated compounds will be screened against the relevant individual PRCs. If the individual PRCs are exceeded, risk management considerations and sound professional judgment will be used to determine if a corrective action is warranted, or if natural attenuation is an appropriate remedial endpoint.

Corrective actions may include:

- Soil and groundwater source removal
- Groundwater containment or treatment at CAAs where PRCs are exceeded for a complete exposure pathway
- Natural attenuation at CAAs where groundwater plumes are not migrating, and where there is no significant risk to human health or the environment

Soil and groundwater that contain volatile chlorinated hydrocarbons at levels harmful to human health or the environment will not be addressed under the corrective action program for petroleum-impacted areas (TtEMI, 2001). However, the corrective action program will address removal of floating product independent of the presence of chlorinated hydrocarbons in groundwater.

1.2 Project Objectives

The objectives of the work performed under this CTO are to: 1) further assess the degree and extent of petroleum hydrocarbon contamination; 2) recover free-phase petroleum product, contaminated soil, and/or dissolved-phase fuel constituents from beneficial-use groundwater; and 3) close each of the four sites after securing regulatory approval. The corrective actions are as follows:

- ***Exchange Service Station (CAA 7)***: Groundwater contains TPH fractions and associated constituents, including methyl tertiary butyl ether (MTBE). Soil is also impacted by petroleum hydrocarbons. The extent of the petroleum hydrocarbons requires further delineation. IT will further assess the extent of contamination, and then design, build, and operate a Dual Vacuum Extraction (DVE) recovery and treatment system for the removal of soil vapor and dissolved-phase fuel constituents from groundwater.
- ***Area 37 (CAA 11) and Building 530/Defueling Area (CAA 13):*** Soil and groundwater at these two sites contain TPH fractions and associated constituents. TTPH concentrations in soil and groundwater exceed the screening limits of 14,000 mg/kg and 20 mg/L, respectively. The degree and extent of the petroleum hydrocarbons requires further evaluation. IT will further define the baseline

conditions in terms of petroleum hydrocarbon distribution, geology, and hydrogeology. Data obtained during this delineation/preliminary design data collection phase will be used to select and design the extraction and treatment technologies to be implemented in the future under this CTO.

- ***Mini-Storage Area (CAA 13):*** Heavy tar-like petroleum hydrocarbons are present in soil beneath the Mini-Storage Area, as well as in an open unpaved area to the northwest. IT will excavate, transport, and dispose off-site the heavy petroleum hydrocarbons and associated impacted soil. Remediation of groundwater is not part of this CTO.

The primary objectives of the field work described in this plan are listed below:

- Further define baseline conditions in terms of geology, hydrogeology, and petroleum hydrocarbon distribution at each of the four sites.
- Evaluate the effectiveness of vacuum-enhanced extraction methods at the Exchange Service Station (CAA 7), Area 37 (CAA 11), and the Building 530/Defueling Area (CAA 13) through pre-pilot testing.
- Through pilot-scale implementation, establish optimal operating parameters for a full-scale DVE system at the Exchange Service Station (CAA 7).
- Expand the Exchange Service Station system from the pilot-level to full-scale, and operate system until appropriate reduction of the dissolved-phase petroleum hydrocarbons is achieved, or no further removal is practical.
- Assess baseline data and test parameters for appropriate selection and subsequent design of optimal recovery and treatment systems to be installed at Area 37 (CAA 11) and the Building 530/Defueling Area (CAA 13).
- Excavate, transport, and dispose of the heavy, tar-like petroleum substance and associated impacted soil at the Mini-Storage Area and from the open space to the northwest (CAA 13).

Decision criteria for achieving these objectives have been developed through the Data Quality Objectives process and are detailed in the SAP.

1.3 Technical Approach

Under this CTO, IT will perform corrective actions at the Exchange Service Station (CAA 7), Area 37 (CAA 11), the Building 530/Defueling Area (CAA 13), and the Mini-Storage Area (CAA 13). With the exception of the Mini-Storage Area, the corrective actions involve the recovery and removal of free product from the water table and/or dissolved-phase contaminants. The extraction and treatment systems to be designed include vacuum-enhanced extraction methods that will remove soil vapor, free product, and contaminated groundwater to be treated by accessory treatment modules. The technical approach for these corrective actions is to perform the activities in four phases in order to evaluate the extent of petroleum hydrocarbon contamination, confirm that the selected treatment systems are effective for the site conditions, establish optimal operating conditions, and design and install the full-scale recovery systems. This phased approach has been designed to expedite the implementation of the corrective actions, and to minimize the need to change identified field activities as installation of the full-scale recovery systems progresses.

The first phase involves the collection of additional site data that will aid in a more complete definition of the nature and extent of areas impacted by petroleum hydrocarbons. Collection of this data will allow for optimal design of the corrective actions. The extent of TPH-related constituents will be defined with respect to their relevant PRCs. Pre-pilot tests will be performed during the first phase of the corrective actions to: 1) confirm the applicability of the vacuum-enhanced extraction technology to site conditions; and 2) to gather site-specific data required for optimizing the depth and spacing of pilot-scale treatment system wells. The pre-pilot tests will be performed at the Exchange Service Station (CAA 7), Area 37 (CAA 11), and the Building 530/Defueling Area (CAA 13). Pre-pilot tests are not planned for the Mini-Storage Area (CAA 13) since the planned interim corrective action at this site involves the excavation, transportation, and off-site disposal of heavy hydrocarbons and impacted soil. For Area 37 (CAA 11) and the Building 530/Defueling Area (CAA 13), data obtained during the first phase will be used to select and design the remedial extraction and treatment technologies to be implemented at each site. This Work Plan and associated documents cover only the first phase of the corrective actions for Area 37 (CAA 11) and the Building 530/Defueling Area (CAA 13). At the Exchange Service Station (CAA 7), where the nature and extent of the dissolve-phase plume is better understood, DVE has been selected for recovery of MTBE and the ancillary dissolved-phase constituents. This Work Plan and associated documents provide a basis for constructing and operating the full-scale system at the Exchange Service Station (CAA 7).

The second phase will be installation of recovery and observation wells within the plumes delineated during the first phase. Pilot tests will be conducted to establish optimal operating conditions for the full-scale systems and, if applicable, to determine final well system designs. Skid-mounted recovery/treatment systems for vacuum-enhanced extraction will be secured for pilot testing. At the conclusion of the pilot tests, the remedial systems will be operated in the pilot-scale mode until the full-scale designs have been completed and implemented. During the pilot operational period, data will be collected and evaluated to aid in the design of the full-scale systems. Implementation will utilize the design-to-build process, which will be based on data collected during the investigation and pilot-scale operation phases.

During the third phase, the systems will be expanded from pilot- to full-scale. The third phase may also include installation of additional remediation wells and/or expansion of treatment sub-systems. Information obtained during the pilot-scale and testing stages will be directly incorporated into the full-scale systems. The full-scale systems will be operated until adequate cleanup can be demonstrated or the recovery of extracted contaminants has reached an insignificant or cost-prohibitive recovery rate. It is assumed that the systems will be operated for up to 1 year (this includes operation in the pilot-scale mode).

The fourth phase of the corrective actions will consist of closure activities including preparation, submittal, and regulatory concurrence of the site closure reports. Site restoration (including abandonment and closure of the extraction well fields) will complete the project.

1.4 Project Schedule

Figure 2, "CTO 37 Corrective Action Schedule," presents the proposed schedule for implementing the corrective actions at the Exchange Service Station (CAA 7), Area 37 (CAA 11), Building 530/Defueling Area (CAA 13), and the Mini-Storage Area (CAA 13). Pre-construction activities will be performed prior to mobilization. These activities include preparation and submittal of project plans, procurement of subcontractors and equipment, and securing of applicable permits.

The initial field effort to delineate the plume areas and collect preliminary design data will commence in mid-July 2001, following submittal and approval of the project plans. This phase of the work will require approximately two months to complete.

Excavation of the heavy tar-like petroleum hydrocarbons from the Mini-Storage Area (CAA 13) is scheduled to begin in late August following delineation efforts. Excavation, backfill, and site restoration will require approximately 1 month.

System installation is anticipated to commence in October 2001 at the Exchange Service Station (CAA 7) and in January 2002 at Area 37 (CAA 11) and the Building 530/Defueling Area (CAA 13). The systems will be operated until adequate cleanup can be demonstrated or the recovery of extracted contaminants has reached an insignificant or cost-prohibitive recovery rate. It is assumed that the systems will be operated for up to 1 year (this includes operation in the pilot-scale mode).

Post-construction submittals to the Navy include the Geographic Information System (GIS) Data Report, technical memoranda (i.e., monthly progress reports), closure reports, and a Field Activity Report. The GIS Data Report will be completed following the delineation phase.

Technical memoranda will be prepared and submitted monthly during the operation of the pilot- and full-scale systems. Closure reports will be finalized after completion of the corrective actions at each site. It is anticipated that the final closure reports will be submitted in the summer of 2003 and the Field Activity Report will be submitted in April 2003, following abandonment of the well fields.

1.5 Work Plan Organization

Section 2.0 provides general background information on each site, including a summary description of the geology and hydrogeology, a site description, and a summary of the results of the previous investigations. Section 3.0 provides a description of the general field activities to be conducted at the sites. Section 4.0 provides the procedures and general work sequence for plume delineation and pre-pilot testing. Section 5.0 presents the plans for constructing, testing, and operating the pilot- and full-scale recovery systems at the Exchange Service Station (CAA 7). Section 6.0 provides the procedures and general work sequence for the corrective action in the Mini-Storage Area of CAA 13. Section 7.0 presents the reporting requirements. Section 8.0 provides a list of all the cited documents within the text, tables, and figures. Appendix A contains the project EPP. Appendix B, Summary of Previous Investigation Results," provides a summary of site locations where analytical results indicate PRC exceedances or potential free product. Appendix B also provides plume maps that are based on previous data. Appendix C, "Detailed Dual Vacuum Extraction Test Procedures and Test Evaluation Methodology," presents detailed test procedures and test evaluation methodology. Appendix D, "Vacuum-Enhanced Extraction Pilot System Description," provides a description of the vacuum-enhanced extraction and treatment system intended for installation under this Work Plan. Appendix E, "Waste Management Plan," provides information on demobilization and waste handling.

2.0 Site Background

This section presents relevant background information on each of the four sites scheduled for remediation under this CTO, including a site description and history, a brief discussion of site geology and hydrogeology, and a summary of the results of previous investigations. The specific activities presented in this document are based on the background information presented in this section. The discussions regarding analytical results from previous investigations are not inclusive of all analytical data acquired. A more thorough summary of the historical analytical data is presented in Appendix B.

2.1 Exchange Service Station, Corrective Action Area 7

The Exchange Service Station (CAA 7) is described in the following subsections. A brief site description of the site history, hydrogeology, and the results of previous investigations are included.

2.1.1 Site Description and History

CAA 7 is comprised of the former Alameda Point Exchange Service Station (Building 459) and the surrounding area, including an unpaved vacant lot to the north (Figure 3, "Exchange Service Station (CAA 7) Site Map"). The former service station, located at the corner of Main Street and West Tower Avenue, operated from 1966 to 1997. The former service station was comprised of an auto repair shop, a small convenience store, and eight underground storage tanks (USTs), which included six gasoline USTs and two waste oil USTs. One of the waste oil USTs possibly contained waste solvents. A pump island, associated fuel lines, an auto hobby shop, and a small convenience store were also part of the station facilities. The service station and associated facilities were closed in April 1997. Base housing and light industrial naval facilities were adjacent to CAA 7.

The primary sources of contamination at CAA 7 are the former USTs, associated fuel lines, and the pump island (Figure 3). Gasoline and unspecified waste oils and solvents were used at CAA 7. Four 10,000-gallon USTs (459-1 through 459-4) were used for gasoline storage and were located northeast of Building 459. USTs 459-1 through 459-4 failed tank tightness testing in 1987 (Environmental Resource Management-West, Inc. [ERM], 1988). UST 459-4 was removed from service, was drained, and was then filled with water in 1987. The other three USTs were drained following closure of the service station in July 1997. An estimated 30 to 70 gallons of fuel were removed from these USTs. USTs 459-1 through 459-4 were removed on November 13, 1998. The fuel lines connecting the tanks and the fuel pumps were also removed.

Although the USTs showed no evidence of leaks, a strong hydrocarbon odor was noted during the excavation, and contamination was observed in both soil and groundwater within the excavation (TtEMI, 1999c).

USTs 459-5 and 459-6, estimated to have a capacity of 10,000 and 8,000 gallons, respectively, were also used for the storage of gasoline and were located west of the pump island (Figure 3). The USTs were abandoned in place due to leakage and were removed in January 1995 (Navy Public Works Center [PWC], 1997a). Hydrocarbon odors were observed during the excavation, and evidence of contamination was present around the excavation perimeter. Underground piping associated with USTs 459-5 and 459-6 was removed to the edge of the excavation and capped.

USTs 459-7 and 459-8, with capacities of 2,000 and 600 gallons, respectively, were located north of Building 459 (Figure 3). UST 459-7 was used for the storage of waste motor oil. UST 459-8 may have been used for the storage of fuel oil and/or solvents (Navy PWC, 1997a). UST 459-7 had been inactive since failing a vacuum test in December 1991 and was reported to be leaking in 1992. The USTs and their associated pipelines were removed in January 1995 (Navy PWC, 1997a). Upon removal, four holes were observed in UST 459-7. UST 459-8 appeared dented but in good shape. During excavation activities, approximately 500 gallons of water were pumped out of the two tanks. An additional 1,000 gallons of water containing free-phase hydrocarbons were removed from the excavation pit of UST 459-7. Contaminated soil was over-excavated to a depth of 2 feet below the floor of the initial excavation pit at UST 459-7. No evidence of contamination was observed in either soil or groundwater during excavation of UST 459-8.

UST 506-1, located near the auto hobby shop (Building 506), had a capacity of 1,400 gallons and was used for the storage of waste lubricating oil from Building 506 (Figure 3). UST 506-1 and the associated vent and product line were removed in February 1995 (Navy PWC, 1997b). Soil was excavated to approximately 2 feet around the perimeter of the tank. The tank was in good condition, and no signs of contamination were observed in soil or groundwater.

2.1.2 Site Hydrogeology

Four geologic units have been encountered at CAA 7: fill material, bay sediments, the Merritt Sand Formation, and the Upper San Antonio Formation (TtEMI, 1999b). The fill material consists of a 1- to 2-foot layer of gravelly sand underlain by approximately 2 to 6 feet of poorly graded sand to silty sand. A similar material was used to backfill tank excavations and was present in one boring to a depth of 10 feet below ground surface (bgs).

The second geologic unit encountered was the bay sediment unit (BSU). Bay sediments are composed of soft, moist silty clay, clay, clayey sand, and clayey silt material containing decaying plant matter. The BSU ranges from 30 to 50 feet in thickness, with the thickest portion south and east of Building 459. The interface between fill material and native sediment is encountered from approximately 3.5 to 6.5 feet bgs, with the shallower depths encountered south of Building 459 and the deeper depths encountered in the vacant lot to the north of Building 459.

Deeper geologic units present beneath CAA 7 are the Merritt Sand Formation and the Upper San Antonio Formation, which overlie the Yerba Buena Mud Aquitard. Merritt Sand is first encountered at depths ranging from 35 to 45 feet bgs. The Merritt Sand Formation is composed of poorly graded sand to silty sand. The Upper San Antonio Formation directly underlies the Merritt Sand Formation beneath CAA 7 and is comprised of grayish olive silty sand.

Three hydrogeologic units were identified at CAA 7: the first water-bearing zone (FWBZ), the BSU, and the second water-bearing zone (SWBZ). Artificial fill material comprises the FWBZ. The BSU separates the two water-bearing zones. The Merritt Sand Formation and Upper San Antonio Formation comprise the SWBZ. The Merritt Sand Formation disappears in the eastern portion of the site before reaching the pump island, so that the Upper San Antonio Formation alone comprises the SWBZ on the eastern portion of the site. Underlying the SWBZ is the Yerba Buena Mud Aquitard.

At least six monitoring wells at CAA 7 are screened in the FWBZ (although part of the screened interval is within the BSU). Three monitoring wells are screened in the SWBZ and either in the Merritt Sand or Upper San Antonio Formations. None of the monitoring wells showed evidence of tidal influence (PRC Environmental Management, Inc. [PRC-EMI], 1997). During monitoring well installation, groundwater was encountered between 0.2 and 5.6 feet bgs within a clayey unit of the FWBZ.

The groundwater flow direction in the FWBZ is likely influenced by preferential flow paths caused by storm and sanitary sewer lines, as well as leaks in these sewer lines. At the eastern site boundary along Main Street, a drainage ditch that runs north to south may also influence the shallow groundwater flow direction (Figure 3) (TtEMI, 1999b). Although the drainage ditch is predominantly dry for most of the year, a local gradient toward the ditch results in local eastward flow rather than the westward flow typical of the region (TtEMI, 1999b). The drainage ditch leads north to a pump station, which discharges to San Francisco Bay.

2.1.3 *Previous Site Investigations*

In order to identify potential impacts of site activities to the subsurface, several investigations have been conducted in the vicinity of CAA 7. Previous investigations include a site investigation (ERM, 1988), UST removal activities from 1995 to 1998 (Navy PWC, 1997a and 1997b; TtEMI, 1999c), a remedial investigation (RI) (TtEMI, 1999a), an Environmental Baseline Survey (EBS) (IT, 2001a), and the Data Gap Investigation (TtEMI, 2001). TPH and benzene, toluene, ethylbenzene, and total xylenes (BTEX) compounds were detected in soil and groundwater at several soil borings and at sampling points within UST excavations. The Data Gap Investigation indicated the presence of MTBE in groundwater samples collected from three of seven locations sampled. MTBE concentrations ranged from 0.0052 to 12 mg/L. At Piezometer CA07-01, MTBE was detected at 12 mg/L. MTBE was detected at 0.0052 mg/L in Monitoring Well M07A-08 and at 0.75 mg/L in Monitoring Well W-1. MTBE was not detected in the other four monitoring wells sampled (M07A-01, M07A-03, M07A-04, and M07A-09).

Accumulated free product was observed in the vicinity of former USTs 459-5 and 459-6, located west of the pump islands (Figure 3) (ERM, 1988). TPH-diesel was most frequently detected and most widely distributed (TtEMI, 1999a). TPH and BTEX concentrations in soil were generally higher in the shallow samples and decreased with depth (TtEMI, 1999a). At several sampling points, the investigations have identified TTPH at concentrations that exceed the screening limits of 14,000 mg/kg in soil and/or 20 mg/L in groundwater. TTPH concentrations above the screening limits suggest the presence of free-phase hydrocarbons beneath the site (Parsons, 2000). BTEX, TPH as diesel, TPH as gasoline, and TPH as motor oil have been detected in soil samples from borings and UST excavations at concentrations that exceed the residential PRCs (Table 1, "Preliminary Remediation Criteria for Soil, Alameda Point, Alameda, California,"). BTEX concentrations in groundwater from Monitoring Wells W-1, W-2, and W-3 have exceeded the AWQC PRCs (Table 2, "Preliminary Remediation Criteria for Groundwater, Alameda Point, Alameda, California," and Figure 3). A summary of analytical data for constituents exceeding screening limits or applicable PRCs is presented in Appendix B.

Remedial actions at the site have consisted of the abandonment of a section of the storm sewer line in which free product was observed. During a site visit in April 1999, free product was observed in the storm drain located in the central portion of Site 7, just north of the former service station. The presence of free product was attributed to the infiltration of impacted groundwater. Utility and video surveys of the sewer lines were conducted in order to identify subsurface connections and the condition of the line. The utility survey indicated that three catch basins in the eastern portion of Site 7 were connected to Manhole 15; each of these structures is located 50 to 1000 feet to the northeast of Building 459 (Figure 3). The outfall from Manhole 15 flows westward to a previously unidentified manhole. No other connections to this sewer line were observed. The video survey revealed damage to the lines. The outfall from Manhole 15 was plugged where it flowed into the previously unidentified manhole and the line grouted. The lines between the catch basins and Manhole 15 were also plugged and grouted and Manhole 15 and the three catch basins were filled with concrete.

2.2 Corrective Action Area 11, Area 37

CAA 11 is described in the following subsections. A brief site description and the site history, hydrogeology, and the results of previous investigations are included.

2.2.1 Site Description and History

CAA 11 (Figure 4, "Area 37 (CAA 11) Site Map") is located in the Alameda Point Engine Testing and Hazardous Material Zone (Zone 17) and includes Installation Restoration (IR) Site 11 (Building 14), a former fuel storage area (Area 37), and a secondary containment structure (Structure 598/HW-04) for three large aboveground storage tanks (ASTs) (IT, 2001a).

Area 37 is a fenced, multipurpose storage area located in the southeastern portion of Alameda Point and just east of the Seaplane Lagoon (Figure 4). This area was constructed in 1941 and has been used as a fuel and chemical storage area. This area covers approximately 110,000 square feet and is paved with asphalt. The remainder of CAA 11, excluding Building 14, is approximately 90 percent paved, with 10 percent bare soil and grass covered areas. Area 37 served as a central storage point for a variety of fuels, including aviation gasoline, automotive gasoline, diesel fuel, and lubricating oil. Fuel was delivered via underground pipelines to engine test facilities on the base and to ships. A subsurface fuel distribution line that was located along the western boundary of CAA 11 near the Seaplane Lagoon has been removed (Figure 4).

Thirty USTs were previously located in CAA 11 (USTs 37-1 through 37-24 and 14-1 through 14-6) (Figure 4). The capacities of USTs 37-1 through 37-24 ranged from 1,500 gallons to 28,000 gallons. USTs 37-1 through 37-8 and 37-17 through 37-24 were used to store jet fuel and USTs 37-9 through 37-16 were used to store gasoline and diesel fuel. USTs 14-1 through 14-3 had a capacity of 10,000 gallons and were used to store lubrication oil, while USTs 14-4, 14-5, and 14-6 stored oil, gasoline and diesel fuel, respectively. USTs 14-4, 14-5, and 14-6 had 1,000-, 4,500-, and 600-gallon capacities, respectively. The Phase I EBS site inspection noted that the total capacity of USTs for petroleum products was approximately 1,500,000 gallons (IT, 2001a). Three 25,000-gallon ASTs are contained in Structure 598/HW-04. Structure 598/HW-

04 is a former Resource Conservation and Recovery Act (RCRA) site that has been closed since 1995. The Navy is continuing negotiations for the closure of seven other RCRA sites (former USTs 37-1, 37-3, 37-4, and 37-13 through 37-16) (IT, 2001a).

Documented spills have occurred in Area 37 (IT, 2001a). In 1983, a release of jet propellant no. 5 (JP-5) fuel occurred in the northwestern portion of Area 37. A significant amount of fuel was spilled on the asphalt pavement, creating a 10-by-10-foot stain. Cleanup measures undertaken in response to this spill included the excavation of contaminated soil. Another documented spill in this area resulted in a 3-foot diameter black stain. These releases occurred while petroleum products were being dispensed at the USTs. A review of aerial photographs and site inspection data indicate that additional undocumented fuel spills have probably occurred.

2.2.2 Site Hydrogeology

Little site-specific hydrogeologic information for Area 37 is available; however, information on the general hydrogeology of Alameda Point is considered applicable (Parsons, 2000). Accordingly, it can be assumed that the geology consists of shallow fill material, underlain by the BSU, followed by deeper geologic units. The FWBZ is found in the fill material, and the SWBZ is found beneath the BSU, with little or no vertical communication between the two units (Parsons, 2000; TtEMI, 1999b). Groundwater flow in the FWBZ is generally directed radially outward from Alameda Point towards San Francisco Bay, the Oakland Inner Harbor, and the Seaplane Lagoon. Groundwater flow is impacted by preferential flow paths such as storm drains and underground utility conduits. A sheet pile wall located on the northern side of the Seaplane Lagoon is reported to impact groundwater flow in that area. It is not known whether this structure or a similar one (which may exist on the eastern side of the Seaplane Lagoon) impacts groundwater flow in CAA 11 (PRC-EMI, 1997).

Two monitoring wells, D11-01 and M11-02, were installed on the southern and northern sides of Building 14, respectively (TtEMI, 1999b). The boring log for Monitoring Well D11-01 indicates the presence of fill material composed of silty sand from ground surface to 5 feet bgs, where groundwater was first encountered. Historical groundwater elevation records indicate that groundwater is found from approximately 6.5 to 7.5 feet bgs during the months of May through July. A layer of silty sand extends from approximately 5 to 10 feet bgs. The BSU is encountered at 10 feet bgs and is approximately 5 feet thick. Merritt Sand underlies the BSU. Similar lithology was found in Soil Boring M11-02. The fill layer consists of well graded and poorly graded sands. Fill is present from beneath the concrete surface layer to approximately 7.5 feet bgs. The well drilling log indicates that groundwater was first encountered at 7 feet bgs. The water level in the well was 4.88 feet bgs in August 1991. The BSU is encountered approximately at 7.5 feet bgs and extends to the Merritt Sand Formation, approximately 13 feet bgs.

PRC-EMI conducted a tidal influence study at Alameda Point in 1997 (PRC-EMI, 1997). The study included Monitoring Well D11-01. The groundwater table in the southeastern section of Alameda Point, within approximately 1,300 feet of the Seaplane Lagoon, was found to be tidally influenced. The tidal fluctuation measured at Monitoring Well D11-01, which is screened in the SWBZ, was approximately 1.1 feet.

Horizontal groundwater gradients at Area 37 vary between the north and south ends of the site (Parsons, 2000). The groundwater flow direction at the southern end of Area 37 is to the west with a gradient of 0.06 feet per foot (ft/ft), while the flow direction in the central and northern end of Area 37 is to the northwest and west and approximately 0.0045 ft/ft.

2.2.3 Previous Site Investigations

In order to identify potential impacts of site activities to the subsurface, several investigations have been conducted in the vicinity of CAA 11. Previous investigations include UST and fuel distribution line removal activities from 1995 to 1998 (Navy PWC, 1996a and 1996b; TtEMI, 1999d and 1999e), an RI (TtEMI, 1999a), an EBS (IT, 2001a), and a Data Gap Investigation (TtEMI, 2001). The previous investigations indicate that a single point source is not likely, but rather that several point sources (including USTs, pipelines, and spills) have resulted in localized areas of contamination. Site data indicate that contaminants are concentrated in the vicinity of: 1) former USTs 14-4 and 14-5 located near the southeastern corner of Building 14; 2) former USTs 37-15 and 37-16 at the southern boundary of Area 37; 3) the former fuel farm, especially in the vicinity of former USTs 37-1 through 37-4, former USTs 37-8 through 37-10, and former USTs 37-12, 37-17, 37-18, and 37-24; and 4) the former fuel distribution line east of Seaplane Lagoon (Figure 4).

Free-phase hydrocarbons were noted in the excavations for USTs 14-4 and 14-5 (Figure 4) (Navy PWC, 1996a). At several sampling points, the investigations identified TTPH in concentrations that exceed the screening limits of 14,000 mg/kg in soil and/or 20 mg/L in groundwater. TTPH concentrations above the screening limits suggest the presence of free-phase hydrocarbons beneath the site (Parsons, 2000). Concentrations of TPH as diesel, as gasoline, as motor oil, and JP-5 in soil have exceeded residential PRCs (Table 1). Concentrations of BTEX in soil have not exceeded residential PRCs. In groundwater, concentrations of toluene and primarily benzene have exceeded PRCs for potential drinking water sources (Table 2). A summary of analytical data for constituents exceeding screening limits or applicable PRCs is presented in Appendix B.

2.3 Corrective Action Area 13, Building 530/Defueling Area

The Building 530/Defueling Area (CAA 13) is described in the following subsections. A brief site description and history, geology and hydrogeology, and the results of previous investigations are included.

2.3.1 Site Description and History

The Building 530/Defueling Area in CAA 13 is located in the Southeastern Refinery and Heavy Industrial Zone. Building 530 was used as a missile rework facility and is IR 23. IR Site 13, former Pacific Coast Oil Works refinery, is located to the north of Building 530. The focus of this CTO are the areas to the west and north of Building 530 (Figure 5, "Building 530/Defueling Area (CAA 13) Site Map").

The area immediately west of Building 530 was used for aircraft defueling between 1958 and 1963 (Figure 5). The defueling area is paved with concrete. The area around all five former defueling pumps is stained. Stains were noted around drainage barrels adjacent to the pumps (IT, 2001a).

Five former ASTs used for fuel storage were located in the paved, open space to the northeast of Building 530 (Figure 5). These ASTs were part of the former Pacific Coast Oil Works refinery facilities. The ASTs are suspected sources for TPH and benzene plumes entering the Building 530 area from the northeast corner and migrating west by southwest (TtEMI, 2001). The plumes may be migrating along storm drain lines that run east-west along the north side of Building 530. Hydrocarbon odors have been reported in these storm drain lines (TtEMI, 2001).

2.3.2 Site Hydrogeology

Building 530 is included in the southeastern portion of Operable Unit 2. As with the previously discussed areas, the first geologic unit consists of fill material (TtEMI, 1999b). Unlike previously discussed areas, the BSU is thin and discontinuous in the southeastern area of Alameda Point. Bay sediments, where encountered, lie approximately 10 to 15 feet bgs in the Building 530 area. These layers are underlain by the Merritt Sand Formation followed by the deeper geological units. The FWBZ is the only water-bearing zone encountered in this area; however, it is present in two separate intervals, located in both the fill layer and the Merritt Sand layer. These two intervals are considered to be in hydraulic communication (the vertical gradient varies from 0.03 ft/ft upward to 0.001 ft/ft downward). Operable Unit 2 groundwater elevations are tidally influenced, especially where storm drains allow communication with the Seaplane Lagoon (TtEMI, 1999b).

Several monitoring wells and soil borings located near Building 530 were used to characterize site geology (Figure 5). Boring D10B-02 is located off the northwest corner of Building 530, and Soil Boring BOR-25 is located southeast of Building 530. Monitoring Well MW530-2 is located on the western side of Building 530, and Monitoring Well D10B-01 is located southwest of Building 530.

- At Boring D10B-01, poorly graded sand was found from beneath a surface layer of asphalt to 15 feet bgs. A layer of silty sand/sandy clay was found from 15 to 17.5 feet bgs. The Merritt Sand Formation was under the silty/sand clay layer. The amount of tidal influence at this location is unknown, but groundwater measurements show that water levels range from 3.92 to 4.55 feet bgs between May and August.

- Silty sand was found at Boring BOR-25 from beneath a surface layer of asphalt to 15 feet bgs. Groundwater was first encountered at 6 feet bgs at the time of drilling (June 20, 1990).

- Silty sand was found at Monitoring Well MW530-2 from beneath a surface layer of asphalt to 12.5 feet bgs. The BSU (clay) was found from 12.5 to 15 feet bgs, where the drilling was terminated. Groundwater was first encountered at 6 feet bgs. The amount of tidal influence fluctuation at this location is unknown, but groundwater measurements show that water levels range from 3.99 to 6 feet bgs between May and August.

- Poorly graded sand was found at Monitoring Well D10B-02 from ground surface to approximately 10 feet bgs. A layer of clayey sand was found from 10 to 11 feet bgs, followed by the BSU (clay) from 11 to 15 feet bgs. The Merritt Sand was found below 15 feet bgs. The amount of tidal fluctuation at this location is not known, but groundwater measurements show that water levels range from 4.16 to 5.36 feet bgs between the months of May and August.

The general groundwater flow direction in southeastern Alameda Point is generally west and southwest toward the Seaplane Lagoon and San Francisco Bay. Groundwater flow is impacted by preferential flow paths such as storm drains and utility corridors near industrial buildings. Although the water table is tidally influenced in the area, the amount of tidal influence is unknown.

2.3.3 Previous Site Investigations

In order to identify potential impacts to the subsurface, several investigations have been conducted in the vicinity of the Building 530/Defueling Area (CAA 13). Previous investigations include an RI (TtEMI, 1999b), a site-wide EBS (IT, 2001a), and the Data Gap Investigation (TtEMI, 2001). The highest TPH concentrations were generally observed at sampling locations to the north and northeast of Building 530 (Figure 5) (TtEMI, 1999b). TPH as diesel and TPH as motor oil appear to be the predominant petroleum fractions present in the subsurface. TPH-diesel fractions predominated in samples collected north of Building 530, and TPH-motor oil fractions predominated in samples collected south of Building 530 (TtEMI, 1999b).

At several sampling points, the investigations identified TTPH at concentrations that exceed the screening limits of 14,000 mg/kg in soil and/or 20 mg/L in groundwater (IT, 2001a). TTPH concentrations above the screening limits suggest the presence of free-phase hydrocarbons beneath the site (Parsons, 2000). Concentrations of benzene, TPH-gasoline, TPH-motor oil, and predominantly TPH-diesel in soil have exceeded residential PRCs (Table 1). In groundwater, concentrations of toluene and primarily benzene have exceeded PRCs for potential drinking water sources (Table 2). A summary of analytical data for constituents exceeding screening limits or applicable PRCs is presented in Appendix B.

2.4 Corrective Action Area 13, Mini-Storage Area

The Mini-Storage Area in CAA 13 is described in the following subsections. A brief site description and history, geology and hydrogeology, and the results of previous investigations are included.

2.4.1 Site Description and History

The Mini-Storage Area is located within CAA 13 and IR Site 13 (Figure 6, "Mini-Storage Area (CAA 13) Site Map"). Activities and historical industrial uses of this area are not well documented (TtEMI, 1999b). Heavy hydrocarbons of an asphaltic, tar-like consistency are the targeted contaminants in this area. The Pacific Coast Oil Works refinery, which operated from 1879 to 1903, was partially located in the Mini-Storage Area. Petroleum refinery operations in the late 1800s consisted of distilling crude oil to kerosene and light fuel oil. Wastes from this type of operation would be expected to include heavier molecular weight hydrocarbons that would weather to an asphaltic, tar-like consistency. Staining and a tar-like substance can be seen on the ground surface at the Mini-Storage Area. A similar tar-like heavy hydrocarbon is present in the open space to the northwest of the Mini-Storage Area (Figure 6). Both of these locations are contained within CAA 13, and both removals will be handled under the Mini-Storage Area scope of work.

Currently, no permanent buildings occupy the Mini-Storage Area, but aerial photographs indicate 18 buildings were located on the parcel in March 1947 (IT, 2001a). Sixteen of the buildings were demolished prior to August 1953, and two of the buildings were demolished prior to November 1981. The Mini-Storage area is currently paved with asphalt and occupied by rows of cinder-block storage lockers.

2.4.2 Site Hydrogeology

The hydrogeology of the Mini-Storage Area is similar to that described for the Building 530/Defueling Area (CAA 13). No direct geological data is available for the Mini-Storage Area; however, several soil borings were installed on the eastern edge of IR Site 13/CAA 13 (TtEMI, 1999b). The three closest soil borings to the Mini-Storage Area are BOR-24 and Monitoring Wells M13-09 and D13-01.

Boring BOR-24 was located southeast of the Mini-Storage Area. Silty sand was found from beneath a surface layer of asphalt to a depth of 6 feet bgs. The silty sand was followed by the Merritt Sand Formation consisting of clayey fine sand from 6 to 12 feet bgs and of silty sand from 12 to 15.5 feet bgs. Groundwater was first encountered at 5 feet bgs.

Monitoring Well M13-09 is located northeast of the Mini-Storage Area. Poorly graded sand was found from beneath a surface layer of asphalt to 13 feet bgs. Bay sediments were not observed, although traces of organic matter and trace silt and trace clay were found from approximately 9.5 to 11 feet bgs. The Merritt Sand Formation was found below 11 feet bgs. Groundwater was first encountered at 3.2 feet bgs.

Monitoring Well D13-01 is located east of the Mini-Storage Area. Gravelly, sandy silt was found from beneath a surface layer of asphalt to a depth of 5 feet bgs. The Merritt Sand Formation consisting of sandy silty clay was found from 5 to 15 feet bgs. The majority of the soil detected beyond 15 feet bgs were poorly graded sands, with intermittent layers of silty sand and sandy clays. Groundwater was first detected at 8.6 feet bgs.

It is unlikely that any of these locations are tidally influenced. Historical groundwater records show that groundwater levels vary between the months of May and August from 2.49 to 4.86 feet bgs at Monitoring Well M13-09 and from 1.33 to 4.2 feet bgs at Monitoring Well D13-01.

2.4.3 Previous Site Investigations

<u>Mini-Storage Area</u>

In order to identify potential impacts to the subsurface, several investigations have been conducted in the vicinity of the Mini-Storage Area (CAA 13) (Figure 6). Previous investigations include an RI (TtEMI, 1999b) and the Data Gap Investigation (TtEMI, 2001). At several sampling points, the investigations have identified TTPH at concentrations that exceed the screening limits of 14,000 mg/kg in soil and/or 20 mg/L in groundwater. TTPH concentrations above the screening limits suggest the presence of free-phase hydrocarbons (Parsons, 2000). Concentrations of TPH-gasoline, TPH-diesel, and predominantly TPH-motor oil in soil have exceeded residential PRCs (Table 1). BTEX concentrations have not exceeded the residential PRCs. In groundwater, the concentration of benzene has exceeded the PRC for potential drinking water sources at various sampling locations (Table 2). A summary of analytical data for constituents exceeding screening limits or applicable PRCs is presented in Appendix B.

Open Area Space to the Northwest

In 1989, the Navy contracted HLA to conduct a geotechnical investigation in the open area to the northwest of the Mini-Storage Area (TtEMI, 1999b). The geotechnical investigation was conducted to prepare for the construction of two proposed buildings known as the Intermediate Maintenance Facility. Eighteen soil borings were drilled in this area as part of the investigation. Free hydrocarbon product was encountered in one boring, and hydrocarbon stains and odors were identified in nine others. Boring B-IMF-07 exhibited the highest concentrations of TPH (Figure 6). Additional sampling in 1991 by PRC confirmed the presence of petroleum hydrocarbons, elevated lead concentrations, and low pH (less than 2) in soil near the same boring. The investigation concluded that the low pH was related to the presence of a tar-like oily material (TtEMI, 1999b).

In 1993, the Navy initiated soil removal activities in the vicinity of Boring B-IMF-07. The excavation area measured approximately 25 by 30 feet and had a maximum depth of 7 feet bgs (TtEMI, 1999b). Approximately 120 cubic yards of contaminated soil was excavated and shipped to a Class I landfill. Lead concentrations in all but one confirmation sample were below 100 mg/kg. The remaining sample had a lead concentration of 121 mg/kg.

3.0 General Field Activities

Prior to installing the remediation systems, field data will be collected to assist in the determination of system dimensions, to assess volume of contaminated soil and groundwater to be addressed, and to determine initial groundwater chemistry. The data will be acquired by driving soil borings with a direct-push technology (DPT) rig in order to screen the vadose zone for hydrocarbons and to collect discrete soil and groundwater samples. Temporary piezometers will be installed in soil borings to determine groundwater flow gradients and to collect additional groundwater samples, as necessary. Once the contaminant plumes are delineated, extraction wells will be installed. At the Mini-Storage Area, free product and associated impacted soil will be excavated for disposal off site.

Sampling conducted to date indicates the presence of dissolved-phase hydrocarbons and the potential presence of free product. The degree and extent of the petroleum hydrocarbons requires further delineation to adequately design the remediation systems. This section describes general field activities that will be performed to further delineate the extent of contamination beneath each of the four sites contained in this Work Plan.

3.1 Sampling and Evaluation of Existing Wells

Prior to conducting plume delineation field activities, select monitoring wells at each CAA will be evaluated and sampled (Table 3, "Corrective Action Area Monitoring Wells To Be Evaluated,"). Monitoring well evaluation activities will include an assessment of well screen intervals in relation to the water table elevation and the type of geologic unit exposed (fill material, BSU, Merritt Sand Formation, and/or Upper San Antonio Formation). Each site monitoring well will be monitored visually for the presence of free product. An oil/water interface probe will be used to check for free product following the procedures outlined in IT Standard Operating Procedure (SOP) No. 5.2, "Nonaqueous Phase Liquid Measurement in Monitoring Wells" (IT, 2000). Depth to groundwater will be measured per IT SOP No. 5.1, "Water Level Measurements in Monitoring Wells" (IT, 2000). Water table contour maps for each site will be generated. Groundwater at select monitoring wells will be sampled as described in Section 4.0 of the Field Sampling Plan (FSP) and IT SOP No. 9.1, "Groundwater Sampling" (IT, 2000). The analytical sampling results will be reviewed prior to conducting plume delineation activities contained in Section 4.0. The results of this review will be utilized to support, if appropriate, a reduction in the list of analyses to be performed at each CAA.

3.2 Permits and Notifications

Prior to mobilization, temporary piezometer and extraction well permit applications will be submitted to the Alameda County Public Works Agency. IT will notify Underground Service Alert (USA) at least 48 hours prior to initiation of drilling, and secure appropriate authorizations from the Caretaker Site Office (CSO). The soil borings will be drilled and the wells will be installed by a C-57 licensed subcontractor and in accordance with County requirements and California Department of Water Resources regulations (California Department of Water Resources, 1981 and 1991).

IT will notify the Bay Area Air Quality Management District (BAAQMD) in writing 5 working days before excavating any contaminated soil, as required by BAAQMD Regulation 8, Rule 40. IT will also notify USA at least 48 hours prior to initiation of excavation activities, and will secure the appropriate authorizations from the CSO. IT will maintain these clearances and authorizations for the duration of the field effort.

3.3 Mobilization

After procurement of equipment and services, mobilization for the field work will occur. A preparatory phase inspection will be held prior to mobilization to discuss project scope, health and safety requirements, sampling procedures, excavation procedures, status of permit submittals and procurements, and quality control protocols. In addition, mobilization will include designating an equipment staging area, a soil staging area, a fluids staging area, an equipment decontamination area, and installing security fence, as necessary, around the work areas. A temporary decontamination pad will be constructed on site. All drilling and heavy equipment will be decontaminated prior to mobilization/demobilization and between boreholes. Protocols for decontamination of equipment are discussed in Section 6.0 of the FSP and in IT SOP No. 6.2, "Drilling and Heavy Equipment Decontamination" (IT, 2000).

3.4 Utility Clearances

Utility clearance surveys will be conducted to determine the configuration of existing site utilities to avoid subsurface drilling and excavation hazards (e.g., utility lines). Land surface utility clearances will be conducted by an independent utility clearance subcontractor. The clearances will be performed at each soil boring, well boring, and excavation location. Utility clearances will be conducted in accordance with IT SOP No. 7.1, "Surface and Subsurface Geophysics" (IT, 2000). Additional project-specific requirements are provided below.

Prior to utility clearance, existing site utility maps will be reviewed with due diligence, and the technical leader (or designee) will mark all preliminary boring and/or excavation areas. Marking will consist of painting or staking the ground surface or pavement at the proposed locations. The stake or ground marking will identify the boring by number. Marking will be done using either a permanent waterproof marker or paint.

A minimum 10-foot radius will be surveyed for subsurface obstructions around the proposed location of each boring and over the entire area where an excavation is proposed. Utility corridors that are known or suspected at the site will also be traced and marked to further evaluate their potential to act as conduits for contaminant transport.

The subcontractor will note each cleared sampling location with paint or with a stake immediately upon clearing it. All suspected underground utility conduits and structures will be marked with color-coded marking paint according to standards established by the American Public Works Association. If utilities or other obstructions or hazards are identified at any location, IT's field representative will identify a new location to be cleared.

Surface geophysical methods that may be used for underground utility identification include, but are not limited to, electromagnetic induction and geomagnetics. Anticipated utilities to be cleared include, but are not limited to, pipelines for natural gas, water, fuel, etc. (generally anything metallic); electrical lines; telephone or other transmission lines; and drainage lines and sewers (industrial, sanitary, and storm).

3.5 Soil and Groundwater Sampling

At all sites, primary and secondary (step-out) soil borings will be drilled using a continuous core, DPT rig. The soil borings will be used to acquire discrete soil and groundwater samples. The methods and procedures for sampling are presented in Sections 4.0 and 6.0, respectively, of the FSP. To evaluate the subsurface lithology, the soil borings will be logged by a geologist working under the direction of a California Registered Geologist. Geologic logs will be produced for each boring according to the Unified Soil Classification System (USCS) and American Society for Testing and Materials (ASTM) D-2488. At the Mini-Storage Area, soil borings will be utilized to assess the extent of free product and impacted soil to be excavated.

Soil borings will be drilled to approximately 20 feet bgs. Except in the Mini-Storage Area, soil samples will be collected where soil is significantly stained or photoionization detector (PID) readings of organic vapor from soil exceed 500 parts per million (ppm). Soil samples from the Mini-Storage Area will be acquired at locations without staining or elevated PID readings.

Except for the Mini-Storage Area, significantly stained soil and high PID readings are not anticipated to exist outside previously investigated areas of concern.

Up to two groundwater samples will be collected per soil boring. A discrete groundwater sample will be acquired via the Hydropunch® method near the soil/groundwater interface of each soil boring (with the exception of the borings drilled in the Mini-Storage Area) per IT SOP No. 10.2, "Cone Penetration Testing and Hydropunch Groundwater Sampling" (IT, 2000). Deeper (15- and 20-foot) discrete groundwater samples will be collected in close proximity to known point sources. As distance from the point sources increases, shallower (10- and 15-foot) discrete groundwater samples will be collected. Actual groundwater sampling depths will be determined in "real-time" and at the discretion of the field geologist.

3.6 Piezometer Installation

Temporary piezometers will be installed in soil borings to confirm the primary direction of groundwater flow and to measure water table fluctuations caused by tidal influence and/or the future pilot treatment system. At Area 37 (CAA 11) and the Building 530/Defueling Area (CAA 13), the temporary piezometers will additionally be used to sample and measure the thickness of free product, if present. The temporary piezometers will be constructed using 1-inch polyvinyl chloride (PVC) blank casing, 1-inch PVC slot casing (10 slot), and a threaded screw end-cap. A non-locking threaded cap or an expandable locking end-cap will form the surface completion of the temporary piezometer that will be screened across the water table to the bottom of the soil boring. In no case shall the top of the screen be less than 3 feet bgs. The maximum depth of the screen interval is anticipated to be about 20 feet bgs. Temporary piezometers will not be installed at the Mini-Storage Area.

3.7 Surveying

All soil borings, temporary piezometers, and extraction wells will be surveyed. All extraction wells will be surveyed prior to field testing. The limits of the excavation(s) at the Mini-Storage Area will also be surveyed. All surveying will be conducted under the supervision or direction of a State of California-certified land surveyor. Surveying will be performed in accordance with IT SOP 23.1, "Land Surveying" (IT, 2000). Additional, project-specific requirements are presented below.

Vertical elevations of each well and piezometer will be determined to the nearest 0.01 foot. The measurement point will be clearly and permanently marked on the well casing. Elevations shall be based on the National Geodetic Vertical Datum of 1929 (NGVD29) as adjusted by the National Geodetic Survey in June 1991 and converted to NGVD29. The horizontal location of each well and piezometer will be determined to the nearest 0.1 foot and will be referenced to the California State Plane Coordinate System, Zone III (NAD83.92), as published by the National Geodetic Survey. If not already present, a minimum of one permanent control monument will be installed within a distance of 1,000 feet of each point to be surveyed.

3.8 Well and Piezometer Abandonment

Following completion of the corrective action at the Exchange Service Station (CAA 7), all site remediation wells and piezometers will be abandoned as outlined in IT SOP 8.3, "Bore Hole and Well Abandonment" (IT, 2000). Wells and piezometers will be abandoned by drilling out the well using the hollow-stem drilling method. Boreholes will then be backfilled to the surface with a bentonite-cement grout. The grout will be tremied into the hole. Destruction of the wells will be in accordance with California Department of Water Resources (CDWR) well abandonment standards (CDWR, 1981, 1988, and 1991).

3.9 Equipment Decontamination

Drilling, development, and heavy equipment will be decontaminated following the procedures outlined in IT SOP 6.2, "Drilling and Heavy Equipment Decontamination" (IT, 2000). Drill rigs and equipment will be decontaminated before mobilization to the field, between boreholes, and prior to demobilization from the field. A decontamination station will be set up in an area exclusively for decontamination of drilling, well development, and heavy equipment. The station will be constructed such that all decontamination rinsate, liquid spray, soil, and other wastes are fully contained for disposal. Fluids and sediment generated at the portable decontamination pad will be contained in portable tanks.

Sampling equipment will be decontaminated to ensure the quality and integrity of the samples collected. Sampling equipment will be decontaminated in accordance with IT SOP 6.1, "Sampling Equipment and Well Material Decontamination" (IT, 2000). Additional project-specific requirements are presented in Section 6.0 of the FSP.

4.0 Plume Delineation Activities

This section outlines plume delineation and pre-pilot test activities. The data collected during the initial field efforts contained in this section will provide further definition of the baseline conditions in terms of contaminant distribution and subsurface hydrogeology. The additional site data will aid in selection and design configuration of the recovery and treatment systems to be installed under this CTO. In the Mini-Storage Area, plume delineation data will be utilized to pre-define the limits of excavation.

4.1 Dissolved-Phase Plume Delineation – Exchange Service Station (CAA 7)

Previous site investigations at the Exchange Service Station (CAA 7) have concentrated on the removal of USTs and on definition of gross contamination in close proximity to the USTs. Prior site investigations have additionally concentrated on areas south of Buildings 459 and 506. The previous investigations have established that the primary contaminant sources within the Exchange Service Station (CAA 7) are former USTs 459-1 through 459-6 and the pump island (Figure 7).

Data gap sampling conducted in April 2000 indicated the presence of MTBE in groundwater samples collected from three of seven locations sampled. At piezometer CA07-001, MTBE was detected at 12 mg/L (Figure 7) (TtEMI, 2001). BTEX concentrations in groundwater Monitoring Wells W-1, W-2, and W-3 have exceeded the AWQC PRCs. Additionally, BTEX and TPH as diesel, gasoline, and motor oil have been detected in soil from borings and/or excavations at concentrations above residential PRCs.

IT will further investigate the extent of petroleum hydrocarbons, and then design, build, and operate a system for removal of the MTBE and ancillary dissolved-phase TPH constituents. It is anticipated that the extraction system will be an expansion of a DVE free product recovery system that will be installed at this site under CTO 13 (IT, 2001b).

This Work Plan provides: 1) the general procedures for further delineating dissolved-phase hydrocarbons and collecting preliminary design data; 2) the projected plans for conducting extraction and treatment system pilot- and full-scale tests; and 3) a basis for constructing and operating the anticipated DVE treatment system.

4.1.1 Soil Boring Placement Strategy

The primary contaminant sources at the Exchange Service Station (CAA 7) are considered to be former service station USTs 459-1 through 459-6, which are likely to have been buried within excavated portions of the BSU (Section 2.1). Because the BSU acts as a 30- to 50-foot thick, semi-confining layer above the SWBZ, and because the original UST excavations are not considered to be greater than 15 ft bgs, discrete groundwater samples will be limited to depths less than 20 ft bgs, which is the maximum anticipated depth of contamination. Dissolved-phase contamination is not anticipated to exist within the Merritt Sand and Upper San Antonio Formations due to the thickness and lithology of the BSU and the light density of the petroleum fuel contaminants.

Following review of the initial groundwater data (Section 3.1), 12 primary soil borings will be drilled and sampled to further assess the extent of petroleum hydrocarbon contamination. Soil borings will be located outside the free-phase hydrocarbon (free product) plume beneath the former service station. The free product boundary will be based on free-product plume delineation activities performed under CTO 13 (IT, 2001b). Primary soil borings will be located around the inferred dissolved-phase plume boundaries to provide further definition of contaminant distribution. Inferred dissolved-phase plume boundaries for various site contaminants are presented in Figure 7, "Primary Soil Boring Locations, Exchange Service Station (CAA 7)," and Appendix B. Placement of soil borings in this manner will permit early evaluation of dissolved-phase plume boundaries up- and down-gradient from the former USTs. Primary soil borings will also be placed at the eastern boundary of the Exchange Service Station to evaluate whether the drainage ditch along Main Street: 1) significantly influences the local groundwater flow gradient; and 2) serves as a conduit for the migration of contaminated groundwater. Twelve proposed primary soil boring locations are identified in Figure 7. Actual soil boring locations may vary according to field conditions.

A discrete groundwater sample will be acquired near the soil/groundwater interface of each soil boring. Deeper (15 and 20 foot) discrete groundwater samples will be collected in close proximity to the former USTs. As distance from the USTs increases, shallower (10 and 15 foot) discrete groundwater samples will be collected. Actual groundwater sampling depths will be determined at the discretion of the field geologist. Up to two groundwater samples will be collected per boring. Soil samples will also be collected from borings if evidence of soil contamination (soil staining or PID readings greater than 500 ppm) is observed. Proposed field and sampling activities for the Exchange Service Station (CAA 7) are identified in Table 4, "Proposed Field Activities for the Exchange Service Station, CAA 7."

Up to 15 secondary soil borings may be advanced. Their locations and associated discrete soil and groundwater sampling depths will be based on analytical results obtained from the primary soil borings. Secondary soil borings will be installed in step-out fashion. The basic strategy will be to "step-out" where soil and groundwater chemical concentrations are above threshold limits and to "step-in" where threshold limits are not exceeded (Tables 1 and 2). The Exchange Service Station and neighboring site boundaries, along with site physical features, such as buildings and underground utilities, will limit the distance of step-out soil borings locations.

4.1.2 Pre-Pilot Testing

Two pre-pilot tests will be conducted at the Exchange Service Station (CAA 7). The pre-pilot tests will consist of extracting vapor and groundwater from one remediation well located just outside the free product plume boundary and from one remediation well located just inside the dissolved-phase plume boundary. A vacuum truck will be used to apply a vacuum to the remediation wells. Each well will be monitored by observation wells located approximately 5 and 15 feet away from the remediation well. The purpose of the pre-pilot tests is to gather site-specific data required for determining the optimum depth of and spacing between remediation wells for the pilot- and full-scale remedial systems. Well locations and screen intervals will be determined after the petroleum hydrocarbon distribution is better defined. Typical well designs are discussed in Section 5.0. To the extent possible, pre-pilot tests will utilize existing wells and piezometers. Recovered groundwater will be treated on site or will be shipped off site for disposal.

Groundwater samples will be acquired before and after purging the remediation wells to determine if vacuum purging alone is a viable means of contaminant reduction beneath the Exchange Service Station. Groundwater samples will also be acquired to evaluate the capability of the aquifer to naturally attenuate. Groundwater sampling will be performed according to Section 4.0 of the FSP.

4.2 Dissolved-Phase Plume Delineation – Area 37 (CAA 11)

Fuel releases have historically occurred at Area 37 in CAA 11. Area 37 served as a fuel and hazardous materials storage area and as a central fuel storage point for a variety of fuels delivered via underground pipelines to engine test facilities around the base and to ships. A subsurface fuel distribution line formerly paralleled the western boundary of this site near the Seaplane Lagoon (Figure 8, "Primary Soil Boring Locations, Area 37 (CAA 11)").

Previous site investigations at this site have primarily concentrated on removal of USTs and associated pipelines within the area. Soil and/or groundwater analytical results indicate the presence of TPH (as diesel, gasoline, motor oil, and JP-5) and VOCs (primarily as BTEX). The previous investigations indicate that a single point source is not likely, but rather that several point sources (including USTs, pipelines, and spills) have resulted in localized areas of contamination. Site data indicate that contaminants are concentrated in the vicinity of: 1) the former oil/water separator UST 14-4 located near the southeastern corner of Building 14; 2) former USTs 37-15 and 37-16 at the southern boundary of Area 37; 3) the former fuel farm, especially in the vicinity of former USTs 37-1 through 37-4, former USTs 37-8 through 37-10, and former USTs 37-12, 37-17, 37-18, and 37-24; and 4) the former fuel distribution line east of the Seaplane Lagoon (Figure 8).

This Work Plan provides the general procedures for: 1) further evaluating the degree and extent of petroleum hydrocarbon contamination; and 2) collecting site-specific preliminary design data. Data obtained during this first phase will be used to select and design the remedial extraction and treatment system to be installed at Area 37. The extraction and treatment system design is anticipated to follow the design projected for the Exchange Service Station in CAA 7 (Section 5.0). Such designs will be considered more fully after the degree and extent of contamination at Area 37 is further assessed.

4.2.1 Soil Boring Placement Strategy

Inferred dissolved-phase plume boundaries for various site contaminants are presented in Appendix B. For the purposes of plume delineation under this Work Plan, Area 37 (CAA 11) is considered to contain four source areas of concern that constitute co-mingled plumes from multiple contaminant sources (Figure 8). The four major source areas of concern are considered to include:

- Source Area 1 – Primary point sources are former oil water separator UST 14-4 and former USTs 37-1 through 37-4, USTs 37-8 through 37-10, and USTs 37-12, 37-17, 37-18, and 37-24. Releases have affected an undefined area between the southern portion of Building 14 and the northern portion of the former fuel farm.
- Source Area 2 – Primary point sources are former USTs 37-8 through 37-10 and UST 37-12. Releases have affected an undefined area in the southern portion of the former fuel farm.
- Source Area 3 – Primary point sources are leaks from the former fuel distribution line along the western boundary of Area 37. Releases are considered to be localized along the excavation for the former distribution line.
- Source Area 4 – Primary point sources are former USTs 37-16 and 37-17. Releases have affected the southernmost portion of Area 37.

Following review of the initial groundwater data (Section 3.1), up to 53 primary soil borings will be drilled and sampled. Primary borings will be placed: 1) outside the assumed boundaries of the source area plumes to aid in defining the limits of the plumes; 2) within the inferred source area plumes to assess the degree to which individual contaminant plumes have co-mingled; 3) within potential free product plume areas modeled by Parsons (Parsons, 2000); and 4) near previous sampling locations for collection of natural attenuation data. Soil borings placed internal to the source area plumes will further identify the source area as a co-mingled plume or as an area with "hot-spots." Primary proposed soil boring locations are identified in Figure 8. Actual soil boring locations may vary according to field conditions.

The general approach to groundwater sampling will be to acquire a discrete groundwater sample from the water table surface at each proposed boring location identified in Figure 8. Deeper, 10- to 20-foot, discrete groundwater samples from the BSU and the Merritt Sand Formation will be acquired at boring locations in close proximity to former contaminant point sources. As distance from the former point sources increases, discrete groundwater samples from the water table and the BSU will be acquired. Up to two groundwater samples will be collected per boring. Soil samples will also be collected from borings if evidence of soil contamination (soil staining or PID readings greater than 500 ppm) is observed. Proposed field and sampling activities for Area 37 (CAA 11) are identified in Table 5, "Proposed Field Activities for Area 37, CAA 11."

Up to 25 secondary soil borings may be advanced. Their locations and associated discrete soil and groundwater sampling depths will be based on analytical results obtained from the primary soil borings. Secondary soil borings will be drilled in step-out fashion. The basic strategy will be to "step-out" where soil and groundwater chemical concentrations are above threshold limits and to "step-in" where threshold limits are not exceeded (Tables 1 and 2). Placement of soil borings in this manner will help differentiate "hot-spot" areas from larger, co-mingled plume areas. Such differentiation is directly related to treatment system design. Area 37 and neighboring site boundaries, along with site physical features, such as buildings and underground utilities, will limit the distance of step-out soil boring locations.

4.2.2 Pre-Pilot Testing

To collect data for use in designing a vacuum-enhanced extraction and treatment system, two pre-pilot tests will be conducted. The pre-pilot tests will consist of extracting vapors and groundwater (or free product, if present) from two remediation wells located inside the petroleum hydrocarbon plume(s). A vacuum truck will be used to apply a vacuum to the remediation wells. Each remediation well will be monitored by observation wells located approximately 5 and 15 feet away from the remediation well. The purpose of the pre-pilot tests will be to gather site-specific data required for determining the optimum depth of and spacing between remediation wells for the pilot- and full-scale remedial systems. Well locations and screen intervals will be determined after the petroleum hydrocarbon distribution is better defined. Typical well designs are discussed in Section 5.0. To the extent possible, pre-pilot tests will utilize existing wells and piezometers. Recovered groundwater will be treated on site or shipped off site for disposal.

Groundwater samples will be acquired before and after purging the wells to determine if vacuum purging alone is a viable means of contaminant reduction beneath Area 37 (CAA 11). Groundwater samples will also be acquired in order to evaluate the capability of the aquifer to naturally attenuate. Groundwater sampling will be performed according to Section 4.0 of the FSP. If free product is present in a pre-pilot remediation well, product thickness will be measured before and after purging the well. Groundwater samples will not be collected from a pre-pilot test well that contains free product.

4.3 Dissolved-Phase Plume Delineation – Building 530/Defueling Area (CAA 13)

Based on prior investigations, there is a sufficient number of sampling locations to indicate that the potential for free product exists west and north of Building 530 (Figure 9, "Primary Soil Boring Locations, Building 530/Defueling Area (CAA 13)"). To the west of Building 530, free product may exist beneath the concrete pad of the defueling area, where TTPH concentrations in soil and groundwater exceeded screening limits of 14,000 mg/kg for soil and exceeded 20 mg/L for groundwater (IT, 2001a). Free product may also be present within the sewer lines north of Building 530.

This Work Plan provides the general procedures for: 1) further evaluating the degree and extent of petroleum hydrocarbon contamination; and 2) collecting site-specific preliminary design data. Data obtained during this first phase will be used to select and design the remedial extraction and treatment system to be installed in the Building 530/Defueling Area in CAA 13. The extraction and treatment system design is anticipated to follow the design projected for the Exchange Service Station (CAA 7) (Section 5.0). Such designs will be considered more fully after the degree and extent of contamination at this site are further assessed.

4.3.1 Soil Boring Placement Strategy

Following review of the initial groundwater data (Section 3.1), 21 primary soil borings will be drilled and sampled to assess the degree and distribution of petroleum hydrocarbons. Soil borings will be placed within the inferred free product plume area to the west of Building 530. Soil borings will also be placed along the storm drain lines that run east-west along the northside of Building 530 (Figure 9). TPH and benzene plumes are suspected to be entering the Building 530 area from the northeast and migrating along these lines (TtEMI, 2001). The depth of the soil borings will be approximately 20 ft bgs. Primary proposed soil boring locations are identified in Figure 9. Actual soil boring locations may vary according to field conditions.

Up to two discrete groundwater samples will be acquired from each boring. One of the samples will be collected from the water table surface. Soil samples will also be collected from borings if evidence of soil contamination (soil staining or PID readings greater than 500 ppm) is observed. Proposed field and sampling activities for the Building 530/Defueling Area in CAA 13, are identified in Table 6, "Proposed Field Activities Building 530/Defueling Area, CAA-13."

Up to 10 secondary soil boring may be advanced. Their locations and associated discrete soil and groundwater sampling depths will be based on analytical results obtained from the primary soil borings. Secondary soil borings will be drilled in step-out fashion. The basic strategy will be to "step-out" where soil and groundwater chemical concentrations are above threshold limits and to "step-in" where threshold limits are not exceeded (Tables 1 and 2). Neighboring site boundaries, along with site physical features, such as buildings and underground utilities, will limit the distance of step-out soil boring locations.

4.3.2 Pre-Pilot Testing

To collect data for use in designing a vacuum-enhanced extraction and treatment system, one pre-pilot test will be conducted. The pre-pilot test will consist of extracting vapors and groundwater (or free product, if present) from a remediation well located inside the petroleum hydrocarbon plume. A vacuum truck will be used to apply a vacuum to the remediation well. Two observation wells, located approximately 5 and 15 feet away from the remediation well, will be used to monitor the remediation well during testing. The purpose of the pre-pilot test is to gather site-specific data required for determining the optimum depth of and spacing between remediation wells for the pilot- and full-scale remedial systems. Well locations and screen intervals will be determined after the petroleum hydrocarbon distribution is better defined. Typical well designs are discussed in Section 5.0. To the extent possible, the pre-pilot test will utilize existing wells and piezometers. Recovered groundwater will be treated on site or shipped off site for disposal.

Groundwater samples will be acquired before and after purging the well to determine if vacuum purging alone is a viable means of contaminant reduction in the Building 530/Defueling Area (CAA 13). Groundwater samples will also be acquired in order to evaluate the capability of the aquifer to naturally attenuate. Groundwater sampling will be performed according to Section 4.0

of the FSP. If free product is present in the pre-pilot remediation well, product thickness will be measured before and after purging the well. Groundwater samples will not be collected if the pre-pilot test well contains free product.

4.4 Free-Product Plume Delineation –Mini-Storage Area (CAA 13)

Heavy hydrocarbons of asphaltic consistency are the targeted contaminants at the Mini-Storage Area, as well as in the area to the northwest (Figure 10, "Primary Soil Boring Locations, Mini-Storage Area (CAA 13)"). The heavy hydrocarbons are thought to originate from petroleum refinery process activities conducted during the late 1800s. Staining and a tar-like substance can be seen on the ground surface at the Mini-Storage Area. Samples collected from this area during the Data Gap Investigation indicated TPH in the range of gasoline, diesel, and motor oil at concentrations exceeding the individual residential PRCs (Table 1) (TtEMI, 2001). TTPH concentrations in groundwater exceeded the screening limit of 20 mg/L. Sampling in the vicinity of the tar-like material found in the open space to the northwest has not been conducted.

The Navy has contracted IT to remove the tar-like substance and associated impacted soil from the Mini-Storage Area and from the open space to the northwest. As part of this corrective action, IT will place soil borings in the Mini-Storage Area to delineate the extent of impact prior to excavation. Pre-defining the limits of excavation will allow IT to relocate storage units, if necessary, prior to commencement of excavation activities. Pre-defining the limits of excavation is not planned in the open space to the northwest. The excavation activities in that area will be defined in the field by visual observation.

4.4.1 Soil Boring Placement Strategy

Up to 40 primary soil borings may be placed to delineate the extent of petroleum hydrocarbon contamination in soil at the Mini-Storage Area. Decisions related to the number and location of primary soil borings will be based on visual observation of soil cores. If evidence of soil contamination (i.e., tar-like material or significant soil staining) is observed in a primary boring, then the boring will be abandoned without sampling. Additional primary borings will be drilled in step-out fashion until evidence of contamination is no longer observed. When evidence of contamination is no longer observed in soil core, the primary boring will be sampled for chemical analysis. Soil and groundwater samples will be collected to delineate the extent of soil contamination and assess the impact to groundwater. Sampling will be in accordance with Section 4.0 of the FSP. Concentrations in soil, only, will be defined with respect to residential PRCs (Table 1). Groundwater remediation is not part of this CTO and, therefore, concentrations in groundwater will not be defined to PRCs. The initial ten proposed primary soil boring locations are identified in Figure 10. Actual soil boring locations may vary according to field conditions. Proposed field and sampling activities for the Mini-Storage Area in CAA 13 are identified in Table 7, "Proposed Field Activities for the Mini-Storage Area, CAA-13."

Analytical results of the primary borings will be reviewed to determine if soil concentrations have been defined with respect to residential PRCs. If soil concentrations at a primary boring location are above the relevant PRCs, then a secondary boring will be drilled at a step-out location and sampled for chemical analysis. Up to 20 secondary soil borings may be drilled to define the concentrations in soil to residential PRCs. Pre-excavation samples that define the limits of excavation will serve the purpose of confirmation samples.

5.0 Construction, Testing, and Operation of Pilot- and Full-Scale Systems

The free product and dissolved-phase contaminant extraction and treatment systems to be designed, constructed, and operated under this CTO will include vacuum-enhanced extraction methods that will remove soil vapor, free product, and contaminated groundwater to be treated by accessory treatment modules. IT will utilize the EPA's "presumptive remedy" approach for the streamlining of cleanup actions where sites have similar historical uses, hydrogeological characteristics, contaminants of concern, and affected environmental media.

While the distribution of free phase and dissolved-phase constituents is not fully defined for these sites, reasonable assumptions as to the contaminant distribution have been made to facilitate the planning of this work. The presumptive remedy approach has led to the design of a DVE and treatment system for the dissolved-phase contaminant removal at the Exchange Service Station in CAA 7. IT anticipates installing similar contaminant extraction and treatment systems at Area 37 (CAA 11) and the Building 530/Defueling Area (CAA 13). The actual systems to be installed will be selected after plume delineation and pre-pilot tests have been completed (Sections 3.0 and 4.0).

The following sections describe the major components involved in the pilot and full-scale vacuum-enhanced extraction and treatment systems for the Exchange Service Station (CAA 7). Pilot- and full-scale testing activities through site closure for the Exchange Service Station are discussed. Extraction and treatment system designs for Area 37 (CAA 11) and the Building 530/Defueling Area (CAA 13) are anticipated to be similar to the design projected for the Exchange Service Station. Such designs will be considered more fully and may substantially change after the respective contaminant plumes have been delineated. This plan contains no further discussion of those systems.

The vacuum-enhanced extraction and treatment system for the Exchange Service Station is anticipated to augment the DVE free-product removal system slated for installation under CTO 13 (Appendix D). The collection trench design for the CTO 13 free-product DVE system is projected to be expanded under this CTO to address dissolved-phase contaminants near the more distal portions of the free product plume. Under this CTO, additional vertical wells are anticipated to be installed to recover soil vapor and deeper groundwater affected by contaminant release in close proximity to the former USTs. The final well field configuration will be designed after dissolved-phase plume delineation activities and pilot tests described in Sections

3.0 and 4.0 have been completed. Full-scale conceptual design documents will be submitted to the Navy prior to full-scale system installation.

5.1 Vacuum-Enhanced Extraction Well Installation

Vertical extraction wells will be installed using a hollow stem auger drill rig. The procedures for hollow-stem auger drilling and well installation are presented in IT SOP 14.1, "Hollow Stem Auger Drilling," and IT SOP 8.1, "Monitoring Well Installation" (IT, 2000). Well borings will be logged by a geologist working under the direction of a California Registered Geologist. Geologic logs will be produced for each well according to the USCS and ASTM D-2488. Additional project-specific requirements are discussed below. Figure 11, "Typical DVE Well Diagram," is presented in the figures section.

The depths of vertical vacuum extraction wells will be determined in the field by the Project Geologist. The extraction wells will be screened across the water table and will extend to the maximum expected depth of contamination. Ideally, the screen will extend at least 5 feet above the water table, but the top of the screen interval and well seal will be no shallower than 3 feet bgs. The maximum anticipated depth of the extraction wells is 20 feet bgs. The extraction wells will be constructed of 4-inch diameter, Schedule 40 PVC. Screens of appropriate length will be specified in the field by the technical lead. Well screens are anticipated to consist of Schedule 40 PVC with 0.020-inch slotted apertures.

The vacuum extraction well sand pack will be set inside the hollow stem augers. The augers will be pulled during sand pack installation. As the augers are pulled out of the borehole, the bottom of the auger will be kept below the top of the sand. Well filter packs will extend a maximum of 1 to 2 feet above the top of the well screen, except for very shallow well installations. A hydrated bentonite pellet seal will be constructed from the top of the filter pack to 1 foot bgs. A highly viscous, neat cement grout may be used to backfill the remaining 1 foot of annulus to ground surface. Wellheads will typically be completed above grade. Wells within roadways or heavy traffic areas will be completed flush to ground surface or within utility boxes.

Horizontal DVE wells may be installed in shallow water table environments in accordance with the design shown in Figure 12, "Typical DVE Accumulation Sump for Non-Tidal Use." These types of wells will be installed in an excavated trench with the vertical member serving as a DVE accumulation sump.

5.2 Extraction Well Development

Newly installed extraction wells and pre-existing site wells will be developed by alternating surging, with a vented surge block, and pumping as specified in IT SOP 8.2, "Monitoring Well Development" (IT, 2000). Well development will be continued until a minimum of three well volumes has been purged, until the turbidity has been reduced to visual clarity, and until temperature, pH, and conductivity values have stabilized to within 10 percent for three consecutive readings. Water from well development will be combined with wastewater generated during equipment decontamination and will be managed according to the Waste Management Plan (Appendix E).

5.3 Treatment System Design

At the Exchange Service Station (CAA 7), liquid-phase treatment modules will be added to the anticipated free product removal and treatment system shown in Figure 13, "Process Flow Diagram, Exchange Service Station (CAA 7)," and described in Appendix D. The treatment module for the dissolved-phase liquid plume will include an air stripper leading to liquid phase granular activated carbon (GAC) vessels to polish volatile organic compounds and MTBE from the liquid fraction. The vapor phase from the air stripper will be piped to the thermal/catalytic oxidizer or alternative vapor-phase GAC. Once hydrocarbon concentrations become low enough that use of the thermal/catalytic oxidizer unit becomes cost prohibitive, the liquid and vapor fractions will be sent through GAC vessels.

5.4 Air and Water Discharge Permits

The free product recovery treatment system installed at the Exchange Service Station will be expanded for use in remediating soil and groundwater containing MTBE and dissolved-phase hydrocarbons. Prior to expanding the extraction system, any existing BAAQMD air permit issued for CTO 13 will be reviewed for applicability for use by the expanded treatment system. To enable inclusion of the CTO 13 air permit for use under CTO 37 without significant permit modification, the CTO 13 air permit application will contain an alternative treatment train that includes possible use of an air stripper and of vapor and special liquid-phase GAC vessels.

Contaminated water collected during pilot- and full-scale operation is anticipated to be disposed at the publicly owned treatment works (POTWs) operated by East Bay Municipal Utility District (EBMUD). Discharge limits for the sanitary sewer that are consistent with operation of the POTW may be imposed by EBMUD. During the pre-pilot test, a groundwater sample from the Exchange Service Station will be analyzed for pre-treatment constituents that may be specified by the POTW. Effluent samples from the treatment system will be acquired to ensure that discharge limits to the sanitary sewer are being met during pilot- and full-scale system operations.

5.5 Exchange Service Station Pilot-Scale System, Equipment Setup

It is anticipated that much of the very same treatment and process equipment used for the free-product removal (CTO 13) at this site will also be utilized for the dissolved-phase portion of the corrective action. Only in the case that the existing equipment is improper for the desired application, will new or separate equipment be used for this portion of the project. In the case that new or different equipment is necessary, the new pilot test equipment will be assembled in an approximately 50-by-50-foot level staging area adjacent to, and in designed coordination with, the CTO 13 treatment system. Piping and hoses will be connected from the collection trenches and extraction wells to the blower skid unit for the vapor- and liquid-phase treatment systems. A portable generator or temporary overhead electrical lines will supply power to the system. All equipment will be grounded in accordance with National Electrical Code standards and local electrical codes.

Upon completion of the installation, pre-operational checkout and testing will be conducted. This testing will include, but is not limited to the following:

- Inspecting electrical power and control wiring connections between equipment and control panels
- Energizing the blower momentarily to check for correctness of motor rotation and piping connection (i.e., blower inlet and outlet are properly connected)
- Inspecting pipes, hoses, and connectors for vacuum or pressure leaks
- Testing and adjusting all level, pressure, temperature, and shutdown controls
- Adjusting, zeroing and calibrating all pressure and vacuum gauges
- Testing automated shut down features of the system, including operation of the expanded GAC and air stripper system

At the conclusion of the initial pre-operational check out, the system will be operated briefly in a shake-down mode and monitored for proper mechanical operation. This portion of the start-up is anticipated to last only a few hours. Following the completion of the shake-down, the system will be shut down to allow subsurface vacuum conditions to equilibrate to ambient conditions.

5.6 Dual Vacuum Extraction Pilot Testing

Prior to actual field testing, depth to groundwater measurements will be collected from each extraction and observation well. Depth to groundwater measurements will be taken in accordance with IT SOP 5.1, "Water Level Measurements in Monitoring Wells" (IT 2000).

A 2-inch diameter extraction tube will then be placed inside the DVE extraction well, at a depth approximately 6 inches below the liquid surface. This will be the initial position of the inner extraction tube for the first vacuum test. Extraction tube and pump intake depths will be set for any vertical DVE well.

DVE testing for either vertical or horizontal vacuum wells potentially tested will be the main activity of the pilot test. The test program will consist of two parts: a maximum vacuum test and a step vacuum test. The maximum vacuum test will be conducted first, followed by the step vacuum test at 25, 50, 75, and 100 percent of the maximum vacuum, unless the maximum is less than 4-inch mercury vacuum, in which case step testing would be conducted at other intermediate vacuum steps.

In addition to running at different vacuum levels, positioning of extraction tubes or pump intake levels will be tested. This testing will consist of orienting each of the tubes at one position 6 inches below and 1 to 2 feet above the water surface inside the extraction wells or sumps. The positions will be measured from the bottom of the V-notch tube or slots of the floating tube to the water surface. The test depths will be adjusted based on the actual site conditions encountered. Detailed procedures for the testing are described in Appendix C. Analytical testing during the pilot test and pilot-scale operation is discussed in Section 6.0 of the FSP.

5.7 Evaluation of DVE Pilot-Test Results

Vacuum-enhanced extraction pilot test results and pilot-scale operation data will be evaluated for applicability of this technology to the site conditions. The results of the pilot-scale test will be summarized in the first monthly technical memorandum to the Navy Remedial Project Manager (RPM) (see Section 7.0 "Documentation and Submittals"). Subsequently, the pilot test and pilot-scale operation data will be used for developing and optimizing design parameters for the full-scale system. The results of these input parameters will be reflected in the drawings and specifications for the full-scale system.

5.8 Anticipated Full-Scale Construction and Operation

A full-scale system design will be generated based on the results of the dissolved-phase delineation activity, the DVE pilot test, and the extended pilot-scale operation. The design drawings and specifications, suitable for a design-build contract, will be produced and submitted to the Navy and Regulators for review and comment. It is not anticipated that these full-scale design drawings and specifications will reflect a "complete" design; instead, they will reflect an engineered design with the bulk of the construction details left to the field engineer.

Although the specific details of the activities associated with the installation of the full-scale system are unknown at this time, it is anticipated that they will not vary significantly from those described for the pilot-scale testing in this plan. The full-scale system will be constructed in accordance with the approved drawings and specifications for the full-scale design.

The final full-scale system is anticipated to utilize the equipment operated for the pilot-scale operation. The remaining portions of the system or optimizations to the system will be installed and operated following approval from the Navy. Operation is currently planned for a period of up to one year although the operational duration may be modified based on system performance and effectiveness. The system will remove residual dissolved-phase product from the groundwater to the extent technically and economically practical.

The operation of the system will be updated in monthly letter reports to the Navy, and the overall system performance will be documented in a final report to be prepared at the termination of system operation. Upon cessation of the full-scale system operations, the aboveground equipment will be disassembled, decontaminated, and removed from the site. Security fencing will be removed and the area restored to its original condition. Following site closure, the extraction wells and piezometers associated with this site will be removed or abandoned as described in Section 3.0 of this Work Plan.

6.0 CAA 13, Mini-Storage Area Corrective Action

Heavy hydrocarbons are the targeted contaminants in soils beneath the Mini-Storage Area and in the open space to the northwest (Figure 10, "Primary Soil Boring Locations, Mini-Storage Area (CAA 13)"). It is assumed that the heavy, tar-like hydrocarbons in the two areas are limited in extent. Therefore, it is assumed that this corrective action will consist of excavation of the tar-like substance from those two areas for transport and off-site disposal. The excavation will be backfilled with clean fill material, which will be compacted before final surface grading. Corrective action-specific activities are discussed in the following subsections.

6.1 Mini-Storage Area Unit Demolition

Currently, the Mini-Storage Area is occupied by several storage unit structures. In order to excavate, recover, and dispose of waste material, it will likely be necessary to either move or demolish some of the existing storage unit structures. If the storage units can be moved intact, they will be moved to a temporary location so that excavation activities can be performed. If it is not possible to move the storage units, the structures within the limits of excavation will be demolished. Concrete and debris resulting from the demolition will be temporarily stockpiled. Demolition/removal activities will be conducted upon formal approval from the Navy.

6.2 Excavation

Once removal and/or demolition of the storage unit structures is complete, excavation activities will commence. As stated previously, the goal of the excavation is the removal of the tar-like substance present in subsurface soil beneath the Mini-Storage Area and in the open space to the northwest (Figure 10). Based on previous investigations, the heavy product observed in this area consists of high molecular weight hydrocarbons and is characterized by a tarry/asphaltic consistency.

The limits of the excavation in the Mini-Storage Area will be based on data and observations made during the delineation activities described in Section 4.4. Excavation limits will be established upon consultation with and concurrence by the Navy. The excavation will continue horizontally to the limits identified from pre-excavation sampling. If during the excavation it becomes apparent that the tar-like substance is present beyond the identified excavation limits, additional excavation beyond the identified limits may be conducted after consultation with the Navy. The excavation will continue vertically until either tar-like substances are no longer encountered or until the water table or a maximum depth of 7 feet bgs is reached. To minimize the amount of groundwater in the excavation and maximize the amount of contaminant recovery, the excavation will be conducted during the summer when groundwater levels are lowest. No shoring or dewatering is anticipated.

The excavation activities to the northwest will be based on visual observation. Stepping out approximately 10 feet from the tar-like substance, up to four exploratory potholes will be excavated around the assumed outer limits of the tar-like substance to confirm that the material is limited in extent. The excavation is anticipated to be no greater than approximately 20 feet laterally in all directions and down to the water table (approximately 5 to 7 feet bgs). If during potholing it becomes apparent that the tar-like substance is present beyond the assumed maximum limits of excavation, the excavation activities will be discontinued and the corrective action re-evaluated with the Navy. If the material is limited in extent, the excavation will continue. The excavation will continue vertically until either the tar-like substance is no longer encountered, or until the water table or a maximum depth of 7 feet bgs is reached. As in the Mini-Storage Area no shoring or dewatering is anticipated.

Excavated materials will be appropriately stockpiled on site or in plastic-lined, DOT-approved roll-off dumpsters. Upon completion of the excavation, excavated materials will be sampled for disposal parameters as presented in Section 4.0 of the FSP.

6.3 Confirmation Sampling

Confirmation samples will be collected from the excavation to the northwest of the Mini-Storage Area. One sample will be collected from each sidewall and two from the bottom of the excavation. Samples will be collected as discussed in Section 4.0 of the FSP. No confirmation samples will be collected from the excavation in the Mini-Storage Area because pre-excavation samples will serve that purpose.

6.4 Excavation Backfill

All excavations will be backfilled with granular clean fill material, with maximum dimensions no greater than 2 inches in diameter. The backfill in the excavations will be compacted to 90 percent relative compaction per ASTM D-1557-92, from the base of the excavations to within 3 feet of the existing ground surface. The backfill within the interval between the 3-foot depth and the ground surface will be compacted to 95 percent relative compaction as per ASTM D-1557-92.

6.5 Site Restoration and Closure

After completion of backfilling and compaction activities, the condition of the site will be restored to that which existed prior to the excavation. Areas that were paved with asphalt will be repaved. Base rock and asphalt thicknesses will be restored to those that existed prior to excavation. Storage unit structures that were either moved or demolished prior to excavation activities will be restored to their original configuration. If the existing storage unit structures were moved to a temporary location, the structures will be moved back to their original locations. If demolition of the existing storage unit structures was required, new storage unit structures will be constructed or installed at the former unit locations.

7.0 Documentation and Submittals

The following submittals will be generated as part of this CTO. The type of reporting will depend on the related planning documents or memoranda of understanding for a particular site.

7.1 Pilot-Scale Specifications and Drawings for Area 37 and the Building 530/Defueling Area

At the completion of contaminant plume delineation and pre-pilot test activities, pilot-scale specifications and drawings for the Area 37 (CAA 11) and Building 530/Defueling Area extraction and treatment systems will be prepared. The pilot-scale specifications and drawings will be produced and submitted to the Navy and regulatory agencies for review and comment. While the specific details of the systems are unknown at this time, it is anticipated that they will not vary significantly from the Exchange Service Station (CAA 7) pilot-scale system described in this Work Plan.

7.2 Technical Memoranda

Monthly performance reports (technical memoranda) will be prepared during the operation of the pilot- and full-scale systems at the Exchange Service Station (CAA 7), Area 37 (CAA 11), and Building 530/Defueling Area (CAA 13). The results of the pilot-scale tests will be summarized in the first monthly technical memorandum for each site. The reports will be submitted to the Navy Remedial Project Manager (RPM) within two weeks following the end of each month of performance.

7.3 Full-Scale Specifications and Drawings

A full-scale system design will be generated for the Exchange Service Station (CAA 7) DVE system based on the results of the dissolved-phase plume delineation activity, the DVE pilot test, and the extended pilot-scale operation. The design drawings and specifications, suitable for a design-build contract, will be produced and submitted to the Navy and regulatory agencies for review and comment. It is not anticipated that these full-scale design drawings and specifications will reflect a "complete" design; instead, they will reflect an engineered design with the bulk of the construction details left to the field engineer.

Similarly, full-scale specifications and drawings will be prepared for the Area 37 (CAA 11) and Building 530/Defueling Area (CAA 13) systems. The design drawings and specifications will be produced and submitted to the Navy and regulatory agencies for review and comment.

7.4 Closure Reports

With concurrence from the regulatory agencies, closure reports for the Exchange Service Station (CAA 7), Area 37 (CAA 11), and Building 530/Defueling Area (CAA 13) will be prepared after completion of the full-scale system operations. The closure reports will document and summarize the results of the corrective actions. The reports will provide sufficient detail to demonstrate and support the recommendation for closure of each site. Each report will be submitted in draft, draft final, and final report status.

7.5 Corrective Action Report for the Mini-Storage Area

A corrective action report will be prepared for the Mini-Storage Area in CAA 13. The report will include a summary of the corrective action completed, a summary of chemical data, data reduction and analysis, and a discussion and interpretation of the results. The report will be submitted in draft, draft final, and final report status.

7.6 Field Activity Report

A field activity report will be submitted within 45 days of completion of field activities. The report will contain a summary of the work performed at the four sites, all analytical results, and waste disposal manifests. The field activity report will be submitted in draft and final report status.

8.0 References

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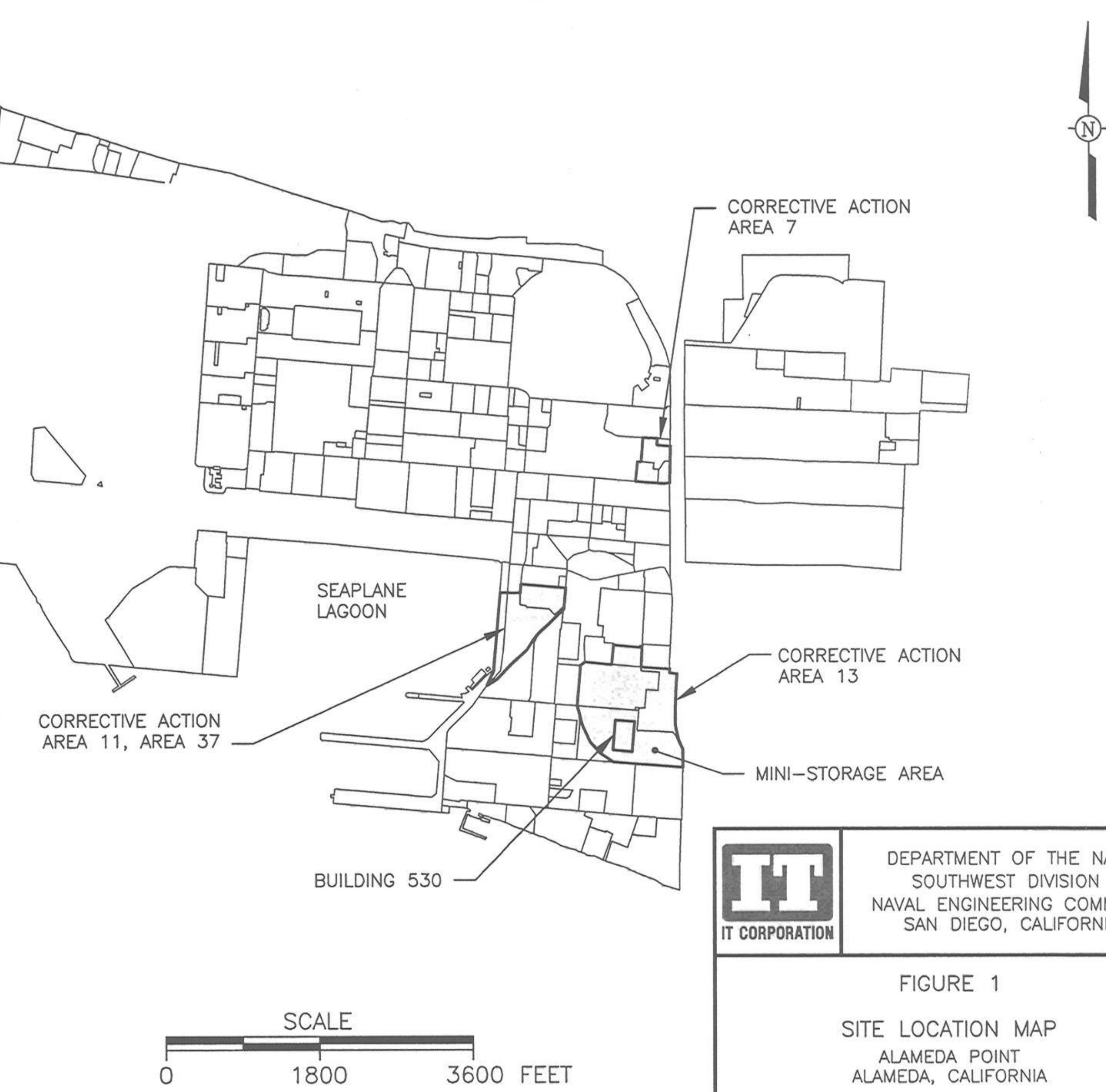
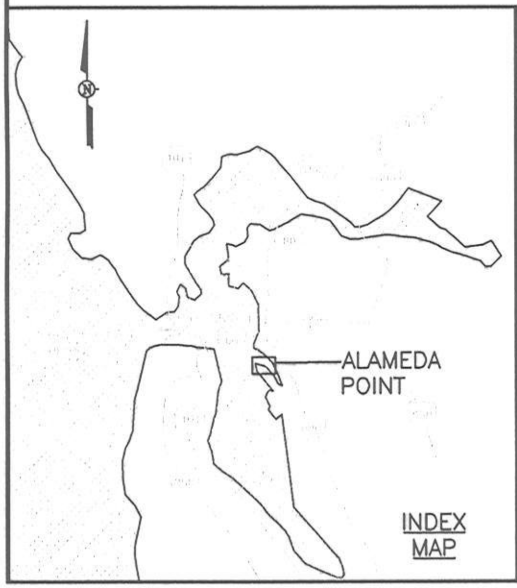
FIGURES

IMAGE	X-REF	OFFICE	DRAWN BY		CHECKED BY		APPROVED BY		DRAWING NUMBER
---	AL99BASE	CONC	BJ	6-07-01	D. Rolz	06/11/01	MIH	6/11/01	823334-A5





IT CORPORATION

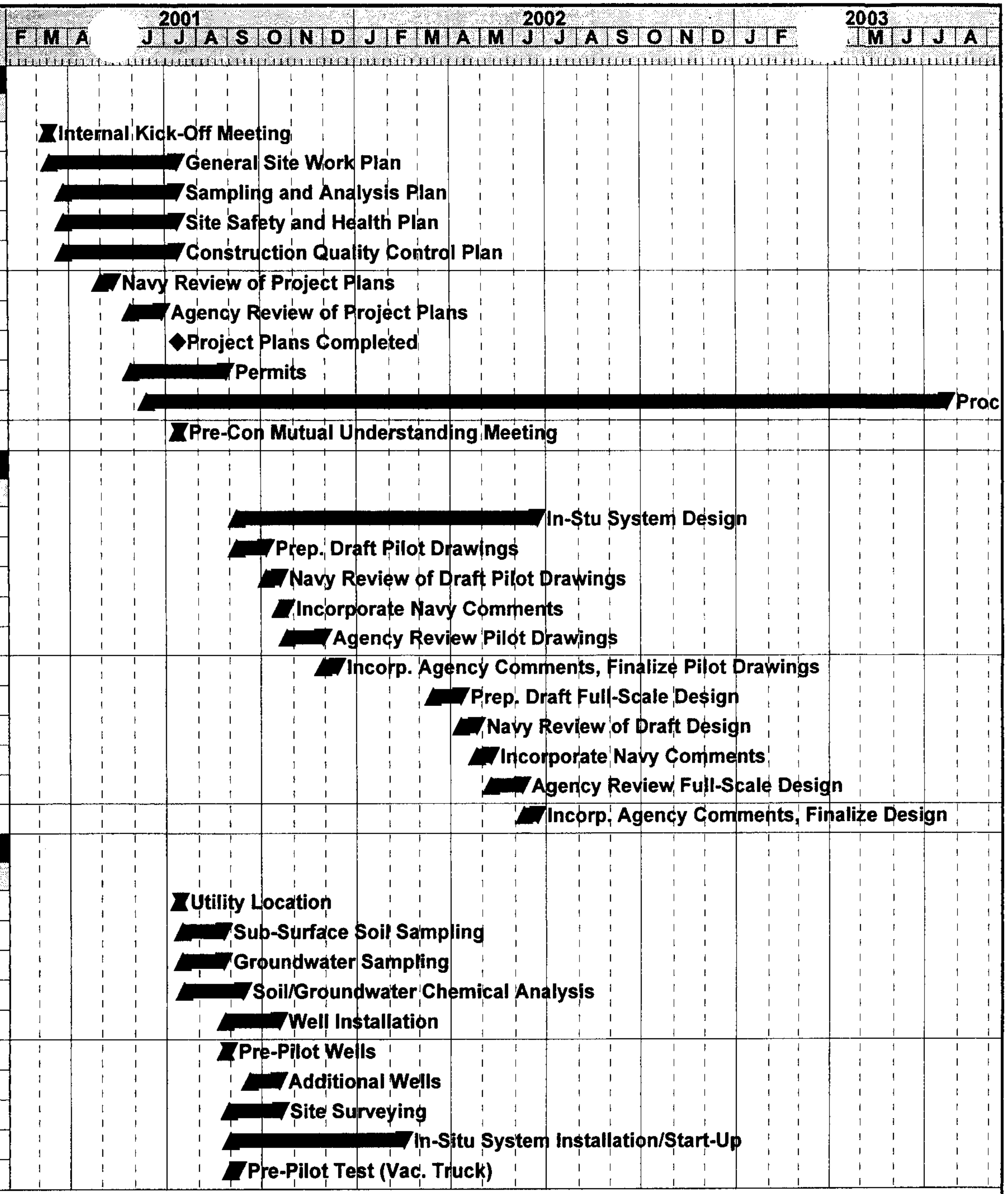
DEPARTMENT OF THE NAVY
SOUTHWEST DIVISION
NAVAL ENGINEERING COMMAND
SAN DIEGO, CALIFORNIA

FIGURE 1

SITE LOCATION MAP

ALAMEDA POINT
ALAMEDA, CALIFORNIA

Activity ID	Activity Description	Orig Dur	Early Start	Early Finish
Pre-Construction				
Pre-Construction Engineering Tasks				
D733010343	Internal Kick-Off Meeting	1	12MAR01*	12MAR01
D733010313	General Site Work Plan	86	13MAR01	12JUL01
D733010301	Sampling and Analysis Plan	76	27MAR01	12JUL01
D733010308	Site Safety and Health Plan	76	27MAR01	12JUL01
D733010314	Construction Quality Control Plan	76	27MAR01	12JUL01
D73010313A	Navy Review of Project Plans	10	30APR01	11MAY01
D73010313B	Agency Review of Project Plans	22	29MAY01	27JUN01
D73010313C	Project Plans Completed	0		12JUL01
D733010338	Permits	65	29MAY01	28AUG01
D733010334	Procurement/Subcontract Activity	535	13JUN01	22JUL03
D733010342	Pre-Con Mutual Understanding	1	13JUL01	13JUL01
Engineering Design				
Sytem Design				
D707110491	In-Stu System Design	201*	07SEP01	21JUN02
D707110501	Prep. Draft Pilot Drawings	20	07SEP01	04OCT01
D707110561	Navy Review of Draft Pilot Drawings	10	05OCT01	18OCT01
D707110571	Incorporate Navy Comments	5	19OCT01	25OCT01
D707110581	Agency Review Pilot Drawings	22	26OCT01	28NOV01
D707110591	Incorp. Agency Comments, Finalize	10	29NOV01	12DEC01
D707110511	Prep. Draft Full-Scale Design	20	14MAR02	10APR02
D707110521	Navy Review of Draft Design	10	11APR02	24APR02
D707110531	Incorporate Navy Comments	10	25APR02	08MAY02
D707110541	Agency Review Full-Scale Design	21	09MAY02	07JUN02
D707110551	Incorp. Agency Comments, Finalize	10	10JUN02	21JUN02
CAA 11, Area 37				
Field Work - Field Operations				
D711010490	Utility Location	1	13JUL01	13JUL01
D711020602	Sub-Surface Soil Sampling	30	16JUL01	24AUG01
D711020502	Groundwater Sampling	30	16JUL01	24AUG01
D711020512	Soil/Groundwater Chemical Analysis	40	17JUL01	11SEP01
D711020402	Well Installation	36	27AUG01	16OCT01
D711020412	Pre-Pilot Wells	3	27AUG01	29AUG01
D711020422	Additional Wells	20	19SEP01	16OCT01
D711010491	Site Surveying	35	30AUG01	18OCT01
D711110405	In-Situ System Installation/Start-Up	114*	31AUG01	13FEB02
D711110415	Pre-Pilot Test (Vac. Truck)	4	31AUG01	06SEP01



Start Date	12DEC00
Finish Date	05AUG03
Data Date	12DEC00
Run Date	12JUN01 08:23

Early Bar
Progress Bar
Critical Activity

WP01 Sheet 1 of 5

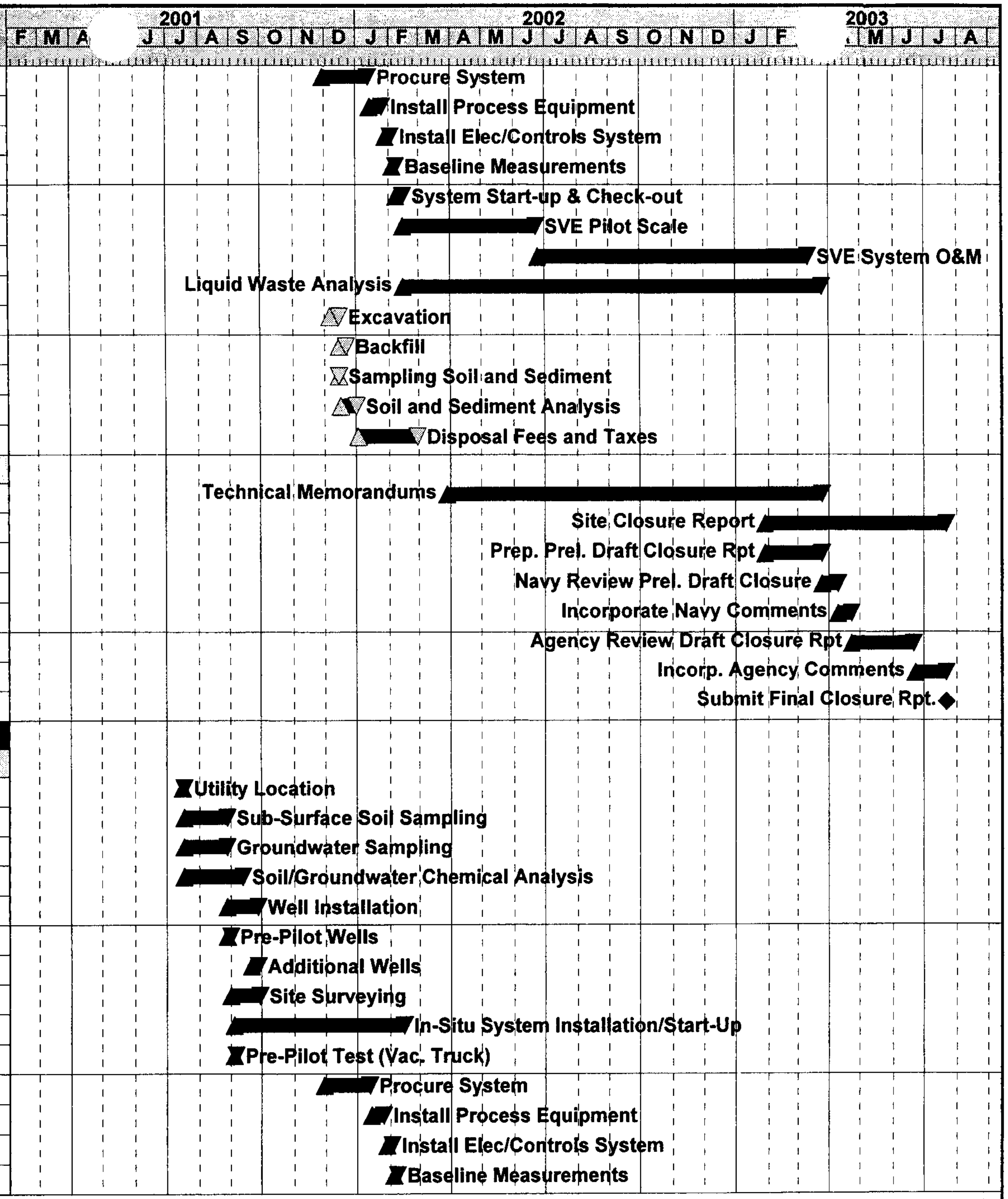
CTO 37

Petroelum Hydrocarbon
Corrective Actions at CAA 7, CAA 11, and CAA 13

FIGURE 2

CTO 37 CORRECTIVE ACTION SCHEDULE

Activity ID	Activity Description	Orig Dur	Early Start	Early Finish
D711110425	Procure System	30	29NOV01	11JAN02
D711110435	Install Process Equipment	10	14JAN02	25JAN02
D711110445	Install Elec/Controls System	5	28JAN02	01FEB02
D711110455	Baseline Measurements	3	04FEB02	06FEB02
D711110465	System Start-up & Check-out	5	07FEB02	13FEB02
D711110406	SVE Pilot Scale	91	14FEB02	21JUN02
D711110490	SVE System O&M	180	24JUN02	10MAR03
D711020903	Liquid Waste Analysis	280	15FEB02	24MAR03
D711080102	Excavation	5	07DEC01	13DEC01
D711200103	Backfill	5	14DEC01	20DEC01
D711020600	Sampling Soil and Sediment	1	14DEC01	14DEC01
D711020907	Soil and Sediment Analysis	10	17DEC01	31DEC01
D711192200	Disposal Fees and Taxes	40	02JAN02	26FEB02
Post-Construction Submittals				
D711110492	Technical Memorandums	251	28MAR02	24MAR03
D711210692	Site Closure Report	123*	28JAN03	21JUL03
D711210702	Prep. Prel. Draft Closure Rpt	40	28JAN03	24MAR03
D711210712	Navy Review Prel. Draft Closure	10	25MAR03	07APR03
D711210722	Incorporate Navy Comments	10	08APR03	21APR03
D711210732	Agency Review Draft Closure Rpt	43	22APR03	20JUN03
D711210742	Incorp. Agency Comments	20	23JUN03	21JUL03
D711210752	Submit Final Closure Rpt.	0		21JUL03
CAA 13, Building 530				
Field Work - Field Operations				
D713010490	Utility Location	1	16JUL01	16JUL01
D713020602	Sub-Surface Soil Sampling	30	17JUL01	27AUG01
D713020502	Groundwater Sampling	30	17JUL01	27AUG01
D713020512	Soil/Groundwater Chemical Analysis	40	18JUL01	12SEP01
D713020402	Well Installation	21*	28AUG01	26SEP01
D713020412	Pre-Pilot Wells	3	28AUG01	30AUG01
D713020422	Additional Wells	5	20SEP01	26SEP01
D713010491	Site Surveying	20	31AUG01	28SEP01
D713110405	In-Situ System Installation/Start-Up	113*	04SEP01	13FEB02
D713110415	Pre-Pilot Test (Vac. Truck)	2	04SEP01	05SEP01
D713110465	Procure System	30	29NOV01	11JAN02
D713110425	Install Process Equipment	10	14JAN02	25JAN02
D713110435	Install Elec/Controls System	5	28JAN02	01FEB02
D713110455	Baseline Measurements	3	04FEB02	06FEB02



Start Date	12DEC00
Finish Date	05AUG03
Data Date	12DEC00
Run Date	12JUN01 08:23

Early Bar
Progress Bar
Critical Activity

WP01 — Sheet 2 of 5

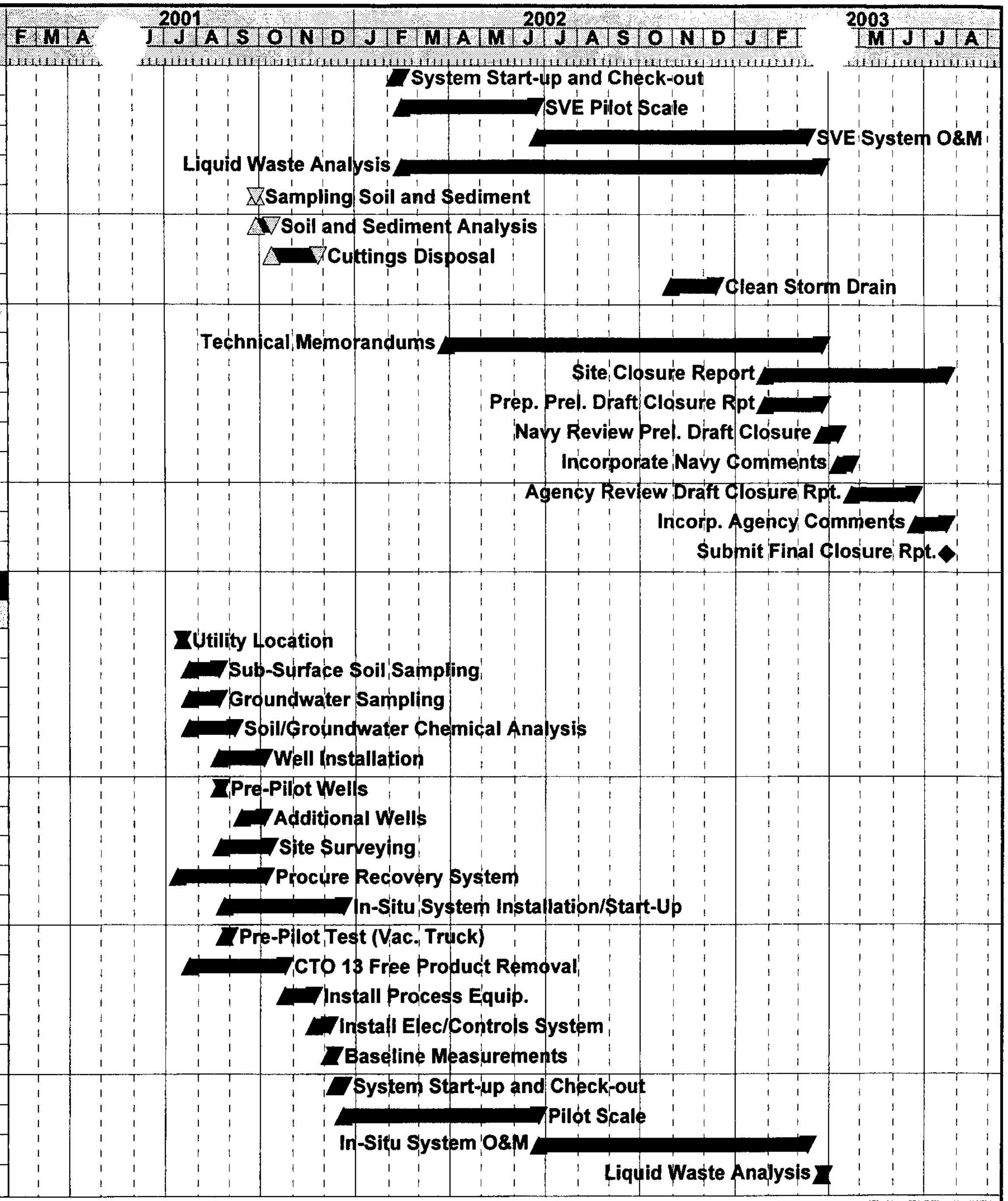
CTO 37

Petroelum Hydrocarbon
Corrective Actions at CAA 7, CAA 11, and CAA 13

FIGURE 2

CTO 37 CORRECTIVE ACTION SCHEDULE

Activity ID	Activity Description	Orig Dur	Early Start	Early Finish
D713110445	System Start-up and Check-out	5	07FEB02	13FEB02
D713110406	SVE Pilot Scale	91	14FEB02	21JUN02
D713110490	SVE System O&M	180	24JUN02	10MAR03
D713020903	Liquid Waste Analysis	280	15FEB02	24MAR03
D713020600	Sampling Soil and Sediment	1	27SEP01	27SEP01
D713020907	Soil and Sediment Analysis	10	28SEP01	11OCT01
D713020917	Cuttings Disposal	30	12OCT01	26NOV01
D703031190	Clean Storm Drain	30	30OCT02	12DEC02
Post-Construction Submittals				
D713110492	Technical Memorandums	251	28MAR02	24MAR03
D713210692	Site Closure Report	123	28JAN03	21JUL03
D713210702	Prep. Prel. Draft Closure Rpt	40	28JAN03	24MAR03
D713210712	Navy Review Prel. Draft Closure	10	25MAR03	07APR03
D713210722	Incorporate Navy Comments	10	08APR03	21APR03
D713210732	Agency Review Draft Closure Rpt.	43	22APR03	20JUN03
D713210742	Incorp. Agency Comments	20	23JUN03	21JUL03
D713210752	Submit Final Closure Rpt.	0		21JUL03
CAA 07, Service Station				
Field Work - Field Operations				
D707010490	Utility Location	1	17JUL01	17JUL01
D707020602	Sub-Surface Soil Sampling	20	24JUL01	20AUG01
D707020502	Groundwater Sampling	20	24JUL01	20AUG01
D707020512	Soil/Groundwater Chemical Analysis	30	25JUL01	05SEP01
D707020402	Well Installation	31*	21AUG01	03OCT01
D707020412	Pre-Pilot Wells	3	21AUG01	23AUG01
D707020422	Additional Wells	15	13SEP01	03OCT01
D707010491	Site Surveying	31	24AUG01	08OCT01
D707110415	Procure Recovery System	60	13JUL01	05OCT01
D707110405	In-Situ System Installation/Start-Up	79*	27AUG01	18DEC01
D707110465	Pre-Pilot Test (Vac. Truck)	4	27AUG01	30AUG01
D707110475	CTO 13 Free Product Removal	65	24JUL01*	23OCT01
D707110425	Install Process Equip.	20	24OCT01	20NOV01
D707110435	Install Elec/Controls System	10	21NOV01	06DEC01
D707110445	Baseline Measurements	3	07DEC01	11DEC01
D707110455	System Start-up and Check-out	5	12DEC01	18DEC01
D707110406	Pilot Scale	131	19DEC01	24JUN02
D707110490	In-Situ System O&M	180	25JUN02	11MAR03
D707020903	Liquid Waste Analysis	1	25MAR03	25MAR03



Start Date	12DEC00
Finish Date	05AUG03
Data Date	12DEC00
Run Date	12JUN01 08:23

Early Bar
Progress Bar
Critical Activity

WP01

Sheet 3 of 5

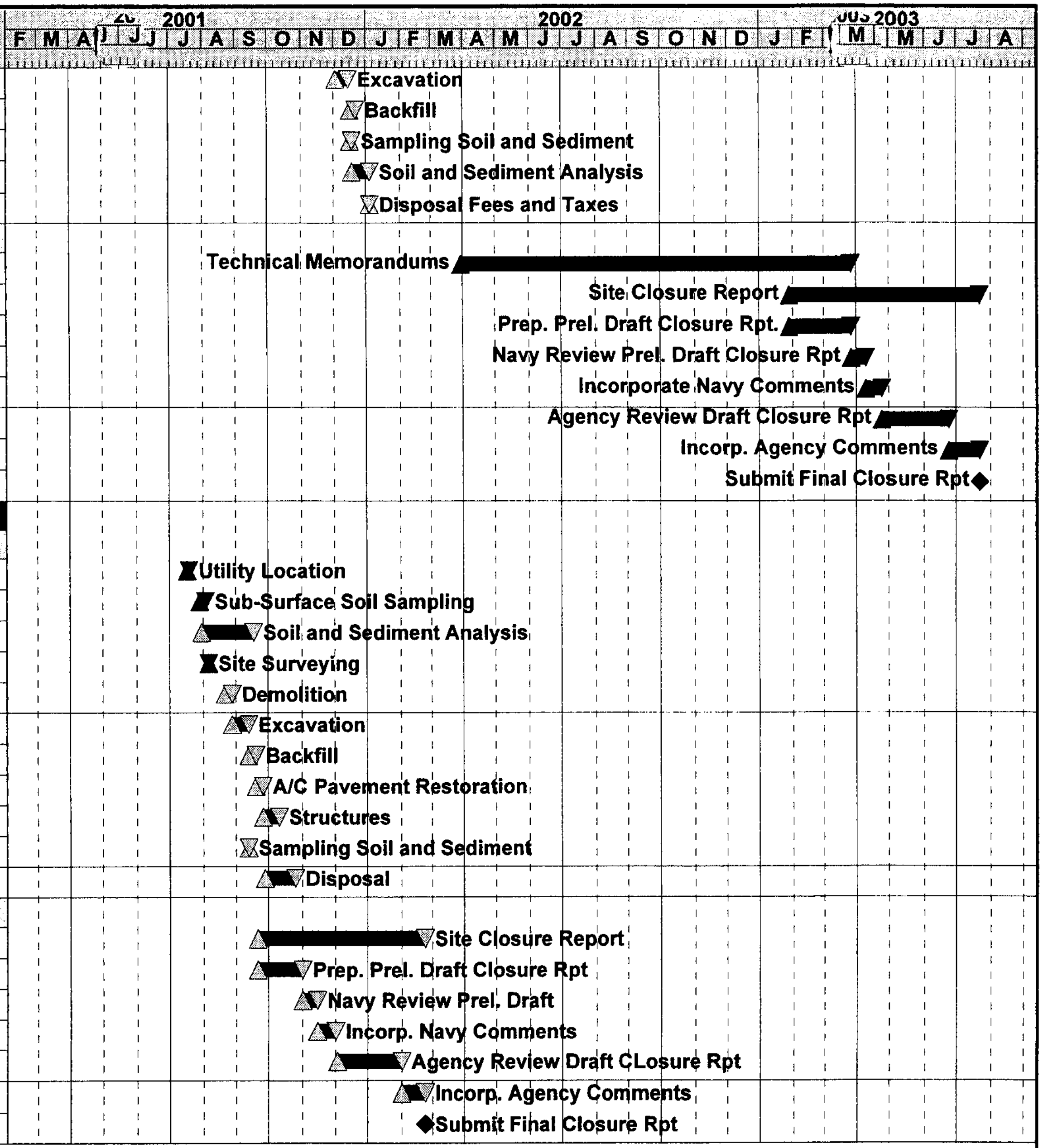
CTO 37

Petroelum Hydrocarbon
Corrective Actions at CAA 7, CAA 11, and CAA 13

FIGURE 2

CTO 37 CORRECTIVE ACTION SCHEDULE

Activity ID	Activity Description	Orig Dur	Early Start	Early Finish
D707080102	Excavation	10	03DEC01	14DEC01
D707200103	Backfill	5	17DEC01	21DEC01
D707020600	Sampling Soil and Sediment	1	17DEC01	17DEC01
D707020907	Soil and Sediment Analysis	10	18DEC01	02JAN02
D707192200	Disposal Fees and Taxes	1	03JAN02	03JAN02
Post-Construction Submittals				
D707110492	Technical Memorandums	251	29MAR02	25MAR03
D707210692	Site Closure Report	123*	29JAN03	22JUL03
D707210702	Prep. Prel. Draft Closure Rpt.	40	29JAN03	25MAR03
D707210712	Navy Review Prel. Draft Closure Rpt	10	26MAR03	08APR03
D707210722	Incorporate Navy Comments	10	09APR03	22APR03
D707210732	Agency Review Draft Closure Rpt	43	23APR03	23JUN03
D707210742	Incorp. Agency Comments	20	24JUN03	22JUL03
D707210752	Submit Final Closure Rpt	0		22JUL03
CAA 13, Mini Storage Area				
Field Work - Field Operations				
D703010490	Utility Location	1	18JUL01	18JUL01
D703020602	Sub-Surface Soil Sampling	5	30JUL01	03AUG01
D703020907	Soil and Sediment Analysis	34	31JUL01	17SEP01
D703010491	Site Surveying	1	06AUG01	06AUG01
D703030100	Demolition	5	21AUG01	27AUG01
D703080102	Excavation	10	28AUG01	11SEP01
D703200103	Backfill	5	12SEP01	18SEP01
D707200304	A/C Pavement Restoration	5	19SEP01	25SEP01
D707200302	Structures	10	26SEP01	09OCT01
D703020600	Sampling Soil and Sediment	1	12SEP01	12SEP01
D703192200	Disposal	20	27SEP01	24OCT01
Post-Construction Submittals				
D703210692	Site Closure Report	107*	20SEP01	21FEB02
D703210702	Prep. Prel. Draft Closure Rpt	30	20SEP01	31OCT01
D703210712	Navy Review Prel. Draft	10	01NOV01	14NOV01
D703210722	Incorp. Navy Comments	10	15NOV01	30NOV01
D703210732	Agency Review Draft CLosure Rpt	42	03DEC01	31JAN02
D703210742	Incorp. Agency Comments	15	01FEB02	21FEB02
D703210752	Submit Final Closure Rpt	0		21FEB02



Start Date	12DEC00
Finish Date	05AUG03
Data Date	12DEC00
Run Date	12JUN01 08:23

Early Bar
Progress Bar
Critical Activity

WP01 Sheet 4 of 5

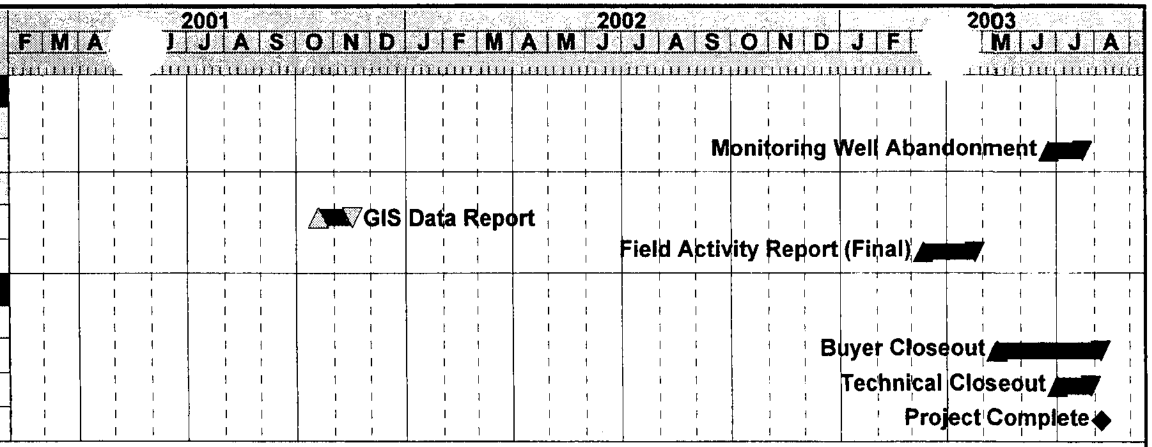
CTO 37

Petroelum Hydrocarbon
Corrective Actions at CAA 7, CAA 11, and CAA 13

FIGURE 2

CTO 37 CORRECTIVE ACTION SCHEDULE

Activity ID	Activity Description	Orig Dur	Early Start	Early Finish
Post-Construction Distributables				
Field Work - Field Operations				
D703020420	Monitoring Well Abandonment	20	24JUN03	22JUL03
Post-Construction Submittals				
D703020990	GIS Data Report	20	19OCT01	15NOV01
D707210605	Field Activity Report (Final)	30	12MAR03	22APR03
Closeout				
Closeout				
D733992010	Buyer Closeout	60	12MAY03	05AUG03
D733992011	Technical Closeout	20	01JUL03	29JUL03
D733992021	Project Complete	0		05AUG03



Start Date 12DEC00 Finish Date 05AUG03 Data Date 12DEC00 Run Date 12JUN01 08:23	Early Bar Progress Bar Critical Activity	WP01 Sheet 5 of 5 CTO 37 Petroelum Hydrocarbon Corrective Actions at CAA 7, CAA 11, and CAA 13	FIGURE 2 CTO 37 CORRECTIVE ACTION SCHEDULE

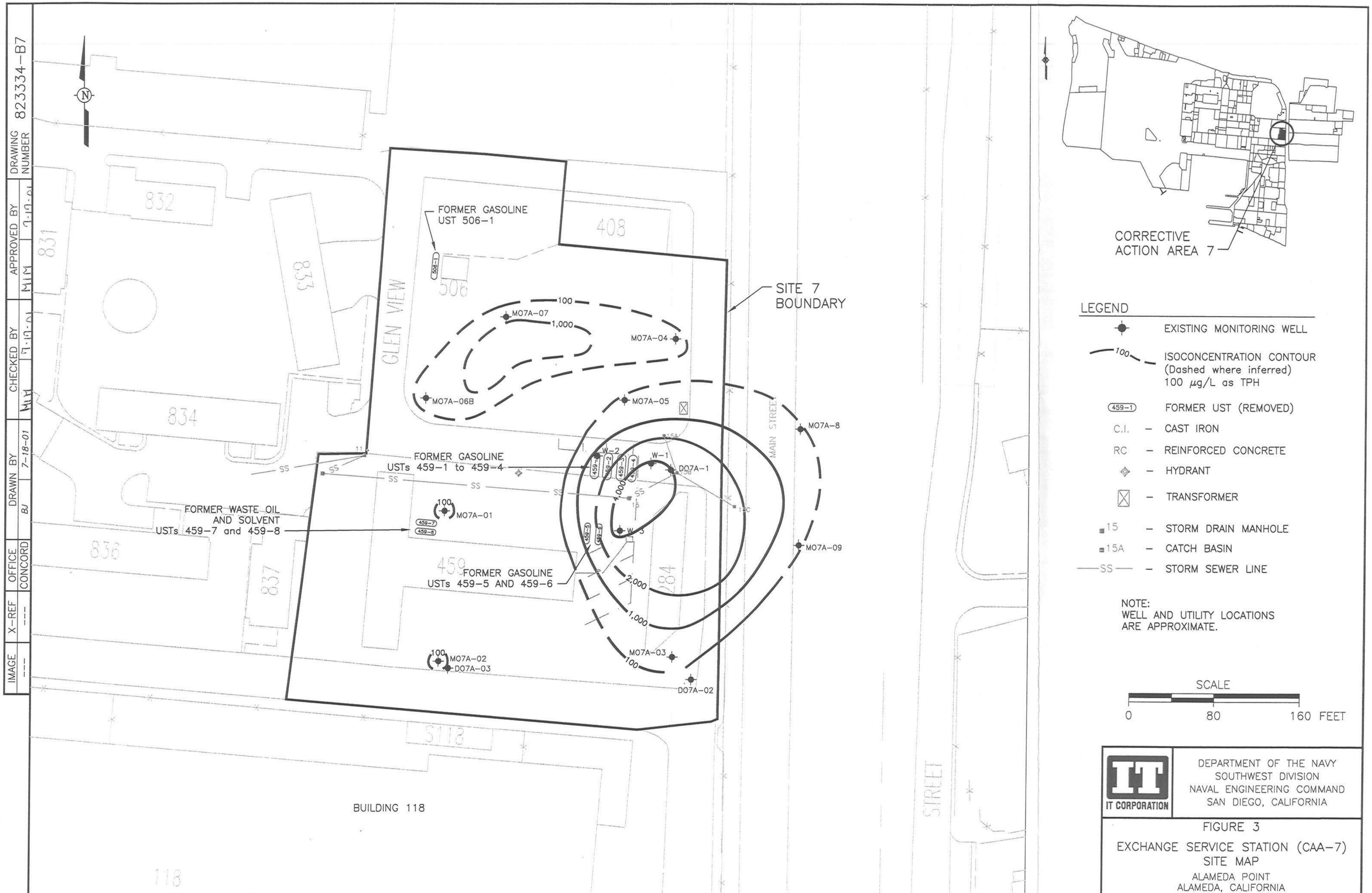


FIGURE 3

EXCHANGE SERVICE STATION (CAA-7)
SITE MAP

ALAMEDA POINT
ALAMEDA, CALIFORNIA

LEGEND

✕	PREVIOUS EXCAVATION 1,2
▲	PREVIOUS GEOPROBE 2

1 SOIL SAMPLE LOCATION INDICATING POTENTIAL FOR FREE PRODUCT (TTPH>14,000 mg/kg).

2 GROUNDWATER SAMPLE LOCATION INDICATING POTENTIAL FOR FREE PRODUCT (TTPH>20 mg/L).

⊠	EXISTING MONITORING WELL (TTPH<14,000 mg/kg AND/OR <20 mg/L)
UST → ▭	SUSPECTED PRIMARY FORMER POINT SOURCE

IMAGE	X-REF	OFFICE	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
---	ALA1BASE	CONC	B. Jensen 6/11/01	D. [signature] 06/11/01	[signature] 6/11/01	823334-D19

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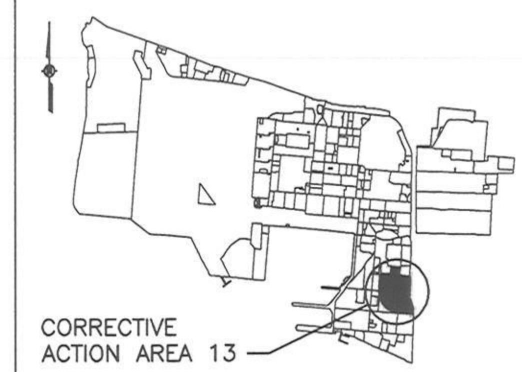
SOUTHWEST DIVISION
SAN DIEGO, CALIFORNIA

FIGURE 4

AREA 37 (CAA-11) SITE MAP
ALAMEDA POINT
ALAMEDA, CALIFORNIA

IMAGE	X-REF	OFFICE	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
---	ALA1BASE	CONC	B. Jensen 6-12-01	MJM 6-11-01	MJM 6-11-01	823334-D20



KEY PLAN

LEGEND

- EXISTING MONITORING WELL₂
- PREVIOUS EXCAVATION₁
- PREVIOUS GEOPROBE₂
- PREVIOUS SOIL BORING₁

1 SOIL SAMPLE LOCATION INDICATING POTENTIAL FOR FREE PRODUCT (TTPH>14,000 mg/kg).

2 GROUNDWATER SAMPLE LOCATION INDICATING POTENTIAL FOR FREE PRODUCT (TTPH>20 mg/L).

- EXISTING MONITORING WELL (TTPH<14,000 mg/L AND/OR <20 mg/kg)
- SW — SANITARY SEWER LINE
- SS — STORM SEWER LINE

SCALE
0 40 80 FEET

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SOUTHWEST DIVISION
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FIGURE 5

BUILDING 530/DEFUELING AREA (CAA-13)
SITE MAP
ALAMEDA POINT
ALAMEDA, CALIFORNIA

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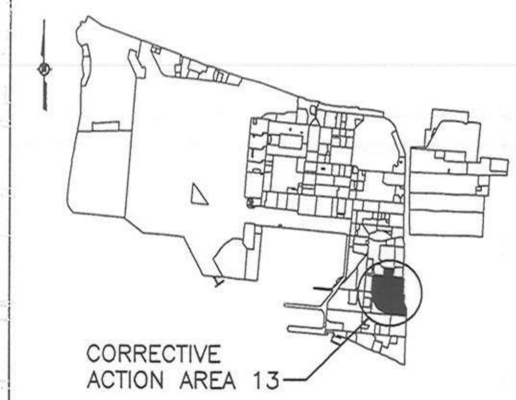

KEY PLAN

LEGEND

- EXISTING MONITORING WELL 2
- PREVIOUS GEOPROBE 2,3
- PREVIOUS SOIL BORING 1,2,3

1 SOIL SAMPLE LOCATION INDICATING POTENTIAL FOR FREE PRODUCT (TTPH>14,000 mg/kg).
2 GROUNDWATER SAMPLE LOCATION INDICATING POTENTIAL FOR FREE PRODUCT (TTPH>20 μg/L).
3 SOIL AND GROUNDWATER SAMPLE LOCATION INDICATING POTENTIAL FOR FREE PRODUCT (TTPH>14,000 mg/kg AND 20 mg/L).

EXISTING MONITORING WELL (TTPH<14,000 mg/kg AND/OR <20 mg/L)

SCALE 0 40 80 FEET

IMAGE	X-REF	OFFICE	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
---	ALA1BASE	CONC	B. Jensen 7/17/01	MLM 7-17-01	MLM 7-17-01	823334-D21

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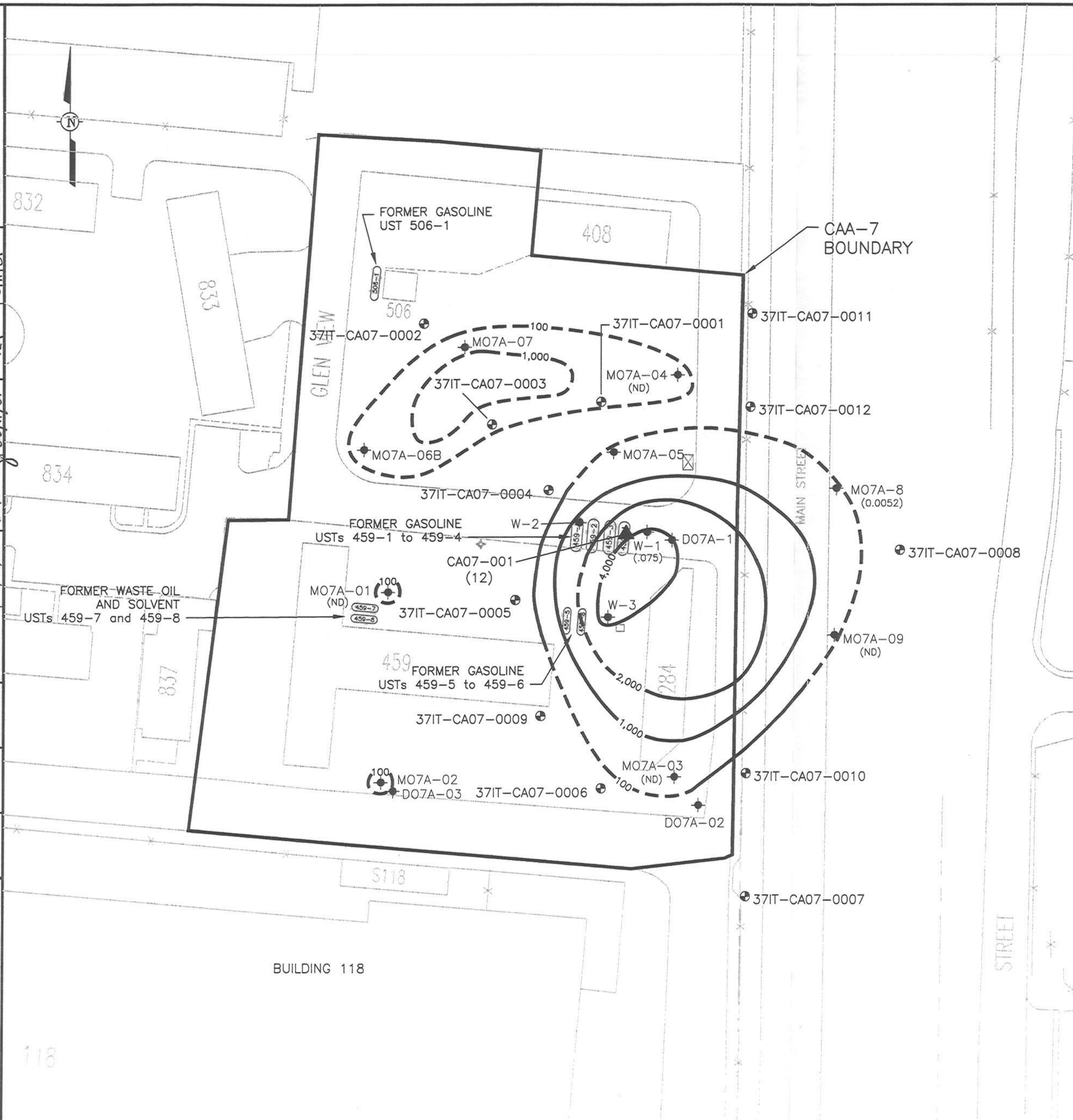
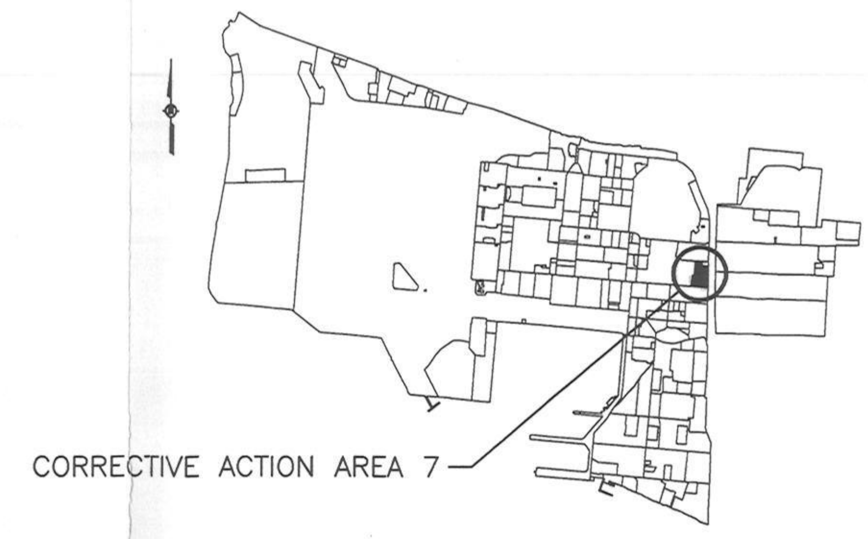
FIGURE 6
MINI-STORAGE AREA (CAA13)
SITE MAP

ALALMEDA POINT
ALAMEDA, CALIFORNIA

IMAGE	X-REF	OFFICE	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
---	---	CONCORD	BJ 6/11/01	D.B. 06/11/01	M.L. 6/11/01	823334-B4





NOTES:

1. WELL AND UTILITY LOCATIONS ARE APPROXIMATE.
2. ACTUAL SOIL BORING LOCATIONS WILL BE DETERMINED IN THE FIELD AND WILL BE BASED ON FIELD CONDITIONS.
3. AT ALL SOIL BORING LOCATIONS, CONTINUOUS CORES WILL BE TAKEN AND TEMPORARY PIEZOMETERS WILL BE INSTALLED TO APPROXIMATELY 20 FEET BELOW GROUND SURFACE (BGS).
4. AT ALL SOIL BORING LOCATIONS UP TO TWO DISCRETE GROUNDWATER SAMPLES WILL BE ACQUIRED. ONE SAMPLE WILL BE ACQUIRED FROM THE WATER TABLE, AND ONE DEEPER SAMPLE WILL BE ACQUIRED AT THE DISCRETION OF THE FIELD GEOLOGIST.
5. ACTUAL DISCRETE GROUNDWATER SAMPLING LOCATIONS WILL BE DETERMINED IN THE FIELD AND WILL BE BASED ON FIELD CONDITIONS.

LEGEND

- PROPOSED PRIMARY SOIL BORING LOCATION
- (.075) EXISTING MONITORING WELL (MTBE CONCENTRATION mg/L)
- (12) PREVIOUS PIEZOMETER (MTBE CONCENTRATION mg/L)
- 100 ISOCONCENTRATION CONTOUR (Dashed where inferred) 100 μg/L as TPH
- ND NOT DETECTED
- 459-1 FORMER UST (REMOVED)
- – HYDRANT
- – TRANSFORMER

SCALE

0 80 160 FEET

IT CORPORATION

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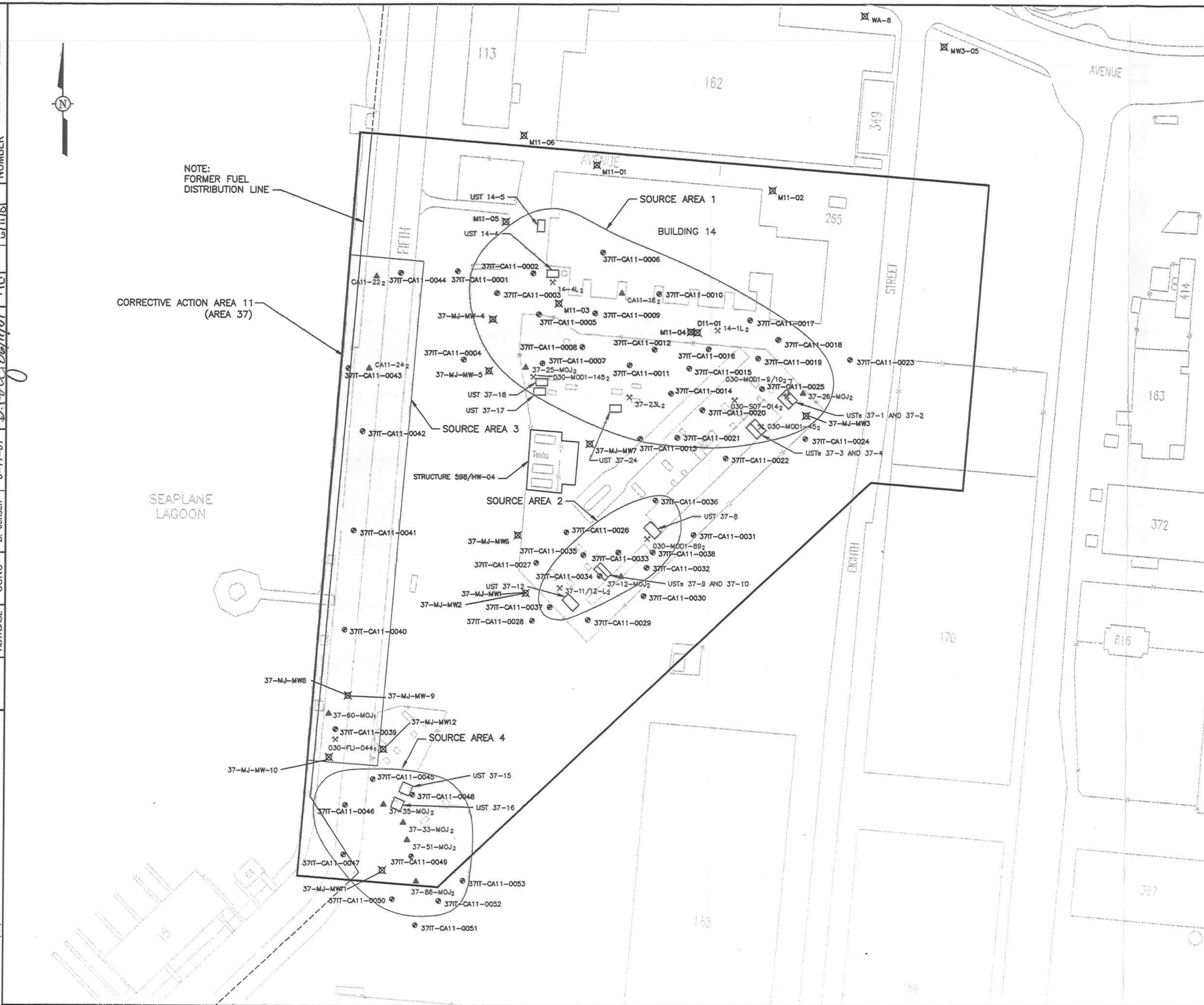
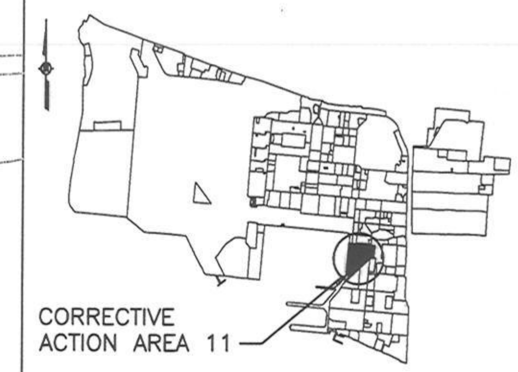
SOUTHWEST DIVISION
NAVAL ENGINEERING COMMAND
SAN DIEGO, CALIFORNIA

FIGURE 7

PRIMARY SOIL BORING LOCATIONS
EXCHANGE SERVICE STATION (CAA-7)
ALAMEDA POINT
ALAMEDA, CALIFORNIA

FORMAT REVISION 2/26/99





KEY PLAN

LEGEND

- ✕ PREVIOUS EXCAVATION 1,2
- ▲ PREVIOUS GEOPROBE 2

1 SOIL SAMPLE LOCATION INDICATING POTENTIAL FOR FREE PRODUCT (TTPH>14,000 mg/kg).

2 GROUNDWATER SAMPLE LOCATION INDICATING POTENTIAL FOR FREE PRODUCT (TTPH>20 mg/L).

- PROPOSED PRIMARY SOIL BORING LOCATION
- EXISTING MONITORING WELL (TTPH<14,000 mg/kg and/or <20 mg/L)
- UST — SUSPECTED PRIMARY FORMER POINT SOURCE

NOTES:

1. AT ALL SOIL BORING LOCATIONS, CONTINUOUS CORES WILL BE TAKEN AND TEMPORARY PIEZOMETERS WILL BE INSTALLED TO APPROXIMATELY 20 FEET BELOW GROUND SURFACE (BGS).
2. AT ALL SOIL BORING LOCATIONS UP TO TWO DISCRETE GROUNDWATER SAMPLES WILL BE ACQUIRED. ONE SAMPLE WILL BE ACQUIRED FROM THE WATER TABLE AND ONE DEEPER SAMPLE WILL BE ACQUIRED AT THE DISCRETEION OF THE FIELD GEOLOGIST.
3. ACTUAL DISCRETE GROUNDWATER SAMPLING LOCATIONS WILL BE DETERMINED IN THE FIELD AND WILL BE BASE ON FIELD CONDITIONS.

SCALE
0 60 120 FEET

IT CORPORATION

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SAN DIEGO, CALIFORNIA

FIGURE 8

PRIMARY SOIL BORING LOCATIONS
AREA 37 (CAA-11)
ALAMEDA POINT
ALAMEDA, CALIFORNIA

IMAGE	X-REF	OFFICE	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
---	ALA1BASE	CONC	B. Jensen 6-11-01	D. [signature] 06/11/01	[signature] 6/11/01	823334-D22

FORMAT REVISION 2/26/99

IMAGE	X-REF	OFFICE	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
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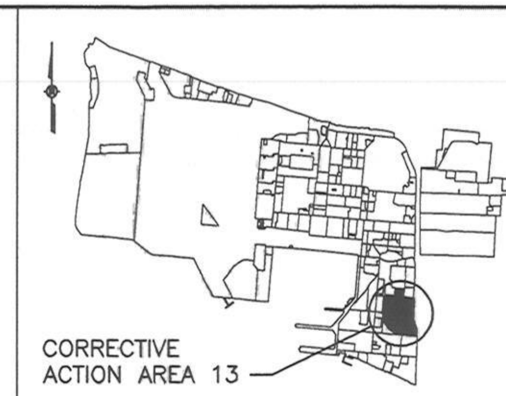

KEY PLAN

LEGEND

- EXISTING MONITORING WELL₂
- PREVIOUS EXCAVATION₁
- PREVIOUS GEOPROBE₂
- PREVIOUS SOIL BORING₁

1 SOIL SAMPLE LOCATION INDICATING POTENTIAL FOR FREE PRODUCT (TTPH>14,000 mg/kg).

2 GROUNDWATER SAMPLE LOCATION INDICATING POTENTIAL FOR FREE PRODUCT (TTPH>20 mg/L).

- PROPOSED PRIMARY SOIL BORING LOCATION
- EXISTING MONITORING WELL (TTPH<14,000 mg/kg AND/OR <20 mg/L)
- —SW— SANITARY SEWER LINE
- —SS— STORM SEWER LINE

NOTES:

1. AT ALL PROPOSED PRIMARY SOIL BORING LOCATIONS, CONTINUOUS CORES WILL BE TAKEN AND TEMPORARY PIEZOMETERS WILL BE INSTALLED TO APPROXIMATELY 20 FEET BELOW GROUND SURFACE (BGS).
2. AT ALL SOIL BORING LOCATIONS UP TO TWO DISCRETE GROUNDWATER SAMPLES WILL BE ACQUIRED. ONE SAMPLE WILL BE ACQUIRED FROM THE WATER TABLE AND ONE DEEPER SAMPLE WILL BE ACQUIRED AT THE DISCRETEION OF THE FIELD GEOLOGIST.
3. ACTUAL DISCRETE GROUNDWATER SAMPLING LOCATIONS WILL BE DETERMINED IN THE FIELD AND WILL BE BASE ON FIELD CONDITIONS.

SCALE 0 40 80 FEET

IT CORPORATION

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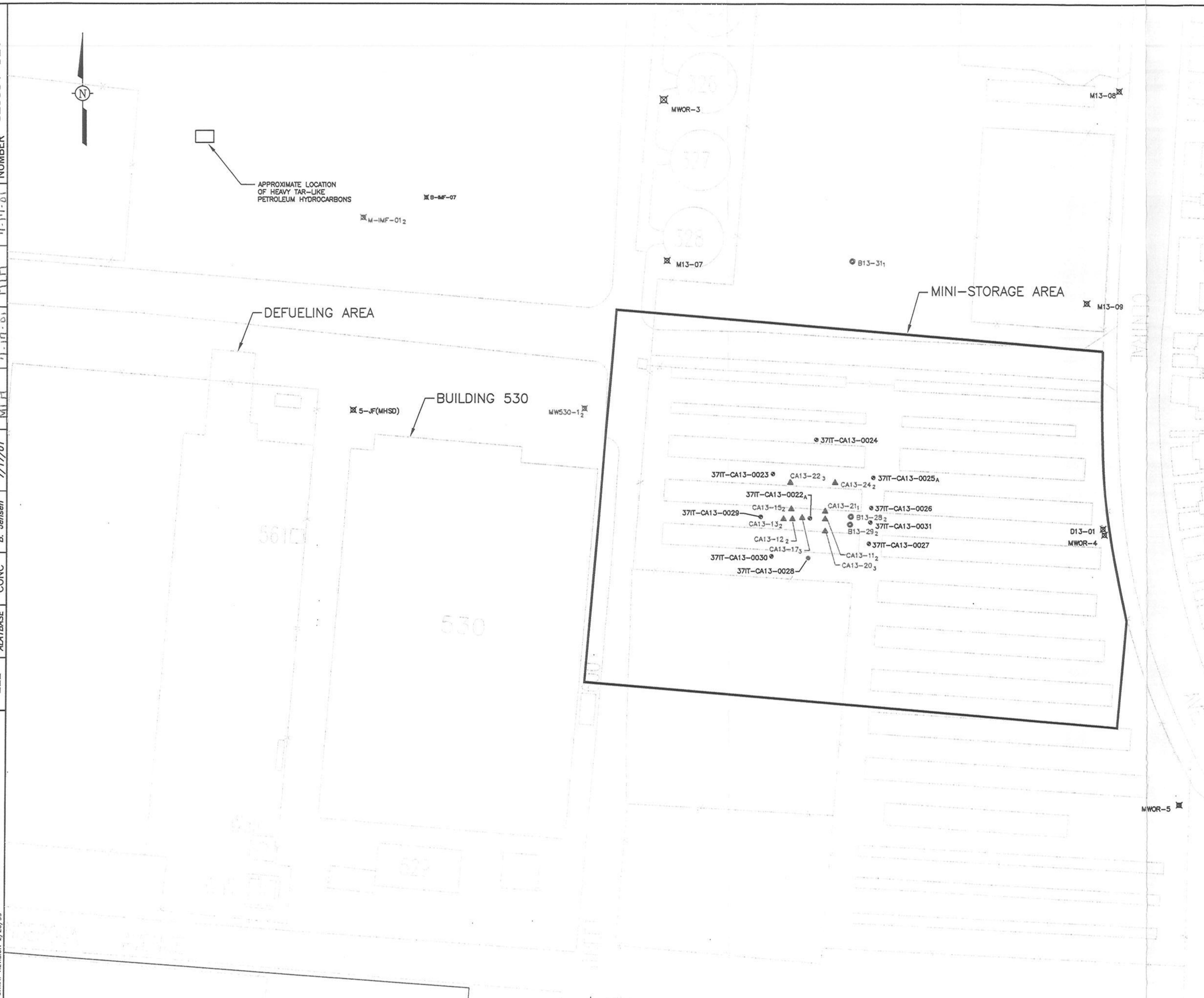
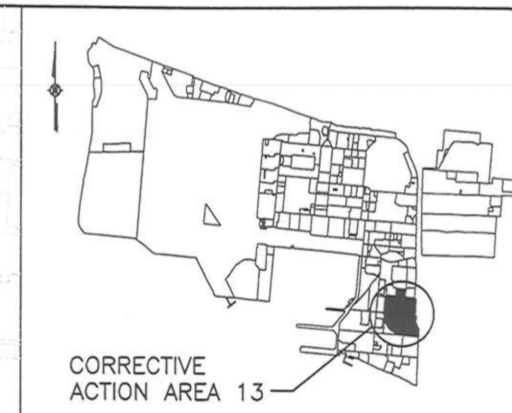
SOUTHWEST DIVISION
SAN DIEGO, CALIFORNIA

FIGURE 9

PRIMARY SOIL BORING LOCATIONS
BUILDING 530/DEFUELING AREA (CAA-13)
ALAMEDA POINT
ALAMEDA, CALIFORNIA

FORMAT REVISION 2/26/99





KEY PLAN

LEGEND

- EXISTING MONITORING WELL 2
- PREVIOUS GEOPROBE 2,3
- PREVIOUS SOIL BORING 1,2,3

1 SOIL SAMPLE LOCATION INDICATING POTENTIAL FOR FREE PRODUCT (TTPH>14,000 mg/kg).
2 GROUNDWATER SAMPLE LOCATION INDICATING POTENTIAL FOR FREE PRODUCT (TTPH>20 mg/L).
3 SOIL AND GROUNDWATER SAMPLE LOCATION INDICATING POTENTIAL FOR FREE PRODUCT (TTPH>14,000 mg/kg AND 20 mg/L).

- PROPOSED PRIMARY SOIL BORING LOCATION

NOTES:

1. AT ALL SOIL BORING LOCATIONS, CONTINUOUS CORES WILL BE TAKEN TO WATER TABLE.
2. ⊘A INDICATES GROUNDWATER SAMPLES AT GROUNDWATER INTERFACE AND APPROXIMATELY 10 FEET BELOW GROUND SURFACE.
3. CONFIRMATION SOIL SAMPLES WILL BE ACQUIRED AT BORINGS WITH LOW PID READINGS AND WITHOUT SIGNIFCANT STAINING.
4. UP TO 30 ADDITIONAL PRIMARY SOIL BORINGS MAY BE DRILLED DURING THE FIST MOBILIZATION IF VISUAL EVIDENCE OF VADOSE ZONE CONTAMINATION IS OBSERVED IN THE INITIAL PRIMARY BORINGS SHOWN.
5. ACTUAL SOIL BORING LOCATIONS WILL BE DETERMINED IN THE FIELD AND WILL BE BASED ON FIELD CONDITIONS.

SCALE
0 40 80 FEET

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SOUTHWEST DIVISION
SAN DIEGO, CALIFORNIA

FIGURE 10

PRIMARY SOIL BORING LOCATIONS
MINI-STORAGE AREA (CAA-13)
ALAMEDA POINT
ALAMEDA, CALIFORNIA

IMAGE	X-REF	OFFICE	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
---	ALA1BASE	CONC	B. Jensen 7/17/01	MLH 7-17-01	MLH 7-17-01	823334-D24

FORMAT REVISION 2/26/99

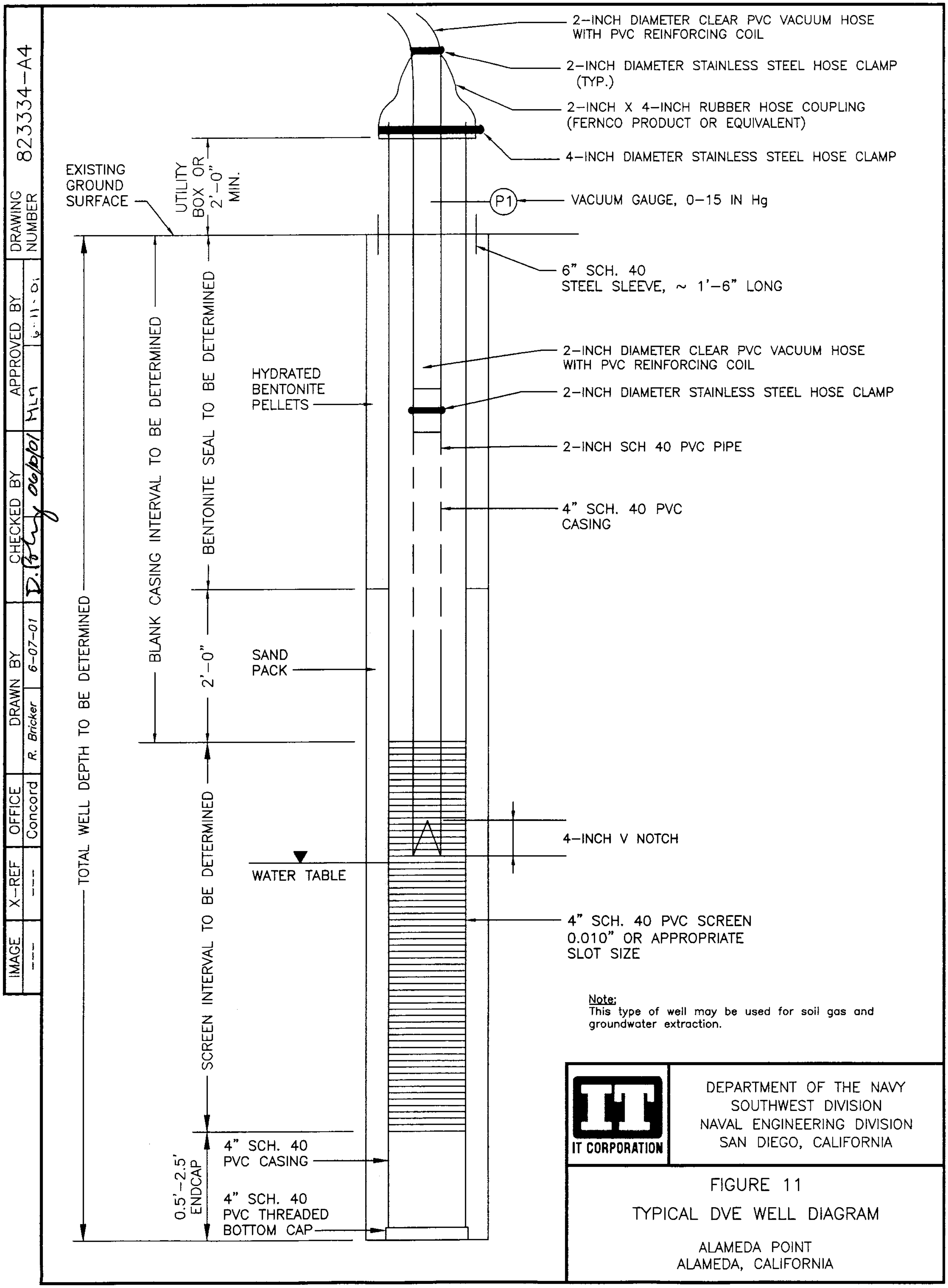
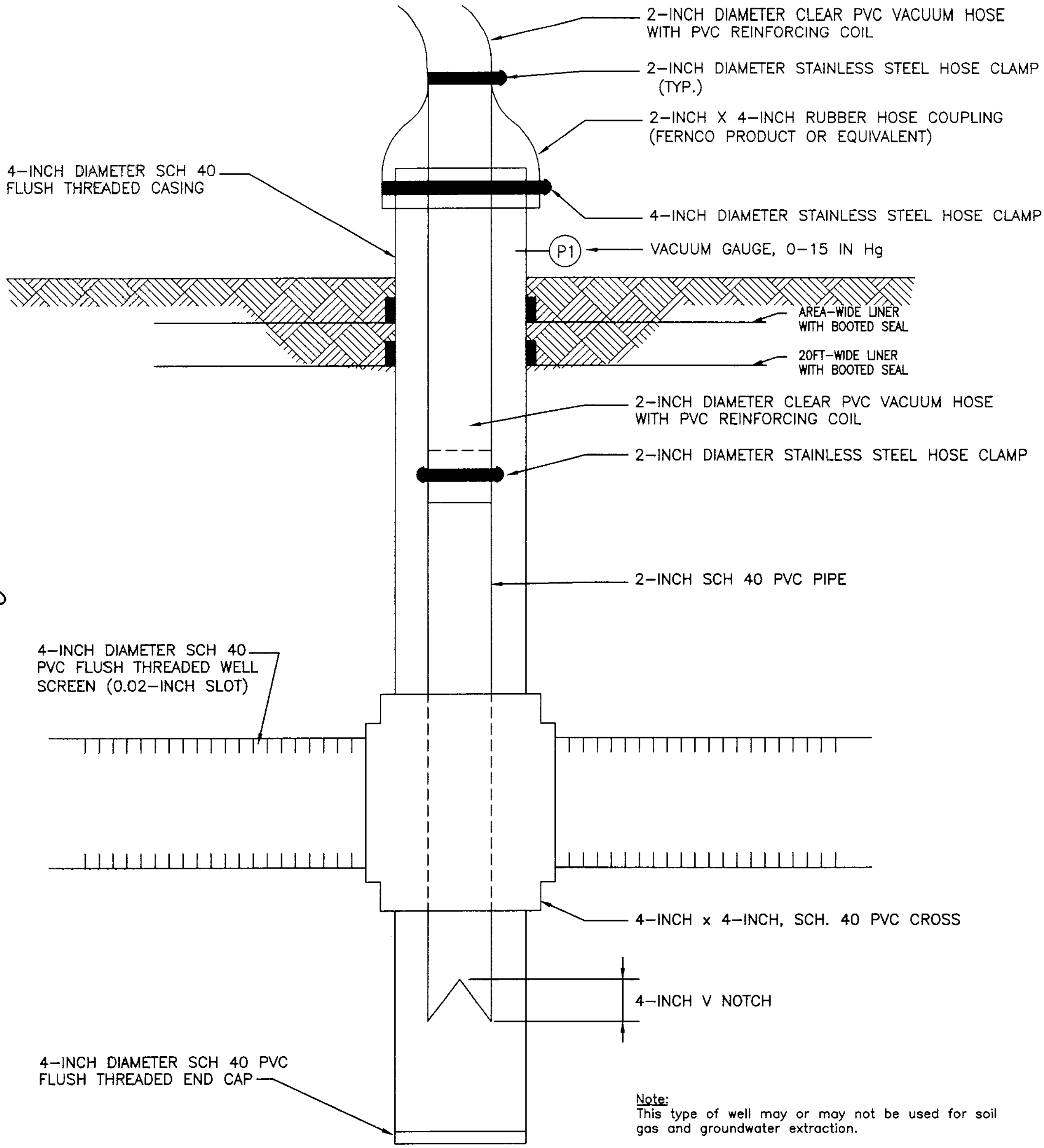


FIGURE 11
TYPICAL DVE WELL DIAGRAM

ALAMEDA POINT
ALAMEDA, CALIFORNIA



Note:
This type of well may or may not be used for soil gas and groundwater extraction.

NOT TO SCALE

IMAGE	X-REF	OFFICE	DRAWN BY		CHECKED BY		APPROVED BY		DRAWING NUMBER
---	---	Concord	R. Bricker	6-07-01	D.B.	06/11/01	MLJ	6-11-01	823334-A3

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION/ISSUE

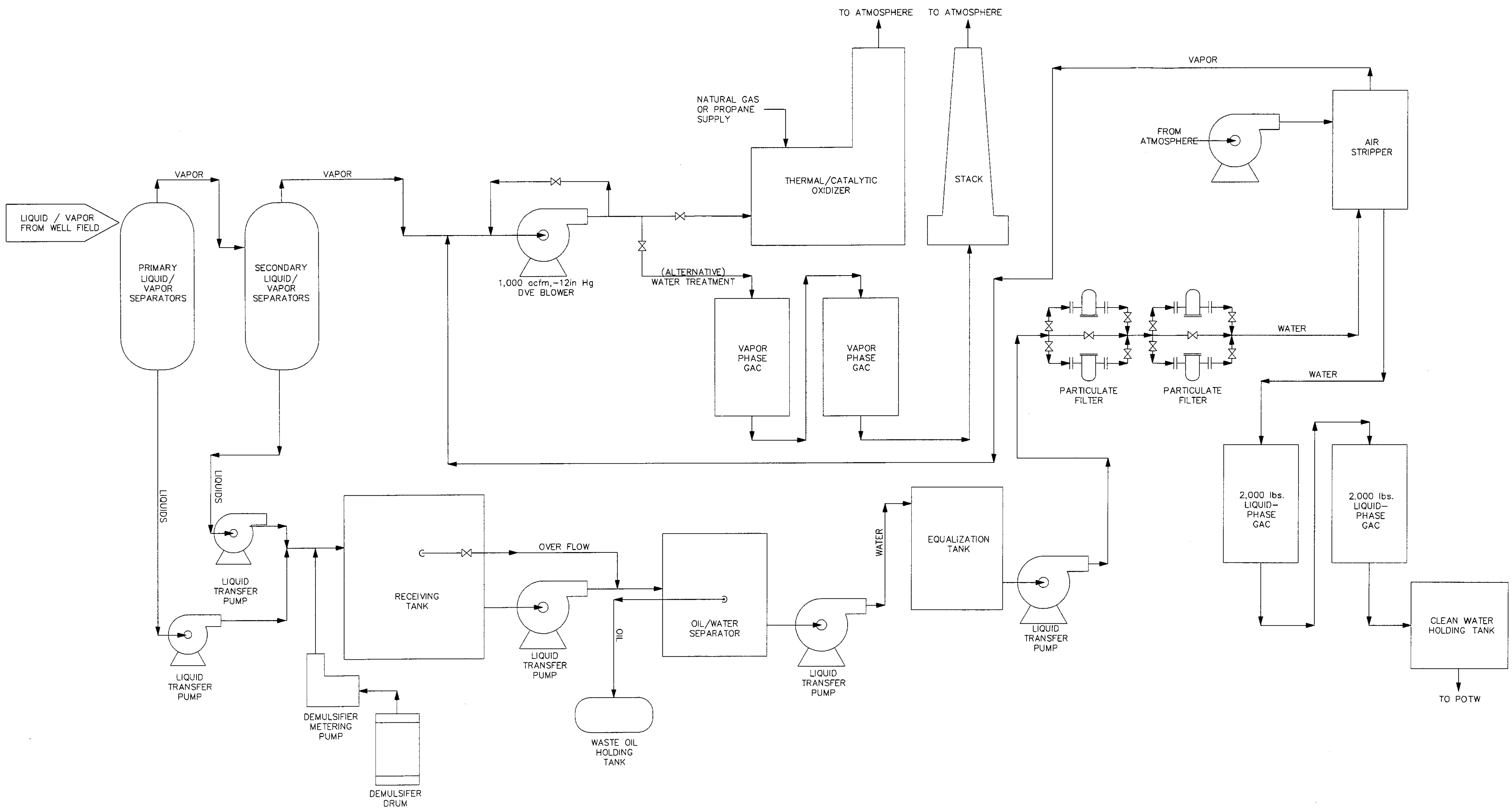
IT CORPORATION

DEPARTMENT OF THE NAVY
SOUTHWEST DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
SAN DIEGO, CALIFORNIA

FIGURE 12

TYPICAL DVE ACCUMULATION SUMP FOR NON-TIDAL USE
ALAMEDA POINT
ALAMEDA, CALIFORNIA

DRAWING NUMBER	APPROVED BY	CHECKED BY	DRAWN BY	OFFICE	X-REF	IMAGE
823334-B2	6-11-01	06/11/01	R. Bricker 6-07-01	Concord	---	---



REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION/ISSUE

IT CORPORATION

DEPARTMENT OF THE NAVY
SOUTHWEST DIVISION
NAVAL ENGINEERING COMMAND
SAN DIEGO, CALIFORNIA

FIGURE 13
PROCESS FLOW DIAGRAM
EXCHANGE SERVICE STATION (CAA7)

ALAMEDA POINT
ALAMEDA, CALIFORNIA

TABLES

Table 1
Preliminary Remediation Criteria for Soil
Alameda Point, Alameda, California[a]

Constituent	Residential (mg/kg)	Nonresidential (mg/kg)
TPH-associated Compounds		
Benzene	0.65[b]	1.5[d]
Toluene	520[b]	520[d]
Ethylbenzene	230[b]	230[d]
Xylenes (Total)	210[b]	210[d]
Methyl Tertiary Butyl Ether	17[b]	37[d]
Lead	221[c]	4,766[e]
TPH Fractions		
Gasoline	1,030[f]	5,900[g]
Diesel/Jet Fuel	1,380[f]	6,700[g]
Motor Oil	1,900[f]	9,400[g]

Notes:

a The PRCs contained in this table are considered interim until final remediation goals are issued by the RWQCB.
b Residential Cal-EPA PRG.
c DTSC LeadSpread 7 ninety-ninth percentile concentration for the child exposure.
d Industrial Cal-EPA PRG.
e DTSC LeadSpread 7 ninety-ninth percentile concentration for the occupational exposure.
f Residential soil action level developed for the Presidio, San Francisco, California.
g Park maintenance worker/groundskeeper soil action level developed for the Presidio, San Francisco, California.

Cal-EPA denotes California Environmental Protection Agency.
mg/kg denotes milligrams per kilogram.
PRG denotes preliminary remediation goal.
TPH denotes total petroleum hydrocarbons.

Table 2
Preliminary Remediation Criteria for Groundwater
Alameda Point, Alameda, California[a]

Constituent	Potential Drinking Water Source MCL[b] (mg/L)	Marine Ecological Receptors Storm Drain Exposure Pathway Ambient Water Quality Criteria[d] (mg/L)
Total Petroleum Hydrocarbon-Associated Compounds		
Benzene	0.001	0.7
Toluene	0.15	5
Ethylbenzene	0.7	0.43
Xylenes (Total)	1.75	No Value
Methyl Tertiary Butyl Ether (MTBE)	0.005[c]	8[e]
Lead	0.015	0.0081
Total Total Petroleum Hydrocarbons	No Value	1.4[f]

a *The PRCs contained in this table are considered interim until final remediation goals are issued by the RWQCB.*

b *California primary MCL, unless noted otherwise.*

c *California secondary MCL.*

d *National Oceanic and Atmospheric Administration Screening Quick Reference Tables, 1999, unless noted otherwise.*

e *Regional Water Quality Control Board, 1998,* Recommended Interim Water Quality Objective (or Aquatic Life Criteria) for Methy Tertiary-Butyl Ether, *September.*

f *Tetra Tech EM Inc., 1997, Draft Corrective Action Plan, Sites 04/19, 04, 14/22, 15, 16, 20, and 25, Naval Station Treasure Island, San Francisco, California, September.*

MCL denotes California maximum contaminant level.

mg/L denotes milligrams per liter.

Table 3
Corrective Action Area Monitoring Wells to Be Evaluated

Monitoring Wells Located Within Specific Correction Areas That Will Be Evaluated As Part Of This Corrective Action Effort

Site	CAA 7 Exchange Service Station	CAA 11 Area 37	CAA 13 530/Defueling Area
Monitoring Well Number	D07A-01	D11-01	D10B-01
	D07A-02	M11-01	D10B-02
	D07A-03	M11-02	M10B-01
	M07A-01	M11-03	M13-06
	M07A-02	M11-04	M13-07
	M07A-03	M11-05	MW410-4
	M07A-04	M11-06	MW530-1
	M07A-05	37-MJ-MW-1	MW530-2
	M07A-06B	37-MJ-MW-2	MW530-3
	M07A-07	37-MJ-MW-3	5-JF(MHSD)
	M07A-08	37-MJ-MW-4	
	M07A-09	37-MJ-MW-5	
	W-1	37-MJ-MW-6	
	W-2	37-MJ-MW-7	
	W-3	37-MJ-MW-8	
		37-MJ-MW-9	
		37-MJ-MW-10	
		37-MJ-MW-11	
		37-MJ-MW-12	

1. *The listed monitoring wells may be sampled as part of this Corrective Action effort. A list of analyses anticipated for each Corrective Action area is provided in the SAP.*
2. *The monitoring wells in the vicinity of the Mini-Storage Area (CAA 13) will not be sampled.*

Table 4
Proposed Field Activities for the Exchange Service Station, CAA 7

Location	Method	Depth (feet)[1]	Field Activity
IT37-CA07-0001	Geoprobe	0.0 to 20.0	Continuous Core[2], Install Temporary Piezometer, Sample Groundwater[3]
IT37-CA07-0002	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA07-0003	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA07-0004	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA07-0005	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA07-0006	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA07-0007	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA07-0008	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA07-0009	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA07-0010	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA07-0011	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA07-0012	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater

[1]Surface soil sample taken below subgrade and above water table.

[2]Sample vadose zone soils with significant staining and/or PID readings greater than 500 ppmv for EPA Methods 8015B (gasoline, diesel, motor oil) and EPA Method 5035/8260B.

[3]Analyze groundwater for EPA Methods 8015B (gasoline and diesel) and EPA Method 8260B (VOCs and oxygenated additives).

Table 5
Proposed Field Activities for Area 37, CAA 11

Location	Method	Depth (feet)[1]	Field Activity
IT37-CA11-0001	Geoprobe	0.0 to 20.0	Continuous Core[2], Install Temporary Piezometer, Sample Groundwater[3]
IT37-CA11-0002	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA11-0003	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA11-0004	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA11-0005	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA11-0006	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA11-0007	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA11-0008	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA11-0009	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA11-0010	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA11-0011	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA11-0012	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA11-0013	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA11-0014	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA11-0015	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA11-0016	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA11-0017	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA11-0018	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA11-0019	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA11-0020	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA11-0021	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA11-0022	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA11-0023	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater

Table 5 (continued)
Proposed Field Activities for Area 37, CAA-11

Location	Method	Depth (feet)[1]	Field Activity
IT37-CA11-0024	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA11-0025	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA11-0026	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA11-0027	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA11-0028	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA11-0029	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA11-0030	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA11-0031	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA11-0032	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA11-0033	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA11-0034	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA11-0035	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA11-0036	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA11-0037	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA11-0038	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA11-0039	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA11-0040	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA11-0041	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA11-0042	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA11-0043	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA11-0044	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA11-0045	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater

Table 5 (continued)
Proposed Field Activities for Area 37, CAA-11

Location	Method	Depth (feet)[1]	Field Activity
IT37-CA11-0046	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA11-0047	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA11-0048	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA11-0049	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA11-0050	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA11-0051	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA11-0052	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA11-0053	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater

[1]Surface soil sample taken below subgrade and above water table.

[2]Sample vadose zone soils with significant staining and/or PID readings greater than 500 ppmv for EPA Methods 8015B (gasoline, diesel, motor oil) and EPA Method 5035/8260B.

[3]Analyze groundwater for EPA Methods 8015B (gasoline and diesel) and EPA Method 8260B (VOCs and oxygenated additives).

Table 6
Proposed Field Activities for Building 530/Defueling Area, CAA 13

Location	Method	Depth (feet)[1]	Field Activity
IT37-CA13-0001	Geoprobe	0.0 to 20.0	Continuous Core[2], Install Temporary Piezometer, Sample Groundwater[3]
IT37-CA13-0002	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA13-0003	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA13-0004	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA13-0005	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA13-0006	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA13-0007	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA13-0008	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA13-0009	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA13-0010	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA13-0011	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA13-0012	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA13-0013	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA13-0014	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA13-0015	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA13-0016	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA13-0017	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA13-0018	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA13-0019	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA13-0020	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater
IT37-CA13-0021	Geoprobe	0.0 to 20.0	Continuous Core, Install Temporary Piezometer, Sample Groundwater

[1]Surface soil sample taken below subgrade and above water table.

[2]Sample vadose zone soils with significant staining and/or PID readings greater than 500 ppmv for EPA Methods 8015B (gasoline, diesel, motor oil) and EPA Method 5035/8260B.

[3]Analyze groundwater for EPA Methods 8015B (gasoline and diesel) and EPA Method 8260B (VOCs and oxygenated additives).

Table 7
Proposed Field Activities for the Mini-Storage Area, CAA 13

Location[1]	Method	Depth (ft)[2, 3]	Activity
IT37-CA13-0022	Geoprobe	0.0 to 20.0	Continuous Core[4], Determine Free Product Thickness, Groundwater Sampling[4]
IT37-CA13-0023	Geoprobe	0.0 to 20.0	Continuous Core, Determine Free Product Thickness
IT37-CA13-0024	Geoprobe	0.0 to 20.0	Continuous Core, Determine Free Product Thickness
IT37-CA13-0025	Geoprobe	0.0 to 20.0	Continuous Core, Determine Free Product Thickness, Groundwater Sampling[4]
IT37-CA13-0026	Geoprobe	0.0 to 20.0	Continuous Core, Determine Free Product Thickness
IT37-CA13-0027	Geoprobe	0.0 to 20.0	Continuous Core, Determine Free Product Thickness
IT37-CA13-0028	Geoprobe	0.0 to 20.0	Continuous Core, Determine Free Product Thickness
IT37-CA13-0029	Geoprobe	0.0 to 20.0	Continuous Core, Determine Free Product Thickness
IT37-CA13-0030	Geoprobe	0.0 to 20.0	Continuous Core, Determine Free Product Thickness
IT37-CA13-0031	Geoprobe	0.0 to 20.0	Continuous Core, Determine Free Product Thickness

[1] *Up to 30 additional primary soil borings may be drilled during the first mobilization if visual evidence of vadose zone contamination is observed in the initial primary borings.*
[2] *Surface soil sample taken below subgrade and above water table.*
[3] *Soil borings without significant product or elevated PID readings will be sampled for EPA Method 8015B (gasoline, diesel, motor oil), EPA Method 5035/8260B, and EPA Method 8310.*
[4] *If free product is not present, groundwater samples will be acquired from the water table and approximately 10 feet bgs. The groundwater samples will be analyzed for EPA Method 8015B (gasoline and diesel), EPA Method 8260B, and EPA Method 8310. If free product is present, acquire groundwater samples from a soil boring without free product.*

APPENDIX A
ENVIRONMENTAL PROTECTION PLAN

Table of Contents

List of Attachments

List of Acronyms and Abbreviations

AST	aboveground storage tank
BAAQMD	Bay Area Air Quality Management District
CSO	Caretaker Site Office
EPP	Environmental Protection Plan
HAZMAT	hazardous materials
IT	IT Corporation
ROICC	Resident Officer in Charge of Construction

1.0 Introduction

This Environmental Protection Plan (EPP) was developed to meet the requirements for performing the work described in this Corrective Action Work Plan in a manner that protects the environment during the contract period. Environmental protection, for the purpose of this project, is defined as maintaining the environment in its natural state and the enhancement and/or restoration of the appearance of disturbed sites after completion of the remedial activities.

To accomplish environmental protection, consideration will be given to air, water, and land resources, including management of visual aesthetics; natural, historical, and archeological resources; noise; and liquid and solid wastes. The IT Corporation (IT) Project Manager will implement the EPP so that all work is performed in a manner that minimizes the pollution of air, water, and land resources and complies with federal, state, and local regulations.

1.1 Conformance with Laws, Regulations, and Permits

The IT Project Manager will verify that all work is performed in accordance with applicable and relevant federal, state, or local regulations and permits for protection of the environment.

1.2 Environmental Conditions

A photo log of Corrective Action Areas 7, 11, and 13 is presented as Attachment 1 of this plan. The photographs in the attachment reflect the areas of the site that are assumed to be the most affected by the planned site activities.

- **Corrective Action Area 7, Exchange Service Station**
  - Photo Number MVC-578f – This photo is a view, looking northeast, of the service station. This photo was taken from the paved area south of Building 459. The canopy and former pump islands are shown in the right portion of the photo. Main Street is visible beyond the canopy. The open space area to the north of the service station is shown in the left portion of the photo.
  - Photo Number MVC-579f – This photo is a view, looking southeast, of the former service station. This photo was taken from the open space area north of the service station. The canopy and former pump islands are shown in the left portion of the photo and Building 459 is shown in the right portion of the photo.
  - Photo Number MVC-580f – This photo is a view, looking east, of the vacant lot north of the former service station. This photo was taken from the western portion of the vacant lot, south of the Auto Hobby Shop (Building 506). The canopy and former pump islands are visible in the right side of the photo.

- **Corrective Action Area 11, Area 37**

  - Photo Number MVC-658f – This photo is a view, looking north, of the western portion of Building 14. This photo was taken from the northern portion of Area 37, just southwest of Building 14. Building 14 is the building in the upper-right corner of the photo. The paved area to the west and southwest of Building 14 are the locations of former underground storage tanks 14-4 and 14-5.

  - Photo Number MVC-673f – This photo is a view, looking east, of the northern portion of Area 37. This photo was taken from the northwest corner of Area 37, near Fifth Street. The portion of Area 37 shown in the photo is open space, some portions of which are paved. Building 14 is visible in the left portion of the photo.

  - Photo Number MVC-649f – This photo is a view looking west from the eastern portion of Area 37. This photo was taken from the northeast corner of Area 37. Most of Area 37 is unpaved and undeveloped. Three aboveground storage tanks (ASTs) remain at Area 37 and are visible in the center of this photo. Seaplane Lagoon is visible in the background.

  - Photo Number MVC-661f – This photo is a close-up view, looking southwest, of the three 25,000-gallon ASTs and the associated secondary containment structure (Structure 598/HW-04).

- **Corrective Action Area 13, Building 530**

  - Photo Number MVC-541f – This photo is a view looking north from the south end of the former aircraft defueling facility on Parcel 211. The former aircraft defueling facility consists of the paved area to the west of Building 530, which can be seen in the right side of the photo. Building 397 is visible in the background.

  - Photo Number MVC-548f – This photo is a view looking southeast from the open space located north of the former aircraft defueling facility and Building 530. This open space area is currently undeveloped and unpaved. Building 530 can be seen in the left side of the photo.

- **Corrective Action Area 13, Mini-Storage Area**

  - Photo Number MVC-014s – This photo is a view looking west toward Building 530 from Corrective Action Area 13, Mini-Storage Area. The results of samples collected from several borings from the area around the asphalt patch shown in this photo suggest the presence of free-phase petroleum hydrocarbons in the subsurface. Storage unit structures, representative of those present through the Mini-Storage Area, are visible on the left and right sides of the photo.

1.3 Protection of Air Resources

Construction activities associated with this project will be conducted in a manner that minimizes the release of airborne particulates and volatile chemical compounds within and outside the project boundary. Air emissions and dust control will be practiced according to the requirements described below.

1.3.1 Process Air Emissions Control

In accordance with the Bay Area Air Quality Management District (BAAQMD), Regulation 8, Rule 47, an air permit will be obtained prior to construction and operation of the remedial systems at CAAs 7, 11, and 13. It is anticipated that vapor emissions will be abated with at least two granular activated carbon vessels configured in series and operated under negative pressure. The pilot tests and remedial systems will be operated in accordance with permit requirements for the protection of air resources.

IT will also notify BAAQMD in writing five working days before excavating any contaminated soil, as required by BAAQMD, Regulation 8, Rule 40.

1.3.2 Dust Control and Air Monitoring

The remedial construction activities include the excavation of trenches for the installation of below-grade process equipment, the excavation of free product and hydrocarbon-impacted soil, backfilling and repaving excavated areas, drilling soil and well borings, and the installation of above-grade process equipment on existing surfaces. Dust emissions will be monitored by visual observation and temporary dust control will be addressed as necessary by any of the approved methods including sprinkling with water or stopping work.

1.3.3 Burning

No hot work permits are anticipated for this work. However, any work requiring an open flame or posing a potential fire hazard shall be coordinated as if they were a planned work element. Coordination efforts would be undertaken with the Caretaker Site Office (CSO), the Project Health an Safety Officer, the Resident Officer in Charge of Construction (ROICC), and the applicable fire department(s) at Alameda Point and/or the City of Alameda.

1.3.4 Noise

Noise receptors are not an anticipated problem at this site. IT will comply with Occupational Safety and Health Administration and applicable local noise standards. Equipment operators, contractors, and other personnel will be required to wear appropriate hearing protection when necessary as detailed in the Site Health and Safety Plan.

1.4 Protection of Land Resources

Construction activities associated with this project will be conducted in a manner to minimize the impact to land resources within and outside the project boundaries. Project activities will be coordinated with the CSO and the ROICC in order to minimize impact to land resources

1.4.1 Landscape Protection

IT will coordinate with the CSO and the ROICC prior to construction activities at the sites to identify any land resources to be preserved within the work areas. IT personnel will mark the areas to be preserved and provide fencing, barriers, or other physical protection. IT will make a reasonable effort to minimize damage of land resources within and outside the project work area.

1.4.2 Historical and Archeological Finds

IT is not aware of any structure(s) and/or artifact(s) of historical importance within the work area. Items discovered during construction activities that could be of historical or archeological interest will be carefully preserved in an undisturbed state. The Site Superintendent will immediately report any findings to the CSO and the ROICC so that proper authorities may be notified.

1.5 Runoff, Soil Erosion, and Sediment Control

In accordance with the Work Plan, soil is to be excavated during the construction of the collection trenches for the treatment system at CAA 7 and during the remedial activities at CAA 13, Mini-Storage Area. Excavated material will either be loaded directly onto truck for transport off-site or be temporarily stockpiled on-site in either drums, roll-off dumpsters or in bulk. Drums and roll-off dumpsters will remain sealed or covered when not in use. Bulk stockpiles will be constructed as to minimize the potential for runoff by using bermed containment areas and covering the bulk pile when not in use. As a precaution against runoff and sedimentation of the storm drains, IT will place temporary seals (plastic and geotextile) over storm drain inlets that could be affected by drainage or sedimentation resulting from the temporary placement of stockpiles.

2.0 Protection of Surface and Groundwater Resources

Construction activities associated with this project will be conducted so as to prevent the discharge of pollutants and to minimize the impact to water resources within and outside the project boundaries. Project activities will be conducted in compliance with all appropriate federal, state, and local laws regarding potential and actual contamination of surface and groundwater. In addition, all site activities will be performed in a manner so as to prevent the discharge of pollutants into existing waterways.

2.1 Spill Prevention Measures

The types of liquids handled during project activities that could potentially result in spills and discharges include petroleum hydrocarbon-contaminated groundwater, well development water, and recovered petroleum product.

When handling and transferring the above liquids during the various activities described in the Work Plan, the following spill prevention measures will be undertaken:

- Process equipment containing liquids, including the liquid/vapor separator, transfer pump, liquid holding tank, and interconnecting hoses and piping, will be placed within a bermed area lined with polyethylene membrane material.
- The holding tank level will be visually monitored regularly and liquids will be transferred for disposal as needed. If more liquid holding capacity is required, additional portable tanks will be utilized.
- Quick-disconnect hose fittings will be checked for proper fit and secured to prevent accidental opening. Outside of the equipment containment area, a portable pan will be inserted underneath each connection prior to disconnecting to prevent dripping on the ground surface.
- During test and start-up operation, all equipment, hoses, and piping will be monitored visually for leaks and drips.
- Drums or other regulation containers containing recovered petroleum product and/or petroleum hydrocarbon-contaminated water will be stored temporarily in over-pack drums or within the lined bermed areas.

2.2 Spill Response

It will be the responsibility of IT to maintain the following equipment and materials for use during spill response activities:

- Absorbent pads
- Granular absorbent material (noncombustible)
- Polyethylene sheeting
- 55-gallon drums
- Shovels and assorted hand tools

If a hazardous waste spill or material release to the air, soil, or water at the site is observed, IT will immediately notify the CSO representative and the facility Fire Department or Hazardous Materials (HAZMAT) unit. An assessment will be make of the magnitude and potential impact of the release. If it is safe to do so, site personnel will attempt to locate the source of the release, prevent further release, and contain the spilled materials as follows:

- The spill area will be approached cautiously. Hazards will be identified based on available information from witnesses to determine the proper personal protection levels, methods, and equipment necessary for the response.

- Control of the spill at the source by shutting off pumps, plugging or closing valves, righting containers or drums, or transferring contents of leaking tanks or drums will be implemented immediately.

- If fuel is spilled, IT will impose a 50-foot radius rule and all sources of ignition shall be eliminated.

- If possible, spill containment will initially be made without entering the immediate release area.

- Spill containment and collection will be performed using absorbent materials and construction of temporary dikes.

Given the types and quantities of liquids handled during this corrective action, it is not anticipated that site personnel will require outside help to manage any spill that may potentially occur. However, if IT personnel cannot safely and sufficiently respond to an environmental release, assistance from the facility or HAZMAT unit will be employed.

3.0 Post-Construction Cleanup

IT will remove all equipment used for the corrective action unless the same equipment is to be used for monitoring or additional site remediation. Final site restoration and cleanup will be performed at the end of the full-scale system operation for this corrective action.

ATTACHMENT 1
PHOTO LOG

Photo No. MVC-578f: CAA 7, Exchange Service Station - View looking northeast of the service station.

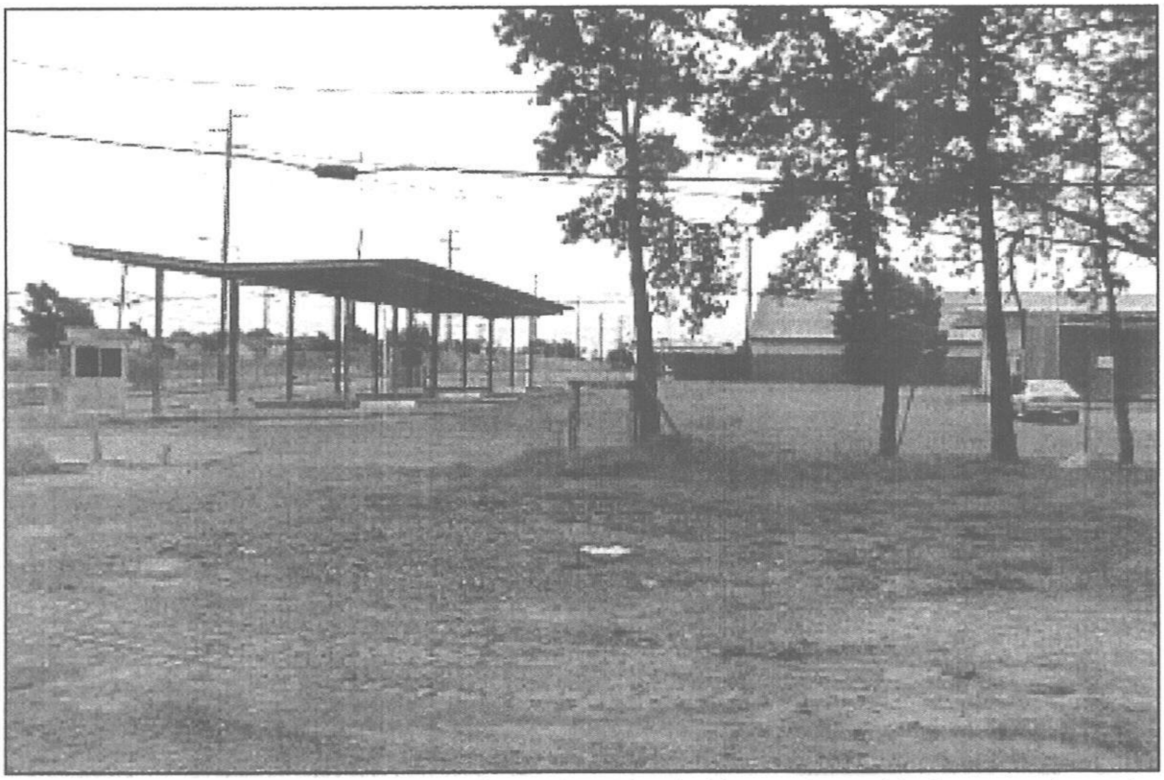


Photo No. MVC-579f: CAA 7, Exchange Service Station - View looking southeast of the former service station.

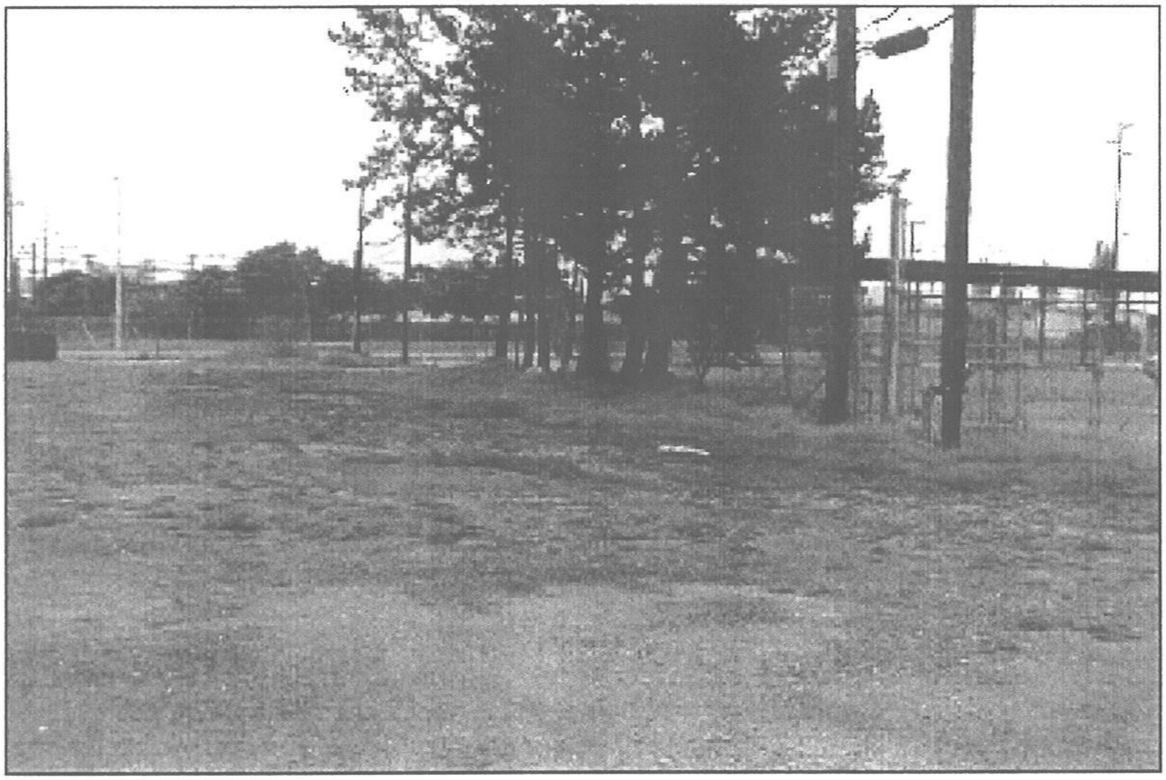


Photo No. MVC-580f: CAA 7, Exchange Service Station - View looking east. This photo was taken from the western portion of the vacant lot, south of the Auto Hobby Shop.

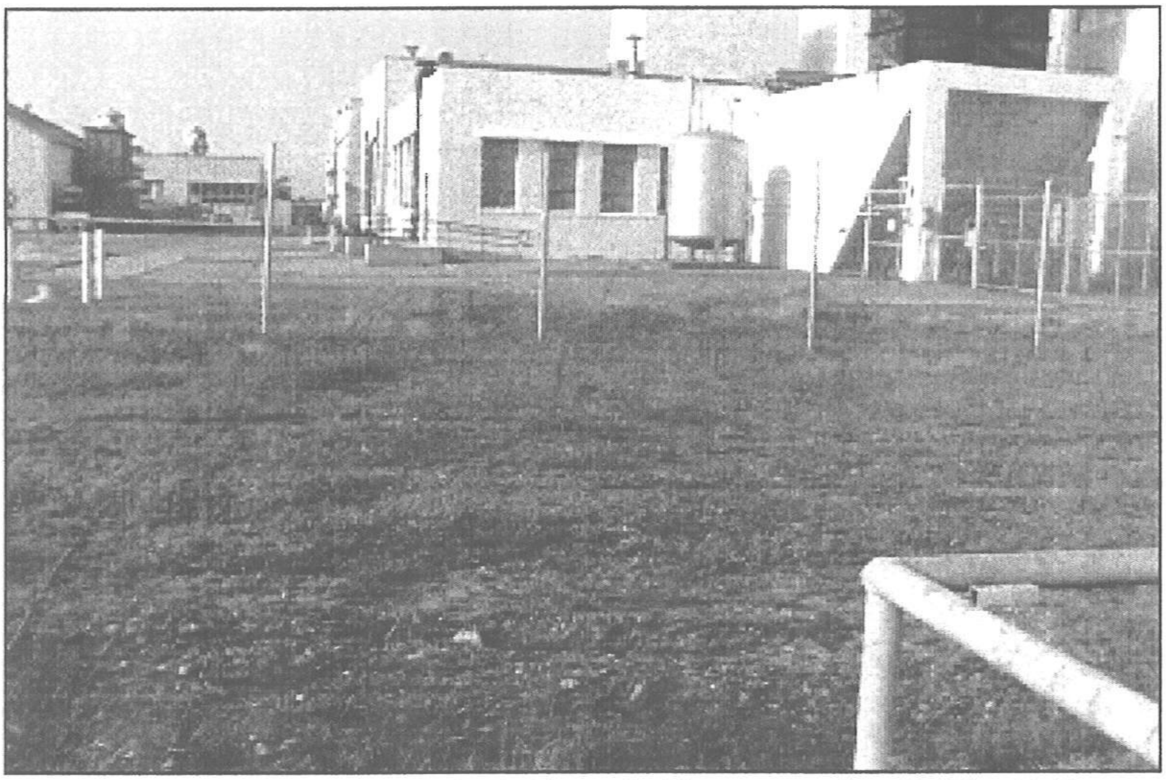


Photo No. MVC-658f: CAA 11, Area 37 - View looking north of the western portion of Building 14. The open space in the foreground is Area 37.

Photo No. MVC-673f: CAA 11, Area 37 - View looking east of the northern portion of Area 37. Building 14 is visible in the left portion of the photo.

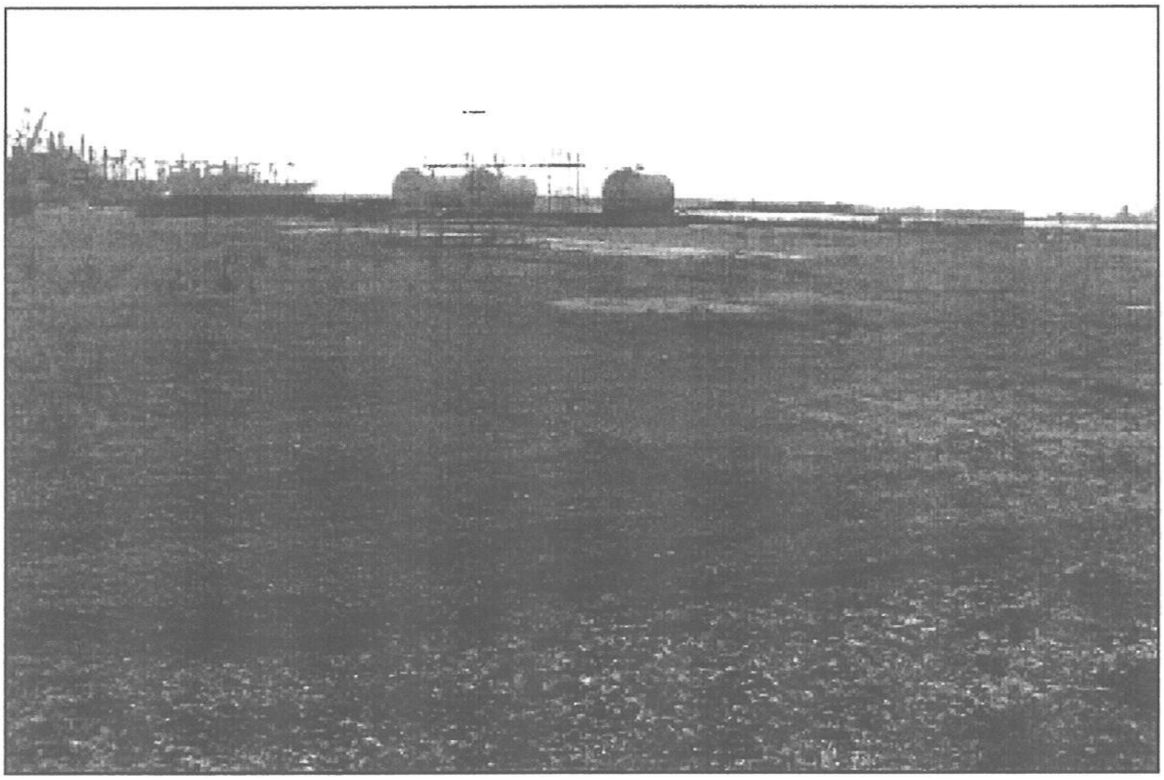


Photo No. MVC-649f: CAA 11, Area 37 - View looking west of Area 37. Three ASTs are visible in the center. Seaplane Lagoon is visible in the background.

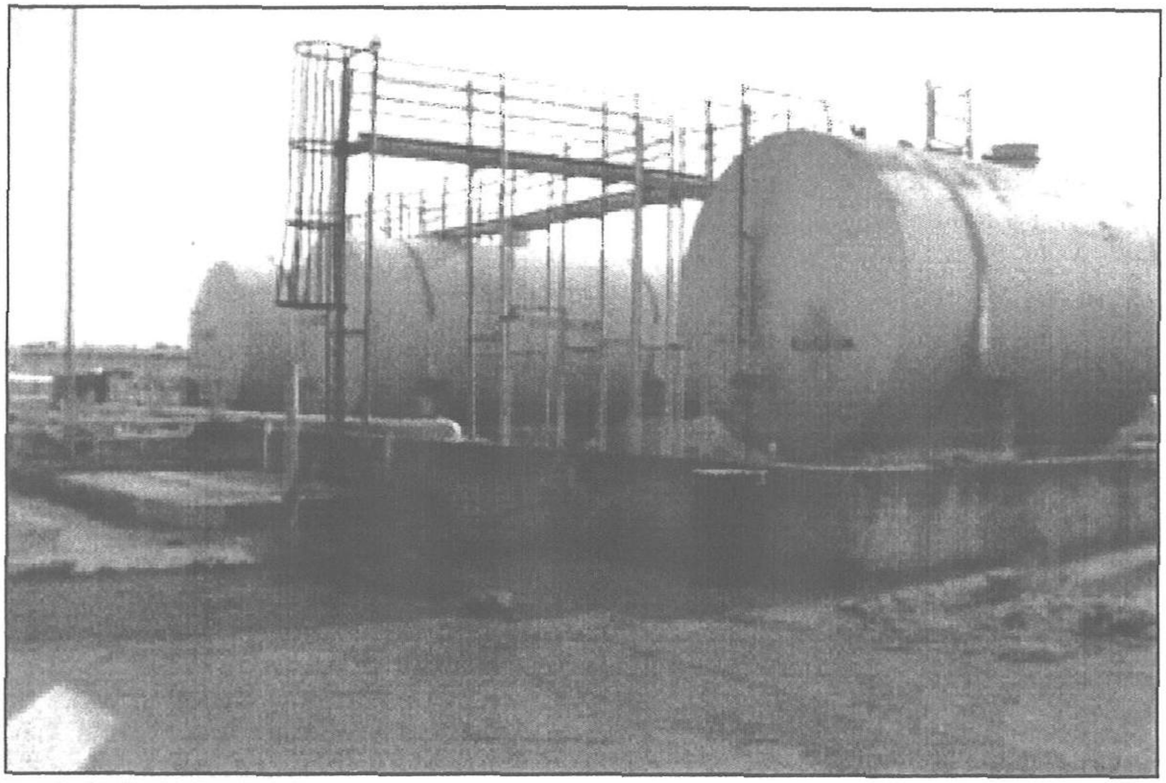


Photo No. MVC-661f: CAA 11, Area 37 - View looking southwest of the three 25,000-gallon ASTs and secondary containment structure.

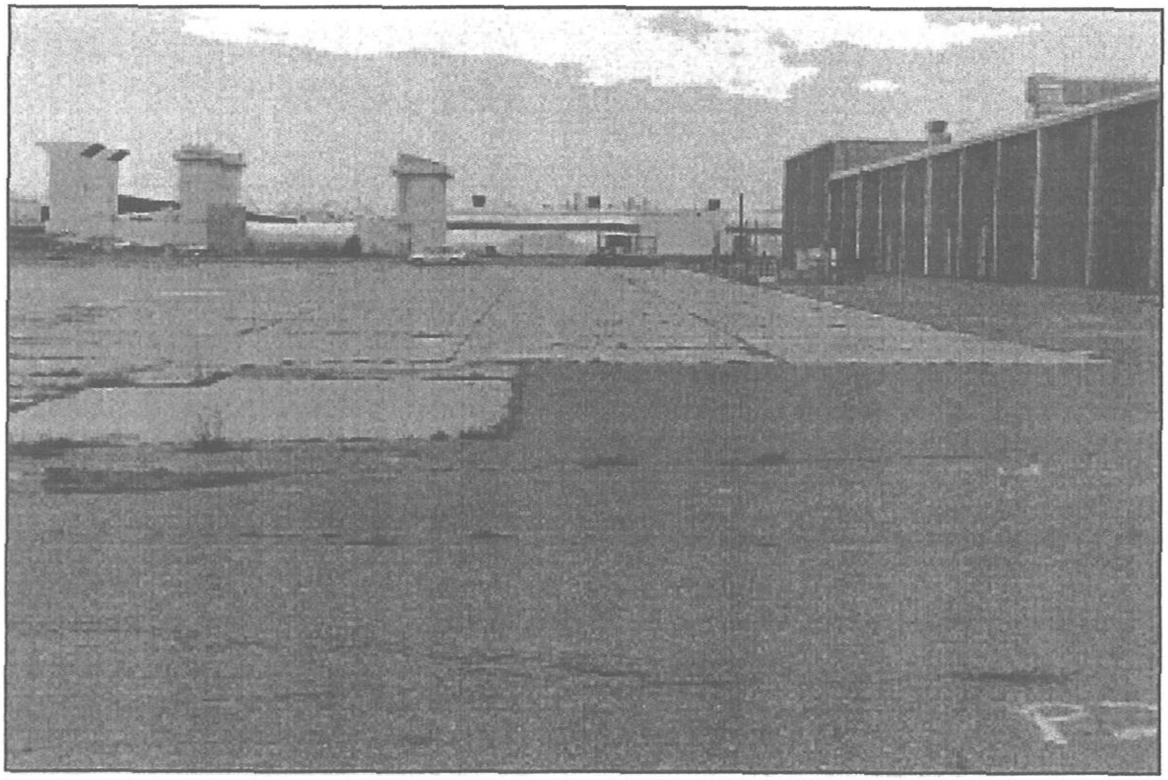


Photo No. MVC-541f: CAA 13, Building 530 - Former aircraft defueling facility on Parcel 211, now the paved area to the west of Building 530 (shown at right). Photo facing north.

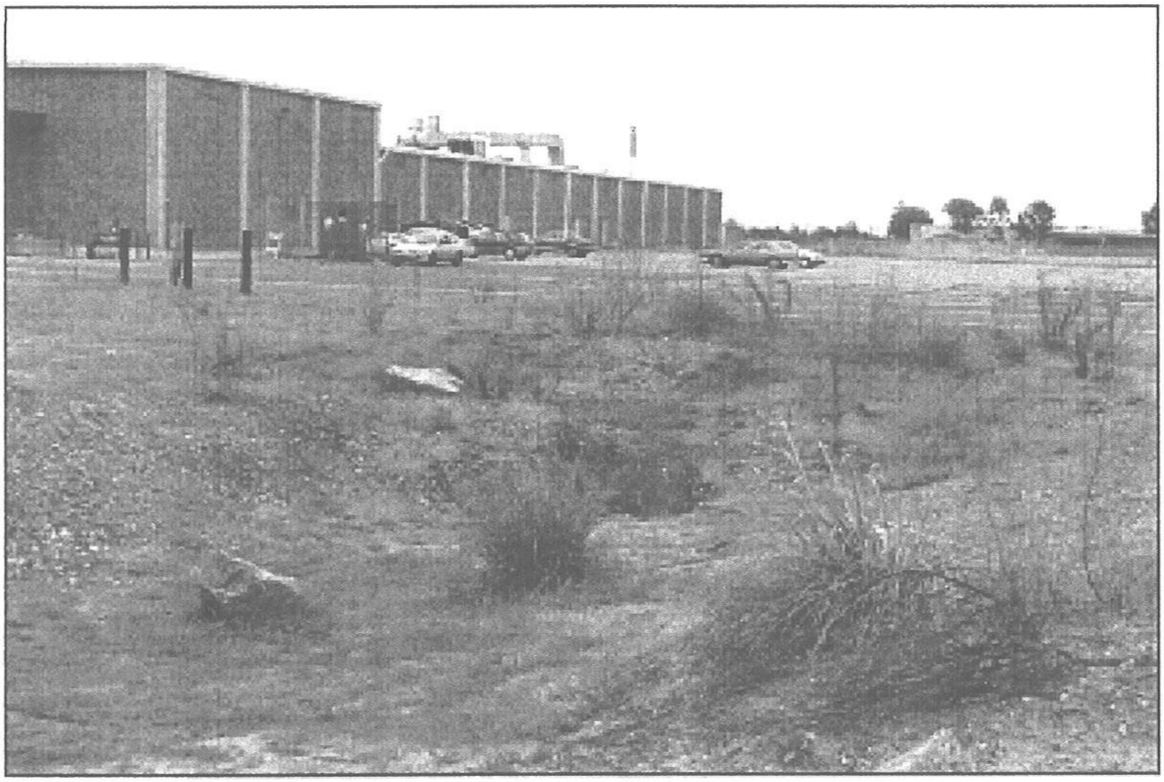


Photo No. MVC-548f: CAA 13, Building 530 - Open space, currently undeveloped and unpaved, located north of the former aircraft defueling facility and Building 530. Building 530 is shown at left. Photo facing southeast.

Photo No. MVC-014s: CAA 13, Mini-Storage Area - View looking west toward Building 530 from Corrective Action Area 13, Mini-Storage Area. Storage unit structures shown on left and right sides. Photo facing west.

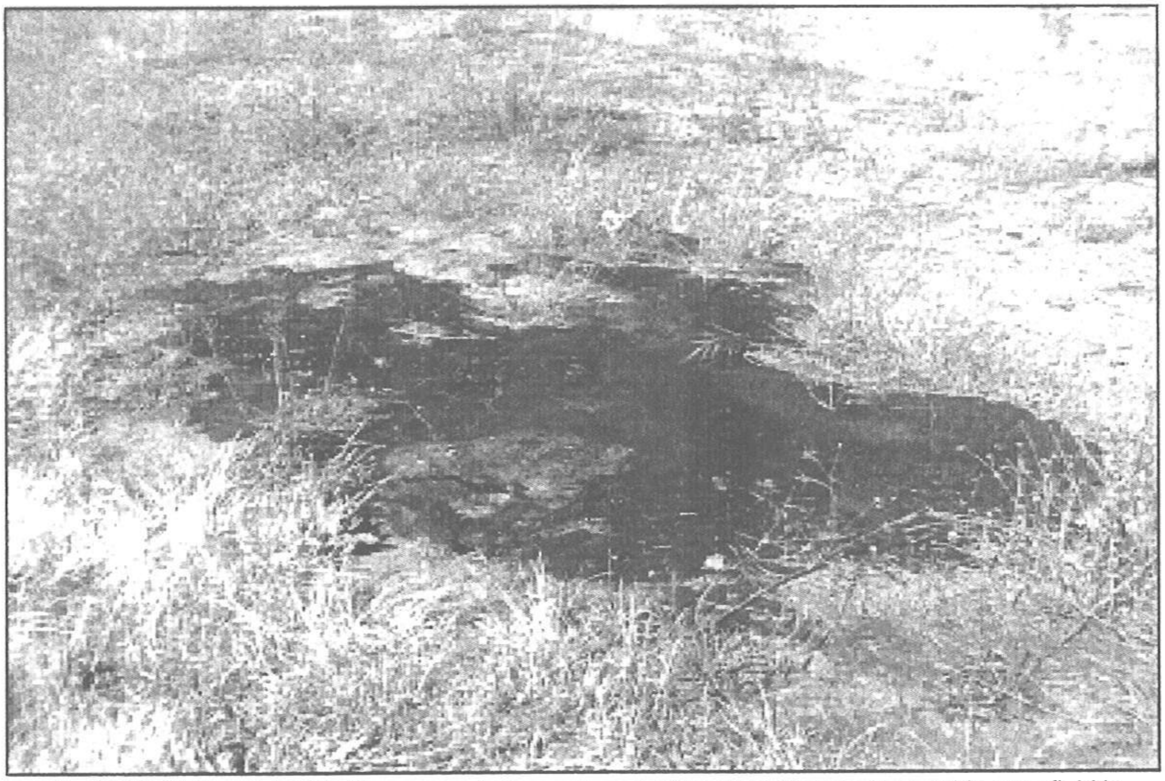


Photo No. MVC-019s: CAA 13, Open space to the northwest of the Mini-Storage Area. This open field is located north of Building 530.

APPENDIX B
SUMMARY OF PREVIOUS INVESTIGATION RESULTS

Appendix B
Table 1
BTEX Exceedences Above the Residential Soil PRC

Corrective Action Area	Sample Location	Sample Type	Easting	Northing	Investigation	Sample ID	Sample Date	Sample Depth (Top)	Sample Depth (Bottom)	Benzene	Ethyl-benzene	Toluene	Xylene
CAA 7	030-MOD1-214	EXCV	1482542.88	472046.88	FUELRA	030-MOD1-214	98-11-13	1.0	1.5	**33**	110	300	**590**
CAA 7	030-MOD1-215	EXCV	1482554.13	472081.31	FUELRA	030-MOD1-215	98-11-13	1.0	1.5	**1.00** J	9.90	29	100
CAA 7	030-MOD1-216	EXCV	1482542.88	472074.91	FUELRA	030-MOD1-216	98-11-13	1.0	1.5	**5.90** J	38	140	**390**
CAA 7	030-MOD1-219	EXCV	1482546.13	472102.13	FUELRA	030-MOD1-219	98-11-13	1.0	1.5	**3.30**	4.80	1.40 U	3.30
CAA 7	030-MOD1-220	EXCV	1482534.13	472108.50	FUELRA	030-MOD1-220	98-11-13	1.0	1.5	**2.30** J	44	7.50	200
CAA 7	030-MOD1-221	EXCV	1482559.63	472138.13	FUELRA	030-MOD1-221	98-11-13	1.0	1.5	**18**	150	300	**790**
CAA 7	459-5E	EXCV	1482499.97	472139.38	459-1 THROUGH 459-8	459-5E	95-04-07	6.0	0.0	**0.90**	4.70	7.00	31
CAA 7	B07A-08	SB	1482484.88	472132.62	CTO262-F_ON	262-S07A-002	94-05-05	2.5	3.0	**250**	**420**	**1,300**	**2,900**
CAA 7	B07A-08	SB	1482484.88	472132.62	CTO262-F_ON	262-S07A-003	94-05-05	5.5	6.0	**4.00**	71	130	**390**
CAA 7	B07A-09	SB	1482501.24	472153.44	CTO262-F_ON	262-S07A-006	94-05-05	5.0	5.5	**4.50**	60	120	**470**
CAA 13/B530	BOR-9	SB	1481937.13	469617.69	CANONIE	BOR-9 [6.5-7.0]	90-07-23	6.5	7.0	**1.00**	0.72 U	1.30	0.72 U
CAA 13/B530	BOR-9	SB	1481937.13	469617.69	CANONIE	BOR-9 [11.0-11.5]	90-07-23	11.0	11.5	**0.96**	1.80	0.75 U	4.10
CAA 13/B530	EX13-009	EXCV	1481969.88	469413.53	CTO137RA	137-S13-009	93-10-07	7.0	0.0	**0.65** J	1.10 J	3.30 J	9.40 J

BOLD indicates concentration exceeds Residential PRCs (Navy, 2001).
Residential PRCs for Benzene = 0.65 mg/kg; Toluene = 520 mg/kg; Ethylbenzene = 230 mg/kg; Xylenes (total) = 210 mg/kg.
No PRC exceedances in samples collected from CAA 11 or CAA 13/MS.
All concentrations presented in mg/kg.

CAA 13/B530 = Corrective Action Area 13, Building 530/Defueling Area

Sample Type
EXCV = Excavation sampling location
SB = Soil boring sampling location

Laboratory Data Qualifiers
U = Undetected at specified detection limit
J = Estimated value

Appendix B
Table 2
TTPH Exceedences Above the Residential Soil PRC

Corrective Action Area	Sample Location	Sample Type	Easting	Northing	Investigation	Sample ID	Sample Date	Sample Depth (Top)	Sample Depth (Bottom)	TPH-J	TPH-D	TPH-G	TPH-MO	TTPH
CAA 7	030-MOD1-214	EXCV	1482542.88	472046.88	FUELRA	030-MOD1-214	98-11-13	1.0	1.5	440 U	1,800 J	550 J	440 U	2,350
CAA 7	030-MOD1-216	EXCV	1482542.88	472074.91	FUELRA	030-MOD1-216	98-11-13	1.0	1.5	170 U	2,800 J	610 J	170 U	3,410
CAA 7	112-001-001	SL	1482383.20	472330.90	EBS PHASE 2A	112-0001M	95-06-20	0.5	1.0	0	760	0.50 U	12,000	12,760
CAA 7	112-001-001	SB	1482383.20	472330.90	EBS PHASE 2A	112-0003M	95-06-20	4.0	4.5	0	250	0.80 U	3,000	3,250
CAA 7	B07A-08	SB	1482484.88	472132.62	CTO262-F_ON	262-S07A-002	94-05-05	2.5	3.0	0	18,000 UJ	27,000	480	45,480
CAA 7	B07A-08	SB	1482484.88	472132.62	CTO262-F_ON	262-S07A-003	94-05-05	5.5	6.0	0	4,600 UJ	4,700	56	9,356
CAA 7	B07A-09	SB	1482501.24	472153.44	CTO262-F_ON	262-S07A-004	94-05-05	0.5	1.0	0	3,500 UJ	6,000	72	9,572
CAA 7	B07A-09	SB	1482501.24	472153.44	CTO262-F_ON	262-S07A-006	94-05-05	5.0	5.5	0	3,800 UJ	5,100	48	8,948
CAA 7	M07A-07	SB	1482402.50	472327.38	CTO262-F_ON	262-S07A-015	94-11-20	0.0	1.5	110 U	110 U	0.56 UJ	4,390 J	4,391
CAA 11	030-FLI-072	EXCV	1481000.77	470211.19	FUELRA	030-FLI-072	98-09-28	0.0	5.0	7,200 J	1,200 U	3,900 J	1,200 U	11,100
CAA 11	030-S07-004	EXCV	1480651.25	470760.89	FUELRA	030-S07-004	98-09-17	0.0	4.5	260 U	260 U	280 J	6,900 J	7,180
CAA 11	030-S07-008	EXCV	1480633.77	470577.46	FUELRA	030-S07-008	98-09-19	0.0	4.5	10 U	77 J	2,000 J	10 U	2,077
CAA 11	030-S07-033	EXCV	1480847.48	470465.38	FUELRA	030-S07-033	98-10-01	0.0	6.0	1,670 J	53 U	53 J	53 U	1,723
CAA 11	030-S07-036	EXCV	1480845.74	470497.37	FUELRA	030-S07-036	98-10-05	0.0	5.0	2,200 J	570 U	1,600 J	570 U	3,800
CAA 11	030-S07-052	EXCV	1481168.58	470448.31	FUELRA	030-S07-052	98-10-10	0.0	3.0	1,740 J	57 U	220 J	57 U	1,960
CAA 11	030-S07-072	EXCV	1480670.63	471027.75	FUELRA	030-S07-072	98-11-10	0.0	7.0	12 U	12 U	1,300	12 U	1,300
CAA 11	134-SN-001	SB	1481418.60	470786.80	EBS PHASE 2A	134S-001M	95-05-31	5.0	5.5	0	11	0.60 U	2,200	2,211
CAA 11	136-001-001	SB	1480767.50	470863.50	EBS PHASE 2A	136-0003M	95-06-23	3.5	4.0	0	62	2.10	2,600	2,664
CAA 11	138-002-004	SL	1480751.60	470119.30	EBS PHASE 2A	138-0004M	95-06-15	0.5	1.0	0	960	0	2,100	3,060
CAA 11	37-10W	EXCV	1480934.82	470210.58	37-1 THROUGH 37-24	37-10W	95-02-03	4.0	0.0	260	310	1,800	100 U	2,370
CAA 11	37-11W	EXCV	1480909.60	470186.01	37-1 THROUGH 37-24	37-11W	95-02-09	5.0	0.0	23	41	1,700	31	1,795
CAA 11	37-21SE	EXCV	1480921.19	470392.76	37-1 THROUGH 37-24	37-21SE	95-06-29	7.0	0.0	200 U	850	1.00 U	3,500	4,350
CAA 11	37-22E	EXCV	1480932.89	470419.66	37-1 THROUGH 37-24	37-22E	95-06-29	7.0	0.0	4,300	130	11	420	4,861
CAA 11	37-26-MOJ	GP	1481224.81	470432.32	37-1 THROUGH 37-24	37-P26	97-08-22	6.0	0.0	2,600	10 U	590	100 U	3,190
CAA 11	B11-12	SB	1481092.13	470516.81	CTO280-F_ON	280-S7B11-014	94-08-16	0.5	1.5	54 U	54 U	0.54 U	3,260 J	3,260
CAA 11	030-FLI-044	EXCV	1480582.46	469958.69	FUELRA	030-FLI-044	98-09-24	0.0	9.0	520 U	6,000 J	12,000 J	520 U	19,040
CAA 11	030-FLI-046	EXCV	1480611.52	469798.67	FUELRA	030-FLI-046	98-09-18	0.0	4.5	220 U	220 U	0.56 U	3,000 J	3,441
CAA 11	030-FLI-047	EXCV	1480653.10	469807.16	FUELRA	030-FLI-047	98-09-18	0.0	8.5	110 U	110 U	0.56 U	2,200 J	2,421
CAA 11	030-MOD1-91	EXCV	1480709.79	469944.93	FUELRA	030-MOD1-91	98-12-14	0.0	10.5	160 U	3,000 J	0	160 U	3,320
CAA 11	138-Z17-008	SL	1480867.50	469989.60	EBS PHASE 2A	138-0008M	95-06-15	0.5	1.0	0	11 U	0	3,200	3,211
CAA 11	139-001-001	SL	1480909.50	469868.50	EBS PHASE 2A	139-0001	95-06-29	0.5	1.0	0	100 U	0.50 U	7,000 ZJ	7,101
CAA 11	37-57-MOJ	GP	1480587.62	469929.79	37-1 THROUGH 37-24	37-P57	97-09-23	6.5	0.0	20 U	3,200	1,800	200 U	5,220
CAA 11	37-58-MOJ	GP	1480585.30	469940.69	37-1 THROUGH 37-24	37-P58	97-09-23	6.5	0.0	20 U	5,700	4,800	200 U	10,720
CAA 11	37-60-MOJ	GP	1480573.25	469994.04	37-1 THROUGH 37-24	37-P60	97-10-01	6.5	0.0	100 U	16,000	7,300	1,000 U	24,400
CAA 11	37-62-MOJ	GP	1480557.50	469934.04	37-1 THROUGH 37-24	37-P62	97-10-01	6.5	0.0	20 U	4,300	2,600	200 U	7,120
CAA 11	37-64-MOJ	GP	1480572.78	469899.57	37-1 THROUGH 37-24	37-P64	97-10-01	6.5	0.0	20 U	5,000	1,700	200 U	6,920
CAA 11	37-65-MOJ	GP	1480585.28	469893.05	37-1 THROUGH 37-24	37-P65	97-10-01	6.0	0.0	20 U	3,700	20	200 U	3,940
CAA 11	37-66-MOJ	GP	1480558.85	469882.99	37-1 THROUGH 37-24	37-P66	97-10-02	6.0	0.0	50	6,100	29	500	6,679
CAA 13/B530	211-001-001	SL	1481869.1	469192.8	EBS PHASE 2A	211-0001M	95-03-31	0.5	1.0	0	1,500	650	270 U	2,150
CAA 13/B530	211-001-002	SL	1481831.7	469137.2	EBS PHASE 2A	211-0002M	95-03-31	0.5	1.0	0	7,900	1,000	2,700 U	8,900
CAA 13/B530	211-001-005	SL	1481832.5	468971.3	EBS PHASE 2A	211-0005	95-03-31	0.0	0.5	0	2,500 YJ	320 ZJ	210 U	2,820
CAA 13/B530	211-001-005	SL	1481832.5	468971.3	EBS PHASE 2A	211-0005M	95-03-31	0.5	1.0	0	1,700	480	260 U	2,180
CAA 13/B530	211-001-008	SL	1481833.8	468823.8	EBS PHASE 2A	211-0008M	95-03-31	0.0	0.5	0	13,000	810	5,600 U	13,810
CAA 13/B530	211-001-008	SL	1481833.8	468823.8	EBS PHASE 2A	211-0008	95-03-31	0.0	0.5	0	17,000 YJ	540 ZJ	440 U	17,540
CAA 13/B530	211-002-011	SB	1481838.5	469032.0	EBS PHASE 2B	211-0015	95-10-17	1.0	2.0	0	3,000	490 YJ	260 U	3,490
CAA 13/B530	211-002-011	SB	1481838.5	469032.0	EBS PHASE 2B	211-0016	95-10-17	5.5	6.5	0	5,700	2,500 YJ	260 U	8,200
CAA 13/B530	211-002-015	SB	1481839.4	468747.6	EBS PHASE 2B	211-0028	95-10-17	5.0	6.0	0	11,000	33 YJ	1,400 U	11,033
CAA 13/B530	211-IWCO-001	SB	1481847.8	468785.8	SCS	211C-001	95-01-20	1.0	2.0	0	9,060 YJ	1,180 ZJ	220 U	10,240
CAA 13/B530	211-SS-001	SB	1481863.8	469182.0	SCS	211M-001M	95-03-01	2.5	3.0	0	5,400	9,300	0	14,700
CAA 13/B530	211-SS-002	SB	1481854.7	469070.8	SCS	211M-002M	95-03-01	2.0	2.5	0	3,800	5,300	0	9,100
CAA 13/B530	211-SS-003	SB	1481844.3	468946.9	SCS	211M-003M	95-03-01	2.5	3.0	0	10,000	18,000	0	28,000
CAA 13/B530	211-SS-004	SB	1481833.9	468822.7	SCS	211M-004M	95-03-01	3.5	4.0	0	35,000	37,000	0	72,000

Appendix B
Table 2
TTPH Exceedences Above the Residential Soil PRC

Corrective Action Area	Sample Location	Sample Type	Easting	Northing	Investigation	Sample ID	Sample Date	Sample Depth (Top)	Sample Depth (Bottom)	TPH-J	TPH-D	TPH-G	TPH-MO	TTPH
CAA 13/B530	B13-41	SB	1481895.0	469490.1	SCAPS_SITE13	ALA13B41-3	94-04-05	7.0	7.5	0	**35,000** J	0	**23,000** J	**58,000**
CAA 13/B530	B13-41	SB	1481895.0	469490.1	SCAPS_SITE13	ALA13B41-4	94-04-05	8.0	8.5	0	**2,200** J	0	1,200 J	3,400
CAA 13/B530	B13-41	SB	1481895.0	469490.1	SCAPS_SITE13	ALA13B41-6	94-04-05	9.0	9.5	0	**12,000** J	0	**7,800** J	**19,800**
CAA 13/B530	B13-42	SB	1482042.6	469454.6	SCAPS_SITE13	ALA13B42-2	94-04-05	5.5	6.0	0	**4,600** J	0	740 UJ	5,340
CAA 13/B530	CA13-26	GP	1481826.0	469687.0	CTO 030 DGI	030-CAP-428	00-06-21	6.5	7.0	0	210 J	**1,100** J	22 U	1,310
CAA 13/B530	EX13-006	EXCV	1481968.8	469422.4	CTO137RA	137-S13-006	93-10-08	4.0	0.0	260 U	**1,600**	6.60	0	1,607
CAA 13/B530	EX13-007	EXCV	1481973.8	469406.8	CTO137RA	137-S13-010	93-10-08	4.0	0.0	2,200 U	**5,800**	12	0	5,812
CAA 13/B530	EX13-009	EXCV	1481969.9	469413.5	CTO137RA	137-S13-009	93-10-08	7.0	0.0	2,400 U	**7,800**	840	0	8,640
CAA 13/MS	B13-28	SB	1482410.8	469122.3	CTO280-F_ON	280-S13-001	94-12-09	1.0	2.0	230 U	230 U	0.57 U	**7,400** J	7,400
CAA 13/MS	B13-28	SB	1482410.8	469122.3	CTO280-F_ON	280-S13-003	94-12-09	5.5	6.0	60 U	60 U	**9,310** J	1,550 J	10,860
CAA 13/MS	B13-29	SB	1482410.0	469115.1	CTO280-F_ON	280-S13-004	94-12-09	1.0	1.5	1,120 UJ	1,120 UJ	**1,710** J	**69,200** J	**73,150**
CAA 13/MS	B13-29	SB	1482410.0	469115.1	CTO280-F_ON	280-S13-005	94-12-09	1.5	2.0	1,100 UJ	1,100 UJ	**1,350** J	**69,600** J	**73,150**
CAA 13/MS	B13-29	SB	1482410.0	469115.1	CTO280-F_ON	280-S13-006	94-12-09	2.5	3.5	460 UJ	460 UJ	**3,300** J	**27,500** J	**31,720**
CAA 13/MS	B13-29	SB	1482410.0	469115.1	CTO280-F_ON	280-S13-007	94-12-09	5.0	5.5	62 U	62 U	**2,750** J	**2,170** J	4,920
CAA 13/MS	B13-30	SB	1482375.9	469554.4	CTO280-F_ON	280-S13-008	94-12-09	1.0	2.0	**5,810** UJ	**5,810** UJ	320 J	**297,000** J	**308,940**
CAA 13/MS	B13-30	SB	1482375.9	469554.4	CTO280-F_ON	280-S13-009	94-12-09	2.5	3.5	480 U	480 U	780 J	**7,550** J	8,330
CAA 13/MS	B13-30	SB	1482375.9	469554.4	CTO280-F_ON	280-S13-010	94-12-09	5.0	5.5	120 U	120 U	810 J	**6,680** J	7,490
CAA 13/MS	B13-31	SB	1482411.4	469354.7	CTO280-F_ON	280-S13-011	94-12-09	1.0	2.0	1,160 UJ	1,160 UJ	8.80 J	**67,200** J	**69,529**
CAA 13/MS	B13-31	SB	1482411.4	469354.7	CTO280-F_ON	280-S13-012	94-12-09	2.5	3.5	120 U	120 U	140 J	**3,200** J	3,340
CAA 13/MS	B13-32	SB	1482243.5	469239.7	CTO280-F_ON	280-S13-017	94-08-12	4.0	5.0	570 U	**2,620** J	300 J	1,440 U	2,920
CAA 13/MS	B13-44	SB	1482400.9	469516.4	SCAPS_SITE13	ALA13B44-2	94-04-06	3.5	4.0	56 UJ	110 U	0	**5,200** J	5,256
CAA 13/MS	B13-44	SB	1482400.9	469516.4	SCAPS_SITE13	ALA13B44-4	94-04-06	8.5	9.0	**1,400** J	**2,100** UJ	0	12 U	3,500
CAA 13/MS	CA13-11	GP	1482387.0	469120.0	CTO 030 DGI	030-CAP-205	00-05-09	3.0	4.0	80	850	1.30	**10,000**	10,931
CAA 13/MS	CA13-12	GP	1482357.0	469120.0	CTO 030 DGI	030-CAP-208	00-05-09	4.5	5.3	170	1,100	9.10 J	**5,700**	6,979
CAA 13/MS	CA13-13	GP	1482349.0	469120.0	CTO 030 DGI	030-CAP-210	00-05-11	4.5	5.5	82 J	390 J	0.50 U	**2,600** J	3,072
CAA 13/MS	CA13-15	GP	1482356.0	469129.0	CTO 030 DGI	030-CAP-214	00-05-11	3.0	4.0	140	480	11 J	**6,500**	7,131
CAA 13/MS	CA13-15	GP	1482356.0	469129.0	CTO 030 DGI	030-CAP-213	00-05-11	4.0	5.0	720	**1,800**	22	**10,000**	12,542
CAA 13/MS	CA13-16	GP	1482377.0	469119.0	CTO 030 DGI	030-CAP-215	00-05-11	1.5	2.5	14	380	0.50 U	**2,300**	2,694
CAA 13/MS	CA13-16	GP	1482377.0	469119.0	CTO 030 DGI	030-CAP-216	00-05-11	4.0	5.0	24	120	0.50 UJ	**2,300**	2,445
CAA 13/MS	CA13-17	GP	1482366.0	469121.0	CTO 030 DGI	030-CAP-217	00-06-14	3.0	3.5	0	**36,000**	2.90 J	**30,000**	**66,003**
CAA 13/MS	CA13-17	GP	1482366.0	469121.0	CTO 030 DGI	030-CAP-218	00-06-14	4.0	4.5	0	**18,000**	200 J	**23,000**	**41,200**
CAA 13/MS	CA13-20	GP	1482387.0	469109.0	CTO 030 DGI	030-CAP-223	00-06-14	3.0	3.5	0	**20,000**	2.50 J	**16,000**	**36,003**
CAA 13/MS	CA13-21	GP	1482387.0	469127.0	CTO 030 DGI	030-CAP-411	00-06-14	3.5	4.0	0	**30,000**	**1,300** J	**27,000**	**58,300**
CAA 13/MS	CA13-21	GP	1482387.0	469127.0	CTO 030 DGI	030-CAP-412	00-06-14	5.5	6.0	0	**7,400**	**1,400** J	**6,100**	**14,900**
CAA 13/MS	CA13-22	GP	1482355.0	469153.0	CTO 030 DGI	030-CAP-414	00-06-14	4.0	4.5	0	**18,000**	83 J	**20,000**	**38,083**
CAA 13/MS	CA13-22	GP	1482355.0	469153.0	CTO 030 DGI	030-CAP-415	00-06-14	7.5	8.0	0	**13,000**	27 J	**14,000**	**27,027**
CAA 13/MS	CA13-23	GP	1482413.0	469119.0	CTO 030 DGI	030-CAP-418	00-06-15	5.0	6.5	0	**3,300**	23 J	**3,000**	6,323
CAA 13/MS	M07C-07	SB	1482615.0	469746.0	CTO280-F_ON	280-S7C-021	94-08-18	0.5	1.5	200 U	200 U	0.53 UJ	**3,000** J	3,001

BOLD indicates concentration exceeds Residential PRCs (Navy, 2001).
Residential PRCs for TPH-J = 1,380 mg/kg; TPH-D = 1,380 mg/kg; TPH-G = 1,030 mg/kg; TPH-MO = 1,900 mg/kg
All concentrations presented in mg/kg.

CAA 13/B530 = Corrective Action Area 13, Building 530
CAA 13/MS = Corrective Action Area 13, Mini-Storage Area

Sample Type
EXCV = Excavation sampling location
GP = Geoprobe sampling location
SL = Surface sampling location
SB = Soil boring sampling location

Laboratory Data Qualifiers
U = Undetected at specified detection limit
J = Estimated value
Y = Fuel Pattern does not fall within 90% of fuel calibration range
Z = Single pattern does not match calibration fuel pattern

TTPH Constituents
TPH-J - Total petroleum hydrocarbons as jet fuel
TPH-D - Total petroleum hydrocarbons as diesel fuel
TPH-G - Total petroleum hydrocarbons as gasoline
TPH-MO - Total petroleum hydrocarbons as motor oil
TTPH - Total total petroleum hydrocarbons (TPH-J + TPH-D + TPH-G + TPH-MO)

Appendix B
Table 3
BTEX Exceedences Above PRCs In Groundwater

Corrective Action Area	Sample Location	Sample Type	Easting	Northing	Investigation	Sample ID	Sample Date	Sample Depth (Top)	Sample Depth (Bottom)	Benzene	Ethyl-benzene	Toluene	Xylene
CAA 7	030-MOD1-263	EXCV	1482502.38	472185.88	FUELRA	030-MOD1-263	98-11-13	0.0	6.5	0.14	**1.70**	0.97	6.60
CAA 7	W-1	MW	1482539.25	472194.03	CTO108GWM	108-S07-012	98-02-05	2.0	10.0	**2.40**	**2.10**	8.80	16.0
CAA 7	W-1	MW	1482539.25	472194.03	CTO280GWQ2	280-S07A-068	95-02-10	2.0	10.0	**2.00**	**1.10**	5.00	9.90
CAA 7	W-1	MW	1482539.25	472194.03	PH2B&3-121	W-1	91-08-21	2.0	10.0	**0.90**	0.29	0.59	1.20
CAA 7	W-1	MW	1482539.25	472194.03	CTO108GWM	108-S07-004	97-11-05	2.0	10.0	0.55	**0.82**	1.10	3.70
CAA 7	W-1	MW	1482539.25	472194.03	CTO108GWM	108-S07-005	97-11-05	2.0	10.0	0.31	**0.46**	0.56	2.10
CAA 7	W-2	MW	1482488.75	472201.03	CTO280GWQ2	280-S07A-072	95-02-10	2.0	10.0	0.025	**0.52**	0.11	2.90
CAA 7	W-3	MW	1482510.38	472131.84	PH2B&3-121	W-3	91-08-21	2.0	10.0	**3.70**	0.13	0.10	0.10
CAA 11	030-FLI-508	EXCV	1480927.03	470234.60	FUELRA	030-FLI-508	98-09-29	7.5	8.0	**0.345**	0.181	**1.19**	0.80
CAA 11	030-MOD1-89	EXCV	1481011.39	470232.56	FUELRA	030-MOD1-89	98-11-16	11.5	12.0	**0.003**	0.008	0.008	0.03
CAA 11	030-MOD1-9/10	EXCV	1481202.74	470428.15	FUELRA	030-MOD1-10	98-11-20	9.0	9.5	**0.002** UJ	0.006 J	0.004 UJ	0.02 J
CAA 11	030-MOD1-9/10	EXCV	1481202.74	470428.15	FUELRA	030-MOD1-9	98-11-20	9.0	9.5	**0.001** UJ	0.006 J	0.002 J	0.02 J
CAA 11	030-S07-013	EXCV	1480884.25	470456.13	FUELRA	030-S07-013A	98-09-30	7.5	8.0	**0.008**	0.006 J	0.045	0.03
CAA 11	030-S07-018	EXCV	1481283.63	470403.69	FUELRA	030-S07-018	98-10-14	6.5	7.0	**0.002** J	0.002 UJ	0.002 J	0.003 J
CAA 11	37-15-MOJ	GP	1480892.35	470192.14	37-1 THROUGH 37-24	37-P15	97-08-22	0.0	0.0	**0.004**	0.040	0.001 U	0.054
CAA 11	37-16-MOJ	GP	1480931.21	470230.88	37-1 THROUGH 37-24	37-P16	97-08-22	0.0	0.0	**0.004**	0.027	0.003 U	0.18
CAA 11	37-33-MOJ	GP	1480676.92	469845.87	37-1 THROUGH 37-24	37-P33	97-08-20	0.0	0.0	0.001 U	0.20	**0.32**	0.84
CAA 11	37-35-MOJ	GP	1480649.51	469870.44	37-1 THROUGH 37-24	37-P35	97-08-21	0.0	0.0	0.001 U	0.01	**0.34**	0.34
CAA 11	37-90-MOJ	GP	1480733.44	469777.37	37-1 THROUGH 37-24	37-P90	97-10-06	0.0	0.0	**0.002**	0.042	0.001 U	0.002
CAA 11	37-L-9	EXCV	1480945.45	470215.11	37-1 THROUGH 37-24	37-L-9	95-02-03	0.0	0.0	**0.700**	0.20	0.026	0.19
CAA 11	37-MJ-MW1	MW	1480844.00	470158.72	37-1 THROUGH 37-24	37-MJ-MW-1	97-12-12	0.0	0.0	**0.005**	0.001 U	0.003	0.001 U
CAA 11	37-MJ-MW-10	MW	1480574.03	469934.72	37-1 THROUGH 37-24	37-MJ-MW-10	98-03-16	0.0	0.0	**0.048**	0.002	0.002	0.001 U
CAA 11	37-MJ-MW11	MW	1480648.50	469781.47	37-1 THROUGH 37-24	37-MJ-MW-11	97-12-12	0.0	0.0	**0.007**	0.001 U	0.001 U	0.001 U
CAA 11	37-MJ-MW11	MW	1480648.50	469781.47	37-1 THROUGH 37-24	37-MJ-MW-11	98-03-16	0.0	0.0	**0.001**	0.001 U	0.001 U	0.001 U
CAA 11	37-MJ-MW6	MW	1480832.63	470237.66	37-1 THROUGH 37-24	37-MJ-MW-6	97-12-12	0.0	0.0	**0.002**	0.001 U	0.001 U	0.001 U
CAA 11	37-MJ-MW-9	MW	1480599.56	470018.82	37-1 THROUGH 37-24	37-MJ-MW-9	98-03-16	0.0	0.0	**0.001**	0.001 U	0.001 U	0.001 U
CAA 11	M07B-01	MW	1480881.88	470909.19	PH2B&3-121	M07B-01	91-08-21	4.0	11.0	**0.002**	0.001 U	0.001 U	0.001 U
CAA 11	M11-01	MW	1480940.13	470743.38	CTO280GWQ1	280-S7B11-055	94-10-26	4.0	9.5	**0.002**	0.001 U	0.001 U	0.001
CAA 11	M11-01	MW	1480940.13	470743.38	CTO280GWQ2	280-S7B11-056	95-02-14	4.0	9.5	**0.002**	0.001 U	0.001 U	0.001 U
CAA 11	M11-01	MW	1480940.13	470743.38	CTO280GWQ4	280-S7B11-058	95-08-23	4.0	9.5	**0.002**	0.001 U	0.001 U	0.001 U
CAA 11	M11-01	MW	1480940.13	470743.38	CTO280GWQ3	280-S7B11-057	95-06-16	4.0	9.5	**0.001**	0.001 U	0.001 U	0.001 J
CAA 11	S04-2-7	HP	1481433.88	470336.47	SITE4_5-F_ON	122-S04-152	98-02-17	30.0	35.0	**0.002** J	0	0.002 J	0
CAA 11	S04-3-7	HP	1481367.00	470487.13	SITE4_5-F_ON	122-S04-124	98-02-11	20.0	25.0	**0.003**	0	0.002	0
CAA 11	S04-3-7	HP	1481367.00	470487.13	SITE4_5-F_ON	122-S04-125	98-02-11	25.0	30.0	**0.002**	0.001 U	0.002	0.001 U
CAA 11	S04-3-8	HP	1481240.00	470421.63	SITE4_5-F_ON	122-S04-164	98-02-19	30.0	35.0	**0.002** J	0	0.002 J	0
CAA 11	S04-4-7	HP	1481300.75	470609.84	SITE4_5-F_ON	122-S04-185	98-03-04	11.5	13.5	**0.004**	0.001 U	0.001	0.002 U
CAA 11	S04-4-7	HP	1481300.75	470609.84	SITE4_5-F_ON	122-S04-137	98-02-13	20.0	25.0	**0.001**	0.001 U	0	0.001 U
CAA 11	S04-5-7	HP	1481204.88	470718.13	SITE4_5-F_ON	122-S04-211	98-03-11	15.5	20.0	**0.001**	0.001 U	0.001	0.002 U
CAA 11	S04-6-8	HP	1480990.25	470805.91	SITE4_5-F_ON	122-S04-231	98-03-26	11.5	13.5	**0.001**	0.001 U	0.001	0.001 U
CAA 11	S04-7-9	HP	1480759.25	470886.31	SITE4_5-F_ON	122-S04-233	98-03-27	9.5	11.5	**0.006**	0.001 U	0.001	0.001 U
CAA 11	S04-7-9	HP	1480759.25	470886.31	SITE4_5-F_ON	122-S04-234	98-03-27	11.5	13.5	**0.001**	0.001 U	0.001 U	0.001 U
CAA 11	S04-7-9	HP	1480759.25	470886.31	SITE4_5-F_ON	122-S04-235	98-03-27	13.5	15.5	**0.001**	0.001 U	0.001 U	0.001 U
CAA 13/B530	211-002-011	HP	1481838.50	469032.00	EBS PHASE 2B	211-0014RS	95-11-29	8.0	9.0	**0.067** D	0.02	0.011	0.01
CAA 13/B530	CA13-07	GP	1481842.00	469049.00	CTO 030 DGI	030-CAP-200	00-04-26	3.0	8.0	**0.043**	0.017	0.002 U	0.002 U
CAA 13/B530	CA13-07	GP	1481842.00	469049.00	CTO 030 DGI	030-CAP-376	00-04-26	3.0	8.0	**0.033**	0.02	0.005 U	0.005 U
CAA 13/B530	CA13-08	GP	1481842.00	469050.00	CTO 030 DGI	030-CAP-376A	00-05-02	3.0	8.0	**0.045**	0.016	0.005 U	0.005 U
CAA 13/B530	CA13-08	GP	1481842.00	469050.00	CTO 030 DGI	030-CAP-200A	00-05-02	3.0	8.0	**0.043**	0.052	0.001 U	0.001 U
CAA 13/B530	D09-01	MW	1481233.75	469003.38	CTO280GWQ2	280-S09-107	95-02-21	50.0	60.0	**0.001** UJ	0.001 U	0.001 U	0.001 U
CAA 13/B530	D10B-01	MW	1481828.88	468748.41	CTO280GWQ2	280-S10B-141	95-02-22	50.0	60.0	**0.001** UJ	0.001 UJ	0.001 UJ	0.001 U
CAA 13/B530	D10B-02	MW	1481914.88	469253.06	CTO280GWQ2	280-S10B-144	95-02-22	50.0	60.0	**0.001** UJ	0.001 UJ	0.001 UJ	0.001 U
CAA 13/B530	DHP-S09-06	HP	1481391.75	469160.16	CTO280-F_ON	280-S09-059	94-09-08	8.0	11.0	**0.010** U	0.086	**0.23**	0.340
CAA 13/B530	DHP-S10B-01	HP	1481917.38	469250.34	CTO280-F_ON	280-S10B-110	94-07-15	40.0	0.0	**0.028**	0.009	0.001	0.054

Appendix B
Table 3
BTEX Exceedences Above PRCs in Groundwater

Corrective Action Area	Sample Location	Sample Type	Easting	Northing	Investigation	Sample ID	Sample Date	Sample Depth (Top)	Sample Depth (Bottom)	Benzene	Ethyl-benzene	Toluene	Xylene
CAA 13/B530	M09-05	MW	1481528.75	468973.63	CTO280GWQ2	280-S09-046	95-02-21	3.5	13.5	**0.001 UJ**	0.001 U	0.001 U	0.001 U
CAA 13/B530	M09-06	MW	1481461.13	468916.06	CTO280GWQ2	280-S09-050	95-02-21	4.0	14.0	**0.001 UJ**	0.001 U	0.001 U	0.001 U
CAA 13/B530	M13-07	MW	1482242.00	469355.03	CTO280GWQ1	280-S13-059	94-11-01	2.5	12.5	**0.086**	0.004 J	0.005 U	0.005 U
CAA 13/B530	M13-07	MW	1482242.00	469355.03	CTO280GWQ4	280-S13-062	95-08-16	2.5	12.5	**0.044**	0.003	0.001 U	0.001
CAA 13/B530	M13-07	MW	1482242.00	469355.03	CTO280GWQ3	280-S13-061	95-06-28	2.5	12.5	**0.023**	0.002	0.001 U	0.001 U
CAA 13/B530	M13-07	MW	1482242.00	469355.03	CTO280GWQ2	280-S13-060	95-02-28	2.5	12.5	**0.011 J**	0.001	0.001 U	0.001 J
CAA 13/B530	MW-1	MW	1481877.38	469662.66	CANONIE	MW-1 [10/15/90]	90-10-15	3.5	13.5	**0.400**	0.034	0.025 U	0.032
CAA 13/B530	MW410-2	MW	1481234.25	469014.69	CTO280GWQ2	280-S09-032	95-02-21	5.0	15.0	**0.001 UJ**	0.001 U	0.001 U	0.001 U
CAA 13/B530	MW410-3	MW	1481346.29	468899.87	CTO280GWQ2	280-S09-037	95-02-21	5.0	15.0	**0.001 UJ**	0.001 U	0.001 U	0.001 U
CAA 13/B530	MW410-4	MW	1481584.50	469040.69	CTO280GWQ2	280-S09-041	95-02-21	5.0	15.0	**0.001 UJ**	0.001 U	0.001 U	0.001 U
CAA 13/B530	MW530-1	MW	1482166.63	469220.34	CANONIE	MW530-1 [08/23/90]	90-08-23	5.0	15.0	**0.019**	0.079	0.007	0.190
CAA 13/B530	MW530-1	MW	1482166.63	469220.34	CTO280GWQ3	280-S10B-020	95-06-26	5.0	15.0	**0.001**	0.014	0.005	0.070
CAA 13/B530	MW530-1	MW	1482166.63	469220.34	CTO280GWQ2	280-S10B-019	95-02-22	5.0	15.0	**0.001 J**	0.007 J	0.003 J	0.047
CAA 13/B530	MW530-1	MW	1482166.63	469220.34	CTO280GWQ2	280-S10B-018	95-02-22	5.0	15.0	**0.001 J**	0.007 J	0.003 J	0.052
CAA 13/B530	MW530-2	MW	1481915.13	468931.97	CTO280GWQ2	280-S10B-023	95-02-22	5.0	15.0	**0.001 UJ**	0.001 UJ	0.001 UJ	0.001 U
CAA 13/B530	MW530-3	MW	1481821.25	468744.41	CTO280GWQ2	280-S10B-027	95-02-22	5.0	15.0	**0.001 UJ**	0.001 UJ	0.001 UJ	0.001 U
CAA 13/B530	MWC2-1	MW	1482296.88	468667.78	CTO280GWQ2	280-S16-035	95-02-28	5.0	15.0	**0.001 UJ**	0.001 U	0.001 U	0.001 U
CAA 13/B530	MWOR-3	MW	1482238.75	469500.47	CTO280GWQ2	280-S13-042	95-02-28	5.0	15.0	**0.001 UJ**	0.001 U	0.001 U	0.001 U
CAA 13/B530	SHP-S09-07	HP	1481310.63	469155.70	CTO280-F_ON	280-S09-061	94-09-07	8.0	11.0	**0.001**	0.007	0.007	0.041
CAA 13/B530	SHP-S09-10	HP	1481427.63	468963.09	CTO280-F_ON	280-S09-067	94-09-06	11.0	0.0	**0.10 U**	0.12	**0.22**	1.20
CAA 13/MS	B13-29	SB	1482410.00	469115.09	CTO280-F_ON	280-S13-146	94-12-09	5.5	6.0	**0.021**	0.052	0.008	0.240
CAA 13/MS	B13-30	SB	1482375.88	469554.44	CTO280-F_ON	280-S13-108	94-12-09	5.5	6.0	**0.18**	0.026	0.008	0.100
CAA 13/MS	CA13-11	GP	1482387.00	469120.00	CTO 030 DGI	030-CAP-225	00-05-09	0.0	10.0	**0.12**	0.015	0.008	0.042
CAA 13/MS	CA13-11	GP	1482387.00	469120.00	CTO 030 DGI	030-CAP-379	00-05-09	0.0	10.0	**0.11**	0.014	0.007	0.039
CAA 13/MS	CA13-12	GP	1482357.00	469120.00	CTO 030 DGI	030-CAP-226	00-05-09	0.0	10.0	**1.10**	0.096	0.056	0.450
CAA 13/MS	CA13-13	GP	1482349.00	469120.00	CTO 030 DGI	030-CAP-227	00-05-11	2.5	7.5	**0.22**	0.008	0.065	0.055
CAA 13/MS	CA13-14	GP	1482354.00	469112.00	CTO 030 DGI	030-CAP-228	00-05-11	3.0	8.0	**0.001**	0.001 U	0.001	0.004
CAA 13/MS	CA13-15	GP	1482356.00	469129.00	CTO 030 DGI	030-CAP-229	00-05-11	3.0	8.0	**1.10**	0.02 U	0.02 U	0.110
CAA 13/MS	CA13-16	GP	1482377.00	469119.00	CTO 030 DGI	030-CAP-230	00-05-11	3.0	8.0	**0.23**	0.018	0.01 U	0.016
CAA 13/MS	CA13-17	GP	1482366.00	469121.00	CTO 030 DGI	030-CAP-231	00-06-14	3.0	8.0	**1.40**	0.085	0.01 J	0.120
CAA 13/MS	CA13-20	GP	1482387.00	469109.00	CTO 030 DGI	030-CAP-234	00-06-14	3.0	8.0	**0.110**	0.036	0.006	0.007
CAA 13/MS	CA13-22	GP	1482355.00	469153.00	CTO 030 DGI	030-CAP-416	00-06-15	3.0	8.0	**0.026**	0.006 J	0.015	0
CAA 13/MS	CA13-23	GP	1482413.00	469119.00	CTO 030 DGI	030-CAP-419	00-06-15	3.0	8.0	**0.024**	0.034	0.011	0
CAA 13/MS	CA13-25	GP	1482338.00	469120.00	CTO 030 DGI	030-CAP-426	00-06-14	3.0	8.0	**0.011**	0.016	0.004	0.055

BOLD indicates concentration exceeds Drinking Water MCL PRCs (Navy, 2001).
Drinking Water MCL PRCs for Benzene = 0.001 mg/L; Ethylbenzene = 0.15 mg/L; Toluene = 0.7 mg/L; Xylenes (total) = 1.75 mg/L
All concentrations presented in mg/L.

CAA 13/B530 = Corrective Action Area 13, Building 530/Defueling Area
CAA 13/MS = Corrective Action Area 13, Mini-Storage Area

Sample Type
EXCV = Excavation sampling location
GP = Geoprobe sampling location
HP = Hydropunch sampling location
SB = Soil boring sampling location
MW = Monitoring well

Laboratory Data Qualifier
U = Undetected at specified detection limit
J = Estimated value
D = Compound identified in an analysis of a secondary sample that has a higher dilution factor

Appendix B
Table 4
TTPH Exceedences Above PRCs In Groundwater

Corrective Action Area	Sample Location	Sample Type	Easting	Northing	Investigation	Sample ID	Sample Date	Sample Depth (Top)	Sample Depth (Bottom)	TPH-J	TPH-D	TPH-G	TPH-MO	TTPH
CAA 7	030-MOD1-263	EXCV	1482502.38	472185.88	FUELRA	030-MOD1-263	98-11-13	0.0	6.5	11 U	37 J	47 J	11 U	**84.0**
CAA 7	112-0014	GP	1482367.57	472383.69		112-0014	99-08-19	5.0	12.0	0	1.20	0	0.400	1.6
CAA 7	112-0015	GP	1482367.53	472383.63		112-0015	99-08-19	5.0	12.0	0	1.10	0	0.620	1.7
CAA 7	459-7L	EXCV	1482316.74	472153.16		459-7L	95-01-26	6.0	0.0	0.540	0.76	0	0.560	1.9
CAA 7	459-L	EXCV	1482493.24	472121.04		459-L	95-04-10	6.0	0.0	8.30	9.10	62	0	**79.4**
CAA 7	DHP-S07A-05	HP	1482457.00	472198.00	CTO280-F_ON	280-S07A-106	94-07-26	16.0	0.0	0.770 U	0.770 U	0.050 U	3.85 UJ	3.9
CAA 7	DHP-S07A-07	HP	1482420.13	472248.41	CTO280-F_ON	280-S07A-109	94-07-21	16.0	0.0	0.100 U	0.100 U	0.050 U	5.83 J	5.8
CAA 7	DHP-S07A-09	HP	1482373.25	472268.72	CTO280-F_ON	280-S07A-112	94-07-26	16.0	0.0	0.77 U	7.89 J	0.056 J	3.85 UJ	11.8
CAA 7	M07A-04	MW	1482559.06	472307.07	CTO280GWQ2	280-S07A-052	95-02-10	3.0	7.0	0.100 U	0.100 U	0.050 U	2.20 J	2.2
CAA 7	M07A-04	MW	1482559.06	472307.07	CTO280GWQ2	280-S07A-051	95-02-10	3.0	7.0	0.100 U	0.100 U	0.050 U	1.90 J	1.9
CAA 7	M07A-04	MW	1482559.06	472307.07	CTO280GWQ3	280-S07A-053	95-06-15	3.0	7.0	0.100 U	0.10 U	0.050 U	1.70 J	1.7
CAA 7	M07A-04	MW	1482559.06	472307.07	CTO280GWQ4	280-S07A-054	95-08-22	3.0	7.0	0.100 U	1.40 J	0.050 UJ	0.500 U	1.5
CAA 7	M07A-07	MW	1482402.50	472327.38	CTO280GWQ1	280-S07A-063	94-12-07	3.0	10.0	0.100 U	0.100 U	0.050 U	2.10 J	2.1
CAA 7	M07A-07	MW	1482402.50	472327.38	CTO280GWQ2	280-S07A-064	95-02-10	3.0	10.0	0.100 U	0.100 U	0.050 U	2.10 J	2.1
CAA 7	M07A-07	MW	1482402.50	472327.38	CTO280GWQ4	280-S07A-066	95-08-23	3.0	10.0	0.100 U	2.00 J	0.050 U	0.500 U	2.0
CAA 7	M07A-07	MW	1482402.50	472327.38	CTO280GWQ3	280-S07A-065	95-06-16	3.0	10.0	0.100 U	1.90 J	0.050 U	0.200 U	1.9
CAA 7	SHP-S07A-07	HP	1482423.25	472244.34	CTO280-F_ON	280-S07A-108	94-07-25	5.0	0.0	0.830 U	0.830 U	0.050 U	6.77 J	6.8
CAA 7	SHP-S07A-08	HP	1482362.25	472209.94	CTO280-F_ON	280-S07A-110	94-07-25	5.0	0.0	0.830 U	0.830 U	0.050 U	4.15 UJ	4.2
CAA 7	SHP-S07A-09	HP	1482376.50	472272.41	CTO280-F_ON	280-S07A-111	94-07-26	6.0	0.0	0.110 U	0.110 U	0.054 J	4.08 J	4.1
CAA 7	SHP-S07A-10	HP	1482615.50	472120.97	CTO280-F_ON	280-S07A-113	94-07-22	6.0	0.0	0.10 UJ	2.51 J	17	0.200 UJ	19.7
CAA 7	SHP-S07A-11	HP	1482619.25	472038.31	CTO280-F_ON	280-S07A-114	94-07-25	5.0	0.0	0.910 U	0.910 U	0.120 J	4.55 UJ	4.7
CAA 7	W-1	MW	1482539.25	472194.03	CTO108GWM	108-S07-018	98-05-06	2.0	10.0	0	5.60 J	130 J	0.500 U	**135.6**
CAA 7	W-1	MW	1482539.25	472194.03	CTO280GWQ2	280-S07A-068	95-02-10	2.0	10.0	17 J	1.00 U	52 J	2.00 U	**69.0**
CAA 7	W-1	MW	1482539.25	472194.03	CTO108GWM	108-S07-012	98-02-05	2.0	10.0	0	7.20 J	49	0.510 J	**56.7**
CAA 7	W-1	MW	1482539.25	472194.03	CTO108GWM	108-S07-004	97-11-05	2.0	10.0	0	3.00 J	34 J	0.300 U	**37.0**
CAA 7	W-1	MW	1482539.25	472194.03	CTO108GWM	108-S07-038	98-08-06	2.0	10.0	0	0.720 J	35 J	0.200 J	**35.9**
CAA 7	W-1	MW	1482539.25	472194.03	CTO108GWM	108-S07-005	97-11-05	2.0	10.0	0	3.00 J	21 J	0.500 Y	**24.5**
CAA 7	W-1	MW	1482539.25	472194.03	CTO280GWQ3	280-S07A-069	95-06-15	2.0	10.0	0.10 U	8.30 J	8.20 J	0.200 U	16.5
CAA 7	W-1	MW	1482539.25	472194.03	CTO280GWQ1	280-S07A-067	94-10-20	2.0	10.0	0.10 U	4.49 J	7.60 J	0.200 U	12.1
CAA 7	W-1	MW	1482539.25	472194.03	CTO280GWQ4	280-S07A-070	95-08-22	2.0	10.0	0.10 U	4.90 J	6.60 J	0.500 U	11.5
CAA 7	W-2	MW	1482488.75	472201.03	CTO280GWQ2	280-S07A-072	95-02-10	2.0	10.0	5.20 J	0.100 U	9.20 J	0.500 U	14.4
CAA 7	W-2	MW	1482488.75	472201.03	CTO280GWQ1	280-S07A-071	94-10-20	2.0	10.0	0.100 U	2.77 J	2.51 J	0.200 U	5.3
CAA 7	W-2	MW	1482488.75	472201.03	CTO280GWQ4	280-S07A-075	95-08-22	2.0	10.0	0.100 U	1.40 J	3.20 J	0.500 U	4.6
CAA 7	W-2	MW	1482488.75	472201.03	CTO280GWQ3	280-S07A-074	95-06-15	2.0	10.0	0.100 U	2.00 J	1.20 J	0.200 U	3.2
CAA 7	W-2	MW	1482488.75	472201.03	CTO280GWQ3	280-S07A-073	95-06-15	2.0	10.0	0.100 U	1.20 J	1.10 J	0.200 U	2.3
CAA 7	W-3	MW	1482510.38	472131.84	CTO280GWQ1	280-S07A-076	94-10-20	2.0	10.0	0.100 U	4.24 J	1.62 J	0.200 U	5.9

Ambient Water Quality Criteria PRC for TTPH is 1.4 mg/kg (Navy, 2001).
BTEX concentrations not included in TTPH value provided.
BOLD indicates potential free product sampling location where TTPH concetration is > 20 mg/L (Parsons, 2000).
All concentrations presented in mg/L.

Sample Type
EXCV = Excavation sampling location
GP = Geoprobe sampling location
HP = Hydropunch sampling location
MW = Monitoring well

TTPH Constituents
TPH-J - Total petroleum hydrocarbons as jet fuel
TPH-D - Total petroleum hydrocarbons as diesel fuel
TPH-G - Total petroleum hydrocarbons as gasoline
TPH-MO - Total petroleum hydrocarbons as motor oil
TTPH - Total total petroleum hydrocarbons (TPH-J + TPH-D + TPH-G + TPH-MO)

Laboratory Data Qualifiers
U = Undetected at specified detection limit
J = Estimated value
Y = Fuel pattern within calibration range, but does not match calibration standard

Legend

- Sample location where benzene, toluene, and/or xylene concentration in soil exceeds potential residential PRC. *Ethylbenzene was not detected above potential PRC.*
- Calculated TTPH location. Undetected "U" flags taken at half the reporting limit. Estimated "J" flags taken at full value.

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FIGURE 1
CAA 7
BTEX PRC EXCEEDENCES AND
POTENTIAL FREE PRODUCT AREAS IN SOIL
ALAMEDA POINT
ALAMEDA, CALIFORNIA

Legend

■ Sample location where TPH-gasoline concentration in soil exceeds 1,030 mg/kg or potential residential PRC.

▲ TPH-gasoline soil sample location. Undetected "U" flags taken at half the reporting limit. Estimated "J" flags taken at full value.

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FIGURE 2
CAA 7
TPH-GASOLINE PRC EXCEEDENCES AND DISTRIBUTION IN SOIL
ALAMEDA POINT
ALAMEDA, CALIFORNIA

Legend

- Sample location where TPH-diesel concentration in soil exceeds 1,380 mg/kg or potential residential PRC.
- TPH-diesel soil sample location. Undetected "U" flags taken at half the reporting limit. Estimated "J" flags taken at full value.

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FIGURE 3
CAA 7
TPH-DIESEL PRC EXCEEDENCES
AND DISTRIBUTION IN SOIL
ALAMEDA POINT
ALAMEDA, CALIFORNIA

Legend

There is no sample location where the JP-5 concentration in soil exceeds 1,380 mg/kg or potential residential PRC.

JP-5 soil sample location. Undetected "U" flags taken at half the reporting limit. Estimated "J" flags taken at full value.

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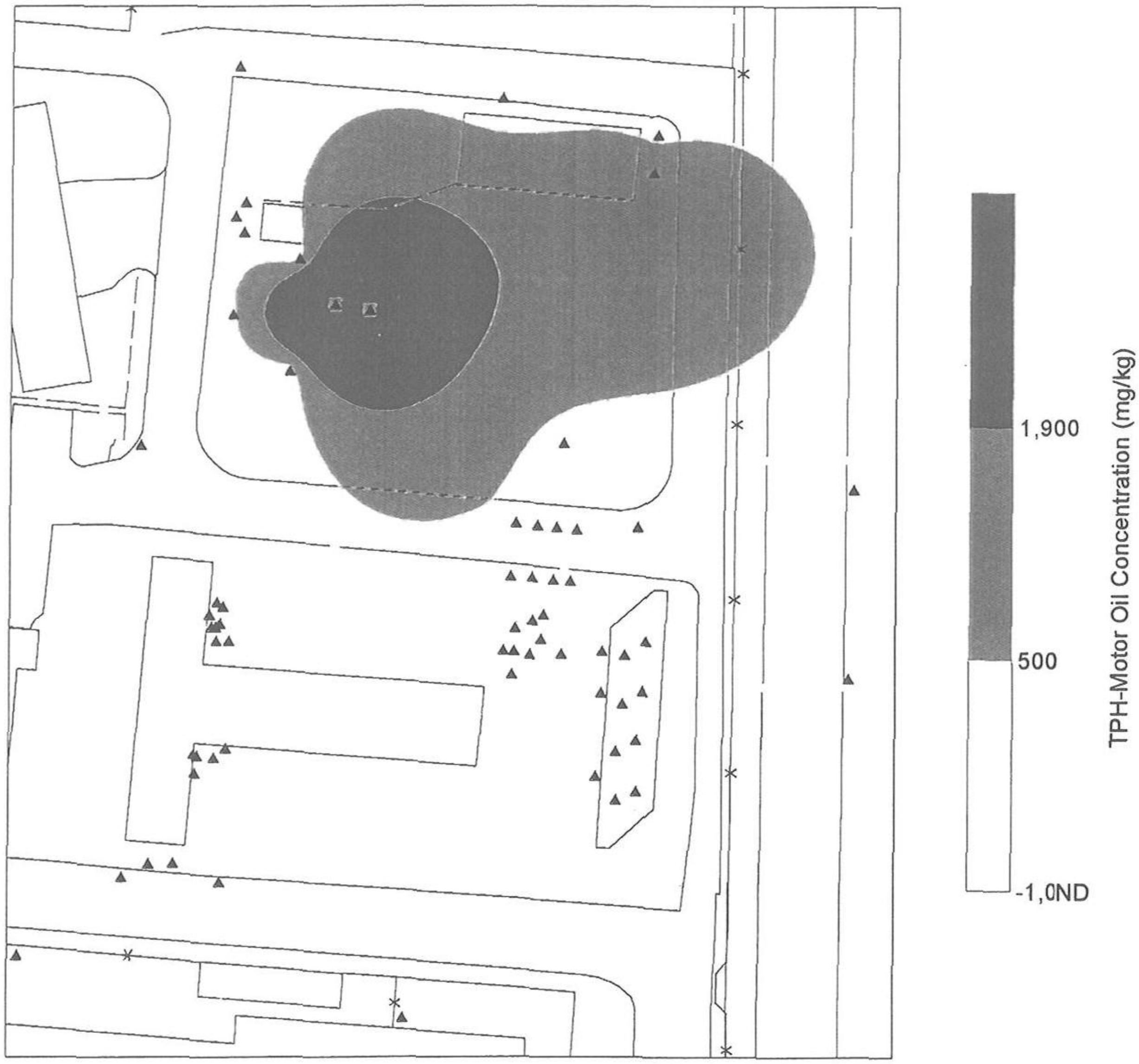
FIGURE 4
CAA 7
JP-5 PRC EXCEEDENCES
AND DISTRIBUTION IN SOIL
ALAMEDA POINT
ALAMEDA, CALIFORNIA



Legend

■ Sample location where TPH-motor oil concentration in soil exceeds 1,9000 mg/kg or potential residential PRC.

▲ TPH-motor oil sample location. Undetected "U" flags taken at half the reporting limit. Estimated "J" flags taken at full value.

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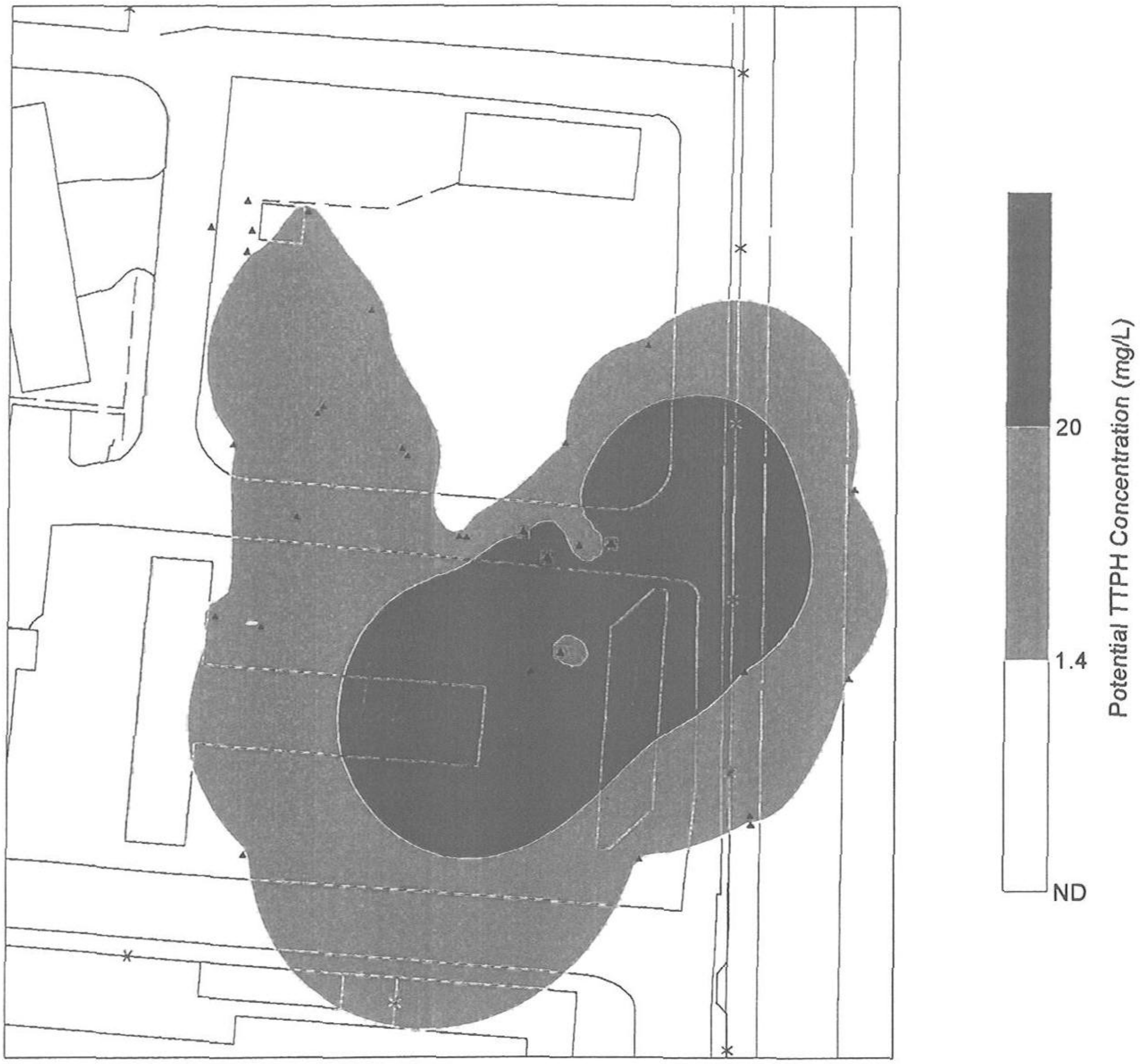
FIGURE 5
CAA 7
TPH-MOTOR OIL PRC EXCEEDENCES
AND DISTRIBUTION IN SOIL
ALAMEDA POINT
ALAMEDA, CALIFORNIA



Legend

- Sample location where benzene, toluene, and/or ethylbenzene concentration in groundwater exceeds AWQC PRC. Xylene was not detected above the PRC.
- ▲ *Calculated TTPH location. Undetected "U" flags* taken at half the reporting limit. Estimated "J" flags taken at full value.

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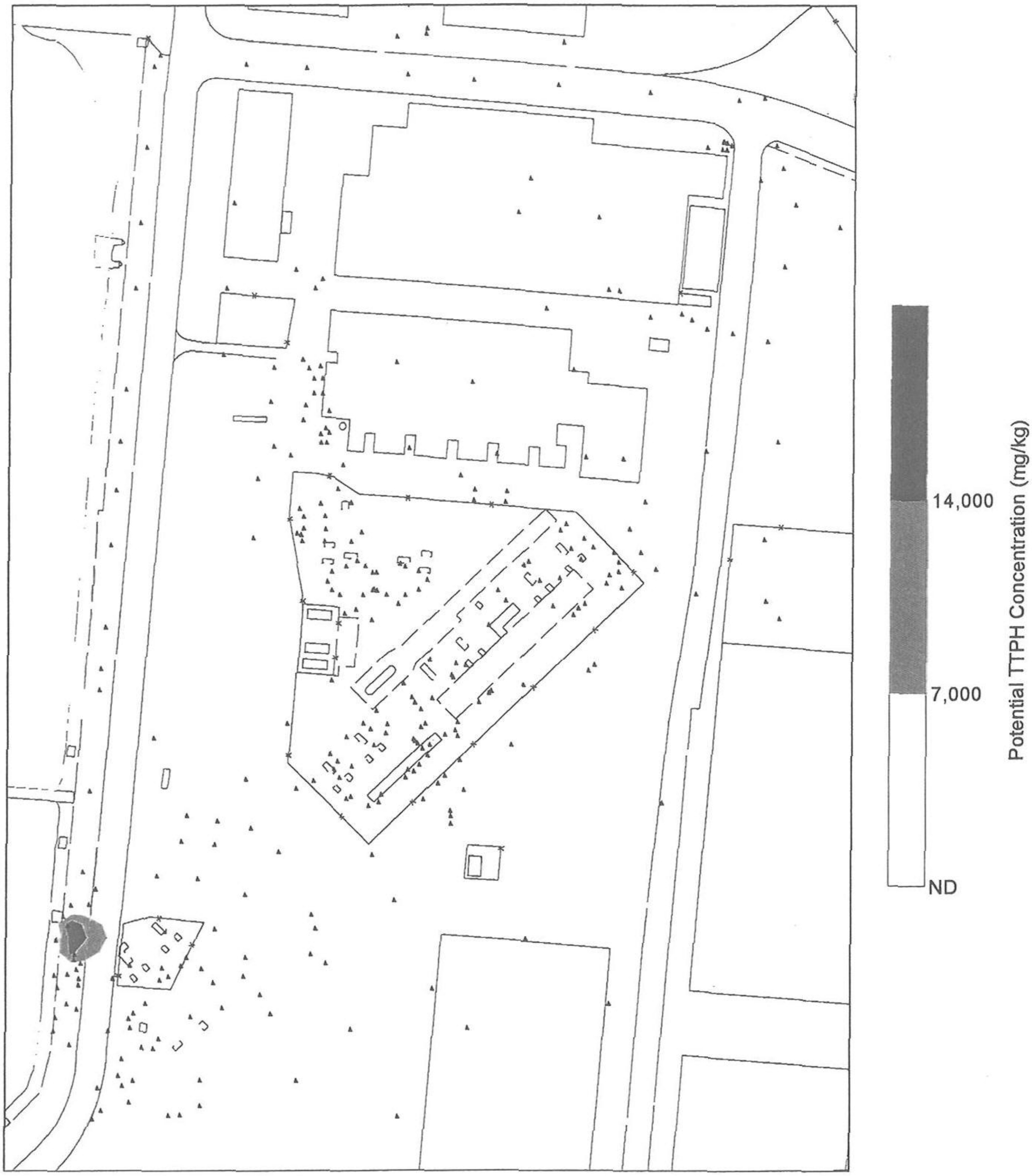
FIGURE 6
CAA 7
BTEX PRC EXCEEDENCES AND POTENTIAL FREE PRODUCT AREAS IN GROUNDWATER
ALAMEDA POINT
ALAMEDA, CALIFORNIA



Legend

Benzene, toluene, ethylbenzene, and xylene were not detected in soil above the potential residential PRCs.

Calculated TTPH location. Undetected "U" flags taken at half the reporting limit. Estimated "J" flags taken at full value.

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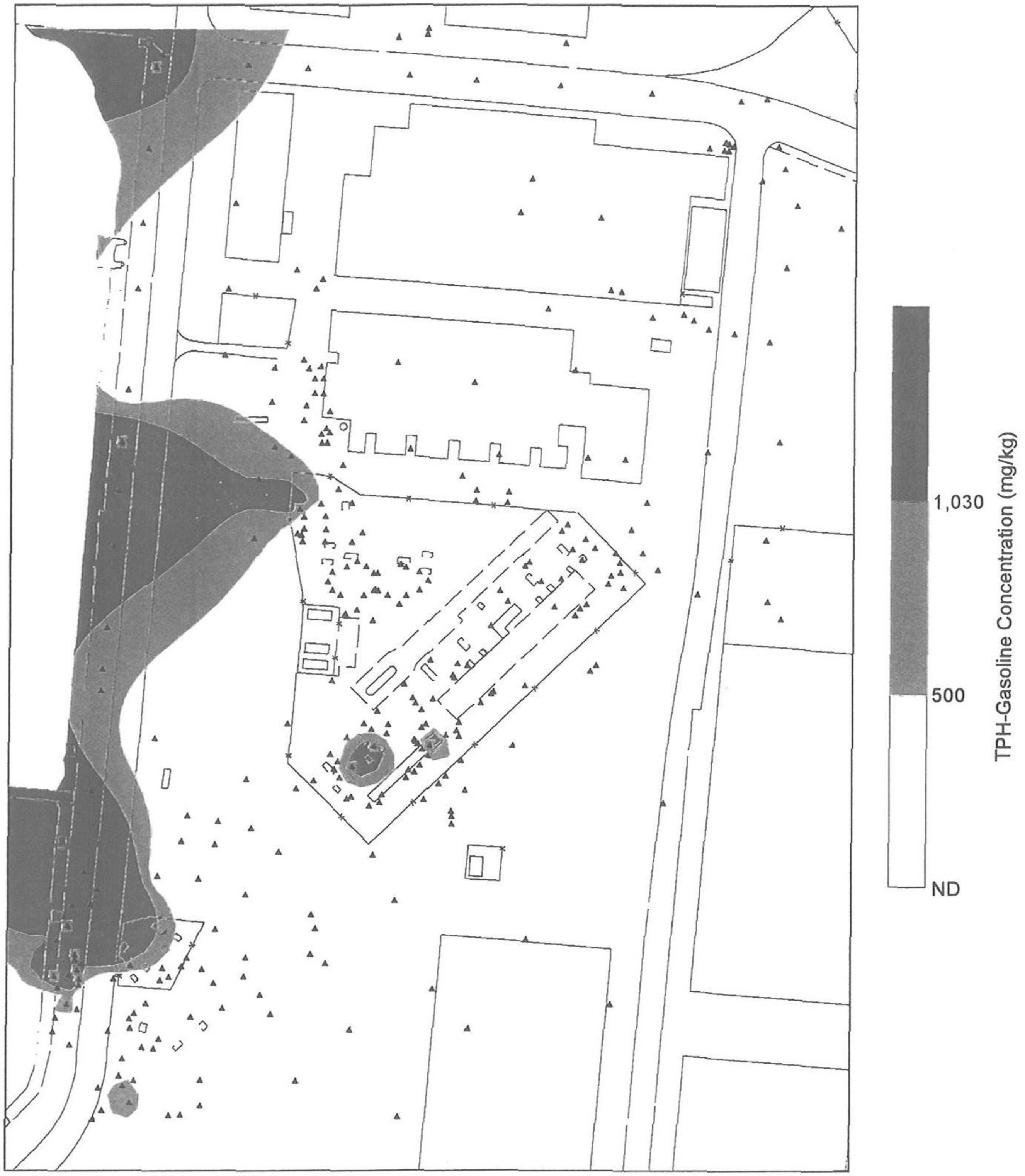
FIGURE 7
CAA 11
BTEX PRC EXCEEDENCES AND POTENTIAL FREE PRODUCT AREAS IN SOIL
ALAMEDA POINT
ALAMEDA, CALIFORNIA



Legend

▪ Sample location where gasoline concentration in soil exceeds 1,030 mg/kg or potential residential PRC.

▲ TPH-gasoline soil sample location. Undetected "U" flags taken at half the reporting limit. Estimated "J" flags taken at full value.

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FIGURE 8
CAA 11
TPH-GASOLINE PRC EXCEEDENCES
AND DISTRIBUTION IN SOIL
ALAMEDA POINT
ALAMEDA, CALIFORNIA

Legend

■ Sample location where TPH-diesel concentration in soil exceeds 1,380 mg/kg or potential residential PRC.

▲ TPH-diesel soil sample location. Undetected "U" flags taken at half the reporting limit. Estimated "J" flags taken at full value.

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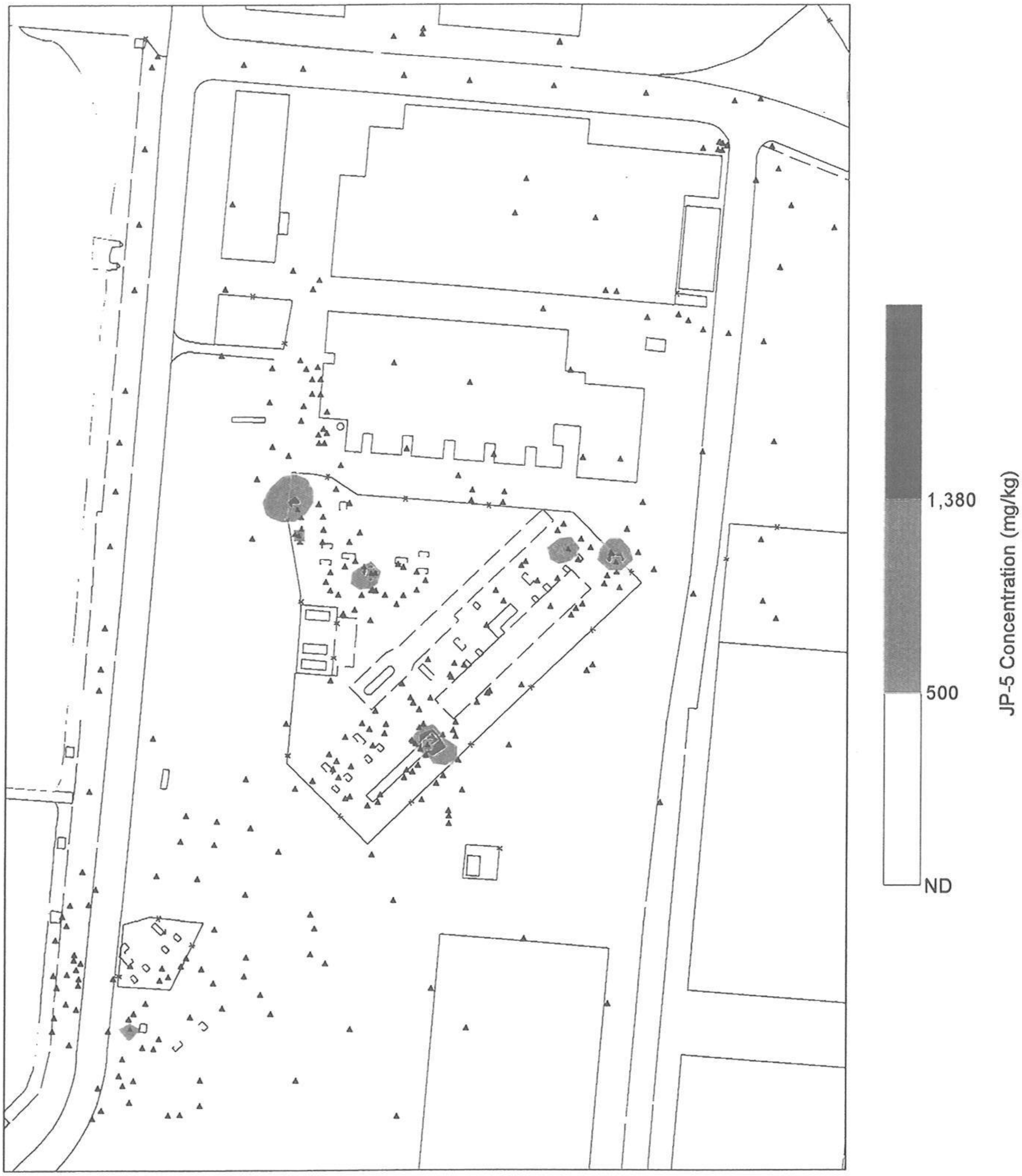
FIGURE 9
CAA 11
TPH-DIESEL PRC EXCEEDENCES
AND DISTRIBUTION IN SOIL
ALAMEDA POINT
ALAMEDA, CALIFORNIA



Legend

▪ Sample location where JP-5 concentration in soil exceeds 1,380 mg/kg or potential residential PRC.

▲ JP-5 soil sample location. Undetected "U" flags taken at half the reporting limit. Estimated "J" flags taken at full value.

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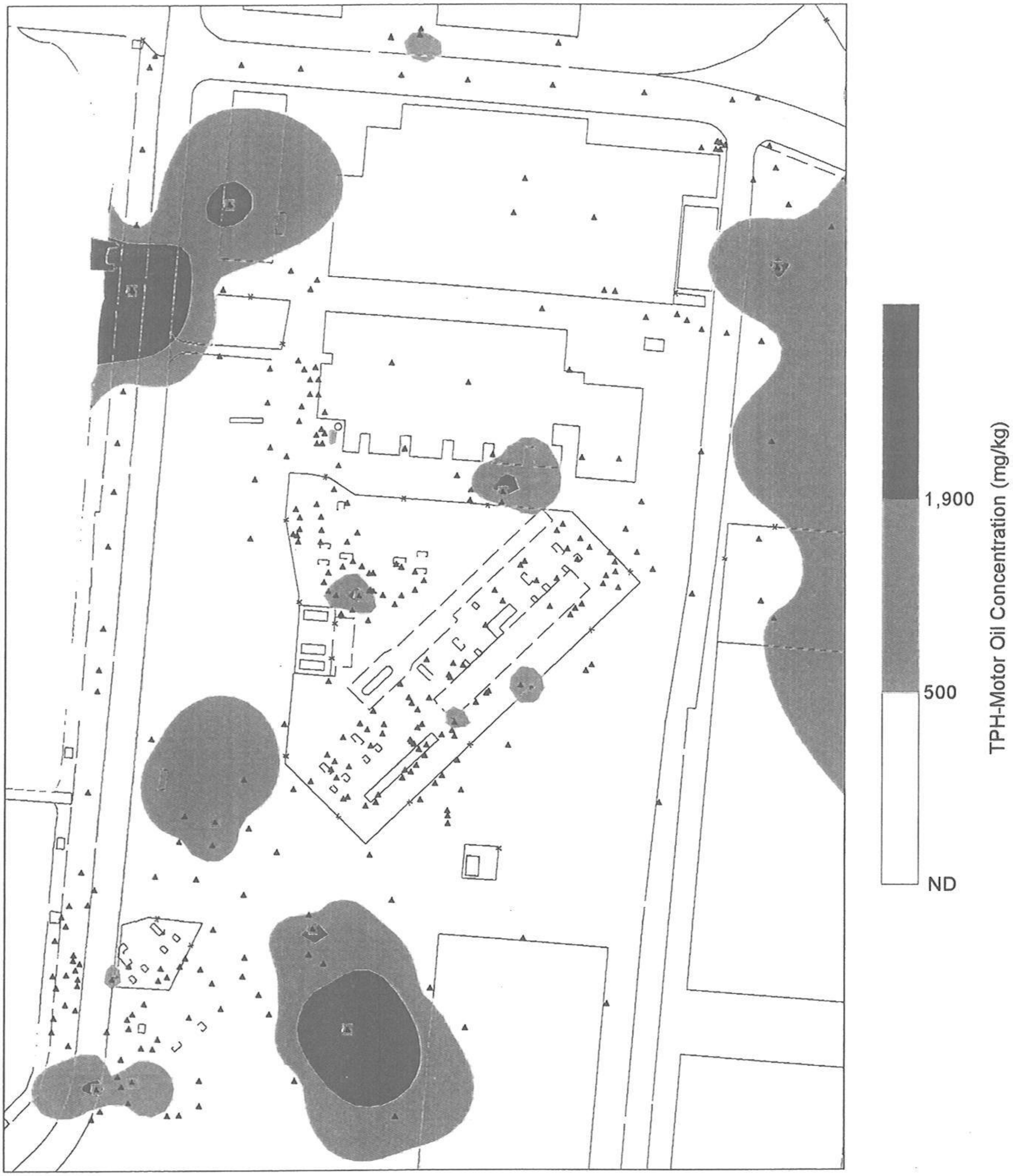
FIGURE 10
CAA 11
JP-5 PRC EXCEEDENCES
AND DISTRIBUTION IN SOIL
ALAMEDA POINT
ALAMEDA, CALIFORNIA



Legend

- Sample location where TPH-motor oil concentration in soil exceeds 1,900 mg/kg or potential residential PRC.
- ▲ TPH-motor oil soil sample location. Undetected "U" flags taken at half the reporting limit. Estimated "J" flags taken at full value.

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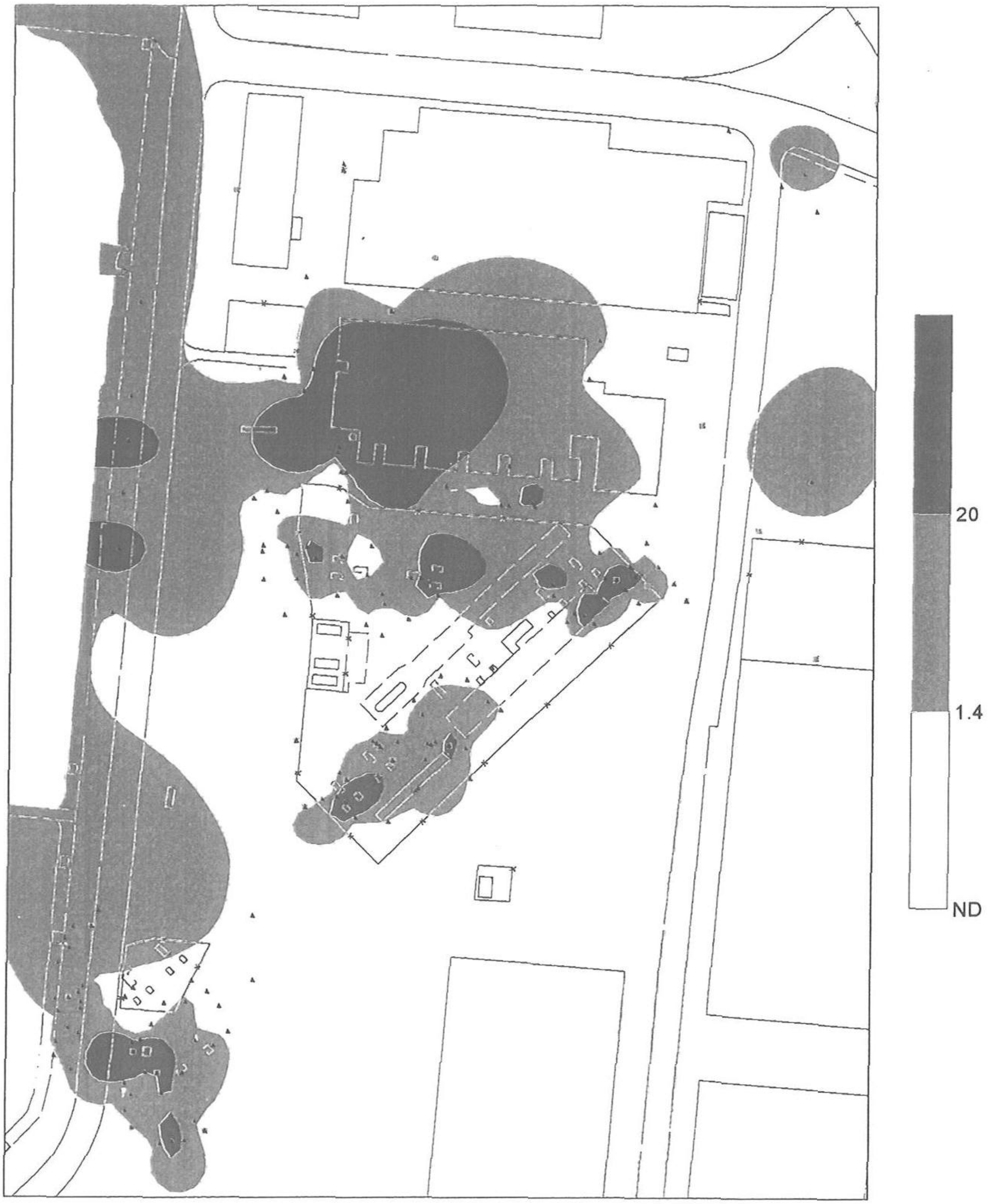
FIGURE 11
CAA 11
TPH-MOTOR OIL PRC EXCEEDENCES
AND DISTRIBUTION IN SOIL
ALAMEDA POINT
ALAMEDA, CALIFORNIA



Legend

- Sample location where benzene and/or toluene concentration in groundwater exceeds potential *drinking water source* PRC.
- Calculated TTPH concnetration. Undetected "U" flags taken at half the reporting limit. Estimated "J" flags taken at full value.

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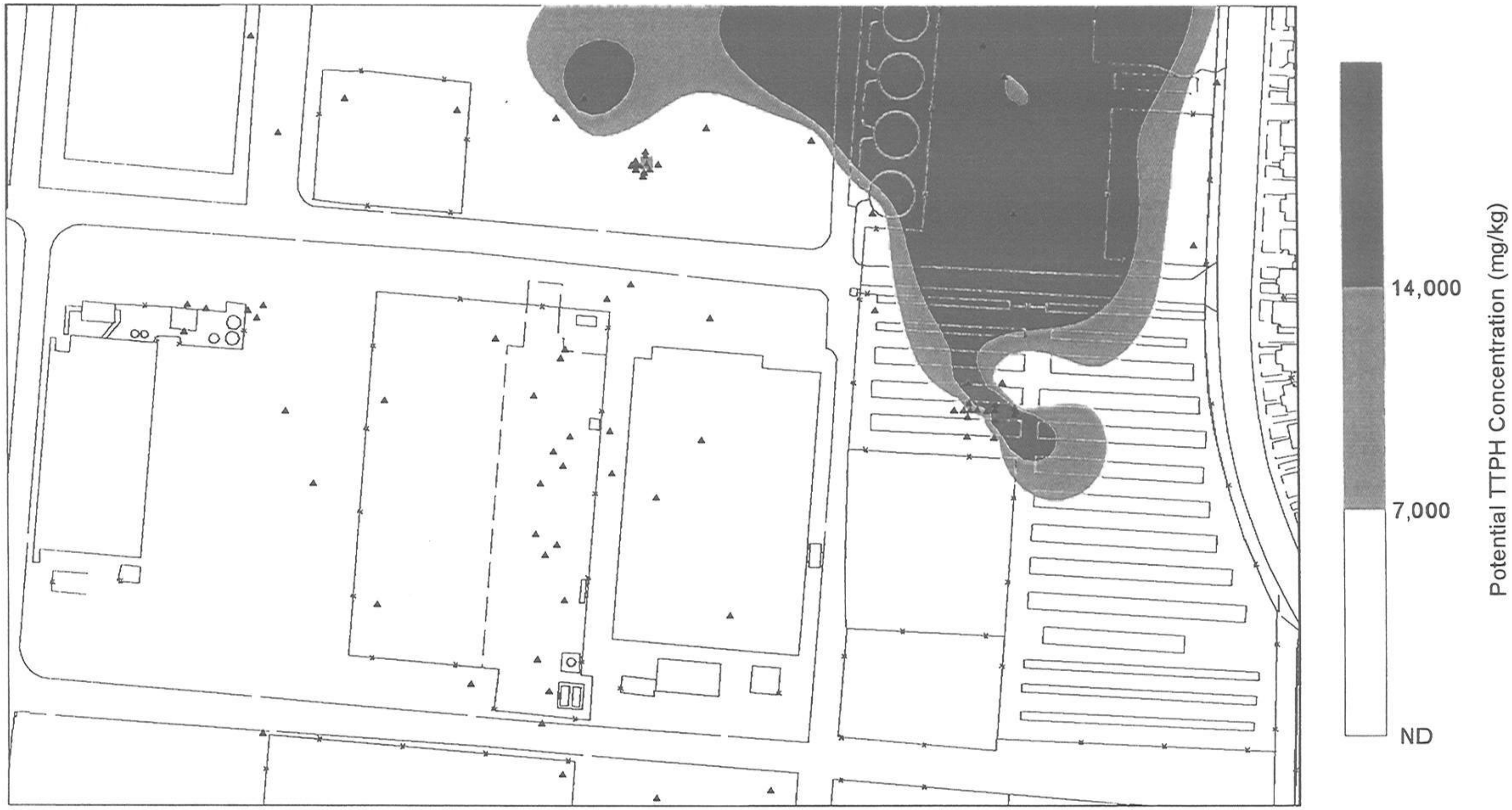
FIGURE 12
CAA 11
BTEX PRC EXCEEDENCES AND POTENTIAL FREE PRODUCT AREAS IN GROUNDWATER
ALAMEDA POINT
ALAMEDA, CALIFORNIA



<u>Legend</u>

- Sample location where benzene in soil exceeds potential residential PRC. Toluene, ethylbenze, and xzylene were not detected above the potential PRC.
- Calculated TTPH location. Undetected "U" flags taken at half the reporting limit. Estimated "J" flags taken at full value.

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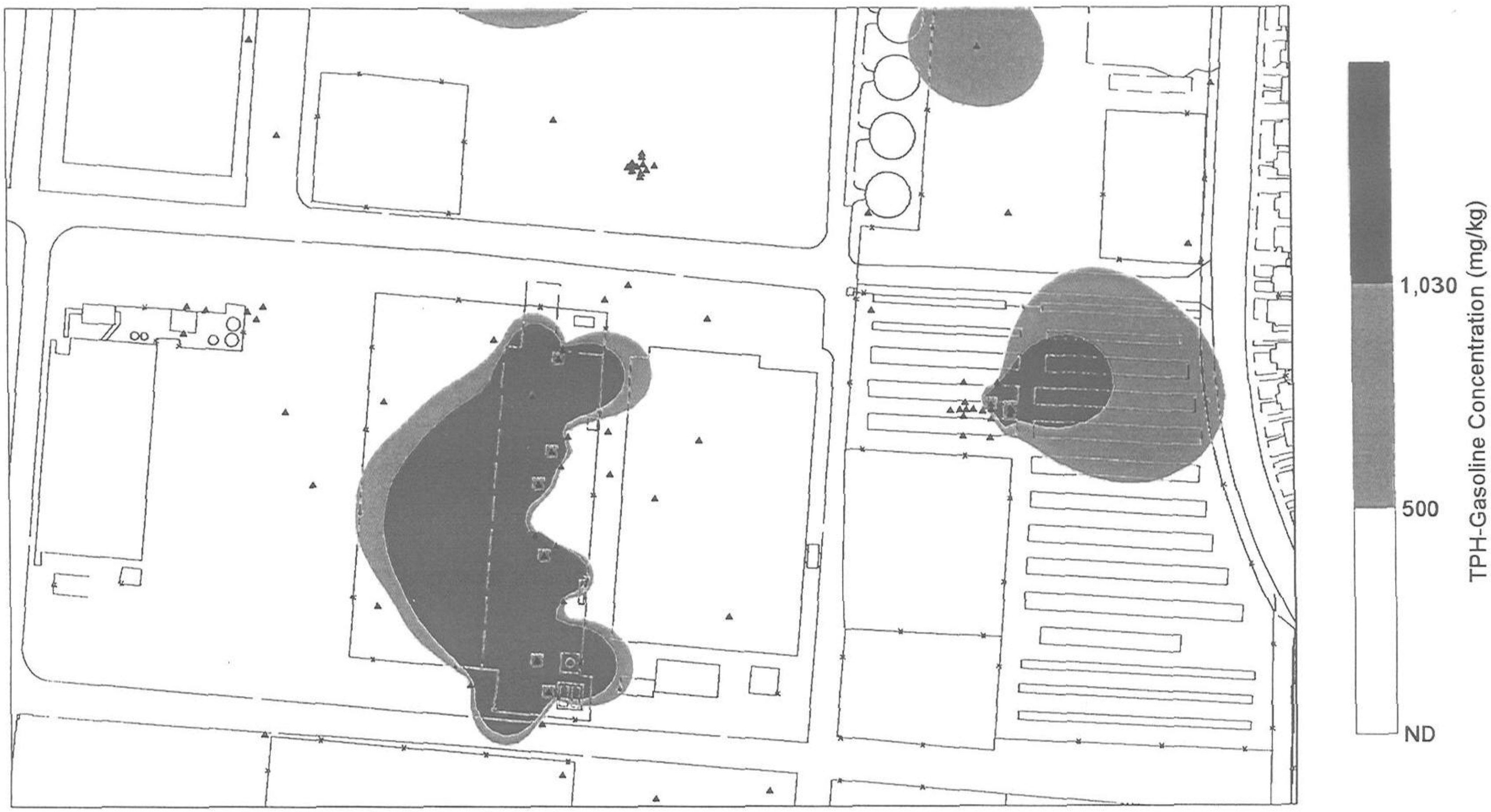
FIGURE 13
CAA 13
BTEX PRC EXCEEDENCES AND
POTENTIAL FREE PRODUCT AREAS IN SOIL
ALAMEDA POINT
ALAMEDA, CALIFORNIA



Legend

■ Sample location where the THP-gasoline concentration in soil exceeds 1,030 mg/kg or potential residential PRC.

▲ TPH-gasoline sample location. Undetected "U" flags taken at half the reporting limit. Estimated "J" flags taken at full value.

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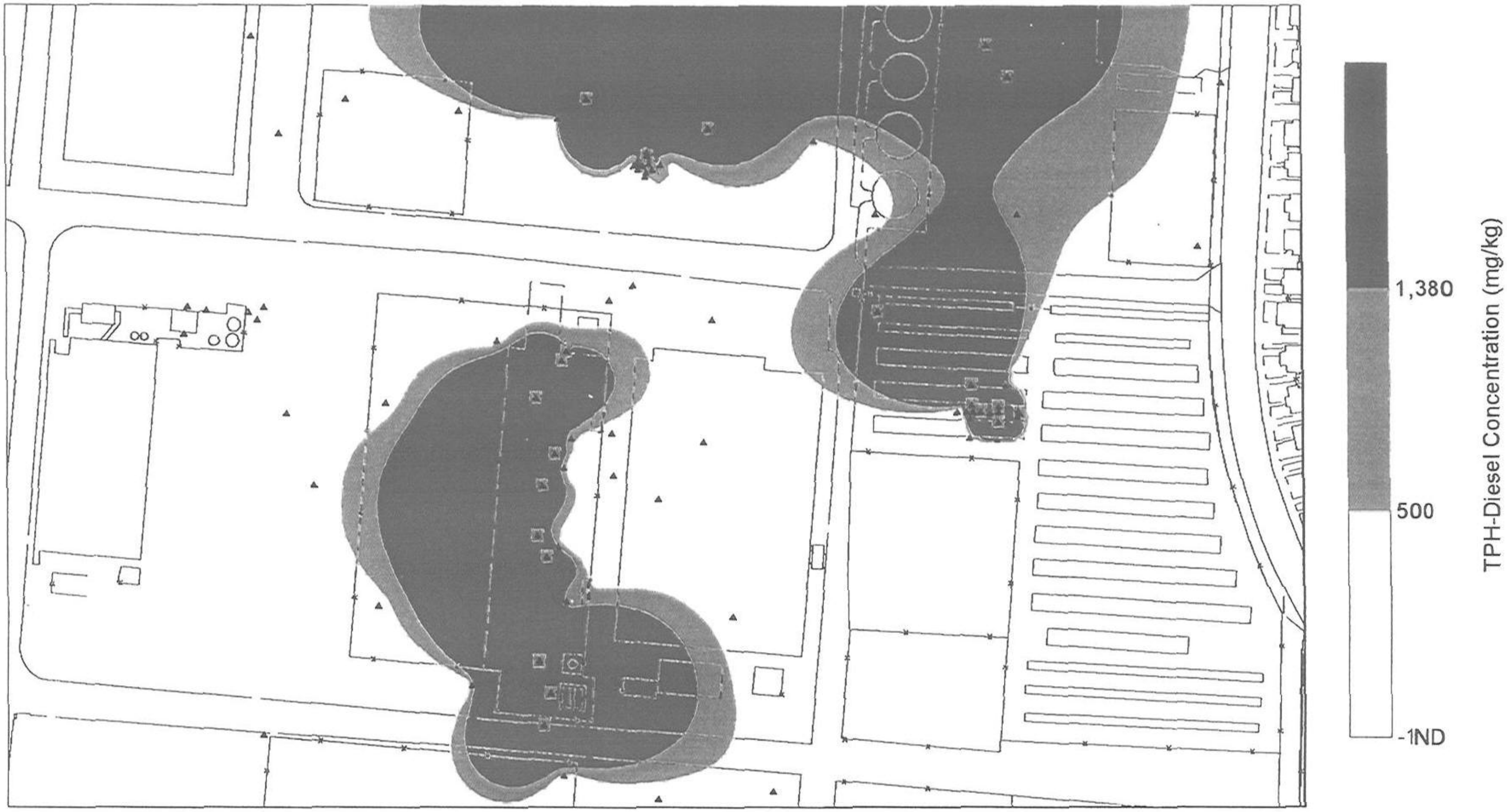
FIGURE 14
CAA 13
TPH-GASOLINE PRC EXCEEDENCES
AND DISTRIBUTION IN SOIL
ALAMEDA POINT
ALAMEDA, CALIFORNIA



Legend

- Sample location where the THP-diesel concentration in soil exceeds 1,380 mg/kg or potential residential PRC.
- TPH-diesel sample location. Undetected "U" flags taken at half the reporting limit. Estimated "J" flags taken at full value.

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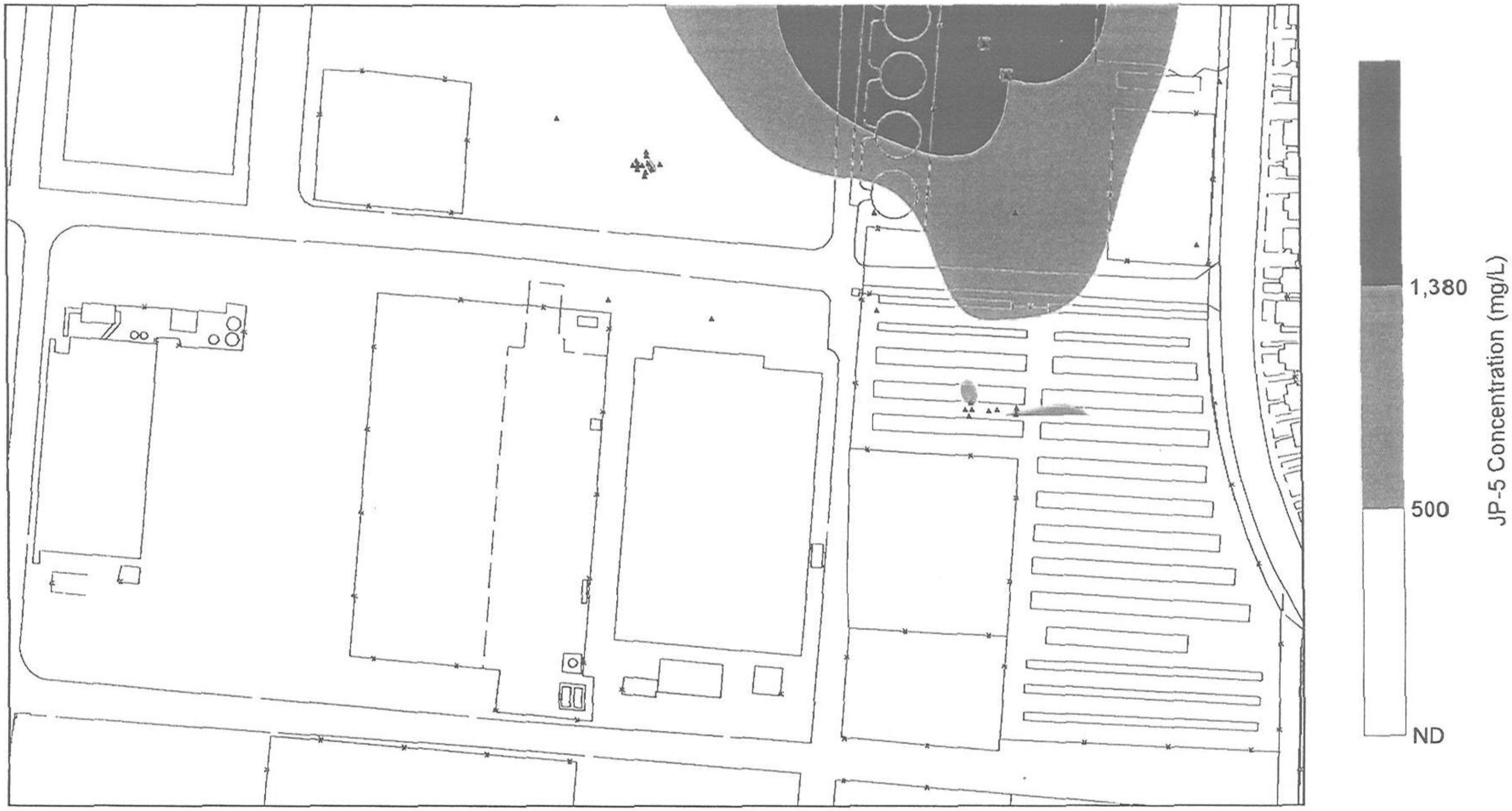
FIGURE 15
CAA 13
TPH-DIESEL PRC EXCEEDENCES
AND DISTRIBUTION IN SOIL
ALAMEDA POINT
ALAMEDA, CALIFORNIA



Legend

■ There is no sample location where the JP-5 concentration in soil exceeds 1,380 mg/kg or potential residential PRC.

▲ JP-5 soil sample location. Undetected "U" flags taken at half the reporting limit. Estimated "J" flags taken at full value.

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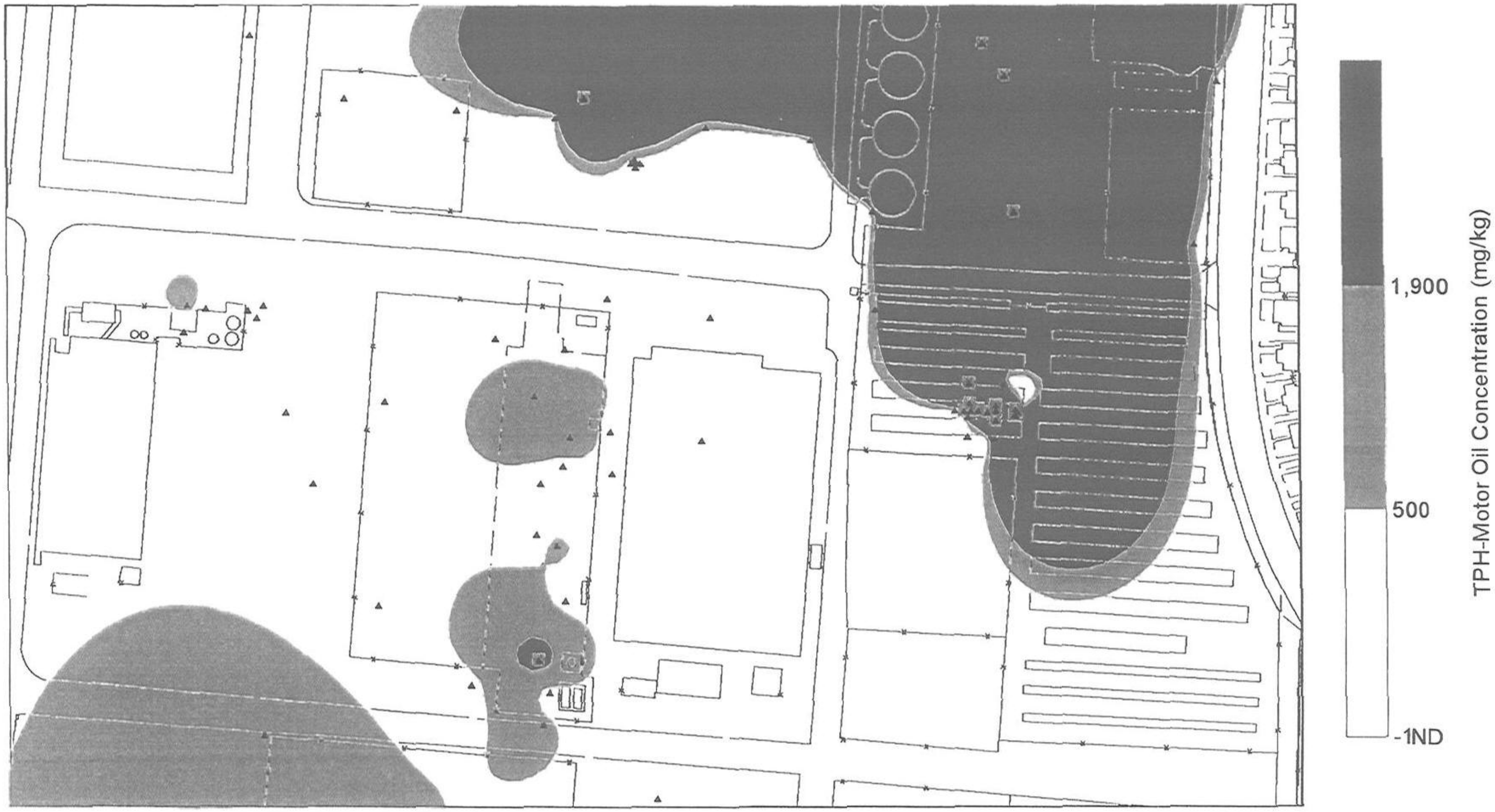
FIGURE 16
CAA 13
JP-5 PRC EXCEEDENCES
AND DISTRIBUTION IN SOIL
ALAMEDA POINT
ALAMEDA, CALIFORNIA



Legend

■ Sample location where the THP-motor oil concentration in soil exceeds 1,900 mg/kg or potential residential PRC.

▲ TPH-motor oil sample location. Undetected "U" flags taken at half the reporting limit. Estimated "J" flags taken at full value.

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FIGURE 17
CAA 13
TPH-MOTOR OIL PRC EXCEEDENCES
AND DISTRIBUTION IN SOIL
ALAMEDA POINT
ALAMEDA, CALIFORNIA

APPENDIX C
DETAILED DUAL VACUUM EXTRACTION TEST PROCEDURES AND TEST EVALUATION METHODOLOGY

Table of Contents

1.0 Introduction

The following sections describe detailed procedures for dual vacuum extraction (DVE) well testing. The testing will include maximum vacuum testing and step vacuum testing.

1.1 Maximum Vacuum Test

Before beginning the step test, the maximum vacuum level attainable at the wellhead will be determined. The maximum level test will be conducted by turning on the DVE blower and gradually increasing the vacuum to the maximum, at which no apparent increase in vacuum level can be attained. At the maximum vacuum level, vacuum pressure attained at the wellhead (both in the well annular space and in the process line) and the vapor flow will be recorded on a data sheet. Step test levels will run at 25%, 50%, 75%, and 100% of the maximum vacuum attainable in the process line at the well. If the maximum vacuum level is 4 inches of Mercury (4" Hg) or less than step test may be adjusted to 35% and 70% of maximum.

At the completion of the maximum vacuum test, liquid accumulated in the liquid and vapor separator will be pumped through a totalizing flowmeter into the receiving tank. The quantity, measured in gallons per minute (gpm), will be recorded on the data sheet.

1.2 Step Vacuum Test

The step test will commence with the 25% vacuum level determined from the maximum vacuum test. Each subsequent vacuum level (i.e., 50 percent and 75 percent) will be run for approximately 30 minutes to 1 hour.

With the 2-inch extraction tube set at the initial position of 6 inches below the liquid surface level, the step vacuum test will be conducted according to the step-by-step procedure described as follows:

1. With the blower on and full bleed air, adjust the blower suction inlet to the desired vacuum level to approximately 25% of the maximum level. The level will be monitored from the vacuum gauge in the process line at the well.
2. Immediately after the blower is running and every 10 minutes thereafter, record the following data on the field data sheets.
   - Vacuum reading at each observation well
   - Vacuum reading at the extraction well (in the annular space of the well)
   - Vacuum reading in the two-inch process line leaving the extraction well

- Vacuum reading in the main process line after the liquid/vapor separators
- Vacuum reading in the main process line after the vapor phase carbon vessels
- Vapor flow rate in the main process line after the liquid/vapor separators
- Temperature of vapor stream in the main process line after the separators
- Total volatile organic compound (VOC) concentrations in the vapor stream at the wellhead, and before and after carbon vessels
- Liquid flow rate estimated from the liquid accumulation time in the separator (Note: if feasible, this estimated value may be rechecked with another approximation from the liquid transfer pump start/stop cycle time)

3. Record any anomalies observed, such as system shutdown due to high-high liquid level in the separator.
4. After the first test is completed, open the air dilution valve at the blower suction inlet to turn down the vacuum. The free product depth and thickness in each observation well will be measured. Measurement of the free product volume in the extracted fluid will be performed using an oil and water level probe. After taking the free product thickness measurement, a sample of the free product and the groundwater will be collected for fuel characterization analysis.
5. Readjust the blower air inlet (or dilution) valves, restart the system and begin testing at the next operating vacuum level (i.e., 50% of maximum vacuum pressure or a pre-selected one), repeating Steps 2 through 4.
6. Continue testing at each vacuum level as previously stated.

1.3 Extraction Tube Testing

Various positions of both the floating and V-notch extraction tubes will be tested to determine the optimum position for minimal water removal and maximum product removal. After completing the first set of vacuum level tests, the second set of step vacuum tests will begin with the bottom or slots (depending on which tube) of the two-inch extraction tube raised 1.5 feet higher (i.e., one foot above the groundwater or free product table). Since the groundwater (and particularly the free product) table may be changed after the first testing, the depth to the water (or free product) table will be measured before the second testing starts. The inner extraction tube position will then be adjusted based on the new well depth measurements, whether the measured results are the same or significantly different than the previous ones. Upon completion of these activities, vacuum testing will resume by following procedures from Steps 1 through 6, Section 1.2.

2.0 Evaluation of Dual Vacuum Extraction System Test Results

The following sections describe methods for evaluating the pilot test results and developing design parameters for the full-scale system.

2.1 Vapor Extraction Radius of Influence

Determination of the maximum radius of vacuum influence for vapor extraction is necessary to design the extraction well layout that will adequately provide sufficient pneumatic containment and extraction of the free product.

The radius of vacuum influence will be measured in the field by taking vacuum readings induced at the test DVE well and the peripheral observation wells located at various distances away from the test well. The negative pressures (i.e., vacuum) measured at the wells will be plotted against the logarithm of distances from the test well. A minimum of three points is necessary for the plot. The radius of influence which corresponds to near zero vacuum will be determined from the plot. A pressure distribution equation may also be used, if necessary, to approximate or verify the radius of influence. This equation involves the usage of only pressure and distance and is:

$$P(r) = Pw \times \{1+[1-(Patm/Pw)^2] \times Ln(r/Rw)/Ln(Rw/R_I)\}^{1/2}$$

Where:

Ln	= natural logarithm
Patm	= absolute ambient pressure, atm
P(r)	= absolute pressure induced at observation well, atm
Pw	= absolute pressure induced at test well (annular space), atm
Rw	= radius of test well, cm
R_I	= radius of influence, cm
r	= distance from test well, cm

An arithmetic mean radius of influence will be determined from the set of radii of influence computed from the several observation wells using the above equation (Johnson, et al., 1990).

In addition, the soil air permeability can be empirically determined using the set of vapor flow rate, vacuum applied, and the estimated radius influence. The equation used to approximate the soil air permeability is based on a one-dimensional steady-state radial flow model (Johnson, et al., 1990) and is:

$$Q/H = \pi \times (k/\mu) \times Pw \times [1 - (Patm/Pw)^2] / Ln(Rw/R_I)$$

Where:

Q	= volumetric air flow, cm^3/sec
H	= well screen length, cm
π	= 3.1416
μ	= air viscosity, g/cm-sec
k	= soil air permeability, cm^2
Ln	= natural logarithm
Pw	= absolute pressure induced at test well (annular space), $g/cm\text{-}sec^2$
Patm	= absolute ambient pressure, $g/cm\text{-}sec^2$
Rw	= radius of test well, cm
R_I	= radius of influence, cm

An average value of soil air permeability can be calculated using the above equation.

2.2 Extraction Flow Rates under Various Operating Conditions

Determination of the air and liquid extraction flow rates yielded from the DVE well under various vacuum and/or extraction tube type is essential for proper sizing of the aboveground extraction and treatment equipment. These flow rates will also be used to develop an operations plan that can yield the desired performance results, given the maximum equipment capacities. Such operating conditions include vacuum applied at the wells and positions of inner extraction tube relative to the groundwater depth.

The air extraction flow rate will be determined by measuring the in-line volumetric flow rate (after the liquid and vapor separator) using a direct reading flow meter designed for airflow measurement. The liquid flow rate, however, will be estimated based on the liquid accumulation time inside the liquid and vapor separator. Since the separator will be operated on high and low levels, the liquid extraction flow rate will be determined from the liquid holding time (between the two levels) inside the separator. The resulting air and liquid extraction rates will be plotted against the vacuum applied to develop an extraction rate profile for the DVE system.

2.3 Free Product Removal

Estimating the free product removal rate is necessary for proper design of the product recovery system. The removal rate will be assessed by measuring the volume of free product layer separated from water in the extracted liquid stream during each step test. The free product removal rate will be estimated for each vacuum level tested at the DVE well. The removal rate will be estimated based on the volume of product removed over the duration of the step test. The removal rate is determined as:

$$Q_{fp} = V_{fp} / t$$

Where:

Q_{fp} = free product removal rate, gals/minute
V_{fp} = volume free product recovered, gallons
t = duration of step test, minutes

3.0 References

Johnson, et al., May-June 1990, *Quantitative Analysis for the Cleanup of Hydrocarbon Contaminated Soils by In-Situ Soil Venting*, Groundwater, Vol. 28, No. 3.

APPENDIX D
VACUUM-ENHANCED EXTRACTION PILOT SYSTEM DESCRIPTION

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List of Figures

Acronyms and Abbreviations

CAA	Corrective Action Area
cfm	cubic feet per minute
CTO	Contract Task Order
DVE	Dual Vacuum Extraction
GAC	granular activated carbon
gpm	gallons per minute
MTBE	methyl tertiary butyl ether
POTW	publicly-owned treatment works
PVC	polyvinyl chloride

1.0 Vacuum-Enhanced Extraction Pilot System Description

The dissolved phase plume extraction and treatment system ultimately designed for Corrective Action Area (CAA) 7 will likely incorporate the free product extraction and treatment system installed under Contract Task Order (CTO) 13 with modifications. While the vacuum enhanced extraction method envisioned for extraction of soil gas and dissolved phase constituents treated under CTO 37 is foreseen, significant alterations to the CTO 13 system may ultimately develop. The following section identifies the extraction and treatment system currently designed for free product recovery under CTO 13 with expected modifications for CTO 37. The dissolved phase extraction and treatment system built to augment the CTO 13 system will ultimately treat the liquid (groundwater) fraction of the dissolved phase plume beneath CAA 7. Extraction and treatment of free product and/or dissolved phase contaminants at CAA 11 and CAA 13 near Building 530 is anticipated to follow a similar design. For purposes of discussion in this Appendix, vacuum-enhanced extraction systems will generally be Dual Vacuum Extraction (DVE) systems since they all involve the simultaneous extraction of vapor and liquid.

2.0 Dual Vacuum Extraction Principle of Operation and Process Description

The principle of operation of the DVE technology is based on activating hydrocarbons in the unsaturated and saturated zones by applying a vacuum in a well near the water or free product level. In this application, subsurface vapor flow reacts to this pressure difference and the lighter-than-water hydrocarbons are drawn toward collection trenches operated under vacuum. Product flow to the collection trenches is established along the capillary fringe and is influenced more by vacuum than by gravity. The use of vacuum-enhanced extraction has been found to increase product yield two to three times that of conventional pumping and drawdown, which depends on the principle of gravity. With the use of an extraction tube placed within vertical members of a horizontal collection trench, extraction of fluid is focused on the floating hydrocarbon layer. Vapors sweeping over the surface of the groundwater/hydrocarbon layer are drawn into the horizontal collection trench and accelerated vertically upward with entrained hydrocarbon/water droplets in the extraction tube. Vapor and entrained liquids flow up the tube and are processed as described below. This extraction method minimizes groundwater removal and disposal. Smearing of hydrocarbon liquid in soil near the water table is less than that observed during drawdown of typical pump-and-treat systems. Depending on soil type and permeability, a slight far-field depression and near-field ascension of the water table may occur in the vicinity of the collection trenches.

Maximum mass removal rate is an objective of system optimization. For the pilot test, the DVE system, comprised of three horizontal collection trenches for each site, will be run at four different vacuum settings. Product removal rates will be calculated for each run. The optimum setting, i.e., highest practical product removal rate, will be used for design of the full-scale system.

This DVE system will consist of collection trenches, collection trench-accumulation sumps, vapor/liquid separators, a vacuum blower, a demulsifier system, an oil/water separator, equalization tanks, a fuel holding tank, a clean water holding tank, particulate filters, an air stripper, emissions control equipment, instrumentation, and associated pumps, piping, and hoses. Liquids and vapors will be extracted simultaneously by the vacuum blower from the collection trenches, using a down-hole extraction tube in the vertical members of the horizontal collection trench. Air, drawn to the collection trenches through the subsurface pore space, will entrain liquid droplets consisting of soil vapor, dissolved-phase contaminants in groundwater, free product, air, and any volatile hydrocarbons. The fluid stream will be separated into its vapor and liquid components and processed through their respective vapor-phase treatment system and a liquid-phase separation and treatment system. Free product will be recovered and disposed of off-site at a recycling facility. Recovered water will be processed through an air stripper and liquid phase-granular activated carbon (GAC) beds for discharge into a clean water holding tank pending discharge to the sanitary sewer and publicly-owned treatment works (POTW) (Figure 14 of this Work Plan). The following sections describe collection trench design, construction and installation, and major process equipment in detail. Liquid phase treatment is more fully described in Section 5.0 of this Work Plan

3.0 Dual Vacuum Extraction Collection Trench Design

The proposed collection pipelines, based on earlier Site Characterization and Analysis Penetrometer data, are shown on Figure 1 of this appendix, "Proposed Piping Network Layout." However, the proposed free product delineation may indicate a larger or smaller plume than that assumed by previous investigations. The DVE pilot test will be conducted with three horizontal collection trenches. The installation of additional collection trenches for full-scale operation will depend on plume delineation and DVE pilot test performance.

The collection trench systems will consist of parallel trenches excavated to approximately 3 feet below ground surface. Inside will be horizontal collection pipes comprised of 4-inch-diameter, 0.02-inch slotted polyvinyl chloride (PVC) well screen in-line with vertical DVE accumulation sumps (see Figure 11 of this Work Plan). Between accumulation sumps, the horizontal collection screen low-intake area will be placed at or just above mean high tide elevation. The accumulation sumps will be comprised of (approximately) 5-foot long, 4-inch diameter, vertical PVC risers completed aboveground. The trenches will be backfilled with the excavated artificial fill material (sand) and covered with a 20-foot wide plastic liner over its entire length, assuring a good booted seal around the vertical sump risers. The entire area to be remediated (including the previously covered trenches) will be covered with another plastic liner. The area-wide liner will be covered with clean sand and gravel to enable light vehicular traffic, and a gravel foundation will be placed for the process equipment. The liners are used to reduce the short-circuiting of air from the ground surface. An alternative method to using liners is to cover the entire area with asphalt.

Two types of fluid extraction devices may be tested, if appropriate. They include a V-notch tube and a self-adjusting floating tube. If tidal changes are not extreme, the most probable accumulation sump will be equipped with a stationary, V-notch vacuum extraction tube. This extraction tube will be made of 2-inch diameter clear PVC vacuum hose attached to an open-ended 2-inch diameter PVC pipe with a V-notch cut into its end. Application and positioning of the stationary tube will be evaluated during pilot testing. Figure 11 of this Work Plan shows the details of this extraction tube.

4.0 Major Process Equipment

Major process equipment will be connected using hoses with camlock fittings and Schedule 40 PVC pipe. Pressure and temperature gauges and flow meters will be installed to monitor the system operation. The process flow diagram for CAA 7 is shown in Figure 14 of this Work Plan. The following sections describe the key components in further detail.

4.1 Vapor Extraction and Treatment Systems

The vapor extraction and primary treatment systems will consist of a thermal/catalytic oxidizer and a positive displacement type blower. At CAA 7, vapors from the collection trench header will be pulled through two liquid/vapor separators piped in series into a downstream vacuum blower. The blower discharge will be routed through a thermal/catalytic oxidizer before being emitted to the atmosphere. Alternatively, at low hydrocarbon levels, vapor treatment will be accomplished using vapor-phase GAC in lieu of an oxidation system.

Liquids that have been removed from the vapor stream will be pumped to the liquid recovery and treatment system. For each site, this system is comprised of product holding tanks, demulsifier units, oil/water separators, and liquid-phase GAC units to further treat the extracted liquids. Thereafter, the treated liquids will be stored, tested, and discharged to the sanitary sewer and POTW.

4.1.1 Vacuum Blower

The vacuum blower will be a positive displacement type, with a maximum capacity of 1,000 cubic feet per minute (cfm) at 12-inch mercury vacuum. The blower will be equipped with an explosion-proof motor and motor controls and overload protection devices. The blower system will also consist of an air filter at the inlet and a silencer at the outlet. The blower will be operated under automatic controls for safety shutdown under emergency conditions, such as high vacuum level at the blower suction inlet. The blower will be located downstream of the liquid/vapor separators and upstream of the thermal/catalytic oxidizer.

4.1.2 Primary and Secondary Liquid/Vapor Separators

Liquid-vapor separation will be accomplished in the first two components in the aboveground process train. The liquid/vapor separators will be used to remove entrained liquid (i.e., groundwater and free product) from the extracted vapor stream. Extracted vapor will pass through two liquid/vapor separators and into the vapor treatment unit located downstream of the vacuum blower unit. Liquids that have been removed from the vapor stream will be pumped to the liquid recovery and treatment system.

The primary liquid/vapor separator will be a vertical vessel with approximately 150 gallons of liquid holding capacity between high and low levels. The secondary liquid/vapor separator is similarly designed with a demister unit, pump and controls, but with smaller liquid batch capacity of approximately 100 gallons. At high liquid level, the liquid transfer pumps will automatically begin pumping accumulated liquid to a 500-gallon receiving tank. The pumps will automatically stop running when the liquid reaches the low level. A high-high level signal reached in the separators will trigger shut down of the entire DVE system.

4.1.3 Vapor Treatment Unit

A thermal/catalytic oxidizer will be used to treat extracted vapors of up to 1,000 cfm. The thermal/catalytic oxidizer will be placed on the discharge side of the blower unit. The treated vapor from the thermal/catalytic oxidizer will be emitted to the atmosphere.

4.2 Liquid Extraction and Treatment System

The liquid recovery and treatment systems will consist of a demulsifier system, a receiving tank, an oil/water separator, a product holding tank, an equalization tank, primary and secondary dual particulate filters, an air stripper, dual GAC beds, and a clean water holding tank. Liquids that have been removed from the liquid/vapor separators will be pumped into a receiving tank. A demulsification solution will be injected into the liquid stream prior to entering the receiving tank. The liquids will be pumped from the receiving tank through an oil/water separator into an equalization tank. Free product separated from the liquid stream by the oil/water separator will gravity flow into the product holding tank. The water collected in the equalization tank will be pumped through dual particulate filters, an air stripper, dual liquid-phase GAC vessels, and into a clean water holding tank.

4.2.1 Demulsification System/Receiving Tank

Liquids recovered from the liquid/vapor separators will be pumped into a receiving tank where the free-phase hydrocarbons and emulsions will be allowed to coalesce and separate from the air- and water-phase by gravity. In the liquid transfer pipe from the liquid/vapor separators to the receiving tank, a demulsifying agent will be injected into the liquid stream to reduce emulsions. All liquids accumulated in the receiving tank will be pumped to the oil/water separator.

The demulsification system will consist of a positive displacement-type injection pump and a drum of demulsifier solution. The receiving tank will be a cross-linked polyethylene-type vessel with a minimum of 500 gallons of liquid holding capacity between high and low levels. At high liquid level, the liquid transfer pump will automatically begin pumping accumulated liquids to the oil/water separator. The pump will automatically stop running when the liquid reaches the low level. A high-high level signal reached in the receiving tank will trigger shut down of the entire DVE system.

4.2.2 Oil/Water Separator and Equalization Tank

The oil/water separator will be used to separate free-phase petroleum hydrocarbons from the liquid stream. The equalization tank will be used to capture any free-phase hydrocarbons not removed by the oil/water separator. The free-phase hydrocarbons accumulated in the equalization tank will be gravity drained by an operator to the product holding tank.

An oil/water separator capable of removing oil droplets 15 microns or greater in diameter from a 50 gallons per minute (gpm) liquid stream will be used. Phase-separated hydrocarbons recovered from the oil/water separator will gravity flow into a 500-gallon product holding tank pending disposal. The product holding tank will contain a high level switch that shuts down the DVE system when the tank is full. A subcontractor licensed to transport and reclaim or dispose of petroleum hydrocarbons will be retained to evacuate the product tank when it is near full. The equalization tank will be a cross-linked, polyethylene-type tank with a minimum of 300 gallons of liquid holding capacity between high and low levels. At high liquid level, the liquid transfer pump will automatically begin pumping accumulated water from the equalization tank through the particulate filters and water treatment system. The pump will automatically stop running when the liquid reaches the low level. A high-high level signal reached in the equalization tank will trigger shut down of the entire DVE system.

4.2.3 Particulate Filters, Air Strippers, and Granular Activated Carbon Treatment System

Dual particulate filters connected in series will be used to reduce sediment loading for the air stripper and the liquid-phase GAC beds at a flow rate of up to 50 gpm. Bag-type filters capable of removing particulates 10 microns or greater in diameter from the 50-gpm liquid stream will be used. The filters will be operated in parallel. Spent particulate filters will be drummed and chemically profiled. A subcontractor licensed to transport and dispose of contaminated filters will be retained to transport and dispose of the filters.

Wastewater treated by the bag filters will be pumped to a low-profile tray air stripper. The stripper will use ambient air to liberate volatile organic compounds from the water (including recalcitrant levels of the more soluble methyl-tert-butyl ether [MTBE]). The off gas from the air stripper will be drawn into the main extraction blower that feeds the thermal/catalytic oxidizer or alternate vapor-phase GAC system. Water treated by the stripper will be pumped to the liquid-phase GAC vessels for additional treatment.

The GAC adsorption units will be operated in series. Each vessel will contain up to 2,000 pounds of virgin or regenerated activated carbon for polishing water laden with petroleum hydrocarbons. Special adsorptive resins or Zeolite may be added to the carbon to promote MTBE removal. Each vessel will be constructed of carbon steel and designed for pressure applications. The treated water from the GAC vessels will be discharged into a 6,900-gallon, clean water holding tank pending discharge. The clean water holding tank will contain a high-level switch, which shuts down the entire DVE system when the tank is full. Spent GAC will be removed from the vessels, transported, and disposed of or regenerated by a licensed subcontractor.

5.0 Test Parameters

During the pilot test construction and operation, samples will be collected from soil borings, from well liquid and vapor streams, and from process liquid and vapor streams. Results of sample analyses will be used to determine the extent and nature of subsurface contamination in the test area and under pilot test operational conditions. A summary of sampling and analysis of all anticipated process streams is presented in Table 2 (Appendix D), "Sampling and Analysis Summary." The Sampling and Analysis Plan presents the locations and detailed procedures for collecting and analyzing samples.

The following parameters associated with system design and operations will be determined or verified from the pilot test:

- The vapor extraction radius of influence of the DVE well(s) under various vacuum conditions
- The vapor extraction rates and concentrations under various vacuum conditions applied at the test well
- Free product and groundwater removal rates under various vacuum conditions applied at the test well
- The vapor and liquid extraction rates at various depths of the extraction tube under various operating vacuum conditions applied at the test well

Data collection procedures and application of the key parameters listed above for full-scale system design are described in detail in the Work Plan. Results of the pilot test will be directly incorporated into the full-scale remediation system.

FIGURES

LEGEND

Symbol	Description
✦	MONITORING WELL
—— E ——	ELECTRICAL LINES
—— STM ——	STEAM LINES
—— G ——	GAS LINES
— — —	FUEL LINES
—— SW ——	SANITARY SEWER LINE
—— SS ——	STORM SEWER LINE
—— IW ——	INDUSTRIAL WASTE LINE
—— T ——	TELEPHONE LINE
—— CTV ——	CABLE TV LINE
—x—x—	FENCE
	SANITARY SEWER MANHOLE
	STORM SEWER MANHOLE
	CATCH BASIN
	INDUSTRIAL WASTE MANHOLE
(459-1)	FORMER UST (REMOVED)
C.I. –	CAST IRON
RC –	REINFORCED CONCRETE
⊙	DVE ACCUMULATION SUMP
–	HYDRANT
☒ –	TRANSFORMER
	DVE COLLECTION TRENCH
	ABOVE GROUND COLLECTION HEADER PIPING

NOTES:
1. WELL AND UTILITY LOCATIONS ARE APPROXIMATE.

XREF: SAS-SW, SSS-SW, IND-SW, OLD-FUEL, FUEL-ALL

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IT CORPORATION

DEPARTMENT OF THE NAVY
SOUTHWEST DIVISION
NAVAL ENGINEERING COMMAND
SAN DIEGO, CALIFORNIA

FIGURE 1
PROPOSED PIPING NETWORK LAYOUT
EXCHANGE SERVICE STATION, CAA-7
ALAMEDA POINT
ALAMEDA, CALIFORNIA

APPENDIX E
WASTE MANAGEMENT PLAN

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Acronyms and Abbreviations

CAA	Corrective Action Area
CCR	California Code of Regulations
CFR	Code of Federal Regulations
COC	chain-of-custody
cy	cubic yards
DOT	U.S. Department of Transportation
DTSC	Department of Toxic Substances Control
EPA	U.S. Environmental Protection Agency
FAR	Federal Acquisitions Regulation
HDPE	high-density polyethylene
HMTA	Hazardous Materials Transportation Act
HWCL	Hazardous Waste Control Law
IATA	International Air Transport Association
IT	IT Corporation
PPE	personal protective equipment
RCRA	Resource Conservation and Recovery Act
T&D	transportation and disposal
TPH	total petroleum hydrocarbons

1.0 Waste Management Plan

All non-expendable equipment and material in contact with site contaminants, such as skid units, tanks, hoses, and pipes, will be decontaminated in the equipment decontamination area. The following probable waste streams will be generated while implementing this Work Plan:

- Personal protective equipment (PPE)
- Soil from boring and collection trench cuttings
- Excavated TPH-contaminated soil
- Concrete and debris generated during excavation activities
- Piezometer and recovery well development water
- Extracted TPH-contaminated vapor
- Extracted TPH-contaminated groundwater
- Extracted free product
- Spent particulate filters
- Spent carbon
- Water generated during equipment decontamination

1.1 Preliminary Information

Waste management milestones and preliminary probable characterization is presented in the following sections. The preliminary waste information is summarized in Table 1, "Preliminary Waste Information."

1.2 Procurement

The transportation and disposal (T&D) Coordinator will establish preliminary waste quantities, characterizations, transportation methods, and disposal methods. The T&D Coordinator will then prepare and submit purchase requisitions, including written T&D subcontractor scopes of work and recommended bidders lists (Federal Acquisition Regulations [FAR] 13.101 through 13.106-3).

The IT T&D Coordinator will technically evaluate all T&D subcontractor submittals and recommend selection of the most responsive, qualified, and cost-effective permitted T&D subcontractors (FAR 13.106-2).

Possible disposal and recycle facilities include, but are not limited to the following:

- Altamont Landfill & Recycling Facility, Livermore, California (for Class II landfill)
- Chemical Waste Management, Kettleman City, California (for Class I landfill)
- ECDC Environmental, East Carbon, Utah (for out-of-state non-Resource Conservation and Recovery Act [RCRA])
- Forward Landfill, Manteca, California (for Class II landfill)
- Romic Environmental Technologies, East Palo Alto, California (for redistillation or fuels blending)
- Safety Kleen (Lokern), Buttonwillow, California (for Class I landfill)
- Seaport Environmental, Redwood City, California (for wastewater treatment followed by discharge)
- TPS Technologies, Richmond, California (for thermal desorption)

1.3 Waste Accumulation and Storage

To the extent possible, IT will store containerized waste in liquid storage tanks, roll-off bins, and drums. For bulk waste, IT will construct containment areas for temporary waste storage (22 CCR 66262.34[a]). Containment areas for containerized-waste liquids and for containerized-waste solids will consist of a high-density polyethylene (HDPE) underlain-liner that has a two-foot berm around its perimeter (22 CCR 66264 Subpart I, 22 CCR 66265 Subpart I).

IT will assign unique ID numbers to waste containers and affix waste labels to waste containers and post adjacent to stockpiles upon the first day of accumulation (22 CCR 66262.34[a][2], 22 CCR 66262.34[a][3], 40 CFR 264 Subpart I, 40 CFR 265 Subpart I). Each waste label will display the waste generator's name, the waste generator's address, the first date of accumulation, the waste ID number and the characterization of the waste.

IT will prepare a waste inventory spreadsheet that will include each waste description, unique container type and ID number, quantity, accumulation method, and first date of accumulation (e.g., Sludge, Bin #DB9999, 15 cubic yards (cy), Bulk, 7/15/01). IT will update the waste inventory spreadsheet weekly.

1.4 Sampling and Analyses

An IT field technician will obtain statistically representative samples of each waste in accordance with the procedures provided in EPA Publication SW-846 (40 CFR Appendices I through III to Part 261, "Representative Sampling Methods"). The Project Chemist or field technician will write an associated waste description of each sample, (as presented in Table 1) in the description section of each waste sample's chain-of-custody (COC) document.

The Project Chemist or field technician will ship waste samples in accordance with the International Air Transport Association (IATA) Dangerous Goods Regulations, 41st Edition, effective January 1, 2000. The subcontracted laboratory will analyze each waste sample. The laboratory or the Field Technician will provide photocopies of the analytical results of each waste to the T&D Coordinator at least ten calendar days prior to scheduled off-site waste shipment. A summary of sampling and analysis of all anticipated waste streams treated on site or treated and disposed of off site is presented in Table 2.

1.5 Waste Characterization

The T&D Coordinator will review the analytical results of each waste and determine the applicability of the Department of Toxic Substances Control (DTSC) California Hazardous Waste Control Law (HWCL) regulations (22 CCR 66261), EPA RCRA regulations (40 CFR 261), and DOT Hazardous Materials Transportation Act (HMTA) regulations (40 CFR 173). In the event that the regulations become effective, these regulations will retroactively apply to the initial date of accumulation (22 CCR 66262.34[a][2]).

In the event that a waste's analytical results warrant changes to the waste's preliminary characterization, IT will modify this plan and the T&D subcontractors' purchase orders.

1.6 Waste Profiling

The T&D Coordinator will first determine if the Navy has any pre-existing waste profile documents on file with the T&D subcontractors. In the event that the Navy possesses pre-existing profiles for CAA-specific wastes, the T&D Coordinator will forward the waste's analytical results to the T&D subcontractors and will update (amend) the pre-existing waste profiles. In the event that the Navy does not possess pre-existing waste profiles, the T&D Coordinator will prepare new waste profiles. The necessary profile documents are presented in Table 1.

The T&D Coordinator will submit the amended and/or new waste profile documents to the Navy, the waste generator, for review and generator "wet-ink" signature certification. After obtaining generator "wet-ink" signature certifications, the T&D Coordinator will submit the waste profile documents to the T&D subcontractors.

The T&D subcontractors will review the waste profile documents to ensure compliance with T&D technologies, procedures, logistics, and permits. Upon waste acceptance approval, the T&D subcontractors will provide to the T&D Coordinator one written waste acceptance letter for each waste stream.

After waste acceptance, IT will schedule off-site transportation for wastes requiring off-site disposal.

1.7 Shipment Preparation

IT will first obtain all T&D subcontractors' requirements and restrictions written for waste quantity, schedule, package and cargo securement, equipment, and personnel. For example, each vehicle will restrict a waste shipment's net-cargo weight (e.g., 80,000-pound gross-weight maximum). If shipping waste drums, IT or the T&D subcontractors will secure all waste container shipments using standard 2-inch by 4-inch wooden beam triangulated blocking-bracing practices. IT or the T&D subcontractors will secure all dump truck or roll-off bin truck shipments using standard HDPE-lining practices and standard leveling-tarping-cording practices. IT will ensure that all waste cargoes are protected from weather and vandalism.

IT will provide and affix all DOT-required labels and placards to waste containers and/or T&D subcontractor vehicles (22 CCR 66262.31 through 66262.33; 49 CFR 172.300 through 172.450). These labels and placards are described in Table 1.

1.8 Manifesting

The IT T&D Coordinator will prepare waste manifest packages (22 CCR 66262.20 through 66262.23; 22 CCR Appendix to Part 66262; 49 CFR 172.200 through 172.205) using IT Corporation's ManageIT™ software. Uniform hazardous waste manifests will describe hazardous wastes, and nonhazardous waste manifests will describe nonhazardous wastes.

The T&D Coordinator will submit the manifest packages to the waste generator for review and generator "wet-ink" custody-signature certification (22 CCR 66262.30[a][1]). After obtaining generator "wet-ink" custody-signature certifications, the T&D Coordinator will submit the manifest packages to the representatives of the first transporter for transporter "wet-ink" custody-signature (22 CCR 66262.30[a][2]). The T&D Coordinator will remove two original copies of each manifest package (22 CCR 66262.40[a]) and make two photocopies of each manifest package. The T&D Coordinator will provide one of the original copies to the waste generator, submit one of the original copies to California DTSC, and keep one of the photocopies for inclusion in the IT Final Report.

Each transporter will obtain a "wet-ink" custody-signature from a representative of the subsequent transporter. The final transporter will obtain a "wet-ink" custody-signature from a representative of the disposal/recycle facility.

The disposal/recycle facility will submit original copies of fully-executed "wet-ink" custody-signed manifests and certificates of disposal (CDs) to the waste generator (22 CCR 66262.40 Y through 66262.43) and submit photocopies of fully-executed manifests and CDs to the T&D Coordinator for inclusion in the IT final report.

TABLES

Table 1
Preliminary Waste Information[1]

Waste Description	Accumulation Methods[2]	Preliminary Characterizations[3]	Profiles & Manifests[4]	Labels & Placards[5]	Transportation Methods	Disposal/Recycle Methods
Soil from excavation operations at CAA 13, including heavy hydrocarbons	Lined roll-off bin containers; or Stockpiled on 20-mil HDPE	Nonhazardous waste solid, not DOT regulated; or California non-RCRA-hazardous waste; DOT Class 9, UN3077, HAZMAT (most probable); or RCRA-hazardous waste; DOT Class 3, UN1863, HAZMAT	Profile package; and Nonhazardous waste manifest California hazardous waste manifest and LDR package	Nonhazardous waste labels; California hazardous waste labels; and Class 9, UN3077 labels and placards (most probable); or Class 3, UN1863 labels and placards	Lined roll-off bin on van truck	Direct California Class II landfill (if nonhazardous) Direct California Class I landfill (if not RCRA-regulated); or Stabilization followed by Class I landfill (if RCRA-regulated for heavy metals); or Class I destructive incineration (if RCRA-regulated for benzene)
Soil from boring and collection trench cuttings	DOT-approved, 55-gallon drums; or Lined roll-off bins	Nonhazardous waste solid, not DOT regulated; or California non-RCRA-hazardous waste; DOT Class 9, UN3077, HAZMAT (most probable); or RCRA-hazardous waste; DOT Class 3, UN1863, HAZMAT	Profile package; and Nonhazardous waste manifest California hazardous waste manifest and LDR package	Nonhazardous waste labels; California hazardous waste labels; and Class 9, UN3077 labels and placards (most probable); or Class 3, UN1863 labels and placards	Stake-bed or van truck	Direct California Class II landfill (if nonhazardous) Direct California Class I landfill (if not RCRA-regulated); or Stabilization followed by Class I landfill (if RCRA-regulated for heavy metals); or Class I destructive incineration (if RCRA-regulated for benzene)
Concrete and debris	Lined roll-off bin containers; or Stockpiled on 20-mil HDPE	Nonhazardous waste solid, not DOT regulated; or California non-RCRA-hazardous waste; DOT Class 9, UN3077, HAZMAT (most probable); or RCRA-hazardous waste; DOT Class 3, UN1863, HAZMAT	Profile package; and Nonhazardous waste manifest California hazardous waste manifest and LDR package	Nonhazardous waste labels; California hazardous waste labels; and Class 9, UN3077 labels and placards (most probable); or Class 3, UN1863 labels and placards	Lined roll-off bin on van truck	Direct California Class II landfill (if nonhazardous) Direct California Class I landfill (if not RCRA-regulated); or Stabilization followed by Class I landfill (if RCRA-regulated for heavy metals); or Class I destructive incineration (if RCRA-regulated for benzene)
Rinse water and extracted waste water[6]	Liquid storage tanks; or UN1A2 open-head drums	Not regulated by EPA or DTSC; Not regulated by DOT (most probable)	Profile package and nonhazardous waste certfication; and Nonhazardous waste manifest package	Nonhazardous waste labels	Vacuum tanker truck Stake bed or van truck (if packaged in drums)	Redistillation followed by carbon desorption and nonhazardous California Class II disposal
Petroleum product (not anticipated but included here for completeness)	Liquid storage tank or UN1A2 open-head drums	Non-RCRA-hazardous waste; not regulated by DOT RCRA-hazardous waste; DOT Class 3, UN1993 Nonhazardous waste liquid	Profile package; and California hazardous waste manifest and LDR package Nonhazardous waste manifest	California hazardous waste label Class 3, UN1863 labels and placards Nonhazardous waste labels	Vacuum tanker truck Stake bed or van truck (if packaged in drums)	Fuels blending
Spent carbon	UN1A2 open-head drum	California non-RCRA-hazardous waste; not regulated by DOT	Profile package California hazardous waste manifest and LDR package	California hazardous waste label	Stake bed or van truck	Regeneration
PPE (do not co-mingle with soil)	UN13H super-sacks; or UN1A2 open-head drums	Nonhazardous waste solid California non-RCRA hazardous waste; Not regulated by DOT	Profile package Nonhazardous waste manifest California hazardous waste manifest and LDR package	Nonhazardous labels California hazardous waste labels	Stake bed or van truck (if nonpumpable and packaged in drums)	Direct California Class I landfill (if not RCRA-regulated) Stabilization followed by Class I landfill (if RCRA-regulated for heavy metals); or Class I destructive incineration (if RCRA-regulated for benzene)
Spent Particulate Bag Filters	UN1A2 open-head drums	Nonhazardous waste solid	Profile package	Nonhazardous labels	Stake bed or van truck (if nonpumpable and packaged in drums)	Direct California Class II landfill (if nonhazardous)

Notes to Table 1:

1 *Information presented in Table 1 was prepared based on information provided in the Sampling and Analysis Plan.*
2 *Written accumulation procedures are presented in Section 1.3.*
3 *Written characterization procedures are presented in Section 1.5.*
4 *Written profiling and manifesting procedures are presented in Sections 1.6 and 1.8, respectively.*
5 *Written shipment preparation procedures are presented in Section 1.7.*
6 *Wastewater may be disposed of at the on-site treatment plant.*
7 *DOT denotes Department of Transportation.*
8 *DTSC denotes Department of Toxic Substance Control.*
9 *EPA denotes U.S. Environmental Protection Agency.*
10 *HAZMAT denotes hazardous materials.*
11 *HDPE denotes high-density polyethylene.*
12 *LDR denotes land disposal restriction.*
13 *RCRA denotes Resource Conservation and Recovery Act.*
14 *UN denotes United Nations.*

Table 2
Sampling and Analysis Summary—Corrective Action Areas 7, 11, and 13

Sample Matrix	Number of Samples (per Site)	Number of QC Samples(Per Site)	Analytical Method Measurement	Description
Dissolved-Phase/Free Product Plume Delineation				
Groundwater	1	One trip blank	VOCs (EPA 5030/8260B)	Sample from piezometer with free product.
Free Product	1	None	TPH fingerprint (EPA 8015B) Viscosity, density, and specific gravity(ASTM D445)	Sample from piezometer or well
Water - Rinsate - Development	 1 1	 None	 TPH full range (EPA 8015B) CAM 17 Metals (EPA 6010B/7000) VOCs (EPA 8260B)	 One composite sample for TPH and metals analysis. One discrete sample for VOCs analysis.
DVE Pre-Pilot and Pilot-Scale Testing				
Vapor - Influent - Stack	 7 1	 None	 TVPH (EPA TO-3) VOCs (EPA TO-14)	 Only one sample analyzed for VOCs
Groundwater - Influent	 4 1	 None	 TPH full range (EPA 8015B) VOCs (EPA 8260B) CAM 17 Metals (EPA 6010B/7000)	 Only one sample analyzed for VOCs and metals
Groundwater - Effluent	 3 1	 Three (3) trip blanks, analyzed only if TPH or VOCs are detected in the effluent.	 TPH full range (EPA 8015B) VOCs (EPA 8260B) CAM 17 Metals (EPA 6010B/7000)	 Only one sample analyzed for metals
Free Product - Recovered	 1	 None	 TPH full range (EPA 8015B) Metals (EPA 6010B/7000) Flash Point (EPA 1010) TOX (EPA 9020B)	 Sample from waste oil holding tank
Soil - Cuttings	 2 2	 None	 TPH full range (EPA 8015B) CAM 17 Metals (EPA 6010B/7000) Reactivity (SW-846 7.3) Corrosivity (SW-846 9045) Ignitability (SW-846 7.1) VOCs (EPA 8260B)	 Discrete grab samples for VOCs analysis. Composite samples for all other analyses.

Table 2 (Continued)
Sampling and Analysis Summary—Corrective Action Areas 7, 11, and 13

Sample Matrix	Number of Samples (per Site)	Number of QC Samples(Per Site)	Analytical Method Measurement	Description
Full-Scale Treatment System Construction, Operations, and Closure				
Vapor - Influent - Stack	 8 1	 None	 TVPH (EPA TO-3) VOCs (EPA TO-14)	 Only one sample analyzed for VOCs.
Groundwater - Influent	 6 1	 None	 TPH full range (EPA 8015B) VOCs (EPA 8260B)	 Only one sample analyzed for VOCs.
Groundwater - Effluent	 6 1	 Six (6) trip blanks, only analyzed if TPH or VOCs are detected in the effluent.	 TPH full range (EPA 8015B) VOCs (EPA 8260B) CAM 17 Metals (EPA 6010B/7000)	 Only one sample analyzed for metals.
Full-Scale Construction, Operations, and Closure (Continued)				
Spent GAC - Vapor Phase	 1	 None	 TPH full range (EPA 8015B) VOCs (EPA 8260B) CAM 17 Metals (EPA 6010B/7000) Reactivity (SW-846 7.3) Corrosivity (SW-846 9045) Ignitability (SW-846 7.1)	 One composite sample
Spent GAC - Liquid Phase	 1	 None	 TPH full range (EPA 8015B) VOCs (EPA 8260B) CAM 17 Metals (EPA 6010B/7000) Reactivity (SW-846 7.3) Corrosivity (SW-846 9045) Ignitability (SW-846 7.1)	 One composite sample
Sludge - (OWS, LV/S, Tank Bottoms)	 1 1	 None	 TPH full range (EPA 8015B) CAM 17 Metals (EPA 6010B/7000) Reactivity (SW-846 7.3) Corrosivity (SW-846 9045) Ignitability (SW-846 7.1) VOCs (EPA 8260B)	 One discrete grab sample for VOCs analysis. One composite sample for all other analyses.
Free Product - Recovered	 1	 None	 TPH full range (EPA 8015B) Metals (EPA 6010B/7000) Flash Point (EPA 1010) TOX (EPA 9020B)	

Table 2 (Continued)
Sampling and Analysis Summary—Corrective Action Areas 7, 11, and 13

Sample Matrix	Number of Samples (per Site)	Number of QC Samples(Per Site)	Analytical Method Measurement	Description
Soil - Cuttings	4 4	None	TPH full range (EPA 8015B) CAM 17 Metals (EPA 6010B/7000) Reactivity (SW-846 7.3) Corrosivity (SW-846 9045) Ignitability (SW-846 7.1) VOCs (EPA 8260B)	Discrete grab samples for VOCs analysis. Composite samples for all other analyses.
Corrective Action Area 13 Soil Excavation				
Water - Decontamination - Rinsate	1 1	None	TPH full range (EPA 8015B) CAM 17 Metals (EPA 6010B/7000) VOCs (EPA 8260B)	One composite sample for TPH and metals analysis. One discrete sample for VOCs analysis.
Corrective Action Area 13 Soil Excavation (Continued)				
Soil	4 4	None	TPH full range (EPA 8015B) CAM 17 Metals (EPA 6010B/7000) Reactivity (SW-846 7.3) Corrosivity (SW-846 9045) Ignitability (SW-846 7.1) SVOCs (EPA 8270B) VOCs (EPA 8260B) Possible TCLP (EPA Method 1311) and STLC analysis (CCR Title 22)	Discrete grab samples for VOCs analysis. Composite samples for all other analyses. One 4-point composite and one grab per 500 cubic yards
Concrete and Debris	1	None	TPH full range (EPA 8015B) CAM 17 Metals (EPA 6010B/7000) Reactivity (SW-846 7.3) Corrosivity (SW-846 9045) Ignitability (SW-846 7.1) Possible TCLP (EPA Method 1311) and STLC analysis (CCR Title 22)	Discrete grab samples for VOCs analysis. Composite samples for all other analyses. One 4-point composite per 500 cubic yards
Demobilization				
Water - Decontamination - Rinsate	 1 1	None	TPH full range (EPA 8015B) CAM 17 Metals (EPA 6010B/7000) VOCs (EPA 8260B)	One composite sample for TPH and metals analysis. One discrete sample for VOCs analysis.
Sludge (OWS, - LV/S, Tank Bottoms)	1 1	None	TPH full range (EPA 8015B) CAM 17 Metals (EPA 6010B/7000) Reactivity (SW-846 7.3) Corrosivity (SW-846 9045) Ignitability (SW-846 7.1) VOCs (EPA 8260B)	One discrete grab sample for VOCs analysis. One composite sample for all other analyses.

FINAL
PROJECT QUALITY CONTROL PLAN
HYDROCARBON PLUME DELINEATION, REMEDIATION, AND SITE CLOSURE MEASURES
CORRECTIVE ACTION AREAS 7, 11, AND 13
ALAMEDA POINT
ALAMEDA, CALIFORNIA

Environmental Remedial Action
Contract No. N62474-98-D-2076
Contract Task Order 0037

Document Control Number 1518
Revision 1

July 20, 2001

Submitted to:

Department of the Navy
Southwest Division
Naval Facilities Engineering Command
1220 Pacific Highway
San Diego, California 92132-5190

Submitted by:

IT Corporation
4005 Port Chicago Highway
Concord, California 94520-1120

Issued to:______________________________ Date:_______________

☐ Controlled ☐ Uncontrolled

FINAL
PROJECT QUALITY CONTROL PLAN
HYDROCARBON PLUME DELINEATION, REMEDIATION, AND SITE CLOSURE MEASURES
CORRECTIVE ACTION AREAS 7, 11, AND 13
ALAMEDA POINT
ALAMEDA, CALIFORNIA

Environmental Remedial Action
Contract No. N62474-98-D-2076
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Document Control Number 1518
Revision 1

July 20, 2001

Approved by: ______________________ Date: 7-20-01
Mary Louise Morse
IT Project Manager

Approved by: ______________________ Date: 20 July 2001
Stephen Massey
IT Program Quality Control Manager

Table of Contents

List of Appendices

Acronyms and Abbreviations

CAA	Corrective Action Area
CTO	Contract Task Order
IT	IT Corporation
PQCP	Project Quality Control Plan
QC	quality control
QCPP	Quality Control Program Plan
SOP	Standard Operating Procedures
SQP	Standard Quality Procedures

1.0 Introduction

This Project Quality Control Plan (PQCP) has been prepared to describe the quality control (QC) actions that IT Corporation (IT) will implement during the hydrogen delineation, remediation, and site closure activities at Corrective Action Areas (CAA) 7, 11, and 13 at Alameda Point, Alameda, California.

This PQCP will be used in conjunction with the Quality Control Program Plan (QCPP) that IT has prepared for work under Remedial Action Contract No. N62474-98-D-2076 and with IT Standard Quality Procedures (SQP)/Standard Operating Procedures (SOP) as applicable. Section 2.0 of this PQCP describes the portions of the QCPP that are applicable to this project and any site-specific modifications to the QCPP that are required. Section 3.0 of this PQCP lists the IT SQPs and SOPs that are applicable. Appendices A through E present the following supporting documentation for the site-specific QC activities that IT will perform throughout the execution of this project:

- Appendix A, Project QC Manager Letter of Designation
- Appendix B, Alternate Project QC Manager Letter of Designation
- Appendix C, Definable Features of Work Matrix
- Appendix D, Testing Plan and Log
- Appendix E, Submittal Register

2.0 Quality Control Program Plan

The following portions of the QCPP are applicable to the work conducted under this project with modifications as noted:

- Management Policy Statement: applicable in its entirety
- Section 1.0 - Introduction: applicable in its entirety
- Section 2.0 - Organization and Responsibilities: applicable with the following modifications:
    1. Add to Section 2.0 The QC organization will be as shown in the applicable Sampling and Analysis Plan
- Section 3.0 - Quality Control Management: applicable in its entirety
- Section 4.0 - Personnel Training and Qualifications: applicable in its entirety
- Section 5.0 - Instructions, Procedures, and Drawings: applicable in its entirety
- Section 6.0 - Document Control: applicable in its entirety
- Section 7.0 - Procurement: applicable in its entirety
- Section 8.0 - Chemical Data Quality: applicable in its entirety
- Section 9.0 - Field Sampling: applicable as described in the Sampling and Analysis Plan
- Section 10.0 - Laboratory Analysis: applicable as described in the Sampling and Analysis Plan
- Section 11.0 - Report Preparation: applicable in its entirety
- Section 12.0 - Review of Work Activities: applicable in its entirety
- Section 13.0 - Inspections: applicable in its entirety
- Section 14.0 - Calibration and Maintenance of Measuring and Test Equipment: applicable in its entirety
- Section 15.0 - Test Control: applicable in its entirety
- Section 16.0 - Nonconformance Control and Corrective Actions: applicable in its entirety
- Section 17.0 - Change Control: not applicable in its entirety. Refer to the Working Draft Project Management Guidelines

- Section 18.0 - Audits and Surveillance: applicable with the following modification: Subsections 18.1 through 18.8 do not apply
- Section 19.0 - Records Management: applicable in its entirety

3.0 Procedures

3.1 Standard Quality Procedures

The following IT SQPs have been determined to be applicable to this project:

- SQP 1.1 - Contractor Quality Control Program
- SQP 3.2 - Indoctrination and Training
- SQP 4.1 - Document Control
- SQP 4.2 - Records Management
- SQP 5.1 - Preparation, Revision, and Approval of Plans and Procedures
- SQP 6.1 - Preparation, Review, and Approval of Procurement Documents
- SQP 7.1 - Quality Inspections and Inspection Records
- SQP 7.2 - Receipt Inspection
- SQP 8.2 - Calibration and Maintenance of Measuring and Test Equipment
- SQP 10.1 - Nonconformance Control
- SQP 10.2 - Corrective Action
- SQP 10.3 - Stop Work Order
- SQP 13.1 - Coordination of Subcontracted Analytical Laboratories

3.2 Standard Operating Procedures

The following IT SOPs have been determined to be applicable to this project:

- SOP 1.1 - Chain of Custody
- SOP 2.1 - Sample Handling, Packaging, and Shipping
- SOP 3.1 - Surface and Shallow Subsurface Soil Sampling
- SOP 3.2 - Subsurface Soil Sampling While Drilling
- SOP 5.1 - Water Level Measurements in Monitoring Wells
- SOP 6.1 - Sampling Equipment and Well Material Decontamination
- SOP 6.2 - Drilling and Heavy Equipment Decontamination
- SOP 7.1 - Surface and Subsurface Geophysics
- SOP 8.1 - Monitoring Well Installation
- SOP 8.2 - Monitoring Well Development
- SOP 9.1 - Groundwater Sampling
- SOP 12.1 - Soil Stockpiling
- SOP 14.1 - Hollow-Stem Auger Drilling
- SOP 17.1 - Sample Labeling
- SOP 17.2 - Sample Numbering
- SOP 18.1 - Field QC Sampling
- SOP 23.1 - Land Surveying

APPENDIX A
PROJECT QC MANAGER LETTER OF DESIGNATION

HYDROCARBON CORRECTIVE ACTIONS
ALAMEDA POINT
ALAMEDA, CALIFORNIA
CONTRACT TASK ORDER 0037

PROJECT QC MANAGER
LETTER OF DESIGNATION

JULY 20, 2001

Mr. Eric Watabayashi,

This letter will serve to assign you as IT Corporation's (IT) Project Quality Control (QC) Manager for the above captioned contract task order. In the case where you are not able to perform the Project QC Manager's duties, Mr. Chuck Holman or Ms. Robyn Matsumoto will serve as your Alternate Project QC Manager. In the role of Project QC Manager you will have the responsibilities and authorities designated in Section 2.1.3 of the Quality Control Program Plan (QCPP). Additionally, you are granted stop work authority and will exercise this authority consistent with the QCPP, Section 16.4 and Standard Quality Procedures (SQP) 10.3. You are granted the authority to approve IT-approved submittals which have been certified by qualified submittal reviewers, as identified in the QC Organization Chart for this contract task order, to ensure the quality of the work, and to direct the removal and/or replacement of nonconforming materials or work. In this capacity you will report directly to me and will administer the established requirements of the contract task order Project QC Plan.

If you have any questions or require additional information, please contact me at (925) 288-2278.

Sincerely,
IT CORPORATION

Stephen Massey
Program QC Manager

APPENDIX B
ALTERNATE PROJECT QC MANAGER LETTER OF DESIGNATION

HYDROCARBON CORRECTIVE ACTIONS
ALAMEDA POINT
ALAMEDA, CALIFORNIA
CONTRACT TASK ORDER 0037

ALTERNATE PROJECT QC MANAGER
LETTER OF DESIGNATION

JULY 20, 2001

Mr. Chuck Holman,

This letter will serve to assign you as IT Corporation's (IT) Alternate Project Quality Control (QC) Manager for the above captioned contract task order. In the case where the designated Project QC Manager, Mr. Eric Watabayashi, is unable to perform the Project QC Manager's duties, you will serve in that capacity. In this role, you will have the responsibilities and authorities designated in Section 2.1.3 of the Quality Control Program Plan (QCPP). Additionally, you will have stop work authority and will exercise this authority consistent with the QCPP, Section 16.4 and Standard Quality Procedures (SQP) 10.3. You are granted the authority to approve IT-approved submittals which have been certified by qualified submittal reviewers, as identified on the QC Organization Chart for this contract task order, to ensure the quality of the work, and to direct the removal and/or replacement of nonconforming materials or work. You will be authorized to act as an alternate for 14 consecutive working days or 30 non-consecutive working days at a maximum. You will report directly to me and will administer the established requirements of the contract task order Project QC Plan.

If you have any questions or require additional information, please contact me at (925) 288-2278.

Sincerely,
IT CORPORATION

Stephen Massey
Program QC Manager

HYDROCARBON CORRECTIVE ACTIONS
ALAMEDA POINT
ALAMEDA, CALIFORNIA
CONTRACT TASK ORDER 0037

ALTERNATE PROJECT QC MANAGER
LETTER OF DESIGNATION

JULY 20, 2001

Mr. Robyn Matsumoto,

This letter will serve to assign you as IT Corporation's (IT) Alternate Project Quality Control (QC) Manager for the above captioned contract task order. In the case where the designated Project QC Manager, Mr. Eric Watabayashi, is unable to perform the Project QC Manager's duties, you will serve in that capacity. In this role, you will have the responsibilities and authorities designated in Section 2.1.3 of the Quality Control Program Plan (QCPP). Additionally, you will have stop work authority and will exercise this authority consistent with the QCPP, Section 16.4 and Standard Quality Procedures (SQP) 10.3. You are granted the authority to approve IT-approved submittals which have been certified by qualified submittal reviewers, as identified on the QC Organization Chart for this contract task order, to ensure the quality of the work, and to direct the removal and/or replacement of nonconforming materials or work. You will be authorized to act as an alternate for 14 consecutive working days or 30 non-consecutive working days at a maximum. You will report directly to me and will administer the established requirements of the contract task order Project QC Plan.

If you have any questions or require additional information, please contact me at (925) 288-2278.

Sincerely,
IT CORPORATION

Stephen Massey
Program QC Manager

APPENDIX C
DEFINABLE FEATURES OF WORK MATRIX

PROJECT QUALITY CONTROL PLAN
HYDROCARBON PLUME DELINEATION, REMEDIATION, AND SITE CLOSURE MEASURES CORRECTIVE ACTION AREAS 7, 11, & 13
ALAMEDA POINT, ALAMEDA, CALIFORNIA
Contract Task Order No. 0037
DEFINABLE FEATURES OF WORK MATRIX

Specification Section	Paragraph No.	Feature of Work	Prep		Initial		Follow up	Remarks
			Req.	Date	Req.	Date	Req.	
Work Plan	3.1	Sampling and Evaluation of Existing Wells	X		X		X	
Work Plan	3.4	Utility Clearance	X		X		X	
Work Plan	3.5	Soil and Groundwater Sampling	X		X		X	
Work Plan	3.5, 3.6	Drilling and Peizometer Installation	X		X		X	
Work Plan	3.7	Surveying	X		X		X	
Work Plan	3.8	Well Piezometer	X		X		X	
Work Plan	4.0	Plume Delineation	X		X		X	
Work Plan	5.1, 5.2	Extraction Well Installation and Development	X		X		X	
Work Plan	5.5, 5.6, 5.7	Exchange Service Station Pilot-Scale System Installation	X		X		X	
Work Plan	5.8	Full-Scale System Installation						
Work Plan	6.1	Mini Storage Unit Demolition, and Removal	X		X		X	
Work Plan	6.2, 6.3	Excavation and Sampling	X		X		X	
Work Plan	6.4, 6.5	Backfill/ Site Restoration	X		X		X	

APPENDIX D
TESTING PLAN AND LOG

TESTING PLAN AND LOG

Contract No. N62474-98-D-2076 Contract Task Order No. 0037	HYDROCARBON PLUME DELINEATION, REMEDIATION, AND SITE CLOSURE FOR CORRECTIVE ACTION AREAS 7, 11,& 13 ALAMEDA POINT, ALAMEDA, CALIFORNIA	CONTRACTOR IT Corporation

SPECIFICATION SECTION AND PARAGRAPH NUMBER	TEST PROCEDURE	TEST NAME	ACCREDITED/ APPROVED LAB YES	NO	SAMPLED BY	LOCATION OF TEST ON SITE	OFF SITE	FREQUENCY OF TEST	DATE COMPLETE	DATE FORWARDED TO CONTR. OFF	REMARKS
**											

*** TESTING REQUIREMENTS ARE SPECIFIED IN THE WORK PLAN FOR THE PILOT SYSTEM TESTING, NO ADDITIONAL TESTING IS ANTICIPATED.*

APPENDIX E
SUBMITTAL REGISTER

SUBMITTAL REGISTER

CONTRACT NO. N62474-98-D-2076
CTO. No. 0037

.LE AND LOCATION: HYDROCARBON DELINEATION, REMEDIATION, AND SITE CLOSURE MEASURES
CORRECTIVE ACTION AREAS 7, 11, &13, ALAMEDA POINT, ALAMEDA CA.

CONTRACTOR
IT Corporation

SPECIFICATION SECTION
Base Contract

				TYPE OF SUBMITTAL									CLASSIFICATION			CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		
TRANS-MITTAL NO. a	ITEM NO. b	SPECIFICATION PARAGRAPH NO. c	DESCRIPTION OF ITEM SUBMITTED d	DATA e	DRAWINGS f	INSTRUCTIONS g	SCHEDULES h	STATEMENTS i	REPORTS j	CERTIFICATES k	SAMPLES l	RECORDS m	INFORMATION ONLY n	GOVERNMENT APPROVED o	REVIEWER p	SUB-MIT q	APPROVAL NEEDED BY r	MATERIAL NEEDED BY s	CODE t	DATE u	SUBMIT TO GOVERN-MENT v	CODE w	DATE x	REMARKS y
	001	N/A	Work Plan, SD-08					X						X										
	002	N/A	Sampling and Analysis Plan, SD-08					X						X										
	003	4.2, 4.3.1	Environmental Protection Plan, SD-08					X						X										
	004	5.3.2	Site Health and Safety Plan, SD-08					X						X										
	005	6.5.2, 6.7, 7.3	Project QC Plan w / Submittal Register, SD-18					X						X										

Continue

SUBMITTAL REGISTER

CONTRACT NO. N62474-98-D-2076
CTO No. 0037

LE AND LOCATION: HYDROCARBON DELINEATION, REMEDIATION, AND SITE CLOSURE MEASURES CORRECTIVE ACTION AREAS 7, 11, &13, ALAMEDA POINT, ALAMEDA CA.

CONTRACTOR
IT Corporation

SPECIFICATION SECTION
Work Plan

TRANS-MITTAL NO. a	ITEM NO. b	SPECIFICATION PARAGRAPH NO. c	DESCRIPTION OF ITEM SUBMITTED d	TYPE OF SUBMITTAL: DATA e	DRAWINGS f	INSTRUCTIONS g	SCHEDULES h	STATEMENTS i	REPORTS j	CERTIFICATES k	SAMPLES l	RECORDS m	CLASSIFICATION: INFORMATION ONLY n	GOVERNMENT APPROVED o	REVIEWER p	CONTRACTOR SCHEDULE DATES: SUB-MIT q	APPROVAL NEEDED BY r	MATERIAL NEEDED BY s	CONTRACTOR ACTION: CODE t	DATE u	SUBMIT TO GOVERN-MENT v	GOVERNMENT ACTION: CODE w	DATE x	REMARKS[1] y
	001	7.1	Pilot–Scale specs and drawings for Area 37 and Building 530/Defueling Area, SD-04		X									X										
	002	7.2	Technical Memoranda, SD-08						X				X											Submitted monthly
	003	7.3	Full-Scale specifications and drawings, SD-04		X									X										
	004	7.4	Closure Report, Draft, SD-08						X					X										
	005	7.4	Closure Report, Draft Final, SD-08						X					X										
	006	7.4	Closure Report, Final, SD-08						X				X											
	007	7.5	Corrective Action Plan for the Mini-Storage Area, Draft, SD-08																					
	008	7.5	Corrective Action Report for the Mini-Storage Area, Draft Final, SD-08						X					X										
	009	7.5	Corrective Action Report for the Mini-Storage Area, Final, SD-08						X				X											
	010	7.6	Field Activity Report, Draft, SD-08						X					X										Within 45 days of field activity completion
	011	7.6	Field Activity Report, Final, SD-08						X				X											